



# SMAJ SERIES

## 400 Watts Surface Mount Transient Voltage Suppressor

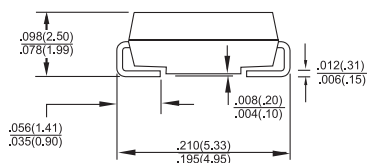
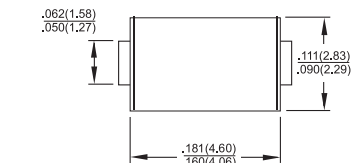
### SMA/DO-214AC

## Features

- ✧ For surface mounted application
- ✧ Low profile package
- ✧ Built-in strain relief
- ✧ Glass passivated junction
- ✧ Excellent clamping capability
- ✧ Fast response time: Typically less than 1.0ps from 0 volt to BV min.
- ✧ Typical  $I_R$  less than 1 $\mu$ A above 10V
- ✧ High temperature soldering guaranteed: 260°C / 10 seconds at terminals
- ✧ Plastic material used carries Underwriters Laboratory Flammability Classification 94V-0
- ✧ 400 watts peak pulse power capability with a 10 x 1000 us waveform (300W above 78V).
- ✧ Green compound with suffix "G" on packing code & prefix "G" on datecode.

## Mechanical Data

- ✧ Case: Molded plastic
- ✧ Terminals: Pure tin plated lead free,
- ✧ Polarity: Indicated by cathode band
- ✧ Standard packaging: 12mm tape (EIA STD RS-481)
- ✧ Weight: 0.064 gram



Dimensions in inches and (millimeters)

Marking Diagram



XX = Specific Device Code  
G = Green Compound  
Y = Year  
M = Work Month

## Maximum Ratings and Electrical Characteristics

Rating at 25 °C ambient temperature unless otherwise specified.

| Type Number                                                                                                    | Symbol         | Value        | Units |
|----------------------------------------------------------------------------------------------------------------|----------------|--------------|-------|
| Peak Power Dissipation at $T_A=25^\circ\text{C}$ , $T_p=1\text{ms}$ (Note 1)                                   | $P_{PK}$       | Minimum 400  | Watts |
| Steady State Power Dissipation                                                                                 | $P_d$          | 1            | Watts |
| Peak Forward Surge Current, 8.3 ms Single Half Sine-wave Superimposed on Rated Load (JEDEC method) (Note 2, 3) | $I_{FSM}$      | 40.0         | Amps  |
| Maximum Instantaneous Forward Voltage at 25.0A for Unidirectional Only                                         | $V_F$          | 3.5          | Volts |
| Operating and Storage Temperature Range                                                                        | $T_J, T_{STG}$ | -55 to + 150 | °C    |

Notes:

1. Non-repetitive Current Pulse Per Fig. 3 and Derated above  $T_A=25^\circ\text{C}$  Per Fig. 2.
2. Mounted on 10mm<sup>2</sup> (.035 mm Thick) Copper Pads to Each Terminal.
3. 8.3ms Single Half Sine-wave or Equivalent Square Wave, Duty Cycle=4 Pulses Per Minute Maximum.

### Devices for Bipolar Applications

1. For Bidirectional Use C or CA Suffix for Types SMAJ5.0 through Types SMAJ188.
2. Electrical Characteristics Apply in Both Directions.

## RATINGS AND CHARACTERISTIC CURVES (SMAJ SERIES)

FIG.1- PEAK PULSE POWER RATING CURVE

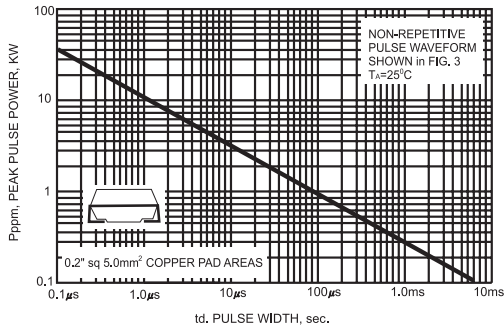


FIG.2- PULSE DERATING CURVE

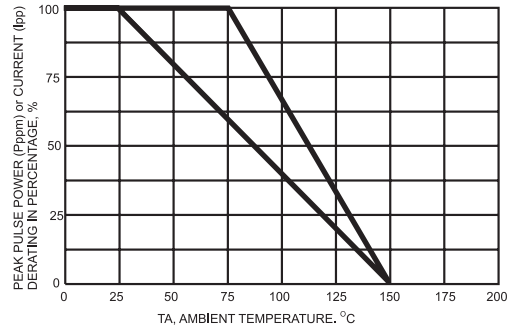


FIG.3- CLAMPING POWER PULSE WAVEFORM

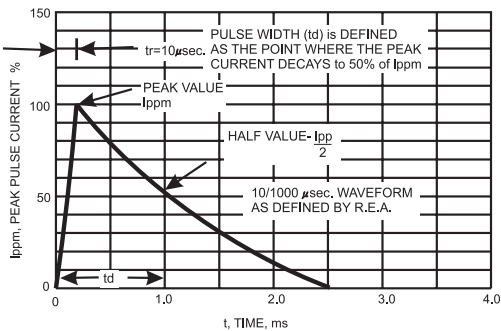


FIG.4- MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

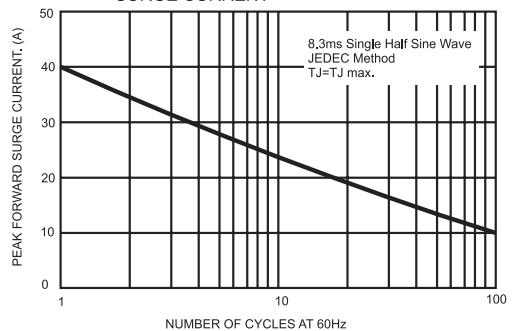
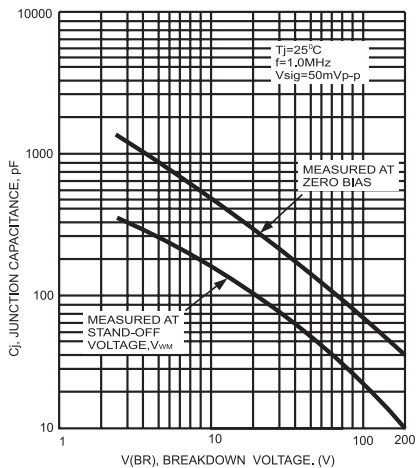


FIG.5- TYPICAL JUNCTION CAPACITANCE



## ELECTRICAL CHARACTERISTICS (TA=25°C unless otherwise noted)

| Device   | Device Marking Code | Working Peak Reverse Voltage<br>V <sub>WM</sub> (Volts) | Breakdown Voltage<br>V <sub>(BR)</sub> (Volts)<br>at I <sub>r</sub> |      | Test Current<br>I <sub>r</sub><br>(mA) | Maximum Clamping Voltage at I <sub>PPM</sub><br>V <sub>c</sub> (Volts)<br>(Note 5) | Maximum Peak Pulse Surge Current<br>I <sub>PPM</sub><br>(Note 5)(Amps) | Maximum Reverse Leakage at V <sub>WM</sub><br>I <sub>o</sub> (uA) |
|----------|---------------------|---------------------------------------------------------|---------------------------------------------------------------------|------|----------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------|-------------------------------------------------------------------|
|          |                     |                                                         | Min.                                                                | Max. |                                        |                                                                                    |                                                                        |                                                                   |
| SMAJ5,0  | AD                  | 5,0                                                     | 6,40                                                                | 7,30 | 10                                     | 9,6                                                                                | 41,7                                                                   | 800                                                               |
| SMAJ5,0A | AE                  | 5,0                                                     | 6,40                                                                | 7,00 | 10                                     | 9,2                                                                                | 43,5                                                                   | 800                                                               |
| SMAJ6,0  | AF                  | 6,0                                                     | 6,67                                                                | 8,15 | 10                                     | 11,4                                                                               | 35,1                                                                   | 800                                                               |
| SMAJ6,0A | AG                  | 6,0                                                     | 6,67                                                                | 7,37 | 10                                     | 10,3                                                                               | 38,8                                                                   | 800                                                               |
| SMAJ6,5  | AH                  | 6,5                                                     | 7,22                                                                | 8,82 | 10                                     | 12,3                                                                               | 32,5                                                                   | 500                                                               |
| SMAJ6,5A | AK                  | 6,5                                                     | 7,22                                                                | 7,98 | 10                                     | 11,2                                                                               | 35,7                                                                   | 500                                                               |
| SMAJ7,0  | AL                  | 7,0                                                     | 7,78                                                                | 9,51 | 10                                     | 13,3                                                                               | 30,1                                                                   | 200                                                               |
| SMAJ7,0A | AM                  | 7,0                                                     | 7,78                                                                | 8,60 | 10                                     | 12,0                                                                               | 33,3                                                                   | 200                                                               |
| SMAJ7,5  | AN                  | 7,5                                                     | 8,33                                                                | 10,3 | 1,0                                    | 14,3                                                                               | 28,0                                                                   | 100                                                               |
| SMAJ7,5A | AP                  | 7,5                                                     | 8,33                                                                | 9,21 | 1,0                                    | 12,9                                                                               | 31,0                                                                   | 100                                                               |
| SMAJ8,0  | AQ                  | 8,0                                                     | 8,89                                                                | 10,9 | 1,0                                    | 15,0                                                                               | 26,7                                                                   | 50,0                                                              |
| SMAJ8,0A | AR                  | 8,0                                                     | 8,89                                                                | 9,83 | 1,0                                    | 13,6                                                                               | 29,4                                                                   | 50,0                                                              |
| SMAJ8,5  | AS                  | 8,5                                                     | 9,44                                                                | 11,5 | 1,0                                    | 15,9                                                                               | 25,2                                                                   | 10,0                                                              |
| SMAJ8,5A | AT                  | 8,5                                                     | 9,44                                                                | 10,4 | 1,0                                    | 14,4                                                                               | 27,8                                                                   | 10,0                                                              |
| SMAJ9,0  | AU                  | 9,0                                                     | 10,0                                                                | 12,2 | 1,0                                    | 16,9                                                                               | 23,7                                                                   | 5,0                                                               |
| SMAJ9,0A | AV                  | 9,0                                                     | 10,0                                                                | 11,1 | 1,0                                    | 15,4                                                                               | 26,0                                                                   | 5,0                                                               |
| SMAJ10   | AW                  | 10                                                      | 11,1                                                                | 13,6 | 1,0                                    | 18,8                                                                               | 21,3                                                                   | 5,0                                                               |
| SMAJ10A  | AX                  | 10                                                      | 11,1                                                                | 12,3 | 1,0                                    | 17,0                                                                               | 23,5                                                                   | 5,0                                                               |
| SMAJ11   | AY                  | 11                                                      | 12,2                                                                | 14,9 | 1,0                                    | 20,1                                                                               | 19,9                                                                   | 5,0                                                               |
| SMAJ11A  | AZ                  | 11                                                      | 12,2                                                                | 13,5 | 1,0                                    | 18,2                                                                               | 22,0                                                                   | 5,0                                                               |
| SMAJ12   | BD                  | 12                                                      | 13,3                                                                | 16,3 | 1,0                                    | 22,0                                                                               | 18,2                                                                   | 5,0                                                               |
| SMAJ12A  | BE                  | 12                                                      | 13,3                                                                | 14,7 | 1,0                                    | 19,9                                                                               | 20,1                                                                   | 5,0                                                               |
| SMAJ13   | BF                  | 13                                                      | 14,4                                                                | 17,6 | 1,0                                    | 23,8                                                                               | 16,8                                                                   | 5,0                                                               |
| SMAJ13A  | BG                  | 13                                                      | 14,4                                                                | 15,9 | 1,0                                    | 21,5                                                                               | 18,6                                                                   | 5,0                                                               |
| SMAJ14   | BH                  | 14                                                      | 15,6                                                                | 19,1 | 1,0                                    | 25,8                                                                               | 15,5                                                                   | 5,0                                                               |
| SMAJ14A  | BK                  | 14                                                      | 15,6                                                                | 17,2 | 1,0                                    | 23,2                                                                               | 17,2                                                                   | 5,0                                                               |
| SMAJ15   | BL                  | 15                                                      | 16,7                                                                | 20,4 | 1,0                                    | 26,9                                                                               | 14,9                                                                   | 5,0                                                               |
| SMAJ15A  | BM                  | 15                                                      | 16,7                                                                | 18,5 | 1,0                                    | 24,4                                                                               | 16,4                                                                   | 5,0                                                               |
| SMAJ16   | BN                  | 16                                                      | 17,8                                                                | 21,8 | 1,0                                    | 28,8                                                                               | 13,9                                                                   | 5,0                                                               |
| SMAJ16A  | BP                  | 16                                                      | 17,8                                                                | 19,7 | 1,0                                    | 26,0                                                                               | 15,4                                                                   | 5,0                                                               |
| SMAJ17   | BQ                  | 17                                                      | 18,9                                                                | 23,1 | 1,0                                    | 30,5                                                                               | 13,1                                                                   | 5,0                                                               |
| SMAJ17A  | BR                  | 17                                                      | 18,9                                                                | 20,9 | 1,0                                    | 27,6                                                                               | 14,5                                                                   | 5,0                                                               |
| SMAJ18   | BS                  | 18                                                      | 20,0                                                                | 24,4 | 1,0                                    | 32,2                                                                               | 12,4                                                                   | 5,0                                                               |
| SMAJ18A  | BT                  | 18                                                      | 20,0                                                                | 22,1 | 1,0                                    | 29,2                                                                               | 13,7                                                                   | 5,0                                                               |
| SMAJ20   | BU                  | 20                                                      | 22,2                                                                | 27,1 | 1,0                                    | 35,8                                                                               | 11,2                                                                   | 5,0                                                               |
| SMAJ20A  | BV                  | 20                                                      | 22,2                                                                | 24,5 | 1,0                                    | 32,4                                                                               | 12,3                                                                   | 5,0                                                               |
| SMAJ22   | BW                  | 22                                                      | 24,4                                                                | 29,8 | 1,0                                    | 39,4                                                                               | 10,2                                                                   | 5,0                                                               |
| SMAJ22A  | BX                  | 22                                                      | 24,4                                                                | 26,9 | 1,0                                    | 35,5                                                                               | 11,3                                                                   | 5,0                                                               |
| SMAJ24   | BY                  | 24                                                      | 26,7                                                                | 32,6 | 1,0                                    | 43,0                                                                               | 9,3                                                                    | 5,0                                                               |
| SMAJ24A  | BZ                  | 24                                                      | 26,7                                                                | 29,5 | 1,0                                    | 38,9                                                                               | 10,3                                                                   | 5,0                                                               |
| SMAJ26   | CD                  | 26                                                      | 28,9                                                                | 35,3 | 1,0                                    | 46,6                                                                               | 8,6                                                                    | 5,0                                                               |
| SMAJ26A  | CE                  | 26                                                      | 28,9                                                                | 31,9 | 1,0                                    | 42,1                                                                               | 9,5                                                                    | 5,0                                                               |
| SMAJ28   | CF                  | 28                                                      | 31,1                                                                | 38,0 | 1,0                                    | 50,0                                                                               | 8,0                                                                    | 5,0                                                               |
| SMAJ28A  | CG                  | 28                                                      | 31,1                                                                | 34,4 | 1,0                                    | 45,4                                                                               | 8,8                                                                    | 5,0                                                               |
| SMAJ30   | CH                  | 30                                                      | 33,3                                                                | 40,7 | 1,0                                    | 53,5                                                                               | 7,5                                                                    | 5,0                                                               |
| SMAJ30A  | CK                  | 30                                                      | 33,3                                                                | 36,8 | 1,0                                    | 48,4                                                                               | 8,3                                                                    | 5,0                                                               |
| SMAJ33   | CL                  | 33                                                      | 36,7                                                                | 44,9 | 1,0                                    | 59,0                                                                               | 6,8                                                                    | 5,0                                                               |
| SMAJ33A  | CM                  | 33                                                      | 36,7                                                                | 40,6 | 1,0                                    | 53,3                                                                               | 7,5                                                                    | 5,0                                                               |
| SMAJ36   | CN                  | 36                                                      | 40,0                                                                | 48,9 | 1,0                                    | 64,3                                                                               | 6,2                                                                    | 5,0                                                               |
| SMAJ36A  | CP                  | 36                                                      | 40,0                                                                | 44,2 | 1,0                                    | 58,1                                                                               | 6,9                                                                    | 5,0                                                               |
| SMAJ40   | CQ                  | 40                                                      | 44,4                                                                | 54,3 | 1,0                                    | 71,4                                                                               | 5,6                                                                    | 5,0                                                               |
| SMAJ40A  | CR                  | 40                                                      | 44,4                                                                | 49,1 | 1,0                                    | 64,5                                                                               | 6,2                                                                    | 5,0                                                               |
| SMAJ43   | CS                  | 43                                                      | 47,8                                                                | 58,4 | 1,0                                    | 76,7                                                                               | 5,2                                                                    | 5,0                                                               |
| SMAJ43A  | CT                  | 43                                                      | 47,8                                                                | 52,8 | 1,0                                    | 69,4                                                                               | 5,8                                                                    | 5,0                                                               |

ELECTRICAL CHARACTERISTICS (TA=25°C unless otherwise noted)

| Device   | Device Marking Code | Working Peak Reverse Voltage<br>V <sub>WM</sub> (Volts) | Breakdown Voltage<br>V <sub>BR</sub> (Volts)<br>at I <sub>r</sub> |      | Test Current<br>I <sub>r</sub><br>(mA) | Maximum Clamping Voltage at I <sub>PPM</sub><br>V <sub>C</sub> (Volts)<br>(Note 5) | Maximum Peak Pulse Surge Current<br>I <sub>PPM</sub><br>(Note 5)(Amps) | Maximum Reverse Leakage at V <sub>WM</sub><br>I <sub>o</sub> (uA) |
|----------|---------------------|---------------------------------------------------------|-------------------------------------------------------------------|------|----------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------|-------------------------------------------------------------------|
|          |                     |                                                         | Min.                                                              | Max. |                                        |                                                                                    |                                                                        |                                                                   |
| SMAJ45   | CU                  | 45                                                      | 50.0                                                              | 61.1 | 1.0                                    | 80.3                                                                               | 5.0                                                                    | 5.0                                                               |
| SMAJ45A  | CV                  | 45                                                      | 50.0                                                              | 55.3 | 1.0                                    | 72.7                                                                               | 5.5                                                                    | 5.0                                                               |
| SMAJ48   | CW                  | 48                                                      | 53.3                                                              | 65.1 | 1.0                                    | 85.5                                                                               | 4.7                                                                    | 5.0                                                               |
| SMAJ48A  | CX                  | 48                                                      | 53.3                                                              | 58.9 | 1.0                                    | 77.4                                                                               | 5.2                                                                    | 5.0                                                               |
| SMAJ51   | CY                  | 51                                                      | 56.7                                                              | 69.3 | 1.0                                    | 91.1                                                                               | 4.4                                                                    | 5.0                                                               |
| SMAJ51A  | CZ                  | 51                                                      | 56.7                                                              | 62.7 | 1.0                                    | 82.4                                                                               | 4.9                                                                    | 5.0                                                               |
| SMAJ54   | RD                  | 54                                                      | 60.0                                                              | 73.3 | 1.0                                    | 96.3                                                                               | 4.2                                                                    | 5.0                                                               |
| SMAJ54A  | RE                  | 54                                                      | 60.0                                                              | 66.3 | 1.0                                    | 87.1                                                                               | 4.6                                                                    | 5.0                                                               |
| SMAJ58   | RF                  | 58                                                      | 64.4                                                              | 78.7 | 1.0                                    | 103                                                                                | 3.9                                                                    | 5.0                                                               |
| SMAJ58A  | RG                  | 58                                                      | 64.4                                                              | 71.2 | 1.0                                    | 93.6                                                                               | 4.3                                                                    | 5.0                                                               |
| SMAJ60   | RH                  | 60                                                      | 66.7                                                              | 81.5 | 1.0                                    | 107                                                                                | 3.7                                                                    | 5.0                                                               |
| SMAJ60A  | RK                  | 60                                                      | 66.7                                                              | 73.7 | 1.0                                    | 96.8                                                                               | 4.1                                                                    | 5.0                                                               |
| SMAJ64   | RL                  | 64                                                      | 71.1                                                              | 86.9 | 1.0                                    | 114                                                                                | 3.5                                                                    | 5.0                                                               |
| SMAJ64A  | RM                  | 64                                                      | 71.1                                                              | 78.6 | 1.0                                    | 103                                                                                | 3.9                                                                    | 5.0                                                               |
| SMAJ70   | RN                  | 70                                                      | 77.8                                                              | 95.1 | 1.0                                    | 125                                                                                | 3.2                                                                    | 5.0                                                               |
| SMAJ70A  | RP                  | 70                                                      | 77.8                                                              | 86.0 | 1.0                                    | 113                                                                                | 3.5                                                                    | 5.0                                                               |
| SMAJ75   | RQ                  | 75                                                      | 83.3                                                              | 102  | 1.0                                    | 134                                                                                | 3.0                                                                    | 5.0                                                               |
| SMAJ75A  | RR                  | 75                                                      | 83.3                                                              | 92.1 | 1.0                                    | 121                                                                                | 3.3                                                                    | 5.0                                                               |
| SMAJ78   | RS                  | 78                                                      | 86.7                                                              | 106  | 1.0                                    | 139                                                                                | 2.9                                                                    | 5.0                                                               |
| SMAJ78A  | RT                  | 78                                                      | 86.7                                                              | 95.8 | 1.0                                    | 126                                                                                | 3.2                                                                    | 5.0                                                               |
| SMAJ85   | RU                  | 85                                                      | 94.4                                                              | 115  | 1.0                                    | 151                                                                                | 2.0                                                                    | 5.0                                                               |
| SMAJ85A  | RV                  | 85                                                      | 94.4                                                              | 104  | 1.0                                    | 137                                                                                | 2.2                                                                    | 5.0                                                               |
| SMAJ90   | RW                  | 90                                                      | 100                                                               | 122  | 1.0                                    | 160                                                                                | 1.9                                                                    | 5.0                                                               |
| SMAJ90A  | RX                  | 90                                                      | 100                                                               | 111  | 1.0                                    | 146                                                                                | 2.1                                                                    | 5.0                                                               |
| SMAJ100  | RY                  | 100                                                     | 111                                                               | 136  | 1.0                                    | 179                                                                                | 1.7                                                                    | 5.0                                                               |
| SMAJ100A | RZ                  | 100                                                     | 111                                                               | 123  | 1.0                                    | 162                                                                                | 1.9                                                                    | 5.0                                                               |
| SMAJ110  | SD                  | 110                                                     | 122                                                               | 149  | 1.0                                    | 196                                                                                | 1.6                                                                    | 5.0                                                               |
| SMAJ110A | SE                  | 110                                                     | 122                                                               | 135  | 1.0                                    | 177                                                                                | 1.7                                                                    | 5.0                                                               |
| SMAJ120  | SF                  | 120                                                     | 133                                                               | 163  | 1.0                                    | 214                                                                                | 1.4                                                                    | 5.0                                                               |
| SMAJ120A | SG                  | 120                                                     | 133                                                               | 147  | 1.0                                    | 193                                                                                | 1.6                                                                    | 5.0                                                               |
| SMAJ130  | SH                  | 130                                                     | 144                                                               | 176  | 1.0                                    | 231                                                                                | 1.3                                                                    | 5.0                                                               |
| SMAJ130A | SK                  | 130                                                     | 144                                                               | 159  | 1.0                                    | 209                                                                                | 1.5                                                                    | 5.0                                                               |
| SMAJ150  | SL                  | 150                                                     | 167                                                               | 204  | 1.0                                    | 266                                                                                | 1.1                                                                    | 5.0                                                               |
| SMAJ150A | SM                  | 150                                                     | 167                                                               | 185  | 1.0                                    | 243                                                                                | 1.3                                                                    | 5.0                                                               |
| SMAJ160  | SN                  | 160                                                     | 178                                                               | 218  | 1.0                                    | 287                                                                                | 1.0                                                                    | 5.0                                                               |
| SMAJ160A | SP                  | 160                                                     | 178                                                               | 197  | 1.0                                    | 259                                                                                | 1.2                                                                    | 5.0                                                               |
| SMAJ170  | SQ                  | 170                                                     | 189                                                               | 231  | 1.0                                    | 304                                                                                | 1.0                                                                    | 5.0                                                               |
| SMAJ170A | SR                  | 170                                                     | 189                                                               | 209  | 1.0                                    | 275                                                                                | 1.1                                                                    | 5.0                                                               |
| SMAJ188  | ST                  | 188                                                     | 209                                                               | 255  | 1.0                                    | 344                                                                                | 0.9                                                                    | 5.0                                                               |
| SMAJ188A | SS                  | 188                                                     | 209                                                               | 231  | 1.0                                    | 328                                                                                | 0.91                                                                   | 5.0                                                               |

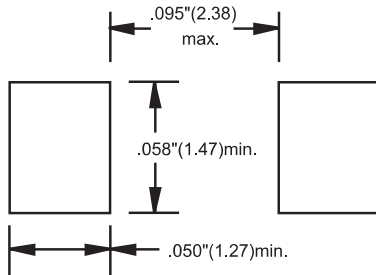
Notes:

1. Non-repetitive current pulse, per Fig. 3 and derated above TA=25°C per Fig. 2
2. Mounted on 5.0mm<sup>2</sup> copper pads to each terminal
3. Lead temperature at TL=75°C
4. Measured on 8.3ms single half sine-wave duty cycle=4 pulses per minutes maximum
5. Peak pulse power waveform is 10/1000 us
6. For Bi-Directional devices having VR of 10 volts and under, the IR limit is double.

## APPLICATION NOTES:

### Recommended Pad Layout

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



Dimensions in inches and (millimeters)

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.