

# 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.

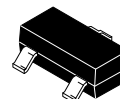
1. FR-5 = 1.0 X 0.75 X 0.62 in.

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

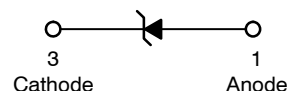


ON Semiconductor®

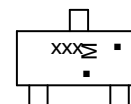
[www.onsemi.com](http://www.onsemi.com)



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

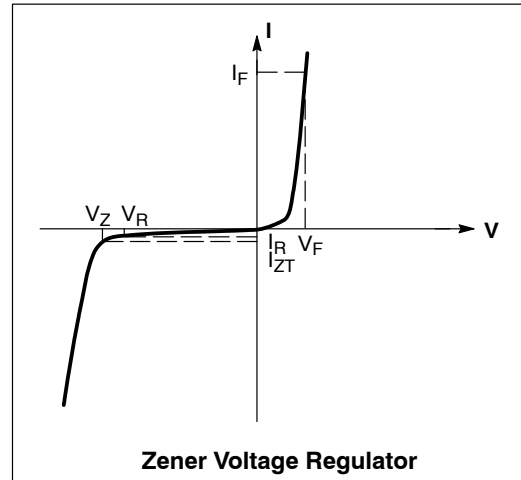
See specific marking information in the device marking column of the Electrical Characteristics table on page 3 of this data sheet.

## 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 |       |
|-------------------|----------------|------------------------|-----|-------|------------|---------------------|---------------------|------|-----------------|-------|
|                   |                | $V_Z$ (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 |
| 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.

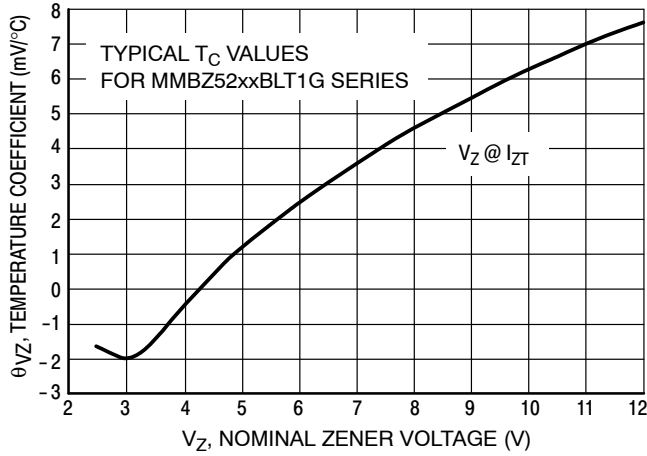
3. Zener voltage is measured with a pulse test current  $I_Z$  at an ambient temperature of 25°C

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

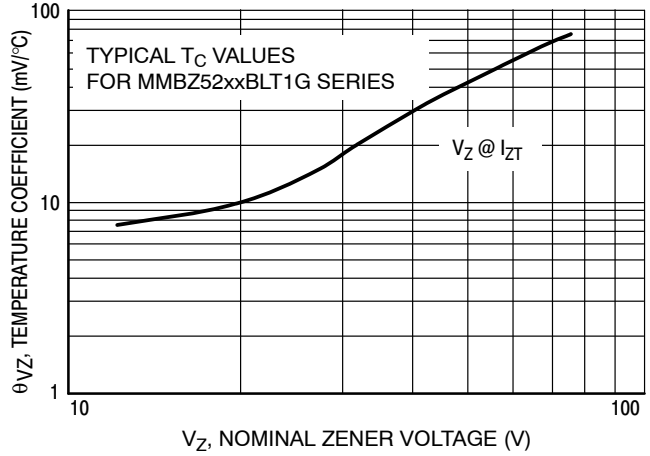
\*Include SZ-prefix devices where applicable.

# MMBZ52xxBLT1G Series, SZMMBZ52xxBLT1G Series

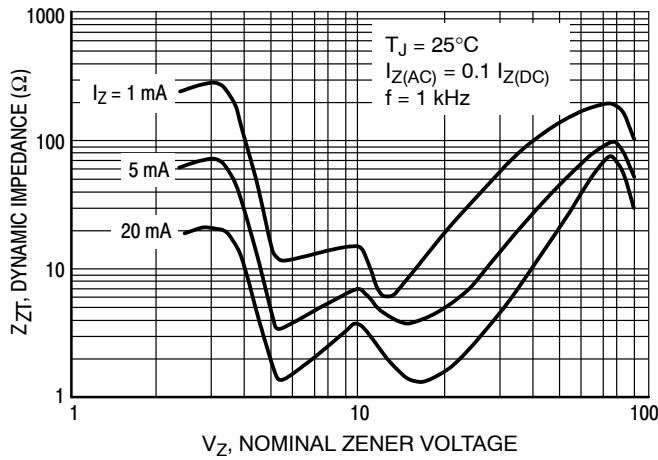
## TYPICAL CHARACTERISTICS



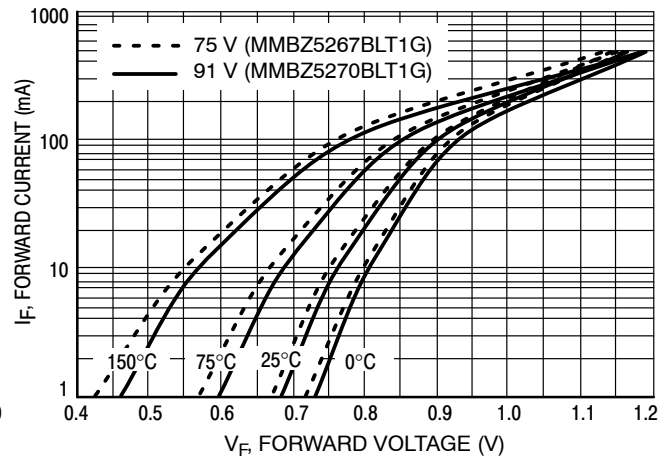
**Figure 1. Temperature Coefficients**  
(Temperature Range -55°C to +150°C)



**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**

TYPICAL CHARACTERISTICS



Figure 5. Typical Capacitance



Figure 6. Typical Leakage Current



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

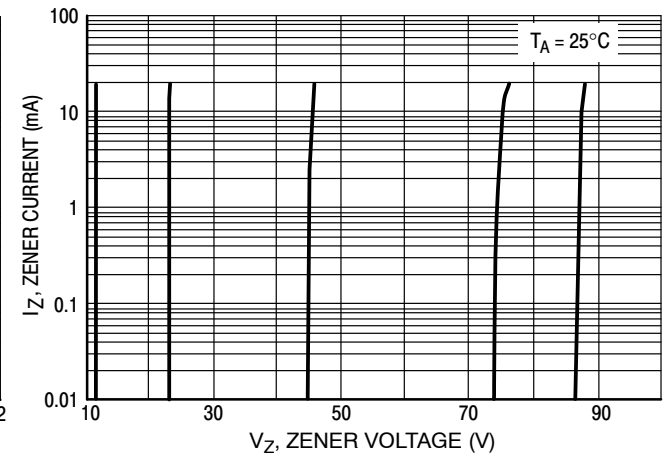


Figure 8. Zener Voltage versus Zener Current (12 V to 91 V)

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®

ON



### 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



DIMENSIONS: MILLIMETERS

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

|                  |                 |                                                                                                                                                                                  |
|------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DOCUMENT NUMBER: | 98ASB42226B     | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| DESCRIPTION:     | SOT-23 (TO-236) | PAGE 1 OF 1                                                                                                                                                                      |

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Email Requests to: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

ON Semiconductor Website: [www.onsemi.com](http://www.onsemi.com)

### TECHNICAL SUPPORT

#### North American Technical Support:

Voice Mail: 1 800-282-9855 Toll Free USA/Canada

Phone: 011 421 33 790 2910

#### Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative