

Transient Voltage Suppressors

SMBJ Series

Transient Voltage Suppressors - SMBJ Series

Features

- Very fast response time
- Halogen free and RoHS compliant
- Low incremental surge resistance
- Optimized for LAN protection applications
- Matte tin lead-free Plated
- Halogen free and RoHS compliant
- Typical I_R less than $1\mu A$ above 12V
- For surface mounted applications to optimize board space
- 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)
- 600W peak pulse power capability with at 10/1000 μs waveform, repetition rate (duty cycle): 0.01%
- High temperature soldering : 260°C/ 40 seconds at terminals



Description

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

Mechanical Characteristics

| Rating | Symbol | Value | Units |
|--|-----------------|----------------|-------|
| Peak Pulse Power Dissipation at $T_A=25^\circ C$ by 10/1000 μs Waveform (Fig.2)(Note 1), (Note 2) | P_{PPM} | 600 | Watts |
| Power Dissipation on Infinite Heat Sink at $T_A=50^\circ C$ | P_D | 5.0 | Watts |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3) | I_{FSM} | 100 | A |
| Maximum Instantaneous Forward Voltage at 25A for Unidirectional Only (Note 4) | V_F | 3.5/5.0 | V |
| Operating junction and Storage Temperature Range. | T_J, T_{STG} | -55°C to 150°C | °C |
| Typical Thermal Resistance Junction to Lead | $R_{\theta JL}$ | 20 | °C/W |
| Typical Thermal Resistance Junction to Ambient | $R_{\theta JA}$ | 100 | °C/W |

Notes:

1. Non-repetitive current pulse, per Fig.4 and derated above $T_A=25^\circ C$ per Fig. 3.
2. Mounted on 5.0x5.0mm copper pad 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. $V_F < 3.5V$ for single die parts and $V_F < 5.0V$ for stacked-die parts

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Electrical Characteristics

| Type Number | | Device Marking Code | | Reverse Stand-Off Voltage | Breakdown Voltage@I _T | | Test Current | Maximum Clamping Voltage@I _{PP} | Peak Pulse Current | Reverse Leakage @V _{RWM} |
|-------------|-----------|---------------------|----|---------------------------|----------------------------------|--------------------------|---------------------|--|---------------------|-----------------------------------|
| UNI | BI | UNI | BI | V _{RWM} (V) | V _{BR MIN.} (V) | V _{BR MAX.} (V) | I _T (mA) | VC(V) | I _{PP} (A) | I _R (μA) |
| SMBJ5.0A | SMBJ5.0CA | KE | AE | 5.0 | 6.40 | 7.25 | 10 | 9.2 | 65.3 | 800 |
| SMBJ6.0A | SMBJ6.0CA | KG | AG | 6.0 | 6.67 | 7.67 | 10 | 10.3 | 58.3 | 800 |
| SMBJ6.5A | SMBJ6.5CA | KK | AK | 6.5 | 7.22 | 8.30 | 10 | 11.2 | 53.6 | 500 |
| SMBJ7.0A | SMBJ7.0CA | KM | AM | 7.0 | 7.78 | 8.95 | 10 | 12.0 | 50.0 | 200 |
| SMBJ7.5A | SMBJ7.5CA | KP | AP | 7.5 | 8.33 | 9.58 | 1 | 12.9 | 46.6 | 100 |
| SMBJ8.0A | SMBJ8.0CA | KR | AR | 8.0 | 8.89 | 10.23 | 1 | 13.6 | 44.1 | 50 |
| SMBJ8.5A | SMBJ8.5CA | KT | AT | 8.5 | 9.44 | 10.82 | 1 | 14.4 | 41.7 | 20 |
| SMBJ9.0A | SMBJ9.0CA | KV | AV | 9.0 | 10.00 | 11.50 | 1 | 15.4 | 39.0 | 10 |
| SMBJ10A | SMBJ10CA | KX | AX | 10.0 | 11.10 | 12.80 | 1 | 17.0 | 35.3 | 5 |
| SMBJ11A | SMBJ11CA | KZ | AZ | 11.0 | 12.20 | 14.00 | 1 | 18.2 | 33.0 | 1 |
| SMBJ12A | SMBJ12CA | LE | BE | 12.0 | 13.30 | 15.30 | 1 | 19.9 | 30.2 | 1 |
| SMBJ13A | SMBJ13CA | LG | BG | 13.0 | 14.40 | 16.50 | 1 | 21.5 | 27.9 | 1 |
| SMBJ14A | SMBJ14CA | LK | BK | 14.0 | 15.60 | 17.90 | 1 | 23.2 | 25.8 | 1 |
| SMBJ15A | SMBJ15CA | LM | BM | 15.0 | 16.70 | 19.20 | 1 | 24.4 | 24.6 | 1 |
| SMBJ16A | SMBJ16CA | LP | BP | 16.0 | 17.80 | 20.50 | 1 | 26.0 | 23.1 | 1 |
| SMBJ17A | SMBJ17CA | LR | BR | 17.0 | 18.90 | 21.70 | 1 | 27.6 | 21.7 | 1 |
| SMBJ18A | SMBJ18CA | LT | BT | 18.0 | 20.00 | 23.30 | 1 | 29.2 | 20.5 | 1 |
| SMBJ20A | SMBJ20CA | LV | BV | 20.0 | 22.20 | 25.50 | 1 | 32.4 | 18.5 | 1 |
| SMBJ22A | SMBJ22CA | LX | BX | 22.0 | 24.40 | 28.00 | 1 | 35.5 | 16.9 | 1 |
| SMBJ24A | SMBJ24CA | LZ | BZ | 24.0 | 26.70 | 30.70 | 1 | 38.9 | 15.2 | 1 |
| SMBJ26A | SMBJ26CA | ME | CE | 26.0 | 28.90 | 33.20 | 1 | 42.1 | 14.2 | 1 |
| SMBJ28A | SMBJ28CA | MG | CG | 28.0 | 31.10 | 35.80 | 1 | 45.4 | 13.2 | 1 |
| SMBJ30A | SMBJ30CA | MK | CK | 30.0 | 33.30 | 38.30 | 1 | 48.4 | 12.4 | 1 |
| SMBJ33A | SMBJ33CA | MM | CM | 33.0 | 36.70 | 42.20 | 1 | 53.3 | 11.3 | 1 |
| SMBJ36A | SMBJ36CA | MP | CP | 36.0 | 40.00 | 46.00 | 1 | 58.1 | 10.3 | 1 |
| SMBJ40A | SMBJ40CA | MR | CR | 40.0 | 44.40 | 51.10 | 1 | 64.5 | 9.3 | 1 |
| SMBJ43A | SMBJ43CA | MT | CT | 43.0 | 47.80 | 54.90 | 1 | 69.4 | 8.6 | 1 |
| SMBJ45A | SMBJ45CA | MV | CV | 45.0 | 50.00 | 57.50 | 1 | 72.7 | 8.3 | 1 |
| SMBJ48A | SMBJ48CA | MX | CX | 48.0 | 53.30 | 61.30 | 1 | 77.4 | 7.7 | 1 |
| SMBJ51A | SMBJ51CA | MZ | CZ | 51.0 | 56.70 | 65.20 | 1 | 82.4 | 7.3 | 1 |
| SMBJ54A | SMBJ54CA | NE | DE | 54.0 | 60.00 | 69.00 | 1 | 87.1 | 6.9 | 1 |
| SMBJ58A | SMBJ58CA | NG | DG | 58.0 | 64.40 | 74.10 | 1 | 93.6 | 6.4 | 1 |
| SMBJ60A | SMBJ60CA | NK | DK | 60.0 | 66.70 | 76.70 | 1 | 96.8 | 6.2 | 1 |
| SMBJ64A | SMBJ64CA | NM | DM | 64.0 | 71.10 | 81.80 | 1 | 103.0 | 5.8 | 1 |
| SMBJ70A | SMBJ70CA | NP | DP | 70.0 | 77.80 | 89.50 | 1 | 113.0 | 5.3 | 1 |
| SMBJ75A | SMBJ75CA | NR | DR | 75.0 | 83.30 | 95.80 | 1 | 121.0 | 4.9 | 1 |
| SMBJ78A | SMBJ78CA | NT | DT | 78.0 | 86.70 | 99.70 | 1 | 126.0 | 4.7 | 1 |
| SMBJ85A | SMBJ85CA | NV | DV | 85.0 | 94.40 | 108.20 | 1 | 137.0 | 4.4 | 1 |
| SMBJ90A | SMBJ90CA | NX | DX | 90.0 | 100.00 | 115.50 | 1 | 146.0 | 4.1 | 1 |
| SMBJ100A | SMBJ100CA | NZ | DZ | 100.0 | 111.00 | 128.00 | 1 | 162.0 | 3.7 | 1 |
| SMBJ110A | SMBJ110CA | PE | EE | 110.0 | 122.00 | 140.50 | 1 | 177.0 | 3.4 | 1 |
| SMBJ120A | SMBJ120CA | PG | EG | 120.0 | 133.00 | 153.00 | 1 | 193.0 | 3.1 | 1 |
| SMBJ130A | SMBJ130CA | PK | EK | 130.0 | 144.00 | 165.50 | 1 | 209.0 | 2.9 | 1 |
| SMBJ150A | SMBJ150CA | PM | EM | 150.0 | 167.00 | 192.60 | 1 | 243.0 | 2.5 | 1 |
| SMBJ160A | SMBJ160CA | PP | EP | 160.0 | 178.00 | 197.00 | 1 | 259.0 | 2.3 | 1 |
| SMBJ170A | SMBJ170CA | PR | ER | 170.0 | 189.00 | 209.00 | 1 | 275.0 | 2.2 | 1 |
| SMBJ180A | SMBJ180CA | PT | ET | 180.0 | 201.00 | 222.00 | 1 | 292.0 | 2.1 | 1 |
| SMBJ190A | SMBJ190CA | PV | EV | 190.0 | 209.00 | 243.20 | 1 | 308.0 | 2.0 | 1 |
| SMBJ200A | SMBJ200CA | PX | EX | 200.0 | 220.00 | 247.00 | 1 | 324.0 | 1.9 | 1 |
| SMBJ210A | SMBJ210CA | PZ | EZ | 210.0 | 231.00 | 268.80 | 1 | 340.0 | 1.8 | 1 |
| SMBJ220A | SMBJ220CA | QE | FE | 220.0 | 242.00 | 281.60 | 1 | 356.0 | 1.7 | 1 |

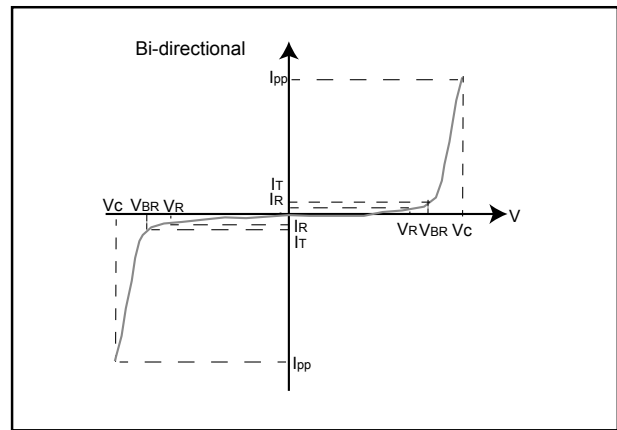
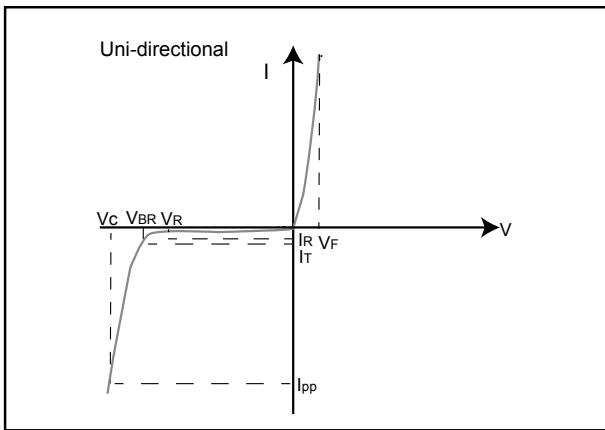
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| Type Number | | Device Marking Code | | Reverse Stand-Off Voltage | | Breakdown Voltage@I _T | | Test Current | Maximum Clamping Voltage@I _{PP} | Peak Pulse Current | Reverse Leakage @V _{RWM} |
|-------------|-----------|---------------------|----|---------------------------|--------------------------|----------------------------------|---------------------|--------------------|--|---------------------|-----------------------------------|
| UNI | BI | UNI | BI | V _{RWM} (V) | V _{BR MIN.} (V) | V _{BR MAX.} (V) | I _T (mA) | V _C (V) | I _{PP} (A) | I _R (μA) | |
| SMBJ250A | SMBJ250CA | QG | FG | 250.0 | 279.0 | 309.0 | 1 | 405.0 | 1.5 | 1 | |
| SMBJ300A | SMBJ300CA | QK | FK | 300.0 | 335.0 | 371.0 | 1 | 486.0 | 1.3 | 1 | |
| SMBJ350A | SMBJ350CA | QM | FM | 350.0 | 391.0 | 432.0 | 1 | 567.0 | 1.1 | 1 | |
| SMBJ400A | SMBJ400CA | QP | FP | 400.0 | 447.0 | 494.0 | 1 | 648.0 | 0.9 | 1 | |
| SMBJ440A | SMBJ440CA | QR | FR | 440.0 | 492.0 | 543.0 | 1 | 713.0 | 0.9 | 1 | |

For bidirectional type having VR of 10 volts and less, the IR limit is double.

I-V Curve Characteristics



PPPM Peak Pulse Power Dissipation -- Max power dissipation

VR Stand-off Voltage -- Maximum voltage that can be applied to the TVS without operation

VBR Breakdown Voltage -- Maximum voltage that flows through the TVS at a specified test current (I_T)

Vc Clamping Voltage -- Peak voltage measured across the TVS at a specified IPPM (peak impulse current)

IR Reverse Leakage Current -- Current measured at VR

VF Forward Voltage Drop for Uni-directional

Ratings and Characteristic Curves (T_A=25° C unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform

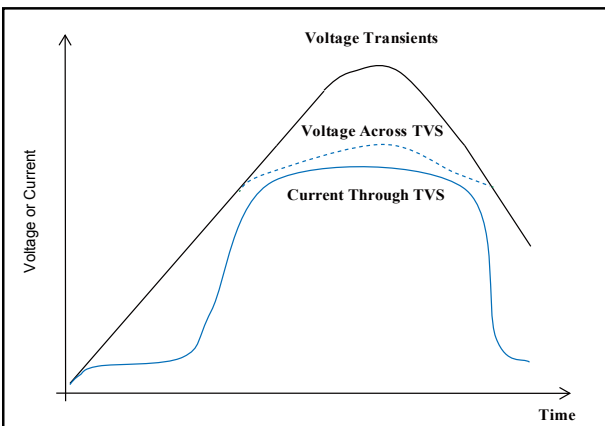
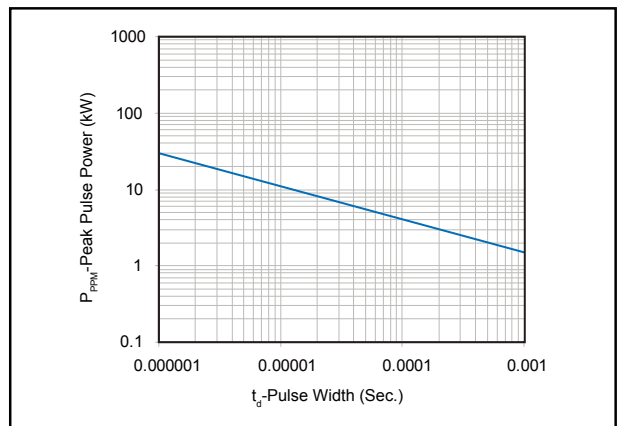


Figure 2 - Peak Pulse Power Rating



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Ratings and Characteristic Curves (TA=25°C unless otherwise noted)

Figure 3 - Pulse Derating Curve



Figure 4 - Pulse Waveform

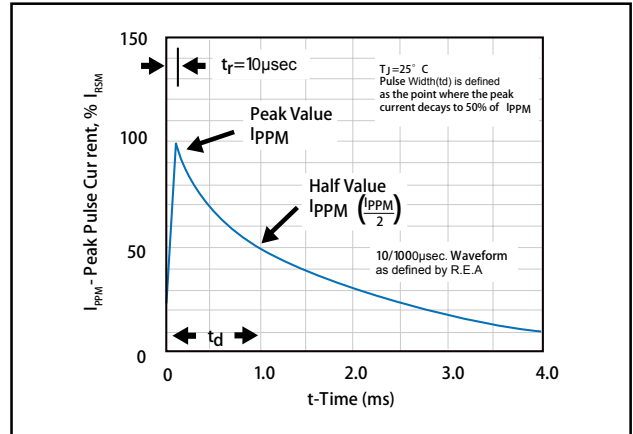


Figure 5 - Typical Junction Capacitance



Figure 6 - Steady State Power Dissipation Derating Curve

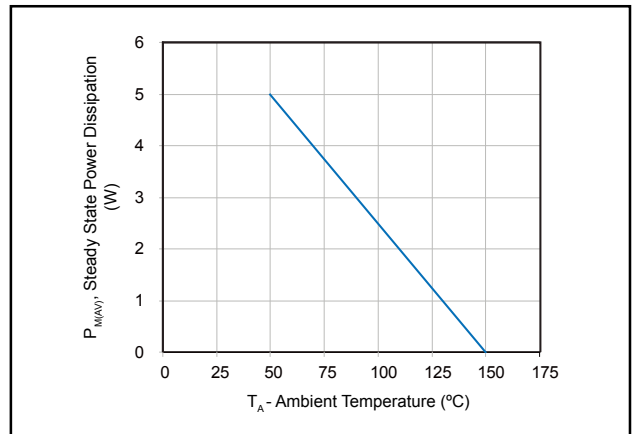


Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only



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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 ^{+0/-5} °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 | 0.003 ounce, 0.093 grams |
| Case | JEDEC DO-214AA Molded Plastic over |
| Polarity | glass passivated junction |
| Termina | Matte Tin axial leads, solderable per JESD22-B102D. |



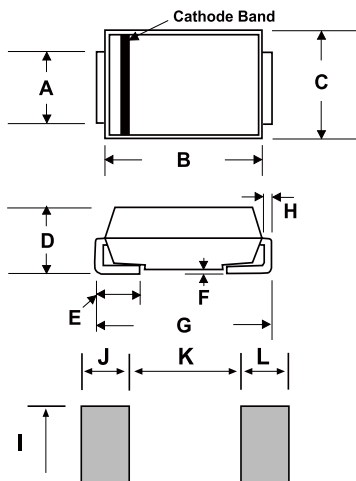
Environmental Specifications

| | |
|---------------------|--------------------------|
| High Temp. Storage | JESD22-A103 |
| HTRB | JESD22-A108 |
| Temperature Cycling | JESD22-A104 |
| MSL | JEDEC-J-STD-020, Level 1 |
| H3TRB | JESD22-A101 |
| RSH | JESD22-A111 |

Flow/Wave Soldering

| | |
|--------------------|------------|
| Peak Temperature : | 265°C |
| Dipping Time : | 10 seconds |
| Soldering : | 1 time |

Dimensions DO-214AA/SMB



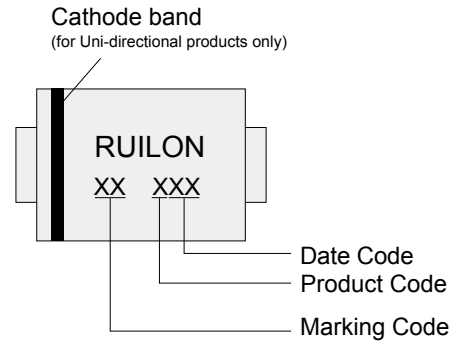
| DIM | Inches | | Millimeters | |
|-----|--------|-------|-------------|-------|
| | Min | Max | Min | Max |
| A | 0.077 | 0.086 | 1.950 | 2.200 |
| B | 0.160 | 0.180 | 4.060 | 4.570 |
| C | 0.130 | 0.155 | 3.300 | 3.940 |
| D | 0.084 | 0.096 | 2.130 | 2.440 |
| E | 0.030 | 0.060 | 0.760 | 1.520 |
| 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 | - |

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Product Name



Part Marking System



Packaging

| Part Number | Component Package | Quantity | Packaging Option | Packaging Specification |
|-------------|-------------------|----------|------------------|-------------------------|
| SMBJxxxXX | DO-214AC | 500 | Tape & Reel | EIA RS-481 |

Tape and Reel Specification



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