

# 1.5 Watt Plastic Surface Mount Zener Voltage Regulators

## 1SMA59xxBT3G Series, SZ1SMA59xxBT3G Series

This complete new line of 1.5 Watt Zener Diodes offers the following advantages.

### Features

- Standard Zener Breakdown Voltage Range – 3.3 V to 68 V
- ESD Rating of Class 3 (> 16 kV) per Human Body Model
- Flat Handling Surface for Accurate Placement
- Package Design for Top Slide or Bottom Circuit Board Mounting
- Low Profile Package
- Ideal Replacement for MELF Packages
- AEC-Q101 Qualified and PPAP Capable – SZ1SMA59xxBT3G
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements
- These are Pb-Free Devices\*

### Mechanical Characteristics:

**CASE:** Void-free, transfer-molded plastic

**FINISH:** All external surfaces are corrosion resistant with readily solderable leads

**MAXIMUM CASE TEMPERATURE FOR SOLDERING PURPOSES:** 260°C for 10 seconds

**POLARITY:** Cathode indicated by molded polarity notch or cathode band

**FLAMMABILITY RATING:** UL 94 V-0 @ 0.125 in

### MAXIMUM RATINGS

| Rating                                                                                                                     | Symbol          | Value          | Unit       |
|----------------------------------------------------------------------------------------------------------------------------|-----------------|----------------|------------|
| DC Power Dissipation @ $T_L = 75^\circ\text{C}$ ,<br>Measured Zero Lead Length (Note 1)<br>Derate above $75^\circ\text{C}$ | $P_D$           | 1.5<br>20      | W<br>mW/°C |
| Thermal Resistance, Junction-to-Lead                                                                                       | $R_{\theta JL}$ | 50             | °C/W       |
| DC Power Dissipation @ $T_A = 25^\circ\text{C}$ (Note 2)<br>Derate above $25^\circ\text{C}$                                | $P_D$           | 0.5<br>4.0     | W<br>mW/°C |
| Thermal Resistance, Junction-to-Ambient                                                                                    | $R_{\theta JA}$ | 250            | °C/W       |
| Operating and Storage Temperature Range                                                                                    | $T_J, T_{stg}$  | -65 to<br>+150 | °C         |

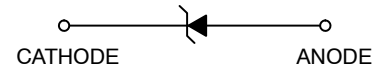
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. 1 in square copper pad, FR-4 board.
2. FR-4 Board, using onsemi minimum recommended footprint.

\*For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



SMA  
CASE 403D  
STYLE 1



### MARKING DIAGRAM



- 8xxB = Device Code (Refer to page 2)
- A = Assembly Location
- Y = Year
- WW = Work Week
- = Pb-Free Package

### ORDERING INFORMATION

| Device         | Package          | Shipping†              |
|----------------|------------------|------------------------|
| 1SMA59xxBT3G   | SMA<br>(Pb-Free) | 5,000 /<br>Tape & Reel |
| SZ1SMA59xxBT3G | SMA<br>(Pb-Free) | 5,000 /<br>Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

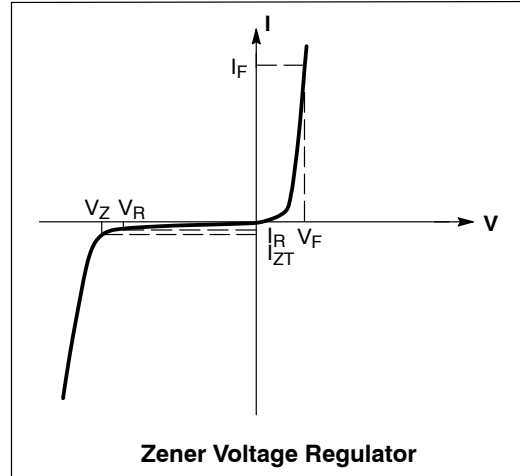
### DEVICE MARKING INFORMATION

See specific marking information in the device marking column of the Electrical Characteristics table on page 2 of this data sheet.

# 1SMA59xxBT3G Series, SZ1SMA59xxBT3G Series

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted,  $V_F = 1.2\text{ V}$  Max. @  $I_F = 200\text{ mA}$  for all types)

| Symbol   | Parameter                          |
|----------|------------------------------------|
| $V_Z$    | Reverse Zener Voltage @ $I_{ZT}$   |
| $I_{ZT}$ | Reverse Current                    |
| $Z_{ZT}$ | Maximum Zener Impedance @ $I_{ZT}$ |
| $I_{ZK}$ | Reverse Current                    |
| $Z_{ZK}$ | Maximum Zener Impedance @ $I_{ZK}$ |
| $I_R$    | Reverse Leakage Current @ $V_R$    |
| $V_R$    | Reverse Voltage                    |
| $I_F$    | Forward Current                    |
| $V_F$    | Forward Voltage @ $I_F$            |
| $I_{ZM}$ | Maximum DC Zener Current           |



**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted,  $V_F = 1.2\text{ V}$  Max. @  $I_F = 200\text{ mA}$  for all types)

| Device* (Note 3) | Device Marking | Zener Voltage (Note 4) |     |       |                   | Zener Impedance                   |                                   |                                 | Leakage Current |       | I <sub>ZM</sub> |
|------------------|----------------|------------------------|-----|-------|-------------------|-----------------------------------|-----------------------------------|---------------------------------|-----------------|-------|-----------------|
|                  |                | V <sub>Z</sub> (Volts) |     |       | @ I <sub>ZT</sub> | Z <sub>TT</sub> @ I <sub>ZT</sub> | Z <sub>ZK</sub> @ I <sub>ZK</sub> | I <sub>R</sub> @ V <sub>R</sub> |                 |       |                 |
|                  |                | Min                    | Nom | Max   | mA                | Ω                                 | Ω                                 | mA                              | μA              | Volts |                 |
| 1SMA5913BT3G     | 813B           | 3.13                   | 3.3 | 3.47  | 113.6             | 10                                | 500                               | 1.0                             | 50              | 1.0   | 455             |
| 1SMA5914BT3G     | 814B           | 3.42                   | 3.6 | 3.78  | 104.2             | 9.0                               | 500                               | 1.0                             | 35.5            | 1.0   | 417             |
| 1SMA5915BT3G     | 815B           | 3.70                   | 3.9 | 4.10  | 96.1              | 7.5                               | 500                               | 1.0                             | 12.5            | 1.0   | 385             |
| 1SMA5916BT3G     | 816B           | 4.08                   | 4.3 | 4.52  | 87.2              | 6.0                               | 500                               | 1.0                             | 2.5             | 1.0   | 349             |
| 1SMA5917BT3G     | 817B           | 4.46                   | 4.7 | 4.94  | 79.8              | 5.0                               | 500                               | 1.0                             | 2.5             | 1.5   | 319             |
| 1SMA5918BT3G     | 818B           | 4.84                   | 5.1 | 5.36  | 73.5              | 4.0                               | 350                               | 1.0                             | 2.5             | 2.0   | 294             |
| 1SMA5919BT3G     | 819B           | 5.32                   | 5.6 | 5.88  | 66.9              | 2.0                               | 250                               | 1.0                             | 2.5             | 3.0   | 268             |
| 1SMA5920BT3G     | 820B           | 5.89                   | 6.2 | 6.51  | 60.5              | 2.0                               | 200                               | 1.0                             | 2.5             | 4.0   | 242             |
| 1SMA5921BT3G     | 821B           | 6.46                   | 6.8 | 7.14  | 55.1              | 2.5                               | 200                               | 1.0                             | 2.5             | 5.2   | 221             |
| 1SMA5922BT3G     | 822B           | 7.12                   | 7.5 | 7.88  | 50                | 3.0                               | 400                               | 0.5                             | 2.5             | 6.0   | 200             |
| 1SMA5923BT3G     | 823B           | 7.79                   | 8.2 | 8.61  | 45.7              | 3.5                               | 400                               | 0.5                             | 2.5             | 6.5   | 183             |
| 1SMA5924BT3G     | 824B           | 8.64                   | 9.1 | 9.56  | 41.2              | 4.0                               | 500                               | 0.5                             | 2.5             | 7.0   | 165             |
| 1SMA5925BT3G     | 825B           | 9.5                    | 10  | 10.5  | 37.5              | 4.5                               | 500                               | 0.25                            | 2.5             | 8.0   | 150             |
| 1SMA5926BT3G     | 826B           | 10.45                  | 11  | 11.55 | 34.1              | 5.5                               | 550                               | 0.25                            | 0.5             | 8.4   | 136             |
| 1SMA5927BT3G     | 827B           | 11.4                   | 12  | 12.6  | 31.2              | 6.5                               | 550                               | 0.25                            | 0.5             | 9.1   | 125             |
| 1SMA5928BT3G     | 828B           | 12.35                  | 13  | 13.65 | 28.8              | 7.0                               | 550                               | 0.25                            | 0.5             | 9.9   | 115             |
| 1SMA5929BT3G     | 829B           | 14.25                  | 15  | 15.75 | 25                | 9.0                               | 600                               | 0.25                            | 0.5             | 11.4  | 100             |
| 1SMA5930BT3G     | 830B           | 15.2                   | 16  | 16.8  | 23.4              | 10                                | 600                               | 0.25                            | 0.5             | 12.2  | 94              |
| 1SMA5931BT3G     | 831B           | 17.1                   | 18  | 18.9  | 20.8              | 12                                | 650                               | 0.25                            | 0.5             | 13.7  | 83              |
| 1SMA5932BT3G     | 832B           | 19                     | 20  | 21    | 18.7              | 14                                | 650                               | 0.25                            | 0.5             | 15.2  | 75              |
| 1SMA5933BT3G     | 833B           | 20.9                   | 22  | 23.1  | 17                | 17.5                              | 650                               | 0.25                            | 0.5             | 16.7  | 68              |
| 1SMA5934BT3G     | 834B           | 22.8                   | 24  | 25.2  | 15.6              | 19                                | 700                               | 0.25                            | 0.5             | 18.2  | 63              |
| 1SMA5935BT3G     | 835B           | 25.65                  | 27  | 28.35 | 13.9              | 23                                | 700                               | 0.25                            | 0.5             | 20.6  | 56              |
| 1SMA5936BT3G     | 836B           | 28.5                   | 30  | 31.5  | 12.5              | 26                                | 750                               | 0.25                            | 0.5             | 22.8  | 50              |
| 1SMA5937BT3G     | 837B           | 31.35                  | 33  | 34.65 | 11.4              | 33                                | 800                               | 0.25                            | 0.5             | 25.1  | 45              |
| 1SMA5938BT3G     | 838B           | 34.2                   | 36  | 37.8  | 10.4              | 38                                | 850                               | 0.25                            | 0.5             | 27.4  | 42              |
| 1SMA5939BT3G     | 839B           | 37.05                  | 39  | 40.95 | 9.6               | 45                                | 900                               | 0.25                            | 0.5             | 29.7  | 38              |
| 1SMA5940BT3G     | 840B           | 40.85                  | 43  | 45.15 | 8.7               | 53                                | 950                               | 0.25                            | 0.5             | 32.7  | 35              |
| 1SMA5941BT3G     | 841B           | 44.65                  | 47  | 49.35 | 8.0               | 67                                | 1000                              | 0.25                            | 0.5             | 35.8  | 32              |
| 1SMA5942BT3G     | 842B           | 48.45                  | 51  | 53.55 | 7.3               | 70                                | 1100                              | 0.25                            | 0.5             | 38.8  | 29              |
| 1SMA5943BT3G     | 843B           | 53.2                   | 56  | 58.8  | 6.7               | 86                                | 1300                              | 0.25                            | 0.5             | 42.6  | 27              |
| 1SMA5945BT3G     | 845B           | 64.6                   | 68  | 71.4  | 5.5               | 120                               | 1700                              | 0.25                            | 0.5             | 51.7  | 22              |

3. Tolerance and Voltage Regulation Designation – The type number listed indicates a tolerance of  $\pm 5\%$ .

4.  $V_Z$  limits are to be guaranteed at thermal equilibrium.

\* Include SZ-prefix devices where applicable.

# 1SMA59xxBT3G Series, SZ1SMA59xxBT3G Series

## RATING AND TYPICAL CHARACTERISTIC CURVES ( $T_A = 25^\circ\text{C}$ )

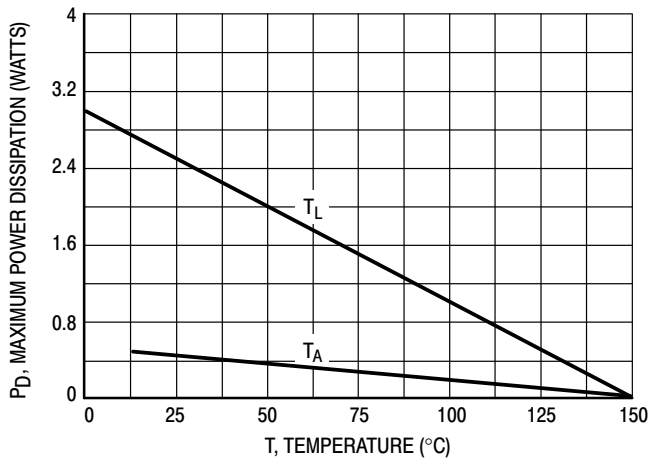


Figure 1. Steady State Power Derating

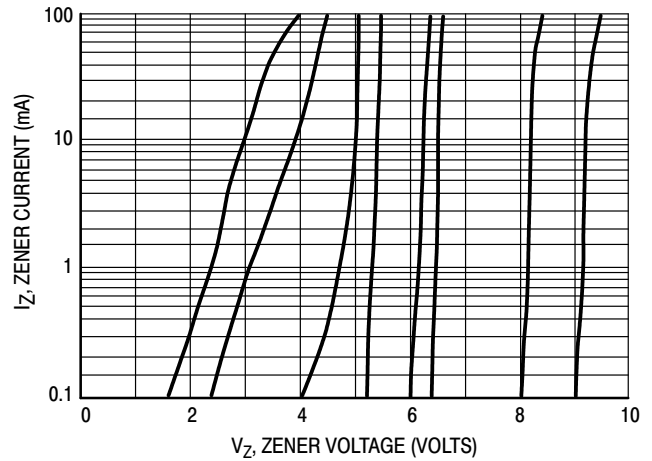


Figure 2.  $V_Z$  - 3.3 thru 10 Volts

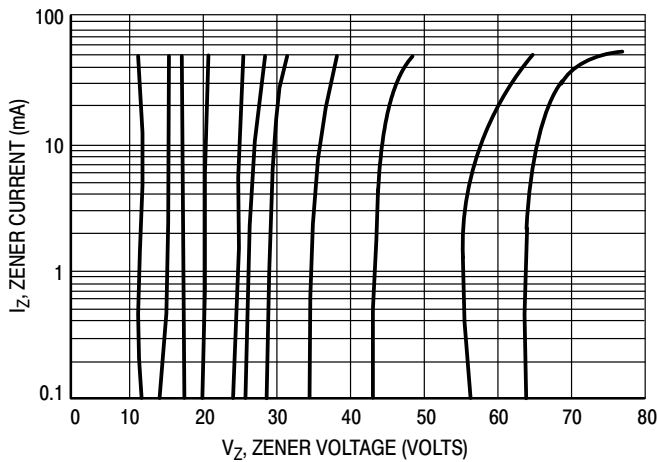


Figure 3.  $V_Z = 12$  thru 68 Volts

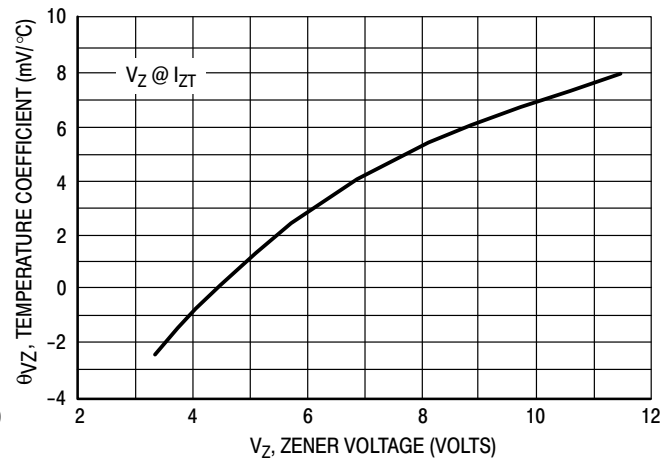


Figure 4. Zener Voltage - 3.3 to 12 Volts

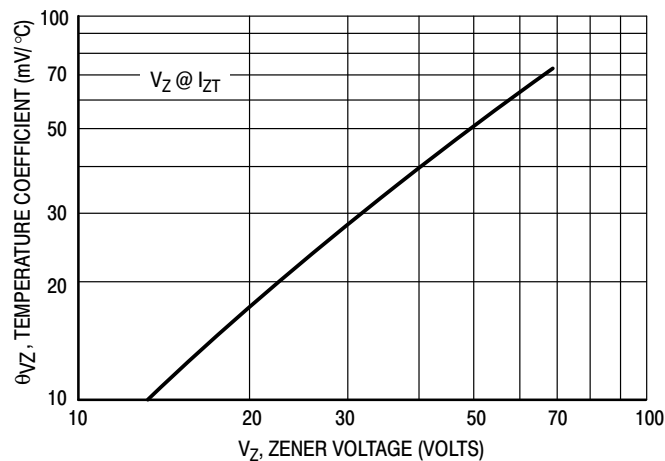


Figure 5. Zener Voltage - 12 to 68 Volts

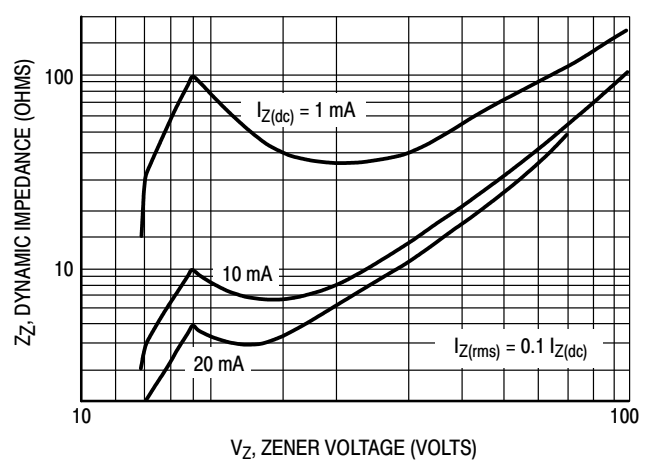


Figure 6. Effect of Zener Voltage

# 1SMA59xxBT3G Series, SZ1SMA59xxBT3G Series

## RATING AND TYPICAL CHARACTERISTIC CURVES ( $T_A = 25^\circ\text{C}$ )

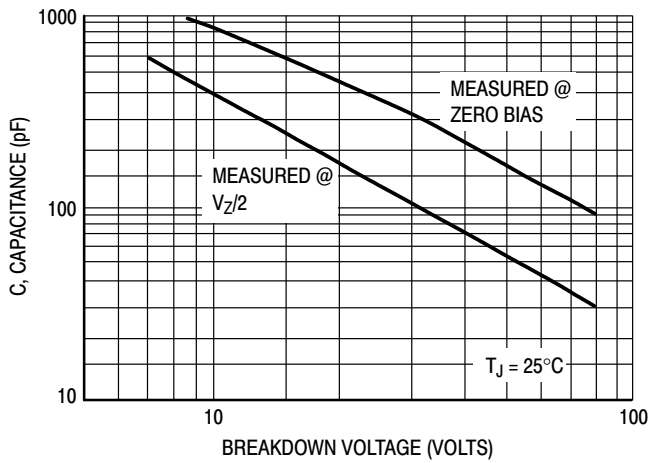


Figure 7. Capacitance Curve

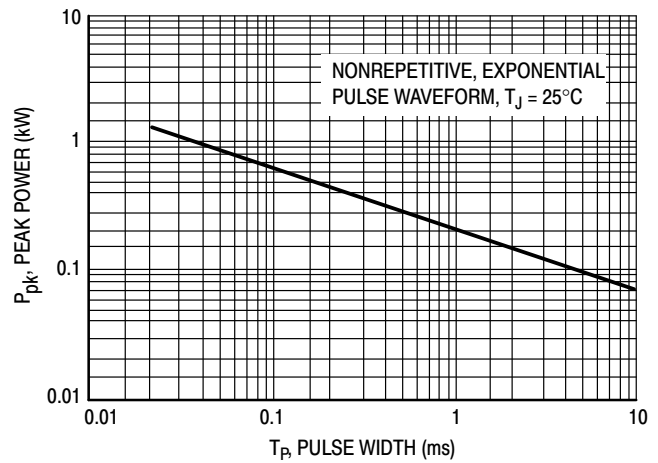


Figure 8. Typical Pulse Rating Curve

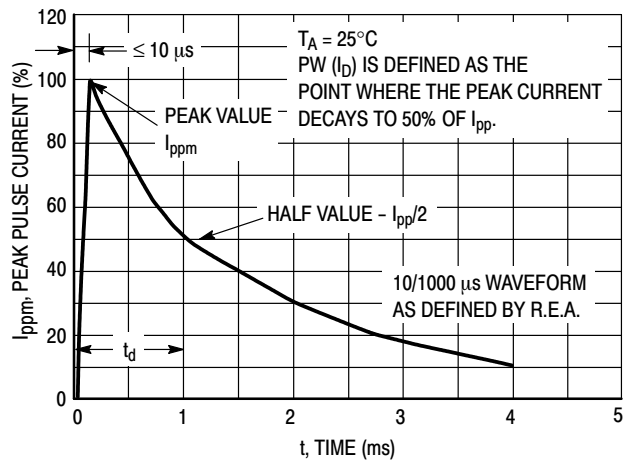


Figure 9. Pulse Waveform

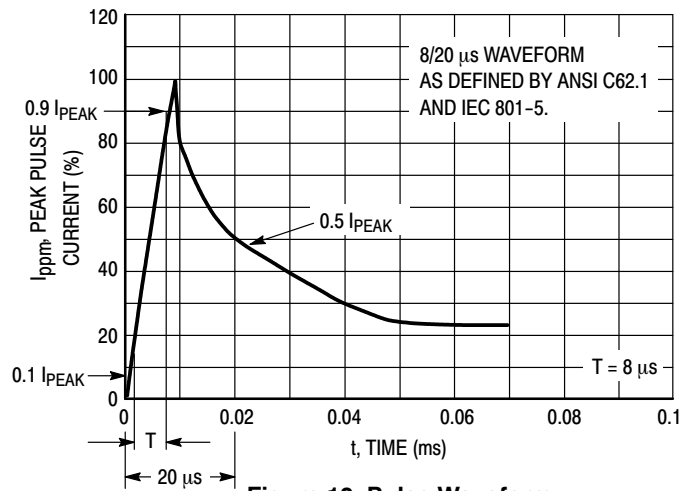


Figure 10. Pulse Waveform

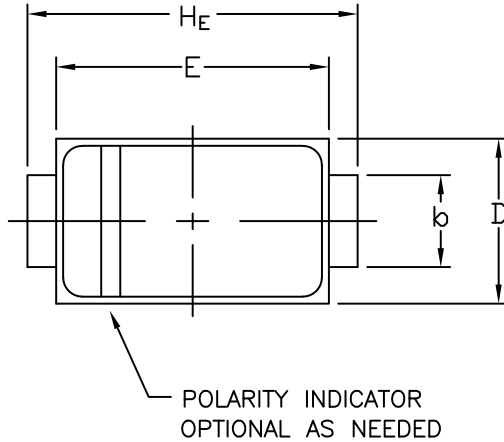


STYLE 1    STYLE 2

SCALE 1:1

### SMA CASE 403D ISSUE J

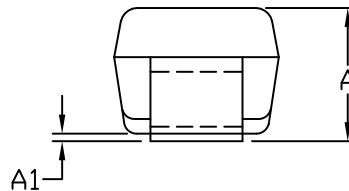
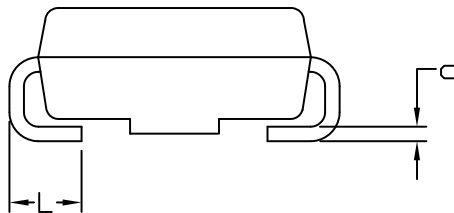
DATE 22 OCT 2021



#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCHES
3. DIMENSION *b* SHALL BE MEASURED WITHIN DIMENSION *L*.

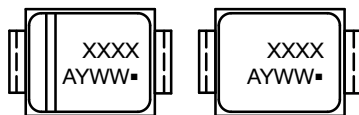
| DIM                  | MILLIMETERS |      |      | INCHES |       |       |
|----------------------|-------------|------|------|--------|-------|-------|
|                      | MIN.        | NOM. | MAX. | MIN.   | NOM.  | MAX.  |
| A                    | 1.97        | 2.10 | 2.20 | 0.078  | 0.083 | 0.087 |
| A1                   | 0.05        | 0.10 | 0.20 | 0.002  | 0.004 | 0.008 |
| <i>b</i>             | 1.27        | 1.45 | 1.63 | 0.050  | 0.057 | 0.064 |
| <i>c</i>             | 0.15        | 0.28 | 0.41 | 0.006  | 0.011 | 0.016 |
| D                    | 2.29        | 2.60 | 2.92 | 0.090  | 0.103 | 0.115 |
| E                    | 4.06        | 4.32 | 4.57 | 0.160  | 0.170 | 0.180 |
| <i>H<sub>E</sub></i> | 4.83        | 5.21 | 5.59 | 0.190  | 0.205 | 0.220 |
| L                    | 0.76        | 1.14 | 1.52 | 0.030  | 0.045 | 0.060 |



STYLE 1:  
PIN 1. CATHODE (POLARITY BAND)  
2. ANODE

STYLE 2:  
NO POLARITY

#### GENERIC MARKING DIAGRAM\*

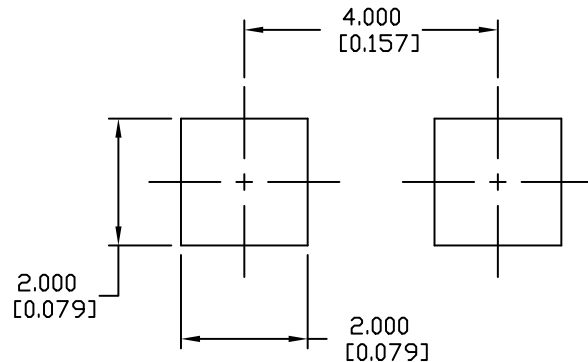


STYLE 1

STYLE 2

XXXX = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
▪ = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.



#### RECOMMENDED MOUNTING FOOTPRINT

|                         |                    |                                                                                                                                                                                  |
|-------------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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