



## 500 Watt Low Capacitance Transient Voltage Suppressors

Screening in  
reference to  
MIL-PRF-19500  
available

### DESCRIPTION

This series of MSMBJSAC5.0 – MSMBJSAC75 high reliability Transient Voltage Suppressors are featured in the SMBJ J-bend design (DO-214AA package) which allows for greater PC board mounting density. They feature unidirectional construction and working standoff voltage ( $V_{WM}$ ) selections from 5 to 75 volts. It is available with either SnPb or RoHS compliant matte-tin plating.



**DO-214AA  
J-bend Package**

**Important:** For the latest information, visit our website <http://www.microsemi.com>.

**NOTE:** All SMB series are equivalent to prior SMS package identifications.

### FEATURES

- Unidirectional low-capacitance device (30 pF). For bidirectional applications, see [Figure 6](#).
- $3\sigma$  lot norm screening performed on standby current  $I_D$
- 100% surge testing of all devices
- Suppresses transients up to 500 W Peak Pulse Power ( $P_{PP}$ ) @ 10/1000  $\mu$ s
- Working standoff voltage ( $V_{WM}$ ) values from 5 to 75 V
- Various screenings in reference to MIL-PRF-19500 are available. Refer to [Hirel Non-Hermetic Product Portfolio](#) for more details on the screening options.  
(See [part nomenclature](#) for all options.)
- High reliability controlled devices have wafer fabrication and assembly lot traceability
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B
- RoHS compliant versions available

### APPLICATIONS / BENEFITS

- Low capacitance for data-line protection to 10 MHz
- Protection for fast data rate lines in aircraft up to:
  - RTCA/DO-160G - Waveform 4 and Waveform 5A (also see [MicroNote 130](#))
  - ARINC 429, Part 1, paragraph 2.4.1.1 up to bit rates of 100 kb/s
- ESD and EFT protection per IEC61000-4-2 and IEC61000-4-4 respectively
- Secondary lightning protection per IEC 61000-4-5 with 42 ohms source impedance:
  - Class 1: MSMBJSAC5.0 to MSMBJSAC75
  - Class 2: MSMBJSAC5.0 to MSMBJSAC45
  - Class 3: MSMBJSAC5.0 to MSMBJSAC22
  - Class 4: MSMBJSAC5.0 to MSMBJSAC10
- Secondary lightning protection per IEC 61000-4-5 with 12 ohms source impedance:
  - Class 1: MSMBJSAC5.0 to MSMBJSAC26
  - Class 2: MSMBJSAC5.0 to MSMBJSAC15
  - Class 3: MSMBJSAC5.0 to MSMBJSAC7.0

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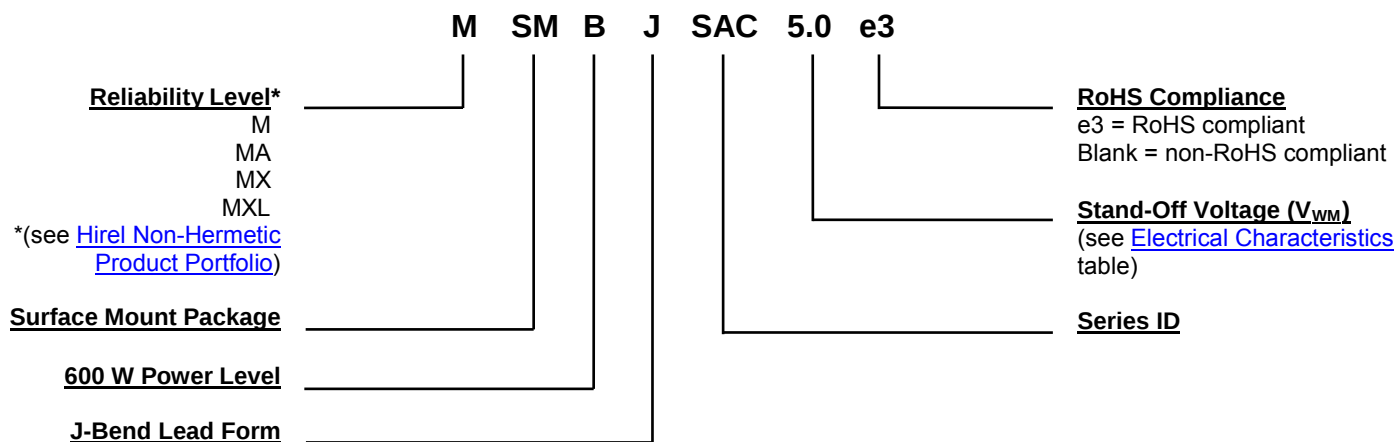
**MAXIMUM RATINGS @ 25 °C unless otherwise stated**

| Parameters/Test Conditions                                         | Symbol                              | Value       | Unit |
|--------------------------------------------------------------------|-------------------------------------|-------------|------|
| Junction and Storage Temperature                                   | T <sub>J</sub> and T <sub>STG</sub> | -65 to +150 | °C   |
| Peak Pulse Power Dissipation @ 10/1000 μs <sup>(1)</sup>           | P <sub>PP</sub>                     | 500         | W    |
| Average Power Dissipation @ T <sub>L</sub> = +75 °C <sup>(2)</sup> | P <sub>M(AV)</sub>                  | 2.5         | W    |
| Clamping Speed (0 volts to V <sub>(BR)</sub> min, theoretical)     | t <sub>clamping</sub>               | < 5         | ns   |
| Solder Temperature @ 10 s                                          |                                     | 260         | °C   |

- Notes:**
1. With impulse repetition rate (duty factor) of 0.01 % max. TVS devices are not typically used for dc power dissipation and are instead operated  $\leq V_{WM}$  (rated standoff voltage) except for transients that briefly drive the device into avalanche breakdown (V<sub>(BR)</sub> to V<sub>C</sub> region) of the TVS element. Also see [Figures 5 and 6](#) for further protection details in rated peak pulse power for unidirectional and bidirectional configurations respectively.
  2. At 3/8 (10 mm) lead length from body.

**MECHANICAL and PACKAGING**

- CASE: Void-free transfer molded thermosetting epoxy body meeting UL94V-0 requirements
- TERMINALS: Tin-lead or RoHS compliant annealed matte-tin plating readily solderable per MIL-STD-750, method 2026
- MARKING: Part number
- POLARITY: Cathode end banded
- TAPE & REEL option: Standard per EIA-481-1-A (add "TR" suffix to part number). Consult factory for quantities.
- WEIGHT: Approximately 0.1 grams
- See [Package Dimensions](#) on last page.

**PART NOMENCLATURE**


**SYMBOLS & DEFINITIONS**

| Symbol     | Definition                                                                                                                                                                                                                                                                                                                                            |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $C_T$      | Total Capacitance: The total small signal capacitance between the diode terminals of a complete device.                                                                                                                                                                                                                                               |
| $I_{(BR)}$ | Breakdown Current: The current used for measuring Breakdown Voltage $V_{(BR)}$ .                                                                                                                                                                                                                                                                      |
| $I_D$      | Standby Current: The current through the device at rated stand-off voltage.                                                                                                                                                                                                                                                                           |
| $I_{PP}$   | Peak Impulse Current: The maximum rated random recurring peak impulse current or nonrepetitive peak impulse current that may be applied to a device. A random recurring or nonrepetitive transient current is usually due to an external cause, and it is assumed that its effect will have completely disappeared before the next transient arrives. |
| $P_{PP}$   | Peak Pulse Power: The rated random recurring peak impulse power or rated nonrepetitive peak impulse power. The impulse power is the maximum-rated value of the product of $I_{PP}$ and $V_C$ .                                                                                                                                                        |
| $V_{(BR)}$ | Breakdown Voltage: The voltage across the device at a specified current $I_{(BR)}$ in the breakdown region.                                                                                                                                                                                                                                           |
| $V_C$      | Clamping Voltage: The voltage across the device in a region of low differential resistance during the application of an impulse current ( $I_{PP}$ ) for a specified waveform.                                                                                                                                                                        |
| $V_{WM}$   | Working Standoff Voltage: The maximum-rated value of dc or repetitive peak positive cathode-to-anode voltage that may be continuously applied over the standard operating temperature.                                                                                                                                                                |

**ELECTRICAL CHARACTERISTICS @ 25 °C unless otherwise stated**

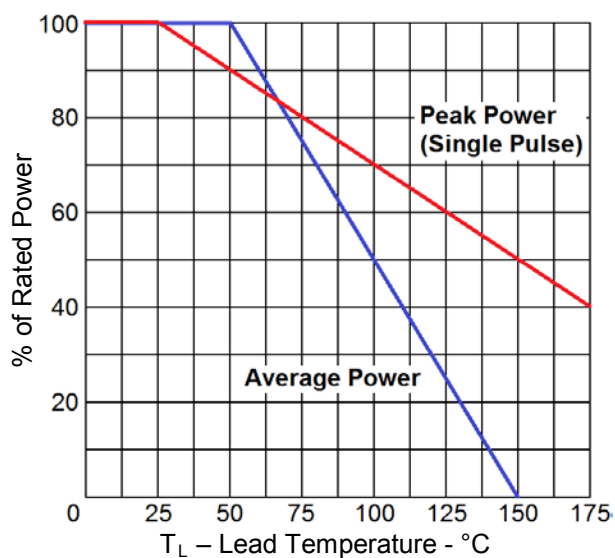
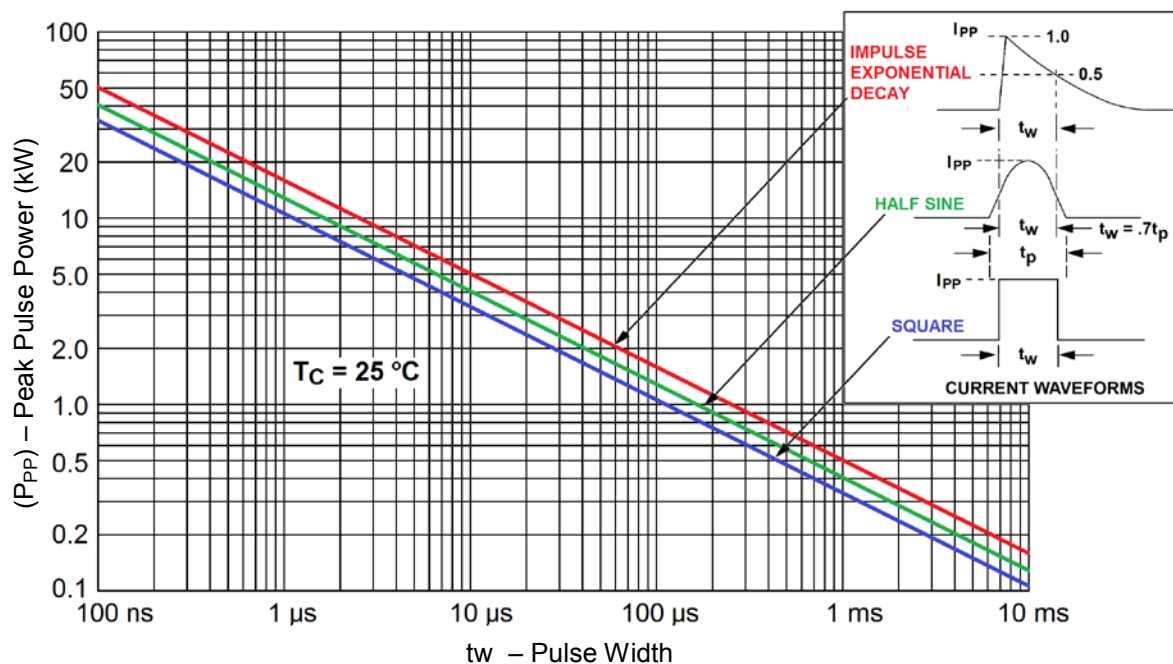
| PART NUMBER | WORKING STAND-OFF VOLTAGE (Note 1)<br>$V_{WM}$ | BREAKDOWN VOLTAGE<br>$V_{BR} @ I_{BR}$<br>1.0mA<br>$V_{(BR)}$ | MAXIMUM STANDBY CURRENT<br>$I_D @ V_{WM}$ | MAXIMUM CLAMPING VOLTAGE<br>$V_C @ I_P = 5.0A$ | MAXIMUM PEAK PULSE CURRENT*<br>RATING (Note 2)<br>$I_{PP}$ | MAXIMUM CAPACITANCE<br>@ 0 Volts<br>$f = 1 \text{ MHz}$<br>$C_T$ | WORKING INVERSE BLOCKING VOLTAGE<br>$V_{WIB}$ | INVERSE BLOCKING LEAKAGE CURRENT<br>@ $V_{WIB}$<br>$I_{IB}$ | PEAK INVERSE BLOCKING VOLTAGE<br>$V_{PIB}$ |
|-------------|------------------------------------------------|---------------------------------------------------------------|-------------------------------------------|------------------------------------------------|------------------------------------------------------------|------------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------------|--------------------------------------------|
|             | Volts                                          | Volts (min)                                                   | $\mu A$                                   | Volts                                          | Amps                                                       | pF                                                               | Volts                                         | $\mu A$                                                     | Volts                                      |
| MSMBJSAC5.0 | 5.0                                            | 7.60                                                          | 300                                       | 10.0                                           | 44                                                         | 30                                                               | 75                                            | 10                                                          | 100                                        |
| MSMBJSAC6.0 | 6.0                                            | 7.90                                                          | 300                                       | 11.2                                           | 41                                                         | 30                                                               | 75                                            | 10                                                          | 100                                        |
| MSMBJSAC7.0 | 7.0                                            | 8.33                                                          | 300                                       | 12.6                                           | 38                                                         | 30                                                               | 75                                            | 10                                                          | 100                                        |
| MSMBJSAC8.0 | 8.0                                            | 8.89                                                          | 100                                       | 13.4                                           | 36                                                         | 30                                                               | 75                                            | 10                                                          | 100                                        |
| MSMBJSAC8.5 | 8.5                                            | 9.44                                                          | 50                                        | 14.0                                           | 34                                                         | 30                                                               | 75                                            | 10                                                          | 100                                        |
| MSMBJSAC10  | 10                                             | 11.10                                                         | 5.0                                       | 16.3                                           | 29                                                         | 30                                                               | 75                                            | 10                                                          | 100                                        |
| MSMBJSAC12  | 12                                             | 13.30                                                         | 5.0                                       | 19.0                                           | 25                                                         | 30                                                               | 75                                            | 10                                                          | 100                                        |
| MSMBJSAC15  | 15                                             | 16.70                                                         | 5.0                                       | 23.6                                           | 20                                                         | 30                                                               | 75                                            | 10                                                          | 100                                        |
| MSMBJSAC18  | 18                                             | 20.00                                                         | 5.0                                       | 28.8                                           | 15                                                         | 30                                                               | 75                                            | 10                                                          | 100                                        |
| MSMBJSAC22  | 22                                             | 24.40                                                         | 5.0                                       | 35.4                                           | 14                                                         | 30                                                               | 75                                            | 10                                                          | 100                                        |
| MSMBJSAC26  | 26                                             | 28.90                                                         | 5.0                                       | 42.3                                           | 11.1                                                       | 30                                                               | 75                                            | 10                                                          | 100                                        |
| MSMBJSAC36  | 36                                             | 40.0                                                          | 5.0                                       | 60.0                                           | 8.6                                                        | 30                                                               | 75                                            | 10                                                          | 100                                        |
| MSMBJSAC45  | 45                                             | 50.00                                                         | 5.0                                       | 77.0                                           | 6.8                                                        | 30                                                               | 150                                           | 10                                                          | 200                                        |
| MSMBJSAC50  | 50                                             | 55.50                                                         | 5.0                                       | 88.0                                           | 5.8                                                        | 30                                                               | 150                                           | 10                                                          | 200                                        |
| MSMBJSAC75  | 75                                             | 83.3                                                          | 5.0                                       | 121                                            | 4.1                                                        | 30                                                               | 150                                           | 10                                                          | 200                                        |

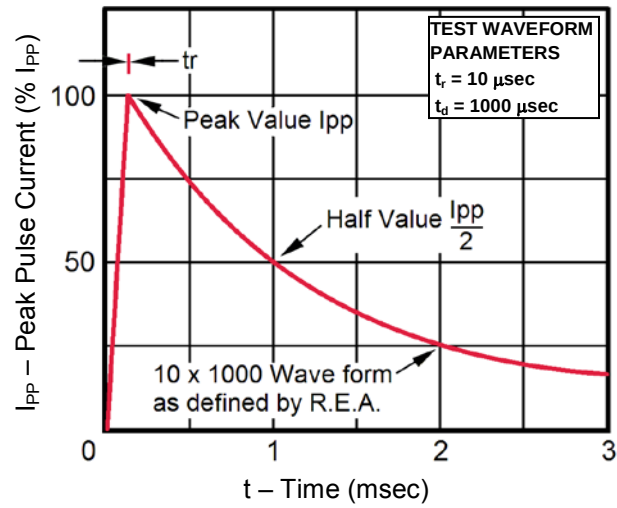
\*See [Figure 3](#). For the MSMBJSAC75, the maximum clamping voltage  $V_C$  is at the maximum rated Peak Pulse Current ( $I_{PP}$ ) of 4.1 Amps.

**Clamping Factor:** The ratio of the numerical value of  $V_C$  to  $V_{(BR)}$  is typically 1.4 @ full rated power, 1.20 @ 50% rated power. Also see [MicroNote 108](#).

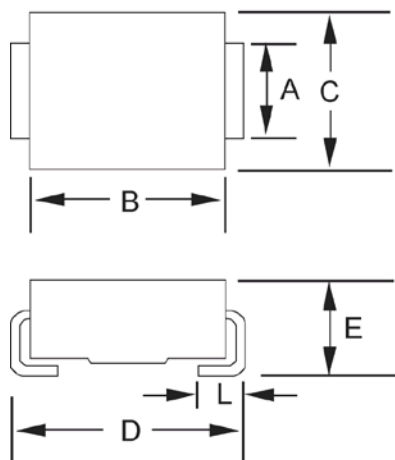
**Note 1:** A Transient Voltage Suppressor is normally selected according to voltage ( $V_{WM}$ ), which should be equal to or greater than the dc or continuous peak operating voltage level.

**Note 2:** Test in TVS avalanche direction. Do not pulse in "forward" direction. See section for [Application Schematics](#) herein.

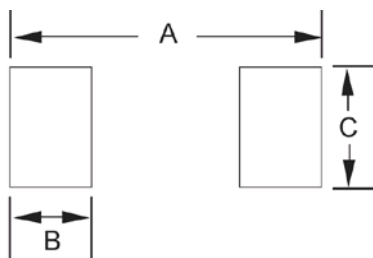
**GRAPHS**


**GRAPHS (continued)**


**Figure 3**  
Peak Pulse Current vs Time

**PACKAGE DIMENSIONS**

**SMBJ (DO-214AA)**

| Ltr | Dimensions |       |             |      |
|-----|------------|-------|-------------|------|
|     | Inch       |       | Millimeters |      |
|     | Min        | Max   | Min         | Max  |
| A   | 0.077      | 0.083 | 1.96        | 2.10 |
| B   | 0.160      | 0.180 | 4.06        | 4.57 |
| C   | 0.130      | 0.155 | 3.30        | 3.94 |
| D   | 0.205      | 0.220 | 5.21        | 5.59 |
| E   | 0.077      | 0.104 | 1.95        | 2.65 |
| L   | 0.030      | 0.060 | 0.76        | 1.52 |

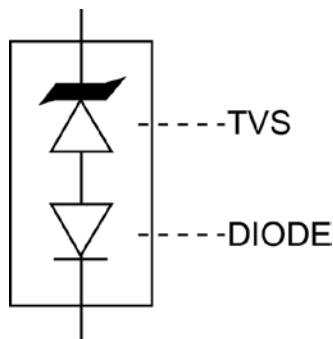
**PAD LAYOUT**


| SMBJ (DO-214AA) |       |             |
|-----------------|-------|-------------|
| Ltr             | Inch  | Millimeters |
| A               | 0.260 | 6.60        |
| B               | 0.085 | 2.16        |
| C               | 0.110 | 2.79        |

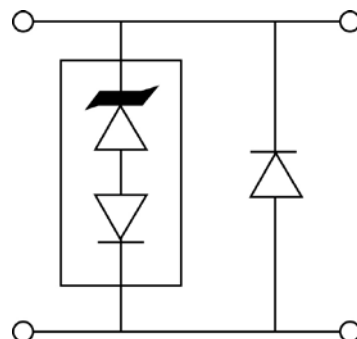
See applications schematics on next page.

**APPLICATION SCHEMATICS**

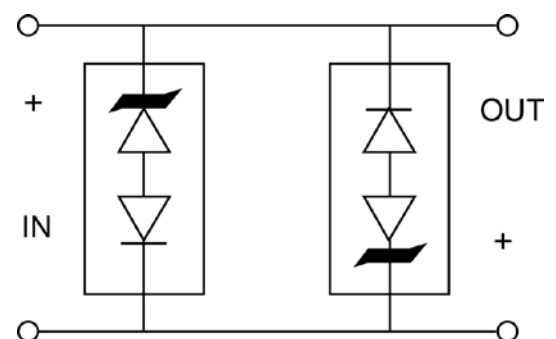
The TVS low capacitance device configuration is shown in Figure 4. As a further option for unidirectional applications, an additional low capacitance rectifier diode may be used in parallel in the same polarity direction as the TVS as shown in Figure 5. In applications where random high voltage transients occur, this will prevent reverse transients from damaging the internal low capacitance rectifier diode and also provide a low voltage conducting direction. The added rectifier diode should be of similar low capacitance and also have a higher reverse voltage rating than the TVS clamping voltage  $V_C$ . The Microsemi recommended rectifier part number is the "[SMBJLCR60](#)" for the application in Figure 5. If using two (2) low capacitance TVS devices in anti-parallel for bidirectional applications, this added protective feature for both directions (including the reverse of each rectifier diode) is also provided. The unidirectional and bidirectional configurations in Figure 5 and 6 will both result in twice the capacitance of Figure 4.



**Figure 4**  
TVS with internal  
Low capacitance diode



**Figure 5**  
Optional Unidirectional  
configuration (TVS and  
separate rectifier diode  
in parallel)



**Figure 6**  
Optional Bidirectional  
configuration (two TVS  
devices in anti-parallel)



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