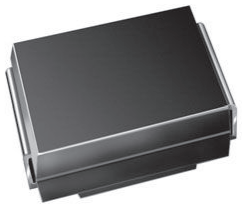
# THE DATASHEET OF

# SMBJ58D-M3/H

# SMBJ5.0D thru SMBJ188D, SMBJ5.0CD thru SMBJ120CD

## Surface-Mount TRANSZORB® Transient Voltage Suppressors



SMB (DO-214AA)

### FEATURES

- Low profile package
- Ideal for automated placement
- ± 3.5 %: very tight $V_{BR}$ tolerance
- Low leakage current
- Available in unidirectional and bidirectional
- 600 W peak pulse power capability with a 10/1000 µs 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
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

### LINKS TO ADDITIONAL RESOURCES

3D Models

| PRIMARY CHARACTERISTICS | |
|---|---|
| $V_{BR}$ (unidirectional) | 6.5 V to 228 V |
| $V_{BR}$ (bidirectional) | 6.5 V to 145 V |
| $V_{WM}$ (unidirectional) | 5.0 V to 188 V |
| $V_{WM}$ (bidirectional) | 5.0 V to 120 V |
| $P_{PPM}$ | 600 W |
| $P_D$ at $T_M$ = 50 °C | 5.0 W |
| $P_D$ at $T_A$ = 25 °C | 1.0 W |
| $T_J$ max. | 150 °C |
| Polarity | Unidirectional, bidirectional |
| Package | SMB (DO-214AA) |

### DEVICES FOR BIDIRECTIONAL APPLICATIONS

For bidirectional devices use CD suffix (e.g. SMBJ5.0CD). 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, MOSFETs, signal lines of sensor units for consumer, computer, industrial, and telecommunication.

### MECHANICAL DATA

**Case:** SMB (DO-214AA)
Molding compound meets UL 94 V-0 flammability rating
Base P/N-M3 - halogen-free, RoHS-compliant, and industrial grade

**Terminals:** matte tin plated leads, solderable per J-STD-002 and JESD 22-B102
M3 suffix meets JESD 201 class 2 whisker test

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

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

| PARAMETER | | SYMBOL | VALUE | UNIT |
|---|---|---|---|---|
| Peak pulse power dissipation | with a 10/1000 µs waveform | $P_{PPM}$ (1) | 600 | W |
| Peak pulse current | with a 10/1000 µs waveform | $I_{PPM}$ (1) | See next table | A |
| Power dissipation | $T_M$ = 50 °C | $P_D$ (2) | 5.0 | W |
| | $T_A$ = 25 °C | $P_D$ (3) | 1.0 | |
| Operating junction and storage temperature range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

**Notes**

(1) Non-repetitive current pulse, per fig. 3 and derated above $T_A$ = 25 °C per fig. 2
(2) Power dissipation mounted on infinite heatsink
(3) Power dissipation mounted on minimum recommended pad layout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**ELECTRICAL CHARACTERISTICS** ($T_A$ = 25 °C unless otherwise noted)

| DEVICE TYPE | DEVICE MARKING CODE | | BREAKDOWN VOLTAGE $V_{BR}$ AT $I_T$ (1) (V) | | TEST CURRENT $I_T$ (mA) | STAND-OFF VOLTAGE $V_{WM}$ (V) | MAXIMUM REVERSE LEAKAGE AT $V_{WM}$ $I_D$ (µA) (2) | MAXIMUM PEAK PULSE SURGE CURRENT $I_{PPM}$ (A) (3) | MAXIMUM CLAMPING VOLTAGE AT $I_{PPM}$ $V_C$ (V) |
|---|---|---|---|---|---|---|---|---|---|
| | UNI | BI | MIN. | MAX. | | | | | |
| (+)SMBJ5.0D | 6AA | 6AA | 6.50 | 6.97 | 10 | 5.0 | 500 | 65.9 | 9.1 |
| (+)SMBJ6.0D | 6AB | 6AB | 6.77 | 7.27 | 10 | 6.0 | 500 | 58.9 | 10.2 |
| (+)SMBJ6.5D | 6AC | 6AC | 7.33 | 7.87 | 10 | 6.5 | 300 | 54.5 | 11.0 |
| (+)SMBJ7.0D | 6AD | 6AD | 7.90 | 8.48 | 10 | 7.0 | 150 | 50.8 | 11.8 |
| (+)SMBJ7.5D | 6AE | 6AE | 8.46 | 9.08 | 1.0 | 7.5 | 75 | 47.2 | 12.7 |
| (+)SMBJ8.0D | 6AF | 6AF | 9.03 | 9.69 | 1.0 | 8.0 | 35 | 44.8 | 13.4 |
| (+)SMBJ8.5D | 6AG | 6AG | 9.57 | 10.3 | 1.0 | 8.5 | 15 | 42.2 | 14.3 |
| (+)SMBJ9.0D | 6AH | 6AH | 10.2 | 10.9 | 1.0 | 9.0 | 5.0 | 39.7 | 15.1 |
| (+)SMBJ10D | 6AK | 6AK | 11.3 | 12.1 | 1.0 | 10 | 2.0 | 35.9 | 16.7 |
| (+)SMBJ11D | 6AL | 6AL | 12.4 | 13.3 | 1.0 | 11 | 2.0 | 33.5 | 17.9 |
| (+)SMBJ12D | 6AM | 6AM | 13.5 | 14.5 | 1.0 | 12 | 2.0 | 30.6 | 19.6 |
| (+)SMBJ13D | 6AN | 6AN | 14.6 | 15.7 | 1.0 | 13 | 0.5 | 28.3 | 21.2 |
| (+)SMBJ14D | 6AP | 6AP | 15.8 | 17.0 | 1.0 | 14 | 0.5 | 26.2 | 22.9 |
| (+)SMBJ15D | 6AQ | 6AQ | 17.0 | 18.2 | 1.0 | 15 | 0.5 | 25.0 | 24.0 |
| (+)SMBJ16D | 6AR | 6AR | 18.1 | 19.4 | 1.0 | 16 | 0.5 | 23.4 | 25.6 |
| (+)SMBJ17D | 6AS | 6AS | 19.2 | 20.6 | 1.0 | 17 | 0.5 | 22.1 | 27.2 |
| (+)SMBJ18D | 6AT | 6AT | 20.3 | 21.8 | 1.0 | 18 | 0.5 | 20.8 | 28.8 |
| (+)SMBJ20D | 6AU | 6AU | 22.5 | 24.2 | 1.0 | 20 | 0.5 | 18.8 | 32.0 |
| (+)SMBJ22D | 6AV | 6AV | 24.8 | 26.6 | 1.0 | 22 | 0.5 | 17.1 | 35.1 |
| (+)SMBJ24D | 6AW | 6AW | 27.1 | 29.1 | 1.0 | 24 | 0.5 | 15.6 | 38.4 |
| (+)SMBJ26D | 6AX | 6AX | 29.3 | 31.5 | 1.0 | 26 | 0.5 | 14.5 | 41.6 |
| (+)SMBJ28D | 6AY | 6AY | 31.6 | 33.9 | 1.0 | 28 | 0.5 | 13.4 | 44.7 |
| (+)SMBJ30D | 6AZ | 6AZ | 33.8 | 36.3 | 1.0 | 30 | 0.5 | 12.6 | 47.7 |
| (+)SMBJ33D | 6BA | 6BA | 37.3 | 40.0 | 1.0 | 33 | 0.5 | 11.5 | 52.5 |
| (+)SMBJ36D | 6BB | 6BB | 40.6 | 43.6 | 1.0 | 36 | 0.5 | 10.5 | 57.3 |
| (+)SMBJ40D | 6BC | 6BC | 45.1 | 48.4 | 1.0 | 40 | 0.5 | 9.43 | 63.6 |
| (+)SMBJ43D | 6BD | 6BD | 48.5 | 52.1 | 1.0 | 43 | 0.5 | 8.76 | 68.5 |
| (+)SMBJ45D | 6BE | 6BE | 50.8 | 54.5 | 1.0 | 45 | 0.5 | 8.40 | 71.6 |
| (+)SMBJ48D | 6BF | 6BF | 54.1 | 58.1 | 1.0 | 48 | 0.5 | 7.90 | 76.3 |
| (+)SMBJ51D | 6BG | 6BG | 57.6 | 61.8 | 1.0 | 51 | 0.5 | 7.40 | 81.2 |
| (+)SMBJ54D | 6BH | 6BH | 60.9 | 65.4 | 1.0 | 54 | 0.5 | 7.00 | 85.9 |
| (+)SMBJ58D | 6BK | 6BK | 65.4 | 70.2 | 1.0 | 58 | 0.5 | 6.50 | 92.3 |
| (+)SMBJ60D | 6BL | 6BL | 67.7 | 72.7 | 1.0 | 60 | 0.5 | 6.28 | 95.5 |
| (+)SMBJ64D | 6BM | 6BM | 72.2 | 77.5 | 1.0 | 64 | 0.5 | 5.88 | 102 |
| (+)SMBJ70D | 6BN | 6BN | 79.0 | 84.8 | 1.0 | 70 | 0.5 | 5.40 | 111 |
| (+)SMBJ75D | 6BP | 6BP | 84.6 | 90.8 | 1.0 | 75 | 0.5 | 5.06 | 119 |
| (+)SMBJ78D | 6BQ | 6BQ | 88.1 | 94.4 | 1.0 | 78 | 0.5 | 4.86 | 124 |
| (+)SMBJ85D | 6BR | 6BR | 95.7 | 103 | 1.0 | 85 | 0.5 | 4.46 | 135 |
| (+)SMBJ90D | 6BS | 6BS | 102 | 109 | 1.0 | 90 | 0.5 | 4.17 | 144 |
| (+)SMBJ100D | 6BT | 6BT | 113 | 121 | 1.0 | 100 | 0.5 | 3.77 | 159 |
| (+)SMBJ110D | 6BU | 6BU | 124 | 133 | 1.0 | 110 | 0.5 | 3.45 | 174 |
| (+)SMBJ120D | 6BV | 6BV | 135 | 145 | 1.0 | 120 | 0.5 | 3.15 | 190 |
| (+)SMBJ130D | 6BW | - | 146 | 157 | 1.0 | 130 | 0.5 | 2.94 | 206 |
| (+)SMBJ150D | 6BX | - | 170 | 182 | 1.0 | 150 | 0.5 | 2.53 | 239 |
| (+)SMBJ160D | 6BY | - | 181 | 194 | 1.0 | 160 | 0.5 | 2.34 | 256 |
| (+)SMBJ170D | 6BZ | - | 192 | 206 | 1.0 | 170 | 0.5 | 2.23 | 270 |
| SMBJ188D | 6CA | - | 212 | 228 | 1.0 | 188 | 0.5 | 2.03 | 301 |

**Notes**

- All terms and symbols are consistent with ANSI/IEEE C62.35

(1) Pulse test: $t_p \leq 50$ ms

(2) For bi-directional types having $V_{WM}$ of 12 V and less, the $I_D$ limit is doubled

(3) Surge current waveform per fig. 3 and derate per fig. 2

(+) Underwriters Laboratory Recognition for the classification of protectors (QVGQ2) under the UL standard for safety 497B and file number E136766 for both uni-directional and bi-directional device


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| THERMAL CHARACTERISTICS ($T_A$ = 25 °C unless otherwise noted) | | | |
|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **VALUE** | **UNIT** |
| Typical thermal resistance, junction to ambient | $R_{\theta JA}$ (1) | 125 | °C/W |
| | $R_{\theta JA}$ (2) | 100 | |
| Typical thermal resistance, junction to mount | $R_{\theta JM}$ | 20 | |

**Notes**

(1) Mounted on minimum recommended pad layout

(2) Mounted on 5.0 mm x 5.0 mm copper pad area

| ORDERING INFORMATION (Example) | | | | |
|---|---|---|---|---|
| **PREFERRED P/N** | **UNIT WEIGHT (g)** | **PREFERRED PACKAGE CODE** | **BASE QUANTITY** | **DELIVERY MODE** |
| SMBJ5.0D-M3/H | 0.096 | H | 750 | 7" diameter plastic tape and reel |
| SMBJ5.0D-M3/I | 0.096 | I | 3200 | 13" diameter plastic tape and reel |

## RATINGS AND CHARACTERISTICS CURVES ($T_A$ = 25 °C unless otherwise noted)

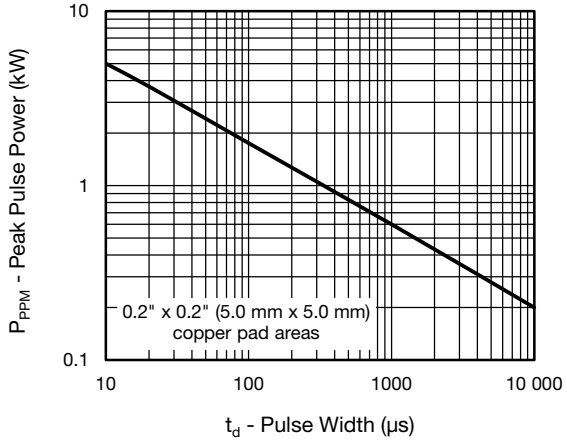


Fig. 1 - Peak Pulse Power Rating Curve

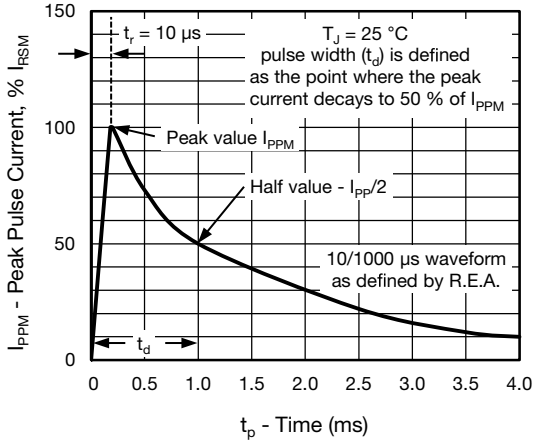


Fig. 3 - Pulse Waveform

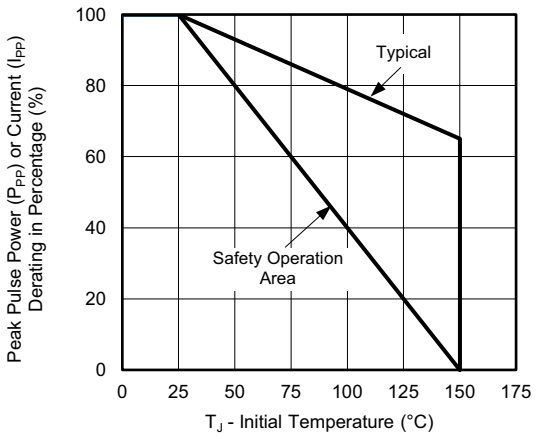


Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature

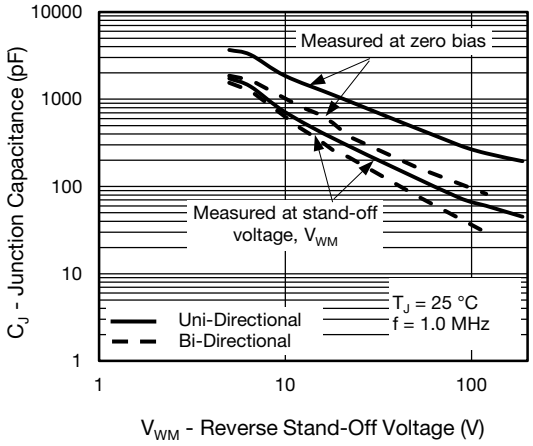


Fig. 4 - Typical Junction Capacitance


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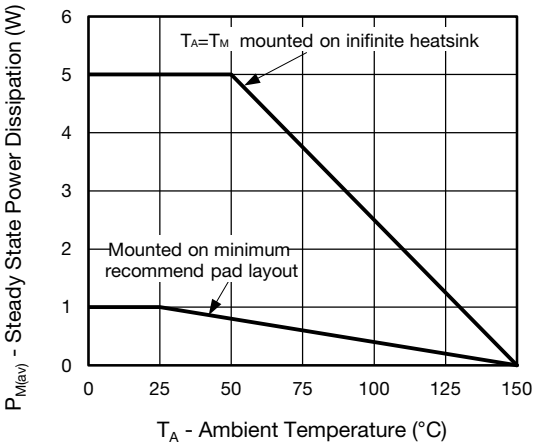



Fig. 5 - Power Dissipation Derating Curve

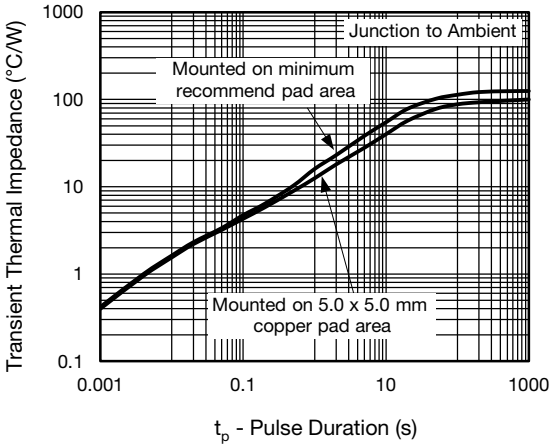
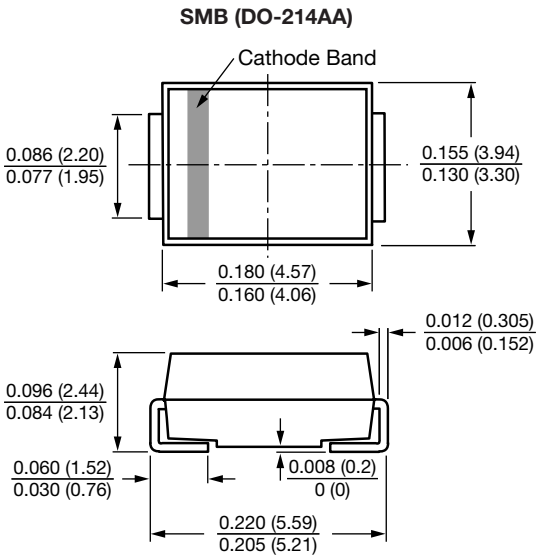


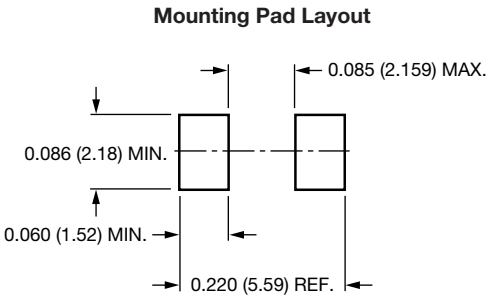

Fig. 6 - Typical Transient Thermal Impedance

**Note**

- Fig.1, 10 000 µs $P_{ppm}$ is actual test for $V_{WM} \leq 60$ V types, over 60 V types 10 000 µs $P_{ppm}$ is curve extensional value

## **PACKAGE OUTLINE DIMENSIONS** in inches (millimeters)





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