Surface Mount 1500 Watt Transient Voltage Suppressor

MSMCG5.0A – MXLSMCG170CAe3, MSMCJ5.0 – MXLSMCJ170CAe3

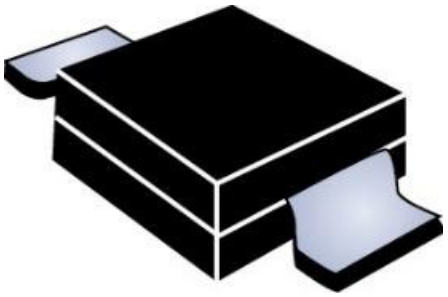
Product Overview

The MSMCG(J)5.0A through MXLSMCG(J)170A series of 1500 watt high-reliability Transient Voltage Suppressors (TVSs) protects a variety of voltage-sensitive components. The SMCG gull-wing design in the DO-215AB package allows for visible solder connections. The SMCJ J-bend design in the DO-214AB package allows for greater PC board mounting density. Selections include unidirectional and bidirectional as well as RoHS compliant versions. 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 fabrication and assembly lot traceability for all M prefix devices
- All devices are 100% surge tested.
- 3σ lot norm screening performed on standby current (I_D) for all M prefix devices
- Available in both unidirectional and bidirectional versions
- Suppress transients up to 1,500W at 10/1000 µs (see Figure 4-1)
- Moisture classification is “Level 1” with no dry pack required per IPC/JEDEC J-STD-020B for all M prefix devices
- Enhanced reliability screening options available in reference to MIL-PRF-19500. Refer to High Reliability Up-Screened Plastic Products Portfolio for more details on the screening options (See Part Nomenclature for all available options)
- RoHS compliant versions available
- Axial-lead equivalent packages for thru-hole mounting are available as 1.5KE6.8A to 1.5KE200CA or 1N6267 thru 1N6303A and 1N5908 (contact Microchip for other surface mount options.)

Figure 1. DO-215AB (SMCG) Package



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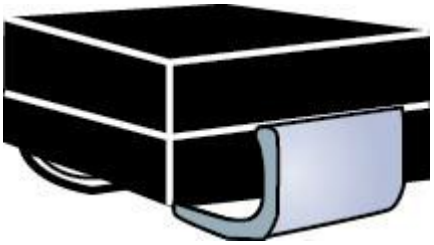
Applications/Benefits

- High-reliability devices
- Available in working stand-off voltage range of 5.0 to 170V
- Protection from switching transients and induced RF
- 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: MSMC 5.0A to MXLSMC 170CA
  Class 2: MSMC 5.0A to MXLSMC 150CA
  Class 3: MSMC 5.0A to MXLSMC 75CA
  Class 4: MSMC 5.0A to MXLSMC 36CA
- Secondary lightning protection per IEC61000-4-5 with 12 ohms source impedance:
  Class 1: MSMC 5.0A to MXLSMC 90CA
  Class 2: MSMC 5.0A to MXLSMC 45CA
  Class 3: MSMC 5.0A to MXLSMC 24CA
  Class 4: MSMC 5.0A to MXLSMC 11CA
- Secondary lightning protection per IEC61000-4-5 with 2 ohms source impedance:
  Class 2: MSMC 5.0A to MXLSMC 22CA
  Class 3: MSMC 5.0A to MXLSMC 10CA

Figure 2. DO-214AB (SMCJ) Package



All SMC series are equivalent to prior SMM package identifications.

Also available:

Commercial Grade: SMCG(J)5.0A – SMCG(J)170CAe3

Axial-Lead: M1.5KE6.8A-MXL1.5KE200CA

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1. Maximum Ratings

Table 1-1. Maximum Ratings

Parameters/Test Conditions		Symbol	Value	Unit
Junction and storage temperature		T_J and T_{STG}	–65 to +150	°C
Thermal resistance junction-to-lead		$R_{\Theta JL}$	20	°C/W
Thermal resistance junction-to-ambient[1]		$R_{\Theta JA}$	80	°C/W
Peak pulse power dissipation at 25 °C (at 10/1000 µs, see Figure 4-1, Figure 4-2, and Figure 4-3)		P_{PP}	1500	W
Impulse repetition rate (duty factor)		df	0.01	%
$t_{clamping}$ (0 volts to V(BR) min.)	Unidirectional Bidirectional	$t_{clamping}$	< 100 < 5	ps ns
Average power dissipation	TL = +30 °C TA = +25 °C	$P_{M(AV)}$	6 1.56[1]	W
Maximum forward surge current[2]		I_{FSM}	200	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
2. Peak impulse of 8.3 ms half-sine wave at 25 °C (unidirectional only)

1.1 Mechanical and Packaging

- Case: Void-free transfer molded thermosetting epoxy body meeting UL94V-0
- Terminals: Tin-lead or RoHS compliant annealed matte-tin plating. Solderable to MIL-STD-750, method 2026
- Marking: Reliability level, part number, and date code
- Polarity: Cathode indicated by band. No cathode band on bi-directional devices
- Tape and reel option: Standard per EIA-481-2 with 16 mm tape (add “TR” suffix to part number). Consult factory for quantities.
- Weight: Approximately 0.25 grams
- See Package Dimensions

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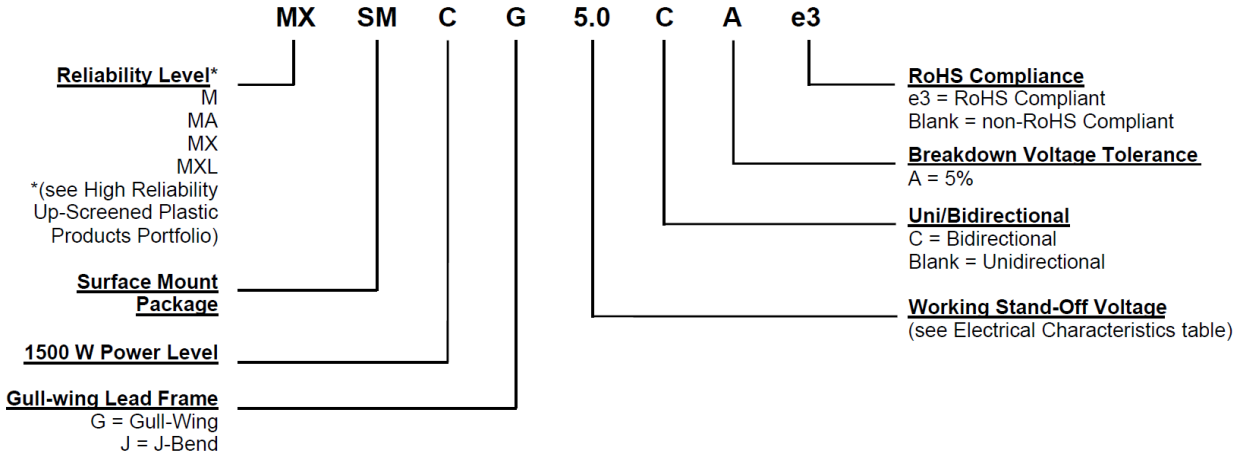
2. Part Nomenclature

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_F	Forward current: The forward current DC value, no alternating component.
I_{PP}	Peak impulse current: The peak current during the impulse.
P_{PP}	Peak pulse power: The peak power that can be applied for a specific pulse width and waveform. The product of V_C and 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.

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3. Electrical Characteristics

Table 3-1. Electrical Characteristics at 25 °C Unless Otherwise Stated

Microchip Part Number		Working Stand-Off Voltage V_{WM} Volts	Breakdown Voltage $V_{(BR)}$ at $I_{(BR)}$ Volts		Maximum Clamping Voltage at I_{PP} Volts	Peak Impulse Current at 10/1000 µs (See Figure 4-2) I_{PP} Amps	Maximum Standby Current at V_{WM} I_D µA
Gull-Wing	J-Bend		Min. Max.	$I_{(BR)}$ mA			
MSMCG5.0(C)A	MSMCJ5.0(C)A	5.0	6.40–7.00	10	9.2	163.0	1000
MSMCG6.0(C)A	MSMCJ6.0(C)A	6.0	6.67–7.37	10	10.3	145.6	1000
MSMCG6.5(C)A	MSMCJ6.5(C)A	6.5	7.22–7.98	10	11.2	133.9	500
MSMCG7.0(C)A	MSMCJ7.0(C)A	7.0	7.78–8.60	10	12.0	125.0	200
MSMCG7.5(C)A	MSMCJ7.5(C)A	7.5	8.33–9.21	1	12.9	116.3	100
MSMCG8.0(C)A	MSMCJ8.0(C)A	8.0	8.89–9.83	1	13.6	110.3	50
MSMCG8.5(C)A	MSMCJ8.5(C)A	8.5	9.44–10.4	1	14.4	104.2	20
MSMCG9.0(C)A	MSMCJ9.0(C)A	9.0	10.0–11.1	1	15.4	97.4	10
MSMCG10(C)A	MSMCJ10(C)A	10	11.1–12.3	1	17.0	88.2	5
MSMCG11(C)A	MSMCJ11(C)A	11	12.2–13.5	1	18.2	82.4	5
MSMCG12(C)A	MSMCJ12(C)A	12	13.3–14.7	1	19.9	75.3	5
MSMCG13(C)A	MSMCJ13(C)A	13	14.4–15.9	1	21.5	69.7	1
MSMCG14(C)A	MSMCJ14(C)A	14	15.6–17.2	1	23.2	64.7	1
MSMCG15(C)A	MSMCJ15(C)A	15	16.7–18.5	1	24.4	61.5	1
MSMCG16(C)A	MSMCJ16(C)A	16	17.8–19.7	1	26.0	57.7	1
MSMCG17(C)A	MSMCJ17(C)A	17	18.9–20.9	1	27.6	53.3	1
MSMCG18(C)A	MSMCJ18(C)A	18	20.0–22.1	1	29.2	51.4	1
MSMCG20(C)A	MSMCJ20(C)A	20	22.2–24.5	1	32.4	46.3	1
MSMCG22(C)A	MSMCJ22(C)A	22	24.4–26.9	1	35.5	42.2	1
MSMCG24(C)A	MSMCJ24(C)A	24	26.7–29.5	1	38.9	38.6	1
MSMCG26(C)A	MSMCJ26(C)A	26	28.9–31.9	1	42.1	35.6	1
MSMCG28(C)A	MSMCJ28(C)A	28	31.1–34.4	1	45.4	33.0	1
MSMCG30(C)A	MSMCJ30(C)A	30	33.3–36.8	1	48.4	31.0	1
MSMCG33(C)A	MSMCJ33(C)A	33	36.7–40.6	1	53.3	28.1	1
MSMCG36(C)A	MSMCJ36(C)A	36	40.0–44.2	1	58.1	25.8	1
MSMCG40(C)A	MSMCJ40(C)A	40	44.4–49.1	1	64.5	23.2	1
MSMCG43(C)A	MSMCJ43(C)A	43	47.8–52.8	1	69.4	21.6	1
MSMCG45(C)A	MSMCJ45(C)A	45	50.0–55.3	1	72.7	20.6	1
MSMCG48(C)A	MSMCJ48(C)A	48	53.3–58.9	1	77.4	19.4	1
MSMCG51(C)A	MSMCJ51(C)A	51	56.7–62.7	1	82.4	18.2	1
MSMCG54(C)A	MSMCJ54(C)A	54	60.0–66.3	1	87.1	17.2	1
MSMCG58(C)A	MSMCJ58(C)A	58	64.4–71.2	1	93.6	16.0	1

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.....continued

Microchip Part Number		Working Stand-Off Voltage V_{WM} Volts	Breakdown Voltage $V_{(BR)}$ at $I_{(BR)}$ Volts		Maximum Clamping Voltage at I_{PP} Volts	Peak Impulse Current at 10/1000 µs (See Figure 4-2) I_{PP} Amps	Maximum Standby Current at V_{WM} I_D µA
Gull-Wing	J-Bend		Min. Max.	$I_{(BR)}$ mA			
MSMCG60(C)A	MSMCJ60(C)A	60	66.7–73.7	1	96.8	15.5	1
MSMCG64(C)A	MSMCJ64(C)A	64	71.1–78.6	1	103.0	14.6	1
MSMCG70(C)A	MSMCJ70(C)A	70	77.8 –86.0	1	113	13.3	1
MSMCG75(C)A	MSMCJ75(C)A	75	83.3–92.1	1	121	12.4	1
MSMCG78(C)A	MSMCJ78(C)A	78	86.7–95.8	1	126	11.4	1
MSMCG85(C)A	MSMCJ85(C)A	85	94.4–104.0	1	137	10.4	1
MSMCG90(C)A	MSMCJ90(C)A	90	100–111	1	146	10.3	1
MSMCG100(C)A	MSMCJ100(C)A	100	111–123	1	162	9.3	1
MSMCG110(C)A	MSMCJ110(C)A	110	122–135	1	177	8.4	1
MSMCG120(C)A	MSMCJ120(C)A	120	133–147	1	193	7.8	1
MSMCG130(C)A	MSMCJ130(C)A	130	144–159	1	209	7.2	1
MSMCG150(C)A	MSMCJ150(C)A	150	167–185	1	243	6.2	1
MSMCG160(C)A	MSMCJ160(C)A	160	178–197	1	259	5.8	1
MSMCG170(C)A	MSMCJ170(C)A	170	189–209	1	275	5.5	1

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4. Graphs

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

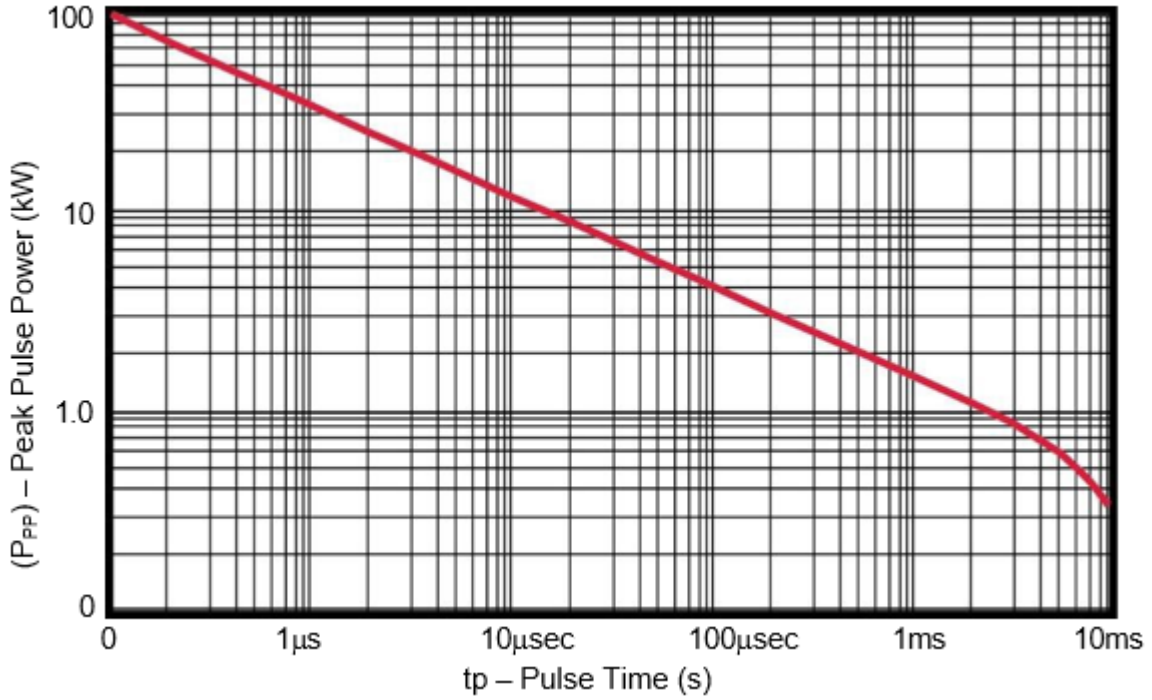

Figure 4-2. Pulse Waveform

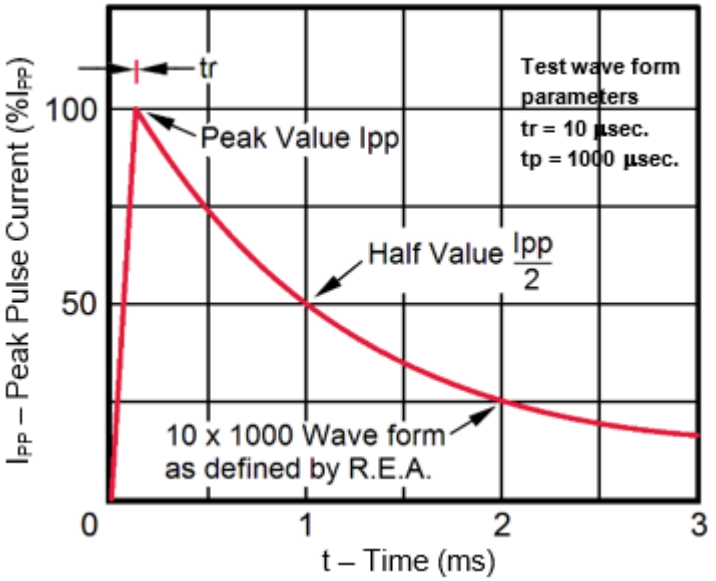

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Figure 4-3. Derating Curve

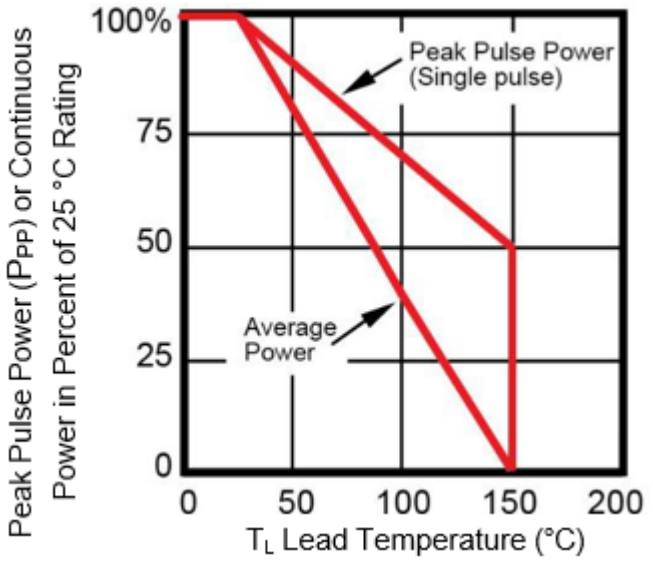
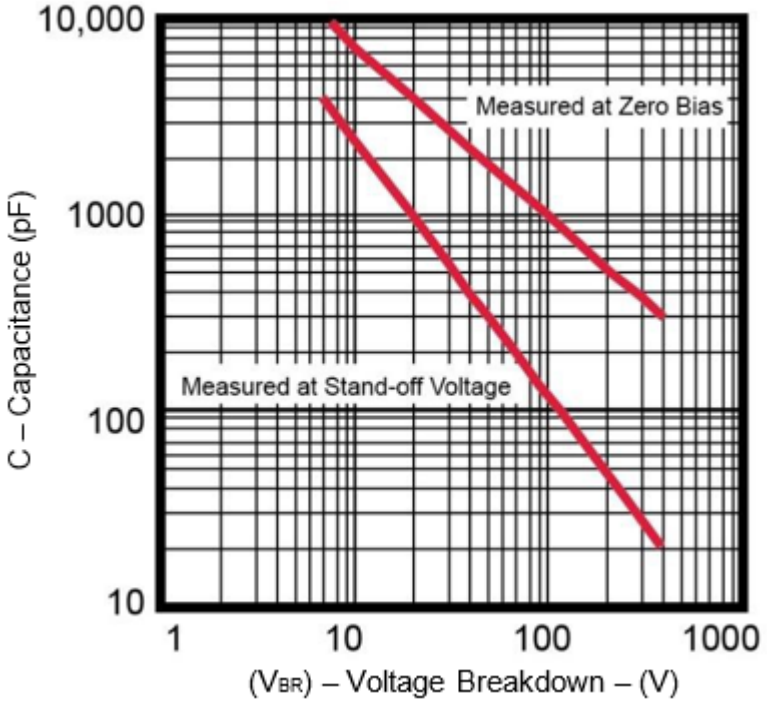


Figure 4-4. Typical Capacitance Vs. Breakdown Voltage (Unidirectional Configuration)[1]



Note:

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

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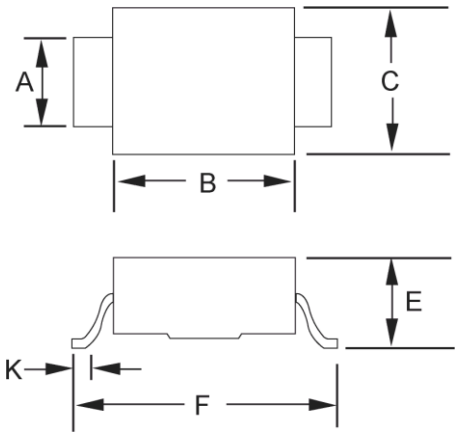
5. Package Dimensions

Figure 5-1. SMCG (DO-215AB)

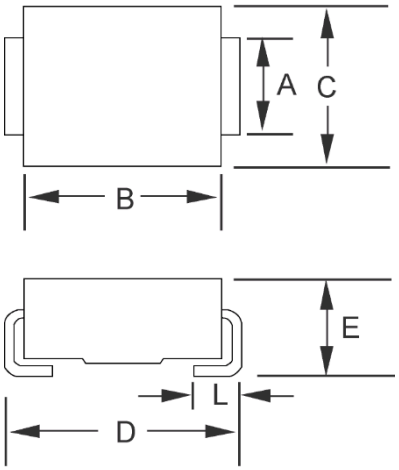


Ltr	Dimensions			
	Inch		Millimeters	
	Min.	Max.	Min.	Max.
A	0.115	0.121	2.92	3.07
B	0.260	0.280	6.60	7.11
C	0.220	0.245	5.59	6.22
E[1]	0.077	0.110	1.95	2.80
F	0.380	0.400	9.65	10.16
K	0.025	0.040	0.635	1.016

Note:

1. Dimension “E” exceeds the JEDEC outline as shown. Typical stand-off height: 0.004”–0.008” (0.1 mm – 0.2 mm).

Figure 5-2. SMCJ (DO-214AB)



Ltr	Dimensions			
	Inch		Millimeters	
	Min.	Max.	Min.	Max.
A	0.115	0.121	2.92	3.07
B	0.260	0.280	6.60	7.11
C	0.220	0.245	5.59	6.22
D	0.305	0.320	7.75	8.13
E[1]	0.077	0.110	1.95	2.80
L	0.030	0.060	0.760	1.52

Note:

1. Dimension “E” exceeds the JEDEC outline in height as shown. Typical stand-off height: 0.004”–0.008” (0.1 mm – 0.2 mm).

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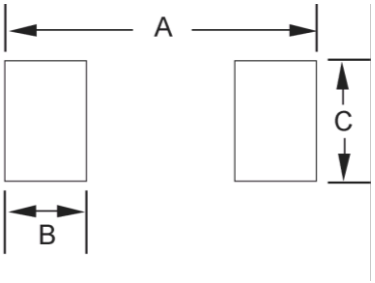
6. Pad Layout

Figure 6-1. Pad Layout



SMCG (DO-215AB)		
Ltr	**Inch**	**Millimeters**
A	0.510	12.95
B	0.110	2.79
C	0.150	3.81

SMCJ (DO-214AB)		
Ltr	**Inch**	**Millimeters**
A	0.390	9.90
B	0.110	2.79
C	0.150	3.81

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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	10/2023	Initial revision.

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