

BZX84BxxxLT1, BZX84CxxxLT1 Series, SZBZX84BxxxLT1G, SZBZX84CxxxLT1G Series



ON Semiconductor®

<http://onsemi.com>

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)
- AEC-Q101 Qualified and PPAP Capable
- 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, 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

MAXIMUM RATINGS

| Rating | Symbol | Max | Unit |
|--|-----------------|----------------|---|
| Total Power Dissipation on FR-5 Board, (Note 1) @ $T_A = 25^\circ\text{C}$ Derated above 25°C | P_D | 225 | mW |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 1.8 556 | $\text{mW}/^\circ\text{C}$ $^\circ\text{C}/\text{W}$ |
| Total Power Dissipation on Alumina Substrate, (Note 2) @ $T_A = 25^\circ\text{C}$ Derated above 25°C | P_D | 300 | mW |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 2.4 417 | $\text{mW}/^\circ\text{C}$ $^\circ\text{C}/\text{W}$ |
| Junction 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. 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.



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† |
|-----------------|---------------------|----------------------|
| BZX84CxxxLT1 | SOT-23 | 3000/Tape & Reel |
| BZX84CxxxLT1G | SOT-23 (Pb-Free) | 3000/Tape & Reel |
| SZBZX84xxxLT1G | SOT-23 (Pb-Free) | 3000/Tape & Reel |
| BZX84CxxxLT3 | SOT-23 | 10,000/Tape & Reel |
| BZX84CxxxLT3G | SOT-23 (Pb-Free) | 10,000/Tape & Reel |
| SZBZXCxxxLT3G | SOT-23 (Pb-Free) | 10,000/Tape & Reel |
| BZX84BxxxLT1 | SOT-23 | 3000/Tape & Reel |
| BZX84BxxxLT1G | SOT-23 (Pb-Free) | 3000 / Tape & Reel |
| SZBZX84BxxxLT1G | SOT-23 (Pb-Free) | 3000 / Tape & Reel |
| BZX84BxxxLT3 | SOT-23 | 10,000 / 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

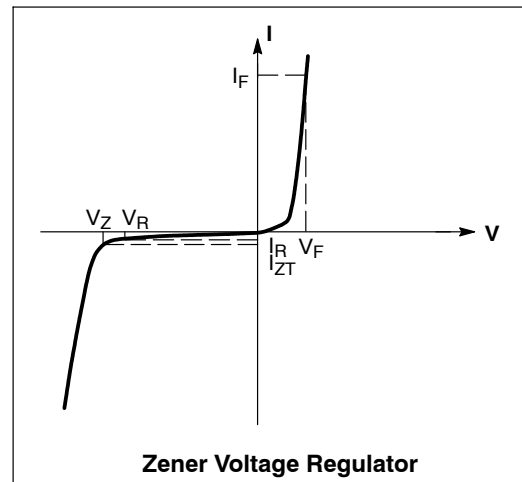
See specific marking information in the device marking column of the Electrical Characteristics table on page 3 of this data sheet.

BZX84BxxxLT1, BZX84CxxxLT1 Series, SZBZX84BxxxLT1G, SZBZX84CxxxLT1G Series

ELECTRICAL CHARACTERISTICS

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

| 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 |
| ΘV_Z | Maximum Temperature Coefficient of V_Z |
| C | Max. Capacitance @ $V_R = 0$ and $f = 1\text{ MHz}$ |



BZX84BxxxLT1, BZX84CxxxLT1 Series, SZBZX84BxxxLT1G, SZBZX84CxxxLT1G Series

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 | |
| SZ/BZX84C2V4LT1, G | Z11 | 2.2 | 2.4 | 2.6 | 100 | 1.7 | 2.1 | 600 | 2.6 | 3.2 | 50 | 50 | 1 | -3.5 | 0 | 450 |
| SZ/BZX84C2V7LT1, G | Z12 | 2.5 | 2.7 | 2.9 | 100 | 1.9 | 2.4 | 600 | 3 | 3.6 | 50 | 20 | 1 | -3.5 | 0 | 450 |
| SZ/BZX84C3V0LT1, G | Z13 | 2.8 | 3 | 3.2 | 95 | 2.1 | 2.7 | 600 | 3.3 | 3.9 | 50 | 10 | 1 | -3.5 | 0 | 450 |
| SZ/BZX84C3V3LT1, G | Z14 | 3.1 | 3.3 | 3.5 | 95 | 2.3 | 2.9 | 600 | 3.6 | 4.2 | 40 | 5 | 1 | -3.5 | 0 | 450 |
| SZ/BZX84C3V6LT1, G | Z15 | 3.4 | 3.6 | 3.8 | 90 | 2.7 | 3.3 | 600 | 3.9 | 4.5 | 40 | 5 | 1 | -3.5 | 0 | 450 |
| SZ/BZX84C3V9LT1, G | 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 |
| SZ/BZX84C4V3LT1, G | W9 | 4 | 4.3 | 4.6 | 90 | 3.3 | 4 | 600 | 4.4 | 5.1 | 30 | 3 | 1 | -3.5 | 0 | 450 |
| SZ/BZX84C4V7LT1/T3, G | Z1 | 4.4 | 4.7 | 5 | 80 | 3.7 | 4.7 | 500 | 4.5 | 5.4 | 15 | 3 | 2 | -3.5 | 0.2 | 260 |
| SZ/BZX84C5V1LT1/T3, G | Z2 | 4.8 | 5.1 | 5.4 | 60 | 4.2 | 5.3 | 480 | 5 | 5.9 | 15 | 2 | 2 | -2.7 | 1.2 | 225 |
| SZ/BZX84C5V6LT1/T3, G | Z3 | 5.2 | 5.6 | 6 | 40 | 4.8 | 6 | 400 | 5.2 | 6.3 | 10 | 1 | 2 | -2.0 | 2.5 | 200 |
| SZ/BZX84C6V2LT1/T3, G | 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 |
| SZ/BZX84C6V8LT1/T3, G | 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 |
| SZ/BZX84C7V5LT1, G | Z6 | 7 | 7.5 | 7.9 | 15 | 6.9 | 7.9 | 80 | 7 | 8 | 6 | 1 | 5 | 2.5 | 5.3 | 140 |
| SZ/BZX84C8V2LT1, G | 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 |
| SZ/BZX84C9V1LT1/T3, G | 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 |
| SZ/BZX84C10LT1, G | 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 |
| SZ/BZX84C11LT1, G | 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 |
| SZ/BZX84C12LT1, G | 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 |
| SZ/BZX84C13LT1, G | Y3 | 12.4 | 13 | 14.1 | 30 | 12.3 | 14 | 170 | 12.5 | 14.2 | 15 | 0.1 | 8 | 7.0 | 11.0 | 120 |
| SZ/BZX84C15LT1/T3, G | 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 |
| SZ/BZX84C16LT1, G | 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 |
| SZ/BZX84C18LT1/T3, G | 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 |
| SZ/BZX84C20LT1, G | 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 |
| SZ/BZX84C22LT1, G | 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 |
| SZ/BZX84C24LT1, G | 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 m- A | | Z _{ZT2} Below @ I _{ZT2} = 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 | |
| SZ/BZX84C27LT1, G | 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 |
| SZ/BZX84C30LT1, G | Y11 | 28 | 30 | 32 | 80 | 27.8 | 32 | 300 | 28.1 | 32.4 | 50 | 0.05 | 21 | 24.4 | 29.4 | 70 |
| SZ/BZX84C33LT1/T3, G | Y12 | 31 | 33 | 35 | 80 | 30.8 | 35 | 325 | 31.1 | 35.4 | 55 | 0.05 | 23.1 | 27.4 | 33.4 | 70 |
| SZ/BZX84C36LT1, G | Y13 | 34 | 36 | 38 | 90 | 33.8 | 38 | 350 | 34.1 | 38.4 | 60 | 0.05 | 25.2 | 30.4 | 37.4 | 70 |
| SZ/BZX84C39LT1, G | Y14 | 37 | 39 | 41 | 130 | 36.7 | 41 | 350 | 37.1 | 41.5 | 70 | 0.05 | 27.3 | 33.4 | 41.2 | 45 |
| SZ/BZX84C43LT1, G | Y15 | 40 | 43 | 46 | 150 | 39.7 | 46 | 375 | 40.1 | 46.5 | 80 | 0.05 | 30.1 | 37.6 | 46.6 | 40 |
| SZ/BZX84C47LT1, G | Y16 | 44 | 47 | 50 | 170 | 43.7 | 50 | 375 | 44.1 | 50.5 | 90 | 0.05 | 32.9 | 42.0 | 51.8 | 40 |
| SZ/BZX84C51LT1, G | Y17 | 48 | 51 | 54 | 180 | 47.6 | 54 | 400 | 48.1 | 54.6 | 100 | 0.05 | 35.7 | 46.6 | 57.2 | 40 |
| SZ/BZX84C56LT1, G | Y18 | 52 | 56 | 60 | 200 | 51.5 | 60 | 425 | 52.1 | 60.8 | 110 | 0.05 | 39.2 | 52.2 | 63.8 | 40 |
| SZ/BZX84C62LT1, G | Y19 | 58 | 62 | 66 | 215 | 57.4 | 66 | 450 | 58.2 | 67 | 120 | 0.05 | 43.4 | 58.8 | 71.6 | 35 |
| SZ/BZX84C68LT1, G | Y20 | 64 | 68 | 72 | 240 | 63.4 | 72 | 475 | 64.2 | 73.2 | 130 | 0.05 | 47.6 | 65.6 | 79.8 | 35 |
| SZ/BZX84C75LT1, G | 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.

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

BZX84BxxxLT1, BZX84CxxxLT1 Series, SZBZX84BxxxLT1G, SZBZX84CxxxLT1G Series

ELECTRICAL CHARACTERISTICS – BZX84BxxxL (Tight Tolerance Series)

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

| Device | Device Marking | V_Z (Volts) @ $I_{ZT} = 5\text{ mA}$ (Note 4) | | | $Z_{ZT} (\Omega)$ @ $I_{ZT} = 5\text{ mA}$ (Note 4) | Max Reverse Leakage Current | | θ_{VZ} (mV/k) @ $I_{ZT} = 5\text{ mA}$ | | C (pF) @ $V_R = 0,$ $f = 1\text{ MHz}$ |
|--------------------|----------------|--|-----|------|---|-----------------------------|---------|---|-----|--|
| | | | | | | I_R | V_R | | | |
| | | Min | Nom | Max | Max | μA | @ Volts | Min | Max | |
| BZX84B4V7LT1, G | T10 | 4.61 | 4.7 | 4.79 | 80 | 3 | 2 | -3.5 | 0.2 | 260 |
| SZ/BZX84B5V1LT1, G | T11 | 5.00 | 5.1 | 5.20 | 60 | 2 | 2 | -2.7 | 1.2 | 225 |
| SZ/BZX84B5V6LT1, G | T12 | 5.49 | 5.6 | 5.71 | 40 | 1 | 2 | -2 | 2.5 | 200 |
| SZ/BZX84B6V2LT1, G | T13 | 6.08 | 6.2 | 6.32 | 10 | 3 | 4 | 0.4 | 3.7 | 185 |
| SZ/BZX84B6V8LT1, G | T14 | 6.66 | 6.8 | 6.94 | 15 | 2 | 4 | 1.2 | 4.5 | 155 |
| SZ/BZX84B7V5LT1, G | T15 | 7.35 | 7.5 | 7.65 | 15 | 1 | 5 | 2.5 | 5.3 | 140 |
| BZX84B8V2LT1, G | T16 | 8.04 | 8.2 | 8.36 | 15 | 0.7 | 5 | 3.2 | 6.2 | 135 |
| BZX84B9V1LT1, G | T17 | 8.92 | 9.1 | 9.28 | 15 | 0.5 | 6 | 3.8 | 7 | 130 |
| SZ/BZX84B12LT1, G | T18 | 11.8 | 12 | 12.2 | 25 | 0.1 | 8 | 6 | 10 | 130 |
| BZX84B15LT1, G | T22 | 14.7 | 15 | 15.3 | 30 | 0.05 | 10.5 | 9.2 | 13 | 110 |
| SZ/BZX84B16LT1, G | T19 | 15.7 | 16 | 16.3 | 40 | 0.05 | 11.2 | 10.4 | 14 | 105 |
| BZX84B18LT1, G | T20 | 17.6 | 18 | 18.4 | 45 | 0.05 | 12.6 | 12.4 | 16 | 100 |
| BZX84B22LT1, G | T24 | 21.6 | 22 | 22.4 | 55 | 0.05 | 15.4 | 16.4 | 20 | 85 |
| BZX84B24LT1, G | 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 .

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

TYPICAL CHARACTERISTICS

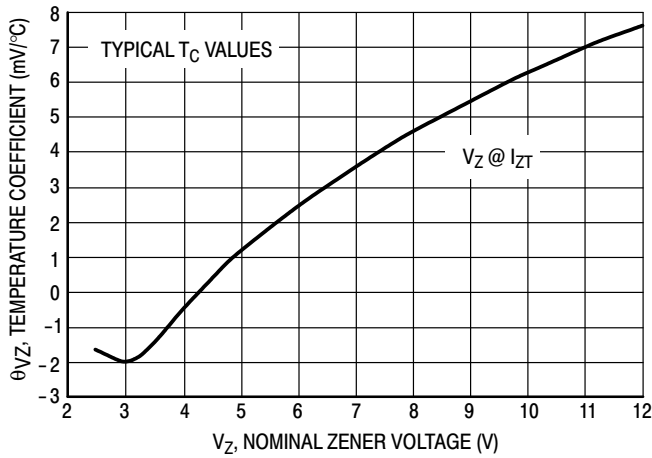


Figure 1. Temperature Coefficients (Temperature Range -55°C to +150°C)

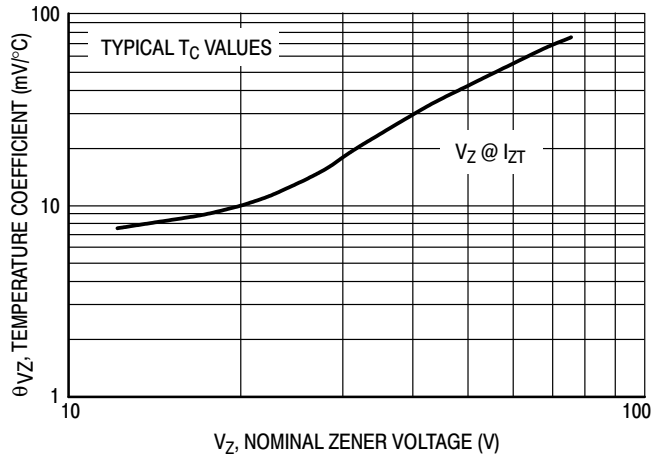


Figure 2. Temperature Coefficients (Temperature Range -55°C to +150°C)

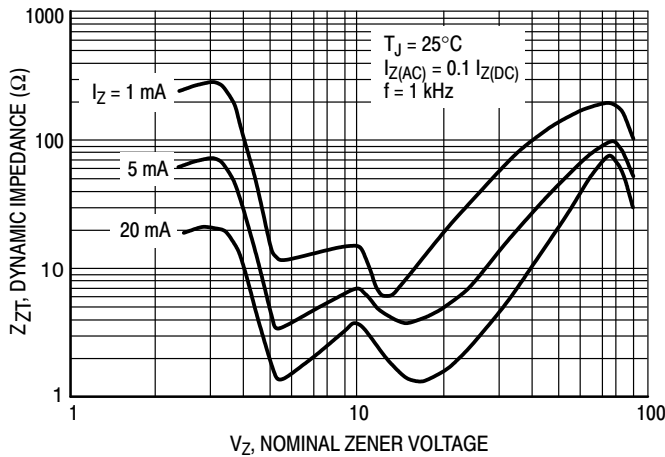


Figure 3. Effect of Zener Voltage on Zener Impedance

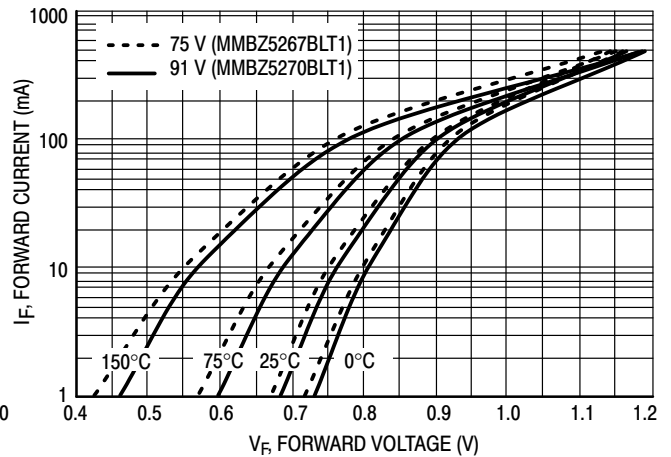


Figure 4. Typical Forward Voltage

TYPICAL CHARACTERISTICS

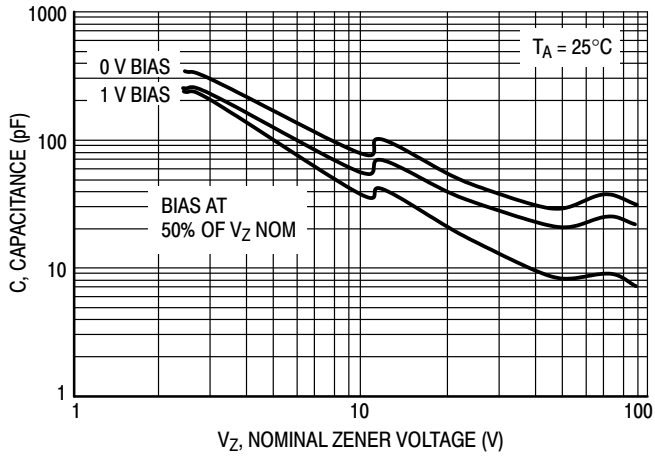


Figure 5. Typical Capacitance

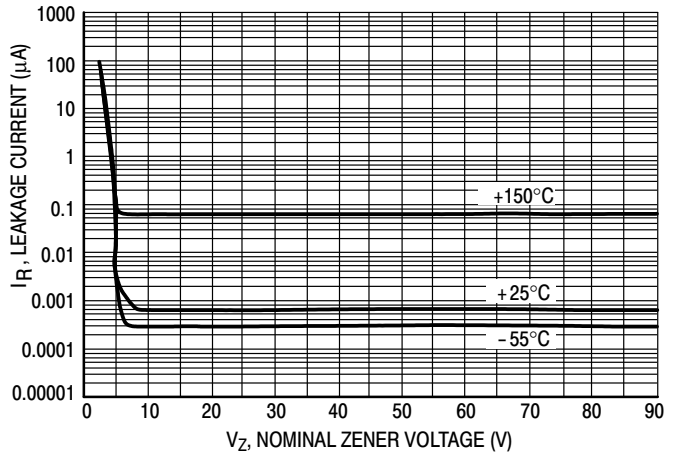


Figure 6. Typical Leakage Current

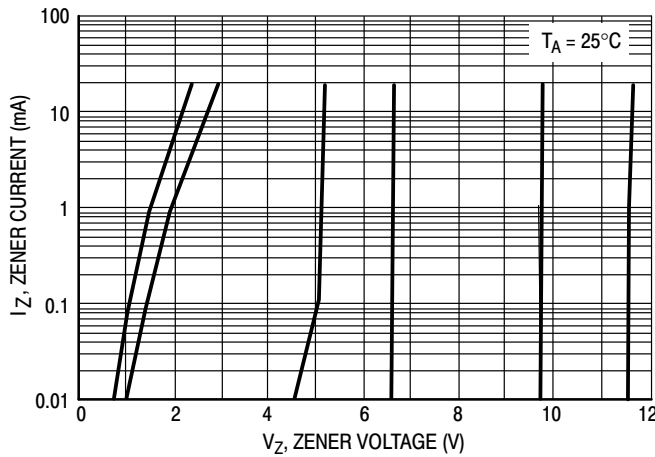


Figure 7. Zener Voltage versus Zener Current (V_Z Up to 12 V)

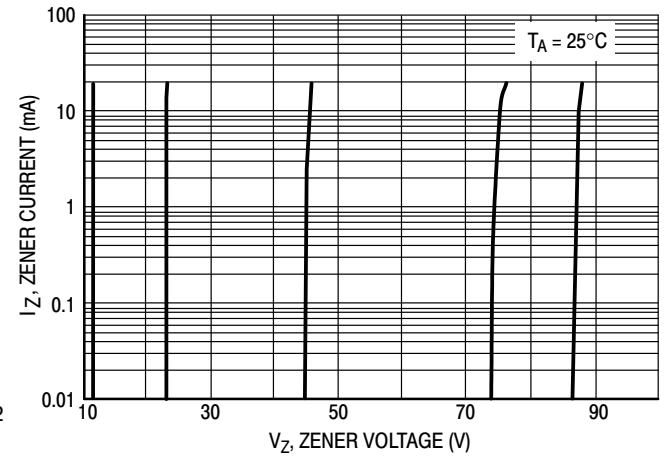
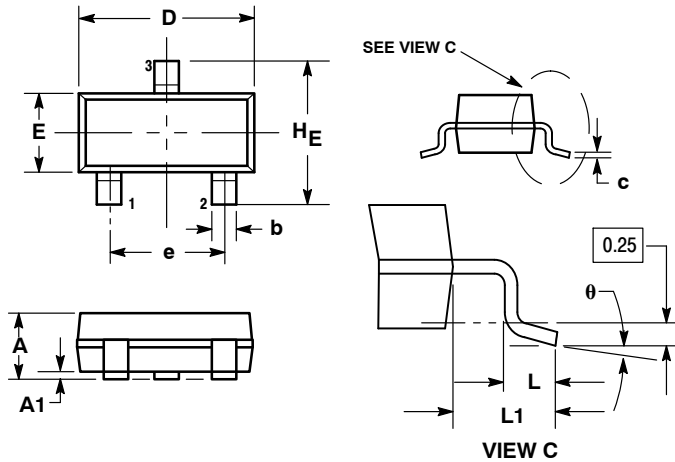


Figure 8. Zener Voltage versus Zener Current (12 V to 91 V)

BZX84BxxxLT1, BZX84CxxxLT1 Series, SZBZX84BxxxLT1G, SZBZX84CxxxLT1G Series

PACKAGE DIMENSIONS

SOT-23 (TO-236) CASE 318-08 ISSUE AP



NOTES:

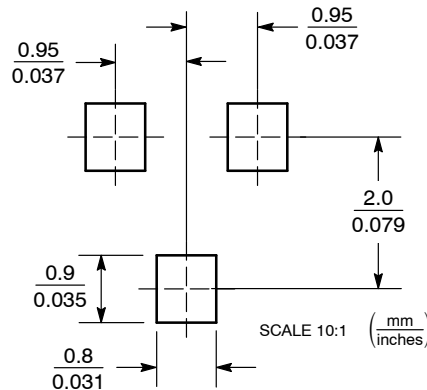
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | MILLIMETERS | | | INCHES | | |
|-------|-------------|------|------|--------|-------|-------|
| | 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 |
| HE | 2.10 | 2.40 | 2.64 | 0.083 | 0.094 | 0.104 |
| theta | 0° | --- | 10° | 0° | --- | 10° |


STYLE 8:

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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