



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 σ 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 ⁽¹⁾ | $R_{\theta JA}$ | 90 | °C/W |
| Peak Pulse Power Dissipation ⁽²⁾ 10/1000us | P_{PP} | 600 | W |
| Rated Average Power Dissipation ⁽¹⁾ | @ $T_L \leq 25$ °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 ⁽³⁾ | 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 STAND-OFF VOLTAGE VWM | BREAKDOWN VOLTAGE | | MAXIMUM CLAMPING VOLTAGE VC @ IPP | PEAK PULSE CURRENT (see Fig. 2) IPP | MAXIMUM STANDBY CURRENT ID @ VWM |
|-------------|-----------|--|-------------------|---------------|--|--|---|
| Gull-Wing | J-Bend | V | V (BR) | @ I(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 |
| A | .077 | .083 | 1.96 | 2.10 |
| B | .160 | .180 | 4.06 | 4.57 |
| C | .130 | .155 | 3.30 | 3.94 |
| E | .077 | .104 | 1.95 | 2.65 |
| F | .235 | .255 | 5.97 | 6.48 |
| K | .015 | .030 | .381 | .762 |


SMBJ (DO-214AA)

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

See pad layout on next page.

PAD LAYOUT


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

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