



**THE DATASHEET OF  
SMCJ51CA-E3/9AT**



## Surface Mount TRANSZORB<sup>®</sup> Transient Voltage Suppressors



SMC (DO-214AB)



### 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                         | SMC (DO-214AB)                |

### DEVICES FOR BIDIRECTION APPLICATIONS

For bidirectional devices use CA suffix (e.g. SMCJ188CA).  
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 available
  - Automotive ordering code: base P/NHE3 or P/NHM3
- 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:** SMC (DO-214AB)

Molding compound meets UL 94 V-0 flammability rating

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

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

Base P/NHE3\_X - RoHS-compliant and AEC-Q101 qualified

Base P/NHM3\_X - halogen-free, RoHS-compliant, and

AEC-Q101 qualified

("\_X" denotes revision code e.g. A, B, ...)

**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    |
| Power dissipation on infinite heatsink, $T_A = 50$ °C                                      | $P_D$          | 6.5            | W    |
| Peak forward surge current 8.3 ms single half sine-wave unidirectional only <sup>(2)</sup> | $I_{FSM}$      | 200            | 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 0.31" 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 MODIFIED "J" BEND LEAD                                         | DEVICE MARKING CODE |     | BREAKDOWN VOLTAGE V <sub>BR</sub> AT I <sub>T</sub> (1) |      | TEST CURRENT I <sub>T</sub> (mA) | STAND-OFF VOLTAGE V <sub>WM</sub> (V) | MAXIMUM REVERSE LEAKAGE AT V <sub>WM</sub> I <sub>D</sub> (μA) (3) | MAXIMUM PEAK PULSE SURGE CURRENT I <sub>PPM</sub> (A) (2) | MAXIMUM CLAMPING VOLTAGE AT I <sub>PPM</sub> V <sub>C</sub> (V) | MAXIMUM TEMPERATURE COEFFICIENT OF V <sub>BR</sub> (%/°C) |
|                                                                            | UNI                 | BI  | MIN.                                                    | MAX. |                                  |                                       |                                                                    |                                                           |                                                                 |                                                           |
| (+)SMCJ5.0A (5)                                                            | GDE                 | GDE | 6.40                                                    | 7.07 | 10                               | 5.0                                   | 1000                                                               | 163.0                                                     | 9.2                                                             | 0.057                                                     |
| (+)SMCJ6.0A                                                                | GDG                 | GDG | 6.67                                                    | 7.37 | 10                               | 6.0                                   | 1000                                                               | 145.6                                                     | 10.3                                                            | 0.059                                                     |
| (+)SMCJ6.5A                                                                | GDK                 | BDK | 7.22                                                    | 7.98 | 10                               | 6.5                                   | 500                                                                | 133.9                                                     | 11.2                                                            | 0.061                                                     |
| (+)SMCJ7.0A                                                                | GDM                 | GDM | 7.78                                                    | 8.60 | 10                               | 7.0                                   | 200                                                                | 125.0                                                     | 12.0                                                            | 0.065                                                     |
| (+)SMCJ7.5A                                                                | GDP                 | BDP | 8.33                                                    | 9.21 | 1.0                              | 7.5                                   | 100                                                                | 116.3                                                     | 12.9                                                            | 0.067                                                     |
| (+)SMCJ8.0A                                                                | GDR                 | BDR | 8.89                                                    | 9.83 | 1.0                              | 8.0                                   | 50                                                                 | 110.3                                                     | 13.6                                                            | 0.069                                                     |
| (+)SMCJ8.5A                                                                | GDT                 | BDT | 9.44                                                    | 10.4 | 1.0                              | 8.5                                   | 20                                                                 | 104.2                                                     | 14.4                                                            | 0.073                                                     |
| (+)SMCJ9.0A                                                                | GDV                 | BDV | 10.0                                                    | 11.1 | 1.0                              | 9.0                                   | 10                                                                 | 97.4                                                      | 15.4                                                            | 0.074                                                     |
| (+)SMCJ10A                                                                 | GDY                 | BDY | 11.1                                                    | 12.3 | 1.0                              | 10                                    | 5.0                                                                | 88.2                                                      | 17.0                                                            | 0.078                                                     |
| (+)SMCJ11A                                                                 | GDZ                 | BDZ | 12.2                                                    | 13.5 | 1.0                              | 11                                    | 5.0                                                                | 82.4                                                      | 18.2                                                            | 0.080                                                     |
| (+)SMCJ12A                                                                 | GEE                 | BEE | 13.3                                                    | 14.7 | 1.0                              | 12                                    | 5.0                                                                | 75.4                                                      | 19.9                                                            | 0.083                                                     |
| (+)SMCJ13A                                                                 | GEG                 | BEG | 14.4                                                    | 15.9 | 1.0                              | 13                                    | 1.0                                                                | 69.8                                                      | 21.5                                                            | 0.084                                                     |
| (+)SMCJ14A                                                                 | GEK                 | BEK | 15.6                                                    | 17.2 | 1.0                              | 14                                    | 1.0                                                                | 64.7                                                      | 23.2                                                            | 0.087                                                     |
| (+)SMCJ15A                                                                 | GEM                 | BEM | 16.7                                                    | 18.5 | 1.0                              | 15                                    | 1.0                                                                | 61.5                                                      | 24.4                                                            | 0.088                                                     |
| (+)SMCJ16A                                                                 | GEP                 | BEP | 17.8                                                    | 19.7 | 1.0                              | 16                                    | 1.0                                                                | 57.7                                                      | 26.0                                                            | 0.089                                                     |
| (+)SMCJ17A                                                                 | GER                 | BER | 18.9                                                    | 20.9 | 1.0                              | 17                                    | 1.0                                                                | 54.3                                                      | 27.6                                                            | 0.090                                                     |
| (+)SMCJ18A                                                                 | GET                 | BET | 20.0                                                    | 22.1 | 1.0                              | 18                                    | 1.0                                                                | 51.4                                                      | 29.2                                                            | 0.092                                                     |
| (+)SMCJ20A                                                                 | GEV                 | BEV | 22.2                                                    | 24.5 | 1.0                              | 20                                    | 1.0                                                                | 46.3                                                      | 32.4                                                            | 0.094                                                     |
| (+)SMCJ22A                                                                 | GEX                 | BEX | 24.4                                                    | 26.9 | 1.0                              | 22                                    | 1.0                                                                | 42.3                                                      | 35.5                                                            | 0.096                                                     |
| (+)SMCJ24A                                                                 | GEZ                 | BEZ | 26.7                                                    | 29.5 | 1.0                              | 24                                    | 1.0                                                                | 38.6                                                      | 38.9                                                            | 0.096                                                     |
| (+)SMCJ26A                                                                 | GFE                 | BFE | 28.9                                                    | 31.9 | 1.0                              | 26                                    | 1.0                                                                | 35.6                                                      | 42.1                                                            | 0.097                                                     |
| (+)SMCJ28A                                                                 | GFG                 | BFG | 31.1                                                    | 34.4 | 1.0                              | 28                                    | 1.0                                                                | 33.0                                                      | 45.4                                                            | 0.098                                                     |
| (+)SMCJ30A                                                                 | GFK                 | BFK | 33.3                                                    | 36.8 | 1.0                              | 30                                    | 1.0                                                                | 31.0                                                      | 48.4                                                            | 0.099                                                     |
| (+)SMCJ33A                                                                 | GFM                 | BFM | 36.7                                                    | 40.6 | 1.0                              | 33                                    | 1.0                                                                | 28.1                                                      | 53.3                                                            | 0.100                                                     |
| (+)SMCJ36A                                                                 | GFP                 | BFP | 40.0                                                    | 44.2 | 1.0                              | 36                                    | 1.0                                                                | 25.8                                                      | 58.1                                                            | 0.100                                                     |
| (+)SMCJ40A                                                                 | GFR                 | BFR | 44.4                                                    | 49.1 | 1.0                              | 40                                    | 1.0                                                                | 23.3                                                      | 64.5                                                            | 0.101                                                     |
| (+)SMCJ43A                                                                 | GFT                 | BFT | 47.8                                                    | 52.8 | 1.0                              | 43                                    | 1.0                                                                | 21.6                                                      | 69.4                                                            | 0.102                                                     |
| (+)SMCJ45A                                                                 | GFV                 | BV  | 50.0                                                    | 55.3 | 1.0                              | 45                                    | 1.0                                                                | 20.6                                                      | 72.7                                                            | 0.102                                                     |
| (+)SMCJ48A                                                                 | GFX                 | BFX | 53.3                                                    | 58.9 | 1.0                              | 48                                    | 1.0                                                                | 19.4                                                      | 77.4                                                            | 0.103                                                     |
| (+)SMCJ51A                                                                 | GFZ                 | BZ  | 56.7                                                    | 62.7 | 1.0                              | 51                                    | 1.0                                                                | 18.2                                                      | 82.4                                                            | 0.104                                                     |
| (+)SMCJ54A                                                                 | GGE                 | BGE | 60.0                                                    | 66.3 | 1.0                              | 54                                    | 1.0                                                                | 17.2                                                      | 87.1                                                            | 0.104                                                     |
| (+)SMCJ58A                                                                 | GGG                 | BGG | 64.4                                                    | 71.2 | 1.0                              | 58                                    | 1.0                                                                | 16.0                                                      | 93.6                                                            | 0.104                                                     |
| (+)SMCJ60A                                                                 | GGK                 | BGK | 66.7                                                    | 73.7 | 1.0                              | 60                                    | 1.0                                                                | 15.5                                                      | 96.8                                                            | 0.105                                                     |
| (+)SMCJ64A                                                                 | GGM                 | BGM | 71.1                                                    | 78.6 | 1.0                              | 64                                    | 1.0                                                                | 14.6                                                      | 103                                                             | 0.105                                                     |
| (+)SMCJ70A                                                                 | GGP                 | BGP | 77.8                                                    | 86.0 | 1.0                              | 70                                    | 1.0                                                                | 13.3                                                      | 113                                                             | 0.105                                                     |
| (+)SMCJ75A                                                                 | GGR                 | BGR | 83.3                                                    | 92.1 | 1.0                              | 75                                    | 1.0                                                                | 12.4                                                      | 121                                                             | 0.106                                                     |
| (+)SMCJ78A                                                                 | GGT                 | BGT | 86.7                                                    | 95.8 | 1.0                              | 78                                    | 1.0                                                                | 11.9                                                      | 126                                                             | 0.106                                                     |
| (+)SMCJ85A                                                                 | GGV                 | BGV | 94.4                                                    | 104  | 1.0                              | 85                                    | 1.0                                                                | 10.9                                                      | 137                                                             | 0.106                                                     |
| (+)SMCJ90A                                                                 | GGX                 | BGX | 100                                                     | 111  | 1.0                              | 90                                    | 1.0                                                                | 10.3                                                      | 146                                                             | 0.106                                                     |
| (+)SMCJ100A                                                                | GGZ                 | BGZ | 111                                                     | 123  | 1.0                              | 100                                   | 1.0                                                                | 9.3                                                       | 162                                                             | 0.107                                                     |
| (+)SMCJ110A                                                                | GHE                 | BHE | 122                                                     | 135  | 1.0                              | 110                                   | 1.0                                                                | 8.5                                                       | 177                                                             | 0.107                                                     |
| (+)SMCJ120A                                                                | GHG                 | BHG | 133                                                     | 147  | 1.0                              | 120                                   | 1.0                                                                | 7.8                                                       | 193                                                             | 0.108                                                     |
| (+)SMCJ130A                                                                | GHK                 | BHK | 144                                                     | 159  | 1.0                              | 130                                   | 1.0                                                                | 7.2                                                       | 209                                                             | 0.108                                                     |
| (+)SMCJ150A                                                                | GHM                 | BHM | 167                                                     | 185  | 1.0                              | 150                                   | 1.0                                                                | 6.2                                                       | 243                                                             | 0.108                                                     |
| (+)SMCJ160A                                                                | GHP                 | BHP | 178                                                     | 197  | 1.0                              | 160                                   | 1.0                                                                | 5.8                                                       | 259                                                             | 0.108                                                     |
| (+)SMCJ170A                                                                | GHR                 | BHR | 189                                                     | 209  | 1.0                              | 170                                   | 1.0                                                                | 5.5                                                       | 275                                                             | 0.108                                                     |
| SMCJ188A                                                                   | GHS                 | BHS | 209                                                     | 231  | 1.0                              | 188                                   | 1.0                                                                | 4.6                                                       | 328                                                             | 0.108                                                     |

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 SMCJ5.0CA, 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 (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 air <sup>(1)</sup>                        | $R_{\theta JA}$ | 75    | °C/W |
| Typical thermal resistance, junction to lead                                              | $R_{\theta JL}$ | 15    |      |

**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                      |
| SMCJ5.0A-E3/57T                       | 0.211           | 57T                    | 850           | 7" diameter plastic tape and reel  |
| SMCJ5.0A-M3/57T                       |                 |                        |               |                                    |
| SMCJ5.0A-E3/9AT                       | 0.211           | 9AT                    | 3500          | 13" diameter plastic tape and reel |
| SMCJ5.0A-M3/9AT                       |                 |                        |               |                                    |
| SMCJ5.0AHE3_A/H <sup>(1)</sup>        | 0.211           | H                      | 850           | 7" diameter plastic tape and reel  |
| SMCJ5.0AHM3_A/H <sup>(1)</sup>        |                 |                        |               |                                    |
| SMCJ5.0AHE3_A/I <sup>(1)</sup>        | 0.211           | I                      | 3500          | 13" diameter plastic tape and reel |
| SMCJ5.0AHM3_A/I <sup>(1)</sup>        |                 |                        |               |                                    |

**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. 4 - Typical Junction Capacitance Unidirectional



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



Fig. 5 - Typical Transient Thermal Impedance



Fig. 3 - Pulse Waveform



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



### PACKAGE OUTLINE DIMENSIONS in inches (millimeters)





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