



# Surface Mount TRANSZORB® Transient Voltage Suppressors



DO-214AC (SMA)

### 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
- AEC-Q101 qualified
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



RoHS  
COMPLIANT

| PRIMARY CHARACTERISTICS         |                                 |
|---------------------------------|---------------------------------|
| V <sub>BR</sub> uni-directional | 6.40 V to 231 V                 |
| V <sub>BR</sub> bi-directional  | 6.40 V to 231 V                 |
| V <sub>WM</sub>                 | 5.0 V to 188 V                  |
| P <sub>PPM</sub>                | 400 W, 300 W                    |
| I <sub>FSM</sub>                | 40 A                            |
| T <sub>J</sub> max.             | 150 °C                          |
| Polarity                        | Uni-directional, bi-directional |
| Package                         | DO-214AC (SMA)                  |

### DEVICES FOR BI-DIRECTION APPLICATIONS

For bi-directional use CA suffix (e.g. SMAJ10CA).  
Electrical characteristics apply in both directions.

### MECHANICAL DATA

**Case:** DO-214AC (SMA)  
Molding compound meets UL 94 V-0 flammability rating  
Base P/N-E3 - RoHS compliant, commercial grade  
Base P/NHE3 - RoHS compliant, AEC-Q101 qualified

**Terminals:** Matte tin plated leads, solderable per J-STD-002 and JESD 22-B102  
M3 suffix meets JESD 201 class 1A whisker test

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

| MAXIMUM RATINGS (T <sub>A</sub> = 25 °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

- <sup>(1)</sup> Non-repetitive current pulse, per fig. 3 and derated above T<sub>A</sub> = 25 °C per fig. 2. Rating is 300 W above 78 V
- <sup>(2)</sup> Mounted on 0.2" x 0.2" (5.0 mm x 5.0 mm) copper pads to each terminal



| ELECTRICAL CHARACTERISTICS (T <sub>A</sub> = 25 °C unless otherwise noted) |                     |    |  |      |                                  |                                       |  |   |   |
|--|---------------------|----|--|------|----------------------------------|---------------------------------------|--|---|---|
| DEVICE TYPE  | DEVICE MARKING CODE |    | BREAKDOWN VOLTAGE V <sub>BR</sub> AT I <sub>T</sub> (1)<br>(V) |      | TEST CURRENT I <sub>T</sub> (mA) | STAND-OFF VOLTAGE V <sub>WM</sub> (V) | MAXIMUM REVERSE LEAKAGE AT V <sub>WM</sub> I <sub>D</sub> (μA) (3) | MAXIMUM PEAK PULSE SURGE CURRENT I <sub>PPM</sub> (A) (2) | MAXIMUM CLAMPING VOLTAGE AT I <sub>PPM</sub> V <sub>C</sub> (V) |
|  | UNI                 | BI | MIN.   | MAX. |                                  |                                       |  |   |   |
| SMAJ5.0A (5)   | AE                  | WE | 6.40   | 7.07 | 10                               | 5.0                                   | 800  | 43.5  | 9.2   |
| SMAJ6.0A   | AG                  | WG | 6.67   | 7.37 | 10                               | 6.0                                   | 800  | 38.8  | 10.3  |
| SMAJ6.5A   | AK                  | WK | 7.22   | 7.98 | 10                               | 6.5                                   | 500  | 35.7  | 11.2  |
| SMAJ7.0A   | AM                  | WM | 7.78   | 8.60 | 10                               | 7.0                                   | 200  | 33.3  | 12.0  |
| SMAJ7.5A   | AP                  | WP | 8.33   | 9.21 | 1.0                              | 7.5                                   | 100  | 31.0  | 12.9  |
| SMAJ8.0A   | AR                  | WR | 8.89   | 9.83 | 1.0                              | 8.0                                   | 50   | 29.4  | 13.6  |
| SMAJ8.5A   | AT                  | WT | 9.44   | 10.4 | 1.0                              | 8.5                                   | 10   | 27.8  | 14.4  |
| SMAJ9.0A   | AV                  | WV | 10.0   | 11.1 | 1.0                              | 9.0                                   | 5.0  | 26.0  | 15.4  |
| SMAJ10A  | AX                  | WX | 11.1   | 12.3 | 1.0                              | 10                                    | 1.0  | 23.5  | 17.0  |
| SMAJ11A  | AZ                  | WZ | 12.2   | 13.5 | 1.0                              | 11                                    | 1.0  | 22.0  | 18.2  |
| SMAJ12A  | BE                  | XE | 13.3   | 14.7 | 1.0                              | 12                                    | 1.0  | 20.1  | 19.9  |
| SMAJ13A  | BG                  | XG | 14.4   | 15.9 | 1.0                              | 13                                    | 1.0  | 18.6  | 21.5  |
| SMAJ14A  | BK                  | XK | 15.6   | 17.2 | 1.0                              | 14                                    | 1.0  | 17.2  | 23.2  |
| SMAJ15A  | BM                  | XM | 16.7   | 18.5 | 1.0                              | 15                                    | 1.0  | 16.4  | 24.4  |
| SMAJ16A  | BP                  | XP | 17.8   | 19.7 | 1.0                              | 16                                    | 1.0  | 15.4  | 26.0  |
| SMAJ17A  | BR                  | XR | 18.9   | 20.9 | 1.0                              | 17                                    | 1.0  | 14.5  | 27.6  |
| SMAJ18A  | BT                  | XT | 20.0   | 22.1 | 1.0                              | 18                                    | 1.0  | 13.7  | 29.2  |
| SMAJ20A  | BV                  | XV | 22.2   | 24.5 | 1.0                              | 20                                    | 1.0  | 12.3  | 32.4  |
| SMAJ22A  | BX                  | XX | 24.4   | 26.9 | 1.0                              | 22                                    | 1.0  | 11.3  | 35.5  |
| SMAJ24A  | BZ                  | XZ | 26.7   | 29.5 | 1.0                              | 24                                    | 1.0  | 10.3  | 38.9  |
| SMAJ26A  | CE                  | YE | 28.9   | 31.9 | 1.0                              | 26                                    | 1.0  | 9.5   | 42.1  |
| SMAJ28A  | CG                  | YG | 31.1   | 34.4 | 1.0                              | 28                                    | 1.0  | 8.8   | 45.4  |
| SMAJ30A  | CK                  | YK | 33.3   | 36.8 | 1.0                              | 30                                    | 1.0  | 8.3   | 48.4  |
| SMAJ33A  | CM                  | YM | 36.7   | 40.6 | 1.0                              | 33                                    | 1.0  | 7.5   | 53.3  |
| SMAJ36A  | CP                  | YP | 40.0   | 44.2 | 1.0                              | 36                                    | 1.0  | 6.9   | 58.1  |
| SMAJ40A  | CR                  | YR | 44.4   | 49.1 | 1.0                              | 40                                    | 1.0  | 6.2   | 64.5  |
| SMAJ43A  | CT                  | YT | 47.8   | 52.8 | 1.0                              | 43                                    | 1.0  | 5.8   | 69.4  |
| SMAJ45A  | CV                  | YV | 50.0   | 55.3 | 1.0                              | 45                                    | 1.0  | 5.5   | 72.7  |
| SMAJ48A  | CX                  | YX | 53.3   | 58.9 | 1.0                              | 48                                    | 1.0  | 5.2   | 77.4  |
| SMAJ51A  | CZ                  | YZ | 56.7   | 62.7 | 1.0                              | 51                                    | 1.0  | 4.9   | 82.4  |
| SMAJ54A  | RE                  | ZE | 60.0   | 66.3 | 1.0                              | 54                                    | 1.0  | 4.6   | 87.1  |
| SMAJ58A  | RG                  | ZG | 64.4   | 71.2 | 1.0                              | 58                                    | 1.0  | 4.3   | 93.6  |
| SMAJ60A  | RK                  | ZK | 66.7   | 73.7 | 1.0                              | 60                                    | 1.0  | 4.1   | 96.8  |
| SMAJ64A  | RM                  | ZM | 71.1   | 78.6 | 1.0                              | 64                                    | 1.0  | 3.9   | 103   |
| SMAJ70A  | RP                  | ZP | 77.8   | 86.0 | 1.0                              | 70                                    | 1.0  | 3.5   | 113   |
| SMAJ75A  | RR                  | ZR | 83.3   | 92.1 | 1.0                              | 75                                    | 1.0  | 3.3   | 121   |
| SMAJ78A  | RT                  | ZT | 86.7   | 95.8 | 1.0                              | 78                                    | 1.0  | 3.2   | 126   |
| SMAJ85A  | RV                  | ZV | 94.4   | 104  | 1.0                              | 85                                    | 1.0  | 2.2   | 137   |
| SMAJ90A  | RX                  | ZX | 100  | 111  | 1.0                              | 90                                    | 1.0  | 2.1   | 146   |
| SMAJ100A   | RZ                  | ZZ | 111  | 123  | 1.0                              | 100                                   | 1.0  | 1.9   | 162   |
| SMAJ110A   | SE                  | VE | 122  | 135  | 1.0                              | 110                                   | 1.0  | 1.7   | 177   |
| SMAJ120A   | VG                  | VG | 133  | 147  | 1.0                              | 120                                   | 1.0  | 1.6   | 193   |
| SMAJ130A   | VK                  | VK | 144  | 159  | 1.0                              | 130                                   | 1.0  | 1.4   | 209   |
| SMAJ150A   | VM                  | VM | 167  | 185  | 1.0                              | 150                                   | 1.0  | 1.2   | 243   |
| SMAJ160A   | SP                  | VP | 178  | 197  | 1.0                              | 160                                   | 1.0  | 1.2   | 259   |
| SMAJ170A   | SR                  | VR | 189  | 209  | 1.0                              | 170                                   | 1.0  | 1.09  | 275   |
| 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)

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

| PARAMETER  | SYMBOL          | VALUE | UNIT               |
|--|-----------------|-------|--------------------|
| Typical thermal resistance, junction to ambient <sup>(1)</sup> | $R_{\theta JA}$ | 120   | $^\circ\text{C/W}$ |
| Typical thermal resistance, junction to lead                   | $R_{\theta JL}$ | 30    | $^\circ\text{C/W}$ |

**Note**

(1) Mounted on minimum recommended pad layout

## ORDERING INFORMATION (Example)

| PREFERRED P/N                 | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                      |
|-------------------------------|-----------------|------------------------|---------------|------------------------------------|
| SMAJ5.0A-E3/61                | 0.064           | 61                     | 1800          | 7" diameter plastic tape and reel  |
| SMAJ5.0A-E3/5A                | 0.064           | 5A                     | 7500          | 13" diameter plastic tape and reel |
| SMAJ5.0AHE3/61 <sup>(1)</sup> | 0.064           | 61                     | 1800          | 7" diameter plastic tape and reel  |
| SMAJ5.0AHE3/5A <sup>(1)</sup> | 0.064           | 5A                     | 7500          | 13" diameter plastic tape and reel |

**Note**

(1) AEC-Q101 qualified

## RATINGS AND CHARACTERISTICS CURVES

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

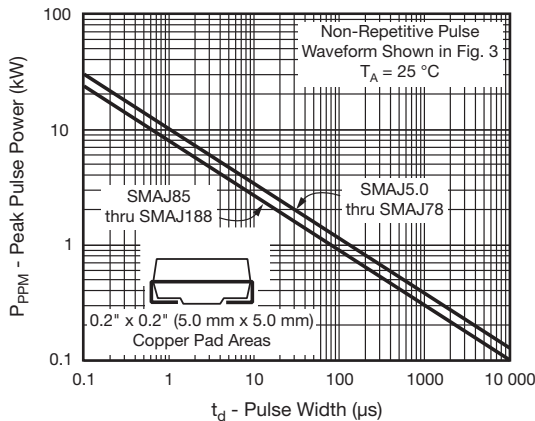


Fig. 1 - Peak Pulse Power Rating Curve

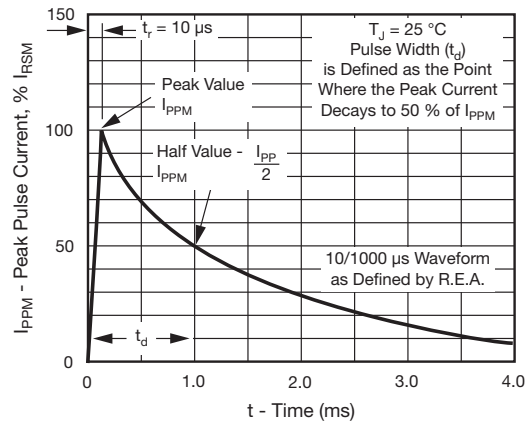


Fig. 3 - Pulse Waveform

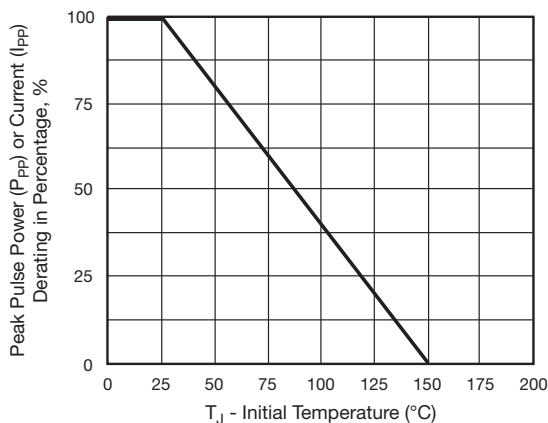


Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature

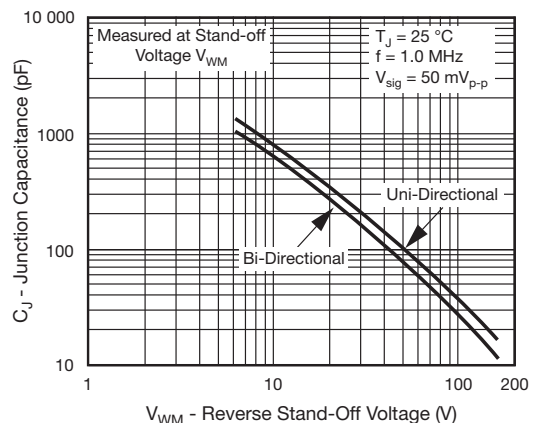


Fig. 4 - Typical Junction Capacitance

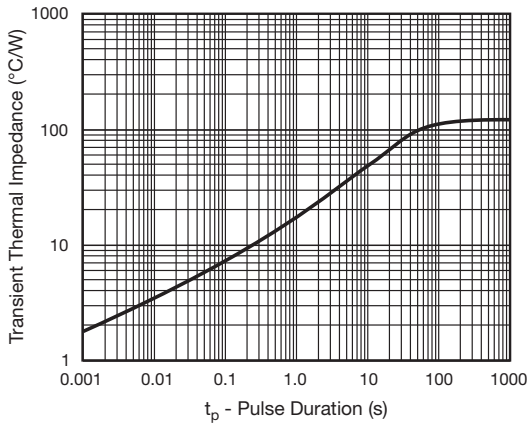


Fig. 5 - Typical Transient Thermal Impedance

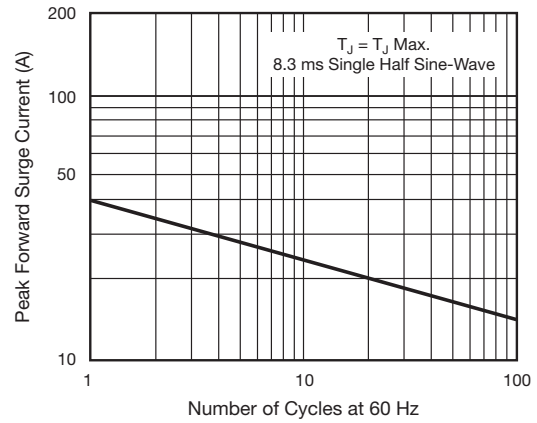
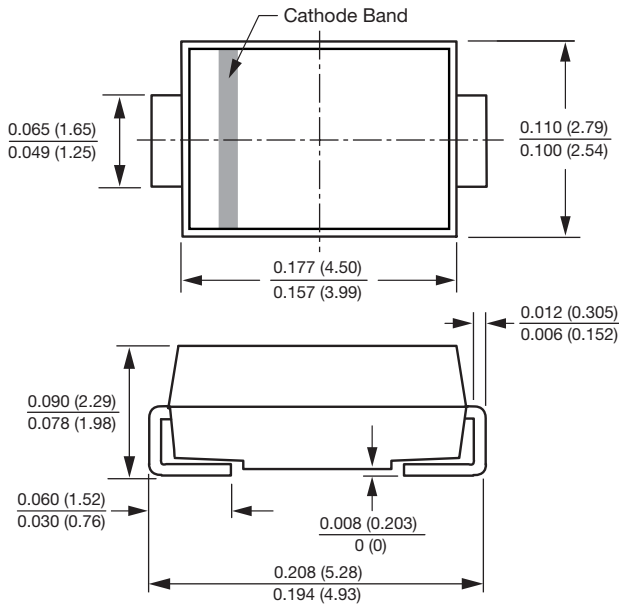


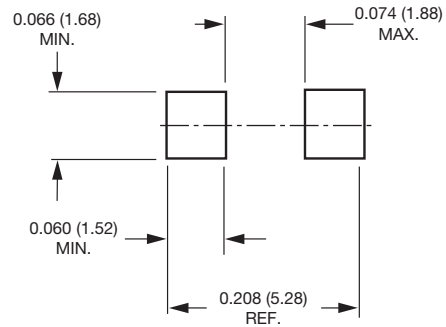
Fig. 6 - Maximum Non-Repetitive Forward Surge Current Uni-Directional Only

### PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

#### DO-214AC (SMA)



#### Mounting Pad Layout





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