



## SMCJ SERIES

### 1500 Watts Surface Mount Transient Voltage Suppressor

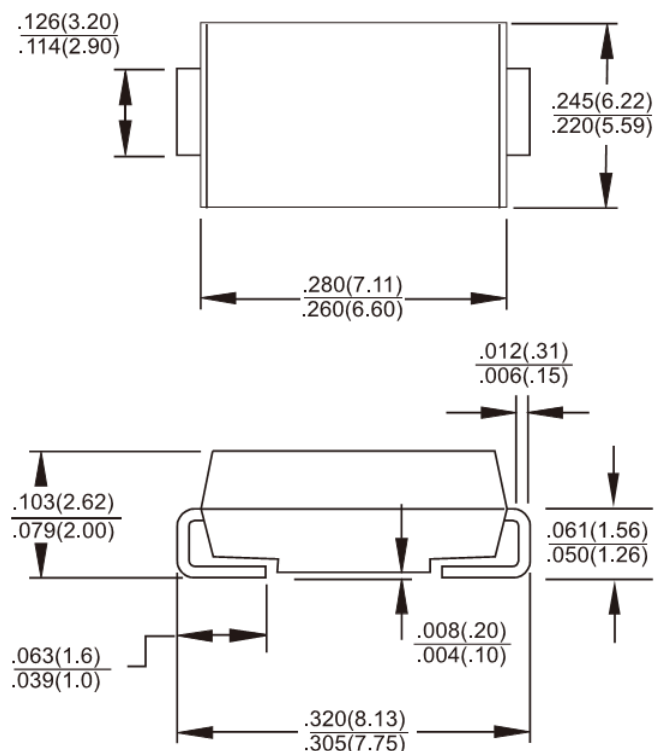
#### SMC/DO-214AB

### Features

- ✧ UL Recognized File # E-326243
- ✧ 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 1uA above 10V
- ✧ High temperature soldering guaranteed: 260°C / 10 seconds at terminals
- ✧ Plastic material used carried Underwriters Laboratory Flammability Classification 94V-0
- ✧ 1500 watts peak pulse power capability with a 10/1000 us waveform
- ✧ 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: 16mm tape per EIA Std RS-481
- ✧ Weight: 0.26 gram



### Dimensions in inches and (millimeters)

#### Marking Diagram



- GXX = 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.

Single phase, half wave, 60 Hz, resistive or inductive load.

For capacitive load, derate current by 20%

| Type Number                                                                                                                        | Symbol                             | Value        | Unit                      |
|------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--------------|---------------------------|
| Peak Power Dissipation at $T_A=25^\circ\text{C}$ , $T_p=1\text{ms}$ (Note 1)                                                       | $P_{PK}$                           | Minimum 1500 | Watts                     |
| Steady State Power Dissipation                                                                                                     | $P_D$                              | 5            | Watts                     |
| Peak Forward Surge Current, 8.3ms Single Half Sine-wave Superimposed on Rated Load (JEDEC method)(Note 2, 3) - Unidirectional Only | $I_{FSM}$                          | 200          | Amps                      |
| Maximum Instantaneous Forward Voltage at 50.0A for Unidirectional Only (Note 4)                                                    | $V_F$                              | 3.5 / 5.0    | Volts                     |
| Typical Thermal Resistance                                                                                                         | $R_{\theta JC}$<br>$R_{\theta JA}$ | 10<br>55     | $^\circ\text{C}/\text{W}$ |
| Operating and Storage Temperature Range                                                                                            | $T_J, T_{STG}$                     | -55 to +150  | $^\circ\text{C}$          |

Note 1: Non-repetitive Current Pulse Per Fig. 3 and Derated above  $T_A=25^\circ\text{C}$  Per Fig. 2

Note 2: Mounted on 16mm x 16mm Copper Pads to Each Terminal

Note 3: 8.3ms Single Half Sine-wave or Equivalent Square Wave, Duty Cycle=4 Pulses Per Minute Maximum

Note 4:  $V_F=3.5\text{V}$  on SMCJ5.0 thru SMCJ90 Devices and  $V_F=5.0\text{V}$  on SMCJ100 thru SMCJ170 Devices

### Devices for Bipolar Applications

1. For Bidirectional Use C or CA Suffix for Types SMCJ5.0 through Types SMCJ170
2. Electrical Characteristics Apply in Both Directions

## RATINGS AND CHARACTERISTIC CURVES (SMCJ SERIES)

FIG. 1 PEAK PULSE POWER RATING CURVE

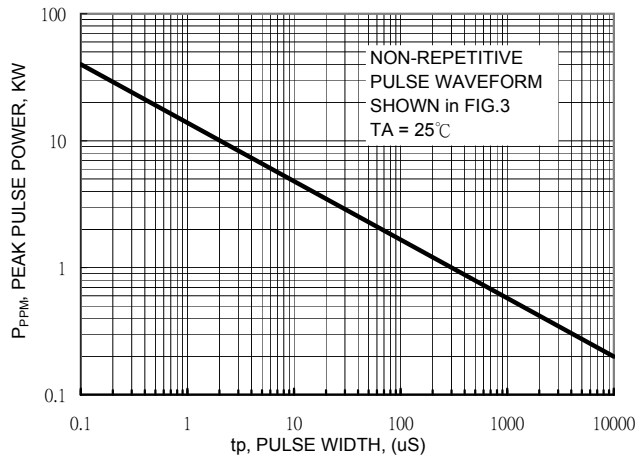


FIG.2 DERATING CURVE

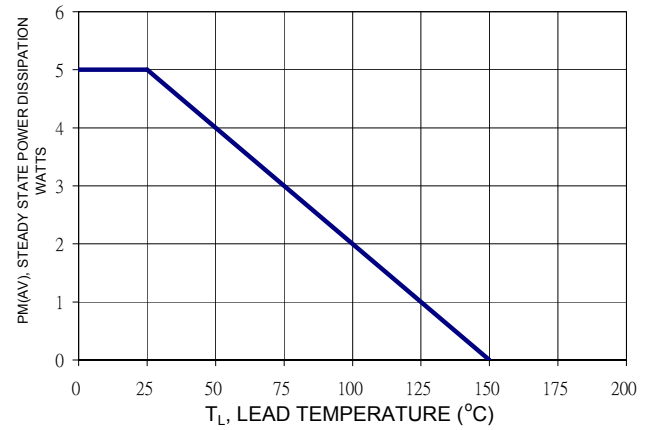


FIG. 3 CLAMPING POWER PULSE WAVEFORM

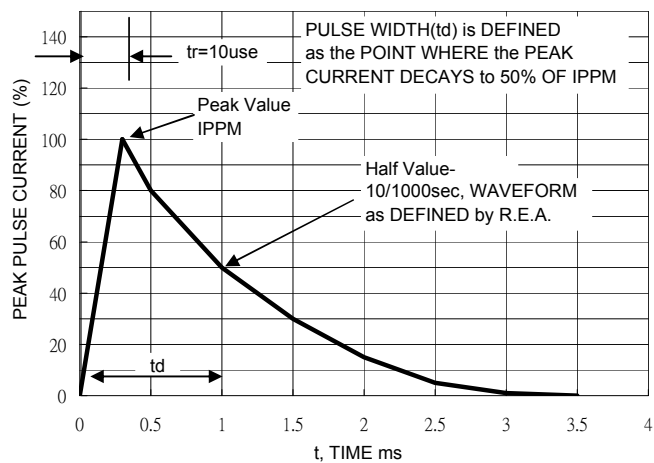


FIG. 4 MAXIMUM NON-REPETITIVE FORWARD SURGE CURRENT

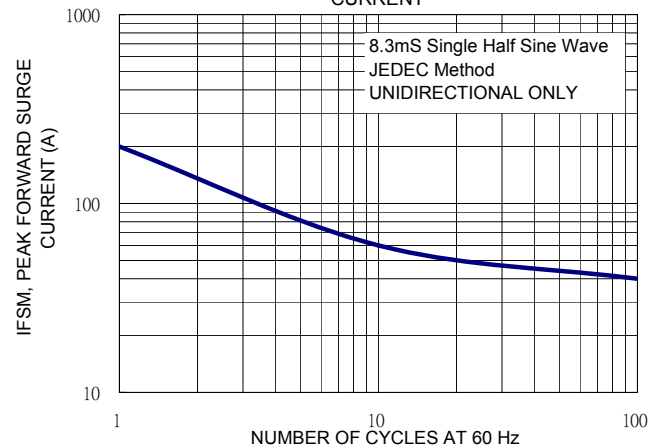
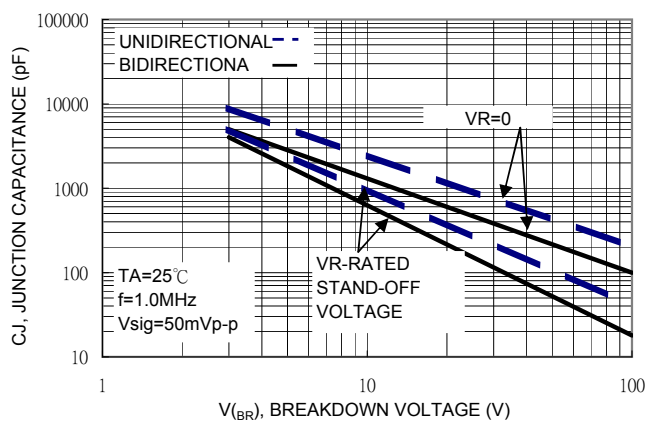


FIG. 5 TYPICAL JUNCTION CAPACITANCE



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

| Device   | Device Marking Code | Breakdown Voltage<br>VBR (V)<br>at $I_T$ |       | Test Current<br>$I_T$<br>(mA) | Stand-Off Voltage<br>$V_{WM}$<br>(V) | Maximum Reverse Leakage<br>@ $V_{WM}$<br>$I_D$ (uA)(Note3) | Maximum Peak Surge Current<br>$I_{PPM}$<br>(A)(Note2) | Maximum Clamping Voltage at IPPM<br>$V_c$ (V) |
|----------|---------------------|------------------------------------------|-------|-------------------------------|--------------------------------------|------------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------|
|          |                     | Min                                      | Max   |                               |                                      |                                                            |                                                       |                                               |
| SMCJ5.0  | GDD                 | 6.4                                      | 7.3   | 10                            | 5                                    | 1000                                                       | 164                                                   | 9.6                                           |
| SMCJ5.0A | GDE                 | 6.4                                      | 7     | 10                            | 5                                    | 1000                                                       | 171                                                   | 9.2                                           |
| SMCJ6.0  | GDF                 | 6.67                                     | 8.15  | 10                            | 6                                    | 1000                                                       | 138                                                   | 11.4                                          |
| SMCJ6.0A | GDG                 | 6.67                                     | 7.37  | 10                            | 6                                    | 1000                                                       | 152                                                   | 10.3                                          |
| SMCJ6.5  | GDH                 | 7.22                                     | 8.82  | 10                            | 6.5                                  | 500                                                        | 128                                                   | 12.3                                          |
| SMCJ6.5A | GDK                 | 7.22                                     | 7.98  | 10                            | 6.5                                  | 500                                                        | 140                                                   | 11.2                                          |
| SMCJ7.0  | GDL                 | 7.78                                     | 9.51  | 10                            | 7                                    | 200                                                        | 118                                                   | 13.3                                          |
| SMCJ7.0A | GDM                 | 7.78                                     | 8.6   | 10                            | 7                                    | 200                                                        | 131                                                   | 12.0                                          |
| SMCJ7.5  | GDN                 | 8.33                                     | 10.30 | 1                             | 7.5                                  | 100                                                        | 110                                                   | 14.3                                          |
| SMCJ7.5A | GDP                 | 8.33                                     | 9.21  | 1                             | 7.5                                  | 100                                                        | 122                                                   | 12.9                                          |
| SMCJ8.0  | GDQ                 | 8.89                                     | 10.9  | 1                             | 8                                    | 50                                                         | 105                                                   | 15.0                                          |
| SMCJ8.0A | GDR                 | 8.89                                     | 9.83  | 1                             | 8                                    | 50                                                         | 115                                                   | 13.6                                          |
| SMCJ8.5  | GDS                 | 9.44                                     | 11.5  | 1                             | 8.5                                  | 20                                                         | 99                                                    | 15.9                                          |
| SMCJ8.5A | GDT                 | 9.44                                     | 10.4  | 1                             | 8.5                                  | 20                                                         | 109                                                   | 14.4                                          |
| SMCJ9.0  | GDU                 | 10                                       | 12.2  | 1                             | 9                                    | 10                                                         | 93                                                    | 16.9                                          |
| SMCJ9.0A | GDV                 | 10                                       | 11.1  | 1                             | 9                                    | 10                                                         | 102                                                   | 15.4                                          |
| SMCJ10   | GDW                 | 11.1                                     | 13.6  | 1                             | 10                                   | 5                                                          | 83                                                    | 18.8                                          |
| SMCJ10A  | GDX                 | 11.1                                     | 12.3  | 1                             | 10                                   | 5                                                          | 92                                                    | 17.0                                          |
| SMCJ11   | GDY                 | 12.2                                     | 14.9  | 1                             | 11                                   | 5                                                          | 78                                                    | 20.1                                          |
| SMCJ11A  | GDZ                 | 12.2                                     | 13.5  | 1                             | 11                                   | 5                                                          | 86                                                    | 18.2                                          |
| SMCJ12   | GED                 | 13.3                                     | 16.3  | 1                             | 12                                   | 5                                                          | 71                                                    | 22.0                                          |
| SMCJ12A  | GEE                 | 13.3                                     | 14.7  | 1                             | 12                                   | 5                                                          | 79                                                    | 19.9                                          |
| SMCJ13   | GEF                 | 14.4                                     | 17.6  | 1                             | 13                                   | 5                                                          | 66                                                    | 23.8                                          |
| SMCJ13A  | GEG                 | 14.4                                     | 15.9  | 1                             | 13                                   | 5                                                          | 73                                                    | 21.5                                          |
| SMCJ14   | GEH                 | 15.6                                     | 19.1  | 1                             | 14                                   | 5                                                          | 61                                                    | 25.8                                          |
| SMCJ14A  | GEK                 | 15.6                                     | 17.2  | 1                             | 14                                   | 5                                                          | 67                                                    | 23.2                                          |
| SMCJ15   | GEL                 | 16.7                                     | 20.4  | 1                             | 15                                   | 5                                                          | 58                                                    | 26.9                                          |
| SMCJ15A  | GEM                 | 16.7                                     | 18.5  | 1                             | 15                                   | 5                                                          | 64                                                    | 24.4                                          |
| SMCJ16   | GEN                 | 17.8                                     | 21.8  | 1                             | 16                                   | 5                                                          | 54                                                    | 28.8                                          |
| SMCJ16A  | GEP                 | 17.8                                     | 19.7  | 1                             | 16                                   | 5                                                          | 60                                                    | 26.0                                          |
| SMCJ17   | GEQ                 | 18.9                                     | 23.1  | 1                             | 17                                   | 5                                                          | 51                                                    | 30.5                                          |
| SMCJ17A  | GER                 | 18.9                                     | 20.9  | 1                             | 17                                   | 5                                                          | 57                                                    | 27.6                                          |
| SMCJ18   | GES                 | 20                                       | 24.4  | 1                             | 18                                   | 5                                                          | 48                                                    | 32.2                                          |
| SMCJ18A  | GET                 | 20                                       | 22.1  | 1                             | 18                                   | 5                                                          | 53                                                    | 29.2                                          |
| SMCJ20   | GEU                 | 22.2                                     | 27.1  | 1                             | 20                                   | 5                                                          | 43                                                    | 35.8                                          |
| SMCJ20A  | GEV                 | 22.2                                     | 24.5  | 1                             | 20                                   | 5                                                          | 48                                                    | 32.4                                          |
| SMCJ22   | GEW                 | 24.4                                     | 29.8  | 1                             | 22                                   | 5                                                          | 39                                                    | 39.4                                          |
| SMCJ22A  | GEX                 | 24.4                                     | 26.9  | 1                             | 22                                   | 5                                                          | 44                                                    | 35.5                                          |
| SMCJ24   | GEY                 | 26.7                                     | 32.6  | 1                             | 24                                   | 5                                                          | 36                                                    | 43.0                                          |
| SMCJ24A  | GEZ                 | 26.7                                     | 29.5  | 1                             | 24                                   | 5                                                          | 40                                                    | 38.9                                          |
| SMCJ26   | GFD                 | 28.9                                     | 35.3  | 1                             | 26                                   | 5                                                          | 33                                                    | 46.6                                          |
| SMCJ26A  | GFE                 | 28.9                                     | 31.9  | 1                             | 26                                   | 5                                                          | 37                                                    | 42.1                                          |
| SMCJ28   | GFF                 | 31.1                                     | 38    | 1                             | 28                                   | 5                                                          | 31                                                    | 50.0                                          |
| SMCJ28A  | GFG                 | 31.1                                     | 34.4  | 1                             | 28                                   | 5                                                          | 34                                                    | 45.4                                          |
| SMCJ30   | GFH                 | 33.3                                     | 40.7  | 1                             | 30                                   | 5                                                          | 29                                                    | 53.5                                          |
| SMCJ30A  | GFK                 | 33.3                                     | 36.8  | 1                             | 30                                   | 5                                                          | 32                                                    | 48.4                                          |
| SMCJ33   | GFL                 | 36.7                                     | 44.9  | 1                             | 33                                   | 5                                                          | 26                                                    | 59.0                                          |
| SMCJ33A  | GFM                 | 36.7                                     | 40.6  | 1                             | 33                                   | 5                                                          | 29                                                    | 53.3                                          |
| SMCJ36   | GFN                 | 40                                       | 48.9  | 1                             | 36                                   | 5                                                          | 24                                                    | 64.3                                          |
| SMCJ36A  | GFP                 | 40                                       | 44.2  | 1                             | 36                                   | 5                                                          | 27                                                    | 58.1                                          |
| SMCJ40   | GFQ                 | 44.4                                     | 54.3  | 1                             | 40                                   | 5                                                          | 22                                                    | 71.4                                          |
| SMCJ40A  | GFR                 | 44.4                                     | 49.1  | 1                             | 40                                   | 5                                                          | 24                                                    | 64.5                                          |
| SMCJ43   | GFS                 | 47.8                                     | 58.4  | 1                             | 43                                   | 5                                                          | 20                                                    | 76.7                                          |
| SMCJ43A  | GFT                 | 47.8                                     | 52.8  | 1                             | 43                                   | 5                                                          | 22                                                    | 69.4                                          |

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

| Device   | Device Marking Code | Breakdown Voltage<br>VBR (V)<br>at $I_T$ |      | Test Current<br>$I_T$<br>(mA) | Stand-Off Voltage<br>$V_{WM}$<br>(V) | Maximum Reverse Leakage<br>@ $V_{WM}$<br>$I_D$ (uA) | Maximum Peak Pulse Surge Current<br>$I_{PPM}$<br>(A)(Note5) | Maximum Clamping Voltage at IPPM<br>$V_c$ (V)<br>(Note5) |
|----------|---------------------|------------------------------------------|------|-------------------------------|--------------------------------------|-----------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------|
|          |                     | Min                                      | Max  |                               |                                      |                                                     |                                                             |                                                          |
| SMCJ45   | GFU                 | 50                                       | 61.1 | 1                             | 45                                   | 5                                                   | 19                                                          | 80.3                                                     |
| SMCJ45A  | GFV                 | 50                                       | 55.3 | 1                             | 45                                   | 5                                                   | 21                                                          | 72.7                                                     |
| SMCJ48   | GFW                 | 53.3                                     | 65.1 | 1                             | 48                                   | 5                                                   | 18                                                          | 85.5                                                     |
| SMCJ48A  | GFX                 | 53.3                                     | 58.9 | 1                             | 48                                   | 5                                                   | 20                                                          | 77.4                                                     |
| SMCJ51   | GFY                 | 56.7                                     | 69.3 | 1                             | 51                                   | 5                                                   | 17                                                          | 91.1                                                     |
| SMCJ51A  | GFZ                 | 56.7                                     | 62.7 | 1                             | 51                                   | 5                                                   | 19                                                          | 82.4                                                     |
| SMCJ54   | GGD                 | 60                                       | 73.3 | 1                             | 54                                   | 5                                                   | 16                                                          | 96.3                                                     |
| SMCJ54A  | GGE                 | 60                                       | 66.3 | 1                             | 54                                   | 5                                                   | 18                                                          | 87.1                                                     |
| SMCJ58   | GGF                 | 64.4                                     | 78.7 | 1                             | 58                                   | 5                                                   | 15                                                          | 103                                                      |
| SMCJ58A  | GGG                 | 64.4                                     | 71.2 | 1                             | 58                                   | 5                                                   | 16                                                          | 93.6                                                     |
| SMCJ60   | GGH                 | 66.7                                     | 81.5 | 1                             | 60                                   | 5                                                   | 14                                                          | 107                                                      |
| SMCJ60A  | GGK                 | 66.7                                     | 73.7 | 1                             | 60                                   | 5                                                   | 16                                                          | 96.8                                                     |
| SMCJ64   | GGL                 | 71.1                                     | 86.9 | 1                             | 64                                   | 5                                                   | 13.8                                                        | 114                                                      |
| SMCJ64A  | GGM                 | 71.1                                     | 78.6 | 1                             | 64                                   | 5                                                   | 15                                                          | 103                                                      |
| SMCJ70   | GGN                 | 77.8                                     | 95.1 | 1                             | 70                                   | 5                                                   | 12.6                                                        | 125                                                      |
| SMCJ70A  | GGP                 | 77.8                                     | 86   | 1                             | 70                                   | 5                                                   | 13.9                                                        | 113                                                      |
| SMCJ75   | GGQ                 | 83.3                                     | 102  | 1                             | 75                                   | 5                                                   | 11.7                                                        | 134                                                      |
| SMCJ75A  | GGR                 | 83.3                                     | 92.1 | 1                             | 75                                   | 5                                                   | 13                                                          | 121                                                      |
| SMCJ78   | GGs                 | 86.7                                     | 106  | 1                             | 78                                   | 5                                                   | 11.3                                                        | 139                                                      |
| SMCJ78A  | GGT                 | 86.7                                     | 95.8 | 1                             | 78                                   | 5                                                   | 12.5                                                        | 126                                                      |
| SMCJ85   | GGU                 | 94.4                                     | 115  | 1                             | 85                                   | 5                                                   | 10.4                                                        | 151                                                      |
| SMCJ85A  | GGV                 | 94.4                                     | 104  | 1                             | 85                                   | 5                                                   | 11.5                                                        | 137                                                      |
| SMCJ90   | GGW                 | 100                                      | 122  | 1                             | 90                                   | 5                                                   | 9.8                                                         | 160                                                      |
| SMCJ90A  | GGX                 | 100                                      | 111  | 1                             | 90                                   | 5                                                   | 10.7                                                        | 146                                                      |
| SMCJ100  | GGY                 | 111                                      | 136  | 1                             | 100                                  | 5                                                   | 8.8                                                         | 179                                                      |
| SMCJ100A | GGZ                 | 111                                      | 123  | 1                             | 100                                  | 5                                                   | 9.7                                                         | 162                                                      |
| SMCJ110  | GHD                 | 122                                      | 149  | 1                             | 110                                  | 5                                                   | 8                                                           | 196                                                      |
| SMCJ110A | GHE                 | 122                                      | 135  | 1                             | 110                                  | 5                                                   | 8.9                                                         | 177                                                      |
| SMCJ120  | GHF                 | 133                                      | 163  | 1                             | 120                                  | 5                                                   | 7.3                                                         | 214                                                      |
| SMCJ120A | GHG                 | 133                                      | 147  | 1                             | 120                                  | 5                                                   | 8.1                                                         | 193                                                      |
| SMCJ130  | GHH                 | 144                                      | 176  | 1                             | 130                                  | 5                                                   | 6.8                                                         | 231                                                      |
| SMCJ130A | GHK                 | 144                                      | 159  | 1                             | 130                                  | 5                                                   | 7.5                                                         | 209                                                      |
| SMCJ150  | GHL                 | 167                                      | 204  | 1                             | 150                                  | 5                                                   | 5.8                                                         | 266                                                      |
| SMCJ150A | GHM                 | 167                                      | 185  | 1                             | 150                                  | 5                                                   | 6.4                                                         | 243                                                      |
| SMCJ160  | GHN                 | 178                                      | 218  | 1                             | 160                                  | 5                                                   | 5.4                                                         | 287                                                      |
| SMCJ160A | GHP                 | 178                                      | 197  | 1                             | 160                                  | 5                                                   | 6                                                           | 259                                                      |
| SMCJ170  | GHQ                 | 189                                      | 231  | 1                             | 170                                  | 5                                                   | 5.1                                                         | 304                                                      |
| SMCJ170A | GHR                 | 189                                      | 209  | 1                             | 170                                  | 5                                                   | 5.7                                                         | 275                                                      |

## Notes:

1.  $V_{BR}$  measure after  $I_T$  applied for 300us,  $I_T$ =square wave pulse or equivalent.
2. Surge current waveform per Figure. 3 and derate per Figure. 2.
3. For bipolar types having  $V_{WM}$  of 10 volts and less, the  $I_D$  limit is doubled.
4. All terms and symbols are consistent with ANSI/IEEE C62.35.

## TVS APPLICATION NOTES:

Transient Voltage Suppressors may be used at various points in a circuit to provide various degrees of protection. The following is a typical linear power supply with transient voltage suppressor units played at different points. All provide protection

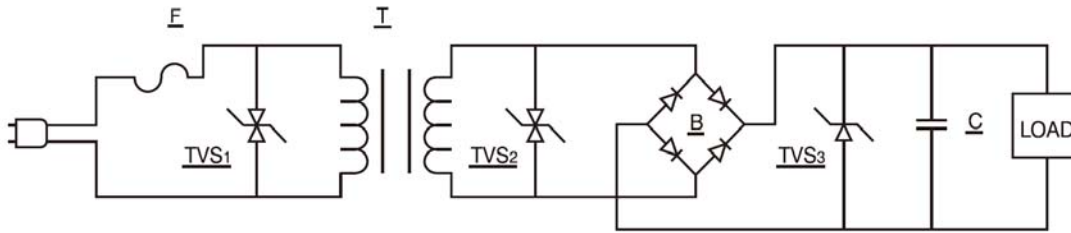


FIGURE 1

Transient Voltage Suppressor 1 provides maximum protection. However, the system will probably require replacement of the line fuse(F) since it provides a dominant portion of the series impedance when a surge is encountered.

Howevr, we do not recommend to use the TVS diode here, unless we can know the electric circuit impedance and the magnitude of surge rushed into the circuit. Otherwise the TVS diode is easy to be destroyed by voltage surge.

Transient Voltage Suppressor 2 provides execllent protection of circuitry excluding the transformer(T). However, since the transformer is a large part of the series impedance, the chance of the line fuse opening during the surge condition is reduced.

Transient Voltage Suppressor 3 provides the load with complete protection. It uses a unidirectional Transient Voltage Suppressor, which is a cost advantage. The series impedance now includes the line fuse, transformer, and bridge rectifier(B) so failure

Any combination of this three, or any one of these applivations, will prevent damage to the load. This would require varying trade-offs in power supply protection versus maintenance(changing the time fuse).

An additional method is to utilize the Trans

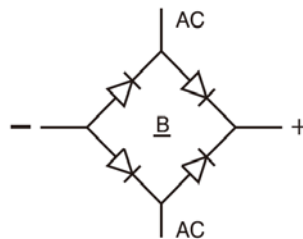


FIGURE 2

### RECOMMENDED PAD SIZES

The pad dimensions should be 0.010"(0.25mm) longer than the contact size, in the lead axis. This allows a solder filler to form, see figure below. Contact factort for soldering methods.

