

# 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         |

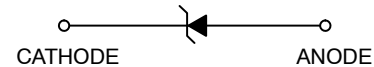
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

- 1 in square copper pad, FR-4 board.
- 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.

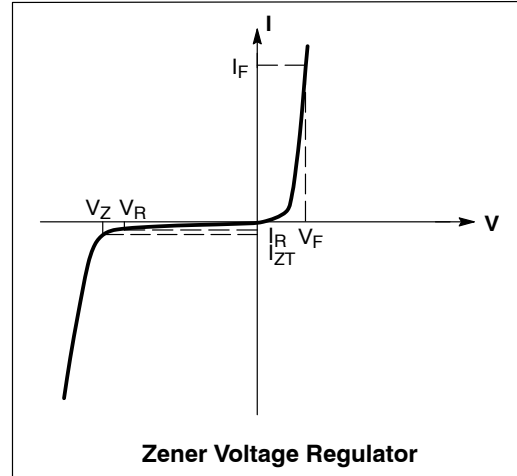
### DEVICE MARKING INFORMATION

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 |       | $I_{ZM}$ |
|------------------|----------------|------------------------|-----|-------|------------|---------------------|---------------------|------|-----------------|-------|----------|
|                  |                | $V_Z$ (Volts)          |     |       | @ $I_{ZT}$ | $Z_{ZT}$ @ $I_{ZT}$ | $Z_{ZK}$ @ $I_{ZK}$ |      | $I_R$ @ $V_R$   |       |          |
|                  |                | Min                    | Nom | Max   | mA         | $\Omega$            | $\Omega$            | mA   | $\mu\text{A}$   | 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 ( $T_A = 25^\circ\text{C}$ )

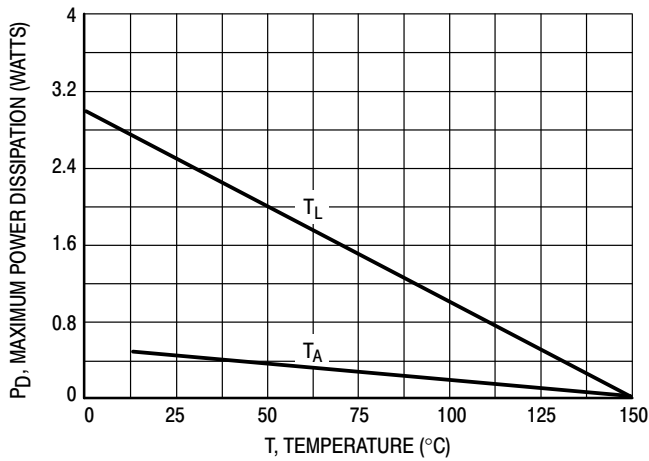


Figure 1. Steady State Power Derating

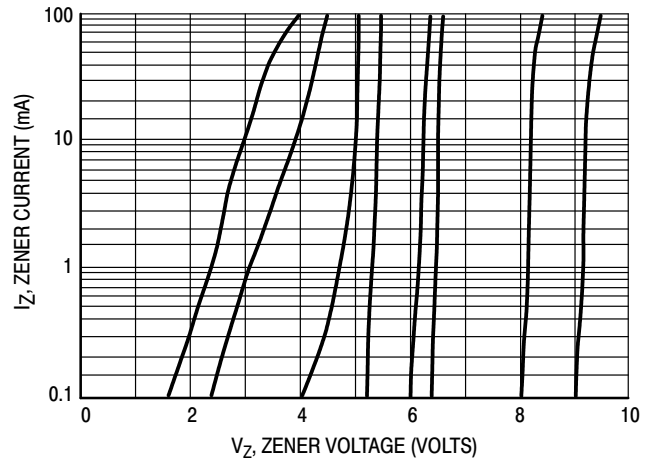


Figure 2.  $V_Z$  - 3.3 thru 10 Volts

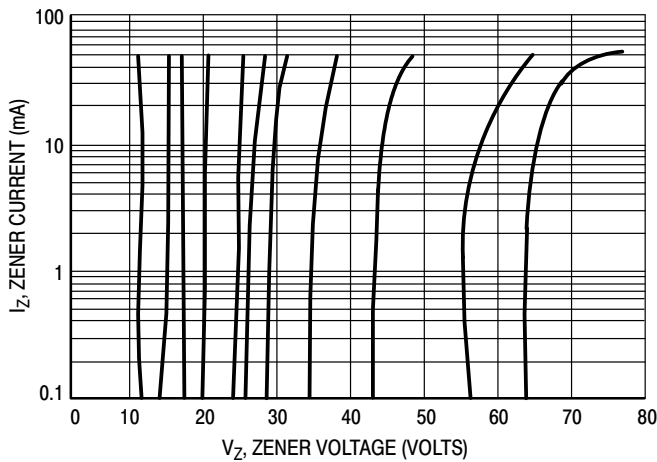


Figure 3.  $V_Z$  = 12 thru 68 Volts

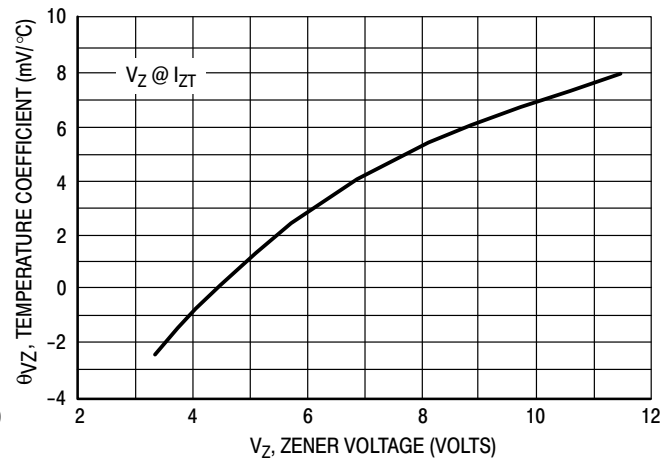


Figure 4. Zener Voltage - 3.3 to 12 Volts

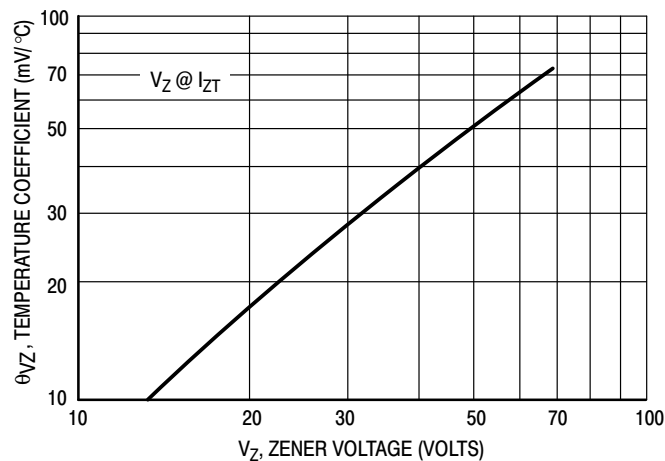


Figure 5. Zener Voltage - 12 to 68 Volts

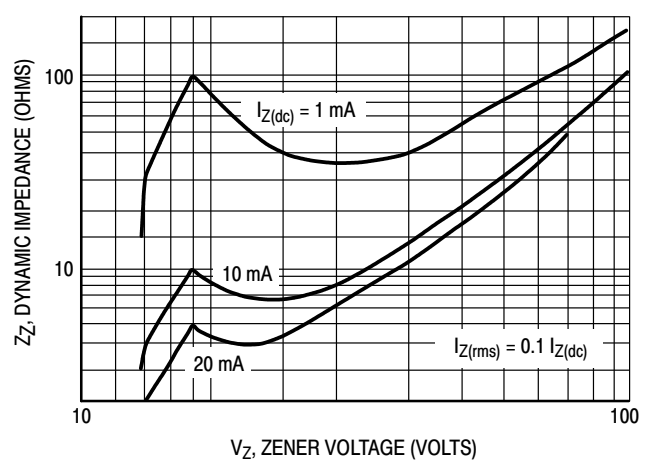


Figure 6. Effect of Zener Voltage

# 1SMA59xxBT3G Series, SZ1SMA59xxBT3G Series

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

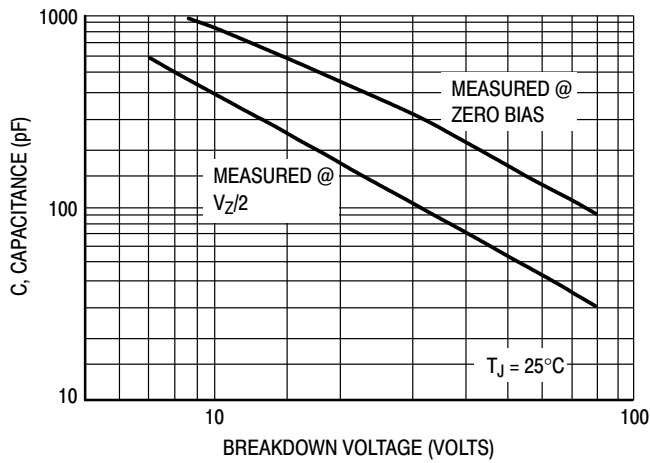


Figure 7. Capacitance Curve

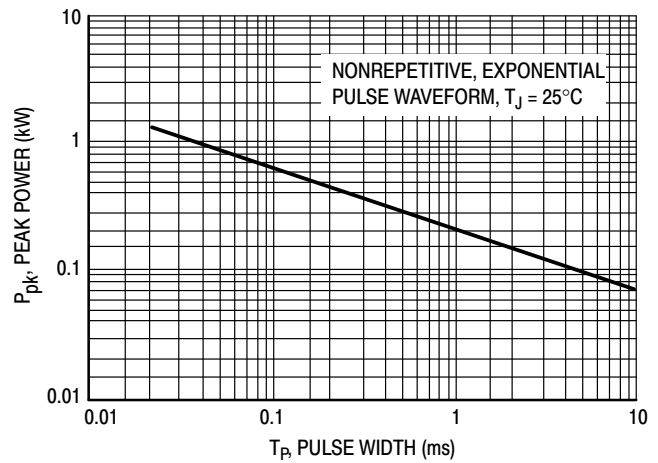


Figure 8. Typical Pulse Rating Curve

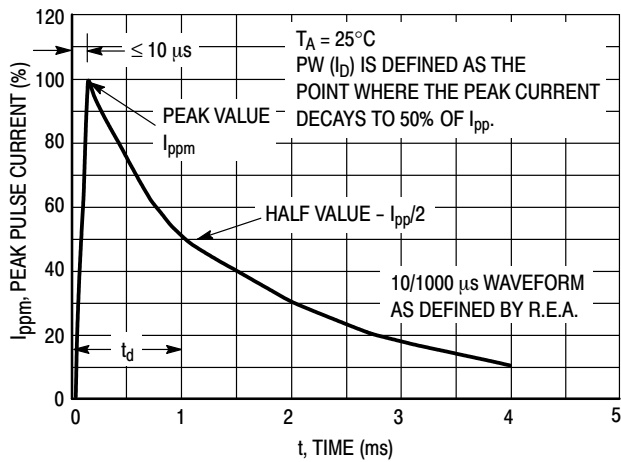


Figure 9. Pulse Waveform

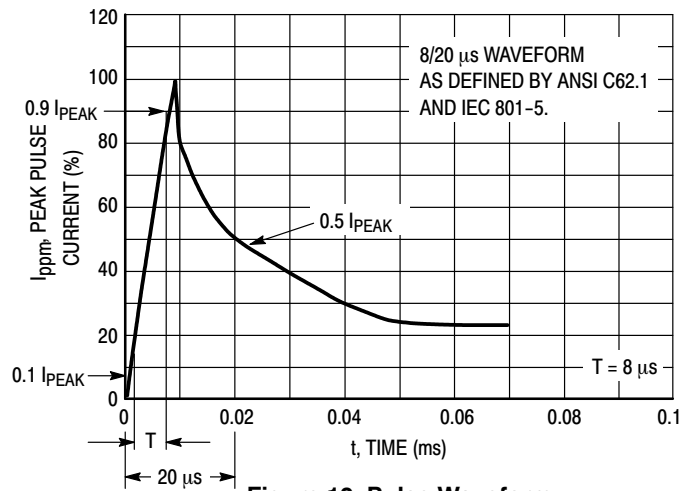


Figure 10. Pulse Waveform



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 |
| $b$   | 1.27        | 1.45 | 1.63 | 0.050  | 0.057 | 0.064 |
| c     | 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 |
| $H_E$ | 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\*

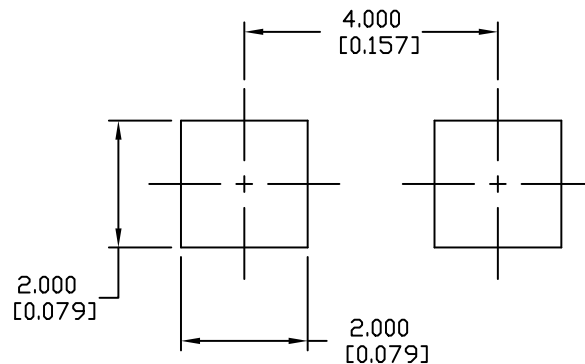


STYLE 1

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

|                         |                    |                                                                                                                                                                                  |
|-------------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DOCUMENT NUMBER:</b> | <b>98AON04079D</b> | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| <b>DESCRIPTION:</b>     | <b>SMA</b>         | <b>PAGE 1 OF 1</b>                                                                                                                                                               |

onsemi and onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

**onsemi**, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## ADDITIONAL INFORMATION

### TECHNICAL PUBLICATIONS:

Technical Library: [www.onsemi.com/design/resources/technical-documentation](http://www.onsemi.com/design/resources/technical-documentation)  
onsemi Website: [www.onsemi.com](http://www.onsemi.com)

### ONLINE SUPPORT: [www.onsemi.com/support](http://www.onsemi.com/support)

For additional information, please contact your local Sales Representative at  
[www.onsemi.com/support/sales](http://www.onsemi.com/support/sales)