

# Surface Mount TRANSZORB® Transient Voltage Suppressors



DO-214AB (SMC)

## PRIMARY CHARACTERISTICS

|                                  |                                 |
|----------------------------------|---------------------------------|
| $V_{WM}$                         | 5.8 V to 459 V                  |
| $V_{BR}$ (uni-directional)       | 6.8 V to 540 V                  |
| $V_{BR}$ (bi-directional)        | 6.8 V to 220 V                  |
| $P_{PPM}$                        | 1500 W                          |
| $P_D$                            | 6.5 W                           |
| $I_{FSM}$ (uni-directional only) | 200 A                           |
| $T_J$ max.                       | 150 °C                          |
| Polarity                         | Uni-directional, bi-directional |
| Package                          | DO-214AB (SMC)                  |

## DEVICES FOR BI-DIRECTION APPLICATIONS

For bi-directional devices use CA suffix (e.g. 1.5SMC220CA).

Electrical characteristics apply in both directions.

## FEATURES

- Low profile package
- Ideal for automated placement
- Glass passivated chip junction
- Available in uni-directional and bi-directional
- 1500 W peak pulse power capability with a 10/1000  $\mu$ s waveform, repetitive rate (duty cycle): 0.01 %
- 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
- AEC-Q101 qualified
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT

## TYPICAL APPLICATIONS

Use in sensitive electronics protection against voltage transients induced by inductive load switching and lighting on ICs, MOSFET, signal lines of sensor units for consumer, computer, industrial, automotive, and telecommunication.

## MECHANICAL DATA

**Case:** DO-214AB (SMC)

Molding compound meets UL 94 V-0 flammability rating  
Base P/N-E3 - RoHS compliant and commercial grade  
Base P/NHE3 - RoHS compliant and AEC-Q101 qualified  
Base P/NHE3\_X - RoHS-compliant and AEC-Q101 qualified  
("X" denotes revision code e.g. A, B, ....)

**Terminals:** Matte tin plated leads, solderable per J-STD-002 and JESD 22-B102

E3 suffix meets JESD 201 class 1A whisker test, HE3 suffix meets JESD 201 class 2 whisker test

**Polarity:** For uni-directional types the band denotes cathode end, no marking on bi-directional types

## MAXIMUM RATINGS ( $T_A = 25$ °C unless otherwise noted)

| PARAMETER                                                                                   | SYMBOL         | VALUE          | UNIT |
|---------------------------------------------------------------------------------------------|----------------|----------------|------|
| Peak power dissipation with a 10/1000 $\mu$ s waveform <sup>(1)(2)</sup> (fig. 1)           | $P_{PPM}$      | 1500           | W    |
| Peak pulse current with a 10/1000 $\mu$ s waveform <sup>(1)</sup> (fig. 3)                  | $I_{PPM}$      | See next table | A    |
| Power dissipation on infinite heatsink at $T_A = 50$ °C                                     | $P_D$          | 6.5            | W    |
| Peak forward surge current 8.3 ms single half sine-wave uni-directional only <sup>(2)</sup> | $I_{FSM}$      | 200            | A    |
| Operating junction and storage temperature range                                            | $T_J, T_{STG}$ | - 65 to + 150  | °C   |

### Notes

<sup>(1)</sup> Non-repetitive current pulse, per fig. 3 and derated above  $T_A = 25$  °C per fig. 2.

<sup>(2)</sup> Mounted on 0.31" x 0.31" (8.0 mm x 8.0 mm) copper pads to each terminal

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

| PART NUMBER | DEVICE MARKING CODE |      | BREAKDOWN VOLTAGE $V_{BR}$ AT $I_T$ <sup>(1)</sup> (V) |      | TEST CURRENT $I_T$ (mA) | STAND-OFF VOLTAGE $V_{WM}$ (V) | MAXIMUM REVERSE LEAKAGE AT $V_{WM}$ $I_D$ <sup>(4)</sup> ( $\mu\text{A}$ ) | MAXIMUM PEAK PULSE CURRENT $I_{PPM}$ <sup>(2)</sup> (A) | MAXIMUM CLAMPING VOLTAGE AT $I_{PPM}$ $V_C$ (V) | MAXIMUM TEMPERATURE COEFFICIENT OF $V_{BR}$ (%/ $^{\circ}\text{C}$ ) |
|-------------|---------------------|------|--------------------------------------------------------|------|-------------------------|--------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------|----------------------------------------------------------------------|
|             | UNI                 | BI   | MIN.                                                   | MAX. |                         |                                |                                                                            |                                                         |                                                 |                                                                      |
| 1.5SMC6.8A  | 6V8A                | 6V8C | 6.45                                                   | 7.14 | 10                      | 5.80                           | 1000                                                                       | 143                                                     | 10.5                                            | 0.057                                                                |
| 1.5SMC7.5A  | 7V5A                | 7V5C | 7.13                                                   | 7.88 | 10                      | 6.40                           | 500                                                                        | 133                                                     | 11.3                                            | 0.061                                                                |
| 1.5SMC8.2A  | 8V2A                | 8V2C | 7.79                                                   | 8.61 | 10                      | 7.02                           | 200                                                                        | 124                                                     | 12.1                                            | 0.065                                                                |
| 1.5SMC9.1A  | 9V1A                | 9V1C | 8.65                                                   | 9.55 | 1.0                     | 7.78                           | 50                                                                         | 112                                                     | 13.4                                            | 0.068                                                                |
| 1.5SMC10A   | 10A                 | 10C  | 9.50                                                   | 10.5 | 1.0                     | 8.55                           | 10                                                                         | 103                                                     | 14.5                                            | 0.073                                                                |
| 1.5SMC11A   | 11A                 | 11C  | 10.5                                                   | 11.6 | 1.0                     | 9.40                           | 5.0                                                                        | 96.2                                                    | 15.6                                            | 0.075                                                                |
| 1.5SMC12A   | 12A                 | 12C  | 11.4                                                   | 12.6 | 1.0                     | 10.2                           | 5.0                                                                        | 89.8                                                    | 16.7                                            | 0.078                                                                |
| 1.5SMC13A   | 13A                 | 13C  | 12.4                                                   | 13.7 | 1.0                     | 11.1                           | 5.0                                                                        | 82.4                                                    | 18.2                                            | 0.081                                                                |
| 1.5SMC15A   | 15A                 | 15C  | 14.3                                                   | 15.8 | 1.0                     | 12.8                           | 1.0                                                                        | 70.8                                                    | 21.2                                            | 0.084                                                                |
| 1.5SMC16A   | 16A                 | 16C  | 15.2                                                   | 16.8 | 1.0                     | 13.6                           | 1.0                                                                        | 66.7                                                    | 22.5                                            | 0.086                                                                |
| 1.5SMC18A   | 18A                 | 18C  | 17.1                                                   | 18.9 | 1.0                     | 15.3                           | 1.0                                                                        | 59.5                                                    | 25.2                                            | 0.089                                                                |
| 1.5SMC20A   | 20A                 | 20C  | 19.0                                                   | 21.0 | 1.0                     | 17.1                           | 1.0                                                                        | 54.2                                                    | 27.7                                            | 0.090                                                                |
| 1.5SMC22A   | 22A                 | 22C  | 20.9                                                   | 23.1 | 1.0                     | 18.8                           | 1.0                                                                        | 49.0                                                    | 30.6                                            | 0.092                                                                |
| 1.5SMC24A   | 24A                 | 24C  | 22.8                                                   | 25.2 | 1.0                     | 20.5                           | 1.0                                                                        | 45.2                                                    | 33.2                                            | 0.090                                                                |
| 1.5SMC27A   | 27A                 | 27C  | 25.7                                                   | 28.4 | 1.0                     | 23.1                           | 1.0                                                                        | 40.0                                                    | 37.5                                            | 0.096                                                                |
| 1.5SMC30A   | 30A                 | 30C  | 28.5                                                   | 31.5 | 1.0                     | 25.6                           | 1.0                                                                        | 36.2                                                    | 41.4                                            | 0.097                                                                |
| 1.5SMC33A   | 33A                 | 33C  | 31.4                                                   | 34.7 | 1.0                     | 28.2                           | 1.0                                                                        | 32.8                                                    | 45.7                                            | 0.098                                                                |
| 1.5SMC36A   | 36A                 | 36C  | 34.2                                                   | 37.8 | 1.0                     | 30.8                           | 1.0                                                                        | 30.1                                                    | 49.9                                            | 0.099                                                                |
| 1.5SMC39A   | 39A                 | 39C  | 37.1                                                   | 41.0 | 1.0                     | 33.3                           | 1.0                                                                        | 27.8                                                    | 53.9                                            | 0.100                                                                |
| 1.5SMC43A   | 43A                 | 43C  | 40.9                                                   | 45.2 | 1.0                     | 36.8                           | 1.0                                                                        | 25.3                                                    | 59.3                                            | 0.101                                                                |
| 1.5SMC47A   | 47A                 | 47C  | 44.7                                                   | 49.4 | 1.0                     | 40.2                           | 1.0                                                                        | 23.1                                                    | 64.8                                            | 0.101                                                                |
| 1.5SMC51A   | 51A                 | 51C  | 48.5                                                   | 53.6 | 1.0                     | 43.6                           | 1.0                                                                        | 21.4                                                    | 70.1                                            | 0.102                                                                |
| 1.5SMC56A   | 56A                 | 56C  | 53.2                                                   | 58.8 | 1.0                     | 47.8                           | 1.0                                                                        | 19.5                                                    | 77.0                                            | 0.103                                                                |
| 1.5SMC62A   | 62A                 | 62C  | 58.9                                                   | 65.1 | 1.0                     | 53.0                           | 1.0                                                                        | 17.6                                                    | 85.0                                            | 0.104                                                                |
| 1.5SMC68A   | 68A                 | 68C  | 64.6                                                   | 71.4 | 1.0                     | 58.1                           | 1.0                                                                        | 16.3                                                    | 92.0                                            | 0.104                                                                |
| 1.5SMC75A   | 75A                 | 75C  | 71.3                                                   | 78.8 | 1.0                     | 64.1                           | 1.0                                                                        | 14.6                                                    | 104                                             | 0.105                                                                |
| 1.5SMC82A   | 82A                 | 82C  | 77.9                                                   | 86.1 | 1.0                     | 70.1                           | 1.0                                                                        | 13.3                                                    | 113                                             | 0.105                                                                |
| 1.5SMC91A   | 91A                 | 91C  | 86.5                                                   | 95.5 | 1.0                     | 77.8                           | 1.0                                                                        | 12.0                                                    | 125                                             | 0.106                                                                |
| 1.5SMC100A  | 100A                | 100C | 95.0                                                   | 105  | 1.0                     | 85.5                           | 1.0                                                                        | 10.9                                                    | 137                                             | 0.106                                                                |
| 1.5SMC110A  | 110A                | 110C | 105                                                    | 116  | 1.0                     | 94.0                           | 1.0                                                                        | 9.9                                                     | 152                                             | 0.107                                                                |
| 1.5SMC120A  | 120A                | 120C | 114                                                    | 126  | 1.0                     | 102                            | 1.0                                                                        | 9.1                                                     | 165                                             | 0.107                                                                |
| 1.5SMC130A  | 130A                | 130C | 124                                                    | 137  | 1.0                     | 111                            | 1.0                                                                        | 8.4                                                     | 179                                             | 0.107                                                                |
| 1.5SMC150A  | 150A                | 150C | 143                                                    | 158  | 1.0                     | 128                            | 1.0                                                                        | 7.2                                                     | 207                                             | 0.106                                                                |
| 1.5SMC160A  | 160A                | 160C | 152                                                    | 168  | 1.0                     | 136                            | 1.0                                                                        | 6.8                                                     | 219                                             | 0.108                                                                |
| 1.5SMC170A  | 170A                | 170C | 162                                                    | 179  | 1.0                     | 145                            | 1.0                                                                        | 6.4                                                     | 234                                             | 0.108                                                                |
| 1.5SMC180A  | 180A                | 180C | 171                                                    | 189  | 1.0                     | 154                            | 1.0                                                                        | 6.1                                                     | 246                                             | 0.108                                                                |
| 1.5SMC200A  | 200A                | 200C | 190                                                    | 210  | 1.0                     | 171                            | 1.0                                                                        | 5.5                                                     | 274                                             | 0.108                                                                |
| 1.5SMC220A  | 220A                | 220C | 209                                                    | 231  | 1.0                     | 185                            | 1.0                                                                        | 4.6                                                     | 328                                             | 0.108                                                                |
| 1.5SMC250A  | 250A                | -    | 237                                                    | 263  | 1.0                     | 214                            | 1.0                                                                        | 4.4                                                     | 344                                             | 0.110                                                                |
| 1.5SMC300A  | 300A                | -    | 285                                                    | 315  | 1.0                     | 256                            | 1.0                                                                        | 3.6                                                     | 414                                             | 0.110                                                                |
| 1.5SMC350A  | 350A                | -    | 333                                                    | 368  | 1.0                     | 300                            | 1.0                                                                        | 3.1                                                     | 482                                             | 0.110                                                                |
| 1.5SMC400A  | 400A                | -    | 380                                                    | 420  | 1.0                     | 342                            | 1.0                                                                        | 2.7                                                     | 548                                             | 0.110                                                                |
| 1.5SMC440A  | 440A                | -    | 418                                                    | 462  | 1.0                     | 376                            | 1.0                                                                        | 2.5                                                     | 602                                             | 0.110                                                                |
| 1.5SMC480A  | 480A                | -    | 456                                                    | 504  | 1.0                     | 408                            | 1.0                                                                        | 2.28                                                    | 658                                             | 0.110                                                                |
| 1.5SMC510A  | 510A                | -    | 485                                                    | 535  | 1.0                     | 434                            | 1.0                                                                        | 2.15                                                    | 698                                             | 0.110                                                                |
| 1.5SMC540A  | 540A                | -    | 513                                                    | 567  | 1.0                     | 459                            | 1.0                                                                        | 2.03                                                    | 740                                             | 0.110                                                                |

**Notes**

- (1) Pulse test:  $t_p \leq 50\text{ ms}$   
(2) Surge current waveform per fig. 3 and derate per fig. 2  
(3) All terms and symbols are consistent with ANSI/IEEE CA62.35  
(4) For bi-directional types with  $V_R$  of 10 V and less, the  $I_D$  limit is doubled  
(5)  $V_F = 3.5\text{ V}$  at  $I_F = 100\text{ A}$  (uni-directional only)

| THERMAL CHARACTERISTICS ( $T_A = 25\text{ }^{\circ}\text{C}$ unless otherwise noted) |                 |       |                      |
|--------------------------------------------------------------------------------------|-----------------|-------|----------------------|
| PARAMETER                                                                            | SYMBOL          | VALUE | UNIT                 |
| Typical thermal resistance, junction to ambient air <sup>(1)</sup>                   | $R_{\theta JA}$ | 75    | $^{\circ}\text{C/W}$ |
| Typical thermal resistance, junction to leads                                        | $R_{\theta JL}$ | 15    |                      |

**Note**
<sup>(1)</sup> Mounted on minimum recommended pad layout

| ORDERING INFORMATION (Example)   |                 |                   |            |              |               |                                    |
|----------------------------------|-----------------|-------------------|------------|--------------|---------------|------------------------------------|
| PREFERRED P/N                    | UNIT WEIGHT (g) | VOLTAGE RANGE (V) |            | PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                      |
|                                  |                 | UNI -             | BI -       |              |               |                                    |
| 1.5SMC6.8A-E3/57T                | 0.211           | 6.8 to 540        | 6.8 to 220 | 57T          | 850           | 7" diameter plastic tape and reel  |
| 1.5SMC6.8A-E3/9AT                | 0.211           | 6.8 to 540        | 6.8 to 220 | 9AT          | 3500          | 13" diameter plastic tape and reel |
| 1.5SMC6.8AHE3/57T <sup>(1)</sup> | 0.211           | 6.8 to 540        | 6.8 to 220 | 57T          | 850           | 7" diameter plastic tape and reel  |
| 1.5SMC6.8AHE3/9AT <sup>(1)</sup> | 0.211           | 6.8 to 540        | 6.8 to 220 | 9AT          | 3500          | 13" diameter plastic tape and reel |
| 1.5SMC250AHE3_A/H <sup>(1)</sup> | 0.211           | 250 to 540        | -          | H            | 850           | 7" diameter plastic tape and reel  |
| 1.5SMC250AHE3_A/I <sup>(1)</sup> | 0.211           | 250 to 540        | -          | I            | 3500          | 13" diameter plastic tape and reel |

**Note**
<sup>(1)</sup> AEC-Q101 qualified

## RATINGS AND CHARACTERISTICS CURVES ( $T_A = 25\text{ }^{\circ}\text{C}$ unless otherwise noted)

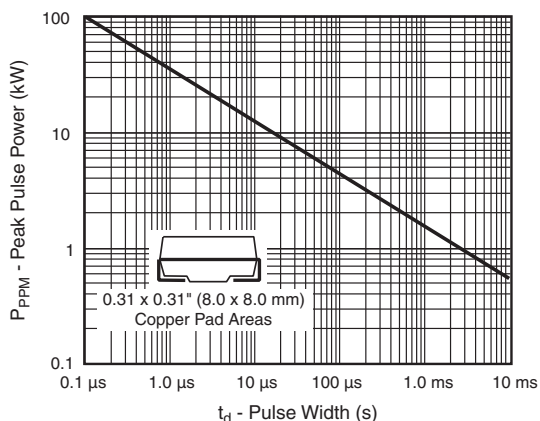


Fig. 1 - Peak Pulse Power Rating Curve

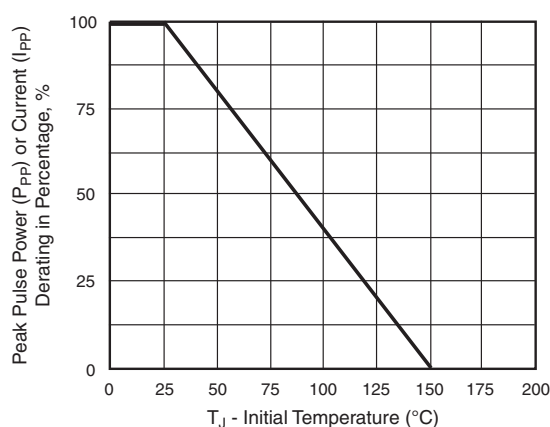


Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature

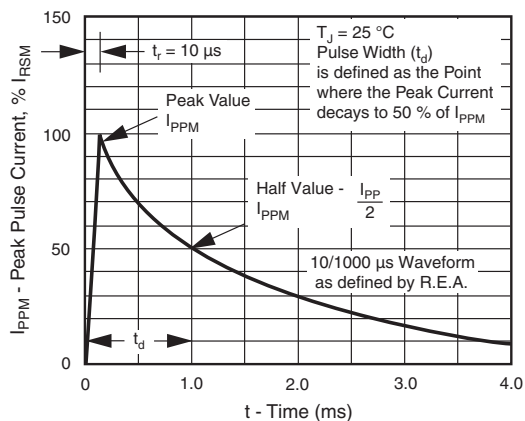


Fig. 3 - Pulse Waveform

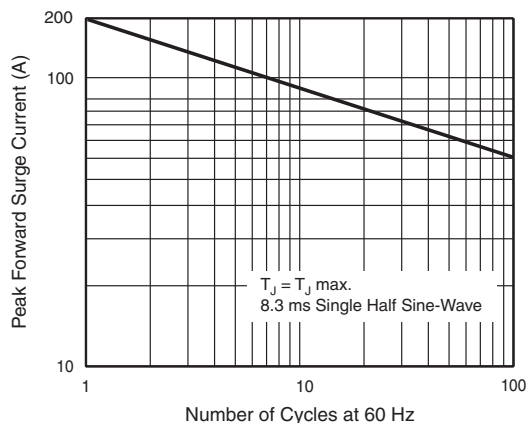


Fig. 6 - Maximum Non-Repetitive Forward Surge Current  
Uni-Directional Use Only

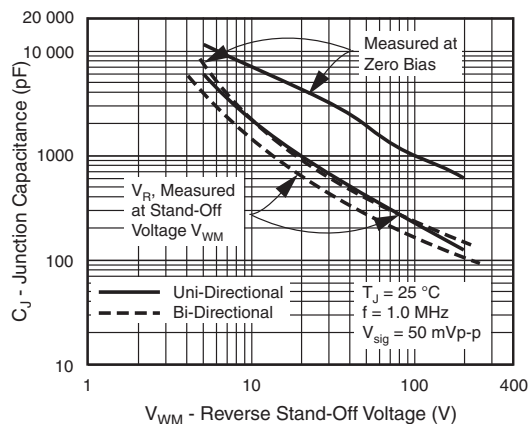


Fig. 4 - Typical Junction Capacitance Uni-Directional

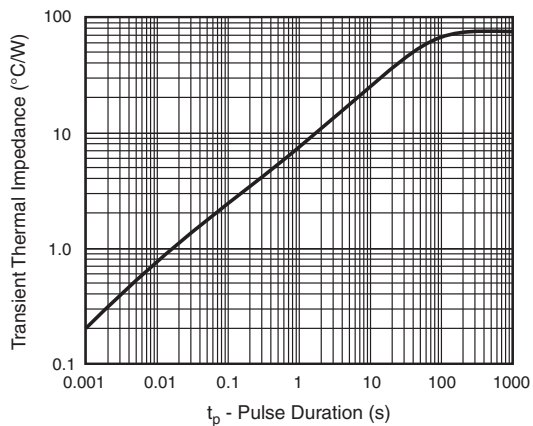
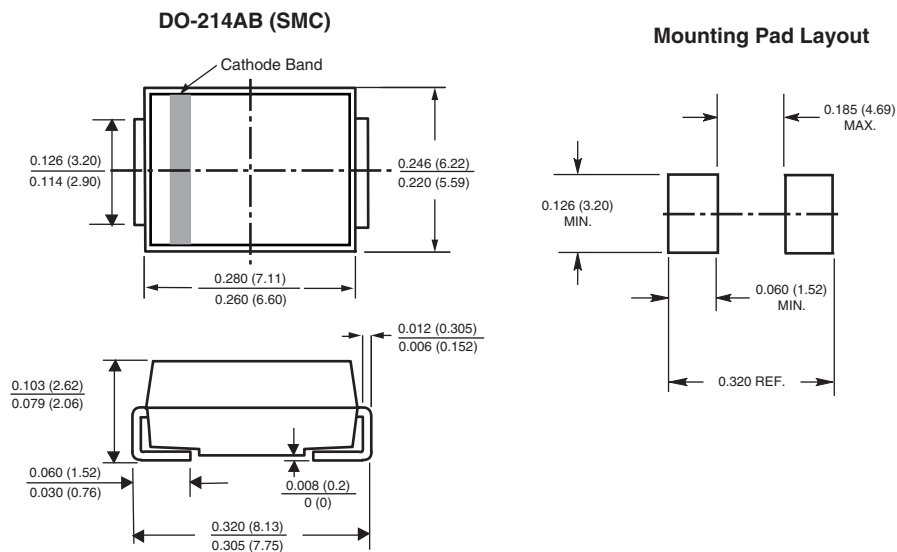


Fig. 5 - Typical Transient Thermal Impedance



### PACKAGE OUTLINE DIMENSIONS in inches (millimeters)





## Disclaimer

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## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

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