



**THE DATASHEET OF  
SMCG160CAHE3/57T**



## Surface Mount TRANSZORB® Transient Voltage Suppressors


**SMCG (DO-215AB)**


### LINKS TO ADDITIONAL RESOURCES



| PRIMARY CHARACTERISTICS         |                               |
|---------------------------------|-------------------------------|
| $V_{BR}$ unidirectional         | 6.40 V to 231 V               |
| $V_{BR}$ bidirectional          | 6.40 V to 231 V               |
| $V_{WM}$                        | 5.0 V to 188 V                |
| $P_{PPM}$                       | 1500 W                        |
| $P_D$                           | 6.5 W                         |
| $I_{FSM}$ (unidirectional only) | 200 A                         |
| $T_J$ max.                      | 150 °C                        |
| Polarity                        | Unidirectional, bidirectional |
| Package                         | SMCG (DO-215AB)               |

### DEVICES FOR BIDIRECTION APPLICATIONS

For bidirectional devices use CA suffix (e.g. SMCG188CA).

Electrical characteristics apply in both directions.

### FEATURES

- Low profile package
- Ideal for automated placement
- Glass passivated chip junction
- Available in unidirectional and bidirectional
- 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:** SMCG (DO-215AB)

Molding compound meets UL 94 V-0 flammability rating

Base P/N-E3 - RoHS compliant, industrial grade

Base P/N-M3 - halogen-free, RoHS compliant, and industrial grade

Base P/NHE3 - RoHS compliant, AEC-Q101 qualified

Base P/NHM3 - halogen-free, RoHS compliant, and AEC-Q101 qualified

**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

| 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>              | $P_{PPM}$      | 1500           | 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> | $I_{FSM}$      | 200            | A    |
| Power dissipation on infinite heatsink, $T_A = 50$ °C                                       | $P_D$          | 6.5            | W    |
| 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 0.31" x 0.31" (8.0 mm x 8.0 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>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. |   |  |   |   |   |
| (+)SMCG5.0A <sup>(5)</sup>   | GDE                    | GDE | 6.40  | 7.07 | 10  | 5.0  | 1000  | 163.0   | 9.20  |
| (+)SMCG6.0A  | GDG                    | GDG | 6.67  | 7.37 | 10  | 6.0  | 1000  | 145.6   | 10.3  |
| (+)SMCG6.5A  | GDK                    | BDK | 7.22  | 7.98 | 10  | 6.5  | 500   | 133.9   | 11.2  |
| (+)SMCG7.0A  | GDM                    | GDM | 7.78  | 8.60 | 10  | 7.0  | 200   | 125.0   | 12.0  |
| (+)SMCG7.5A  | GDP                    | BDP | 8.33  | 9.21 | 1.0                                       | 7.5  | 100   | 116.3   | 12.9  |
| (+)SMCG8.0A  | GDR                    | BDR | 8.89  | 9.83 | 1.0                                       | 8.0  | 50  | 110.3   | 13.6  |
| (+)SMCG8.5A  | GDT                    | BDT | 9.44  | 10.4 | 1.0                                       | 8.5  | 20  | 104.2   | 14.4  |
| (+)SMCG9.0A  | GDV                    | BDV | 10.0  | 11.1 | 1.0                                       | 9.0  | 10  | 97.4  | 15.4  |
| (+)SMCG10A   | GDX                    | BDX | 11.1  | 12.3 | 1.0                                       | 10   | 5.0   | 88.2  | 17.0  |
| (+)SMCG11A   | GDZ                    | GDZ | 12.2  | 13.5 | 1.0                                       | 11   | 5.0   | 82.4  | 18.2  |
| (+)SMCG12A   | GEE                    | BEE | 13.3  | 14.7 | 1.0                                       | 12   | 5.0   | 75.4  | 19.9  |
| (+)SMCG13A   | GEG                    | GEG | 14.4  | 15.9 | 1.0                                       | 13   | 1.0   | 69.8  | 21.5  |
| (+)SMCG14A   | GEK                    | BEK | 15.6  | 17.2 | 1.0                                       | 14   | 1.0   | 64.7  | 23.2  |
| (+)SMCG15A   | GEM                    | BEM | 16.7  | 18.5 | 1.0                                       | 15   | 1.0   | 61.5  | 24.4  |
| (+)SMCG16A   | GEP                    | GEP | 17.8  | 19.7 | 1.0                                       | 16   | 1.0   | 57.7  | 26.0  |
| (+)SMCG17A   | GER                    | GER | 18.9  | 20.9 | 1.0                                       | 17   | 1.0   | 54.3  | 27.6  |
| (+)SMCG18A   | GET                    | BET | 20.0  | 22.1 | 1.0                                       | 18   | 1.0   | 51.4  | 29.2  |
| (+)SMCG20A   | GEV                    | BEV | 22.2  | 24.5 | 1.0                                       | 20   | 1.0   | 46.3  | 32.4  |
| (+)SMCG22A   | GEX                    | BEX | 24.4  | 26.9 | 1.0                                       | 22   | 1.0   | 42.3  | 35.5  |
| (+)SMCG24A   | GEZ                    | BEZ | 26.7  | 29.5 | 1.0                                       | 24   | 1.0   | 38.6  | 38.9  |
| (+)SMCG26A   | GFE                    | BFE | 28.9  | 31.9 | 1.0                                       | 26   | 1.0   | 35.6  | 42.1  |
| (+)SMCG28A   | GFG                    | BFG | 31.1  | 34.4 | 1.0                                       | 28   | 1.0   | 33.0  | 45.4  |
| (+)SMCG30A   | GFK                    | BFK | 33.3  | 36.8 | 1.0                                       | 30   | 1.0   | 31.0  | 48.4  |
| (+)SMCG33A   | GFM                    | BFM | 36.7  | 40.6 | 1.0                                       | 33   | 1.0   | 28.1  | 53.3  |
| (+)SMCG36A   | GFP                    | BFP | 40.0  | 44.2 | 1.0                                       | 36   | 1.0   | 25.8  | 58.1  |
| (+)SMCG40A   | GFR                    | BFR | 44.4  | 49.1 | 1.0                                       | 40   | 1.0   | 23.3  | 64.5  |
| (+)SMCG43A   | GFT                    | BFT | 47.8  | 52.8 | 1.0                                       | 43   | 1.0   | 21.6  | 69.4  |
| (+)SMCG45A   | GFV                    | GFV | 50.0  | 55.3 | 1.0                                       | 45   | 1.0   | 20.6  | 72.7  |
| (+)SMCG48A   | GFX                    | GFX | 53.3  | 58.9 | 1.0                                       | 48   | 1.0   | 19.4  | 77.4  |
| (+)SMCG51A   | GFZ                    | GFZ | 56.7  | 62.7 | 1.0                                       | 51   | 1.0   | 18.2  | 82.4  |
| (+)SMCG54A   | GGE                    | GGE | 60.0  | 66.3 | 1.0                                       | 54   | 1.0   | 17.2  | 87.1  |
| (+)SMCG58A   | GGG                    | GGG | 64.4  | 71.2 | 1.0                                       | 58   | 1.0   | 16.0  | 93  |
| (+)SMCG60A   | GGK                    | GGK | 66.7  | 73.7 | 1.0                                       | 60   | 1.0   | 15.5  | 96  |
| (+)SMCG64A   | GGM                    | GGM | 71.1  | 78.6 | 1.0                                       | 64   | 1.0   | 14.6  | 103   |
| (+)SMCG70A   | GGP                    | GGP | 77.8  | 86.0 | 1.0                                       | 70   | 1.0   | 13.3  | 113   |
| (+)SMCG75A   | GGR                    | GGR | 83.3  | 92.1 | 1.0                                       | 75   | 1.0   | 12.4  | 121   |
| (+)SMCG78A   | GGT                    | GGT | 86.7  | 95.8 | 1.0                                       | 78   | 1.0   | 11.9  | 126   |
| (+)SMCG85A   | GGV                    | GGV | 94.4  | 104  | 1.0                                       | 85   | 1.0   | 10.9  | 137   |
| (+)SMCG90A   | GGX                    | GGX | 100   | 111  | 1.0                                       | 90   | 1.0   | 10.3  | 146   |
| (+)SMCG100A  | GGZ                    | GGZ | 111   | 123  | 1.0                                       | 100  | 1.0   | 9.3   | 162   |
| (+)SMCG110A  | GHE                    | GHE | 122   | 135  | 1.0                                       | 110  | 1.0   | 8.5   | 177   |
| (+)SMCG120A  | GHG                    | GHG | 133   | 147  | 1.0                                       | 120  | 1.0   | 7.8   | 193   |
| (+)SMCG130A  | GHK                    | GHK | 144   | 159  | 1.0                                       | 130  | 1.0   | 7.2   | 209   |
| (+)SMCG150A  | GHM                    | GHM | 167   | 185  | 1.0                                       | 150  | 1.0   | 6.2   | 243   |
| (+)SMCG160A  | GHP                    | GHP | 178   | 197  | 1.0                                       | 160  | 1.0   | 5.8   | 259   |
| (+)SMCG170A  | GHR                    | GHR | 189   | 209  | 1.0                                       | 170  | 1.0   | 5.5   | 275   |
| SMCG188A   | GHS                    | GHS | 209   | 231  | 1.0                                       | 188  | 1.0   | 4.6   | 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 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 SMCG5.0CA, the maximum V<sub>BR</sub> is 7.25 V
- (6) V<sub>F</sub> = 3.5 V at I<sub>F</sub> = 100 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 unidirectional and bidirectional devices



| THERMAL CHARACTERISTICS (T <sub>A</sub> = 25 °C unless otherwise noted) |                  |       |      |
|---|------------------|-------|------|
| PARAMETER   | SYMBOL           | VALUE | UNIT |
| Typical thermal resistance, junction to ambient <sup>(1)</sup>          | R <sub>θJA</sub> | 75    | °C/W |
| Typical thermal resistance, junction to lead                            | R <sub>θJL</sub> | 15    |      |

**Note**

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

| ORDERING INFORMATION (Example) |                 |                        |               |                                    |
|--------------------------------|-----------------|------------------------|---------------|------------------------------------|
| PREFERRED P/N                  | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                      |
| SMCG5.0A-E3/57T                | 0.211           | 57T                    | 850           | 7" diameter plastic tape and reel  |
| SMCG5.0A-M3/57T                | 0.211           | 57T                    | 850           | 7" diameter plastic tape and reel  |
| SMCG5.0A-E3/9AT                | 0.211           | 9AT                    | 3500          | 13" diameter plastic tape and reel |
| SMCG5.0A-M3/9AT                | 0.211           | 9AT                    | 3500          | 13" diameter plastic tape and reel |
| SMCG5.0AHE3/57T <sup>(1)</sup> | 0.211           | 57T                    | 850           | 7" diameter plastic tape and reel  |
| SMCG5.0AHM3/57T <sup>(1)</sup> | 0.211           | 57T                    | 850           | 7" diameter plastic tape and reel  |
| SMCG5.0AHE3/9AT <sup>(1)</sup> | 0.211           | 9AT                    | 3500          | 13" diameter plastic tape and reel |
| SMCG5.0AHM3/9AT <sup>(1)</sup> | 0.211           | 9AT                    | 3500          | 13" diameter plastic tape and reel |

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



Fig. 3 - Pulse Waveform



Fig. 5 - Typical Transient Thermal Impedance



Fig. 4 - Typical Junction Capacitance Uni-Directional



Fig. 6 - Maximum Non-Repetitive Peak Forward Surge Current Unidirectional Use Only

## PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

### SMCG (DO-215AB)



### Mounting Pad Layout





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