# BZX84BxxxLT1G, BZX84CxxxLT1G Series, SZBZX84BxxxLT1G, SZBZX84CxxxLT1G Series

# Zener Voltage Regulators

## 225 mW SOT−23 Surface Mount

This series of Zener diodes is offered in the convenient, surface mount plastic SOT−23 package. These devices are designed to provide voltage regulation with minimum space requirement. They are well suited for applications such as cellular phones, hand held portables, and high density PC boards.

### Features

- 225 mW Rating on FR−4 or FR−5 Board
- Zener Breakdown Voltage Range − 2.4 V to 75 V
- Package Designed for Optimal Automated Board Assembly
- Small Package Size for High Density Applications
- ESD Rating of Class 3 (> 16 kV) per Human Body Model
- Tight Tolerance Series Available (See Page 4)
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free and are RoHS Compliant

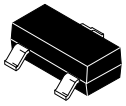
### Mechanical Characteristics

**CASE:** Void-free, transfer-molded, thermosetting plastic case
**FINISH:** Corrosion resistant finish, easily Solderable
**MAXIMUM CASE TEMPERATURE FOR SOLDERING PURPOSES:** 260°C for 10 Seconds
**POLARITY:** Cathode indicated by polarity band
**FLAMMABILITY RATING:** UL 94 V−0

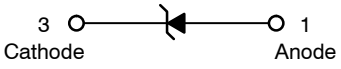
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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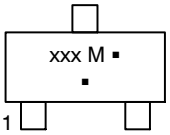
**http://onsemi.com**



**SOT−23**
**CASE 318**
**STYLE 8**




### MARKING DIAGRAM




xxx = Device Code
M = Date Code*
▪ = Pb−Free Package
(Note: Microdot may be in either location)
*Date Code orientation may vary depending upon manufacturing location.

### ORDERING INFORMATION

| Device | Package | Shipping† |
|---|---|---|
| BZX84CxxxLT1G | SOT−23 (Pb−Free) | 3,000 / Tape & Reel |
| SZBZX84CxxxLT1G | SOT−23 (Pb−Free) | 3,000 / Tape & Reel |
| BZX84CxxxLT3G | SOT−23 (Pb−Free) | 10,000 / Tape & Reel |
| SZBZX84CxxxLT3G | SOT−23 (Pb−Free) | 10,000 / Tape & Reel |
| BZX84BxxxLT1G | SOT−23 (Pb−Free) | 3,000 / Tape & Reel |
| SZBZX84BxxxLT1G | SOT−23 (Pb−Free) | 3,000 / Tape & Reel |
| BZX84BxxxLT3G | SOT−23 (Pb−Free) | 10,000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

### DEVICE MARKING INFORMATION

See specific marking information in the device marking column of the Electrical Characteristics table on page 3 of this data sheet.

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## MAXIMUM RATINGS

| Rating | Symbol | Max | Unit |
|---|---|---|---|
| Total Power Dissipation on FR−5 Board, (Note 1) @ $T_A$ = 25°C<br>Derated above 25°C<br>Thermal Resistance, Junction−to−Ambient | $P_D$<br><br><br>$R_{\theta JA}$ | <br>225<br>1.8<br>556 | <br>mW<br>mW/°C<br>°C/W |
| Total Power Dissipation on Alumina Substrate, (Note 2) @ $T_A$ = 25°C<br>Derated above 25°C<br>Thermal Resistance, Junction−to−Ambient | $P_D$<br><br><br>$R_{\theta JA}$ | <br>300<br>2.4<br>417 | <br>mW<br>mW/°C<br>°C/W |
| Junction and Storage Temperature Range | $T_J$, $T_{stg}$ | −65 to +150 | °C |

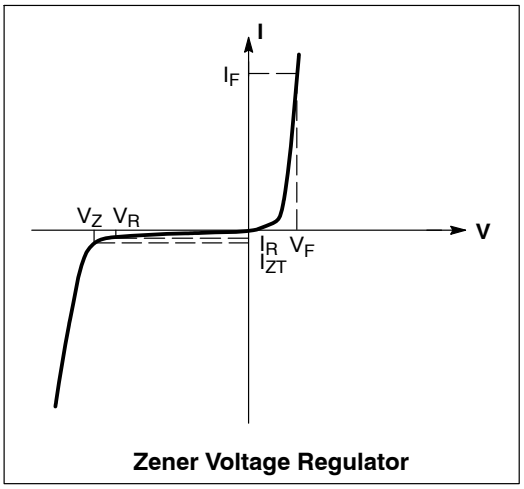
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. FR−5 = 1.0 X 0.75 X 0.62 in.
2. Alumina = 0.4 X 0.3 X 0.024 in., 99.5% alumina.

## ELECTRICAL CHARACTERISTICS

(Pinout: 1-Anode, 2-No Connection, 3-Cathode) ($T_A$ = 25°C unless otherwise noted, $V_F$ = 0.90 V Max. @ $I_F$ = 10 mA)

| Symbol | Parameter |
|---|---|
| $V_Z$ | Reverse Zener Voltage @ $I_{ZT}$ |
| $I_{ZT}$ | Reverse Current |
| $Z_{ZT}$ | Maximum Zener Impedance @ $I_{ZT}$ |
| $I_R$ | Reverse Leakage Current @ $V_R$ |
| $V_R$ | Reverse Voltage |
| $I_F$ | Forward Current |
| $V_F$ | Forward Voltage @ $I_F$ |
| $\Theta V_Z$ | Maximum Temperature Coefficient of $V_Z$ |
| C | Max. Capacitance @ $V_R$ = 0 and f = 1 MHz |




**Zener Voltage Regulator**

## ELECTRICAL CHARACTERISTICS – BZX84CxxxLT1 SERIES (STANDARD TOLERANCE)

(Pinout: 1-Anode, 2-No Connection, 3-Cathode) ($T_A$ = 25°C unless otherwise noted, $V_F$ = 0.90 V Max. @ $I_F$ = 10 mA)
(Devices listed in ***bold, italic*** are ON Semiconductor Preferred devices.)

| Device* | Device Marking | $V_{Z1}$ (Volts) @ $I_{ZT1}$ = 5 mA (Note 3) | | | $Z_{ZT1}$ (Ω) @ $I_{ZT1}$ = 5 mA | $V_{Z2}$ (V) @ $I_{ZT2}$ = 1 mA (Note 3) | | $Z_{ZT2}$ (Ω) @ $I_{ZT2}$ = 1 mA | $V_{Z3}$ (V) @ $I_{ZT3}$ = 20 mA (Note 3) | | $Z_{ZT3}$ (Ω) @ $I_{ZT3}$ = 20 mA | Max Reverse Leakage Current | | $\theta_{VZ}$ (mV/k) @ $I_{ZT1}$ = 5 mA | | C (pF) @ $V_R$ = 0 f = 1 MHz |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Nom | Max | | Min | Max | | Min | Max | | $I_R$ μA @ | $V_R$ Volts | Min | Max | |
| BZX84C2V4LT1G | Z11 | 2.2 | 2.4 | 2.6 | 100 | 1.7 | 2.1 | 600 | 2.6 | 3.2 | 50 | 50 | 1 | –3.5 | 0 | 450 |
| BZX84C2V7LT1G | Z12 | 2.5 | 2.7 | 2.9 | 100 | 1.9 | 2.4 | 600 | 3 | 3.6 | 50 | 20 | 1 | –3.5 | 0 | 450 |
| BZX84C3V0LT1G | Z13 | 2.8 | 3 | 3.2 | 95 | 2.1 | 2.7 | 600 | 3.3 | 3.9 | 50 | 10 | 1 | –3.5 | 0 | 450 |
| BZX84C3V3LT1G | Z14 | 3.1 | 3.3 | 3.5 | 95 | 2.3 | 2.9 | 600 | 3.6 | 4.2 | 40 | 5 | 1 | –3.5 | 0 | 450 |
| BZX84C3V6LT1G | Z15 | 3.4 | 3.6 | 3.8 | 90 | 2.7 | 3.3 | 600 | 3.9 | 4.5 | 40 | 5 | 1 | –3.5 | 0 | 450 |
| BZX84C3V9LT1G | Z16 | 3.7 | 3.9 | 4.1 | 90 | 2.9 | 3.5 | 600 | 4.1 | 4.7 | 30 | 3 | 1 | –3.5 | –2.5 | 450 |
| BZX84C4V3LT1G | W9 | 4 | 4.3 | 4.6 | 90 | 3.3 | 4 | 600 | 4.4 | 5.1 | 30 | 3 | 1 | –3.5 | 0 | 450 |
| ***BZX84C4V7LT1/T3G*** | ***Z1*** | ***4.4*** | ***4.7*** | ***5*** | ***80*** | ***3.7*** | ***4.7*** | ***500*** | ***4.5*** | ***5.4*** | ***15*** | ***3*** | ***2*** | ***–3.5*** | ***0.2*** | ***260*** |
| ***BZX84C5V1LT1/T3G*** | ***Z2*** | ***4.8*** | ***5.1*** | ***5.4*** | ***60*** | ***4.2*** | ***5.3*** | ***480*** | ***5*** | ***5.9*** | ***15*** | ***2*** | ***2*** | ***–2.7*** | ***1.2*** | ***225*** |
| ***BZX84C5V6LT1/T3G*** | ***Z3*** | ***5.2*** | ***5.6*** | ***6*** | ***40*** | ***4.8*** | ***6*** | ***400*** | ***5.2*** | ***6.3*** | ***10*** | ***1*** | ***2*** | ***–2.0*** | ***2.5*** | ***200*** |
| ***BZX84C6V2LT1/T3G*** | ***Z4*** | ***5.8*** | ***6.2*** | ***6.6*** | ***10*** | ***5.6*** | ***6.6*** | ***150*** | ***5.8*** | ***6.8*** | ***6*** | ***3*** | ***4*** | ***0.4*** | ***3.7*** | ***185*** |
| BZX84C6V8LT1/T3G | Z5 | 6.4 | 6.8 | 7.2 | 15 | 6.3 | 7.2 | 80 | 6.4 | 7.4 | 6 | 2 | 4 | 1.2 | 4.5 | 155 |
| BZX84C7V5LT1G | Z6 | 7 | 7.5 | 7.9 | 15 | 6.9 | 7.9 | 80 | 7 | 8 | 6 | 1 | 5 | 2.5 | 5.3 | 140 |
| BZX84C8V2LT1G | Z7 | 7.7 | 8.2 | 8.7 | 15 | 7.6 | 8.7 | 80 | 7.7 | 8.8 | 6 | 0.7 | 5 | 3.2 | 6.2 | 135 |
| BZX84C9V1LT1/T3G | Z8 | 8.5 | 9.1 | 9.6 | 15 | 8.4 | 9.6 | 100 | 8.5 | 9.7 | 8 | 0.5 | 6 | 3.8 | 7.0 | 130 |
| BZX84C10LT1G | Z9 | 9.4 | 10 | 10.6 | 20 | 9.3 | 10.6 | 150 | 9.4 | 10.7 | 10 | 0.2 | 7 | 4.5 | 8.0 | 130 |
| BZX84C11LT1G | Y1 | 10.4 | 11 | 11.6 | 20 | 10.2 | 11.6 | 150 | 10.4 | 11.8 | 10 | 0.1 | 8 | 5.4 | 9.0 | 130 |
| ***BZX84C12LT1G*** | ***Y2*** | ***11.4*** | ***12*** | ***12.7*** | ***25*** | ***11.2*** | ***12.7*** | ***150*** | ***11.4*** | ***12.9*** | ***10*** | ***0.1*** | ***8*** | ***6.0*** | ***10.0*** | ***130*** |
| BZX84C13LT1G | Y3 | 12.4 | 13 | 14.1 | 30 | 12.3 | 14 | 170 | 12.5 | 14.2 | 15 | 0.1 | 8 | 7.0 | 11.0 | 120 |
| BZX84C15LT1/T3G | Y4 | 13.8 | 15 | 15.6 | 30 | 13.7 | 15.5 | 200 | 13.9 | 15.7 | 20 | 0.05 | 10.5 | 9.2 | 13.0 | 110 |
| BZX84C16LT1G | Y5 | 15.3 | 16 | 17.1 | 40 | 15.2 | 17 | 200 | 15.4 | 17.2 | 20 | 0.05 | 11.2 | 10.4 | 14.0 | 105 |
| ***BZX84C18LT1/T3G*** | ***Y6*** | ***16.8*** | ***18*** | ***19.1*** | ***45*** | ***16.7*** | ***19*** | ***225*** | ***16.9*** | ***19.2*** | ***20*** | ***0.05*** | ***12.6*** | ***12.4*** | ***16.0*** | ***100*** |
| BZX84C20LT1G | Y7 | 18.8 | 20 | 21.2 | 55 | 18.7 | 21.1 | 225 | 18.9 | 21.4 | 20 | 0.05 | 14 | 14.4 | 18.0 | 85 |
| BZX84C22LT1G | Y8 | 20.8 | 22 | 23.3 | 55 | 20.7 | 23.2 | 250 | 20.9 | 23.4 | 25 | 0.05 | 15.4 | 16.4 | 20.0 | 85 |
| BZX84C24LT1G | Y9 | 22.8 | 24 | 25.6 | 70 | 22.7 | 25.5 | 250 | 22.9 | 25.7 | 25 | 0.05 | 16.8 | 18.4 | 22.0 | 80 |
| Device* | Device Marking | $V_{Z1}$ Below @ $I_{ZT1}$ = 2 mA | | | $Z_{ZT1}$ Below @ $I_{ZT1}$ = 2 mA | $V_{Z2}$ Below @ $I_{ZT2}$ = 0.1 mA | | $Z_{ZT2}$ Below @ $I_{ZT4}$ = 0.5 mA | $V_{Z3}$ Below @ $I_{ZT3}$ = 10 mA | | $Z_{ZT3}$ Below @ $I_{ZT3}$ = 10 mA | Max Reverse Leakage Current | | $\theta_{VZ}$ (mV/k) Below @ $I_{ZT1}$ = 2 mA | | C (pF) @ $V_R$ = 0 f = 1 MHz |
| | | Min | Nom | Max | | Min | Max | | Min | Max | | $I_R$ μA @ | $V_R$ (V) | Min | Max | |
| BZX84C27LT1G | Y10 | 25.1 | 27 | 28.9 | 80 | 25 | 28.9 | 300 | 25.2 | 29.3 | 45 | 0.05 | 18.9 | 21.4 | 25.3 | 70 |
| BZX84C30LT1G | Y11 | 28 | 30 | 32 | 80 | 27.8 | 32 | 300 | 28.1 | 32.4 | 50 | 0.05 | 21 | 24.4 | 29.4 | 70 |
| BZX84C33LT1/T3G | Y12 | 31 | 33 | 35 | 80 | 30.8 | 35 | 325 | 31.1 | 35.4 | 55 | 0.05 | 23.1 | 27.4 | 33.4 | 70 |
| BZX84C36LT1G | Y13 | 34 | 36 | 38 | 90 | 33.8 | 38 | 350 | 34.1 | 38.4 | 60 | 0.05 | 25.2 | 30.4 | 37.4 | 70 |
| BZX84C39LT1G | Y14 | 37 | 39 | 41 | 130 | 36.7 | 41 | 350 | 37.1 | 41.5 | 70 | 0.05 | 27.3 | 33.4 | 41.2 | 45 |
| BZX84C43LT1G | Y15 | 40 | 43 | 46 | 150 | 39.7 | 46 | 375 | 40.1 | 46.5 | 80 | 0.05 | 30.1 | 37.6 | 46.6 | 40 |
| BZX84C47LT1G | Y16 | 44 | 47 | 50 | 170 | 43.7 | 50 | 375 | 44.1 | 50.5 | 90 | 0.05 | 32.9 | 42.0 | 51.8 | 40 |
| BZX84C51LT1G | Y17 | 48 | 51 | 54 | 180 | 47.6 | 54 | 400 | 48.1 | 54.6 | 100 | 0.05 | 35.7 | 46.6 | 57.2 | 40 |
| BZX84C56LT1G | Y18 | 52 | 56 | 60 | 200 | 51.5 | 60 | 425 | 52.1 | 60.8 | 110 | 0.05 | 39.2 | 52.2 | 63.8 | 40 |
| BZX84C62LT1G | Y19 | 58 | 62 | 66 | 215 | 57.4 | 66 | 450 | 58.2 | 67 | 120 | 0.05 | 43.4 | 58.8 | 71.6 | 35 |
| BZX84C68LT1G | Y20 | 64 | 68 | 72 | 240 | 63.4 | 72 | 475 | 64.2 | 73.2 | 130 | 0.05 | 47.6 | 65.6 | 79.8 | 35 |
| BZX84C75LT1G | Y21 | 70 | 75 | 79 | 255 | 69.4 | 79 | 500 | 70.3 | 80.2 | 140 | 0.05 | 52.5 | 73.4 | 88.6 | 35 |

3. Zener voltage is measured with a pulse test current $I_Z$ at an ambient temperature of 25°C.

*Include SZ-prefix devices where applicable.

## ELECTRICAL CHARACTERISTICS – BZX84BxxxL (Tight Tolerance Series)

(Pinout: 1-Anode, 2-No Connection, 3-Cathode) ($T_A$ = 25°C unless otherwise noted, $V_F$ = 0.90 V Max. @ $I_F$ = 10 mA)

| Device* | Device Marking | $V_Z$ (Volts) @ $I_{ZT}$ = 5 mA (Note 4) | | | $Z_{ZT}$ (Ω) @ $I_{ZT}$ = 5 mA (Note 4) | Max Reverse Leakage Current | | $\theta_{VZ}$ (mV/k) @ $I_{ZT}$ = 5 mA | | C (pF) @ $V_R$ =0, f = 1 MHz |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $I_R$ @ $V_R$ | | | | |
| | | Min | Nom | Max | Max | μA | Volts | Min | Max | |
| BZX84B4V7LT1G | T10 | 4.61 | 4.7 | 4.79 | 80 | 3 | 2 | −3.5 | 0.2 | 260 |
| BZX84B5V1LT1G | T11 | 5.00 | 5.1 | 5.20 | 60 | 2 | 2 | −2.7 | 1.2 | 225 |
| BZX84B5V6LT1G | T12 | 5.49 | 5.6 | 5.71 | 40 | 1 | 2 | −2 | 2.5 | 200 |
| BZX84B6V2LT1G | T13 | 6.08 | 6.2 | 6.32 | 10 | 3 | 4 | 0.4 | 3.7 | 185 |
| BZX84B6V8LT1G | T14 | 6.66 | 6.8 | 6.94 | 15 | 2 | 4 | 1.2 | 4.5 | 155 |
| BZX84B7V5LT1G | T15 | 7.35 | 7.5 | 7.65 | 15 | 1 | 5 | 2.5 | 5.3 | 140 |
| BZX84B8V2LT1G | T16 | 8.04 | 8.2 | 8.36 | 15 | 0.7 | 5 | 3.2 | 6.2 | 135 |
| BZX84B9V1LT1G | T17 | 8.92 | 9.1 | 9.28 | 15 | 0.5 | 6 | 3.8 | 7 | 130 |
| BZX84B12LT1G | T18 | 11.8 | 12 | 12.2 | 25 | 0.1 | 8 | 6 | 10 | 130 |
| BZX84B15LT1G | T22 | 14.7 | 15 | 15.3 | 30 | 0.05 | 10.5 | 9.2 | 13 | 110 |
| BZX84B16LT1G | T19 | 15.7 | 16 | 16.3 | 40 | 0.05 | 11.2 | 10.4 | 14 | 105 |
| BZX84B18LT1G | T20 | 17.6 | 18 | 18.4 | 45 | 0.05 | 12.6 | 12.4 | 16 | 100 |
| BZX84B22LT1G | T24 | 21.6 | 22 | 22.4 | 55 | 0.05 | 15.4 | 16.4 | 20 | 85 |
| BZX84B24LT1G | T25 | 23.5 | 24 | 24.5 | 70 | 0.05 | 16.8 | 18.4 | 22 | 80 |

4. Zener voltage is measured with a pulse test current $I_Z$ at an ambient temperature of 25°C.

*Include SZ-prefix devices where applicable.

## TYPICAL CHARACTERISTICS

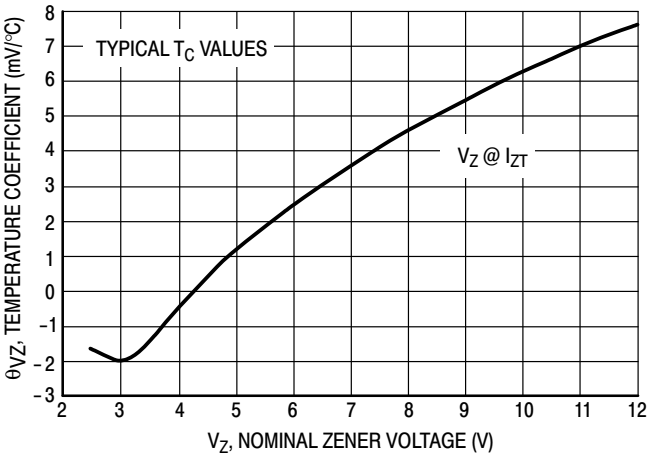



**Figure 1. Temperature Coefficients (Temperature Range − 55°C to +150°C)**

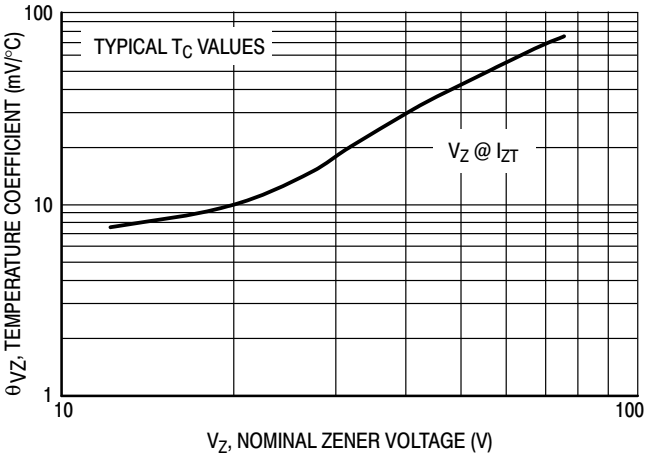



**Figure 2. Temperature Coefficients (Temperature Range − 55°C to +150°C)**

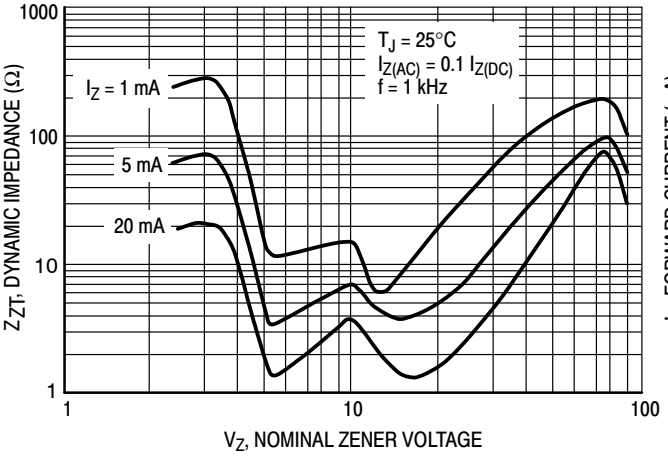



**Figure 3. Effect of Zener Voltage on Zener Impedance**

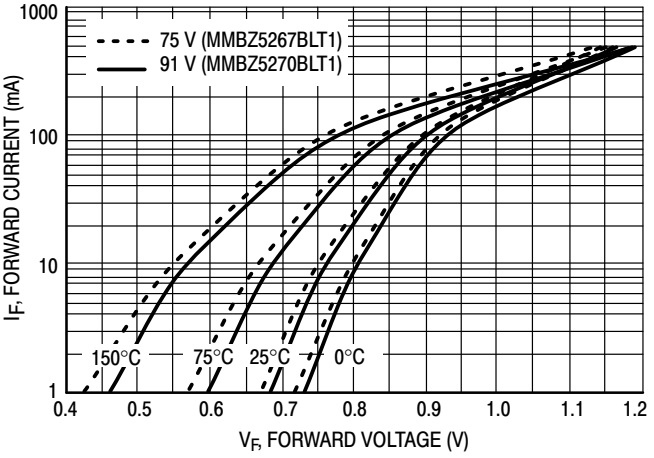



**Figure 4. Typical Forward Voltage**

## TYPICAL CHARACTERISTICS

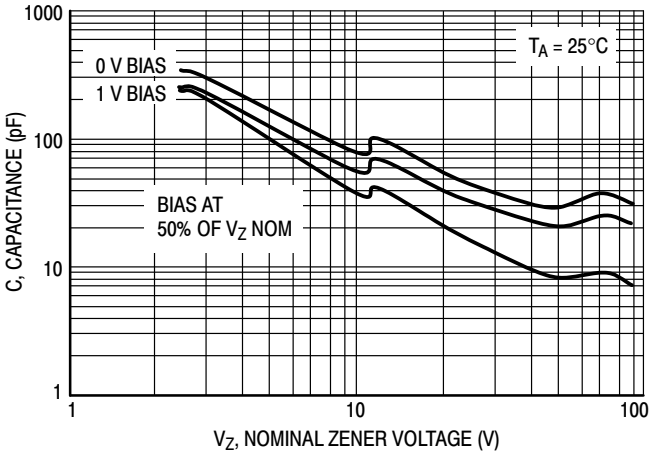



**Figure 5. Typical Capacitance**

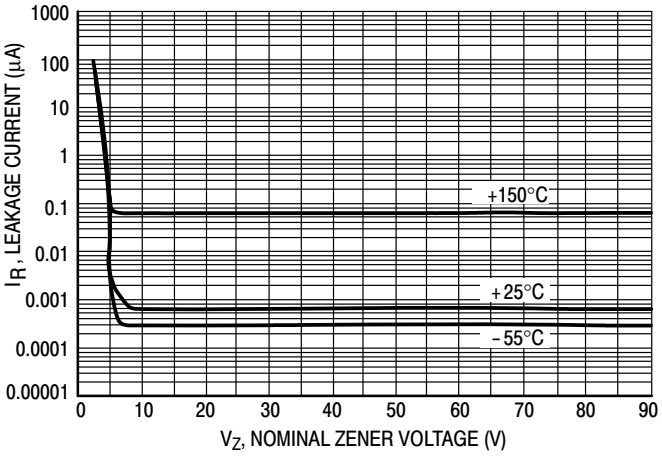



**Figure 6. Typical Leakage Current**

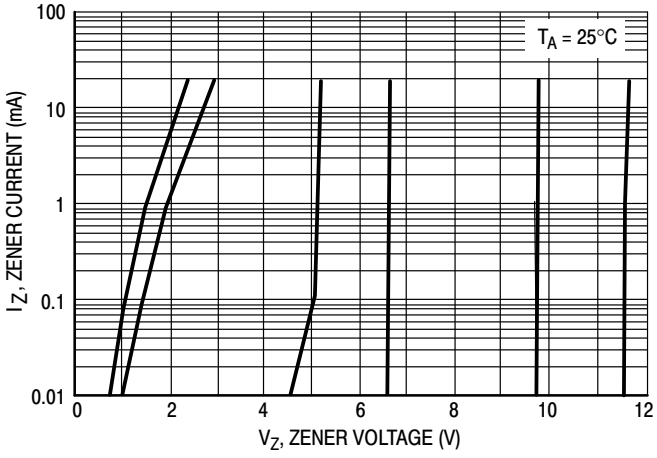



**Figure 7. Zener Voltage versus Zener Current ($V_Z$ Up to 12 V)**

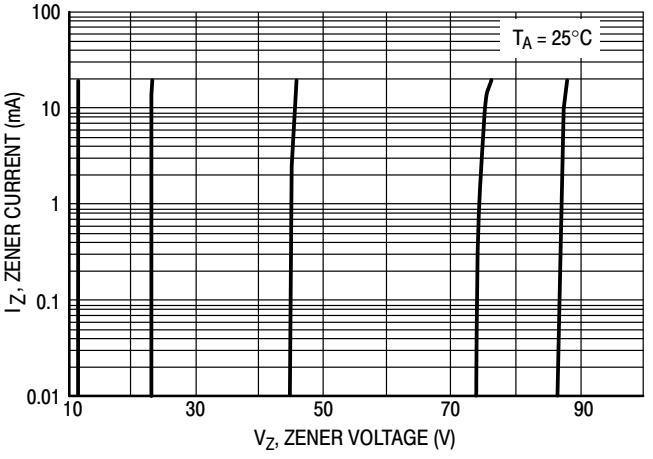
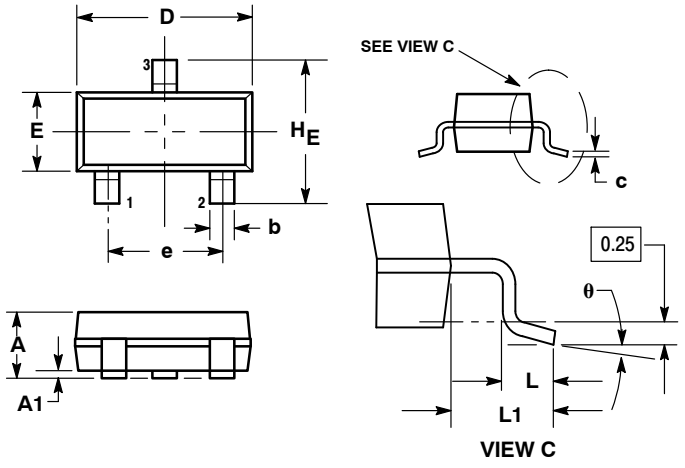



**Figure 8. Zener Voltage versus Zener Current (12 V to 91 V)**

# BZX84BxxxLT1G, BZX84CxxxLT1G Series, SZBZX84BxxxLT1G, SZBZX84CxxxLT1G Series

## PACKAGE DIMENSIONS

**SOT−23 (TO−236)**
CASE 318−08
ISSUE AP

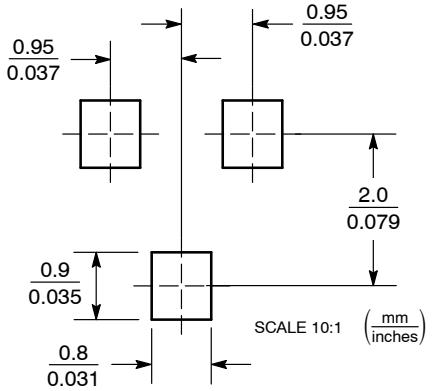



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| | MILLIMETERS | | | INCHES | | |
|---|---|---|---|---|---|---|
| DIM | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.89 | 1.00 | 1.11 | 0.035 | 0.040 | 0.044 |
| A1 | 0.01 | 0.06 | 0.10 | 0.001 | 0.002 | 0.004 |
| b | 0.37 | 0.44 | 0.50 | 0.015 | 0.018 | 0.020 |
| c | 0.09 | 0.13 | 0.18 | 0.003 | 0.005 | 0.007 |
| D | 2.80 | 2.90 | 3.04 | 0.110 | 0.114 | 0.120 |
| E | 1.20 | 1.30 | 1.40 | 0.047 | 0.051 | 0.055 |
| e | 1.78 | 1.90 | 2.04 | 0.070 | 0.075 | 0.081 |
| L | 0.10 | 0.20 | 0.30 | 0.004 | 0.008 | 0.012 |
| L1 | 0.35 | 0.54 | 0.69 | 0.014 | 0.021 | 0.029 |
| $H_E$ | 2.10 | 2.40 | 2.64 | 0.083 | 0.094 | 0.104 |
| θ | 0° | −−− | 10° | 0° | −−− | 10° |

STYLE 8:
PIN 1. ANODE
2. NO CONNECTION
3. CATHODE

## SOLDERING 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.

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