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SCOTTSDALE DIVISION

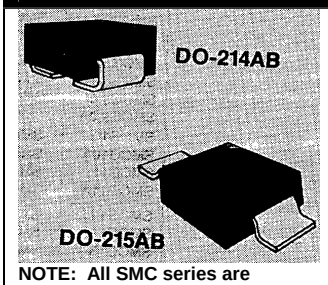
# SMCJ5.0 thru SMCJ170CA, e3 and SMCG5.0 thru SMCG170CA, e3

## SURFACE MOUNT 1500 Watt Transient Voltage Suppressor

## DESCRIPTION

The SMCJ5.0-170A or SMCG5.0-170A series of 1500 W Transient Voltage Suppressors (TVSs) protects a variety of voltage-sensitive components. It is available in J-bend design (SMCJ) with the DO-214AB package for greater PC board mounting density or in a Gull-wing design (SMCG) in the DO-215AB for visible solder connections. Selections include unidirectional and bidirectional as well as RoHS Compliant with an e3 suffix. They can protect from secondary lightning effects per IEC61000-4-5 and class levels defined herein, or for inductive switching environments and induced RF protection. 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.

## APPEARANCE




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

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

## FEATURES

- Economical surface mount design in both J-bend or Gull-wing terminations
- Available in both Unidirectional and Bidirectional construction with a C or CA suffix
- Optional 100% **screening for avionics grade** is available by adding MA prefix to part number for added 100% temperature cycle -55°C to +125°C (10X) as well as surge (3X) and 24 hours HTRB with post test $V_{BR}$ & $I_D$ (in the operating direction for unidirectional or both directions for bidirectional)
- Options for screening in accordance with MIL-PRF-19500 for JANTX by adding MX prefix to the part number.
- Axial-lead equivalent packages for thru-hole mounting available as 1.5KE6.8 to 1.5KE200CA or 1N6267 thru 1N6303A and 1N5908 (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 "e3" suffix

## APPLICATIONS / BENEFITS

- Selections for 5.0 to 170 volts standoff voltages ($V_{WM}$)
- 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: SMC 5.0 to SMC 170A or CA
  - Class 2: SMC 5.0 to SMC 150A or CA
  - Class 3: SMC 5.0 to SMC 75A or CA
  - Class 4: SMC 5.0 to SMC 36A or CA
- Secondary lightning protection per IEC61000-4-5 with 12 Ohms source impedance:
  - Class 1 : SMC 5.0 to SMC 90A or CA
  - Class 2: SMC 5.0 to SMC 45A or CA
  - Class 3: SMC 5.0 to SMC 24A or CA
  - Class 4: SMC 5.0 to SMC 11A or CA
- Secondary lightning protection per IEC61000-4-5 with 2 Ohms source impedance:
  - Class 2: SMC 5.0 to SMC 22A or CA
  - Class 3: SMC 5.0 to SMC 10A or CA

## MAXIMUM RATINGS

- Peak Pulse Power dissipation at 25°C: 1500 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: 20°C/W junction to lead, or 80°C/W junction to ambient when mounted on FR4 PC board (1oz Cu) with recommended footprint (see last page)
- Steady-State Power dissipation: 6 watts at $T_L$ = 30°C, or 1.56 watts at $T_A$ = 25°C when mounted on FR4 PC board with recommended footprint
- Forward Surge: 200 Amps peak impulse of 8.3 ms half-sine wave at 25ºC (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) leads, tin-lead or RoHS compliant annealed matte-tin plating solderable to MIL-STD-750, method 2026
- POLARITY: Cathode indicated by band. No marking on bi-directional devices
- MARKING: Part number without "SM" prefix (e.g. C5.0, C5.0A, C5.0CA, MXC5.0A, 5.0Ae3, C5.0CAe3, C36, C36A, C36CA, MAC36CA, 36CAe3, etc.)
- TAPE & REEL option: Standard per EIA-481-2 with 16 mm tape, 750 per 7 inch reel or 2500 per 13 inch reel (add "TR" suffix to part number)
- WEIGHT: 0.25 grams



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## ELECTRICAL CHARACTERISTICS @ 25°C

| MICROSEMI PART NUMBER | | REVERSE STAND-OFF VOLTAGE | 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 | $V_{WM}$ Volts | MIN. MAX. | $I_{(BR)}$ mA | Volts | Amps | µA |
| SMCG5.0 | SMCJ5.0 | 5.0 | 6.40 – 7.30 | 10 | 9.6 | 156.2 | 1000 |
| SMCG5.0A | SMCJ5.0A | 5.0 | 6.40 – 7.00 | 10 | 9.2 | 163.0 | 1000 |
| SMCG6.0 | SMCJ6.0 | 6.0 | 6.67 – 8.15 | 10 | 11.4 | 131.6 | 1000 |
| SMCG6.0A | SMCJ6.0A | 6.0 | 6.67 – 7.37 | 10 | 10.3 | 145.6 | 1000 |
| SMCG6.5 | SMCJ6.5 | 6.5 | 7.22 – 8.82 | 10 | 12.3 | 122.0 | 500 |
| SMCG6.5A | SMCJ6.5A | 6.5 | 7.22 – 7.98 | 10 | 11.2 | 133.9 | 500 |
| SMCG7.0 | SMCJ7.0 | 7.0 | 7.78 – 9.51 | 10 | 13.3 | 112.8 | 200 |
| SMCG7.0A | SMCJ7.0A | 7.0 | 7.78 – 8.60 | 10 | 12.0 | 125.0 | 200 |
| SMCG7.5 | SMCJ7.5 | 7.5 | 8.33 – 10.2 | 1 | 14.3 | 104.9 | 100 |
| SMCG7.5A | SMCJ7.5A | 7.5 | 8.33 – 9.21 | 1 | 12.9 | 116.3 | 100 |
| SMCG8.0 | SMCJ8.0 | 8.0 | 8.89 – 10.9 | 1 | 15.0 | 100.0 | 50 |
| SMCG8.0A | SMCJ8.0A | 8.0 | 8.89 – 9.83 | 1 | 13.6 | 110.3 | 50 |
| SMCG8.5 | SMCJ8.5 | 8.5 | 9.44 – 11.5 | 1 | 15.9 | 94.3 | 20 |
| SMCG8.5A | SMCJ8.5A | 8.5 | 9.44 – 10.4 | 1 | 14.4 | 104.2 | 20 |
| SMCG9.0 | SMCJ9.0 | 9.0 | 10.0 – 12.2 | 1 | 16.9 | 88.7 | 10 |
| SMCG9.0A | SMCJ9.0A | 9.0 | 10.0 – 11.1 | 1 | 15.4 | 97.4 | 10 |
| SMCG10 | SMCJ10 | 10 | 11.1 – 13.6 | 1 | 18.8 | 79.8 | 5 |
| SMCG10A | SMCJ10A | 10 | 11.1 – 12.3 | 1 | 17.0 | 88.2 | 5 |
| SMCG11 | SMCJ11 | 11 | 12.2 – 14.9 | 1 | 20.1 | 74.6 | 5 |
| SMCG11A | SMCJ11A | 11 | 12.2 – 13.5 | 1 | 18.2 | 82.4 | 5 |
| SMCG12 | SMCJ12 | 12 | 13.3 – 16.3 | 1 | 22.0 | 68.2 | 5 |
| SMCG12A | SMCJ12A | 12 | 13.3 – 14.7 | 1 | 19.9 | 75.3 | 5 |
| SMCG13 | SMCJ13 | 13 | 14.4 – 17.6 | 1 | 23.8 | 63.0 | 1 |
| SMCG13A | SMCJ13A | 13 | 14.4 – 15.9 | 1 | 21.5 | 69.7 | 1 |
| SMCG14 | SMCJ14 | 14 | 15.6 – 19.1 | 1 | 25.8 | 58.1 | 1 |
| SMCG14A | SMCJ14A | 14 | 15.6 – 17.2 | 1 | 23.2 | 64.7 | 1 |
| SMCG15 | SMCJ15 | 15 | 16.7 – 20.4 | 1 | 26.9 | 55.8 | 1 |
| SMCG15A | SMCJ15A | 15 | 16.7 – 18.5 | 1 | 24.4 | 61.5 | 1 |
| SMCG16 | SMCJ16 | 16 | 17.8 – 21.8 | 1 | 28.8 | 52.1 | 1 |
| SMCG16A | SMCJ16A | 16 | 17.8 – 19.7 | 1 | 26.0 | 57.7 | 1 |
| SMCG17 | SMCJ17 | 17 | 18.9 – 23.1 | 1 | 30.5 | 49.2 | 1 |
| SMCG17A | SMCJ17A | 17 | 18.9 – 20.9 | 1 | 27.6 | 53.3 | 1 |
| SMCG18 | SMCJ18 | 18 | 20.0 – 24.4 | 1 | 32.2 | 46.6 | 1 |
| SMCG18A | SMCJ18A | 18 | 20.0 – 22.1 | 1 | 29.2 | 51.4 | 1 |
| SMCG20 | SMCJ20 | 20 | 22.2 – 27.1 | 1 | 35.8 | 41.9 | 1 |
| SMCG20A | SMCJ20A | 20 | 22.2 – 24.5 | 1 | 32.4 | 46.3 | 1 |
| SMCG22 | SMCJ22 | 22 | 24.4 – 29.8 | 1 | 39.4 | 38.1 | 1 |
| SMCG22A | SMCJ22A | 22 | 24.4 – 26.9 | 1 | 35.5 | 42.2 | 1 |
| SMCG24 | SMCJ24 | 24 | 26.7 – 32.6 | 1 | 43.0 | 34.9 | 1 |
| SMCG24A | SMCJ24A | 24 | 26.7 – 29.5 | 1 | 38.9 | 38.6 | 1 |
| SMCG26 | SMCJ26 | 26 | 28.9 – 35.3 | 1 | 46.6 | 32.2 | 1 |
| SMCG26A | SMCJ26A | 26 | 28.9 – 31.9 | 1 | 42.1 | 35.6 | 1 |
| SMCG28 | SMCJ28 | 28 | 31.1 – 38.0 | 1 | 50.0 | 30.0 | 1 |
| SMCG28A | SMCJ28A | 28 | 31.1 – 34.4 | 1 | 45.4 | 33.0 | 1 |
| SMCG30 | SMCJ30 | 30 | 33.3 – 40.7 | 1 | 53.5 | 28.0 | 1 |
| SMCG30A | SMCJ30A | 30 | 33.3 – 36.8 | 1 | 48.4 | 31.0 | 1 |
| SMCG33 | SMCJ33 | 33 | 36.7 – 44.9 | 1 | 59.0 | 25.2 | 1 |
| SMCG33A | SMCJ33A | 33 | 36.7 – 40.6 | 1 | 53.3 | 28.1 | 1 |
| SMCG36 | SMCJ36 | 36 | 40.0 – 48.9 | 1 | 64.3 | 23.3 | 1 |
| SMCG36A | SMCJ36A | 36 | 40.0 – 44.2 | 1 | 58.1 | 25.8 | 1 |
| SMCG40 | SMCJ40 | 40 | 44.4 – 54.3 | 1 | 71.4 | 21.0 | 1 |
| SMCG40A | SMCJ40A | 40 | 44.4 – 49.1 | 1 | 64.5 | 23.2 | 1 |
| SMCG43 | SMCJ43 | 43 | 47.8 – 58.4 | 1 | 76.7 | 19.6 | 1 |
| SMCG43A | SMCJ43A | 43 | 47.8 – 52.8 | 1 | 69.4 | 21.6 | 1 |
| SMCG45 | SMCJ45 | 45 | 50.0 – 61.1 | 1 | 80.3 | 18.7 | 1 |
| SMCG45A | SMCJ45A | 45 | 50.0 – 55.3 | 1 | 72.7 | 20.6 | 1 |



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| MICROSEMI PART NUMBER | | REVERSE STAND-OFF VOLTAGE | 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 | $V_{WM}$ Volts | MIN. MAX. | $I_{(BR)}$ mA | Volts | Amps | µA |
| SMCG48 | SMCJ48 | 48 | 53.3 – 65.1 | 1 | 85.5 | 17.5 | 1 |
| SMCG48A | SMCJ48A | 48 | 53.3 – 58.9 | 1 | 77.4 | 19.4 | 1 |
| SMCG51 | SMCJ51 | 51 | 56.7 – 69.3 | 1 | 91.1 | 18.5 | 1 |
| SMCG51A | SMCJ51A | 51 | 56.7 – 62.7 | 1 | 82.4 | 18.2 | 1 |
| SMCG54 | SMCJ54 | 54 | 60.0 – 73.3 | 1 | 96.3 | 15.6 | 1 |
| SMCG54A | SMCJ54A | 54 | 60.0 – 66.3 | 1 | 87.1 | 17.2 | 1 |
| SMCG58 | SMCJ58 | 58 | 64.4 – 78.7 | 1 | 103.0 | 14.6 | 1 |
| SMCG58A | SMCJ58A | 58 | 64.4 – 71.2 | 1 | 93.6 | 16.0 | 1 |
| SMCG60 | SMCJ60 | 60 | 66.7 – 81.5 | 1 | 107.0 | 14.0 | 1 |
| SMCG60A | SMCJ60A | 60 | 66.7 – 73.7 | 1 | 96.8 | 15.5 | 1 |
| SMCG64 | SMCJ64 | 64 | 71.1 – 86.9 | 1 | 114.0 | 13.2 | 1 |
| SMCG64A | SMCJ64A | 64 | 71.1 – 78.6 | 1 | 103.0 | 14.6 | 1 |
| SMCG70 | SMCJ70 | 70 | 77.8 – 95.1 | 1 | 125 | 12.0 | 1 |
| SMCG70A | SMCJ70A | 70 | 77.8 – 86.0 | 1 | 113 | 13.3 | 1 |
| SMCG75 | SMCJ75 | 75 | 83.3 – 102.0 | 1 | 134 | 11.2 | 1 |
| SMCG75A | SMCJ75A | 75 | 83.3 – 92.1 | 1 | 121 | 12.4 | 1 |
| SMCG78 | SMCJ78 | 78 | 86.7 – 106.0 | 1 | 139 | 10.8 | 1 |
| SMCG78A | SMCJ78A | 78 | 86.7 – 95.8 | 1 | 126 | 11.4 | 1 |
| SMCG85 | SMCJ85 | 85 | 94.4 – 115.0 | 1 | 151 | 9.9 | 1 |
| SMCG85A | SMCJ85A | 85 | 94.4 – 104.0 | 1 | 137 | 10.4 | 1 |
| SMCG90 | SMCJ90 | 90 | 100 – 122 | 1 | 160 | 9.4 | 1 |
| SMCG90A | SMCJ90A | 90 | 100 – 111 | 1 | 146 | 10.3 | 1 |
| SMCG100 | SMCJ100 | 100 | 111 – 136 | 1 | 179 | 8.4 | 1 |
| SMCG100A | SMCJ100A | 100 | 111 – 123 | 1 | 162 | 9.3 | 1 |
| SMCG110 | SMCJ110 | 110 | 122 – 149 | 1 | 196 | 7.7 | 1 |
| SMCG110A | SMCJ110A | 110 | 122 – 135 | 1 | 177 | 8.4 | 1 |
| SMCG120 | SMCJ120 | 120 | 133 – 163 | 1 | 214 | 7.0 | 1 |
| SMCG120A | SMCJ120A | 120 | 133 – 147 | 1 | 193 | 7.8 | 1 |
| SMCG130 | SMCJ130 | 130 | 144 – 176 | 1 | 231 | 6.5 | 1 |
| SMCG130A | SMCJ130A | 130 | 144 – 159 | 1 | 209 | 7.2 | 1 |
| SMCG150 | SMCJ150 | 150 | 167 – 204 | 1 | 268 | 5.6 | 1 |
| SMCG150A | SMCJ150A | 150 | 167 – 185 | 1 | 243 | 6.2 | 1 |
| SMCG160 | SMCJ160 | 160 | 178 – 218 | 1 | 287 | 5.2 | 1 |
| SMCG160A | SMCJ160A | 160 | 178 – 197 | 1 | 259 | 5.8 | 1 |
| SMCG170 | SMCJ170 | 170 | 189 – 231 | 1 | 304 | 4.9 | 1 |
| SMCG170A | SMCJ170A | 170 | 189 – 209 | 1 | 275 | 5.5 | 1 |

- For Bidirectional device types indicate a C or CA suffix after the part number. (i.e.: SMCG170CA or SMCJ170C). Bidirectional capacitance is half that shown in figure 4 at zero volts.
- Microsemi Corp's SMC series (1500 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

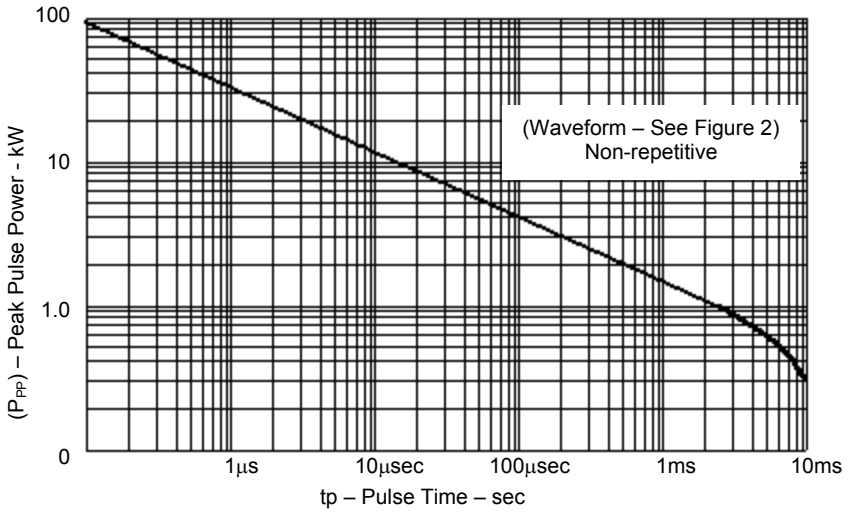



**FIGURE 1 –** Peak Pulse Power vs. Pulse Time

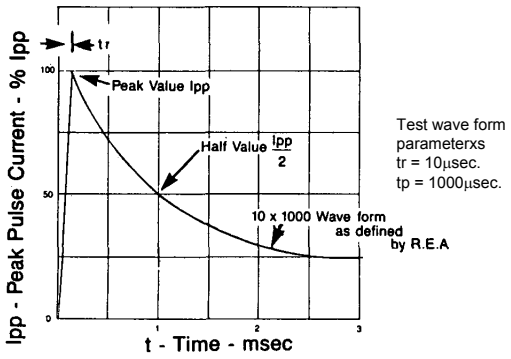



**FIGURE 2** – PULSE WAVEFORM

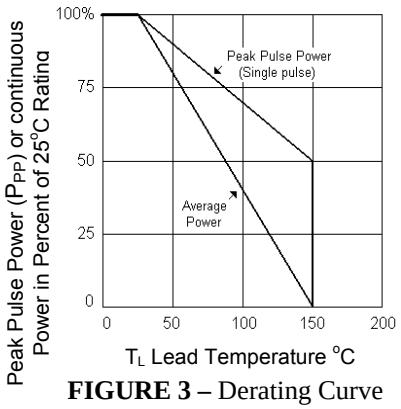



**FIGURE 3 –** Derating Curve

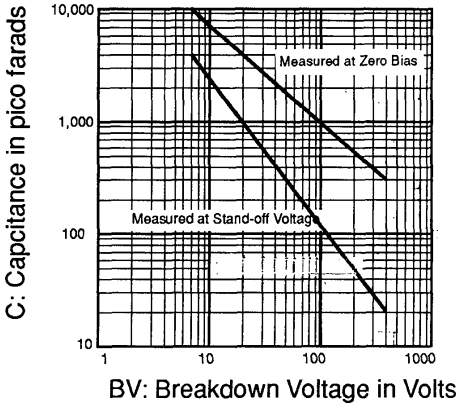
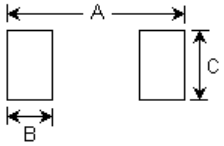



**FIGURE 4**
Typical Capacitance vs.
Breakdown Voltage

## PAD LAYOUT



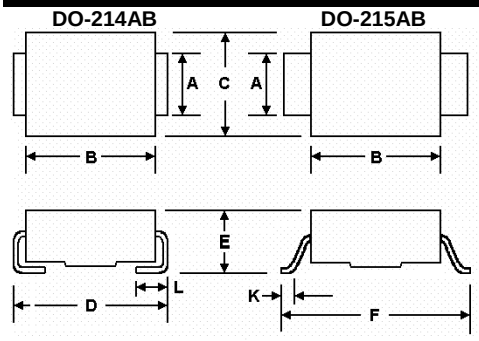

**SMCJ**

| | INCHES | mm |
|---|---|---|
| A | .390 | 9.90 |
| B | .110 | 2.79 |
| C | .150 | 3.81 |

**SMCG**

| | INCHES | mm |
|---|---|---|
| A | 0.510 | 12.95 |
| B | 0.110 | 2.79 |
| C | 0.150 | 3.81 |

## PACKAGE DIMENSIONS




| DIMENSIONS IN INCHES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | K | L |
| MIN | .115 | .260 | .220 | .305 | .077 | .380 | .025 | .030 |
| MAX | .121 | .280 | .245 | .320 | .104 | .400 | .040 | .060 |
| **DIMENSIONS IN MILLIMETERS** | | | | | | | | |
| MIN | 2.92 | 6.60 | 5.59 | 7.75 | 1.95 | 9.65 | 0.635 | .760 |
| MAX | 3.07 | 7.11 | 6.22 | 8.13 | 2.65 | 10.16 | 1.016 | 1.520 |

Typical Standoff Height: 0.004” – 0.008” (0.1mm – 0.2mm)



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