# BZX84BxxxLT1G, BZX84CxxxLT1G Series, SZBZX84BxxxLT1G, SZBZX84CxxxLT1G Series

# Zener Voltage Regulators

## 250 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

- 250 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
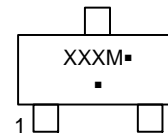**FINISH:** Corrosion resistant finish, easily Solderable
**MAXIMUM CASE TEMPERATURE FOR SOLDERING PURPOSES:**
  260°C for 10 Seconds
**POLARITY:** Cathode indicated by polarity band
**FLAMMABILITY RATING:** UL 94 V−0

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

## ON Semiconductor®

**SOT−23**
**CASE 318**
**STYLE 8**

3 ○——▷|——○ 1
Cathode           Anode

### MARKING DIAGRAM



XXXM▪

1

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 |
| SZBZX84BxxxLT3G | 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.

**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>250<br>2.0<br>500 | <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 those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.
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 |
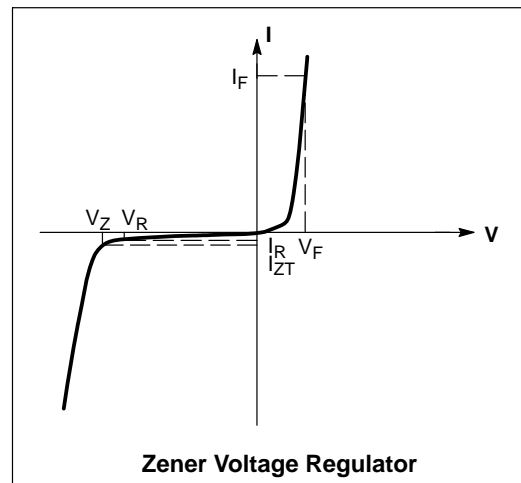


**Zener Voltage Regulator**

## 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 | | $θ_{VZ}$ (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 | | $θ_{VZ}$ (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.

*Includes 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 | |
| BZX84B3V3LT1G | T2A | 3.23 | 3.3 | 3.37 | 95 | 5 | 1 | −3.5 | 0 | 450 |
| 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, T3G | T17 | 8.92 | 9.1 | 9.28 | 15 | 0.5 | 6 | 3.8 | 7 | 130 |
| BZX84B10LT1G | T2E | 9.8 | 10 | 10.2 | 20 | 0.2 | 7 | 4.5 | 8 | 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.

**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) @ $I_{ZT}$ = 2 mA (Note 4) | | | $Z_{ZT}$ (Ω) @ $I_{ZT}$ = 2 mA (Note 4) | Max Reverse Leakage Current | | $\theta_{VZ}$ (mV/k) @ $I_{ZT}$ = 2 mA | | C (pF) @ $V_R$ =0, f = 1 MHz |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $I_R$ @ | $V_R$ | | | |
| | | Min | Nom | Max | Max | μA | Volts | Min | Max | |
| BZX84B27LT1G | T27 | 26.5 | 27 | 27.5 | 80 | 0.05 | 18.9 | 21.4 | 25.3 | 70 |

*Includes SZ-prefix devices where applicable.

## TYPICAL CHARACTERISTICS
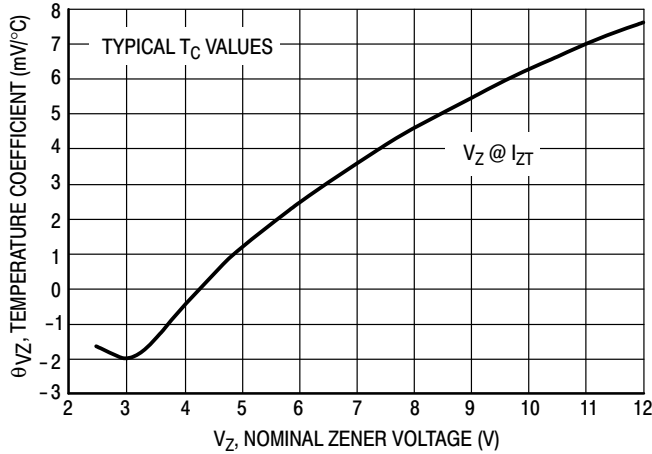


**Figure 1. Temperature Coefficients (Temperature Range −55°C to +150°C)**
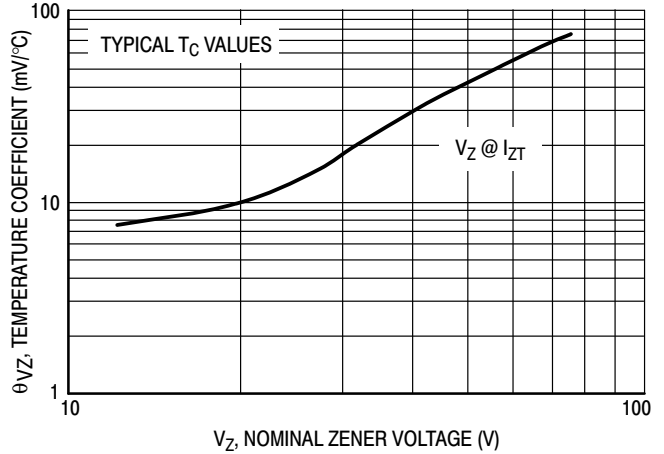


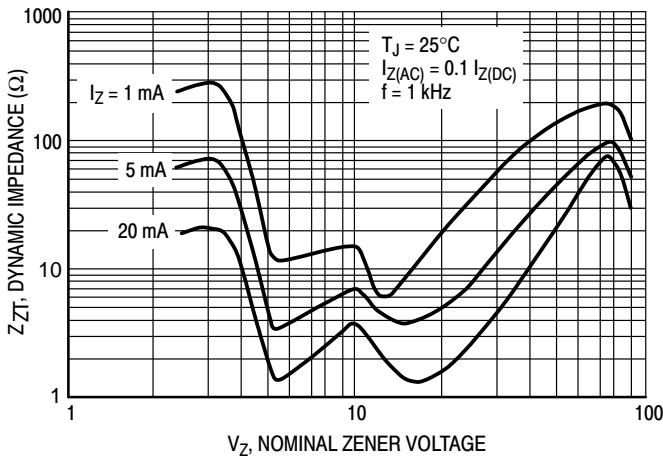**Figure 2. Temperature Coefficients (Temperature Range −55°C to +150°C)**



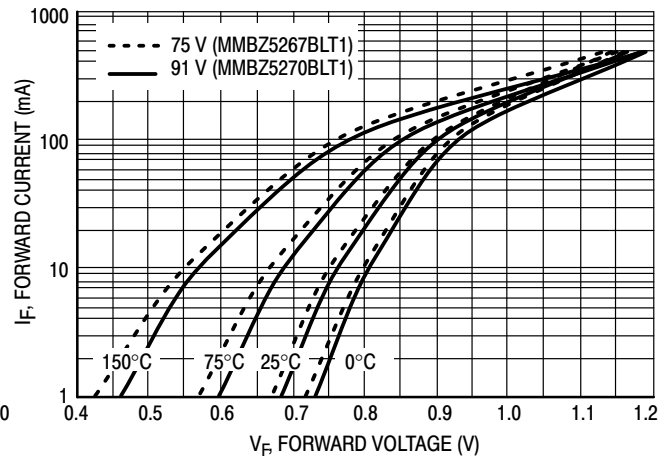**Figure 3. Effect of Zener Voltage on Zener Impedance**



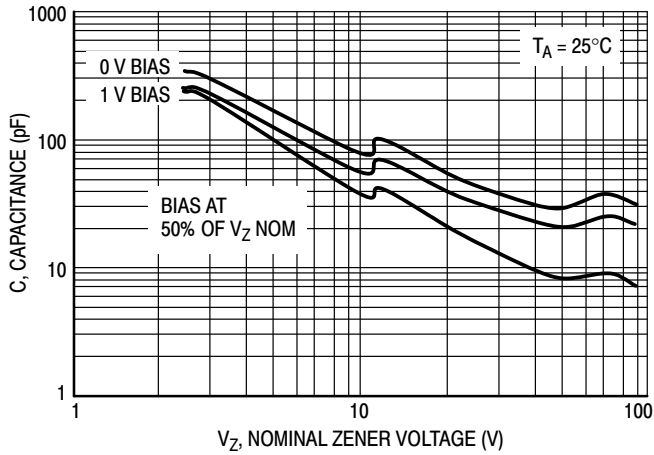**Figure 4. Typical Forward Voltage**

## TYPICAL CHARACTERISTICS



Figure 5. Typical Capacitance
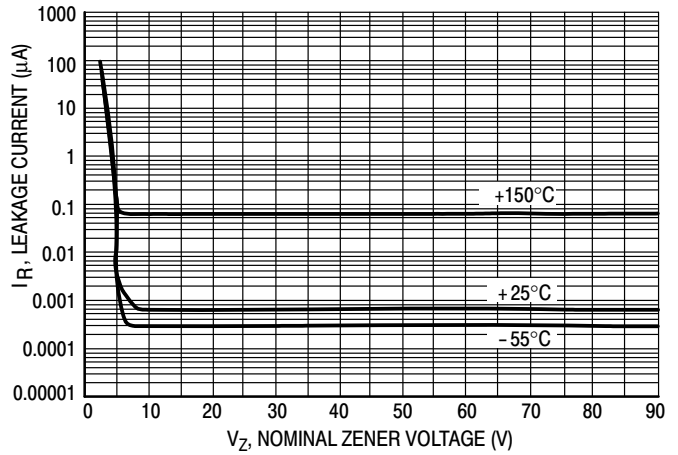


Figure 6. Typical Leakage Current



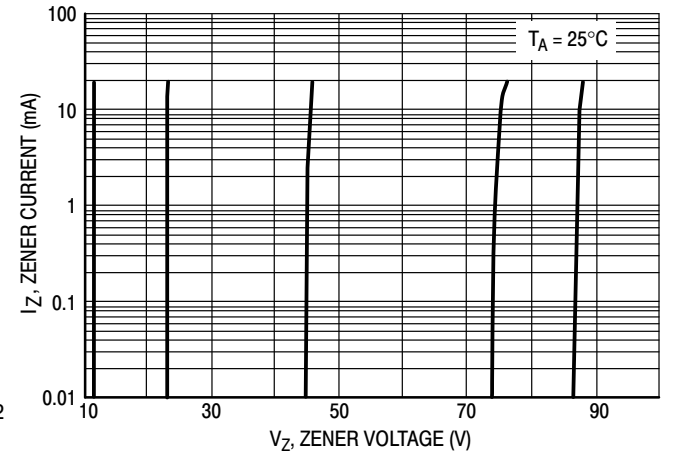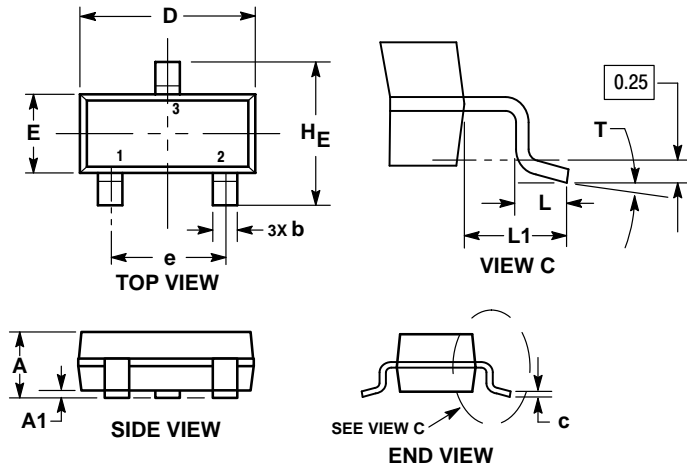Figure 7. Zener Voltage versus Zener Current
(V_Z Up to 12 V)



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 AR

**TOP VIEW**

**SIDE VIEW**

**VIEW C**

**END VIEW**

SEE VIEW C

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-----|-----|-----|-----|-----|-----|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.89 | 1.00 | 1.11 | 0.035 | 0.039 | 0.044 |
| A1 | 0.01 | 0.06 | 0.10 | 0.000 | 0.002 | 0.004 |
| b | 0.37 | 0.44 | 0.50 | 0.015 | 0.017 | 0.020 |
| c | 0.08 | 0.14 | 0.20 | 0.003 | 0.006 | 0.008 |
| 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 | 0.080 |
| L | 0.30 | 0.43 | 0.55 | 0.012 | 0.017 | 0.022 |
| L1 | 0.35 | 0.54 | 0.69 | 0.014 | 0.021 | 0.027 |
| HE | 2.10 | 2.40 | 2.64 | 0.083 | 0.094 | 0.104 |
| T | 0° | ––– | 10° | 0° | ––– | 10° |

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

## RECOMMENDED SOLDERING FOOTPRINT

2.90

3X 0.90

3X 0.80

0.95 PITCH

DIMENSIONS: MILLIMETERS

◊

**BZX84C2V4LT1/D**