600 Watt Surface Mount Transient Voltage Suppressor

MSMBG5.0A – MXLSMBG170CAe3, MSMBJ5.0A – MXLSMBJ170CAe3

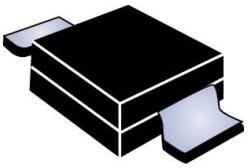
Product Overview

The MSMB 5.0A through MSMB 170CA series of surface mount 600 watt transient voltage suppressors provide a selection of stand-off voltages (V_{WM}) from 5.0 to 170V. 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. These are available with a variety of upscreening options for enhanced reliability. They can protect against the secondary effects of lightning per IEC61000-4-5 and against voltage pulses from inductive switching environments and induced by RF radiation. Since their response time is virtually instantaneous, they can also be used in protection from ESD and EFT per IEC61000-4-2 and IEC61000-4-4.

Features

- High reliability devices with wafer fabrication and assembly lot traceability for all M prefix devices.
- 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.)
- Suppress transients up to 600W at 10/1000 µs (see Figure 4-1)
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020F for all M prefix devices.
- Axial-lead equivalent packages for thru-hole mounting are available as P6KE6.8A - P6KE200CAe3 (contact Microchip for other surface mount options.)
- 3σ lot norm screening performed on standby current (I_D) for all M prefix devices
- RoHS compliant versions available

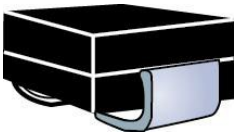
Figure 1. DO-215AA Gull-wing Package



Applications/Benefits

- High-reliability devices
- Available in working stand-off voltage range 5.0–170V
- Protects sensitive components such as IC's, CMOS, Bipolar, BiCMOS, ECL, DTL, T2L, and so on
- Protection from switching transients and 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

Figure 2. DO-214AA J-bend Package



All SMB series are equivalent to prior SMS package identifications.

Also available in:

Commercial Grade: SMBJ5.0A – SMBJ170CAe3

T-18 Package (Axial-Leaded): P6KE6.8A – P6KE200CAe3

Table of Contents

1. Maximum Ratings

Table 1-1. Maximum Ratings at 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]	10/1000 µs	P_{PP}	600	W
Average power dissipation[1]	at $T_L \leq 25$ °C at $T_A = 25$ °C	$P_{M(AV)}$	5 1.38	W
$T_{clamping}$ (0 volts to $V_{(BR)}$ min)	Unidirectional Bidirectional	—	< 100 < 5	Ps ns
Forward surge current[3]		I_{FS}	100	A (pk)
Solder temperature at 10 s		T_{SP}	260	°C

Notes:

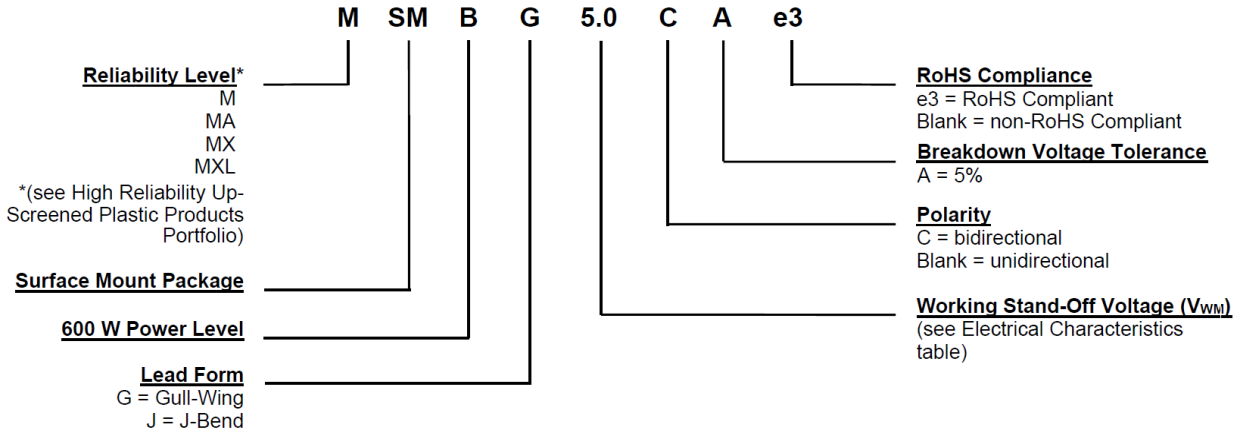
1. When mounted on FR4 PC board (1 oz Cu) with recommended footprint (see Pad Layout)
2. With impulse repetition rate (duty factor) of 0.01% or less (also Figure 4-1, Figure 4-2, and Figure 4-3)
3. Peak impulse of 8.3 ms half-sine wave (unidirectional only)

1.1 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: Reliability level, part number, date code
- Polarity: Cathode indicated by band. No cathode band on bi-directional devices.
- Tape and 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

2. Part Nomenclature

Figure 2-1. Part Nomenclature



2.1 Symbols and Definitions

Table 2-1. Symbols and Definitions

Symbol	Definition
$I_{(BR)}$	Breakdown current – The current used for measuring breakdown voltage $V_{(BR)}$.
I_D	Standby current - The current at the rated stand-off voltage (V_{WM}).
I_{PP}	Peak pulse current - The peak current during the impulse.
P_{PP}	Peak pulse power: The peak power that can be applied for specific pulse width and waveform. The product of V_C an I_{PP}.
$V_{(BR)}$	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 stand-off 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.

3. Electrical Characteristics

Table 3-1. Electrical Characteristics at 25 °C

Microchip Part Number		Working Stand-Off Voltage V_{WM}	Breakdown Voltage $V_{(BR)}$ at $I_{(BR)}$		Maximum Clamping Voltage V_C at I_{PP}	Peak Pulse Current at 10/1000 µs (see Figure 4-2) I_{PP}	Maximum Standby Current I_D at V_{WM}
Gull-Wing	J-Bend	V	V	mA	V	A	µA
MSMBG5.0(C)A	MSMBJ5.0(C)A	5	6.40–7.00	10	9.2	65.2	800
MSMBG6.0(C)A	MSMBJ6.0(C)A	6	6.67–7.37	10	10.3	58.3	800
MSMBG6.5(C)A	MSMBJ6.5(C)A	6.5	7.22–7.98	10	11.2	53.6	500
MSMBG7.0(C)A	MSMBJ7.0(C)A	7	7.78–8.60	10	12	50	200
MSMBG7.5(C)A	MSMBJ7.5(C)A	7.5	8.33–9.21	1	12.9	46.5	100
MSMBG8.0(C)A	MSMBJ8.0(C)A	8	8.89–9.83	1	13.6	44.1	50
MSMBG8.5(C)A	MSMBJ8.5(C)A	8.5	9.44–10.4	1	14.4	41.7	10
MSMBG9.0(C)A	MSMBJ9.0(C)A	9	10.0–11.1	1	15.4	39	5
MSMBG10(C)A	MSMBJ10(C)A	10	11.1–12.3	1	17	35.3	5
MSMBG11(C)A	MSMBJ11(C)A	11	12.2–13.5	1	18.2	33	5
MSMBG12(C)A	MSMBJ12(C)A	12	13.3–14.7	1	19.9	30.2	5
MSMBG13(C)A	MSMBJ13(C)A	13	14.4–15.9	1	21.5	27.9	1
MSMBG14(C)A	MSMBJ14(C)A	14	15.6–17.2	1	23.2	25.8	1
MSMBG15(C)A	MSMBJ15(C)A	15	16.7–18.5	1	24.4	24	1
MSMBG16(C)A	MSMBJ16(C)A	16	17.8–19.7	1	26	23.1	1
MSMBG17(C)A	MSMBJ17(C)A	17	18.9–20.9	1	27.6	21.7	1
MSMBG18(C)A	MSMBJ18(C)A	18	20.0–22.1	1	29.2	20.5	1
MSMBG20(C)A	MSMBJ20(C)A	20	22.2–24.5	1	32.4	18.5	1
MSMBG22(C)A	MSMBJ22(C)A	22	24.4–26.9	1	35.5	16.9	1
MSMBG24(C)A	MSMBJ24(C)A	24	26.7–29.5	1	38.9	15.4	1
MSMBG26(C)A	MSMBJ26(C)A	26	28.9–31.9	1	42.1	14.2	1
MSMBG28(C)A	MSMBJ28(C)A	28	31.1–34.4	1	45.4	13.2	1
MSMBG30(C)A	MSMBJ30(C)A	30	33.3–36.8	1	48.4	12.4	1
MSMBG33(C)A	MSMBJ33(C)A	33	36.7–40.6	1	53.3	11.3	1
MSMBG36(C)A	MSMBJ36(C)A	36	40.0–44.2	1	58.1	10.3	1
MSMBG40(C)A	MSMBJ40(C)A	40	44.4–49.1	1	64.5	9.3	1
MSMBG43(C)A	MSMBJ43(C)A	43	47.8–52.8	1	69.4	8.6	1
MSMBG45(C)A	MSMBJ45(C)A	45	50.0–55.3	1	72.7	8.3	1
MSMBG48(C)A	MSMBJ48(C)A	48	53.3–58.9	1	77.4	7.7	1
MSMBG51(C)A	MSMBJ51(C)A	51	56.7–62.7	1	82.4	7.3	1
MSMBG54(C)A	MSMBJ54(C)A	54	60.0–66.3	1	87.1	6.9	1
MSMBG58(C)A	MSMBJ58(C)A	58	64.4–71.2	1	93.6	6.4	1

.....continued

Microchip Part Number		Working Stand-Off Voltage V_{WM}	Breakdown Voltage $V_{(BR)}$ at $I_{(BR)}$		Maximum Clamping Voltage V_C at I_{PP}	Peak Pulse Current at 10/1000 µs (see Figure 4-2) I_{PP}	Maximum Standby Current I_D at V_{WM}
Gull-Wing	J-Bend	V	V	mA	V	A	µA
MSMBG60(C)A	MSMBJ60(C)A	60	66.7–73.7	1	96.8	6.2	1
MSMBG64(C)A	MSMBJ64(C)A	64	71.1–78.6	1	103	5.8	1
MSMBG70(C)A	MSMBJ70(C)A	70	77.8–86.0	1	113	5.3	1
MSMBG75(C)A	MSMBJ75(C)A	75	83.3–92.1	1	121	4.9	1
MSMBG78(C)A	MSMBJ78(C)A	78	86.7–95.8	1	126	4.7	1
MSMBG85(C)A	MSMBJ85(C)A	85	94.4–104	1	137	4.4	1
MSMBG90(C)A	MSMBJ90(C)A	90	100–111	1	146	4.1	1
MSMBG100(C)A	MSMBJ100(C)A	100	111–123	1	162	3.7	1
MSMBG110(C)A	MSMBJ110(C)A	110	122–135	1	177	3.4	1
MSMBG120(C)A	MSMBJ120(C)A	120	133–147	1	193	3.1	1
MSMBG130(C)A	MSMBJ130(C)A	130	144–159	1	209	2.9	1
MSMBG150(C)A	MSMBJ150(C)A	150	167–185	1	243	2.5	1
MSMBG160(C)A	MSMBJ160(C)A	160	178–197	1	259	2.3	1
MSMBG170(C)A	MSMBJ170(C)A	170	189–209	1	275	2.2	1

4. Graphs

Figure 4-1. Peak Pulse Power Vs. Pulse Time

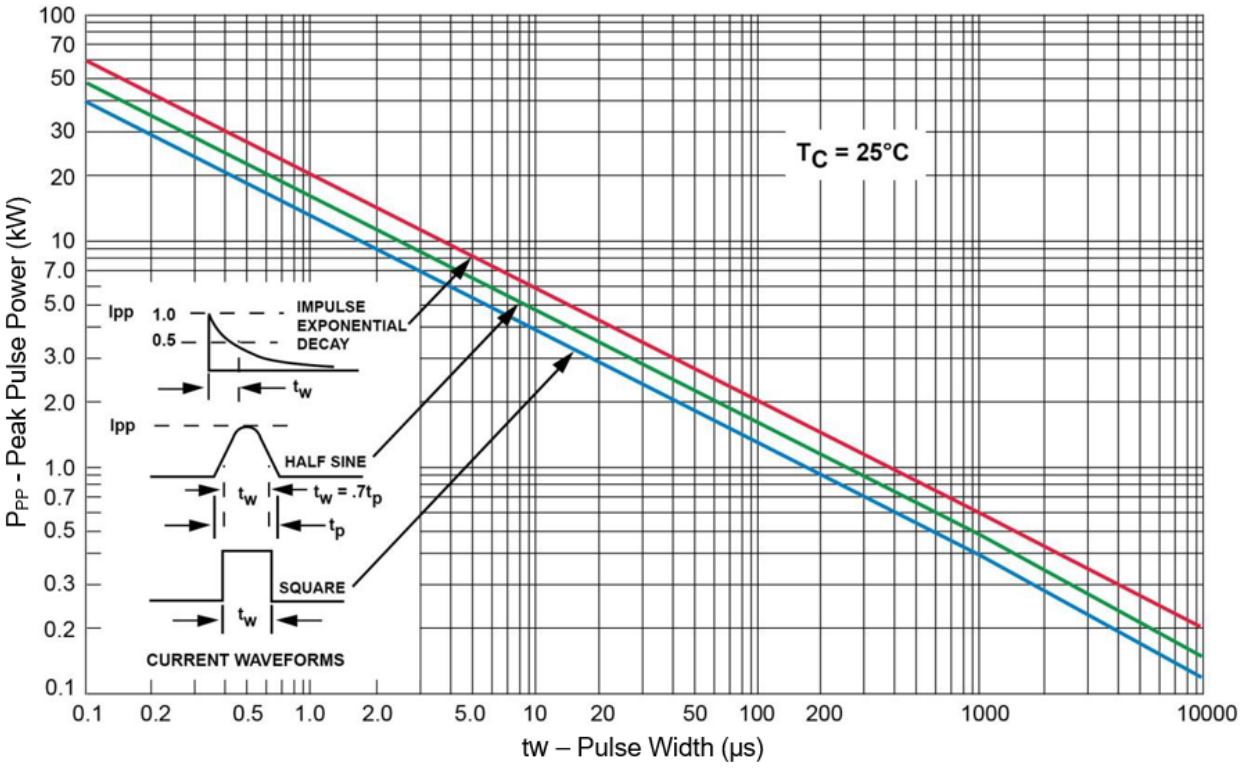


Figure 4-2. Pulse Waveform for 10/1000 Exponential Surge

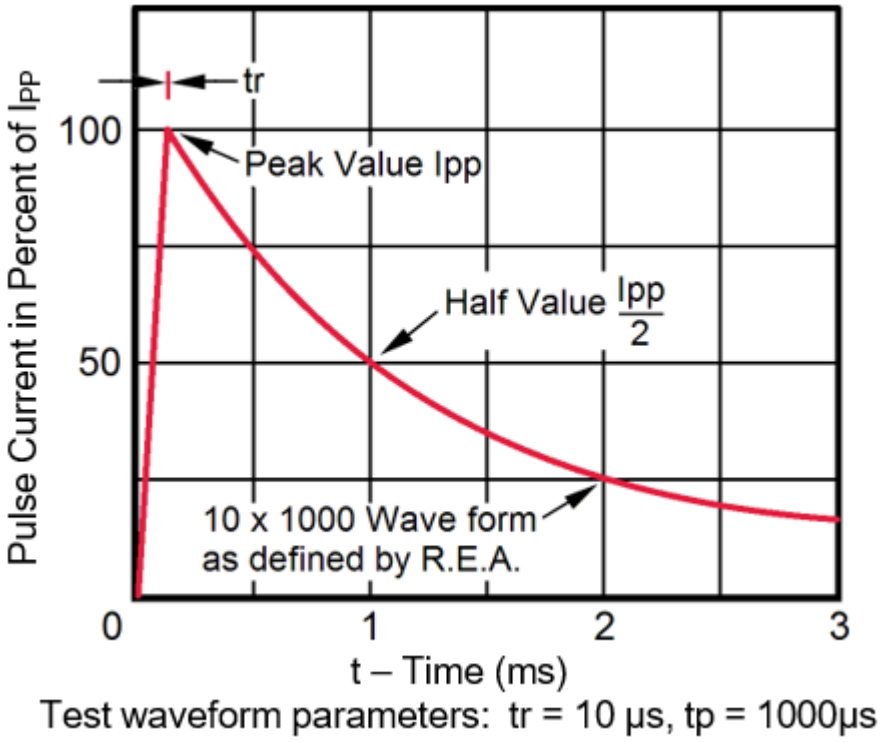


Figure 4-3. Derating Curve

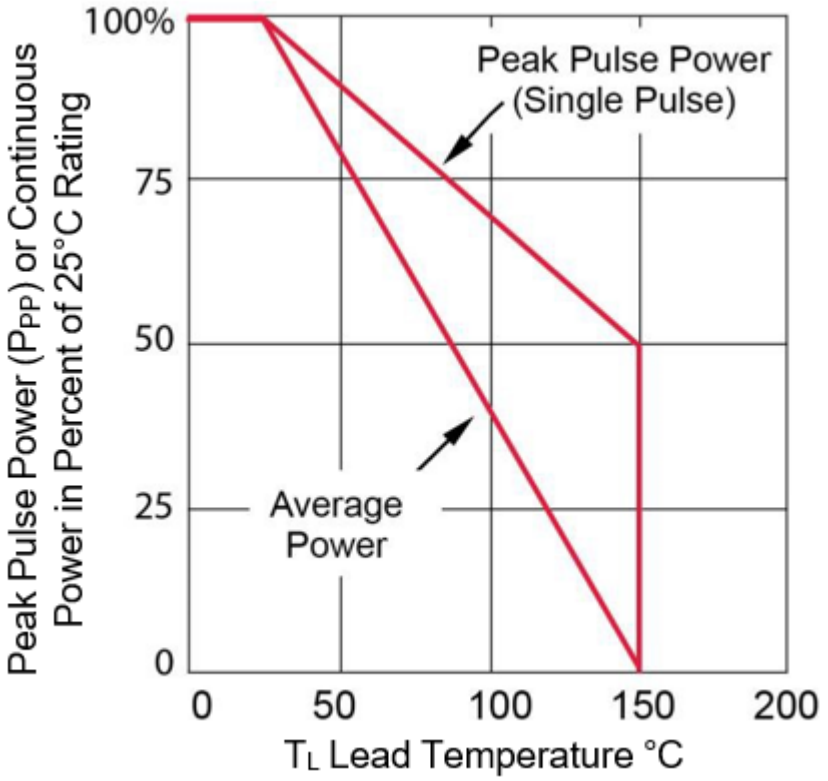
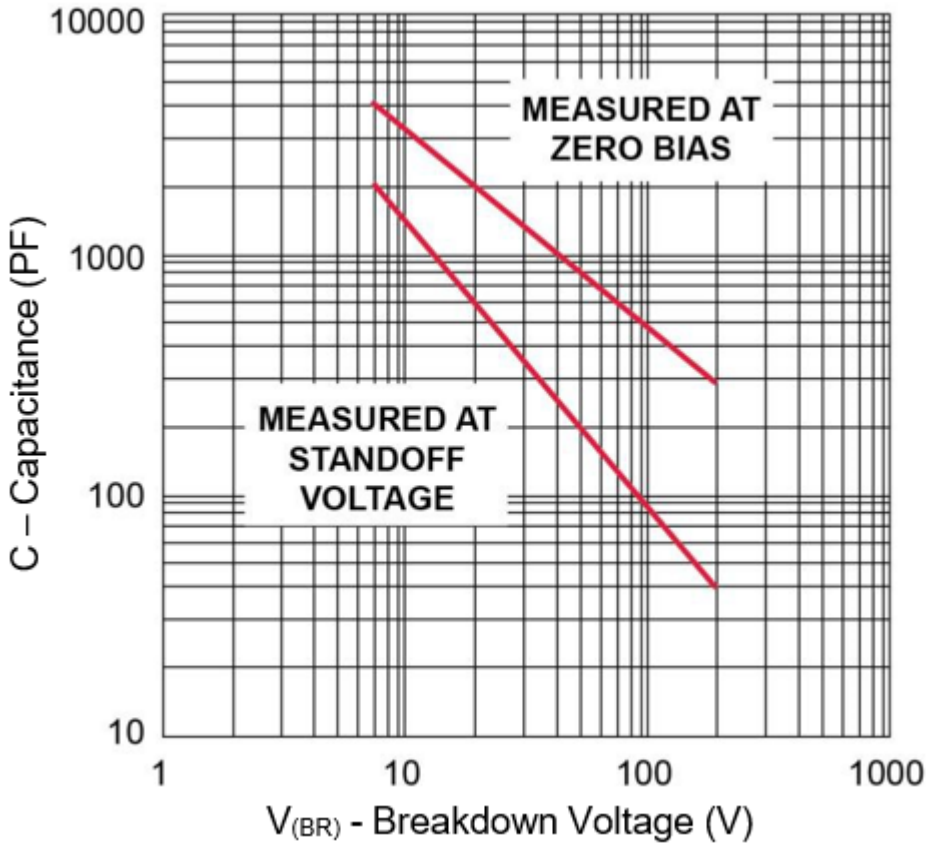


Figure 4-4. Typical Capacitance Vs. Breakdown Voltage[1]

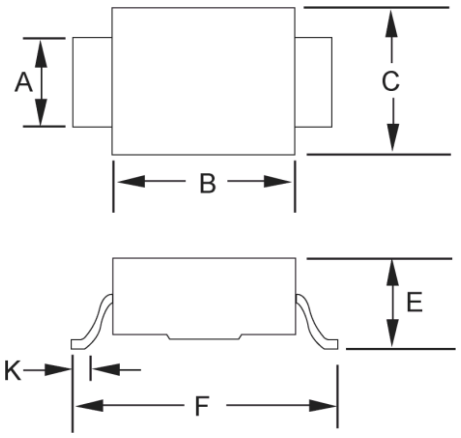


Note:

1. Bidirectional capacitance is half that shown at zero volts.

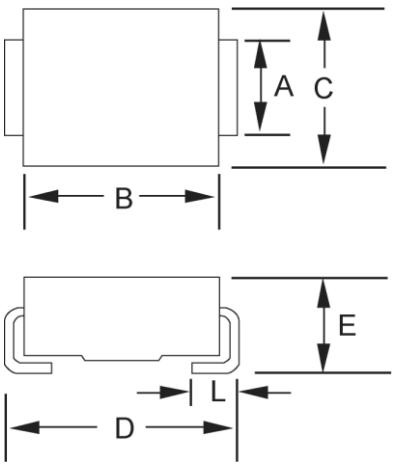
5. Package Dimensions

Figure 5-1. SMBG (DO-215AA)



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
E	0.077	0.104	1.95	2.65
F	0.235	0.255	5.97	6.48
K	0.015	0.030	0.381	0.762

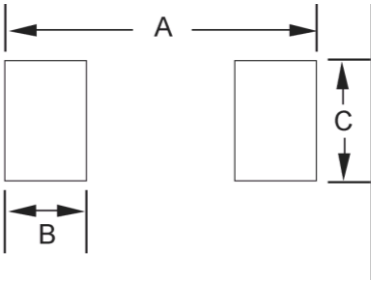
Figure 5-2. SMBJ (DO-214AA)



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	0.760	1.52

6. Pad Layout

Figure 6-1. 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

7. Revision History

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

Revision	Date	Description
A	11/2023	Initial revision.

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