

## Surface Mount Transient Voltage Suppressors (TVS)

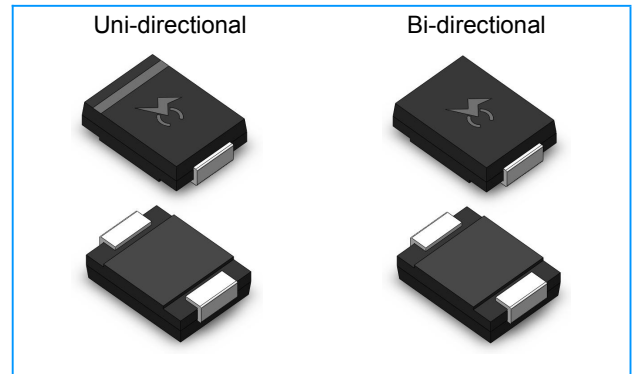
**SMCJ Series 5.0 To 440 V 1500W**

### Description

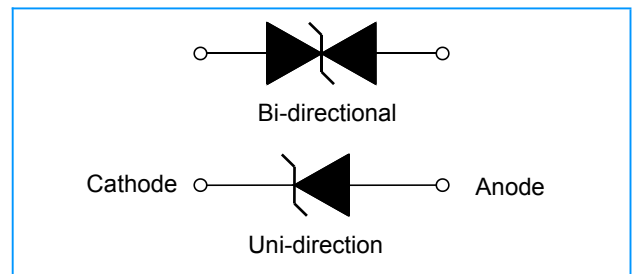
The SMCJ series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

### Features


- ◆ For surface mounted applications in order to optimize board space
- ◆ Low leakage
- ◆ Uni and Bidirectional unit
- ◆ Glass passivated junction
- ◆ Low inductance
- ◆ Excellent clamping capability
- ◆ 1500W Peak power capability at 10 × 1000μs waveform Repetition rate (duty cycle):0.01%
- ◆ Fast response time: typically less than 1.0ps from 0 Volts to  $V_{BR}$  min
- ◆ Typical  $I_R$  less than 5μA above 12V.
- ◆ High Temperature soldering: 260°C/40 seconds at terminals
- ◆ Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR}@25^\circ\text{C} \times \Delta T$
- ◆ Plastic package has Underwriters Laboratory Flammability 94V-0
- ◆ Matte tin lead-free Plated
- ◆ Halogen free and RoHS compliant
- ◆ Typical failure mode is short from over-specified voltage or current
- ◆ Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- ◆ IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- ◆ ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- ◆ EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)



### Functional Diagram



### Agency Approvals

| AGENCY   | AGENCY FILE NUMBER |
|--|--------------------|
|  | E341027            |

### Applications

TVS devices are ideal for the protection of I/O interfaces,  $V_{CC}$  bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

### Maximum Ratings ( $T_A=25^\circ\text{C}$ unless otherwise noted)

| Parameter  | Symbol         | Value          | Unit             |
|--|----------------|----------------|------------------|
| Peak Pulse Power Dissipation with a 10/1000μs waveform (Fig.1)(Note 1), (Note 2) | $P_{PPM}$      | 1500           | Watts            |
| Peak Pulse Current with a 10/1000μs waveform.(Note1, Fig.3)                      | $I_{PP}$       | See Next Table | Amps             |
| Power Dissipation on Infinite Heat Sink at $T_L=75^\circ\text{C}$                | $P_{M(AV)}$    | 6.5            | Watt             |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)                 | $I_{FSM}$      | 200            | Amps             |
| Maximum Instantaneous Forward Voltage at 25A for Unidirectional Only (Note 4)    | $V_F$          | 3.5/5.0        | Voltage          |
| Operating junction and Storage Temperature Range.                                | $T_J, T_{STG}$ | -55 to +150    | $^\circ\text{C}$ |

### Notes:

1. Non-repetitive current pulse, per Fig. 3 and derated above  $T_A = 25^\circ\text{C}$  per Fig. 2.
2. Mounted on 5.0mm x 5.0mm (0.03mm thick) Copper Pads to each terminal.
3. 8.3ms single half sine-wave, or equivalent square wave, Duty cycle = 4 pulses per minutes maximum.
4.  $V_F < 3.5\text{V}$  for  $V_{BR} < 200\text{V}$  and  $V_F < 6.5\text{V}$  for  $V_{BR} > 201\text{V}$ .

## Surface Mount Transient Voltage Suppressors (TVS)

**SMCJ Series 5.0 To 440 V 1500W**

Electrical Characteristics ( $T_A=25^\circ\text{C}$  unless otherwise noted)

| Part Number |           | Marking |     | Reverse Stand-Off Voltage $V_{RWM}$ (V) | Breakdown Voltage $V_{BR}$ (V) @ $I_T$ |       | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$ @ $I_{PP}$ (V) | Maximum Peak Pulse Current $I_{PP}$ (A) | Maximum Reverse Leakage $I_R$ @ $V_{RWM}$ ( $\mu\text{A}$ ) |
|-------------|-----------|---------|-----|---|--|-------|-------------------------|---|---|---|
| Uni         | Bi        | Uni     | Bi  |   | MIN                                    | MAX   |                         |   |   |   |
| SMCJ5.0A    | SMCJ5.0CA | GDE     | BDE | 5.0                                     | 6.40                                   | 7.00  | 10                      | 9.2   | 163.04                                  | 1000  |
| SMCJ6.0A    | SMCJ6.0CA | GDG     | BDG | 6.0                                     | 6.67                                   | 7.37  | 10                      | 10.3  | 145.63                                  | 1000  |
| SMCJ6.5A    | SMCJ6.5CA | GDK     | BDK | 6.5                                     | 7.22                                   | 7.98  | 10                      | 11.2  | 133.93                                  | 500   |
| SMCJ7.0A    | SMCJ7.0CA | GDM     | BDM | 7.0                                     | 7.78                                   | 8.60  | 10                      | 12.0  | 125.00                                  | 200   |
| SMCJ7.5A    | SMCJ7.5CA | GDP     | BDP | 7.5                                     | 8.33                                   | 9.21  | 1                       | 12.9  | 116.28                                  | 100   |
| SMCJ8.0A    | SMCJ8.0CA | GDR     | BDR | 8.0                                     | 8.89                                   | 9.83  | 1                       | 13.6  | 110.29                                  | 50  |
| SMCJ8.5A    | SMCJ8.5CA | GDT     | BDT | 8.5                                     | 9.44                                   | 10.40 | 1                       | 14.4  | 104.17                                  | 20  |
| SMCJ9.0A    | SMCJ9.0CA | GDV     | BDV | 9.0                                     | 10.00                                  | 11.10 | 1                       | 15.4  | 97.40                                   | 10  |
| SMCJ10A     | SMCJ10CA  | GDX     | BDX | 10.0                                    | 11.10                                  | 12.30 | 1                       | 17.0  | 88.24                                   | 5   |
| SMCJ11A     | SMCJ11CA  | GDZ     | BDZ | 11.0                                    | 12.20                                  | 13.50 | 1                       | 18.2  | 82.42                                   | 5   |
| SMCJ12A     | SMCJ12CA  | GEE     | BEE | 12.0                                    | 13.30                                  | 14.70 | 1                       | 19.9  | 75.38                                   | 5   |
| SMCJ13A     | SMCJ13CA  | GEG     | BEG | 13.0                                    | 14.40                                  | 15.90 | 1                       | 21.5  | 69.77                                   | 5   |
| SMCJ14A     | SMCJ14CA  | GEK     | BEK | 14.0                                    | 15.60                                  | 17.20 | 1                       | 23.2  | 64.66                                   | 5   |
| SMCJ15A     | SMCJ15CA  | GEM     | BEM | 15.0                                    | 16.70                                  | 18.50 | 1                       | 24.4  | 61.48                                   | 5   |
| SMCJ16A     | SMCJ16CA  | GEP     | BEP | 16.0                                    | 17.80                                  | 19.70 | 1                       | 26.0  | 57.69                                   | 5   |
| SMCJ17A     | SMCJ17CA  | GER     | BER | 17.0                                    | 18.90                                  | 20.90 | 1                       | 27.6  | 54.35                                   | 5   |
| SMCJ18A     | SMCJ18CA  | GET     | BET | 18.0                                    | 20.00                                  | 22.10 | 1                       | 29.2  | 51.37                                   | 5   |
| SMCJ19A     | SMCJ19CA  | GEB     | BEB | 19.0                                    | 21.10                                  | 23.30 | 1                       | 30.8  | 48.73                                   | 5   |
| SMCJ20A     | SMCJ20CA  | GEV     | BEV | 20.0                                    | 22.20                                  | 24.50 | 1                       | 32.4  | 46.30                                   | 5   |
| SMCJ22A     | SMCJ22CA  | GEX     | BEX | 22.0                                    | 24.40                                  | 26.90 | 1                       | 35.5  | 42.25                                   | 5   |
| SMCJ24A     | SMCJ24CA  | GEZ     | BEZ | 24.0                                    | 26.70                                  | 29.50 | 1                       | 38.9  | 38.56                                   | 5   |
| SMCJ26A     | SMCJ26CA  | GFE     | BFE | 26.0                                    | 28.90                                  | 31.90 | 1                       | 42.1  | 35.63                                   | 5   |
| SMCJ28A     | SMCJ28CA  | GFG     | BFG | 28.0                                    | 31.10                                  | 34.40 | 1                       | 45.4  | 33.04                                   | 5   |
| SMCJ30A     | SMCJ30CA  | GFK     | BFK | 30.0                                    | 33.30                                  | 36.80 | 1                       | 48.4  | 30.99                                   | 5   |
| SMCJ33A     | SMCJ33CA  | GFM     | BFM | 33.0                                    | 36.70                                  | 40.60 | 1                       | 53.3  | 28.14                                   | 5   |
| SMCJ36A     | SMCJ36CA  | GFP     | BFP | 36.0                                    | 40.00                                  | 44.20 | 1                       | 58.1  | 25.82                                   | 5   |
| SMCJ40A     | SMCJ40CA  | GFR     | BFR | 40.0                                    | 44.40                                  | 49.10 | 1                       | 64.5  | 23.26                                   | 5   |
| SMCJ43A     | SMCJ43CA  | GFT     | BFT | 43.0                                    | 47.80                                  | 52.80 | 1                       | 69.4  | 21.61                                   | 5   |

## Surface Mount Transient Voltage Suppressors (TVS)

SMCJ Series 5.0 To 440 V 1500W

Electrical Characteristics ( $T_A=25^\circ\text{C}$  unless otherwise noted) (Continue)

| Part Number |           | Marking |      | Reverse Stand-Off Voltage $V_{RWM}$ (V) | Breakdown Voltage $V_{BR}$ (V) @ $I_T$ |        | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$ @ $I_{PP}$ (V) | Maximum Peak Pulse Current $I_{PP}$ (A) | Maximum Reverse Leakage $I_R$ @ $V_{RWM}$ ( $\mu\text{A}$ ) |
|-------------|-----------|---------|------|---|--|--------|-------------------------|---|---|---|
| Uni         | Bi        | Uni     | Bi   |   | MIN                                    | MAX    |                         |   |   |   |
| SMCJ45A     | SMCJ45CA  | GFV     | BFV  | 45.0                                    | 50.00                                  | 55.30  | 1                       | 72.7  | 20.63                                   | 5   |
| SMCJ48A     | SMCJ48CA  | GFX     | BFX  | 48.0                                    | 53.30                                  | 58.90  | 1                       | 77.4  | 19.38                                   | 5   |
| SMCJ51A     | SMCJ51CA  | GFZ     | BFZ  | 51.0                                    | 56.70                                  | 62.70  | 1                       | 82.4  | 18.20                                   | 5   |
| SMCJ54A     | SMCJ54CA  | GGE     | BGE  | 54.0                                    | 60.00                                  | 66.30  | 1                       | 87.1  | 17.22                                   | 5   |
| SMCJ58A     | SMCJ58CA  | GGG     | BGG  | 58.0                                    | 64.40                                  | 71.20  | 1                       | 93.6  | 16.03                                   | 5   |
| SMCJ60A     | SMCJ60CA  | G GK    | B GK | 60.0                                    | 66.70                                  | 73.70  | 1                       | 96.8  | 15.50                                   | 5   |
| SMCJ64A     | SMCJ64CA  | G GM    | B GM | 64.0                                    | 71.10                                  | 78.60  | 1                       | 103.0   | 14.56                                   | 5   |
| SMCJ70A     | SMCJ70CA  | G GP    | B GP | 70.0                                    | 77.80                                  | 86.00  | 1                       | 113.0   | 13.27                                   | 5   |
| SMCJ75A     | SMCJ75CA  | G GR    | B GR | 75.0                                    | 83.30                                  | 92.10  | 1                       | 121.0   | 12.40                                   | 5   |
| SMCJ78A     | SMCJ78CA  | G GT    | B GT | 78.0                                    | 86.70                                  | 95.80  | 1                       | 126.0   | 11.90                                   | 5   |
| SMCJ80A     | SMCJ80CA  | G GB    | B GB | 80.0                                    | 88.80                                  | 97.60  | 1                       | 129.6   | 11.57                                   | 5   |
| SMCJ85A     | SMCJ85CA  | G GV    | B GV | 85.0                                    | 94.40                                  | 104.00 | 1                       | 137.0   | 10.95                                   | 5   |
| SMCJ90A     | SMCJ90CA  | G GX    | B GX | 90.0                                    | 100.00                                 | 111.00 | 1                       | 146.0   | 10.27                                   | 5   |
| SMCJ100A    | SMCJ100CA | G GZ    | B GZ | 100.0                                   | 111.00                                 | 123.00 | 1                       | 162.0   | 9.26                                    | 5   |
| SMCJ110A    | SMCJ110CA | G HE    | B HE | 110.0                                   | 122.00                                 | 135.00 | 1                       | 177.0   | 8.47                                    | 5   |
| SMCJ120A    | SMCJ120CA | G HG    | B HG | 120.0                                   | 133.00                                 | 147.00 | 1                       | 193.0   | 7.77                                    | 5   |
| SMCJ130A    | SMCJ130CA | G HK    | B HK | 130.0                                   | 144.00                                 | 159.00 | 1                       | 209.0   | 7.18                                    | 5   |
| SMCJ140A    | SMCJ140CA | G HB    | B HB | 140.0                                   | 155.00                                 | 171.00 | 1                       | 226.8   | 6.61                                    | 5   |
| SMCJ150A    | SMCJ150CA | G HM    | B HM | 150.0                                   | 167.00                                 | 185.00 | 1                       | 243.0   | 6.17                                    | 5   |
| SMCJ160A    | SMCJ160CA | G HP    | B HP | 160.0                                   | 178.00                                 | 197.00 | 1                       | 259.0   | 5.79                                    | 5   |
| SMCJ170A    | SMCJ170CA | G HR    | B HR | 170.0                                   | 189.00                                 | 209.00 | 1                       | 275.0   | 5.45                                    | 5   |
| SMCJ180A    | SMCJ180CA | G HT    | B HT | 180.0                                   | 201.00                                 | 220.00 | 1                       | 291.6   | 5.14                                    | 5   |
| SMCJ190A    | SMCJ190CA | G HV    | B HV | 190.0                                   | 211.00                                 | 232.00 | 1                       | 307.8   | 4.87                                    | 5   |
| SMCJ200A    | SMCJ200CA | G HW    | B HW | 200.0                                   | 224.00                                 | 247.00 | 1                       | 324.0   | 4.60                                    | 5   |
| SMCJ220A    | SMCJ220CA | G HX    | B HX | 220.0                                   | 246.00                                 | 272.00 | 1                       | 356.0   | 4.20                                    | 5   |
| SMCJ250A    | SMCJ250CA | G HZ    | B HZ | 250.0                                   | 279.00                                 | 309.00 | 1                       | 405.0   | 3.70                                    | 5   |
| SMCJ300A    | SMCJ300CA | G JE    | B JE | 300.0                                   | 335.00                                 | 371.00 | 1                       | 486.0   | 3.10                                    | 5   |
| SMCJ350A    | SMCJ350CA | G JG    | B JG | 350.0                                   | 391.00                                 | 432.00 | 1                       | 567.0   | 2.60                                    | 5   |
| SMCJ400A    | SMCJ400CA | G JK    | B JK | 400.0                                   | 447.00                                 | 494.00 | 1                       | 648.0   | 2.30                                    | 5   |
| SMCJ440A    | SMCJ440CA | G JM    | B JM | 440.0                                   | 492.00                                 | 543.00 | 1                       | 713.0   | 2.10                                    | 5   |

**Note:**

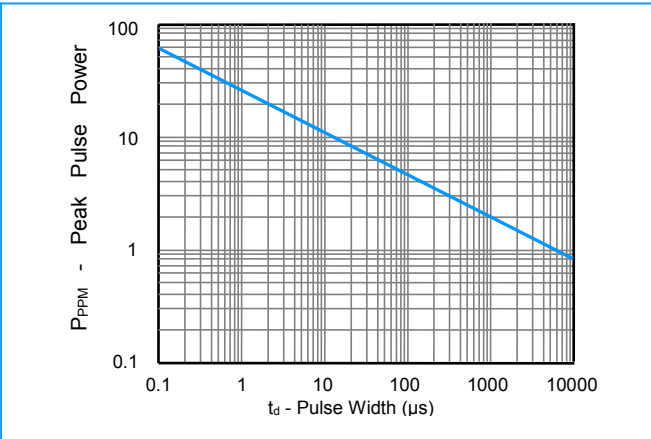
1. Suffix 'A' denotes 5% tolerance device.
2. Add suffix 'CA' after part number to specify Bi-directional devices.
3. For Bi-Directional devices having  $V_R$  of 10 volts and under, the  $I_R$  limit is doubl.

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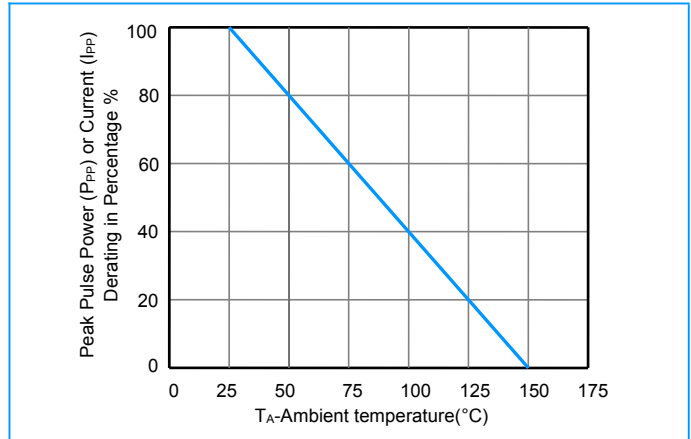
**SMCJ Series 5.0 To 440 V 1500W**

**Ratings and Characteristic Curves ( $T_A=25^\circ\text{C}$  unless otherwise noted)**

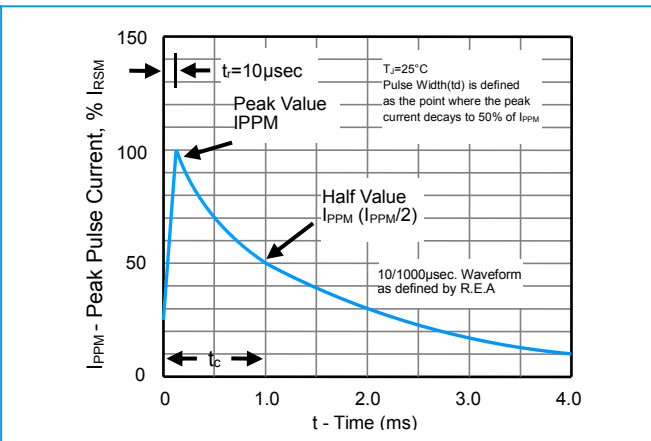
**Figure 1 - Peak Pulse Power Rating Curve**



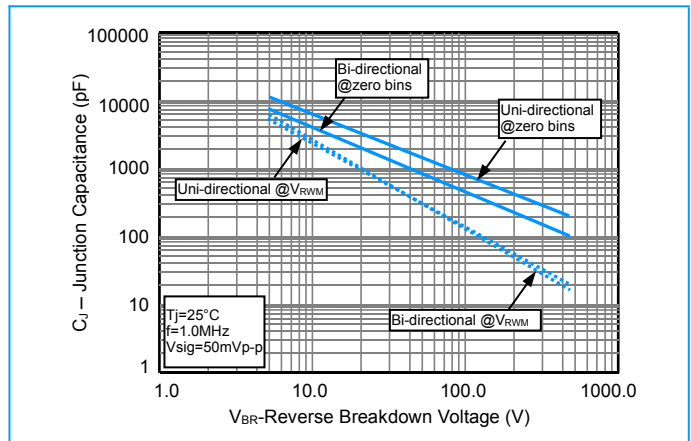
**Figure 2 - Pulse Derating Curve**



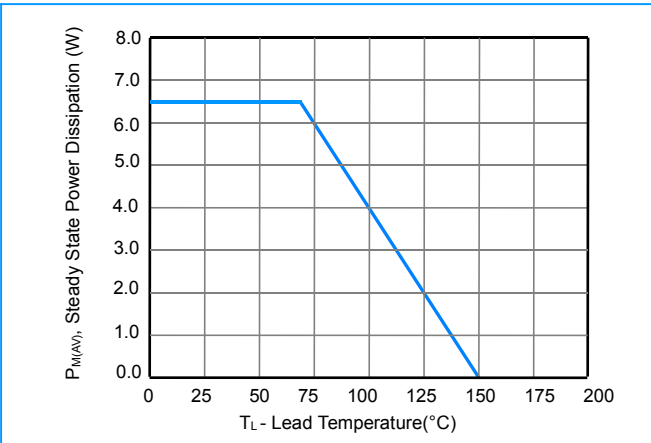
**Figure 3 - Pulse Waveform**



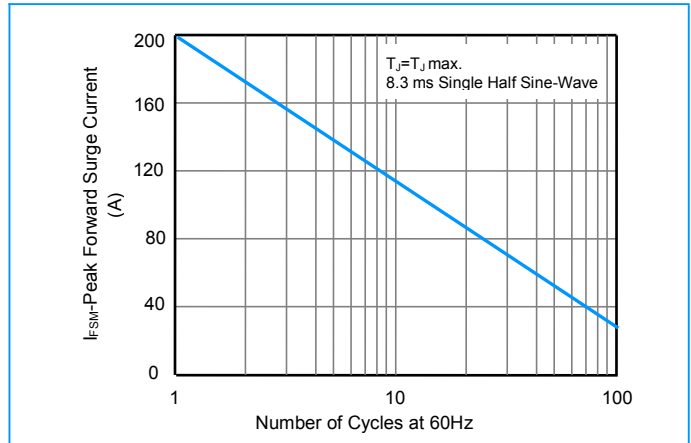
**Figure 4 - Typical Junction Capacitance**



**Figure 5 - Steady State Power Derating Curve**



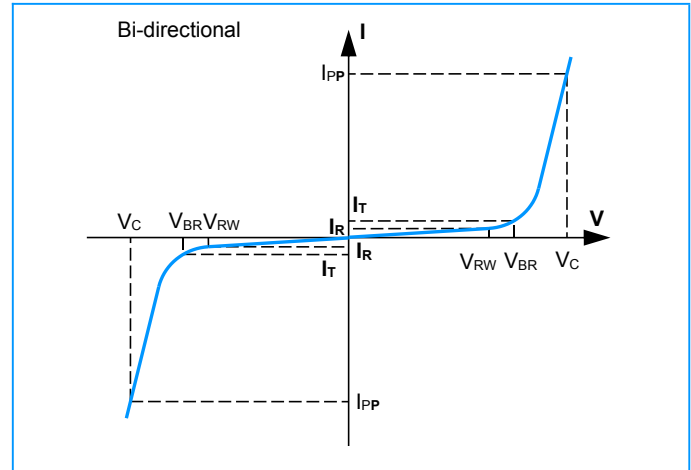
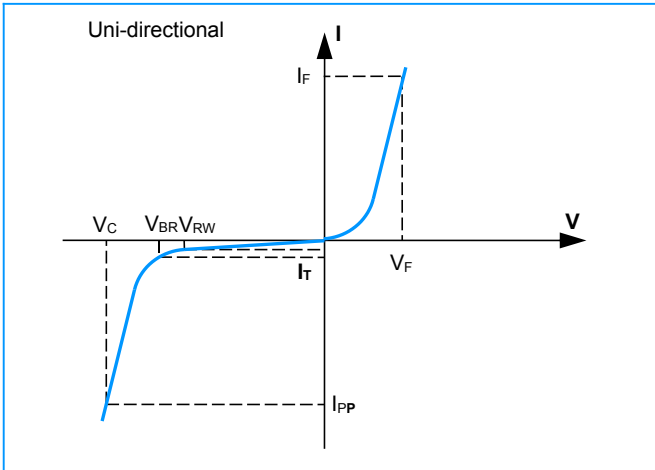
**Figure 6 - Maximum Non-Repetitive Surge Current**



# Surface Mount Transient Voltage Suppressors (TVS)

**SMCJ Series 5.0 To 440 V 1500W**

## I-V Curve Characteristics



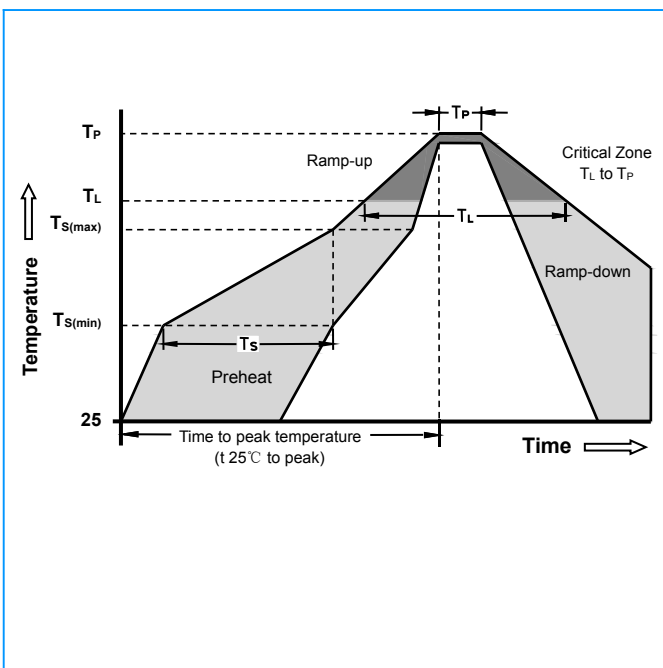
## Physical Specifications

|                 |  |
|-----------------|--|
| <b>Weight</b>   | 0.007 ounce, 0.21 gram                                       |
| <b>Case</b>     | JEDEC DO-214AB Molded Plastic over glass passivated junction |
| <b>Polarity</b> | Color band denotes cathode except Bipolar                    |
| <b>Terminal</b> | Matte Tin-plated leads, Solderable per JESD22-B102D          |

## Environmental Specifications

|                           |             |
|---------------------------|-------------|
| <b>Temperature Cycle</b>  | JESD22-A104 |
| <b>Pressure Cooker</b>    | JESD22-A102 |
| <b>High Temp. Storage</b> | JESD22-A103 |
| <b>HTRB</b>               | JESD22-A108 |
| <b>Thermal Shock</b>      | JESD22-A106 |

## Soldering Parameters

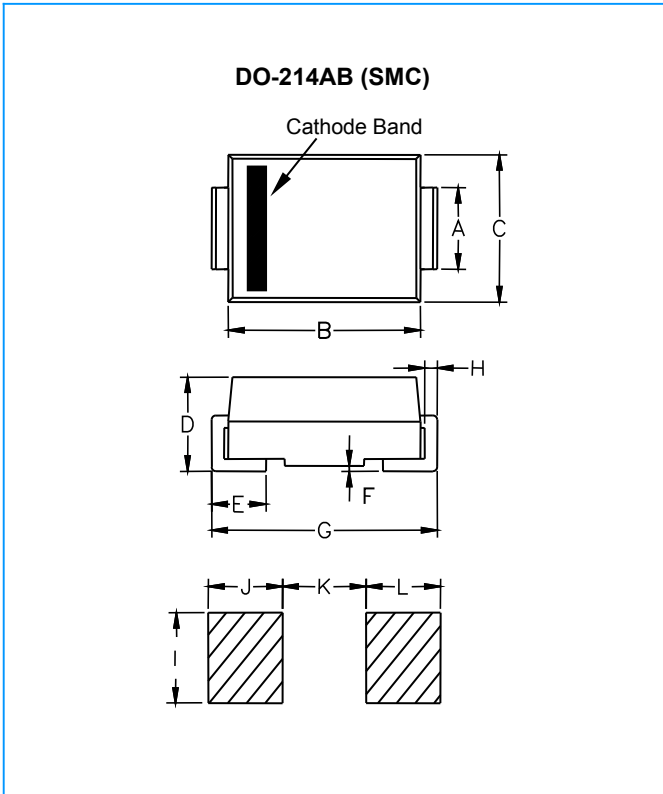


|   |                                    |                    |
|---|------------------------------------|--------------------|
| <b>Reflow Condition</b>   |                                    | Lead-free assembly |
| <b>Pre Heat</b>   | -Temperature Min ( $T_{S(min)}$ )  | 150°C              |
|   | -Temperature Max ( $T_{S(max)}$ )  | 200°C              |
|   | - Time (min to max) ( $T_S$ )      | 60 -180 Seconds    |
| <b>Average ramp up rate ( Liquidus Temp <math>T_L</math>) to peak</b> |                                    | 3°C/second max     |
| <b><math>T_{S(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>     |                                    | 3°C/second max     |
| <b>Reflow</b>   | - Temperature ( $T_L$ ) (Liquidus) | 217°C              |
|   | - Time (min to max) ( $T_L$ )      | 60 -150 Seconds    |
| <b>Peak Temperature (<math>T_P</math>)</b>                            |                                    | 260 +0/-5°C        |
| <b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>  |                                    | 20 -40 Seconds     |
| <b>Ramp-down Rate</b>   |                                    | 6°C/second max     |
| <b>Time 25°C to peak Temperature (<math>T_P</math>)</b>               |                                    | 8 minutes Max      |
| <b>Do not exceed</b>  |                                    | 280°C              |

# Surface Mount Transient Voltage Suppressors (TVS)

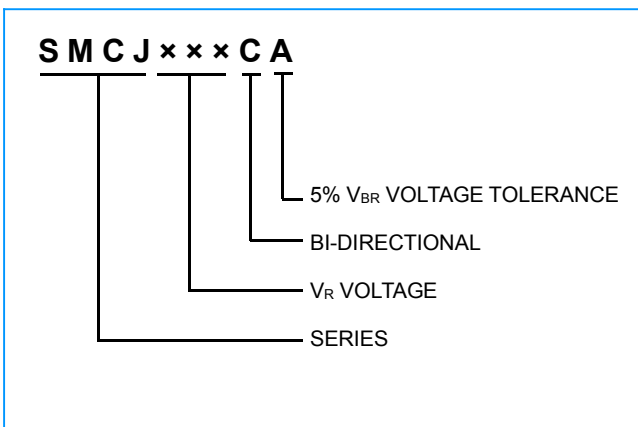
**SMCJ Series 5.0 To 440 V 1500W**

## Dimensions

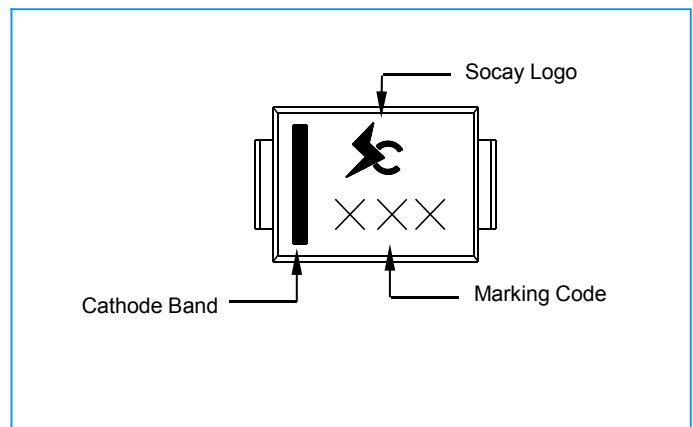


| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| A          | 0.108  | 0.126 | 2.75        | 3.20  |
| B          | 0.260  | 0.280 | 6.52        | 7.11  |
| C          | 0.220  | 0.244 | 5.52        | 6.20  |
| D          | 0.079  | 0.103 | 1.98        | 2.62  |
| E          | 0.030  | 0.060 | 0.75        | 1.52  |
| F          | -      | 0.008 | -           | 0.203 |
| G          | 0.305  | 0.320 | 7.64        | 8.13  |
| H          | 0.006  | 0.012 | 0.15        | 0.31  |
| I          | 0.121  | -     | 3.07        | -     |
| J          | 0.0675 | -     | 1.715       | -     |
| K          | -      | 0.185 | -           | 4.69  |
| L          | 0.0675 | -     | 1.715       | -     |

## Part Numbering



## Part Marking



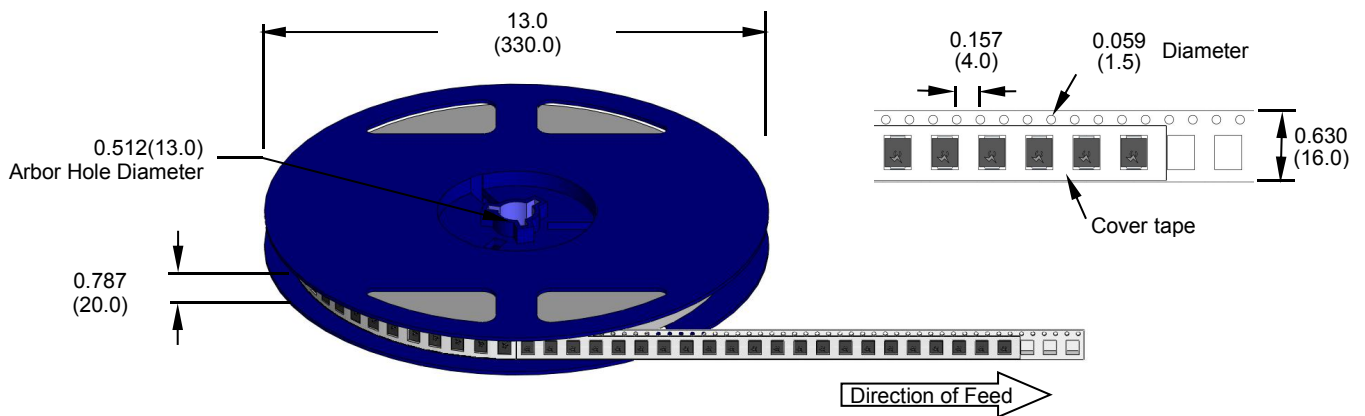
## Surface Mount Transient Voltage Suppressors (TVS)

**SMCJ Series 5.0 To 440 V 1500W**

### Packaging

| Part Number | Component Package | Reel (pcs) | Per Carton (pcs) | Packaging Option          | Reel Diameters (mm) |
|-------------|-------------------|------------|------------------|---------------------------|---------------------|
| SMCJXXXXX   | DO-214AB (SMC)    | 3000       | 48000            | Tape & Reel -20mm/13"tape | 330.0               |

### Tape and Reel Specifications



Dimensions are in inches (and millimeters)