

# 1SMA5913BT3 Series

## 1.5 Watt Plastic Surface Mount Zener Voltage Regulators

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

### Specification 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
- 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      | Watts<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance –<br>Junction-to-Lead  | $R_{\theta JL}$ | 50             | $^\circ\text{C}/\text{W}$     |
| DC Power Dissipation @ $T_A = 25^\circ\text{C}$<br>(Note 2.) Derate above $25^\circ\text{C}$                                | $P_D$           | 0.5<br>4.0     | Watts<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance –<br>Junction-to-Ambient   | $R_{\theta JA}$ | 250            | $^\circ\text{C}/\text{W}$     |
| Operating and Storage<br>Temperature Range  | $T_J, T_{stg}$  | -65 to<br>+150 | $^\circ\text{C}$              |

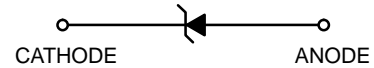
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

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



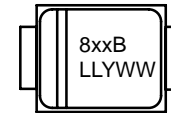
ON Semiconductor®

<http://onsemi.com>



SMA  
CASE 403D  
PLASTIC

### MARKING DIAGRAM



8xxB = Specific Device Code  
(See Table Next Page)  
LL = Assembly Location  
Y = Year  
WW = Work Week

### ORDERING INFORMATION

| Device*      | Package          | Shipping†        |
|--------------|------------------|------------------|
| 1SMA59xxBT3  | SMA              | 5000/Tape & Reel |
| 1SMA59xxBT3G | SMA<br>(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.

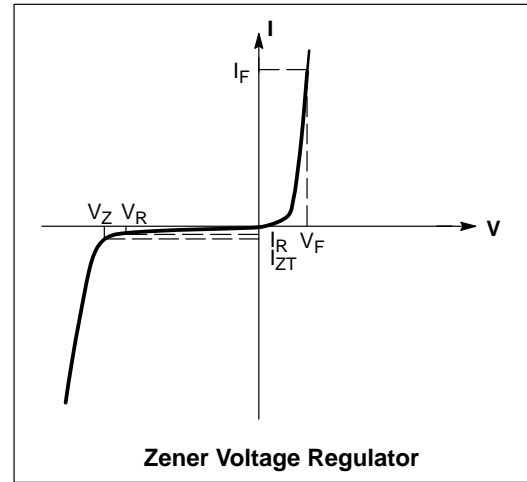
Individual devices are listed on page 2 of this data sheet.

\*The "T3" suffix refers to a 13 inch reel.

# 1SMA5913BT3 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 1) | Device Marking | Zener Voltage (Note 2) |     |       |            | Zener Impedance     |                     |               | Leakage Current |       | $I_{ZM}$<br>mA(dc) |
|-----------------|----------------|------------------------|-----|-------|------------|---------------------|---------------------|---------------|-----------------|-------|--------------------|
|                 |                | $V_Z$ (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 |                    |
| 1SMA5913BT3     | 813B           | 3.13                   | 3.3 | 3.47  | 113.6      | 10                  | 500                 | 1.0           | 50              | 1.0   | 455                |
| 1SMA5914BT3     | 814B           | 3.42                   | 3.6 | 3.78  | 104.2      | 9.0                 | 500                 | 1.0           | 35.5            | 1.0   | 417                |
| 1SMA5915BT3     | 815B           | 3.70                   | 3.9 | 4.10  | 96.1       | 7.5                 | 500                 | 1.0           | 12.5            | 1.0   | 385                |
| 1SMA5916BT3     | 816B           | 4.08                   | 4.3 | 4.52  | 87.2       | 6.0                 | 500                 | 1.0           | 2.5             | 1.0   | 349                |
| 1SMA5917BT3     | 817B           | 4.46                   | 4.7 | 4.94  | 79.8       | 5.0                 | 500                 | 1.0           | 2.5             | 1.5   | 319                |
| 1SMA5918BT3     | 818B           | 4.84                   | 5.1 | 5.36  | 73.5       | 4.0                 | 350                 | 1.0           | 2.5             | 2.0   | 294                |
| 1SMA5919BT3     | 819B           | 5.32                   | 5.6 | 5.88  | 66.9       | 2.0                 | 250                 | 1.0           | 2.5             | 3.0   | 268                |
| 1SMA5920BT3     | 820B           | 5.89                   | 6.2 | 6.51  | 60.5       | 2.0                 | 200                 | 1.0           | 2.5             | 4.0   | 242                |
| 1SMA5921BT3     | 821B           | 6.46                   | 6.8 | 7.14  | 55.1       | 2.5                 | 200                 | 1.0           | 2.5             | 5.2   | 221                |
| 1SMA5922BT3     | 822B           | 7.12                   | 7.5 | 7.88  | 50         | 3.0                 | 400                 | 0.5           | 2.5             | 6.0   | 200                |
| 1SMA5923BT3     | 823B           | 7.79                   | 8.2 | 8.61  | 45.7       | 3.5                 | 400                 | 0.5           | 2.5             | 6.5   | 183                |
| 1SMA5924BT3, G* | 824B           | 8.64                   | 9.1 | 9.56  | 41.2       | 4.0                 | 500                 | 0.5           | 2.5             | 7.0   | 165                |
| 1SMA5925BT3     | 825B           | 9.5                    | 10  | 10.5  | 37.5       | 4.5                 | 500                 | 0.25          | 2.5             | 8.0   | 150                |
| 1SMA5926BT3     | 826B           | 10.45                  | 11  | 11.55 | 34.1       | 5.5                 | 550                 | 0.25          | 0.5             | 8.4   | 136                |
| 1SMA5927BT3, G* | 827B           | 11.4                   | 12  | 12.6  | 31.2       | 6.5                 | 550                 | 0.25          | 0.5             | 9.1   | 125                |
| 1SMA5928BT3     | 828B           | 12.35                  | 13  | 13.65 | 28.8       | 7.0                 | 550                 | 0.25          | 0.5             | 9.9   | 115                |
| 1SMA5929BT3, G* | 829B           | 14.25                  | 15  | 15.75 | 25         | 9.0                 | 600                 | 0.25          | 0.5             | 11.4  | 100                |
| 1SMA5930BT3     | 830B           | 15.2                   | 16  | 16.8  | 23.4       | 10                  | 600                 | 0.25          | 0.5             | 12.2  | 94                 |
| 1SMA5931BT3     | 831B           | 17.1                   | 18  | 18.9  | 20.8       | 12                  | 650                 | 0.25          | 0.5             | 13.7  | 83                 |
| 1SMA5932BT3     | 832B           | 19                     | 20  | 21    | 18.7       | 14                  | 650                 | 0.25          | 0.5             | 15.2  | 75                 |
| 1SMA5933BT3     | 833B           | 20.9                   | 22  | 23.1  | 17         | 17.5                | 650                 | 0.25          | 0.5             | 16.7  | 68                 |
| 1SMA5934BT3     | 834B           | 22.8                   | 24  | 25.2  | 15.6       | 19                  | 700                 | 0.25          | 0.5             | 18.2  | 63                 |
| 1SMA5935BT3     | 835B           | 25.65                  | 27  | 28.35 | 13.9       | 23                  | 700                 | 0.25          | 0.5             | 20.6  | 56                 |
| 1SMA5936BT3     | 836B           | 28.5                   | 30  | 31.5  | 12.5       | 26                  | 750                 | 0.25          | 0.5             | 22.8  | 50                 |
| 1SMA5937BT3     | 837B           | 31.35                  | 33  | 34.65 | 11.4       | 33                  | 800                 | 0.25          | 0.5             | 25.1  | 45                 |
| 1SMA5938BT3     | 838B           | 34.2                   | 36  | 37.8  | 10.4       | 38                  | 850                 | 0.25          | 0.5             | 27.4  | 42                 |
| 1SMA5939BT3     | 839B           | 37.05                  | 39  | 40.95 | 9.6        | 45                  | 900                 | 0.25          | 0.5             | 29.7  | 38                 |
| 1SMA5940BT3, G* | 840B           | 40.85                  | 43  | 45.15 | 8.7        | 53                  | 950                 | 0.25          | 0.5             | 32.7  | 35                 |
| 1SMA5941BT3     | 841B           | 44.65                  | 47  | 49.35 | 8.0        | 67                  | 1000                | 0.25          | 0.5             | 35.8  | 32                 |
| 1SMA5942BT3     | 842B           | 48.45                  | 51  | 53.55 | 7.3        | 70                  | 1100                | 0.25          | 0.5             | 38.8  | 29                 |
| 1SMA5943BT3, G* | 843B           | 53.2                   | 56  | 58.8  | 6.7        | 86                  | 1300                | 0.25          | 0.5             | 42.6  | 27                 |
| 1SMA5944BT3     | 844B           | 58.9                   | 62  | 65.1  | 6.0        | 100                 | 1500                | 0.25          | 0.5             | 47.1  | 24                 |
| 1SMA5945BT3     | 845B           | 64.6                   | 68  | 71.4  | 5.5        | 120                 | 1700                | 0.25          | 0.5             | 51.7  | 22                 |

1. Tolerance and Voltage Regulation Designation – The type number listed indicates a tolerance of  $\pm 5\%$ .
  2.  $V_Z$  limits are to be guaranteed at thermal equilibrium.
- \* The "G" suffix indicates Pb-Free package available.

# 1SMA5913BT3 Series

## Rating and Typical Characteristic Curves ( $T_A = 25^\circ\text{C}$ )

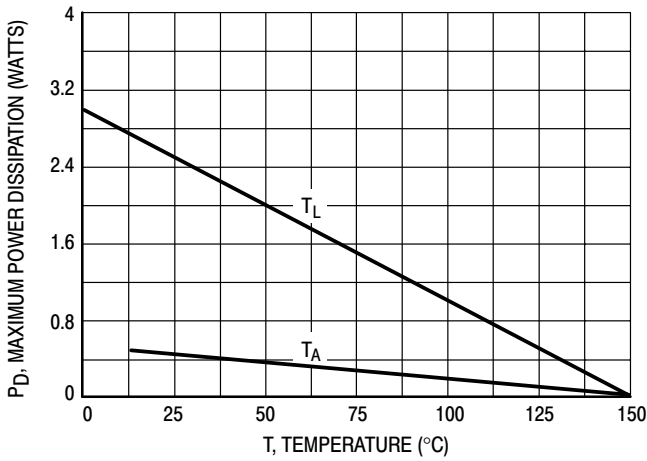


Figure 1. Steady State Power Derating

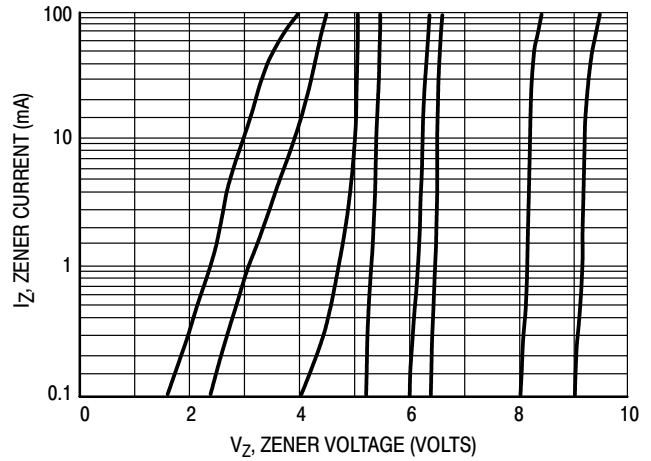


Figure 2.  $V_Z$  - 3.3 thru 10 Volts

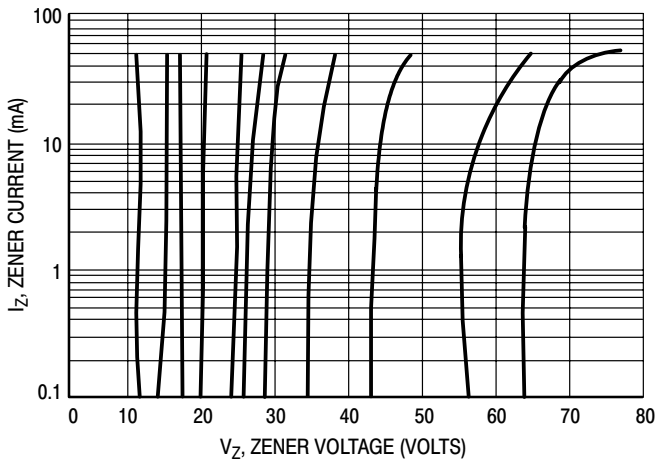


Figure 3.  $V_Z = 12$  thru 68 Volts

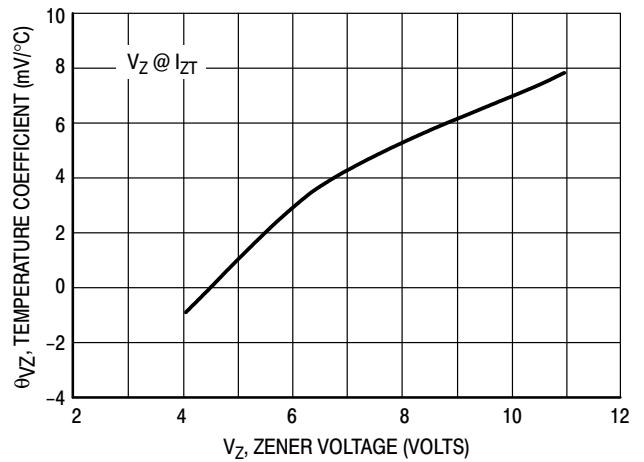


Figure 4. Zener Voltage - 3.3 to 12 Volts

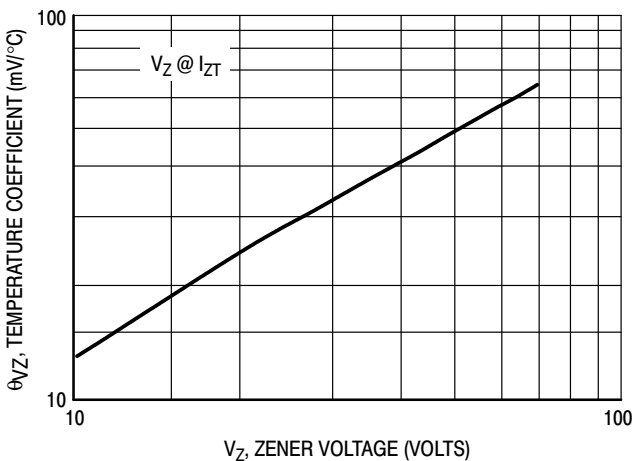


Figure 5. Zener Voltage - 14 to 68 Volts

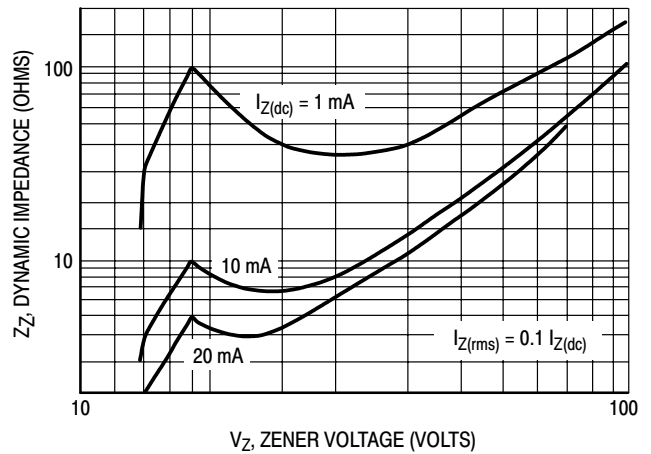


Figure 6. Effect of Zener Voltage

# 1SMA5913BT3 Series

## Rating and Typical Characteristic Curves ( $T_A = 25^\circ\text{C}$ )

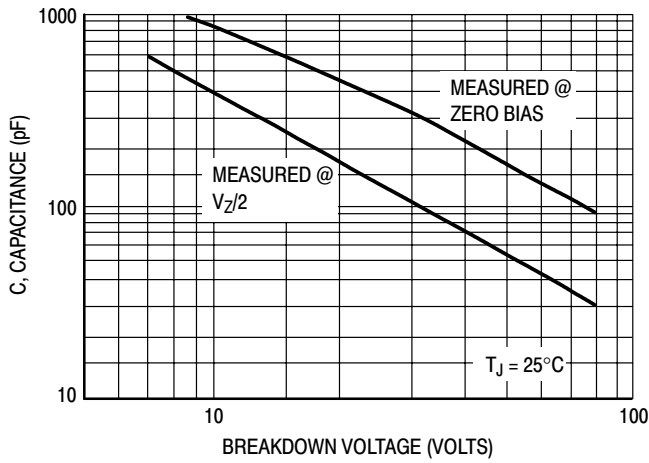


Figure 7. Capacitance Curve

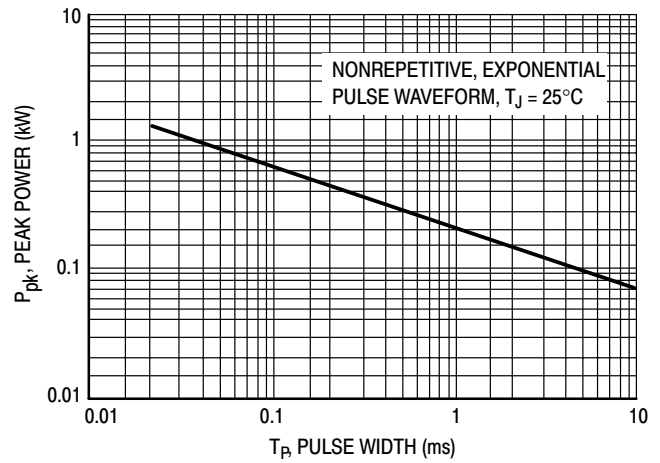


Figure 8. Typical Pulse Rating Curve

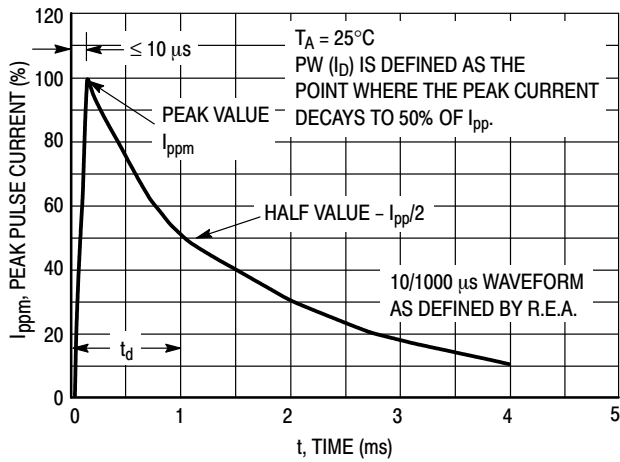


Figure 9. Pulse Waveform

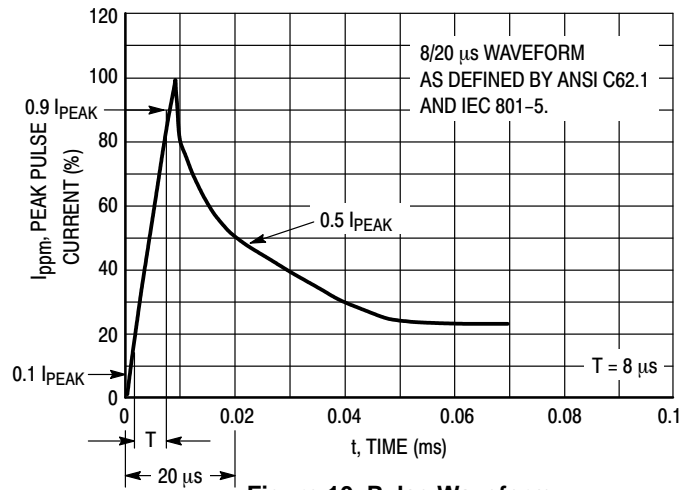
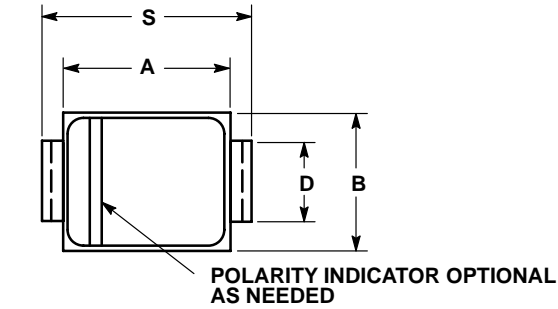


Figure 10. Pulse Waveform

# 1SMA5913BT3 Series

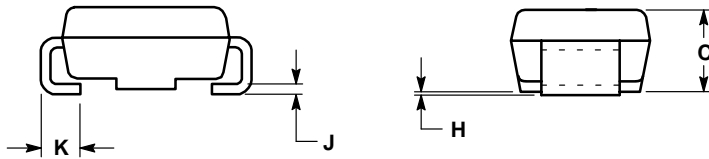
## OUTLINE DIMENSIONS

SMA  
CASE 403D-02  
ISSUE A

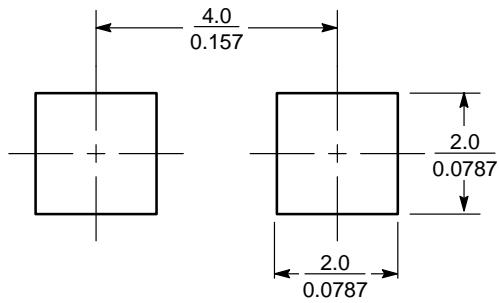


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. 403D-01 OBSOLETE, NEW STANDARD IS 403D-02.

| DIM | INCHES |       | MILLIMETERS |      |
|-----|--------|-------|-------------|------|
|     | MIN    | MAX   | MIN         | MAX  |
| A   | 0.160  | 0.180 | 4.06        | 4.57 |
| B   | 0.090  | 0.115 | 2.29        | 2.92 |
| C   | 0.075  | 0.095 | 1.91        | 2.41 |
| D   | 0.050  | 0.064 | 1.27        | 1.63 |
| H   | 0.002  | 0.006 | 0.05        | 0.15 |
| J   | 0.006  | 0.016 | 0.15        | 0.41 |
| K   | 0.030  | 0.060 | 0.76        | 1.52 |
| S   | 0.190  | 0.220 | 4.83        | 5.59 |



### 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.

# 1SMA5913BT3 Series

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