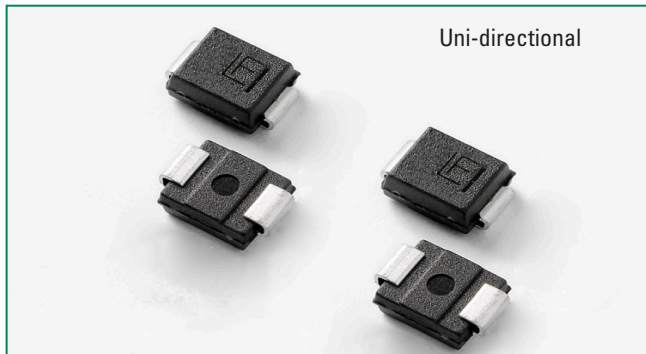


### SMBJ-E Series



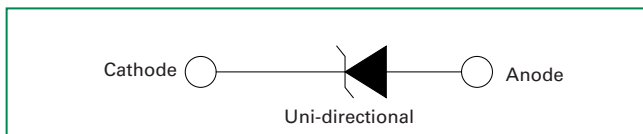
#### Maximum Ratings and Thermal Characteristics ( $T_A=25^\circ\text{C}$ unless otherwise noted)

| 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) | $P_{PPM}$       | 600        | W                  |
| Power Dissipation on Infinite Heat Sink at $T_L=50^\circ\text{C}$  | $P_D$           | 5.0        | W                  |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)   | $I_{FSM}$       | 100        | A                  |
| Maximum Instantaneous Forward Voltage at 50A for Unidirectional Only   | $V_F$           | 3.5        | V                  |
| Operating Temperature Range  | $T_J$           | -65 to 150 | $^\circ\text{C}$   |
| Storage Temperature Range  | $T_{STG}$       | -65 to 175 | $^\circ\text{C}$   |
| Typical Thermal Resistance Junction to Lead  | $R_{\theta JL}$ | 20         | $^\circ\text{C/W}$ |
| Typical Thermal Resistance Junction to Ambient   | $R_{\theta JA}$ | 100        | $^\circ\text{C/W}$ |

**Notes:**

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

#### Functional Diagram



#### Description

The SMBJ-E 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
- 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 30kV(Air), 30kV (Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2
- 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
- 600W peak pulse power capability at 10/1000 $\mu\text{s}$  waveform, repetition rate (duty cycles):0.01%
- High temperature to reflow soldering guaranteed: 260 $^\circ\text{C}$ /40sec
- $V_{BR} @ T_J = V_{BR} @ 25^\circ\text{C} \times (1 + \alpha T \times (T_J - 25))$  ( $\alpha$  T: Temperature Coefficient, typical value is 0.1%)
- EPI silicon technology
- Meet MSL level1, per J-STD-020C, LF maximum peak of 260 $^\circ\text{C}$
- 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

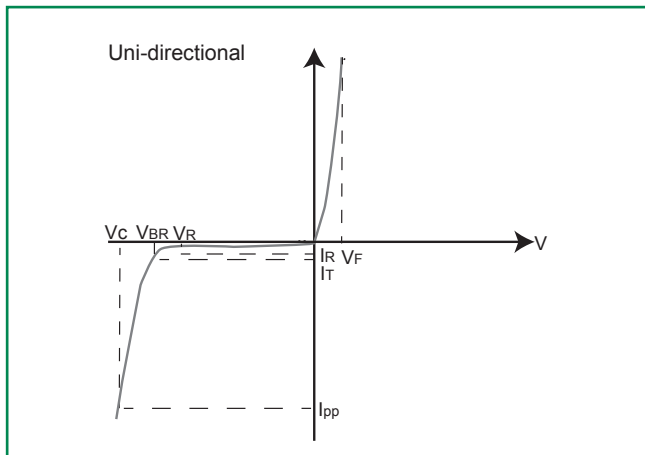
TVS devices are ideal for the protection of I/O Interfaces,  $V_{CC}$  bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

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

| Part Number (Uni) | Marking | Reverse Stand off Voltage $V_R$ (Volts) | Breakdown Voltage $V_{BR}$ (Volts) @ $I_T$ |        | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$ @ $I_{pp}$ (V) | Maximum Peak Pulse Current $I_{pp}$ (A) | Maximum Reverse Leakage $I_R$ @ $V_R$ ( $\mu\text{A}$ ) |
|-------------------|---------|---|--|--------|-------------------------|---|---|---|
|                   |         |   | MIN  | MAX    |                         |   |   |   |
| SMBJ300A-E        | YE      | 300                                     | 335.0                                      | 371.0  | 1                       | 486.0   | 1.30                                    | 1   |
| SMBJ350A-E        | YG      | 350                                     | 391.0                                      | 432.0  | 1                       | 567.0   | 1.10                                    | 1   |
| SMBJ400A-E*       | YK      | 400                                     | 447.0                                      | 494.0  | 1                       | 648.0   | 0.93                                    | 1   |
| SMBJ440A-E*       | YM      | 440                                     | 492.0                                      | 543.0  | 1                       | 713.0   | 0.85                                    | 1   |
| SMBJ500A-E*       | YN      | 500                                     | 558.0                                      | 618.0  | 1                       | 810.0   | 0.75                                    | 1   |
| SMBJ550A-E*       | YP      | 550                                     | 614.0                                      | 680.0  | 1                       | 891.0   | 0.67                                    | 1   |
| SMBJ600A-E*       | YR      | 600                                     | 670.0                                      | 741.0  | 1                       | 971.0   | 0.62                                    | 1   |
| SMBJ650A-E*       | YS      | 650                                     | 726.0                                      | 803.0  | 1                       | 1052.0  | 0.57                                    | 1   |
| SMBJ700A-E*       | YT      | 700                                     | 782.0                                      | 865.0  | 1                       | 1133.0  | 0.53                                    | 1   |
| SMBJ750A-E*       | YU      | 750                                     | 837.0                                      | 927.0  | 1                       | 1213.0  | 0.50                                    | 1   |
| SMBJ850A-E*       | YV      | 850                                     | 950.0                                      | 1050.0 | 1                       | 1365.0  | 0.44                                    | 1   |

Note: for parts with \* are still under development

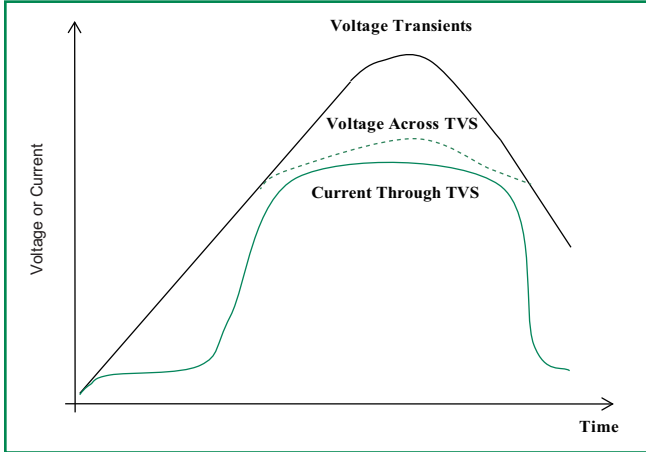
**I-V Curve Characteristics**



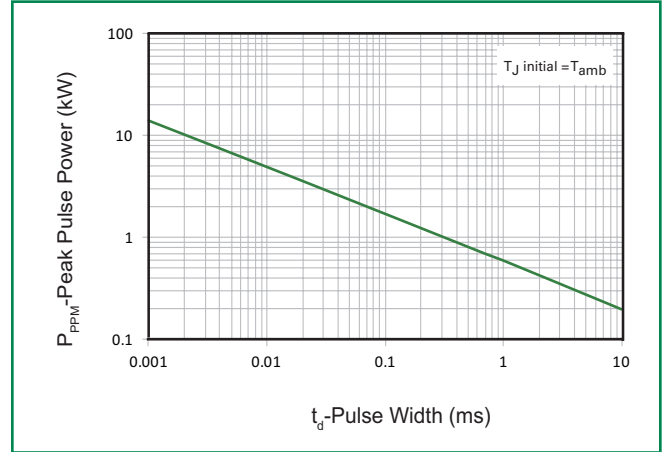
- $P_{ppm}$  Peak Pulse Power Dissipation** – Max power dissipation
- $V_R$  Stand-off Voltage** – Maximum voltage that can be applied to the TVS without operation
- $V_{BR}$  Breakdown Voltage** – Maximum voltage that flows through the TVS at a specified test current ( $I_T$ )
- $V_C$  Clamping Voltage** – Peak voltage measured across the TVS 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)

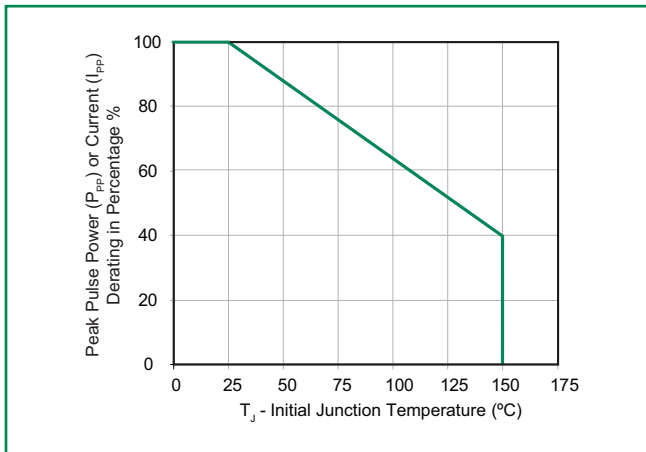
**Figure 1 - TVS Transients Clamping Waveform**



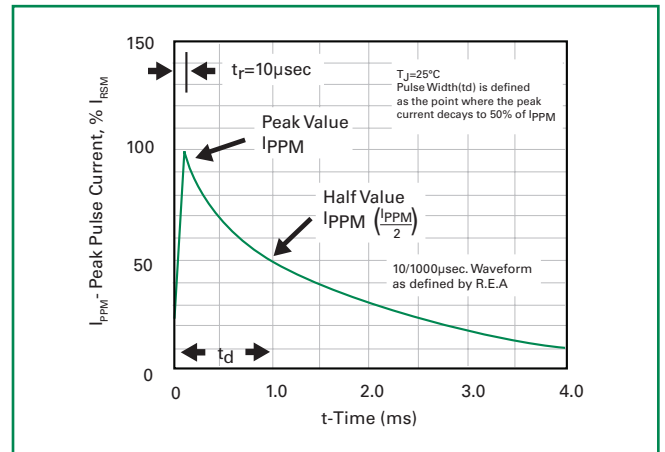
**Figure 2 - Peak Pulse Power Rating**



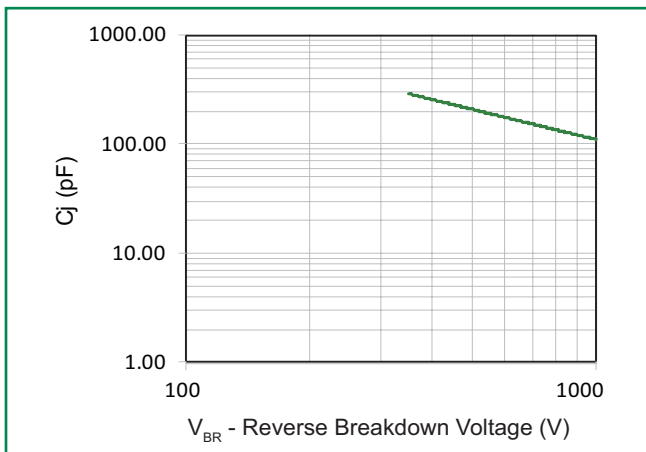
**Figure 3 - Peak Pulse Power Derating Curve**



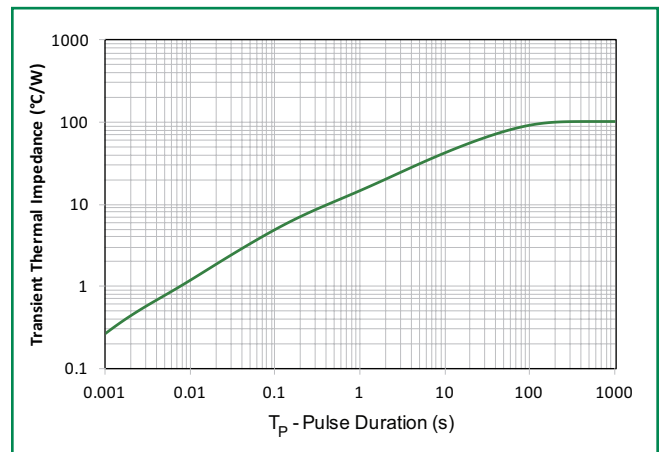
**Figure 4 - Pulse Waveform**



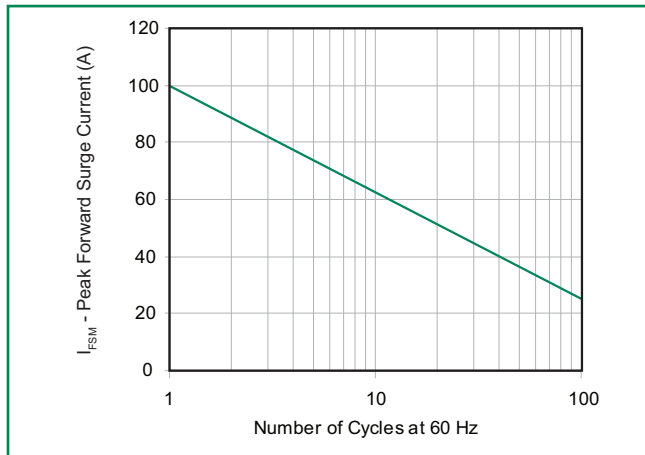
**Figure 5 - Typical Junction Capacitance**



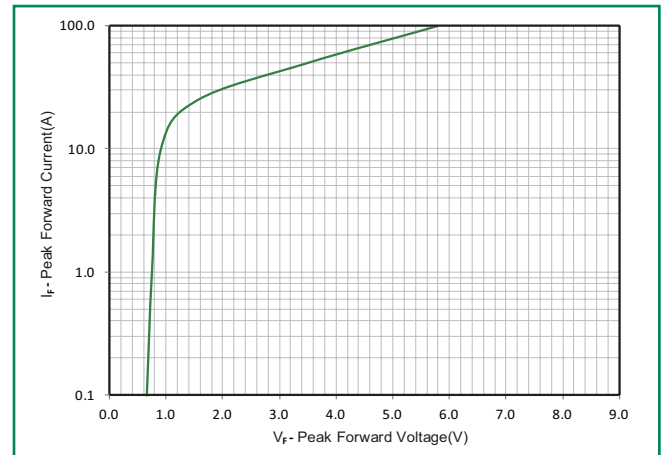
**Figure 6 - Typical Transient Thermal Impedance**



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

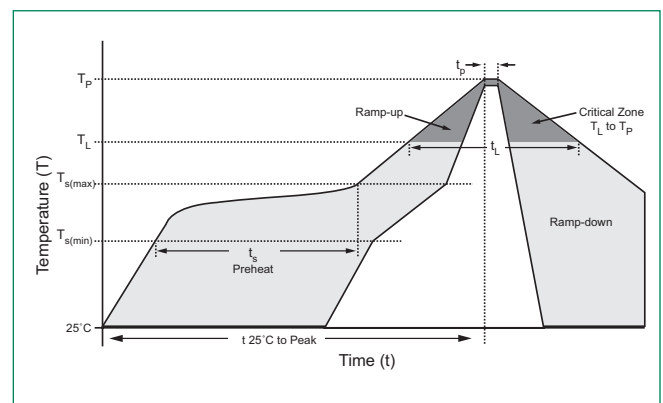


**Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)**



**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**

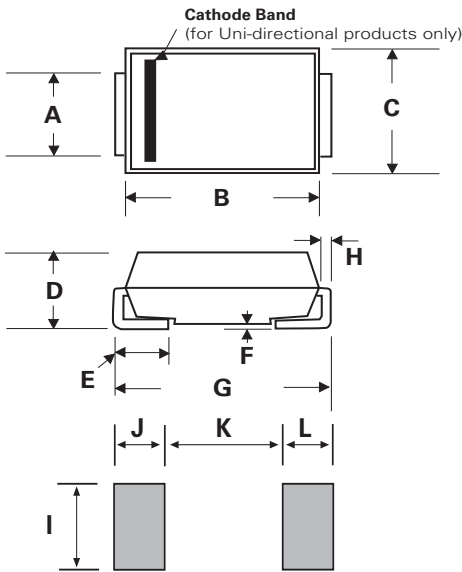
|                 |   |
|-----------------|---|
| <b>Weight</b>   | 0.003 ounce, 0.093 grams  |
| <b>Case</b>     | JEDEC DO214AA. Molded plastic body over glass passivated junction |
| <b>Polarity</b> | Color band denotes cathode except Bidirectional                   |
| <b>Terminal</b> | Matte Tin-plated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

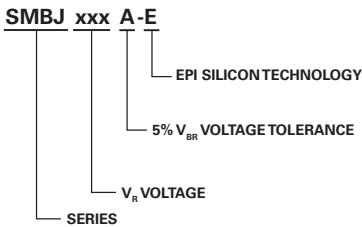
**Dimensions**

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

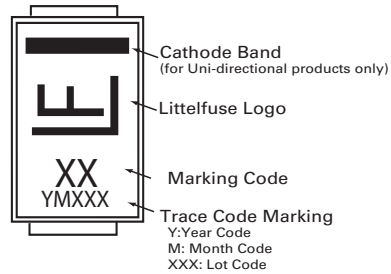


| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| A          | 0.076  | 0.086 | 1.930       | 2.200 |
| B          | 0.160  | 0.187 | 4.060       | 4.750 |
| C          | 0.130  | 0.155 | 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 |
|-------------|-------------------|----------|----------------------------------|-------------------------|
| SMBJxxx A-E | DO-214AA          | 3000     | Tape & Reel - 12mm tape/13" reel | EIA STD RS-481          |

**Tape and Reel Specification**

