

# 1SMA59xxBT3G Series, SZ1SMA59xxBT3G Series

## 1.5 Watt Plastic Surface Mount Zener Voltage Regulators

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
- Pb-Free Packages are Available\*

### 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 Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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

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

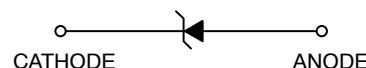


ON Semiconductor®

<http://onsemi.com>



SMA  
CASE 403D  
PLASTIC  
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.

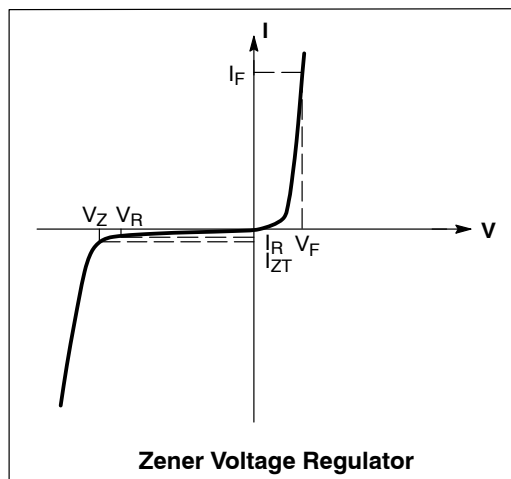
### DEVICE MARKING INFORMATION

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,  $V_F = 1.5\text{ V}$  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,  $V_F = 1.5\text{ V}$  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>ZT</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              |
| 1SMA5944BT3G     | 844B           | 58.9                   | 62  | 65.1  | 6.0               | 100                               | 1500                              | 0.25                            | 0.5             | 47.1  | 24              |
| 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 ( $T_A = 25^\circ\text{C}$ )

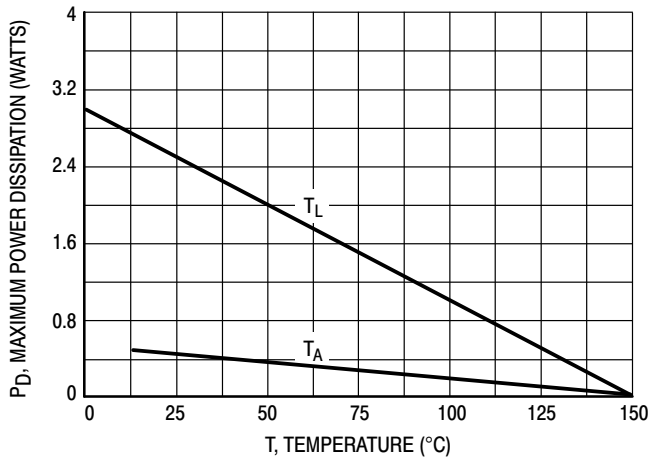


Figure 1. Steady State Power Derating

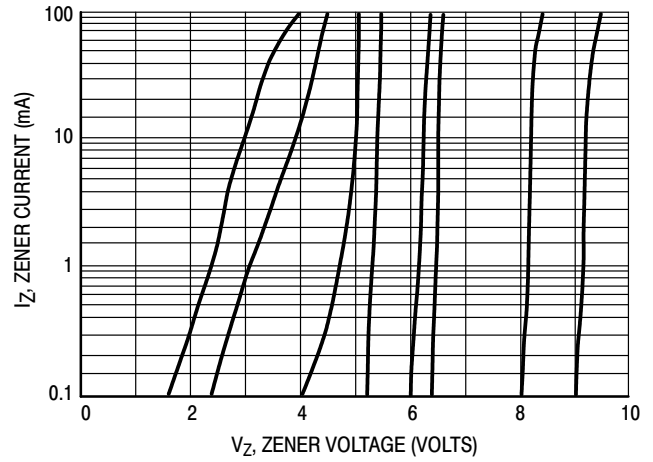


Figure 2.  $V_Z$  - 3.3 thru 10 Volts

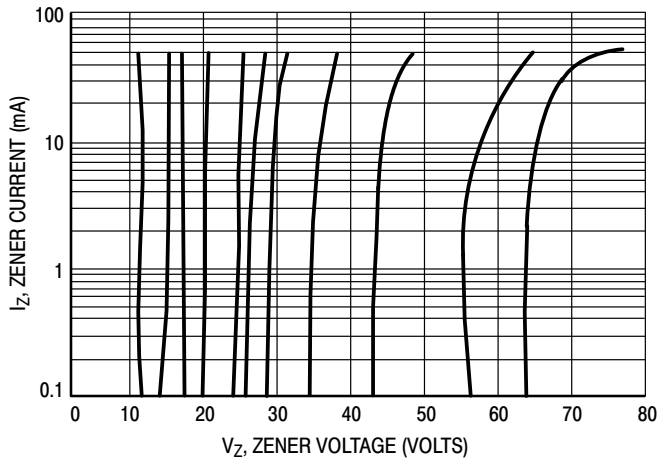


Figure 3.  $V_Z = 12$  thru 68 Volts

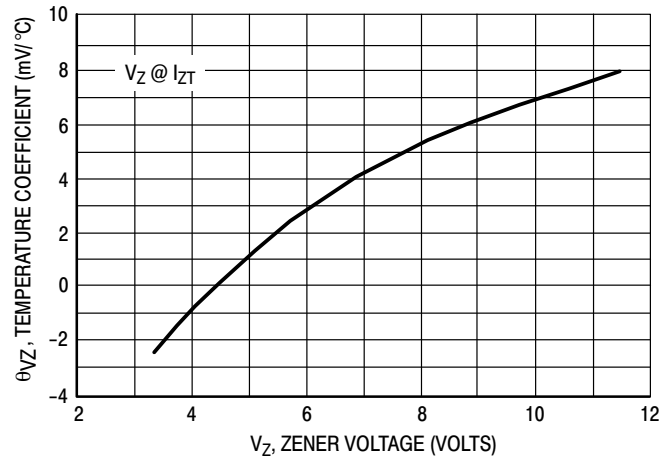


Figure 4. Zener Voltage - 3.3 to 12 Volts

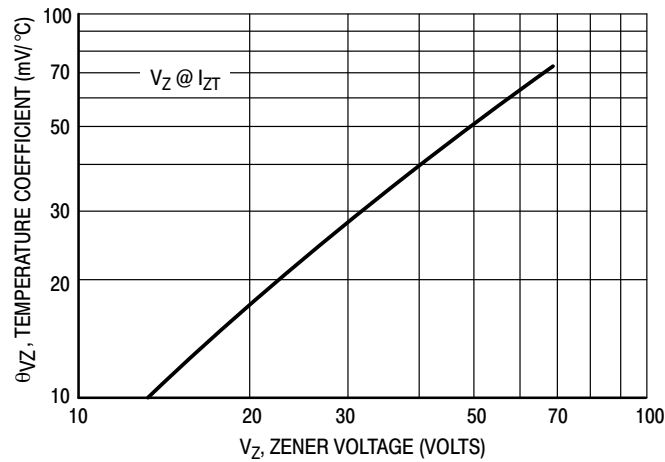


Figure 5. Zener Voltage - 12 to 68 Volts

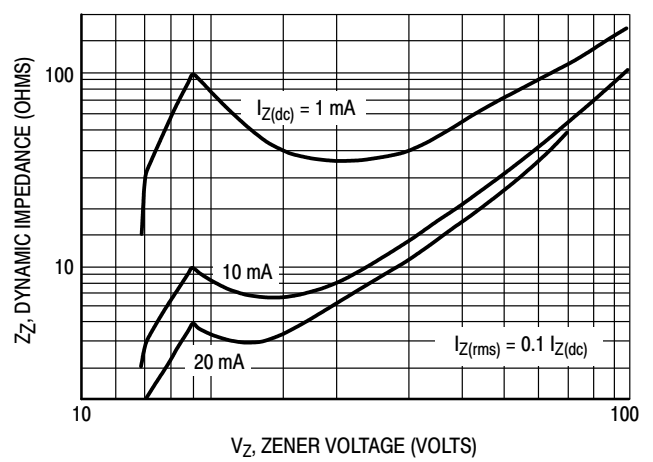


Figure 6. Effect of Zener Voltage

# 1SMA59xxBT3G Series, SZ1SMA59xxBT3G Series

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

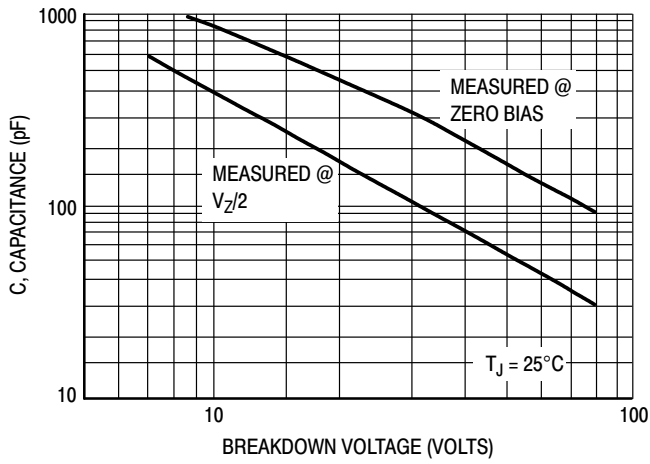


Figure 7. Capacitance Curve

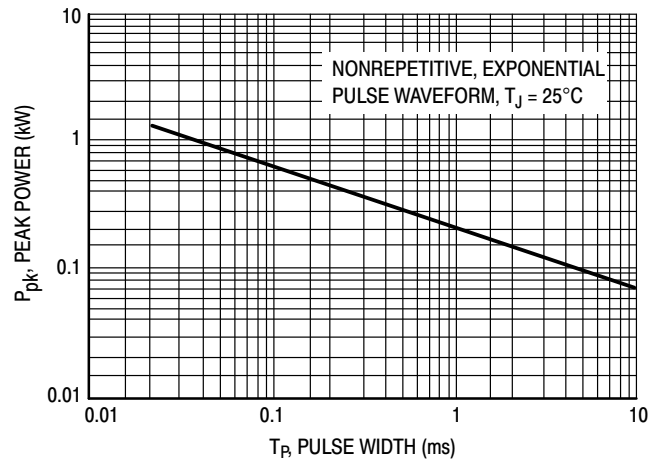


Figure 8. Typical Pulse Rating Curve

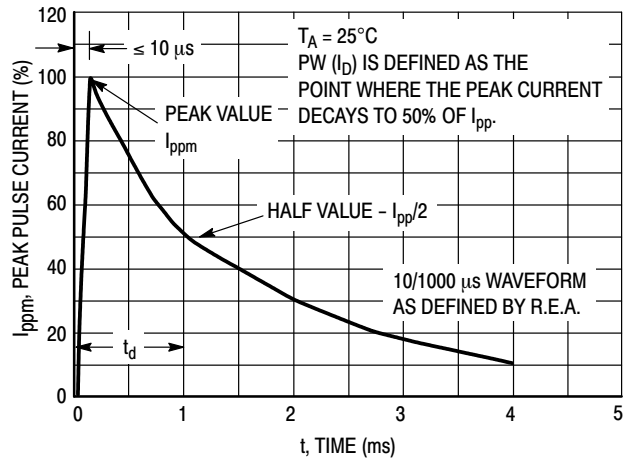


Figure 9. Pulse Waveform

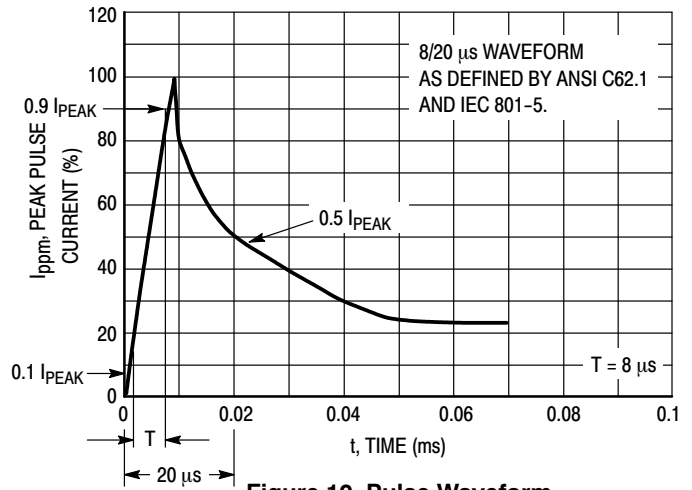
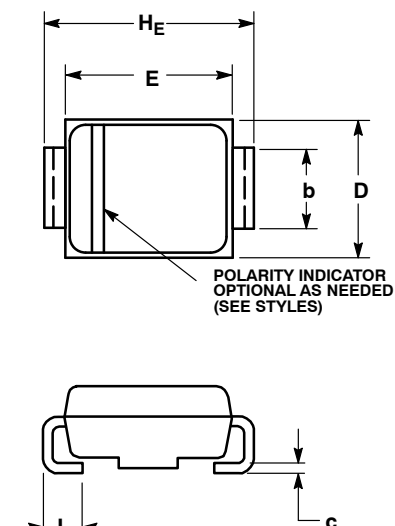


Figure 10. Pulse Waveform

# 1SMA59xxBT3G Series, SZ1SMA59xxBT3G Series

## PACKAGE DIMENSIONS

### SMA CASE 403D-02 ISSUE F

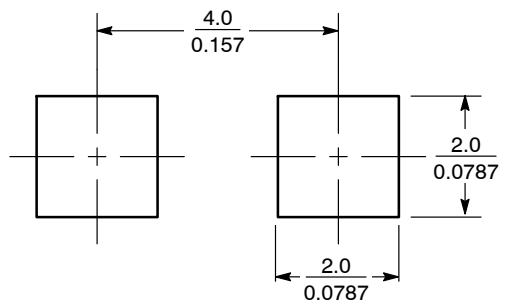


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. 403D-01 OBSOLETE, NEW STANDARD IS 403D-02.

| 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 | 0.15 | 0.002  | 0.004 | 0.006 |
| 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 |
| HE  | 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:
1. CATHODE (POLARITY BAND)
  2. ANODE

### SOLDERING FOOTPRINT\*



SCALE 8:1 (mm/inches)

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

ON Semiconductor and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC 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. "Typical" parameters which may be provided in SCILLC 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. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC 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 SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
Email: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

N. American Technical Support: 800-282-9855 Toll Free  
USA/Canada

Europe, Middle East and Africa Technical Support:  
Phone: 421 33 790 2910

Japan Customer Focus Center  
Phone: 81-3-5817-1050

ON Semiconductor Website: [www.onsemi.com](http://www.onsemi.com)

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local  
Sales Representative