MMSZ2V4ET1 Series

Zener Voltage Regulators

500 mW SOD−123 Surface Mount

Three complete series of Zener diodes are offered in the convenient, surface mount plastic SOD−123 package. These devices provide a convenient alternative to the leadless 34−package style.

Specification Features

- 500 mW Rating on FR−4 or FR−5 Board
- Wide Zener Reverse Voltage Range − 2.4 V to 56 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
- Peak Power − 225 W (8 X 20 μs)

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
Peak Power Dissipation @ 20 μs (Note 1) @ $T_L \le 25°C$	P_{pk}	225	Watts
Total Power Dissipation on FR−5 Board, (Note 2) @ $T_L = 75°C$ Derated above 75°C	P_D	500 6.7	mW mW/°C
Thermal Resistance − Junction−to−Ambient (Note 3)	$R_{\theta JA}$	340	°C/W
Thermal Resistance − Junction−to−Lead (Note 3)	$R_{\theta JL}$	150	°C/W
Junction and Storage Temperature Range	T_J, T_{stg}	−55 to +150	°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. Nonrepetitive current pulse per Figure 11
2. FR−5 = 3.5 X 1.5 inches, using the On minimum recommended footprint as shown in Figure 12.
3. Thermal Resistance measurement obtained via infrared Scan Method

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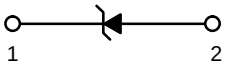
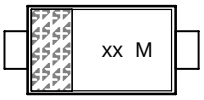


SOD−123
CASE 425
STYLE 1

MARKING DIAGRAM



xx = Specific Device Code
M = Date Code

ORDERING INFORMATION

Device	Package	Shipping†
MMSZxxxET1	SOD−123	3000/Tape & Reel
MMSZxxxET3	SOD−123	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 Specifications Brochure, BRD8011/D.

DEVICE MARKING INFORMATION

See specific marking information in the device marking column of the Electrical Characteristics table on page 2 of this data sheet.

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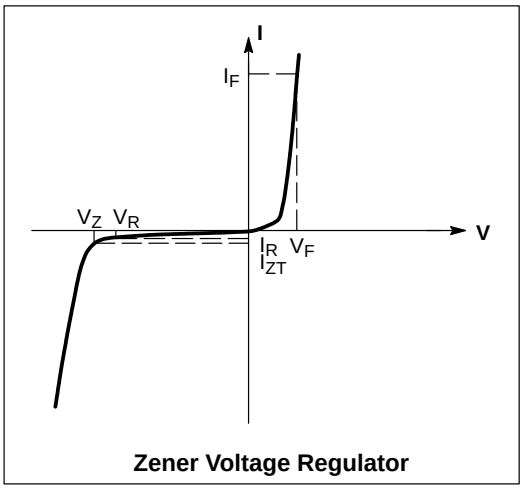
ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted, V_F = 0.95 V Max. @ I_F = 10 mA)

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



Zener Voltage Regulator

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted, V_F = 0.9 V Max. @ I_F = 10 mA)

Device	Device Marking	V_{Z1} (V) (Notes 4 and 5) @ I_{ZT1} = 5 mA			Z_{ZT1} (Note 6)	V_{Z2} (V) (Notes 4 and 5) @ I_{ZT2} = 1 mA		Z_{ZT2} (Note 6)	Leakage Current I_R @ V_R	
		Min	Nom	Max	Ω	Min	Max	Ω	μA	V
MMSZ2V4ET1	CL1	2.28	2.4	2.52	100	1.7	2.1	600	50	1
MMSZ2V7ET1	CL2	2.57	2.7	2.84	100	1.9	2.4	600	20	1
MMSZ3V0ET1	CL3	2.85	3.0	3.15	95	2.1	2.7	600	10	1
MMSZ3V3ET1	CL4	3.14	3.3	3.47	95	2.3	2.9	600	5	1
MMSZ3V6ET1	CL5	3.42	3.6	3.78	90	2.7	3.3	600	5	1
MMSZ3V9ET1	CL6	3.71	3.9	4.10	90	2.9	3.5	600	3	1
MMSZ4V3ET1	CL7	4.09	4.3	4.52	90	3.3	4.0	600	3	1
MMSZ4V7ET1	CL8	4.47	4.7	4.94	80	3.7	4.7	500	3	2
MMSZ5V1ET1	***CL9***	***4.85***	***5.1***	***5.36***	***60***	***4.2***	***5.3***	***480***	***2***	***2***
MMSZ5V6ET1	***CM1***	***5.32***	***5.6***	***5.88***	***40***	***4.8***	***6.0***	***400***	***1***	***2***
MMSZ6V2ET1	***CM2***	***5.89***	***6.2***	***6.51***	***10***	***5.6***	***6.6***	***150***	***3***	***4***
MMSZ6V8ET1	CM3	6.46	6.8	7.14	15	6.3	7.2	80	2	4
MMSZ7V5ET1	CM4	7.13	7.5	7.88	15	6.9	7.9	80	1	5
MMSZ8V2ET1	CM5	7.79	8.2	8.61	15	7.6	8.7	80	0.7	5
MMSZ9V1ET1	CM6	8.65	9.1	9.56	15	8.4	9.6	100	0.5	6
MMSZ10ET1	CM7	9.50	10	10.50	20	9.3	10.6	150	0.2	7
MMSZ11ET1	CM8	10.45	11	11.55	20	10.2	11.6	150	0.1	8
MMSZ12ET1	CM9	11.40	12	12.60	25	11.2	12.7	150	0.1	8
MMSZ13ET1	CN1	12.35	13	13.65	30	12.3	14.0	170	0.1	8
MMSZ15ET1	CN2	14.25	15	15.75	30	13.7	15.5	200	0.05	10.5
MMSZ16ET1	CN3	15.20	16	16.80	40	15.2	17.0	200	0.05	11.2
MMSZ18ET1	***CN4***	***17.10***	***18***	***18.90***	***45***	***16.7***	***19.0***	***225***	***0.05***	***12.6***

Devices listed in ***bold, italic*** are ON Semiconductor **Preferred** devices. **Preferred** devices are recommended choices for future use and best overall value.

4. The type numbers shown have a standard tolerance of ±5% on the nominal Zener Voltage.
5. Tolerance and Voltage Designation: Zener Voltage (VZ) is measured with the Zener Current applied for PW = 1 ms.
6. Z_{ZT} and Z_{ZK} are measured by dividing the AC voltage drop across the device by the AC current applied. The specified limits are for $I_{Z(AC)}$ = 0.1 $I_{Z(DC)}$, with the AC frequency = 1 kHz.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted, V_F = 0.9 V Max. @ I_F = 10 mA)

Device	Device Marking	V_{Z1} (V) (Notes 4 and 5) @ I_{ZT1} = 5 mA			Z_{ZT1} (Note 6)	V_{Z2} (V) (Notes 4 and 5) @ I_{ZT2} = 1 mA		Z_{ZT2} (Note 6)	Leakage Current I_R @ V_R	
		Min	Nom	Max	Ω	Min	Max	Ω	μA	V
MMSZ20ET1	CN5	19.00	20	21.00	55	18.7	21.1	225	0.05	14
MMSZ22ET1	CN6	20.90	22	23.10	55	20.7	23.2	250	0.05	15.4
MMSZ24ET1	CN7	22.80	24	25.20	70	22.7	25.5	250	0.05	16.8
MMSZ27ET1	CN8	25.65	27	28.35	80	25	28.9	300	0.05	18.9
MMSZ30ET1	CN9	28.50	30	31.50	80	27.8	32	300	0.05	21
MMSZ33ET1	CP1	31.35	33	34.65	80	30.8	35	325	0.05	23.1
MMSZ36ET1	CP2	34.20	36	37.80	90	33.8	38	350	0.05	25.2
MMSZ39ET1	***CP3***	***37.05***	***39***	***40.95***	***130***	***36.7***	***41***	***350***	***0.05***	***27.3***
MMSZ43ET1	CP4	40.85	43	45.15	150	39.7	46	375	0.05	30.1
MMSZ47ET1	CP5									
MMSZ51ET1	CP6	48.45	51	53.55	180	47.6	54	400	0.05	35.7
MMSZ56ET1	CP7	53.20	56	58.80	200	51.5	60	425	0.05	39.2

Devices listed in ***bold, italic*** are ON Semiconductor **Preferred** devices. **Preferred** devices are recommended choices for future use and best overall value.

4. The type numbers shown have a standard tolerance of ±5% on the nominal Zener Voltage.
5. Tolerance and Voltage Designation: Zener Voltage (VZ) is measured with the Zener Current applied for PW = 1 ms.
6. Z_{ZT} and Z_{ZK} are measured by dividing the AC voltage drop across the device by the AC current applied. The specified limits are for $I_{Z(AC)}$ = 0.1 $I_{Z(DC)}$, with the AC frequency = 1 kHz.

TYPICAL CHARACTERISTICS

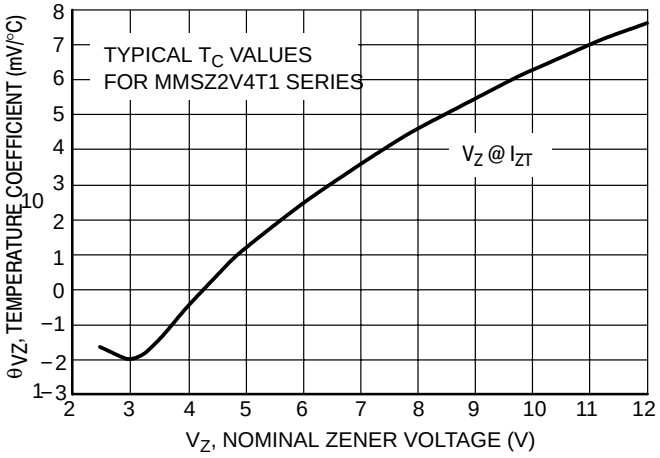


Figure 1. Temperature Coefficients (Temperature Range −55°C to +150°C)

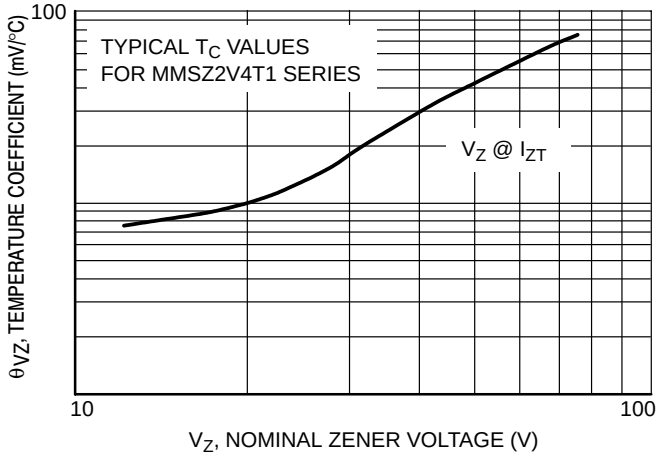


Figure 2. Temperature Coefficients (Temperature Range −55°C to +150°C)

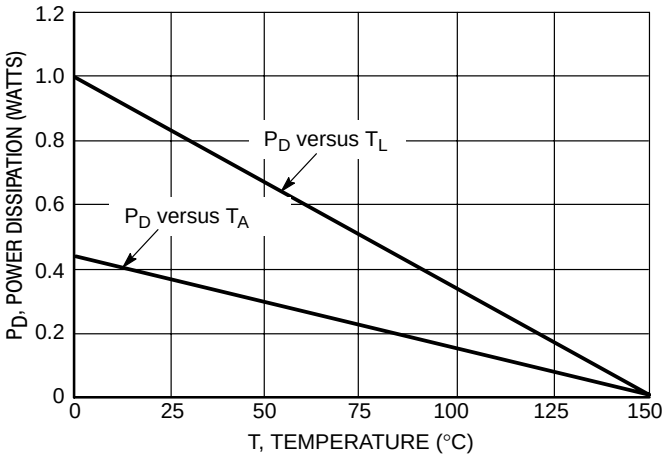


Figure 3. Steady State Power Derating

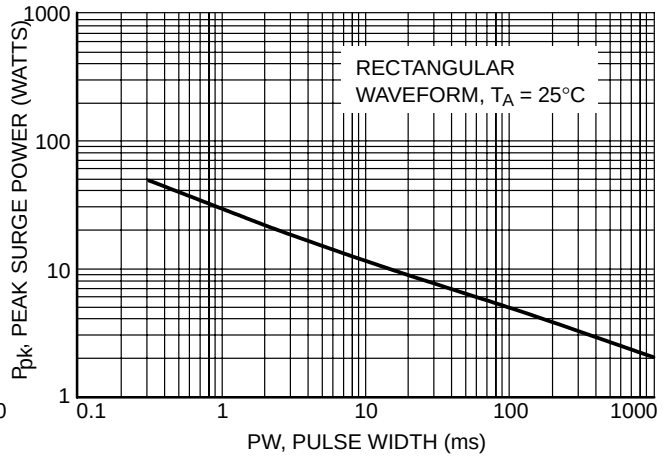


Figure 4. Maximum Nonrepetitive Surge Power

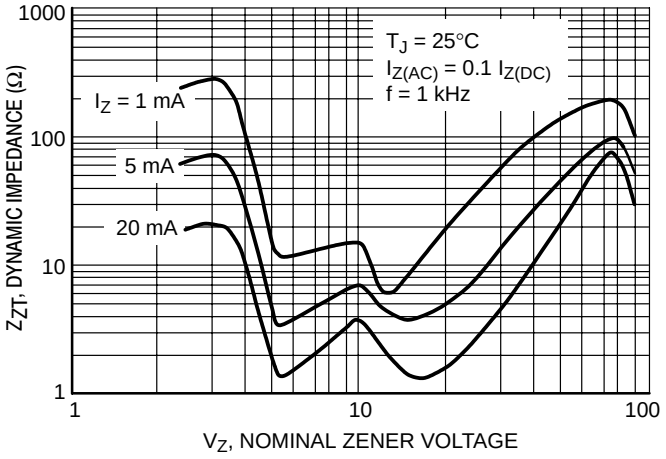


Figure 5. Effect of Zener Voltage on Zener Impedance

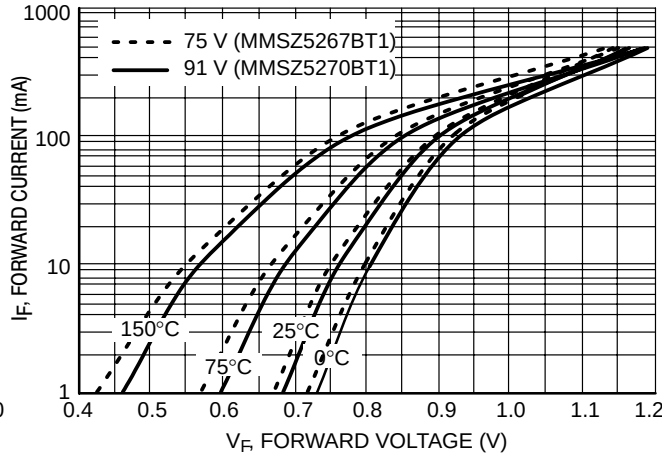


Figure 6. Typical Forward Voltage

TYPICAL CHARACTERISTICS

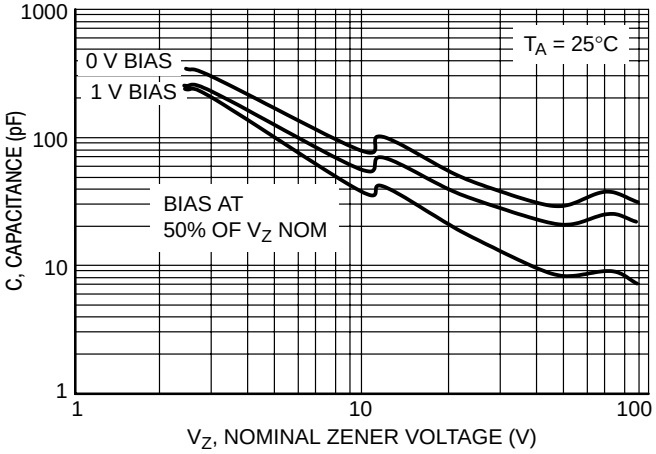


Figure 7. Typical Capacitance

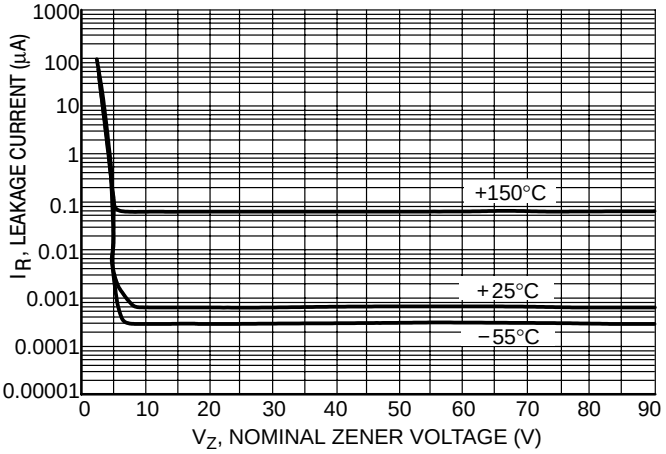


Figure 8. Typical Leakage Current

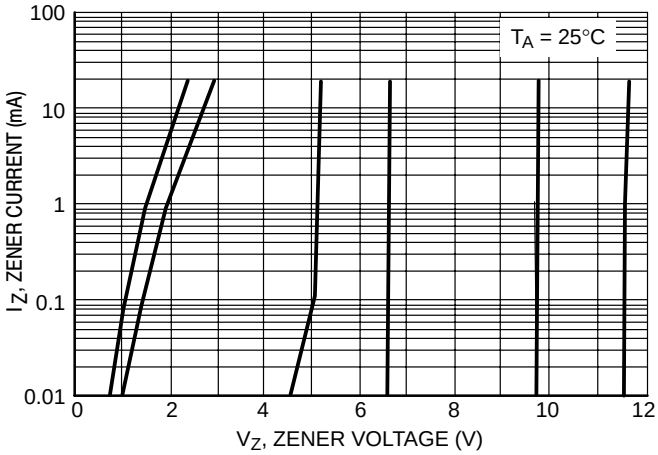


Figure 9. Zener Voltage versus Zener Current (V_Z Up to 12 V)

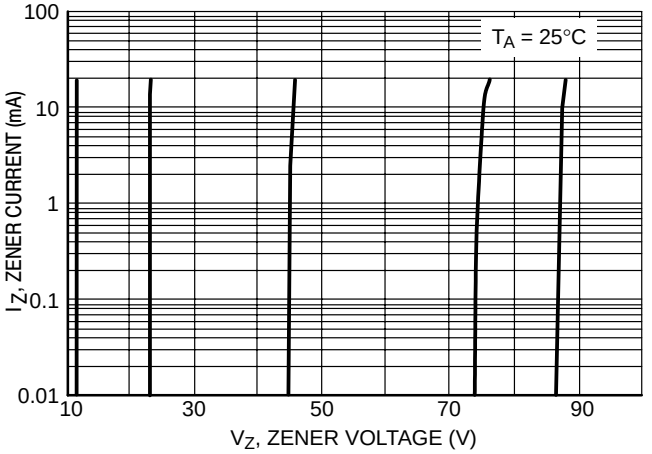


Figure 10. Zener Voltage versus Zener Current (12 V to 91 V)

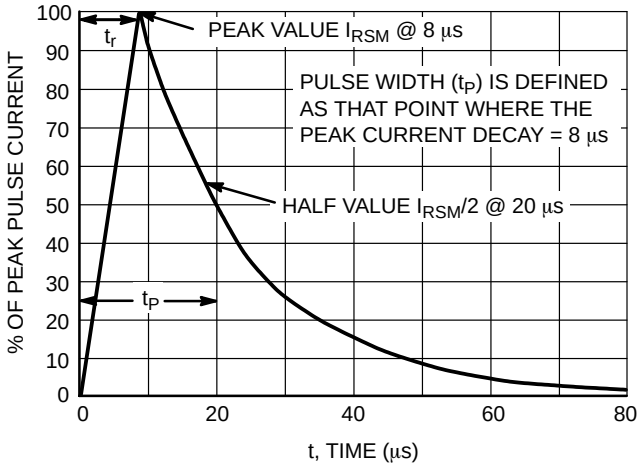
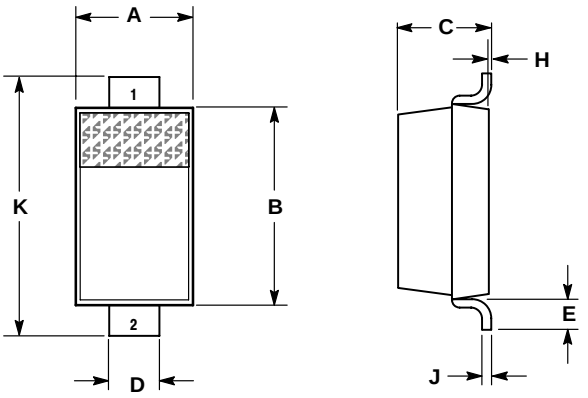


Figure 11. 8 × 20 μs Pulse Waveform

PACKAGE DIMENSIONS

SOD−123
CASE 425−04
ISSUE C

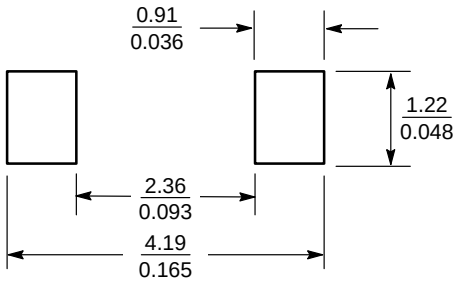


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.055	0.071	1.40	1.80
B	0.100	0.112	2.55	2.85
C	0.037	0.053	0.95	1.35
D	0.020	0.028	0.50	0.70
E	0.01	−−−	0.25	−−−
H	0.000	0.004	0.00	0.10
J	−−−	0.006	−−−	0.15
K	0.140	0.152	3.55	3.85

STYLE 1:
PIN 1. CATHODE
2. ANODE

SOLDERING FOOTPRINT



SCALE 10:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

Figure 12. SOD−123

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