



**THE DATASHEET OF  
SMAJ45CA-E3/61**



## Surface Mount TRANSZORB® Transient Voltage Suppressors


**SMA (DO-214AC)**

**RoHS**  
COMPLIANT  
**HALOGEN**  
**FREE**  
Available

**FEATURES**

- Low profile package
- Ideal for automated placement
- Glass passivated chip junction
- Available in uni-directional and bi-directional
- 400 W peak pulse power capability with a 10/1000  $\mu$ s waveform, repetitive rate (duty cycle): 0.01 % (300 W above 78 V)
- 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)

| PRIMARY CHARACTERISTICS  |                                 |
|--------------------------|---------------------------------|
| $V_{BR}$ uni-directional | 6.40 V to 231 V                 |
| $V_{BR}$ bi-directional  | 6.40 V to 231 V                 |
| $V_{WM}$                 | 5.0 V to 188 V                  |
| $P_{PPM}$                | 400 W, 300 W                    |
| $I_{FSM}$                | 40 A                            |
| $T_J$ max.               | 150 °C                          |
| Polarity                 | Uni-directional, bi-directional |
| Package                  | SMA (DO-214AC)                  |

**DEVICES FOR BI-DIRECTION APPLICATIONS**

For bi-directional use CA suffix (e.g. SMAJ10CA).  
Electrical characteristics apply in both directions.

**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:** SMA (DO-214AC)

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 uni-directional types the band denotes cathode end, no marking on bi-directional 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> (fig. 1)     | $P_{PPM}$      | 400            | W    |
| Peak pulse current with a 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> | $I_{FSM}$      | 40             | 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. Rating is 300 W above 78 V

<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  | DEVICE MARKING CODE |    | BREAKDOWN VOLTAGE V <sub>BR</sub> AT I <sub>T</sub> <sup>(1)</sup> (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) <sup>(3)</sup> | MAXIMUM PEAK PULSE SURGE CURRENT I <sub>PPM</sub> (A) <sup>(2)</sup> | MAXIMUM CLAMPING VOLTAGE AT I <sub>PPM</sub> V <sub>C</sub> (V) |
|  | UNI                 | BI | MIN.   | MAX. |                                  |                                       |   |  |   |
| (+)SMAJ5.0A <sup>(5)</sup>   | AE                  | WE | 6.40   | 7.07 | 10                               | 5.0                                   | 800   | 43.5   | 9.2   |
| (+)SMAJ6.0A  | AG                  | WG | 6.67   | 7.37 | 10                               | 6.0                                   | 800   | 38.8   | 10.3  |
| (+)SMAJ6.5A  | AK                  | WK | 7.22   | 7.98 | 10                               | 6.5                                   | 500   | 35.7   | 11.2  |
| (+)SMAJ7.0A  | AM                  | WM | 7.78   | 8.60 | 10                               | 7.0                                   | 200   | 33.3   | 12.0  |
| (+)SMAJ7.5A  | AP                  | WP | 8.33   | 9.21 | 1.0                              | 7.5                                   | 100   | 31.0   | 12.9  |
| (+)SMAJ8.0A  | AR                  | WR | 8.89   | 9.83 | 1.0                              | 8.0                                   | 50  | 29.4   | 13.6  |
| (+)SMAJ8.5A  | AT                  | WT | 9.44   | 10.4 | 1.0                              | 8.5                                   | 10  | 27.8   | 14.4  |
| (+)SMAJ9.0A  | AV                  | WV | 10.0   | 11.1 | 1.0                              | 9.0                                   | 5.0   | 26.0   | 15.4  |
| (+)SMAJ10A   | AX                  | WX | 11.1   | 12.3 | 1.0                              | 10                                    | 1.0   | 23.5   | 17.0  |
| (+)SMAJ11A   | AZ                  | WZ | 12.2   | 13.5 | 1.0                              | 11                                    | 1.0   | 22.0   | 18.2  |
| (+)SMAJ12A   | BE                  | XE | 13.3   | 14.7 | 1.0                              | 12                                    | 1.0   | 20.1   | 19.9  |
| (+)SMAJ13A   | BG                  | XG | 14.4   | 15.9 | 1.0                              | 13                                    | 1.0   | 18.6   | 21.5  |
| (+)SMAJ14A   | BK                  | XK | 15.6   | 17.2 | 1.0                              | 14                                    | 1.0   | 17.2   | 23.2  |
| (+)SMAJ15A   | BM                  | XM | 16.7   | 18.5 | 1.0                              | 15                                    | 1.0   | 16.4   | 24.4  |
| (+)SMAJ16A   | BP                  | XP | 17.8   | 19.7 | 1.0                              | 16                                    | 1.0   | 15.4   | 26.0  |
| (+)SMAJ17A   | BR                  | XR | 18.9   | 20.9 | 1.0                              | 17                                    | 1.0   | 14.5   | 27.6  |
| (+)SMAJ18A   | BT                  | XT | 20.0   | 22.1 | 1.0                              | 18                                    | 1.0   | 13.7   | 29.2  |
| (+)SMAJ20A   | BV                  | XV | 22.2   | 24.5 | 1.0                              | 20                                    | 1.0   | 12.3   | 32.4  |
| (+)SMAJ22A   | BX                  | XX | 24.4   | 26.9 | 1.0                              | 22                                    | 1.0   | 11.3   | 35.5  |
| (+)SMAJ24A   | BZ                  | XZ | 26.7   | 29.5 | 1.0                              | 24                                    | 1.0   | 10.3   | 38.9  |
| (+)SMAJ26A   | CE                  | YE | 28.9   | 31.9 | 1.0                              | 26                                    | 1.0   | 9.5  | 42.1  |
| (+)SMAJ28A   | CG                  | YG | 31.1   | 34.4 | 1.0                              | 28                                    | 1.0   | 8.8  | 45.4  |
| (+)SMAJ30A   | CK                  | YK | 33.3   | 36.8 | 1.0                              | 30                                    | 1.0   | 8.3  | 48.4  |
| (+)SMAJ33A   | CM                  | YM | 36.7   | 40.6 | 1.0                              | 33                                    | 1.0   | 7.5  | 53.3  |
| (+)SMAJ36A   | CP                  | YP | 40.0   | 44.2 | 1.0                              | 36                                    | 1.0   | 6.9  | 58.1  |
| (+)SMAJ40A   | CR                  | YR | 44.4   | 49.1 | 1.0                              | 40                                    | 1.0   | 6.2  | 64.5  |
| (+)SMAJ43A   | CT                  | YT | 47.8   | 52.8 | 1.0                              | 43                                    | 1.0   | 5.8  | 69.4  |
| (+)SMAJ45A   | CV                  | YV | 50.0   | 55.3 | 1.0                              | 45                                    | 1.0   | 5.5  | 72.7  |
| (+)SMAJ48A   | CX                  | YX | 53.3   | 58.9 | 1.0                              | 48                                    | 1.0   | 5.2  | 77.4  |
| (+)SMAJ51A   | CZ                  | YZ | 56.7   | 62.7 | 1.0                              | 51                                    | 1.0   | 4.9  | 82.4  |
| (+)SMAJ54A   | RE                  | ZE | 60.0   | 66.3 | 1.0                              | 54                                    | 1.0   | 4.6  | 87.1  |
| (+)SMAJ58A   | RG                  | ZG | 64.4   | 71.2 | 1.0                              | 58                                    | 1.0   | 4.3  | 93.6  |
| (+)SMAJ60A   | RK                  | ZK | 66.7   | 73.7 | 1.0                              | 60                                    | 1.0   | 4.1  | 96.8  |
| (+)SMAJ64A   | RM                  | ZM | 71.1   | 78.6 | 1.0                              | 64                                    | 1.0   | 3.9  | 103   |
| (+)SMAJ70A   | RP                  | ZP | 77.8   | 86.0 | 1.0                              | 70                                    | 1.0   | 3.5  | 113   |
| (+)SMAJ75A   | RR                  | ZR | 83.3   | 92.1 | 1.0                              | 75                                    | 1.0   | 3.3  | 121   |
| (+)SMAJ78A   | RT                  | ZT | 86.7   | 95.8 | 1.0                              | 78                                    | 1.0   | 3.2  | 126   |
| (+)SMAJ85A   | RV                  | ZV | 94.4   | 104  | 1.0                              | 85                                    | 1.0   | 2.2  | 137   |
| (+)SMAJ90A   | RX                  | ZX | 100  | 111  | 1.0                              | 90                                    | 1.0   | 2.1  | 146   |
| (+)SMAJ100A  | RZ                  | ZZ | 111  | 123  | 1.0                              | 100                                   | 1.0   | 1.9  | 162   |
| (+)SMAJ110A  | SE                  | VE | 122  | 135  | 1.0                              | 110                                   | 1.0   | 1.7  | 177   |
| (+)SMAJ120A  | VG                  | VG | 133  | 147  | 1.0                              | 120                                   | 1.0   | 1.6  | 193   |
| (+)SMAJ130A  | VK                  | VK | 144  | 159  | 1.0                              | 130                                   | 1.0   | 1.4  | 209   |
| (+)SMAJ150A  | VM                  | VM | 167  | 185  | 1.0                              | 150                                   | 1.0   | 1.2  | 243   |
| (+)SMAJ160A  | SP                  | VP | 178  | 197  | 1.0                              | 160                                   | 1.0   | 1.2  | 259   |
| (+)SMAJ170A  | SR                  | VR | 189  | 209  | 1.0                              | 170                                   | 1.0   | 1.09   | 275   |
| (+)SMAJ188A  | SS                  | VS | 209  | 231  | 1.0                              | 188                                   | 1.0   | 0.91   | 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 SMAJ5.0CA, the maximum V<sub>BR</sub> is 7.25 V
- (6) V<sub>F</sub> = 3.5 V at I<sub>F</sub> = 25 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 device



| 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> | 120   | °C/W |
| Typical thermal resistance, junction to lead                            | R <sub>θJL</sub> | 30    | °C/W |

**Note**

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

| ORDERING INFORMATION (Example) |                 |                        |               |                                    |
|--------------------------------|-----------------|------------------------|---------------|------------------------------------|
| PREFERRED P/N                  | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                      |
| SMAJ5.0A-E3/61                 | 0.064           | 61                     | 1800          | 7" diameter plastic tape and reel  |
| SMAJ5.0A-M3/61                 |                 |                        |               |                                    |
| SMAJ5.0A-E3/5A                 | 0.064           | 5A                     | 7500          | 13" diameter plastic tape and reel |
| SMAJ5.0A-M3/5A                 |                 |                        |               |                                    |
| SMAJ5.0AHE3_A/H <sup>(1)</sup> | 0.064           | H                      | 1800          | 7" diameter plastic tape and reel  |
| SMAJ5.0AHM3_A/H <sup>(1)</sup> |                 |                        |               |                                    |
| SMAJ5.0AHE3_A/I <sup>(1)</sup> | 0.064           | I                      | 7500          | 13" diameter plastic tape and reel |
| SMAJ5.0AHM3_A/I <sup>(1)</sup> |                 |                        |               |                                    |

**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

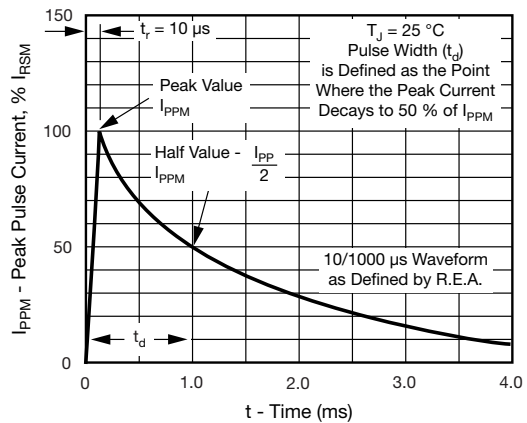


Fig. 3 - Pulse Waveform



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



Fig. 4 - Typical Junction Capacitance

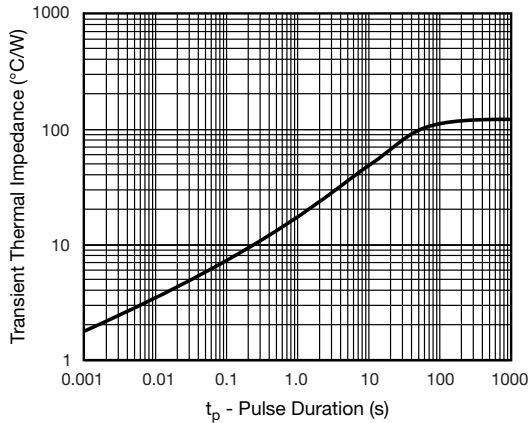


Fig. 5 - Typical Transient Thermal Impedance

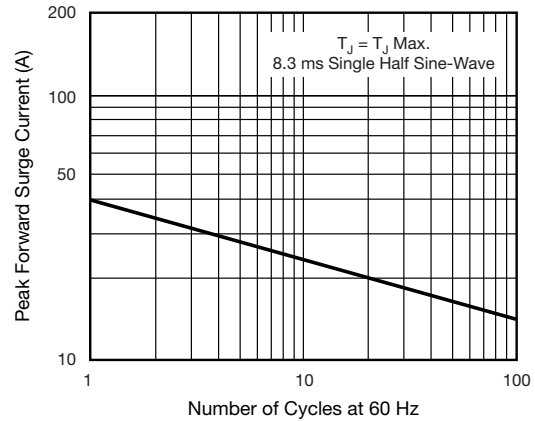
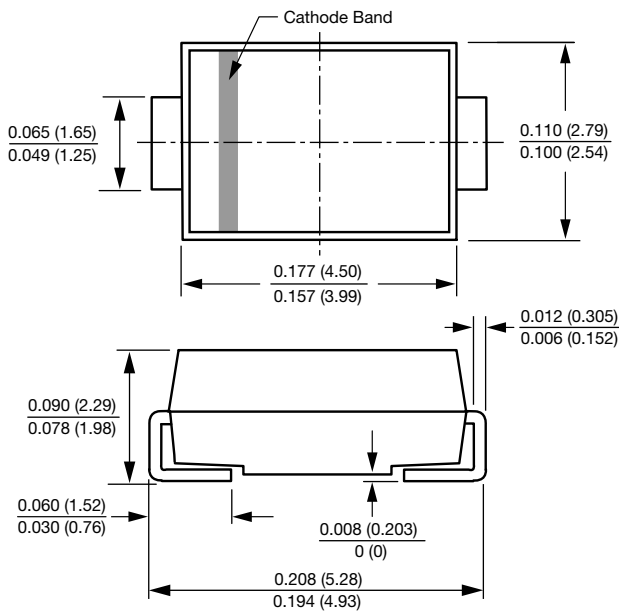


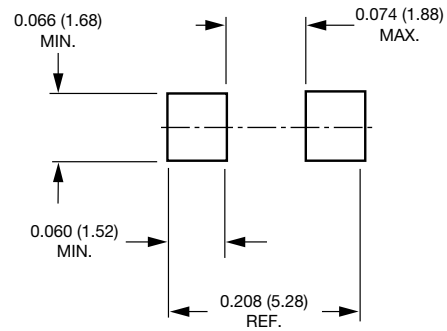
Fig. 6 - Maximum Non-Repetitive Forward Surge Current Uni-Directional Only

## PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

### SMA (DO-214AC)



### Mounting Pad Layout





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