

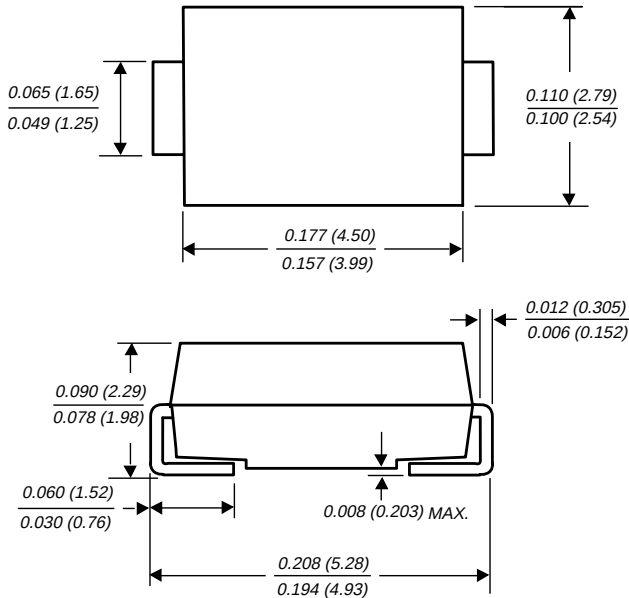
# SMAJ5.0 THRU SMAJ170CA

## SURFACE MOUNT TRANSZORB™ TRANSIENT VOLTAGE SUPPRESSOR

Stand-off Voltage - 5.0 to 170 Volts

Peak Pulse Power - 300 Watts

### DO-214AC



Dimensions in inches and (millimeters)

### FEATURES

- ♦ Optimized for LAN protection applications
- ♦ Ideal for ESD protection of data lines in accordance with IEC 1000-4-2 (IEC801-2)
- ♦ Ideal for EFT protection of data lines in accordance with IEC1000-4-4 (IEC801-4)
- ♦ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ♦ Glass passivated junction
- ♦ Excellent clamping capability
- ♦ Low incremental surge resistance
- ♦ Fast response time: typically less than 1.0ps from 0 Volts to V<sub>BR</sub> min.
- ♦ 300W peak pulse power capability with a 10/1000μs waveform, repetition rate (duty cycle): 0.01%
- ♦ High temperature soldering guaranteed: 250°C/10 seconds at terminals



### MECHANICAL DATA

**Case:** JEDEC DO-214AC molded plastic body over passivated chip

**Terminals:** Solder plated, solderable per MIL-STD-750, Method 2026

**Polarity:** For uni-directional types the color band denotes the cathode, which is positive with respect to the anode under normal TVS operation

**Mounting Position:** Any

**Weight:** 0.002 ounces, 0.064 gram

### DEVICES FOR BIDIRECTIONAL APPLICATIONS

For bi-directional use suffix C or CA for types SMAJ5.0 thru SMAJ170 (e.g. SMAJ5.0C, SMAJ170CA)  
Electrical characteristics apply in both directions.

### MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

|                                                                                                                                     | SYMBOLS                           | VALUE       | UNITS |
|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------|-------|
| Peak pulse power dissipation with a 10/1000μs waveform (NOTE 1, 2, FIG.1)                                                           | PPM                               | Minimum 300 | Watts |
| Peak pulse current with a 10/1000μs waveform (NOTE 1)                                                                               | I <sub>PPM</sub>                  | SEE TABLE 1 | Amps  |
| Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) (NOTES 2, 3) - unidirectional only | I <sub>FSM</sub>                  | 40.0        | Amps  |
| Maximum instantaneous forward voltage at 25A (NOTE 3)                                                                               | V <sub>F</sub>                    | 3.5         | Volts |
| Operating junction and storage temperature range                                                                                    | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C    |

#### NOTES:

- (1) Non-repetitive current pulse, per Fig.3 and derated above T<sub>A</sub>=25°C per Fig. 2
- (2) Mounted on 0.2 x 0.2" (5.0 x 5.0mm) copper pads to each terminal
- (3) Measured on 8.3ms single half sine-wave. For uni-directional devices only.

ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C unless otherwise noted) TABLE 1

| Device   | Device Marking Code |    | Breakdown Voltage V <sub>BR</sub> (Volts) at I <sub>T</sub><br>(NOTE 1) |      | Test Current I <sub>T</sub> (mA) | Working Peak Reverse Voltage V <sub>WM</sub> (Volts) | Maximum Reverse Leakage a V <sub>WM</sub><br>(NOTE 3) I <sub>D</sub> (μA) | Maximum Peak Pulse Surge Current I <sub>PPM</sub><br>(NOTE 2) (Amps) | Maximum Clamping Voltage at I <sub>PPM</sub> V <sub>c</sub> (Volts) |
|----------|---------------------|----|-------------------------------------------------------------------------|------|----------------------------------|------------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------|
|          | UNI                 | BI | Min.                                                                    | Max. |                                  |                                                      |                                                                           |                                                                      |                                                                     |
| SMAJ5.0  | AD                  | WD | 6.4                                                                     | 7.82 | 10                               | 5.0                                                  | 800                                                                       | 31.3                                                                 | 9.6                                                                 |
| SMAJ5.0A | AE                  | WE | 6.4                                                                     | 7.07 | 10                               | 5.0                                                  | 800                                                                       | 32.6                                                                 | 9.2                                                                 |
| SMAJ6.0  | AF                  | WF | 6.67                                                                    | 8.15 | 10                               | 6.0                                                  | 800                                                                       | 26.3                                                                 | 11.4                                                                |
| SMAJ6.0A | AG                  | WG | 6.67                                                                    | 7.37 | 10                               | 6.0                                                  | 800                                                                       | 29.1                                                                 | 10.3                                                                |
| SMAJ6.5  | AH                  | WH | 7.22                                                                    | 8.82 | 10                               | 6.5                                                  | 500                                                                       | 24.4                                                                 | 12.3                                                                |
| SMAJ6.5A | AK                  | WK | 7.22                                                                    | 7.98 | 10                               | 6.5                                                  | 500                                                                       | 26.8                                                                 | 11.2                                                                |
| SMAJ7.0  | AL                  | WL | 7.78                                                                    | 9.51 | 10                               | 7.0                                                  | 200                                                                       | 22.6                                                                 | 13.3                                                                |
| SMAJ7.0A | AM                  | WM | 7.78                                                                    | 8.6  | 10                               | 7.0                                                  | 200                                                                       | 25.0                                                                 | 12.0                                                                |
| SMAJ7.5  | AN                  | WN | 8.33                                                                    | 10.3 | 1.0                              | 7.5                                                  | 100                                                                       | 21.0                                                                 | 14.3                                                                |
| SMAJ7.5A | AP                  | WP | 8.33                                                                    | 9.21 | 1.0                              | 7.5                                                  | 100                                                                       | 23.3                                                                 | 12.9                                                                |
| SMAJ8.0  | AQ                  | WQ | 8.89                                                                    | 10.9 | 1.0                              | 8.0                                                  | 50.0                                                                      | 20.0                                                                 | 15.0                                                                |
| SMAJ8.0A | AR                  | WR | 8.89                                                                    | 9.83 | 1.0                              | 8.0                                                  | 50.0                                                                      | 22.1                                                                 | 13.6                                                                |
| SMAJ8.5  | AS                  | WS | 9.44                                                                    | 11.5 | 1.0                              | 8.5                                                  | 10.0                                                                      | 18.9                                                                 | 15.9                                                                |
| SMAJ8.5A | AT                  | WT | 9.44                                                                    | 10.4 | 1.0                              | 8.5                                                  | 10.0                                                                      | 20.8                                                                 | 14.4                                                                |
| SMAJ9.0  | AU                  | WU | 10.0                                                                    | 12.2 | 1.0                              | 9.0                                                  | 5.0                                                                       | 17.8                                                                 | 16.9                                                                |
| SMAJ9.0A | AV                  | WV | 10.0                                                                    | 11.1 | 1.0                              | 9.0                                                  | 5.0                                                                       | 19.5                                                                 | 15.4                                                                |
| SMAJ10   | AW                  | WW | 11.1                                                                    | 13.6 | 1.0                              | 10.0                                                 | 5.0                                                                       | 16.0                                                                 | 18.8                                                                |
| SMAJ10A  | AX                  | WX | 11.1                                                                    | 12.3 | 1.0                              | 10.0                                                 | 5.0                                                                       | 17.6                                                                 | 17.0                                                                |
| SMAJ11   | AY                  | WY | 12.2                                                                    | 14.9 | 1.0                              | 11.0                                                 | 5.0                                                                       | 14.9                                                                 | 20.1                                                                |
| SMAJ11A  | AZ                  | WZ | 12.2                                                                    | 13.5 | 1.0                              | 11.0                                                 | 5.0                                                                       | 16.5                                                                 | 18.2                                                                |
| SMAJ12   | BD                  | XD | 13.3                                                                    | 16.3 | 1.0                              | 12.0                                                 | 5.0                                                                       | 13.6                                                                 | 22.0                                                                |
| SMAJ12A  | BE                  | XE | 13.3                                                                    | 14.7 | 1.0                              | 12.0                                                 | 5.0                                                                       | 15.1                                                                 | 19.9                                                                |
| SMAJ13   | BF                  | XF | 14.4                                                                    | 17.6 | 1.0                              | 13.0                                                 | 5.0                                                                       | 12.6                                                                 | 23.8                                                                |
| SMAJ13A  | BG                  | XG | 14.4                                                                    | 15.9 | 1.0                              | 13.0                                                 | 5.0                                                                       | 14.0                                                                 | 21.5                                                                |
| SMAJ14   | BH                  | XH | 15.6                                                                    | 19.1 | 1.0                              | 14.0                                                 | 5.0                                                                       | 11.6                                                                 | 25.8                                                                |
| SMAJ14A  | BK                  | XK | 15.6                                                                    | 17.2 | 1.0                              | 14.0                                                 | 5.0                                                                       | 12.9                                                                 | 23.2                                                                |
| SMAJ15   | BL                  | XL | 16.7                                                                    | 20.4 | 1.0                              | 15.0                                                 | 5.0                                                                       | 11.2                                                                 | 26.9                                                                |
| SMAJ15A  | BM                  | XM | 16.7                                                                    | 18.5 | 1.0                              | 15.0                                                 | 5.0                                                                       | 12.3                                                                 | 24.4                                                                |
| SMAJ16   | BN                  | XN | 17.8                                                                    | 21.8 | 1.0                              | 16.0                                                 | 5.0                                                                       | 10.4                                                                 | 28.8                                                                |
| SMAJ16A  | BP                  | XP | 17.8                                                                    | 19.7 | 1.0                              | 16.0                                                 | 5.0                                                                       | 11.5                                                                 | 26.0                                                                |
| SMAJ17   | BQ                  | XQ | 18.9                                                                    | 23.1 | 1.0                              | 17.0                                                 | 5.0                                                                       | 9.8                                                                  | 30.5                                                                |
| SMAJ17A  | BR                  | XR | 18.9                                                                    | 20.9 | 1.0                              | 17.0                                                 | 5.0                                                                       | 10.9                                                                 | 27.6                                                                |
| SMAJ18   | BS                  | XS | 20.0                                                                    | 24.4 | 1.0                              | 18.0                                                 | 5.0                                                                       | 9.3                                                                  | 32.2                                                                |
| SMAJ18A  | BT                  | XT | 20.0                                                                    | 22.1 | 1.0                              | 18.0                                                 | 5.0                                                                       | 10.3                                                                 | 29.2                                                                |
| SMAJ20   | BU                  | XU | 22.2                                                                    | 27.1 | 1.0                              | 20.0                                                 | 5.0                                                                       | 8.4                                                                  | 35.8                                                                |
| SMAJ20A  | BV                  | XV | 22.2                                                                    | 24.5 | 1.0                              | 20.0                                                 | 5.0                                                                       | 9.3                                                                  | 32.4                                                                |
| SMAJ22   | BW                  | XW | 24.4                                                                    | 29.8 | 1.0                              | 22.0                                                 | 5.0                                                                       | 7.6                                                                  | 39.4                                                                |
| SMAJ22A  | BX                  | XX | 24.4                                                                    | 26.9 | 1.0                              | 22.0                                                 | 5.0                                                                       | 8.5                                                                  | 35.5                                                                |
| SMAJ24   | BY                  | XY | 26.7                                                                    | 32.6 | 1.0                              | 24.0                                                 | 5.0                                                                       | 7.0                                                                  | 43.0                                                                |
| SMAJ24A  | BZ                  | XZ | 26.7                                                                    | 29.5 | 1.0                              | 24.0                                                 | 5.0                                                                       | 7.7                                                                  | 38.9                                                                |
| SMAJ26   | CD                  | YD | 28.9                                                                    | 35.3 | 1.0                              | 26.0                                                 | 5.0                                                                       | 6.4                                                                  | 46.6                                                                |
| SMAJ26A  | CE                  | YE | 28.9                                                                    | 31.9 | 1.0                              | 26.0                                                 | 5.0                                                                       | 7.1                                                                  | 42.1                                                                |
| SMAJ28   | CF                  | YF | 31.1                                                                    | 38.0 | 1.0                              | 28.0                                                 | 5.0                                                                       | 6.0                                                                  | 50.0                                                                |
| SMAJ28A  | CG                  | YG | 31.1                                                                    | 34.4 | 1.0                              | 28.0                                                 | 5.0                                                                       | 6.6                                                                  | 45.4                                                                |
| SMAJ30   | CH                  | YH | 33.3                                                                    | 40.7 | 1.0                              | 30.0                                                 | 5.0                                                                       | 5.6                                                                  | 53.5                                                                |
| SMAJ30A  | CK                  | YK | 33.3                                                                    | 36.8 | 1.0                              | 30.0                                                 | 5.0                                                                       | 6.2                                                                  | 48.4                                                                |
| SMAJ33   | CL                  | YL | 36.7                                                                    | 44.9 | 1.0                              | 33.0                                                 | 5.0                                                                       | 5.1                                                                  | 59.0                                                                |
| SMAJ33A  | CM                  | YM | 36.7                                                                    | 40.6 | 1.0                              | 33.0                                                 | 5.0                                                                       | 5.6                                                                  | 53.3                                                                |
| SMAJ36   | CN                  | YN | 40.0                                                                    | 48.9 | 1.0                              | 36.0                                                 | 5.0                                                                       | 4.7                                                                  | 64.3                                                                |
| SMAJ36A  | CP                  | YP | 40.0                                                                    | 44.2 | 1.0                              | 36.0                                                 | 5.0                                                                       | 5.2                                                                  | 58.1                                                                |
| SMAJ40   | CQ                  | YQ | 44.4                                                                    | 54.3 | 1.0                              | 40.0                                                 | 5.0                                                                       | 4.2                                                                  | 71.4                                                                |
| SMAJ40A  | CR                  | YR | 44.4                                                                    | 49.1 | 1.0                              | 40.0                                                 | 5.0                                                                       | 4.7                                                                  | 64.5                                                                |
| SMAJ43   | CS                  | YS | 47.8                                                                    | 58.4 | 1.0                              | 43.0                                                 | 5.0                                                                       | 3.9                                                                  | 76.7                                                                |
| SMAJ43A  | CT                  | YT | 47.8                                                                    | 52.8 | 1.0                              | 43.0                                                 | 5.0                                                                       | 4.3                                                                  | 69.4                                                                |
| SMAJ45   | CU                  | YU | 50.0                                                                    | 61.1 | 1.0                              | 45.0                                                 | 5.0                                                                       | 80.3                                                                 | 3.7                                                                 |
| SMAJ45A  | CV                  | YV | 50.0                                                                    | 55.3 | 1.0                              | 45                                                   | 5.0                                                                       | 72.7                                                                 | 4.1                                                                 |
| SMAJ48   | CW                  | YW | 53.3                                                                    | 65.1 | 1.0                              | 48                                                   | 5.0                                                                       | 85.5                                                                 | 3.5                                                                 |
| SMAJ48A  | CX                  | YX | 53.3                                                                    | 58.9 | 1.0                              | 48                                                   | 5.0                                                                       | 77.4                                                                 | 3.9                                                                 |
| SMAJ51   | CY                  | YY | 56.7                                                                    | 69.3 | 1.0                              | 51                                                   | 5.0                                                                       | 91.1                                                                 | 3.3                                                                 |
| SMAJ51A  | CZ                  | YZ | 56.7                                                                    | 62.7 | 1.0                              | 51                                                   | 5.0                                                                       | 82.4                                                                 | 3.6                                                                 |

# ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C unless otherwise noted) TABLE 1 (Cont'd)

| Device   | Device Marking Code |    | Breakdown Voltage V <sub>BR</sub> (Volts) at I <sub>T</sub><br>(NOTE 1) |      | Test Current I <sub>T</sub> (mA) | Working Peak Reverse Voltage V <sub>WM</sub> (Volts) | Maximum Reverse Leakage a V <sub>WM</sub><br>(NOTE 3) I <sub>D</sub> (μA) | Maximum Peak Pulse Surge Current I <sub>PPM</sub><br>(NOTE 2) (Amps) | Maximum Clamping Voltage at I <sub>PPM</sub><br>V <sub>c</sub> (Volts) |
|----------|---------------------|----|-------------------------------------------------------------------------|------|----------------------------------|------------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------------------------------------------|
|          | UNI                 | BI | Min.                                                                    | Max. |                                  |                                                      |                                                                           |                                                                      |                                                                        |
| SMAJ54   | RD                  | ZD | 60.0                                                                    | 73.3 | 1.0                              | 54                                                   | 5.0                                                                       | 96.3                                                                 | 3.1                                                                    |
| SMAJ54A  | RE                  | ZE | 60.0                                                                    | 66.3 | 1.0                              | 54                                                   | 5.0                                                                       | 87.1                                                                 | 3.4                                                                    |
| SMAJ58   | RF                  | ZF | 64.4                                                                    | 78.7 | 1.0                              | 58                                                   | 5.0                                                                       | 103                                                                  | 2.9                                                                    |
| SMAJ58A  | RG                  | ZG | 64.4                                                                    | 71.2 | 1.0                              | 58                                                   | 5.0                                                                       | 93.6                                                                 | 3.2                                                                    |
| SMAJ60   | RH                  | ZH | 66.7                                                                    | 81.5 | 1.0                              | 60                                                   | 5.0                                                                       | 107                                                                  | 2.8                                                                    |
| SMAJ60A  | RK                  | ZK | 66.7                                                                    | 73.7 | 1.0                              | 60                                                   | 5.0                                                                       | 96.8                                                                 | 3.1                                                                    |
| SMAJ64   | RL                  | ZL | 71.1                                                                    | 86.4 | 1.0                              | 64                                                   | 5.0                                                                       | 114                                                                  | 2.6                                                                    |
| SMAJ64A  | RM                  | ZM | 71.1                                                                    | 78.6 | 1.0                              | 64                                                   | 5.0                                                                       | 103                                                                  | 2.9                                                                    |
| SMAJ70   | RN                  | ZN | 77.8                                                                    | 95.1 | 1.0                              | 70                                                   | 5.0                                                                       | 125                                                                  | 2.4                                                                    |
| SMAJ70A  | RP                  | ZP | 77.8                                                                    | 86   | 1.0                              | 70                                                   | 5.0                                                                       | 113                                                                  | 2.7                                                                    |
| SMAJ75   | RQ                  | ZQ | 83.3                                                                    | 102  | 1.0                              | 75                                                   | 5.0                                                                       | 134                                                                  | 2.2                                                                    |
| SMAJ75A  | RR                  | ZR | 83.3                                                                    | 92.1 | 1.0                              | 75                                                   | 5.0                                                                       | 121                                                                  | 2.5                                                                    |
| SMAJ78   | RS                  | ZS | 86.7                                                                    | 106  | 1.0                              | 78                                                   | 5.0                                                                       | 139                                                                  | 2.2                                                                    |
| SMAJ78A  | RT                  | ZT | 86.7                                                                    | 95.8 | 1.0                              | 78                                                   | 5.0                                                                       | 126                                                                  | 2.4                                                                    |
| SMAJ85   | RU                  | ZU | 94.4                                                                    | 115  | 1.0                              | 85                                                   | 5.0                                                                       | 151                                                                  | 2                                                                      |
| SMAJ85A  | RV                  | ZV | 94.4                                                                    | 104  | 1.0                              | 85                                                   | 5.0                                                                       | 137                                                                  | 2.2                                                                    |
| SMAJ90   | RW                  | ZW | 100                                                                     | 122  | 1.0                              | 90                                                   | 5.0                                                                       | 160                                                                  | 1.9                                                                    |
| SMAJ90A  | RX                  | ZX | 100                                                                     | 111  | 1.0                              | 90                                                   | 5.0                                                                       | 146                                                                  | 2.1                                                                    |
| SMAJ100  | RY                  | ZY | 111                                                                     | 136  | 1.0                              | 100                                                  | 5.0                                                                       | 179                                                                  | 1.7                                                                    |
| SMAJ100A | RZ                  | ZZ | 111                                                                     | 123  | 1.0                              | 100                                                  | 5.0                                                                       | 162                                                                  | 1.9                                                                    |
| SMAJ110  | SD                  | VD | 122                                                                     | 149  | 1.0                              | 110                                                  | 5.0                                                                       | 196                                                                  | 1.5                                                                    |
| SMAJ110A | SE                  | VE | 122                                                                     | 135  | 1.0                              | 110                                                  | 5.0                                                                       | 177                                                                  | 1.7                                                                    |
| SMAJ120  | SF                  | VF | 133                                                                     | 163  | 1.0                              | 120                                                  | 5.0                                                                       | 214                                                                  | 1.4                                                                    |
| SMAJ120A | SG                  | VG | 133                                                                     | 147  | 1.0                              | 120                                                  | 5.0                                                                       | 193                                                                  | 1.6                                                                    |
| SMAJ130  | SH                  | VH | 144                                                                     | 176  | 1.0                              | 130                                                  | 5.0                                                                       | 231                                                                  | 1.3                                                                    |
| SMAJ130A | SK                  | VK | 144                                                                     | 159  | 1.0                              | 130                                                  | 5.0                                                                       | 209                                                                  | 1.4                                                                    |
| SMAJ150  | SL                  | VL | 167                                                                     | 204  | 1.0                              | 150                                                  | 5.0                                                                       | 268                                                                  | 1.1                                                                    |
| SMAJ150A | SM                  | VM | 167                                                                     | 185  | 1.0                              | 150                                                  | 5.0                                                                       | 243                                                                  | 1.2                                                                    |
| SMAJ160  | SN                  | VN | 178                                                                     | 218  | 1.0                              | 160                                                  | 5.0                                                                       | 287                                                                  | 1.0                                                                    |
| SMAJ160A | SP                  | VP | 178                                                                     | 197  | 1.0                              | 160                                                  | 5.0                                                                       | 259                                                                  | 1.2                                                                    |
| SMAJ170  | SQ                  | VQ | 189                                                                     | 231  | 1                                | 170                                                  | 5.0                                                                       | 304                                                                  | 0.99                                                                   |
| SMAJ170A | SR                  | VR | 189                                                                     | 209  | 1.0                              | 170                                                  | 5.0                                                                       | 275                                                                  | 1.09                                                                   |

## NOTES:

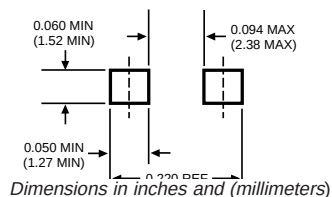
- (1) V<sub>BR</sub> measured after I<sub>T</sub> applied for 300μs square wave pulse or equivalent
- (2) Surge current waveform per Fig. 3 and derate per Fig. 2
- (3) For bi-directional types having V<sub>WM</sub> of 10 Volts and less, the I<sub>D</sub> limit is doubled
- (4) For the bi-directional SMAJ5.0CA, the maximum V<sub>BR</sub> is 7.25V.
- (5) All terms and symbols are consistent with ANSI/IEEE C62.35

## APPLICATION NOTES

### RECOMMENDED PAD LAYOUT

The pad dimensions should be 0.010" (2.5mm) longer than the contact size in the lead axis. This allows a solder fillet to form, see figure below. Contact factory for soldering methods.

#### MODIFIED J-BEND



This device is designed specifically for transient voltage suppression from threats generated by ESD for board level load switching components.

The wide leads assure a large surface contact for good heat dissipation, and a low resistance path for surge current flow to ground.

This series is designed to optimize board space and for use with surface mount technology automated assembly equipment.

They can be easily mounted on printed circuit boards and ceramic substrates to protect sensitive components from transient voltage damage.

# MAXIMUM RATINGS AND CHARACTERISTIC CURVES SMAJ5.0 THRU SMAJ170CA

FIG. 1 - PEAK PULSE POWER RATING CURVE

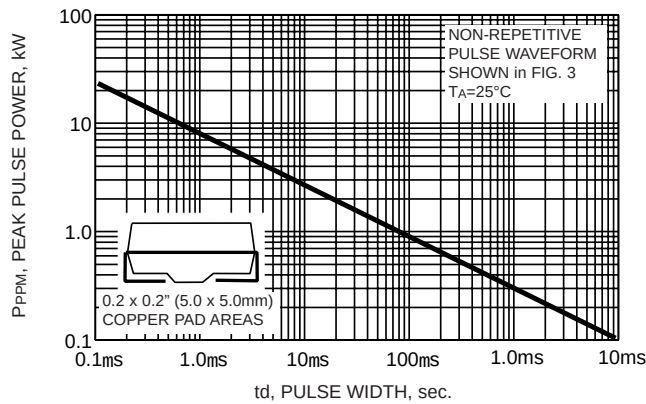


FIG. 2 - PULSE DERATING CURVE

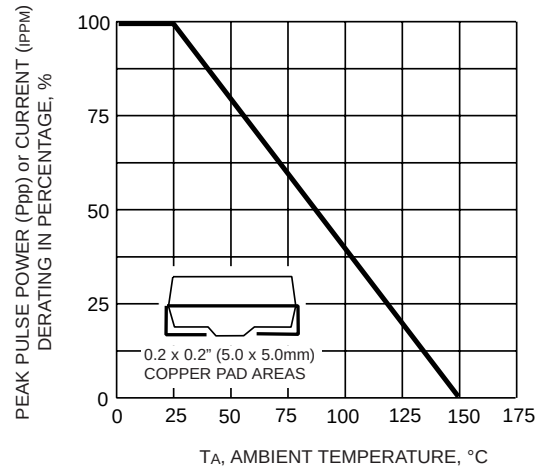


FIG. 3 - PULSE WAVEFORM

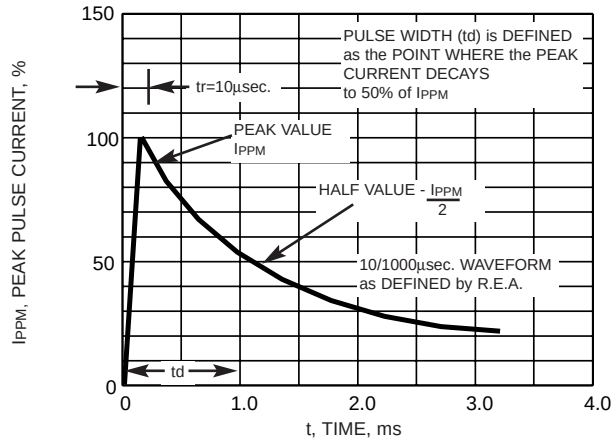


FIG. 4 - TYPICAL JUNCTION CAPACITANCE

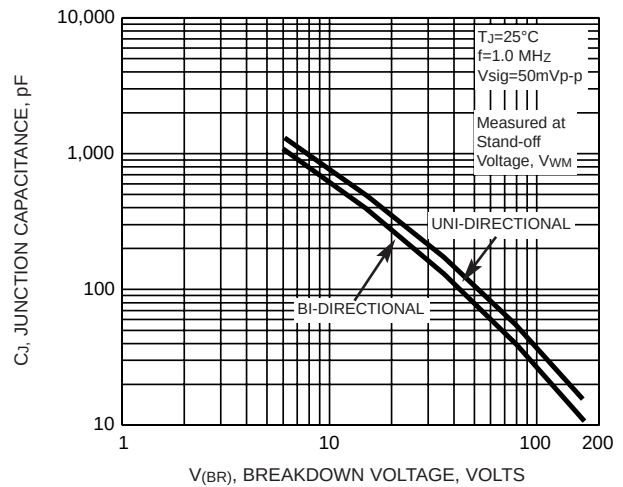


FIG. 5- Typical Response to 8KV Positive Going ESD Pulse Per IEC1000 - 4-2 (IEC801-2)

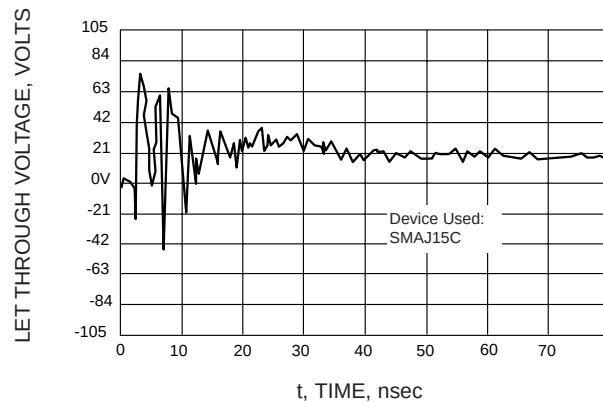


FIG. 6 - MAXIMUM NON-REPETITIVE FORWARD SURGE CURRENT UNIDIRECTIONAL ONLY

