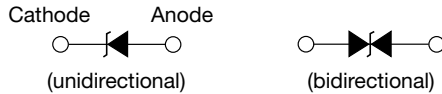


# Surface-Mount TRANSZORB<sup>®</sup> Transient Voltage Suppressors


**SMA (DO-214AC)**


## LINKS TO ADDITIONAL RESOURCES



| PRIMARY CHARACTERISTICS  |                               |
|--------------------------|-------------------------------|
| $V_{BR}$ uni-directional | 6.40 V to 231 V               |
| $V_{BR}$ bi-directional  | 6.40 V to 231 V               |
| $V_{WM}$                 | 5.0 V to 188 V                |
| $P_{PPM}$                | 400 W, 300 W                  |
| $P_D$                    | 3.3 W                         |
| $I_{FSM}$                | 40 A                          |
| $T_J$ max.               | 150 °C                        |
| Polarity                 | Unidirectional, bidirectional |
| Package                  | SMA (DO-214AC)                |

## DEVICES FOR BIDIRECTION APPLICATIONS

For bidirectional use CA suffix (e.g. SMAJ10CA). Electrical characteristics apply in both directions.

## TYPICAL APPLICATIONS

Use in sensitive electronics protection against voltage transients induced by inductive load switching and lighting on ICs, MOSFET, signal lines of sensor units for consumer, computer, industrial, automotive, and telecommunication.

| MAXIMUM RATINGS ( $T_A = 25$ °C unless otherwise noted)                         |                |                |      |
|---------------------------------------------------------------------------------|----------------|----------------|------|
| PARAMETER                                                                       | SYMBOL         | VALUE          | UNIT |
| Peak pulse power dissipation with a 10/1000 $\mu$ s waveform (1)(2) (fig. 1)    | $P_{PPM}$      | 400            | W    |
| Peak pulse current with a waveform (1)                                          | $I_{PPM}$      | See next table | A    |
| Power dissipation on infinite heatsink at $T_A = 50$ °C                         | $P_D$          | 3.3            | W    |
| Peak forward surge current 8.3 ms single half sine-wave unidirectional only (2) | $I_{FSM}$      | 40             | A    |
| Operating junction and storage temperature range                                | $T_J, T_{STG}$ | -55 to +150    | °C   |

### Notes

- Non-repetitive current pulse, per fig. 3 and derated above  $T_A = 25$  °C per fig. 2. Rating is 300 W above 78 V
- Mounted on 0.2" x 0.2" (5.0 mm x 5.0 mm) copper pads to each terminal

## FEATURES

- Low profile package
- Ideal for automated placement
- Glass passivated chip junction
- Available in unidirectional and bidirectional
- 400 W peak pulse power capability with a 10/1000  $\mu$ s waveform, repetitive rate (duty cycle): 0.01 % (300 W above 78 V)
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- AEC-Q101 qualified available
  - Automotive ordering code: base P/NHE3 or P/NHM3
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



## MECHANICAL DATA

### Case: SMA (DO-214AC)

Molding compound meets UL 94 V-0 flammability rating

Base P/N-E3 - RoHS-compliant, commercial grade

Base P/N-M3 - halogen-free, RoHS-compliant, commercial grade

Base P/NHE3\_X - RoHS-compliant and AEC-Q101 qualified

Base P/NHM3\_X - halogen-free, RoHS-compliant, and AEC-Q101 qualified

("\_X" denotes revision code e.g. A, B, ...)

**Terminals:** matte tin plated leads, solderable per J-STD-002 and JESD 22-B102

E3, M3, HE3, and HM3 suffix meets JESD 201 class 2 whisker test

**Polarity:** for unidirectional types the band denotes cathode end, no marking on bidirectional types



| ELECTRICAL CHARACTERISTICS (T <sub>A</sub> = 25 °C unless otherwise noted) |                     |    |                                                             |      |                                  |                                       |                                                                    |                                                           |                                                                 |                                                           |
|----------------------------------------------------------------------------|---------------------|----|-------------------------------------------------------------|------|----------------------------------|---------------------------------------|--------------------------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------|
| DEVICE TYPE                                                                | DEVICE MARKING CODE |    | BREAKDOWN VOLTAGE V <sub>BR</sub> AT I <sub>T</sub> (1) (V) |      | TEST CURRENT I <sub>T</sub> (mA) | STAND-OFF VOLTAGE V <sub>WM</sub> (V) | MAXIMUM REVERSE LEAKAGE AT V <sub>WM</sub> I <sub>D</sub> (μA) (3) | MAXIMUM PEAK PULSE SURGE CURRENT I <sub>PPM</sub> (A) (2) | MAXIMUM CLAMPING VOLTAGE AT I <sub>PPM</sub> V <sub>C</sub> (V) | MAXIMUM TEMPERATURE COEFFICIENT OF V <sub>BR</sub> (%/°C) |
|                                                                            | UNI                 | BI | MIN.                                                        | MAX. |                                  |                                       |                                                                    |                                                           |                                                                 |                                                           |
| (+)SMAJ5.0A (5)                                                            | AE                  | WE | 6.40                                                        | 7.07 | 10                               | 5.0                                   | 800                                                                | 43.5                                                      | 9.2                                                             | 0.057                                                     |
| (+)SMAJ6.0A                                                                | AG                  | WG | 6.67                                                        | 7.37 | 10                               | 6.0                                   | 800                                                                | 38.8                                                      | 10.3                                                            | 0.059                                                     |
| (+)SMAJ6.5A                                                                | AK                  | WK | 7.22                                                        | 7.98 | 10                               | 6.5                                   | 500                                                                | 35.7                                                      | 11.2                                                            | 0.061                                                     |
| (+)SMAJ7.0A                                                                | AM                  | WM | 7.78                                                        | 8.60 | 10                               | 7.0                                   | 200                                                                | 33.3                                                      | 12.0                                                            | 0.065                                                     |
| (+)SMAJ7.5A                                                                | AP                  | WP | 8.33                                                        | 9.21 | 1.0                              | 7.5                                   | 100                                                                | 31.0                                                      | 12.9                                                            | 0.067                                                     |
| (+)SMAJ8.0A                                                                | AR                  | WR | 8.89                                                        | 9.83 | 1.0                              | 8.0                                   | 50                                                                 | 29.4                                                      | 13.6                                                            | 0.069                                                     |
| (+)SMAJ8.5A                                                                | AT                  | WT | 9.44                                                        | 10.4 | 1.0                              | 8.5                                   | 10                                                                 | 27.8                                                      | 14.4                                                            | 0.073                                                     |
| (+)SMAJ9.0A                                                                | AV                  | WV | 10.0                                                        | 11.1 | 1.0                              | 9.0                                   | 5.0                                                                | 26.0                                                      | 15.4                                                            | 0.074                                                     |
| (+)SMAJ10A                                                                 | AX                  | WX | 11.1                                                        | 12.3 | 1.0                              | 10                                    | 1.0                                                                | 23.5                                                      | 17.0                                                            | 0.078                                                     |
| (+)SMAJ11A                                                                 | AZ                  | WZ | 12.2                                                        | 13.5 | 1.0                              | 11                                    | 1.0                                                                | 22.0                                                      | 18.2                                                            | 0.080                                                     |
| (+)SMAJ12A                                                                 | BE                  | XE | 13.3                                                        | 14.7 | 1.0                              | 12                                    | 1.0                                                                | 20.1                                                      | 19.9                                                            | 0.083                                                     |
| (+)SMAJ13A                                                                 | BG                  | XG | 14.4                                                        | 15.9 | 1.0                              | 13                                    | 1.0                                                                | 18.6                                                      | 21.5                                                            | 0.084                                                     |
| (+)SMAJ14A                                                                 | BK                  | XK | 15.6                                                        | 17.2 | 1.0                              | 14                                    | 1.0                                                                | 17.2                                                      | 23.2                                                            | 0.087                                                     |
| (+)SMAJ15A                                                                 | BM                  | XM | 16.7                                                        | 18.5 | 1.0                              | 15                                    | 1.0                                                                | 16.4                                                      | 24.4                                                            | 0.088                                                     |
| (+)SMAJ16A                                                                 | BP                  | XP | 17.8                                                        | 19.7 | 1.0                              | 16                                    | 1.0                                                                | 15.4                                                      | 26.0                                                            | 0.089                                                     |
| (+)SMAJ17A                                                                 | BR                  | XR | 18.9                                                        | 20.9 | 1.0                              | 17                                    | 1.0                                                                | 14.5                                                      | 27.6                                                            | 0.090                                                     |
| (+)SMAJ18A                                                                 | BT                  | XT | 20.0                                                        | 22.1 | 1.0                              | 18                                    | 1.0                                                                | 13.7                                                      | 29.2                                                            | 0.092                                                     |
| (+)SMAJ20A                                                                 | BV                  | XV | 22.2                                                        | 24.5 | 1.0                              | 20                                    | 1.0                                                                | 12.3                                                      | 32.4                                                            | 0.094                                                     |
| (+)SMAJ22A                                                                 | BX                  | XX | 24.4                                                        | 26.9 | 1.0                              | 22                                    | 1.0                                                                | 11.3                                                      | 35.5                                                            | 0.096                                                     |
| (+)SMAJ24A                                                                 | BZ                  | XZ | 26.7                                                        | 29.5 | 1.0                              | 24                                    | 1.0                                                                | 10.3                                                      | 38.9                                                            | 0.096                                                     |
| (+)SMAJ26A                                                                 | CE                  | YE | 28.9                                                        | 31.9 | 1.0                              | 26                                    | 1.0                                                                | 9.5                                                       | 42.1                                                            | 0.097                                                     |
| (+)SMAJ28A                                                                 | CG                  | YG | 31.1                                                        | 34.4 | 1.0                              | 28                                    | 1.0                                                                | 8.8                                                       | 45.4                                                            | 0.098                                                     |
| (+)SMAJ30A                                                                 | CK                  | YK | 33.3                                                        | 36.8 | 1.0                              | 30                                    | 1.0                                                                | 8.3                                                       | 48.4                                                            | 0.099                                                     |
| (+)SMAJ33A                                                                 | CM                  | YM | 36.7                                                        | 40.6 | 1.0                              | 33                                    | 1.0                                                                | 7.5                                                       | 53.3                                                            | 0.100                                                     |
| (+)SMAJ36A                                                                 | CP                  | YP | 40.0                                                        | 44.2 | 1.0                              | 36                                    | 1.0                                                                | 6.9                                                       | 58.1                                                            | 0.100                                                     |
| (+)SMAJ40A                                                                 | CR                  | YR | 44.4                                                        | 49.1 | 1.0                              | 40                                    | 1.0                                                                | 6.2                                                       | 64.5                                                            | 0.101                                                     |
| (+)SMAJ43A                                                                 | CT                  | YT | 47.8                                                        | 52.8 | 1.0                              | 43                                    | 1.0                                                                | 5.8                                                       | 69.4                                                            | 0.102                                                     |
| (+)SMAJ45A                                                                 | CV                  | YV | 50.0                                                        | 55.3 | 1.0                              | 45                                    | 1.0                                                                | 5.5                                                       | 72.7                                                            | 0.102                                                     |
| (+)SMAJ48A                                                                 | CX                  | YX | 53.3                                                        | 58.9 | 1.0                              | 48                                    | 1.0                                                                | 5.2                                                       | 77.4                                                            | 0.103                                                     |
| (+)SMAJ51A                                                                 | CZ                  | YZ | 56.7                                                        | 62.7 | 1.0                              | 51                                    | 1.0                                                                | 4.9                                                       | 82.4                                                            | 0.104                                                     |
| (+)SMAJ54A                                                                 | RE                  | ZE | 60.0                                                        | 66.3 | 1.0                              | 54                                    | 1.0                                                                | 4.6                                                       | 87.1                                                            | 0.104                                                     |
| (+)SMAJ58A                                                                 | RG                  | ZG | 64.4                                                        | 71.2 | 1.0                              | 58                                    | 1.0                                                                | 4.3                                                       | 93.6                                                            | 0.104                                                     |
| (+)SMAJ60A                                                                 | RK                  | ZK | 66.7                                                        | 73.7 | 1.0                              | 60                                    | 1.0                                                                | 4.1                                                       | 96.8                                                            | 0.105                                                     |
| (+)SMAJ64A                                                                 | RM                  | ZM | 71.1                                                        | 78.6 | 1.0                              | 64                                    | 1.0                                                                | 3.9                                                       | 103                                                             | 0.105                                                     |
| (+)SMAJ70A                                                                 | RP                  | ZP | 77.8                                                        | 86.0 | 1.0                              | 70                                    | 1.0                                                                | 3.5                                                       | 113                                                             | 0.105                                                     |
| (+)SMAJ75A                                                                 | RR                  | ZR | 83.3                                                        | 92.1 | 1.0                              | 75                                    | 1.0                                                                | 3.3                                                       | 121                                                             | 0.106                                                     |
| (+)SMAJ78A                                                                 | RT                  | ZT | 86.7                                                        | 95.8 | 1.0                              | 78                                    | 1.0                                                                | 3.2                                                       | 126                                                             | 0.106                                                     |
| (+)SMAJ85A                                                                 | RV                  | ZV | 94.4                                                        | 104  | 1.0                              | 85                                    | 1.0                                                                | 2.2                                                       | 137                                                             | 0.106                                                     |
| (+)SMAJ90A                                                                 | RX                  | ZX | 100                                                         | 111  | 1.0                              | 90                                    | 1.0                                                                | 2.1                                                       | 146                                                             | 0.106                                                     |
| (+)SMAJ100A                                                                | RZ                  | ZZ | 111                                                         | 123  | 1.0                              | 100                                   | 1.0                                                                | 1.9                                                       | 162                                                             | 0.107                                                     |
| (+)SMAJ110A                                                                | SE                  | VE | 122                                                         | 135  | 1.0                              | 110                                   | 1.0                                                                | 1.7                                                       | 177                                                             | 0.107                                                     |
| (+)SMAJ120A                                                                | VG                  | VG | 133                                                         | 147  | 1.0                              | 120                                   | 1.0                                                                | 1.6                                                       | 193                                                             | 0.108                                                     |
| (+)SMAJ130A                                                                | VK                  | VK | 144                                                         | 159  | 1.0                              | 130                                   | 1.0                                                                | 1.4                                                       | 209                                                             | 0.108                                                     |
| (+)SMAJ150A                                                                | VM                  | VM | 167                                                         | 185  | 1.0                              | 150                                   | 1.0                                                                | 1.2                                                       | 243                                                             | 0.108                                                     |
| (+)SMAJ160A                                                                | SP                  | VP | 178                                                         | 197  | 1.0                              | 160                                   | 1.0                                                                | 1.2                                                       | 259                                                             | 0.108                                                     |
| (+)SMAJ170A                                                                | SR                  | VR | 189                                                         | 209  | 1.0                              | 170                                   | 1.0                                                                | 1.09                                                      | 275                                                             | 0.108                                                     |
| (+)SMAJ188A                                                                | SS                  | VS | 209                                                         | 231  | 1.0                              | 188                                   | 1.0                                                                | 0.91                                                      | 328                                                             | 0.108                                                     |

Notes

- (1) Pulse test: t<sub>p</sub> ≤ 50 ms
- (2) Surge current waveform per fig. 3 and derate per fig. 2
- (3) For bidirectional types having V<sub>WM</sub> of 10 V and less, the I<sub>D</sub> limit is doubled
- (4) All terms and symbols are consistent with ANSI/IEEE C62.35
- (5) For the bi-directional SMAJ5.0CA, the maximum V<sub>BR</sub> is 7.25 V
- (6) V<sub>F</sub> = 3.5 V at I<sub>F</sub> = 25 A (unidirectional only)
- (+) Underwriters Laboratory Recognition for the classification of protectors (QVGG2) under the UL standard for safety 497B and file number E136766 for both unidirectional and bidirectional device



| <b>THERMAL CHARACTERISTICS</b> ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted) |                 |       |                    |
|-------------------------------------------------------------------------------------------|-----------------|-------|--------------------|
| PARAMETER                                                                                 | SYMBOL          | VALUE | UNIT               |
| Typical thermal resistance, junction to ambient <sup>(1)</sup>                            | $R_{\theta JA}$ | 120   | $^\circ\text{C/W}$ |
| Typical thermal resistance, junction to lead                                              | $R_{\theta JL}$ | 30    | $^\circ\text{C/W}$ |

**Note**

<sup>(1)</sup> Mounted on minimum recommended pad layout

| <b>ORDERING INFORMATION</b> (Example) |                 |                        |               |                                    |
|---------------------------------------|-----------------|------------------------|---------------|------------------------------------|
| PREFERRED P/N                         | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                      |
| SMAJ5.0A-E3/61                        | 0.064           | 61                     | 1800          | 7" diameter plastic tape and reel  |
| SMAJ5.0A-M3/61                        |                 |                        |               |                                    |
| SMAJ5.0A-E3/5A                        | 0.064           | 5A                     | 7500          | 13" diameter plastic tape and reel |
| SMAJ5.0A-M3/5A                        |                 |                        |               |                                    |
| SMAJ5.0AHE3_A/H <sup>(1)</sup>        | 0.064           | H                      | 1800          | 7" diameter plastic tape and reel  |
| SMAJ5.0AHM3_A/H <sup>(1)</sup>        |                 |                        |               |                                    |
| SMAJ5.0AHE3_A/I <sup>(1)</sup>        | 0.064           | I                      | 7500          | 13" diameter plastic tape and reel |
| SMAJ5.0AHM3_A/I <sup>(1)</sup>        |                 |                        |               |                                    |

**Note**

<sup>(1)</sup> AEC-Q101 qualified

## RATINGS AND CHARACTERISTICS CURVES ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted)

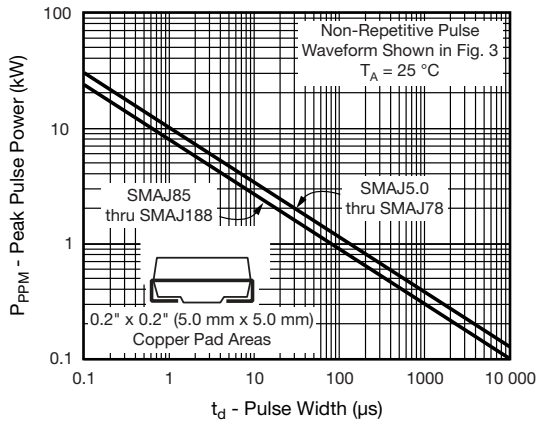


Fig. 1 - Peak Pulse Power Rating Curve

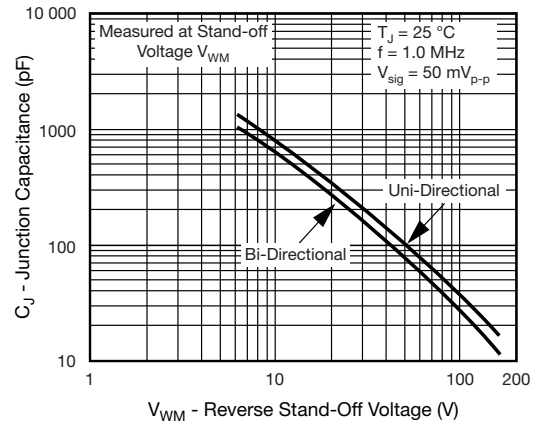


Fig. 4 - Typical Junction Capacitance

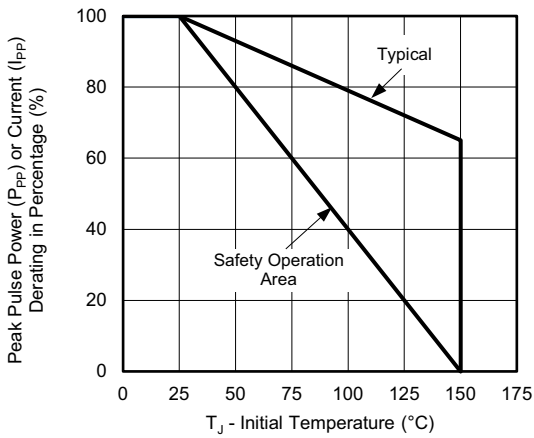


Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature

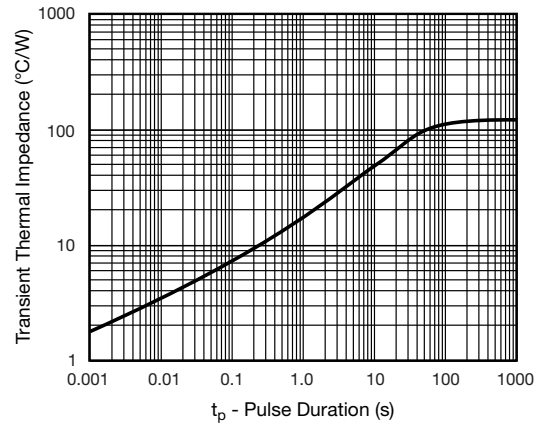


Fig. 5 - Typical Transient Thermal Impedance

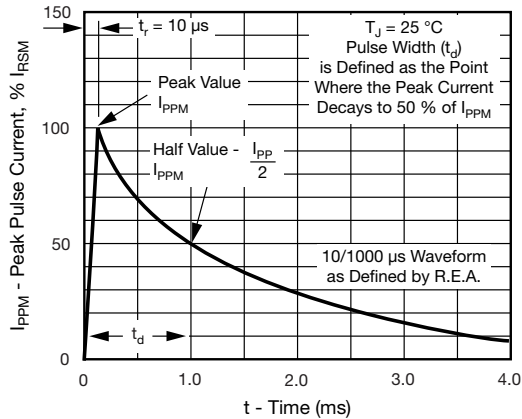


Fig. 3 - Pulse Waveform

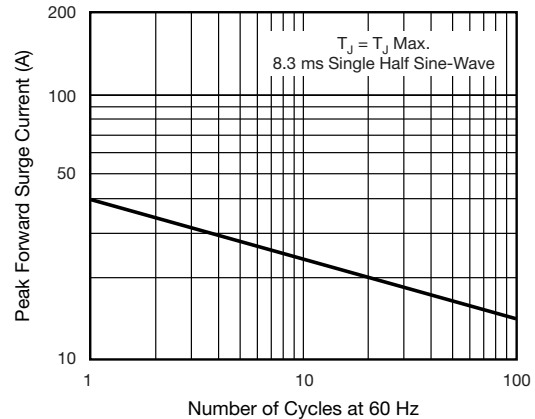
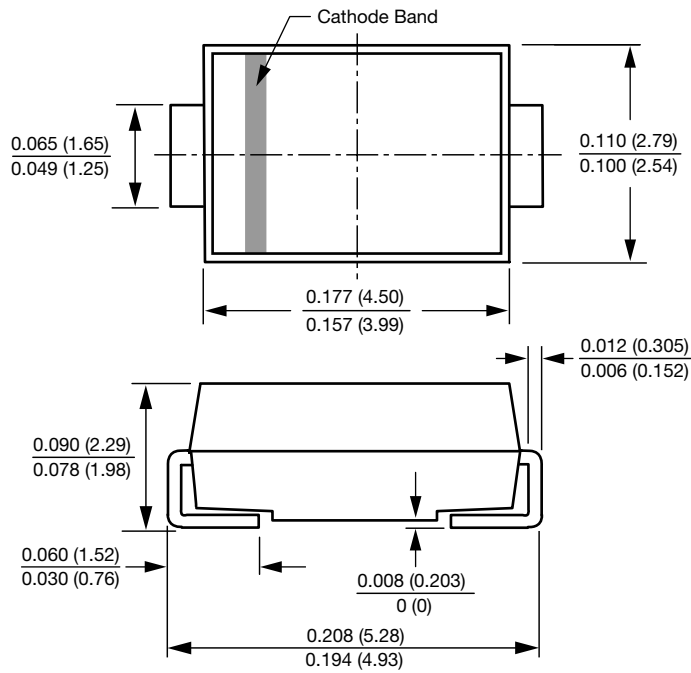


Fig. 6 - Maximum Non-Repetitive Forward Surge Current Unidirectional Only

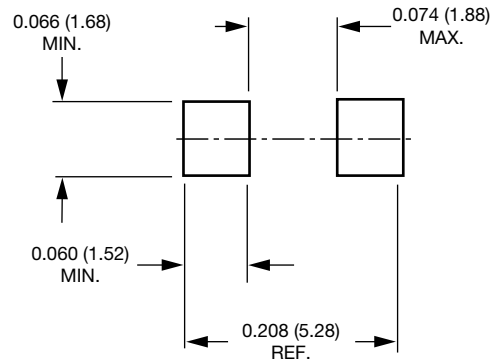


## PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

### SMA (DO-214AC)



### Mounting Pad Layout





## Disclaimer

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