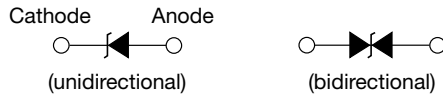


# Surface-Mount TRANSZORB<sup>®</sup> Transient Voltage Suppressors


**SMB (DO-214AA)**

**FEATURES**

- Low profile package
- Ideal for automated placement
- Glass passivated chip junction
- Available in unidirectional and bidirectional
- 600 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 available
  - Automotive ordering code: base P/NHE3 or P/NHM3
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**LINKS TO ADDITIONAL RESOURCES**


| PRIMARY CHARACTERISTICS         |                               |
|---------------------------------|-------------------------------|
| $V_{BR}$ (bidirectional)        | 6.4 V to 231 V                |
| $V_{BR}$ (unidirectional)       | 6.4 V to 231 V                |
| $V_{WM}$                        | 5.0 V to 188 V                |
| $P_{PPM}$                       | 600 W                         |
| $P_D$                           | 5.0 W                         |
| $I_{FSM}$ (unidirectional only) | 100 A                         |
| $T_J$ max.                      | 150 °C                        |
| Polarity                        | Unidirectional, bidirectional |
| Package                         | SMB (DO-214AA)                |

**MECHANICAL DATA**

**Case:** SMB (DO-214AA)

Molding compound meets UL 94 V-0 flammability rating  
 Base P/N-E3 - RoHS-compliant, commercial grade  
 Base P/N-M3 - halogen-free, RoHS-compliant, commercial grade  
 Base P/NHE3\_X - RoHS-compliant and AEC-Q101 qualified  
 Base P/NHM3\_X - halogen-free, 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, M3, HE3, and HM3 suffix meets JESD 201 class 2 whisker test

**Polarity:** for unidirectional types the band denotes cathode end, no marking on bidirectional types

**DEVICES FOR BIDIRECTION APPLICATIONS**

For bidirectional devices use CA suffix (e.g. SMBJ10CA).  
 Electrical characteristics apply in both directions.

**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, and telecommunication.

| MAXIMUM RATINGS ( $T_A = 25$ °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)    | $P_{PPM}$      | 600            | W    |
| Peak pulse current with a 10/1000 $\mu$ s waveform <sup>(1)</sup>                          | $I_{PPM}$      | See next table | A    |
| Power dissipation on infinite heatsink at $T_A = 50$ °C                                    | $P_D$          | 5.0            | W    |
| Peak forward surge current 8.3 ms single half sine-wave unidirectional only <sup>(2)</sup> | $I_{FSM}$      | 100            | A    |
| Operating junction and storage temperature range   | $T_J, T_{STG}$ | -55 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 0.2" 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<br>MODIFIED<br>"J" BEND<br>LEAD                                | DEVICE<br>MARKING<br>CODE |    | BREAKDOWN<br>VOLTAGE<br>V <sub>BR</sub> AT I <sub>T</sub> (1)<br>(V) |      | TEST<br>CURRENT<br>I <sub>T</sub><br>(mA) | STAND-OFF<br>VOLTAGE<br>V <sub>WM</sub><br>(V) | MAXIMUM<br>REVERSE<br>LEAKAGE<br>AT V <sub>WM</sub><br>I <sub>D</sub> (μA) (3) | MAXIMUM<br>PEAK PULSE<br>SURGE<br>CURRENT<br>I <sub>PPM</sub> (A) (2) | MAXIMUM<br>CLAMPING<br>VOLTAGE AT<br>I <sub>PPM</sub><br>V <sub>C</sub> (V) | MAXIMUM<br>TEMPERATURE<br>COEFFICIENT<br>OF V <sub>BR</sub><br>(%/°C) |
|  | UNI                       | BI | MIN.   | MAX. |   |  |  |   |   |   |
| (+)SMBJ5.0A (5)  | KE                        | KE | 6.40   | 7.07 | 10  | 5.0  | 800  | 65.2  | 9.2   | 0.057   |
| (+)SMBJ6.0A  | KG                        | KG | 6.67   | 7.37 | 10  | 6.0  | 800  | 58.3  | 10.3  | 0.059   |
| (+)SMBJ6.5A  | KK                        | AK | 7.22   | 7.98 | 10  | 6.5  | 500  | 53.6  | 11.2  | 0.061   |
| (+)SMBJ7.0A  | KM                        | KM | 7.78   | 8.60 | 10  | 7.0  | 200  | 50.0  | 12.0  | 0.065   |
| (+)SMBJ7.5A  | KP                        | AP | 8.33   | 9.21 | 1.0                                       | 7.5  | 100  | 46.5  | 12.9  | 0.067   |
| (+)SMBJ8.0A  | KR                        | AR | 8.89   | 9.83 | 1.0                                       | 8.0  | 50   | 44.1  | 13.6  | 0.069   |
| (+)SMBJ8.5A  | KT                        | AT | 9.44   | 10.4 | 1.0                                       | 8.5  | 20   | 41.7  | 14.4  | 0.073   |
| (+)SMBJ9.0A  | KV                        | AV | 10.0   | 11.1 | 1.0                                       | 9.0  | 10   | 39.0  | 15.4  | 0.074   |
| (+)SMBJ10A   | KX                        | AX | 11.1   | 12.3 | 1.0                                       | 10   | 5.0  | 35.3  | 17.0  | 0.078   |
| (+)SMBJ11A   | KZ                        | KZ | 12.2   | 13.5 | 1.0                                       | 11   | 5.0  | 33.0  | 18.2  | 0.080   |
| (+)SMBJ12A   | LE                        | BE | 13.3   | 14.7 | 1.0                                       | 12   | 5.0  | 30.2  | 19.9  | 0.083   |
| (+)SMBJ13A   | LG                        | LG | 14.4   | 15.9 | 1.0                                       | 13   | 1.0  | 27.9  | 21.5  | 0.084   |
| (+)SMBJ14A   | LK                        | BK | 15.6   | 17.2 | 1.0                                       | 14   | 1.0  | 25.9  | 23.2  | 0.087   |
| (+)SMBJ15A   | LM                        | BM | 16.7   | 18.5 | 1.0                                       | 15   | 1.0  | 24.6  | 24.4  | 0.088   |
| (+)SMBJ16A   | LP                        | LM | 17.8   | 19.7 | 1.0                                       | 16   | 1.0  | 23.1  | 26.0  | 0.089   |
| (+)SMBJ17A   | LR                        | LR | 18.9   | 20.9 | 1.0                                       | 17   | 1.0  | 21.7  | 27.6  | 0.090   |
| (+)SMBJ18A   | LT                        | BT | 20.0   | 22.1 | 1.0                                       | 18   | 1.0  | 20.5  | 29.2  | 0.092   |
| (+)SMBJ20A   | LV                        | LV | 22.2   | 24.5 | 1.0                                       | 20   | 1.0  | 18.5  | 32.4  | 0.094   |
| (+)SMBJ22A   | LX                        | BX | 24.4   | 26.9 | 1.0                                       | 22   | 1.0  | 16.9  | 35.5  | 0.096   |
| (+)SMBJ24A   | LZ                        | BZ | 26.7   | 29.5 | 1.0                                       | 24   | 1.0  | 15.4  | 38.9  | 0.096   |
| (+)SMBJ26A   | ME                        | CE | 28.9   | 31.9 | 1.0                                       | 26   | 1.0  | 14.3  | 42.1  | 0.097   |
| (+)SMBJ28A   | MG                        | MG | 31.1   | 34.4 | 1.0                                       | 28   | 1.0  | 13.2  | 45.4  | 0.098   |
| (+)SMBJ30A   | MK                        | CK | 33.3   | 36.8 | 1.0                                       | 30   | 1.0  | 12.4  | 48.4  | 0.099   |
| (+)SMBJ33A   | MM                        | CM | 36.7   | 40.6 | 1.0                                       | 33   | 1.0  | 11.3  | 53.3  | 0.100   |
| (+)SMBJ36A   | MP                        | CP | 40.0   | 44.2 | 1.0                                       | 36   | 1.0  | 10.3  | 58.1  | 0.100   |
| (+)SMBJ40A   | MR                        | CR | 44.4   | 49.1 | 1.0                                       | 40   | 1.0  | 9.3   | 64.5  | 0.101   |
| (+)SMBJ43A   | MT                        | CT | 47.8   | 52.8 | 1.0                                       | 43   | 1.0  | 8.6   | 69.4  | 0.102   |
| (+)SMBJ45A   | MV                        | MV | 50.0   | 55.3 | 1.0                                       | 45   | 1.0  | 8.3   | 72.7  | 0.102   |
| (+)SMBJ48A   | MX                        | MX | 53.3   | 58.9 | 1.0                                       | 48   | 1.0  | 7.8   | 77.4  | 0.103   |
| (+)SMBJ51A   | MZ                        | MZ | 56.7   | 62.7 | 1.0                                       | 51   | 1.0  | 7.3   | 82.4  | 0.104   |
| (+)SMBJ54A   | NE                        | NE | 60.0   | 66.3 | 1.0                                       | 54   | 1.0  | 6.9   | 87.1  | 0.104   |
| (+)SMBJ58A   | NG                        | NG | 64.4   | 71.2 | 1.0                                       | 58   | 1.0  | 6.4   | 93.6  | 0.104   |
| (+)SMBJ60A   | NK                        | NK | 66.7   | 73.7 | 1.0                                       | 60   | 1.0  | 6.2   | 96.8  | 0.105   |
| (+)SMBJ64A   | NM                        | NM | 71.1   | 78.6 | 1.0                                       | 64   | 1.0  | 5.8   | 103   | 0.105   |
| (+)SMBJ70A   | NP                        | NP | 77.8   | 86.0 | 1.0                                       | 70   | 1.0  | 5.3   | 113   | 0.105   |
| (+)SMBJ75A   | NR                        | NR | 83.3   | 92.1 | 1.0                                       | 75   | 1.0  | 5.0   | 121   | 0.106   |
| (+)SMBJ78A   | NT                        | NT | 86.7   | 95.8 | 1.0                                       | 78   | 1.0  | 4.8   | 126   | 0.106   |
| (+)SMBJ85A   | NV                        | NV | 94.4   | 104  | 1.0                                       | 85   | 1.0  | 4.4   | 137   | 0.106   |
| (+)SMBJ90A   | NX                        | NX | 100  | 111  | 1.0                                       | 90   | 1.0  | 4.1   | 146   | 0.106   |
| (+)SMBJ100A  | NZ                        | NZ | 111  | 123  | 1.0                                       | 100  | 1.0  | 3.7   | 162   | 0.107   |
| (+)SMBJ110A  | PE                        | PE | 122  | 135  | 1.0                                       | 110  | 1.0  | 3.4   | 177   | 0.107   |
| (+)SMBJ120A  | PG                        | PG | 133  | 147  | 1.0                                       | 120  | 1.0  | 3.1   | 193   | 0.108   |
| (+)SMBJ130A  | PK                        | PK | 144  | 159  | 1.0                                       | 130  | 1.0  | 2.9   | 209   | 0.108   |
| (+)SMBJ150A  | PM                        | PM | 167  | 185  | 1.0                                       | 150  | 1.0  | 2.5   | 243   | 0.108   |
| (+)SMBJ160A  | PP                        | PP | 178  | 197  | 1.0                                       | 160  | 1.0  | 2.3   | 259   | 0.108   |
| (+)SMBJ170A  | PR                        | PR | 189  | 209  | 1.0                                       | 170  | 1.0  | 2.2   | 275   | 0.108   |
| SMBJ188A   | PS                        | PS | 209  | 231  | 1.0                                       | 188  | 1.0  | 2.0   | 328   | 0.108   |

Notes

- (1) Pulse test: t<sub>p</sub> ≤ 50 ms
- (2) Surge current waveform per fig. 3 and derate per fig. 2
- (3) For bidirectional 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 bidirectional SMBJ5.0CA, the maximum V<sub>BR</sub> is 7.25 V
- (6) V<sub>F</sub> = 3.5 V max. at I<sub>F</sub> = 50 A (unidirectional only)
- (+) Underwriters laboratory recognition for the classification of protectors (QVGG2) under the UL standard for safety 497B and file number E136766 for both uni-directional and bi-directional devices



| <b>THERMAL CHARACTERISTICS</b> ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted) |                 |       |      |
|---|-----------------|-------|------|
| PARAMETER   | SYMBOL          | VALUE | UNIT |
| Typical thermal resistance, junction to ambient <sup>(1)</sup>                            | $R_{\theta JA}$ | 100   | °C/W |
| Typical thermal resistance, junction to lead  | $R_{\theta JL}$ | 20    |      |

**Note**

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

| <b>ORDERING INFORMATION</b> (Example) |                 |                        |               |                                    |
|---------------------------------------|-----------------|------------------------|---------------|------------------------------------|
| PREFERRED P/N                         | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                      |
| SMBJ5.0A-E3/52                        | 0.096           | 52                     | 750           | 7" diameter plastic tape and reel  |
| SMBJ5.0A-M3/52                        |                 |                        |               |                                    |
| SMBJ5.0A-E3/5B                        | 0.096           | 5B                     | 3200          | 13" diameter plastic tape and reel |
| SMBJ5.0A-M3/5B                        |                 |                        |               |                                    |
| SMBJ5.0AHE3_A/H <sup>(1)</sup>        | 0.096           | H                      | 750           | 7" diameter plastic tape and reel  |
| SMBJ5.0AHM3_A/H <sup>(1)</sup>        |                 |                        |               |                                    |
| SMBJ5.0AHE3_A/I <sup>(1)</sup>        | 0.096           | I                      | 3200          | 13" diameter plastic tape and reel |
| SMBJ5.0AHM3_A/I <sup>(1)</sup>        |                 |                        |               |                                    |

**Note**

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

## RATINGS AND CHARACTERISTICS CURVES (T<sub>A</sub> = 25 °C unless otherwise noted)

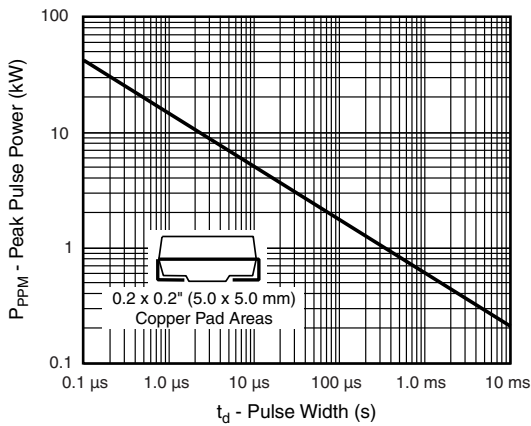


Fig. 1 - Peak Pulse Power Rating Curve

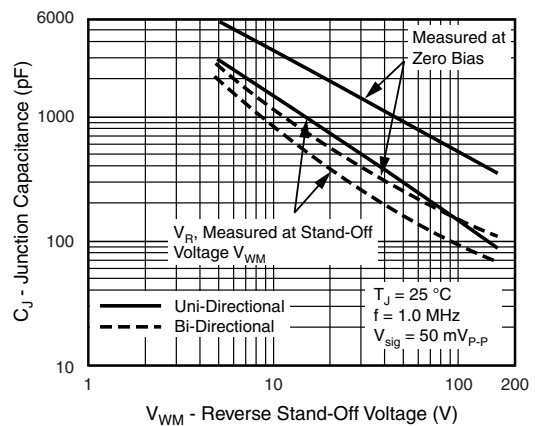


Fig. 4 - Typical Junction Capacitance

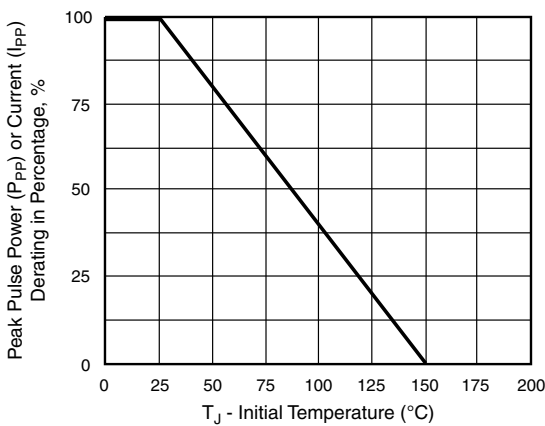


Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature

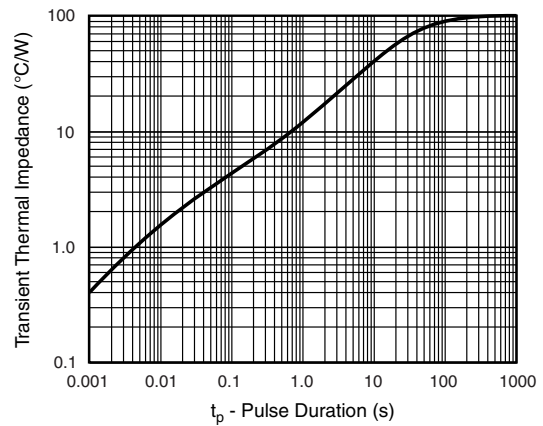


Fig. 5 - Typical Transient Thermal Impedance

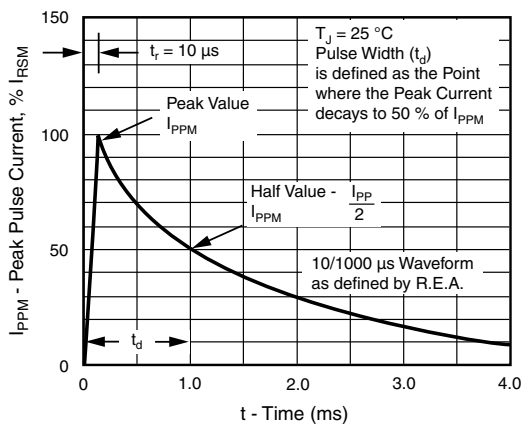


Fig. 3 - Pulse Waveform

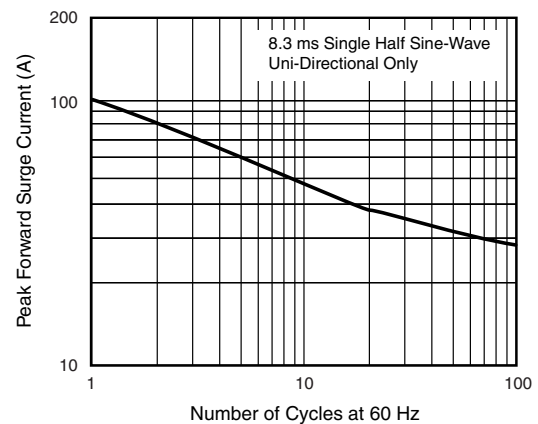
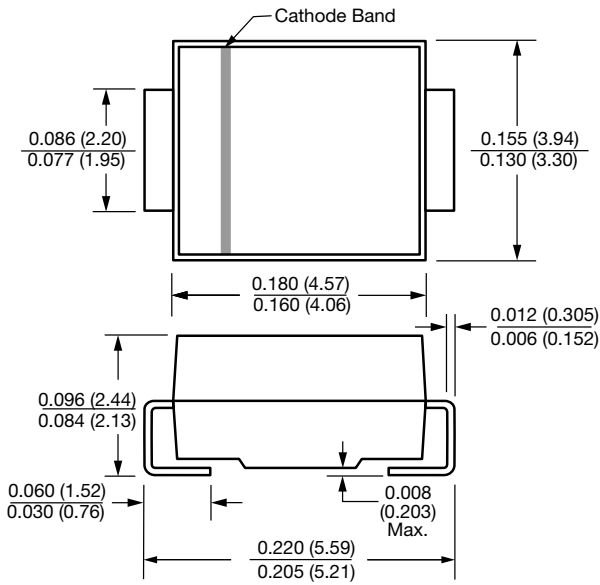


Fig. 6 - Maximum Non-Repetitive Peak Forward Surge Current

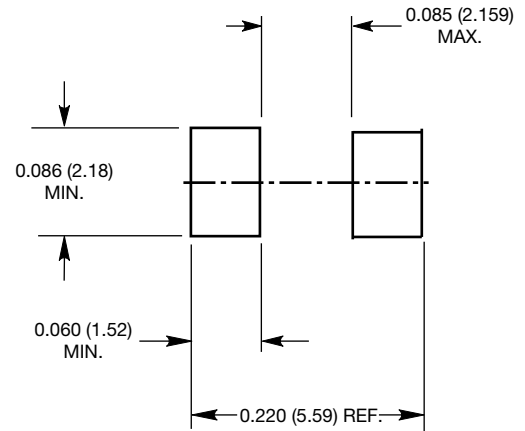


## PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

SMB (DO-214AA)



Mounting Pad Layout





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