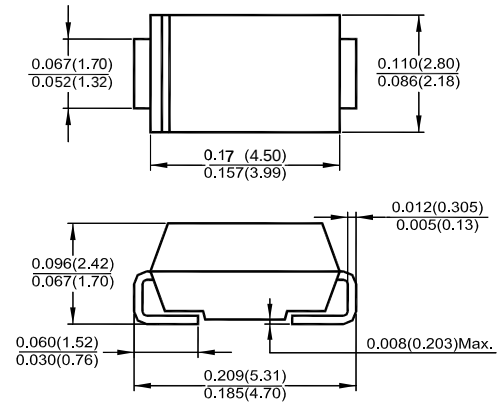


## FEATURES

- Low profile package
- Ideal for automated placement
- Glass passivated chip junction
- Available in uni-directional and bi-directional
- 400 W peak pulse power capability with a 10/1000  $\mu$ s waveform, repetitive rate (duty cycle): 0.01 % (300 W above 78 V)
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Solder dip 260 °C, 40 s
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

## SMAJ5.0 -SMAJ188 CA



Dimensions in inches and (millimeters)  
DO-214AC (SMA)

## DEVICES FOR BI-DIRECTION APPLICATIONS

For bi-directional use C or CA suffix (e.g. SMAJ10C, SMAJ10CA).

Electrical characteristics apply in both directions.

## MAXIMUM RATINGS ( $T_A = 25\text{ °C}$ unless otherwise noted)

| PARAMETER                                                                                   | SYMBOL                            | VALUE          | UNIT |
|---------------------------------------------------------------------------------------------|-----------------------------------|----------------|------|
| Peak pulse power dissipation with a 10/1000 $\mu$ s waveform <sup>(1)(2)</sup> (Fig. 1)     | P <sub>PPM</sub>                  | 400            | W    |
| Peak pulse current with a waveform <sup>(1)</sup>                                           | I <sub>PPM</sub>                  | See next table | A    |
| Peak forward surge current 8.3 ms single half sine-wave uni-directional only <sup>(2)</sup> | I <sub>FSM</sub>                  | 40             | A    |
| Operating junction and storage temperature range                                            | T <sub>J</sub> , T <sub>STG</sub> | - 55 to + 150  | °C   |

### Notes:

(1) Non-repetitive current pulse, per Fig. 3 and derated above  $T_A = 25\text{ °C}$  per Fig. 2. Rating is 300 W above 78 V

(2) Mounted on 0.2 x 0.2" (5.0 x 5.0 mm) copper pads to each terminal

## THERMAL CHARACTERISTICS ( $T_A = 25\text{ °C}$ unless otherwise noted)

| PARAMETER                                                      | SYMBOL           | VALUE | UNIT |
|----------------------------------------------------------------|------------------|-------|------|
| Typical thermal resistance, junction to ambient <sup>(1)</sup> | R <sub>θJA</sub> | 120   | °C/W |
| Typical thermal resistance, junction to lead                   | R <sub>θJL</sub> | 30    | °C/W |

### Note:

(1) Mounted on minimum recommended pad layout

Electrical Characteristics (TA=25°C, unless otherwise noted)

SMAJ5.0 -SMAJ188 CA

**ELECTRICAL CHARACTERISTICS** (TA = 25 °C unless otherwise noted)

| DEVICE TYPE             | DEVICE MARKING CODE |    | BREAKDOWN VOLTAGE<br>V <sub>BR</sub> AT I <sub>T</sub> <sup>(1)</sup><br>(V) |      | TEST CURRENT<br>I <sub>T</sub><br>(mA) | STAND-OFF VOLTAGE<br>V <sub>WM</sub><br>(V) | MAXIMUM REVERSE LEAKAGE<br>AT V <sub>WM</sub><br>I <sub>D</sub> (μA) <sup>(3)</sup> | MAXIMUM PEAK PULSE SURGE CURRENT<br>I <sub>PPM</sub> (A) <sup>(2)</sup> | MAXIMUM CLAMPING VOLTAGE AT<br>I <sub>PPM</sub><br>V <sub>C</sub> (V) |
|-------------------------|---------------------|----|------------------------------------------------------------------------------|------|----------------------------------------|---------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------------------------------|
|                         | UNI                 | BI | MIN.                                                                         | MAX. |                                        |                                             |                                                                                     |                                                                         |                                                                       |
| SMAJ5.0                 | AD                  | WD | 6.40                                                                         | 7.82 | 10                                     | 5.0                                         | 800                                                                                 | 41.7                                                                    | 9.6                                                                   |
| SMAJ5.0A <sup>(5)</sup> | AE                  | WE | 6.40                                                                         | 7.07 | 10                                     | 5.0                                         | 800                                                                                 | 43.5                                                                    | 9.2                                                                   |
| SMAJ6.0                 | AF                  | WF | 6.67                                                                         | 8.15 | 10                                     | 6.0                                         | 800                                                                                 | 35.1                                                                    | 11.4                                                                  |
| SMAJ6.0A                | AG                  | WG | 6.67                                                                         | 7.37 | 10                                     | 6.0                                         | 800                                                                                 | 38.8                                                                    | 10.3                                                                  |
| SMAJ6.5                 | AH                  | WH | 7.22                                                                         | 8.82 | 10                                     | 6.5                                         | 500                                                                                 | 32.5                                                                    | 12.3                                                                  |
| SMAJ6.5A                | AK                  | WK | 7.22                                                                         | 7.98 | 10                                     | 6.5                                         | 500                                                                                 | 35.7                                                                    | 11.2                                                                  |
| SMAJ7.0                 | AL                  | WL | 7.78                                                                         | 9.51 | 10                                     | 7.0                                         | 200                                                                                 | 30.1                                                                    | 13.3                                                                  |
| SMAJ7.0A                | AM                  | WM | 7.78                                                                         | 8.60 | 10                                     | 7.0                                         | 200                                                                                 | 33.3                                                                    | 12.0                                                                  |
| SMAJ7.5                 | AN                  | WN | 8.33                                                                         | 10.2 | 1.0                                    | 7.5                                         | 100                                                                                 | 28.0                                                                    | 14.3                                                                  |
| SMAJ7.5A                | AP                  | WP | 8.33                                                                         | 9.21 | 1.0                                    | 7.5                                         | 100                                                                                 | 31.0                                                                    | 12.9                                                                  |
| SMAJ8.0                 | AQ                  | WQ | 8.89                                                                         | 10.9 | 1.0                                    | 8.0                                         | 50                                                                                  | 26.7                                                                    | 15.0                                                                  |
| SMAJ8.0A                | AR                  | WR | 8.89                                                                         | 9.83 | 1.0                                    | 8.0                                         | 50                                                                                  | 29.4                                                                    | 13.6                                                                  |
| SMAJ8.5                 | AS                  | WS | 9.44                                                                         | 11.5 | 1.0                                    | 8.5                                         | 10                                                                                  | 25.2                                                                    | 15.9                                                                  |
| SMAJ8.5A                | AT                  | WT | 9.44                                                                         | 10.4 | 1.0                                    | 8.5                                         | 10                                                                                  | 27.8                                                                    | 14.4                                                                  |
| SMAJ9.0                 | AU                  | WU | 10.0                                                                         | 12.2 | 1.0                                    | 9.0                                         | 5.0                                                                                 | 23.7                                                                    | 16.9                                                                  |
| SMAJ9.0A                | AV                  | WV | 10.0                                                                         | 11.1 | 1.0                                    | 9.0                                         | 5.0                                                                                 | 26.0                                                                    | 15.4                                                                  |
| SMAJ10                  | AW                  | WW | 11.1                                                                         | 13.6 | 1.0                                    | 10                                          | 1.0                                                                                 | 21.3                                                                    | 18.8                                                                  |
| SMAJ10A                 | AX                  | WX | 11.1                                                                         | 12.3 | 1.0                                    | 10                                          | 1.0                                                                                 | 23.5                                                                    | 17.0                                                                  |
| SMAJ11                  | AY                  | WY | 12.2                                                                         | 14.9 | 1.0                                    | 11                                          | 1.0                                                                                 | 19.9                                                                    | 20.1                                                                  |
| SMAJ11A                 | AZ                  | WZ | 12.2                                                                         | 13.5 | 1.0                                    | 11                                          | 1.0                                                                                 | 22.0                                                                    | 18.2                                                                  |
| SMAJ12                  | BD                  | XD | 13.3                                                                         | 16.3 | 1.0                                    | 12                                          | 1.0                                                                                 | 18.2                                                                    | 22.0                                                                  |
| SMAJ12A                 | BE                  | XE | 13.3                                                                         | 14.7 | 1.0                                    | 12                                          | 1.0                                                                                 | 20.1                                                                    | 19.9                                                                  |
| SMAJ13                  | BF                  | XF | 14.4                                                                         | 17.6 | 1.0                                    | 13                                          | 1.0                                                                                 | 16.8                                                                    | 23.8                                                                  |
| SMAJ13A                 | BG                  | XG | 14.4                                                                         | 15.9 | 1.0                                    | 13                                          | 1.0                                                                                 | 18.6                                                                    | 21.5                                                                  |
| SMAJ14                  | BH                  | XH | 15.6                                                                         | 19.1 | 1.0                                    | 14                                          | 1.0                                                                                 | 15.5                                                                    | 25.8                                                                  |
| SMAJ14A                 | BK                  | XK | 15.6                                                                         | 17.2 | 1.0                                    | 14                                          | 1.0                                                                                 | 17.2                                                                    | 23.2                                                                  |
| SMAJ15                  | BL                  | XL | 16.7                                                                         | 20.4 | 1.0                                    | 15                                          | 1.0                                                                                 | 14.9                                                                    | 26.9                                                                  |
| SMAJ15A                 | BM                  | XM | 16.7                                                                         | 18.5 | 1.0                                    | 15                                          | 1.0                                                                                 | 16.4                                                                    | 24.4                                                                  |
| SMAJ16                  | BN                  | XN | 17.8                                                                         | 21.8 | 1.0                                    | 16                                          | 1.0                                                                                 | 13.9                                                                    | 28.8                                                                  |
| SMAJ16A                 | BP                  | XP | 17.8                                                                         | 19.7 | 1.0                                    | 16                                          | 1.0                                                                                 | 15.4                                                                    | 26.0                                                                  |
| SMAJ17                  | BQ                  | XQ | 18.9                                                                         | 23.1 | 1.0                                    | 17                                          | 1.0                                                                                 | 13.1                                                                    | 30.5                                                                  |
| SMAJ17A                 | BR                  | XR | 18.9                                                                         | 20.9 | 1.0                                    | 17                                          | 1.0                                                                                 | 14.5                                                                    | 27.6                                                                  |
| SMAJ18                  | BS                  | XS | 20.0                                                                         | 24.4 | 1.0                                    | 18                                          | 1.0                                                                                 | 12.4                                                                    | 32.2                                                                  |
| SMAJ18A                 | BT                  | XT | 20.0                                                                         | 22.1 | 1.0                                    | 18                                          | 1.0                                                                                 | 13.7                                                                    | 29.2                                                                  |
| SMAJ20                  | BU                  | XU | 22.2                                                                         | 27.1 | 1.0                                    | 20                                          | 1.0                                                                                 | 11.2                                                                    | 35.8                                                                  |
| SMAJ20A                 | BV                  | XV | 22.2                                                                         | 24.5 | 1.0                                    | 20                                          | 1.0                                                                                 | 12.3                                                                    | 32.4                                                                  |
| SMAJ22                  | BW                  | XW | 24.4                                                                         | 29.8 | 1.0                                    | 22                                          | 1.0                                                                                 | 10.2                                                                    | 39.4                                                                  |
| SMAJ22A                 | BX                  | XX | 24.4                                                                         | 26.9 | 1.0                                    | 22                                          | 1.0                                                                                 | 11.3                                                                    | 35.5                                                                  |
| SMAJ24                  | BY                  | XY | 26.7                                                                         | 32.6 | 1.0                                    | 24                                          | 1.0                                                                                 | 9.3                                                                     | 43.0                                                                  |
| SMAJ24A                 | BZ                  | XZ | 26.7                                                                         | 29.5 | 1.0                                    | 24                                          | 1.0                                                                                 | 10.3                                                                    | 38.9                                                                  |
| SMAJ26                  | CD                  | YD | 28.9                                                                         | 35.3 | 1.0                                    | 26                                          | 1.0                                                                                 | 8.6                                                                     | 46.6                                                                  |
| SMAJ26A                 | CE                  | YE | 28.9                                                                         | 31.9 | 1.0                                    | 26                                          | 1.0                                                                                 | 9.5                                                                     | 42.1                                                                  |
| SMAJ28                  | CF                  | YF | 31.1                                                                         | 38.0 | 1.0                                    | 28                                          | 1.0                                                                                 | 8.0                                                                     | 50.0                                                                  |
| SMAJ28A                 | CG                  | YG | 31.1                                                                         | 34.4 | 1.0                                    | 28                                          | 1.0                                                                                 | 8.8                                                                     | 45.4                                                                  |
| SMAJ30                  | CH                  | YH | 33.3                                                                         | 40.7 | 1.0                                    | 30                                          | 1.0                                                                                 | 7.5                                                                     | 53.5                                                                  |
| SMAJ30A                 | CK                  | YK | 33.3                                                                         | 36.8 | 1.0                                    | 30                                          | 1.0                                                                                 | 8.3                                                                     | 48.4                                                                  |
| SMAJ33                  | CL                  | YL | 36.7                                                                         | 44.9 | 1.0                                    | 33                                          | 1.0                                                                                 | 6.8                                                                     | 59.0                                                                  |
| SMAJ33A                 | CM                  | YM | 36.7                                                                         | 40.6 | 1.0                                    | 33                                          | 1.0                                                                                 | 7.5                                                                     | 53.3                                                                  |
| SMAJ36                  | CN                  | YN | 40.0                                                                         | 48.9 | 1.0                                    | 36                                          | 1.0                                                                                 | 6.2                                                                     | 64.3                                                                  |
| SMAJ36A                 | CP                  | YP | 40.0                                                                         | 44.2 | 1.0                                    | 36                                          | 1.0                                                                                 | 6.9                                                                     | 58.1                                                                  |
| SMAJ40                  | CQ                  | YQ | 44.4                                                                         | 54.3 | 1.0                                    | 40                                          | 1.0                                                                                 | 5.6                                                                     | 71.4                                                                  |

Electrical Characteristics (TA=25°C, unless otherwise noted)

SMAJ5.0 -SMAJ188 CA

**ELECTRICAL CHARACTERISTICS** (TA = 25 °C unless otherwise noted)

| DEVICE TYPE | DEVICE MARKING CODE |    | BREAKDOWN VOLTAGE<br>V <sub>BR</sub> AT I <sub>T</sub> <sup>(1)</sup><br>(V) |      | TEST CURRENT<br>I <sub>T</sub><br>(mA) | STAND-OFF VOLTAGE<br>V <sub>WM</sub><br>(V) | MAXIMUM REVERSE LEAKAGE AT V <sub>WM</sub><br>I <sub>D</sub> (μA) <sup>(3)</sup> | MAXIMUM PEAK PULSE SURGE CURRENT<br>I <sub>PPM</sub> (A) <sup>(2)</sup> | MAXIMUM CLAMPING VOLTAGE AT<br>I <sub>PPM</sub><br>V <sub>C</sub> (V) |
|-------------|---------------------|----|------------------------------------------------------------------------------|------|----------------------------------------|---------------------------------------------|----------------------------------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------------------------------|
|             | UNI                 | BI | MIN.                                                                         | MAX. |                                        |                                             |                                                                                  |                                                                         |                                                                       |
| SMAJ40A     | CR                  | YR | 44.4                                                                         | 49.1 | 1.0                                    | 40                                          | 1.0                                                                              | 6.2                                                                     | 64.5                                                                  |
| SMAJ43      | CS                  | YS | 47.8                                                                         | 58.4 | 1.0                                    | 43                                          | 1.0                                                                              | 5.2                                                                     | 76.7                                                                  |
| SMAJ43A     | CT                  | YT | 47.8                                                                         | 52.8 | 1.0                                    | 43                                          | 1.0                                                                              | 5.8                                                                     | 69.4                                                                  |
| SMAJ45      | CU                  | YU | 50.0                                                                         | 61.1 | 1.0                                    | 45                                          | 1.0                                                                              | 5.0                                                                     | 80.3                                                                  |
| SMAJ45A     | CV                  | YV | 50.0                                                                         | 55.3 | 1.0                                    | 45                                          | 1.0                                                                              | 5.5                                                                     | 72.7                                                                  |
| SMAJ48      | CW                  | YW | 53.3                                                                         | 65.1 | 1.0                                    | 48                                          | 1.0                                                                              | 4.7                                                                     | 85.5                                                                  |
| SMAJ48A     | CX                  | YX | 53.3                                                                         | 58.9 | 1.0                                    | 48                                          | 1.0                                                                              | 5.2                                                                     | 77.4                                                                  |
| SMAJ51      | CY                  | YY | 56.7                                                                         | 69.3 | 1.0                                    | 51                                          | 1.0                                                                              | 4.4                                                                     | 91.1                                                                  |
| SMAJ51A     | CZ                  | YZ | 56.7                                                                         | 62.7 | 1.0                                    | 51                                          | 1.0                                                                              | 4.9                                                                     | 82.4                                                                  |
| SMAJ54      | RD                  | ZD | 60.0                                                                         | 73.3 | 1.0                                    | 54                                          | 1.0                                                                              | 4.2                                                                     | 96.3                                                                  |
| SMAJ54A     | RE                  | ZE | 60.0                                                                         | 66.3 | 1.0                                    | 54                                          | 1.0                                                                              | 4.6                                                                     | 87.1                                                                  |
| SMAJ58      | RF                  | ZF | 64.4                                                                         | 78.7 | 1.0                                    | 58                                          | 1.0                                                                              | 3.9                                                                     | 103                                                                   |
| SMAJ58A     | RG                  | ZG | 64.4                                                                         | 71.2 | 1.0                                    | 58                                          | 1.0                                                                              | 4.3                                                                     | 93.6                                                                  |
| SMAJ60      | RH                  | ZH | 66.7                                                                         | 81.5 | 1.0                                    | 60                                          | 1.0                                                                              | 3.7                                                                     | 107                                                                   |
| SMAJ60A     | RK                  | ZK | 66.7                                                                         | 73.7 | 1.0                                    | 60                                          | 1.0                                                                              | 4.1                                                                     | 96.8                                                                  |
| SMAJ64      | RL                  | ZL | 71.1                                                                         | 86.9 | 1.0                                    | 64                                          | 1.0                                                                              | 3.5                                                                     | 114                                                                   |
| SMAJ64A     | RM                  | ZM | 71.1                                                                         | 78.6 | 1.0                                    | 64                                          | 1.0                                                                              | 3.9                                                                     | 103                                                                   |
| SMAJ70      | RN                  | ZN | 77.8                                                                         | 95.1 | 1.0                                    | 70                                          | 1.0                                                                              | 3.2                                                                     | 125                                                                   |
| SMAJ70A     | RP                  | ZP | 77.8                                                                         | 86.0 | 1.0                                    | 70                                          | 1.0                                                                              | 3.5                                                                     | 113                                                                   |
| SMAJ75      | RQ                  | ZQ | 83.3                                                                         | 102  | 1.0                                    | 75                                          | 1.0                                                                              | 3.0                                                                     | 134                                                                   |
| SMAJ75A     | RR                  | ZR | 83.3                                                                         | 92.1 | 1.0                                    | 75                                          | 1.0                                                                              | 3.3                                                                     | 121                                                                   |
| SMAJ78      | RS                  | ZS | 86.7                                                                         | 106  | 1.0                                    | 78                                          | 1.0                                                                              | 2.9                                                                     | 139                                                                   |
| SMAJ78A     | RT                  | ZT | 86.7                                                                         | 95.8 | 1.0                                    | 78                                          | 1.0                                                                              | 3.2                                                                     | 126                                                                   |
| SMAJ85      | RU                  | ZU | 94.4                                                                         | 115  | 1.0                                    | 85                                          | 1.0                                                                              | 2.0                                                                     | 151                                                                   |
| SMAJ85A     | RV                  | ZV | 94.4                                                                         | 104  | 1.0                                    | 85                                          | 1.0                                                                              | 2.2                                                                     | 137                                                                   |
| SMAJ90      | RW                  | ZW | 100                                                                          | 122  | 1.0                                    | 90                                          | 1.0                                                                              | 1.9                                                                     | 160                                                                   |
| SMAJ90A     | RX                  | ZX | 100                                                                          | 111  | 1.0                                    | 90                                          | 1.0                                                                              | 2.1                                                                     | 146                                                                   |
| SMAJ100     | RY                  | ZY | 111                                                                          | 136  | 1.0                                    | 100                                         | 1.0                                                                              | 1.7                                                                     | 179                                                                   |
| SMAJ100A    | RZ                  | ZZ | 111                                                                          | 123  | 1.0                                    | 100                                         | 1.0                                                                              | 1.9                                                                     | 162                                                                   |
| SMAJ110     | VD                  | VD | 122                                                                          | 149  | 1.0                                    | 110                                         | 1.0                                                                              | 1.5                                                                     | 196                                                                   |
| SMAJ110A    | SE                  | VE | 122                                                                          | 135  | 1.0                                    | 110                                         | 1.0                                                                              | 1.7                                                                     | 177                                                                   |
| SMAJ120     | SF                  | VF | 133                                                                          | 163  | 1.0                                    | 120                                         | 1.0                                                                              | 1.4                                                                     | 214                                                                   |
| SMAJ120A    | VG                  | VG | 133                                                                          | 147  | 1.0                                    | 120                                         | 1.0                                                                              | 1.6                                                                     | 193                                                                   |
| SMAJ130     | SH                  | VH | 144                                                                          | 176  | 1.0                                    | 130                                         | 1.0                                                                              | 1.3                                                                     | 231                                                                   |
| SMAJ130A    | VK                  | VK | 144                                                                          | 159  | 1.0                                    | 130                                         | 1.0                                                                              | 1.4                                                                     | 209                                                                   |
| SMAJ150     | SL                  | VL | 167                                                                          | 204  | 1.0                                    | 150                                         | 1.0                                                                              | 1.1                                                                     | 268                                                                   |
| SMAJ150A    | VM                  | VM | 167                                                                          | 185  | 1.0                                    | 150                                         | 1.0                                                                              | 1.2                                                                     | 243                                                                   |
| SMAJ160     | SN                  | VN | 178                                                                          | 218  | 1.0                                    | 160                                         | 1.0                                                                              | 1.0                                                                     | 287                                                                   |
| SMAJ160A    | SP                  | VP | 178                                                                          | 197  | 1.0                                    | 160                                         | 1.0                                                                              | 1.2                                                                     | 259                                                                   |
| SMAJ170     | SQ                  | VQ | 189                                                                          | 231  | 1.0                                    | 170                                         | 1.0                                                                              | 0.99                                                                    | 304                                                                   |
| SMAJ170A    | SR                  | VR | 189                                                                          | 209  | 1.0                                    | 170                                         | 1.0                                                                              | 1.09                                                                    | 275                                                                   |
| SMAJ188     | ST                  | VT | 209                                                                          | 255  | 1.0                                    | 188                                         | 1.0                                                                              | 0.90                                                                    | 344                                                                   |
| SMAJ188A    | SS                  | VS | 209                                                                          | 231  | 1.0                                    | 188                                         | 1.0                                                                              | 0.91                                                                    | 328                                                                   |

**Notes:**

- (1) Pulse test: t<sub>p</sub> ≤ 50 ms
- (2) Surge current waveform per Fig. 3 and derate per Fig. 2
- (3) For bi-directional types having V<sub>WM</sub> of 10 V and less, the I<sub>D</sub> limit is doubled
- (4) All terms and symbols are consistent with ANSI/IEEE C62.35
- (5) For the bi-directional SMAJ5.0CA, the maximum V<sub>BR</sub> is 7.25 V
- (6) V<sub>F</sub> = 3.5 V at I<sub>F</sub> = 25 A (uni-directional only)

# SMAJ5.0 -SMAJ188 CA Typical Characteristics

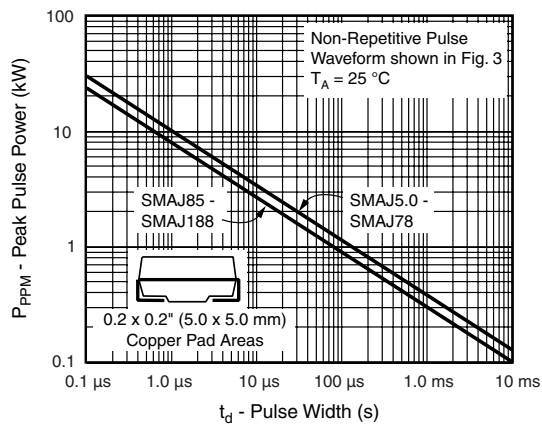


Figure 1. Peak Pulse Power Rating Curve

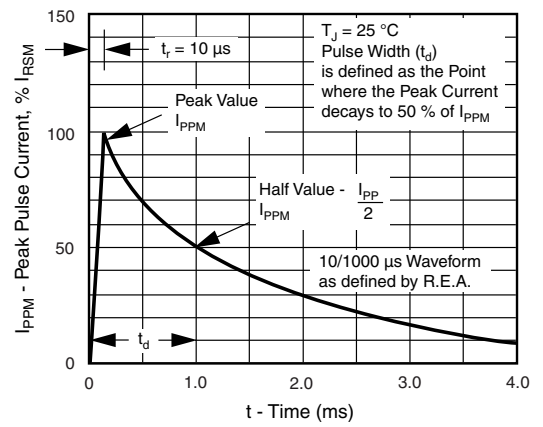


Figure 3. Pulse Waveform

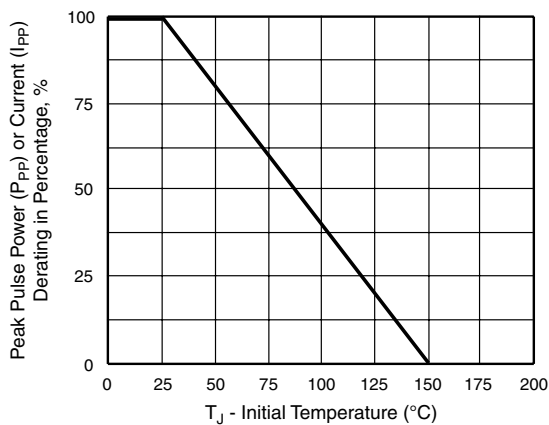


Figure 2. Pulse Power or Current vs. Initial Junction Temperature

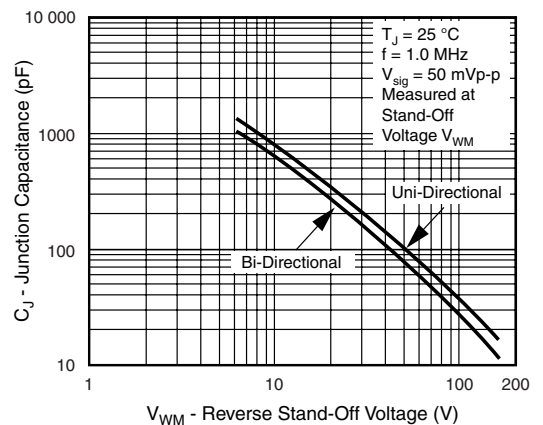


Figure 4. Typical Junction Capacitance

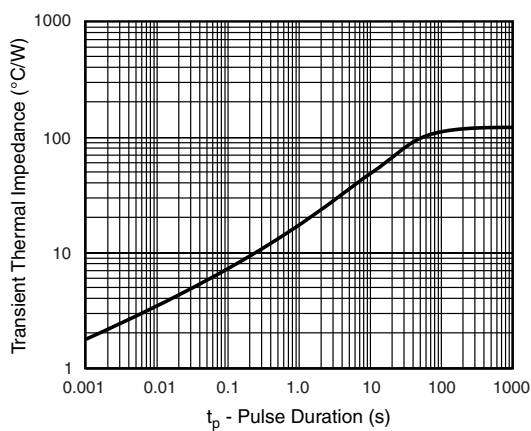


Figure 5. Typical Transient Thermal Impedance

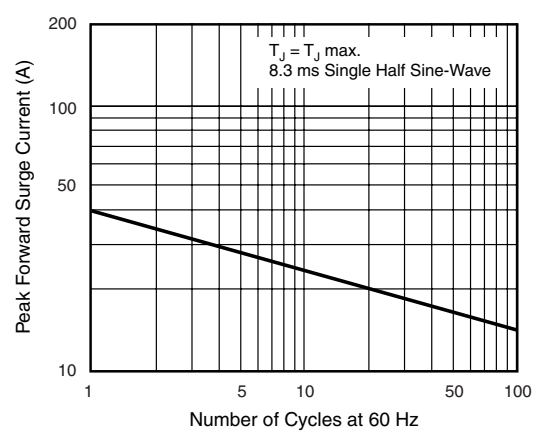


Figure 6. Maximum Non-Repetitive Forward Surge Current  
Uni-Directional Only