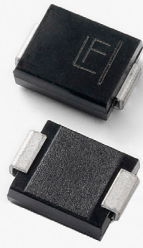


## 5.0SMDJ Series



Uni-directional



Bi-directional



### Agency Approvals

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

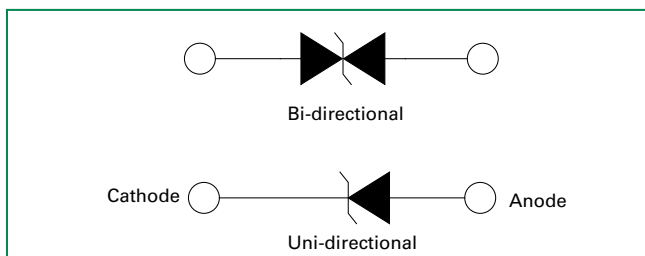
### Maximum Ratings and Thermal Characteristics ( $T_A=25^\circ\text{C}$ unless otherwise noted)

| Parameter                                                                                                          | Symbol         | Value      | Unit               |
|--------------------------------------------------------------------------------------------------------------------|----------------|------------|--------------------|
| Peak Pulse Power Dissipation at $T_A=25^\circ\text{C}$ by 10/1000 $\mu\text{s}$ Waveform (Fig.2)(Note 1), (Note 2) | $P_{PPM}$      | 5000       | W                  |
| Power Dissipation on Infinite Heat Sink at $T_A=50^\circ\text{C}$                                                  | $P_{MAV}$      | 6.5        | W                  |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)                                                   | $I_{FSM}$      | 300        | A                  |
| Maximum Instantaneous Forward Voltage at 100A for Unidirectional Only                                              | $V_F$          | 5.0        | V                  |
| Operating Junction and Storage Temperature Range                                                                   | $T_J, T_{STG}$ | -55 to 150 | $^\circ\text{C}$   |
| Typical Thermal Resistance Junction to Lead                                                                        | $R_{uJL}$      | 15         | $^\circ\text{C/W}$ |
| Typical Thermal Resistance Junction to Ambient                                                                     | $R_{uJA}$      | 75         | $^\circ\text{C/W}$ |

#### Notes:

1. Non-repetitive current pulse, per Fig. 4 and derated above  $T_A = 25^\circ\text{C}$  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.

### Functional Diagram



### Description

The 5.0SMDJ 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 to optimize board space
- Low profile package
- 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)
- Built-in strain relief
- $V_{BR} @ T_J = V_{BR} @ 25^\circ\text{C} \times (1 + \alpha T \times (T_J - 25))$  ( $\alpha T$ : Temperature Coefficient)
- Glass passivated chip junction
- 5000W peak pulse power capability at 10/1000 $\mu\text{s}$  waveform, repetition rate (duty cycles):0.01 %
- Fast response time: typically less than 1.0ps from 0V to BV min
- Excellent clamping capability
- Low incremental surge resistance
- Typical  $I_R$  less than 5 $\mu\text{A}$  above 22V
- High temperature soldering guaranteed: 260 $^\circ\text{C}$ /40 seconds at terminals
- Plastic package has underwriters laboratory flammability 94V-0
- Meet MSL level1, per J-STD-020, LF maximum peak of 260 $^\circ\text{C}$
- Matte tin lead-free plated
- Halogen free and RoHS compliant

### 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.

### Additional Information



Datasheet



Resources



Samples

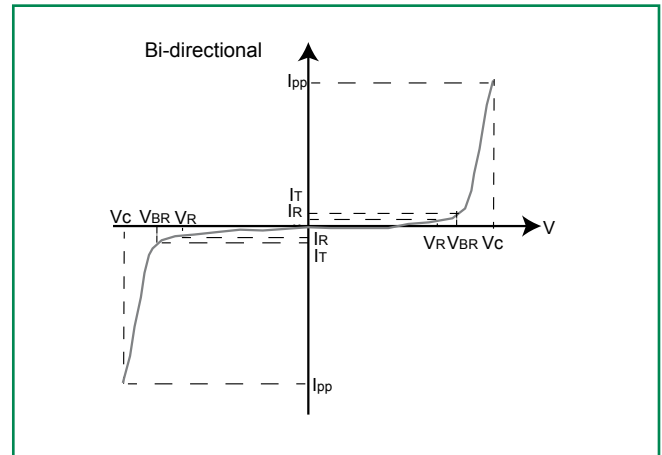
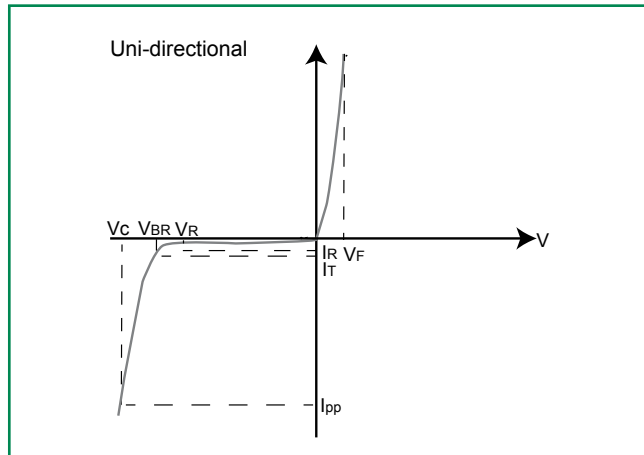
### Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

| 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    |                                  |                                                               |                                                |                                                              |                                                                                                     |
| 5.0SMDJ12A        | 5.0SMDJ12CA      | 5PEP    | 5BEP | 12.0                                             | 13.30                                                      | 14.70  | 10                               | 19.9                                                          | 252.00                                         | 800                                                          | X                                                                                                   |
| 5.0SMDJ13A        | 5.0SMDJ13CA      | 5PEQ    | 5BEQ | 13.0                                             | 14.40                                                      | 15.90  | 10                               | 21.5                                                          | 233.00                                         | 500                                                          | X                                                                                                   |
| 5.0SMDJ14A        | 5.0SMDJ14CA      | 5PER    | 5BER | 14.0                                             | 15.60                                                      | 17.20  | 10                               | 23.2                                                          | 216.00                                         | 200                                                          | X                                                                                                   |
| 5.0SMDJ15A        | 5.0SMDJ15CA      | 5PES    | 5BES | 15.0                                             | 16.70                                                      | 18.50  | 1                                | 24.4                                                          | 205.00                                         | 100                                                          | X                                                                                                   |
| 5.0SMDJ16A        | 5.0SMDJ16CA      | 5PET    | 5BET | 16.0                                             | 17.80                                                      | 19.70  | 1                                | 26.0                                                          | 193.00                                         | 50                                                           | X                                                                                                   |
| 5.0SMDJ17A        | 5.0SMDJ17CA      | 5PEU    | 5BEU | 17.0                                             | 18.90                                                      | 20.90  | 1                                | 27.6                                                          | 181.00                                         | 20                                                           | X                                                                                                   |
| 5.0SMDJ18A        | 5.0SMDJ18CA      | 5PEV    | 5BEV | 18.0                                             | 20.00                                                      | 22.10  | 1                                | 29.2                                                          | 172.00                                         | 10                                                           | X                                                                                                   |
| 5.0SMDJ20A        | 5.0SMDJ20CA      | 5PEW    | 5BEW | 20.0                                             | 22.20                                                      | 24.50  | 1                                | 32.4                                                          | 155.00                                         | 5                                                            | X                                                                                                   |
| 5.0SMDJ22A        | 5.0SMDJ22CA      | 5PEX    | 5BEX | 22.0                                             | 24.40                                                      | 26.90  | 1                                | 35.5                                                          | 141.00                                         | 5                                                            | X                                                                                                   |
| 5.0SMDJ24A        | 5.0SMDJ24CA      | 5PEZ    | 5BEZ | 24.0                                             | 26.70                                                      | 29.50  | 1                                | 38.9                                                          | 129.00                                         | 5                                                            | X                                                                                                   |
| 5.0SMDJ26A        | 5.0SMDJ26CA      | 5PFE    | 5BFE | 26.0                                             | 28.90                                                      | 31.90  | 1                                | 42.1                                                          | 119.00                                         | 5                                                            | X                                                                                                   |
| 5.0SMDJ28A        | 5.0SMDJ28CA      | 5PFG    | 5BFG | 28.0                                             | 31.10                                                      | 34.40  | 1                                | 45.4                                                          | 110.00                                         | 5                                                            | X                                                                                                   |
| 5.0SMDJ30A        | 5.0SMDJ30CA      | 5PFK    | 5BFK | 30.0                                             | 33.30                                                      | 36.80  | 1                                | 48.4                                                          | 103.00                                         | 5                                                            | X                                                                                                   |
| 5.0SMDJ33A        | 5.0SMDJ33CA      | 5PFM    | 5BFM | 33.0                                             | 36.70                                                      | 40.60  | 1                                | 53.3                                                          | 93.90                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ36A        | 5.0SMDJ36CA      | 5PFP    | 5BFP | 36.0                                             | 40.00                                                      | 44.20  | 1                                | 58.1                                                          | 86.10                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ40A        | 5.0SMDJ40CA      | 5PFR    | 5BFR | 40.0                                             | 44.40                                                      | 49.10  | 1                                | 64.5                                                          | 77.60                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ43A        | 5.0SMDJ43CA      | 5PFT    | 5BFT | 43.0                                             | 47.80                                                      | 52.80  | 1                                | 69.4                                                          | 72.10                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ45A        | 5.0SMDJ45CA      | 5PFV    | 5BFV | 45.0                                             | 50.00                                                      | 55.30  | 1                                | 72.7                                                          | 68.80                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ48A        | 5.0SMDJ48CA      | 5PFX    | 5BFX | 48.0                                             | 53.30                                                      | 58.90  | 1                                | 77.4                                                          | 64.70                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ51A        | 5.0SMDJ51CA      | 5PFZ    | 5BFZ | 51.0                                             | 56.70                                                      | 62.70  | 1                                | 82.4                                                          | 60.70                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ54A        | 5.0SMDJ54CA      | 5PGE    | 5BGE | 54.0                                             | 60.00                                                      | 66.30  | 1                                | 87.1                                                          | 57.50                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ58A        | 5.0SMDJ58CA      | 5PGG    | 5BGG | 58.0                                             | 64.40                                                      | 71.20  | 1                                | 93.6                                                          | 53.50                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ60A        | 5.0SMDJ60CA      | 5PGK    | 5BGK | 60.0                                             | 66.70                                                      | 73.70  | 1                                | 96.8                                                          | 51.70                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ64A        | 5.0SMDJ64CA      | 5PGM    | 5BGM | 64.0                                             | 71.10                                                      | 78.60  | 1                                | 103.0                                                         | 48.60                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ70A        | 5.0SMDJ70CA      | 5PGP    | 5BGB | 70.0                                             | 77.80                                                      | 86.00  | 1                                | 113.0                                                         | 44.30                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ75A        | 5.0SMDJ75CA      | 5PGR    | 5BGR | 75.0                                             | 83.30                                                      | 92.10  | 1                                | 121.0                                                         | 41.40                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ78A        | 5.0SMDJ78CA      | 5PGT    | 5BGT | 78.0                                             | 86.70                                                      | 95.80  | 1                                | 126.0                                                         | 39.70                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ85A        | 5.0SMDJ85CA      | 5PGV    | 5BGV | 85.0                                             | 94.40                                                      | 104.00 | 1                                | 137.0                                                         | 36.50                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ90A        | 5.0SMDJ90CA      | 5PGX    | 5BGX | 90.0                                             | 100.00                                                     | 111.00 | 1                                | 146.0                                                         | 34.30                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ100A       | 5.0SMDJ100CA     | 5PGZ    | 5BGZ | 100.0                                            | 111.00                                                     | 123.00 | 1                                | 162.0                                                         | 30.90                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ110A       | 5.0SMDJ110CA     | 5PHE    | 5BHE | 110.0                                            | 122.00                                                     | 135.00 | 1                                | 177.0                                                         | 28.30                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ120A       | 5.0SMDJ120CA     | 5PHG    | 5BHG | 120.0                                            | 133.00                                                     | 147.00 | 1                                | 193.0                                                         | 26.00                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ130A       | 5.0SMDJ130CA     | 5PHK    | 5BHK | 130.0                                            | 144.00                                                     | 159.00 | 1                                | 209.0                                                         | 24.00                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ150A       | 5.0SMDJ150CA     | 5PHM    | 5BHM | 150.0                                            | 167.00                                                     | 185.00 | 1                                | 243.0                                                         | 20.60                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ160A       | 5.0SMDJ160CA     | 5PHP    | 5BHB | 160.0                                            | 178.00                                                     | 197.00 | 1                                | 259.0                                                         | 19.30                                          | 5                                                            | X                                                                                                   |
| 5.0SMDJ170A       | 5.0SMDJ170CA     | 5PHR    | 5BHR | 170.0                                            | 189.00                                                     | 209.00 | 1                                | 275.0                                                         | 18.20                                          | 5                                                            | X                                                                                                   |

For Bidirectional type having V<sub>R</sub> of 20 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 A parts.

## I-V Curve Characteristics



**P<sub>PPM</sub>** Peak Pulse Power Dissipation – Max power dissipation

**V<sub>R</sub>** Stand-off Voltage – Maximum voltage that can be applied to the TVS without operation

**V<sub>BR</sub>** Breakdown Voltage – Maximum voltage that flows through the TVS at a specified test current (I<sub>T</sub>)

**V<sub>C</sub>** Clamping Voltage – Peak voltage measured across the suppressor at a specified I<sub>PPM</sub> (peak impulse current)

**I<sub>R</sub>** Reverse Leakage Current – Current measured at V<sub>R</sub>

**V<sub>F</sub>** Forward Voltage Drop for Uni-directional

## Ratings and Characteristic Curves (T<sub>A</sub>=25°C unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform

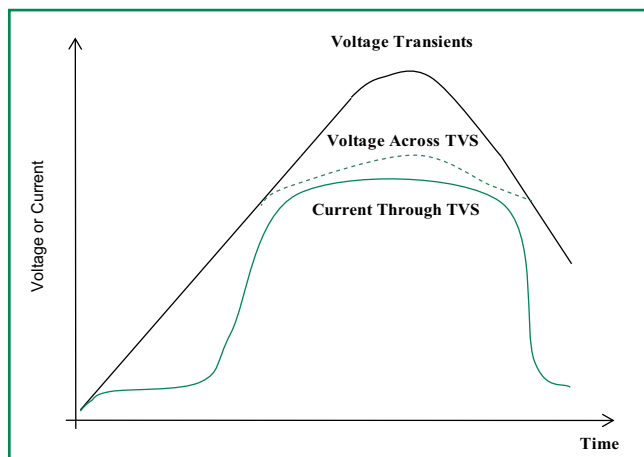
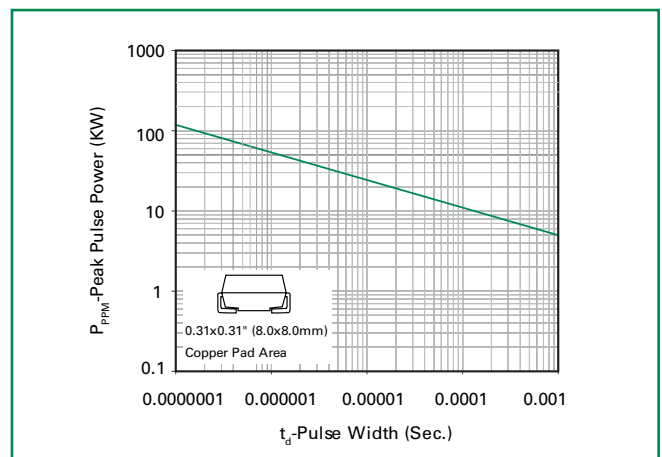


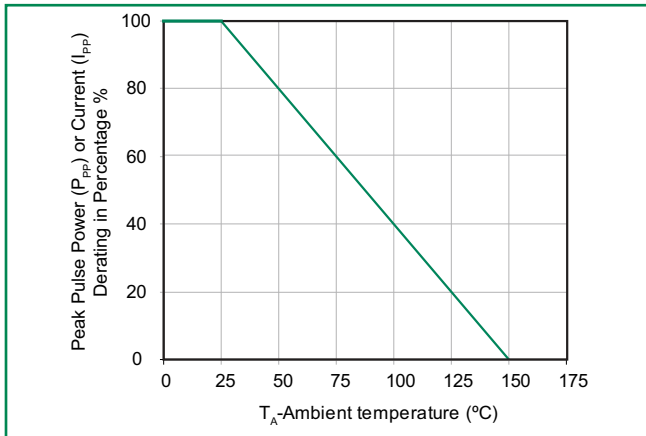
Figure 2 - Peak Pulse Power Rating



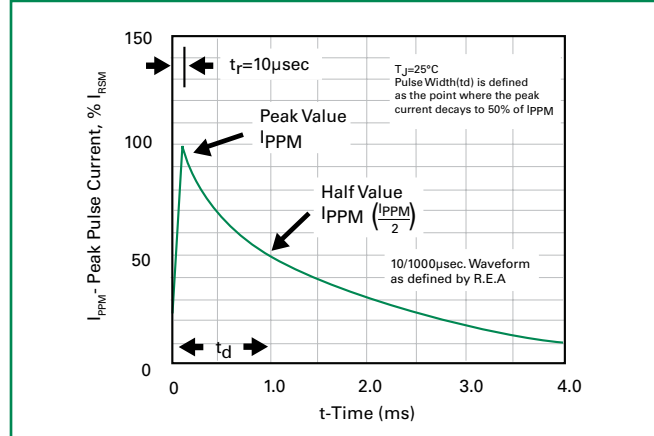
continues on next page.

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

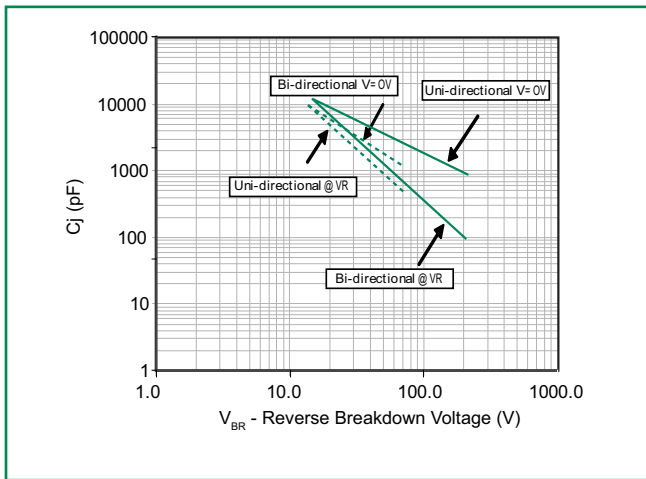
**Figure 3 - Peak Pulse Power or Current Derating Curve vs Initial Junction Temperature**



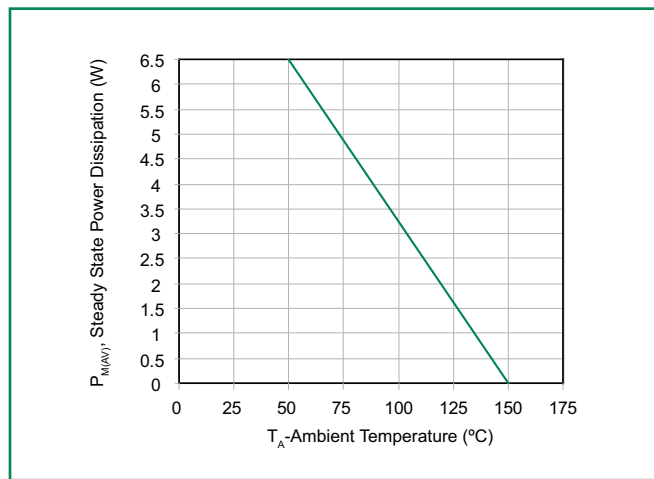
**Figure 4 - Pulse Waveform**



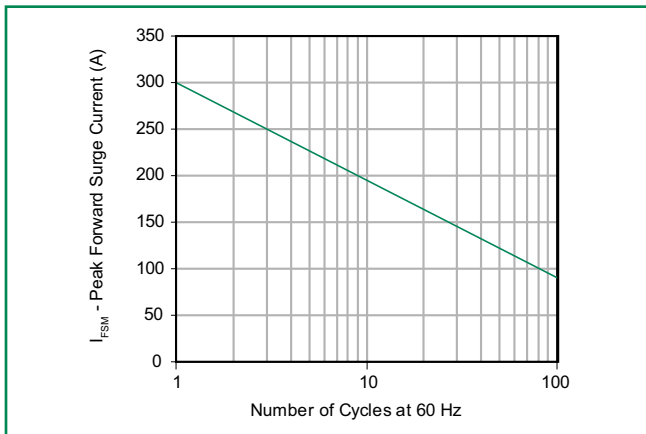
**Figure 5 - Typical Junction Capacitance**



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

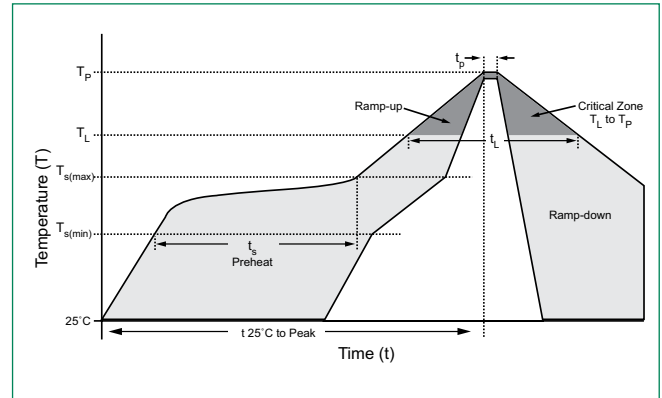


**Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only**



### 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 <sup>+0/-5</sup> °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                   |



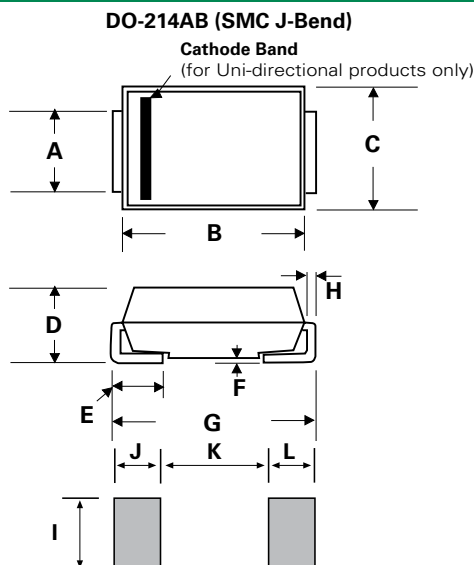
### Physical Specifications

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

### Environmental Specifications

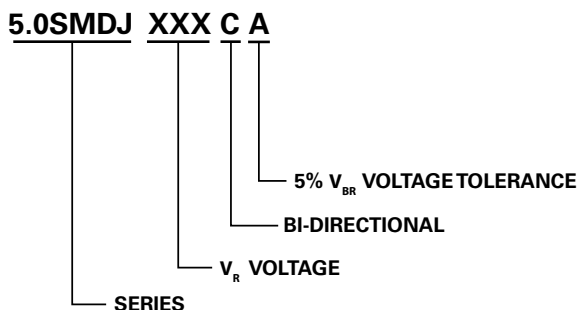
|                     |                          |
|---------------------|--------------------------|
| High Temp. Storage  | JESD22-A103              |
| HTRB                | JESD22-A108              |
| Temperature Cycling | JESD22-A104              |
| MSL                 | JEDEC-J-STD-020, Level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

### Dimensions

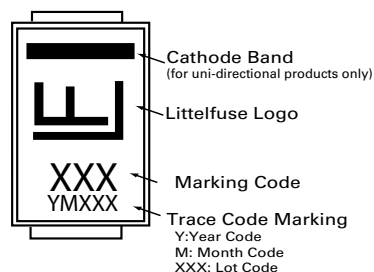


| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| A          | 0.114  | 0.126 | 2.900       | 3.200 |
| B          | 0.260  | 0.280 | 6.600       | 7.110 |
| C          | 0.220  | 0.245 | 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 Options

| Part number     | Component Package | Quantity | Packaging Option            | Packaging Specification |
|-----------------|-------------------|----------|-----------------------------|-------------------------|
| 5.0SMDJxxxXX    | DO-214AB          | 3000     | Tape & Reel – 16mm/13" tape | EIA STD RS-481          |
| 5.0SMDJxxxXX-T7 | DO-214AB          | 500      | Tape & Reel – 16mm/7" tape  | EIA STD RS-481          |

### Tape and Reel Specification

