

## Surface Mount TRANSZORB® Transient Voltage Suppressors


**DO-215AA (SMBG)**

**RoHS**  
COMPLIANT

### FEATURES

- Low profile package
- Ideal for automated placement
- Glass passivated chip junction
- Available in uni-directional and bi-directional
- 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
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://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:** DO-215AA (SMBG)

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

E3 suffix meets JESD 201 class 2 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

### PRIMARY CHARACTERISTICS

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

### DEVICES FOR BI-DIRECTION APPLICATIONS

For bi-directional 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 $\mu$ 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    |
| Peak forward surge current 8.3 ms single half sine-wave uni-directional 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** ( $T_A = 25\text{ }^{\circ}\text{C}$  unless otherwise noted)

| DEVICE TYPE<br>MODIFIED<br>GULL WING | DEVICE MARKING<br>CODE |    | BREAKDOWN<br>VOLTAGE<br>$V_{BR}$ AT $I_T$ <sup>(1)</sup><br>(V) |      | TEST<br>CURRENT<br>$I_T$<br>(mA) | STAND-OFF<br>VOLTAGE<br>$V_{WM}$<br>(V) | MAXIMUM<br>REVERSE<br>LEAKAGE<br>AT $V_{WM}$<br>$I_D$ ( $\mu\text{A}$ ) <sup>(3)</sup> | MAXIMUM<br>PEAK PULSE<br>SURGE<br>CURRENT<br>$I_{PPM}$ (A) <sup>(2)</sup> | MAXIMUM<br>CLAMPING<br>VOLTAGE AT<br>$I_{PPM}$<br>$V_C$ (V) |
|--------------------------------------|------------------------|----|-----------------------------------------------------------------|------|----------------------------------|-----------------------------------------|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------|
|                                      | UNI                    | BI | MIN.                                                            | MAX. |                                  |                                         |                                                                                        |                                                                           |                                                             |
| (+)SMBG5.0A <sup>(5)</sup>           | 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 bi-directional 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 bi-directional SMBG5.0CA, the maximum  $V_{BR}$  is 7.25 V(6)  $V_F = 3.5\text{ V}$  at  $I_F = 50\text{ A}$  (uni-directional only)

(+) 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 devices

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

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

**Note**
<sup>(1)</sup> 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 <sup>(1)</sup> | 0.096           | 52                     | 750           | 7" diameter plastic tape and reel  |
| SMBG5.0AHE3/5B <sup>(1)</sup> | 0.096           | 5B                     | 3200          | 13" diameter plastic tape and reel |

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

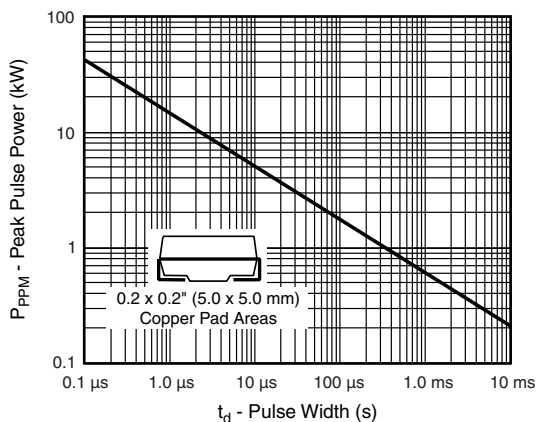
**RATINGS AND CHARACTERISTICS CURVES** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)


Fig. 1 - Peak Pulse Power Rating Curve

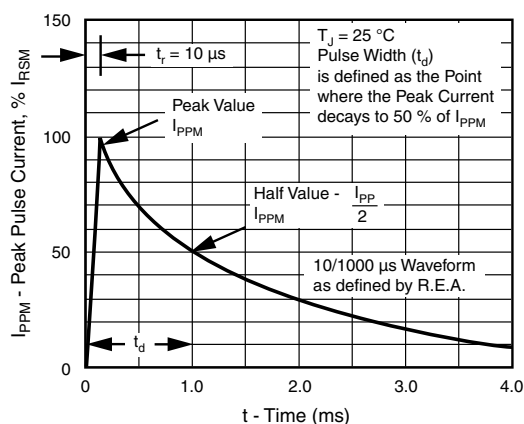


Fig. 3 - Pulse Waveform

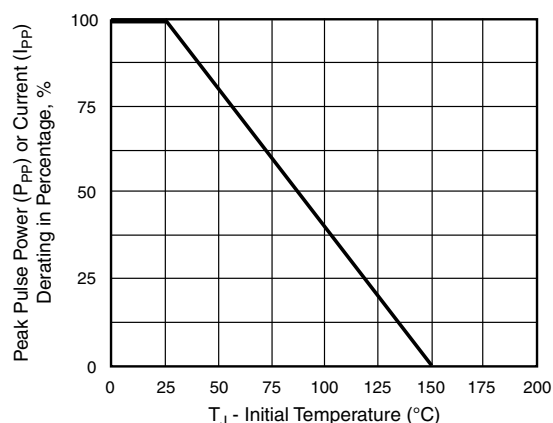


Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature

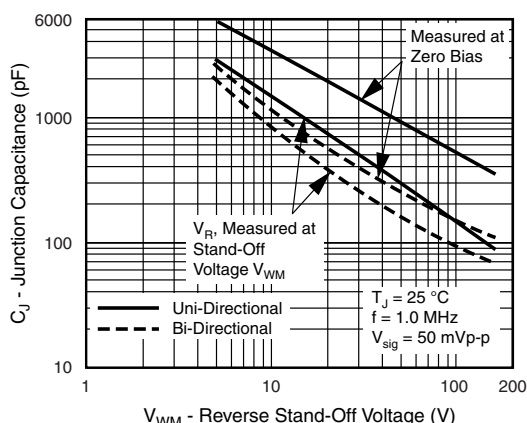


Fig. 4 - Typical Junction Capacitance

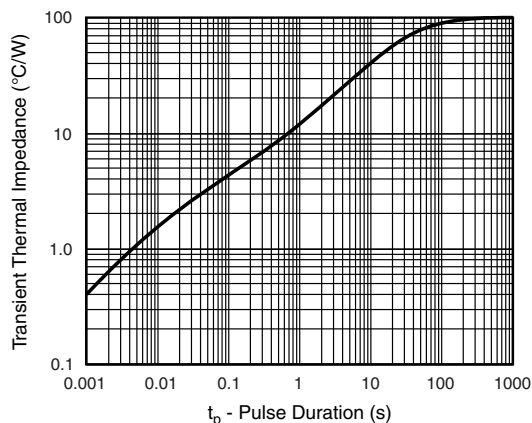


Fig. 5 - Typical Transient Thermal Impedance

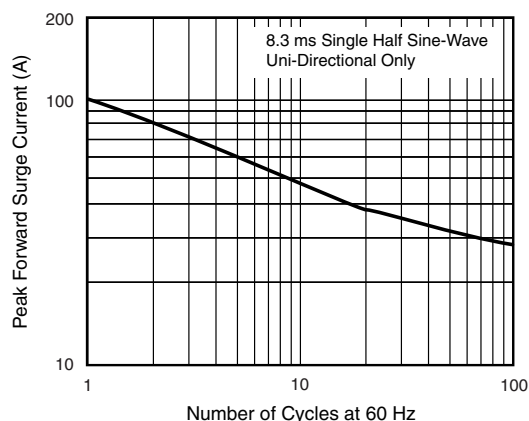
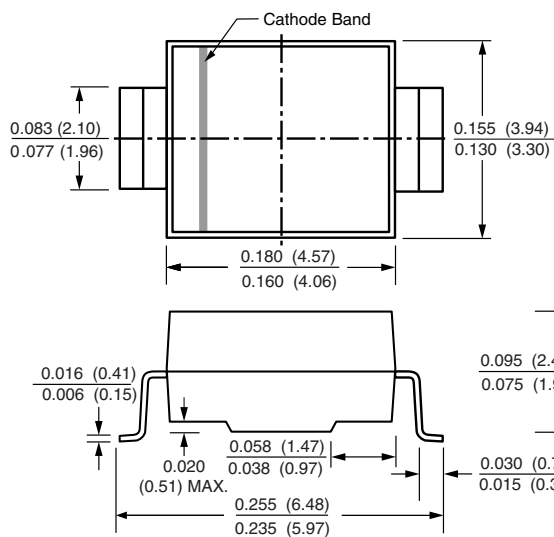
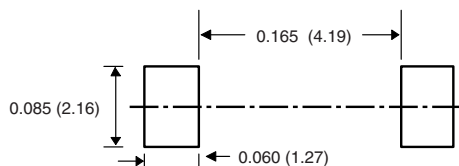


Fig. 6 - Maximum Non-Repetitive Peak Forward Surge Current

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

**DO-215AA (SMBG)**

**Mounting Pad Layout**




## Disclaimer

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## Material Category Policy

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