



**THE DATASHEET OF  
SMCJ24A-M3/9AT**



# 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) (V) |      | 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   | GDX                 | BDX | 11.1  | 12.3 | 1.0                              | 10                                    | 5.0  | 88.2  | 17.0  | 0.078   |
| (+)SMCJ11A   | GDZ                 | GDZ | 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                 | GEG | 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                 | GEP | 17.8  | 19.7 | 1.0                              | 16                                    | 1.0  | 57.7  | 26.0  | 0.089   |
| (+)SMCJ17A   | GER                 | GER | 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                 | GFV | 50.0  | 55.3 | 1.0                              | 45                                    | 1.0  | 20.6  | 72.7  | 0.102   |
| (+)SMCJ48A   | GFX                 | GFX | 53.3  | 58.9 | 1.0                              | 48                                    | 1.0  | 19.4  | 77.4  | 0.103   |
| (+)SMCJ51A   | GFZ                 | GFZ | 56.7  | 62.7 | 1.0                              | 51                                    | 1.0  | 18.2  | 82.4  | 0.104   |
| (+)SMCJ54A   | GGE                 | GGE | 60.0  | 66.3 | 1.0                              | 54                                    | 1.0  | 17.2  | 87.1  | 0.104   |
| (+)SMCJ58A   | GGG                 | GGG | 64.4  | 71.2 | 1.0                              | 58                                    | 1.0  | 16.0  | 93.6  | 0.104   |
| (+)SMCJ60A   | GGK                 | GGK | 66.7  | 73.7 | 1.0                              | 60                                    | 1.0  | 15.5  | 96.8  | 0.105   |
| (+)SMCJ64A   | GGM                 | GGM | 71.1  | 78.6 | 1.0                              | 64                                    | 1.0  | 14.6  | 103   | 0.105   |
| (+)SMCJ70A   | GGP                 | GGP | 77.8  | 86.0 | 1.0                              | 70                                    | 1.0  | 13.3  | 113   | 0.105   |
| (+)SMCJ75A   | GGR                 | GGR | 83.3  | 92.1 | 1.0                              | 75                                    | 1.0  | 12.4  | 121   | 0.106   |
| (+)SMCJ78A   | GGT                 | GGT | 86.7  | 95.8 | 1.0                              | 78                                    | 1.0  | 11.9  | 126   | 0.106   |
| (+)SMCJ85A   | GGV                 | GGV | 94.4  | 104  | 1.0                              | 85                                    | 1.0  | 10.9  | 137   | 0.106   |
| (+)SMCJ90A   | GGX                 | GGX | 100   | 111  | 1.0                              | 90                                    | 1.0  | 10.3  | 146   | 0.106   |
| (+)SMCJ100A  | GGZ                 | GGZ | 111   | 123  | 1.0                              | 100                                   | 1.0  | 9.3   | 162   | 0.107   |
| (+)SMCJ110A  | GHE                 | GHE | 122   | 135  | 1.0                              | 110                                   | 1.0  | 8.5   | 177   | 0.107   |
| (+)SMCJ120A  | GHG                 | GHG | 133   | 147  | 1.0                              | 120                                   | 1.0  | 7.8   | 193   | 0.108   |
| (+)SMCJ130A  | GHK                 | GHK | 144   | 159  | 1.0                              | 130                                   | 1.0  | 7.2   | 209   | 0.108   |
| (+)SMCJ150A  | GHM                 | GHM | 167   | 185  | 1.0                              | 150                                   | 1.0  | 6.2   | 243   | 0.108   |
| (+)SMCJ160A  | GHP                 | GHP | 178   | 197  | 1.0                              | 160                                   | 1.0  | 5.8   | 259   | 0.108   |
| (+)SMCJ170A  | GHR                 | GHR | 189   | 209  | 1.0                              | 170                                   | 1.0  | 5.5   | 275   | 0.108   |
| SMCJ188A   | GHS                 | GHS | 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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