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SMBJ5.0 thru SMBJ170A, CA, e3 and SMBG5.0 thru SMBG170A, CA, e3

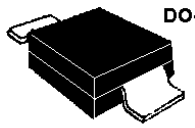
SURFACE MOUNT 600 Watt Transient Voltage Suppressor

DESCRIPTION

This SMBJ5.0-170A or SMBG5.0-170A series of surface mount 600 W Transient Voltage Suppressors (TVSs) protects a variety of voltage-sensitive components from destruction or degradation. It is available in J-bend design (SMBJ) with the DO-214AA package for greater PC board mounting density or in a Gull-wing design (SMBG) in the DO-215AA for visible solder connections. It is also available in both unidirectional and bidirectional configurations with a C or CA suffix part number as well as RoHS Compliant with an e3 suffix. Their response time is virtually instantaneous. As a result, they can be used for protection from ESD or EFT per IEC61000-4-2 and IEC61000-4-4, or for inductive switching environments and induced RF protection. They can also protect from secondary lightning effects per IEC61000-4-5 and class levels defined herein. Microsemi also offers numerous other TVS products to meet higher and lower power demands and special applications.

IMPORTANT: For the most current data, consult *MICROSEMI's* website: http://www.microsemi.com

APPEARANCE





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

FEATURES

- Available in both unidirectional and bidirectional construction (add C or CA suffix for bidirectional)
- Selections for 5.0 to 170 volts standoff voltages (V_{WM})
- Optional 100% **screening for avionics grade** is available by adding MA prefix to part number for 100% temperature cycle -55°C to +125°C (10X) as well as surge (3X) and 24 hours HTRB with post test V_Z & I_R (in operating direction for unidirectional or both directions for bidirectional)
- Options for screening in accordance with MIL-PRF-19500 for JANTX are available by adding MX prefix to the part number.
- Axial-lead equivalent packages for thru-hole mounting available as P6KE6.8 to P6KE200CA (consult factory for other surface mount options)
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B
- RoHS compliant devices available by adding an "e3" suffix

APPLICATIONS / BENEFITS

- Economical surface mount design in both J-bend or Gull-wing terminations
- Protects sensitive components such as IC's, CMOS, Bipolar, BiCMOS, ECL, DTL, T^2L, etc.
- Protection from switching transients & induced RF
- Compliant to IEC61000-4-2 and IEC61000-4-4 for ESD and EFT protection respectively
- Secondary lightning protection per IEC61000-4-5 with 42 Ohms source impedance:
  - Class 1: SMB 5.0 to SMB 120A or CA
  - Class 2: SMB 5.0 to SMB 60A or CA
  - Class 3: SMB 5.0 to SMB 30A or CA
  - Class 4: SMB 5.0 to SMB 15A or CA
- Secondary lightning protection per IEC61000-4-5 with 12 Ohms source impedance:
  - Class 1: SMB 5.0 to SMB 36A or CA
  - Class 2: SMB 5.0 to SMB 18A or CA

MAXIMUM RATINGS

- Peak Pulse Power dissipation at 25°C: 600 watts at 10/1000 µs (also see Fig 1,2, and 3).
- Impulse repetition rate (duty factor): 0.01%
- $t_{clamping}$ (0 volts to $V_{(BR)}$ min.): < 100 ps theoretical for unidirectional and < 5 ns for bidirectional
- Operating and Storage temperature: -65°C to +150°C
- Thermal resistance: 25°C/W junction to lead, or 90°C/W junction to ambient when mounted on FR4 PC board (1oz Cu) with recommended footprint (see last page)
- Steady-State Power dissipation: 5 watts at T_L = 25°C, or 1.38 watts at T_A = 25°C when mounted on FR4 PC board with recommended footprint
- Forward Surge at 25ºC: 100 Amps peak impulse of 8.3 ms half-sine wave (unidirectional only)
- Solder temperatures: 260°C for 10 s (maximum)

MECHANICAL AND PACKAGING

- CASE: Void-free transfer molded thermosetting epoxy body meeting UL94V-0
- TERMINALS: Gull-wing or C-bend (modified J-bend) tin-lead or RoHS compliant annealed matte-tin plating solderable per MIL-STD-750, method 2026
- POLARITY: Cathode indicated by band. No marking on bi-directional devices
- MARKING: Part number without standard prefix (e.g. 5.0, 5.0A, 5.0CA, 5.0Ae3, 36, MX36A, 36CAe3, etc.)
- TAPE & REEL option: Standard per EIA-481-1-A with 12 mm tape, 750 per 7 inch reel or 2500 per 13 inch reel (add "TR" suffix to part number)
- WEIGHT: 0.1 grams
- See package dimension on last page

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ELECTRICAL CHARACTERISTICS @ 25°C

MICROSEMI PART NUMBER		REVERSE STAND-OFF VOLTAGE V_{WM}	BREAKDOWN VOLTAGE $V_{(BR)}$ @ $I_{(BR)}$ Volts		MAXIMUM CLAMPING VOLTAGE @ I_{PP}	PEAK PULSE CURRENT (See Fig. 2) I_{PP}	MAXIMUM STANDBY CURRENT @ V_{WM} I_D
GULL-WING LEAD	MODIFIED "J" BEND LEAD	Volts	MIN. MAX.	$I_{(BR)}$ mA	Volts	Amps	µA
SMBG5.0	SMBJ5.0	5.0	6.40 – 7.30	10	9.6	62.5	800
SMBG5.0A	SMBJ5.0A	5.0	6.40 – 7.00	10	9.2	65.2	800
SMBG6.0	SMBJ6.0	6.0	6.67 – 8.15	10	11.4	52.6	800
SMBG6.0A	SMBJ6.0A	6.0	6.67 – 7.37	10	10.3	58.3	800
SMBG6.5	SMBJ6.5	6.5	7.22 – 8.82	10	12.3	48.7	500
SMBG6.5A	SMBJ6.5A	6.5	7.22 – 7.98	10	11.2	53.6	500
SMBG7.0	SMBJ7.0	7.0	7.78 – 9.51	10	13.3	45.1	200
SMBG7.0A	SMBJ7.0A	7.0	7.78 – 8.60	10	12.0	50.0	200
SMBG7.5	SMBJ7.5	7.5	8.33 – 10.2	1	14.3	42.0	100
SMBG7.5A	SMBJ7.5A	7.5	8.33 – 9.21	1	12.9	46.5	100
SMBG8.0	SMBJ8.0	8.0	8.89 – 10.9	1	15.0	40.0	50
SMBG8.0A	SMBJ8.0A	8.0	8.89 – 9.83	1	13.6	44.1	50
SMBG8.5	SMBJ8.5	8.5	9.44 – 11.5	1	15.9	37.7	10
SMBG8.5A	SMBJ8.5A	8.5	9.44 – 10.4	1	14.4	41.7	10
SMBG9.0	SMBJ9.0	9.0	10.0 – 12.2	1	16.9	35.5	5
SMBG9.0A	SMBJ9.0A	9.0	10.0 – 11.1	1	15.4	39.0	5
SMBG10	SMBJ10	10	11.1 – 13.6	1	18.8	31.9	5
SMBG10A	SMBJ10A	10	11.1 – 12.3	1	17.0	35.3	5
SMBG11	SMBJ11	11	12.2 – 14.9	1	20.1	29.9	5
SMBG11A	SMBJ11A	11	12.2 – 13.5	1	18.2	33.0	5
SMBG12	SMBJ12	12	13.3 – 16.3	1	22.0	27.3	5
SMBG12A	SMBJ12A	12	13.3 – 14.7	1	19.9	30.2	5
SMBG13	SMBJ13	13	14.4 – 17.6	1	23.8	25.2	1
SMBG13A	SMBJ13A	13	14.4 – 15.9	1	21.5	27.9	1
SMBG14	SMBJ14	14	15.6 – 19.1	1	25.8	23.3	1
SMBG14A	SMBJ14A	14	15.6 – 17.2	1	23.2	25.8	1
SMBG15	SMBJ15	15	16.7 – 20.4	1	26.9	22.3	1
SMBG15A	SMBJ15A	15	16.7 – 18.5	1	24.4	24.0	1
SMBG16	SMBJ16	16	17.8 – 21.8	1	28.8	20.8	1
SMBG16A	SMBJ16A	16	17.8 – 19.7	1	26.0	23.1	1
SMBG17	SMBJ17	17	18.9 – 23.1	1	30.5	19.7	1
SMBG17A	SMBJ17A	17	18.9 – 20.9	1	27.6	21.7	1
SMBG18	SMBJ18	18	20.0 – 24.4	1	32.2	18.6	1
SMBG18A	SMBJ18A	18	20.0 – 22.1	1	29.2	20.5	1
SMBG20	SMBJ20	20	22.2 – 27.1	1	35.8	16.7	1
SMBG20A	SMBJ20A	20	22.2 – 24.5	1	32.4	18.5	1
SMBG22	SMBJ22	22	24.4 – 29.8	1	39.4	15.2	1
SMBG22A	SMBJ22A	22	24.4 – 26.9	1	35.5	16.9	1
SMBG24	SMBJ24	24	26.7 – 32.6	1	43.0	14.0	1
SMBG24A	SMBJ24A	24	26.7 – 29.5	1	38.9	15.4	1
SMBG26	SMBJ26	26	28.9 – 35.3	1	46.6	12.4	1
SMBG26A	SMBJ26A	26	28.9 – 31.9	1	42.1	14.2	1
SMBG28	SMBJ28	28	31.1 – 38.0	1	50.0	12.0	1
SMBG28A	SMBJ28A	28	31.1 – 34.4	1	45.4	13.2	1
SMBG30	SMBJ30	30	33.3 – 40.7	1	53.5	11.2	1
SMBG30A	SMBJ30A	30	33.3 – 36.8	1	48.4	12.4	1
SMBG33	SMBJ33	33	36.7 – 44.9	1	59.0	10.2	1
SMBG33A	SMBJ33A	33	36.7 – 40.6	1	53.3	11.3	1
SMBG36	SMBJ36	36	40.0 – 48.9	1	64.3	9.3	1
SMBG36A	SMBJ36A	36	40.0 – 44.2	1	58.1	10.3	1
SMBG40	SMBJ40	40	44.4 – 54.3	1	71.4	8.4	1
SMBG40A	SMBJ40A	40	44.4 – 49.1	1	64.5	9.3	1
SMBG43	SMBJ43	43	47.8 – 58.4	1	76.7	7.8	1
SMBG43A	SMBJ43A	43	47.8 – 52.8	1	69.4	8.6	1
SMBG45	SMBJ45	45	50.0 – 61.1	1	80.3	7.5	1
SMBG45A	SMBJ45A	45	50.0 – 55.3	1	72.7	8.3	1

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MICROSEMI PART NUMBER		REVERSE STAND-OFF VOLTAGE V_{WM}	BREAKDOWN VOLTAGE $V_{(BR)}$ @ $I_{(BR)}$ Volts		MAXIMUM CLAMPING VOLTAGE @ I_{PP}	PEAK PULSE CURRENT (See Fig. 2) I_{PP}	MAXIMUM STANDBY CURRENT @ V_{WM} I_D
GULL-WING LEAD	MODIFIED "J" BEND LEAD	Volts	MIN. MAX.	$I_{(BR)}$ mA	Volts	Amps	µA
SMBG48	SMBJ48	48	53.3 – 65.1	1	85.5	7.0	1
SMBG48A	SMBJ48A	48	53.3 – 58.9	1	77.4	7.7	1
SMBG51	SMBJ51	51	56.7 – 69.3	1	91.1	6.6	1
SMBG51A	SMBJ51A	51	56.7 – 62.7	1	82.4	7.3	1
SMBG54	SMBJ54	54	60.0 – 73.3	1	96.3	6.2	1
SMBG54A	SMBJ54A	54	60.0 – 66.3	1	87.1	6.9	1
SMBG58	SMBJ58	58	64.4 – 78.7	1	103	5.8	1
SMBG58A	SMBJ58A	58	64.4 – 71.2	1	93.6	6.4	1
SMBG60	SMBJ60	60	66.7 – 81.5	1	107	5.6	1
SMBG60A	SMBJ60A	60	66.7 – 73.7	1	96.8	6.2	1
SMBG64	SMBJ64	64	71.1 – 86.9	1	114	5.3	1
SMBG64A	SMBJ64A	64	71.1 – 78.6	1	103	5.8	1
SMBG70	SMBJ70	70	77.8 – 95.1	1	125	4.8	1
SMBG70A	SMBJ70A	70	77.8 – 86.0	1	113	5.3	1
SMBG75	SMBJ75	75	83.3 – 102	1	134	4.5	1
SMBG75A	SMBJ75A	75	83.3 – 92.1	1	121	4.9	1
SMBG78	SMBJ78	78	86.7 – 106	1	139	4.3	1
SMBG78A	SMBJ78A	78	86.7 – 95.8	1	126	4.7	1
SMBG85	SMBJ85	85	94.4 – 115	1	151	3.9	1
SMBG85A	SMBJ85A	85	94.4 – 104	1	137	4.4	1
SMBG90	SMBJ90	90	100 – 122	1	160	3.8	1
SMBG90A	SMBJ90A	90	100 – 111	1	146	4.1	1
SMBG100	SMBJ100	100	111 – 136	1	179	3.4	1
SMBG100A	SMBJ100A	100	111 – 123	1	162	3.7	1
SMBG110	SMBJ110	110	122 – 149	1	196	3.0	1
SMBG110A	SMBJ110A	110	122 – 135	1	177	3.4	1
SMBG120	SMBJ120	120	133 – 163	1	214	2.8	1
SMBG120A	SMBJ120A	120	133 – 147	1	193	3.1	1
SMBG130	SMBJ130	130	144 – 176	1	231	2.6	1
SMBG130A	SMBJ130A	130	144 – 159	1	209	2.9	1
SMBG150	SMBJ150	150	167 – 204	1	268	2.2	1
SMBG150A	SMBJ150A	150	167 – 185	1	243	2.5	1
SMBG160	SMBJ160	160	178 – 218	1	287	2.1	1
SMBG160A	SMBJ160A	160	178 – 197	1	259	2.3	1
SMBG170	SMBJ170	170	189 – 231	1	304	2.0	1
SMBG170A	SMBJ170A	170	189 – 209	1	275	2.2	1

- For Bidirectional device types indicate a C or CA suffix after the part number. (i.e.: SMBG170CA or SMBJ170C). Bidirectional capacitance is half that shown in figure 4 at zero volts.
- Microsemi Corp's SMB series (600 W) surface mountable packages are designed specifically for transient voltage suppression. The wide leads assure a large surface contact for good heat dissipation, and a low resistance path for surge current flow to ground. These high speed transient voltage suppressors can be used to effectively protect sensitive components such as integrated circuits and MOS devices.

SYMBOLS & DEFINITIONS

Symbol	Definition	Symbol	Definition
V_{WM}	Working Peak (Standoff) Voltage	I_{PP}	Peak Pulse Current
P_{PP}	Peak Pulse Power	V_C	Clamping Voltage
$V_{(BR)}$	Breakdown Voltage	$I_{(BR)}$	Breakdown Current for $V_{(BR)}$
I_D	Standby Current		

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GRAPHS

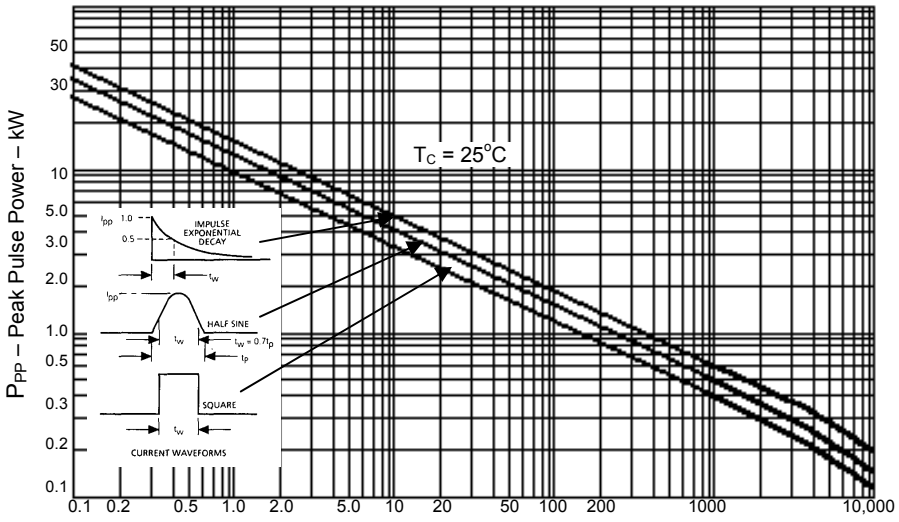
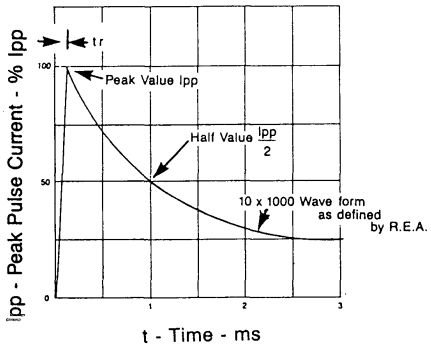


FIGURE 1
Peak Pulse Power vs. Pulse Time



Test waveform parameters: tr=10 µs, tw=1000 µs

FIGURE 2
Pulse Waveform for Exponential Surge

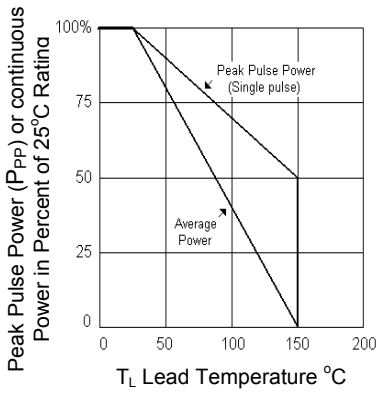


FIGURE 3 - Derating Curve

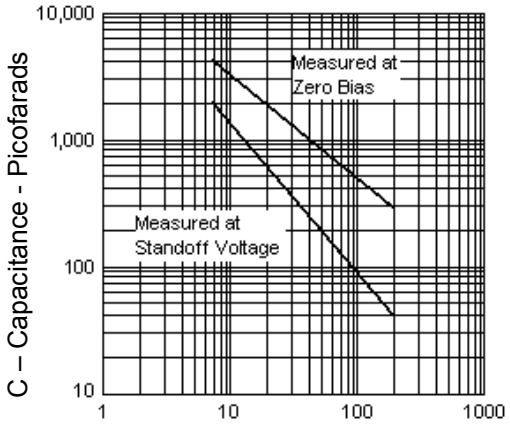
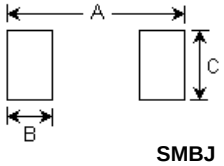


FIGURE 4
Typical Capacitance vs Breakdown Voltage

PAD LAYOUT



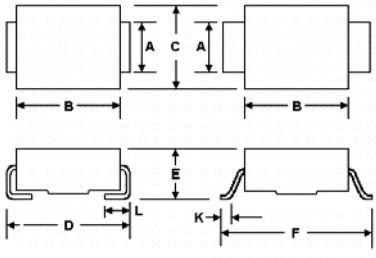
SMBJ

	INCHES	mm
A	.260	6.60
B	.085	2.16
C	.110	2.79

SMBG

	INCHES	mm
A	0.320	8.13
B	0.085	2.16
C	0.110	2.79

PACKAGE DIMENSIONS



	A	B	C	D	E	F	K	L
MIN	.077	.160	.130	.205	.077	.235	.015	.030
MAX	.083	.180	.155	.220	.104	.255	.030	.060
DIMENSIONS IN MILLIMETERS								
MIN	1.96	4.06	3.30	5.21	1.95	5.97	.381	.760
MAX	2.10	4.57	3.94	5.59	2.65	6.48	.762	1.520

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