# 1SMA59xxBT3 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**

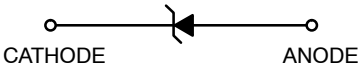
| Rating | Symbol | Value | Unit |
|---|---|---|---|
| DC Power Dissipation @ $T_L$ = 75°C, Measured Zero Lead Length (Note 1) | $P_D$ | 1.5 | W |
| Derate above 75°C | | 20 | mW/°C |
| Thermal Resistance, Junction−to−Lead | $R_{\theta JL}$ | 50 | °C/W |
| DC Power Dissipation @ $T_A$ = 25°C (Note 2)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

ON Semiconductor®

http://onsemi.com






**SMA**
**CASE 403D**
**PLASTIC**

**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† |
|---|---|---|
| 1SMA59xxBT3 | SMA | 5000 / Tape & Reel |
| 1SMA59xxBT3G | SMA (Pb−Free) | 5000 / Tape & Reel |
| SZ1SMA59xxBT3G | SMA (Pb−Free) | 5000 / 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.

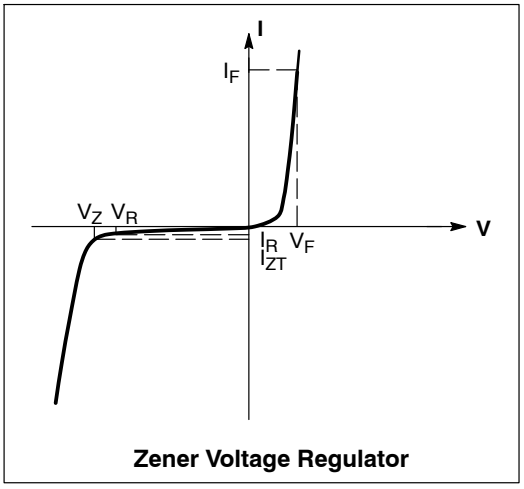
**DEVICE MARKING INFORMATION**

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

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**ELECTRICAL CHARACTERISTICS** ($T_A$ = 25°C unless otherwise noted, $V_F$ = 1.5 V Max. @ $I_F$ = 200 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 |




**Zener Voltage Regulator**

**ELECTRICAL CHARACTERISTICS** ($T_A$ = 25°C unless otherwise noted, $V_F$ = 1.5 V Max. @ $I_F$ = 200 mA for all types)

| Device* (Note 3) | Device Marking | Zener Voltage (Note 4) $V_Z$ (Volts) Min | Nom | Max | @ $I_{ZT}$ mA | Zener Impedance $Z_{ZT}$ @ $I_{ZT}$ Ω | $Z_{ZK}$ @ $I_{ZK}$ Ω | mA | Leakage Current $I_R$ @ $V_R$ μA | Volts | $I_{ZM}$ mA(dc) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SZ/1SMA5913BT3, G | 813B | 3.13 | 3.3 | 3.47 | 113.6 | 10 | 500 | 1.0 | 50 | 1.0 | 455 |
| 1SMA5914BT3, G | 814B | 3.42 | 3.6 | 3.78 | 104.2 | 9.0 | 500 | 1.0 | 35.5 | 1.0 | 417 |
| SZ/1SMA5915BT3, G | 815B | 3.70 | 3.9 | 4.10 | 96.1 | 7.5 | 500 | 1.0 | 12.5 | 1.0 | 385 |
| SZ/1SMA5916BT3, G | 816B | 4.08 | 4.3 | 4.52 | 87.2 | 6.0 | 500 | 1.0 | 2.5 | 1.0 | 349 |
| SZ/1SMA5917BT3, G | 817B | 4.46 | 4.7 | 4.94 | 79.8 | 5.0 | 500 | 1.0 | 2.5 | 1.5 | 319 |
| SZ/1SMA5918BT3, G | 818B | 4.84 | 5.1 | 5.36 | 73.5 | 4.0 | 350 | 1.0 | 2.5 | 2.0 | 294 |
| SZ/1SMA5919BT3, G | 819B | 5.32 | 5.6 | 5.88 | 66.9 | 2.0 | 250 | 1.0 | 2.5 | 3.0 | 268 |
| SZ/1SMA5920BT3, G | 820B | 5.89 | 6.2 | 6.51 | 60.5 | 2.0 | 200 | 1.0 | 2.5 | 4.0 | 242 |
| SZ/1SMA5921BT3, G | 821B | 6.46 | 6.8 | 7.14 | 55.1 | 2.5 | 200 | 1.0 | 2.5 | 5.2 | 221 |
| SZ/1SMA5922BT3, G | 822B | 7.12 | 7.5 | 7.88 | 50 | 3.0 | 400 | 0.5 | 2.5 | 6.0 | 200 |
| SZ/1SMA5923BT3, G | 823B | 7.79 | 8.2 | 8.61 | 45.7 | 3.5 | 400 | 0.5 | 2.5 | 6.5 | 183 |
| SZ/1SMA5924BT3, G | 824B | 8.64 | 9.1 | 9.56 | 41.2 | 4.0 | 500 | 0.5 | 2.5 | 7.0 | 165 |
| SZ/1SMA5925BT3, G | 825B | 9.5 | 10 | 10.5 | 37.5 | 4.5 | 500 | 0.25 | 2.5 | 8.0 | 150 |
| 1SMA5926BT3, G | 826B | 10.45 | 11 | 11.55 | 34.1 | 5.5 | 550 | 0.25 | 0.5 | 8.4 | 136 |
| SZ/1SMA5927BT3, G | 827B | 11.4 | 12 | 12.6 | 31.2 | 6.5 | 550 | 0.25 | 0.5 | 9.1 | 125 |
| SZ/1SMA5928BT3, G | 828B | 12.35 | 13 | 13.65 | 28.8 | 7.0 | 550 | 0.25 | 0.5 | 9.9 | 115 |
| SZ/1SMA5929BT3, G | 829B | 14.25 | 15 | 15.75 | 25 | 9.0 | 600 | 0.25 | 0.5 | 11.4 | 100 |
| SZ/1SMA5930BT3, G | 830B | 15.2 | 16 | 16.8 | 23.4 | 10 | 600 | 0.25 | 0.5 | 12.2 | 94 |
| SZ/1SMA5931BT3, G | 831B | 17.1 | 18 | 18.9 | 20.8 | 12 | 650 | 0.25 | 0.5 | 13.7 | 83 |
| SZ/1SMA5932BT3, G | 832B | 19 | 20 | 21 | 18.7 | 14 | 650 | 0.25 | 0.5 | 15.2 | 75 |
| SZ/1SMA5933BT3, G | 833B | 20.9 | 22 | 23.1 | 17 | 17.5 | 650 | 0.25 | 0.5 | 16.7 | 68 |
| SZ/1SMA5934BT3, G | 834B | 22.8 | 24 | 25.2 | 15.6 | 19 | 700 | 0.25 | 0.5 | 18.2 | 63 |
| SZ/1SMA5935BT3, G | 835B | 25.65 | 27 | 28.35 | 13.9 | 23 | 700 | 0.25 | 0.5 | 20.6 | 56 |
| SZ/1SMA5936BT3, G | 836B | 28.5 | 30 | 31.5 | 12.5 | 26 | 750 | 0.25 | 0.5 | 22.8 | 50 |
| SZ/1SMA5937BT3, G | 837B | 31.35 | 33 | 34.65 | 11.4 | 33 | 800 | 0.25 | 0.5 | 25.1 | 45 |
| SZ/1SMA5938BT3, G | 838B | 34.2 | 36 | 37.8 | 10.4 | 38 | 850 | 0.25 | 0.5 | 27.4 | 42 |
| SZ/1SMA5939BT3, G | 839B | 37.05 | 39 | 40.95 | 9.6 | 45 | 900 | 0.25 | 0.5 | 29.7 | 38 |
| SZ/1SMA5940BT3, G | 840B | 40.85 | 43 | 45.15 | 8.7 | 53 | 950 | 0.25 | 0.5 | 32.7 | 35 |
| SZ/1SMA5941BT3, G | 841B | 44.65 | 47 | 49.35 | 8.0 | 67 | 1000 | 0.25 | 0.5 | 35.8 | 32 |
| SZ/1SMA5942BT3, G | 842B | 48.45 | 51 | 53.55 | 7.3 | 70 | 1100 | 0.25 | 0.5 | 38.8 | 29 |
| SZ/1SMA5943BT3, G | 843B | 53.2 | 56 | 58.8 | 6.7 | 86 | 1300 | 0.25 | 0.5 | 42.6 | 27 |
| 1SMA5944BT3, G | 844B | 58.9 | 62 | 65.1 | 6.0 | 100 | 1500 | 0.25 | 0.5 | 47.1 | 24 |
| SZ/1SMA5945BT3, G | 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 ±5%.
4. $V_Z$ limits are to be guaranteed at thermal equilibrium.

***** The "G" suffix indicates Pb−Free package available.

## RATING AND TYPICAL CHARACTERISTIC CURVES ($T_A$ = 25°C)

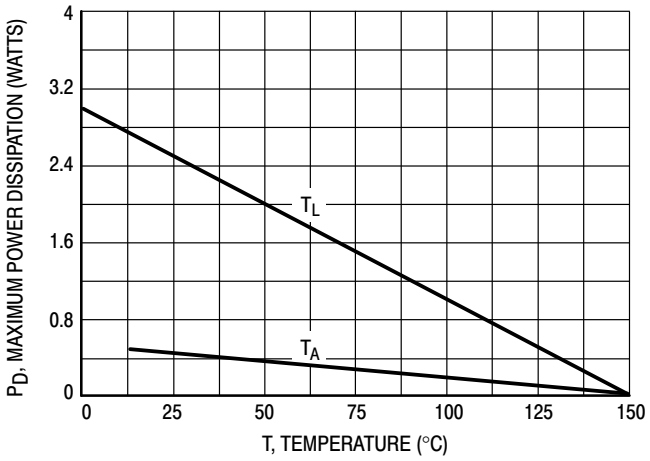



**Figure 1. Steady State Power Derating**

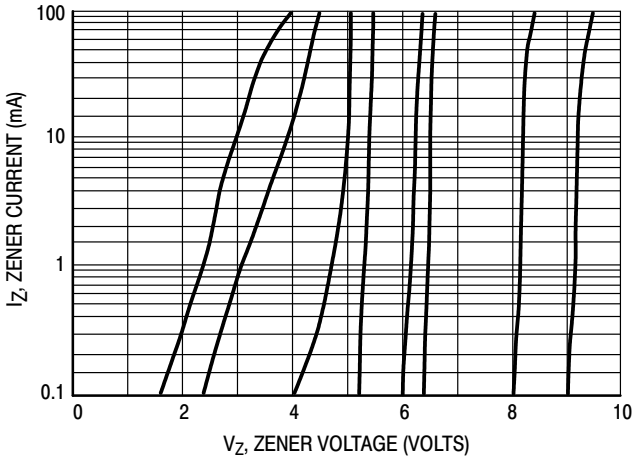



**Figure 2. $V_Z$ – 3.3 thru 10 Volts**

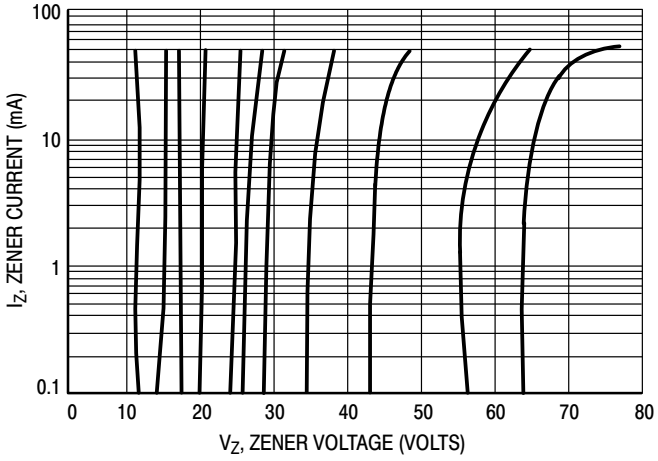



**Figure 3. $V_Z$ = 12 thru 68 Volts**

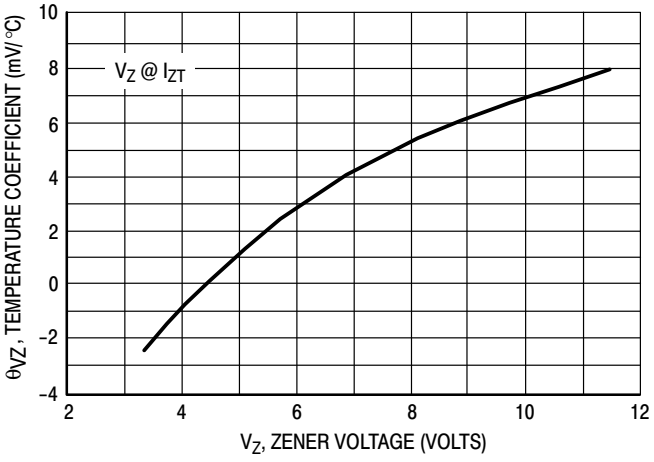



**Figure 4. Zener Voltage – 3.3 to 12 Volts**

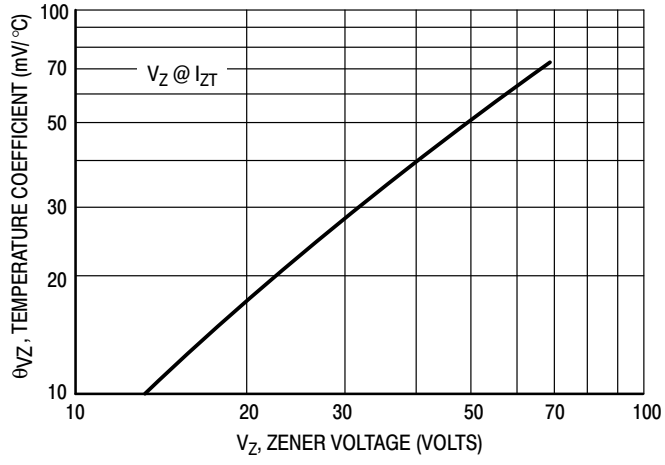



**Figure 5. Zener Voltage – 12 to 68 Volts**

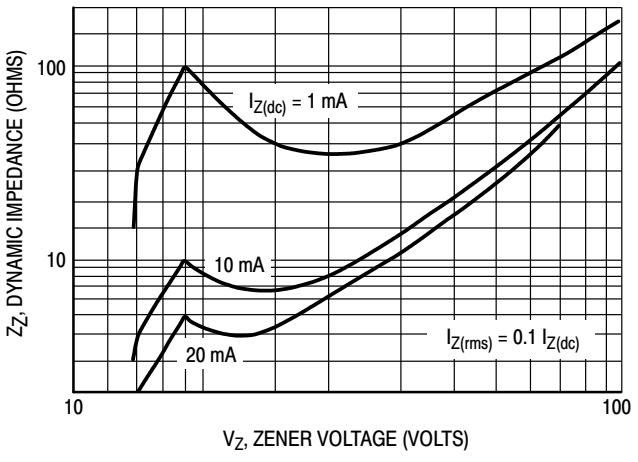



**Figure 6. Effect of Zener Voltage**

## RATING AND TYPICAL CHARACTERISTIC CURVES ($T_A$ = 25°C)

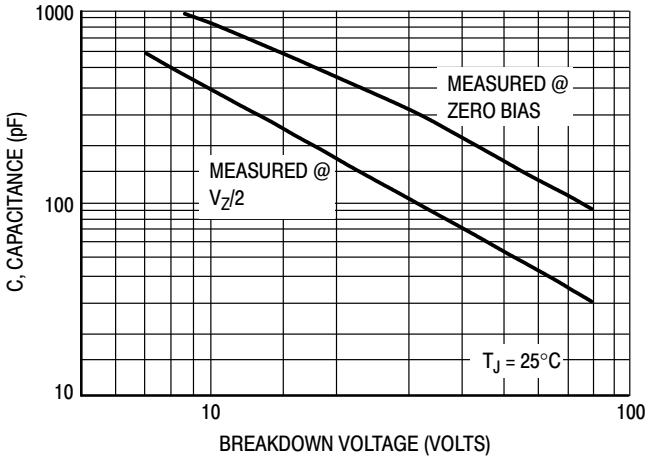



**Figure 7. Capacitance Curve**

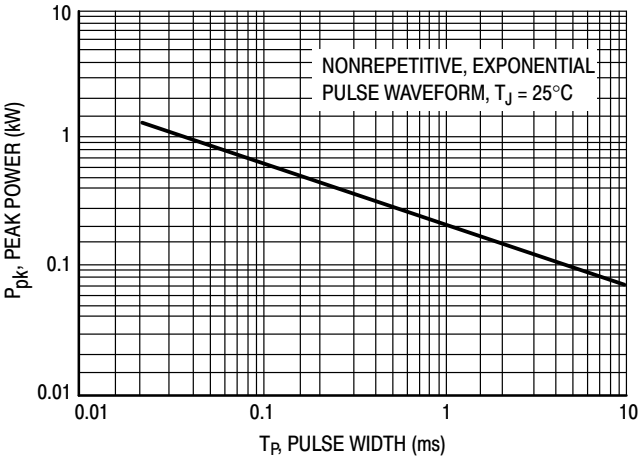



**Figure 8. Typical Pulse Rating Curve**

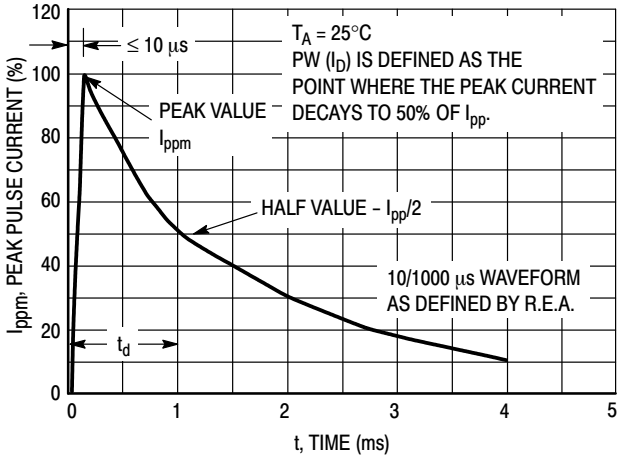



**Figure 9. Pulse Waveform**

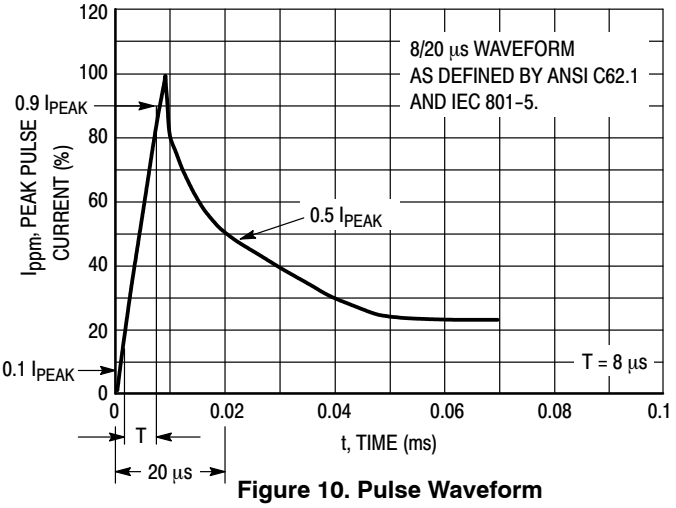
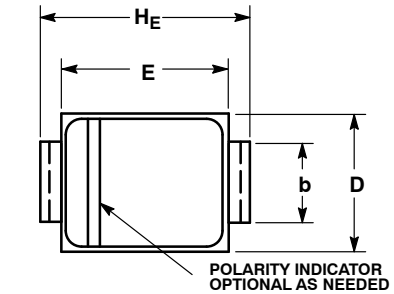
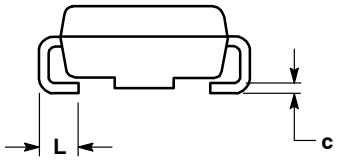


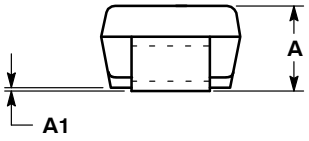

**Figure 10. Pulse Waveform**

## PACKAGE DIMENSIONS

**SMA**
CASE 403D−02
ISSUE F



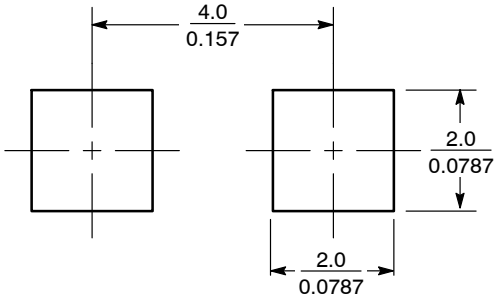




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 403D−01 OBSOLETE, NEW STANDARD IS 403D−02.

| | MILLIMETERS | | | INCHES | | |
|---|---|---|---|---|---|---|
| DIM | 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 |
| $H_E$ | 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

### SOLDERING FOOTPRINT*




SCALE 8:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

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

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