

### SMBJ Series



#### Agency Approvals

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

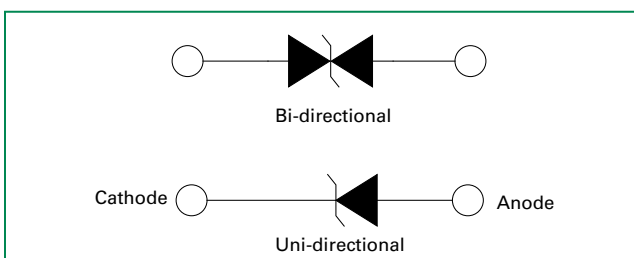
#### Maximum Ratings and Thermal Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

| 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), (Note 5) | P <sub>PPM</sub> | 600        | W    |
| Power Dissipation on Infinite Heat Sink at T <sub>L</sub> =50°C  | P <sub>D</sub>   | 5.0        | W    |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)   | I <sub>FSM</sub> | 100        | A    |
| Maximum Instantaneous Forward Voltage at 50A for Unidirectional Only (Note 4)                                  | V <sub>F</sub>   | 3.5/5.0    | V    |
| Operating Temperature Range  | T <sub>J</sub>   | -65 to 150 | °C   |
| Storage Temperature Range  | T <sub>STG</sub> | -65 to 175 | °C   |
| Typical Thermal Resistance Junction to Lead  | R <sub>θJL</sub> | 20         | °C/W |
| Typical Thermal Resistance Junction to Ambient   | R <sub>θJA</sub> | 100        | °C/W |

#### Notes:

1. Non-repetitive current pulse, per Fig. 4 and derated above T<sub>J</sub> (initial) =25°C per Fig. 3.
2. Mounted on copper pad area of 0.2x0.2" (5.0 x 5.0mm) 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 single die parts and V<sub>F</sub> < 5.0V for stacked-die parts.
5. The P<sub>PPM</sub> of stacked-die parts is 800W; please contact Littelfuse for details on the stacked-die components.

#### Functional Diagram



#### Description

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

#### Features

- 600W peak pulse power capability at 10/1000µs waveform, repetition rate (duty cycles):0.01%
- Excellent clamping capability
- Low incremental surge resistance
- Typical I<sub>R</sub> less than 1µA when V<sub>BR</sub> min>12V
- For surface mounted applications to optimize board space
- Low profile package
- Typical failure mode is a short circuit condition for current events exceeding component rating
- Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- IEC-61000-4-2 ESD 30kV(Air), 30kV (Contact)
- EFT protection of data lines in accordance with IEC 61000-4-4
- Built-in strain relief
- Fast response time: typically less than 1.0ps from 0V to BV min
- High temperature to reflow soldering guaranteed: 260°C/40sec
- V<sub>BR</sub> @ T<sub>J</sub> = V<sub>BR</sub> @ 25°C x (1 + α T x (T<sub>J</sub> - 25)) (α T: Temperature Coefficient, typical value is 0.1%)
- Plastic package is flammability rated V-0 per UL-94
- Meet MSL level1, per J-STD-020, lead-frame maximum peak of 260°C
- Matte tin lead-free plated
- Halogen free and RoHS compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (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.

#### Additional Information



Datasheet




Resources



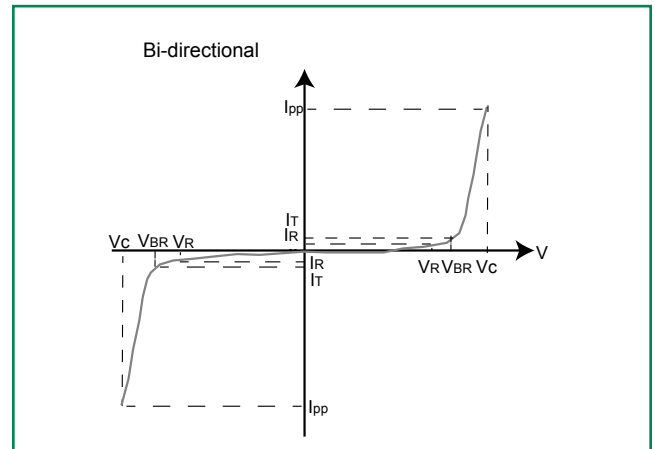
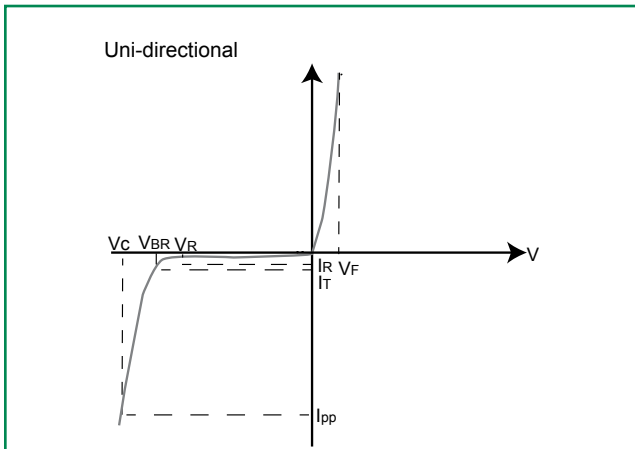
Samples

### 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> /1000 (V) | Maximum Peak Pulse Current I <sub>PP</sub> (A) at 10/1000 | Maximum Reverse Leakage I <sub>R</sub> @ V <sub>R</sub> (µA) | Maximum Temperature coefficient of V <sub>BR</sub> (%/C) | Agency Recognition  |
|-------------------|------------------|---------|----|--|--|--------|----------------------------------|---|---|--|--|--|
|                   |                  | UNI     | BI |  | MIN  | MAX    |                                  |   |   |  |  |  |
| SMBJ5.0A          | SMBJ5.0CA        | KE      | AE | 5.0  | 6.40   | 7.00   | 10                               | 9.2   | 65.3  | 800  | 0.041  | X  |
| SMBJ6.0A          | SMBJ6.0CA        | KG      | AG | 6.0  | 6.67   | 7.37   | 10                               | 10.3  | 58.3  | 800  | 0.046  | X  |
| SMBJ6.5A          | SMBJ6.5CA        | KK      | AK | 6.5  | 7.22   | 7.98   | 10                               | 11.2  | 53.6  | 500  | 0.052  | X  |
| SMBJ7.0A          | SMBJ7.0CA        | KM      | AM | 7.0  | 7.78   | 8.60   | 10                               | 12.0  | 50.0  | 200  | 0.058  | X  |
| SMBJ7.5A          | SMBJ7.5CA        | KP      | AP | 7.5  | 8.33   | 9.21   | 1                                | 12.9  | 46.6  | 100  | 0.061  | X  |
| SMBJ8.0A          | SMBJ8.0CA        | KR      | AR | 8.0  | 8.89   | 9.83   | 1                                | 13.6  | 44.2  | 50   | 0.064  | X  |
| SMBJ8.5A          | SMBJ8.5CA        | KT      | AT | 8.5  | 9.44   | 10.40  | 1                                | 14.4  | 41.7  | 20   | 0.066  | X  |
| SMBJ9.0A          | SMBJ9.0CA        | KV      | AV | 9.0  | 10.00  | 11.10  | 1                                | 15.4  | 39.0  | 10   | 0.069  | X  |
| SMBJ10A           | SMBJ10CA         | KX      | AX | 10.0   | 11.10  | 12.30  | 1                                | 17.0  | 35.3  | 5  | 0.071  | X  |
| SMBJ11A           | SMBJ11CA         | KZ      | AZ | 11.0   | 12.20  | 13.50  | 1                                | 18.2  | 33.0  | 1  | 0.074  | X  |
| SMBJ12A           | SMBJ12CA         | LE      | BE | 12.0   | 13.30  | 14.70  | 1                                | 19.9  | 30.2  | 1  | 0.075  | X  |
| SMBJ13A           | SMBJ13CA         | LG      | BG | 13.0   | 14.40  | 15.90  | 1                                | 21.5  | 28.0  | 1  | 0.076  | X  |
| SMBJ14A           | SMBJ14CA         | LK      | BK | 14.0   | 15.60  | 17.20  | 1                                | 23.2  | 25.9  | 1  | 0.08   | X  |
| SMBJ15A           | SMBJ15CA         | LM      | BM | 15.0   | 16.70  | 18.50  | 1                                | 24.4  | 24.6  | 1  | 0.083  | X  |
| SMBJ16A           | SMBJ16CA         | LP      | BP | 16.0   | 17.80  | 19.70  | 1                                | 26.0  | 23.1  | 1  | 0.084  | X  |
| SMBJ17A           | SMBJ17CA         | LR      | BR | 17.0   | 18.90  | 20.90  | 1                                | 27.6  | 21.8  | 1  | 0.085  | X  |
| SMBJ18A           | SMBJ18CA         | LT      | BT | 18.0   | 20.00  | 22.10  | 1                                | 29.2  | 20.6  | 1  | 0.088  | X  |
| SMBJ20A           | SMBJ20CA         | LV      | BV | 20.0   | 22.20  | 24.50  | 1                                | 32.4  | 18.6  | 1  | 0.091  | X  |
| SMBJ22A           | SMBJ22CA         | LX      | BX | 22.0   | 24.40  | 26.90  | 1                                | 35.5  | 16.9  | 1  | 0.092  | X  |
| SMBJ24A           | SMBJ24CA         | LZ      | BZ | 24.0   | 26.70  | 29.50  | 1                                | 38.9  | 15.5  | 1  | 0.092  | X  |
| SMBJ26A           | SMBJ26CA         | ME      | CE | 26.0   | 28.90  | 31.90  | 1                                | 42.1  | 14.3  | 1  | 0.093  | X  |
| SMBJ28A           | SMBJ28CA         | MG      | CG | 28.0   | 31.10  | 34.40  | 1                                | 45.4  | 13.3  | 1  | 0.094  | X  |
| SMBJ30A           | SMBJ30CA         | MK      | CK | 30.0   | 33.30  | 36.80  | 1                                | 48.4  | 12.4  | 1  | 0.096  | X  |
| SMBJ33A           | SMBJ33CA         | MM      | CM | 33.0   | 36.70  | 40.60  | 1                                | 53.3  | 11.3  | 1  | 0.097  | X  |
| SMBJ36A           | SMBJ36CA         | MP      | CP | 36.0   | 40.00  | 44.20  | 1                                | 58.1  | 10.4  | 1  | 0.098  | X  |
| SMBJ40A           | SMBJ40CA         | MR      | CR | 40.0   | 44.40  | 49.10  | 1                                | 64.5  | 9.3   | 1  | 0.099  | X  |
| SMBJ43A           | SMBJ43CA         | MT      | CT | 43.0   | 47.80  | 52.80  | 1                                | 69.4  | 8.7   | 1  | 0.1  | X  |
| SMBJ45A           | SMBJ45CA         | MV      | CV | 45.0   | 50.00  | 55.30  | 1                                | 72.7  | 8.3   | 1  | 0.101  | X  |
| SMBJ48A           | SMBJ48CA         | MX      | CX | 48.0   | 53.30  | 58.90  | 1                                | 77.4  | 7.8   | 1  | 0.101  | X  |
| SMBJ51A           | SMBJ51CA         | MZ      | CZ | 51.0   | 56.70  | 62.70  | 1                                | 82.4  | 7.3   | 1  | 0.101  | X  |
| SMBJ54A           | SMBJ54CA         | NE      | DE | 54.0   | 60.00  | 66.30  | 1                                | 87.1  | 6.9   | 1  | 0.102  | X  |
| SMBJ58A           | SMBJ58CA         | NG      | DG | 58.0   | 64.40  | 71.20  | 1                                | 93.6  | 6.5   | 1  | 0.103  | X  |
| SMBJ60A           | SMBJ60CA         | NK      | DK | 60.0   | 66.70  | 73.70  | 1                                | 96.8  | 6.2   | 1  | 0.103  | X  |
| SMBJ64A           | SMBJ64CA         | NM      | DM | 64.0   | 71.10  | 78.60  | 1                                | 103.0   | 5.9   | 1  | 0.104  | X  |
| SMBJ70A           | SMBJ70CA         | NP      | DP | 70.0   | 77.80  | 86.00  | 1                                | 113.0   | 5.3   | 1  | 0.105  | X  |
| SMBJ75A           | SMBJ75CA         | NR      | DR | 75.0   | 83.30  | 92.10  | 1                                | 121.0   | 5.0   | 1  | 0.106  | X  |
| SMBJ78A           | SMBJ78CA         | NT      | DT | 78.0   | 86.70  | 95.80  | 1                                | 126.0   | 4.8   | 1  | 0.106  | X  |
| SMBJ85A           | SMBJ85CA         | NV      | DV | 85.0   | 94.40  | 104.00 | 1                                | 137.0   | 4.4   | 1  | 0.106  | X  |
| SMBJ90A           | SMBJ90CA         | NX      | DX | 90.0   | 100.00   | 111.00 | 1                                | 146.0   | 4.1   | 1  | 0.107  | X  |
| SMBJ100A          | SMBJ100CA        | NZ      | DZ | 100.0  | 111.00   | 123.00 | 1                                | 162.0   | 3.7   | 1  | 0.107  | X  |
| SMBJ110A          | SMBJ110CA        | PE      | EE | 110.0  | 122.00   | 135.00 | 1                                | 177.0   | 3.4   | 1  | 0.107  | X  |
| SMBJ120A          | SMBJ120CA        | PG      | EG | 120.0  | 133.00   | 147.00 | 1                                | 193.0   | 3.1   | 1  | 0.108  | X  |
| SMBJ130A          | SMBJ130CA        | PK      | EK | 130.0  | 144.00   | 159.00 | 1                                | 209.0   | 2.9   | 1  | 0.108  | X  |
| SMBJ150A          | SMBJ150CA        | PM      | EM | 150.0  | 167.00   | 185.00 | 1                                | 243.0   | 2.5   | 1  | 0.108  | X  |
| SMBJ160A          | SMBJ160CA        | PP      | EP | 160.0  | 178.00   | 197.00 | 1                                | 259.0   | 2.3   | 1  | 0.108  | X  |
| SMBJ170A          | SMBJ170CA        | PR      | ER | 170.0  | 189.00   | 209.00 | 1                                | 275.0   | 2.2   | 1  | 0.108  | X  |
| SMBJ180A          | SMBJ180CA        | PT      | ET | 180.0  | 201.00   | 222.00 | 1                                | 292.0   | 2.1   | 1  | 0.108  | X  |
| SMBJ188A          | SMBJ188CA        | PB      | EB | 188.0  | 209.00   | 231.00 | 1                                | 304.0   | 2.0   | 1  | 0.11   | X  |
| SMBJ200A          | SMBJ200CA        | PV      | EV | 200.0  | 224.00   | 247.00 | 1                                | 324.0   | 1.9   | 1  | 0.11   | X  |
| SMBJ220A          | SMBJ220CA        | PX      | EX | 220.0  | 246.00   | 272.00 | 1                                | 356.0   | 1.7   | 1  | 0.11   | X  |
| SMBJ250A          | SMBJ250CA        | PZ      | EZ | 250.0  | 279.00   | 309.00 | 1                                | 405.0   | 1.5   | 1  | 0.11   | X  |
| SMBJ300A*         | SMBJ300CA*       | QE      | FE | 300.0  | 335.00   | 371.00 | 1                                | 486.0   | 1.3   | 1  | 0.112  |  |
| SMBJ350A*         | SMBJ350CA*       | QG      | FG | 350.0  | 391.00   | 432.00 | 1                                | 567.0   | 1.1   | 1  | 0.112  |  |
| SMBJ400A*         | SMBJ400CA*       | QK      | FK | 400.0  | 447.00   | 494.00 | 1                                | 648.0   | 0.9   | 1  | 0.112  |  |
| SMBJ440A*         | SMBJ440CA*       | QM      | FM | 440.0  | 492.00   | 543.00 | 1                                | 713.0   | 0.9   | 1  | 0.112  |  |

For bidirectional type having V<sub>R</sub> of 10 volts and less, the I<sub>R</sub> limit is double.  
 Components marked with "\*" use stacked-die, therefore they have a higher surge capability (typical 1.8\*I<sub>PP</sub>).

### 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 TVS 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

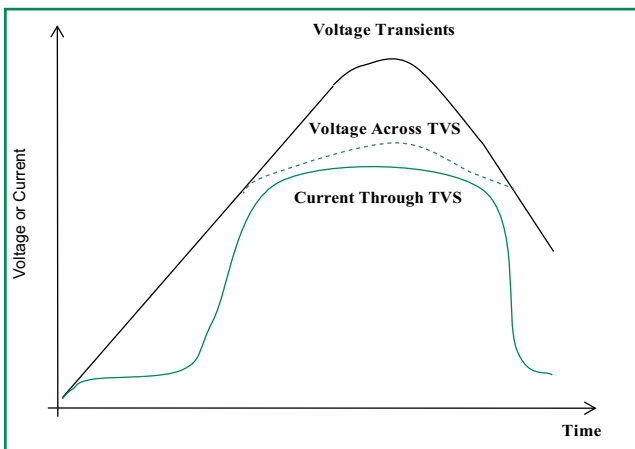
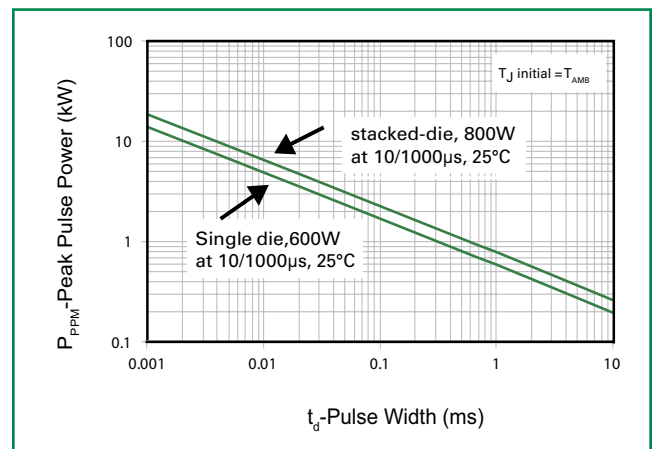


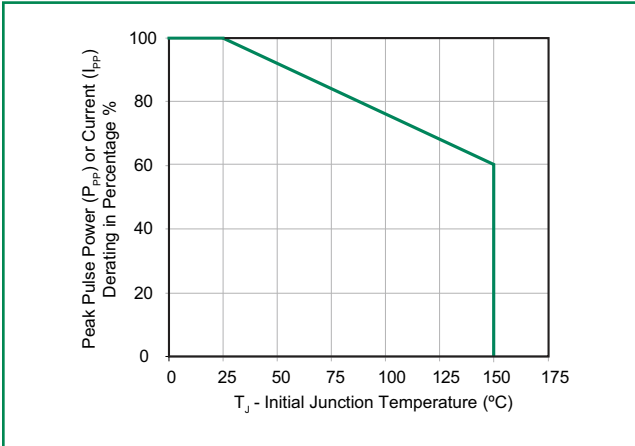
Figure 2 - Peak Pulse Power Rating



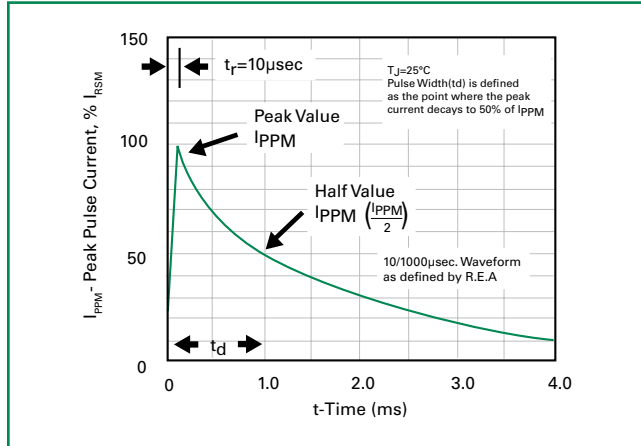
continues on next page.

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

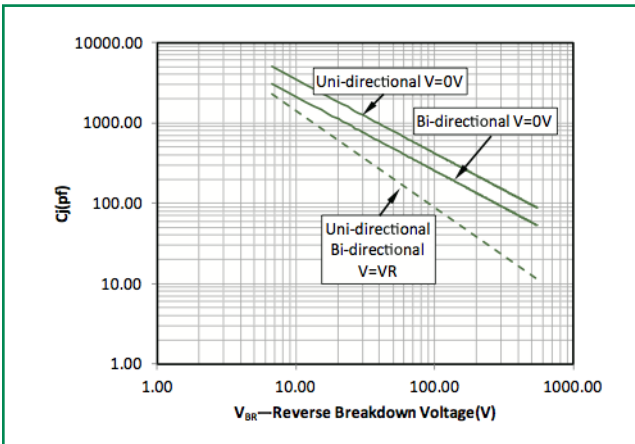
**Figure 3 - Peak Pulse Power Derating Curve**



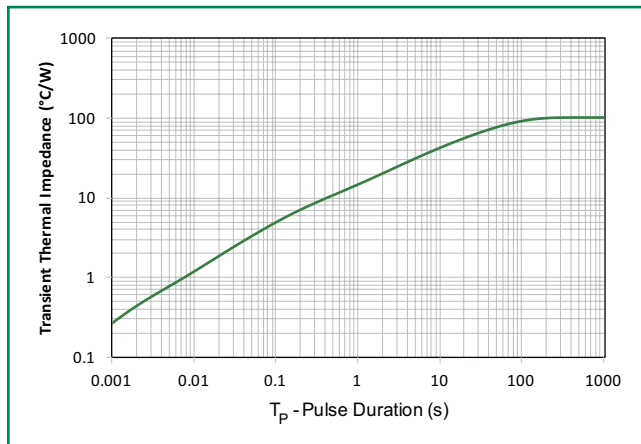
**Figure 4 - Pulse Waveform**



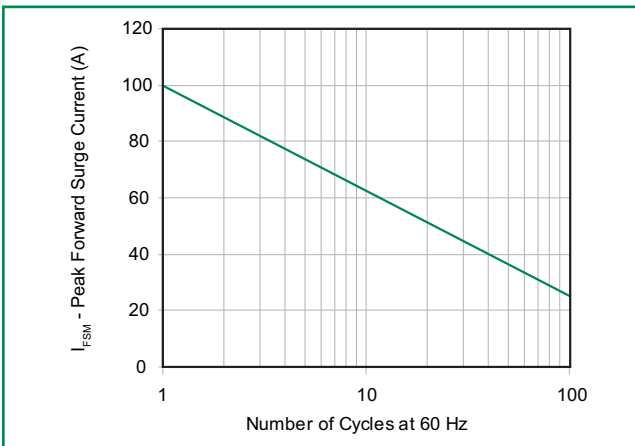
**Figure 5 - Typical Junction Capacitance**



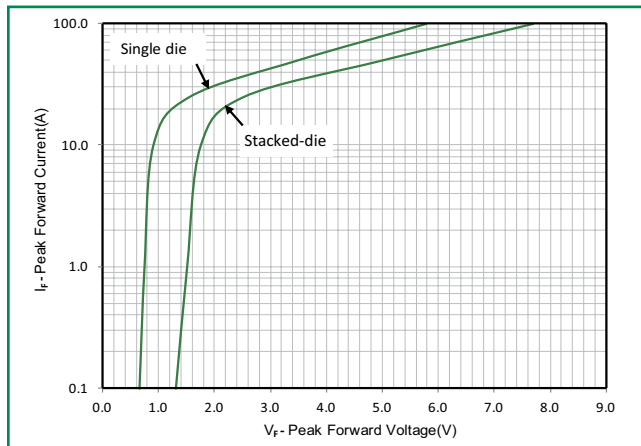
**Figure 6 - Typical Transient Thermal Impedance**



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

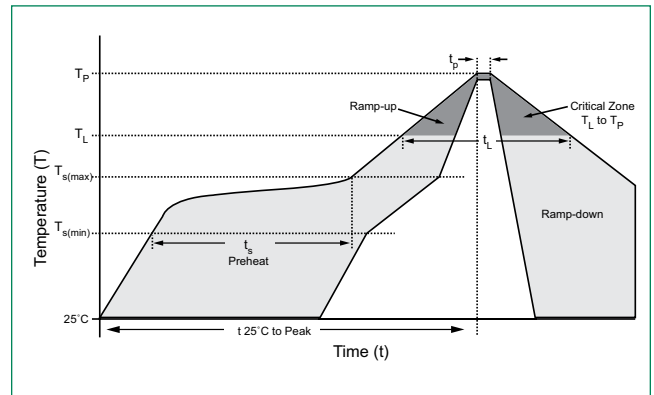


**Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)**



### 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 ( $T_A$ ) to peak) |                                    | 3°C/second max          |
| $T_{s(max)}$ to $T_A$ - Ramp-up Rate                   |                                    | 3°C/second max          |
| Reflow   | - Temperature ( $T_A$ ) (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  |                                    | 260°C                   |



### Physical Specifications

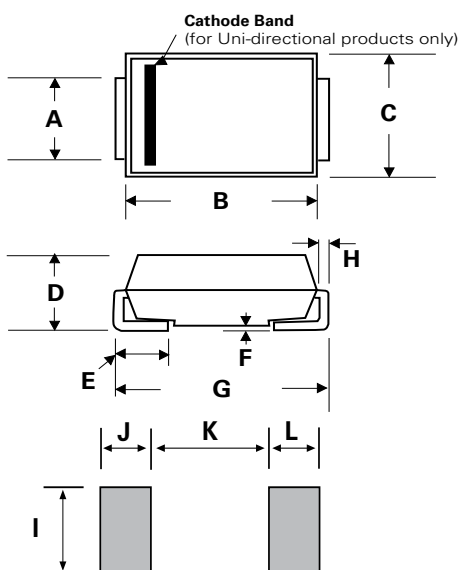
|                 |   |
|-----------------|---|
| <b>Weight</b>   | 0.003 ounce, 0.093 grams  |
| <b>Case</b>     | JEDEC DO214AA. Molded plastic body over glass passivated junction |
| <b>Polarity</b> | Color band denotes cathode except Bidirectional                   |
| <b>Terminal</b> | Matte Tin-plated 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-A111              |

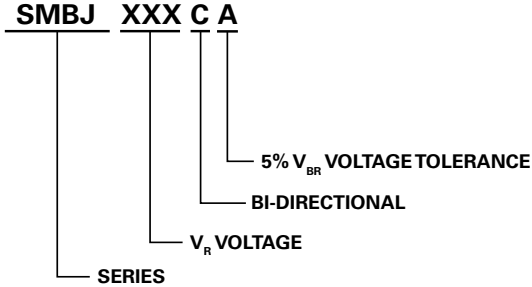
### Dimensions

#### DO-214AA (SMB J-Bend)

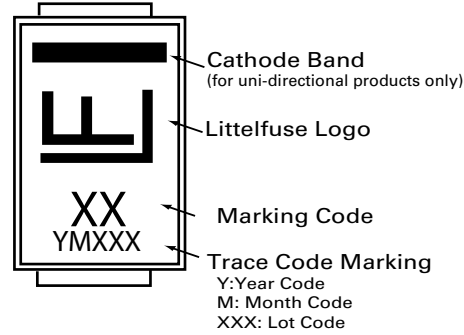


| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| A          | 0.076  | 0.086 | 1.930       | 2.200 |
| B          | 0.160  | 0.187 | 4.060       | 4.750 |
| C          | 0.130  | 0.155 | 3.300       | 3.940 |
| D          | 0.078  | 0.103 | 1.990       | 2.610 |
| E          | 0.030  | 0.060 | 0.760       | 1.520 |
| F          | -      | 0.008 | -           | 0.203 |
| G          | 0.205  | 0.220 | 5.210       | 5.590 |
| H          | 0.006  | 0.012 | 0.152       | 0.305 |
| I          | 0.089  | -     | 2.260       | -     |
| J          | 0.085  | -     | 2.160       | -     |
| K          | -      | 0.107 | -           | 2.740 |
| L          | 0.085  | -     | 2.160       | -     |

### Part Numbering System



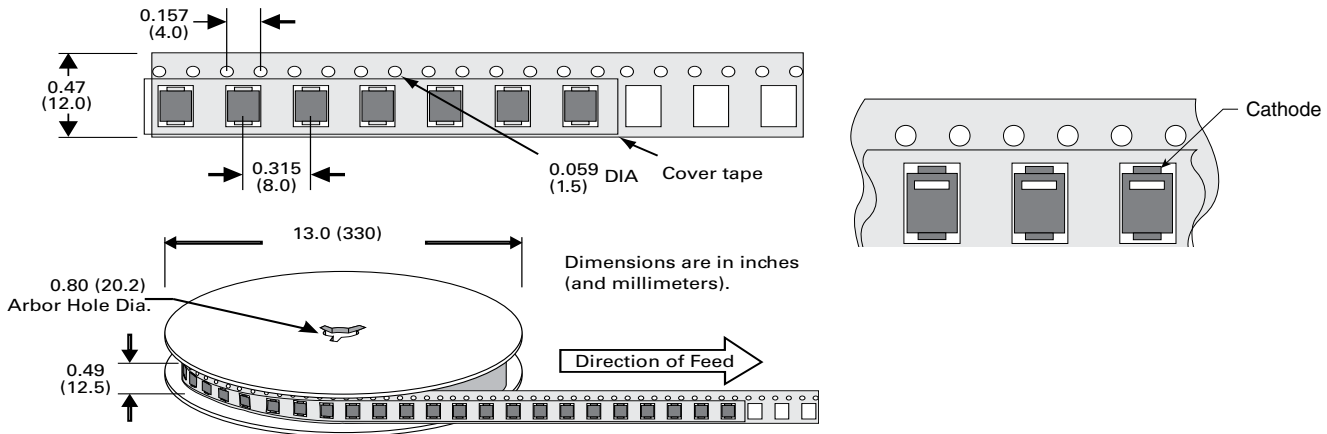
### Part Marking System



### Packaging

| Part number | Component Package | Quantity | Packaging Option                 | Packaging Specification |
|-------------|-------------------|----------|----------------------------------|-------------------------|
| SMBJxxxXX   | DO-214AA          | 3000     | Tape & Reel - 12mm tape/13" reel | EIA STD RS-481          |

### Tape and Reel Specification



**Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics).**