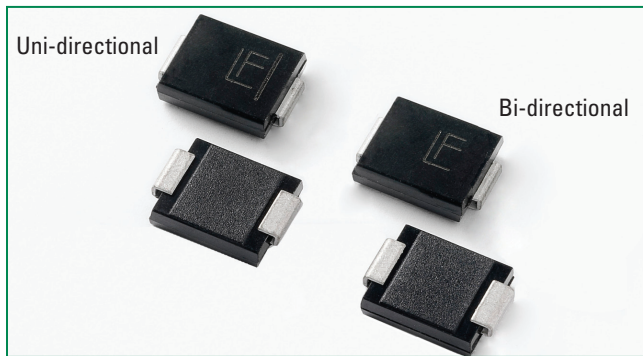


## SMCJ Series



### Agency Approvals

| AGENCY | AGENCY FILE NUMBER |
|--------|--------------------|
|        | E230531            |

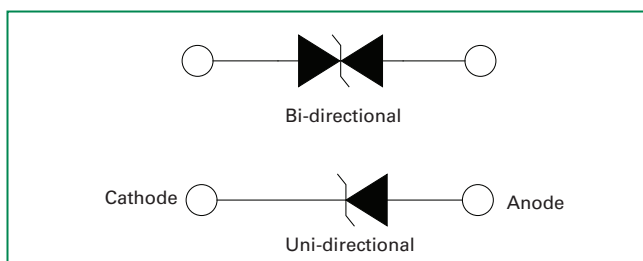
### Maximum Ratings and Thermal Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

| Parameter                                                                                            | Symbol                            | Value      | Unit |
|------------------------------------------------------------------------------------------------------|-----------------------------------|------------|------|
| Peak Pulse Power Dissipation at T <sub>A</sub> =25°C by 10/1000µs Waveform (Fig.2)(Note 1), (Note 2) | P <sub>PPM</sub>                  | 1500       | W    |
| Power Dissipation on Infinite Heat Sink at T <sub>A</sub> =50°C                                      | P <sub>MAV</sub>                  | 6.5        | W    |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)                                     | I <sub>FSM</sub>                  | 200        | A    |
| Maximum Instantaneous Forward Voltage at 100A for Unidirectional Only (Note 4)                       | V <sub>F</sub>                    | 3.5/5.0    | V    |
| Operating Junction and Storage Temperature Range                                                     | T <sub>J</sub> , T <sub>STG</sub> | -55 to 150 | °C   |
| Typical Thermal Resistance Junction to Lead                                                          | R <sub>uJL</sub>                  | 15         | °C/W |
| Typical Thermal Resistance Junction to Ambient                                                       | R <sub>uJA</sub>                  | 75         | °C/W |

**Notes:**

1. Non-repetitive current pulse, per Fig. 4 and derated above T<sub>A</sub> = 25°C per Fig. 3.
2. Mounted on copper pad area of 0.31x0.31" (8.0 x 8.0mm) to each terminal.
3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only, duty cycle=4 per minute maximum.
4. V<sub>F</sub><3.5V for V<sub>BR</sub> ≤ 200V and V<sub>F</sub><5.0V for V<sub>BR</sub> ≥ 201V.

### Functional Diagram



### Description

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

### Features

- Excellent clamping capability
- Low incremental surge resistance
- Typical I<sub>R</sub> less than 1µA above 12V
- For surface mounted applications to optimize board space
- Low profile package
- Built-in strain relief
- 1500W peak pulse power capability at 10/1000µs waveform, repetition rate (duty cycles):0.01 %
- 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)
- Fast response time: typically less than 1.0ps from 0V to BV min
- V<sub>BR</sub> @T<sub>J</sub> = V<sub>BR</sub> @25°C × (1 + α T × (T<sub>J</sub> - 25)) (α T: Temperature Coefficient)
- Glass passivated chip junction
- High temperature soldering guaranteed: 260°C/40 seconds at terminals
- Plastic package has underwriters laboratory flammability 94V-O
- Meet MSL level1, per J-STD-020, LF maximum peak of 260°C
- Matte tin lead-free plated
- Halogen free and RoHS compliant
- 2nd level interconnect is Pb-free per IPC/JEDEC J-STD-609A.01

### Applications

TVS devices are ideal for the protection of I/O Interfaces, V<sub>CC</sub> bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

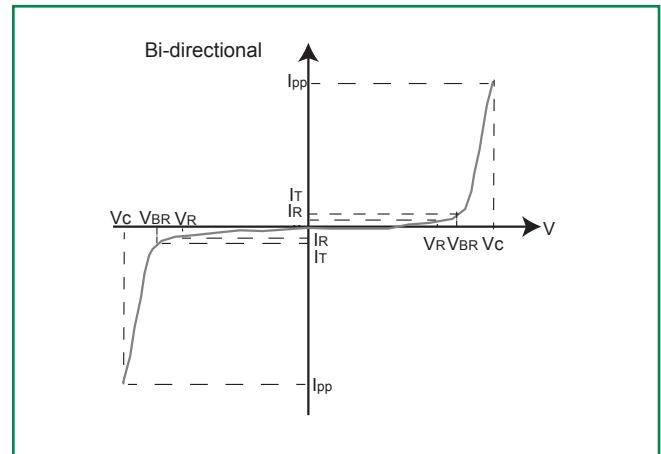
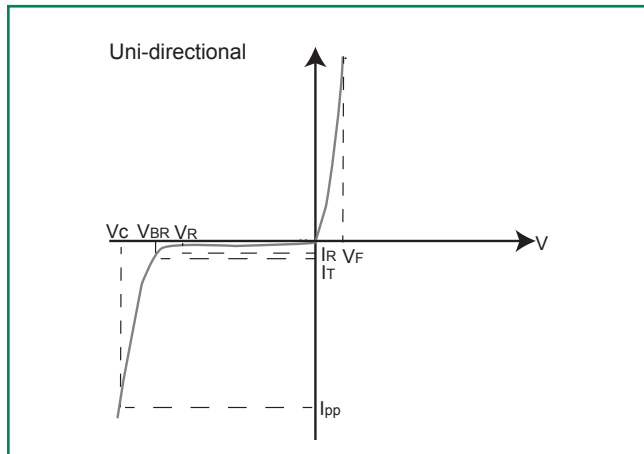
### Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

| Part Number (Uni) | Part Number (Bi) | Marking |     | Reverse Stand off Voltage V <sub>R</sub> (Volts) | Breakdown Voltage V <sub>BR</sub> (Volts) @ I <sub>T</sub> |        | Test Current I <sub>T</sub> (mA) | Maximum Clamping Voltage V <sub>C</sub> @ I <sub>pp</sub> (V) | Maximum Peak Pulse Current I <sub>pp</sub> (A) | Maximum Reverse Leakage I <sub>R</sub> @ V <sub>R</sub> (μA) | Agency Approval  |
|-------------------|------------------|---------|-----|--------------------------------------------------|------------------------------------------------------------|--------|----------------------------------|---------------------------------------------------------------|------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
|                   |                  | UNI     | BI  |                                                  | MIN                                                        | MAX    |                                  |                                                               |                                                |                                                              |                                                                                                     |
| SMCJ5.0A          | SMCJ5.0CA        | GDE     | BDE | 5.0                                              | 6.40                                                       | 7.00   | 10                               | 9.2                                                           | 163.0                                          | 800                                                          | X                                                                                                   |
| SMCJ6.0A          | SMCJ6.0CA        | GDG     | BDG | 6.0                                              | 6.67                                                       | 7.37   | 10                               | 10.3                                                          | 145.7                                          | 800                                                          | X                                                                                                   |
| SMCJ6.5A          | SMCJ6.5CA        | GDK     | BDK | 6.5                                              | 7.22                                                       | 7.98   | 10                               | 11.2                                                          | 134.0                                          | 500                                                          | X                                                                                                   |
| SMCJ7.0A          | SMCJ7.0CA        | GDM     | BDM | 7.0                                              | 7.78                                                       | 8.60   | 10                               | 12.0                                                          | 125.0                                          | 200                                                          | X                                                                                                   |
| SMCJ7.5A          | SMCJ7.5CA        | GDP     | BDP | 7.5                                              | 8.33                                                       | 9.21   | 1                                | 12.9                                                          | 116.3                                          | 100                                                          | X                                                                                                   |
| SMCJ8.0A          | SMCJ8.0CA        | GDR     | BDR | 8.0                                              | 8.89                                                       | 9.83   | 1                                | 13.6                                                          | 110.3                                          | 50                                                           | X                                                                                                   |
| SMCJ8.5A          | SMCJ8.5CA        | GDT     | BDT | 8.5                                              | 9.44                                                       | 10.40  | 1                                | 14.4                                                          | 104.2                                          | 20                                                           | X                                                                                                   |
| SMCJ9.0A          | SMCJ9.0CA        | GDV     | BDV | 9.0                                              | 10.00                                                      | 11.10  | 1                                | 15.4                                                          | 97.4                                           | 10                                                           | X                                                                                                   |
| SMCJ10A           | SMCJ10CA         | GDX     | BDX | 10.0                                             | 11.10                                                      | 12.30  | 1                                | 17.0                                                          | 88.3                                           | 5                                                            | X                                                                                                   |
| SMCJ11A           | SMCJ11CA         | GDZ     | BDZ | 11.0                                             | 12.20                                                      | 13.50  | 1                                | 18.2                                                          | 82.5                                           | 1                                                            | X                                                                                                   |
| SMCJ12A           | SMCJ12CA         | GEE     | BEE | 12.0                                             | 13.30                                                      | 14.70  | 1                                | 19.9                                                          | 75.4                                           | 1                                                            | X                                                                                                   |
| SMCJ13A           | SMCJ13CA         | GEG     | BEG | 13.0                                             | 14.40                                                      | 15.90  | 1                                | 21.5                                                          | 69.8                                           | 1                                                            | X                                                                                                   |
| SMCJ14A           | SMCJ14CA         | GEK     | BEK | 14.0                                             | 15.60                                                      | 17.20  | 1                                | 23.2                                                          | 64.7                                           | 1                                                            | X                                                                                                   |
| SMCJ15A           | SMCJ15CA         | GEM     | BEM | 15.0                                             | 16.70                                                      | 18.50  | 1                                | 24.4                                                          | 61.5                                           | 1                                                            | X                                                                                                   |
| SMCJ16A           | SMCJ16CA         | GEP     | BEP | 16.0                                             | 17.80                                                      | 19.70  | 1                                | 26.0                                                          | 57.7                                           | 1                                                            | X                                                                                                   |
| SMCJ17A           | SMCJ17CA         | GER     | BER | 17.0                                             | 18.90                                                      | 20.90  | 1                                | 27.6                                                          | 54.4                                           | 1                                                            | X                                                                                                   |
| SMCJ18A           | SMCJ18CA         | GET     | BET | 18.0                                             | 20.00                                                      | 22.10  | 1                                | 29.2                                                          | 51.4                                           | 1                                                            | X                                                                                                   |
| SMCJ20A           | SMCJ20CA         | GEV     | BEV | 20.0                                             | 22.20                                                      | 24.50  | 1                                | 32.4                                                          | 46.3                                           | 1                                                            | X                                                                                                   |
| SMCJ22A           | SMCJ22CA         | GEX     | BEX | 22.0                                             | 24.40                                                      | 26.90  | 1                                | 35.5                                                          | 42.3                                           | 1                                                            | X                                                                                                   |
| SMCJ24A           | SMCJ24CA         | GEZ     | BEZ | 24.0                                             | 26.70                                                      | 29.50  | 1                                | 38.9                                                          | 38.6                                           | 1                                                            | X                                                                                                   |
| SMCJ26A           | SMCJ26CA         | GFE     | BEF | 26.0                                             | 28.90                                                      | 31.90  | 1                                | 42.1                                                          | 35.7                                           | 1                                                            | X                                                                                                   |
| SMCJ28A           | SMCJ28CA         | GFG     | BFG | 28.0                                             | 31.10                                                      | 34.40  | 1                                | 45.4                                                          | 33.1                                           | 1                                                            | X                                                                                                   |
| SMCJ30A           | SMCJ30CA         | GFK     | BFK | 30.0                                             | 33.30                                                      | 36.80  | 1                                | 48.4                                                          | 31.0                                           | 1                                                            | X                                                                                                   |
| SMCJ33A           | SMCJ33CA         | GFM     | BFM | 33.0                                             | 36.70                                                      | 40.60  | 1                                | 53.3                                                          | 28.2                                           | 1                                                            | X                                                                                                   |
| SMCJ36A           | SMCJ36CA         | GFP     | BFP | 36.0                                             | 40.00                                                      | 44.20  | 1                                | 58.1                                                          | 25.9                                           | 1                                                            | X                                                                                                   |
| SMCJ40A           | SMCJ40CA         | GFR     | BFR | 40.0                                             | 44.40                                                      | 49.10  | 1                                | 64.5                                                          | 23.3                                           | 1                                                            | X                                                                                                   |
| SMCJ43A           | SMCJ43CA         | GFT     | BFT | 43.0                                             | 47.80                                                      | 52.80  | 1                                | 69.4                                                          | 21.7                                           | 1                                                            | X                                                                                                   |
| SMCJ45A           | SMCJ45CA         | GFV     | BFV | 45.0                                             | 50.00                                                      | 55.30  | 1                                | 72.7                                                          | 20.6                                           | 1                                                            | X                                                                                                   |
| SMCJ48A           | SMCJ48CA         | GFX     | BFX | 48.0                                             | 53.30                                                      | 58.90  | 1                                | 77.4                                                          | 19.4                                           | 1                                                            | X                                                                                                   |
| SMCJ51A           | SMCJ51CA         | GFZ     | BFZ | 51.0                                             | 56.70                                                      | 62.70  | 1                                | 82.4                                                          | 18.2                                           | 1                                                            | X                                                                                                   |
| SMCJ54A           | SMCJ54CA         | GGE     | BGE | 54.0                                             | 60.00                                                      | 66.30  | 1                                | 87.1                                                          | 17.3                                           | 1                                                            | X                                                                                                   |
| SMCJ58A           | SMCJ58CA         | GGG     | BGG | 58.0                                             | 64.40                                                      | 71.20  | 1                                | 93.6                                                          | 16.1                                           | 1                                                            | X                                                                                                   |
| SMCJ60A           | SMCJ60CA         | G GK    | BGK | 60.0                                             | 66.70                                                      | 73.70  | 1                                | 96.8                                                          | 15.5                                           | 1                                                            | X                                                                                                   |
| SMCJ64A           | SMCJ64CA         | GGM     | BGM | 64.0                                             | 71.10                                                      | 78.60  | 1                                | 103.0                                                         | 14.6                                           | 1                                                            | X                                                                                                   |
| SMCJ70A           | SMCJ70CA         | GGP     | BGP | 70.0                                             | 77.80                                                      | 86.00  | 1                                | 113.0                                                         | 13.3                                           | 1                                                            | X                                                                                                   |
| SMCJ75A           | SMCJ75CA         | GGR     | BGR | 75.0                                             | 83.30                                                      | 92.10  | 1                                | 121.0                                                         | 12.4                                           | 1                                                            | X                                                                                                   |
| SMCJ78A           | SMCJ78CA         | GGT     | BGT | 78.0                                             | 86.70                                                      | 95.80  | 1                                | 126.0                                                         | 11.9                                           | 1                                                            | X                                                                                                   |
| SMCJ85A           | SMCJ85CA         | GGV     | BGV | 85.0                                             | 94.40                                                      | 104.00 | 1                                | 137.0                                                         | 11.0                                           | 1                                                            | X                                                                                                   |
| SMCJ90A           | SMCJ90CA         | GGX     | BGX | 90.0                                             | 100.00                                                     | 111.00 | 1                                | 146.0                                                         | 10.3                                           | 1                                                            | X                                                                                                   |
| SMCJ100A          | SMCJ100CA        | GGZ     | BGZ | 100.0                                            | 111.00                                                     | 123.00 | 1                                | 162.0                                                         | 9.3                                            | 1                                                            | X                                                                                                   |
| SMCJ110A          | SMCJ110CA        | GHE     | BHE | 110.0                                            | 122.00                                                     | 135.00 | 1                                | 177.0                                                         | 8.5                                            | 1                                                            | X                                                                                                   |
| SMCJ120A          | SMCJ120CA        | GHG     | BHG | 120.0                                            | 133.00                                                     | 147.00 | 1                                | 193.0                                                         | 7.8                                            | 1                                                            | X                                                                                                   |
| SMCJ130A          | SMCJ130CA        | G HK    | BHK | 130.0                                            | 144.00                                                     | 159.00 | 1                                | 209.0                                                         | 7.2                                            | 1                                                            | X                                                                                                   |
| SMCJ150A          | SMCJ150CA        | G HM    | BHM | 150.0                                            | 167.00                                                     | 185.00 | 1                                | 243.0                                                         | 6.2                                            | 1                                                            | X                                                                                                   |
| SMCJ160A          | SMCJ160CA        | GHP     | BHP | 160.0                                            | 178.00                                                     | 197.00 | 1                                | 259.0                                                         | 5.8                                            | 1                                                            | X                                                                                                   |
| SMCJ170A          | SMCJ170CA        | GHR     | BHR | 170.0                                            | 189.00                                                     | 209.00 | 1                                | 275.0                                                         | 5.5                                            | 1                                                            | X                                                                                                   |
| SMCJ180A          | SMCJ180CA        | GHT     | BHT | 180.0                                            | 201.00                                                     | 222.00 | 1                                | 292.0                                                         | 5.1                                            | 1                                                            | X                                                                                                   |
| SMCJ200A          | SMCJ200CA        | GHV     | BHV | 200.0                                            | 224.00                                                     | 247.00 | 1                                | 324.0                                                         | 4.6                                            | 1                                                            | X                                                                                                   |
| SMCJ220A          | SMCJ220CA        | G HX    | BHX | 220.0                                            | 246.00                                                     | 272.00 | 1                                | 356.0                                                         | 4.2                                            | 1                                                            | X                                                                                                   |
| SMCJ250A          | SMCJ250CA        | GHZ     | BHZ | 250.0                                            | 279.00                                                     | 309.00 | 1                                | 405.0                                                         | 3.7                                            | 1                                                            | X                                                                                                   |
| SMCJ300A          | SMCJ300CA        | GJE     | BJE | 300.0                                            | 335.00                                                     | 371.00 | 1                                | 486.0                                                         | 3.1                                            | 1                                                            | X                                                                                                   |
| SMCJ350A          | SMCJ350CA        | GJG     | BJG | 350.0                                            | 391.00                                                     | 432.00 | 1                                | 567.0                                                         | 2.6                                            | 1                                                            | X                                                                                                   |
| SMCJ400A          | SMCJ400CA        | GJK     | BJK | 400.0                                            | 447.00                                                     | 494.00 | 1                                | 648.0                                                         | 2.3                                            | 1                                                            | X                                                                                                   |
| SMCJ440A          | SMCJ440CA        | GJM     | BJM | 440.0                                            | 492.00                                                     | 543.00 | 1                                | 713.0                                                         | 2.1                                            | 1                                                            | X                                                                                                   |

For bidirectional type having V<sub>R</sub> of 10 volts and less, the I<sub>R</sub> limit is double.  
 For parts without A, the V<sub>BR</sub> is + 10% and V<sub>C</sub> is 5% higher than with A parts.

SMCJ Series

## I-V Curve Characteristics



**$P_{PPM}$  Peak Pulse Power Dissipation** – Max power dissipation

**$V_R$  Stand-off Voltage** – Maximum voltage that can be applied to the TVS without operation

**$V_{BR}$  Breakdown Voltage** – Maximum voltage that flows through the TVS at a specified test current ( $I_T$ )

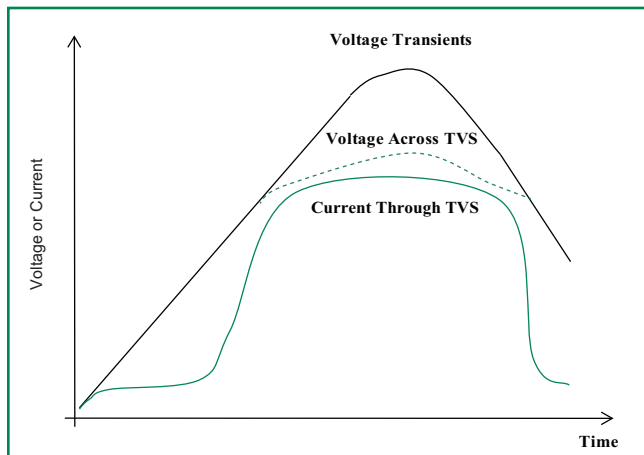
**$V_C$  Clamping Voltage** – Peak voltage measured across the suppressor at a specified  $I_{PPM}$  (peak impulse current)

**$I_R$  Reverse Leakage Current** – Current measured at  $V_R$

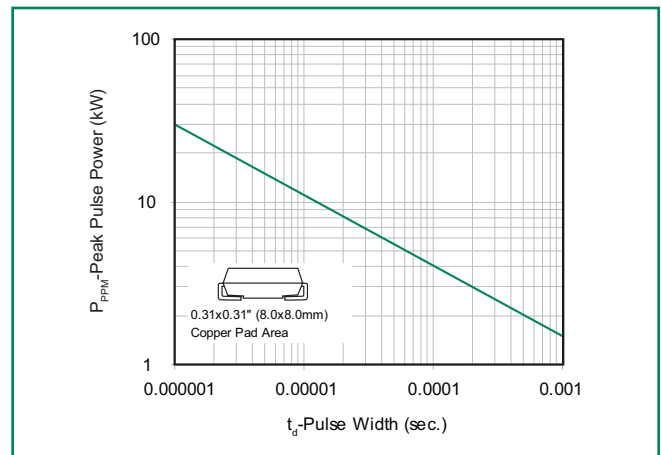
**$V_F$  Forward Voltage Drop for Uni-directional**

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

**Figure 1 - TVS Transients Clamping Waveform**



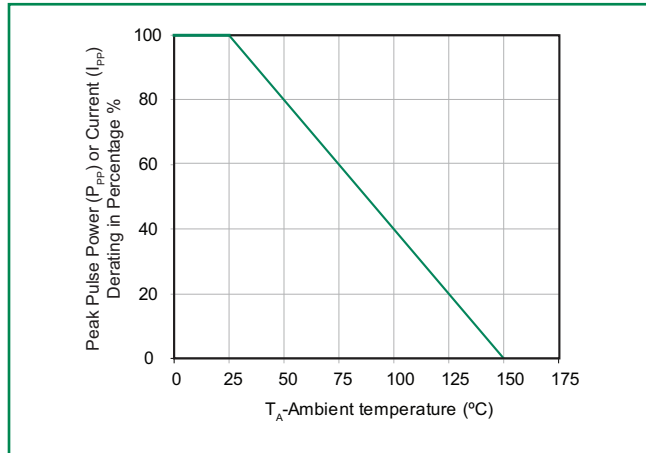
**Figure 2 - Peak Pulse Power Rating**



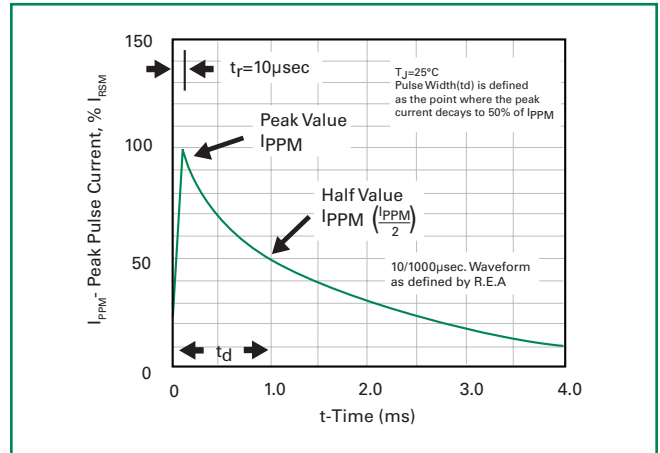
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**Ratings and Characteristic Curves** ( $T_A=25^\circ\text{C}$  unless otherwise noted) (Continued)

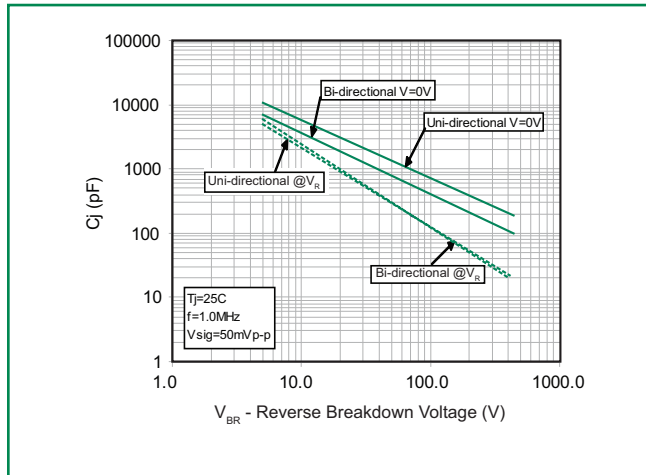
**Figure 3 - Pulse Derating Curve**



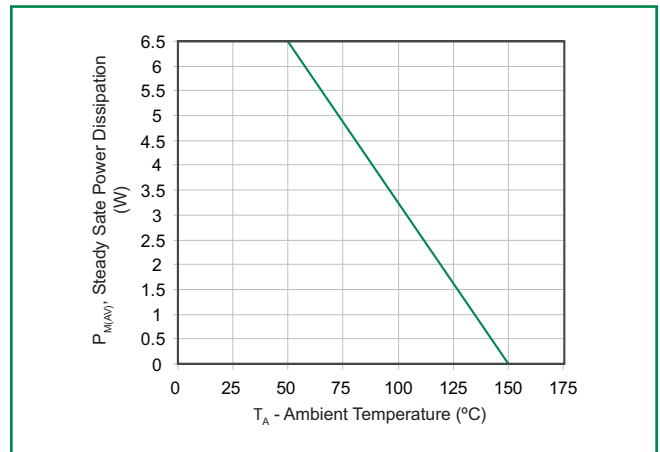
**Figure 4 - Pulse Waveform**



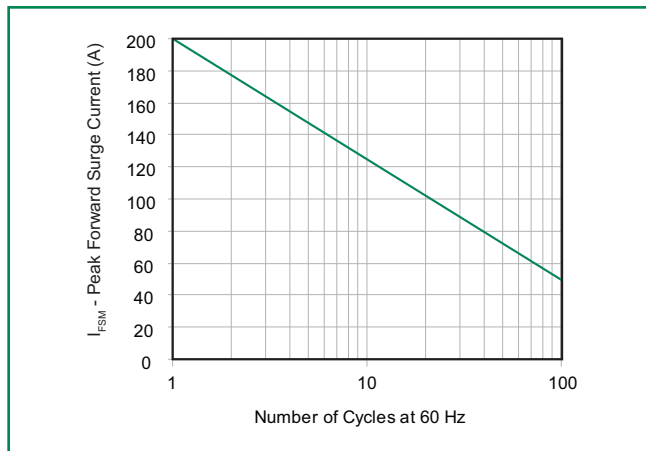
**Figure 5 - Typical Junction Capacitance**



**Figure 6 - Steady State Power Dissipation Derating Curve**

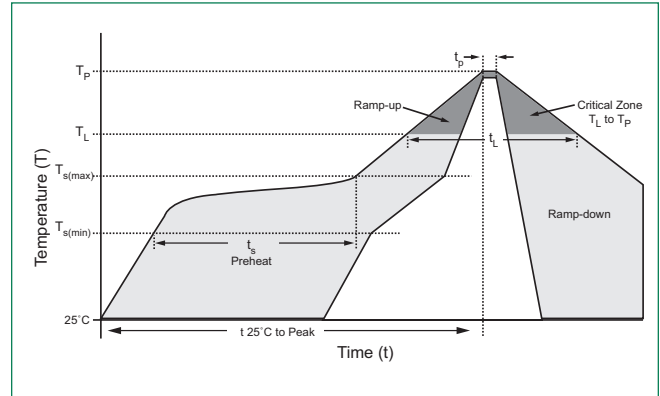


**Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only**



### Soldering Parameters

|                                                       |                                    |                    |
|-------------------------------------------------------|------------------------------------|--------------------|
| Reflow Condition                                      |                                    | Lead-free assembly |
| Pre Heat                                              | - Temperature Min ( $T_{s(min)}$ ) | 150°C              |
|                                                       | - Temperature Max ( $T_{s(max)}$ ) | 200°C              |
|                                                       | - Time (min to max) ( $t_s$ )      | 60 – 180 secs      |
| Average ramp up rate (Liquidus Temp ( $T_L$ ) to peak |                                    | 3°C/second max     |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate                  |                                    | 3°C/second max     |
| Reflow                                                | - Temperature ( $T_L$ ) (Liquidus) | 217°C              |
|                                                       | - Time (min to max) ( $t_s$ )      | 60 – 150 seconds   |
| Peak Temperature ( $T_p$ )                            |                                    | 260 $^{+0/-5}$ °C  |
| Time within 5°C of actual peak Temperature ( $t_p$ )  |                                    | 20 – 40 seconds    |
| Ramp-down Rate                                        |                                    | 6°C/second max     |
| Time 25°C to peak Temperature ( $T_p$ )               |                                    | 8 minutes Max.     |
| Do not exceed                                         |                                    | 280°C              |



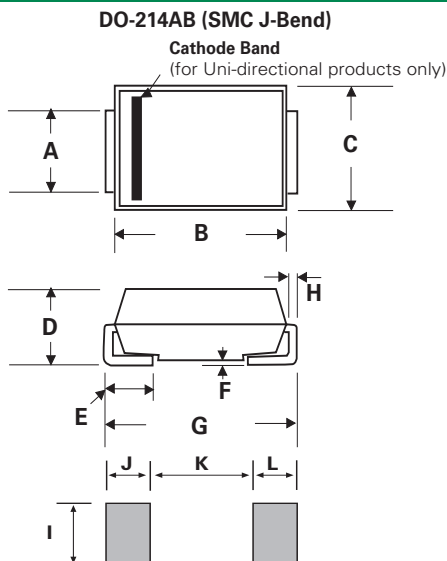
### Physical Specifications

|                 |                                                                   |
|-----------------|-------------------------------------------------------------------|
| <b>Weight</b>   | 0.007 ounce, 0.21 grams                                           |
| <b>Case</b>     | JEDEC DO214AB. Molded plastic body over glass passivated junction |
| <b>Polarity</b> | Color band denotes positive end (cathode) except Bidirectional.   |
| <b>Terminal</b> | Matte Tin-plated leads, Solderable per JESD22-B102                |

### Environmental Specifications

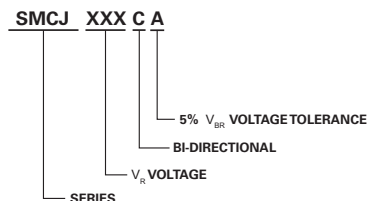
|                            |                          |
|----------------------------|--------------------------|
| <b>High Temp. Storage</b>  | JESD22-A103              |
| <b>HTRB</b>                | JESD22-A108              |
| <b>Temperature Cycling</b> | JESD22-A104              |
| <b>MSL</b>                 | JEDEC-J-STD-020, Level 1 |
| <b>H3TRB</b>               | JESD22-A101              |
| <b>RSH</b>                 | JESD22-B106              |

### Dimensions

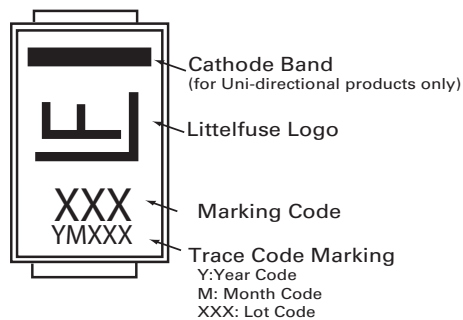


| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| A          | 0.114  | 0.126 | 2.900       | 3.200 |
| B          | 0.260  | 0.280 | 6.600       | 7.110 |
| C          | 0.220  | 0.245 | 5.590       | 6.220 |
| D          | 0.079  | 0.103 | 2.060       | 2.620 |
| E          | 0.030  | 0.060 | 0.760       | 1.520 |
| F          | -      | 0.008 | -           | 0.203 |
| G          | 0.305  | 0.320 | 7.750       | 8.130 |
| H          | 0.006  | 0.012 | 0.152       | 0.305 |
| I          | 0.129  | -     | 3.300       | -     |
| J          | 0.094  | -     | 2.400       | -     |
| K          | -      | 0.165 | -           | 4.200 |
| L          | 0.094  | -     | 2.400       | -     |

### Part Numbering System



### Part Marking System



### Packaging

| Part number | Component Package | Quantity | Packaging Option                 | Packaging Specification |
|-------------|-------------------|----------|----------------------------------|-------------------------|
| SMCJxxxXX   | DO-214AB          | 3000     | Tape & Reel - 16mm tape/13" reel | EIA STD RS-481          |

### Tape and Reel Specification

