

Surface Mount TRANSZORB® Transient Voltage Suppressors


SMBG (DO-215AA)

RoHS
COMPLIANT

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 μ 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

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: SMBG (DO-215AA)

Molding compound meets UL 94 V-0 flammability rating
Base P/N-E3 - RoHS-compliant, industrial grade
Base P/NHE3 - RoHS-compliant, AEC-Q101 qualified

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

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

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

PRIMARY CHARACTERISTICS

| | |
|---------------------------------|-------------------------------|
| V_{WM} | 5.0 V to 188 V |
| V_{BR} (unidirectional) | 6.4 V to 231 V |
| V_{BR} (bidirectional) | 6.4 V to 231 V |
| P_{PPM} | 600 W |
| I_{FSM} (unidirectional only) | 100 A |
| T_J max. | 150 °C |
| Polarity | Unidirectional, bidirectional |
| Package | SMBG (DO-215AA) |

DEVICES FOR BIDIRECTION APPLICATIONS

For bidirectional devices use CA suffix (e.g. SMBG10CA).

Electrical characteristics apply in both directions.

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

| PARAMETER | SYMBOL | VALUE | UNIT |
|--|----------------|----------------|------|
| Peak pulse power dissipation with a 10/1000 μ s waveform ⁽¹⁾⁽²⁾ (fig. 1) | P_{PPM} | 600 | W |
| Peak pulse current with a 10/1000 μ s waveform ⁽¹⁾ | I_{PPM} | See next table | A |
| Peak forward surge current 8.3 ms single half sine-wave unidirectional only ⁽²⁾ | I_{FSM} | 100 | A |
| 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⁾ Mounted on 0.2" x 0.2" (5.0 mm x 5.0 mm) copper pads to each terminal

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

| DEVICE TYPE MODIFIED GULL WING | 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) ⁽³⁾ | MAXIMUM PEAK PULSE SURGE CURRENT I_{PPM} (A) ⁽²⁾ | MAXIMUM CLAMPING VOLTAGE AT I_{PPM} V_C (V) |
|--------------------------------------|------------------------|----|---|------|----------------------------------|---|--|---|---|
| | UNI | BI | MIN. | MAX. | | | | | |
| (+)SMBG5.0A ⁽⁵⁾ | KE | KE | 6.40 | 7.07 | 10 | 5.0 | 800 | 65.2 | 9.2 |
| (+)SMBG6.0A | KG | KG | 6.67 | 7.37 | 10 | 6.0 | 800 | 58.3 | 10.3 |
| (+)SMBG6.5A | KK | AK | 7.22 | 7.98 | 10 | 6.5 | 500 | 53.6 | 11.2 |
| (+)SMBG7.0A | KM | KM | 7.78 | 8.60 | 10 | 7.0 | 200 | 50.0 | 12.0 |
| (+)SMBG7.5A | KP | AP | 8.33 | 9.21 | 1.0 | 7.5 | 100 | 46.5 | 12.9 |
| (+)SMBG8.0A | KR | AR | 8.89 | 9.83 | 1.0 | 8.0 | 50 | 44.1 | 13.6 |
| (+)SMBG8.5A | KT | AT | 9.44 | 10.4 | 1.0 | 8.5 | 20 | 41.7 | 14.4 |
| (+)SMBG9.0A | KV | AV | 10.0 | 11.1 | 1.0 | 9.0 | 10 | 39.0 | 15.4 |
| (+)SMBG10A | KX | AX | 11.1 | 12.3 | 1.0 | 10 | 5.0 | 35.3 | 17.0 |
| (+)SMBG11A | KZ | KZ | 12.2 | 13.5 | 1.0 | 11 | 5.0 | 33.0 | 18.2 |
| (+)SMBG12A | LE | BE | 13.3 | 14.7 | 1.0 | 12 | 5.0 | 30.2 | 19.9 |
| (+)SMBG13A | LG | LG | 14.4 | 15.9 | 1.0 | 13 | 1.0 | 27.9 | 21.5 |
| (+)SMBG14A | LK | BK | 15.6 | 17.2 | 1.0 | 14 | 1.0 | 25.9 | 23.2 |
| (+)SMBG15A | LM | BM | 16.7 | 18.5 | 1.0 | 15 | 1.0 | 24.6 | 24.4 |
| (+)SMBG16A | LP | LM | 17.8 | 19.7 | 1.0 | 16 | 1.0 | 23.1 | 26.0 |
| (+)SMBG17A | LR | LR | 18.9 | 20.9 | 1.0 | 17 | 1.0 | 21.7 | 27.6 |
| (+)SMBG18A | LT | BT | 20.0 | 22.1 | 1.0 | 18 | 1.0 | 20.5 | 29.2 |
| (+)SMBG20A | LV | LV | 22.2 | 24.5 | 1.0 | 20 | 1.0 | 18.5 | 32.4 |
| (+)SMBG22A | LX | BX | 24.4 | 26.9 | 1.0 | 22 | 1.0 | 16.9 | 35.5 |
| (+)SMBG24A | LZ | BZ | 26.7 | 29.5 | 1.0 | 24 | 1.0 | 15.4 | 38.9 |
| (+)SMBG26A | ME | CE | 28.9 | 31.9 | 1.0 | 26 | 1.0 | 14.3 | 42.1 |
| (+)SMBG28A | MG | MG | 31.1 | 34.4 | 1.0 | 28 | 1.0 | 13.2 | 45.4 |
| (+)SMBG30A | MK | CK | 33.3 | 36.8 | 1.0 | 30 | 1.0 | 12.4 | 48.4 |
| (+)SMBG33A | MM | CM | 36.7 | 40.6 | 1.0 | 33 | 1.0 | 11.3 | 53.3 |
| (+)SMBG36A | MP | CP | 40.0 | 44.2 | 1.0 | 36 | 1.0 | 10.3 | 58.1 |
| (+)SMBG40A | MR | CR | 44.4 | 49.1 | 1.0 | 40 | 1.0 | 9.3 | 64.5 |
| (+)SMBG43A | MT | CT | 47.8 | 52.8 | 1.0 | 43 | 1.0 | 8.6 | 69.4 |
| (+)SMBG45A | MV | MV | 50.0 | 55.3 | 1.0 | 45 | 1.0 | 8.3 | 72.7 |
| (+)SMBG48A | MX | MX | 53.3 | 58.9 | 1.0 | 48 | 1.0 | 7.8 | 77.4 |
| (+)SMBG51A | MZ | MZ | 56.7 | 62.7 | 1.0 | 51 | 1.0 | 7.3 | 82.4 |
| (+)SMBG54A | NE | NE | 60.0 | 66.3 | 1.0 | 54 | 1.0 | 6.9 | 87.1 |
| (+)SMBG58A | NG | NG | 64.4 | 71.2 | 1.0 | 58 | 1.0 | 6.4 | 93.6 |
| (+)SMBG60A | NK | NK | 66.7 | 73.7 | 1.0 | 60 | 1.0 | 6.2 | 96.8 |
| (+)SMBG64A | NM | NM | 71.1 | 78.6 | 1.0 | 64 | 1.0 | 5.8 | 103 |
| (+)SMBG70A | NP | NP | 77.8 | 86.0 | 1.0 | 70 | 1.0 | 5.3 | 113 |
| (+)SMBG75A | NR | NR | 83.3 | 92.1 | 1.0 | 75 | 1.0 | 5.0 | 121 |
| (+)SMBG78A | NT | NT | 86.7 | 95.8 | 1.0 | 78 | 1.0 | 4.8 | 126 |
| (+)SMBG85A | NV | NV | 94.4 | 104 | 1.0 | 85 | 1.0 | 4.4 | 137 |
| (+)SMBG90A | NX | NX | 100 | 111 | 1.0 | 90 | 1.0 | 4.1 | 146 |
| (+)SMBG100A | NZ | NZ | 111 | 123 | 1.0 | 100 | 1.0 | 3.7 | 162 |
| (+)SMBG110A | PE | PE | 122 | 135 | 1.0 | 110 | 1.0 | 3.4 | 177 |
| (+)SMBG120A | PG | PG | 133 | 147 | 1.0 | 120 | 1.0 | 3.1 | 193 |
| (+)SMBG130A | PK | PK | 144 | 159 | 1.0 | 130 | 1.0 | 2.9 | 209 |
| (+)SMBG150A | PM | PM | 167 | 185 | 1.0 | 150 | 1.0 | 2.5 | 243 |
| (+)SMBG160A | PP | PP | 178 | 197 | 1.0 | 160 | 1.0 | 2.3 | 259 |
| (+)SMBG170A | PR | PR | 189 | 209 | 1.0 | 170 | 1.0 | 2.2 | 275 |
| SMBG188A | PS | PS | 209 | 231 | 1.0 | 188 | 1.0 | 2.0 | 328 |

Notes(1) Pulse test: $t_p \leq 50\text{ ms}$

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

(3) For bidirectional types having V_{WM} of 10 V and less, the I_D limit is doubled

(4) All terms and symbols are consistent with ANSI/IEEE C62.35

(5) For the bidirectional SMBG5.0CA, the maximum V_{BR} is 7.25 V(6) $V_F = 3.5\text{ V}$ at $I_F = 50\text{ A}$ (unidirectional only)

(+) Underwriters laboratory recognition for the classification of protectors (QVGQ2) under the UL standard for safety 497B and file number E136766 for both unidirectional and bidirectional devices

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

| PARAMETER | SYMBOL | VALUE | UNIT |
|--|-----------------|-------|-----------------------------|
| Typical thermal resistance, junction to ambient ⁽¹⁾ | $R_{\theta JA}$ | 100 | $^{\circ}\text{C}/\text{W}$ |
| Typical thermal resistance, junction to lead | $R_{\theta JL}$ | 20 | |

Note
⁽¹⁾ Mounted on minimum recommended pad layout

ORDERING INFORMATION (Example)

| PREFERRED P/N | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE |
|-------------------------------|-----------------|------------------------|---------------|------------------------------------|
| SMBG5.0A-E3/52 | 0.096 | 52 | 750 | 7" diameter plastic tape and reel |
| SMBG5.0A-E3/5B | 0.096 | 5B | 3200 | 13" diameter plastic tape and reel |
| SMBG5.0AHE3/52 ⁽¹⁾ | 0.096 | 52 | 750 | 7" diameter plastic tape and reel |
| SMBG5.0AHE3/5B ⁽¹⁾ | 0.096 | 5B | 3200 | 13" diameter plastic tape and reel |

Note
⁽¹⁾ AEC-Q101 qualified

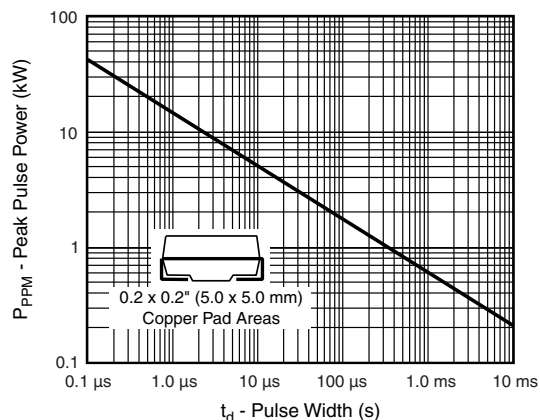
RATINGS AND CHARACTERISTICS CURVES ($T_A = 25\text{ }^{\circ}\text{C}$ unless otherwise noted)


Fig. 1 - Peak Pulse Power Rating Curve

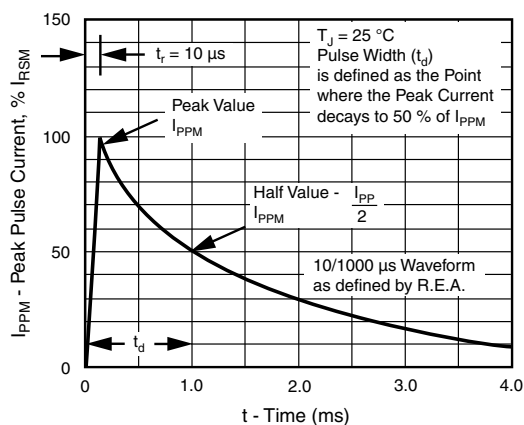


Fig. 3 - Pulse Waveform

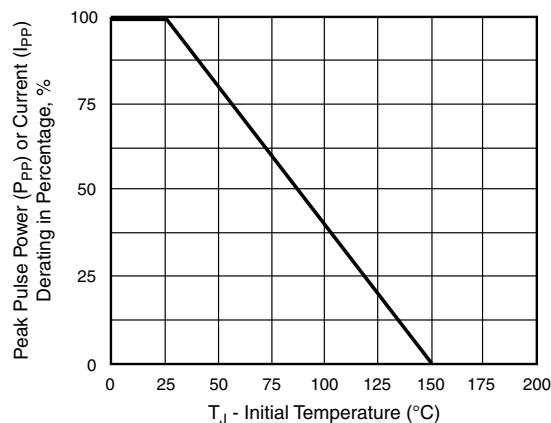


Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature

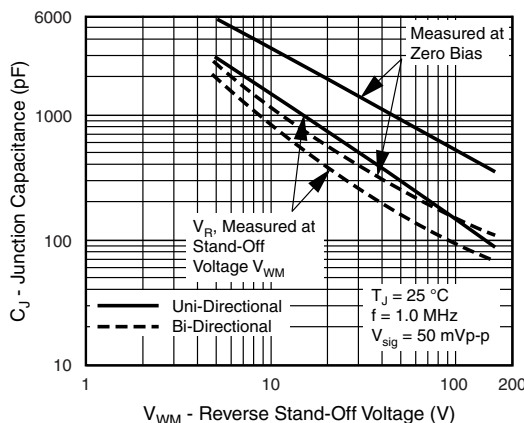


Fig. 4 - Typical Junction Capacitance

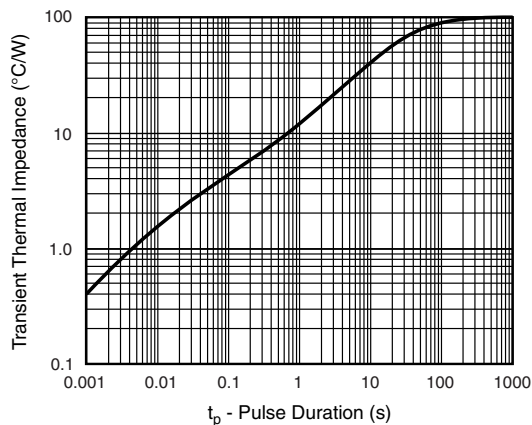


Fig. 5 - Typical Transient Thermal Impedance

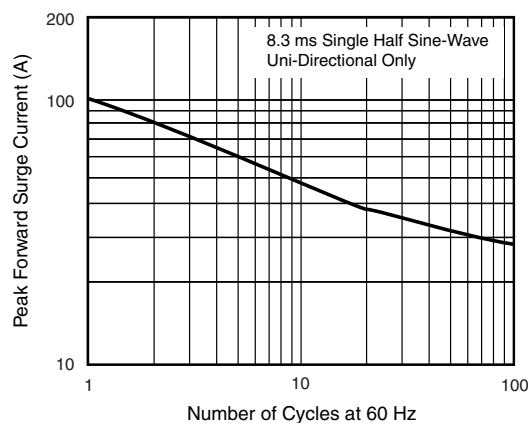
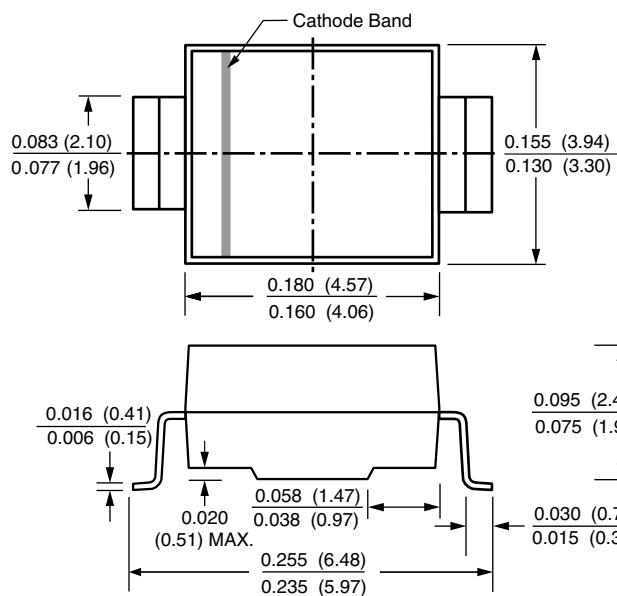


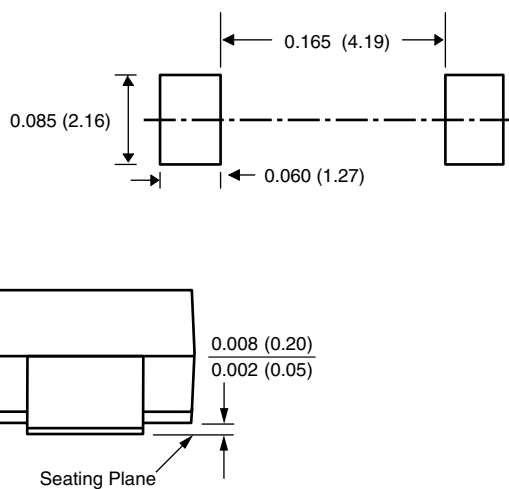
Fig. 6 - Maximum Non-Repetitive Peak Forward Surge Current

PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

SMBG (DO-215AA)



Mounting Pad Layout





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