



**THE DATASHEET OF  
SMBG9.0CHE3/52**





# Surface Mount TRANSZORB® Transient Voltage Suppressors



DO-215AA (SMBG)

| PRIMARY CHARACTERISTICS                 |                                 |
|-----------------------------------------|---------------------------------|
| V <sub>WM</sub>                         | 5.0 V to 188 V                  |
| V <sub>BR</sub> (uni-directional)       | 6.4 V to 231 V                  |
| V <sub>BR</sub> (bi-directional)        | 6.4 V to 231 V                  |
| P <sub>PPM</sub>                        | 600 W                           |
| I <sub>FSM</sub> (uni-directional only) | 100 A                           |
| T <sub>J</sub> 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.

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



RoHS  
COMPLIANT

### 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 1A 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

| MAXIMUM RATINGS (T <sub>A</sub> = 25 °C unless otherwise noted)                             |                                   |                |      |
|---------------------------------------------------------------------------------------------|-----------------------------------|----------------|------|
| PARAMETER                                                                                   | SYMBOL                            | VALUE          | UNIT |
| Peak pulse power dissipation with a 10/1000 μs waveform <sup>(1)(2)</sup> (fig. 1)          | P <sub>PPM</sub>                  | 600            | W    |
| Peak pulse current with a 10/1000 μs 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>                  | 100            | 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.

<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>GULL WING                                       | DEVICE MARKING<br>CODE |    | BREAKDOWN<br>VOLTAGE<br>V <sub>BR</sub> AT I <sub>T</sub> <sup>(1)</sup><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) <sup>(3)</sup> | MAXIMUM<br>PEAK PULSE<br>SURGE<br>CURRENT<br>I <sub>PPM</sub> (A) <sup>(2)</sup> | MAXIMUM<br>CLAMPING<br>VOLTAGE AT<br>I <sub>PPM</sub><br>V <sub>C</sub> (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<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 SMBG/SMBJ5.8CA, the maximum V<sub>BR</sub> is 7.25 V
- (6) V<sub>F</sub> = 3.5 V at I<sub>F</sub> = 50 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

| <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                      |
| 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** ( $T_A = 25\text{ }^\circ\text{C}$  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



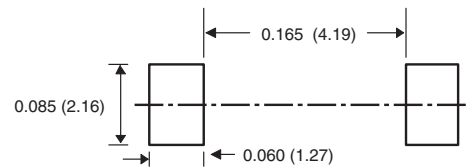
Fig. 6 - Maximum Non-Repetitive Peak Forward Surge Current

## PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

### DO-215AA (SMBG)



### Mounting Pad Layout





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