

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 μ s waveform.
- Typical leakage current less than 1 μ A above 13V.
- Very fast response time, typically less than 1.0ps from 0 volt to V_{BR} minimum.
- High temperature soldering guaranteed: 265 $^{\circ}$ C/10 sec.
- MSL: JEDEC-J-STD-020, Level 1

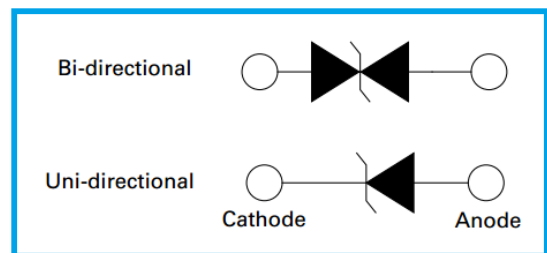


Applications

- 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.
- Surface mount device, solderable per MIL-STD-750, Method 2026
- Polarity: Color band denoted cathode except bidirectional.

Maximum Ratings and Thermal Characteristics

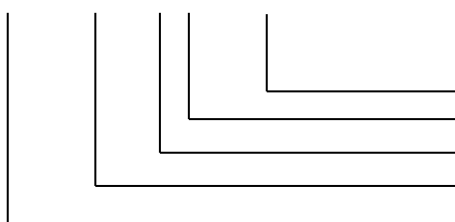
| Parameter | Symbol | Value | Unit |
|--|----------------|-----------|--------------|
| Peak Pulse Power Dissipation on 10/1000 μ s waveform (Note 1, Fig.1). | P_{PPM} | Min 600 | Watt |
| Peak Pulse Current of 10/1000 μ s waveform (Note 1, Fig.3). | I_{PPM} | See Table | Amp |
| Steady State Power Dissipation at $T_L = 75^{\circ}$ 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 | $^{\circ}$ C |

Note:

1. Non-repetitive current pulse, per Fig.3 and derated above $T_A = 25^{\circ}$ 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)

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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 (μ A) @ V_R |
|-------------|-----------|---------|----|-------------------------------------|--|------|-------------------------|---|---|--|
| Uni | Bi | Uni | Bi | | Min. | Max. | | | | |
| SMBJ5.0A | SMBJ5.0CA | KE | AE | 5.0 | 6.40 | 7.00 | 10 | 9.2 | 65.22 | 800 |
| SMBJ6.0A | SMBJ6.0CA | KG | AG | 6.0 | 6.67 | 7.37 | 10 | 10.3 | 58.25 | 800 |
| SMBJ6.5A | SMBJ6.5CA | KK | AK | 6.5 | 7.22 | 7.98 | 10 | 11.2 | 53.57 | 500 |
| SMBJ7.0A | SMBJ7.0CA | KM | AM | 7.0 | 7.78 | 8.60 | 10 | 12.0 | 50.00 | 200 |
| SMBJ7.5A | SMBJ7.5CA | KP | AP | 7.5 | 8.33 | 9.21 | 1 | 12.9 | 46.51 | 100 |
| SMBJ8.0A | SMBJ8.0CA | KR | AR | 8.0 | 8.89 | 9.83 | 1 | 13.6 | 44.12 | 50 |
| SMBJ8.5A | SMBJ8.5CA | KT | AT | 8.5 | 9.44 | 10.4 | 1 | 14.4 | 41.67 | 20 |
| SMBJ9.0A | SMBJ9.0CA | KV | AV | 9.0 | 10.0 | 11.1 | 1 | 15.4 | 38.96 | 10 |
| SMBJ10A | SMBJ10CA | KX | AX | 10.0 | 11.1 | 12.3 | 1 | 17.0 | 35.29 | 5 |
| SMBJ11A | SMBJ11CA | KZ | AZ | 11.0 | 12.2 | 13.5 | 1 | 18.2 | 32.97 | 1 |
| SMBJ12A | SMBJ12CA | LE | BE | 12.0 | 13.3 | 14.7 | 1 | 19.9 | 30.15 | 1 |
| SMBJ13A | SMBJ13CA | LG | BG | 13.0 | 14.4 | 15.9 | 1 | 21.5 | 27.91 | 1 |
| SMBJ14A | SMBJ14CA | LK | BK | 14.0 | 15.6 | 17.2 | 1 | 23.2 | 25.86 | 1 |
| SMBJ15A | SMBJ15CA | LM | BM | 15.0 | 16.7 | 18.5 | 1 | 24.4 | 24.59 | 1 |
| SMBJ16A | SMBJ16CA | LP | BP | 16.0 | 17.8 | 19.7 | 1 | 26.0 | 23.08 | 1 |
| SMBJ17A | SMBJ17CA | LR | BR | 17.0 | 18.9 | 20.9 | 1 | 27.6 | 21.74 | 1 |
| SMBJ18A | SMBJ18CA | LT | BT | 18.0 | 20.0 | 22.1 | 1 | 29.2 | 20.55 | 1 |

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| 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 (μ A) @ V_R |
|-------------|-----------|---------|----|-------------------------------------|--|-------|-------------------------|---|---|--|
| Uni | Bi | Uni | Bi | | Min. | Max. | | | | |
| SMBJ20A | SMBJ20CA | LV | BV | 20.0 | 22.2 | 24.5 | 1 | 32.4 | 19.49 | 1 |
| SMBJ22A | SMBJ22CA | LX | BX | 22.0 | 24.4 | 26.9 | 1 | 35.5 | 18.52 | 1 |
| SMBJ24A | SMBJ24CA | LZ | BZ | 24.0 | 26.7 | 29.5 | 1 | 38.9 | 16.90 | 1 |
| SMBJ26A | SMBJ26CA | ME | CE | 26.0 | 28.9 | 31.9 | 1 | 42.1 | 15.42 | 1 |
| SMBJ28A | SMBJ28CA | MG | CG | 28.0 | 31.1 | 34.4 | 1 | 45.4 | 14.25 | 1 |
| SMBJ30A | SMBJ30CA | MK | CK | 30.0 | 33.3 | 36.8 | 1 | 48.4 | 13.22 | 1 |
| SMBJ33A | SMBJ33CA | MM | CM | 33.0 | 36.7 | 40.6 | 1 | 53.3 | 12.40 | 1 |
| SMBJ36A | SMBJ36CA | MP | CP | 36.0 | 40.0 | 44.2 | 1 | 58.1 | 11.26 | 1 |
| SMBJ40A | SMBJ40CA | MR | CR | 40.0 | 44.4 | 49.1 | 1 | 64.5 | 10.33 | 1 |
| SMBJ43A | SMBJ43CA | MT | CT | 43.0 | 47.8 | 52.8 | 1 | 69.4 | 9.30 | 1 |
| SMBJ45A | SMBJ45CA | MV | CV | 45.0 | 50.0 | 55.3 | 1 | 72.7 | 8.65 | 1 |
| SMBJ48A | SMBJ48CA | MX | CX | 48.0 | 53.3 | 58.9 | 1 | 77.4 | 8.25 | 1 |
| SMBJ51A | SMBJ51CA | MZ | CZ | 51.0 | 56.7 | 62.7 | 1 | 82.4 | 7.75 | 1 |
| SMBJ54A | SMBJ54CA | NE | DE | 54.0 | 60.0 | 66.3 | 1 | 87.1 | 7.28 | 1 |
| SMBJ58A | SMBJ58CA | NG | DG | 58.0 | 64.4 | 71.2 | 1 | 93.6 | 6.89 | 1 |
| SMBJ60A | SMBJ60CA | NK | DK | 60.0 | 66.7 | 73.7 | 1 | 96.8 | 6.41 | 1 |
| SMBJ64A | SMBJ64CA | NM | DM | 64.0 | 71.1 | 78.6 | 1 | 103.0 | 6.20 | 1 |
| SMBJ70A | SMBJ70CA | NP | DP | 70.0 | 77.8 | 86.0 | 1 | 113.0 | 5.83 | 1 |
| SMBJ75A | SMBJ75CA | NR | DR | 75.0 | 83.3 | 92.1 | 1 | 121.0 | 5.31 | 1 |
| SMBJ78A | SMBJ78CA | NT | DT | 78.0 | 86.7 | 95.8 | 1 | 126.0 | 4.96 | 1 |
| SMBJ85A | SMBJ85CA | NV | DV | 85.0 | 94.4 | 104.0 | 1 | 137.0 | 4.76 | 1 |
| SMBJ90A | SMBJ90CA | NX | DX | 90.0 | 100.0 | 111.0 | 1 | 146.0 | 4.38 | 1 |
| SMBJ100A | SMBJ100CA | NZ | DZ | 100.0 | 111.0 | 123.0 | 1 | 162.0 | 4.11 | 1 |
| SMBJ110A | SMBJ110CA | PE | EE | 110.0 | 122.0 | 135.0 | 1 | 177.0 | 3.70 | 1 |
| SMBJ120A | SMBJ120CA | PG | EG | 120.0 | 133.0 | 147.0 | 1 | 193.0 | 3.39 | 1 |
| SMBJ130A | SMBJ130CA | PK | EK | 130.0 | 144.0 | 159.0 | 1 | 209.0 | 3.11 | 1 |
| SMBJ150A | SMBJ150CA | PM | EM | 150.0 | 167.0 | 185.0 | 1 | 243.0 | 2.87 | 1 |
| SMBJ160A | SMBJ160CA | PP | EP | 160.0 | 178.0 | 197.0 | 1 | 259.0 | 2.47 | 1 |
| SMBJ170A | SMBJ170CA | PR | ER | 170.0 | 189.0 | 209.0 | 1 | 275.0 | 2.32 | 1 |
| SMBJ180A | SMBJ180CA | PT | ET | 180.0 | 201.0 | 222.0 | 1 | 292.0 | 2.18 | 1 |
| SMBJ190A | SMBJ190CA | PA | EC | 190.0 | 209.0 | 243.0 | 1 | 308.0 | 2.06 | 1 |
| SMBJ200A | SMBJ200CA | PV | EV | 200.0 | 224.0 | 247.0 | 1 | 324.0 | 1.95 | 1 |
| SMBJ220A | SMBJ220CA | PX | EX | 220.0 | 246.0 | 272.0 | 1 | 356.0 | 1.85 | 1 |
| SMBJ250A | SMBJ250CA | PZ | EZ | 250.0 | 279.0 | 309.0 | 1 | 405.0 | 1.69 | 1 |
| SMBJ300A | SMBJ300CA | QE | FE | 300.0 | 335.0 | 371.0 | 1 | 486.0 | 1.48 | 1 |
| SMBJ350A | SMBJ350CA | QG | FG | 350.0 | 391.0 | 432.0 | 1 | 567.0 | 1.23 | 1 |
| SMBJ400A | SMBJ400CA | QK | FK | 400.0 | 447.0 | 494.0 | 1 | 648.0 | 1.06 | 1 |
| SMBJ440A | SMBJ440CA | QM | FM | 440.0 | 492.0 | 543.0 | 1 | 713.0 | 0.93 | 1 |

Note:

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

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Ratings and Characteristic Curves

Fig 1 - Peak Pulse Power Rating Curve

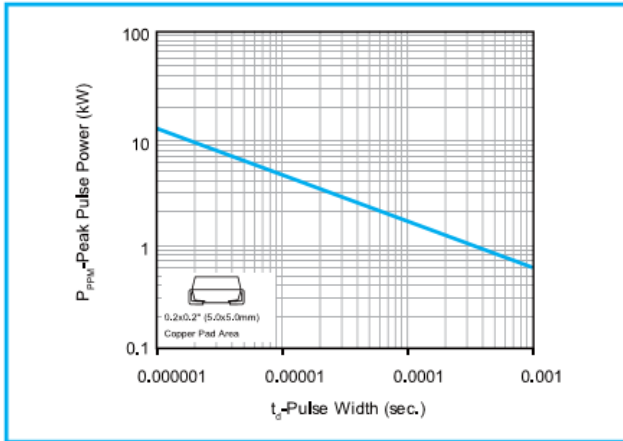


Fig 2 - Pulse Derating Curve

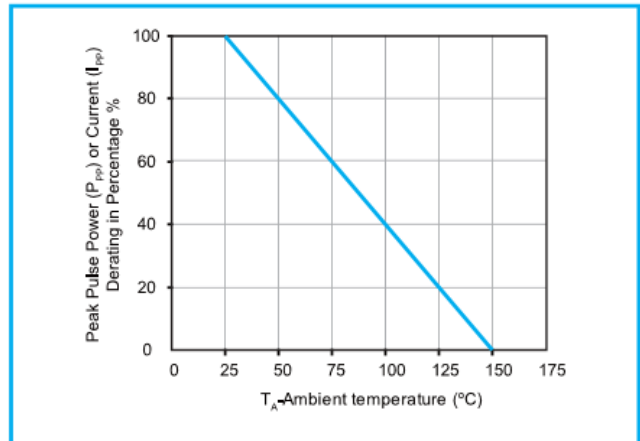


Fig 3 - Pulse Waveform

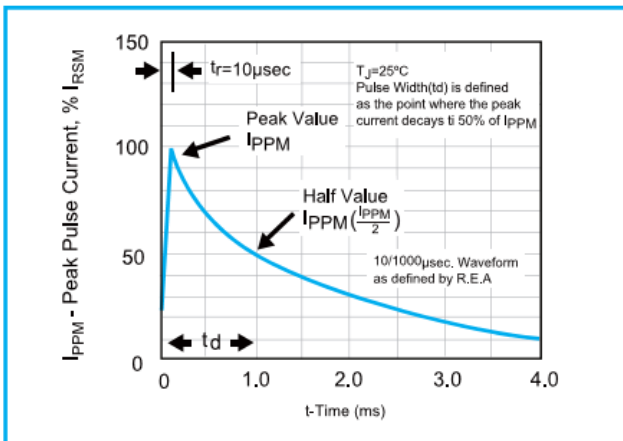


Fig 4 - Typical Junction Capacitance

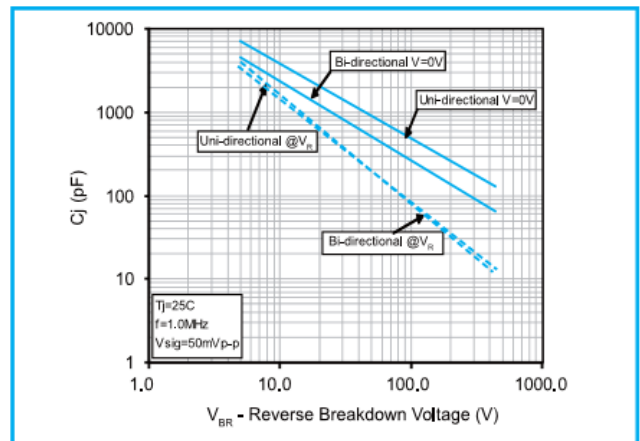


Fig 5 - Steady State Power Dissipation Derating Curve

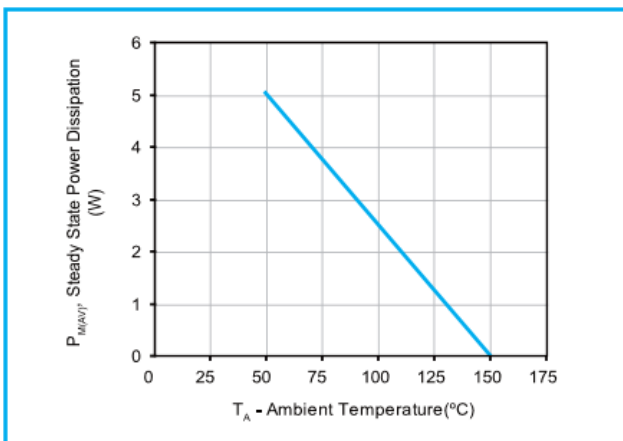
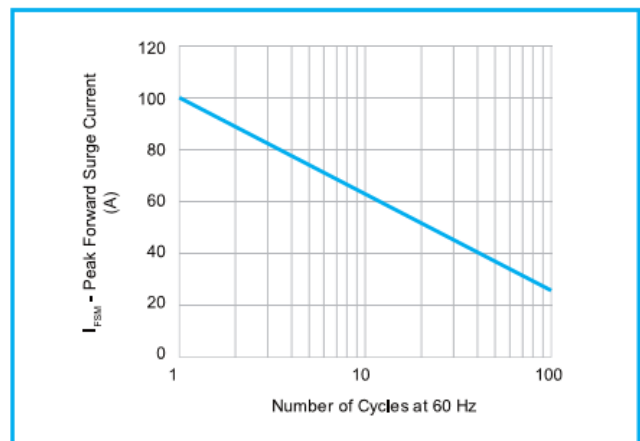
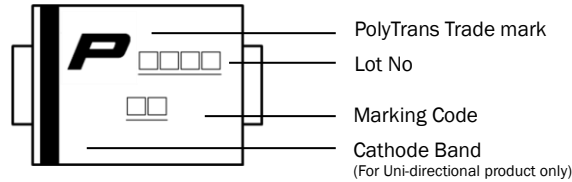


Fig 6 - Maximum Non-Repetitive Forward Surge Current (Uni-directional Only)

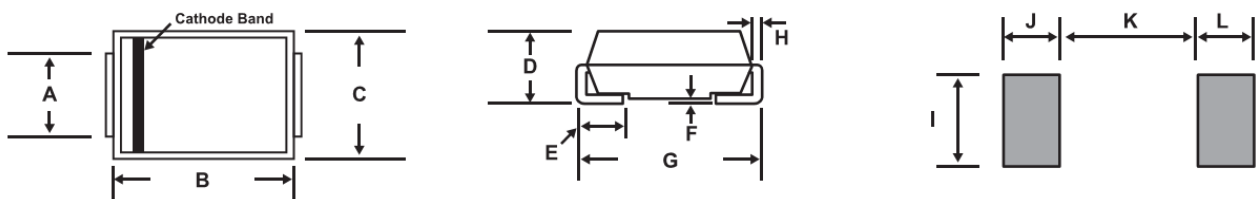


TVS Diode – SMBJ Series

Marking Definitions



Physical Dimensions



| Dimension | Millimeters | | Inches | |
|-----------|-------------|------|--------|-------|
| | Min | Max | Min | Max |
| A | 1.90 | 2.20 | 0.077 | 0.086 |
| B | 4.06 | 4.85 | 0.160 | 0.191 |
| 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. |



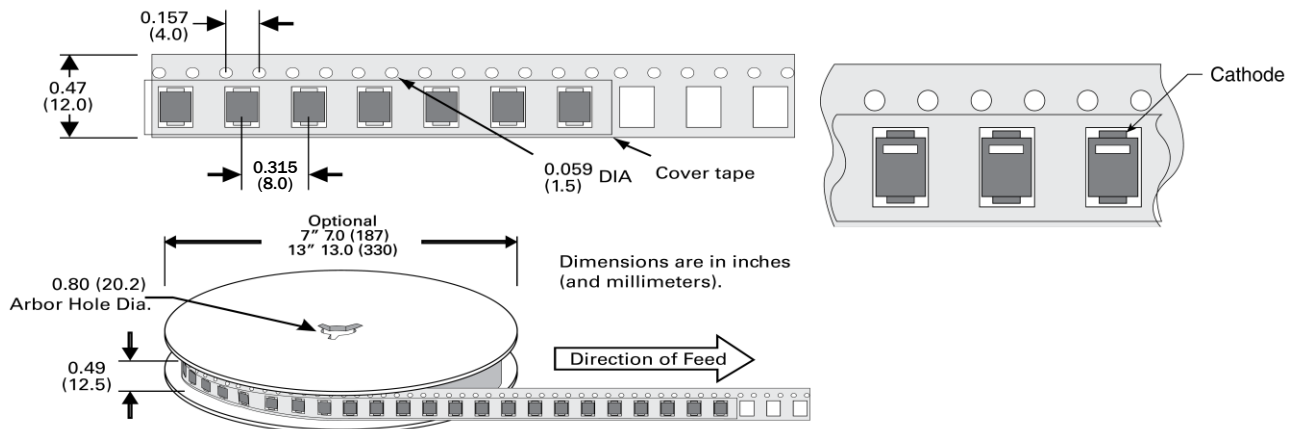
Note: If the soldering temperatures exceed the recommended profile, devices may not meet the performance requirements.

TVS Diode – SMBJ Series

Packaging Information

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

Tape and Reel Specifications



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