



1500 Watt Low Capacitance Surface Mount Transient Voltage Suppressor

Screening in reference to MIL-PRF-19500 available

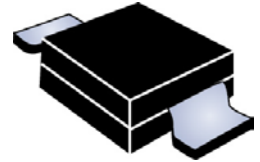
DESCRIPTION

This high-reliability surface mount Transient Voltage Suppressor (TVS) product family includes a rectifier diode in series with and in the opposite direction to the primary TVS protection diode. The circuit being protected sees only the rectifier diode's low 100 pF capacitance. They are available in either a DO-215AB (gull-wing) or DO-214AB (J-bend) package and RoHS compliant versions are available. The low capacitance of these TVS devices allows them to be applied to the protection of high-frequency signal and communication lines in inductive switching environments or systems exposed to the secondary effects of lightning per IEC61000-4-5 as well as RTCA/DO-160D or ARINC 429 for airborne avionics. They also protect from ESD and EFT per IEC61000-4-2 and IEC61000-4-4. If bipolar transient capability is required, two of these low capacitance TVS devices may be used in parallel and opposite directions (anti-parallel) for complete ac protection ([figure 6](#)).

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

FEATURES

- Available in standoff voltage range of 6.5 to 170 V.
- Low capacitance of 100 pF or less.
- Molding compound flammability rating: UL94V-O.
- Two different terminations available in C-bend (modified J-bend with DO-214AB) or Gull-wing (DO-215AB).
- Screening 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.




**DO-215AB
(SMCG) Package**




**DO-214AB
(SMCJ) Package**

NOTE: All SMC series are equivalent to prior SMM package identifications.

Also available in:

Commercial grade
 [SMCG\(J\)LCE6.5 – SMCJ\(J\)LCE170Ae3](#)

Case 1 package
(axial-leaded)
 [MLCE6.5 – MLCE170Ae3](#)

APPLICATIONS / BENEFITS

- 1500 watts peak pulse power at 10/1000 μ s.
- Low capacitance for high frequency data line protection to 1 MHz.
- Protection for aircraft fast data rate lines up to level 5 waveform 4 and level 2 waveform 5A in RTCA/DO-160D (also see [MicroNote 130](#)) & ARINC 429 with bit rates of 100 kb/s (per ARINC 429, Part 1, par 2.4.1.1).
- IEC61000-4-2 ESD 15 kV (air), 8 kV (contact).
- IEC61000-4-5 (lightning) as further detailed in LCE6.5 thru LCE170A [data sheet](#).
- T1/E1 line cards.
- Base stations, WAN & XDSL interfaces.
- CSU/DSU equipment.

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MAXIMUM RATINGS @ 25 °C unless otherwise stated

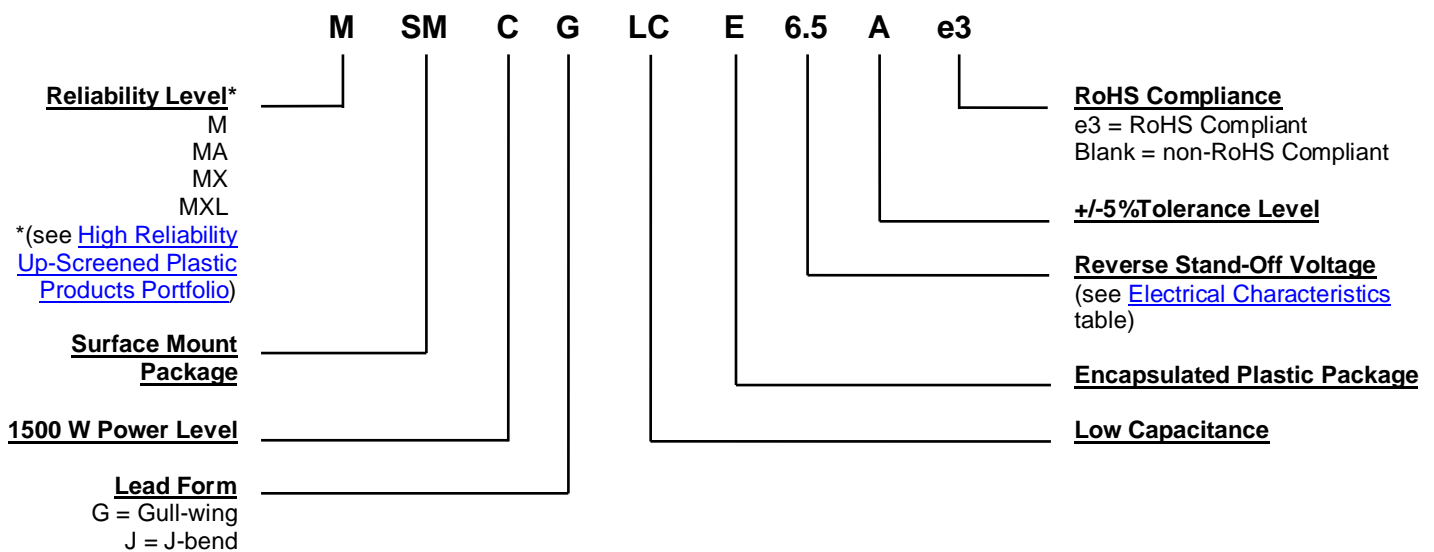
| Parameters/Test Conditions | Symbol | Value | Unit |
|---|-------------------------------------|----------------------|------|
| Junction and Storage Temperature | T _J and T _{STG} | -65 to +150 | °C |
| Thermal Resistance Junction-to-Lead ⁽¹⁾ | R _{θJL} | 20 | °C/W |
| Peak Pulse Power dissipation @ 25 °C (at 10/1000 μs, see figures 1, 2, and 3) ⁽²⁾ | P _{PP} | 1500 | W |
| Clamping Factor | @ Full Rated Power | 1.4 | |
| | @ 50 % Rated Power | 1.30 | |
| t _{clamping} (0 volts to V _(BR) min.) | t _{clamping} | < 5x10 ⁻⁹ | s |
| Rated Average Power Dissipation T _L = +50 °C | P _{M(AV)} | 5.0 | W |
| Solder Temperature @ 10 s | T _{SP} | 260 | °C |

- Notes:**
1. Typical junction to lead (tab) at mounting plane.
 2. With a repetition rate of 0.01% or less. When pulse testing, do not pulse in opposite direction (see “[application schematics](#)” section herein and figures 5 & 6 for further protection in both directions.)

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: Part number with abbreviated prefix (MCLC6.5A, MCLC6.5Ae3, MCLC33, MCLC33e3, etc.).
- POLARITY: Cathode indicated by band.
- TAPE & REEL option: Standard per EIA-481-B with 16 mm tape (add “TR” suffix to part number). Consult factory for quantities.
- WEIGHT: Approximately 0.25 grams.
- See [Package Dimensions](#) on last page.

PART NOMENCLATURE



SYMBOLS & 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 standoff voltage V_{WM} . |
| I_F | Forward Current: The forward current dc value, no alternating component. |
| I_O | Average Rectified Output Current: The output current averaged over a full cycle with a 50 Hz or 60 Hz sine-wave input and a 180 degree conduction angle. |
| I_{PP} | Peak Impulse Current: The peak current during the impulse. |
| P_{PP} | Peak Pulse Power: The peak power dissipation resulting from the peak impulse current I_{PP} . |
| V_C | Clamping Voltage: The maximum clamping voltage at specified I_{PP} (peak pulse current) at the specified pulse conditions. |
| $V_{(BR)}$ | Minimum Breakdown Voltage: The minimum voltage the device will exhibit at a specified current. |
| V_{WM} | Working Peak Voltage: The maximum peak voltage that can be applied over the operating temperature range. This is also referred to as the standoff voltage. |

ELECTRICAL CHARACTERISTICS @ 25 °C unless otherwise stated

| Part Number | | Reverse Stand-Off Voltage V_{WM} | Breakdown Voltage $V_{(BR)}$ @ $I_{(BR)}$ | | | Maximum Reverse Leakage @ V_{WM} I_D | Maximum Clamping Voltage @ I_{PP} V_C | Maximum Peak Pulse Current I_{PP} @ 10/1000 Amps | Maximum Capacitance @ 0 Volts, $f = 1$ MHz | Working Inverse Blocking Voltage V_{WIB} | Inverse Blocking Leakage Current I_{IB} | Peak Inverse Blocking Voltage V_{PIB} |
|--------------|--------------|------------------------------------|---|------|-----|--|---|--|--|--|---|---|
| Gull-Wing | J-Bend | | Volts | MIN | MAX | | | | | | | |
| MSMCGLCE6.5A | MSMCJLCE6.5A | 6.5 | 7.22 | 7.98 | 10 | 1000 | 11.2 | 100 | 100 | 75 | 10 | 100 |
| MSMCGLCE7.0A | MSMCJLCE7.0A | 7.0 | 7.78 | 8.60 | 10 | 500 | 12.0 | 100 | 100 | 75 | 10 | 100 |
| MSMCGLCE7.5A | MSMCJLCE7.5A | 7.5 | 8.33 | 10.2 | 10 | 250 | 12.9 | 100 | 100 | 75 | 10 | 100 |
| MSMCGLCE8.0A | MSMCJLCE8.0A | 8.0 | 8.89 | 9.83 | 1 | 100 | 13.6 | 100 | 100 | 75 | 10 | 100 |
| MSMCGLCE8.5A | MSMCJLCE8.5A | 8.5 | 9.44 | 10.4 | 1 | 50 | 14.4 | 100 | 100 | 75 | 10 | 100 |
| MSMCGLCE9.0A | MSMCJLCE9.0A | 9.0 | 10.0 | 11.1 | 1 | 10 | 15.4 | 97 | 100 | 75 | 10 | 100 |
| MSMCGLCE10A | MSMCJLCE10A | 10 | 11.1 | 12.3 | 1 | 5 | 17.0 | 88 | 100 | 75 | 10 | 100 |
| MSMCGLCE11A | MSMCJLCE11A | 11 | 12.2 | 13.5 | 1 | 5 | 18.2 | 82 | 100 | 75 | 10 | 100 |
| MSMCGLCE12A | MSMCJLCE12A | 12 | 13.3 | 14.7 | 1 | 5 | 19.9 | 75 | 100 | 75 | 10 | 100 |
| MSMCGLCE13A | MSMCJLCE13A | 13 | 14.4 | 15.9 | 1 | 5 | 21.5 | 70 | 100 | 75 | 10 | 100 |
| MSMCGLCE14A | MSMCJLCE14A | 14 | 15.6 | 17.2 | 1 | 5 | 23.2 | 65 | 100 | 75 | 10 | 100 |
| MSMCGLCE15A | MSMCJLCE15A | 15 | 16.7 | 18.5 | 1 | 5 | 24.4 | 61 | 100 | 75 | 10 | 100 |
| MSMCGLCE16A | MSMCJLCE16A | 16 | 17.8 | 19.7 | 1 | 5 | 26.0 | 57 | 100 | 75 | 10 | 100 |
| MSMCGLCE17A | MSMCJLCE17A | 17 | 18.9 | 20.9 | 1 | 5 | 27.6 | 54 | 100 | 75 | 10 | 100 |
| MSMCGLCE18A | MSMCJLCE18A | 18 | 20.0 | 22.1 | 1 | 5 | 29.2 | 51 | 100 | 75 | 10 | 100 |
| MSMCGLCE20A | MSMCJLCE20A | 20 | 22.2 | 24.5 | 1 | 5 | 32.4 | 46 | 100 | 75 | 10 | 100 |
| MSMCGLCE22A | MSMCJLCE22A | 22 | 24.4 | 26.9 | 1 | 5 | 35.5 | 42 | 100 | 75 | 10 | 100 |
| MSMCGLCE24A | MSMCJLCE24A | 24 | 26.7 | 29.5 | 1 | 5 | 38.9 | 39 | 100 | 75 | 10 | 100 |
| MSMCGLCE26A | MSMCJLCE26A | 26 | 28.9 | 31.9 | 1 | 5 | 42.1 | 36 | 100 | 75 | 10 | 100 |
| MSMCGLCE28A | MSMCJLCE28A | 28 | 31.1 | 34.4 | 1 | 5 | 45.5 | 33 | 100 | 75 | 10 | 100 |
| MSMCGLCE30A | MSMCJLCE30A | 30 | 33.3 | 36.8 | 1 | 5 | 48.4 | 31 | 100 | 75 | 10 | 100 |
| MSMCGLCE33A | MSMCJLCE33A | 33 | 36.7 | 40.6 | 1 | 5 | 53.3 | 28.1 | 100 | 75 | 10 | 100 |
| MSMCGLCE36A | MSMCJLCE36A | 36 | 40.0 | 44.2 | 1 | 5 | 58.1 | 25.8 | 100 | 75 | 10 | 100 |
| MSMCGLCE40A | MSMCJLCE40A | 40 | 44.4 | 49.1 | 1 | 5 | 64.5 | 23.3 | 100 | 75 | 10 | 100 |
| MSMCGLCE43A | MSMCJLCE43A | 43 | 47.8 | 52.8 | 1 | 5 | 69.4 | 21.6 | 100 | 150 | 10 | 200 |
| MSMCGLCE45A | MSMCJLCE45A | 45 | 50.0 | 55.3 | 1 | 5 | 72.7 | 20.6 | 100 | 150 | 10 | 200 |
| MSMCGLCE48A | MSMCJLCE48A | 48 | 53.3 | 58.9 | 1 | 5 | 77.4 | 19.4 | 100 | 150 | 10 | 200 |
| MSMCGLCE51A | MSMCJLCE51A | 51 | 56.7 | 62.7 | 1 | 5 | 82.4 | 18.2 | 100 | 150 | 10 | 200 |
| MSMCGLCE54A | MSMCJLCE54A | 54 | 60.0 | 66.3 | 1 | 5 | 87.1 | 17.2 | 100 | 150 | 10 | 200 |
| MSMCGLCE58A | MSMCJLCE58A | 58 | 64.4 | 71.2 | 1 | 5 | 93.6 | 16.0 | 100 | 150 | 10 | 200 |
| MSMCGLCE60A | MSMCJLCE60A | 60 | 66.7 | 73.7 | 1 | 5 | 96.8 | 15.5 | 90 | 150 | 10 | 200 |
| MSMCGLCE64A | MSMCJLCE64A | 64 | 71.1 | 78.6 | 1 | 5 | 103 | 14.6 | 90 | 150 | 10 | 200 |
| MSMCGLCE70A | MSMCJLCE70A | 70 | 77.8 | 85.0 | 1 | 5 | 113 | 13.3 | 90 | 150 | 10 | 200 |
| MSMCGLCE75A | MSMCJLCE75A | 75 | 83.3 | 92.1 | 1 | 5 | 121 | 12.4 | 90 | 150 | 10 | 200 |
| MSMCGLCE80A | MSMCJLCE80A | 80 | 88.7 | 98.0 | 1 | 5 | 129 | 11.6 | 90 | 150 | 10 | 200 |
| MSMCGLCE90A | MSMCJLCE90A | 90 | 100 | 111 | 1 | 5 | 146 | 10.3 | 90 | 300 | 10 | 200 |
| MSMCGLCE100A | MSMCJLCE100A | 100 | 111 | 123 | 1 | 5 | 162 | 9.3 | 90 | 300 | 10 | 200 |
| MSMCGLCE110A | MSMCJLCE110A | 110 | 122 | 135 | 1 | 5 | 178 | 8.4 | 90 | 300 | 10 | 400 |
| MSMCGLCE120A | MSMCJLCE120A | 120 | 133 | 147 | 1 | 5 | 193 | 7.8 | 90 | 300 | 10 | 400 |
| MSMCGLCE130A | MSMCJLCE130A | 130 | 144 | 159 | 1 | 5 | 209 | 7.2 | 90 | 300 | 10 | 400 |
| MSMCGLCE150A | MSMCJLCE150A | 150 | 167 | 185 | 1 | 5 | 243 | 6.2 | 90 | 300 | 10 | 400 |
| MSMCGLCE160A | MSMCJLCE160A | 160 | 178 | 197 | 1 | 5 | 259 | 5.8 | 90 | 300 | 10 | 400 |
| MSMCGLCE170A | MSMCJLCE170A | 170 | 189 | 209 | 1 | 5 | 275 | 5.4 | 90 | 300 | 10 | 400 |

NOTE 1: TVS are normally selected according to the reverse standoff voltage" (V_{WM}) which should be equal to or greater than the dc or peak operating voltage level.

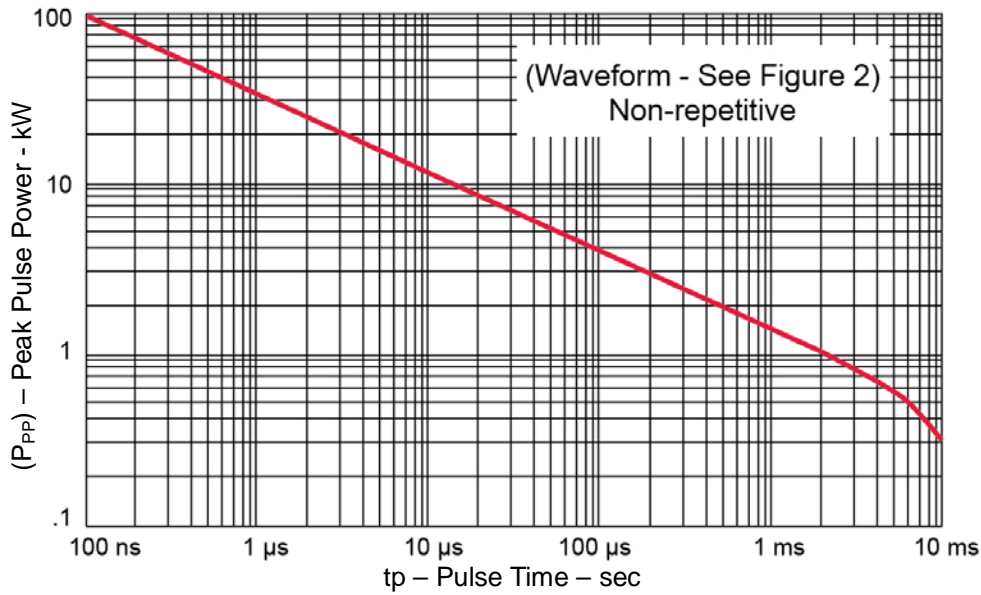
GRAPHS


FIGURE 1
Peak Pulse Power vs. Pulse Time

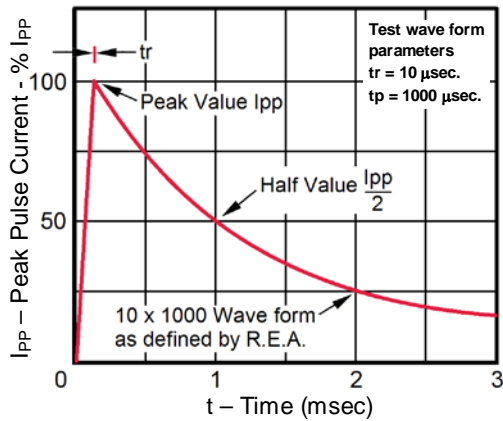


FIGURE 2
Pulse Waveform

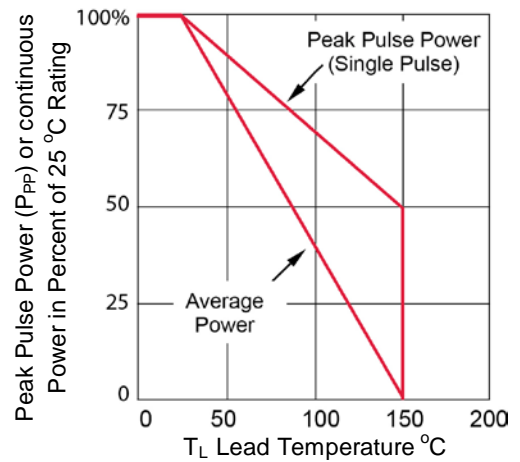


FIGURE 3
Derating Curve

APPLICATION SCHEMATICS

The TVS low capacitance device configuration is shown in figure 4. As a further option for unidirectional applications, an additional low capacitance rectifier diode may be used in parallel in the same polarity direction as the TVS as shown in figure 5. In applications where random high voltage transients occur, this will prevent reverse transients from damaging the internal low capacitance rectifier diode and also provide a low voltage conducting direction. The added rectifier diode should be of similar low capacitance and also have a higher reverse voltage rating than the TVS clamping voltage V_C . The Microsemi recommended rectifier part number for the application in figure 5 is the “SMBJLCR80” or “SMBGLCR80” depending on the terminal configuration desired. If using two (2) low capacitance TVS devices in anti-parallel for bidirectional applications, this added protective feature for both directions (including the reverse of each rectifier diode) is inherently provided in Figure 6. The unidirectional and bidirectional configurations in figure 5 and 6 will both result in twice the capacitance of figure 4.

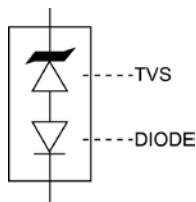


FIGURE 4
TVS with internal low capacitance rectifier diode

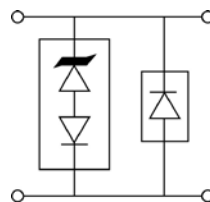


FIGURE 5
Optional Unidirectional configuration (TVS and separate rectifier diode in parallel)

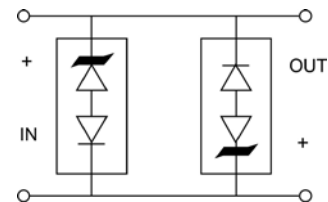
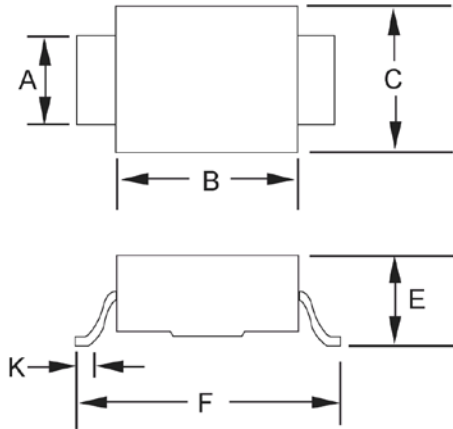
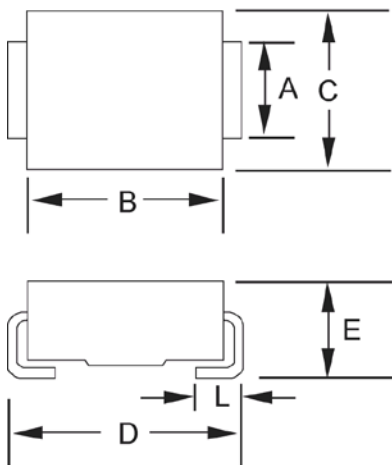


FIGURE 6
Optional Bidirectional configuration (two TVS devices in anti-parallel)

PACKAGE DIMENSIONS

SMCG (DO-215AB)

| Ltr | Dimensions | | | |
|----------|------------|------|-------------|-------|
| | Inch | | Millimeters | |
| | Min | Max | Min | Max |
| A | .115 | .121 | 2.92 | 3.07 |
| B | .260 | .280 | 6.60 | 7.11 |
| C | .220 | .245 | 5.59 | 6.22 |
| E | .077 | .110 | 1.95 | 2.80 |
| F | .380 | .400 | 9.65 | 10.16 |
| K | .025 | .040 | 0.635 | 1.016 |

NOTES: Dimension "E" exceeds the JEDEC outline as shown.
Typical Standoff Height: 0.004" – 0.008" (0.1 mm – 0.2 mm).


SMCJ (DO-214AB)

| Ltr | Dimensions | | | |
|----------|------------|------|-------------|------|
| | Inch | | Millimeters | |
| | Min | Max | Min | Max |
| A | .115 | .121 | 2.92 | 3.07 |
| B | .260 | .280 | 6.60 | 7.11 |
| C | .220 | .245 | 5.59 | 6.22 |
| D | .305 | .320 | 7.75 | 8.13 |
| E | .077 | .110 | 1.95 | 2.80 |
| L | .030 | .060 | .760 | 1.52 |

NOTES: Dimension "E" exceeds the JEDEC outline in height as shown.
Typical Standoff Height: 0.004" – 0.008" (0.1 mm – 0.2 mm).

PAD LAYOUT


| SMCG (DO-215AB) | | |
|------------------------|-------------|--------------------|
| Ltr | Inch | Millimeters |
| A | .510 | 12.95 |
| B | .110 | 2.79 |
| C | .150 | 3.81 |

| SMCJ (DO-214AB) | | |
|------------------------|-------------|--------------------|
| Ltr | Inch | Millimeters |
| A | .390 | 9.90 |
| B | .110 | 2.79 |
| C | .150 | 3.81 |