



**THE DATASHEET OF
1SMA5916BT3**



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

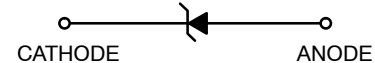
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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.

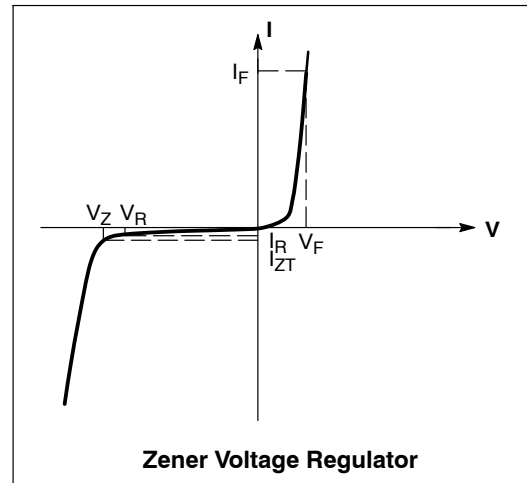
DEVICE MARKING INFORMATION

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

1SMA59xxBT3 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_{ZM} |
|-------------------|----------------|------------------------|-----|-------|------------|---------------------|---------------------|---------------|-----------------|-------|----------|
| | | V_Z (Volts) | | | @ I_{ZT} | Z_{ZT} @ I_{ZT} | Z_{ZK} @ I_{ZK} | I_R @ V_R | | | |
| | | Min | Nom | Max | mA | Ω | Ω | mA | μA | Volts | |
| 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 $\pm 5\%$.

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

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

1SMA59xxBT3 Series, SZ1SMA59xxBT3G Series

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

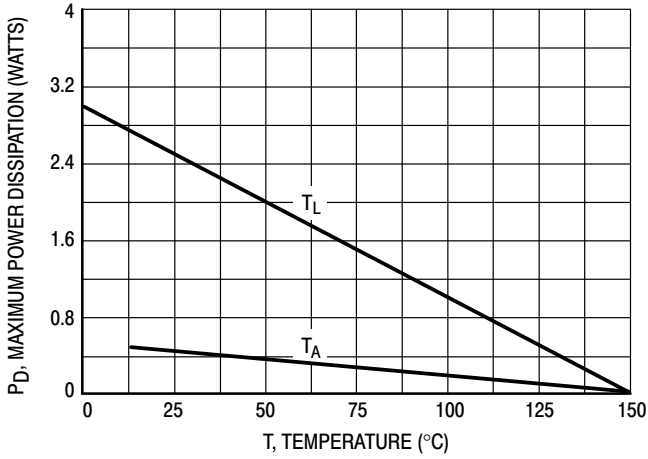


Figure 1. Steady State Power Derating

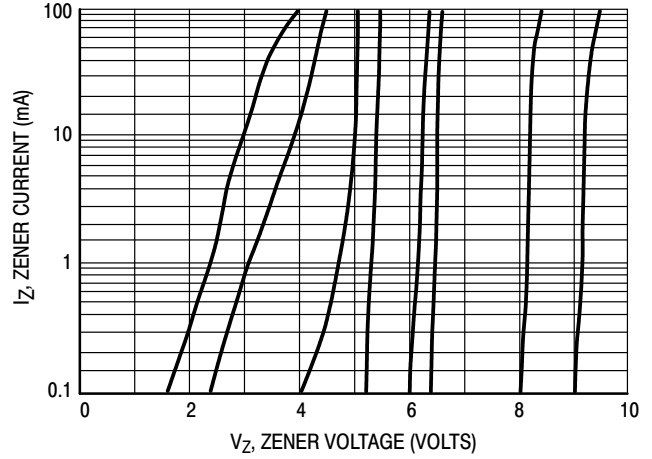


Figure 2. V_Z - 3.3 thru 10 Volts

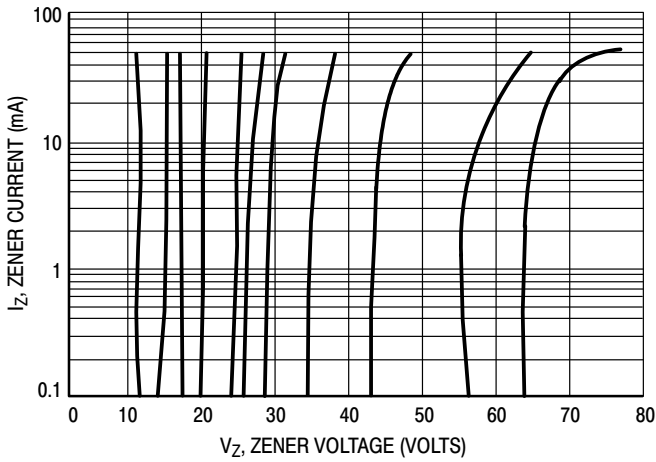


Figure 3. $V_Z = 12$ thru 68 Volts

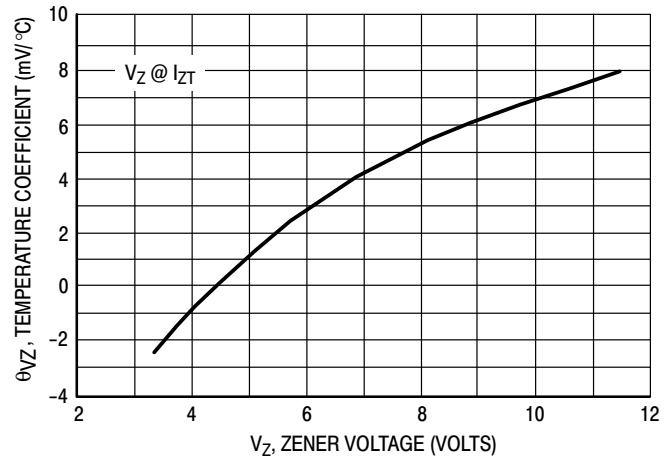


Figure 4. Zener Voltage - 3.3 to 12 Volts

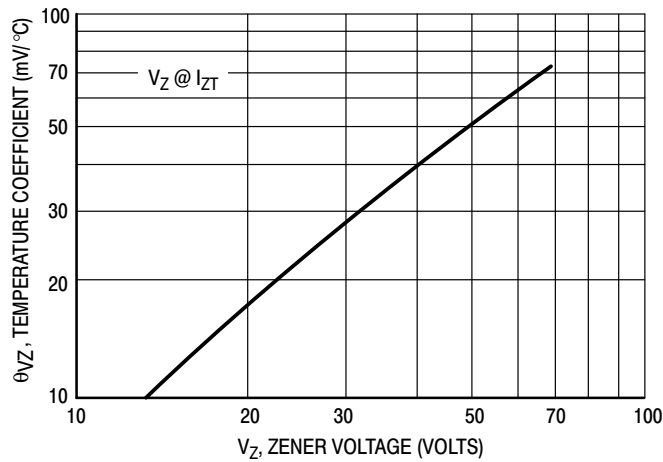


Figure 5. Zener Voltage - 12 to 68 Volts

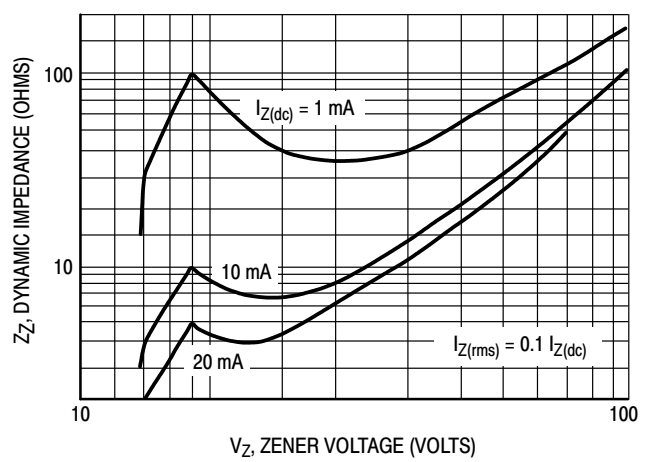


Figure 6. Effect of Zener Voltage

1SMA59xxBT3 Series, SZ1SMA59xxBT3G Series

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

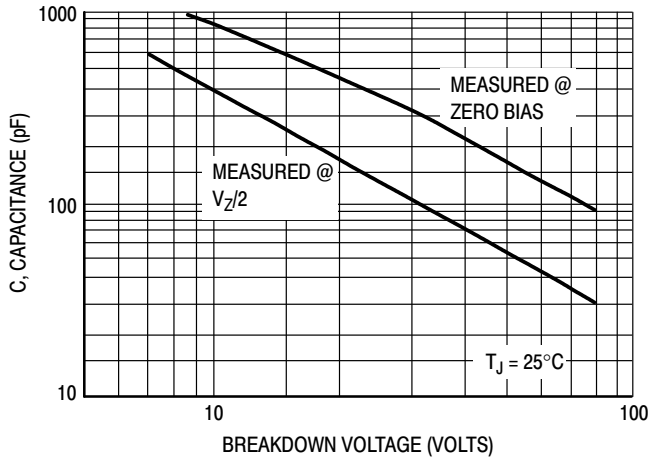


Figure 7. Capacitance Curve

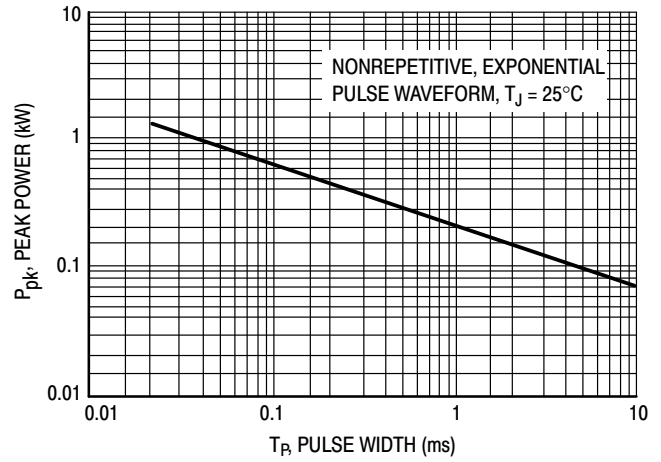


Figure 8. Typical Pulse Rating Curve

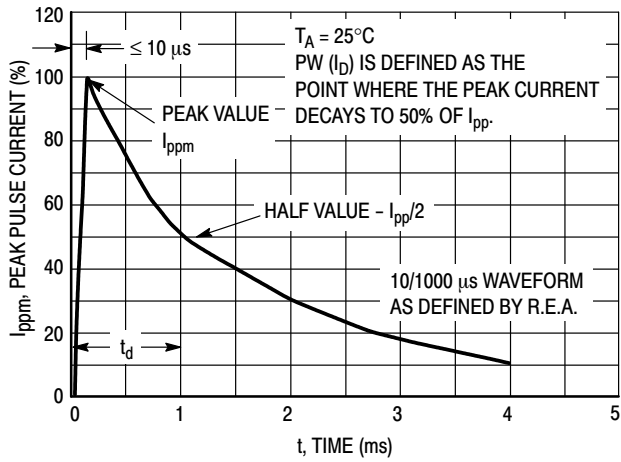


Figure 9. Pulse Waveform

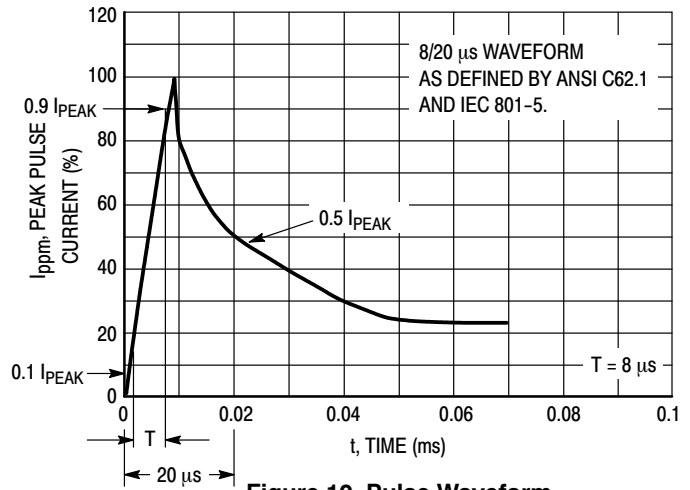
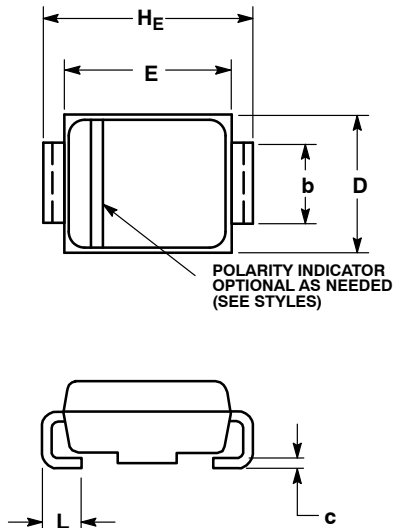


Figure 10. Pulse Waveform

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PACKAGE DIMENSIONS

SMA CASE 403D-02 ISSUE F

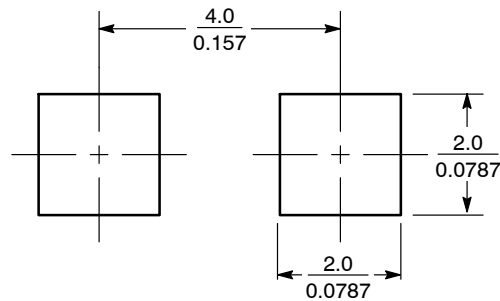


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. 403D-01 OBSOLETE, NEW STANDARD IS 403D-02.

| 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:
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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