

# Zener Voltage Regulators

500 mW SOD-523, Standard Tolerance Series

## MM5ZxxxT1G Series, SZMM5ZxxxT1G Series

This series of Zener diodes is packaged in a SOD-523 surface mount package. They are designed to provide voltage regulation protection and are especially attractive in situations where space is at a premium. They are well suited for applications such as cellular phones, hand held portables, and high density PC boards.

### Specification Features:

- Standard Zener Breakdown Voltage Range – 2.4 V to 75 V
- Standard Tolerance Series
- Steady State Power Rating of 500 mW
- Small Body Outline Dimensions:  
0.047" x 0.032" (1.20 mm x 0.80 mm)  
Low Body Height: 0.028" (0.7 mm)
- 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 and are RoHS Compliant\*

### Mechanical Characteristics:

**CASE:** Void-free, transfer-molded, thermosetting plastic  
Epoxy Meets UL 94 V-0

**LEAD FINISH:** 100% Matte Sn (Tin)

**MOUNTING POSITION:** Any

**QUALIFIED MAX REFLOW TEMPERATURE:** 260 °C

Device Meets MSL 1 Requirements

### MAXIMUM RATINGS

| Rating                                                                                                      | Symbol          | Max            | Unit        |
|-------------------------------------------------------------------------------------------------------------|-----------------|----------------|-------------|
| Total Device Dissipation FR-4 Board,<br>(Note 1) @ $T_A = 25\text{ }^{\circ}\text{C}$<br>Derate above 25 °C | $P_D$           | 500<br>4.0     | mW<br>mW/°C |
| Thermal Resistance,<br>Junction-to-Ambient (Note 1)                                                         | $R_{\theta JA}$ | 250            | °C/W        |
| Junction and Storage Temperature Range                                                                      | $T_J, T_{stg}$  | -65 to<br>+150 | °C          |

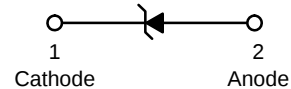
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. FR-4 printed circuit board, single-sided copper, mounting pad 1 cm<sup>2</sup>.

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



SOD-523  
CASE 502  
STYLE 1



### MARKING DIAGRAM



XX = Specific 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 <sup>†</sup>  |
|--------------|----------------------|------------------------|
| MM5ZxxxT1G   | SOD-523<br>(Pb-Free) | 3,000 /<br>Tape & Reel |
| SZMM5ZxxxT1G | SOD-523<br>(Pb-Free) | 3,000 /<br>Tape & Reel |
| MM5ZxxxT5G   | SOD-523<br>(Pb-Free) | 8,000 /<br>Tape & Reel |
| SZMM5ZxxxT5G | SOD-523<br>(Pb-Free) | 8,000 /<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 tables starting on page 3 of this data sheet.

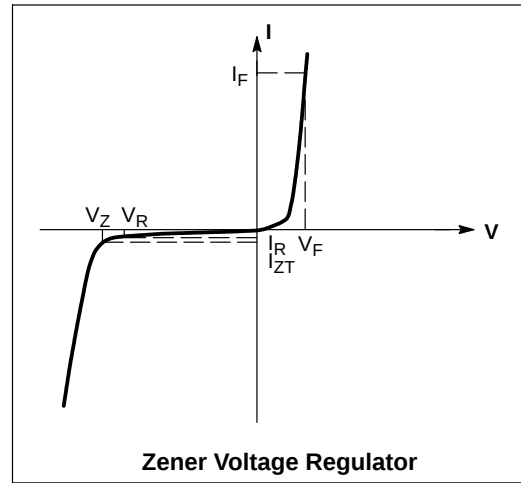
## MM5ZxxxT1G Series, SZMM5ZxxxT1G Series

### ELECTRICAL CHARACTERISTICS

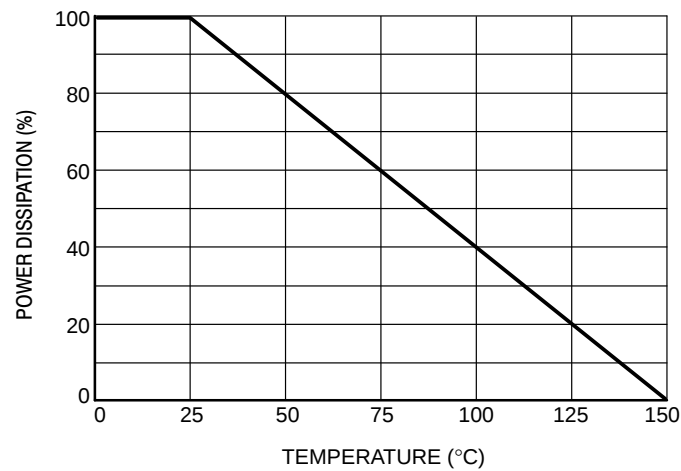
( $T_A = 25^\circ\text{C}$  unless otherwise noted,

$V_F = 0.9\text{ V Max. @ } I_F = 10\text{ mA}$  for all types)

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



### TYPICAL CHARACTERISTICS



**Figure 1. Steady State Power Derating**

## MM5ZxxxT1G Series, SZMM5ZxxxT1G Series

### ELECTRICAL CHARACTERISTICS – Standard Tolerance Series

(T<sub>A</sub> = 25 °C unless otherwise noted, V<sub>F</sub> = 0.9 V Max. @ I<sub>F</sub> = 10 mA for all types)

| Device*        | Device Marking | V <sub>Z1</sub> (V) @<br>(Note 1)<br>(Note 2) |       |      | V <sub>Z2</sub> (V) @<br>(Note 1)<br>(Note 2) |      | Zener Impedance                      |                                   |     | Leakage Current                 |       | θV <sub>Z</sub><br>(mV/k) @ I <sub>ZT</sub> |      | C<br>@ V <sub>R</sub> = 0<br>f = 1 MHz |
|----------------|----------------|-----------------------------------------------|-------|------|-----------------------------------------------|------|--------------------------------------|-----------------------------------|-----|---------------------------------|-------|---------------------------------------------|------|----------------------------------------|
|                |                |                                               |       |      |                                               |      | Z <sub>ZT</sub><br>@ I <sub>ZT</sub> | Z <sub>ZK</sub> @ I <sub>ZK</sub> |     | I <sub>R</sub> @ V <sub>R</sub> |       |                                             |      |                                        |
|                |                | Min                                           | Nom   | Max  | Min                                           | Max  | Ω                                    | Ω                                 | mA  | μA                              | Volts | Min                                         | Max  | pF                                     |
| MM5Z2V4T1G/T5G | 00             | 2.2                                           | 2.4   | 2.6  | 1.7                                           | 2.1  | 100                                  | 1000                              | 1.0 | 50                              | 1.0   | -3.5                                        | 0    | 450                                    |
| MM5Z2V7T1G/T5G | 01             | 2.5                                           | 2.7   | 2.9  | 1.9                                           | 2.4  | 100                                  | 1000                              | 1.0 | 20                              | 1.0   | -3.5                                        | 0    | 450                                    |
| MM5Z3V0T1G/T5G | 02             | 2.8                                           | 3.0   | 3.2  | 2.1                                           | 2.7  | 100                                  | 1000                              | 1.0 | 10                              | 1.0   | -3.5                                        | 0    | 450                                    |
| MM5Z3V3T1G/T5G | 05             | 3.1                                           | 3.3   | 3.5  | 2.3                                           | 2.9  | 95                                   | 1000                              | 1.0 | 5                               | 1.0   | -3.5                                        | 0    | 450                                    |
| MM5Z3V6T1G/T5G | 06             | 3.4                                           | 3.6   | 3.8  | 2.7                                           | 3.3  | 90                                   | 1000                              | 1.0 | 5                               | 1.0   | -3.5                                        | 0    | 450                                    |
| MM5Z3V9T1G/T5G | AJ             | 3.7                                           | 3.9   | 4.2  | 2.9                                           | 3.5  | 90                                   | 1000                              | 1.0 | 3                               | 1.0   | -3.5                                        | 0    | 450                                    |
| MM5Z4V3T1G/T5G | 08             | 4.0                                           | 4.3   | 4.6  | 3.3                                           | 4    | 90                                   | 1000                              | 1.0 | 3                               | 1.0   | -3.5                                        | 0    | 450                                    |
| MM5Z4V7T1G/T5G | 09             | 4.4                                           | 4.7   | 5.0  | 3.7                                           | 4.7  | 80                                   | 800                               | 1.0 | 3                               | 2.0   | -3.5                                        | 0.2  | 260                                    |
| MM5Z5V1T1G/T5G | 0A             | 4.8                                           | 5.1   | 5.4  | 4.2                                           | 5.3  | 60                                   | 500                               | 1.0 | 2                               | 2.0   | -2.7                                        | 1.2  | 225                                    |
| MM5Z5V6T1G/T5G | 0C             | 5.2                                           | 5.6   | 6.0  | 4.8                                           | 6    | 40                                   | 200                               | 1.0 | 1                               | 2.0   | -2.0                                        | 2.5  | 200                                    |
| MM5Z6V2T1G/T5G | 0E             | 5.8                                           | 6.2   | 6.6  | 5.6                                           | 6.6  | 10                                   | 100                               | 1.0 | 3                               | 4.0   | 0.4                                         | 3.7  | 185                                    |
| MM5Z6V8T1G/T5G | 0F             | 6.4                                           | 6.8   | 7.2  | 6.3                                           | 7.2  | 15                                   | 160                               | 1.0 | 2                               | 4.0   | 1.2                                         | 4.5  | 155                                    |
| MM5Z7V5T1G/T5G | 0G             | 7.0                                           | 7.5   | 7.9  | 6.9                                           | 7.9  | 15                                   | 160                               | 1.0 | 1                               | 5.0   | 2.5                                         | 5.3  | 140                                    |
| MM5Z8V2T1G/T5G | 0H             | 7.7                                           | 8.2   | 8.7  | 7.6                                           | 8.7  | 15                                   | 160                               | 1.0 | 0.7                             | 5.0   | 3.2                                         | 6.2  | 135                                    |
| MM5Z9V1T1G/T5G | 0K             | 8.5                                           | 9.1   | 9.6  | 8.4                                           | 9.6  | 15                                   | 160                               | 1.0 | 0.2                             | 7.0   | 3.8                                         | 7.0  | 130                                    |
| MM5Z10VT1G/T5G | 0L             | 9.4                                           | 10    | 10.6 | 9.3                                           | 10.6 | 20                                   | 160                               | 1.0 | 0.1                             | 8.0   | 4.5                                         | 8.0  | 130                                    |
| MM5Z11VT1G/T5G | 0M             | 10.4                                          | 11    | 11.6 | 10.2                                          | 11.6 | 20                                   | 160                               | 1.0 | 0.1                             | 8.0   | 5.4                                         | 9.0  | 130                                    |
| MM5Z12VT1G/T5G | 0N             | 11.4                                          | 12    | 12.7 | 11.2                                          | 12.7 | 25                                   | 80                                | 1.0 | 0.1                             | 8.0   | 6.0                                         | 10   | 130                                    |
| MM5Z13VT1G/T5G | 0P             | 12.4                                          | 13.25 | 14.1 | 12.3                                          | 14   | 30                                   | 80                                | 1.0 | 0.1                             | 8.0   | 7.0                                         | 11   | 120                                    |
| MM5Z15VT1G/T5G | 0T             | 14.3                                          | 15    | 15.8 | 13.7                                          | 15.5 | 30                                   | 80                                | 1.0 | 0.05                            | 10.5  | 9.2                                         | 13   | 110                                    |
| MM5Z16VT1G/T5G | 0U             | 15.3                                          | 16.2  | 17.1 | 15.2                                          | 17   | 40                                   | 80                                | 1.0 | 0.05                            | 11.2  | 10.4                                        | 14   | 105                                    |
| MM5Z18VT1G/T5G | 0W             | 16.8                                          | 18    | 19.1 | 16.7                                          | 19   | 45                                   | 80                                | 1.0 | 0.05                            | 12.6  | 12.4                                        | 16   | 100                                    |
| MM5Z20VT1G/T5G | 0Z             | 18.8                                          | 20    | 21.2 | 18.7                                          | 21.1 | 55                                   | 100                               | 1.0 | 0.05                            | 14.0  | 14.4                                        | 18   | 85                                     |
| MM5Z22VT1G/T5G | 10             | 20.8                                          | 22    | 23.3 | 20.7                                          | 23.2 | 55                                   | 100                               | 1.0 | 0.05                            | 15.4  | 16.4                                        | 20   | 85                                     |
| MM5Z24VT1G/T5G | 11             | 22.8                                          | 24.2  | 25.6 | 22.7                                          | 25.5 | 70                                   | 120                               | 1.0 | 0.05                            | 16.8  | 18.4                                        | 22   | 80                                     |
| MM5Z27VT1G/T5G | 12             | 25.1                                          | 27    | 28.9 | 25                                            | 28.9 | 80                                   | 300                               | 1.0 | 0.05                            | 18.9  | 21.4                                        | 25.3 | 70                                     |
| MM5Z30VT1G/T5G | 14             | 28                                            | 30    | 32   | 27.8                                          | 32   | 80                                   | 300                               | 1.0 | 0.05                            | 21.0  | 24.4                                        | 29.4 | 70                                     |
| MM5Z33VT1G/T5G | 18             | 31                                            | 33    | 35   | 30.8                                          | 35   | 80                                   | 300                               | 1.0 | 0.05                            | 23.2  | 27.4                                        | 33.4 | 70                                     |
| MM5Z36VT1G/T5G | 19             | 34                                            | 36    | 38   | 33.8                                          | 38   | 90                                   | 500                               | 1.0 | 0.05                            | 25.2  | 30.4                                        | 37.4 | 70                                     |
| MM5Z39VT1G/T5G | 20             | 37                                            | 39    | 41   | 36.7                                          | 41   | 130                                  | 500                               | 1.0 | 0.05                            | 27.3  | 33.4                                        | 41.2 | 45                                     |
| MM5Z43VT1G/T5G | 21             | 40                                            | 43    | 46   | 39.7                                          | 46   | 150                                  | 500                               | 1.0 | 0.05                            | 30.1  | 37.6                                        | 46.6 | 40                                     |
| MM5Z47VT1G/T5G | 1A             | 44                                            | 47    | 50   | 43.7                                          | 50   | 170                                  | 500                               | 1.0 | 0.05                            | 32.9  | 42.0                                        | 51.8 | 40                                     |
| MM5Z51VT1G**   | 1C             | 48                                            | 51    | 54   | 47.6                                          | 54   | 180                                  | 500                               | 1.0 | 0.05                            | 35.7  | 46.6                                        | 57.2 | 40                                     |
| MM5Z56VT1G**   | 1D             | 52                                            | 56    | 60   | 51.5                                          | 60   | 200                                  | 500                               | 1.0 | 0.05                            | 39.2  | 52.2                                        | 63.8 | 40                                     |
| MM5Z62VT1G**   | 1E             | 58                                            | 62    | 66   | 57.4                                          | 66   | 215                                  | 500                               | 1.0 | 0.05                            | 43.4  | 58.8                                        | 71.6 | 35                                     |
| MM5Z68VT1G**   | 1F             | 64                                            | 68    | 72   | 63.4                                          | 72   | 240                                  | 500                               | 1.0 | 0.05                            | 47.6  | 65.6                                        | 79.8 | 35                                     |
| MM5Z75VT1G**   | 1G             | 70                                            | 75    | 79   | 69.4                                          | 79   | 255                                  | 500                               | 1.0 | 0.05                            | 52.5  | 73.4                                        | 88.6 | 35                                     |

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.

1. I<sub>ZT1</sub> = 5 mA: 2.4 to 24 V, I<sub>ZT1</sub> = 2 mA: 27 to 75 V; I<sub>ZT2</sub> = 1 mA: 2.4 to 24 V, I<sub>ZT2</sub> = 0.5 mA: 27 to 75 V.

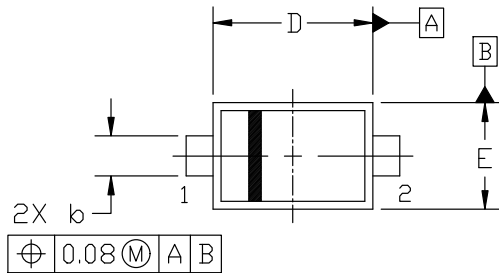
2. Zener voltage is measured with a pulse test current I<sub>Z</sub> at an ambient temperature of 25 °C.

\*Includes SZ-prefix devices where applicable.

\*\*Contact Sales.


**SOD-523 1.20x0.80x0.60**  
**CASE 502**  
**ISSUE F**

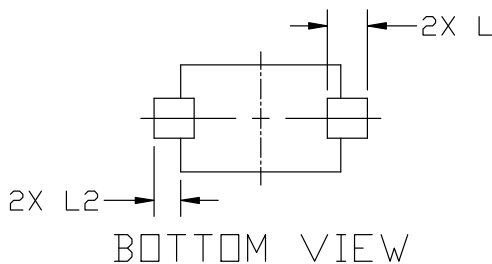
DATE 08 FEB 2024



TOP VIEW



SIDE VIEW



BOTTOM VIEW

**GENERIC**  
**MARKING DIAGRAM\***

XX = Specific Device Code  
M Date Code

\*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. Some products may not follow the Generic Marking.

STYLE 1: PIN 1: CATHODE (POLARITY BAND)  
2: ANODE  
STYLE 2: NO POLARITY

## NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH, 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 |      |      |
|-----|-------------|------|------|
|     | MIN.        | NOM. | MAX. |
| A   | 0.50        | 0.60 | 0.70 |
| b   | 0.25        | 0.30 | 0.35 |
| c   | 0.07        | 0.14 | 0.20 |
| D   | 1.10        | 1.20 | 1.30 |
| E   | 0.70        | 0.80 | 0.90 |
| H   | 1.50        | 1.60 | 1.70 |
| L   | 0.30 REF    |      |      |
| L2  | 0.15        | 0.20 | 0.25 |


RECOMMENDED MOUNTING  
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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