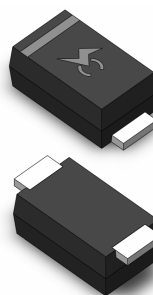
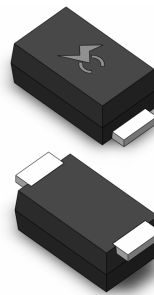


## Surface Mount Transient Voltage Suppressors (TVS)

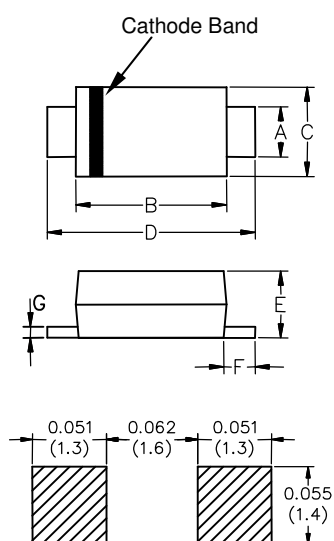
**SMF Series 5.0 To 190 V 200W**

### Features

- u Compatible with industrial standard package SOD-123
- u For surface mounted applications in order to optimize board space
- u Low leakage
- u Uni and Bidirectional unit
- u Glass passivated junction
- u Low inductance
- u Excellent clamping capability
- u 200W Peak power capability at  $10 \times 1000\mu\text{s}$  waveform
- u Repetition rate (duty cycle): 0.01%
- u Fast response time: typically less than 1.0ps from 0 Volts to  $V_{BR}$  min
- u High Temperature soldering:  $260^\circ\text{C}/40$  seconds at terminals
- u Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR@25^\circ\text{C}} \times \Delta T$
- u Plastic package has Underwriters Laboratory Flammability 94V-0
- u Matte tin lead-free Plated
- u Halogen free and RoHS compliant
- u Typical failure mode is short from over-specified voltage or current
- u Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- u IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- u ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- u EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)

**Uni-directional**

**Bi-directional**

**SOD-123**

### Dimensions

**SOD-123**


| Dimensions | Inches |       | Millimeters |      |
|------------|--------|-------|-------------|------|
|            | Min    | Max   | Min         | Max  |
| <b>A</b>   | 0.031  | 0.044 | 0.77        | 1.09 |
| <b>B</b>   | 0.1    | 0.112 | 2.51        | 2.81 |
| <b>C</b>   | 0.055  | 0.071 | 1.38        | 1.78 |
| <b>D</b>   | 0.140  | 0.152 | 3.51        | 3.82 |
| <b>E</b>   | 0.037  | 0.053 | 0.93        | 1.33 |
| <b>F</b>   | 0.01   | -     | 0.25        | -    |
| <b>G</b>   | -      | 0.008 | -           | 0.20 |

**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

| Part Number |          | Marking |    | Reverse Stand-Off Voltage V <sub>RWM</sub> (V) | Breakdown Voltage V <sub>BR</sub> (V) @I <sub>T</sub> |        | Test Current I <sub>T</sub> (mA) | Maximum Clamping Voltage V <sub>C</sub> @I <sub>PP</sub> (V) | Maximum Peak Pulse Current I <sub>PP</sub> (A) | Maximum Reverse Leakage I <sub>R</sub> @V <sub>RWM</sub> (μA) |
|-------------|----------|---------|----|------------------------------------------------|-------------------------------------------------------|--------|----------------------------------|--------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------------|
| Uni         | Bi       | Uni     | Bi |                                                | MIN                                                   | MAX    |                                  |                                                              |                                                |                                                               |
| SMF5.0A     | SMF5.0CA | FE      | KE | 5.0                                            | 6.40                                                  | 7.00   | 10                               | 9.2                                                          | 21.74                                          | 400                                                           |
| SMF6.0A     | SMF6.0CA | FG      | KG | 6.0                                            | 6.67                                                  | 7.37   | 10                               | 10.3                                                         | 19.42                                          | 400                                                           |
| SMF6.5A     | SMF6.5CA | FK      | KK | 6.5                                            | 7.22                                                  | 7.98   | 10                               | 11.2                                                         | 17.86                                          | 250                                                           |
| SMF7.0A     | SMF7.0CA | FM      | KM | 7.0                                            | 7.78                                                  | 8.60   | 10                               | 12.0                                                         | 16.67                                          | 100                                                           |
| SMF7.5A     | SMF7.5CA | FP      | KP | 7.5                                            | 8.33                                                  | 9.21   | 1                                | 12.9                                                         | 15.50                                          | 50                                                            |
| SMF8.0A     | SMF8.0CA | FR      | KR | 8.0                                            | 8.89                                                  | 9.83   | 1                                | 13.6                                                         | 14.71                                          | 25                                                            |
| SMF8.5A     | SMF8.5CA | FT      | KT | 8.5                                            | 9.44                                                  | 10.40  | 1                                | 14.4                                                         | 13.89                                          | 10                                                            |
| SMF9.0A     | SMF9.0CA | FV      | KV | 9.0                                            | 10.00                                                 | 11.10  | 1                                | 15.4                                                         | 12.99                                          | 5                                                             |
| SMF10A      | SMF10CA  | FX      | KX | 10.0                                           | 11.10                                                 | 12.30  | 1                                | 17.0                                                         | 11.76                                          | 2.5                                                           |
| SMF11A      | SMF11CA  | FZ      | KZ | 11.0                                           | 12.20                                                 | 13.50  | 1                                | 18.2                                                         | 10.99                                          | 2.5                                                           |
| SMF12A      | SMF12CA  | HE      | LE | 12.0                                           | 13.30                                                 | 14.70  | 1                                | 19.9                                                         | 10.05                                          | 2.5                                                           |
| SMF13A      | SMF13CA  | HG      | LG | 13.0                                           | 14.40                                                 | 15.90  | 1                                | 21.5                                                         | 9.30                                           | 1                                                             |
| SMF14A      | SMF14CA  | HK      | LK | 14.0                                           | 15.60                                                 | 17.20  | 1                                | 23.2                                                         | 8.62                                           | 1                                                             |
| SMF15A      | SMF15CA  | HM      | LM | 15.0                                           | 16.70                                                 | 18.50  | 1                                | 24.4                                                         | 8.20                                           | 1                                                             |
| SMF16A      | SMF16CA  | HP      | LP | 16.0                                           | 17.80                                                 | 19.70  | 1                                | 26.0                                                         | 7.69                                           | 1                                                             |
| SMF17A      | SMF17CA  | HR      | LR | 17.0                                           | 18.90                                                 | 20.90  | 1                                | 27.6                                                         | 7.25                                           | 1                                                             |
| SMF18A      | SMF18CA  | HT      | LT | 18.0                                           | 20.00                                                 | 22.10  | 1                                | 29.2                                                         | 6.85                                           | 1                                                             |
| SMF19A      | SMF19CA  | HB      | LB | 19.0                                           | 21.10                                                 | 23.30  | 1                                | 30.6                                                         | 6.54                                           | 1                                                             |
| SMF20A      | SMF20CA  | HV      | LV | 20.0                                           | 22.20                                                 | 24.50  | 1                                | 32.4                                                         | 6.17                                           | 1                                                             |
| SMF22A      | SMF22CA  | HX      | LX | 22.0                                           | 24.40                                                 | 26.90  | 1                                | 35.5                                                         | 5.63                                           | 1                                                             |
| SMF24A      | SMF24CA  | HZ      | LZ | 24.0                                           | 26.70                                                 | 29.50  | 1                                | 38.9                                                         | 5.14                                           | 1                                                             |
| SMF26A      | SMF26CA  | JE      | ME | 26.0                                           | 28.90                                                 | 31.90  | 1                                | 42.1                                                         | 4.75                                           | 1                                                             |
| SMF28A      | SMF28CA  | JG      | MG | 28.0                                           | 31.10                                                 | 34.40  | 1                                | 45.4                                                         | 4.41                                           | 1                                                             |
| SMF30A      | SMF30CA  | JK      | MK | 30.0                                           | 33.30                                                 | 36.80  | 1                                | 48.4                                                         | 4.13                                           | 1                                                             |
| SMF33A      | SMF33CA  | JM      | MM | 33.0                                           | 36.70                                                 | 40.60  | 1                                | 53.3                                                         | 3.75                                           | 1                                                             |
| SMF36A      | SMF36CA  | JP      | MP | 36.0                                           | 40.00                                                 | 44.20  | 1                                | 58.1                                                         | 3.44                                           | 1                                                             |
| SMF40A      | SMF40CA  | JR      | MR | 40.0                                           | 44.40                                                 | 49.10  | 1                                | 64.5                                                         | 3.10                                           | 1                                                             |
| SMF43A      | SMF43CA  | JT      | MT | 43.0                                           | 47.80                                                 | 52.80  | 1                                | 69.4                                                         | 2.88                                           | 1                                                             |
| SMF45A      | SMF45CA  | JV      | MV | 45.0                                           | 50.00                                                 | 55.30  | 1                                | 72.7                                                         | 2.75                                           | 1                                                             |
| SMF48A      | SMF48CA  | JX      | MX | 48.0                                           | 53.30                                                 | 58.90  | 1                                | 77.4                                                         | 2.58                                           | 1                                                             |
| SMF51A      | SMF51CA  | JZ      | MZ | 51.0                                           | 56.70                                                 | 62.70  | 1                                | 82.4                                                         | 2.43                                           | 1                                                             |
| SMF54A      | SMF54CA  | XE      | NE | 54.0                                           | 60.00                                                 | 66.30  | 1                                | 87.1                                                         | 2.30                                           | 1                                                             |
| SMF58A      | SMF58CA  | XG      | NG | 58.0                                           | 64.40                                                 | 71.20  | 1                                | 93.6                                                         | 2.14                                           | 1                                                             |
| SMF60A      | SMF60CA  | XK      | NK | 60.0                                           | 66.70                                                 | 73.70  | 1                                | 96.8                                                         | 2.07                                           | 1                                                             |
| SMF64A      | SMF64CA  | XM      | NM | 64.0                                           | 71.10                                                 | 78.60  | 1                                | 103.0                                                        | 1.94                                           | 1                                                             |
| SMF70A      | SMF70CA  | XP      | NP | 70.0                                           | 77.80                                                 | 86.00  | 1                                | 113.0                                                        | 1.77                                           | 1                                                             |
| SMF75A      | SMF75CA  | XR      | NR | 75.0                                           | 83.30                                                 | 92.10  | 1                                | 121.0                                                        | 1.65                                           | 1                                                             |
| SMF78A      | SMF78CA  | XT      | NT | 78.0                                           | 86.70                                                 | 95.80  | 1                                | 126.0                                                        | 1.59                                           | 1                                                             |
| SMF80A      | SMF80CA  | XB      | NB | 80.0                                           | 88.80                                                 | 97.60  | 1                                | 129.0                                                        | 1.55                                           | 1                                                             |
| SMF85A      | SMF85CA  | XV      | NV | 85.0                                           | 94.40                                                 | 104.00 | 1                                | 137.0                                                        | 1.46                                           | 1                                                             |
| SMF90A      | SMF90CA  | XX      | NX | 90.0                                           | 100.00                                                | 111.00 | 1                                | 146.0                                                        | 1.37                                           | 1                                                             |
| SMF100A     | SMF100CA | XZ      | NZ | 100.0                                          | 111.00                                                | 123.00 | 1                                | 162.0                                                        | 1.23                                           | 1                                                             |
| SMF110A     | SMF110CA | TE      | PE | 110.0                                          | 122.00                                                | 135.00 | 1                                | 177.0                                                        | 1.13                                           | 1                                                             |
| SMF120A     | SMF120CA | TG      | PG | 120.0                                          | 133.00                                                | 147.00 | 1                                | 193.0                                                        | 1.04                                           | 1                                                             |
| SMF130A     | SMF130CA | TK      | PK | 130.0                                          | 144.00                                                | 159.00 | 1                                | 209.0                                                        | 0.96                                           | 1                                                             |
| SMF140A     | SMF140CA | TB      | PB | 140.0                                          | 155.00                                                | 171.00 | 1                                | 224.0                                                        | 0.89                                           | 1                                                             |
| SMF150A     | SMF150CA | TM      | PM | 150.0                                          | 167.00                                                | 185.00 | 1                                | 243.0                                                        | 0.82                                           | 1                                                             |
| SMF160A     | SMF160CA | TP      | PP | 160.0                                          | 178.00                                                | 197.00 | 1                                | 259.0                                                        | 0.77                                           | 1                                                             |
| SMF170A     | SMF170CA | TR      | PR | 170.0                                          | 189.00                                                | 209.00 | 1                                | 275.0                                                        | 0.73                                           | 1                                                             |
| SMF180A     | SMF180CA | TT      | PT | 180.0                                          | 200.00                                                | 220.00 | 1                                | 292.0                                                        | 0.69                                           | 1                                                             |

**Note:**

1. Suffix 'A' denotes 5% tolerance device. Without 'A' denotes 10% tolerance device
2. Add suffix 'C' or 'CA' after part number to specify Bi-directional devices
3. For Bi-Directional devices having V<sub>B</sub> of 10 volts and under, the I<sub>R</sub> limit is double

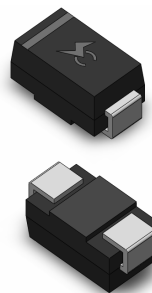
## Surface Mount Transient Voltage Suppressors (TVS)

**SMAJ Series 5.0 To 440 V 400W**

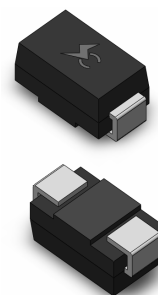
### Features

- u For surface mounted applications in order to optimize board space
- u Low leakage
- u Uni and Bidirectional unit
- u Glass passivated junction
- u Low inductance
- u Excellent clamping capability
- u 400W Peak power capability at 10 × 1000μs waveform
- u Repetition rate (duty cycle):0.01%
- u Fast response time: typically less than 1.0ps from 0 Volts to V<sub>BR</sub> min
- u Typical I<sub>R</sub> less than 5μA above 12V
- u High Temperature soldering: 260°C/40 seconds at terminals
- u Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR@25^{\circ}C} \times \Delta T$
- u Plastic package has Underwriters Laboratory Flammability 94V-0
- u Matte tin lead-free Plated
- u Halogen free and RoHS compliant
- u Typical failure mode is short from over-specified voltage or current
- u Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- u IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- u ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- u EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)

### Uni-directional



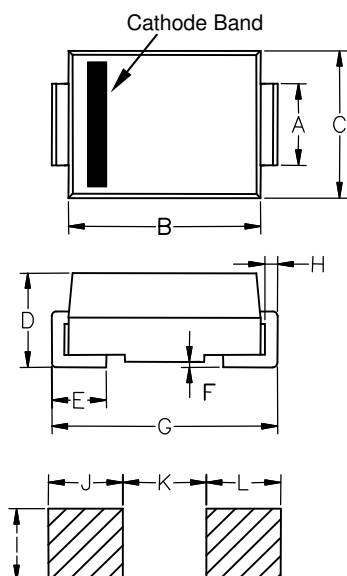
### Bi-directional



**DO-214AC (SMA)**

### Dimensions

**DO-214AC (SMA)**



| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| <b>A</b>   | 0.049  | 0.064 | 1.230       | 1.630 |
| <b>B</b>   | 0.162  | 0.179 | 4.10        | 4.550 |
| <b>C</b>   | 0.099  | 0.109 | 2.510       | 2.760 |
| <b>D</b>   | 0.077  | 0.089 | 1.960       | 2.260 |
| <b>E</b>   | 0.030  | 0.060 | 0.750       | 1.510 |
| <b>F</b>   | -      | 0.008 | -           | 0.203 |
| <b>G</b>   | 0.192  | 0.206 | 4.87        | 5.220 |
| <b>H</b>   | 0.006  | 0.012 | 0.152       | 0.305 |
| <b>I</b>   | 0.070  | -     | 1.800       | -     |
| <b>J</b>   | 0.082  | -     | 2.100       | -     |
| <b>K</b>   | -      | 0.090 | -           | 2.300 |
| <b>L</b>   | 0.082  | -     | 2.100       | -     |

**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

| Part Number |           | Marking |    | Reverse<br>Stand-Off<br>Voltage<br>V <sub>RWM</sub> (V) | Breakdown<br>Voltage V <sub>BR</sub> (V)<br>@I <sub>T</sub> |       | Test<br>Current<br>I <sub>T</sub><br>(mA) | Maximum<br>Clamping<br>Voltage<br>V <sub>C</sub><br>@I <sub>PP</sub> (V) | Maximum<br>Peak<br>Pulse<br>Current<br>I <sub>PP</sub> (A) | Maximum<br>Reverse<br>Leakage I <sub>R</sub><br>@V <sub>RWM</sub><br>(μA) |
|-------------|-----------|---------|----|---------------------------------------------------------|-------------------------------------------------------------|-------|-------------------------------------------|--------------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------|
| Uni         | Bi        | Uni     | Bi |                                                         | MIN                                                         | MAX   |                                           |                                                                          |                                                            |                                                                           |
| SMAJ5.0     | SMAJ5.0C  | AD      | WD | 5.0                                                     | 6.40                                                        | 7.30  | 10                                        | 9.6                                                                      | 41.67                                                      | 800                                                                       |
| SMAJ5.0A    | SMAJ5.0CA | AE      | WE | 5.0                                                     | 6.40                                                        | 7.00  | 10                                        | 9.2                                                                      | 43.48                                                      | 800                                                                       |
| SMAJ6.0     | SMAJ6.0C  | AF      | WF | 6.0                                                     | 6.67                                                        | 8.15  | 10                                        | 11.4                                                                     | 35.09                                                      | 800                                                                       |
| SMAJ6.0A    | SMAJ6.0CA | AG      | WG | 6.0                                                     | 6.67                                                        | 7.37  | 10                                        | 10.3                                                                     | 38.83                                                      | 800                                                                       |
| SMAJ6.5     | SMAJ6.5C  | AH      | WH | 6.5                                                     | 7.22                                                        | 8.82  | 10                                        | 12.3                                                                     | 32.52                                                      | 500                                                                       |
| SMAJ6.5A    | SMAJ6.5CA | AK      | WK | 6.5                                                     | 7.22                                                        | 7.98  | 10                                        | 11.2                                                                     | 35.71                                                      | 500                                                                       |
| SMAJ7.0     | SMAJ7.0C  | AL      | WL | 7.0                                                     | 7.78                                                        | 9.51  | 10                                        | 13.3                                                                     | 30.08                                                      | 200                                                                       |
| SMAJ7.0A    | SMAJ7.0CA | AM      | WM | 7.0                                                     | 7.78                                                        | 8.60  | 10                                        | 12.0                                                                     | 33.33                                                      | 200                                                                       |
| SMAJ7.5     | SMAJ7.5C  | AN      | WN | 7.5                                                     | 8.33                                                        | 10.20 | 1                                         | 14.3                                                                     | 27.97                                                      | 100                                                                       |
| SMAJ7.5A    | SMAJ7.5CA | AP      | WP | 7.5                                                     | 8.33                                                        | 9.21  | 1                                         | 12.9                                                                     | 31.01                                                      | 100                                                                       |
| SMAJ8.0     | SMAJ8.0C  | AQ      | WQ | 8.0                                                     | 8.89                                                        | 10.90 | 1                                         | 15.0                                                                     | 26.67                                                      | 50                                                                        |
| SMAJ8.0A    | SMAJ8.0CA | AR      | WR | 8.0                                                     | 8.89                                                        | 9.83  | 1                                         | 13.6                                                                     | 29.41                                                      | 50                                                                        |
| SMAJ8.5     | SMAJ8.5C  | AS      | WS | 8.5                                                     | 9.44                                                        | 11.50 | 1                                         | 15.9                                                                     | 25.16                                                      | 10                                                                        |
| SMAJ8.5A    | SMAJ8.5CA | AT      | WT | 8.5                                                     | 9.44                                                        | 10.40 | 1                                         | 14.4                                                                     | 27.78                                                      | 10                                                                        |
| SMAJ9.0     | SMAJ9.0C  | AU      | WU | 9.0                                                     | 10.00                                                       | 12.20 | 1                                         | 16.9                                                                     | 23.67                                                      | 5                                                                         |
| SMAJ9.0A    | SMAJ9.0CA | AV      | WV | 9.0                                                     | 10.00                                                       | 11.10 | 1                                         | 15.4                                                                     | 25.97                                                      | 5                                                                         |
| SMAJ10      | SMAJ10C   | AW      | WW | 10.0                                                    | 11.10                                                       | 13.60 | 1                                         | 18.8                                                                     | 21.28                                                      | 5                                                                         |
| SMAJ10A     | SMAJ10CA  | AX      | WX | 10.0                                                    | 11.10                                                       | 12.30 | 1                                         | 17.0                                                                     | 23.53                                                      | 5                                                                         |
| SMAJ11      | SMAJ11C   | AY      | WY | 11.0                                                    | 12.20                                                       | 14.90 | 1                                         | 20.1                                                                     | 19.90                                                      | 5                                                                         |
| SMAJ11A     | SMAJ11CA  | AZ      | WZ | 11.0                                                    | 12.20                                                       | 13.50 | 1                                         | 18.2                                                                     | 21.98                                                      | 5                                                                         |
| SMAJ12      | SMAJ12C   | BD      | XD | 12.0                                                    | 13.30                                                       | 16.30 | 1                                         | 22.0                                                                     | 18.18                                                      | 5                                                                         |
| SMAJ12A     | SMAJ12CA  | BE      | XE | 12.0                                                    | 13.30                                                       | 14.70 | 1                                         | 19.9                                                                     | 20.10                                                      | 5                                                                         |
| SMAJ13      | SMAJ13C   | BF      | XF | 13.0                                                    | 14.40                                                       | 17.60 | 1                                         | 23.8                                                                     | 16.81                                                      | 5                                                                         |
| SMAJ13A     | SMAJ13CA  | BG      | XG | 13.0                                                    | 14.40                                                       | 15.90 | 1                                         | 21.5                                                                     | 18.60                                                      | 5                                                                         |
| SMAJ14      | SMAJ14C   | BH      | XH | 14.0                                                    | 15.60                                                       | 19.10 | 1                                         | 25.8                                                                     | 15.50                                                      | 5                                                                         |
| SMAJ14A     | SMAJ14CA  | BK      | XK | 14.0                                                    | 15.60                                                       | 17.20 | 1                                         | 23.2                                                                     | 17.24                                                      | 5                                                                         |
| SMAJ15      | SMAJ15C   | BL      | XL | 15.0                                                    | 16.70                                                       | 20.40 | 1                                         | 26.9                                                                     | 14.87                                                      | 5                                                                         |
| SMAJ15A     | SMAJ15CA  | BM      | XM | 15.0                                                    | 16.70                                                       | 18.50 | 1                                         | 24.4                                                                     | 16.39                                                      | 5                                                                         |
| SMAJ16      | SMAJ16C   | BN      | XN | 16.0                                                    | 17.80                                                       | 21.80 | 1                                         | 28.8                                                                     | 13.89                                                      | 5                                                                         |
| SMAJ16A     | SMAJ16CA  | BP      | XP | 16.0                                                    | 17.80                                                       | 19.70 | 1                                         | 26.0                                                                     | 15.38                                                      | 5                                                                         |
| SMAJ17      | SMAJ17C   | BQ      | XQ | 17.0                                                    | 18.90                                                       | 23.10 | 1                                         | 30.5                                                                     | 13.11                                                      | 5                                                                         |
| SMAJ17A     | SMAJ17CA  | BR      | XR | 17.0                                                    | 18.90                                                       | 20.90 | 1                                         | 27.6                                                                     | 14.49                                                      | 5                                                                         |
| SMAJ18      | SMAJ18C   | BS      | XS | 18.0                                                    | 20.00                                                       | 24.40 | 1                                         | 32.2                                                                     | 12.42                                                      | 5                                                                         |
| SMAJ18A     | SMAJ18CA  | BT      | XT | 18.0                                                    | 20.00                                                       | 22.10 | 1                                         | 29.2                                                                     | 13.70                                                      | 5                                                                         |
| SMAJ19      | SMAJ19C   | BA      | XA | 19.0                                                    | 21.13                                                       | 25.76 | 1                                         | 34.0                                                                     | 11.76                                                      | 5                                                                         |
| SMAJ19A     | SMAJ19CA  | BB      | XB | 19.0                                                    | 21.10                                                       | 23.30 | 1                                         | 30.8                                                                     | 13.00                                                      | 5                                                                         |
| SMAJ20      | SMAJ20C   | BU      | XU | 20.0                                                    | 22.20                                                       | 27.10 | 1                                         | 35.8                                                                     | 11.17                                                      | 5                                                                         |
| SMAJ20A     | SMAJ20CA  | BV      | XV | 20.0                                                    | 22.20                                                       | 24.50 | 1                                         | 32.4                                                                     | 12.35                                                      | 5                                                                         |
| SMAJ22      | SMAJ22C   | BW      | XW | 22.0                                                    | 24.40                                                       | 29.80 | 1                                         | 39.4                                                                     | 10.15                                                      | 5                                                                         |
| SMAJ22A     | SMAJ22CA  | BX      | XX | 22.0                                                    | 24.40                                                       | 26.90 | 1                                         | 35.5                                                                     | 11.27                                                      | 5                                                                         |
| SMAJ24      | SMAJ24C   | BY      | XY | 24.0                                                    | 26.70                                                       | 32.60 | 1                                         | 43.0                                                                     | 9.30                                                       | 5                                                                         |
| SMAJ24A     | SMAJ24CA  | BZ      | XZ | 24.0                                                    | 26.70                                                       | 29.50 | 1                                         | 38.9                                                                     | 10.28                                                      | 5                                                                         |
| SMAJ26      | SMAJ26C   | CD      | YD | 26.0                                                    | 28.90                                                       | 35.30 | 1                                         | 46.6                                                                     | 8.56                                                       | 5                                                                         |
| SMAJ26A     | SMAJ26CA  | CE      | YE | 26.0                                                    | 28.90                                                       | 31.90 | 1                                         | 42.1                                                                     | 9.50                                                       | 5                                                                         |
| SMAJ28      | SMAJ28C   | CF      | YF | 28.0                                                    | 31.10                                                       | 38.00 | 1                                         | 50.0                                                                     | 8.00                                                       | 5                                                                         |
| SMAJ28A     | SMAJ28CA  | CG      | YG | 28.0                                                    | 31.10                                                       | 34.40 | 1                                         | 45.4                                                                     | 8.81                                                       | 5                                                                         |
| SMAJ30      | SMAJ30C   | CH      | YH | 30.0                                                    | 33.30                                                       | 40.70 | 1                                         | 53.5                                                                     | 7.48                                                       | 5                                                                         |
| SMAJ30A     | SMAJ30CA  | CK      | YK | 30.0                                                    | 33.30                                                       | 36.80 | 1                                         | 48.4                                                                     | 8.26                                                       | 5                                                                         |
| SMAJ33      | SMAJ33C   | CL      | YL | 33.0                                                    | 36.70                                                       | 44.90 | 1                                         | 59.0                                                                     | 6.78                                                       | 5                                                                         |
| SMAJ33A     | SMAJ33CA  | CM      | YM | 33.0                                                    | 36.70                                                       | 40.60 | 1                                         | 53.3                                                                     | 7.50                                                       | 5                                                                         |
| SMAJ36      | SMAJ36C   | CN      | YN | 36.0                                                    | 40.00                                                       | 48.90 | 1                                         | 64.3                                                                     | 6.22                                                       | 5                                                                         |
| SMAJ36A     | SMAJ36CA  | CP      | YP | 36.0                                                    | 40.00                                                       | 44.20 | 1                                         | 58.1                                                                     | 6.88                                                       | 5                                                                         |
| SMAJ40      | SMAJ40C   | CQ      | YQ | 40.0                                                    | 44.40                                                       | 54.30 | 1                                         | 71.4                                                                     | 5.60                                                       | 5                                                                         |
| SMAJ40A     | SMAJ40CA  | CR      | YR | 40.0                                                    | 44.40                                                       | 49.10 | 1                                         | 64.5                                                                     | 6.20                                                       | 5                                                                         |
| SMAJ43      | SMAJ43C   | CS      | YS | 43.0                                                    | 47.80                                                       | 58.40 | 1                                         | 76.7                                                                     | 5.22                                                       | 5                                                                         |
| SMAJ43A     | SMAJ43CA  | CT      | YT | 43.0                                                    | 47.80                                                       | 52.80 | 1                                         | 69.4                                                                     | 5.76                                                       | 5                                                                         |

**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

| Part Number |           | Marking |    | Reverse<br>Stand-Off<br>Voltage<br>V <sub>RWM</sub> (V) | Breakdown<br>Voltage V <sub>BR</sub> (V)<br>@I <sub>T</sub> |        | Test<br>Current<br>I <sub>T</sub><br>(mA) | Maximum<br>Clamping<br>Voltage<br>V <sub>C</sub><br>@I <sub>PP</sub> (V) | Maximum<br>Peak<br>Pulse<br>Current<br>I <sub>PP</sub> (A) | Maximum<br>Reverse<br>Leakage I <sub>R</sub><br>@V <sub>RWM</sub><br>(μA) |
|-------------|-----------|---------|----|---------------------------------------------------------|-------------------------------------------------------------|--------|-------------------------------------------|--------------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------|
| Uni         | Bi        | Uni     | Bi |                                                         | MIN                                                         | MAX    |                                           |                                                                          |                                                            |                                                                           |
| SMAJ45      | SMAJ45C   | CU      | YU | 45.0                                                    | 50.00                                                       | 61.10  | 1                                         | 80.3                                                                     | 4.98                                                       | 5                                                                         |
| SMAJ45A     | SMAJ45CA  | CV      | YV | 45.0                                                    | 50.00                                                       | 55.30  | 1                                         | 72.7                                                                     | 5.50                                                       | 5                                                                         |
| SMAJ48      | SMAJ48C   | CW      | YW | 48.0                                                    | 53.30                                                       | 65.10  | 1                                         | 85.5                                                                     | 4.68                                                       | 5                                                                         |
| SMAJ48A     | SMAJ48CA  | CX      | YX | 48.0                                                    | 53.30                                                       | 58.90  | 1                                         | 77.4                                                                     | 5.17                                                       | 5                                                                         |
| SMAJ51      | SMAJ51C   | CY      | YY | 51.0                                                    | 56.70                                                       | 69.30  | 1                                         | 91.1                                                                     | 4.39                                                       | 5                                                                         |
| SMAJ51A     | SMAJ51CA  | CZ      | YZ | 51.0                                                    | 56.70                                                       | 62.70  | 1                                         | 82.4                                                                     | 4.85                                                       | 5                                                                         |
| SMAJ54      | SMAJ54C   | RD      | ZD | 54.0                                                    | 60.00                                                       | 73.30  | 1                                         | 96.3                                                                     | 4.15                                                       | 5                                                                         |
| SMAJ54A     | SMAJ54CA  | RE      | ZE | 54.0                                                    | 60.00                                                       | 66.30  | 1                                         | 87.1                                                                     | 4.59                                                       | 5                                                                         |
| SMAJ58      | SMAJ58C   | RF      | ZF | 58.0                                                    | 64.40                                                       | 78.70  | 1                                         | 103.0                                                                    | 3.88                                                       | 5                                                                         |
| SMAJ58A     | SMAJ58CA  | RG      | ZG | 58.0                                                    | 64.40                                                       | 71.20  | 1                                         | 93.6                                                                     | 4.27                                                       | 5                                                                         |
| SMAJ60      | SMAJ60C   | RH      | ZH | 60.0                                                    | 66.70                                                       | 81.50  | 1                                         | 107.0                                                                    | 3.74                                                       | 5                                                                         |
| SMAJ60A     | SMAJ60CA  | RK      | ZK | 60.0                                                    | 66.70                                                       | 73.70  | 1                                         | 96.8                                                                     | 4.13                                                       | 5                                                                         |
| SMAJ64      | SMAJ64C   | RL      | ZL | 64.0                                                    | 71.10                                                       | 86.90  | 1                                         | 114.0                                                                    | 3.51                                                       | 5                                                                         |
| SMAJ64A     | SMAJ64CA  | RM      | ZM | 64.0                                                    | 71.10                                                       | 78.60  | 1                                         | 103.0                                                                    | 3.88                                                       | 5                                                                         |
| SMAJ70      | SMAJ70C   | RN      | ZN | 70.0                                                    | 77.80                                                       | 95.10  | 1                                         | 125.0                                                                    | 3.20                                                       | 5                                                                         |
| SMAJ70A     | SMAJ70CA  | RP      | ZP | 70.0                                                    | 77.80                                                       | 86.00  | 1                                         | 113.0                                                                    | 3.54                                                       | 5                                                                         |
| SMAJ75      | SMAJ75C   | RQ      | ZQ | 75.0                                                    | 83.30                                                       | 102.00 | 1                                         | 134.0                                                                    | 2.99                                                       | 5                                                                         |
| SMAJ75A     | SMAJ75CA  | RR      | ZR | 75.0                                                    | 83.30                                                       | 92.10  | 1                                         | 121.0                                                                    | 3.31                                                       | 5                                                                         |
| SMAJ78      | SMAJ78C   | RS      | ZS | 78.0                                                    | 86.70                                                       | 106.00 | 1                                         | 139.0                                                                    | 2.88                                                       | 5                                                                         |
| SMAJ78A     | SMAJ78CA  | RT      | ZT | 78.0                                                    | 86.70                                                       | 95.80  | 1                                         | 126.0                                                                    | 3.17                                                       | 5                                                                         |
| SMAJ80      | SMAJ80C   | RA      | ZA | 80.0                                                    | 88.96                                                       | 108.80 | 1                                         | 143.2                                                                    | 2.79                                                       | 5                                                                         |
| SMAJ80A     | SMAJ80CA  | RB      | ZB | 80.0                                                    | 88.80                                                       | 97.60  | 1                                         | 129.6                                                                    | 3.09                                                       | 5                                                                         |
| SMAJ85      | SMAJ85C   | RU      | ZU | 85.0                                                    | 94.40                                                       | 115.00 | 1                                         | 151.0                                                                    | 2.65                                                       | 5                                                                         |
| SMAJ85A     | SMAJ85CA  | RV      | ZV | 85.0                                                    | 94.40                                                       | 104.00 | 1                                         | 137.0                                                                    | 2.92                                                       | 5                                                                         |
| SMAJ90      | SMAJ90C   | RW      | ZW | 90.0                                                    | 100.00                                                      | 122.00 | 1                                         | 160.0                                                                    | 2.50                                                       | 5                                                                         |
| SMAJ90A     | SMAJ90CA  | RX      | ZX | 90.0                                                    | 100.00                                                      | 111.00 | 1                                         | 146.0                                                                    | 2.74                                                       | 5                                                                         |
| SMAJ100     | SMAJ100C  | RY      | ZY | 100.0                                                   | 111.00                                                      | 136.00 | 1                                         | 179.0                                                                    | 2.23                                                       | 5                                                                         |
| SMAJ100A    | SMAJ100CA | RZ      | ZZ | 100.0                                                   | 111.00                                                      | 123.00 | 1                                         | 162.0                                                                    | 2.47                                                       | 5                                                                         |
| SMAJ110     | SMAJ110C  | SD      | VD | 110.0                                                   | 122.00                                                      | 149.00 | 1                                         | 196.0                                                                    | 2.04                                                       | 5                                                                         |
| SMAJ110A    | SMAJ110CA | SE      | VE | 110.0                                                   | 122.00                                                      | 135.00 | 1                                         | 177.0                                                                    | 2.26                                                       | 5                                                                         |
| SMAJ120     | SMAJ120C  | SF      | VF | 120.0                                                   | 133.00                                                      | 163.00 | 1                                         | 214.0                                                                    | 1.87                                                       | 5                                                                         |
| SMAJ120A    | SMAJ120CA | SG      | VG | 120.0                                                   | 133.00                                                      | 147.00 | 1                                         | 193.0                                                                    | 2.07                                                       | 5                                                                         |
| SMAJ130     | SMAJ130C  | SH      | VH | 130.0                                                   | 144.00                                                      | 176.00 | 1                                         | 231.0                                                                    | 1.73                                                       | 5                                                                         |
| SMAJ130A    | SMAJ130CA | SK      | VK | 130.0                                                   | 144.00                                                      | 159.00 | 1                                         | 209.0                                                                    | 1.91                                                       | 5                                                                         |
| SMAJ140     | SMAJ140C  | SA      | VA | 140.0                                                   | 155.68                                                      | 190.40 | 1                                         | 250.6                                                                    | 1.60                                                       | 5                                                                         |
| SMAJ140A    | SMAJ140CA | SB      | VB | 140.0                                                   | 155.00                                                      | 171.00 | 1                                         | 226.8                                                                    | 1.76                                                       | 5                                                                         |
| SMAJ150     | SMAJ150C  | SL      | VL | 150.0                                                   | 167.00                                                      | 204.00 | 1                                         | 268.0                                                                    | 1.49                                                       | 5                                                                         |
| SMAJ150A    | SMAJ150CA | SM      | VM | 150.0                                                   | 167.00                                                      | 185.00 | 1                                         | 243.0                                                                    | 1.65                                                       | 5                                                                         |
| SMAJ160     | SMAJ160C  | SN      | VN | 160.0                                                   | 178.00                                                      | 218.00 | 1                                         | 287.0                                                                    | 1.39                                                       | 5                                                                         |
| SMAJ160A    | SMAJ160CA | SP      | VP | 160.0                                                   | 178.00                                                      | 197.00 | 1                                         | 259.0                                                                    | 1.54                                                       | 5                                                                         |
| SMAJ170     | SMAJ170C  | SQ      | VQ | 170.0                                                   | 189.00                                                      | 231.00 | 1                                         | 304.0                                                                    | 1.32                                                       | 5                                                                         |
| SMAJ170A    | SMAJ170CA | SR      | VR | 170.0                                                   | 189.00                                                      | 209.00 | 1                                         | 275.0                                                                    | 1.45                                                       | 5                                                                         |
| SMAJ180     | SMAJ180C  | SS      | VS | 180.0                                                   | 201.00                                                      | 244.80 | 1                                         | 322.2                                                                    | 1.24                                                       | 5                                                                         |
| SMAJ180A    | SMAJ180CA | ST      | VT | 180.0                                                   | 201.00                                                      | 220.00 | 1                                         | 291.6                                                                    | 1.37                                                       | 5                                                                         |
| SMAJ190     | SMAJ190C  | SU      | VU | 190.0                                                   | 211.21                                                      | 258.40 | 1                                         | 340.1                                                                    | 1.18                                                       | 5                                                                         |
| SMAJ190A    | SMAJ190CA | SV      | VV | 190.0                                                   | 211.00                                                      | 232.00 | 1                                         | 307.8                                                                    | 1.30                                                       | 5                                                                         |
| SMAJ200A    | SMAJ200CA | SW      | VW | 200.0                                                   | 224.00                                                      | 247.00 | 1                                         | 324.0                                                                    | 1.23                                                       | 5                                                                         |
| SMAJ220A    | SMAJ220CA | SX      | VX | 220.0                                                   | 246.00                                                      | 272.00 | 1                                         | 356.0                                                                    | 1.12                                                       | 5                                                                         |
| SMAJ250A    | SMAJ250CA | SZ      | VZ | 250.0                                                   | 279.00                                                      | 309.00 | 1                                         | 405.0                                                                    | 0.99                                                       | 5                                                                         |
| SMAJ300A    | SMAJ300CA | DE      | HE | 300.0                                                   | 335.00                                                      | 371.00 | 1                                         | 486.0                                                                    | 0.82                                                       | 5                                                                         |
| SMAJ350A    | SMAJ350CA | DG      | HG | 350.0                                                   | 391.00                                                      | 432.00 | 1                                         | 567.0                                                                    | 0.71                                                       | 5                                                                         |
| SMAJ400A    | SMAJ400CA | DK      | HK | 400.0                                                   | 447.00                                                      | 494.00 | 1                                         | 648.0                                                                    | 0.62                                                       | 5                                                                         |
| SMAJ440A    | SMAJ440CA | DM      | HM | 440.0                                                   | 492.00                                                      | 543.00 | 1                                         | 713.0                                                                    | 0.56                                                       | 5                                                                         |

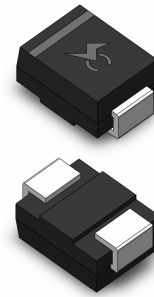
**Note:**

1. Suffix 'A' denotes 5% tolerance device. Without 'A' denotes 10% tolerance device
2. Add suffix 'C' or 'CA' after part number to specify Bi-directional devices
3. For Bi-Directional devices having V<sub>R</sub> of 10 volts and under, the I<sub>R</sub> limit is double

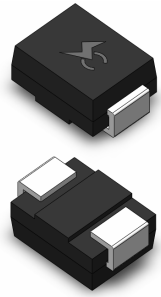
### Features

- u For surface mounted applications in order to optimize board space
- u Low leakage
- u Uni and Bidirectional unit
- u Glass passivated junction
- u Low inductance
- u Excellent clamping capability
- u 600W Peak power capability at  $10 \times 1000\mu\text{s}$  waveform
- u Repetition rate (duty cycle): 0.01%
- u Fast response time: typically less than 1.0ps from 0 Volts to  $V_{BR \text{ min}}$
- u Typical  $I_R$  less than  $5\mu\text{A}$  above 12V.
- u High Temperature soldering:  $260^\circ\text{C}/40$  seconds at terminals
- u Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR@25^\circ\text{C}} \times \Delta T$
- u Plastic package has Underwriters Laboratory Flammability 94V-0
- u Matte tin lead-free Plated
- u Halogen free and RoHS compliant
- u Typical failure mode is short from over-specified voltage or current
- u Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- u IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- u ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- u EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)

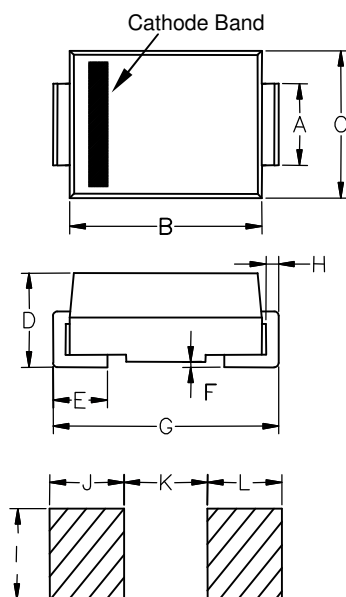
Uni-directional



Bi-directional


**DO-214AA (SMB)**

### Dimensions

**DO-214AA (SMB)**


| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| A          | 0.077  | 0.087 | 1.960       | 2.200 |
| B          | 0.171  | 0.191 | 4.350       | 4.850 |
| C          | 0.130  | 0.155 | 3.300       | 3.940 |
| D          | 0.084  | 0.096 | 2.130       | 2.440 |
| E          | 0.030  | 0.060 | 0.750       | 1.520 |
| F          | -      | 0.008 | -           | 0.203 |
| G          | 0.201  | 0.216 | 5.100       | 5.500 |
| H          | 0.006  | 0.012 | 0.152       | 0.305 |
| I          | 0.089  | -     | 2.260       | -     |
| J          | 0.085  | -     | 2.160       | -     |
| K          | -      | 0.107 | -           | 2.740 |
| L          | 0.085  | -     | 2.160       | -     |

**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

| Part Number |           | Marking |    | Reverse<br>Stand-Off<br>Voltage<br>V <sub>RWM</sub> (V) | Breakdown<br>Voltage V <sub>BR</sub> (V)<br>@I <sub>T</sub> |       | Test<br>Current<br>I <sub>T</sub><br>(mA) | Maximum<br>Clamping<br>Voltage<br>V <sub>C</sub><br>@I <sub>PP</sub> (V) | Maximum<br>Peak<br>Pulse<br>Current<br>I <sub>PP</sub> (A) | Maximum<br>Reverse<br>Leakage I <sub>R</sub><br>@V <sub>RWM</sub><br>(μA) |
|-------------|-----------|---------|----|---------------------------------------------------------|-------------------------------------------------------------|-------|-------------------------------------------|--------------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------|
| Uni         | Bi        | Uni     | Bi |                                                         | MIN                                                         | MAX   |                                           |                                                                          |                                                            |                                                                           |
| SMBJ5.0     | SMBJ5.0C  | KD      | AD | 5.0                                                     | 6.40                                                        | 7.30  | 10                                        | 9.6                                                                      | 62.50                                                      | 800                                                                       |
| SMBJ5.0A    | SMBJ5.0CA | KE      | AE | 5.0                                                     | 6.40                                                        | 7.00  | 10                                        | 9.2                                                                      | 65.22                                                      | 800                                                                       |
| SMBJ6.0     | SMBJ6.0C  | KF      | AF | 6.0                                                     | 6.67                                                        | 8.15  | 10                                        | 11.4                                                                     | 52.63                                                      | 800                                                                       |
| SMBJ6.0A    | SMBJ6.0CA | KG      | AG | 6.0                                                     | 6.67                                                        | 7.37  | 10                                        | 10.3                                                                     | 58.25                                                      | 800                                                                       |
| SMBJ6.5     | SMBJ6.5C  | KH      | AH | 6.5                                                     | 7.22                                                        | 8.82  | 10                                        | 12.3                                                                     | 48.78                                                      | 500                                                                       |
| SMBJ6.5A    | SMBJ6.5CA | KK      | AK | 6.5                                                     | 7.22                                                        | 7.98  | 10                                        | 11.2                                                                     | 53.57                                                      | 500                                                                       |
| SMBJ7.0     | SMBJ7.0C  | KL      | AL | 7.0                                                     | 7.78                                                        | 9.51  | 10                                        | 13.3                                                                     | 45.11                                                      | 200                                                                       |
| SMBJ7.0A    | SMBJ7.0CA | KM      | AM | 7.0                                                     | 7.78                                                        | 8.60  | 10                                        | 12.0                                                                     | 50.00                                                      | 200                                                                       |
| SMBJ7.5     | SMBJ7.5C  | KN      | AN | 7.5                                                     | 8.33                                                        | 10.20 | 1                                         | 14.3                                                                     | 41.96                                                      | 100                                                                       |
| SMBJ7.5A    | SMBJ7.5CA | KP      | AP | 7.5                                                     | 8.33                                                        | 9.21  | 1                                         | 12.9                                                                     | 46.51                                                      | 100                                                                       |
| SMBJ8.0     | SMBJ8.0C  | KQ      | AQ | 8.0                                                     | 8.89                                                        | 10.90 | 1                                         | 15.0                                                                     | 40.00                                                      | 50                                                                        |
| SMBJ8.0A    | SMBJ8.0CA | KR      | AR | 8.0                                                     | 8.89                                                        | 9.83  | 1                                         | 13.6                                                                     | 44.12                                                      | 50                                                                        |
| SMBJ8.5     | SMBJ8.5C  | KS      | AS | 8.5                                                     | 9.44                                                        | 11.50 | 1                                         | 15.9                                                                     | 37.74                                                      | 10                                                                        |
| SMBJ8.5A    | SMBJ8.5CA | KT      | AT | 8.5                                                     | 9.44                                                        | 10.40 | 1                                         | 14.4                                                                     | 41.67                                                      | 10                                                                        |
| SMBJ9.0     | SMBJ9.0C  | KU      | AU | 9.0                                                     | 10.00                                                       | 12.20 | 1                                         | 16.9                                                                     | 35.50                                                      | 5                                                                         |
| SMBJ9.0A    | SMBJ9.0CA | KV      | AV | 9.0                                                     | 10.00                                                       | 11.10 | 1                                         | 15.4                                                                     | 38.96                                                      | 5                                                                         |
| SMBJ10      | SMBJ10C   | KW      | AA | 10.0                                                    | 11.10                                                       | 13.60 | 1                                         | 18.8                                                                     | 31.91                                                      | 5                                                                         |
| SMBJ10A     | SMBJ10CA  | KX      | AX | 10.0                                                    | 11.10                                                       | 12.30 | 1                                         | 17.0                                                                     | 35.29                                                      | 5                                                                         |
| SMBJ11      | SMBJ11C   | KY      | AY | 11.0                                                    | 12.20                                                       | 14.90 | 1                                         | 20.1                                                                     | 29.85                                                      | 5                                                                         |
| SMBJ11A     | SMBJ11CA  | KZ      | WZ | 11.0                                                    | 12.20                                                       | 13.50 | 1                                         | 18.2                                                                     | 32.97                                                      | 5                                                                         |
| SMBJ12      | SMBJ12C   | LD      | BD | 12.0                                                    | 13.30                                                       | 16.30 | 1                                         | 22.0                                                                     | 27.27                                                      | 5                                                                         |
| SMBJ12A     | SMBJ12CA  | LE      | BE | 12.0                                                    | 13.30                                                       | 14.70 | 1                                         | 19.9                                                                     | 30.15                                                      | 5                                                                         |
| SMBJ13      | SMBJ13C   | LF      | BF | 13.0                                                    | 14.40                                                       | 17.60 | 1                                         | 23.8                                                                     | 25.21                                                      | 5                                                                         |
| SMBJ13A     | SMBJ13CA  | LG      | BG | 13.0                                                    | 14.40                                                       | 15.90 | 1                                         | 21.5                                                                     | 27.91                                                      | 5                                                                         |
| SMBJ14      | SMBJ14C   | LH      | BH | 14.0                                                    | 15.60                                                       | 19.10 | 1                                         | 25.8                                                                     | 23.26                                                      | 5                                                                         |
| SMBJ14A     | SMBJ14CA  | LK      | BK | 14.0                                                    | 15.60                                                       | 17.20 | 1                                         | 23.2                                                                     | 25.86                                                      | 5                                                                         |
| SMBJ15      | SMBJ15C   | LL      | BL | 15.0                                                    | 16.70                                                       | 20.40 | 1                                         | 26.9                                                                     | 22.30                                                      | 5                                                                         |
| SMBJ15A     | SMBJ15CA  | LM      | BM | 15.0                                                    | 16.70                                                       | 18.50 | 1                                         | 24.4                                                                     | 24.59                                                      | 5                                                                         |
| SMBJ16      | SMBJ16C   | LN      | BN | 16.0                                                    | 17.80                                                       | 21.80 | 1                                         | 28.8                                                                     | 20.83                                                      | 5                                                                         |
| SMBJ16A     | SMBJ16CA  | LP      | BP | 16.0                                                    | 17.80                                                       | 19.70 | 1                                         | 26.0                                                                     | 23.08                                                      | 5                                                                         |
| SMBJ17      | SMBJ17C   | LQ      | BQ | 17.0                                                    | 18.90                                                       | 23.10 | 1                                         | 30.5                                                                     | 19.67                                                      | 5                                                                         |
| SMBJ17A     | SMBJ17CA  | LR      | BR | 17.0                                                    | 18.90                                                       | 20.90 | 1                                         | 27.6                                                                     | 21.74                                                      | 5                                                                         |
| SMBJ18      | SMBJ18C   | LS      | BS | 18.0                                                    | 20.00                                                       | 24.40 | 1                                         | 32.2                                                                     | 18.63                                                      | 5                                                                         |
| SMBJ18A     | SMBJ18CA  | LT      | BT | 18.0                                                    | 20.00                                                       | 22.10 | 1                                         | 29.2                                                                     | 20.55                                                      | 5                                                                         |
| SMBJ19      | SMBJ19C   | LA      | BA | 19.0                                                    | 21.13                                                       | 25.76 | 1                                         | 34.0                                                                     | 17.64                                                      | 5                                                                         |
| SMBJ19A     | SMBJ19CA  | LB      | BB | 19.0                                                    | 21.10                                                       | 23.30 | 1                                         | 30.8                                                                     | 19.49                                                      | 5                                                                         |
| SMBJ20      | SMBJ20C   | LU      | BU | 20.0                                                    | 22.20                                                       | 27.10 | 1                                         | 35.8                                                                     | 16.67                                                      | 5                                                                         |
| SMBJ20A     | SMBJ20CA  | LV      | BV | 20.0                                                    | 22.20                                                       | 24.50 | 1                                         | 32.4                                                                     | 18.52                                                      | 5                                                                         |
| SMBJ22      | SMBJ22C   | LW      | BW | 22.0                                                    | 24.40                                                       | 29.80 | 1                                         | 39.4                                                                     | 15.23                                                      | 5                                                                         |
| SMBJ22A     | SMBJ22CA  | LX      | BX | 22.0                                                    | 24.40                                                       | 26.90 | 1                                         | 35.5                                                                     | 16.90                                                      | 5                                                                         |
| SMBJ24      | SMBJ24C   | LY      | BY | 24.0                                                    | 26.70                                                       | 32.60 | 1                                         | 43.0                                                                     | 13.95                                                      | 5                                                                         |
| SMBJ24A     | SMBJ24CA  | LZ      | BZ | 24.0                                                    | 26.70                                                       | 29.50 | 1                                         | 38.9                                                                     | 15.42                                                      | 5                                                                         |
| SMBJ26      | SMBJ26C   | MD      | CD | 26.0                                                    | 28.90                                                       | 35.30 | 1                                         | 46.6                                                                     | 12.88                                                      | 5                                                                         |
| SMBJ26A     | SMBJ26CA  | ME      | CE | 26.0                                                    | 28.90                                                       | 31.90 | 1                                         | 42.1                                                                     | 14.25                                                      | 5                                                                         |
| SMBJ28      | SMBJ28C   | MF      | CF | 28.0                                                    | 31.10                                                       | 38.00 | 1                                         | 50.0                                                                     | 12.00                                                      | 5                                                                         |
| SMBJ28A     | SMBJ28CA  | MG      | CG | 28.0                                                    | 31.10                                                       | 34.40 | 1                                         | 45.4                                                                     | 13.22                                                      | 5                                                                         |
| SMBJ30      | SMBJ30C   | MH      | CH | 30.0                                                    | 33.30                                                       | 40.70 | 1                                         | 53.5                                                                     | 11.21                                                      | 5                                                                         |
| SMBJ30A     | SMBJ30CA  | MK      | CK | 30.0                                                    | 33.30                                                       | 36.80 | 1                                         | 48.4                                                                     | 12.40                                                      | 5                                                                         |
| SMBJ33      | SMBJ33C   | ML      | CL | 33.0                                                    | 36.70                                                       | 44.90 | 1                                         | 59.0                                                                     | 10.17                                                      | 5                                                                         |
| SMBJ33A     | SMBJ33CA  | MM      | CM | 33.0                                                    | 36.70                                                       | 40.60 | 1                                         | 53.3                                                                     | 11.26                                                      | 5                                                                         |
| SMBJ36      | SMBJ36C   | MN      | CN | 36.0                                                    | 40.00                                                       | 48.90 | 1                                         | 64.3                                                                     | 9.33                                                       | 5                                                                         |
| SMBJ36A     | SMBJ36CA  | MP      | CP | 36.0                                                    | 40.00                                                       | 44.20 | 1                                         | 58.1                                                                     | 10.33                                                      | 5                                                                         |
| SMBJ40      | SMBJ40C   | MQ      | CQ | 40.0                                                    | 44.40                                                       | 54.30 | 1                                         | 71.4                                                                     | 8.40                                                       | 5                                                                         |
| SMBJ40A     | SMBJ40CA  | MR      | CR | 40.0                                                    | 44.40                                                       | 49.10 | 1                                         | 64.5                                                                     | 9.30                                                       | 5                                                                         |
| SMBJ43      | SMBJ43C   | MS      | CS | 43.0                                                    | 47.80                                                       | 58.40 | 1                                         | 76.7                                                                     | 7.82                                                       | 5                                                                         |
| SMBJ43A     | SMBJ43CA  | MT      | CT | 43.0                                                    | 47.80                                                       | 52.80 | 1                                         | 69.4                                                                     | 8.65                                                       | 5                                                                         |

**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

| Part Number |           | Marking |    | Reverse Stand-Off Voltage V <sub>RWM</sub> (V) | Breakdown Voltage V <sub>BR</sub> (V) @I <sub>T</sub> |        | Test Current I <sub>T</sub> (mA) | Maximum Clamping Voltage V <sub>C</sub> @I <sub>PP</sub> (V) | Maximum Peak Pulse Current I <sub>PP</sub> (A) | Maximum Reverse Leakage I <sub>R</sub> @V <sub>RWM</sub> (μA) |
|-------------|-----------|---------|----|------------------------------------------------|-------------------------------------------------------|--------|----------------------------------|--------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------------|
| Uni         | Bi        | Uni     | Bi |                                                | MIN                                                   | MAX    |                                  |                                                              |                                                |                                                               |
| SMBJ45      | SMBJ45C   | MU      | CU | 45.0                                           | 50.00                                                 | 61.10  | 1                                | 80.3                                                         | 7.47                                           | 5                                                             |
| SMBJ45A     | SMBJ45CA  | MV      | CV | 45.0                                           | 50.00                                                 | 55.30  | 1                                | 72.7                                                         | 8.25                                           | 5                                                             |
| SMBJ48      | SMBJ48C   | MW      | CW | 48.0                                           | 53.30                                                 | 65.10  | 1                                | 85.5                                                         | 7.02                                           | 5                                                             |
| SMBJ48A     | SMBJ48CA  | MX      | CX | 48.0                                           | 53.30                                                 | 58.90  | 1                                | 77.4                                                         | 7.75                                           | 5                                                             |
| SMBJ51      | SMBJ51C   | MY      | CY | 51.0                                           | 56.70                                                 | 69.30  | 1                                | 91.1                                                         | 6.59                                           | 5                                                             |
| SMBJ51A     | SMBJ51CA  | MZ      | CZ | 51.0                                           | 56.70                                                 | 62.70  | 1                                | 82.4                                                         | 7.28                                           | 5                                                             |
| SMBJ54      | SMBJ54C   | ND      | DD | 54.0                                           | 60.00                                                 | 73.30  | 1                                | 96.3                                                         | 6.23                                           | 5                                                             |
| SMBJ54A     | SMBJ54CA  | NE      | DE | 54.0                                           | 60.00                                                 | 66.30  | 1                                | 87.1                                                         | 6.89                                           | 5                                                             |
| SMBJ58      | SMBJ58C   | NF      | DF | 58.0                                           | 64.40                                                 | 78.70  | 1                                | 103.0                                                        | 5.83                                           | 5                                                             |
| SMBJ58A     | SMBJ58CA  | NG      | DG | 58.0                                           | 64.40                                                 | 71.20  | 1                                | 93.6                                                         | 6.41                                           | 5                                                             |
| SMBJ60      | SMBJ60C   | NH      | DH | 60.0                                           | 66.70                                                 | 81.50  | 1                                | 107.0                                                        | 5.61                                           | 5                                                             |
| SMBJ60A     | SMBJ60CA  | NK      | DK | 60.0                                           | 66.70                                                 | 73.70  | 1                                | 96.8                                                         | 6.20                                           | 5                                                             |
| SMBJ64      | SMBJ64C   | NL      | DL | 64.0                                           | 71.10                                                 | 86.90  | 1                                | 114.0                                                        | 5.26                                           | 5                                                             |
| SMBJ64A     | SMBJ64CA  | NM      | DM | 64.0                                           | 71.10                                                 | 78.60  | 1                                | 103.0                                                        | 5.83                                           | 5                                                             |
| SMBJ70      | SMBJ70C   | NN      | DN | 70.0                                           | 77.80                                                 | 95.10  | 1                                | 125.0                                                        | 4.80                                           | 5                                                             |
| SMBJ70A     | SMBJ70CA  | NP      | DP | 70.0                                           | 77.80                                                 | 86.00  | 1                                | 113.0                                                        | 5.31                                           | 5                                                             |
| SMBJ75      | SMBJ75C   | NQ      | DQ | 75.0                                           | 83.30                                                 | 102.00 | 1                                | 134.0                                                        | 4.48                                           | 5                                                             |
| SMBJ75A     | SMBJ75CA  | NR      | DR | 75.0                                           | 83.30                                                 | 92.10  | 1                                | 121.0                                                        | 4.96                                           | 5                                                             |
| SMBJ78      | SMBJ78C   | NS      | DS | 78.0                                           | 86.70                                                 | 106.00 | 1                                | 139.0                                                        | 4.32                                           | 5                                                             |
| SMBJ78A     | SMBJ78CA  | NT      | DT | 78.0                                           | 86.70                                                 | 95.80  | 1                                | 126.0                                                        | 4.76                                           | 5                                                             |
| SMBJ80      | SMBJ80C   | NA      | DA | 80.0                                           | 88.96                                                 | 108.80 | 1                                | 143.2                                                        | 4.19                                           | 5                                                             |
| SMBJ80A     | SMBJ80CA  | NB      | DB | 80.0                                           | 88.80                                                 | 97.60  | 1                                | 129.6                                                        | 4.63                                           | 5                                                             |
| SMBJ85      | SMBJ85C   | NU      | DU | 85.0                                           | 94.40                                                 | 115.00 | 1                                | 151.0                                                        | 3.97                                           | 5                                                             |
| SMBJ85A     | SMBJ85CA  | NV      | DV | 85.0                                           | 94.40                                                 | 104.00 | 1                                | 137.0                                                        | 4.38                                           | 5                                                             |
| SMBJ90      | SMBJ90C   | NW      | DW | 90.0                                           | 100.00                                                | 122.00 | 1                                | 160.0                                                        | 3.75                                           | 5                                                             |
| SMBJ90A     | SMBJ90CA  | NX      | DX | 90.0                                           | 100.00                                                | 111.00 | 1                                | 146.0                                                        | 4.11                                           | 5                                                             |
| SMBJ100     | SMBJ100C  | NY      | DY | 100.0                                          | 111.00                                                | 136.00 | 1                                | 179.0                                                        | 3.35                                           | 5                                                             |
| SMBJ100A    | SMBJ100CA | NZ      | DZ | 100.0                                          | 111.00                                                | 123.00 | 1                                | 162.0                                                        | 3.70                                           | 5                                                             |
| SMBJ110     | SMBJ110C  | PD      | ED | 110.0                                          | 122.00                                                | 149.00 | 1                                | 196.0                                                        | 3.06                                           | 5                                                             |
| SMBJ110A    | SMBJ110CA | PE      | EE | 110.0                                          | 122.00                                                | 135.00 | 1                                | 177.0                                                        | 3.39                                           | 5                                                             |
| SMBJ120     | SMBJ120C  | PF      | EF | 120.0                                          | 133.00                                                | 163.00 | 1                                | 214.0                                                        | 2.80                                           | 5                                                             |
| SMBJ120A    | SMBJ120CA | PG      | EG | 120.0                                          | 133.00                                                | 147.00 | 1                                | 193.0                                                        | 3.11                                           | 5                                                             |
| SMBJ130     | SMBJ130C  | PH      | EH | 130.0                                          | 144.00                                                | 176.00 | 1                                | 231.0                                                        | 2.60                                           | 5                                                             |
| SMBJ130A    | SMBJ130CA | PK      | EK | 130.0                                          | 144.00                                                | 159.00 | 1                                | 209.0                                                        | 2.87                                           | 5                                                             |
| SMBJ140     | SMBJ140C  | PA      | EA | 140.0                                          | 155.68                                                | 190.40 | 1                                | 250.6                                                        | 2.39                                           | 5                                                             |
| SMBJ140A    | SMBJ140CA | PB      | EB | 140.0                                          | 155.00                                                | 171.00 | 1                                | 226.8                                                        | 2.65                                           | 5                                                             |
| SMBJ150     | SMBJ150C  | PL      | EL | 150.0                                          | 167.00                                                | 204.00 | 1                                | 268.0                                                        | 2.24                                           | 5                                                             |
| SMBJ150A    | SMBJ150CA | PM      | EM | 150.0                                          | 167.00                                                | 185.00 | 1                                | 243.0                                                        | 2.47                                           | 5                                                             |
| SMBJ160     | SMBJ160C  | PN      | EN | 160.0                                          | 178.00                                                | 218.00 | 1                                | 287.0                                                        | 2.09                                           | 5                                                             |
| SMBJ160A    | SMBJ160CA | PP      | EP | 160.0                                          | 178.00                                                | 197.00 | 1                                | 259.0                                                        | 2.32                                           | 5                                                             |
| SMBJ170     | SMBJ170C  | PQ      | EQ | 170.0                                          | 189.00                                                | 231.00 | 1                                | 304.0                                                        | 1.97                                           | 5                                                             |
| SMBJ170A    | SMBJ170CA | PR      | ER | 170.0                                          | 189.00                                                | 209.00 | 1                                | 275.0                                                        | 2.18                                           | 5                                                             |
| SMBJ180     | SMBJ180C  | PS      | ES | 180.0                                          | 201.00                                                | 244.80 | 1                                | 322.2                                                        | 1.86                                           | 5                                                             |
| SMBJ180A    | SMBJ180CA | PT      | ET | 180.0                                          | 201.00                                                | 220.00 | 1                                | 291.6                                                        | 2.06                                           | 5                                                             |
| SMBJ190     | SMBJ190C  | PU      | EU | 190.0                                          | 211.21                                                | 258.40 | 1                                | 340.1                                                        | 1.76                                           | 5                                                             |
| SMBJ190A    | SMBJ190CA | PV      | EV | 190.0                                          | 211.00                                                | 232.00 | 1                                | 307.8                                                        | 1.95                                           | 5                                                             |
| SMBJ200A    | SMBJ200CA | PW      | EW | 200.0                                          | 224.00                                                | 247.00 | 1                                | 324.0                                                        | 1.85                                           | 5                                                             |
| SMBJ220A    | SMBJ220CA | PX      | EX | 220.0                                          | 246.00                                                | 272.00 | 1                                | 356.0                                                        | 1.69                                           | 5                                                             |
| SMBJ250A    | SMBJ250CA | PZ      | EZ | 250.0                                          | 279.00                                                | 309.00 | 1                                | 405.0                                                        | 1.48                                           | 5                                                             |
| SMBJ300A    | SMBJ300CA | QE      | FE | 300.0                                          | 335.00                                                | 371.00 | 1                                | 486.0                                                        | 1.23                                           | 5                                                             |
| SMBJ350A    | SMBJ350CA | QG      | FG | 350.0                                          | 391.00                                                | 432.00 | 1                                | 567.0                                                        | 1.06                                           | 5                                                             |
| SMBJ400A    | SMBJ400CA | QK      | FK | 400.0                                          | 447.00                                                | 494.00 | 1                                | 648.0                                                        | 0.93                                           | 5                                                             |
| SMBJ440A    | SMBJ440CA | QM      | FM | 440.0                                          | 492.00                                                | 543.00 | 1                                | 713.0                                                        | 0.84                                           | 5                                                             |

**Note:**

1. Suffix 'A' denotes 5% tolerance device. Without 'A' denotes 10% tolerance device
2. Add suffix 'C' or 'CA' after part number to specify Bi-directional devices
3. For Bi-Directional devices having V<sub>R</sub> of 10 volts and under, the I<sub>R</sub> limit is double

## Surface Mount Transient Voltage Suppressors (TVS)

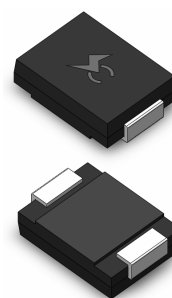
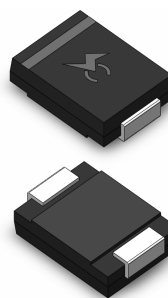
**SMCJ Series 5.0 To 440 V 1500W**

### Features

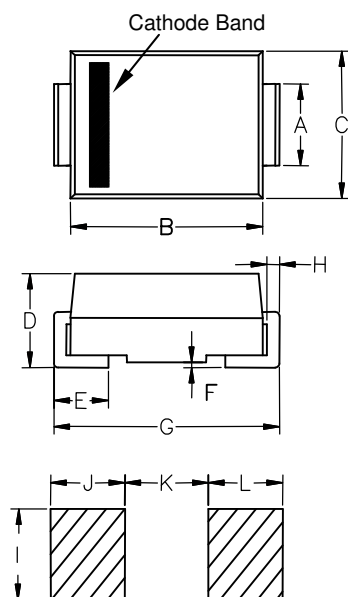
- u For surface mounted applications in order to optimize board space
- u Low leakage
- u Uni and Bidirectional unit
- u Glass passivated junction
- u Low inductance
- u Excellent clamping capability
- u 1500W Peak power capability at 10 × 1000μs waveform
- u Repetition rate (duty cycle):0.01%
- u Fast response time: typically less than 1.0ps from 0 Volts to V<sub>BR</sub> min
- u Typical I<sub>R</sub> less than 5μA above 12V.
- u High Temperature soldering: 260°C/40 seconds at terminals
- u Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR}@25^{\circ}\text{C} \times \Delta T$
- u Plastic package has Underwriters Laboratory Flammability 94V-0
- u Matte tin lead-free Plated
- u Halogen free and RoHS compliant
- u Typical failure mode is short from over-specified voltage or current
- u Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- u IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- u ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- u EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)

Uni-directional

Bi-directional


**DO-214AB (SMC)**

### Dimensions

**DO-214AB (SMC)**


| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| <b>A</b>   | 0.114  | 0.126 | 2.860       | 3.160 |
| <b>B</b>   | 0.260  | 0.280 | 6.520       | 7.020 |
| <b>C</b>   | 0.220  | 0.245 | 5.520       | 6.150 |
| <b>D</b>   | 0.079  | 0.103 | 1.980       | 2.590 |
| <b>E</b>   | 0.030  | 0.060 | 0.750       | 1.510 |
| <b>F</b>   | -      | 0.008 | -           | 0.203 |
| <b>G</b>   | 0.305  | 0.320 | 7.640       | 8.020 |
| <b>H</b>   | 0.006  | 0.012 | 0.152       | 0.305 |
| <b>I</b>   | 0.129  | -     | 3.300       | -     |
| <b>J</b>   | 0.094  | -     | 2.400       | -     |
| <b>K</b>   | -      | 0.165 | -           | 4.200 |
| <b>L</b>   | 0.094  | -     | 2.400       | -     |

**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

| Part Number |           | Marking |     | Reverse<br>Stand-Off<br>Voltage<br>V <sub>RWM</sub> (V) | Breakdown<br>Voltage V <sub>BR</sub> (V)<br>@I <sub>T</sub> |       | Test<br>Current<br>I <sub>T</sub><br>(mA) | Maximum<br>Clamping<br>Voltage<br>V <sub>C</sub><br>@I <sub>PP</sub> (V) | Maximum<br>Peak<br>Pulse<br>Current<br>I <sub>PP</sub> (A) | Maximum<br>Reverse<br>Leakage I <sub>R</sub><br>@V <sub>RWM</sub><br>(μA) |
|-------------|-----------|---------|-----|---------------------------------------------------------|-------------------------------------------------------------|-------|-------------------------------------------|--------------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------|
| Uni         | Bi        | Uni     | Bi  |                                                         | MIN                                                         | MAX   |                                           |                                                                          |                                                            |                                                                           |
| SMCJ5.0     | SMCJ5.0C  | GDD     | BDD | 5.0                                                     | 6.40                                                        | 7.30  | 10                                        | 9.6                                                                      | 156.25                                                     | 1000                                                                      |
| SMCJ5.0A    | SMCJ5.0CA | GDE     | BDE | 5.0                                                     | 6.40                                                        | 7.00  | 10                                        | 9.2                                                                      | 163.04                                                     | 1000                                                                      |
| SMCJ6.0     | SMCJ6.0C  | GDF     | BDF | 6.0                                                     | 6.67                                                        | 8.15  | 10                                        | 11.4                                                                     | 131.58                                                     | 1000                                                                      |
| SMCJ6.0A    | SMCJ6.0CA | GDG     | BDG | 6.0                                                     | 6.67                                                        | 7.37  | 10                                        | 10.3                                                                     | 145.63                                                     | 1000                                                                      |
| SMCJ6.5     | SMCJ6.5C  | GDH     | BDH | 6.5                                                     | 7.22                                                        | 8.82  | 10                                        | 12.3                                                                     | 121.95                                                     | 500                                                                       |
| SMCJ6.5A    | SMCJ6.5CA | GDK     | BDK | 6.5                                                     | 7.22                                                        | 7.98  | 10                                        | 11.2                                                                     | 133.93                                                     | 500                                                                       |
| SMCJ7.0     | SMCJ7.0C  | GDL     | BDL | 7.0                                                     | 7.78                                                        | 9.51  | 10                                        | 13.3                                                                     | 112.78                                                     | 200                                                                       |
| SMCJ7.0A    | SMCJ7.0CA | GDM     | BDM | 7.0                                                     | 7.78                                                        | 8.60  | 10                                        | 12.0                                                                     | 125.00                                                     | 200                                                                       |
| SMCJ7.5     | SMCJ7.5C  | GDN     | BDN | 7.5                                                     | 8.33                                                        | 10.20 | 1                                         | 14.3                                                                     | 104.90                                                     | 100                                                                       |
| SMCJ7.5A    | SMCJ7.5CA | GDP     | BDP | 7.5                                                     | 8.33                                                        | 9.21  | 1                                         | 12.9                                                                     | 116.28                                                     | 100                                                                       |
| SMCJ8.0     | SMCJ8.0C  | GDQ     | BDQ | 8.0                                                     | 8.89                                                        | 10.90 | 1                                         | 15.0                                                                     | 100.00                                                     | 50                                                                        |
| SMCJ8.0A    | SMCJ8.0CA | GDR     | BDR | 8.0                                                     | 8.89                                                        | 9.83  | 1                                         | 13.6                                                                     | 110.29                                                     | 50                                                                        |
| SMCJ8.5     | SMCJ8.5C  | GDS     | BDS | 8.5                                                     | 9.44                                                        | 11.50 | 1                                         | 15.9                                                                     | 94.34                                                      | 20                                                                        |
| SMCJ8.5A    | SMCJ8.5CA | GDT     | BDT | 8.5                                                     | 9.44                                                        | 10.40 | 1                                         | 14.4                                                                     | 104.17                                                     | 20                                                                        |
| SMCJ9.0     | SMCJ9.0C  | GDU     | BDU | 9.0                                                     | 10.00                                                       | 12.20 | 1                                         | 16.9                                                                     | 88.76                                                      | 10                                                                        |
| SMCJ9.0A    | SMCJ9.0CA | GDV     | BDV | 9.0                                                     | 10.00                                                       | 11.10 | 1                                         | 15.4                                                                     | 97.40                                                      | 10                                                                        |
| SMCJ10      | SMCJ10C   | GDW     | BDW | 10.0                                                    | 11.10                                                       | 13.60 | 1                                         | 18.8                                                                     | 79.79                                                      | 5                                                                         |
| SMCJ10A     | SMCJ10CA  | GDX     | BDX | 10.0                                                    | 11.10                                                       | 12.30 | 1                                         | 17.0                                                                     | 88.24                                                      | 5                                                                         |
| SMCJ11      | SMCJ11C   | GDY     | BDY | 11.0                                                    | 12.20                                                       | 14.90 | 1                                         | 20.1                                                                     | 74.63                                                      | 5                                                                         |
| SMCJ11A     | SMCJ11CA  | GDZ     | BDZ | 11.0                                                    | 12.20                                                       | 13.50 | 1                                         | 18.2                                                                     | 82.42                                                      | 5                                                                         |
| SMCJ12      | SMCJ12C   | GED     | BED | 12.0                                                    | 13.30                                                       | 16.30 | 1                                         | 22.0                                                                     | 68.18                                                      | 5                                                                         |
| SMCJ12A     | SMCJ12CA  | GEE     | BEE | 12.0                                                    | 13.30                                                       | 14.70 | 1                                         | 19.9                                                                     | 75.38                                                      | 5                                                                         |
| SMCJ13      | SMCJ13C   | GEF     | BEF | 13.0                                                    | 14.40                                                       | 17.60 | 1                                         | 23.8                                                                     | 63.03                                                      | 5                                                                         |
| SMCJ13A     | SMCJ13CA  | GEG     | BEG | 13.0                                                    | 14.40                                                       | 15.90 | 1                                         | 21.5                                                                     | 69.77                                                      | 5                                                                         |
| SMCJ14      | SMCJ14C   | GEH     | BEH | 14.0                                                    | 15.60                                                       | 19.10 | 1                                         | 25.8                                                                     | 58.14                                                      | 5                                                                         |
| SMCJ14A     | SMCJ14CA  | GEK     | BEK | 14.0                                                    | 15.60                                                       | 17.20 | 1                                         | 23.2                                                                     | 64.66                                                      | 5                                                                         |
| SMCJ15      | SMCJ15C   | GEL     | BEL | 15.0                                                    | 16.70                                                       | 20.40 | 1                                         | 26.9                                                                     | 55.76                                                      | 5                                                                         |
| SMCJ15A     | SMCJ15CA  | GEM     | BEM | 15.0                                                    | 16.70                                                       | 18.50 | 1                                         | 24.4                                                                     | 61.48                                                      | 5                                                                         |
| SMCJ16      | SMCJ16C   | GEN     | BEN | 16.0                                                    | 17.80                                                       | 21.80 | 1                                         | 28.8                                                                     | 52.08                                                      | 5                                                                         |
| SMCJ16A     | SMCJ16CA  | GEP     | BEP | 16.0                                                    | 17.80                                                       | 19.70 | 1                                         | 26.0                                                                     | 57.69                                                      | 5                                                                         |
| SMCJ17      | SMCJ17C   | GEQ     | BEQ | 17.0                                                    | 18.90                                                       | 23.10 | 1                                         | 30.5                                                                     | 49.18                                                      | 5                                                                         |
| SMCJ17A     | SMCJ17CA  | GER     | BER | 17.0                                                    | 18.90                                                       | 20.90 | 1                                         | 27.6                                                                     | 54.35                                                      | 5                                                                         |
| SMCJ18      | SMCJ18C   | GES     | BES | 18.0                                                    | 20.00                                                       | 24.40 | 1                                         | 32.2                                                                     | 46.58                                                      | 5                                                                         |
| SMCJ18A     | SMCJ18CA  | GET     | BET | 18.0                                                    | 20.00                                                       | 22.10 | 1                                         | 29.2                                                                     | 51.37                                                      | 5                                                                         |
| SMCJ19      | SMCJ19C   | GEA     | BEA | 19.0                                                    | 21.13                                                       | 25.76 | 1                                         | 34.0                                                                     | 44.10                                                      | 5                                                                         |
| SMCJ19A     | SMCJ19CA  | GEB     | BEB | 19.0                                                    | 21.10                                                       | 23.30 | 1                                         | 30.8                                                                     | 48.73                                                      | 5                                                                         |
| SMCJ20      | SMCJ20C   | GEU     | BEU | 20.0                                                    | 22.20                                                       | 27.10 | 1                                         | 35.8                                                                     | 41.90                                                      | 5                                                                         |
| SMCJ20A     | SMCJ20CA  | GEV     | BEV | 20.0                                                    | 22.20                                                       | 24.50 | 1                                         | 32.4                                                                     | 46.30                                                      | 5                                                                         |
| SMCJ22      | SMCJ22C   | GEW     | BEW | 22.0                                                    | 24.40                                                       | 29.80 | 1                                         | 39.4                                                                     | 38.07                                                      | 5                                                                         |
| SMCJ22A     | SMCJ22CA  | GEX     | BEX | 22.0                                                    | 24.40                                                       | 26.90 | 1                                         | 35.5                                                                     | 42.25                                                      | 5                                                                         |
| SMCJ24      | SMCJ24C   | GEY     | BEY | 24.0                                                    | 26.70                                                       | 32.60 | 1                                         | 43.0                                                                     | 34.88                                                      | 5                                                                         |
| SMCJ24A     | SMCJ24CA  | GEZ     | BEZ | 24.0                                                    | 26.70                                                       | 29.50 | 1                                         | 38.9                                                                     | 38.56                                                      | 5                                                                         |
| SMCJ26      | SMCJ26C   | GFD     | BFD | 26.0                                                    | 28.90                                                       | 35.30 | 1                                         | 46.6                                                                     | 32.19                                                      | 5                                                                         |
| SMCJ26A     | SMCJ26CA  | GFE     | BFE | 26.0                                                    | 28.90                                                       | 31.90 | 1                                         | 42.1                                                                     | 35.63                                                      | 5                                                                         |
| SMCJ28      | SMCJ28C   | GFF     | BFF | 28.0                                                    | 31.10                                                       | 38.00 | 1                                         | 50.0                                                                     | 30.00                                                      | 5                                                                         |
| SMCJ28A     | SMCJ28CA  | GFG     | BFG | 28.0                                                    | 31.10                                                       | 34.40 | 1                                         | 45.4                                                                     | 33.04                                                      | 5                                                                         |
| SMCJ30      | SMCJ30C   | GFH     | BFH | 30.0                                                    | 33.30                                                       | 40.70 | 1                                         | 53.5                                                                     | 28.04                                                      | 5                                                                         |
| SMCJ30A     | SMCJ30CA  | GFK     | BFK | 30.0                                                    | 33.30                                                       | 36.80 | 1                                         | 48.4                                                                     | 30.99                                                      | 5                                                                         |
| SMCJ33      | SMCJ33C   | GFL     | BFL | 33.0                                                    | 36.70                                                       | 44.90 | 1                                         | 59.0                                                                     | 25.42                                                      | 5                                                                         |
| SMCJ33A     | SMCJ33CA  | GFM     | BFM | 33.0                                                    | 36.70                                                       | 40.60 | 1                                         | 53.3                                                                     | 28.14                                                      | 5                                                                         |
| SMCJ36      | SMCJ36C   | GFN     | BFN | 36.0                                                    | 40.00                                                       | 48.90 | 1                                         | 64.3                                                                     | 23.33                                                      | 5                                                                         |
| SMCJ36A     | SMCJ36CA  | GFP     | BFP | 36.0                                                    | 40.00                                                       | 44.20 | 1                                         | 58.1                                                                     | 25.82                                                      | 5                                                                         |
| SMCJ40      | SMCJ40C   | GFQ     | BFQ | 40.0                                                    | 44.40                                                       | 54.30 | 1                                         | 71.4                                                                     | 21.01                                                      | 5                                                                         |
| SMCJ40A     | SMCJ40CA  | GFR     | BFR | 40.0                                                    | 44.40                                                       | 49.10 | 1                                         | 64.5                                                                     | 23.26                                                      | 5                                                                         |
| SMCJ43      | SMCJ43C   | GFS     | BFS | 43.0                                                    | 47.80                                                       | 58.40 | 1                                         | 76.7                                                                     | 19.56                                                      | 5                                                                         |
| SMCJ43A     | SMCJ43CA  | GFT     | BFT | 43.0                                                    | 47.80                                                       | 52.80 | 1                                         | 69.4                                                                     | 21.61                                                      | 5                                                                         |

# Surface Mount Transient Voltage Suppressors (TVS)

SMCJ Series 5.0 To 440 V 1500W

## Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

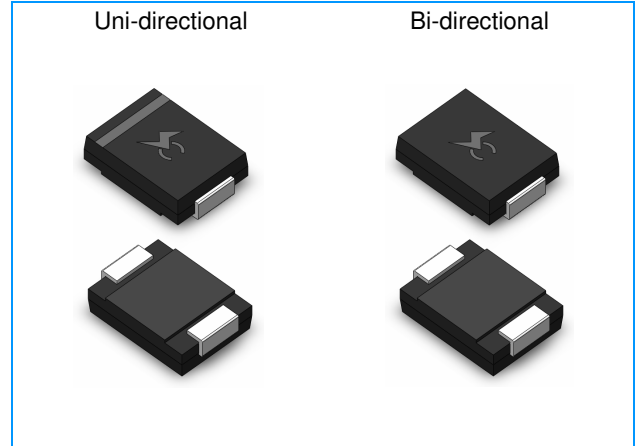
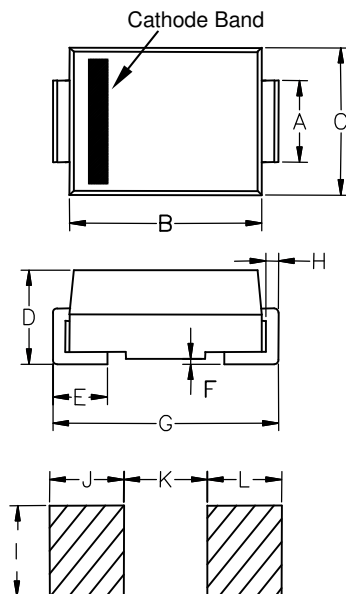
| Part Number |           | Marking |     | Reverse Stand-Off Voltage<br>V <sub>RWM</sub> (V) | Breakdown Voltage V <sub>BR</sub> (V)<br>@I <sub>T</sub> |        | Test Current<br>I <sub>T</sub> (mA) | Maximum Clamping Voltage<br>V <sub>C</sub><br>@I <sub>PP</sub> (V) | Maximum Peak Pulse Current<br>I <sub>PP</sub> (A) | Maximum Reverse Leakage I <sub>R</sub><br>@V <sub>RWM</sub> (μA) |
|-------------|-----------|---------|-----|---------------------------------------------------|----------------------------------------------------------|--------|-------------------------------------|--------------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------|
| Uni         | Bi        | Uni     | Bi  |                                                   | MIN                                                      | MAX    |                                     |                                                                    |                                                   |                                                                  |
| SMCJ45      | SMCJ45C   | GFU     | BFU | 45.0                                              | 50.00                                                    | 61.10  | 1                                   | 80.3                                                               | 18.68                                             | 5                                                                |
| SMCJ45A     | SMCJ45CA  | GFV     | BFV | 45.0                                              | 50.00                                                    | 55.30  | 1                                   | 72.7                                                               | 20.63                                             | 5                                                                |
| SMCJ48      | SMCJ48C   | GFW     | BFW | 48.0                                              | 53.30                                                    | 65.10  | 1                                   | 85.5                                                               | 17.54                                             | 5                                                                |
| SMCJ48A     | SMCJ48CA  | GFY     | BFY | 48.0                                              | 53.30                                                    | 58.90  | 1                                   | 77.4                                                               | 19.38                                             | 5                                                                |
| SMCJ51      | SMCJ51C   | GFY     | BFY | 51.0                                              | 56.70                                                    | 69.30  | 1                                   | 91.1                                                               | 16.47                                             | 5                                                                |
| SMCJ51A     | SMCJ51CA  | GFZ     | BFZ | 51.0                                              | 56.70                                                    | 62.70  | 1                                   | 82.4                                                               | 18.20                                             | 5                                                                |
| SMCJ54      | SMCJ54C   | GGD     | BGD | 54.0                                              | 60.00                                                    | 73.30  | 1                                   | 96.3                                                               | 15.58                                             | 5                                                                |
| SMCJ54A     | SMCJ54CA  | GGE     | BGE | 54.0                                              | 60.00                                                    | 66.30  | 1                                   | 87.1                                                               | 17.22                                             | 5                                                                |
| SMCJ58      | SMCJ58C   | GGF     | BGF | 58.0                                              | 64.40                                                    | 78.70  | 1                                   | 103.0                                                              | 14.56                                             | 5                                                                |
| SMCJ58A     | SMCJ58CA  | GGG     | BGG | 58.0                                              | 64.40                                                    | 71.20  | 1                                   | 93.6                                                               | 16.03                                             | 5                                                                |
| SMCJ60      | SMCJ60C   | GGH     | BGH | 60.0                                              | 66.70                                                    | 81.50  | 1                                   | 107.0                                                              | 14.02                                             | 5                                                                |
| SMCJ60A     | SMCJ60CA  | GGK     | BGK | 60.0                                              | 66.70                                                    | 73.70  | 1                                   | 96.8                                                               | 15.50                                             | 5                                                                |
| SMCJ64      | SMCJ64C   | GGL     | BGL | 64.0                                              | 71.10                                                    | 86.90  | 1                                   | 114.0                                                              | 13.16                                             | 5                                                                |
| SMCJ64A     | SMCJ64CA  | GGM     | BGM | 64.0                                              | 71.10                                                    | 78.60  | 1                                   | 103.0                                                              | 14.56                                             | 5                                                                |
| SMCJ70      | SMCJ70C   | GGN     | BGN | 70.0                                              | 77.80                                                    | 95.10  | 1                                   | 125.0                                                              | 12.00                                             | 5                                                                |
| SMCJ70A     | SMCJ70CA  | GGP     | BGP | 70.0                                              | 77.80                                                    | 86.00  | 1                                   | 113.0                                                              | 13.27                                             | 5                                                                |
| SMCJ75      | SMCJ75C   | GGQ     | BGQ | 75.0                                              | 83.30                                                    | 102.00 | 1                                   | 134.0                                                              | 11.19                                             | 5                                                                |
| SMCJ75A     | SMCJ75CA  | GGR     | BGR | 75.0                                              | 83.30                                                    | 92.10  | 1                                   | 121.0                                                              | 12.40                                             | 5                                                                |
| SMCJ78      | SMCJ78C   | GGS     | BGS | 78.0                                              | 86.70                                                    | 106.00 | 1                                   | 139.0                                                              | 10.79                                             | 5                                                                |
| SMCJ78A     | SMCJ78CA  | GGT     | BGT | 78.0                                              | 86.70                                                    | 95.80  | 1                                   | 126.0                                                              | 11.90                                             | 5                                                                |
| SMCJ80      | SMCJ80C   | GGA     | BGA | 80.0                                              | 88.96                                                    | 108.80 | 1                                   | 143.2                                                              | 10.47                                             | 5                                                                |
| SMCJ80A     | SMCJ80CA  | GGB     | BGB | 80.0                                              | 88.80                                                    | 97.60  | 1                                   | 129.6                                                              | 11.57                                             | 5                                                                |
| SMCJ85      | SMCJ85C   | GGU     | BGU | 85.0                                              | 94.40                                                    | 115.00 | 1                                   | 151.0                                                              | 9.93                                              | 5                                                                |
| SMCJ85A     | SMCJ85CA  | GGV     | BGV | 85.0                                              | 94.40                                                    | 104.00 | 1                                   | 137.0                                                              | 10.95                                             | 5                                                                |
| SMCJ90      | SMCJ90C   | GGW     | BGW | 90.0                                              | 100.00                                                   | 122.00 | 1                                   | 160.0                                                              | 9.38                                              | 5                                                                |
| SMCJ90A     | SMCJ90CA  | GGX     | BGX | 90.0                                              | 100.00                                                   | 111.00 | 1                                   | 146.0                                                              | 10.27                                             | 5                                                                |
| SMCJ100     | SMCJ100C  | GGY     | BGY | 100.0                                             | 111.00                                                   | 136.00 | 1                                   | 179.0                                                              | 8.38                                              | 5                                                                |
| SMCJ100A    | SMCJ100CA | GGZ     | BGZ | 100.0                                             | 111.00                                                   | 123.00 | 1                                   | 162.0                                                              | 9.26                                              | 5                                                                |
| SMCJ110     | SMCJ110C  | GHD     | BHD | 110.0                                             | 122.00                                                   | 149.00 | 1                                   | 196.0                                                              | 7.65                                              | 5                                                                |
| SMCJ110A    | SMCJ110CA | GHE     | BHE | 110.0                                             | 122.00                                                   | 135.00 | 1                                   | 177.0                                                              | 8.47                                              | 5                                                                |
| SMCJ120     | SMCJ120C  | GHF     | BHF | 120.0                                             | 133.00                                                   | 163.00 | 1                                   | 214.0                                                              | 7.01                                              | 5                                                                |
| SMCJ120A    | SMCJ120CA | GHG     | BHG | 120.0                                             | 133.00                                                   | 147.00 | 1                                   | 193.0                                                              | 7.77                                              | 5                                                                |
| SMCJ130     | SMCJ130C  | GHH     | BHH | 130.0                                             | 144.00                                                   | 176.00 | 1                                   | 231.0                                                              | 6.49                                              | 5                                                                |
| SMCJ130A    | SMCJ130CA | GHK     | BHK | 130.0                                             | 144.00                                                   | 159.00 | 1                                   | 209.0                                                              | 7.18                                              | 5                                                                |
| SMCJ140     | SMCJ140C  | GHA     | BHA | 140.0                                             | 155.68                                                   | 190.40 | 1                                   | 250.6                                                              | 5.99                                              | 5                                                                |
| SMCJ140A    | SMCJ140CA | GHB     | BHB | 140.0                                             | 155.00                                                   | 171.00 | 1                                   | 226.8                                                              | 6.61                                              | 5                                                                |
| SMCJ150     | SMCJ150C  | GHL     | BHL | 150.0                                             | 167.00                                                   | 204.00 | 1                                   | 268.0                                                              | 5.60                                              | 5                                                                |
| SMCJ150A    | SMCJ150CA | GHM     | BHM | 150.0                                             | 167.00                                                   | 185.00 | 1                                   | 243.0                                                              | 6.17                                              | 5                                                                |
| SMCJ160     | SMCJ160C  | GHN     | BHN | 160.0                                             | 178.00                                                   | 218.00 | 1                                   | 287.0                                                              | 5.23                                              | 5                                                                |
| SMCJ160A    | SMCJ160CA | GHP     | BHP | 160.0                                             | 178.00                                                   | 197.00 | 1                                   | 259.0                                                              | 5.79                                              | 5                                                                |
| SMCJ170     | SMCJ170C  | GHQ     | BHQ | 170.0                                             | 189.00                                                   | 231.00 | 1                                   | 304.0                                                              | 4.93                                              | 5                                                                |
| SMCJ170A    | SMCJ170CA | GHR     | BHR | 170.0                                             | 189.00                                                   | 209.00 | 1                                   | 275.0                                                              | 5.45                                              | 5                                                                |
| SMCJ180     | SMCJ180C  | GHS     | BHS | 180.0                                             | 201.00                                                   | 244.80 | 1                                   | 322.2                                                              | 4.66                                              | 5                                                                |
| SMCJ180A    | SMCJ180CA | GHT     | BHT | 180.0                                             | 201.00                                                   | 220.00 | 1                                   | 291.6                                                              | 5.14                                              | 5                                                                |
| SMCJ190     | SMCJ190C  | GHU     | BHU | 190.0                                             | 211.21                                                   | 258.40 | 1                                   | 340.1                                                              | 4.41                                              | 5                                                                |
| SMCJ190A    | SMCJ190CA | GHV     | BHV | 190.0                                             | 211.00                                                   | 232.00 | 1                                   | 307.8                                                              | 4.87                                              | 5                                                                |
| SMCJ200A    | SMCJ200CA | GHW     | BHW | 200.0                                             | 224.00                                                   | 247.00 | 1                                   | 324.0                                                              | 4.60                                              | 5                                                                |
| SMCJ220A    | SMCJ220CA | GHX     | BHX | 220.0                                             | 246.00                                                   | 272.00 | 1                                   | 356.0                                                              | 4.20                                              | 5                                                                |
| SMCJ250A    | SMCJ250CA | GHZ     | BHZ | 250.0                                             | 279.00                                                   | 309.00 | 1                                   | 405.0                                                              | 3.70                                              | 5                                                                |
| SMCJ300A    | SMCJ300CA | GJE     | BJE | 300.0                                             | 335.00                                                   | 371.00 | 1                                   | 486.0                                                              | 3.10                                              | 5                                                                |
| SMCJ350A    | SMCJ350CA | GJG     | BJG | 350.0                                             | 391.00                                                   | 432.00 | 1                                   | 567.0                                                              | 2.60                                              | 5                                                                |
| SMCJ400A    | SMCJ400CA | GJK     | BJK | 400.0                                             | 447.00                                                   | 494.00 | 1                                   | 648.0                                                              | 2.30                                              | 5                                                                |
| SMCJ440A    | SMCJ440CA | GJM     | BJM | 440.0                                             | 492.00                                                   | 543.00 | 1                                   | 713.0                                                              | 2.10                                              | 5                                                                |

### Note:

1. Suffix 'A' denotes 5% tolerance device. Without 'A' denotes 10% tolerance device
2. Add suffix 'C' or 'CA' after part number to specify Bi-directional devices
3. For Bi-Directional devices having V<sub>R</sub> of 10 volts and under, the I<sub>R</sub> limit is double

**Features**

- u For surface mounted applications in order to optimize board space
- u Low leakage
- u Uni and Bidirectional unit
- u Glass passivated junction
- u Low inductance
- u Excellent clamping capability
- u 3000W Peak power capability at 10 × 1000μs waveform
- u Repetition rate (duty cycle):0.01%
- u Fast response time: typically less than 1.0ps from 0 Volts to V<sub>BR</sub> min
- u Typical I<sub>R</sub> less than 5μA above 12V.
- u High Temperature soldering: 260°C/40 seconds at terminals
- u Typical maximum temperature coefficient ΔV<sub>BR</sub> = 0.1% × V<sub>BR</sub>@25°C× ΔT
- u Plastic package has Underwriters Laboratory Flammability 94V-0
- u Matte tin lead-free Plated
- u Halogen free and RoHS compliant
- u Typical failure mode is short from over-specified voltage or current
- u Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- u IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- u ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- u EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)


**DO-214AB (SMC)**
**Dimensions**
**DO-214AB (SMC)**


| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| <b>A</b>   | 0.114  | 0.126 | 2.860       | 3.160 |
| <b>B</b>   | 0.260  | 0.280 | 6.520       | 7.020 |
| <b>C</b>   | 0.220  | 0.245 | 5.520       | 6.150 |
| <b>D</b>   | 0.079  | 0.103 | 1.980       | 2.590 |
| <b>E</b>   | 0.030  | 0.060 | 0.750       | 1.510 |
| <b>F</b>   | -      | 0.008 | -           | 0.203 |
| <b>G</b>   | 0.305  | 0.320 | 7.640       | 8.020 |
| <b>H</b>   | 0.006  | 0.012 | 0.152       | 0.305 |
| <b>I</b>   | 0.129  | -     | 3.300       | -     |
| <b>J</b>   | 0.094  | -     | 2.400       | -     |
| <b>K</b>   | -      | 0.165 | -           | 4.200 |
| <b>L</b>   | 0.094  | -     | 2.400       | -     |

# Surface Mount Transient Voltage Suppressors (TVS)

SMDJ Series 5.0 To 440 V 3000W

Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

| Part Number |           | Marking |     | Reverse Stand-Off Voltage V <sub>RWM</sub> (V) | Breakdown Voltage V <sub>BR</sub> (V) |       | Test Current I <sub>T</sub> (mA) | Maximum Clamping Voltage V <sub>C</sub> @I <sub>PP</sub> (V) | Maximum Peak Pulse Current I <sub>PP</sub> (A) | Maximum Reverse Leakage I <sub>R</sub> @V <sub>RWM</sub> (μA) |
|-------------|-----------|---------|-----|------------------------------------------------|---------------------------------------|-------|----------------------------------|--------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------------|
| Uni         | Bi        | Uni     | Bi  |                                                | MIN                                   | MAX   |                                  |                                                              |                                                |                                                               |
| SMDJ5.0     | SMDJ5.0C  | RDD     | DDD | 5.0                                            | 6.40                                  | 7.30  | 10                               | 9.6                                                          | 312.50                                         | 1000                                                          |
| SMDJ5.0A    | SMDJ5.0CA | RDE     | DDE | 5.0                                            | 6.40                                  | 7.00  | 10                               | 9.2                                                          | 326.09                                         | 1000                                                          |
| SMDJ6.0     | SMDJ6.0C  | RDF     | DDF | 6.0                                            | 6.67                                  | 8.15  | 10                               | 11.4                                                         | 263.16                                         | 1000                                                          |
| SMDJ6.0A    | SMDJ6.0CA | RDG     | DDG | 6.0                                            | 6.67                                  | 7.37  | 10                               | 10.3                                                         | 291.26                                         | 1000                                                          |
| SMDJ6.5     | SMDJ6.5C  | RDH     | DDH | 6.5                                            | 7.22                                  | 8.82  | 10                               | 12.3                                                         | 243.90                                         | 500                                                           |
| SMDJ6.5A    | SMDJ6.5CA | RDK     | DDK | 6.5                                            | 7.22                                  | 7.98  | 10                               | 11.2                                                         | 267.86                                         | 500                                                           |
| SMDJ7.0     | SMDJ7.0C  | RDL     | DDL | 7.0                                            | 7.78                                  | 9.51  | 10                               | 13.3                                                         | 225.56                                         | 200                                                           |
| SMDJ7.0A    | SMDJ7.0CA | PDM     | DDM | 7.0                                            | 7.78                                  | 8.60  | 10                               | 12.0                                                         | 250.00                                         | 200                                                           |
| SMDJ7.5     | SMDJ7.5C  | PDN     | DDN | 7.5                                            | 8.33                                  | 10.20 | 1                                | 14.3                                                         | 209.79                                         | 100                                                           |
| SMDJ7.5A    | SMDJ7.5CA | PDP     | DDP | 7.5                                            | 8.33                                  | 9.21  | 1                                | 12.9                                                         | 232.56                                         | 100                                                           |
| SMDJ8.0     | SMDJ8.0C  | PDQ     | DDQ | 8.0                                            | 8.89                                  | 10.90 | 1                                | 15.0                                                         | 200.00                                         | 50                                                            |
| SMDJ8.0A    | SMDJ8.0CA | PDR     | DDR | 8.0                                            | 8.89                                  | 9.83  | 1                                | 13.6                                                         | 220.59                                         | 50                                                            |
| SMDJ8.5     | SMDJ8.5C  | PDS     | DDS | 8.5                                            | 9.44                                  | 11.50 | 1                                | 15.9                                                         | 188.68                                         | 25                                                            |
| SMDJ8.5A    | SMDJ8.5CA | PDT     | DDT | 8.5                                            | 9.44                                  | 10.40 | 1                                | 14.4                                                         | 208.33                                         | 25                                                            |
| SMDJ9.0     | SMDJ9.0C  | PDU     | DDU | 9.0                                            | 10.00                                 | 12.20 | 1                                | 16.9                                                         | 177.51                                         | 10                                                            |
| SMDJ9.0A    | SMDJ9.0CA | PDV     | DDV | 9.0                                            | 10.00                                 | 11.10 | 1                                | 15.4                                                         | 194.81                                         | 10                                                            |
| SMDJ10      | SMDJ10C   | PDW     | DDW | 10.0                                           | 11.10                                 | 13.60 | 1                                | 18.8                                                         | 159.57                                         | 5                                                             |
| SMDJ10A     | SMDJ10CA  | PDX     | DDX | 10.0                                           | 11.10                                 | 12.30 | 1                                | 17.0                                                         | 176.47                                         | 5                                                             |
| SMDJ11      | SMDJ11C   | PDY     | DDY | 11.0                                           | 12.20                                 | 14.90 | 1                                | 20.1                                                         | 149.25                                         | 5                                                             |
| SMDJ11A     | SMDJ11CA  | PDZ     | DDZ | 11.0                                           | 12.20                                 | 13.50 | 1                                | 18.2                                                         | 164.84                                         | 5                                                             |
| SMDJ12      | SMDJ12C   | PED     | DED | 12.0                                           | 13.30                                 | 16.30 | 1                                | 22.0                                                         | 136.36                                         | 5                                                             |
| SMDJ12A     | SMDJ12CA  | PEE     | DEE | 12.0                                           | 13.30                                 | 14.70 | 1                                | 19.9                                                         | 150.75                                         | 5                                                             |
| SMDJ13      | SMDJ13C   | PEF     | DEF | 13.0                                           | 14.40                                 | 17.60 | 1                                | 23.8                                                         | 126.05                                         | 5                                                             |
| SMDJ13A     | SMDJ13CA  | PEG     | DEG | 13.0                                           | 14.40                                 | 15.90 | 1                                | 21.5                                                         | 139.53                                         | 5                                                             |
| SMDJ14      | SMDJ14C   | PEH     | DEH | 14.0                                           | 15.60                                 | 19.10 | 1                                | 25.8                                                         | 116.28                                         | 5                                                             |
| SMDJ14A     | SMDJ14CA  | PEK     | DEK | 14.0                                           | 15.60                                 | 17.20 | 1                                | 23.2                                                         | 129.31                                         | 5                                                             |
| SMDJ15      | SMDJ15C   | PEL     | DEL | 15.0                                           | 16.70                                 | 20.40 | 1                                | 26.9                                                         | 111.52                                         | 5                                                             |
| SMDJ15A     | SMDJ15CA  | PEM     | DEM | 15.0                                           | 16.70                                 | 18.50 | 1                                | 24.4                                                         | 122.95                                         | 5                                                             |
| SMDJ16      | SMDJ16C   | PEN     | DEN | 16.0                                           | 17.80                                 | 21.80 | 1                                | 28.8                                                         | 104.17                                         | 5                                                             |
| SMDJ16A     | SMDJ16CA  | PEP     | DEP | 16.0                                           | 17.80                                 | 19.70 | 1                                | 26.0                                                         | 115.38                                         | 5                                                             |
| SMDJ17      | SMDJ17C   | PEQ     | DEQ | 17.0                                           | 18.90                                 | 23.10 | 1                                | 30.5                                                         | 98.36                                          | 5                                                             |
| SMDJ17A     | SMDJ17CA  | PER     | DER | 17.0                                           | 18.90                                 | 20.90 | 1                                | 27.6                                                         | 108.70                                         | 5                                                             |
| SMDJ18      | SMDJ18C   | PES     | DES | 18.0                                           | 20.00                                 | 24.40 | 1                                | 32.2                                                         | 93.17                                          | 5                                                             |
| SMDJ18A     | SMDJ18CA  | PET     | DET | 18.0                                           | 20.00                                 | 22.10 | 1                                | 29.2                                                         | 102.74                                         | 5                                                             |
| SMDJ19      | SMDJ19C   | PEA     | DEA | 19.0                                           | 21.13                                 | 25.76 | 1                                | 34.0                                                         | 88.21                                          | 5                                                             |
| SMDJ19A     | SMDJ19CA  | PEB     | DEB | 19.0                                           | 21.10                                 | 23.30 | 1                                | 30.8                                                         | 97.47                                          | 5                                                             |
| SMDJ20      | SMDJ20C   | PEU     | DEU | 20.0                                           | 22.20                                 | 27.10 | 1                                | 35.8                                                         | 83.80                                          | 5                                                             |
| SMDJ20A     | SMDJ20CA  | PEV     | DEV | 20.0                                           | 22.20                                 | 24.50 | 1                                | 32.4                                                         | 92.59                                          | 5                                                             |
| SMDJ22      | SMDJ22C   | PEW     | DEW | 22.0                                           | 24.40                                 | 29.80 | 1                                | 39.4                                                         | 76.14                                          | 5                                                             |
| SMDJ22A     | SMDJ22CA  | PEX     | DEX | 22.0                                           | 24.40                                 | 26.90 | 1                                | 35.5                                                         | 84.51                                          | 5                                                             |
| SMDJ24      | SMDJ24C   | PEY     | DEY | 24.0                                           | 26.70                                 | 32.60 | 1                                | 43.0                                                         | 69.77                                          | 5                                                             |
| SMDJ24A     | SMDJ24CA  | PEZ     | DEZ | 24.0                                           | 26.70                                 | 29.50 | 1                                | 38.9                                                         | 77.12                                          | 5                                                             |
| SMDJ26      | SMDJ26C   | PFD     | DFD | 26.0                                           | 28.90                                 | 35.30 | 1                                | 46.6                                                         | 64.38                                          | 5                                                             |
| SMDJ26A     | SMDJ26CA  | PFE     | DFE | 26.0                                           | 28.90                                 | 31.90 | 1                                | 42.1                                                         | 71.26                                          | 5                                                             |
| SMDJ28      | SMDJ28C   | PFF     | DFF | 28.0                                           | 31.10                                 | 38.00 | 1                                | 50.0                                                         | 60.00                                          | 5                                                             |
| SMDJ28A     | SMDJ28CA  | PFG     | DFG | 28.0                                           | 31.10                                 | 34.40 | 1                                | 45.4                                                         | 66.08                                          | 5                                                             |
| SMDJ30      | SMDJ30C   | PFH     | DFH | 30.0                                           | 33.30                                 | 40.70 | 1                                | 53.5                                                         | 56.07                                          | 5                                                             |
| SMDJ30A     | SMDJ30CA  | PFK     | DFK | 30.0                                           | 33.30                                 | 36.80 | 1                                | 48.4                                                         | 61.98                                          | 5                                                             |
| SMDJ33      | SMDJ33C   | PFL     | DFL | 33.0                                           | 36.70                                 | 44.90 | 1                                | 59.0                                                         | 50.85                                          | 5                                                             |
| SMDJ33A     | SMDJ33CA  | PFM     | DFM | 33.0                                           | 36.70                                 | 40.60 | 1                                | 53.3                                                         | 56.29                                          | 5                                                             |
| SMDJ36      | SMDJ36C   | PFN     | DFN | 36.0                                           | 40.00                                 | 48.90 | 1                                | 64.3                                                         | 46.66                                          | 5                                                             |
| SMDJ36A     | SMDJ36CA  | PFP     | DFP | 36.0                                           | 40.00                                 | 44.20 | 1                                | 58.1                                                         | 51.64                                          | 5                                                             |
| SMDJ40      | SMDJ40C   | PFQ     | DFQ | 40.0                                           | 44.40                                 | 54.30 | 1                                | 71.4                                                         | 42.02                                          | 5                                                             |
| SMDJ40A     | SMDJ40CA  | PFR     | DFR | 40.0                                           | 44.40                                 | 49.10 | 1                                | 64.5                                                         | 46.51                                          | 5                                                             |
| SMDJ43      | SMDJ43C   | PFS     | DFS | 43.0                                           | 47.80                                 | 58.40 | 1                                | 76.7                                                         | 39.11                                          | 5                                                             |
| SMDJ43A     | SMDJ43CA  | PFT     | DFT | 43.0                                           | 47.80                                 | 52.80 | 1                                | 69.4                                                         | 43.23                                          | 5                                                             |

**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

| Part Number |           | Marking |     | Reverse Stand-Off Voltage<br>V <sub>RWM</sub> (V) | Breakdown Voltage V <sub>BR</sub> (V)<br>@I <sub>T</sub> |        | Test Current<br>I <sub>T</sub> (mA) | Maximum Clamping Voltage<br>V <sub>C</sub><br>@I <sub>PP</sub> (V) | Maximum Peak Pulse Current<br>I <sub>PP</sub> (A) | Maximum Reverse Leakage I <sub>R</sub><br>@V <sub>RWM</sub> (μA) |
|-------------|-----------|---------|-----|---------------------------------------------------|----------------------------------------------------------|--------|-------------------------------------|--------------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------|
| Uni         | Bi        | Uni     | Bi  |                                                   | MIN                                                      | MAX    |                                     |                                                                    |                                                   |                                                                  |
| SMDJ45      | SMDJ45C   | PFU     | DFU | 45.0                                              | 50.00                                                    | 61.10  | 1                                   | 80.3                                                               | 37.36                                             | 5                                                                |
| SMDJ45A     | SMDJ45CA  | PFV     | DFV | 45.0                                              | 50.00                                                    | 55.30  | 1                                   | 72.7                                                               | 41.27                                             | 5                                                                |
| SMDJ48      | SMDJ48C   | PFW     | DFW | 48.0                                              | 53.30                                                    | 65.10  | 1                                   | 85.5                                                               | 35.09                                             | 5                                                                |
| SMDJ48A     | SMDJ48CA  | PFX     | DFX | 48.0                                              | 53.30                                                    | 58.90  | 1                                   | 77.4                                                               | 38.76                                             | 5                                                                |
| SMDJ51      | SMDJ51C   | PFY     | DFY | 51.0                                              | 56.70                                                    | 69.30  | 1                                   | 91.1                                                               | 32.93                                             | 5                                                                |
| SMDJ51A     | SMDJ51CA  | PFZ     | DFZ | 51.0                                              | 56.70                                                    | 62.70  | 1                                   | 82.4                                                               | 36.41                                             | 5                                                                |
| SMDJ54      | SMDJ54C   | RGD     | DGD | 54.0                                              | 60.00                                                    | 73.30  | 1                                   | 96.3                                                               | 31.15                                             | 5                                                                |
| SMDJ54A     | SMDJ54CA  | RGE     | DGE | 54.0                                              | 60.00                                                    | 66.30  | 1                                   | 87.1                                                               | 34.44                                             | 5                                                                |
| SMDJ58      | SMDJ58C   | RGF     | DGF | 58.0                                              | 64.40                                                    | 78.70  | 1                                   | 103.0                                                              | 29.13                                             | 5                                                                |
| SMDJ58A     | SMDJ58CA  | PGG     | DGG | 58.0                                              | 64.40                                                    | 71.20  | 1                                   | 93.6                                                               | 32.05                                             | 5                                                                |
| SMDJ60      | SMDJ60C   | RGH     | DGH | 60.0                                              | 66.70                                                    | 81.50  | 1                                   | 107.0                                                              | 28.04                                             | 5                                                                |
| SMDJ60A     | SMDJ60CA  | PGK     | DGK | 60.0                                              | 66.70                                                    | 73.70  | 1                                   | 96.8                                                               | 30.99                                             | 5                                                                |
| SMDJ64      | SMDJ64C   | PGL     | DGL | 64.0                                              | 71.10                                                    | 86.90  | 1                                   | 114.0                                                              | 26.32                                             | 5                                                                |
| SMDJ64A     | SMDJ64CA  | PGM     | DGM | 64.0                                              | 71.10                                                    | 78.60  | 1                                   | 103.0                                                              | 29.13                                             | 5                                                                |
| SMDJ70      | SMDJ70C   | PGN     | DGN | 70.0                                              | 77.80                                                    | 95.10  | 1                                   | 125.0                                                              | 24.00                                             | 5                                                                |
| SMDJ70A     | SMDJ70CA  | PGP     | DGP | 70.0                                              | 77.80                                                    | 86.00  | 1                                   | 113.0                                                              | 26.55                                             | 5                                                                |
| SMDJ75      | SMDJ75C   | PGQ     | DGQ | 75.0                                              | 83.30                                                    | 102.00 | 1                                   | 134.0                                                              | 22.39                                             | 5                                                                |
| SMDJ75A     | SMDJ75CA  | PGR     | DGR | 75.0                                              | 83.30                                                    | 92.10  | 1                                   | 121.0                                                              | 24.79                                             | 5                                                                |
| SMDJ78      | SMDJ78C   | PGS     | DGS | 78.0                                              | 86.70                                                    | 106.00 | 1                                   | 139.0                                                              | 21.58                                             | 5                                                                |
| SMDJ78A     | SMDJ78CA  | PGT     | DGT | 78.0                                              | 86.70                                                    | 95.80  | 1                                   | 126.0                                                              | 23.81                                             | 5                                                                |
| SMDJ80      | SMDJ80C   | PGA     | DGA | 80.0                                              | 88.96                                                    | 108.80 | 1                                   | 143.2                                                              | 20.95                                             | 5                                                                |
| SMDJ80A     | SMDJ80CA  | PGB     | DGB | 80.0                                              | 88.80                                                    | 97.60  | 1                                   | 129.6                                                              | 23.15                                             | 5                                                                |
| SMDJ85      | SMDJ85C   | PGU     | DGU | 85.0                                              | 94.40                                                    | 115.00 | 1                                   | 151.0                                                              | 19.87                                             | 5                                                                |
| SMDJ85A     | SMDJ85CA  | PGV     | DGV | 85.0                                              | 94.40                                                    | 104.00 | 1                                   | 137.0                                                              | 21.90                                             | 5                                                                |
| SMDJ90      | SMDJ90C   | PGW     | DGW | 90.0                                              | 100.00                                                   | 122.00 | 1                                   | 160.0                                                              | 18.75                                             | 5                                                                |
| SMDJ90A     | SMDJ90CA  | PGX     | DGX | 90.0                                              | 100.00                                                   | 111.00 | 1                                   | 146.0                                                              | 20.55                                             | 5                                                                |
| SMDJ100     | SMDJ100C  | PGY     | DGY | 100.0                                             | 111.00                                                   | 136.00 | 1                                   | 179.0                                                              | 16.76                                             | 5                                                                |
| SMDJ100A    | SMDJ100CA | PGZ     | DGZ | 100.0                                             | 111.00                                                   | 123.00 | 1                                   | 162.0                                                              | 18.52                                             | 5                                                                |
| SMDJ110     | SMDJ110C  | PHD     | DHD | 110.0                                             | 122.00                                                   | 149.00 | 1                                   | 196.0                                                              | 15.31                                             | 5                                                                |
| SMDJ110A    | SMDJ110CA | PHE     | DHE | 110.0                                             | 122.00                                                   | 135.00 | 1                                   | 177.0                                                              | 16.95                                             | 5                                                                |
| SMDJ120     | SMDJ120C  | PHF     | DHF | 120.0                                             | 133.00                                                   | 163.00 | 1                                   | 214.0                                                              | 14.02                                             | 5                                                                |
| SMDJ120A    | SMDJ120CA | PHG     | DHG | 120.0                                             | 133.00                                                   | 147.00 | 1                                   | 193.0                                                              | 15.54                                             | 5                                                                |
| SMDJ130     | SMDJ130C  | PHH     | DHH | 130.0                                             | 144.00                                                   | 176.00 | 1                                   | 231.0                                                              | 12.99                                             | 5                                                                |
| SMDJ130A    | SMDJ130CA | PHK     | DHK | 130.0                                             | 144.00                                                   | 159.00 | 1                                   | 209.0                                                              | 14.35                                             | 5                                                                |
| SMDJ140     | SMDJ140C  | PHA     | DHA | 140.0                                             | 155.68                                                   | 190.40 | 1                                   | 250.6                                                              | 11.97                                             | 5                                                                |
| SMDJ140A    | SMDJ140CA | PHB     | DHB | 140.0                                             | 155.00                                                   | 171.00 | 1                                   | 226.8                                                              | 13.23                                             | 5                                                                |
| SMDJ150     | SMDJ150C  | PHL     | DHL | 150.0                                             | 167.00                                                   | 204.00 | 1                                   | 268.0                                                              | 11.19                                             | 5                                                                |
| SMDJ150A    | SMDJ150CA | PHM     | DHM | 150.0                                             | 167.00                                                   | 185.00 | 1                                   | 243.0                                                              | 12.35                                             | 5                                                                |
| SMDJ160     | SMDJ160C  | PHN     | DHN | 160.0                                             | 178.00                                                   | 218.00 | 1                                   | 287.0                                                              | 10.45                                             | 5                                                                |
| SMDJ160A    | SMDJ160CA | PHP     | DHP | 160.0                                             | 178.00                                                   | 197.00 | 1                                   | 259.0                                                              | 11.58                                             | 5                                                                |
| SMDJ170     | SMDJ170C  | PHQ     | DHQ | 170.0                                             | 189.00                                                   | 231.00 | 1                                   | 304.0                                                              | 9.87                                              | 5                                                                |
| SMDJ170A    | SMDJ170CA | PHR     | DHR | 170.0                                             | 189.00                                                   | 209.00 | 1                                   | 275.0                                                              | 10.91                                             | 5                                                                |
| SMDJ180     | SMDJ180C  | PHS     | DHS | 180.0                                             | 201.00                                                   | 244.80 | 1                                   | 322.2                                                              | 9.31                                              | 5                                                                |
| SMDJ180A    | SMDJ180CA | PHT     | DHT | 180.0                                             | 201.00                                                   | 220.00 | 1                                   | 291.6                                                              | 10.29                                             | 5                                                                |
| SMDJ190     | SMDJ190C  | PHU     | DHU | 190.0                                             | 211.21                                                   | 258.40 | 1                                   | 340.1                                                              | 8.82                                              | 5                                                                |
| SMDJ190A    | SMDJ190CA | PHV     | DHV | 190.0                                             | 211.00                                                   | 232.00 | 1                                   | 307.8                                                              | 9.75                                              | 5                                                                |
| SMDJ200A    | SMDJ200CA | PHW     | DHW | 200.0                                             | 224.00                                                   | 247.00 | 1                                   | 324.0                                                              | 9.26                                              | 5                                                                |
| SMDJ220A    | SMDJ220CA | PHX     | DHX | 220.0                                             | 246.00                                                   | 272.00 | 1                                   | 356.0                                                              | 8.43                                              | 5                                                                |
| SMDJ250A    | SMDJ250CA | PHZ     | DHZ | 250.0                                             | 279.00                                                   | 309.00 | 1                                   | 405.0                                                              | 7.41                                              | 5                                                                |
| SMDJ300A    | SMDJ300CA | PJE     | DJE | 300.0                                             | 335.00                                                   | 371.00 | 1                                   | 486.0                                                              | 6.17                                              | 5                                                                |
| SMDJ350A    | SMDJ350CA | PJG     | DJG | 350.0                                             | 391.00                                                   | 432.00 | 1                                   | 567.0                                                              | 5.29                                              | 5                                                                |
| SMDJ400A    | SMDJ400CA | PJK     | DJK | 400.0                                             | 447.00                                                   | 494.00 | 1                                   | 648.0                                                              | 4.63                                              | 5                                                                |
| SMDJ440A    | SMDJ440CA | PJM     | DJM | 440.0                                             | 492.00                                                   | 543.00 | 1                                   | 713.0                                                              | 4.21                                              | 5                                                                |

**Note:**

1. Suffix 'A' denotes 5% tolerance device. Without 'A' denotes 10% tolerance device
2. Add suffix 'C' or 'CA' after part number to specify Bi-directional devices
3. For Bi-Directional devices having V<sub>R</sub> of 10 volts and under, the I<sub>R</sub> limit is double

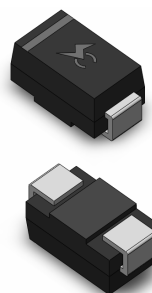
## Surface Mount Transient Voltage Suppressors (TVS)

P4SMAJ Series 6.8 To 600 V 400W

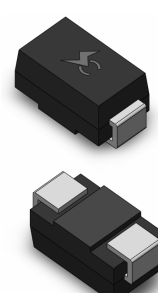
### Features

- u For surface mounted applications in order to optimize board space
- u Low leakage
- u Uni and Bidirectional unit
- u Glass passivated junction
- u Low inductance
- u Excellent clamping capability
- u 400W Peak power capability at  $10 \times 1000\mu\text{s}$  waveform
- u Repetition rate (duty cycle): 0.01%
- u Fast response time: typically less than 1.0ps from 0 Volts to  $V_{BR}$  min
- u Typical  $I_R$  less than  $5\mu\text{A}$  above 12V.
- u High Temperature soldering:  $260^\circ\text{C}/40$  seconds at terminals
- u Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR}@25^\circ\text{C} \times \Delta T$
- u Plastic package has Underwriters Laboratory Flammability 94V-0
- u Matte tin lead-free Plated
- u Halogen free and RoHS compliant
- u Typical failure mode is short from over-specified voltage or current
- u Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- u IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- u ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- u EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)

#### Uni-directional



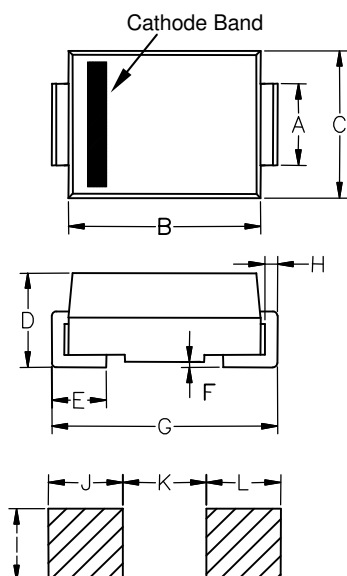
#### Bi-directional



**DO-214AC (SMA)**

### Dimensions

**DO-214AC (SMA)**



| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| <b>A</b>   | 0.049  | 0.064 | 1.230       | 1.630 |
| <b>B</b>   | 0.162  | 0.179 | 4.10        | 4.550 |
| <b>C</b>   | 0.099  | 0.109 | 2.510       | 2.760 |
| <b>D</b>   | 0.077  | 0.089 | 1.960       | 2.260 |
| <b>E</b>   | 0.030  | 0.060 | 0.750       | 1.510 |
| <b>F</b>   | -      | 0.008 | -           | 0.203 |
| <b>G</b>   | 0.192  | 0.206 | 4.87        | 5.220 |
| <b>H</b>   | 0.006  | 0.012 | 0.152       | 0.305 |
| <b>I</b>   | 0.070  | -     | 1.800       | -     |
| <b>J</b>   | 0.082  | -     | 2.100       | -     |
| <b>K</b>   | -      | 0.090 | -           | 2.300 |
| <b>L</b>   | 0.082  | -     | 2.100       | -     |

**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

| Part Number |            | Marking |      | Reverse Stand-Off Voltage<br>V <sub>RWM</sub> (V) | Breakdown Voltage V <sub>BR</sub> (V)<br>@I <sub>T</sub> |        | Test Current<br>I <sub>T</sub> (mA) | Maximum Clamping Voltage<br>V <sub>C</sub><br>@I <sub>PP</sub> (V) | Maximum Peak Pulse Current<br>I <sub>PP</sub> (A) | Maximum Reverse Leakage I <sub>R</sub><br>@V <sub>RWM</sub> (μA) |
|-------------|------------|---------|------|---------------------------------------------------|----------------------------------------------------------|--------|-------------------------------------|--------------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------|
| Uni         | Bi         | Uni     | Bi   |                                                   | MIN                                                      | MAX    |                                     |                                                                    |                                                   |                                                                  |
| P4SMA6.8A   | P4SMA6.8CA | 6V8A    | 6V8C | 5.8                                               | 6.46                                                     | 7.14   | 10                                  | 10.5                                                               | 38.10                                             | 1000                                                             |
| P4SMA7.5A   | P4SMA7.5CA | 7V5A    | 7V5C | 6.4                                               | 7.13                                                     | 7.88   | 10                                  | 11.3                                                               | 35.40                                             | 500                                                              |
| P4SMA8.2A   | P4SMA8.2CA | 8V2A    | 8V2C | 7.0                                               | 7.79                                                     | 8.61   | 10                                  | 12.1                                                               | 33.06                                             | 200                                                              |
| P4SMA9.1A   | P4SMA9.1CA | 9V1A    | 9V1C | 7.8                                               | 8.65                                                     | 9.56   | 1                                   | 13.4                                                               | 29.85                                             | 50                                                               |
| P4SMA10A    | P4SMA10CA  | 10A     | 10C  | 8.6                                               | 9.50                                                     | 10.50  | 1                                   | 14.5                                                               | 27.59                                             | 10                                                               |
| P4SMA11A    | P4SMA11CA  | 11A     | 11C  | 9.4                                               | 10.45                                                    | 11.55  | 1                                   | 15.6                                                               | 25.64                                             | 5                                                                |
| P4SMA12A    | P4SMA12CA  | 12A     | 12C  | 10.2                                              | 11.40                                                    | 12.60  | 1                                   | 16.7                                                               | 23.95                                             | 5                                                                |
| P4SMA13A    | P4SMA13CA  | 13A     | 13C  | 11.1                                              | 12.35                                                    | 13.65  | 1                                   | 18.2                                                               | 21.98                                             | 5                                                                |
| P4SMA15A    | P4SMA15CA  | 15A     | 15C  | 12.8                                              | 14.25                                                    | 15.75  | 1                                   | 21.2                                                               | 18.87                                             | 5                                                                |
| P4SMA16A    | P4SMA16CA  | 16A     | 16C  | 13.6                                              | 15.20                                                    | 16.80  | 1                                   | 22.5                                                               | 17.78                                             | 5                                                                |
| P4SMA18A    | P4SMA18CA  | 18A     | 18C  | 15.3                                              | 17.10                                                    | 18.90  | 1                                   | 25.2                                                               | 15.87                                             | 5                                                                |
| P4SMA20A    | P4SMA20CA  | 20A     | 20C  | 17.1                                              | 19.00                                                    | 21.00  | 1                                   | 27.7                                                               | 14.44                                             | 5                                                                |
| P4SMA22A    | P4SMA22CA  | 22A     | 22C  | 18.8                                              | 20.90                                                    | 23.10  | 1                                   | 30.6                                                               | 13.07                                             | 5                                                                |
| P4SMA24A    | P4SMA24CA  | 24A     | 24C  | 20.5                                              | 22.80                                                    | 25.20  | 1                                   | 33.2                                                               | 12.05                                             | 5                                                                |
| P4SMA27A    | P4SMA27CA  | 27A     | 27C  | 23.1                                              | 25.65                                                    | 28.35  | 1                                   | 37.5                                                               | 10.67                                             | 5                                                                |
| P4SMA30A    | P4SMA30CA  | 30A     | 30C  | 25.6                                              | 28.50                                                    | 31.50  | 1                                   | 41.4                                                               | 9.66                                              | 5                                                                |
| P4SMA33A    | P4SMA33CA  | 33A     | 33C  | 28.2                                              | 31.35                                                    | 34.65  | 1                                   | 45.7                                                               | 8.75                                              | 5                                                                |
| P4SMA36A    | P4SMA36CA  | 36A     | 36C  | 30.8                                              | 34.20                                                    | 37.80  | 1                                   | 49.9                                                               | 8.02                                              | 5                                                                |
| P4SMA39A    | P4SMA39CA  | 39A     | 39C  | 33.3                                              | 37.05                                                    | 40.95  | 1                                   | 53.9                                                               | 7.42                                              | 5                                                                |
| P4SMA43A    | P4SMA43CA  | 43A     | 43C  | 36.8                                              | 40.85                                                    | 45.15  | 1                                   | 59.3                                                               | 6.75                                              | 5                                                                |
| P4SMA47A    | P4SMA47CA  | 47A     | 47C  | 40.2                                              | 44.65                                                    | 49.35  | 1                                   | 64.8                                                               | 6.17                                              | 5                                                                |
| P4SMA51A    | P4SMA51CA  | 51A     | 51C  | 43.6                                              | 48.45                                                    | 53.55  | 1                                   | 70.1                                                               | 5.71                                              | 5                                                                |
| P4SMA56A    | P4SMA56CA  | 56A     | 56C  | 47.8                                              | 53.20                                                    | 58.80  | 1                                   | 77.0                                                               | 5.19                                              | 5                                                                |
| P4SMA62A    | P4SMA62CA  | 62A     | 62C  | 53.0                                              | 58.90                                                    | 65.10  | 1                                   | 85.0                                                               | 4.71                                              | 5                                                                |
| P4SMA68A    | P4SMA68CA  | 68A     | 68C  | 58.1                                              | 64.60                                                    | 71.40  | 1                                   | 92.0                                                               | 4.35                                              | 5                                                                |
| P4SMA75A    | P4SMA75CA  | 75A     | 75C  | 64.1                                              | 71.25                                                    | 78.75  | 1                                   | 103.0                                                              | 3.88                                              | 5                                                                |
| P4SMA82A    | P4SMA82CA  | 82A     | 82C  | 70.1                                              | 77.90                                                    | 86.10  | 1                                   | 113.0                                                              | 3.54                                              | 5                                                                |
| P4SMA91A    | P4SMA91CA  | 91A     | 91C  | 77.8                                              | 86.45                                                    | 95.55  | 1                                   | 125.0                                                              | 3.20                                              | 5                                                                |
| P4SMA100A   | P4SMA100CA | 100A    | 100C | 85.5                                              | 95.00                                                    | 105.00 | 1                                   | 137.0                                                              | 2.92                                              | 5                                                                |
| P4SMA110A   | P4SMA110CA | 110A    | 110C | 94.0                                              | 104.50                                                   | 115.50 | 1                                   | 152.0                                                              | 2.63                                              | 5                                                                |
| P4SMA120A   | P4SMA120CA | 120A    | 120C | 102.0                                             | 114.00                                                   | 126.00 | 1                                   | 165.0                                                              | 2.42                                              | 5                                                                |
| P4SMA130A   | P4SMA130CA | 130A    | 130C | 111.0                                             | 123.50                                                   | 136.50 | 1                                   | 179.0                                                              | 2.23                                              | 5                                                                |
| P4SMA150A   | P4SMA150CA | 150A    | 150C | 128.0                                             | 142.50                                                   | 157.50 | 1                                   | 207.0                                                              | 1.93                                              | 5                                                                |
| P4SMA160A   | P4SMA160CA | 160A    | 160C | 136.0                                             | 152.00                                                   | 168.00 | 1                                   | 219.0                                                              | 1.83                                              | 5                                                                |
| P4SMA170A   | P4SMA170CA | 170A    | 170C | 145.0                                             | 161.50                                                   | 178.50 | 1                                   | 234.0                                                              | 1.71                                              | 5                                                                |
| P4SMA180A   | P4SMA180CA | 180A    | 180C | 154.0                                             | 171.00                                                   | 189.00 | 1                                   | 246.0                                                              | 1.63                                              | 5                                                                |
| P4SMA200A   | P4SMA200CA | 200A    | 200C | 171.0                                             | 190.00                                                   | 210.00 | 1                                   | 274.0                                                              | 1.46                                              | 5                                                                |
| P4SMA220A   | P4SMA220CA | 220A    | 220C | 185.0                                             | 209.00                                                   | 231.00 | 1                                   | 328.0                                                              | 1.22                                              | 5                                                                |
| P4SMA250A   | P4SMA250CA | 250A    | 250C | 214.0                                             | 237.50                                                   | 262.50 | 1                                   | 344.0                                                              | 1.16                                              | 5                                                                |
| P4SMA300A   | P4SMA300CA | 300A    | 300C | 256.0                                             | 285.00                                                   | 315.00 | 1                                   | 414.0                                                              | 0.97                                              | 5                                                                |
| P4SMA350A   | P4SMA350CA | 350A    | 350C | 299.3                                             | 332.50                                                   | 367.50 | 1                                   | 482.0                                                              | 0.83                                              | 5                                                                |
| P4SMA380A   | P4SMA380CA | 380A    | 380C | 324.9                                             | 361.00                                                   | 399.00 | 1                                   | 524.4                                                              | 0.76                                              | 5                                                                |
| P4SMA400A   | P4SMA400CA | 400A    | 400C | 342.0                                             | 380.00                                                   | 420.00 | 1                                   | 552.0                                                              | 0.72                                              | 5                                                                |
| P4SMA440A   | P4SMA440CA | 440A    | 440C | 376.2                                             | 418.00                                                   | 462.00 | 1                                   | 607.2                                                              | 0.66                                              | 5                                                                |
| P4SMA500A   | P4SMA500CA | 500A    | 500C | 427.5                                             | 475.00                                                   | 525.00 | 1                                   | 690.0                                                              | 0.58                                              | 5                                                                |
| P4SMA520A   | P4SMA520CA | 520A    | 520C | 444.6                                             | 494.00                                                   | 546.00 | 1                                   | 717.6                                                              | 0.56                                              | 5                                                                |
| P4SMA550A   | P4SMA550CA | 550A    | 550C | 470.3                                             | 522.50                                                   | 577.50 | 1                                   | 759.0                                                              | 0.53                                              | 5                                                                |
| P4SMA600A   | P4SMA600CA | 600A    | 600C | 513.0                                             | 570.00                                                   | 630.00 | 1                                   | 828.0                                                              | 0.48                                              | 5                                                                |

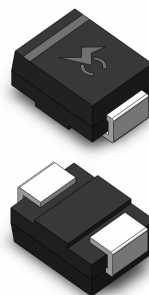
**Note:**

1. Suffix 'A' denotes 5% tolerance device. Without 'A' denotes 10% tolerance device
2. Add suffix 'C' or 'CA' after part number to specify Bi-directional devices
3. For Bi-Directional devices having V<sub>R</sub> of 10 volts and under, the I<sub>R</sub> limit is double

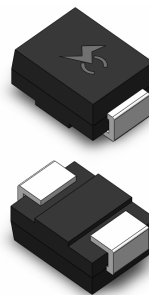
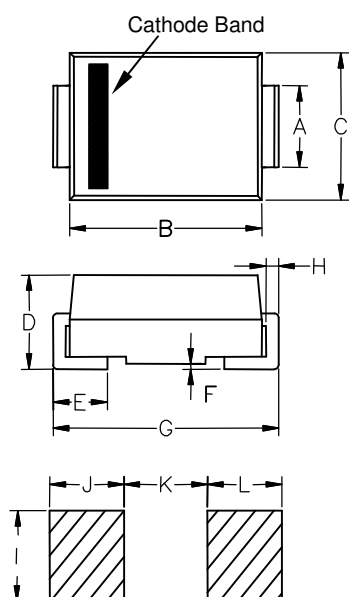
**Features**

- u For surface mounted applications in order to optimize board space
- u Low leakage
- u Uni and Bidirectional unit
- u Glass passivated junction
- u Low inductance
- u Excellent clamping capability
- u 600W Peak power capability at  $10 \times 1000\mu\text{s}$  waveform
- u Repetition rate (duty cycle):0.01%
- u Fast response time: typically less than 1.0ps from 0 Volts to  $V_{BR \text{ min}}$
- u Typical  $I_R$  less than  $5\mu\text{A}$  above 12V.
- u High Temperature soldering:  $260^\circ\text{C}/40$  seconds at terminals
- u Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR@25^\circ\text{C}} \times \Delta T$
- u Plastic package has Underwriters Laboratory Flammability 94V-0
- u Matte tin lead-free Plated
- u Halogen free and RoHS compliant
- u Typical failure mode is short from over-specified voltage or current
- u Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- u IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- u ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- u EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)

Uni-directional



Bi-directional


**DO-214AA (SMB)**
**Dimensions**
**DO-214AA (SMB)**


| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| A          | 0.077  | 0.087 | 1.960       | 2.200 |
| B          | 0.171  | 0.191 | 4.350       | 4.850 |
| C          | 0.130  | 0.155 | 3.300       | 3.940 |
| D          | 0.084  | 0.096 | 2.130       | 2.440 |
| E          | 0.030  | 0.060 | 0.750       | 1.520 |
| F          | -      | 0.008 | -           | 0.203 |
| G          | 0.201  | 0.216 | 5.100       | 5.500 |
| H          | 0.006  | 0.012 | 0.152       | 0.305 |
| I          | 0.089  | -     | 2.260       | -     |
| J          | 0.085  | -     | 2.160       | -     |
| K          | -      | 0.107 | -           | 2.740 |
| L          | 0.085  | -     | 2.160       | -     |

**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

| Part Number |            | Marking |      | Reverse Stand-Off Voltage V <sub>RWM</sub> (V) | Breakdown Voltage V <sub>BR</sub> (V) @I <sub>T</sub> |        | Test Current I <sub>T</sub> (mA) | Maximum Clamping Voltage V <sub>C</sub> @I <sub>PP</sub> (V) | Maximum Peak Pulse Current I <sub>PP</sub> (A) | Maximum Reverse Leakage I <sub>R</sub> @V <sub>RWM</sub> (μA) |
|-------------|------------|---------|------|------------------------------------------------|-------------------------------------------------------|--------|----------------------------------|--------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------------|
| Uni         | Bi         | Uni     | Bi   |                                                | MIN                                                   | MAX    |                                  |                                                              |                                                |                                                               |
| P6SMB6.8A   | P6SMB6.8CA | 6V8A    | 6V8C | 5.8                                            | 6.46                                                  | 7.14   | 10                               | 10.5                                                         | 57.14                                          | 1000                                                          |
| P6SMB7.5A   | P6SMB7.5CA | 7V5A    | 7V5C | 6.4                                            | 7.13                                                  | 7.88   | 10                               | 11.3                                                         | 53.10                                          | 500                                                           |
| P6SMB8.2A   | P6SMB8.2CA | 8V2A    | 8V2C | 7.0                                            | 7.79                                                  | 8.61   | 10                               | 12.1                                                         | 49.59                                          | 200                                                           |
| P6SMB9.1A   | P6SMB9.1CA | 9V1A    | 9V1C | 7.8                                            | 8.65                                                  | 9.56   | 1                                | 13.4                                                         | 44.78                                          | 50                                                            |
| P6SMB10A    | P6SMB10CA  | 10A     | 10C  | 8.6                                            | 9.50                                                  | 10.50  | 1                                | 14.5                                                         | 41.38                                          | 10                                                            |
| P6SMB11A    | P6SMB11CA  | 11A     | 11C  | 9.4                                            | 10.45                                                 | 11.55  | 1                                | 15.6                                                         | 38.46                                          | 5                                                             |
| P6SMB12A    | P6SMB12CA  | 12A     | 12C  | 10.2                                           | 11.40                                                 | 12.60  | 1                                | 16.7                                                         | 35.93                                          | 5                                                             |
| P6SMB13A    | P6SMB13CA  | 13A     | 13C  | 11.1                                           | 12.35                                                 | 13.65  | 1                                | 18.2                                                         | 32.97                                          | 5                                                             |
| P6SMB15A    | P6SMB15CA  | 15A     | 15C  | 12.8                                           | 14.25                                                 | 15.75  | 1                                | 21.2                                                         | 28.30                                          | 5                                                             |
| P6SMB16A    | P6SMB16CA  | 16A     | 16C  | 13.6                                           | 15.20                                                 | 16.80  | 1                                | 22.5                                                         | 26.67                                          | 5                                                             |
| P6SMB18A    | P6SMB18CA  | 18A     | 18C  | 15.3                                           | 17.10                                                 | 18.90  | 1                                | 25.2                                                         | 23.81                                          | 5                                                             |
| P6SMB20A    | P6SMB20CA  | 20A     | 20C  | 17.1                                           | 19.00                                                 | 21.00  | 1                                | 27.7                                                         | 21.66                                          | 5                                                             |
| P6SMB22A    | P6SMB22CA  | 22A     | 22C  | 18.8                                           | 20.90                                                 | 23.10  | 1                                | 30.6                                                         | 19.61                                          | 5                                                             |
| P6SMB24A    | P6SMB24CA  | 24A     | 24C  | 20.5                                           | 22.80                                                 | 25.20  | 1                                | 33.2                                                         | 18.07                                          | 5                                                             |
| P6SMB27A    | P6SMB27CA  | 27A     | 27C  | 23.1                                           | 25.65                                                 | 28.35  | 1                                | 37.5                                                         | 16.00                                          | 5                                                             |
| P6SMB30A    | P6SMB30CA  | 30A     | 30C  | 25.6                                           | 28.50                                                 | 31.50  | 1                                | 41.4                                                         | 14.49                                          | 5                                                             |
| P6SMB33A    | P6SMB33CA  | 33A     | 33C  | 28.2                                           | 31.35                                                 | 34.65  | 1                                | 45.7                                                         | 13.13                                          | 5                                                             |
| P6SMB36A    | P6SMB36CA  | 36A     | 36C  | 30.8                                           | 34.20                                                 | 37.80  | 1                                | 49.9                                                         | 12.02                                          | 5                                                             |
| P6SMB39A    | P6SMB39CA  | 39A     | 39C  | 33.3                                           | 37.05                                                 | 40.95  | 1                                | 53.9                                                         | 11.13                                          | 5                                                             |
| P6SMB43A    | P6SMB43CA  | 43A     | 43C  | 36.8                                           | 40.85                                                 | 45.15  | 1                                | 59.3                                                         | 1012                                           | 5                                                             |
| P6SMB47A    | P6SMB47CA  | 47A     | 47C  | 40.2                                           | 44.65                                                 | 49.35  | 1                                | 64.8                                                         | 9.26                                           | 5                                                             |
| P6SMB51A    | P6SMB51CA  | 51A     | 51C  | 43.6                                           | 48.45                                                 | 53.55  | 1                                | 70.1                                                         | 8.56                                           | 5                                                             |
| P6SMB56A    | P6SMB56CA  | 56A     | 56C  | 47.8                                           | 53.20                                                 | 58.80  | 1                                | 77.0                                                         | 7.79                                           | 5                                                             |
| P6SMB62A    | P6SMB62CA  | 62A     | 62C  | 53.0                                           | 58.90                                                 | 65.10  | 1                                | 85.0                                                         | 7.06                                           | 5                                                             |
| P6SMB68A    | P6SMB68CA  | 68A     | 68C  | 58.1                                           | 64.60                                                 | 71.40  | 1                                | 92.0                                                         | 6.52                                           | 5                                                             |
| P6SMB75A    | P6SMB75CA  | 75A     | 75C  | 64.1                                           | 71.25                                                 | 78.75  | 1                                | 103.0                                                        | 5.83                                           | 5                                                             |
| P6SMB82A    | P6SMB82CA  | 82A     | 82C  | 70.1                                           | 77.90                                                 | 86.10  | 1                                | 113.0                                                        | 5.31                                           | 5                                                             |
| P6SMB91A    | P6SMB91CA  | 91A     | 91C  | 77.8                                           | 86.45                                                 | 95.55  | 1                                | 125.0                                                        | 4.80                                           | 5                                                             |
| P6SMB100A   | P6SMB100CA | 100A    | 100C | 85.5                                           | 95.00                                                 | 105.00 | 1                                | 137.0                                                        | 4.38                                           | 5                                                             |
| P6SMB110A   | P6SMB110CA | 110A    | 110C | 94.0                                           | 104.50                                                | 115.50 | 1                                | 152.0                                                        | 3.95                                           | 5                                                             |
| P6SMB120A   | P6SMB120CA | 120A    | 120C | 102.0                                          | 114.00                                                | 126.00 | 1                                | 165.0                                                        | 3.64                                           | 5                                                             |
| P6SMB130A   | P6SMB130CA | 130A    | 130C | 111.0                                          | 123.50                                                | 136.50 | 1                                | 179.0                                                        | 3.35                                           | 5                                                             |
| P6SMB150A   | P6SMB150CA | 150A    | 150C | 128.0                                          | 142.50                                                | 157.50 | 1                                | 207.0                                                        | 2.90                                           | 5                                                             |
| P6SMB160A   | P6SMB160CA | 160A    | 160C | 136.0                                          | 152.00                                                | 168.00 | 1                                | 219.0                                                        | 2.74                                           | 5                                                             |
| P6SMB170A   | P6SMB170CA | 170A    | 170C | 145.0                                          | 161.50                                                | 178.50 | 1                                | 234.0                                                        | 2.56                                           | 5                                                             |
| P6SMB180A   | P6SMB180CA | 180A    | 180C | 154.0                                          | 171.00                                                | 189.00 | 1                                | 246.0                                                        | 2.44                                           | 5                                                             |
| P6SMB200A   | P6SMB200CA | 200A    | 200C | 171.0                                          | 190.00                                                | 210.00 | 1                                | 274.0                                                        | 2.19                                           | 5                                                             |
| P6SMB220A   | P6SMB220CA | 220A    | 220C | 185.0                                          | 209.00                                                | 231.00 | 1                                | 328.0                                                        | 1.83                                           | 5                                                             |
| P6SMB250A   | P6SMB250CA | 250A    | 250C | 214.0                                          | 237.50                                                | 262.50 | 1                                | 344.0                                                        | 1.74                                           | 5                                                             |
| P6SMB300A   | P6SMB300CA | 300A    | 300C | 256.0                                          | 285.00                                                | 315.00 | 1                                | 414.0                                                        | 1.45                                           | 5                                                             |
| P6SMB350A   | P6SMB350CA | 350A    | 350C | 299.3                                          | 332.50                                                | 367.50 | 1                                | 482.0                                                        | 1.24                                           | 5                                                             |
| P6SMB380A   | P6SMB380CA | 380A    | 380C | 324.9                                          | 361.00                                                | 399.00 | 1                                | 524.4                                                        | 1.14                                           | 5                                                             |
| P6SMB400A   | P6SMB400CA | 400A    | 400C | 342.0                                          | 380.00                                                | 420.00 | 1                                | 552.0                                                        | 1.09                                           | 5                                                             |
| P6SMB440A   | P6SMB440CA | 440A    | 440C | 376.2                                          | 418.00                                                | 462.00 | 1                                | 607.2                                                        | 0.99                                           | 5                                                             |
| P6SMB500A   | P6SMB500CA | 500A    | 500C | 427.5                                          | 475.00                                                | 525.00 | 1                                | 690.0                                                        | 0.87                                           | 5                                                             |
| P6SMB520A   | P6SMB520CA | 520A    | 520C | 444.6                                          | 494.00                                                | 546.00 | 1                                | 717.6                                                        | 0.84                                           | 5                                                             |
| P6SMB550A   | P6SMB550CA | 550A    | 550C | 470.3                                          | 522.50                                                | 577.50 | 1                                | 759.0                                                        | 0.79                                           | 5                                                             |
| P6SMB600A   | P6SMB600CA | 600A    | 600C | 513.0                                          | 570.00                                                | 630.00 | 1                                | 828.0                                                        | 0.72                                           | 5                                                             |

**Note:**

1. Suffix 'A' denotes 5% tolerance device. Without 'A' denotes 10% tolerance device
2. Add suffix 'C' or 'CA' after part number to specify Bi-directional devices
3. For Bi-Directional devices having V<sub>R</sub> of 10 volts and under, the I<sub>R</sub> limit is double

## Surface Mount Transient Voltage Suppressors (TVS)

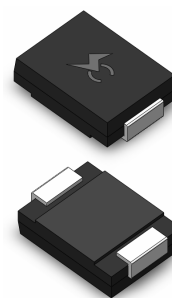
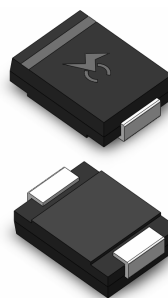
**1.5SMC Series 6.8 To 600 V 1500W**

### Features

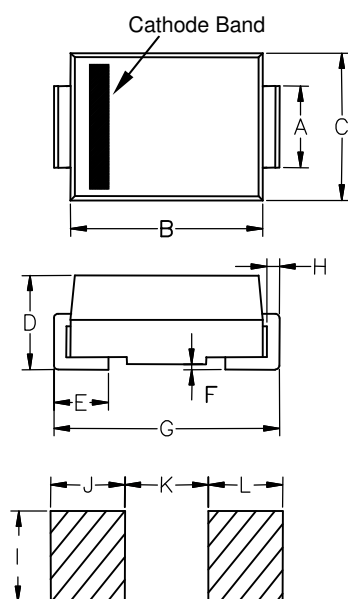
- u For surface mounted applications in order to optimize board space
- u Low leakage
- u Uni and Bidirectional unit
- u Glass passivated junction
- u Low inductance
- u Excellent clamping capability
- u 1500W Peak power capability at  $10 \times 1000\mu\text{s}$  waveform
- u Repetition rate (duty cycle):0.01%
- u Fast response time: typically less than 1.0ps from 0 Volts to  $V_{BR}$  min
- u Typical  $I_R$  less than  $5\mu\text{A}$  above 12V.
- u High Temperature soldering:  $260^\circ\text{C}/40$  seconds at terminals
- u Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR}@25^\circ\text{C} \times \Delta T$
- u Plastic package has Underwriters Laboratory Flammability 94V-0
- u Matte tin lead-free Plated
- u Halogen free and RoHS compliant
- u Typical failure mode is short from over-specified voltage or current
- u Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- u IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- u ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- u EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)

Uni-directional

Bi-directional


**DO-214AB (SMC)**

### Dimensions

**DO-214AB (SMC)**


| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| <b>A</b>   | 0.114  | 0.126 | 2.860       | 3.160 |
| <b>B</b>   | 0.260  | 0.280 | 6.520       | 7.020 |
| <b>C</b>   | 0.220  | 0.245 | 5.520       | 6.150 |
| <b>D</b>   | 0.079  | 0.103 | 1.980       | 2.590 |
| <b>E</b>   | 0.030  | 0.060 | 0.750       | 1.510 |
| <b>F</b>   | -      | 0.008 | -           | 0.203 |
| <b>G</b>   | 0.305  | 0.320 | 7.640       | 8.020 |
| <b>H</b>   | 0.006  | 0.012 | 0.152       | 0.305 |
| <b>I</b>   | 0.129  | -     | 3.300       | -     |
| <b>J</b>   | 0.094  | -     | 2.400       | -     |
| <b>K</b>   | -      | 0.165 | -           | 4.200 |
| <b>L</b>   | 0.094  | -     | 2.400       | -     |

**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

| Part Number |             | Marking |      | Reverse Stand-Off Voltage $V_{RWM}(V)$ | Breakdown Voltage $V_{BR}$ (V) @ $I_T$ |        | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$ @ $I_{PP}$ (V) | Maximum Peak Pulse Current $I_{PP}$ (A) | Maximum Reverse Leakage $I_R$ @ $V_{RWM}$ ( $\mu\text{A}$ ) |
|-------------|-------------|---------|------|----------------------------------------|----------------------------------------|--------|-------------------------|-----------------------------------------------|-----------------------------------------|-------------------------------------------------------------|
| Uni         | Bi          | Uni     | Bi   |                                        | MIN                                    | MAX    |                         |                                               |                                         |                                                             |
| 1.5SMC6.8A  | 1.5SMC6.8CA | 6V8A    | 6V8C | 5.8                                    | 6.46                                   | 7.14   | 10                      | 10.5                                          | 142.86                                  | 1000                                                        |
| 1.5SMC7.5A  | 1.5SMC7.5CA | 7V5A    | 7V5C | 6.4                                    | 7.13                                   | 7.88   | 10                      | 11.3                                          | 132.74                                  | 500                                                         |
| 1.5SMC8.2A  | 1.5SMC8.2CA | 8V2A    | 8V2C | 7.0                                    | 7.79                                   | 8.61   | 10                      | 12.1                                          | 123.97                                  | 200                                                         |
| 1.5SMC9.1A  | 1.5SMC9.1CA | 9V1A    | 9V1C | 7.8                                    | 8.65                                   | 9.56   | 1                       | 13.4                                          | 111.94                                  | 50                                                          |
| 1.5SMC10A   | 1.5SMC10CA  | 10A     | 10C  | 8.6                                    | 9.50                                   | 10.50  | 1                       | 14.5                                          | 103.45                                  | 10                                                          |
| 1.5SMC11A   | 1.5SMC11CA  | 11A     | 11C  | 9.4                                    | 10.45                                  | 11.55  | 1                       | 15.6                                          | 96.15                                   | 5                                                           |
| 1.5SMC12A   | 1.5SMC12CA  | 12A     | 12C  | 10.2                                   | 11.40                                  | 12.60  | 1                       | 16.7                                          | 89.82                                   | 5                                                           |
| 1.5SMC13A   | 1.5SMC13CA  | 13A     | 13C  | 11.1                                   | 12.35                                  | 13.65  | 1                       | 18.2                                          | 82.42                                   | 5                                                           |
| 1.5SMC15A   | 1.5SMC15CA  | 15A     | 15C  | 12.8                                   | 14.25                                  | 15.75  | 1                       | 21.2                                          | 70.75                                   | 5                                                           |
| 1.5SMC16A   | 1.5SMC16CA  | 16A     | 16C  | 13.6                                   | 15.20                                  | 16.80  | 1                       | 22.5                                          | 66.67                                   | 5                                                           |
| 1.5SMC18A   | 1.5SMC18CA  | 18A     | 18C  | 15.3                                   | 17.10                                  | 18.90  | 1                       | 25.2                                          | 59.52                                   | 5                                                           |
| 1.5SMC20A   | 1.5SMC20CA  | 20A     | 20C  | 17.1                                   | 19.00                                  | 21.00  | 1                       | 27.7                                          | 54.15                                   | 5                                                           |
| 1.5SMC22A   | 1.5SMC22CA  | 22A     | 22C  | 18.8                                   | 20.90                                  | 23.10  | 1                       | 30.6                                          | 49.02                                   | 5                                                           |
| 1.5SMC24A   | 1.5SMC24CA  | 24A     | 24C  | 20.5                                   | 22.80                                  | 25.20  | 1                       | 33.2                                          | 45.18                                   | 5                                                           |
| 1.5SMC27A   | 1.5SMC27CA  | 27A     | 27C  | 23.1                                   | 25.65                                  | 28.35  | 1                       | 37.5                                          | 40.00                                   | 5                                                           |
| 1.5SMC30A   | 1.5SMC30CA  | 30A     | 30C  | 25.6                                   | 28.50                                  | 31.50  | 1                       | 41.4                                          | 36.23                                   | 5                                                           |
| 1.5SMC33A   | 1.5SMC33CA  | 33A     | 33C  | 28.2                                   | 31.35                                  | 34.65  | 1                       | 45.7                                          | 32.82                                   | 5                                                           |
| 1.5SMC36A   | 1.5SMC36CA  | 36A     | 36C  | 30.8                                   | 34.20                                  | 37.80  | 1                       | 49.9                                          | 30.06                                   | 5                                                           |
| 1.5SMC39A   | 1.5SMC39CA  | 39A     | 39C  | 33.3                                   | 37.05                                  | 40.95  | 1                       | 53.9                                          | 27.83                                   | 5                                                           |
| 1.5SMC43A   | 1.5SMC43CA  | 43A     | 43C  | 36.8                                   | 40.85                                  | 45.15  | 1                       | 59.3                                          | 25.30                                   | 5                                                           |
| 1.5SMC47A   | 1.5SMC47CA  | 47A     | 47C  | 40.2                                   | 44.65                                  | 49.35  | 1                       | 64.8                                          | 23.15                                   | 5                                                           |
| 1.5SMC51A   | 1.5SMC51CA  | 51A     | 51C  | 43.6                                   | 48.45                                  | 53.55  | 1                       | 70.1                                          | 21.40                                   | 5                                                           |
| 1.5SMC56A   | 1.5SMC56CA  | 56A     | 56C  | 47.8                                   | 53.20                                  | 58.80  | 1                       | 77.0                                          | 19.48                                   | 5                                                           |
| 1.5SMC62A   | 1.5SMC62CA  | 62A     | 62C  | 53.0                                   | 58.90                                  | 65.10  | 1                       | 85.0                                          | 17.65                                   | 5                                                           |
| 1.5SMC68A   | 1.5SMC68CA  | 68A     | 68C  | 58.1                                   | 64.60                                  | 71.40  | 1                       | 92.0                                          | 16.30                                   | 5                                                           |
| 1.5SMC75A   | 1.5SMC75CA  | 75A     | 75C  | 64.1                                   | 71.25                                  | 78.75  | 1                       | 103.0                                         | 14.56                                   | 5                                                           |
| 1.5SMC82A   | 1.5SMC82CA  | 82A     | 82C  | 70.1                                   | 77.90                                  | 86.10  | 1                       | 113.0                                         | 13.27                                   | 5                                                           |
| 1.5SMC91A   | 1.5SMC91CA  | 91A     | 91C  | 77.8                                   | 86.45                                  | 95.55  | 1                       | 125.0                                         | 12.00                                   | 5                                                           |
| 1.5SMC100A  | 1.5SMC100CA | 100A    | 100C | 85.5                                   | 95.00                                  | 105.00 | 1                       | 137.0                                         | 10.95                                   | 5                                                           |
| 1.5SMC110A  | 1.5SMC110CA | 110A    | 110C | 94.0                                   | 104.50                                 | 115.50 | 1                       | 152.0                                         | 9.87                                    | 5                                                           |
| 1.5SMC120A  | 1.5SMC120CA | 120A    | 120C | 102.0                                  | 114.00                                 | 126.00 | 1                       | 165.0                                         | 9.09                                    | 5                                                           |
| 1.5SMC130A  | 1.5SMC130CA | 130A    | 130C | 111.0                                  | 123.50                                 | 136.50 | 1                       | 179.0                                         | 8.38                                    | 5                                                           |
| 1.5SMC150A  | 1.5SMC150CA | 150A    | 150C | 128.0                                  | 142.50                                 | 157.50 | 1                       | 207.0                                         | 7.25                                    | 5                                                           |
| 1.5SMC160A  | 1.5SMC160CA | 160A    | 160C | 136.0                                  | 152.00                                 | 168.00 | 1                       | 219.0                                         | 6.85                                    | 5                                                           |
| 1.5SMC170A  | 1.5SMC170CA | 170A    | 170C | 145.0                                  | 161.50                                 | 178.50 | 1                       | 234.0                                         | 6.41                                    | 5                                                           |
| 1.5SMC180A  | 1.5SMC180CA | 180A    | 180C | 154.0                                  | 171.00                                 | 189.00 | 1                       | 246.0                                         | 6.10                                    | 5                                                           |
| 1.5SMC200A  | 1.5SMC200CA | 200A    | 200C | 171.0                                  | 190.00                                 | 210.00 | 1                       | 274.0                                         | 5.47                                    | 5                                                           |
| 1.5SMC220A  | 1.5SMC220CA | 220A    | 220C | 185.0                                  | 209.00                                 | 231.00 | 1                       | 328.0                                         | 4.57                                    | 5                                                           |
| 1.5SMC250A  | 1.5SMC250CA | 250A    | 250C | 214.0                                  | 237.50                                 | 262.50 | 1                       | 344.0                                         | 4.36                                    | 5                                                           |
| 1.5SMC300A  | 1.5SMC300CA | 300A    | 300C | 256.0                                  | 285.00                                 | 315.00 | 1                       | 414.0                                         | 3.62                                    | 5                                                           |
| 1.5SMC350A  | 1.5SMC350CA | 350A    | 350C | 299.3                                  | 332.50                                 | 367.50 | 1                       | 482.0                                         | 3.11                                    | 5                                                           |
| 1.5SMC380A  | 1.5SMC380CA | 380A    | 380C | 324.9                                  | 361.00                                 | 399.00 | 1                       | 524.4                                         | 2.86                                    | 5                                                           |
| 1.5SMC400A  | 1.5SMC400CA | 400A    | 400C | 342.0                                  | 380.00                                 | 420.00 | 1                       | 552.0                                         | 2.72                                    | 5                                                           |
| 1.5SMC440A  | 1.5SMC440CA | 440A    | 440C | 376.2                                  | 418.00                                 | 462.00 | 1                       | 607.2                                         | 2.47                                    | 5                                                           |
| 1.5SMC500A  | 1.5SMC500CA | 500A    | 500C | 427.5                                  | 475.00                                 | 525.00 | 1                       | 690.0                                         | 2.17                                    | 5                                                           |
| 1.5SMC520A  | 1.5SMC520CA | 520A    | 520C | 444.6                                  | 494.00                                 | 546.00 | 1                       | 717.6                                         | 2.09                                    | 5                                                           |
| 1.5SMC550A  | 1.5SMC550CA | 550A    | 550C | 470.3                                  | 522.50                                 | 577.50 | 1                       | 759.0                                         | 1.98                                    | 5                                                           |
| 1.5SMC600A  | 1.5SMC600CA | 600A    | 600C | 513.0                                  | 570.00                                 | 630.00 | 1                       | 828.0                                         | 1.81                                    | 5                                                           |

**Note:**

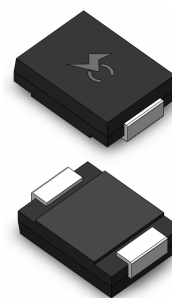
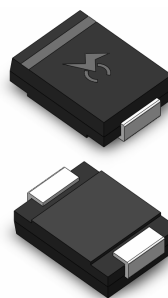
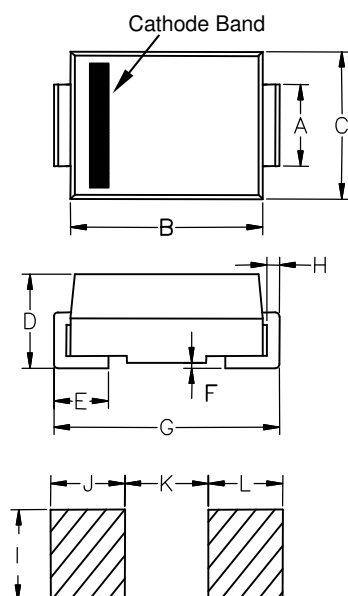
1. Suffix 'A' denotes 5% tolerance device. Without 'A' denotes 10% tolerance device
2. Add suffix 'C' or 'CA' after part number to specify Bi-directional devices
3. For Bi-Directional devices having  $V_R$  of 10 volts and under, the  $I_R$  limit is double

**Features**

- u For surface mounted applications in order to optimize board space
- u Low leakage
- u Uni and Bidirectional unit
- u Glass passivated junction
- u Low inductance
- u Excellent clamping capability
- u 5000W Peak power capability at 10 × 1000μs waveform
- u Repetition rate (duty cycle):0.01%
- u Fast response time: typically less than 1.0ps from 0 Volts to V<sub>BR</sub> min
- u Typical I<sub>R</sub> less than 5μA above 25V.
- u High Temperature soldering: 260°C/40 seconds at terminals
- u Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR}@25^{\circ}\text{C} \times \Delta T$
- u Plastic package has Underwriters Laboratory Flammability 94V-0
- u Matte tin lead-free Plated
- u Halogen free and RoHS compliant
- u Typical failure mode is short from over-specified voltage or current
- u Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- u IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- u ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- u EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)

Uni-directional

Bi-directional


**DO-214AB (SMC)**
**Dimensions**
**DO-214AB (SMC)**


| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| <b>A</b>   | 0.114  | 0.126 | 2.860       | 3.160 |
| <b>B</b>   | 0.260  | 0.280 | 6.520       | 7.020 |
| <b>C</b>   | 0.220  | 0.245 | 5.520       | 6.150 |
| <b>D</b>   | 0.079  | 0.103 | 1.980       | 2.590 |
| <b>E</b>   | 0.030  | 0.060 | 0.750       | 1.510 |
| <b>F</b>   | -      | 0.008 | -           | 0.203 |
| <b>G</b>   | 0.305  | 0.320 | 7.640       | 8.020 |
| <b>H</b>   | 0.006  | 0.012 | 0.152       | 0.305 |
| <b>I</b>   | 0.129  | -     | 3.300       | -     |
| <b>J</b>   | 0.094  | -     | 2.400       | -     |
| <b>K</b>   | -      | 0.165 | -           | 4.200 |
| <b>L</b>   | 0.094  | -     | 2.400       | -     |

**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

| Part Number |             | Marking |      | Reverse Stand-Off Voltage V <sub>RWM</sub> (V) | Breakdown Voltage V <sub>BR</sub> (V)<br>@I <sub>T</sub> |       | Test Current I <sub>T</sub> (mA) | Maximum Clamping Voltage V <sub>C</sub><br>@I <sub>PP</sub> (V) | Maximum Peak Pulse Current I <sub>PP</sub> (A) | Maximum Reverse Leakage I <sub>R</sub><br>@V <sub>RWM</sub> (μA) |
|-------------|-------------|---------|------|------------------------------------------------|----------------------------------------------------------|-------|----------------------------------|-----------------------------------------------------------------|------------------------------------------------|------------------------------------------------------------------|
| Uni         | Bi          | Uni     | Bi   |                                                | MIN                                                      | MAX   |                                  |                                                                 |                                                |                                                                  |
| 5.0SMDJ11   | 5.0SMDJ11C  | 5PDW    | 5BDW | 11.0                                           | 12.20                                                    | 14.90 | 1                                | 20.1                                                            | 251.24                                         | 800                                                              |
| 5.0SMDJ11A  | 5.0SMDJ11CA | 5PDX    | 5BDX | 11.0                                           | 12.20                                                    | 13.50 | 1                                | 18.2                                                            | 277.47                                         | 800                                                              |
| 5.0SMDJ12   | 5.0SMDJ12C  | 5PDY    | 5BDY | 12.0                                           | 13.30                                                    | 16.30 | 1                                | 22.0                                                            | 229.55                                         | 800                                                              |
| 5.0SMDJ12A  | 5.0SMDJ12CA | 5PDZ    | 5BDZ | 12.0                                           | 13.30                                                    | 14.70 | 1                                | 19.9                                                            | 253.77                                         | 800                                                              |
| 5.0SMDJ13   | 5.0SMDJ13C  | 5PED    | 5BED | 13.0                                           | 14.40                                                    | 17.60 | 1                                | 23.8                                                            | 212.18                                         | 500                                                              |
| 5.0SMDJ13A  | 5.0SMDJ13CA | 5PEE    | 5BEE | 13.0                                           | 14.40                                                    | 15.90 | 1                                | 21.5                                                            | 234.88                                         | 500                                                              |
| 5.0SMDJ14   | 5.0SMDJ14C  | 5PEF    | 5BEF | 14.0                                           | 15.60                                                    | 19.10 | 1                                | 25.8                                                            | 195.74                                         | 200                                                              |
| 5.0SMDJ14A  | 5.0SMDJ14CA | 5PEG    | 5BEG | 14.0                                           | 15.60                                                    | 17.20 | 1                                | 23.2                                                            | 217.67                                         | 200                                                              |
| 5.0SMDJ15   | 5.0SMDJ15C  | 5PEH    | 5BEH | 15.0                                           | 16.70                                                    | 20.40 | 1                                | 26.9                                                            | 187.73                                         | 100                                                              |
| 5.0SMDJ15A  | 5.0SMDJ15CA | 5PEK    | 5BEK | 15.0                                           | 16.70                                                    | 18.50 | 1                                | 24.4                                                            | 206.97                                         | 100                                                              |
| 5.0SMDJ16   | 5.0SMDJ16C  | 5PEL    | 5BEL | 16.0                                           | 17.80                                                    | 21.80 | 1                                | 28.8                                                            | 175.35                                         | 50                                                               |
| 5.0SMDJ16A  | 5.0SMDJ16CA | 5PEM    | 5BEM | 16.0                                           | 17.80                                                    | 19.70 | 1                                | 26.0                                                            | 194.23                                         | 50                                                               |
| 5.0SMDJ17   | 5.0SMDJ17C  | 5PEN    | 5BEN | 17.0                                           | 18.90                                                    | 23.10 | 1                                | 30.5                                                            | 165.57                                         | 20                                                               |
| 5.0SMDJ17A  | 5.0SMDJ17CA | 5PEP    | 5BEP | 17.0                                           | 18.90                                                    | 20.90 | 1                                | 27.6                                                            | 182.97                                         | 20                                                               |
| 5.0SMDJ18   | 5.0SMDJ18C  | 5PEQ    | 5BEQ | 18.0                                           | 20.00                                                    | 24.40 | 1                                | 32.2                                                            | 156.83                                         | 10                                                               |
| 5.0SMDJ18A  | 5.0SMDJ18CA | 5PER    | 5BER | 18.0                                           | 20.00                                                    | 22.10 | 1                                | 29.2                                                            | 172.95                                         | 10                                                               |
| 5.0SMDJ19   | 5.0SMDJ19C  | 5PES    | 5BES | 19.0                                           | 21.13                                                    | 25.76 | 1                                | 34.0                                                            | 148.49                                         | 10                                                               |
| 5.0SMDJ19A  | 5.0SMDJ19CA | 5PET    | 5BET | 19.0                                           | 21.10                                                    | 23.30 | 1                                | 30.8                                                            | 164.07                                         | 10                                                               |
| 5.0SMDJ20   | 5.0SMDJ20C  | 5PEU    | 5BEU | 20.0                                           | 22.20                                                    | 27.10 | 1                                | 35.8                                                            | 141.06                                         | 5                                                                |
| 5.0SMDJ20A  | 5.0SMDJ20CA | 5PEV    | 5BEV | 20.0                                           | 22.20                                                    | 24.50 | 1                                | 32.4                                                            | 155.86                                         | 5                                                                |
| 5.0SMDJ22   | 5.0SMDJ22C  | 5PEW    | 5BEW | 22.0                                           | 24.40                                                    | 29.80 | 1                                | 39.4                                                            | 128.17                                         | 5                                                                |
| 5.0SMDJ22A  | 5.0SMDJ22CA | 5PEX    | 5BEX | 22.0                                           | 24.40                                                    | 26.90 | 1                                | 35.5                                                            | 142.25                                         | 5                                                                |
| 5.0SMDJ24   | 5.0SMDJ24C  | 5PEY    | 5BEY | 24.0                                           | 26.70                                                    | 32.60 | 1                                | 43.0                                                            | 117.44                                         | 5                                                                |
| 5.0SMDJ24A  | 5.0SMDJ24CA | 5PEZ    | 5BEZ | 24.0                                           | 26.70                                                    | 29.50 | 1                                | 38.9                                                            | 129.82                                         | 5                                                                |
| 5.0SMDJ26   | 5.0SMDJ26C  | 5PFD    | 5BFD | 26.0                                           | 28.90                                                    | 35.30 | 1                                | 46.6                                                            | 108.37                                         | 5                                                                |
| 5.0SMDJ26A  | 5.0SMDJ26CA | 5PFE    | 5BFE | 26.0                                           | 28.90                                                    | 31.90 | 1                                | 42.1                                                            | 119.95                                         | 5                                                                |
| 5.0SMDJ28   | 5.0SMDJ28C  | 5PFF    | 5BFF | 28.0                                           | 31.10                                                    | 38.00 | 1                                | 50.0                                                            | 101.00                                         | 5                                                                |
| 5.0SMDJ28A  | 5.0SMDJ28CA | 5PFG    | 5BFG | 28.0                                           | 31.10                                                    | 34.40 | 1                                | 45.4                                                            | 111.23                                         | 5                                                                |
| 5.0SMDJ30   | 5.0SMDJ30C  | 5PFH    | 5BFH | 30.0                                           | 33.30                                                    | 40.70 | 1                                | 53.5                                                            | 94.39                                          | 5                                                                |
| 5.0SMDJ30A  | 5.0SMDJ30CA | 5PFK    | 5BFK | 30.0                                           | 33.30                                                    | 36.80 | 1                                | 48.4                                                            | 104.34                                         | 5                                                                |
| 5.0SMDJ33   | 5.0SMDJ33C  | 5PFL    | 5BFL | 33.0                                           | 36.70                                                    | 44.90 | 1                                | 59.0                                                            | 85.59                                          | 5                                                                |
| 5.0SMDJ33A  | 5.0SMDJ33CA | 5PFM    | 5BFM | 33.0                                           | 36.70                                                    | 40.60 | 1                                | 53.3                                                            | 94.75                                          | 5                                                                |
| 5.0SMDJ36   | 5.0SMDJ36C  | 5PFN    | 5BFN | 36.0                                           | 40.00                                                    | 48.90 | 1                                | 64.3                                                            | 78.54                                          | 5                                                                |
| 5.0SMDJ36A  | 5.0SMDJ36CA | 5PFP    | 5BFP | 36.0                                           | 40.00                                                    | 44.20 | 1                                | 58.1                                                            | 86.92                                          | 5                                                                |
| 5.0SMDJ40   | 5.0SMDJ40C  | 5PFQ    | 5BFQ | 40.0                                           | 44.40                                                    | 54.30 | 1                                | 71.4                                                            | 70.73                                          | 5                                                                |
| 5.0SMDJ40A  | 5.0SMDJ40CA | 5PFR    | 5BFR | 40.0                                           | 44.40                                                    | 49.10 | 1                                | 64.5                                                            | 78.29                                          | 5                                                                |
| 5.0SMDJ43   | 5.0SMDJ43C  | 5PFS    | 5BFS | 43.0                                           | 47.80                                                    | 58.40 | 1                                | 76.7                                                            | 65.84                                          | 5                                                                |
| 5.0SMDJ43A  | 5.0SMDJ43CA | 5PFT    | 5BFT | 43.0                                           | 47.80                                                    | 52.80 | 1                                | 69.4                                                            | 72.77                                          | 5                                                                |
| 5.0SMDJ45   | 5.0SMDJ45C  | 5PFU    | 5BFU | 45.0                                           | 50.00                                                    | 61.10 | 1                                | 80.3                                                            | 62.89                                          | 5                                                                |
| 5.0SMDJ45A  | 5.0SMDJ45CA | 5PFV    | 5BFV | 45.0                                           | 50.00                                                    | 55.30 | 1                                | 72.7                                                            | 69.46                                          | 5                                                                |
| 5.0SMDJ48   | 5.0SMDJ48C  | 5PFW    | 5BFW | 48.0                                           | 53.30                                                    | 65.10 | 1                                | 85.5                                                            | 59.06                                          | 5                                                                |
| 5.0SMDJ48A  | 5.0SMDJ48CA | 5PFX    | 5BFX | 48.0                                           | 53.30                                                    | 58.90 | 1                                | 77.4                                                            | 65.25                                          | 5                                                                |
| 5.0SMDJ51   | 5.0SMDJ51C  | 5PFY    | 5BFY | 51.0                                           | 56.70                                                    | 69.30 | 1                                | 91.1                                                            | 55.43                                          | 5                                                                |
| 5.0SMDJ51A  | 5.0SMDJ51CA | 5PFZ    | 5BFZ | 51.0                                           | 56.70                                                    | 62.70 | 1                                | 82.4                                                            | 61.29                                          | 5                                                                |
| 5.0SMDJ54   | 5.0SMDJ54C  | 5PGD    | 5BGD | 54.0                                           | 60.00                                                    | 73.30 | 1                                | 96.3                                                            | 52.44                                          | 5                                                                |
| 5.0SMDJ54A  | 5.0SMDJ54CA | 5PGE    | 5BGE | 54.0                                           | 60.00                                                    | 66.30 | 1                                | 87.1                                                            | 57.98                                          | 5                                                                |
| 5.0SMDJ58   | 5.0SMDJ58C  | 5PGF    | 5BGF | 58.0                                           | 64.40                                                    | 78.70 | 1                                | 103.0                                                           | 49.03                                          | 5                                                                |
| 5.0SMDJ58A  | 5.0SMDJ58CA | 5PGG    | 5BGG | 58.0                                           | 64.40                                                    | 71.20 | 1                                | 93.6                                                            | 53.95                                          | 5                                                                |

**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

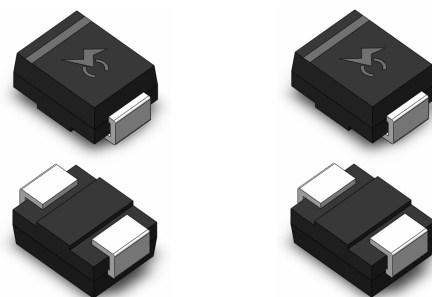
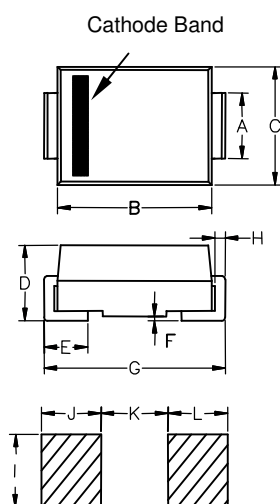
| Part Number |              | Marking |      | Reverse Stand-Off Voltage V <sub>RWM</sub> (V) | Breakdown Voltage V <sub>BR</sub> (V) @I <sub>T</sub> |        | Test Current I <sub>T</sub> (mA) | Maximum Clamping Voltage V <sub>C</sub> @I <sub>PP</sub> (V) | Maximum Peak Pulse Current I <sub>PP</sub> (A) | Maximum Reverse Leakage I <sub>R</sub> @V <sub>RWM</sub> (μA) |
|-------------|--------------|---------|------|------------------------------------------------|-------------------------------------------------------|--------|----------------------------------|--------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------------|
| Uni         | Bi           | Uni     | Bi   |                                                | MIN                                                   | MAX    |                                  |                                                              |                                                |                                                               |
| 5.0SMDJ60   | 5.0SMDJ60C   | 5PGH    | 5BGH | 60.0                                           | 66.70                                                 | 81.50  | 1                                | 107.0                                                        | 47.20                                          | 5                                                             |
| 5.0SMDJ60A  | 5.0SMDJ60CA  | 5PGK    | 5BGK | 60.0                                           | 66.70                                                 | 73.70  | 1                                | 96.8                                                         | 52.17                                          | 5                                                             |
| 5.0SMDJ64   | 5.0SMDJ64C   | 5PGL    | 5BGL | 64.0                                           | 71.10                                                 | 86.90  | 1                                | 114.0                                                        | 44.30                                          | 5                                                             |
| 5.0SMDJ64A  | 5.0SMDJ64CA  | 5PGM    | 5BGM | 64.0                                           | 71.10                                                 | 78.60  | 1                                | 103.0                                                        | 49.03                                          | 5                                                             |
| 5.0SMDJ70   | 5.0SMDJ70C   | 5PGN    | 5BGN | 70.0                                           | 77.80                                                 | 95.10  | 1                                | 125.0                                                        | 40.40                                          | 5                                                             |
| 5.0SMDJ70A  | 5.0SMDJ70CA  | 5PGP    | 5BGP | 70.0                                           | 77.80                                                 | 86.00  | 1                                | 113.0                                                        | 44.69                                          | 5                                                             |
| 5.0SMDJ75   | 5.0SMDJ75C   | 5PGQ    | 5BGQ | 75.0                                           | 83.30                                                 | 102.00 | 1                                | 134.0                                                        | 37.69                                          | 5                                                             |
| 5.0SMDJ75A  | 5.0SMDJ75CA  | 5PGR    | 5BGR | 75.0                                           | 83.30                                                 | 92.10  | 1                                | 121.0                                                        | 41.74                                          | 5                                                             |
| 5.0SMDJ78   | 5.0SMDJ78C   | 5PGS    | 5BGS | 78.0                                           | 86.70                                                 | 106.00 | 1                                | 139.0                                                        | 36.33                                          | 5                                                             |
| 5.0SMDJ78A  | 5.0SMDJ78CA  | 5PGT    | 5BGT | 78.0                                           | 86.70                                                 | 95.80  | 1                                | 126.0                                                        | 40.08                                          | 5                                                             |
| 5.0SMDJ80   | 5.0SMDJ80C   | 5PGA    | 5BGA | 80.0                                           | 88.96                                                 | 108.80 | 1                                | 143.2                                                        | 35.27                                          | 5                                                             |
| 5.0SMDJ80A  | 5.0SMDJ80CA  | 5PGB    | 5BGB | 80.0                                           | 88.80                                                 | 97.60  | 1                                | 129.6                                                        | 38.97                                          | 5                                                             |
| 5.0SMDJ85   | 5.0SMDJ85C   | 5PGU    | 5BGU | 85.0                                           | 94.40                                                 | 115.00 | 1                                | 151.0                                                        | 33.44                                          | 5                                                             |
| 5.0SMDJ85A  | 5.0SMDJ85CA  | 5PGV    | 5BGV | 85.0                                           | 94.40                                                 | 104.00 | 1                                | 137.0                                                        | 36.86                                          | 5                                                             |
| 5.0SMDJ90   | 5.0SMDJ90C   | 5PGW    | 5BGW | 90.0                                           | 100.00                                                | 122.00 | 1                                | 160.0                                                        | 31.56                                          | 5                                                             |
| 5.0SMDJ90A  | 5.0SMDJ90CA  | 5PGX    | 5BGX | 90.0                                           | 100.00                                                | 111.00 | 1                                | 146.0                                                        | 34.59                                          | 5                                                             |
| 5.0SMDJ100  | 5.0SMDJ100C  | 5PGY    | 5BGY | 100.0                                          | 111.00                                                | 136.00 | 1                                | 179.0                                                        | 28.21                                          | 5                                                             |
| 5.0SMDJ100A | 5.0SMDJ100CA | 5PGZ    | 5BGZ | 100.0                                          | 111.00                                                | 123.00 | 1                                | 162.0                                                        | 31.17                                          | 5                                                             |
| 5.0SMDJ110  | 5.0SMDJ110C  | 5PHD    | 5BHD | 110.0                                          | 122.00                                                | 149.00 | 1                                | 196.0                                                        | 25.77                                          | 5                                                             |
| 5.0SMDJ110A | 5.0SMDJ110CA | 5PHE    | 5BHE | 110.0                                          | 122.00                                                | 135.00 | 1                                | 177.0                                                        | 28.53                                          | 5                                                             |
| 5.0SMDJ120  | 5.0SMDJ120C  | 5PHF    | 5BHF | 120.0                                          | 133.00                                                | 163.00 | 1                                | 214.0                                                        | 23.60                                          | 5                                                             |
| 5.0SMDJ120A | 5.0SMDJ120CA | 5PHG    | 5BHG | 120.0                                          | 133.00                                                | 147.00 | 1                                | 193.0                                                        | 26.17                                          | 5                                                             |
| 5.0SMDJ130  | 5.0SMDJ130C  | 5PHH    | 5BHH | 130.0                                          | 144.00                                                | 176.00 | 1                                | 231.0                                                        | 21.86                                          | 5                                                             |
| 5.0SMDJ130A | 5.0SMDJ130CA | 5PHK    | 5BHK | 130.0                                          | 144.00                                                | 159.00 | 1                                | 209.0                                                        | 24.16                                          | 5                                                             |
| 5.0SMDJ140  | 5.0SMDJ140C  | 5PHA    | 5BHA | 140.0                                          | 155.68                                                | 190.40 | 1                                | 250.6                                                        | 20.15                                          | 5                                                             |
| 5.0SMDJ140A | 5.0SMDJ140CA | 5PHB    | 5BHB | 140.0                                          | 155.00                                                | 171.00 | 1                                | 226.8                                                        | 22.27                                          | 5                                                             |
| 5.0SMDJ150  | 5.0SMDJ150C  | 5PHL    | 5BHL | 150.0                                          | 167.00                                                | 204.00 | 1                                | 268.0                                                        | 18.84                                          | 5                                                             |
| 5.0SMDJ150A | 5.0SMDJ150CA | 5PHM    | 5BHM | 150.0                                          | 167.00                                                | 185.00 | 1                                | 243.0                                                        | 20.78                                          | 5                                                             |
| 5.0SMDJ160  | 5.0SMDJ160C  | 5PHN    | 5BHN | 160.0                                          | 178.00                                                | 218.00 | 1                                | 287.0                                                        | 17.60                                          | 5                                                             |
| 5.0SMDJ160A | 5.0SMDJ160CA | 5PHP    | 5BHP | 160.0                                          | 178.00                                                | 197.00 | 1                                | 259.0                                                        | 19.50                                          | 5                                                             |
| 5.0SMDJ170  | 5.0SMDJ170C  | 5PHQ    | 5BHQ | 170.0                                          | 189.00                                                | 231.00 | 1                                | 304.0                                                        | 16.61                                          | 5                                                             |
| 5.0SMDJ170A | 5.0SMDJ170CA | 5PHR    | 5BHR | 170.0                                          | 189.00                                                | 209.00 | 1                                | 275.0                                                        | 18.36                                          | 5                                                             |
| 5.0SMDJ180  | 5.0SMDJ180C  | 5PHS    | 5BHS | 180.0                                          | 201.00                                                | 244.80 | 1                                | 322.2                                                        | 15.67                                          | 5                                                             |
| 5.0SMDJ180A | 5.0SMDJ180CA | 5PHT    | 5BHT | 180.0                                          | 201.00                                                | 220.00 | 1                                | 291.6                                                        | 17.32                                          | 5                                                             |
| 5.0SMDJ190  | 5.0SMDJ190C  | 5PHU    | 5BHU | 190.0                                          | 211.21                                                | 258.40 | 1                                | 340.1                                                        | 14.85                                          | 5                                                             |
| 5.0SMDJ190A | 5.0SMDJ190CA | 5PHV    | 5BHV | 190.0                                          | 211.00                                                | 232.00 | 1                                | 307.8                                                        | 16.41                                          | 5                                                             |
| 5.0SMDJ200A | 5.0SMDJ200CA | 5PHW    | 5BHW | 200.0                                          | 224.00                                                | 247.00 | 1                                | 324.0                                                        | 9.26                                           | 5                                                             |
| 5.0SMDJ220A | 5.0SMDJ220CA | 5PHX    | 5BHX | 220.0                                          | 246.00                                                | 272.00 | 1                                | 356.0                                                        | 8.43                                           | 5                                                             |
| 5.0SMDJ250A | 5.0SMDJ250CA | 5PHZ    | 5BHZ | 250.0                                          | 279.00                                                | 309.00 | 1                                | 405.0                                                        | 7.41                                           | 5                                                             |
| 5.0SMDJ300A | 5.0SMDJ300CA | 5PJE    | 5BJE | 300.0                                          | 335.00                                                | 371.00 | 1                                | 486.0                                                        | 6.17                                           | 5                                                             |
| 5.0SMDJ350A | 5.0SMDJ350CA | 5PJG    | 5BJG | 350.0                                          | 391.00                                                | 432.00 | 1                                | 567.0                                                        | 5.29                                           | 5                                                             |
| 5.0SMDJ400A | 5.0SMDJ400CA | 5PJK    | 5BJK | 400.0                                          | 447.00                                                | 494.00 | 1                                | 648.0                                                        | 4.63                                           | 5                                                             |
| 5.0SMDJ440A | 5.0SMDJ440CA | 5PJM    | 5BJM | 440.0                                          | 492.00                                                | 543.00 | 1                                | 713.0                                                        | 4.21                                           | 5                                                             |

**Note:**

1. Suffix 'A' denotes 5% tolerance device. Without 'A' denotes 10% tolerance device
2. Add suffix 'C' or 'CA' after part number to specify Bi-directional devices
3. For Bi-Directional devices having V<sub>R</sub> of 10 volts and under, the I<sub>R</sub> limit is double

**Features**

- u Glass passivated chip
- u 500W peak pulse power capability with a 10/1000 $\mu$ s waveform, repetitive rate (duty cycle): 0.01%
- u Low leakage
- u Excellent clamping capability
- u Very fast response time
- u RoHS compliant

**Uni-directional**

**DO-214AA(SMB)**
**Dimensions**
**DO-214AA (SMB)**


| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| <b>A</b>   | 0.077  | 0.087 | 1.960       | 2.200 |
| <b>B</b>   | 0.171  | 0.191 | 4.350       | 4.850 |
| <b>C</b>   | 0.130  | 0.155 | 3.300       | 3.940 |
| <b>D</b>   | 0.084  | 0.096 | 2.130       | 2.440 |
| <b>E</b>   | 0.030  | 0.060 | 0.750       | 1.520 |
| <b>F</b>   | -      | 0.008 | -           | 0.203 |
| <b>G</b>   | 0.201  | 0.216 | 5.100       | 5.500 |
| <b>H</b>   | 0.006  | 0.012 | 0.152       | 0.305 |
| <b>I</b>   | 0.089  | -     | 2.260       | -     |
| <b>J</b>   | 0.085  | -     | 2.160       | -     |
| <b>K</b>   | -      | 0.107 | -           | 2.740 |
| <b>L</b>   | 0.085  | -     | 2.160       | -     |

**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

| Part Number | Device Marking Code | Reverse Stand-Off Voltage VRWM (V) | Breakdown Voltage VBR @IT=1.0mA (V) | Maximum Reverse Leakage IR @VRWM ( $\mu$ A) | Maximum Clamping Voltage VC @IPP (V) | Maximum Peak Pulse Current IPP (A) | Maximum Junction Capacitance @0V (pF) | Working Inverse Blocking Voltage VWIB (V) | Inverse Blocking Leakage Current IIB @VWIB (mA) | Peak Inverse Voltage VPIB (V) |
|-------------|---------------------|------------------------------------|-------------------------------------|---------------------------------------------|--------------------------------------|------------------------------------|---------------------------------------|-------------------------------------------|-------------------------------------------------|-------------------------------|
|             |                     |                                    | MIN                                 |                                             |                                      |                                    |                                       |                                           |                                                 |                               |
| SACB5.0     | SAD                 | 5.0                                | 7.60                                | 300                                         | 10.0                                 | 44.0                               | 45                                    | 75                                        | 1                                               | 100                           |
| SACB6.0     | SAE                 | 6.0                                | 7.90                                | 300                                         | 11.2                                 | 41.0                               | 45                                    | 75                                        | 1                                               | 100                           |
| SACB7.0     | SAF                 | 7.0                                | 8.33                                | 300                                         | 12.6                                 | 38.0                               | 45                                    | 75                                        | 1                                               | 100                           |
| SACB8.0     | SAG                 | 8.0                                | 8.89                                | 100                                         | 13.4                                 | 36.0                               | 45                                    | 75                                        | 1                                               | 100                           |
| SACB8.5     | SAH                 | 8.5                                | 9.44                                | 50                                          | 14.0                                 | 34.0                               | 45                                    | 75                                        | 1                                               | 100                           |
| SACB10      | SAK                 | 10.0                               | 11.10                               | 5                                           | 16.3                                 | 29.0                               | 45                                    | 75                                        | 1                                               | 100                           |
| SACB12      | SAL                 | 12.0                               | 13.30                               | 5                                           | 19.0                                 | 25.0                               | 45                                    | 75                                        | 1                                               | 100                           |
| SACB15      | SAM                 | 15.0                               | 16.67                               | 5                                           | 23.6                                 | 20.0                               | 45                                    | 75                                        | 1                                               | 100                           |
| SACB18      | SAN                 | 18.0                               | 20.00                               | 5                                           | 28.8                                 | 15.0                               | 45                                    | 75                                        | 1                                               | 100                           |
| SACB22      | SAP                 | 22.0                               | 24.40                               | 5                                           | 35.4                                 | 14.0                               | 45                                    | 75                                        | 1                                               | 100                           |
| SACB26      | SAQ                 | 26.0                               | 28.90                               | 5                                           | 42.3                                 | 11.1                               | 45                                    | 75                                        | 1                                               | 100                           |
| SACB30      | SAR                 | 30.0                               | 33.30                               | 5                                           | 48.6                                 | 10.0                               | 45                                    | 75                                        | 1                                               | 100                           |
| SACB36      | SAS                 | 36.0                               | 40.00                               | 5                                           | 60.0                                 | 8.6                                | 45                                    | 75                                        | 1                                               | 100                           |
| SACB45      | SAT                 | 45.0                               | 50.00                               | 5                                           | 77.0                                 | 6.8                                | 45                                    | 150                                       | 1                                               | 200                           |
| SACB50      | SAU                 | 50.0                               | 55.50                               | 5                                           | 88.0                                 | 5.8                                | 45                                    | 150                                       | 1                                               | 200                           |

## Surface Mount Transient Voltage Suppressors (TVS)

SM8S Series 10 To 43 V 6600W

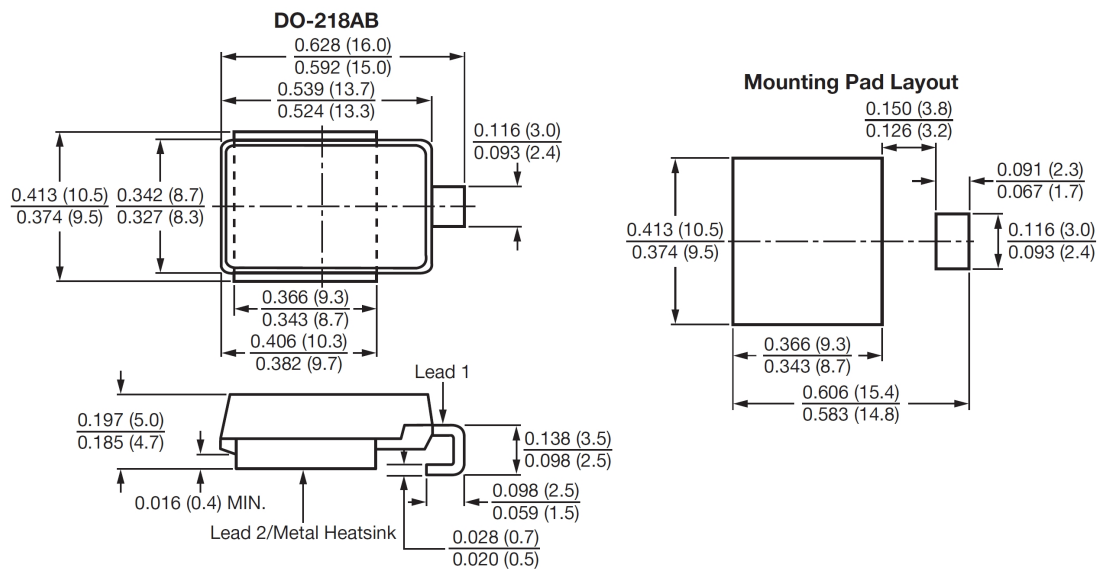
### Features

- u Junction passivation optimized design passivated anisotropic rectifier technology
- u  $T_J=175^{\circ}\text{C}$  capability suitable for high reliability and automotive requirement
- u Available in uni-directional polarity only
- u Low leakage current
- u Low forward voltage drop
- u High surge capability
- u Meets ISO7637-2 surge specification (varied by test condition)
- u Meets MSL level 1, per J-STD-020, LF maximum peak of  $245^{\circ}\text{C}$
- u AEC-Q101 qualified
- u Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC



**DO-218AB**

### Dimensions



**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

| Part Number | Stand-Off Voltage<br>$V_{MW}$<br>(V) | Breakdown Voltage<br>$V_{BR}$ (V) |      | Test Current<br>$I_T$<br>(mA) | Maximum Reverse Leakage at $V_{WM}$<br>$I_D(\mu\text{A})$ | Maximum Reverse at $V_{WM}$<br>$T_J=175^{\circ}\text{C}$<br>$I_D(\mu\text{A})$ | Maximum Peak Pulse Current at 10/1000 $\mu\text{s}$ Waveform (A) | Maximum Clamping Voltage at $I_{PPM}$<br>$V_C$ (V) |
|-------------|--------------------------------------|-----------------------------------|------|-------------------------------|-----------------------------------------------------------|--------------------------------------------------------------------------------|------------------------------------------------------------------|----------------------------------------------------|
|             |                                      | MIN.                              | MAX. |                               |                                                           |                                                                                |                                                                  |                                                    |
| SM8S10      | 10.0                                 | 11.1                              | 13.6 | 5.0                           | 15                                                        | 250                                                                            | 351                                                              | 18.8                                               |
| SM8S10A     | 10.0                                 | 11.1                              | 12.3 | 5.0                           | 15                                                        | 250                                                                            | 388                                                              | 17.0                                               |
| SM8S11      | 11.0                                 | 12.2                              | 14.9 | 5.0                           | 10                                                        | 150                                                                            | 328                                                              | 20.1                                               |
| SM8S11A     | 11.0                                 | 12.2                              | 13.5 | 5.0                           | 10                                                        | 150                                                                            | 363                                                              | 18.2                                               |
| SM8S12      | 12.0                                 | 13.3                              | 16.3 | 5.0                           | 10                                                        | 150                                                                            | 300                                                              | 22.0                                               |
| SM8S12A     | 12.0                                 | 13.3                              | 14.7 | 5.0                           | 10                                                        | 150                                                                            | 332                                                              | 19.9                                               |
| SM8S13      | 13.0                                 | 14.4                              | 17.6 | 5.0                           | 10                                                        | 150                                                                            | 277                                                              | 23.8                                               |
| SM8S13A     | 13.0                                 | 14.4                              | 15.9 | 5.0                           | 10                                                        | 150                                                                            | 307                                                              | 21.5                                               |
| SM8S14      | 14.0                                 | 15.6                              | 19.1 | 5.0                           | 10                                                        | 150                                                                            | 256                                                              | 25.8                                               |
| SM8S14A     | 14.0                                 | 15.6                              | 17.2 | 5.0                           | 10                                                        | 150                                                                            | 284                                                              | 23.2                                               |
| SM8S15      | 15.0                                 | 16.7                              | 20.4 | 5.0                           | 10                                                        | 150                                                                            | 245                                                              | 26.9                                               |
| SM8S15A     | 15.0                                 | 16.7                              | 18.5 | 5.0                           | 10                                                        | 150                                                                            | 270                                                              | 24.4                                               |
| SM8S16      | 16.0                                 | 17.8                              | 21.8 | 5.0                           | 10                                                        | 150                                                                            | 229                                                              | 28.8                                               |
| SM8S16A     | 16.0                                 | 17.8                              | 19.7 | 5.0                           | 10                                                        | 150                                                                            | 254                                                              | 26.0                                               |
| SM8S17      | 17.0                                 | 18.9                              | 23.1 | 5.0                           | 10                                                        | 150                                                                            | 216                                                              | 30.5                                               |
| SM8S17A     | 17.0                                 | 18.9                              | 20.9 | 5.0                           | 10                                                        | 150                                                                            | 239                                                              | 27.6                                               |
| SM8S18      | 18.0                                 | 20.0                              | 24.4 | 5.0                           | 10                                                        | 150                                                                            | 205                                                              | 32.2                                               |
| SM8S18A     | 18.0                                 | 20.0                              | 22.1 | 5.0                           | 10                                                        | 150                                                                            | 226                                                              | 29.2                                               |
| SM8S20      | 20.0                                 | 22.2                              | 27.1 | 5.0                           | 10                                                        | 150                                                                            | 184                                                              | 35.8                                               |
| SM8S20A     | 20.0                                 | 22.2                              | 24.5 | 5.0                           | 10                                                        | 150                                                                            | 204                                                              | 32.4                                               |
| SM8S22      | 22.0                                 | 24.4                              | 29.8 | 5.0                           | 10                                                        | 150                                                                            | 168                                                              | 39.4                                               |
| SM8S22A     | 22.0                                 | 24.4                              | 26.9 | 5.0                           | 10                                                        | 150                                                                            | 186                                                              | 35.5                                               |
| SM8S24      | 24.0                                 | 26.7                              | 32.6 | 5.0                           | 10                                                        | 150                                                                            | 153                                                              | 43.0                                               |
| SM8S24A     | 24.0                                 | 26.7                              | 29.5 | 5.0                           | 10                                                        | 150                                                                            | 170                                                              | 38.9                                               |
| SM8S26      | 26.0                                 | 28.9                              | 35.3 | 5.0                           | 10                                                        | 150                                                                            | 142                                                              | 46.6                                               |
| SM8S26A     | 26.0                                 | 28.9                              | 31.9 | 5.0                           | 10                                                        | 150                                                                            | 157                                                              | 42.1                                               |
| SM8S28      | 28.0                                 | 31.1                              | 38.0 | 5.0                           | 10                                                        | 150                                                                            | 132                                                              | 50.1                                               |
| SM8S28A     | 28.0                                 | 31.1                              | 34.4 | 5.0                           | 10                                                        | 150                                                                            | 145                                                              | 45.4                                               |
| SM8S30      | 30.0                                 | 33.3                              | 40.7 | 5.0                           | 10                                                        | 150                                                                            | 123                                                              | 53.5                                               |
| SM8S30A     | 30.0                                 | 33.3                              | 36.8 | 5.0                           | 10                                                        | 150                                                                            | 136                                                              | 48.4                                               |
| SM8S33      | 33.0                                 | 36.7                              | 44.9 | 5.0                           | 10                                                        | 150                                                                            | 112                                                              | 59.0                                               |
| SM8S33A     | 33.0                                 | 36.7                              | 40.6 | 5.0                           | 10                                                        | 150                                                                            | 124                                                              | 53.3                                               |
| SM8S36      | 36.0                                 | 40.0                              | 48.9 | 5.0                           | 10                                                        | 150                                                                            | 103                                                              | 64.3                                               |
| SM8S36A     | 36.0                                 | 40.0                              | 44.2 | 5.0                           | 10                                                        | 150                                                                            | 114                                                              | 58.1                                               |
| SM8S40      | 40.0                                 | 44.4                              | 54.3 | 5.0                           | 10                                                        | 150                                                                            | 92.4                                                             | 71.4                                               |
| SM8S40A     | 40.0                                 | 44.4                              | 49.1 | 5.0                           | 10                                                        | 150                                                                            | 102                                                              | 64.5                                               |
| SM8S43      | 43.0                                 | 47.8                              | 58.4 | 5.0                           | 10                                                        | 150                                                                            | 86                                                               | 76.7                                               |
| SM8S43A     | 43.0                                 | 47.8                              | 52.8 | 5.0                           | 10                                                        | 150                                                                            | 95.1                                                             | 69.4                                               |

**Note:**

For all types maximum  $V_F = 1.8\text{V}$  at  $I_F = 100\text{A}$  measured on 8.3 ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum.

## Axial Lead Transient Voltage Suppressors (TVS)

P4KE Series 6.8 To 600 V 400W

### Features

- u Glass passivated chip junction in DO-41 Package
- u Low leakage
- u Uni and Bidirectional unit
- u Excellent clamping capability
- u 400W Peak power capability at  $10 \times 1000\mu\text{s}$  waveform
- u Repetition rate (duty cycle): 0.01%
- u Fast response time: typically less than 1.0ps from 0 Volts to  $V_{BR}$  min
- u Typical  $I_R$  less than 5 $\mu\text{A}$  above 12V.
- u High Temperature soldering: 260°C/40 seconds at terminals
- u Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR@25^\circ\text{C}} \times \Delta T$
- u Plastic package has Underwriters Laboratory Flammability 94V-0
- u Matte tin lead-free Plated
- u Halogen free and RoHS compliant
- u Typical failure mode is short from over-specified voltage or current
- u Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- u IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- u ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- u EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)

Uni-directional

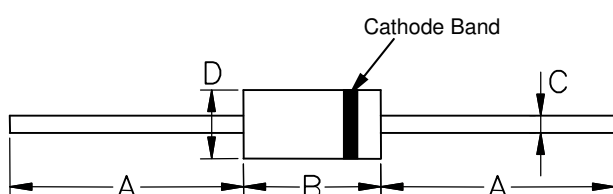
Bi-directional



**DO-204AL (DO-41)**

### Dimensions

**DO-204AL (DO-41)**



| Dimensions | Inches |       | Millimeters |      |
|------------|--------|-------|-------------|------|
|            | Min    | Max   | Min         | Max  |
| <b>A</b>   | 1.000  | -     | 25.40       | -    |
| <b>B</b>   | 0.165  | 0.205 | 4.19        | 5.21 |
| <b>C</b>   | 0.028  | 0.033 | 0.71        | 0.84 |
| <b>D</b>   | 0.090  | 0.117 | 2.29        | 2.97 |

**Electrical Characteristics ( $T_A=25^\circ\text{C}$  unless otherwise noted)**

| Part Number |           | Reverse Stand-Off Voltage $V_{RWM}(V)$ | Breakdown Voltage $V_{BR}$ (V) @ $I_T$ |       | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$ @ $I_{PP}$ (V) | Maximum Peak Pulse Current $I_{PP}$ (A) | Maximum Reverse Leakage $I_R$ @ $V_{RWM}$ ( $\mu A$ ) |
|-------------|-----------|----------------------------------------|----------------------------------------|-------|-------------------------|-----------------------------------------------|-----------------------------------------|-------------------------------------------------------|
| Uni         | Bi        |                                        | MIN                                    | MAX   |                         |                                               |                                         |                                                       |
| P4KE6.8     | P4KE6.8C  | 5.5                                    | 6.12                                   | 7.48  | 10                      | 10.8                                          | 37.04                                   | 1000                                                  |
| P4KE6.8A    | P4KE6.8CA | 5.8                                    | 6.46                                   | 7.14  | 10                      | 10.5                                          | 38.10                                   | 1000                                                  |
| P4KE7.5     | P4KE7.5C  | 6.1                                    | 6.75                                   | 8.25  | 10                      | 11.7                                          | 34.19                                   | 500                                                   |
| P4KE7.5A    | P4KE7.5CA | 6.4                                    | 7.13                                   | 7.88  | 10                      | 11.3                                          | 35.40                                   | 500                                                   |
| P4KE8.2     | P4KE8.2C  | 6.6                                    | 7.38                                   | 9.02  | 10                      | 12.5                                          | 32.00                                   | 200                                                   |
| P4KE8.2A    | P4KE8.2CA | 7.0                                    | 7.79                                   | 8.61  | 10                      | 12.1                                          | 33.06                                   | 200                                                   |
| P4KE9.1     | P4KE9.1C  | 7.4                                    | 8.19                                   | 10.01 | 1                       | 13.8                                          | 28.99                                   | 50                                                    |
| P4KE9.1A    | P4KE9.1CA | 7.8                                    | 8.65                                   | 9.56  | 1                       | 13.4                                          | 29.85                                   | 50                                                    |
| P4KE10      | P4KE10C   | 8.1                                    | 9.00                                   | 11.00 | 1                       | 15.0                                          | 26.67                                   | 10                                                    |
| P4KE10A     | P4KE10CA  | 8.6                                    | 9.50                                   | 10.50 | 1                       | 14.5                                          | 27.59                                   | 10                                                    |
| P4KE11      | P4KE11C   | 8.9                                    | 9.90                                   | 12.10 | 1                       | 16.2                                          | 24.69                                   | 5                                                     |
| P4KE11A     | P4KE11CA  | 9.4                                    | 10.45                                  | 11.55 | 1                       | 15.6                                          | 25.64                                   | 5                                                     |
| P4KE12      | P4KE12C   | 9.7                                    | 10.80                                  | 13.20 | 1                       | 17.3                                          | 23.12                                   | 5                                                     |
| P4KE12A     | P4KE12CA  | 10.2                                   | 11.40                                  | 12.60 | 1                       | 16.7                                          | 23.95                                   | 5                                                     |
| P4KE13      | P4KE13C   | 10.5                                   | 11.70                                  | 14.30 | 1                       | 19.0                                          | 21.05                                   | 5                                                     |
| P4KE13A     | P4KE13CA  | 11.1                                   | 12.35                                  | 13.65 | 1                       | 18.2                                          | 21.98                                   | 5                                                     |
| P4KE15      | P4KE15C   | 12.1                                   | 13.50                                  | 16.50 | 1                       | 22.0                                          | 18.18                                   | 5                                                     |
| P4KE15A     | P4KE15CA  | 12.8                                   | 14.25                                  | 15.75 | 1                       | 21.2                                          | 18.87                                   | 5                                                     |
| P4KE16      | P4KE16C   | 12.9                                   | 14.40                                  | 17.60 | 1                       | 23.5                                          | 17.02                                   | 5                                                     |
| P4KE16A     | P4KE16CA  | 13.6                                   | 15.20                                  | 16.80 | 1                       | 22.5                                          | 17.78                                   | 5                                                     |
| P4KE18      | P4KE18C   | 14.5                                   | 16.20                                  | 19.80 | 1                       | 26.5                                          | 15.09                                   | 5                                                     |
| P4KE18A     | P4KE18CA  | 15.3                                   | 17.10                                  | 18.90 | 1                       | 25.2                                          | 15.87                                   | 5                                                     |
| P4KE20      | P4KE20C   | 16.2                                   | 18.00                                  | 22.00 | 1                       | 29.1                                          | 13.75                                   | 5                                                     |
| P4KE20A     | P4KE20CA  | 17.1                                   | 19.00                                  | 21.00 | 1                       | 27.7                                          | 14.44                                   | 5                                                     |
| P4KE22      | P4KE22C   | 17.8                                   | 19.80                                  | 24.20 | 1                       | 31.9                                          | 12.54                                   | 5                                                     |
| P4KE22A     | P4KE22CA  | 18.8                                   | 20.90                                  | 23.10 | 1                       | 30.6                                          | 13.07                                   | 5                                                     |
| P4KE24      | P4KE24C   | 19.4                                   | 21.60                                  | 26.40 | 1                       | 34.7                                          | 11.53                                   | 5                                                     |
| P4KE24A     | P4KE24CA  | 20.5                                   | 22.80                                  | 25.20 | 1                       | 33.2                                          | 12.05                                   | 5                                                     |
| P4KE27      | P4KE27C   | 21.8                                   | 24.30                                  | 29.70 | 1                       | 39.1                                          | 10.23                                   | 5                                                     |
| P4KE27A     | P4KE27CA  | 23.1                                   | 25.65                                  | 28.35 | 1                       | 37.5                                          | 10.67                                   | 5                                                     |
| P4KE30      | P4KE30C   | 24.3                                   | 27.00                                  | 33.00 | 1                       | 43.5                                          | 9.20                                    | 5                                                     |
| P4KE30A     | P4KE30CA  | 25.6                                   | 28.50                                  | 31.50 | 1                       | 41.4                                          | 9.66                                    | 5                                                     |
| P4KE33      | P4KE33C   | 26.8                                   | 29.70                                  | 36.30 | 1                       | 47.7                                          | 8.39                                    | 5                                                     |
| P4KE33A     | P4KE33CA  | 28.2                                   | 31.35                                  | 34.65 | 1                       | 45.7                                          | 8.75                                    | 5                                                     |
| P4KE36      | P4KE36C   | 29.1                                   | 32.40                                  | 39.60 | 1                       | 52.0                                          | 7.69                                    | 5                                                     |
| P4KE36A     | P4KE36CA  | 30.8                                   | 34.20                                  | 37.80 | 1                       | 49.9                                          | 8.02                                    | 5                                                     |
| P4KE39      | P4KE39C   | 31.6                                   | 35.10                                  | 42.90 | 1                       | 56.4                                          | 7.09                                    | 5                                                     |
| P4KE39A     | P4KE39CA  | 33.3                                   | 37.05                                  | 40.95 | 1                       | 53.9                                          | 7.42                                    | 5                                                     |
| P4KE43      | P4KE43C   | 34.8                                   | 38.70                                  | 47.30 | 1                       | 61.9                                          | 6.46                                    | 5                                                     |
| P4KE43A     | P4KE43CA  | 36.8                                   | 40.85                                  | 45.15 | 1                       | 59.3                                          | 6.75                                    | 5                                                     |
| P4KE47      | P4KE47C   | 38.1                                   | 42.30                                  | 51.70 | 1                       | 67.8                                          | 5.90                                    | 5                                                     |
| P4KE47A     | P4KE47CA  | 40.2                                   | 44.65                                  | 49.35 | 1                       | 64.8                                          | 6.17                                    | 5                                                     |
| P4KE51      | P4KE51C   | 41.3                                   | 45.90                                  | 56.10 | 1                       | 73.5                                          | 5.44                                    | 5                                                     |
| P4KE51A     | P4KE51CA  | 43.6                                   | 48.45                                  | 53.55 | 1                       | 70.1                                          | 5.71                                    | 5                                                     |
| P4KE56      | P4KE56C   | 45.4                                   | 50.40                                  | 61.60 | 1                       | 80.5                                          | 4.97                                    | 5                                                     |
| P4KE56A     | P4KE56CA  | 47.8                                   | 53.20                                  | 58.80 | 1                       | 77.0                                          | 5.19                                    | 5                                                     |
| P4KE62      | P4KE62C   | 50.2                                   | 55.80                                  | 68.20 | 1                       | 89.0                                          | 4.49                                    | 5                                                     |
| P4KE62A     | P4KE62CA  | 53.0                                   | 58.90                                  | 65.10 | 1                       | 85.0                                          | 4.71                                    | 5                                                     |
| P4KE68      | P4KE68C   | 55.1                                   | 61.20                                  | 74.80 | 1                       | 98.0                                          | 4.08                                    | 5                                                     |
| P4KE68A     | P4KE68CA  | 58.1                                   | 64.60                                  | 71.40 | 1                       | 92.0                                          | 4.35                                    | 5                                                     |
| P4KE75      | P4KE75C   | 60.7                                   | 67.50                                  | 82.50 | 1                       | 108.0                                         | 3.70                                    | 5                                                     |
| P4KE75A     | P4KE75CA  | 64.1                                   | 71.25                                  | 78.75 | 1                       | 103.0                                         | 3.88                                    | 5                                                     |
| P4KE82      | P4KE82C   | 66.4                                   | 73.80                                  | 90.20 | 1                       | 118.0                                         | 3.39                                    | 5                                                     |
| P4KE82A     | P4KE82CA  | 70.1                                   | 77.90                                  | 86.10 | 1                       | 113.0                                         | 3.54                                    | 5                                                     |

# Axial Lead Transient Voltage Suppressors (TVS)

P4KE Series 6.8 To 600 V 400W

## Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

| Part Number |           | Reverse Stand-Off Voltage<br>V <sub>RWM</sub> (V) | Breakdown Voltage V <sub>BR</sub> (V)<br>@I <sub>T</sub> |        | Test Current<br>I <sub>T</sub> (mA) | Maximum Clamping Voltage<br>V <sub>C</sub><br>@I <sub>PP</sub> (V) | Maximum Peak Pulse Current<br>I <sub>PP</sub> (A) | Maximum Reverse Leakage I <sub>R</sub><br>@V <sub>RWM</sub> (μA) |
|-------------|-----------|---------------------------------------------------|----------------------------------------------------------|--------|-------------------------------------|--------------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------|
| Uni         | Bi        |                                                   | MIN                                                      | MAX    |                                     |                                                                    |                                                   |                                                                  |
| P4KE91      | P4KE91C   | 73.7                                              | 81.90                                                    | 100.10 | 1                                   | 131.0                                                              | 3.05                                              | 5                                                                |
| P4KE91A     | P4KE91CA  | 77.8                                              | 86.45                                                    | 95.55  | 1                                   | 125.0                                                              | 3.20                                              | 5                                                                |
| P4KE100     | P4KE100C  | 81.0                                              | 90.00                                                    | 110.00 | 1                                   | 144.0                                                              | 2.78                                              | 5                                                                |
| P4KE100A    | P4KE100CA | 85.5                                              | 95.00                                                    | 105.00 | 1                                   | 137.0                                                              | 2.92                                              | 5                                                                |
| P4KE110     | P4KE110C  | 89.2                                              | 99.00                                                    | 121.00 | 1                                   | 158.0                                                              | 2.53                                              | 5                                                                |
| P4KE110A    | P4KE110CA | 94.0                                              | 104.50                                                   | 115.50 | 1                                   | 152.0                                                              | 2.63                                              | 5                                                                |
| P4KE120     | P4KE120C  | 97.2                                              | 108.00                                                   | 132.00 | 1                                   | 173.0                                                              | 2.31                                              | 5                                                                |
| P4KE120A    | P4KE120CA | 102.0                                             | 114.00                                                   | 126.00 | 1                                   | 165.0                                                              | 2.42                                              | 5                                                                |
| P4KE130     | P4KE130C  | 105.0                                             | 117.00                                                   | 143.00 | 1                                   | 187.0                                                              | 2.14                                              | 5                                                                |
| P4KE130A    | P4KE130CA | 111.0                                             | 123.50                                                   | 136.50 | 1                                   | 179.0                                                              | 2.23                                              | 5                                                                |
| P4KE150     | P4KE150C  | 121.0                                             | 135.00                                                   | 165.00 | 1                                   | 215.0                                                              | 1.86                                              | 5                                                                |
| P4KE150A    | P4KE150CA | 128.0                                             | 142.50                                                   | 157.50 | 1                                   | 207.0                                                              | 1.93                                              | 5                                                                |
| P4KE160     | P4KE160C  | 130.0                                             | 144.00                                                   | 176.00 | 1                                   | 230.0                                                              | 1.74                                              | 5                                                                |
| P4KE160A    | P4KE160CA | 136.0                                             | 152.00                                                   | 168.00 | 1                                   | 219.0                                                              | 1.83                                              | 5                                                                |
| P4KE170     | P4KE170C  | 138.0                                             | 153.00                                                   | 187.00 | 1                                   | 244.0                                                              | 1.64                                              | 5                                                                |
| P4KE170A    | P4KE170CA | 145.0                                             | 161.50                                                   | 178.50 | 1                                   | 234.0                                                              | 1.71                                              | 5                                                                |
| P4KE180     | P4KE180C  | 146.0                                             | 162.00                                                   | 198.00 | 1                                   | 258.0                                                              | 1.55                                              | 5                                                                |
| P4KE180A    | P4KE180CA | 154.0                                             | 171.00                                                   | 189.00 | 1                                   | 246.0                                                              | 1.63                                              | 5                                                                |
| P4KE200     | P4KE200C  | 162.0                                             | 180.00                                                   | 220.00 | 1                                   | 287.0                                                              | 1.39                                              | 5                                                                |
| P4KE200A    | P4KE200CA | 171.0                                             | 190.00                                                   | 210.00 | 1                                   | 274.0                                                              | 1.46                                              | 5                                                                |
| P4KE220     | P4KE220C  | 175.0                                             | 198.00                                                   | 242.00 | 1                                   | 344.0                                                              | 1.16                                              | 5                                                                |
| P4KE220A    | P4KE220CA | 185.0                                             | 209.00                                                   | 231.00 | 1                                   | 328.0                                                              | 1.22                                              | 5                                                                |
| P4KE250     | P4KE250C  | 202.0                                             | 225.00                                                   | 275.00 | 1                                   | 360.0                                                              | 1.11                                              | 5                                                                |
| P4KE250A    | P4KE250CA | 214.0                                             | 237.50                                                   | 262.50 | 1                                   | 344.0                                                              | 1.16                                              | 5                                                                |
| P4KE300     | P4KE300C  | 243.0                                             | 270.00                                                   | 330.00 | 1                                   | 430.0                                                              | 0.93                                              | 5                                                                |
| P4KE300A    | P4KE300CA | 256.0                                             | 285.00                                                   | 315.00 | 1                                   | 414.0                                                              | 0.97                                              | 5                                                                |
| P4KE350     | P4KE350C  | 284.0                                             | 315.00                                                   | 385.00 | 1                                   | 504.0                                                              | 0.79                                              | 5                                                                |
| P4KE350A    | P4KE350CA | 299.3                                             | 332.50                                                   | 367.50 | 1                                   | 482.0                                                              | 0.83                                              | 5                                                                |
| P4KE380     | P4KE380C  | 308.6                                             | 342.00                                                   | 418.00 | 1                                   | 547.2                                                              | 0.73                                              | 5                                                                |
| P4KE380A    | P4KE380CA | 324.9                                             | 361.00                                                   | 399.00 | 1                                   | 524.4                                                              | 0.76                                              | 5                                                                |
| P4KE400     | P4KE400C  | 324.8                                             | 360.00                                                   | 440.00 | 1                                   | 576.0                                                              | 0.69                                              | 5                                                                |
| P4KE400A    | P4KE400CA | 342.0                                             | 380.00                                                   | 420.00 | 1                                   | 552.0                                                              | 0.72                                              | 5                                                                |
| P4KE440     | P4KE440C  | 357.3                                             | 396.00                                                   | 484.00 | 1                                   | 633.6                                                              | 0.63                                              | 5                                                                |
| P4KE440A    | P4KE440CA | 376.2                                             | 418.00                                                   | 462.00 | 1                                   | 607.2                                                              | 0.66                                              | 5                                                                |
| P4KE500     | P4KE500C  | 406.0                                             | 450.00                                                   | 550.00 | 1                                   | 720.0                                                              | 0.56                                              | 5                                                                |
| P4KE500A    | P4KE500CA | 427.5                                             | 475.00                                                   | 525.00 | 1                                   | 690.0                                                              | 0.58                                              | 5                                                                |
| P4KE520     | P4KE520C  | 422.2                                             | 468.00                                                   | 572.00 | 1                                   | 748.8                                                              | 0.53                                              | 5                                                                |
| P4KE520A    | P4KE520CA | 444.6                                             | 494.00                                                   | 546.00 | 1                                   | 717.6                                                              | 0.56                                              | 5                                                                |
| P4KE550     | P4KE550C  | 446.6                                             | 495.00                                                   | 605.00 | 1                                   | 792.0                                                              | 0.51                                              | 5                                                                |
| P4KE550A    | P4KE550CA | 470.3                                             | 522.50                                                   | 577.50 | 1                                   | 759.0                                                              | 0.53                                              | 5                                                                |
| P4KE600     | P4KE600C  | 487.2                                             | 540.00                                                   | 660.00 | 1                                   | 864.0                                                              | 0.46                                              | 5                                                                |
| P4KE600A    | P4KE600CA | 513.0                                             | 570.00                                                   | 630.00 | 1                                   | 828.0                                                              | 0.48                                              | 5                                                                |

### Note:

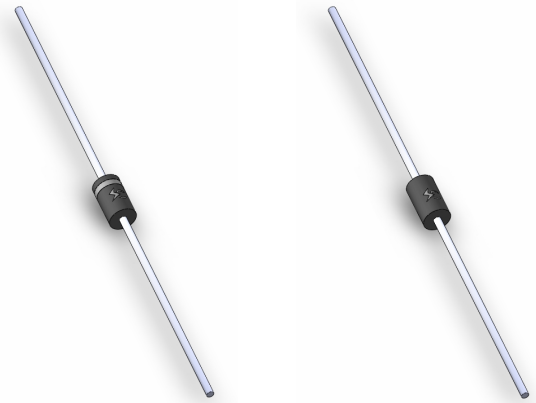
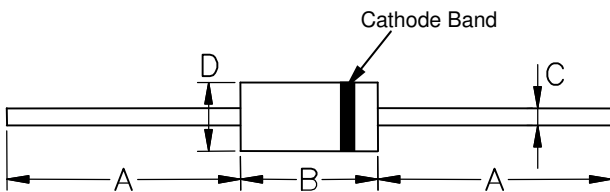
1. Suffix 'A' denotes 5% tolerance device. Without 'A' denotes 10% tolerance device
2. Add suffix 'C' or 'CA' after part number to specify Bi-directional devices
3. For Bi-Directional devices having V<sub>R</sub> of 10 volts and under, the I<sub>R</sub> limit is double

**Features**

- u Glass passivated chip junction in DO-15 Package
- u Low leakage
- u Uni and Bidirectional unit
- u Excellent clamping capability
- u 500W Peak power capability at  $10 \times 1000\mu\text{s}$  waveform
- u Repetition rate (duty cycle): 0.01%
- u Fast response time: typically less than 1.0ps from 0 Volts to  $V_{BR}$  min
- u Typical  $I_R$  less than 5 $\mu\text{A}$  above 12V.
- u High Temperature soldering: 260°C/40 seconds at terminals
- u Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR}@25^\circ\text{C} \times \Delta T$
- u Plastic package has Underwriters Laboratory Flammability 94V-0
- u Matte tin lead-free Plated
- u Halogen free and RoHS compliant
- u Typical failure mode is short from over-specified voltage or current
- u Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- u IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- u ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- u EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)

Uni-directional

Bi-directional


**DO-204AC (DO-15)**
**Dimensions**
**DO-204AC (DO-15)**


| Dimensions | Inches |       | Millimeters |      |
|------------|--------|-------|-------------|------|
|            | Min    | Max   | Min         | Max  |
| <b>A</b>   | 1.000  | -     | 25.40       | -    |
| <b>B</b>   | 0.230  | 0.300 | 5.85        | 7.63 |
| <b>C</b>   | 0.028  | 0.033 | 0.71        | 0.84 |
| <b>D</b>   | 0.102  | 0.142 | 2.60        | 3.61 |

# Axial Lead Transient Voltage Suppressors (TVS)

SA Series 5.0 To 190 V 500W

Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)

| Part Number |         | Reverse Stand-Off Voltage $V_{RWM}(V)$ | Breakdown Voltage $V_{BR}$ (V) @ $I_T$ |       | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$ @ $I_{PP}$ (V) | Maximum Peak Pulse Current $I_{PP}$ (A) | Maximum Reverse Leakage $I_R$ @ $V_{RWM}$ ( $\mu A$ ) |
|-------------|---------|----------------------------------------|----------------------------------------|-------|-------------------------|-----------------------------------------------|-----------------------------------------|-------------------------------------------------------|
| Uni         | Bi      |                                        | MIN                                    | MAX   |                         |                                               |                                         |                                                       |
| SA5.0       | SA5.0C  | 5.0                                    | 6.40                                   | 7.30  | 10                      | 9.6                                           | 52.08                                   | 600                                                   |
| SA5.0A      | SA5.0CA | 5.0                                    | 6.40                                   | 7.00  | 10                      | 9.2                                           | 54.35                                   | 600                                                   |
| SA6.0       | SA6.0C  | 6.0                                    | 6.67                                   | 8.15  | 10                      | 11.4                                          | 43.86                                   | 600                                                   |
| SA6.0A      | SA6.0CA | 6.0                                    | 6.67                                   | 7.37  | 10                      | 10.3                                          | 48.54                                   | 600                                                   |
| SA6.5       | SA6.5C  | 6.5                                    | 7.22                                   | 8.82  | 10                      | 12.3                                          | 40.65                                   | 400                                                   |
| SA6.5A      | SA6.5CA | 6.5                                    | 7.22                                   | 7.98  | 10                      | 11.2                                          | 44.64                                   | 400                                                   |
| SA7.0       | SA7.0C  | 7.0                                    | 7.78                                   | 9.51  | 10                      | 13.3                                          | 37.59                                   | 150                                                   |
| SA7.0A      | SA7.0CA | 7.0                                    | 7.78                                   | 8.60  | 10                      | 12.0                                          | 41.67                                   | 150                                                   |
| SA7.5       | SA7.5C  | 7.5                                    | 8.33                                   | 10.20 | 1                       | 14.3                                          | 34.97                                   | 50                                                    |
| SA7.5A      | SA7.5CA | 7.5                                    | 8.33                                   | 9.21  | 1                       | 12.9                                          | 38.76                                   | 50                                                    |
| SA8.0       | SA8.0C  | 8.0                                    | 8.89                                   | 10.90 | 1                       | 15.0                                          | 33.33                                   | 25                                                    |
| SA8.0A      | SA8.0CA | 8.0                                    | 8.89                                   | 9.83  | 1                       | 13.6                                          | 36.76                                   | 25                                                    |
| SA8.5       | SA8.5C  | 8.5                                    | 9.44                                   | 11.50 | 1                       | 15.9                                          | 31.45                                   | 5                                                     |
| SA8.5A      | SA8.5CA | 8.5                                    | 9.44                                   | 10.40 | 1                       | 14.4                                          | 34.72                                   | 5                                                     |
| SA9.0       | SA9.0C  | 9.0                                    | 10.00                                  | 12.20 | 1                       | 16.9                                          | 29.59                                   | 5                                                     |
| SA9.0A      | SA9.0CA | 9.0                                    | 10.00                                  | 11.10 | 1                       | 15.4                                          | 32.47                                   | 5                                                     |
| SA10        | SA10C   | 10.0                                   | 11.10                                  | 13.60 | 1                       | 18.8                                          | 26.60                                   | 5                                                     |
| SA10A       | SA10CA  | 10.0                                   | 11.10                                  | 12.30 | 1                       | 17.0                                          | 29.41                                   | 5                                                     |
| SA11        | SA11C   | 11.0                                   | 12.20                                  | 14.90 | 1                       | 20.1                                          | 24.88                                   | 5                                                     |
| SA11A       | SA11CA  | 11.0                                   | 12.20                                  | 13.50 | 1                       | 18.2                                          | 27.47                                   | 5                                                     |
| SA12        | SA12C   | 12.0                                   | 13.30                                  | 16.30 | 1                       | 22.0                                          | 22.73                                   | 5                                                     |
| SA12A       | SA12CA  | 12.0                                   | 13.30                                  | 14.70 | 1                       | 19.9                                          | 25.13                                   | 5                                                     |
| SA13        | SA13C   | 13.0                                   | 14.40                                  | 17.60 | 1                       | 23.8                                          | 21.01                                   | 5                                                     |
| SA13A       | SA13CA  | 13.0                                   | 14.40                                  | 15.90 | 1                       | 21.5                                          | 23.26                                   | 5                                                     |
| SA14        | SA14C   | 14.0                                   | 15.60                                  | 19.10 | 1                       | 25.8                                          | 19.38                                   | 5                                                     |
| SA14A       | SA14CA  | 14.0                                   | 15.60                                  | 17.20 | 1                       | 23.2                                          | 21.55                                   | 5                                                     |
| SA15        | SA15C   | 15.0                                   | 16.70                                  | 20.40 | 1                       | 26.9                                          | 18.59                                   | 5                                                     |
| SA15A       | SA15CA  | 15.0                                   | 16.70                                  | 18.50 | 1                       | 24.4                                          | 20.49                                   | 5                                                     |
| SA16        | SA16C   | 16.0                                   | 17.80                                  | 21.80 | 1                       | 28.8                                          | 17.36                                   | 5                                                     |
| SA16A       | SA16CA  | 16.0                                   | 17.80                                  | 19.70 | 1                       | 26.0                                          | 19.23                                   | 5                                                     |
| SA17        | SA17C   | 17.0                                   | 18.90                                  | 23.10 | 1                       | 30.5                                          | 16.39                                   | 5                                                     |
| SA17A       | SA17CA  | 17.0                                   | 18.90                                  | 20.90 | 1                       | 27.6                                          | 18.12                                   | 5                                                     |
| SA18        | SA18C   | 18.0                                   | 20.00                                  | 24.40 | 1                       | 32.2                                          | 15.53                                   | 5                                                     |
| SA18A       | SA18CA  | 18.0                                   | 20.00                                  | 22.10 | 1                       | 29.2                                          | 17.12                                   | 5                                                     |
| SA19        | SA19C   | 19.0                                   | 21.13                                  | 25.76 | 1                       | 34.0                                          | 14.70                                   | 5                                                     |
| SA19A       | SA19CA  | 19.0                                   | 21.10                                  | 23.30 | 1                       | 30.8                                          | 16.24                                   | 5                                                     |
| SA20        | SA20C   | 20.0                                   | 22.20                                  | 27.10 | 1                       | 35.8                                          | 13.97                                   | 5                                                     |
| SA20A       | SA20CA  | 20.0                                   | 22.20                                  | 24.50 | 1                       | 32.4                                          | 15.43                                   | 5                                                     |
| SA22        | SA22C   | 22.0                                   | 24.40                                  | 29.80 | 1                       | 39.4                                          | 12.69                                   | 5                                                     |
| SA22A       | SA22CA  | 22.0                                   | 24.40                                  | 26.90 | 1                       | 35.5                                          | 14.08                                   | 5                                                     |
| SA24        | SA24C   | 24.0                                   | 26.70                                  | 32.60 | 1                       | 43.0                                          | 11.63                                   | 5                                                     |
| SA24A       | SA24CA  | 24.0                                   | 26.70                                  | 29.50 | 1                       | 38.9                                          | 12.85                                   | 5                                                     |
| SA26        | SA26C   | 26.0                                   | 28.90                                  | 35.30 | 1                       | 46.6                                          | 10.73                                   | 5                                                     |
| SA26A       | SA26CA  | 26.0                                   | 28.90                                  | 31.90 | 1                       | 42.1                                          | 11.88                                   | 5                                                     |
| SA28        | SA28C   | 28.0                                   | 31.10                                  | 38.00 | 1                       | 50.0                                          | 10.00                                   | 5                                                     |
| SA28A       | SA28CA  | 28.0                                   | 31.10                                  | 34.40 | 1                       | 45.4                                          | 11.01                                   | 5                                                     |
| SA30        | SA30C   | 30.0                                   | 33.30                                  | 40.70 | 1                       | 53.5                                          | 9.35                                    | 5                                                     |
| SA30A       | SA30CA  | 30.0                                   | 33.30                                  | 36.80 | 1                       | 48.4                                          | 10.33                                   | 5                                                     |
| SA33        | SA33C   | 33.0                                   | 36.70                                  | 44.90 | 1                       | 59.0                                          | 8.47                                    | 5                                                     |
| SA33A       | SA33CA  | 33.0                                   | 36.70                                  | 40.60 | 1                       | 53.3                                          | 9.38                                    | 5                                                     |
| SA36        | SA36C   | 36.0                                   | 40.00                                  | 48.90 | 1                       | 64.3                                          | 7.78                                    | 5                                                     |
| SA36A       | SA36CA  | 36.0                                   | 40.00                                  | 44.20 | 1                       | 58.1                                          | 8.61                                    | 5                                                     |
| SA40        | SA40C   | 40.0                                   | 44.40                                  | 54.30 | 1                       | 71.4                                          | 7.00                                    | 5                                                     |
| SA40A       | SA40CA  | 40.0                                   | 44.40                                  | 49.10 | 1                       | 64.5                                          | 7.75                                    | 5                                                     |

**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

| Part Number |         | Reverse Stand-Off Voltage $V_{RWM}(V)$ | Breakdown Voltage $V_{BR}$ (V) @ $I_T$ |        | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$ @ $I_{PP}$ (V) | Maximum Peak Pulse Current $I_{PP}$ (A) | Maximum Reverse Leakage $I_R$ @ $V_{RWM}$ ( $\mu A$ ) |
|-------------|---------|----------------------------------------|----------------------------------------|--------|-------------------------|-----------------------------------------------|-----------------------------------------|-------------------------------------------------------|
| Uni         | Bi      |                                        | MIN                                    | MAX    |                         |                                               |                                         |                                                       |
| SA43        | SA43C   | 43.0                                   | 47.80                                  | 58.40  | 1                       | 76.7                                          | 6.52                                    | 5                                                     |
| SA43A       | SA43CA  | 43.0                                   | 47.80                                  | 52.80  | 1                       | 69.4                                          | 7.20                                    | 5                                                     |
| SA45        | SA45C   | 45.0                                   | 50.00                                  | 61.10  | 1                       | 80.3                                          | 6.23                                    | 5                                                     |
| SA45A       | SA45CA  | 45.0                                   | 50.00                                  | 55.30  | 1                       | 72.7                                          | 6.88                                    | 5                                                     |
| SA48        | SA48C   | 48.0                                   | 53.30                                  | 65.10  | 1                       | 85.5                                          | 5.85                                    | 5                                                     |
| SA48A       | SA48CA  | 48.0                                   | 53.30                                  | 58.90  | 1                       | 77.4                                          | 6.46                                    | 5                                                     |
| SA51        | SA51C   | 51.0                                   | 56.70                                  | 69.30  | 1                       | 91.1                                          | 5.49                                    | 5                                                     |
| SA51A       | SA51CA  | 51.0                                   | 56.70                                  | 62.70  | 1                       | 82.4                                          | 6.07                                    | 5                                                     |
| SA54        | SA54C   | 54.0                                   | 60.00                                  | 73.30  | 1                       | 96.3                                          | 5.19                                    | 5                                                     |
| SA54A       | SA54CA  | 54.0                                   | 60.00                                  | 66.30  | 1                       | 87.1                                          | 5.74                                    | 5                                                     |
| SA58        | SA58C   | 58.0                                   | 64.40                                  | 78.70  | 1                       | 103.0                                         | 4.85                                    | 5                                                     |
| SA58A       | SA58CA  | 58.0                                   | 64.40                                  | 71.20  | 1                       | 93.6                                          | 5.34                                    | 5                                                     |
| SA60        | SA60C   | 60.0                                   | 66.70                                  | 81.50  | 1                       | 107.0                                         | 4.67                                    | 5                                                     |
| SA60A       | SA60CA  | 60.0                                   | 66.70                                  | 73.70  | 1                       | 96.8                                          | 5.17                                    | 5                                                     |
| SA64        | SA64C   | 64.0                                   | 71.10                                  | 86.90  | 1                       | 114.0                                         | 4.39                                    | 5                                                     |
| SA64A       | SA64CA  | 64.0                                   | 71.10                                  | 78.60  | 1                       | 103.0                                         | 4.85                                    | 5                                                     |
| SA70        | SA70C   | 70.0                                   | 77.80                                  | 95.10  | 1                       | 125.0                                         | 4.00                                    | 5                                                     |
| SA70A       | SA70CA  | 70.0                                   | 77.80                                  | 86.00  | 1                       | 113.0                                         | 4.42                                    | 5                                                     |
| SA75        | SA75C   | 75.0                                   | 83.30                                  | 102.00 | 1                       | 134.0                                         | 3.37                                    | 5                                                     |
| SA75A       | SA75CA  | 75.0                                   | 83.30                                  | 92.10  | 1                       | 121.0                                         | 4.13                                    | 5                                                     |
| SA78        | SA78C   | 78.0                                   | 86.70                                  | 106.00 | 1                       | 139.0                                         | 3.60                                    | 5                                                     |
| SA78A       | SA78CA  | 78.0                                   | 86.70                                  | 95.80  | 1                       | 126.0                                         | 3.97                                    | 5                                                     |
| SA80        | SA80C   | 80.0                                   | 88.96                                  | 108.80 | 1                       | 143.2                                         | 3.49                                    | 5                                                     |
| SA80A       | SA80CA  | 80.0                                   | 88.80                                  | 97.60  | 1                       | 129.6                                         | 3.86                                    | 5                                                     |
| SA85        | SA85C   | 85.0                                   | 94.40                                  | 115.00 | 1                       | 151.0                                         | 3.31                                    | 5                                                     |
| SA85A       | SA85CA  | 85.0                                   | 94.40                                  | 104.00 | 1                       | 137.0                                         | 3.65                                    | 5                                                     |
| SA90        | SA90C   | 90.0                                   | 100.00                                 | 122.00 | 1                       | 160.0                                         | 3.13                                    | 5                                                     |
| SA90A       | SA90CA  | 90.0                                   | 100.00                                 | 111.00 | 1                       | 146.0                                         | 3.42                                    | 5                                                     |
| SA100       | SA100C  | 100.0                                  | 111.00                                 | 136.00 | 1                       | 179.0                                         | 2.79                                    | 5                                                     |
| SA100A      | SA100CA | 100.0                                  | 111.00                                 | 123.00 | 1                       | 162.0                                         | 3.09                                    | 5                                                     |
| SA110       | SA110C  | 110.0                                  | 122.00                                 | 149.00 | 1                       | 196.0                                         | 2.55                                    | 5                                                     |
| SA110A      | SA110CA | 110.0                                  | 122.00                                 | 135.00 | 1                       | 177.0                                         | 2.82                                    | 5                                                     |
| SA120       | SA120C  | 120.0                                  | 133.00                                 | 163.00 | 1                       | 214.0                                         | 2.34                                    | 5                                                     |
| SA120A      | SA120CA | 120.0                                  | 133.00                                 | 147.00 | 1                       | 193.0                                         | 2.59                                    | 5                                                     |
| SA130       | SA130C  | 130.0                                  | 144.00                                 | 176.00 | 1                       | 231.0                                         | 2.16                                    | 5                                                     |
| SA130A      | SA130CA | 130.0                                  | 144.00                                 | 159.00 | 1                       | 209.0                                         | 2.39                                    | 5                                                     |
| SA140       | SA140C  | 140.0                                  | 155.68                                 | 190.40 | 1                       | 250.6                                         | 2.00                                    | 5                                                     |
| SA140A      | SA140CA | 140.0                                  | 155.00                                 | 171.00 | 1                       | 226.8                                         | 2.20                                    | 5                                                     |
| SA150       | SA150C  | 150.0                                  | 167.00                                 | 204.00 | 1                       | 268.0                                         | 1.87                                    | 5                                                     |
| SA150A      | SA150CA | 150.0                                  | 167.00                                 | 185.00 | 1                       | 243.0                                         | 2.06                                    | 5                                                     |
| SA160       | SA160C  | 160.0                                  | 178.00                                 | 218.00 | 1                       | 287.0                                         | 1.74                                    | 5                                                     |
| SA160A      | SA160CA | 160.0                                  | 178.00                                 | 197.00 | 1                       | 259.0                                         | 1.93                                    | 5                                                     |
| SA170       | SA170C  | 170.0                                  | 189.00                                 | 231.00 | 1                       | 304.0                                         | 1.64                                    | 5                                                     |
| SA170A      | SA170CA | 170.0                                  | 189.00                                 | 209.00 | 1                       | 275.0                                         | 1.82                                    | 5                                                     |
| SA180       | SA180C  | 180.0                                  | 201.00                                 | 244.80 | 1                       | 322.2                                         | 1.55                                    | 5                                                     |
| SA180A      | SA180CA | 180.0                                  | 201.00                                 | 220.00 | 1                       | 291.6                                         | 1.71                                    | 5                                                     |
| SA190       | SA190C  | 190.0                                  | 211.21                                 | 258.40 | 1                       | 340.1                                         | 1.47                                    | 5                                                     |
| SA190A      | SA190CA | 190.0                                  | 211.00                                 | 232.00 | 1                       | 307.8                                         | 1.62                                    | 5                                                     |

**Note:**

1. Suffix 'A' denotes 5% tolerance device. Without 'A' denotes 10% tolerance device
2. Add suffix 'C' or 'CA' after part number to specify Bi-directional devices
3. For Bi-Directional devices having  $V_R$  of 10 volts and under, the  $I_R$  limit is double

## Axial Lead Transient Voltage Suppressors (TVS)

P6KE Series 6.8 To 600 V 600W

### Features

- u Glass passivated chip junction in DO-15 Package
- u Low leakage
- u Uni and Bidirectional unit
- u Excellent clamping capability
- u 600W Peak power capability at  $10 \times 1000\mu\text{s}$  waveform
- u Repetition rate (duty cycle): 0.01%
- u Fast response time: typically less than 1.0ps from 0 Volts to  $V_{BR}$  min
- u Typical  $I_R$  less than 5 $\mu\text{A}$  above 12V.
- u High Temperature soldering: 260°C/40 seconds at terminals
- u Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR@25^\circ\text{C}} \times \Delta T$
- u Plastic package has Underwriters Laboratory Flammability 94V-0
- u Matte tin lead-free Plated
- u Halogen free and RoHS compliant
- u Typical failure mode is short from over-specified voltage or current
- u Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- u IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- u ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- u EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)

Uni-directional

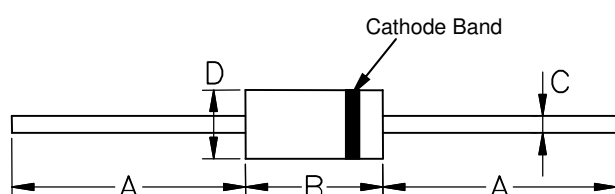
Bi-directional



DO-204AC (DO-15)

### Dimensions

DO-204AC (DO-15)



| Dimensions | Inches |       | Millimeters |      |
|------------|--------|-------|-------------|------|
|            | Min    | Max   | Min         | Max  |
| A          | 1.000  | -     | 25.40       | -    |
| B          | 0.165  | 0.205 | 4.19        | 5.21 |
| C          | 0.028  | 0.033 | 0.71        | 0.84 |
| D          | 0.090  | 0.117 | 2.29        | 2.97 |

**Electrical Characteristics ( $T_A=25^\circ\text{C}$  unless otherwise noted)**

| Part Number |           | Reverse Stand-Off Voltage $V_{RWM}(V)$ | Breakdown Voltage $V_{BR}$ (V) @ $I_T$ |       | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$ @ $I_{PP}$ (V) | Maximum Peak Pulse Current $I_{PP}$ (A) | Maximum Reverse Leakage $I_R$ @ $V_{RWM}$ ( $\mu A$ ) |
|-------------|-----------|----------------------------------------|----------------------------------------|-------|-------------------------|-----------------------------------------------|-----------------------------------------|-------------------------------------------------------|
| Uni         | Bi        |                                        | MIN                                    | MAX   |                         |                                               |                                         |                                                       |
| P6KE6.8     | P6KE6.8C  | 5.5                                    | 6.12                                   | 7.48  | 10                      | 10.8                                          | 55.56                                   | 1000                                                  |
| P6KE6.8A    | P6KE6.8CA | 5.8                                    | 6.46                                   | 7.14  | 10                      | 10.5                                          | 57.14                                   | 1000                                                  |
| P6KE7.5     | P6KE7.5C  | 6.1                                    | 6.75                                   | 8.25  | 10                      | 11.7                                          | 51.28                                   | 500                                                   |
| P6KE7.5A    | P6KE7.5CA | 6.4                                    | 7.13                                   | 7.88  | 10                      | 11.3                                          | 53.10                                   | 500                                                   |
| P6KE8.2     | P6KE8.2C  | 6.6                                    | 7.38                                   | 9.02  | 10                      | 12.5                                          | 48.00                                   | 200                                                   |
| P6KE8.2A    | P6KE8.2CA | 7.0                                    | 7.79                                   | 8.61  | 10                      | 12.1                                          | 49.59                                   | 200                                                   |
| P6KE9.1     | P6KE9.1C  | 7.4                                    | 8.19                                   | 10.01 | 1                       | 13.8                                          | 43.48                                   | 50                                                    |
| P6KE9.1A    | P6KE9.1CA | 7.8                                    | 8.65                                   | 9.56  | 1                       | 13.4                                          | 44.78                                   | 50                                                    |
| P6KE10      | P6KE10C   | 8.1                                    | 9.00                                   | 11.00 | 1                       | 15.0                                          | 40.00                                   | 10                                                    |
| P6KE10A     | P6KE10CA  | 8.6                                    | 9.50                                   | 10.50 | 1                       | 14.5                                          | 41.38                                   | 10                                                    |
| P6KE11      | P6KE11C   | 8.9                                    | 9.90                                   | 12.10 | 1                       | 16.2                                          | 37.04                                   | 5                                                     |
| P6KE11A     | P6KE11CA  | 9.4                                    | 10.45                                  | 11.55 | 1                       | 15.6                                          | 38.46                                   | 5                                                     |
| P6KE12      | P6KE12C   | 9.7                                    | 10.80                                  | 13.20 | 1                       | 17.3                                          | 34.68                                   | 5                                                     |
| P6KE12A     | P6KE12CA  | 10.2                                   | 11.40                                  | 12.60 | 1                       | 16.7                                          | 35.93                                   | 5                                                     |
| P6KE13      | P6KE13C   | 10.5                                   | 11.70                                  | 14.30 | 1                       | 19.0                                          | 31.58                                   | 5                                                     |
| P6KE13A     | P6KE13CA  | 11.1                                   | 12.35                                  | 13.65 | 1                       | 18.2                                          | 32.97                                   | 5                                                     |
| P6KE15      | P6KE15C   | 12.1                                   | 13.50                                  | 16.50 | 1                       | 22.0                                          | 27.27                                   | 5                                                     |
| P6KE15A     | P6KE15CA  | 12.8                                   | 14.25                                  | 15.75 | 1                       | 21.2                                          | 28.30                                   | 5                                                     |
| P6KE16      | P6KE16C   | 12.9                                   | 14.40                                  | 17.60 | 1                       | 23.5                                          | 25.53                                   | 5                                                     |
| P6KE16A     | P6KE16CA  | 13.6                                   | 15.20                                  | 16.80 | 1                       | 22.5                                          | 26.67                                   | 5                                                     |
| P6KE18      | P6KE18C   | 14.5                                   | 16.20                                  | 19.80 | 1                       | 26.5                                          | 22.64                                   | 5                                                     |
| P6KE18A     | P6KE18CA  | 15.3                                   | 17.10                                  | 18.90 | 1                       | 25.2                                          | 23.81                                   | 5                                                     |
| P6KE20      | P6KE20C   | 16.2                                   | 18.00                                  | 22.00 | 1                       | 29.1                                          | 20.62                                   | 5                                                     |
| P6KE20A     | P6KE20CA  | 17.1                                   | 19.00                                  | 21.00 | 1                       | 27.7                                          | 21.66                                   | 5                                                     |
| P6KE22      | P6KE22C   | 17.8                                   | 19.80                                  | 24.20 | 1                       | 31.9                                          | 18.81                                   | 5                                                     |
| P6KE22A     | P6KE22CA  | 18.8                                   | 20.90                                  | 23.10 | 1                       | 30.6                                          | 19.61                                   | 5                                                     |
| P6KE24      | P6KE24C   | 19.4                                   | 21.60                                  | 26.40 | 1                       | 34.7                                          | 17.29                                   | 5                                                     |
| P6KE24A     | P6KE24CA  | 20.5                                   | 22.80                                  | 25.20 | 1                       | 33.2                                          | 18.07                                   | 5                                                     |
| P6KE27      | P6KE27C   | 21.8                                   | 24.30                                  | 29.70 | 1                       | 39.1                                          | 15.35                                   | 5                                                     |
| P6KE27A     | P6KE27CA  | 23.1                                   | 25.65                                  | 28.35 | 1                       | 37.5                                          | 16.00                                   | 5                                                     |
| P6KE30      | P6KE30C   | 24.3                                   | 27.00                                  | 33.00 | 1                       | 43.5                                          | 13.79                                   | 5                                                     |
| P6KE30A     | P6KE30CA  | 25.6                                   | 28.50                                  | 31.50 | 1                       | 41.4                                          | 14.49                                   | 5                                                     |
| P6KE33      | P6KE33C   | 26.8                                   | 29.70                                  | 36.30 | 1                       | 47.7                                          | 12.58                                   | 5                                                     |
| P6KE33A     | P6KE33CA  | 28.2                                   | 31.35                                  | 34.65 | 1                       | 45.7                                          | 13.13                                   | 5                                                     |
| P6KE36      | P6KE36C   | 29.1                                   | 32.40                                  | 39.60 | 1                       | 52.0                                          | 11.54                                   | 5                                                     |
| P6KE36A     | P6KE36CA  | 30.8                                   | 34.20                                  | 37.80 | 1                       | 49.9                                          | 12.02                                   | 5                                                     |
| P6KE39      | P6KE39C   | 31.6                                   | 35.10                                  | 42.90 | 1                       | 56.4                                          | 10.64                                   | 5                                                     |
| P6KE39A     | P6KE39CA  | 33.3                                   | 37.05                                  | 40.95 | 1                       | 53.9                                          | 11.13                                   | 5                                                     |
| P6KE43      | P6KE43C   | 34.8                                   | 38.70                                  | 47.30 | 1                       | 61.9                                          | 9.69                                    | 5                                                     |
| P6KE43A     | P6KE43CA  | 36.8                                   | 40.85                                  | 45.15 | 1                       | 59.3                                          | 10.12                                   | 5                                                     |
| P6KE47      | P6KE47C   | 38.1                                   | 42.30                                  | 51.70 | 1                       | 67.8                                          | 8.85                                    | 5                                                     |
| P6KE47A     | P6KE47CA  | 40.2                                   | 44.65                                  | 49.35 | 1                       | 64.8                                          | 9.26                                    | 5                                                     |
| P6KE51      | P6KE51C   | 41.3                                   | 45.90                                  | 56.10 | 1                       | 73.5                                          | 8.16                                    | 5                                                     |
| P6KE51A     | P6KE51CA  | 43.6                                   | 48.45                                  | 53.55 | 1                       | 70.1                                          | 8.56                                    | 5                                                     |
| P6KE56      | P6KE56C   | 45.4                                   | 50.40                                  | 61.60 | 1                       | 80.5                                          | 7.45                                    | 5                                                     |
| P6KE56A     | P6KE56CA  | 47.8                                   | 53.20                                  | 58.80 | 1                       | 77.0                                          | 7.79                                    | 5                                                     |
| P6KE62      | P6KE62C   | 50.2                                   | 55.80                                  | 68.20 | 1                       | 89.0                                          | 6.74                                    | 5                                                     |
| P6KE62A     | P6KE62CA  | 53.0                                   | 58.90                                  | 65.10 | 1                       | 85.0                                          | 7.06                                    | 5                                                     |
| P6KE68      | P6KE68C   | 55.1                                   | 61.20                                  | 74.80 | 1                       | 98.0                                          | 6.12                                    | 5                                                     |
| P6KE68A     | P6KE68CA  | 58.1                                   | 64.60                                  | 71.40 | 1                       | 92.0                                          | 6.52                                    | 5                                                     |
| P6KE75      | P6KE75C   | 60.7                                   | 67.50                                  | 82.50 | 1                       | 108.0                                         | 5.56                                    | 5                                                     |
| P6KE75A     | P6KE75CA  | 64.1                                   | 71.25                                  | 78.75 | 1                       | 103.0                                         | 5.83                                    | 5                                                     |
| P6KE82      | P6KE82C   | 66.4                                   | 73.80                                  | 90.20 | 1                       | 118.0                                         | 5.08                                    | 5                                                     |
| P6KE82A     | P6KE82CA  | 70.1                                   | 77.90                                  | 86.10 | 1                       | 113.0                                         | 5.31                                    | 5                                                     |

## Axial Lead Transient Voltage Suppressors (TVS)

P6KE Series 6.8 To 600 V 600W

### Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

| Part Number |           | Reverse Stand-Off Voltage<br>V <sub>RWM</sub> (V) | Breakdown Voltage V <sub>BR</sub> (V)<br>@I <sub>T</sub> |        | Test Current<br>I <sub>T</sub> (mA) | Maximum Clamping Voltage<br>V <sub>C</sub><br>@I <sub>PP</sub> (V) | Maximum Peak Pulse Current<br>I <sub>PP</sub> (A) | Maximum Reverse Leakage I <sub>R</sub><br>@V <sub>RWM</sub> (μA) |
|-------------|-----------|---------------------------------------------------|----------------------------------------------------------|--------|-------------------------------------|--------------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------|
| Uni         | Bi        |                                                   | MIN                                                      | MAX    |                                     |                                                                    |                                                   |                                                                  |
| P6KE91      | P6KE91C   | 73.7                                              | 81.90                                                    | 100.10 | 1                                   | 131.0                                                              | 4.58                                              | 5                                                                |
| P6KE91A     | P6KE91CA  | 77.8                                              | 86.45                                                    | 95.55  | 1                                   | 125.0                                                              | 4.80                                              | 5                                                                |
| P6KE100     | P6KE100C  | 81.0                                              | 90.00                                                    | 110.00 | 1                                   | 144.0                                                              | 4.17                                              | 5                                                                |
| P6KE100A    | P6KE100CA | 85.5                                              | 95.00                                                    | 105.00 | 1                                   | 137.0                                                              | 4.38                                              | 5                                                                |
| P6KE110     | P6KE110C  | 89.2                                              | 99.00                                                    | 121.00 | 1                                   | 158.0                                                              | 3.80                                              | 5                                                                |
| P6KE110A    | P6KE110CA | 94.0                                              | 104.50                                                   | 115.50 | 1                                   | 152.0                                                              | 3.95                                              | 5                                                                |
| P6KE120     | P6KE120C  | 97.2                                              | 108.00                                                   | 132.00 | 1                                   | 173.0                                                              | 3.47                                              | 5                                                                |
| P6KE120A    | P6KE120CA | 102.0                                             | 114.00                                                   | 126.00 | 1                                   | 165.0                                                              | 3.64                                              | 5                                                                |
| P6KE130     | P6KE130C  | 105.0                                             | 117.00                                                   | 143.00 | 1                                   | 187.0                                                              | 3.21                                              | 5                                                                |
| P6KE130A    | P6KE130CA | 111.0                                             | 123.50                                                   | 136.50 | 1                                   | 179.0                                                              | 3.35                                              | 5                                                                |
| P6KE150     | P6KE150C  | 121.0                                             | 135.00                                                   | 165.00 | 1                                   | 215.0                                                              | 2.79                                              | 5                                                                |
| P6KE150A    | P6KE150CA | 128.0                                             | 142.50                                                   | 157.50 | 1                                   | 207.0                                                              | 2.90                                              | 5                                                                |
| P6KE160     | P6KE160C  | 130.0                                             | 144.00                                                   | 176.00 | 1                                   | 230.0                                                              | 2.61                                              | 5                                                                |
| P6KE160A    | P6KE160CA | 136.0                                             | 152.00                                                   | 168.00 | 1                                   | 219.0                                                              | 2.74                                              | 5                                                                |
| P6KE170     | P6KE170C  | 138.0                                             | 153.00                                                   | 187.00 | 1                                   | 244.0                                                              | 2.46                                              | 5                                                                |
| P6KE170A    | P6KE170CA | 145.0                                             | 161.50                                                   | 178.50 | 1                                   | 234.0                                                              | 2.56                                              | 5                                                                |
| P6KE180     | P6KE180C  | 146.0                                             | 162.00                                                   | 198.00 | 1                                   | 258.0                                                              | 2.33                                              | 5                                                                |
| P6KE180A    | P6KE180CA | 154.0                                             | 171.00                                                   | 189.00 | 1                                   | 246.0                                                              | 2.44                                              | 5                                                                |
| P6KE200     | P6KE200C  | 162.0                                             | 180.00                                                   | 220.00 | 1                                   | 287.0                                                              | 2.09                                              | 5                                                                |
| P6KE200A    | P6KE200CA | 171.0                                             | 190.00                                                   | 210.00 | 1                                   | 274.0                                                              | 2.19                                              | 5                                                                |
| P6KE220     | P6KE220C  | 175.0                                             | 198.00                                                   | 242.00 | 1                                   | 344.0                                                              | 1.74                                              | 5                                                                |
| P6KE220A    | P6KE220CA | 185.0                                             | 209.00                                                   | 231.00 | 1                                   | 328.0                                                              | 1.83                                              | 5                                                                |
| P6KE250     | P6KE250C  | 202.0                                             | 225.00                                                   | 275.00 | 1                                   | 360.0                                                              | 1.67                                              | 5                                                                |
| P6KE250A    | P6KE250CA | 214.0                                             | 237.50                                                   | 262.50 | 1                                   | 344.0                                                              | 1.74                                              | 5                                                                |
| P6KE300     | P6KE300C  | 243.0                                             | 270.00                                                   | 330.00 | 1                                   | 430.0                                                              | 1.40                                              | 5                                                                |
| P6KE300A    | P6KE300CA | 256.0                                             | 285.00                                                   | 315.00 | 1                                   | 414.0                                                              | 1.45                                              | 5                                                                |
| P6KE350     | P6KE350C  | 284.0                                             | 315.00                                                   | 385.00 | 1                                   | 504.0                                                              | 1.19                                              | 5                                                                |
| P6KE350A    | P6KE350CA | 299.3                                             | 332.50                                                   | 367.50 | 1                                   | 482.0                                                              | 1.24                                              | 5                                                                |
| P6KE380     | P6KE380C  | 308.6                                             | 342.00                                                   | 418.00 | 1                                   | 547.2                                                              | 1.10                                              | 5                                                                |
| P6KE380A    | P6KE380CA | 324.9                                             | 361.00                                                   | 399.00 | 1                                   | 524.4                                                              | 1.14                                              | 5                                                                |
| P6KE400     | P6KE400C  | 324.8                                             | 360.00                                                   | 440.00 | 1                                   | 576.0                                                              | 1.05                                              | 5                                                                |
| P6KE400A    | P6KE400CA | 342.0                                             | 380.00                                                   | 420.00 | 1                                   | 552.0                                                              | 1.09                                              | 5                                                                |
| P6KE440     | P6KE440C  | 357.3                                             | 396.00                                                   | 484.00 | 1                                   | 633.6                                                              | 0.95                                              | 5                                                                |
| P6KE440A    | P6KE440CA | 376.2                                             | 418.00                                                   | 462.00 | 1                                   | 607.2                                                              | 0.99                                              | 5                                                                |
| P6KE500     | P6KE500C  | 406.0                                             | 450.00                                                   | 550.00 | 1                                   | 720.0                                                              | 0.83                                              | 5                                                                |
| P6KE500A    | P6KE500CA | 427.5                                             | 475.00                                                   | 525.00 | 1                                   | 690.0                                                              | 0.87                                              | 5                                                                |
| P6KE520     | P6KE520C  | 422.2                                             | 468.00                                                   | 572.00 | 1                                   | 748.8                                                              | 0.80                                              | 5                                                                |
| P6KE520A    | P6KE520CA | 444.6                                             | 494.00                                                   | 546.00 | 1                                   | 717.6                                                              | 0.84                                              | 5                                                                |
| P6KE550     | P6KE550C  | 446.6                                             | 495.00                                                   | 605.00 | 1                                   | 792.0                                                              | 0.76                                              | 5                                                                |
| P6KE550A    | P6KE550CA | 470.3                                             | 522.50                                                   | 577.50 | 1                                   | 759.0                                                              | 0.79                                              | 5                                                                |
| P6KE600     | P6KE600C  | 487.2                                             | 540.00                                                   | 660.00 | 1                                   | 864.0                                                              | 0.69                                              | 5                                                                |
| P6KE600A    | P6KE600CA | 513.0                                             | 570.00                                                   | 630.00 | 1                                   | 828.0                                                              | 0.72                                              | 5                                                                |

#### Note:

1. Suffix 'A' denotes 5% tolerance device. Without 'A' denotes 10% tolerance device
2. Add suffix 'C' or 'CA' after part number to specify Bi-directional devices
3. For Bi-Directional devices having V<sub>R</sub> of 10 volts and under, the I<sub>R</sub> limit is double

## Axial Lead Transient Voltage Suppressors (TVS)

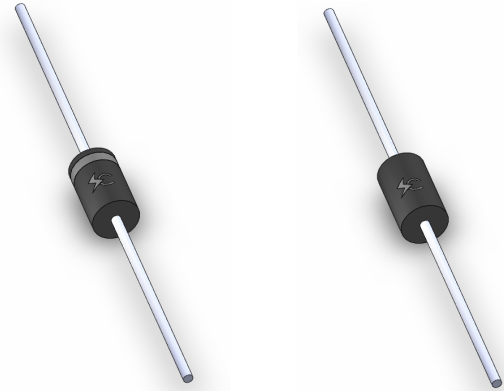
1.5KE Series 6.8 To 600 V 1500W

## Features

- u Glass passivated chip junction in DO-15 Package
- u Low leakage
- u Uni and Bidirectional unit
- u Excellent clamping capability
- u 600W Peak power capability at  $10 \times 1000\mu\text{s}$  waveform Repetition rate (duty cycle):0.01%
- u Fast response time: typically less than 1.0ps from 0 Volts to  $V_{BR}$  min
- u Typical  $I_R$  less than  $5\mu\text{A}$  above 12V.
- u High Temperature soldering:  $260^\circ\text{C}/40$  seconds at terminals
- u Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR}@25^\circ\text{C} \times \Delta T$
- u Plastic package has Underwriters Laboratory Flammability 94V-0
- u Matte tin lead-free Plated
- u Halogen free and RoHS compliant
- u Typical failure mode is short from over-specified voltage or current
- u Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- u IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- u ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- u EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)

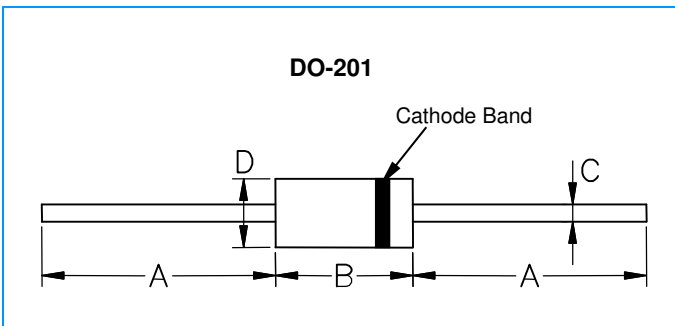
Uni-directional

Bi-directional



**DO-201**

## Dimensions



| Dimensions | Inches |       | Millimeters |      |
|------------|--------|-------|-------------|------|
|            | Min    | Max   | Min         | Max  |
| <b>A</b>   | 1.000  | -     | 25.40       | -    |
| <b>B</b>   | 0.285  | 0.375 | 7.24        | 9.53 |
| <b>C</b>   | 0.038  | 0.042 | 0.97        | 1.07 |
| <b>D</b>   | 0.189  | 0.209 | 4.79        | 5.30 |

**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

| Part Number |            | Reverse Stand-Off Voltage<br>V <sub>RWM</sub> (V) | Breakdown Voltage V <sub>BR</sub> (V)<br>@I <sub>T</sub> |       | Test Current<br>I <sub>T</sub> (mA) | Maximum Clamping Voltage<br>V <sub>C</sub><br>@I <sub>PP</sub> (V) | Maximum Peak Pulse Current<br>I <sub>PP</sub> (A) | Maximum Reverse Leakage I <sub>R</sub><br>@V <sub>RWM</sub> (μA) |
|-------------|------------|---------------------------------------------------|----------------------------------------------------------|-------|-------------------------------------|--------------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------|
| Uni         | Bi         |                                                   | MIN                                                      | MAX   |                                     |                                                                    |                                                   |                                                                  |
| 1.5KE6.8    | 1.5KE6.8C  | 5.5                                               | 6.12                                                     | 7.48  | 10                                  | 10.8                                                               | 138.89                                            | 1000                                                             |
| 1.5KE6.8A   | 1.5KE6.8CA | 5.8                                               | 6.46                                                     | 7.14  | 10                                  | 10.5                                                               | 142.86                                            | 1000                                                             |
| 1.5KE7.5    | 1.5KE7.5C  | 6.1                                               | 6.75                                                     | 8.25  | 10                                  | 11.7                                                               | 128.21                                            | 500                                                              |
| 1.5KE7.5A   | 1.5KE7.5CA | 6.4                                               | 7.13                                                     | 7.88  | 10                                  | 11.3                                                               | 132.74                                            | 500                                                              |
| 1.5KE8.2    | 1.5KE8.2C  | 6.6                                               | 7.38                                                     | 9.02  | 10                                  | 12.5                                                               | 120.00                                            | 200                                                              |
| 1.5KE8.2A   | 1.5KE8.2CA | 7.0                                               | 7.79                                                     | 8.61  | 10                                  | 12.1                                                               | 123.97                                            | 200                                                              |
| 1.5KE9.1    | 1.5KE9.1C  | 7.4                                               | 8.19                                                     | 10.01 | 1                                   | 13.8                                                               | 108.70                                            | 50                                                               |
| 1.5KE9.1A   | 1.5KE9.1CA | 7.8                                               | 8.65                                                     | 9.56  | 1                                   | 13.4                                                               | 111.94                                            | 50                                                               |
| 1.5KE10     | 1.5KE10C   | 8.1                                               | 9.00                                                     | 11.00 | 1                                   | 15.0                                                               | 100.00                                            | 10                                                               |
| 1.5KE10A    | 1.5KE10CA  | 8.6                                               | 9.50                                                     | 10.50 | 1                                   | 14.5                                                               | 103.45                                            | 10                                                               |
| 1.5KE11     | 1.5KE11C   | 8.9                                               | 9.90                                                     | 12.10 | 1                                   | 16.2                                                               | 92.59                                             | 5                                                                |
| 1.5KE11A    | 1.5KE11CA  | 9.4                                               | 10.45                                                    | 11.55 | 1                                   | 15.6                                                               | 96.15                                             | 5                                                                |
| 1.5KE12     | 1.5KE12C   | 9.7                                               | 10.80                                                    | 13.20 | 1                                   | 17.3                                                               | 86.71                                             | 5                                                                |
| 1.5KE12A    | 1.5KE12CA  | 10.2                                              | 11.40                                                    | 12.60 | 1                                   | 16.7                                                               | 89.82                                             | 5                                                                |
| 1.5KE13     | 1.5KE13C   | 10.5                                              | 11.70                                                    | 14.30 | 1                                   | 19.0                                                               | 78.95                                             | 5                                                                |
| 1.5KE13A    | 1.5KE13CA  | 11.1                                              | 12.35                                                    | 13.65 | 1                                   | 18.2                                                               | 82.42                                             | 5                                                                |
| 1.5KE15     | 1.5KE15C   | 12.1                                              | 13.50                                                    | 16.50 | 1                                   | 22.0                                                               | 68.18                                             | 5                                                                |
| 1.5KE15A    | 1.5KE15CA  | 12.8                                              | 14.25                                                    | 15.75 | 1                                   | 21.2                                                               | 70.75                                             | 5                                                                |
| 1.5KE16     | 1.5KE16C   | 12.9                                              | 14.40                                                    | 17.60 | 1                                   | 23.5                                                               | 63.83                                             | 5                                                                |
| 1.5KE16A    | 1.5KE16CA  | 13.6                                              | 15.20                                                    | 16.80 | 1                                   | 22.5                                                               | 66.67                                             | 5                                                                |
| 1.5KE18     | 1.5KE18C   | 14.5                                              | 16.20                                                    | 19.80 | 1                                   | 26.5                                                               | 56.60                                             | 5                                                                |
| 1.5KE18A    | 1.5KE18CA  | 15.3                                              | 17.10                                                    | 18.90 | 1                                   | 25.2                                                               | 59.52                                             | 5                                                                |
| 1.5KE20     | 1.5KE20C   | 16.2                                              | 18.00                                                    | 22.00 | 1                                   | 29.1                                                               | 51.55                                             | 5                                                                |
| 1.5KE20A    | 1.5KE20CA  | 17.1                                              | 19.00                                                    | 21.00 | 1                                   | 27.7                                                               | 54.15                                             | 5                                                                |
| 1.5KE22     | 1.5KE22C   | 17.8                                              | 19.80                                                    | 24.20 | 1                                   | 31.9                                                               | 47.02                                             | 5                                                                |
| 1.5KE22A    | 1.5KE22CA  | 18.8                                              | 20.90                                                    | 23.10 | 1                                   | 30.6                                                               | 49.02                                             | 5                                                                |
| 1.5KE24     | 1.5KE24C   | 19.4                                              | 21.60                                                    | 26.40 | 1                                   | 34.7                                                               | 43.23                                             | 5                                                                |
| 1.5KE24A    | 1.5KE24CA  | 20.5                                              | 22.80                                                    | 25.20 | 1                                   | 33.2                                                               | 45.18                                             | 5                                                                |
| 1.5KE27     | 1.5KE27C   | 21.8                                              | 24.30                                                    | 29.70 | 1                                   | 39.1                                                               | 38.36                                             | 5                                                                |
| 1.5KE27A    | 1.5KE27CA  | 23.1                                              | 25.65                                                    | 28.35 | 1                                   | 37.5                                                               | 40.00                                             | 5                                                                |
| 1.5KE30     | 1.5KE30C   | 24.3                                              | 27.00                                                    | 33.00 | 1                                   | 43.5                                                               | 34.48                                             | 5                                                                |
| 1.5KE30A    | 1.5KE30CA  | 25.6                                              | 28.50                                                    | 31.50 | 1                                   | 41.4                                                               | 36.23                                             | 5                                                                |
| 1.5KE33     | 1.5KE33C   | 26.8                                              | 29.70                                                    | 36.30 | 1                                   | 47.7                                                               | 31.45                                             | 5                                                                |
| 1.5KE33A    | 1.5KE33CA  | 28.2                                              | 31.35                                                    | 34.65 | 1                                   | 45.7                                                               | 32.82                                             | 5                                                                |
| 1.5KE36     | 1.5KE36C   | 29.1                                              | 32.40                                                    | 39.60 | 1                                   | 52.0                                                               | 28.85                                             | 5                                                                |
| 1.5KE36A    | 1.5KE36CA  | 30.8                                              | 34.20                                                    | 37.80 | 1                                   | 49.9                                                               | 30.06                                             | 5                                                                |
| 1.5KE39     | 1.5KE39C   | 31.6                                              | 35.10                                                    | 42.90 | 1                                   | 56.4                                                               | 36.60                                             | 5                                                                |
| 1.5KE39A    | 1.5KE39CA  | 33.3                                              | 37.05                                                    | 40.95 | 1                                   | 53.9                                                               | 27.83                                             | 5                                                                |
| 1.5KE43     | 1.5KE43C   | 34.8                                              | 38.70                                                    | 47.30 | 1                                   | 61.9                                                               | 24.23                                             | 5                                                                |
| 1.5KE43A    | 1.5KE43CA  | 36.8                                              | 40.85                                                    | 45.15 | 1                                   | 59.3                                                               | 25.30                                             | 5                                                                |
| 1.5KE47     | 1.5KE47C   | 38.1                                              | 42.30                                                    | 51.70 | 1                                   | 67.8                                                               | 22.12                                             | 5                                                                |
| 1.5KE47A    | 1.5KE47CA  | 40.2                                              | 44.65                                                    | 49.35 | 1                                   | 64.8                                                               | 23.15                                             | 5                                                                |
| 1.5KE51     | 1.5KE51C   | 41.3                                              | 45.90                                                    | 56.10 | 1                                   | 73.5                                                               | 20.41                                             | 5                                                                |
| 1.5KE51A    | 1.5KE51CA  | 43.6                                              | 48.45                                                    | 53.55 | 1                                   | 70.1                                                               | 21.40                                             | 5                                                                |
| 1.5KE56     | 1.5KE56C   | 45.4                                              | 50.40                                                    | 61.60 | 1                                   | 80.5                                                               | 18.63                                             | 5                                                                |
| 1.5KE56A    | 1.5KE56CA  | 47.8                                              | 53.20                                                    | 58.80 | 1                                   | 77.0                                                               | 19.48                                             | 5                                                                |
| 1.5KE62     | 1.5KE62C   | 50.2                                              | 55.80                                                    | 68.20 | 1                                   | 89.0                                                               | 16.85                                             | 5                                                                |
| 1.5KE62A    | 1.5KE62CA  | 53.0                                              | 58.90                                                    | 65.10 | 1                                   | 85.0                                                               | 17.65                                             | 5                                                                |
| 1.5KE68     | 1.5KE68C   | 55.1                                              | 61.20                                                    | 74.80 | 1                                   | 98.0                                                               | 15.31                                             | 5                                                                |
| 1.5KE68A    | 1.5KE68CA  | 58.1                                              | 64.60                                                    | 71.40 | 1                                   | 92.0                                                               | 16.30                                             | 5                                                                |
| 1.5KE75     | 1.5KE75C   | 60.7                                              | 67.50                                                    | 82.50 | 1                                   | 108.0                                                              | 13.89                                             | 5                                                                |
| 1.5KE75A    | 1.5KE75CA  | 64.1                                              | 71.25                                                    | 78.75 | 1                                   | 103.0                                                              | 14.56                                             | 5                                                                |
| 1.5KE82     | 1.5KE82C   | 66.4                                              | 73.80                                                    | 90.20 | 1                                   | 118.0                                                              | 12.71                                             | 5                                                                |
| 1.5KE82A    | 1.5KE82CA  | 70.1                                              | 77.90                                                    | 86.10 | 1                                   | 113.0                                                              | 13.27                                             | 5                                                                |

**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

| Part Number |            | Reverse Stand-Off Voltage<br>V <sub>RWM</sub> (V) | Breakdown Voltage V <sub>BR</sub> (V)<br>@I <sub>T</sub> |        | Test Current<br>I <sub>T</sub> (mA) | Maximum Clamping Voltage<br>V <sub>C</sub><br>@I <sub>PP</sub> (V) | Maximum Peak Pulse Current<br>I <sub>PP</sub> (A) | Maximum Reverse Leakage I <sub>R</sub><br>@V <sub>RWM</sub> (μA) |
|-------------|------------|---------------------------------------------------|----------------------------------------------------------|--------|-------------------------------------|--------------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------|
| Uni         | Bi         |                                                   | MIN                                                      | MAX    |                                     |                                                                    |                                                   |                                                                  |
| 1.5KE91     | 1.5KE91C   | 73.7                                              | 81.90                                                    | 100.10 | 1                                   | 131.0                                                              | 11.45                                             | 5                                                                |
| 1.5KE91A    | 1.5KE91CA  | 77.8                                              | 86.45                                                    | 95.55  | 1                                   | 125.0                                                              | 12.00                                             | 5                                                                |
| 1.5KE100    | 1.5KE100C  | 81.0                                              | 90.00                                                    | 110.00 | 1                                   | 144.0                                                              | 10.42                                             | 5                                                                |
| 1.5KE100A   | 1.5KE100CA | 85.5                                              | 95.00                                                    | 105.00 | 1                                   | 137.0                                                              | 10.95                                             | 5                                                                |
| 1.5KE110    | 1.5KE110C  | 89.2                                              | 99.00                                                    | 121.00 | 1                                   | 158.0                                                              | 9.49                                              | 5                                                                |
| 1.5KE110A   | 1.5KE110CA | 94.0                                              | 104.50                                                   | 115.50 | 1                                   | 152.0                                                              | 9.87                                              | 5                                                                |
| 1.5KE120    | 1.5KE120C  | 97.2                                              | 108.00                                                   | 132.00 | 1                                   | 173.0                                                              | 8.67                                              | 5                                                                |
| 1.5KE120A   | 1.5KE120CA | 102.0                                             | 114.00                                                   | 126.00 | 1                                   | 165.0                                                              | 9.09                                              | 5                                                                |
| 1.5KE130    | 1.5KE130C  | 105.0                                             | 117.00                                                   | 143.00 | 1                                   | 187.0                                                              | 8.02                                              | 5                                                                |
| 1.5KE130A   | 1.5KE130CA | 111.0                                             | 123.50                                                   | 136.50 | 1                                   | 179.0                                                              | 8.38                                              | 5                                                                |
| 1.5KE150    | 1.5KE150C  | 121.0                                             | 135.00                                                   | 165.00 | 1                                   | 215.0                                                              | 6.98                                              | 5                                                                |
| 1.5KE150A   | 1.5KE150CA | 128.0                                             | 142.50                                                   | 157.50 | 1                                   | 207.0                                                              | 7.25                                              | 5                                                                |
| 1.5KE160    | 1.5KE160C  | 130.0                                             | 144.00                                                   | 176.00 | 1                                   | 230.0                                                              | 6.52                                              | 5                                                                |
| 1.5KE160A   | 1.5KE160CA | 136.0                                             | 152.00                                                   | 168.00 | 1                                   | 219.0                                                              | 6.85                                              | 5                                                                |
| 1.5KE170    | 1.5KE170C  | 138.0                                             | 153.00                                                   | 187.00 | 1                                   | 244.0                                                              | 6.15                                              | 5                                                                |
| 1.5KE170A   | 1.5KE170CA | 145.0                                             | 161.50                                                   | 178.50 | 1                                   | 234.0                                                              | 6.41                                              | 5                                                                |
| 1.5KE180    | 1.5KE180C  | 146.0                                             | 162.00                                                   | 198.00 | 1                                   | 258.0                                                              | 5.81                                              | 5                                                                |
| 1.5KE180A   | 1.5KE180CA | 154.0                                             | 171.00                                                   | 189.00 | 1                                   | 246.0                                                              | 6.10                                              | 5                                                                |
| 1.5KE200    | 1.5KE200C  | 162.0                                             | 180.00                                                   | 220.00 | 1                                   | 287.0                                                              | 5.23                                              | 5                                                                |
| 1.5KE200A   | 1.5KE200CA | 171.0                                             | 190.00                                                   | 210.00 | 1                                   | 274.0                                                              | 5.47                                              | 5                                                                |
| 1.5KE220    | 1.5KE220C  | 175.0                                             | 198.00                                                   | 242.00 | 1                                   | 344.0                                                              | 4.36                                              | 5                                                                |
| 1.5KE220A   | 1.5KE220CA | 185.0                                             | 209.00                                                   | 231.00 | 1                                   | 328.0                                                              | 4.57                                              | 5                                                                |
| 1.5KE250    | 1.5KE250C  | 202.0                                             | 225.00                                                   | 275.00 | 1                                   | 360.0                                                              | 4.17                                              | 5                                                                |
| 1.5KE250A   | 1.5KE250CA | 214.0                                             | 237.50                                                   | 262.50 | 1                                   | 344.0                                                              | 4.36                                              | 5                                                                |
| 1.5KE300    | 1.5KE300C  | 243.0                                             | 270.00                                                   | 330.00 | 1                                   | 430.0                                                              | 3.49                                              | 5                                                                |
| 1.5KE300A   | 1.5KE300CA | 256.0                                             | 285.00                                                   | 315.00 | 1                                   | 414.0                                                              | 3.62                                              | 5                                                                |
| 1.5KE350    | 1.5KE350C  | 284.0                                             | 315.00                                                   | 385.00 | 1                                   | 504.0                                                              | 2.98                                              | 5                                                                |
| 1.5KE350A   | 1.5KE350CA | 299.3                                             | 332.50                                                   | 367.50 | 1                                   | 482.0                                                              | 3.11                                              | 5                                                                |
| 1.5KE380    | 1.5KE380C  | 308.6                                             | 342.00                                                   | 418.00 | 1                                   | 547.2                                                              | 2.74                                              | 5                                                                |
| 1.5KE380A   | 1.5KE380CA | 324.9                                             | 361.00                                                   | 399.00 | 1                                   | 524.4                                                              | 2.86                                              | 5                                                                |
| 1.5KE400    | 1.5KE400C  | 324.8                                             | 360.00                                                   | 440.00 | 1                                   | 576.0                                                              | 2.60                                              | 5                                                                |
| 1.5KE400A   | 1.5KE400CA | 342.0                                             | 380.00                                                   | 420.00 | 1                                   | 552.0                                                              | 2.72                                              | 5                                                                |
| 1.5KE440    | 1.5KE440C  | 357.3                                             | 396.00                                                   | 484.00 | 1                                   | 633.6                                                              | 2.37                                              | 5                                                                |
| 1.5KE440A   | 1.5KE440CA | 376.2                                             | 418.00                                                   | 462.00 | 1                                   | 607.2                                                              | 2.47                                              | 5                                                                |
| 1.5KE500    | 1.5KE500C  | 406.0                                             | 450.00                                                   | 550.00 | 1                                   | 720.0                                                              | 2.08                                              | 5                                                                |
| 1.5KE500A   | 1.5KE500CA | 427.5                                             | 475.00                                                   | 525.00 | 1                                   | 690.0                                                              | 2.17                                              | 5                                                                |
| 1.5KE520    | 1.5KE520C  | 422.2                                             | 468.00                                                   | 572.00 | 1                                   | 748.8                                                              | 2.00                                              | 5                                                                |
| 1.5KE520A   | 1.5KE520CA | 444.6                                             | 494.00                                                   | 546.00 | 1                                   | 717.6                                                              | 2.09                                              | 5                                                                |
| 1.5KE550    | 1.5KE550C  | 446.6                                             | 495.00                                                   | 605.00 | 1                                   | 792.0                                                              | 1.89                                              | 5                                                                |
| 1.5KE550A   | 1.5KE550CA | 470.3                                             | 522.50                                                   | 577.50 | 1                                   | 759.0                                                              | 1.98                                              | 5                                                                |
| 1.5KE600    | 1.5KE600C  | 487.2                                             | 540.00                                                   | 660.00 | 1                                   | 864.0                                                              | 1.74                                              | 5                                                                |
| 1.5KE600A   | 1.5KE600CA | 513.0                                             | 570.00                                                   | 630.00 | 1                                   | 828.0                                                              | 1.81                                              | 5                                                                |

**Note:**

1. Suffix 'A' denotes 5% tolerance device. Without 'A' denotes 10% tolerance device
2. Add suffix 'C' or 'CA' after part number to specify Bi-directional devices
3. For Bi-Directional devices having V<sub>R</sub> of 10 volts and under, the I<sub>R</sub> limit is double

## Axial Lead Transient Voltage Suppressors (TVS)

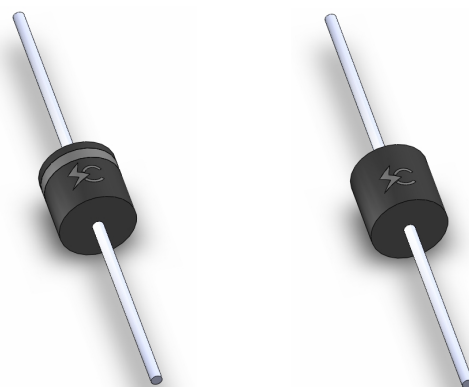
**3KP Series 5.0 To 190 V 3000W**

### Features

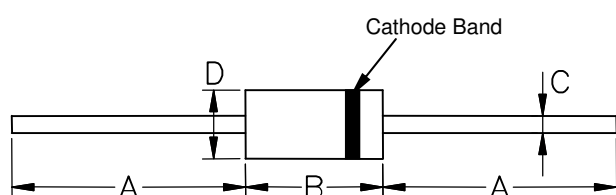
- u Glass passivated chip junction in P600 Package
- u Low leakage
- u Uni and Bidirectional unit
- u Excellent clamping capability
- u 3000W Peak power capability at  $10 \times 1000\mu\text{s}$  waveform Repetition rate (duty cycle):0.01%
- u Fast response time: typically less than 1.0ps from 0 Volts to  $V_{BR}$  min
- u Typical  $I_R$  less than 5 $\mu\text{A}$  above 12V.
- u High Temperature soldering: 260°C/40 seconds at terminals
- u Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR@25^\circ\text{C}} \times \Delta T$
- u Plastic package has Underwriters Laboratory Flammability 94V-0
- u Matte tin lead-free Plated
- u Halogen free and RoHS compliant
- u Typical failure mode is short from over-specified voltage or current
- u Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- u IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- u ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- u EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)

Uni-directional

Bi-directional


**R6/P600**

### Dimensions

**R6/P600**


| Dimensions | Inches |       | Millimeters |      |
|------------|--------|-------|-------------|------|
|            | Min    | Max   | Min         | Max  |
| <b>A</b>   | 1.000  | -     | 25.40       | -    |
| <b>B</b>   | 0.340  | 0.360 | 8.64        | 9.14 |
| <b>C</b>   | 0.048  | 0.052 | 1.22        | 1.32 |
| <b>D</b>   | 0.340  | 0.360 | 8.64        | 9.14 |

**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

| Part Number |          | Reverse<br>Stand-Off<br>Voltage<br>$V_{\text{RWM}}(\text{V})$ | Breakdown<br>Voltage $V_{\text{BR}}$ (V)<br>@ $I_{\text{T}}$ |       | Test<br>Current<br>$I_{\text{T}}$ (mA) | Maximum<br>Clamping<br>Voltage<br>$V_{\text{C}}$<br>@ $I_{\text{PP}}$ (V) | Maximum<br>Peak<br>Pulse<br>Current<br>$I_{\text{PP}}$ (A) | Maximum<br>Reverse<br>Leakage $I_{\text{R}}$<br>@ $V_{\text{RWM}}$<br>( $\mu\text{A}$ ) |
|-------------|----------|---------------------------------------------------------------|--------------------------------------------------------------|-------|----------------------------------------|---------------------------------------------------------------------------|------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Uni         | Bi       |                                                               | MIN                                                          | MAX   |                                        |                                                                           |                                                            |                                                                                         |
| 3KP5.0      | 3KP5.0C  | 5.0                                                           | 6.40                                                         | 7.30  | 50                                     | 9.6                                                                       | 312.50                                                     | 1000                                                                                    |
| 3KP5.0A     | 3KP5.0CA | 5.0                                                           | 6.40                                                         | 7.00  | 50                                     | 9.2                                                                       | 326.09                                                     | 1000                                                                                    |
| 3KP6.0      | 3KP6.0C  | 6.0                                                           | 6.67                                                         | 8.15  | 50                                     | 11.4                                                                      | 263.16                                                     | 1000                                                                                    |
| 3KP6.0A     | 3KP6.0CA | 6.0                                                           | 6.67                                                         | 7.37  | 50                                     | 10.3                                                                      | 291.26                                                     | 1000                                                                                    |
| 3KP6.5      | 3KP6.5C  | 6.5                                                           | 7.22                                                         | 8.82  | 50                                     | 12.3                                                                      | 243.90                                                     | 500                                                                                     |
| 3KP6.5A     | 3KP6.5CA | 6.5                                                           | 7.22                                                         | 7.98  | 50                                     | 11.2                                                                      | 267.86                                                     | 500                                                                                     |
| 3KP7.0      | 3KP7.0C  | 7.0                                                           | 7.78                                                         | 9.51  | 50                                     | 13.3                                                                      | 225.56                                                     | 200                                                                                     |
| 3KP7.0A     | 3KP7.0CA | 7.0                                                           | 7.78                                                         | 8.60  | 50                                     | 12.0                                                                      | 250.00                                                     | 200                                                                                     |
| 3KP7.5      | 3KP7.5C  | 7.5                                                           | 8.33                                                         | 10.20 | 5                                      | 14.3                                                                      | 209.79                                                     | 100                                                                                     |
| 3KP7.5A     | 3KP7.5CA | 7.5                                                           | 8.33                                                         | 9.21  | 5                                      | 12.9                                                                      | 232.56                                                     | 100                                                                                     |
| 3KP8.0      | 3KP8.0C  | 8.0                                                           | 8.89                                                         | 10.90 | 5                                      | 15.0                                                                      | 200.00                                                     | 50                                                                                      |
| 3KP8.0A     | 3KP8.0CA | 8.0                                                           | 8.89                                                         | 9.83  | 5                                      | 13.6                                                                      | 220.59                                                     | 50                                                                                      |
| 3KP8.5      | 3KP8.5C  | 8.5                                                           | 9.44                                                         | 11.50 | 5                                      | 15.9                                                                      | 188.68                                                     | 25                                                                                      |
| 3KP8.5A     | 3KP8.5CA | 8.5                                                           | 9.44                                                         | 10.40 | 5                                      | 14.4                                                                      | 208.33                                                     | 25                                                                                      |
| 3KP9.0      | 3KP9.0C  | 9.0                                                           | 10.00                                                        | 12.20 | 5                                      | 16.9                                                                      | 177.51                                                     | 10                                                                                      |
| 3KP9.0A     | 3KP9.0CA | 9.0                                                           | 10.00                                                        | 11.10 | 5                                      | 15.4                                                                      | 194.81                                                     | 10                                                                                      |
| 3KP10       | 3KP10C   | 10.0                                                          | 11.10                                                        | 13.60 | 5                                      | 18.8                                                                      | 159.57                                                     | 5                                                                                       |
| 3KP10A      | 3KP10CA  | 10.0                                                          | 11.10                                                        | 12.30 | 5                                      | 17.0                                                                      | 176.47                                                     | 5                                                                                       |
| 3KP11       | 3KP11C   | 11.0                                                          | 12.20                                                        | 14.90 | 5                                      | 20.1                                                                      | 149.25                                                     | 5                                                                                       |
| 3KP11A      | 3KP11CA  | 11.0                                                          | 12.20                                                        | 13.50 | 5                                      | 18.2                                                                      | 164.84                                                     | 5                                                                                       |
| 3KP12       | 3KP12C   | 12.0                                                          | 13.30                                                        | 16.30 | 5                                      | 22.0                                                                      | 136.36                                                     | 5                                                                                       |
| 3KP12A      | 3KP12CA  | 12.0                                                          | 13.30                                                        | 14.70 | 5                                      | 19.9                                                                      | 150.75                                                     | 5                                                                                       |
| 3KP13       | 3KP13C   | 13.0                                                          | 14.40                                                        | 17.60 | 5                                      | 23.8                                                                      | 126.05                                                     | 5                                                                                       |
| 3KP13A      | 3KP13CA  | 13.0                                                          | 14.40                                                        | 15.90 | 5                                      | 21.5                                                                      | 139.53                                                     | 5                                                                                       |
| 3KP14       | 3KP14C   | 14.0                                                          | 15.60                                                        | 19.10 | 5                                      | 25.8                                                                      | 116.28                                                     | 5                                                                                       |
| 3KP14A      | 3KP14CA  | 14.0                                                          | 15.60                                                        | 17.20 | 5                                      | 23.2                                                                      | 129.31                                                     | 5                                                                                       |
| 3KP15       | 3KP15C   | 15.0                                                          | 16.70                                                        | 20.40 | 5                                      | 26.9                                                                      | 111.52                                                     | 5                                                                                       |
| 3KP15A      | 3KP15CA  | 15.0                                                          | 16.70                                                        | 18.50 | 5                                      | 24.4                                                                      | 122.95                                                     | 5                                                                                       |
| 3KP16       | 3KP16C   | 16.0                                                          | 17.80                                                        | 21.80 | 5                                      | 28.8                                                                      | 104.17                                                     | 5                                                                                       |
| 3KP16A      | 3KP16CA  | 16.0                                                          | 17.80                                                        | 19.70 | 5                                      | 26.0                                                                      | 115.38                                                     | 5                                                                                       |
| 3KP17       | 3KP17C   | 17.0                                                          | 18.90                                                        | 23.10 | 5                                      | 30.5                                                                      | 98.36                                                      | 5                                                                                       |
| 3KP17A      | 3KP17CA  | 17.0                                                          | 18.90                                                        | 20.90 | 5                                      | 27.6                                                                      | 108.70                                                     | 5                                                                                       |
| 3KP18       | 3KP18C   | 18.0                                                          | 20.00                                                        | 24.40 | 5                                      | 32.2                                                                      | 93.17                                                      | 5                                                                                       |
| 3KP18A      | 3KP18CA  | 18.0                                                          | 20.00                                                        | 22.10 | 5                                      | 29.2                                                                      | 102.74                                                     | 5                                                                                       |
| 3KP19       | 3KP19C   | 19.0                                                          | 21.13                                                        | 25.76 | 5                                      | 34.0                                                                      | 88.21                                                      | 5                                                                                       |
| 3KP19A      | 3KP19CA  | 19.0                                                          | 21.10                                                        | 23.30 | 5                                      | 30.8                                                                      | 97.47                                                      | 5                                                                                       |
| 3KP20       | 3KP20C   | 20.0                                                          | 22.20                                                        | 27.10 | 5                                      | 35.8                                                                      | 83.80                                                      | 5                                                                                       |
| 3KP20A      | 3KP20CA  | 20.0                                                          | 22.20                                                        | 24.50 | 5                                      | 32.4                                                                      | 92.59                                                      | 5                                                                                       |
| 3KP22       | 3KP22C   | 22.0                                                          | 24.40                                                        | 29.80 | 5                                      | 39.4                                                                      | 76.14                                                      | 5                                                                                       |
| 3KP22A      | 3KP22CA  | 22.0                                                          | 24.40                                                        | 26.90 | 5                                      | 35.5                                                                      | 84.51                                                      | 5                                                                                       |
| 3KP24       | 3KP24C   | 24.0                                                          | 26.70                                                        | 32.60 | 5                                      | 43.0                                                                      | 69.77                                                      | 5                                                                                       |
| 3KP24A      | 3KP24CA  | 24.0                                                          | 26.70                                                        | 29.50 | 5                                      | 38.9                                                                      | 77.12                                                      | 5                                                                                       |
| 3KP26       | 3KP26C   | 26.0                                                          | 28.90                                                        | 35.30 | 5                                      | 46.6                                                                      | 64.38                                                      | 5                                                                                       |
| 3KP26A      | 3KP26CA  | 26.0                                                          | 28.90                                                        | 31.90 | 5                                      | 42.1                                                                      | 71.26                                                      | 5                                                                                       |
| 3KP28       | 3KP28C   | 28.0                                                          | 31.10                                                        | 38.00 | 5                                      | 50.0                                                                      | 60.00                                                      | 5                                                                                       |
| 3KP28A      | 3KP28CA  | 28.0                                                          | 31.10                                                        | 34.40 | 5                                      | 45.4                                                                      | 66.08                                                      | 5                                                                                       |
| 3KP30       | 3KP30C   | 30.0                                                          | 33.30                                                        | 40.70 | 5                                      | 53.5                                                                      | 56.07                                                      | 5                                                                                       |
| 3KP30A      | 3KP30CA  | 30.0                                                          | 33.30                                                        | 36.80 | 5                                      | 48.4                                                                      | 61.98                                                      | 5                                                                                       |
| 3KP33       | 3KP33C   | 33.0                                                          | 36.70                                                        | 44.90 | 5                                      | 59.0                                                                      | 50.85                                                      | 5                                                                                       |
| 3KP33A      | 3KP33CA  | 33.0                                                          | 36.70                                                        | 40.60 | 5                                      | 53.3                                                                      | 56.29                                                      | 5                                                                                       |
| 3KP36       | 3KP36C   | 36.0                                                          | 40.00                                                        | 48.90 | 5                                      | 64.3                                                                      | 46.66                                                      | 5                                                                                       |
| 3KP36A      | 3KP36CA  | 36.0                                                          | 40.00                                                        | 44.20 | 5                                      | 58.1                                                                      | 51.64                                                      | 5                                                                                       |
| 3KP40       | 3KP40C   | 40.0                                                          | 44.40                                                        | 54.30 | 5                                      | 71.4                                                                      | 42.02                                                      | 5                                                                                       |
| 3KP40A      | 3KP40CA  | 40.0                                                          | 44.40                                                        | 49.10 | 5                                      | 64.5                                                                      | 46.51                                                      | 5                                                                                       |
| 3KP43       | 3KP43C   | 43.0                                                          | 47.80                                                        | 58.40 | 5                                      | 76.7                                                                      | 39.11                                                      | 5                                                                                       |
| 3KP43A      | 3KP43CA  | 43.0                                                          | 47.80                                                        | 52.80 | 5                                      | 69.4                                                                      | 43.23                                                      | 5                                                                                       |

# Axial Lead Transient Voltage Suppressors (TVS)

**3KP Series 5.0 To 190 V 3000W**

## Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

| Part Number |          | Reverse Stand-Off Voltage V <sub>RWM</sub> (V) | Breakdown Voltage V <sub>BR</sub> (V) @I <sub>T</sub> |        | Test Current I <sub>T</sub> (mA) | Maximum Clamping Voltage V <sub>C</sub> @I <sub>PP</sub> (V) | Maximum Peak Pulse Current I <sub>PP</sub> (A) | Maximum Reverse Leakage I <sub>R</sub> @V <sub>RWM</sub> (μA) |
|-------------|----------|------------------------------------------------|-------------------------------------------------------|--------|----------------------------------|--------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------------|
| Uni         | Bi       |                                                | MIN                                                   | MAX    |                                  |                                                              |                                                |                                                               |
| 3KP45       | 3KP45C   | 45.0                                           | 50.00                                                 | 61.10  | 5                                | 80.3                                                         | 37.36                                          | 5                                                             |
| 3KP45A      | 3KP45CA  | 45.0                                           | 50.00                                                 | 55.30  | 5                                | 72.7                                                         | 41.27                                          | 5                                                             |
| 3KP48       | 3KP48C   | 48.0                                           | 53.30                                                 | 65.10  | 5                                | 85.5                                                         | 35.09                                          | 5                                                             |
| 3KP48A      | 3KP48CA  | 48.0                                           | 53.30                                                 | 58.90  | 5                                | 77.4                                                         | 38.76                                          | 5                                                             |
| 3KP51       | 3KP51C   | 51.0                                           | 56.70                                                 | 69.30  | 5                                | 91.1                                                         | 32.93                                          | 5                                                             |
| 3KP51A      | 3KP51CA  | 51.0                                           | 56.70                                                 | 62.70  | 5                                | 82.4                                                         | 36.41                                          | 5                                                             |
| 3KP54       | 3KP54C   | 54.0                                           | 60.00                                                 | 73.30  | 5                                | 96.3                                                         | 31.15                                          | 5                                                             |
| 3KP54A      | 3KP54CA  | 54.0                                           | 60.00                                                 | 66.30  | 5                                | 87.1                                                         | 34.44                                          | 5                                                             |
| 3KP58       | 3KP58C   | 58.0                                           | 64.40                                                 | 78.70  | 5                                | 103.0                                                        | 29.13                                          | 5                                                             |
| 3KP58A      | 3KP58CA  | 58.0                                           | 64.40                                                 | 71.20  | 5                                | 93.6                                                         | 32.05                                          | 5                                                             |
| 3KP60       | 3KP60C   | 60.0                                           | 66.70                                                 | 81.50  | 5                                | 107.0                                                        | 28.04                                          | 5                                                             |
| 3KP60A      | 3KP60CA  | 60.0                                           | 66.70                                                 | 73.70  | 5                                | 96.8                                                         | 30.99                                          | 5                                                             |
| 3KP64       | 3KP64C   | 64.0                                           | 71.10                                                 | 86.90  | 5                                | 114.0                                                        | 26.32                                          | 5                                                             |
| 3KP64A      | 3KP64CA  | 64.0                                           | 71.10                                                 | 78.60  | 5                                | 103.0                                                        | 29.13                                          | 5                                                             |
| 3KP70       | 3KP70C   | 70.0                                           | 77.80                                                 | 95.10  | 5                                | 125.0                                                        | 24.00                                          | 5                                                             |
| 3KP70A      | 3KP70CA  | 70.0                                           | 77.80                                                 | 86.00  | 5                                | 113.0                                                        | 26.55                                          | 5                                                             |
| 3KP75       | 3KP75C   | 75.0                                           | 83.30                                                 | 102.00 | 5                                | 134.0                                                        | 22.39                                          | 5                                                             |
| 3KP75A      | 3KP75CA  | 75.0                                           | 83.30                                                 | 92.10  | 5                                | 121.0                                                        | 24.79                                          | 5                                                             |
| 3KP78       | 3KP78C   | 78.0                                           | 86.70                                                 | 106.00 | 5                                | 139.0                                                        | 21.58                                          | 5                                                             |
| 3KP78A      | 3KP78CA  | 78.0                                           | 86.70                                                 | 95.80  | 5                                | 126.0                                                        | 23.81                                          | 5                                                             |
| 3KP80       | 3KP80C   | 80.0                                           | 88.96                                                 | 108.80 | 5                                | 143.2                                                        | 20.95                                          | 5                                                             |
| 3KP80A      | 3KP80CA  | 80.0                                           | 88.80                                                 | 97.60  | 5                                | 129.6                                                        | 23.15                                          | 5                                                             |
| 3KP85       | 3KP85C   | 85.0                                           | 94.40                                                 | 115.00 | 5                                | 151.0                                                        | 19.87                                          | 5                                                             |
| 3KP85A      | 3KP85CA  | 85.0                                           | 94.40                                                 | 104.00 | 5                                | 137.0                                                        | 21.90                                          | 5                                                             |
| 3KP90       | 3KP90C   | 90.0                                           | 100.00                                                | 122.00 | 5                                | 160.0                                                        | 18.75                                          | 5                                                             |
| 3KP90A      | 3KP90CA  | 90.0                                           | 100.00                                                | 111.00 | 5                                | 146.0                                                        | 20.55                                          | 5                                                             |
| 3KP100      | 3KP100C  | 100.0                                          | 111.00                                                | 136.00 | 5                                | 179.0                                                        | 16.76                                          | 5                                                             |
| 3KP100A     | 3KP100CA | 100.0                                          | 111.00                                                | 123.00 | 5                                | 162.0                                                        | 18.52                                          | 5                                                             |
| 3KP110      | 3KP110C  | 110.0                                          | 122.00                                                | 149.00 | 5                                | 196.0                                                        | 15.31                                          | 5                                                             |
| 3KP110A     | 3KP110CA | 110.0                                          | 122.00                                                | 135.00 | 5                                | 177.0                                                        | 16.95                                          | 5                                                             |
| 3KP120      | 3KP120C  | 120.0                                          | 133.00                                                | 163.00 | 5                                | 214.0                                                        | 14.02                                          | 5                                                             |
| 3KP120A     | 3KP120CA | 120.0                                          | 133.00                                                | 147.00 | 5                                | 193.0                                                        | 15.54                                          | 5                                                             |
| 3KP130      | 3KP130C  | 130.0                                          | 144.00                                                | 176.00 | 5                                | 231.0                                                        | 12.99                                          | 5                                                             |
| 3KP130A     | 3KP130CA | 130.0                                          | 144.00                                                | 159.00 | 5                                | 209.0                                                        | 14.35                                          | 5                                                             |
| 3KP140      | 3KP140C  | 140.0                                          | 155.68                                                | 190.40 | 5                                | 250.6                                                        | 11.97                                          | 5                                                             |
| 3KP140A     | 3KP140CA | 140.0                                          | 155.00                                                | 171.00 | 5                                | 226.8                                                        | 13.23                                          | 5                                                             |
| 3KP150      | 3KP150C  | 150.0                                          | 167.00                                                | 204.00 | 5                                | 268.0                                                        | 11.19                                          | 5                                                             |
| 3KP150A     | 3KP150CA | 150.0                                          | 167.00                                                | 185.00 | 5                                | 243.0                                                        | 12.35                                          | 5                                                             |
| 3KP160      | 3KP160C  | 160.0                                          | 178.00                                                | 218.00 | 5                                | 287.0                                                        | 10.45                                          | 5                                                             |
| 3KP160A     | 3KP160CA | 160.0                                          | 178.00                                                | 197.00 | 5                                | 259.0                                                        | 11.58                                          | 5                                                             |
| 3KP170      | 3KP170C  | 170.0                                          | 189.00                                                | 231.00 | 5                                | 304.0                                                        | 9.87                                           | 5                                                             |
| 3KP170A     | 3KP170CA | 170.0                                          | 189.00                                                | 209.00 | 5                                | 275.0                                                        | 10.91                                          | 5                                                             |
| 3KP180      | 3KP180C  | 180.0                                          | 201.00                                                | 244.80 | 5                                | 322.2                                                        | 9.31                                           | 5                                                             |
| 3KP180A     | 3KP180CA | 180.0                                          | 201.00                                                | 220.00 | 5                                | 291.6                                                        | 10.29                                          | 5                                                             |
| 3KP190      | 3KP190C  | 190.0                                          | 211.21                                                | 258.40 | 5                                | 340.1                                                        | 8.82                                           | 5                                                             |
| 3KP190A     | 3KP190CA | 190.0                                          | 211.00                                                | 232.00 | 5                                | 307.8                                                        | 9.75                                           | 5                                                             |

### Note:

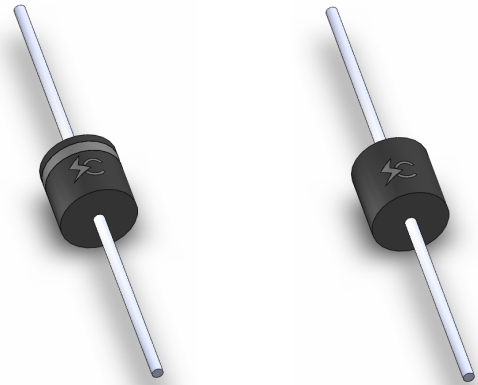
1. Suffix 'A' denotes 5% tolerance device. Without 'A' denotes 10% tolerance device
2. Add suffix 'C' or 'CA' after part number to specify Bi-directional devices
3. For Bi-Directional devices having V<sub>B</sub> of 10 volts and under, the I<sub>R</sub> limit is double

### Features

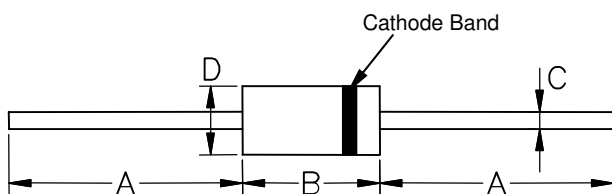
- u Glass passivated chip junction in P600 Package
- u Low leakage
- u Uni and Bidirectional unit
- u Excellent clamping capability
- u 5000W Peak power capability at  $10 \times 1000\mu\text{s}$  waveform Repetition rate (duty cycle):0.01%
- u Fast response time: typically less than 1.0ps from 0 Volts to  $V_{BR}$  min
- u Typical  $I_R$  less than 5 $\mu\text{A}$  above 12V.
- u High Temperature soldering: 260°C/40 seconds at terminals
- u Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR}@25^\circ\text{C} \times \Delta T$
- u Plastic package has Underwriters Laboratory Flammability 94V-0
- u Matte tin lead-free Plated
- u Halogen free and RoHS compliant
- u Typical failure mode is short from over-specified voltage or current
- u Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- u IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- u ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- u EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)

Uni-directional

Bi-directional


**R6/P600**

### Dimensions

**R6/P600**


| Dimensions | Inches |       | Millimeters |      |
|------------|--------|-------|-------------|------|
|            | Min    | Max   | Min         | Max  |
| <b>A</b>   | 1.000  | -     | 25.40       | -    |
| <b>B</b>   | 0.340  | 0.360 | 8.64        | 9.14 |
| <b>C</b>   | 0.048  | 0.052 | 1.22        | 1.32 |
| <b>D</b>   | 0.340  | 0.360 | 8.64        | 9.14 |

# Axial Lead Transient Voltage Suppressors (TVS)

**5KP Series 5.0 To 190 V 5000W**
**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

| Part Number |          | Reverse<br>Stand-Off<br>Voltage<br>$V_{RWM}(V)$ | Breakdown<br>Voltage $V_{BR}$ (V)<br>@ $I_T$ |       | Test<br>Current<br>$I_T$ (mA) | Maximum<br>Clamping<br>Voltage<br>$V_C$<br>@ $I_{PP}$ (V) | Maximum<br>Peak<br>Pulse<br>Current<br>$I_{PP}$ (A) | Maximum<br>Reverse<br>Leakage $I_R$<br>@ $V_{RWM}$<br>( $\mu A$ ) |
|-------------|----------|-------------------------------------------------|----------------------------------------------|-------|-------------------------------|-----------------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------------|
| Uni         | Bi       |                                                 | MIN                                          | MAX   |                               |                                                           |                                                     |                                                                   |
| 5KP5.0      | 5KP5.0C  | 5.0                                             | 6.40                                         | 7.30  | 10                            | 9.6                                                       | 520.83                                              | 800                                                               |
| 5KP5.0A     | 5KP5.0CA | 5.0                                             | 6.40                                         | 7.00  | 10                            | 9.2                                                       | 543.48                                              | 800                                                               |
| 5KP6.0      | 5KP6.0C  | 6.0                                             | 6.67                                         | 8.15  | 10                            | 11.4                                                      | 438.60                                              | 800                                                               |
| 5KP6.0A     | 5KP6.0CA | 6.0                                             | 6.67                                         | 7.37  | 10                            | 10.3                                                      | 485.44                                              | 800                                                               |
| 5KP6.5      | 5KP6.5C  | 6.5                                             | 7.22                                         | 8.82  | 10                            | 12.3                                                      | 406.50                                              | 500                                                               |
| 5KP6.5A     | 5KP6.5CA | 6.5                                             | 7.22                                         | 7.98  | 10                            | 11.2                                                      | 446.43                                              | 500                                                               |
| 5KP7.0      | 5KP7.0C  | 7.0                                             | 7.78                                         | 9.51  | 10                            | 13.3                                                      | 375.94                                              | 200                                                               |
| 5KP7.0A     | 5KP7.0CA | 7.0                                             | 7.78                                         | 8.60  | 10                            | 12.0                                                      | 416.67                                              | 200                                                               |
| 5KP7.5      | 5KP7.5C  | 7.5                                             | 8.33                                         | 10.20 | 1                             | 14.3                                                      | 349.65                                              | 100                                                               |
| 5KP7.5A     | 5KP7.5CA | 7.5                                             | 8.33                                         | 9.21  | 1                             | 12.9                                                      | 387.60                                              | 100                                                               |
| 5KP8.0      | 5KP8.0C  | 8.0                                             | 8.89                                         | 10.90 | 1                             | 15.0                                                      | 333.33                                              | 50                                                                |
| 5KP8.0A     | 5KP8.0CA | 8.0                                             | 8.89                                         | 9.83  | 1                             | 13.6                                                      | 367.65                                              | 50                                                                |
| 5KP8.5      | 5KP8.5C  | 8.5                                             | 9.44                                         | 11.50 | 1                             | 15.9                                                      | 314.47                                              | 20                                                                |
| 5KP8.5A     | 5KP8.5CA | 8.5                                             | 9.44                                         | 10.40 | 1                             | 14.4                                                      | 347.22                                              | 20                                                                |
| 5KP9.0      | 5KP9.0C  | 9.0                                             | 10.00                                        | 12.20 | 1                             | 16.9                                                      | 295.86                                              | 10                                                                |
| 5KP9.0A     | 5KP9.0CA | 9.0                                             | 10.00                                        | 11.10 | 1                             | 15.4                                                      | 324.68                                              | 10                                                                |
| 5KP10       | 5KP10C   | 10.0                                            | 11.10                                        | 13.60 | 1                             | 18.8                                                      | 265.96                                              | 5                                                                 |
| 5KP10A      | 5KP10CA  | 10.0                                            | 11.10                                        | 12.30 | 1                             | 17.0                                                      | 294.12                                              | 5                                                                 |
| 5KP11       | 5KP11C   | 11.0                                            | 12.20                                        | 14.90 | 1                             | 20.1                                                      | 248.76                                              | 5                                                                 |
| 5KP11A      | 5KP11CA  | 11.0                                            | 12.20                                        | 13.50 | 1                             | 18.2                                                      | 274.73                                              | 5                                                                 |
| 5KP12       | 5KP12C   | 12.0                                            | 13.30                                        | 16.30 | 1                             | 22.0                                                      | 227.27                                              | 5                                                                 |
| 5KP12A      | 5KP12CA  | 12.0                                            | 13.30                                        | 14.70 | 1                             | 19.9                                                      | 251.26                                              | 5                                                                 |
| 5KP13       | 5KP13C   | 13.0                                            | 14.40                                        | 17.60 | 1                             | 23.8                                                      | 210.08                                              | 5                                                                 |
| 5KP13A      | 5KP13CA  | 13.0                                            | 14.40                                        | 15.90 | 1                             | 21.5                                                      | 232.56                                              | 5                                                                 |
| 5KP14       | 5KP14C   | 14.0                                            | 15.60                                        | 19.10 | 1                             | 25.8                                                      | 193.80                                              | 5                                                                 |
| 5KP14A      | 5KP14CA  | 14.0                                            | 15.60                                        | 17.20 | 1                             | 23.2                                                      | 215.52                                              | 5                                                                 |
| 5KP15       | 5KP15C   | 15.0                                            | 16.70                                        | 20.40 | 1                             | 26.9                                                      | 185.87                                              | 5                                                                 |
| 5KP15A      | 5KP15CA  | 15.0                                            | 16.70                                        | 18.50 | 1                             | 24.4                                                      | 204.92                                              | 5                                                                 |
| 5KP16       | 5KP16C   | 16.0                                            | 17.80                                        | 21.80 | 1                             | 28.8                                                      | 173.61                                              | 5                                                                 |
| 5KP16A      | 5KP16CA  | 16.0                                            | 17.80                                        | 19.70 | 1                             | 26.0                                                      | 192.31                                              | 5                                                                 |
| 5KP17       | 5KP17C   | 17.0                                            | 18.90                                        | 23.10 | 1                             | 30.5                                                      | 163.93                                              | 5                                                                 |
| 5KP17A      | 5KP17CA  | 17.0                                            | 18.90                                        | 20.90 | 1                             | 27.6                                                      | 181.16                                              | 5                                                                 |
| 5KP18       | 5KP18C   | 18.0                                            | 20.00                                        | 24.40 | 1                             | 32.2                                                      | 155.28                                              | 5                                                                 |
| 5KP18A      | 5KP18CA  | 18.0                                            | 20.00                                        | 22.10 | 1                             | 29.2                                                      | 171.23                                              | 5                                                                 |
| 5KP19       | 5KP19C   | 19.0                                            | 21.13                                        | 25.76 | 1                             | 34.0                                                      | 147.02                                              | 5                                                                 |
| 5KP19A      | 5KP19CA  | 19.0                                            | 21.10                                        | 23.30 | 1                             | 30.8                                                      | 162.44                                              | 5                                                                 |
| 5KP20       | 5KP20C   | 20.0                                            | 22.20                                        | 27.10 | 1                             | 35.8                                                      | 139.66                                              | 5                                                                 |
| 5KP20A      | 5KP20CA  | 20.0                                            | 22.20                                        | 24.50 | 1                             | 32.4                                                      | 154.32                                              | 5                                                                 |
| 5KP22       | 5KP22C   | 22.0                                            | 24.40                                        | 29.80 | 1                             | 39.4                                                      | 126.90                                              | 5                                                                 |
| 5KP22A      | 5KP22CA  | 22.0                                            | 24.40                                        | 26.90 | 1                             | 35.5                                                      | 140.85                                              | 5                                                                 |
| 5KP24       | 5KP24C   | 24.0                                            | 26.70                                        | 32.60 | 1                             | 43.0                                                      | 116.28                                              | 5                                                                 |
| 5KP24A      | 5KP24CA  | 24.0                                            | 26.70                                        | 29.50 | 1                             | 38.9                                                      | 128.53                                              | 5                                                                 |
| 5KP26       | 5KP26C   | 26.0                                            | 28.90                                        | 35.30 | 1                             | 46.6                                                      | 107.30                                              | 5                                                                 |
| 5KP26A      | 5KP26CA  | 26.0                                            | 28.90                                        | 31.90 | 1                             | 42.1                                                      | 118.76                                              | 5                                                                 |
| 5KP28       | 5KP28C   | 28.0                                            | 31.10                                        | 38.00 | 1                             | 50.0                                                      | 100.00                                              | 5                                                                 |
| 5KP28A      | 5KP28CA  | 28.0                                            | 31.10                                        | 34.40 | 1                             | 45.4                                                      | 110.13                                              | 5                                                                 |
| 5KP30       | 5KP30C   | 30.0                                            | 33.30                                        | 40.70 | 1                             | 53.5                                                      | 93.46                                               | 5                                                                 |
| 5KP30A      | 5KP30CA  | 30.0                                            | 33.30                                        | 36.80 | 1                             | 48.4                                                      | 103.31                                              | 5                                                                 |
| 5KP33       | 5KP33C   | 33.0                                            | 36.70                                        | 44.90 | 1                             | 59.0                                                      | 84.75                                               | 5                                                                 |
| 5KP33A      | 5KP33CA  | 33.0                                            | 36.70                                        | 40.60 | 1                             | 53.3                                                      | 93.81                                               | 5                                                                 |
| 5KP36       | 5KP36C   | 36.0                                            | 40.00                                        | 48.90 | 1                             | 64.3                                                      | 77.76                                               | 5                                                                 |
| 5KP36A      | 5KP36CA  | 36.0                                            | 40.00                                        | 44.20 | 1                             | 58.1                                                      | 86.06                                               | 5                                                                 |
| 5KP40       | 5KP40C   | 40.0                                            | 44.40                                        | 54.30 | 1                             | 71.4                                                      | 70.03                                               | 5                                                                 |
| 5KP40A      | 5KP40CA  | 40.0                                            | 44.40                                        | 49.10 | 1                             | 64.5                                                      | 77.52                                               | 5                                                                 |
| 5KP43       | 5KP43C   | 43.0                                            | 47.80                                        | 58.40 | 1                             | 76.7                                                      | 65.19                                               | 5                                                                 |
| 5KP43A      | 5KP43CA  | 43.0                                            | 47.80                                        | 52.80 | 1                             | 69.4                                                      | 72.05                                               | 5                                                                 |

**Axial Lead Transient Voltage Suppressors (TVS)**
**5KP Series 5.0 To 190 V 5000W**
**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

| Part Number |          | Reverse Stand-Off Voltage $V_{\text{RWM}}$ (V) | Breakdown Voltage $V_{\text{BR}}$ (V) @ $I_{\text{T}}$ |        | Test Current $I_{\text{T}}$ (mA) | Maximum Clamping Voltage $V_{\text{C}}$ @ $I_{\text{PP}}$ (V) | Maximum Peak Pulse Current $I_{\text{PP}}$ (A) | Maximum Reverse Leakage $I_{\text{R}}$ @ $V_{\text{RWM}}$ ( $\mu\text{A}$ ) |
|-------------|----------|------------------------------------------------|--------------------------------------------------------|--------|----------------------------------|---------------------------------------------------------------|------------------------------------------------|-----------------------------------------------------------------------------|
| Uni         | Bi       |                                                | MIN                                                    | MAX    |                                  |                                                               |                                                |                                                                             |
| 5KP45       | 5KP45C   | 45.0                                           | 50.00                                                  | 61.10  | 1                                | 80.3                                                          | 62.27                                          | 5                                                                           |
| 5KP45A      | 5KP45CA  | 45.0                                           | 50.00                                                  | 55.30  | 1                                | 72.7                                                          | 68.78                                          | 5                                                                           |
| 5KP48       | 5KP48C   | 48.0                                           | 53.30                                                  | 65.10  | 1                                | 85.5                                                          | 58.48                                          | 5                                                                           |
| 5KP48A      | 5KP48CA  | 48.0                                           | 53.30                                                  | 58.90  | 1                                | 77.4                                                          | 64.60                                          | 5                                                                           |
| 5KP51       | 5KP51C   | 51.0                                           | 56.70                                                  | 69.30  | 1                                | 91.1                                                          | 54.88                                          | 5                                                                           |
| 5KP51A      | 5KP51CA  | 51.0                                           | 56.70                                                  | 62.70  | 1                                | 82.4                                                          | 60.68                                          | 5                                                                           |
| 5KP54       | 5KP54C   | 54.0                                           | 60.00                                                  | 73.30  | 1                                | 96.3                                                          | 51.92                                          | 5                                                                           |
| 5KP54A      | 5KP54CA  | 54.0                                           | 60.00                                                  | 66.30  | 1                                | 87.1                                                          | 57.41                                          | 5                                                                           |
| 5KP58       | 5KP58C   | 58.0                                           | 64.40                                                  | 78.70  | 1                                | 103.0                                                         | 48.54                                          | 5                                                                           |
| 5KP58A      | 5KP58CA  | 58.0                                           | 64.40                                                  | 71.20  | 1                                | 93.6                                                          | 53.42                                          | 5                                                                           |
| 5KP60       | 5KP60C   | 60.0                                           | 66.70                                                  | 81.50  | 1                                | 107.0                                                         | 46.73                                          | 5                                                                           |
| 5KP60A      | 5KP60CA  | 60.0                                           | 66.70                                                  | 73.70  | 1                                | 96.8                                                          | 51.65                                          | 5                                                                           |
| 5KP64       | 5KP64C   | 64.0                                           | 71.10                                                  | 86.90  | 1                                | 114.0                                                         | 43.86                                          | 5                                                                           |
| 5KP64A      | 5KP64CA  | 64.0                                           | 71.10                                                  | 78.60  | 1                                | 103.0                                                         | 48.54                                          | 5                                                                           |
| 5KP70       | 5KP70C   | 70.0                                           | 77.80                                                  | 95.10  | 1                                | 125.0                                                         | 40.00                                          | 5                                                                           |
| 5KP70A      | 5KP70CA  | 70.0                                           | 77.80                                                  | 86.00  | 1                                | 113.0                                                         | 44.25                                          | 5                                                                           |
| 5KP75       | 5KP75C   | 75.0                                           | 83.30                                                  | 102.00 | 1                                | 134.0                                                         | 37.31                                          | 5                                                                           |
| 5KP75A      | 5KP75CA  | 75.0                                           | 83.30                                                  | 92.10  | 1                                | 121.0                                                         | 41.32                                          | 5                                                                           |
| 5KP78       | 5KP78C   | 78.0                                           | 86.70                                                  | 106.00 | 1                                | 139.0                                                         | 35.97                                          | 5                                                                           |
| 5KP78A      | 5KP78CA  | 78.0                                           | 86.70                                                  | 95.80  | 1                                | 126.0                                                         | 39.68                                          | 5                                                                           |
| 5KP80       | 5KP80C   | 80.0                                           | 88.96                                                  | 108.80 | 1                                | 143.2                                                         | 34.92                                          | 5                                                                           |
| 5KP80A      | 5KP80CA  | 80.0                                           | 88.80                                                  | 97.60  | 1                                | 129.6                                                         | 38.58                                          | 5                                                                           |
| 5KP85       | 5KP85C   | 85.0                                           | 94.40                                                  | 115.00 | 1                                | 151.0                                                         | 33.11                                          | 5                                                                           |
| 5KP85A      | 5KP85CA  | 85.0                                           | 94.40                                                  | 104.00 | 1                                | 137.0                                                         | 36.50                                          | 5                                                                           |
| 5KP90       | 5KP90C   | 90.0                                           | 100.00                                                 | 122.00 | 1                                | 160.0                                                         | 31.25                                          | 5                                                                           |
| 5KP90A      | 5KP90CA  | 90.0                                           | 100.00                                                 | 111.00 | 1                                | 146.0                                                         | 34.25                                          | 5                                                                           |
| 5KP100      | 5KP100C  | 100.0                                          | 111.00                                                 | 136.00 | 1                                | 179.0                                                         | 27.93                                          | 5                                                                           |
| 5KP100A     | 5KP100CA | 100.0                                          | 111.00                                                 | 123.00 | 1                                | 162.0                                                         | 30.86                                          | 5                                                                           |
| 5KP110      | 5KP110C  | 110.0                                          | 122.00                                                 | 149.00 | 1                                | 196.0                                                         | 25.51                                          | 5                                                                           |
| 5KP110A     | 5KP110CA | 110.0                                          | 122.00                                                 | 135.00 | 1                                | 177.0                                                         | 28.25                                          | 5                                                                           |
| 5KP120      | 5KP120C  | 120.0                                          | 133.00                                                 | 163.00 | 1                                | 214.0                                                         | 23.36                                          | 5                                                                           |
| 5KP120A     | 5KP120CA | 120.0                                          | 133.00                                                 | 147.00 | 1                                | 193.0                                                         | 25.91                                          | 5                                                                           |
| 5KP130      | 5KP130C  | 130.0                                          | 144.00                                                 | 176.00 | 1                                | 231.0                                                         | 21.65                                          | 5                                                                           |
| 5KP130A     | 5KP130CA | 130.0                                          | 144.00                                                 | 159.00 | 1                                | 209.0                                                         | 23.92                                          | 5                                                                           |
| 5KP140      | 5KP140C  | 140.0                                          | 155.68                                                 | 190.40 | 1                                | 250.6                                                         | 19.95                                          | 5                                                                           |
| 5KP140A     | 5KP140CA | 140.0                                          | 155.00                                                 | 171.00 | 1                                | 226.8                                                         | 22.05                                          | 5                                                                           |
| 5KP150      | 5KP150C  | 150.0                                          | 167.00                                                 | 204.00 | 1                                | 268.0                                                         | 18.66                                          | 5                                                                           |
| 5KP150A     | 5KP150CA | 150.0                                          | 167.00                                                 | 185.00 | 1                                | 243.0                                                         | 20.58                                          | 5                                                                           |
| 5KP160      | 5KP160C  | 160.0                                          | 178.00                                                 | 218.00 | 1                                | 287.0                                                         | 17.42                                          | 5                                                                           |
| 5KP160A     | 5KP160CA | 160.0                                          | 178.00                                                 | 197.00 | 1                                | 259.0                                                         | 19.31                                          | 5                                                                           |
| 5KP170      | 5KP170C  | 170.0                                          | 189.00                                                 | 231.00 | 1                                | 304.0                                                         | 16.45                                          | 5                                                                           |
| 5KP170A     | 5KP170CA | 170.0                                          | 189.00                                                 | 209.00 | 1                                | 275.0                                                         | 18.18                                          | 5                                                                           |
| 5KP180      | 5KP180C  | 180.0                                          | 201.00                                                 | 244.80 | 1                                | 322.2                                                         | 15.52                                          | 5                                                                           |
| 5KP180A     | 5KP180CA | 180.0                                          | 201.00                                                 | 220.00 | 1                                | 291.6                                                         | 17.15                                          | 5                                                                           |
| 5KP190      | 5KP190C  | 190.0                                          | 211.21                                                 | 258.40 | 1                                | 340.1                                                         | 14.70                                          | 5                                                                           |
| 5KP190A     | 5KP190CA | 190.0                                          | 211.00                                                 | 232.00 | 1                                | 307.8                                                         | 16.24                                          | 5                                                                           |

**Note:**

1. Suffix 'A' denotes 5% tolerance device. Without 'A' denotes 10% tolerance device
2. Add suffix 'C' or 'CA' after part number to specify Bi-directional devices
3. For Bi-Directional devices having  $V_{\text{B}}$  of 10 volts and under, the  $I_{\text{R}}$  limit is double

## Axial Lead Transient Voltage Suppressors (TVS)

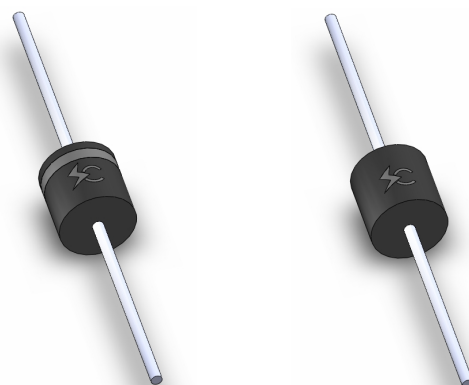
**8KP Series 24 To 43 V 8000W**

### Features

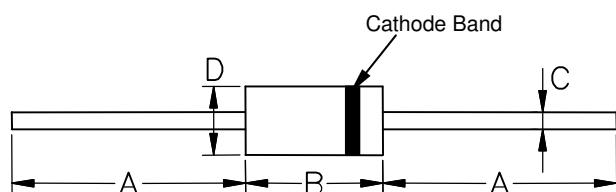
- u Glass passivated chip junction in P600 Package
- u Low leakage
- u Uni and Bidirectional unit
- u Excellent clamping capability
- u 8000W Peak power capability at  $10 \times 1000\mu\text{s}$  waveform
- u Repetition rate (duty cycle): 0.01%
- u Fast response time
- u RoHS compliant

Uni-directional

Bi-directional


**R6/P600**

### Dimensions

**R6/P600**


| Dimensions | Inches |       | Millimeters |      |
|------------|--------|-------|-------------|------|
|            | Min    | Max   | Min         | Max  |
| <b>A</b>   | 1.000  | -     | 25.40       | -    |
| <b>B</b>   | 0.340  | 0.360 | 8.64        | 9.14 |
| <b>C</b>   | 0.048  | 0.052 | 1.22        | 1.32 |
| <b>D</b>   | 0.340  | 0.360 | 8.64        | 9.14 |

### Electrical Characteristics ( $T_A=25^\circ\text{C}$ unless otherwise noted)

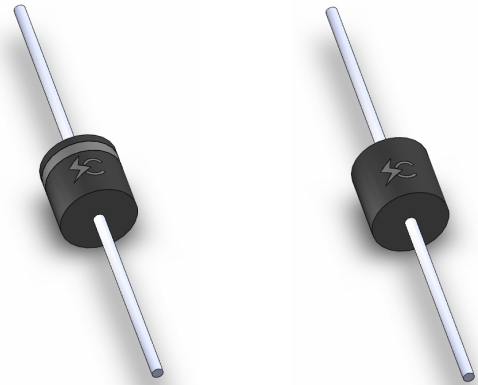
| Part Number |         | Reverse Stand-Off Voltage $V_{RWM}(V)$ | Breakdown Voltage $V_{BR}$ (V) @ $I_T$ |      | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$ @ $I_{PP}$ (V) | Maximum Peak Pulse Current $I_{PP}$ (A) | Maximum Reverse Leakage $I_R$ @ $V_{RWM}$ ( $\mu\text{A}$ ) |
|-------------|---------|----------------------------------------|----------------------------------------|------|-------------------------|-----------------------------------------------|-----------------------------------------|-------------------------------------------------------------|
| Uni         | Bi      |                                        | MIN                                    | MAX  |                         |                                               |                                         |                                                             |
| 8KP24A      | 8KP24CA | 24                                     | 26.7                                   | 29.5 | 1                       | 38.9                                          | 206                                     | 5                                                           |
| 8KP33A      | 8KP33CA | 33                                     | 36.7                                   | 40.6 | 1                       | 53.3                                          | 150                                     | 5                                                           |
| 8KP36A      | 8KP36CA | 36                                     | 40.0                                   | 44.2 | 1                       | 58.1                                          | 148                                     | 5                                                           |
| 8KP40A      | 8KP40CA | 40                                     | 44.4                                   | 49.1 | 1                       | 64.5                                          | 124                                     | 5                                                           |
| 8KP43A      | 8KP43CA | 43                                     | 47.8                                   | 52.8 | 1                       | 69.4                                          | 115                                     | 5                                                           |

### Features

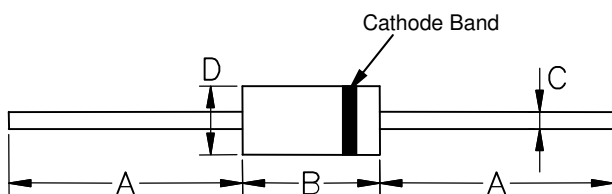
- u Glass passivated chip junction in P600 Package
- u Low leakage
- u Uni and Bidirectional unit
- u Excellent clamping capability
- u 15000W Peak power capability at  $10 \times 1000\mu\text{s}$  waveform
- u Repetition rate (duty cycle): 0.01%
- u Fast response time: typically less than 1.0ps from 0 Volts to  $V_{BR}$  min
- u Typical  $I_R$  less than 5 $\mu\text{A}$  above 12V.
- u High Temperature soldering: 260°C/40 seconds at terminals
- u Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR@25^\circ\text{C}} \times \Delta T$
- u Plastic package has Underwriters Laboratory Flammability 94V-0
- u Matte tin lead-free Plated
- u Halogen free and RoHS compliant
- u Typical failure mode is short from over-specified voltage or current
- u Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- u IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- u ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- u EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)

Uni-directional

Bi-directional


**R6/P600**

### Dimensions

**R6/P600**


| Dimensions | Inches |       | Millimeters |      |
|------------|--------|-------|-------------|------|
|            | Min    | Max   | Min         | Max  |
| <b>A</b>   | 1.000  | -     | 25.40       | -    |
| <b>B</b>   | 0.340  | 0.360 | 8.64        | 9.14 |
| <b>C</b>   | 0.048  | 0.052 | 1.22        | 1.32 |
| <b>D</b>   | 0.340  | 0.360 | 8.64        | 9.14 |

# Axial Lead Transient Voltage Suppressors (TVS)

**15KPA Series 17 To 280 V 15000W**

## Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

| Part Number |            | Reverse Stand-Off Voltage<br>V <sub>RWM</sub> (V) | Breakdown Voltage V <sub>BR</sub> (V)<br>@I <sub>T</sub> |        | Test Current<br>I <sub>T</sub> (mA) | Maximum Clamping Voltage<br>V <sub>C</sub><br>@I <sub>PP</sub> (V) | Maximum Peak Pulse Current<br>I <sub>PP</sub> (A) | Maximum Reverse Leakage I <sub>R</sub><br>@V <sub>RWM</sub> (μA) |
|-------------|------------|---------------------------------------------------|----------------------------------------------------------|--------|-------------------------------------|--------------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------|
| Uni         | Bi         |                                                   | MIN                                                      | MAX    |                                     |                                                                    |                                                   |                                                                  |
| 15KPA17A    | 15KPA17CA  | 17                                                | 18.99                                                    | 20.79  | 50                                  | 29.3                                                               | 515.4                                             | 5000                                                             |
| 15KPA18A    | 15KPA18CA  | 18                                                | 20.11                                                    | 22.01  | 50                                  | 30.9                                                               | 488.7                                             | 5000                                                             |
| 15KPA20A    | 15KPA20CA  | 20                                                | 22.34                                                    | 24.46  | 20                                  | 34.3                                                               | 440.2                                             | 1500                                                             |
| 15KPA22A    | 15KPA22CA  | 22                                                | 24.57                                                    | 26.91  | 10                                  | 37.1                                                               | 407.0                                             | 500                                                              |
| 15KPA24A    | 15KPA24CA  | 24                                                | 26.81                                                    | 29.35  | 5                                   | 40.7                                                               | 371.0                                             | 150                                                              |
| 15KPA26A    | 15KPA26CA  | 26                                                | 29.04                                                    | 31.80  | 5                                   | 44.0                                                               | 343.2                                             | 50                                                               |
| 15KPA28A    | 15KPA28CA  | 28                                                | 31.28                                                    | 34.24  | 5                                   | 47.5                                                               | 317.9                                             | 25                                                               |
| 15KPA30A    | 15KPA30CA  | 30                                                | 33.51                                                    | 36.70  | 5                                   | 50.7                                                               | 297.8                                             | 15                                                               |
| 15KPA33A    | 15KPA33CA  | 33                                                | 36.90                                                    | 40.40  | 5                                   | 54.7                                                               | 276.1                                             | 2                                                                |
| 15KPA36A    | 15KPA36CA  | 36                                                | 40.20                                                    | 44.00  | 5                                   | 59.8                                                               | 252.5                                             | 2                                                                |
| 15KPA40A    | 15KPA40CA  | 40                                                | 44.70                                                    | 48.90  | 5                                   | 65.8                                                               | 229.5                                             | 2                                                                |
| 15KPA43A    | 15KPA43CA  | 43                                                | 48.00                                                    | 52.60  | 5                                   | 69.8                                                               | 216.3                                             | 2                                                                |
| 15KPA45A    | 15KPA45CA  | 45                                                | 50.30                                                    | 55.00  | 5                                   | 72.8                                                               | 207.4                                             | 2                                                                |
| 15KPA48A    | 15KPA48CA  | 48                                                | 53.60                                                    | 58.70  | 5                                   | 77.7                                                               | 194.3                                             | 2                                                                |
| 15KPA51A    | 15KPA51CA  | 51                                                | 57.00                                                    | 62.40  | 5                                   | 82.9                                                               | 182.1                                             | 2                                                                |
| 15KPA54A    | 15KPA54CA  | 54                                                | 60.30                                                    | 66.00  | 5                                   | 87.7                                                               | 172.2                                             | 2                                                                |
| 15KPA58A    | 15KPA58CA  | 58                                                | 64.80                                                    | 70.90  | 5                                   | 93.8                                                               | 161.0                                             | 2                                                                |
| 15KPA60A    | 15KPA60CA  | 60                                                | 67.00                                                    | 73.40  | 5                                   | 97.4                                                               | 155.0                                             | 2                                                                |
| 15KPA64A    | 15KPA64CA  | 64                                                | 71.50                                                    | 78.30  | 5                                   | 104.2                                                              | 144.9                                             | 2                                                                |
| 15KPA70A    | 15KPA70CA  | 70                                                | 78.20                                                    | 85.60  | 5                                   | 113.6                                                              | 132.9                                             | 2                                                                |
| 15KPA75A    | 15KPA75CA  | 75                                                | 83.80                                                    | 91.70  | 5                                   | 122.0                                                              | 123.8                                             | 2                                                                |
| 15KPA78A    | 15KPA78CA  | 78                                                | 87.10                                                    | 95.40  | 5                                   | 126.1                                                              | 119.7                                             | 2                                                                |
| 15KPA85A    | 15KPA85CA  | 85                                                | 94.90                                                    | 104.00 | 5                                   | 137.6                                                              | 109.7                                             | 2                                                                |
| 15KPA90A    | 15KPA90CA  | 90                                                | 100.50                                                   | 110.10 | 5                                   | 145.6                                                              | 103.7                                             | 2                                                                |
| 15KPA100A   | 15KPA100CA | 100                                               | 111.70                                                   | 122.30 | 5                                   | 161.3                                                              | 93.6                                              | 2                                                                |
| 15KPA110A   | 15KPA110CA | 110                                               | 122.90                                                   | 134.50 | 5                                   | 178.6                                                              | 84.5                                              | 2                                                                |
| 15KPA120A   | 15KPA120CA | 120                                               | 134.00                                                   | 146.80 | 5                                   | 192.3                                                              | 78.5                                              | 2                                                                |
| 15KPA130A   | 15KPA130CA | 130                                               | 145.20                                                   | 159.00 | 5                                   | 208.3                                                              | 72.5                                              | 2                                                                |
| 15KPA150A   | 15KPA150CA | 150                                               | 167.60                                                   | 183.50 | 5                                   | 241.9                                                              | 62.4                                              | 2                                                                |
| 15KPA160A   | 15KPA160CA | 160                                               | 178.70                                                   | 195.70 | 5                                   | 258.6                                                              | 58.4                                              | 2                                                                |
| 15KPA170A   | 15KPA170CA | 170                                               | 189.90                                                   | 207.90 | 5                                   | 272.7                                                              | 55.4                                              | 2                                                                |
| 15KPA180A   | 15KPA180CA | 180                                               | 201.10                                                   | 220.10 | 5                                   | 288.5                                                              | 52.3                                              | 2                                                                |
| 15KPA200A   | 15KPA200CA | 200                                               | 223.40                                                   | 244.60 | 5                                   | 319.1                                                              | 47.3                                              | 2                                                                |
| 15KPA220A   | 15KPA220CA | 220                                               | 245.70                                                   | 269.10 | 5                                   | 428.6                                                              | 42.2                                              | 2                                                                |
| 15KPA240A   | 15KPA240CA | 240                                               | 268.10                                                   | 293.50 | 5                                   | 384.6                                                              | 39.3                                              | 2                                                                |
| 15KPA260A   | 15KPA260CA | 260                                               | 290.40                                                   | 318.00 | 5                                   | 416.7                                                              | 36.2                                              | 2                                                                |
| 15KPA280A   | 15KPA280CA | 280                                               | 312.80                                                   | 342.40 | 5                                   | 454.5                                                              | 33.2                                              | 2                                                                |

**Note:**

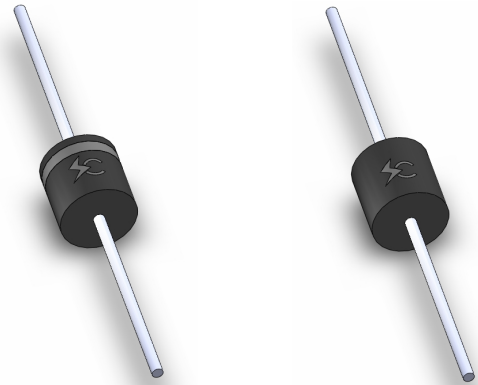
- For Bi-Directional devices having V<sub>R</sub> of 30 volts and under, the I<sub>R</sub> limit is double

### Features

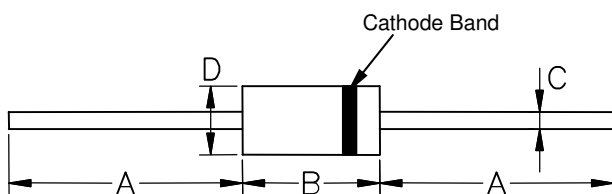
- u Glass passivated chip junction in P600 Package
- u Low leakage
- u Uni and Bidirectional unit
- u Excellent clamping capability
- u 20000W Peak power capability at  $10 \times 1000\mu\text{s}$  waveform Repetition rate (duty cycle):0.01%
- u Fast response time: typically less than 1.0ps from 0 Volts to  $V_{BR}$  min
- u Typical  $I_R$  less than 5 $\mu\text{A}$  above 12V.
- u High Temperature soldering: 260°C/40 seconds at terminals
- u Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR}@25^\circ\text{C} \times \Delta T$
- u Plastic package has Underwriters Laboratory Flammability 94V-0
- u Matte tin lead-free Plated
- u Halogen free and RoHS compliant
- u Typical failure mode is short from over-specified voltage or current
- u Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- u IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- u ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- u EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)

Uni-directional

Bi-directional


**R6/P600**

### Dimensions

**R6/P600**


| Dimensions | Inches |       | Millimeters |      |
|------------|--------|-------|-------------|------|
|            | Min    | Max   | Min         | Max  |
| <b>A</b>   | 1.000  | -     | 25.40       | -    |
| <b>B</b>   | 0.340  | 0.360 | 8.64        | 9.14 |
| <b>C</b>   | 0.048  | 0.052 | 1.22        | 1.32 |
| <b>D</b>   | 0.340  | 0.360 | 8.64        | 9.14 |

# Axial Lead Transient Voltage Suppressors (TVS)

20KPA Series 20 To 300 V 20000W

## Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

| Part Number |            | Reverse Stand-Off Voltage<br>V <sub>RWM</sub> (V) | Breakdown Voltage V <sub>BR</sub> (V)<br>@I <sub>T</sub> |     | Test Current<br>I <sub>T</sub> (mA) | Maximum Clamping Voltage<br>V <sub>C</sub><br>@I <sub>PP</sub> (V) | Maximum Peak Pulse Current<br>I <sub>PP</sub> (A) | Maximum Reverse Leakage I <sub>R</sub><br>@V <sub>RWM</sub> (μA) |
|-------------|------------|---------------------------------------------------|----------------------------------------------------------|-----|-------------------------------------|--------------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------|
| Uni         | Bi         |                                                   | MIN                                                      | MAX |                                     |                                                                    |                                                   |                                                                  |
| 20KPA20A    | 20KPA20CA  | 20                                                | 22.34                                                    | 50  | 36.8                                | 548.9                                                              | 5000                                              | 5000                                                             |
| 20KPA24A    | 20KPA24CA  | 24                                                | 26.81                                                    | 50  | 41.2                                | 490.3                                                              | 5000                                              | 5000                                                             |
| 20KPA26A    | 20KPA26CA  | 26                                                | 29.04                                                    | 50  | 22.7                                | 451.9                                                              | 2000                                              | 1500                                                             |
| 20KPA28A    | 20KPA28CA  | 28                                                | 31.28                                                    | 50  | 48.0                                | 420.8                                                              | 1000                                              | 500                                                              |
| 20KPA30A    | 20KPA30CA  | 30                                                | 33.51                                                    | 5   | 51.5                                | 392.2                                                              | 250                                               | 150                                                              |
| 20KPA32A    | 20KPA32CA  | 32                                                | 35.74                                                    | 5   | 54.3                                | 372.0                                                              | 150                                               | 50                                                               |
| 20KPA34A    | 20KPA34CA  | 34                                                | 38.00                                                    | 5   | 57.5                                | 351.3                                                              | 50                                                | 25                                                               |
| 20KPA36A    | 20KPA36CA  | 36                                                | 40.20                                                    | 5   | 61.5                                | 328.5                                                              | 20                                                | 15                                                               |
| 20KPA40A    | 20KPA40CA  | 40                                                | 44.70                                                    | 5   | 67.8                                | 297.9                                                              | 15                                                | 2                                                                |
| 20KPA44A    | 20KPA44CA  | 44                                                | 49.10                                                    | 5   | 72.7                                | 277.9                                                              | 2                                                 | 2                                                                |
| 20KPA48A    | 20KPA48CA  | 48                                                | 53.60                                                    | 5   | 79.4                                | 254.4                                                              | 2                                                 | 2                                                                |
| 20KPA52A    | 20KPA52CA  | 52                                                | 58.10                                                    | 5   | 85.8                                | 235.4                                                              | 2                                                 | 2                                                                |
| 20KPA56A    | 20KPA56CA  | 56                                                | 62.60                                                    | 5   | 92.6                                | 218.1                                                              | 2                                                 | 2                                                                |
| 20KPA60A    | 20KPA60CA  | 60                                                | 67.00                                                    | 5   | 97.6                                | 207.0                                                              | 2                                                 | 2                                                                |
| 20KPA64A    | 20KPA64CA  | 64                                                | 71.50                                                    | 5   | 104.0                               | 194.2                                                              | 2                                                 | 2                                                                |
| 20KPA68A    | 20KPA68CA  | 68                                                | 76.00                                                    | 5   | 110.0                               | 183.6                                                              | 2                                                 | 2                                                                |
| 20KPA72A    | 20KPA72CA  | 72                                                | 80.40                                                    | 5   | 116.0                               | 174.1                                                              | 2                                                 | 2                                                                |
| 20KPA80A    | 20KPA80A   | 80                                                | 89.40                                                    | 5   | 130.0                               | 155.4                                                              | 2                                                 | 2                                                                |
| 20KPA88A    | 20KPA88CA  | 88                                                | 98.30                                                    | 5   | 142.0                               | 142.3                                                              | 2                                                 | 2                                                                |
| 20KPA96A    | 20KPA96CA  | 96                                                | 107.20                                                   | 5   | 155.0                               | 130.3                                                              | 2                                                 | 2                                                                |
| 20KPA104A   | 20KPA104CA | 104                                               | 116.20                                                   | 5   | 168.0                               | 120.2                                                              | 2                                                 | 2                                                                |
| 20KPA112A   | 20KPA112CA | 112                                               | 125.10                                                   | 5   | 182.0                               | 111.0                                                              | 2                                                 | 2                                                                |
| 20KPA120A   | 20KPA120CA | 120                                               | 134.00                                                   | 5   | 194.0                               | 104.1                                                              | 2                                                 | 2                                                                |
| 20KPA132A   | 20KPA132CA | 132                                               | 147.40                                                   | 5   | 213.0                               | 94.8                                                               | 2                                                 | 2                                                                |
| 20KPA144A   | 20KPA144CA | 144                                               | 160.80                                                   | 5   | 232.0                               | 87.1                                                               | 2                                                 | 2                                                                |
| 20KPA160A   | 20KPA160CA | 160                                               | 178.70                                                   | 5   | 258.0                               | 78.3                                                               | 2                                                 | 2                                                                |
| 20KPA172A   | 20KPA172CA | 172                                               | 192.10                                                   | 5   | 277.0                               | 72.9                                                               | 2                                                 | 2                                                                |
| 20KPA180A   | 20KPA180CA | 180                                               | 201.10                                                   | 5   | 291.0                               | 69.4                                                               | 2                                                 | 2                                                                |
| 20KPA192A   | 20KPA192CA | 192                                               | 214.50                                                   | 5   | 309.0                               | 65.4                                                               | 2                                                 | 2                                                                |
| 20KPA204A   | 20KPA204CA | 204                                               | 227.90                                                   | 5   | 329.0                               | 61.4                                                               | 2                                                 | 2                                                                |
| 20KPA216A   | 20KPA216CA | 216                                               | 241.30                                                   | 5   | 348.0                               | 58.0                                                               | 2                                                 | 2                                                                |
| 20KPA232A   | 20KPA232CA | 232                                               | 159.10                                                   | 5   | 374.0                               | 54.0                                                               | 2                                                 | 2                                                                |
| 20KPA240A   | 20KPA240CA | 240                                               | 268.10                                                   | 5   | 387.0                               | 52.2                                                               | 2                                                 | 2                                                                |
| 20KPA256A   | 20KPA256CA | 256                                               | 286.00                                                   | 5   | 412.0                               | 49.0                                                               | 2                                                 | 2                                                                |
| 20KPA280A   | 20KPA280CA | 280                                               | 312.80                                                   | 5   | 451.0                               | 44.8                                                               | 2                                                 | 2                                                                |
| 20KPA300A   | 20KPA300CA | 300                                               | 335.10                                                   | 5   | 483.0                               | 41.8                                                               | 2                                                 | 2                                                                |

### Note:

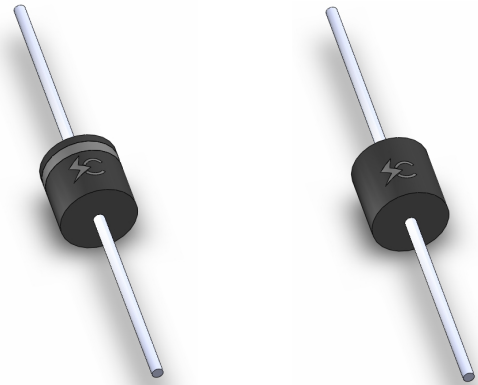
- For Bi-Directional devices having V<sub>R</sub> of 40 volts and under, the I<sub>R</sub> limit is double

### Features

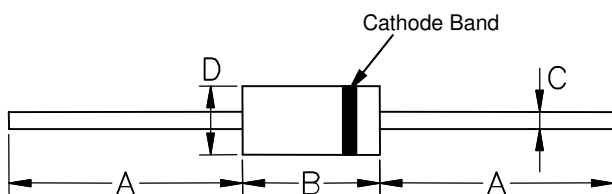
- u Glass passivated chip junction in P600 Package
- u Low leakage
- u Uni and Bidirectional unit
- u Excellent clamping capability
- u 30000W Peak power capability at  $10 \times 1000\mu\text{s}$  waveform
- u Repetition rate (duty cycle): 0.01%
- u Fast response time: typically less than 1.0ps from 0 Volts to  $V_{BR}$  min
- u Typical  $I_R$  less than 5 $\mu\text{A}$  above 12V.
- u High Temperature soldering: 260°C/40 seconds at terminals
- u Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR}@25^\circ\text{C} \times \Delta T$
- u Plastic package has Underwriters Laboratory Flammability 94V-0
- u Matte tin lead-free Plated
- u Halogen free and RoHS compliant
- u Typical failure mode is short from over-specified voltage or current
- u Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- u IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- u ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- u EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)

Uni-directional

Bi-directional


**R6/P600**

### Dimensions

**R6/P600**


| Dimensions | Inches |       | Millimeters |      |
|------------|--------|-------|-------------|------|
|            | Min    | Max   | Min         | Max  |
| <b>A</b>   | 1.000  | -     | 25.40       | -    |
| <b>B</b>   | 0.340  | 0.360 | 8.64        | 9.14 |
| <b>C</b>   | 0.048  | 0.052 | 1.22        | 1.32 |
| <b>D</b>   | 0.340  | 0.360 | 8.64        | 9.14 |

# Axial Lead Transient Voltage Suppressors (TVS)

**30KPA Series 28 To 288 V 30000W**

## Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

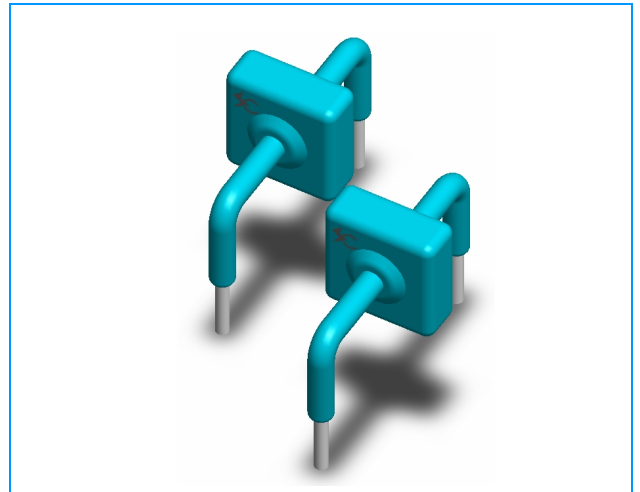
| Part Number |            | Reverse Stand-Off Voltage<br>V <sub>RWM</sub> (V) | Breakdown Voltage V <sub>BR</sub><br>(V)<br>@I <sub>T</sub> | Test Current<br>I <sub>T</sub> (mA) | Maximum Clamping Voltage V <sub>C</sub><br>@I <sub>PP</sub> (V) | Maximum Peak Pulse Current<br>I <sub>PP</sub> (A) | Maximum Reverse Leakage<br>I <sub>R</sub><br>@V <sub>RWM</sub> |
|-------------|------------|---------------------------------------------------|-------------------------------------------------------------|-------------------------------------|-----------------------------------------------------------------|---------------------------------------------------|----------------------------------------------------------------|
| Uni         | Bi         |                                                   | MIN                                                         |                                     |                                                                 |                                                   |                                                                |
| 30KPA28A    | 30KPA28CA  | 28                                                | 31.28                                                       | 50                                  | 50.0                                                            | 606.0                                             | 5000                                                           |
| 30KPA30A    | 30KPA30CA  | 30                                                | 33.51                                                       | 50                                  | 55.2                                                            | 548.9                                             | 5000                                                           |
| 30KPA33A    | 30KPA33CA  | 33                                                | 36.90                                                       | 50                                  | 58.5                                                            | 517.9                                             | 5000                                                           |
| 30KPA36A    | 30KPA36CA  | 36                                                | 40.20                                                       | 50                                  | 61.8                                                            | 490.3                                             | 5000                                                           |
| 30KPA39A    | 30KPA39CA  | 39                                                | 43.60                                                       | 20                                  | 67.2                                                            | 450.9                                             | 2000                                                           |
| 30KPA42A    | 30KPA42CA  | 42                                                | 46.90                                                       | 10                                  | 72.0                                                            | 420.8                                             | 1000                                                           |
| 30KPA43A    | 30KPA43CA  | 43                                                | 48.00                                                       | 10                                  | 73.0                                                            | 415.1                                             | 1000                                                           |
| 30KPA45A    | 30KPA45CA  | 45                                                | 50.30                                                       | 5                                   | 77.4                                                            | 391.5                                             | 250                                                            |
| 30KPA48A    | 30KPA48CA  | 48                                                | 53.60                                                       | 5                                   | 81.6                                                            | 371.3                                             | 150                                                            |
| 30KPA51A    | 30KPA51CA  | 51                                                | 57.00                                                       | 5                                   | 86.4                                                            | 350.7                                             | 50                                                             |
| 30KPA54A    | 30KPA54CA  | 54                                                | 60.30                                                       | 5                                   | 91.4                                                            | 331.5                                             | 20                                                             |
| 30KPA58A    | 30KPA58CA  | 58                                                | 64.80                                                       | 5                                   | 92.4                                                            | 327.9                                             | 20                                                             |
| 30KPA60A    | 30KPA60CA  | 60                                                | 67.00                                                       | 5                                   | 102.0                                                           | 297.1                                             | 15                                                             |
| 30KPA64A    | 30KPA64CA  | 64                                                | 71.50                                                       | 5                                   | 104.0                                                           | 291.3                                             | 10                                                             |
| 30KPA66A    | 30KPA66CA  | 66                                                | 73.70                                                       | 5                                   | 107.0                                                           | 283.2                                             | 2                                                              |
| 30KPA70A    | 30KPA70CA  | 70                                                | 78.20                                                       | 5                                   | 109.0                                                           | 278.0                                             | 2                                                              |
| 30KPA71A    | 30KPA71CA  | 71                                                | 79.30                                                       | 5                                   | 111.5                                                           | 271.7                                             | 2                                                              |
| 30KPA72A    | 30KPA72CA  | 72                                                | 80.40                                                       | 5                                   | 114.0                                                           | 265.8                                             | 2                                                              |
| 30KPA75A    | 30KPA75CA  | 75                                                | 83.80                                                       | 5                                   | 119.4                                                           | 253.8                                             | 2                                                              |
| 30KPA78A    | 30KPA78CA  | 78                                                | 87.10                                                       | 5                                   | 129.0                                                           | 234.9                                             | 2                                                              |
| 30KPA84A    | 30KPA84CA  | 84                                                | 93.80                                                       | 5                                   | 139.2                                                           | 217.7                                             | 2                                                              |
| 30KPA90A    | 30KPA90CA  | 90                                                | 100.50                                                      | 5                                   | 146.4                                                           | 207.0                                             | 2                                                              |
| 30KPA96A    | 30KPA96CA  | 96                                                | 107.20                                                      | 5                                   | 156.0                                                           | 194.2                                             | 2                                                              |
| 30KPA102A   | 30KPA102CA | 102                                               | 113.90                                                      | 5                                   | 165.6                                                           | 183.0                                             | 2                                                              |
| 30KPA108A   | 30KPA108CA | 108                                               | 120.60                                                      | 5                                   | 175.2                                                           | 172.9                                             | 2                                                              |
| 30KPA120A   | 30KPA120CA | 120                                               | 134.00                                                      | 5                                   | 194.4                                                           | 155.9                                             | 2                                                              |
| 30KPA132A   | 30KPA132CA | 132                                               | 147.40                                                      | 5                                   | 213.0                                                           | 142.3                                             | 2                                                              |
| 30KPA144A   | 30KPA144CA | 144                                               | 160.80                                                      | 5                                   | 223.2                                                           | 135.8                                             | 2                                                              |
| 30KPA150A   | 30KPA150CA | 150                                               | 167.60                                                      | 5                                   | 233.4                                                           | 129.8                                             | 2                                                              |
| 30KPA156A   | 30KPA156CA | 156                                               | 174.30                                                      | 5                                   | 245.0                                                           | 123.7                                             | 2                                                              |
| 30KPA160A   | 30KPA160CA | 160                                               | 178.70                                                      | 5                                   | 252.6                                                           | 120.0                                             | 2                                                              |
| 30KPA168A   | 30KPA168CA | 168                                               | 187.70                                                      | 5                                   | 272.4                                                           | 111.2                                             | 2                                                              |
| 30KPA170A   | 30KPA170CA | 170                                               | 189.90                                                      | 5                                   | 275.0                                                           | 110.2                                             | 2                                                              |
| 30KPA180A   | 30KPA180CA | 180                                               | 201.10                                                      | 5                                   | 290.4                                                           | 104.3                                             | 2                                                              |
| 30KPA198A   | 30KPA198CA | 198                                               | 221.20                                                      | 5                                   | 319.8                                                           | 94.7                                              | 2                                                              |
| 30KPA216A   | 30KPA216CA | 216                                               | 241.30                                                      | 5                                   | 348.6                                                           | 86.9                                              | 2                                                              |
| 30KPA240A   | 30KPA240CA | 240                                               | 268.10                                                      | 5                                   | 387.0                                                           | 78.3                                              | 2                                                              |
| 30KPA258A   | 30KPA258CA | 258                                               | 188.20                                                      | 5                                   | 416.4                                                           | 72.8                                              | 2                                                              |
| 30KPA260A   | 30KPA260CA | 260                                               | 290.40                                                      | 5                                   | 416.0                                                           | 72.8                                              | 2                                                              |
| 30KPA270A   | 30KPA270CA | 270                                               | 301.60                                                      | 5                                   | 436.2                                                           | 69.5                                              | 2                                                              |
| 30KPA280A   | 30KPA280CA | 280                                               | 312.80                                                      | 5                                   | 464.0                                                           | 65.3                                              | 2                                                              |
| 30KPA288A   | 30KPA288CA | 288                                               | 321.70                                                      | 5                                   | 469.9                                                           | 64.5                                              | 2                                                              |

**Note:**

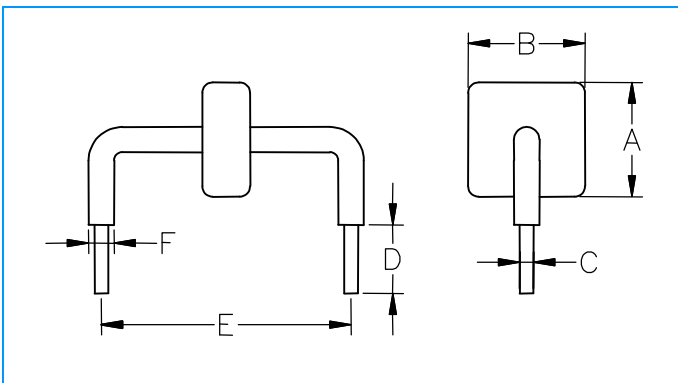
- For Bi-Directional devices having V<sub>R</sub> of 40 volts and under, the I<sub>R</sub> limit is double

### Features

- u Axial lead terminals
- u High current transient suppressor
- u Excellent Clamping Capability
- u Glass Passivated Junction
- u Bi-directional
- u Low Slope Resistance
- u Repetition Rate (duty cycle):0.01%
- u Hazardous Substances Free
- u RoHS Compliant
- u High Temperature soldering: 260°C/10 seconds at terminals
- u Epoxy Encapsulated
- u Silver plated leads
- u Solderable per MIL-STD-202 Method 208



### Dimensions



| Dimensions | Inches                 | Millimeters         |
|------------|------------------------|---------------------|
| <b>A</b>   | max 0.571              | max 14.5            |
| <b>B</b>   | Max0.500               | max 12.7            |
| <b>C</b>   | $\Phi 0.051 \pm 0.004$ | $\Phi 1.30 \pm 0.1$ |
| <b>D</b>   | $0.236 \pm 0.040$      | $6.0 \pm 1.0$       |
| <b>E</b>   | $0.950 \pm 0.028$      | $24.15 \pm 0.7$     |
| <b>F</b>   | max 0.10               | max 2.5             |

# Radial Lead Transient Voltage Suppressors (TVS)

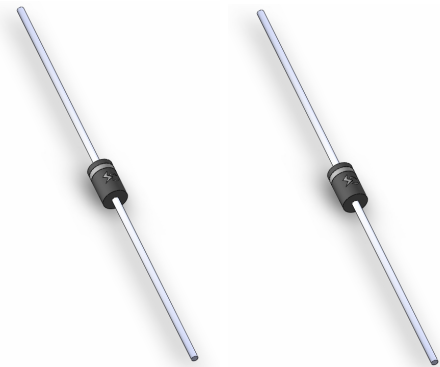
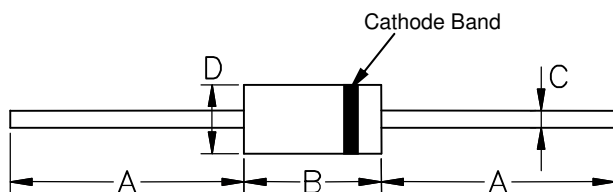
**K Series 1KA To 15KA**
**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

| Part Number | Reverse Stand-Off Voltage |        | Breakdown Voltage                          | Test Current           | Current Rating                 | Maximum Energy   | Maximum Clamping Voltage               | Reverse Leakage             |
|-------------|---------------------------|--------|--------------------------------------------|------------------------|--------------------------------|------------------|----------------------------------------|-----------------------------|
|             | VAC(V)                    | VDC(V) | V <sub>BR</sub> (V)<br>MIN.@I <sub>T</sub> | I <sub>T</sub><br>(mA) | I <sub>PP</sub> 8/20μs<br>(KA) | 10/1000μs<br>(A) | V <sub>C</sub> (V)<br>@I <sub>PP</sub> | I <sub>R</sub> (μA)<br>@VDC |
| KA-012      | 8.5                       | 12.8   | 14                                         | 1                      | 3                              | 500              | 28                                     | 20                          |
| KA-015      | 11                        | 15     | 17                                         | 1                      | 3                              | 650              | 30                                     | 20                          |
| KA-020      | 14                        | 20     | 22                                         | 1                      | 3                              | 800              | 40                                     | 20                          |
| KA-025      | 17                        | 25     | 28                                         | 1                      | 3                              | 950              | 50                                     | 20                          |
| KA-030      | 21                        | 30     | 33                                         | 1                      | 3                              | 1200             | 60                                     | 20                          |
| KA-042      | 30                        | 42     | 47                                         | 1                      | 3                              | 1700             | 77                                     | 20                          |
| KA-058      | 40                        | 58     | 64                                         | 1                      | 3                              | 2450             | 110                                    | 20                          |
| KA-066      | 45                        | 66     | 70                                         | 1                      | 3                              | 2600             | 125                                    | 20                          |
| KA-076      | 54                        | 76     | 85                                         | 1                      | 3                              | 2800             | 140                                    | 20                          |
| KA-100      | 72                        | 100    | 110                                        | 1                      | 3                              | 4250             | 165                                    | 20                          |
| KA-133      | 100                       | 133    | 147                                        | 1                      | 3                              | 5300             | 220                                    | 20                          |
| KA-170      | 130                       | 170    | 180                                        | 1                      | 3                              | 7000             | 260                                    | 20                          |
| KA-190      | 145                       | 190    | 200                                        | 1                      | 3                              | 8400             | 290                                    | 20                          |
| KA-200      | 150                       | 200    | 222                                        | 1                      | 3                              | 8600             | 330                                    | 20                          |
| KA-240      | 180                       | 240    | 250                                        | 1                      | 3                              | 9100             | 340                                    | 20                          |
| KB-012      | 8.5                       | 12.8   | 14                                         | 1                      | 6                              | 1000             | 28                                     | 20                          |
| KB-015      | 11                        | 15     | 17                                         | 1                      | 6                              | 1300             | 30                                     | 20                          |
| KB-020      | 14                        | 20     | 22                                         | 1                      | 6                              | 1600             | 40                                     | 20                          |
| KB-025      | 17                        | 25     | 28                                         | 1                      | 6                              | 1900             | 50                                     | 20                          |
| KB-030      | 21                        | 30     | 33                                         | 1                      | 6                              | 2400             | 60                                     | 20                          |
| KB-042      | 30                        | 42     | 47                                         | 1                      | 6                              | 3400             | 77                                     | 20                          |
| KB-058      | 40                        | 58     | 64                                         | 1                      | 6                              | 4900             | 110                                    | 20                          |
| KB-066      | 45                        | 66     | 70                                         | 1                      | 6                              | 5200             | 125                                    | 20                          |
| KB-076      | 54                        | 76     | 83                                         | 1                      | 6                              | 5600             | 135                                    | 20                          |
| KB-100      | 72                        | 100    | 110                                        | 1                      | 6                              | 8500             | 165                                    | 20                          |
| KB-133      | 100                       | 133    | 147                                        | 1                      | 6                              | 10600            | 220                                    | 20                          |
| KB-170      | 130                       | 170    | 180                                        | 1                      | 6                              | 14000            | 260                                    | 20                          |
| KB-190      | 145                       | 190    | 200                                        | 1                      | 6                              | 16800            | 290                                    | 20                          |
| KB-200      | 150                       | 200    | 222                                        | 1                      | 6                              | 17200            | 330                                    | 20                          |
| KB-240      | 180                       | 240    | 250                                        | 1                      | 6                              | 18000            | 340                                    | 20                          |
| KB-275      | 210                       | 275    | 300                                        | 1                      | 6                              | 19000            | 435                                    | 20                          |
| KB-300      | 230                       | 300    | 330                                        | 1                      | 6                              | 25500            | 470                                    | 20                          |
| KB-380      | 275                       | 380    | 401                                        | 1                      | 6                              | 30000            | 520                                    | 20                          |
| KC-012      | 8.5                       | 12.8   | 14                                         | 1                      | 10                             | 1665             | 28                                     | 20                          |
| KC-015      | 11                        | 15     | 17                                         | 1                      | 10                             | 2164             | 30                                     | 20                          |
| KC-020      | 14                        | 20     | 22                                         | 1                      | 10                             | 2664             | 40                                     | 20                          |
| KC-025      | 17                        | 25     | 28                                         | 1                      | 10                             | 3163             | 50                                     | 20                          |
| KC-030      | 21                        | 30     | 33                                         | 1                      | 10                             | 3996             | 60                                     | 20                          |
| KC-042      | 30                        | 42     | 47                                         | 1                      | 10                             | 5661             | 77                                     | 20                          |
| KC-058      | 40                        | 58     | 64                                         | 1                      | 10                             | 8158             | 110                                    | 20                          |
| KC-066      | 45                        | 66     | 70                                         | 1                      | 10                             | 8658             | 125                                    | 20                          |
| KC-076      | 54                        | 76     | 83                                         | 1                      | 10                             | 9324             | 135                                    | 20                          |
| KC-100      | 72                        | 100    | 110                                        | 1                      | 10                             | 14152            | 165                                    | 20                          |
| KC-133      | 100                       | 133    | 147                                        | 1                      | 10                             | 17649            | 220                                    | 20                          |
| KC-170      | 130                       | 170    | 180                                        | 1                      | 10                             | 23310            | 260                                    | 20                          |
| KC-190      | 145                       | 190    | 200                                        | 1                      | 10                             | 27972            | 290                                    | 20                          |
| KC-200      | 150                       | 200    | 222                                        | 1                      | 10                             | 28638            | 330                                    | 20                          |
| KD-012      | 8.5                       | 12.8   | 14                                         | 1                      | 15                             | 2665             | 28                                     | 20                          |
| KD-015      | 11                        | 15     | 17                                         | 1                      | 15                             | 3464             | 30                                     | 20                          |
| KD-020      | 14                        | 20     | 22                                         | 1                      | 15                             | 4264             | 40                                     | 20                          |
| KD-025      | 17                        | 25     | 28                                         | 1                      | 15                             | 5063             | 50                                     | 20                          |
| KD-030      | 21                        | 30     | 33                                         | 1                      | 15                             | 6396             | 60                                     | 20                          |
| KD-042      | 30                        | 42     | 47                                         | 1                      | 15                             | 9061             | 77                                     | 20                          |
| KD-058      | 40                        | 58     | 64                                         | 1                      | 15                             | 13058            | 110                                    | 20                          |
| KD-066      | 45                        | 66     | 70                                         | 1                      | 15                             | 13858            | 125                                    | 20                          |
| KD-076      | 54                        | 76     | 85                                         | 1                      | 15                             | 14924            | 145                                    | 20                          |

**Features**

- u Glass passivated chip
- u 500W peak pulse power capability with a 10/1000 $\mu$ s waveform, repetitive rate (duty cycle): 0.01%
- u Low leakage
- u Excellent clamping capability
- u Very fast response time
- u RoHS compliant

Uni-directional


**DO204AC (DO-15)**
**Dimensions**
**DO-204AC (DO-15)**


| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| <b>A</b>   | 0.077  | 0.087 | 1.960       | 2.200 |
| <b>B</b>   | 0.171  | 0.191 | 4.350       | 4.850 |
| <b>C</b>   | 0.130  | 0.155 | 3.300       | 3.940 |
| <b>D</b>   | 0.084  | 0.096 | 2.130       | 2.440 |

**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

| Part Number | Reverse Stand-Off Voltage $V_{RWM}$ (V) | Breakdown Voltage $V_{BR}$ @ $I_T=1.0mA$ (V) | Maximum Reverse Leakage $I_R$ @ $V_{RWM}$ ( $\mu A$ ) | Maximum Clamping Voltage $V_C$ @ $I_{PP}$ (V) | Maximum Peak Pulse Current $I_{PP}$ (A) | Maximum Junction Capacitance @0V (pF) | Working Inverse Blocking Voltage $V_{WIB}$ (V) | Inverse Blocking Leakage Current $I_{IB}$ @ $V_{WIB}$ (mA) | Peak Inverse Voltage $V_{PIB}$ (V) |
|-------------|-----------------------------------------|----------------------------------------------|-------------------------------------------------------|-----------------------------------------------|-----------------------------------------|---------------------------------------|------------------------------------------------|------------------------------------------------------------|------------------------------------|
|             |                                         | MIN                                          |                                                       |                                               |                                         |                                       |                                                |                                                            |                                    |
| SAC5.0      | 5.0                                     | 7.60                                         | 300                                                   | 10.0                                          | 44.0                                    | 50                                    | 75                                             | 1                                                          | 100                                |
| SAC6.0      | 6.0                                     | 7.90                                         | 300                                                   | 11.2                                          | 41.0                                    | 50                                    | 75                                             | 1                                                          | 100                                |
| SAC7.0      | 7.0                                     | 8.33                                         | 300                                                   | 12.6                                          | 38.0                                    | 50                                    | 75                                             | 1                                                          | 100                                |
| SAC8.0      | 8.0                                     | 8.89                                         | 100                                                   | 13.4                                          | 36.0                                    | 50                                    | 75                                             | 1                                                          | 100                                |
| SAC8.5      | 8.5                                     | 9.44                                         | 50                                                    | 14.0                                          | 34.0                                    | 50                                    | 75                                             | 1                                                          | 100                                |
| SAC10       | 10.0                                    | 11.10                                        | 5                                                     | 16.3                                          | 29.0                                    | 50                                    | 75                                             | 1                                                          | 100                                |
| SAC12       | 12.0                                    | 13.30                                        | 5                                                     | 19.0                                          | 25.0                                    | 50                                    | 75                                             | 1                                                          | 100                                |
| SAC15       | 15.0                                    | 16.67                                        | 5                                                     | 23.6                                          | 20.0                                    | 50                                    | 75                                             | 1                                                          | 100                                |
| SAC18       | 18.0                                    | 20.00                                        | 5                                                     | 28.8                                          | 15.0                                    | 50                                    | 75                                             | 1                                                          | 100                                |
| SAC22       | 22.0                                    | 24.40                                        | 5                                                     | 35.4                                          | 14.0                                    | 50                                    | 75                                             | 1                                                          | 100                                |
| SAC26       | 26.0                                    | 28.90                                        | 5                                                     | 42.3                                          | 11.1                                    | 50                                    | 75                                             | 1                                                          | 100                                |
| SAC30       | 30.0                                    | 33.30                                        | 5                                                     | 48.6                                          | 10.0                                    | 50                                    | 75                                             | 1                                                          | 100                                |
| SAC36       | 36.0                                    | 40.00                                        | 5                                                     | 60.0                                          | 8.6                                     | 50                                    | 75                                             | 1                                                          | 100                                |
| SAC45       | 45.0                                    | 50.00                                        | 5                                                     | 77.0                                          | 6.8                                     | 50                                    | 150                                            | 1                                                          | 200                                |
| SAC50       | 50.0                                    | 55.50                                        | 5                                                     | 88.0                                          | 5.8                                     | 50                                    | 150                                            | 1                                                          | 200                                |

## Axial Lead Transient Voltage Suppressors (TVS)

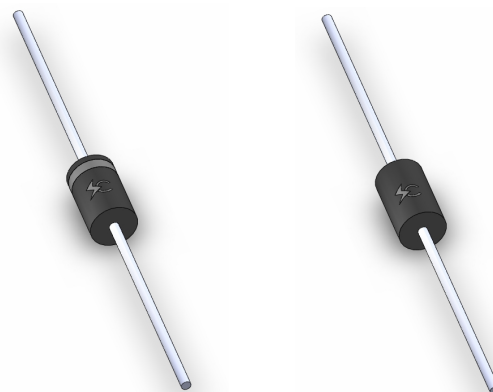
LCE Series 6.5 To 90 V 1500W Low Capacitance

### Features

- u Glass passivated chip
- u 1500W peak pulse power capability with a 10/1000 $\mu$ s waveform, repetitive rate (duty cycle): 0.01%
- u Low leakage
- u Excellent clamping capability
- u Very fast response time
- u RoHS compliant

Uni-directional

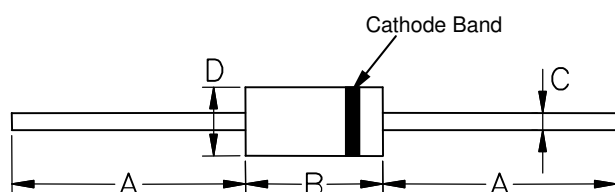
Bi-directional



DO-201

### Dimensions

DO-201



| Dimensions | Inches |       | Millimeters |      |
|------------|--------|-------|-------------|------|
|            | Min    | Max   | Min         | Max  |
| <b>A</b>   | 1.000  | -     | 25.40       | -    |
| <b>B</b>   | 0.285  | 0.375 | 7.24        | 9.53 |
| <b>C</b>   | 0.038  | 0.042 | 0.97        | 1.07 |
| <b>D</b>   | 0.189  | 0.209 | 4.79        | 5.30 |

**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

| Part Number | Reverse Stand-Off Voltage V <sub>RWM</sub> (V) | Breakdown Voltage V <sub>BR</sub> @I <sub>T</sub> (V) |        | Test Current I <sub>T</sub> (mA) | Maximum Reverse Leakage I <sub>R</sub> @V <sub>RWM</sub> (μA) | Maximum Clamping Voltage V <sub>C</sub> @I <sub>PP</sub> (V) | Maximum Peak Pulse Current I <sub>PP</sub> (A) | Maximum Junction Capacitance @0V (pF) | Working Inverse Blocking Voltage V <sub>WIB</sub> (V) | Inverse Blocking Leakage Current I <sub>IB</sub> @V <sub>WIB</sub> (mA) | Peak Inverse Voltage V <sub>PIB</sub> (V) |
|-------------|------------------------------------------------|-------------------------------------------------------|--------|----------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------|---------------------------------------|-------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------|
|             |                                                | Min                                                   | Max    |                                  |                                                               |                                                              |                                                |                                       |                                                       |                                                                         |                                           |
| LCE6.5      | 6.5                                            | 7.22                                                  | 8.82   | 10                               | 1000                                                          | 12.3                                                         | 100                                            | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE6.5A     | 6.5                                            | 7.22                                                  | 7.98   | 10                               | 1000                                                          | 11.2                                                         | 100                                            | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE7.0      | 7.0                                            | 7.78                                                  | 9.51   | 10                               | 500                                                           | 13.3                                                         | 100                                            | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE7.0A     | 7.0                                            | 7.78                                                  | 8.60   | 10                               | 500                                                           | 12.0                                                         | 100                                            | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE7.5      | 7.5                                            | 8.33                                                  | 10.20  | 10                               | 250                                                           | 14.3                                                         | 100                                            | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE7.5A     | 7.5                                            | 8.33                                                  | 9.21   | 10                               | 250                                                           | 12.9                                                         | 100                                            | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE8.0      | 8.0                                            | 8.89                                                  | 10.90  | 1                                | 100                                                           | 15.0                                                         | 100                                            | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE8.0A     | 8.0                                            | 8.89                                                  | 9.83   | 1                                | 100                                                           | 13.6                                                         | 100                                            | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE8.5      | 8.5                                            | 9.44                                                  | 11.50  | 1                                | 50                                                            | 15.9                                                         | 94                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE8.5A     | 8.5                                            | 9.44                                                  | 10.40  | 1                                | 50                                                            | 14.4                                                         | 100                                            | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE9.0      | 9.0                                            | 10.00                                                 | 12.20  | 1                                | 10                                                            | 16.9                                                         | 89                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE9.0A     | 9.0                                            | 10.00                                                 | 11.10  | 1                                | 10                                                            | 15.4                                                         | 97                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE10       | 10.0                                           | 11.10                                                 | 13.60  | 1                                | 5                                                             | 18.8                                                         | 80                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE10A      | 10.0                                           | 11.10                                                 | 12.30  | 1                                | 5                                                             | 17.0                                                         | 88                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE11       | 11.0                                           | 12.20                                                 | 14.90  | 1                                | 5                                                             | 20.1                                                         | 74                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE11A      | 11.0                                           | 12.20                                                 | 13.50  | 1                                | 5                                                             | 18.2                                                         | 82                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE12       | 12.0                                           | 13.30                                                 | 16.30  | 1                                | 5                                                             | 22.0                                                         | 68                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE12A      | 12.0                                           | 13.30                                                 | 14.70  | 1                                | 5                                                             | 19.9                                                         | 75                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE13       | 13.0                                           | 14.40                                                 | 17.60  | 1                                | 5                                                             | 23.8                                                         | 63                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE13A      | 13.0                                           | 14.40                                                 | 15.90  | 1                                | 5                                                             | 21.5                                                         | 70                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE14       | 14.0                                           | 15.60                                                 | 19.10  | 1                                | 5                                                             | 25.8                                                         | 58                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE14A      | 14.0                                           | 15.60                                                 | 17.20  | 1                                | 5                                                             | 23.2                                                         | 65                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE15       | 15.0                                           | 16.70                                                 | 20.40  | 1                                | 5                                                             | 26.9                                                         | 56                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE15A      | 15.0                                           | 16.70                                                 | 18.50  | 1                                | 5                                                             | 24.4                                                         | 61                                             | 100                                   | 75                                                    | 1                                                                       | 200                                       |
| LCE16       | 16.0                                           | 17.80                                                 | 21.80  | 1                                | 5                                                             | 28.8                                                         | 52                                             | 100                                   | 75                                                    | 1                                                                       | 200                                       |
| LCE16A      | 16.0                                           | 17.80                                                 | 19.70  | 1                                | 5                                                             | 26.0                                                         | 57                                             | 100                                   | 75                                                    | 1                                                                       | 200                                       |
| LCE17       | 17.0                                           | 18.90                                                 | 23.10  | 1                                | 5                                                             | 30.5                                                         | 49                                             | 100                                   | 75                                                    | 1                                                                       | 200                                       |
| LCE17A      | 17.0                                           | 18.90                                                 | 20.90  | 1                                | 5                                                             | 27.6                                                         | 54                                             | 100                                   | 75                                                    | 1                                                                       | 200                                       |
| LCE18       | 18.0                                           | 20.00                                                 | 24.40  | 1                                | 5                                                             | 32.2                                                         | 46                                             | 100                                   | 75                                                    | 1                                                                       | 200                                       |
| LCE18A      | 18.0                                           | 20.00                                                 | 22.10  | 1                                | 5                                                             | 29.2                                                         | 51                                             | 100                                   | 75                                                    | 1                                                                       | 200                                       |
| LCE20       | 20.0                                           | 22.20                                                 | 27.10  | 1                                | 5                                                             | 35.8                                                         | 42                                             | 100                                   | 75                                                    | 1                                                                       | 200                                       |
| LCE20A      | 20.0                                           | 22.20                                                 | 24.50  | 1                                | 5                                                             | 32.4                                                         | 46                                             | 100                                   | 75                                                    | 1                                                                       | 200                                       |
| LCE22       | 22.0                                           | 24.40                                                 | 29.80  | 1                                | 5                                                             | 39.4                                                         | 38                                             | 100                                   | 75                                                    | 1                                                                       | 200                                       |
| LCE22A      | 22.0                                           | 24.40                                                 | 26.90  | 1                                | 5                                                             | 35.5                                                         | 42                                             | 100                                   | 75                                                    | 1                                                                       | 200                                       |
| LCE24       | 24.0                                           | 26.70                                                 | 32.60  | 1                                | 5                                                             | 43.0                                                         | 35                                             | 100                                   | 75                                                    | 1                                                                       | 200                                       |
| LCE24A      | 24.0                                           | 26.70                                                 | 29.50  | 1                                | 5                                                             | 38.9                                                         | 39                                             | 100                                   | 75                                                    | 1                                                                       | 200                                       |
| LCE26       | 26.0                                           | 28.90                                                 | 35.30  | 1                                | 5                                                             | 46.6                                                         | 32                                             | 100                                   | 75                                                    | 1                                                                       | 200                                       |
| LCE26A      | 26.0                                           | 28.90                                                 | 31.90  | 1                                | 5                                                             | 42.1                                                         | 36                                             | 100                                   | 75                                                    | 1                                                                       | 200                                       |
| LCE28       | 28.0                                           | 31.10                                                 | 38.00  | 1                                | 5                                                             | 50.1                                                         | 30                                             | 100                                   | 75                                                    | 1                                                                       | 200                                       |
| LCE28A      | 28.0                                           | 31.10                                                 | 34.40  | 1                                | 5                                                             | 45.5                                                         | 33                                             | 100                                   | 75                                                    | 1                                                                       | 200                                       |
| LCE30A      | 30.0                                           | 33.30                                                 | 36.80  | 1                                | 5                                                             | 48.4                                                         | 31                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE33A      | 33.0                                           | 36.70                                                 | 40.60  | 1                                | 5                                                             | 53.3                                                         | 28                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE36A      | 36.0                                           | 40.00                                                 | 44.20  | 1                                | 5                                                             | 58.1                                                         | 26                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE40A      | 40.0                                           | 44.40                                                 | 49.10  | 1                                | 5                                                             | 64.5                                                         | 23                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE43A      | 43.0                                           | 47.80                                                 | 52.80  | 1                                | 5                                                             | 69.4                                                         | 22                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE45A      | 45.0                                           | 50.00                                                 | 55.30  | 1                                | 5                                                             | 72.7                                                         | 21                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE48A      | 48.0                                           | 53.30                                                 | 58.90  | 1                                | 5                                                             | 77.4                                                         | 19                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE51A      | 51.0                                           | 56.70                                                 | 62.70  | 1                                | 5                                                             | 82.4                                                         | 18                                             | 100                                   | 75                                                    | 1                                                                       | 100                                       |
| LCE54A      | 54.0                                           | 60.00                                                 | 66.30  | 1                                | 5                                                             | 87.1                                                         | 17                                             | 100                                   | 100                                                   | 1                                                                       | 125                                       |
| LCE58A      | 58.0                                           | 64.40                                                 | 71.20  | 1                                | 5                                                             | 93.6                                                         | 16                                             | 100                                   | 100                                                   | 1                                                                       | 125                                       |
| LCE60A      | 60.0                                           | 66.70                                                 | 73.70  | 1                                | 5                                                             | 96.8                                                         | 16                                             | 100                                   | 100                                                   | 1                                                                       | 125                                       |
| LCE64A      | 64.0                                           | 71.10                                                 | 78.60  | 1                                | 5                                                             | 103.0                                                        | 15                                             | 100                                   | 100                                                   | 1                                                                       | 125                                       |
| LCE70A      | 70.0                                           | 77.80                                                 | 86.00  | 1                                | 5                                                             | 113.0                                                        | 13                                             | 100                                   | 125                                                   | 1                                                                       | 150                                       |
| LCE75A      | 75.0                                           | 83.30                                                 | 92.10  | 1                                | 5                                                             | 121.0                                                        | 12                                             | 100                                   | 125                                                   | 1                                                                       | 150                                       |
| LCE85A      | 85.0                                           | 94.40                                                 | 104.00 | 1                                | 5                                                             | 129.0                                                        | 12                                             | 100                                   | 125                                                   | 1                                                                       | 150                                       |
| LCE90A      | 90.0                                           | 100.00                                                | 111.00 | 1                                | 5                                                             | 146.0                                                        | 10                                             | 100                                   | 125                                                   | 1                                                                       | 150                                       |