



## 600 Watt Surface Mount Transient Voltage Suppressor

Screening in  
reference to  
MIL-PRF-19500  
available

### DESCRIPTION

The MSMB 5.0A – MSMB 170CA series of surface mount 600 watt transient voltage suppressors provide a selection of standoff voltages ( $V_{wm}$ ) from 5.0 to 170 V. These high-reliability devices are available in either unidirectional or bidirectional versions. The SMBG Gull-wing design in the DO-215AA package is ideal for visible solder connections. The SMBJ J-bend design in the DO-214AA package allows for greater PC board mounting density. It is available with SnPb or RoHS compliant matte-tin plating.

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

### FEATURES

- High reliability devices with wafer fabrication and assembly lot traceability.
- All devices 100% surge tested.
- Enhanced reliability screening in reference to MIL-PRF-19500 is also available. Refer to [High Reliability Up-Screened Plastic Products Portfolio](#) for more details on the screening options.  
(See [part nomenclature](#) for all options.)
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B.
- 3 $\sigma$  lot norm screening performed on standby current ( $I_D$ ).
- RoHS compliant versions available.



**DO-215AA  
Gull-wing Package**



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

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

### APPLICATIONS / BENEFITS

- Protects sensitive components such as IC's, CMOS, Bipolar, BiCMOS, ECL, DTL, T2L, etc.
- Protection from switching transients & RF induced voltage pulses.
- Protection from ESD and EFT per IEC 61000-4-2 and IEC 61000-4-4.
- Secondary lightning protection per IEC61000-4-5 with 42 ohms source impedance:
  - Class 1: MSB 5.0A to MSMB 120CA
  - Class 2: MSMB 5.0A to MSMB 60CA
  - Class 3: MSMB 5.0A to MSMB 30CA
  - Class 4: MSMB 5.0A to MSMB 15CA
- Secondary lightning protection per IEC61000-4-5 with 12 ohms source impedance:
  - Class 1: MSMB 5.0A to MSMB 36CA
  - Class 2: MSMB 5.0A to MSMB 18CA

Also available in:

 **Commercial Grade**  
[SMBJ5.0A – SMBJ170CAe3](#)

 **T-18 package**  
(axial-leaded)  
[P6KE6.8A – P6KE200CAe3](#)

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

| Parameters/Test Conditions                             | Symbol              | Value       | Unit   |
|--|---------------------|-------------|--------|
| Junction and Storage Temperature                       | $T_J$ and $T_{STG}$ | -65 to +150 | °C     |
| Thermal Resistance, Junction to Lead                   | $R_{\theta JL}$     | 25          | °C/W   |
| Thermal Resistance, Junction to Ambient <sup>(1)</sup> | $R_{\theta JA}$     | 90          | °C/W   |
| Peak Pulse Power Dissipation <sup>(2)</sup> 10/1000us  | $P_{PP}$            | 600         | W      |
| Rated Average Power Dissipation <sup>(1)</sup>         | @ $T_L \leq 25$ °C  | 5           | W      |
|  | @ $T_A = 25$ °C     | 1.38        |        |
| $T_{clamping}$ (0 volts to $V_{(BR)}$ min)             | Unidirectional      | < 100       | ps     |
|  | Bidirectional       | < 5         | ns     |
| Forward Surge Current <sup>(3)</sup>                   | $I_{FS}$            | 100         | A (pk) |
| Solder Temperature @ 10 s                              | $T_{SP}$            | 260         | °C     |

- Notes:**
1. When mounted on FR4 PC board (1oz Cu) with recommended footprint (see [pad layout](#) on last page).
  2. With impulse repetition rate (duty factor) of 0.01 % or less (also [Figure 1 and 4](#)).
  3. Peak impulse of 8.3 ms half-sine wave (unidirectional only).

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**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   |
|------------|--|
| $V_{WM}$   | Working Peak (Standoff) Voltage - The maximum peak voltage that can be applied over the operating temperature range. This is also referred to as standoff voltage. |
| $P_{PP}$   | Peak Pulse Power - Rated random recurring peak impulse power dissipation.  |
| $V_{(BR)}$ | Breakdown Voltage - The minimum voltage the device will exhibit at a specified current.  |
| $I_D$      | Standby Current - The current at the rated standoff voltage ( $V_{WM}$ ).  |
| $I_{PP}$   | Peak Pulse Current - The peak current during the impulse.  |
| $V_C$      | Clamping Voltage - Clamping voltage at $I_{PP}$ (peak pulse current) at the specified pulse conditions (typically shown as maximum value).                         |
| $I_{BR}$   | Breakdown Current – The current used for measuring breakdown voltage $V_{(BR)}$ .  |

**ELECTRICAL CHARACTERISTICS @ 25 °C**

| PART NUMBER |           | REVERSE<br>STAND-OFF<br>VOLTAGE<br>VWM | BREAKDOWN VOLTAGE |               | MAXIMUM<br>CLAMPING<br>VOLTAGE<br>VC @ IPP | PEAK PULSE<br>CURRENT<br>(see Fig. 2)<br>IPP | MAXIMUM<br>STANDBY<br>CURRENT<br>ID @ VWM |
|-------------|-----------|--|-------------------|---------------|--|--|---|
| Gull-Wing   | J-Bend    | V                                      | V (BR)            | @ I(BR)<br>mA | V  | A  | µA  |
| MSMBG5.0A   | MSMBJ5.0A | 5                                      | 6.40 – 7.00       | 10            | 9.2  | 65.2   | 800                                       |
| MSMBG6.0A   | MSMBJ6.0A | 6                                      | 6.67 – 7.37       | 10            | 10.3                                       | 58.3   | 800                                       |
| MSMBG6.5A   | MSMBJ6.5A | 6.5                                    | 7.22 – 7.98       | 10            | 11.2                                       | 53.6   | 500                                       |
| MSMBG7.0A   | MSMBJ7.0A | 7                                      | 7.78 – 8.60       | 10            | 12   | 50   | 200                                       |
| MSMBG7.5A   | MSMBJ7.5A | 7.5                                    | 8.33 – 9.21       | 1             | 12.9                                       | 46.5   | 100                                       |
| MSMBG8.0A   | MSMBJ8.0A | 8                                      | 8.89 – 9.83       | 1             | 13.6                                       | 44.1   | 50  |
| MSMBG8.5A   | MSMBJ8.5A | 8.5                                    | 9.44 – 10.4       | 1             | 14.4                                       | 41.7   | 10  |
| MSMBG9.0A   | MSMBJ9.0A | 9                                      | 10.0 – 11.1       | 1             | 15.4                                       | 39   | 5   |
| MSMBG10A    | MSMBJ10A  | 10                                     | 11.1 – 12.3       | 1             | 17   | 35.3   | 5   |
| MSMBG11A    | MSMBJ11A  | 11                                     | 12.2 – 13.5       | 1             | 18.2                                       | 33   | 5   |
| MSMBG12A    | MSMBJ12A  | 12                                     | 13.3 – 14.7       | 1             | 19.9                                       | 30.2   | 5   |
| MSMBG13A    | MSMBJ13A  | 13                                     | 14.4 – 15.9       | 1             | 21.5                                       | 27.9   | 1   |
| MSMBG14A    | MSMBJ14A  | 14                                     | 15.6 – 17.2       | 1             | 23.2                                       | 25.8   | 1   |
| MSMBG15A    | MSMBJ15A  | 15                                     | 16.7 – 18.5       | 1             | 24.4                                       | 24   | 1   |
| MSMBG16A    | MSMBJ16A  | 16                                     | 17.8 – 19.7       | 1             | 26   | 23.1   | 1   |
| MSMBG17A    | MSMBJ17A  | 17                                     | 18.9 – 20.9       | 1             | 27.6                                       | 21.7   | 1   |
| MSMBG18A    | MSMBJ18A  | 18                                     | 20.0 – 22.1       | 1             | 29.2                                       | 20.5   | 1   |
| MSMBG20A    | MSMBJ20A  | 20                                     | 22.2 – 24.5       | 1             | 32.4                                       | 18.5   | 1   |
| MSMBG22A    | MSMBJ22A  | 22                                     | 24.4 – 26.9       | 1             | 35.5                                       | 16.9   | 1   |
| MSMBG24A    | MSMBJ24A  | 24                                     | 26.7 – 29.5       | 1             | 38.9                                       | 15.4   | 1   |
| MSMBG26A    | MSMBJ26A  | 26                                     | 28.9 – 31.9       | 1             | 42.1                                       | 14.2   | 1   |
| MSMBG28A    | MSMBJ28A  | 28                                     | 31.1 – 34.4       | 1             | 45.4                                       | 13.2   | 1   |
| MSMBG30A    | MSMBJ30A  | 30                                     | 33.3 – 36.8       | 1             | 48.4                                       | 12.4   | 1   |
| MSMBG33A    | MSMBJ33A  | 33                                     | 36.7 – 40.6       | 1             | 53.3                                       | 11.3   | 1   |
| MSMBG36A    | MSMBJ36A  | 36                                     | 40.0 – 44.2       | 1             | 58.1                                       | 10.3   | 1   |
| MSMBG40A    | MSMBJ40A  | 40                                     | 44.4 – 49.1       | 1             | 64.5                                       | 9.3  | 1   |
| MSMBG43A    | MSMBJ43A  | 43                                     | 47.8 – 52.8       | 1             | 69.4                                       | 8.6  | 1   |
| MSMBG45A    | MSMBJ45A  | 45                                     | 50.0 – 55.3       | 1             | 72.7                                       | 8.3  | 1   |
| MSMBG48A    | MSMBJ48A  | 48                                     | 53.3 – 58.9       | 1             | 77.4                                       | 7.7  | 1   |
| MSMBG51A    | MSMBJ51A  | 51                                     | 56.7 – 62.7       | 1             | 82.4                                       | 7.3  | 1   |
| MSMBG54A    | MSMBJ54A  | 54                                     | 60.0 – 66.3       | 1             | 87.1                                       | 6.9  | 1   |
| MSMBG58A    | MSMBJ58A  | 58                                     | 64.4 – 71.2       | 1             | 93.6                                       | 6.4  | 1   |
| MSMBG60A    | MSMBJ60A  | 60                                     | 66.7 – 73.7       | 1             | 96.8                                       | 6.2  | 1   |
| MSMBG64A    | MSMBJ64A  | 64                                     | 71.1 – 78.6       | 1             | 103  | 5.8  | 1   |
| MSMBG70A    | MSMBJ70A  | 70                                     | 77.8 – 86.0       | 1             | 113  | 5.3  | 1   |
| MSMBG75A    | MSMBJ75A  | 75                                     | 83.3 – 92.1       | 1             | 121  | 4.9  | 1   |
| MSMBG78A    | MSMBJ78A  | 78                                     | 86.7 – 95.8       | 1             | 126  | 4.7  | 1   |
| MSMBG85A    | MSMBJ85A  | 85                                     | 94.4 – 104        | 1             | 137  | 4.4  | 1   |
| MSMBG90A    | MSMBJ90A  | 90                                     | 100 – 111         | 1             | 146  | 4.1  | 1   |
| MSMBG100A   | MSMBJ100A | 100                                    | 111 – 123         | 1             | 162  | 3.7  | 1   |
| MSMBG110A   | MSMBJ110A | 110                                    | 122 – 135         | 1             | 177  | 3.4  | 1   |
| MSMBG120A   | MSMBJ120A | 120                                    | 133 – 147         | 1             | 193  | 3.1  | 1   |
| MSMBG130A   | MSMBJ130A | 130                                    | 144 – 159         | 1             | 209  | 2.9  | 1   |
| MSMBG150A   | MSMBJ150A | 150                                    | 167 – 185         | 1             | 243  | 2.5  | 1   |
| MSMBG160A   | MSMBJ160A | 160                                    | 178 – 197         | 1             | 259  | 2.3  | 1   |
| MSMBG170A   | MSMBJ170A | 170                                    | 189 – 209         | 1             | 275  | 2.2  | 1   |

GRAPHS



**FIGURE 1**  
Peak Pulse Power vs Pulse Time



Test waveform parameters:  $t_r=10 \mu s$ ,  $t_p=1000 \mu s$

**FIGURE 2**  
Pulse Waveform for 10/1000 Exponential Surge

**GRAPHS (continued)**


**FIGURE 3**  
Derating Curve



**FIGURE 4**  
Typical Capacitance vs. Breakdown Voltage  
NOTE: Bidirectional capacitance is half that shown at zero volts.

**PACKAGE DIMENSIONS**

**SMBG (DO-215AA)**

| Ltr      | Dimensions |      |             |      |
|----------|------------|------|-------------|------|
|          | Inch       |      | Millimeters |      |
|          | Min        | Max  | Min         | Max  |
| <b>A</b> | .077       | .083 | 1.96        | 2.10 |
| <b>B</b> | .160       | .180 | 4.06        | 4.57 |
| <b>C</b> | .130       | .155 | 3.30        | 3.94 |
| <b>E</b> | .077       | .104 | 1.95        | 2.65 |
| <b>F</b> | .235       | .255 | 5.97        | 6.48 |
| <b>K</b> | .015       | .030 | .381        | .762 |


**SMBJ (DO-214AA)**

| Ltr      | Dimensions |      |             |      |
|----------|------------|------|-------------|------|
|          | Inch       |      | Millimeters |      |
|          | Min        | Max  | Min         | Max  |
| <b>A</b> | .077       | .083 | 1.96        | 2.10 |
| <b>B</b> | .160       | .180 | 4.06        | 4.57 |
| <b>C</b> | .130       | .155 | 3.30        | 3.94 |
| <b>D</b> | .205       | .220 | 5.21        | 5.59 |
| <b>E</b> | .077       | .104 | 1.95        | 2.65 |
| <b>L</b> | .030       | .060 | .760        | 1.52 |

See pad layout on next page.

**PAD LAYOUT**


| <b>SMBG (DO-215AA)</b> |             |                    |
|------------------------|-------------|--------------------|
| <b>Ltr</b>             | <b>Inch</b> | <b>Millimeters</b> |
| <b>A</b>               | 0.320       | 8.13               |
| <b>B</b>               | 0.085       | 2.16               |
| <b>C</b>               | 0.110       | 2.79               |

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