



# 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 $\mu s$  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 $\mu s$ 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 <sub>T</sub> |                          | Test Current        | Maximum Clamping Voltage@I <sub>PP</sub> | Peak Pulse Current  | Reverse Leakage @V <sub>RWM</sub> |
|-------------|-----------|---------------------|----|---------------------------|----------------------------------|--------------------------|---------------------|--|---------------------|-----------------------------------|
| UNI         | BI        | UNI                 | BI | V <sub>RWM</sub> (V)      | V <sub>BR MIN.</sub> (V)         | V <sub>BR MAX.</sub> (V) | I <sub>T</sub> (mA) | VC(V)                                    | I <sub>PP</sub> (A) | I <sub>R</sub> (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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### Electrical Characteristics

| Type Number |           | Device Marking Code |    | Reverse Stand-Off Voltage |                          | Breakdown Voltage@I <sub>T</sub> |                     | Test Current       | Maximum Clamping Voltage@I <sub>PP</sub> | Peak Pulse Current  | Reverse Leakage @V <sub>RWM</sub> |
|-------------|-----------|---------------------|----|---------------------------|--------------------------|----------------------------------|---------------------|--------------------|--|---------------------|-----------------------------------|
| UNI         | BI        | UNI                 | BI | V <sub>RWM</sub> (V)      | V <sub>BR MIN.</sub> (V) | V <sub>BR MAX.</sub> (V)         | I <sub>T</sub> (mA) | V <sub>C</sub> (V) | I <sub>PP</sub> (A)                      | I <sub>R</sub> (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 (IT)

**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<sub>A</sub>=25° C unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform

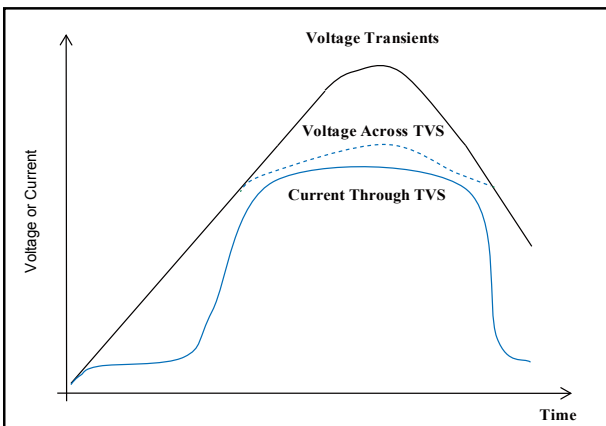
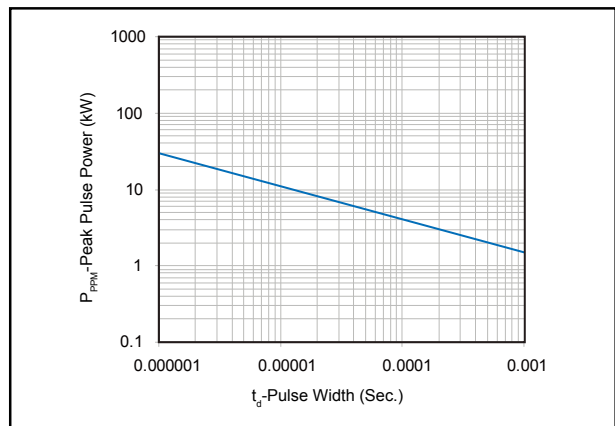


Figure 2 - Peak Pulse Power Rating



## Transient Voltage Suppressors - SMBJ Series

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

Figure 3 - Pulse Derating Curve



Figure 4 - Pulse Waveform

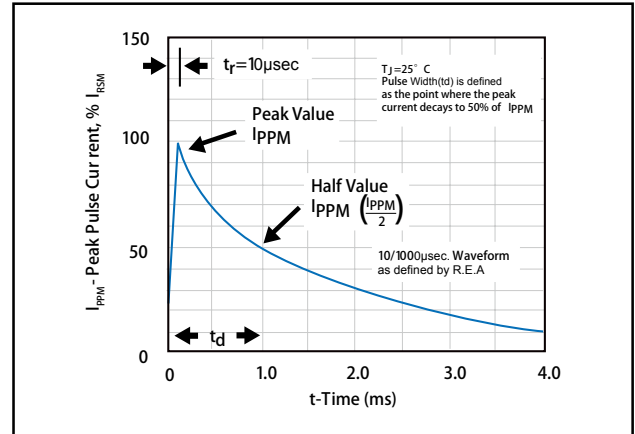


Figure 5 - Typical Junction Capacitance



Figure 6 - Steady State Power Dissipation Derating Curve

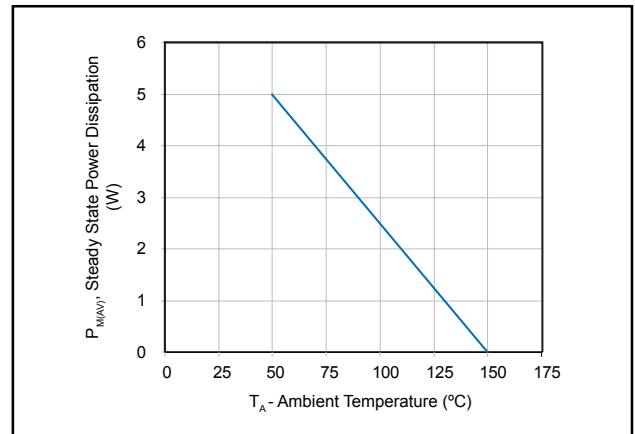


Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only



## Transient Voltage Suppressors - SMBJ Series

### 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  |                                    | 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. |



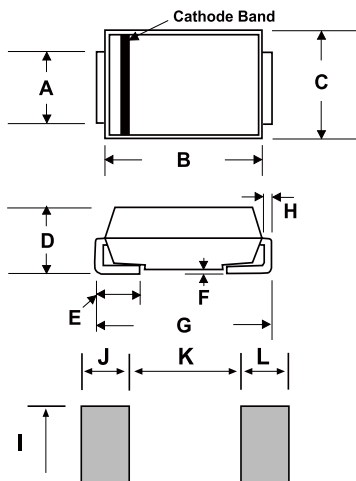
### Environmental Specifications

|                     |                          |
|---------------------|--------------------------|
| 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       | -     |

## Transient Voltage Suppressors - SMBJ Series

### 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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[MMAD1108/TR13](#) [5KP100A](#) [5KP15A](#) [5KP18A](#) [5KP48A](#) [5KP90A](#)