



**THE DATASHEET OF
MM5Z22VT1G**



MM5ZxxxT1G Series, SZMM5ZxxxT1G Series

Zener Voltage Regulators

500 mW SOD-523 Surface Mount

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
- 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, (Note 1) @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 500 4.0 | mW mW/°C |
| Thermal Resistance, Junction-to-Ambient (Note 1) | $R_{\theta JA}$ | 250 | °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-4 printed circuit board, single-sided copper, mounting pad 1 cm².

*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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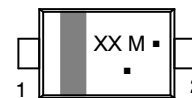
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SOD-523
CASE 502
STYLE 1



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† |
|--------------|----------------------|------------------------|
| MM5ZxxxT1G | SOD-523 (Pb-Free) | 3,000 / Tape & Reel |
| SZMM5ZxxxT1G | SOD-523 (Pb-Free) | 3,000 / Tape & Reel |
| MM5ZxxxT5G | SOD-523 (Pb-Free) | 8,000 / Tape & Reel |
| SZMM5ZxxxT5G | SOD-523 (Pb-Free) | 8,000 / Tape & Reel |

†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 |
| Θ_{VZ} | 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 ($T_A = 25^\circ\text{C}$ unless otherwise noted, $V_F = 0.9\text{ V Max.}$ @ $I_F = 10\text{ mA}$ for all types)

| Device* | Device Marking | $V_{Z1}\text{ (V) @}$ (Note 1) (Note 2) | | | $V_{Z2}\text{ (V) @}$ (Note 1) (Note 2) | | Zener Impedance | | | Leakage Current | | ΘV_Z (mV/k) @ I_{ZT} | | C @ $V_R = 0$ f = 1 MHz pF |
|----------------|----------------|---|-------|------|---|------|------------------------|---------------------|-----|-----------------|-------|-----------------------------------|------|-------------------------------------|
| | | | | | | | Z_{ZT} @ I_{ZT} | Z_{ZK} @ I_{ZK} | | I_R @ V_R | | | | |
| | | Min | Nom | Max | Min | Max | Ω | Ω | mA | μA | Volts | Min | Max | |
| 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 | 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 | 20 | 37 | 39 | 41 | 36.7 | 41 | 130 | 500 | 1.0 | 0.05 | 27.3 | 33.4 | 41.2 | 45 |
| MM5Z43VT1G | 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. $I_{ZT1} = 5\text{ mA}$: 2.4 to 24 V, $I_{ZT1} = 2\text{ mA}$: 27 to 75 V; $I_{ZT2} = 1\text{ mA}$: 2.4 to 24 V, $I_{ZT2} = 0.5\text{ mA}$: 27 to 75 V.

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

*Includes SZ-prefix devices where applicable.

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PACKAGE DIMENSIONS

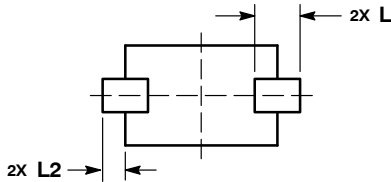
SOD-523
CASE 502
ISSUE E



TOP VIEW



SIDE VIEW



BOTTOM VIEW

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 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 _E | 1.50 | 1.60 | 1.70 |
| L | 0.30 REF | | |
| L ₂ | 0.15 | 0.20 | 0.25 |

STYLE 1:

1. CATHODE (POLARITY BAND)
2. ANODE

RECOMMENDED 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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