

## TVS Diode – SMBJ Series

### Features

- Plastic package, excellent insulation strength.
- Glass passivated chip junction in SMB package.
- Excellent voltage clamping capability.
- Low Zener impedance.
- 600W peak pulse power capability on 10/1000 $\mu$ s waveform.
- Typical leakage current less than 1 $\mu$ A above 13V.
- Very fast response time, typically less than 1.0ps from 0 volt to  $V_{BR}$  minimum.
- High temperature soldering guaranteed: 265°C/10 sec.
- MSL: JEDEC-J-STD-020, Level 1

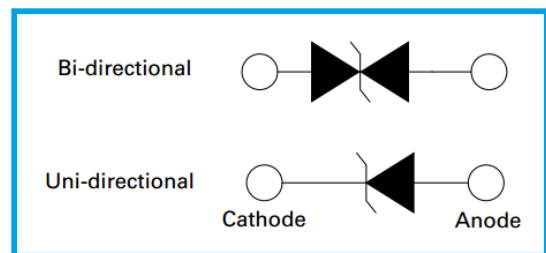


### Applications

- I/O interface,  $V_{CC}$  bus
- Telecom
- Industrial and consumer electronic applications.
- Relay and electromagnetic valve surge absorption.

### Agency Approval

- UL file no.: E474915



### Mechanical and Physical Data

- Case: JEDEC SMB molded plastic.
- Axial leaded, solderable per MIL-STD-750, Method 2026
- Polarity: Color band denoted cathode except bidirectional.

### Maximum Ratings and Thermal Characteristics

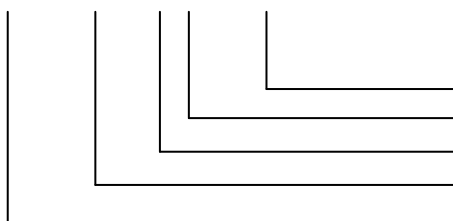
| Parameter  | Symbol         | Value     | Unit             |
|--|----------------|-----------|------------------|
| Peak Pulse Power Dissipation on 10/1000 $\mu$ s waveform (Note 1, Fig.1).                            | $P_{PPM}$      | Min 600   | Watt             |
| Peak Pulse Current of 10/1000 $\mu$ s waveform (Note 1, Fig.3).                                      | $I_{PPM}$      | See Table | Amp              |
| Steady State Power Dissipation at $T_L = 75^\circ\text{C}$ , Lead lengths 0.375", (9.5mm) (Fig.5).   | $P_{M(AV)}$    | 5.0       | Watt             |
| Peak Forward Surge Current, 8.3 ms Single Half Sine Wave Superimposed on Rated Load (Note 2, Fig.6). | $I_{FSM}$      | 100       | Amp              |
| Operating Junction and Storage Temperature Range.  | $T_J, T_{STG}$ | -55~150   | $^\circ\text{C}$ |

Note:

1. Non-repetitive current pulse, per Fig.3 and derated above  $T_A = 25^\circ\text{C}$  per Fig.2.
2. 8.3ms single half sine wave, or equivalent square wave, Duty cycle = 4 pulses per minutes maximum.

### Part Number Code

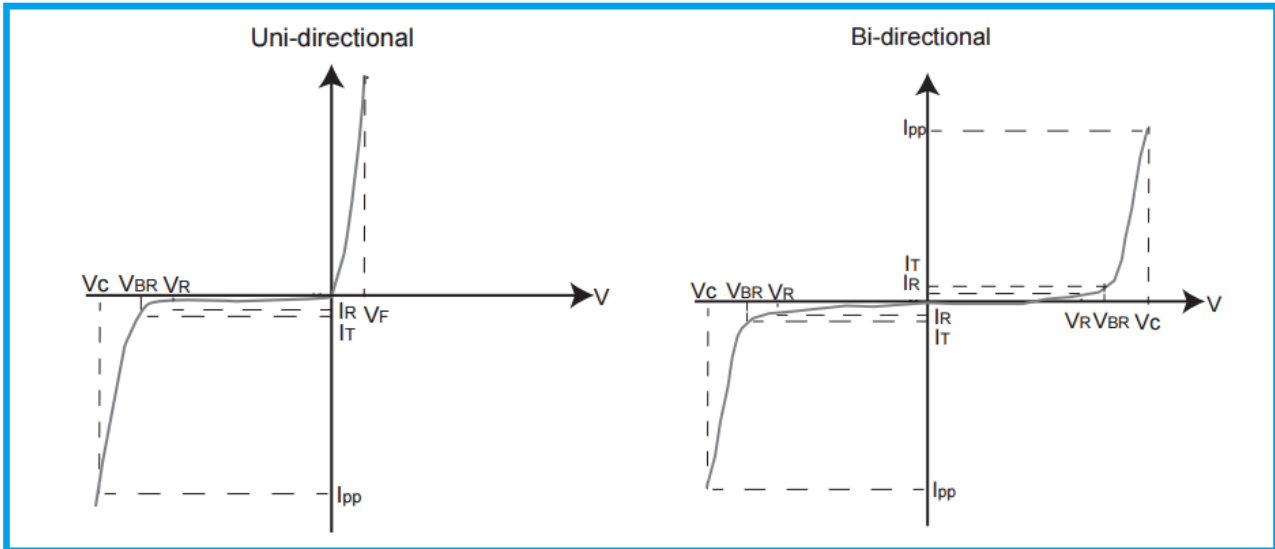
SMBJ □□□ CA - □□□



- Packaging Code (T13: Tape with 13" Reel; T7: Tape with 7")
- $V_{BR}$  Voltage tolerance (A: 5%; Blank: 10%)
- C: Bi-directional; Blank: Uni-directional
- Reverse Stand-Off Voltage or Typical Breakdown Voltage
- SMBJ Series (600W)

## TVS Diode – SMBJ Series

### I-V Curve Characteristics



$I_{PPM}$  Peak Pulse Power Dissipation – Maximum 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

### Electrical Characteristics

| Part Number |           | Marking |    | Reverse Stand Off Voltage $V_R$ (V) | Breakdown Voltage $V_{BR}$ (V) @ $I_T$ |      | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$ (V) @ $I_{PP}$ | Maximum Peak Pulse Current $I_{PP}$ (A) | Maximum Reverse Leakage $I_R$ ( $\mu$ A) @ $V_R$ | UL |
|-------------|-----------|---------|----|-------------------------------------|--|------|-------------------------|---|---|--|----|
| Uni         | Bi        | Uni     | Bi |                                     | Min.                                   | Max. |                         |   |   |  |    |
| SMBJ5.0A    | SMBJ5.0CA | KE      | AE | 5.0                                 | 6.40                                   | 7.00 | 10                      | 9.2   | 65.3                                    | 800  | ✓  |
| SMBJ6.0A    | SMBJ6.0CA | KG      | AG | 6.0                                 | 6.67                                   | 7.37 | 10                      | 10.3  | 58.3                                    | 800  | ✓  |
| SMBJ6.5A    | SMBJ6.5CA | KK      | AK | 6.5                                 | 7.22                                   | 7.98 | 10                      | 11.2  | 53.6                                    | 500  | ✓  |
| SMBJ7.0A    | SMBJ7.0CA | KM      | AM | 7.0                                 | 7.78                                   | 8.60 | 10                      | 12.0  | 50.0                                    | 200  | ✓  |
| SMBJ7.5A    | SMBJ7.5CA | KP      | AP | 7.5                                 | 8.33                                   | 9.21 | 1                       | 12.9  | 46.6                                    | 100  | ✓  |
| SMBJ8.0A    | SMBJ8.0CA | KR      | AR | 8.0                                 | 8.89                                   | 9.83 | 1                       | 13.6  | 44.2                                    | 50   | ✓  |
| SMBJ8.5A    | SMBJ8.5CA | KT      | AT | 8.5                                 | 9.44                                   | 10.4 | 1                       | 14.4  | 41.7                                    | 20   | ✓  |
| SMBJ9.0A    | SMBJ9.0CA | KV      | AV | 9.0                                 | 10.0                                   | 11.1 | 1                       | 15.4  | 39.0                                    | 10   | ✓  |
| SMBJ10A     | SMBJ10CA  | KX      | AX | 10.0                                | 11.1                                   | 12.3 | 1                       | 17.0  | 35.3                                    | 5  | ✓  |
| SMBJ11A     | SMBJ11CA  | KZ      | AZ | 11.0                                | 12.2                                   | 13.5 | 1                       | 18.2  | 33.0                                    | 1  | ✓  |
| SMBJ12A     | SMBJ12CA  | LE      | BE | 12.0                                | 13.3                                   | 14.7 | 1                       | 19.9  | 30.2                                    | 1  | ✓  |
| SMBJ13A     | SMBJ13CA  | LG      | BG | 13.0                                | 14.4                                   | 15.9 | 1                       | 21.5  | 28.0                                    | 1  | ✓  |
| SMBJ14A     | SMBJ14CA  | LK      | BK | 14.0                                | 15.6                                   | 17.2 | 1                       | 23.2  | 25.9                                    | 1  | ✓  |
| SMBJ15A     | SMBJ15CA  | LM      | BM | 15.0                                | 16.7                                   | 18.5 | 1                       | 24.4  | 24.6                                    | 1  | ✓  |
| SMBJ16A     | SMBJ16CA  | LP      | BP | 16.0                                | 17.8                                   | 19.7 | 1                       | 26.0  | 23.1                                    | 1  | ✓  |
| SMBJ17A     | SMBJ17CA  | LR      | BR | 17.0                                | 18.9                                   | 20.9 | 1                       | 27.6  | 21.8                                    | 1  | ✓  |
| SMBJ18A     | SMBJ18CA  | LT      | BT | 18.0                                | 20.0                                   | 22.1 | 1                       | 29.2  | 20.6                                    | 1  | ✓  |

## TVS Diode – SMBJ Series

| Part Number |           | Marking |    | Reverse Stand Off Voltage $V_R$ (V) | Breakdown Voltage $V_{BR}$ (V) @ $I_T$ |       | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$ (V) @ $I_{PP}$ | Maximum Peak Pulse Current $I_{PP}$ (A) | Maximum Reverse Leakage $I_R$ ( $\mu$ A) @ $V_R$ | UL      |
|-------------|-----------|---------|----|-------------------------------------|--|-------|-------------------------|---|---|--|---------|
| Uni         | Bi        | Uni     | Bi |                                     | Min.                                   | Max.  |                         |   |   |  |         |
| SMBJ20A     | SMBJ20CA  | LV      | BV | 20.0                                | 22.2                                   | 24.5  | 1                       | 32.4  | 18.6                                    | 1  | ✓       |
| SMBJ22A     | SMBJ22CA  | LX      | BX | 22.0                                | 24.4                                   | 26.9  | 1                       | 35.5  | 16.9                                    | 1  | ✓       |
| SMBJ24A     | SMBJ24CA  | LZ      | BZ | 24.0                                | 26.7                                   | 29.5  | 1                       | 38.9  | 15.5                                    | 1  | ✓       |
| SMBJ26A     | SMBJ26CA  | ME      | CE | 26.0                                | 28.9                                   | 31.9  | 1                       | 42.1  | 14.3                                    | 1  | ✓       |
| SMBJ28A     | SMBJ28CA  | MG      | CG | 28.0                                | 31.1                                   | 34.4  | 1                       | 45.4  | 13.3                                    | 1  | ✓       |
| SMBJ30A     | SMBJ30CA  | MK      | CK | 30.0                                | 33.3                                   | 36.8  | 1                       | 48.4  | 12.4                                    | 1  | ✓       |
| SMBJ33A     | SMBJ33CA  | MM      | CM | 33.0                                | 36.7                                   | 40.6  | 1                       | 53.3  | 11.3                                    | 1  | ✓       |
| SMBJ36A     | SMBJ36CA  | MP      | CP | 36.0                                | 40.0                                   | 44.2  | 1                       | 58.1  | 10.4                                    | 1  | ✓       |
| SMBJ40A     | SMBJ40CA  | MR      | CR | 40.0                                | 44.4                                   | 49.1  | 1                       | 64.5  | 9.3                                     | 1  | ✓       |
| SMBJ43A     | SMBJ43CA  | MT      | CT | 43.0                                | 47.8                                   | 52.8  | 1                       | 69.4  | 8.7                                     | 1  | Pending |
| SMBJ45A     | SMBJ45CA  | MV      | CV | 45.0                                | 50.0                                   | 55.3  | 1                       | 72.7  | 8.3                                     | 1  | Pending |
| SMBJ48A     | SMBJ48CA  | MX      | CX | 48.0                                | 53.3                                   | 58.9  | 1                       | 77.4  | 7.8                                     | 1  | Pending |
| SMBJ51A     | SMBJ51CA  | MZ      | CZ | 51.0                                | 56.7                                   | 62.7  | 1                       | 82.4  | 7.3                                     | 1  | Pending |
| SMBJ54A     | SMBJ54CA  | NE      | DE | 54.0                                | 60.0                                   | 66.3  | 1                       | 87.1  | 6.9                                     | 1  | Pending |
| SMBJ58A     | SMBJ58CA  | NG      | DG | 58.0                                | 64.4                                   | 71.2  | 1                       | 93.6  | 6.5                                     | 1  | Pending |
| SMBJ60A     | SMBJ60CA  | NK      | DK | 60.0                                | 66.7                                   | 73.7  | 1                       | 96.8  | 6.2                                     | 1  | Pending |
| SMBJ64A     | SMBJ64CA  | NM      | DM | 64.0                                | 71.1                                   | 78.6  | 1                       | 103.0   | 5.9                                     | 1  | Pending |
| SMBJ70A     | SMBJ70CA  | NP      | DP | 70.0                                | 77.8                                   | 86.0  | 1                       | 113.0   | 5.3                                     | 1  | Pending |
| SMBJ75A     | SMBJ75CA  | NR      | DR | 75.0                                | 83.3                                   | 92.1  | 1                       | 121.0   | 5.0                                     | 1  | Pending |
| SMBJ78A     | SMBJ78CA  | NT      | DT | 78.0                                | 86.7                                   | 95.8  | 1                       | 126.0   | 4.8                                     | 1  | Pending |
| SMBJ85A     | SMBJ85CA  | NV      | DV | 85.0                                | 94.4                                   | 104.0 | 1                       | 137.0   | 4.4                                     | 1  | Pending |
| SMBJ90A     | SMBJ90CA  | NX      | DX | 90.0                                | 100.0                                  | 111.0 | 1                       | 146.0   | 4.1                                     | 1  | Pending |
| SMBJ100A    | SMBJ100CA | NZ      | DZ | 100.0                               | 111.0                                  | 123.0 | 1                       | 162.0   | 3.7                                     | 1  | Pending |
| SMBJ110A    | SMBJ110CA | PE      | EE | 110.0                               | 122.0                                  | 135.0 | 1                       | 177.0   | 3.4                                     | 1  | Pending |
| SMBJ120A    | SMBJ120CA | PG      | EG | 120.0                               | 133.0                                  | 147.0 | 1                       | 193.0   | 3.1                                     | 1  | Pending |
| SMBJ130A    | SMBJ130CA | PK      | EK | 130.0                               | 144.0                                  | 159.0 | 1                       | 209.0   | 2.9                                     | 1  | Pending |
| SMBJ150A    | SMBJ150CA | PM      | EM | 150.0                               | 167.0                                  | 185.0 | 1                       | 243.0   | 2.5                                     | 1  | Pending |
| SMBJ160A    | SMBJ160CA | PP      | EP | 160.0                               | 178.0                                  | 197.0 | 1                       | 259.0   | 2.3                                     | 1  | Pending |
| SMBJ170A    | SMBJ170CA | PR      | ER | 170.0                               | 189.0                                  | 209.0 | 1                       | 275.0   | 2.2                                     | 1  | Pending |
| SMBJ180A    | SMBJ180CA | PT      | ET | 180.0                               | 201.0                                  | 222.0 | 1                       | 292.0   | 2.1                                     | 1  | Pending |
| SMBJ190A    | SMBJ190CA | PA      | EC | 190.0                               | 209.0                                  | 243.0 | 1                       | 308.0   | 2.0                                     | 1  | Pending |
| SMBJ200A    | SMBJ200CA | PV      | EV | 200.0                               | 224.0                                  | 247.0 | 1                       | 324.0   | 1.9                                     | 1  | Pending |
| SMBJ220A    | SMBJ220CA | PX      | EX | 220.0                               | 246.0                                  | 272.0 | 1                       | 356.0   | 1.7                                     | 1  | Pending |
| SMBJ250A    | SMBJ250CA | PZ      | EZ | 250.0                               | 279.0                                  | 309.0 | 1                       | 405.0   | 1.5                                     | 1  | Pending |
| SMBJ300A    | SMBJ300CA | QE      | FE | 300.0                               | 335.0                                  | 371.0 | 1                       | 486.0   | 1.3                                     | 1  | Pending |
| SMBJ350A    | SMBJ350CA | QG      | FG | 350.0                               | 391.0                                  | 432.0 | 1                       | 567.0   | 1.1                                     | 1  | Pending |
| SMBJ400A    | SMBJ400CA | QK      | FK | 400.0                               | 447.0                                  | 494.0 | 1                       | 648.0   | 0.9                                     | 1  | Pending |
| SMBJ440A    | SMBJ440CA | QM      | FM | 440.0                               | 492.0                                  | 543.0 | 1                       | 713.0   | 0.9                                     | 1  | Pending |

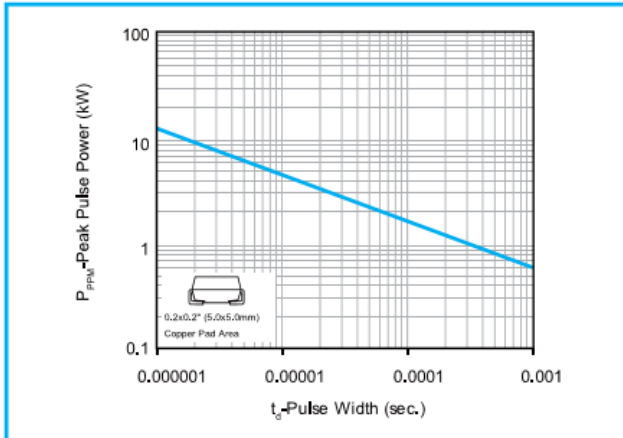
Note:

1. For bi-directional type having  $V_R$  of 10 volts and less, the  $I_R$  limit is double.

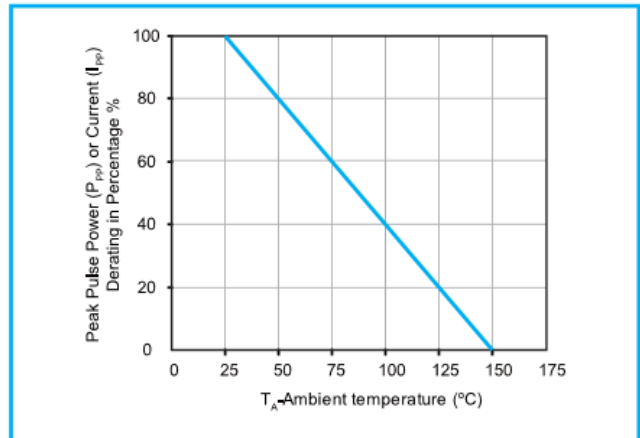
## TVS Diode – SMBJ Series

### Ratings and Characteristic Curves

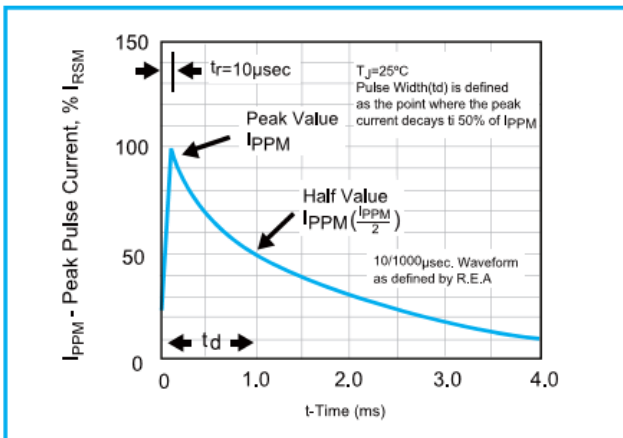
**Fig 1 - Peak Pulse Power Rating Curve**



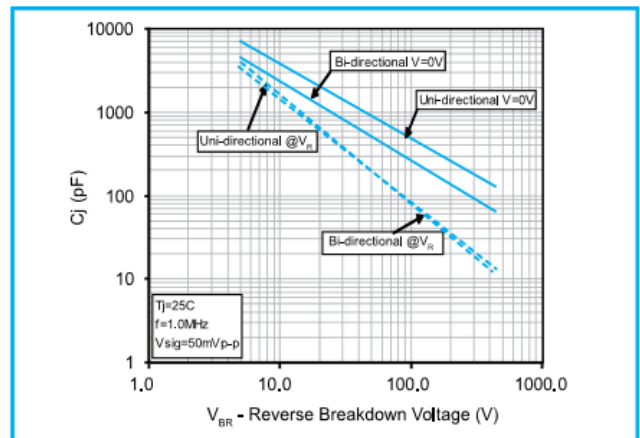
**Fig 2 - Pulse Derating Curve**



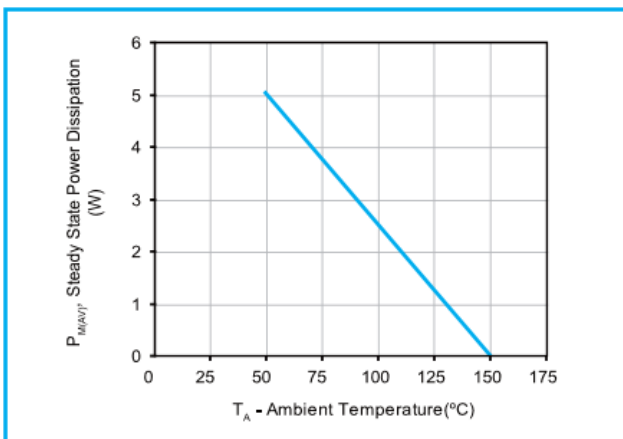
**Fig 3 - Pulse Waveform**



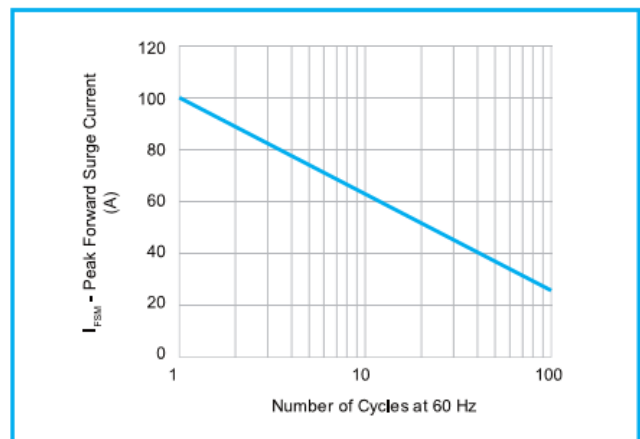
**Fig 4 - Typical Junction Capacitance**



**Fig 5 - Steady State Power Dissipation Derating Curve**

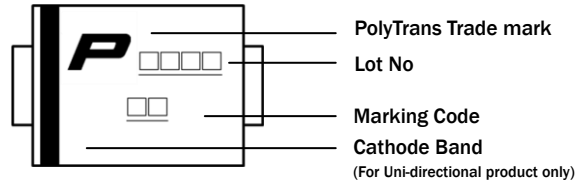


**Fig 6 - Maximum Non-Repetitive Forward Surge Current (Uni-directional Only)**

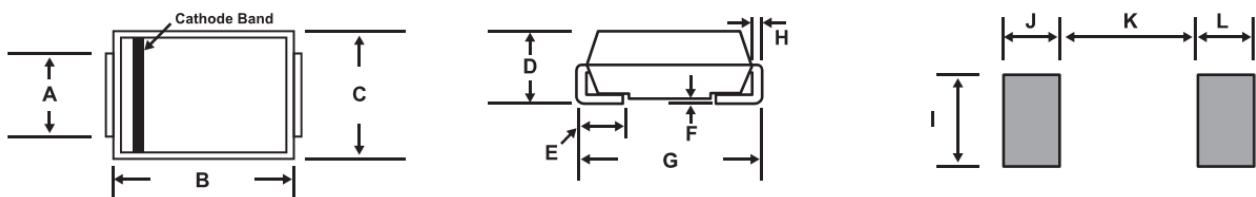


## TVS Diode – SMBJ Series

### Marking Definitions



### Physical Dimensions



| Dimension | Millimeters |      | Inches |       |
|-----------|-------------|------|--------|-------|
|           | Min         | Max  | Min    | Max   |
| A         | 1.90        | 2.20 | 0.077  | 0.086 |
| B         | 4.06        | 4.70 | 0.160  | 0.180 |
| C         | 3.30        | 3.94 | 0.130  | 0.155 |
| D         | 1.95        | 2.44 | 0.084  | 0.096 |
| E         | 0.76        | 1.52 | 0.030  | 0.060 |
| F         | -           | 0.20 | -      | 0.008 |
| G         | 5.21        | 5.59 | 0.205  | 0.220 |
| H         | 0.15        | 0.31 | 0.006  | 0.012 |
| I         | 2.26        | -    | 0.089  | -     |
| J         | 2.16        | -    | 0.085  | -     |
| K         | -           | 2.74 | -      | 0.107 |
| L         | 2.16        | -    | 0.085  | -     |

### Lead Free Reflow Soldering Recommendations

|  |                   |
|--|-------------------|
| Preheat  |                   |
| - Temperature Min ( $T_{s\_min}$ )                   | 150°C             |
| - Temperature Max ( $T_{s\_max}$ )                   | 200°C             |
| - Time ( $T_{s\_min}$ to $T_{s\_max}$ )              | 60-180 seconds    |
| - Average Ramp-Up Rate                               | 1~3°C/second      |
| Peak Temperature                                     | 260°C max.        |
| Time within 5°C of actual Peak Temperature ( $t_p$ ) | 40 seconds max.   |
| Ramp-Down Rate                                       | 6 °C /second max. |



Note: If the soldering temperatures exceed the recommended profile, devices may not meet the performance requirements.

## TVS Diode – SMBJ Series

### Packaging Information

| Part Number | Packaging Code | Component Package | Quantity | Packaging Option                 | Packaging Specification |
|-------------|----------------|-------------------|----------|----------------------------------|-------------------------|
| SMBJ Series | T13            | D0-214AA          | 3000     | Tape & Reel - 12mm tape/13" reel | EIA STD RS-481          |
| SMBJ Series | T7             | D0-214AA          | 500      | Tape & Reel - 12mm tape/7" reel  | EIA STD RS-481          |

### Tape and Reel Specifications

