

# Zener Voltage Regulators

## 225 mW SOT-23 Surface Mount

### MMBZ52xxBLT1G Series, SZMMBZ52xxBLT1G Series

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 Voltage Range – 2.4 V to 91 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
- 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, Halogen Free/BFR 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

#### MAXIMUM RATINGS

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

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.

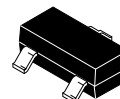
1. FR-5 = 1.0 X 0.75 X 0.62 in.

2. Alumina = 0.4 X 0.3 X 0.024 in, 99.5% alumina.

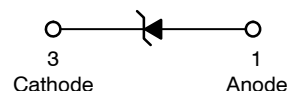


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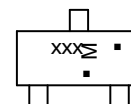
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SOT-23  
CASE 318  
STYLE 8



#### MARKING DIAGRAM



xxx = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

| Device          | Package             | Shipping <sup>†</sup>   |
|-----------------|---------------------|-------------------------|
| MMBZ52xxBLT1G   | SOT-23<br>(Pb-Free) | 3,000 /<br>Tape & Reel  |
| SZMMBZ52xxBLT1G | SOT-23<br>(Pb-Free) | 3,000 /<br>Tape & Reel  |
| MMBZ52xxBLT3G   | SOT-23<br>(Pb-Free) | 10,000 /<br>Tape & Reel |
| SZMMBZ52xxBLT3G | SOT-23<br>(Pb-Free) | 10,000 /<br>Tape & Reel |

<sup>†</sup>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

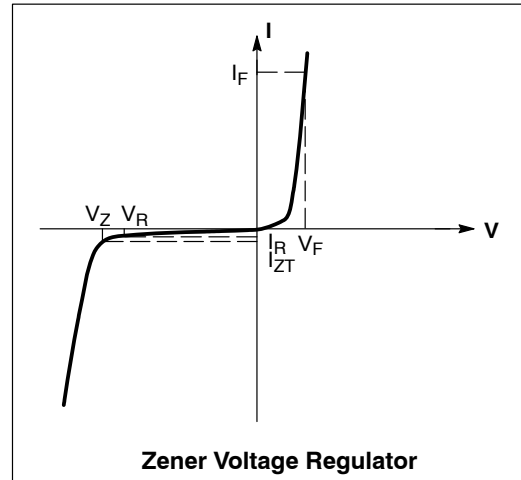
See specific marking information in the device marking column of the Electrical Characteristics table on page 3 of this data sheet.

## MMBZ52xxBLT1G Series, SZMMBZ52xxBLT1G Series

### ELECTRICAL CHARACTERISTICS

(Pinout: 1-Anode, 2-No Connection, 3-Cathode) ( $T_A = 25^\circ\text{C}$   
unless otherwise noted,  $V_F = 0.95\text{ V Max. @ } I_F = 10\text{ mA}$ )

| Symbol   | Parameter                          |
|----------|------------------------------------|
| $V_Z$    | Reverse Zener Voltage @ $I_{ZT}$   |
| $I_{ZT}$ | Reverse Current                    |
| $Z_{ZT}$ | Maximum Zener Impedance @ $I_{ZT}$ |
| $I_{ZK}$ | 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 @ $I_F$            |



## MMBZ52xxBLT1G Series, SZMMBZ52xxBLT1G Series

**ELECTRICAL CHARACTERISTICS** (Pinout: 1-Anode, 2-NC, 3-Cathode) ( $V_F = 0.9\text{ V Max @ } I_F = 10\text{ mA}$  for all types.)

| Device*           | Device Marking | Zener Voltage (Note 3) |     |       |                   | Zener Impedance                   |                                   |      | Leakage Current                 |       |
|-------------------|----------------|------------------------|-----|-------|-------------------|-----------------------------------|-----------------------------------|------|---------------------------------|-------|
|                   |                | V <sub>Z</sub> (Volts) |     |       | @ I <sub>ZT</sub> | Z <sub>YT</sub> @ I <sub>ZT</sub> | Z <sub>ZK</sub> @ I <sub>ZK</sub> |      | I <sub>R</sub> @ V <sub>R</sub> |       |
|                   |                | Min                    | Nom | Max   | mA                | Ω                                 | Ω                                 | mA   | μA                              | Volts |
| MMBZ5221BLT1G     | 18A            | 2.28                   | 2.4 | 2.52  | 20                | 30                                | 1200                              | 0.25 | 100                             | 1     |
| MMBZ5222BLT1G     | 18B            | 2.37                   | 2.5 | 2.63  | 20                | 30                                | 1250                              | 0.25 | 100                             | 1     |
| MMBZ5223BLT1G     | 18C            | 2.56                   | 2.7 | 2.84  | 20                | 30                                | 1300                              | 0.25 | 75                              | 1     |
| MMBZ5224BLT1G     | 18D            | 2.66                   | 2.8 | 2.94  | 20                | 30                                | 1400                              | 0.25 | 75                              | 1     |
| MMBZ5225BLT1G     | 18E            | 2.85                   | 3   | 3.15  | 20                | 29                                | 1600                              | 0.25 | 50                              | 1     |
| MMBZ5226BLT1G     | 8A             | 3.13                   | 3.3 | 3.47  | 20                | 28                                | 1600                              | 0.25 | 25                              | 1     |
| MMBZ5227BLT1G     | 8B             | 3.42                   | 3.6 | 3.78  | 20                | 24                                | 1700                              | 0.25 | 15                              | 1     |
| MMBZ5228BLT1G     | 8C             | 3.70                   | 3.9 | 4.10  | 20                | 23                                | 1900                              | 0.25 | 10                              | 1     |
| MMBZ5229BLT1G     | 8D             | 4.08                   | 4.3 | 4.52  | 20                | 22                                | 2000                              | 0.25 | 5                               | 1     |
| MMBZ5230BLT1G     | 8E             | 4.46                   | 4.7 | 4.94  | 20                | 19                                | 1900                              | 0.25 | 5                               | 2     |
| MMBZ5231BLT1G/T3G | 8F             | 4.84                   | 5.1 | 5.36  | 20                | 17                                | 1600                              | 0.25 | 5                               | 2     |
| MMBZ5232BLT1G/T3G | 8G             | 5.32                   | 5.6 | 5.88  | 20                | 11                                | 1600                              | 0.25 | 5                               | 3     |
| MMBZ5233BLT1G     | 8H             | 5.70                   | 6   | 6.30  | 20                | 7                                 | 1600                              | 0.25 | 5                               | 3.5   |
| MMBZ5234BLT1G/T3G | 8J             | 5.89                   | 6.2 | 6.51  | 20                | 7                                 | 1000                              | 0.25 | 5                               | 4     |
| MMBZ5235BLT1G     | 8K             | 6.46                   | 6.8 | 7.14  | 20                | 5                                 | 750                               | 0.25 | 3                               | 5     |
| MMBZ5236BLT1G     | 8L             | 7.12                   | 7.5 | 7.88  | 20                | 6                                 | 500                               | 0.25 | 3                               | 6     |
| MMBZ5237BLT1G     | 8M             | 7.79                   | 8.2 | 8.61  | 20                | 8                                 | 500                               | 0.25 | 3                               | 6.5   |
| MMBZ5238BLT1G     | 8N             | 8.26                   | 8.7 | 9.14  | 20                | 8                                 | 600                               | 0.25 | 3                               | 6.5   |
| MMBZ5239BLT1G     | 8P             | 8.64                   | 9.1 | 9.56  | 20                | 10                                | 600                               | 0.25 | 3                               | 7     |
| MMBZ5240BLT1G     | 8Q             | 9.50                   | 10  | 10.50 | 20                | 17                                | 600                               | 0.25 | 3                               | 8     |
| MMBZ5241BLT1G/T3G | 8R             | 10.4                   | 11  | 11.55 | 20                | 22                                | 600                               | 0.25 | 2                               | 8.4   |
| MMBZ5242BLT1G/T3G | 8S             | 11.40                  | 12  | 12.60 | 20                | 30                                | 600                               | 0.25 | 1                               | 9.1   |
| MMBZ5243BLT1G     | 8T             | 12.35                  | 13  | 13.65 | 9.5               | 13                                | 600                               | 0.25 | 0.5                             | 9.9   |
| MMBZ5244BLT1G     | 8U             | 13.30                  | 14  | 14.70 | 9                 | 15                                | 600                               | 0.25 | 0.1                             | 10    |
| MMBZ5245BLT1G     | 8V             | 14.25                  | 15  | 15.75 | 8.5               | 16                                | 600                               | 0.25 | 0.1                             | 11    |
| MMBZ5246BLT1G     | 8W             | 15.20                  | 16  | 16.80 | 7.8               | 17                                | 600                               | 0.25 | 0.1                             | 12    |
| MMBZ5247BLT1G/T3G | 8X             | 16.15                  | 17  | 17.85 | 7.4               | 19                                | 600                               | 0.25 | 0.1                             | 13    |
| MMBZ5248BLT1G/T3G | 8Y             | 17.10                  | 18  | 18.90 | 7                 | 21                                | 600                               | 0.25 | 0.1                             | 14    |
| MMBZ5249BLT1G     | 8Z             | 18.05                  | 19  | 19.95 | 6.6               | 23                                | 600                               | 0.25 | 0.1                             | 14    |
| MMBZ5250BLT1G/T3G | 81A            | 19.00                  | 20  | 21.00 | 6.2               | 25                                | 600                               | 0.25 | 0.1                             | 15    |
| MMBZ5251BLT1G     | 81B            | 20.90                  | 22  | 23.10 | 5.6               | 29                                | 600                               | 0.25 | 0.1                             | 17    |
| MMBZ5252BLT1G     | 81C            | 22.80                  | 24  | 25.20 | 5.2               | 33                                | 600                               | 0.25 | 0.1                             | 18    |
| MMBZ5253BLT1G     | 81D            | 23.75                  | 25  | 26.25 | 5                 | 35                                | 600                               | 0.25 | 0.1                             | 19    |
| MMBZ5254BLT1G     | 81E            | 25.65                  | 27  | 28.35 | 4.6               | 41                                | 600                               | 0.25 | 0.1                             | 21    |
| MMBZ5255BLT1G     | 81F            | 26.60                  | 28  | 29.40 | 4.5               | 44                                | 600                               | 0.25 | 0.1                             | 21    |
| MMBZ5256BLT1G     | 81G            | 28.50                  | 30  | 31.50 | 4.2               | 49                                | 600                               | 0.25 | 0.1                             | 23    |
| MMBZ5257BLT1G/T3G | 81H            | 31.35                  | 33  | 34.65 | 3.8               | 58                                | 700                               | 0.25 | 0.1                             | 25    |
| MMBZ5258BLT1G     | 81J            | 34.20                  | 36  | 37.80 | 3.4               | 70                                | 700                               | 0.25 | 0.1                             | 27    |
| MMBZ5259BLT1G     | 81K            | 37.05                  | 39  | 40.95 | 3.2               | 80                                | 800                               | 0.25 | 0.1                             | 30    |
| MMBZ5260BLT1G     | 81L            | 40.85                  | 43  | 45.15 | 3                 | 93                                | 900                               | 0.25 | 0.1                             | 33    |
| MMBZ5261BLT1G/T3G | 81M            | 44.65                  | 47  | 49.35 | 2.7               | 105                               | 1000                              | 0.25 | 0.1                             | 36    |
| MMBZ5262BLT1G     | 81N            | 48.45                  | 51  | 53.55 | 2.5               | 125                               | 1100                              | 0.25 | 0.1                             | 39    |
| MMBZ5263BLT1G     | 81P            | 53.20                  | 56  | 58.80 | 2.2               | 150                               | 1300                              | 0.25 | 0.1                             | 43    |
| MMBZ5264BLT1G     | 81Q            | 57.00                  | 60  | 63.00 | 2.1               | 170                               | 1400                              | 0.25 | 0.1                             | 46    |
| MMBZ5265BLT1G     | 81R            | 58.90                  | 62  | 65.10 | 2                 | 185                               | 1400                              | 0.25 | 0.1                             | 47    |
| MMBZ5266BLT1G     | 81S            | 64.60                  | 68  | 71.40 | 1.8               | 230                               | 1600                              | 0.25 | 0.1                             | 52    |
| MMBZ5267BLT1G     | 81T            | 71.25                  | 75  | 78.75 | 1.7               | 270                               | 1700                              | 0.25 | 0.1                             | 56    |
| MMBZ5268BLT1G     | 81U            | 77.90                  | 82  | 86.10 | 1.5               | 330                               | 2000                              | 0.25 | 0.1                             | 62    |
| MMBZ5270BLT1G     | 81W            | 86.45                  | 91  | 95.55 | 1.4               | 400                               | 2300                              | 0.25 | 0.1                             | 69    |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

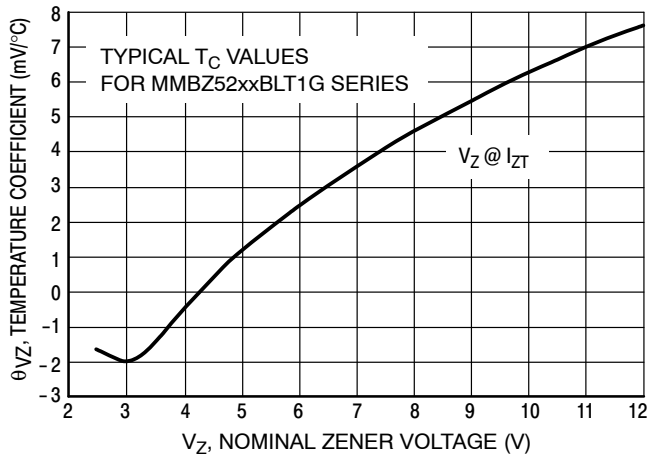
3. Zener voltage is measured with a pulse test current  $I_Z$  at an ambient temperature of 25°C

NOTE: MMBZ5233BLT1G, MMBZ5246BLT1G, MMBZ5251BLT1G, and MMBZ5252BLT1G Not Available in 10,000/Tape & Reel.

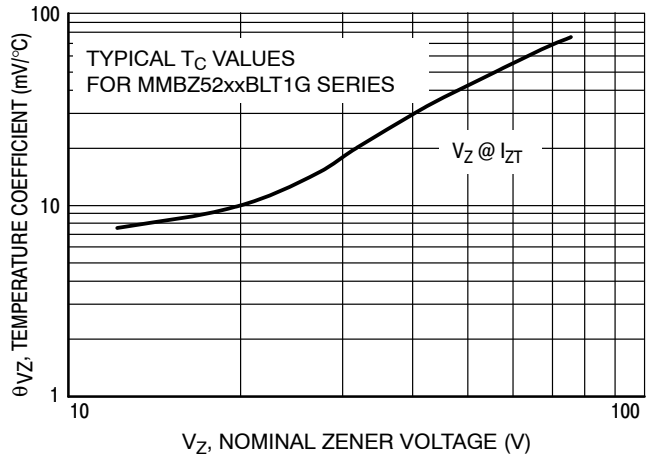
\*Include SZ-prefix devices where applicable.

# MMBZ52xxBLT1G Series, SZMMBZ52xxBLT1G Series

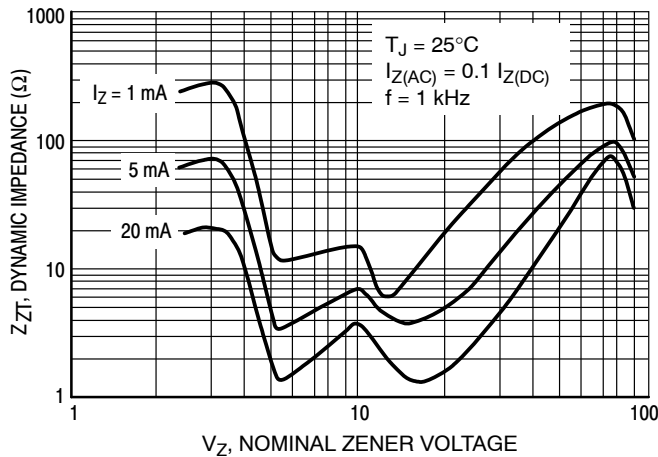
## TYPICAL CHARACTERISTICS



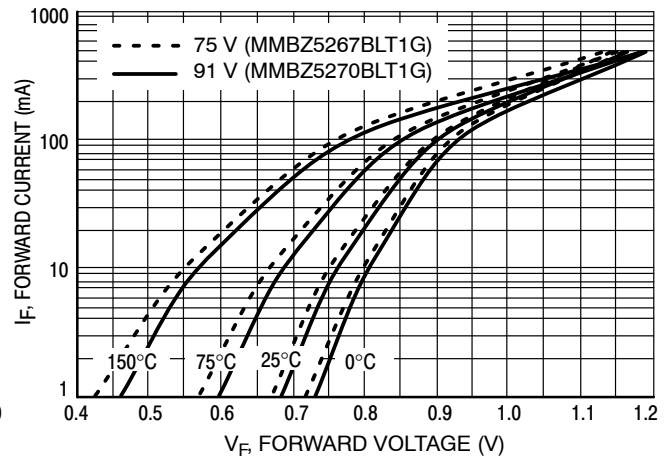
**Figure 1. Temperature Coefficients**  
(Temperature Range -55°C to +150°C)



**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**

# MMBZ52xxBLT1G Series, SZMMBZ52xxBLT1G Series

## TYPICAL CHARACTERISTICS

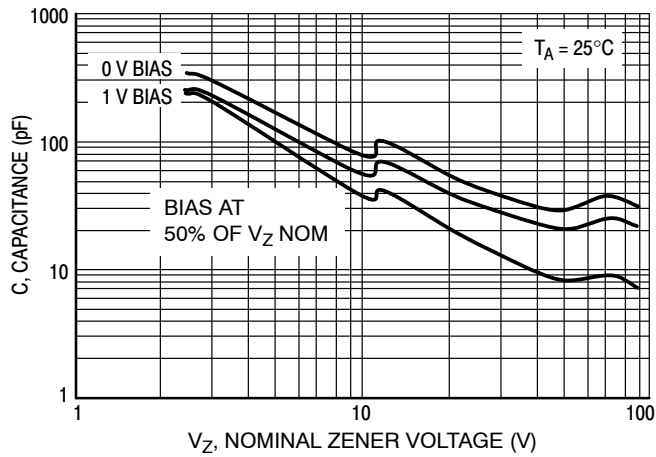


Figure 5. Typical Capacitance

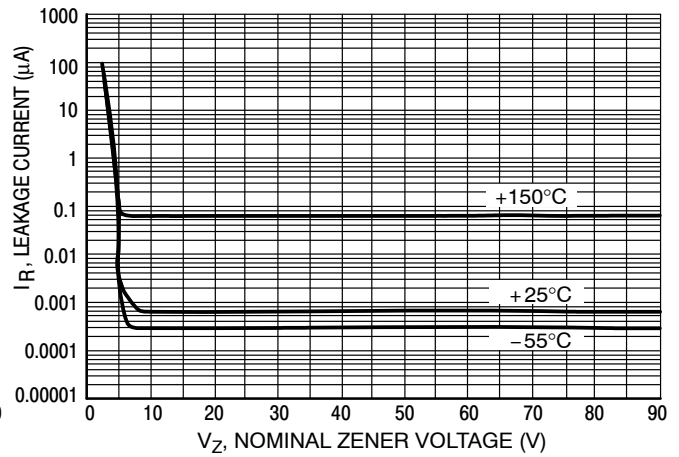


Figure 6. Typical Leakage Current

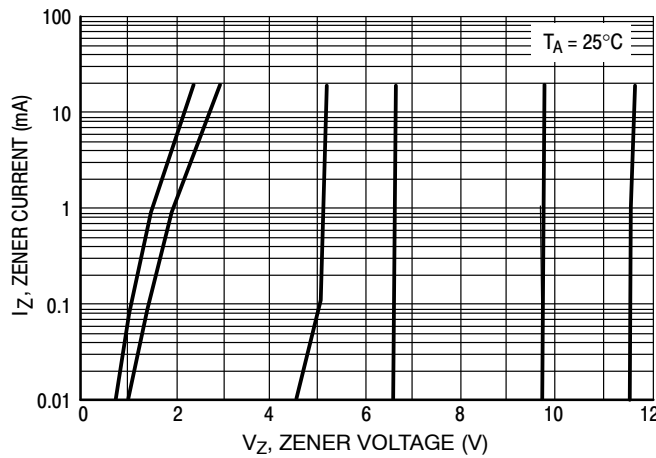


Figure 7. Zener Voltage versus Zener Current ( $V_Z$  Up to 12 V)

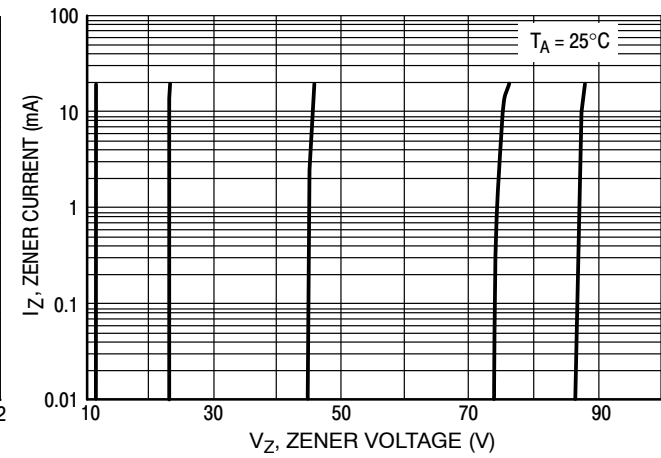
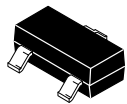


Figure 8. Zener Voltage versus Zener Current (12 V to 91 V)

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

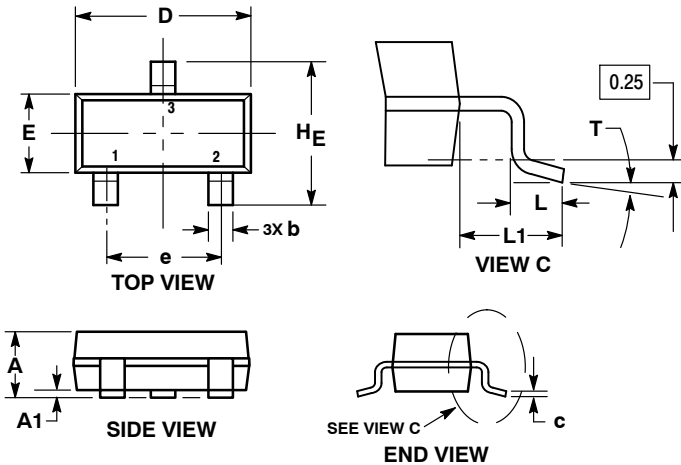
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## SOT-23 (TO-236) CASE 318-08 ISSUE AS

DATE 30 JAN 2018

SCALE 4:1

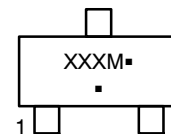


### NOTES:

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°   |

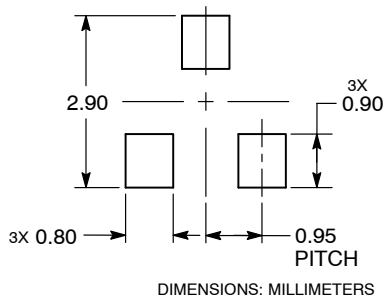
### GENERIC MARKING DIAGRAM\*



XXX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

### RECOMMENDED SOLDERING FOOTPRINT



STYLE 1 THRU 5:  
CANCELLED

STYLE 6:  
PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

STYLE 7:  
PIN 1. EMITTER  
2. BASE  
3. COLLECTOR

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

STYLE 9:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

STYLE 10:  
PIN 1. DRAIN  
2. SOURCE  
3. GATE

STYLE 11:  
PIN 1. ANODE  
2. CATHODE  
3. CATHODE-ANODE

STYLE 12:  
PIN 1. CATHODE  
2. CATHODE  
3. ANODE

STYLE 13:  
PIN 1. SOURCE  
2. DRAIN  
3. GATE

STYLE 14:  
PIN 1. CATHODE  
2. GATE  
3. ANODE

STYLE 15:  
PIN 1. GATE  
2. CATHODE  
3. ANODE

STYLE 16:  
PIN 1. ANODE  
2. CATHODE  
3. CATHODE

STYLE 17:  
PIN 1. NO CONNECTION  
2. ANODE  
3. CATHODE

STYLE 18:  
PIN 1. NO CONNECTION  
2. CATHODE  
3. ANODE

STYLE 19:  
PIN 1. CATHODE  
2. ANODE  
3. CATHODE-ANODE

STYLE 20:  
PIN 1. CATHODE  
2. ANODE  
3. GATE

STYLE 21:  
PIN 1. GATE  
2. SOURCE  
3. DRAIN

STYLE 22:  
PIN 1. RETURN  
2. OUTPUT  
3. INPUT

STYLE 23:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

STYLE 24:  
PIN 1. GATE  
2. DRAIN  
3. SOURCE

STYLE 25:  
PIN 1. ANODE  
2. CATHODE  
3. GATE

STYLE 26:  
PIN 1. CATHODE  
2. ANODE  
3. NO CONNECTION

STYLE 27:  
PIN 1. CATHODE  
2. CATHODE  
3. CATHODE

STYLE 28:  
PIN 1. ANODE  
2. ANODE  
3. ANODE

|                         |                        |                                                                                                                                                                                  |
|-------------------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| <b>DESCRIPTION:</b>     | <b>SOT-23 (TO-236)</b> | <b>PAGE 1 OF 1</b>                                                                                                                                                               |

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