MMSZxxxET1G Series, SZMMSZxxxET1G 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)
- AEC−Q101 Qualified and PPAP Capable
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements
- Pb−Free Packages are Available*

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	W
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

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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

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

ON Semiconductor®

http://onsemi.com

SOD−123
CASE 425
STYLE 1

MARKING DIAGRAM

xxx = Device Code
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
MMSZxxxET1G	SOD−123 (Pb−Free)	3,000 / Tape & Reel
SZMMSZxxxET1G	SOD−123 (Pb−Free)	3,000 / Tape & Reel
MMSZxxxET3G	SOD−123 (Pb−Free)	10,000 / Tape & Reel

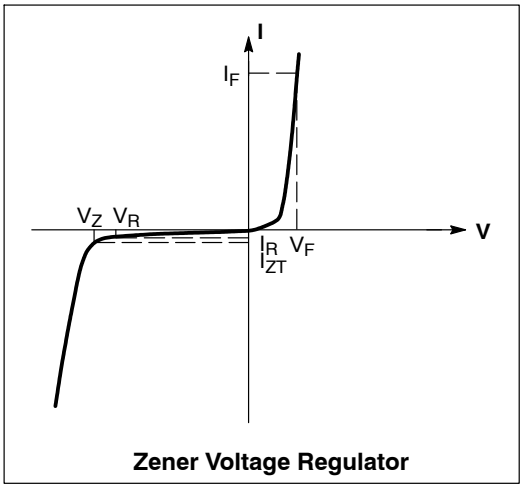
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

DEVICE MARKING INFORMATION

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

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)	Max Reverse Leakage Current I_R @ V_R	
		Min	Nom	Max	Ω	Min	Max	Ω	μA	V
MMSZ2V4ET1G	CL1	2.28	2.4	2.52	100	1.7	2.1	600	50	1
MMSZ2V7ET1G	CL2	2.57	2.7	2.84	100	1.9	2.4	600	20	1
MMSZ3V0ET1G	CL3	2.85	3.0	3.15	95	2.1	2.7	600	10	1
MMSZ3V3ET1G	CL4	3.14	3.3	3.47	95	2.3	2.9	600	5	1
MMSZ3V6ET1G	CL5	3.42	3.6	3.78	90	2.7	3.3	600	5	1
MMSZ3V9ET1G	CL6	3.71	3.9	4.10	90	2.9	3.5	600	3	1
MMSZ4V3ET1G	CL7	4.09	4.3	4.52	90	3.3	4.0	600	3	1
MMSZ4V7ET1G	CL8	4.47	4.7	4.94	80	3.7	4.7	500	3	2
MMSZ5V1ET1G	***CL9***	***4.85***	***5.1***	***5.36***	***60***	***4.2***	***5.3***	***480***	***2***	***2***
MMSZ5V6ET1G	***CM1***	***5.32***	***5.6***	***5.88***	***40***	***4.8***	***6.0***	***400***	***1***	***2***
MMSZ6V2ET1G	***CM2***	***5.89***	***6.2***	***6.51***	***10***	***5.6***	***6.6***	***150***	***3***	***4***
MMSZ6V8ET1G	CM3	6.46	6.8	7.14	15	6.3	7.2	80	2	4
MMSZ7V5ET1G	CM4	7.13	7.5	7.88	15	6.9	7.9	80	1	5
MMSZ8V2ET1G	CM5	7.79	8.2	8.61	15	7.6	8.7	80	0.7	5
MMSZ9V1ET1G	CM6	8.65	9.1	9.56	15	8.4	9.6	100	0.5	6
MMSZ10ET1G	CM7	9.50	10	10.50	20	9.3	10.6	150	0.2	7
MMSZ11ET1G	CM8	10.45	11	11.55	20	10.2	11.6	150	0.1	8
MMSZ12ET1G	CM9	11.40	12	12.60	25	11.2	12.7	150	0.1	8
MMSZ13ET1G	CN1	12.35	13	13.65	30	12.3	14.0	170	0.1	8
MMSZ15ET1G	CN2	14.25	15	15.75	30	13.7	15.5	200	0.05	10.5
MMSZ16ET1G	CN3	15.20	16	16.80	40	15.2	17.0	200	0.05	11.2
MMSZ18ET1G	***CN4***	***17.10***	***18***	***18.90***	***45***	***16.7***	***19.0***	***225***	***0.05***	***12.6***
MMSZ20ET1G	CN5	19.00	20	21.00	55	18.7	21.1	225	0.05	14
MMSZ22ET1G	CN6	20.90	22	23.10	55	20.7	23.2	250	0.05	15.4
MMSZ24ET1G	CN7	22.80	24	25.20	70	22.7	25.5	250	0.05	16.8

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.

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

*Include SZ-prefix devices where applicable.

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 7 and 8) @ I_{ZT1} = 2 mA			Z_{ZT1} (Note 9)	V_{Z2} (V) (Notes 7 and 8) @ I_{ZT2} = 0.1 mA		Z_{ZT2} (Note 9) @ I_{ZT2} = 0.5 mA	Max Reverse Leakage Current I_R @ V_R	
		Min	Nom	Max	Ω	Min	Max	Ω	μA	V
MMSZ27ET1G	CN8	25.65	27	28.35	80	25	28.9	300	0.05	18.9
MMSZ30ET1G	CN9	28.50	30	31.50	80	27.8	32	300	0.05	21
MMSZ33ET1G	CP1	31.35	33	34.65	80	30.8	35	325	0.05	23.1
MMSZ36ET1G	CP2	34.20	36	37.80	90	33.8	38	350	0.05	25.2
MMSZ39ET1G	***CP3***	***37.05***	***39***	***40.95***	***130***	***36.7***	***41***	***350***	***0.05***	***27.3***
MMSZ43ET1G	CP4	40.85	43	45.15	150	39.7	46	375	0.05	30.1
MMSZ47ET1G	CP5	44.65	47	49.35	170	43.7	50	375	0.05	32.9
MMSZ51ET1G	CP6	48.45	51	53.55	180	47.6	54	400	0.05	35.7
MMSZ56ET1G	CP7	53.20	56	58.80	200	51.5	60	425	0.05	39.2

7. The type numbers shown have a standard tolerance of ±5% on the nominal Zener Voltage.
8. Tolerance and Voltage Designation: Zener Voltage (VZ) is measured with the Zener Current applied for PW = 1 ms.
9. 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.

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

*Include SZ-prefix devices where applicable.

TYPICAL CHARACTERISTICS

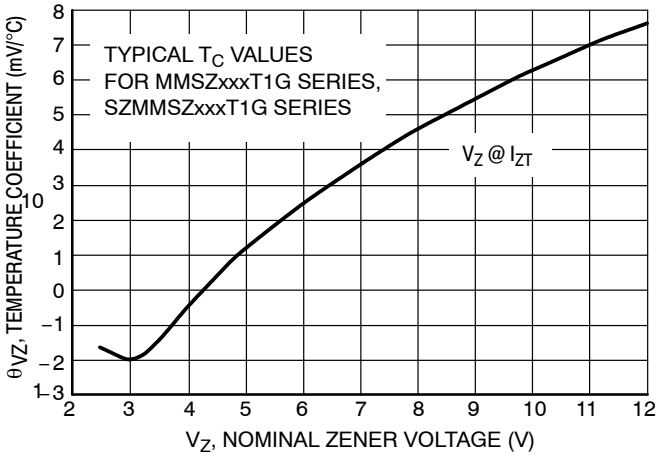


Figure 1. Temperature Coefficients (Temperature Range −55°C to +150°C)

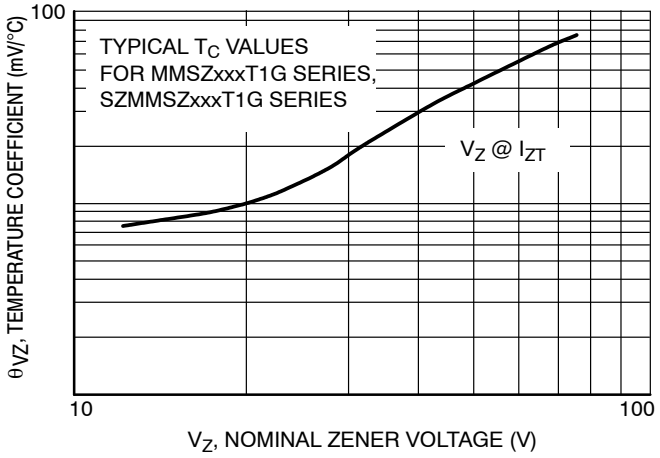


Figure 2. Temperature Coefficients (Temperature Range −55°C to +150°C)

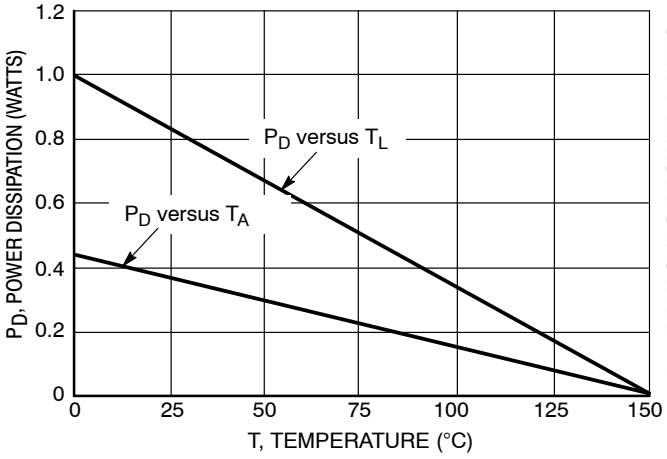


Figure 3. Steady State Power Derating

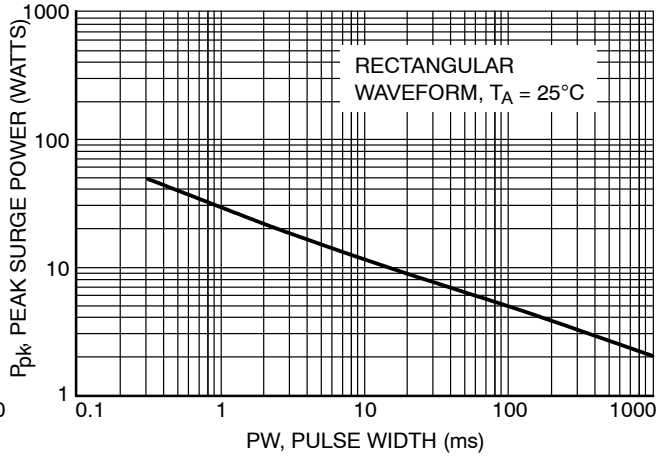


Figure 4. Maximum Nonrepetitive Surge Power

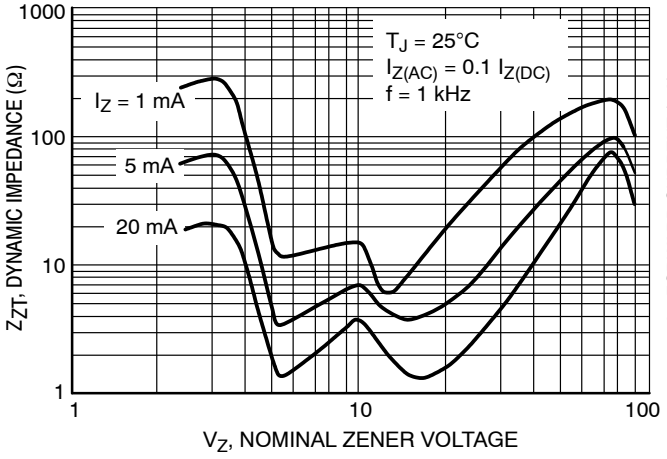


Figure 5. Effect of Zener Voltage on Zener Impedance

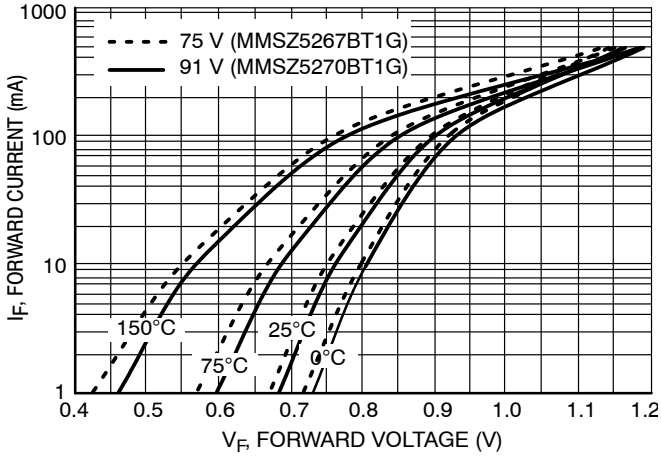


Figure 6. Typical Forward Voltage

TYPICAL CHARACTERISTICS

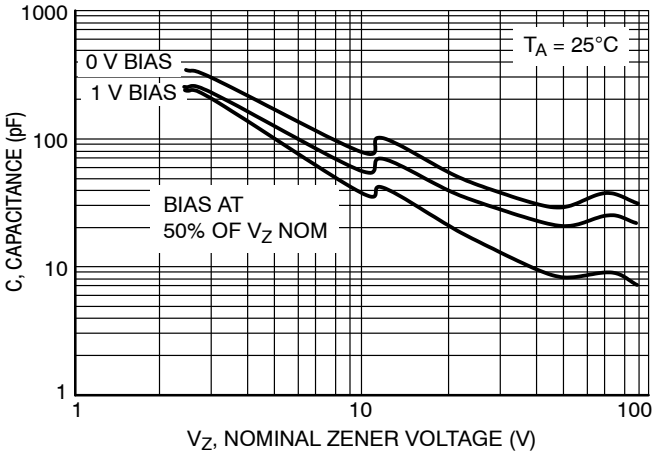


Figure 7. Typical Capacitance

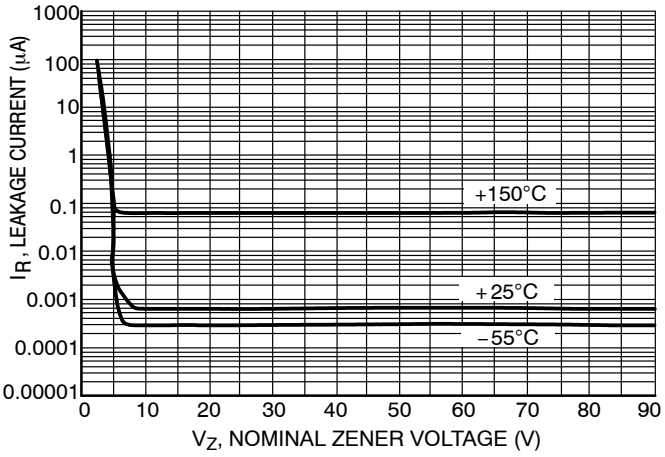


Figure 8. Typical Leakage Current

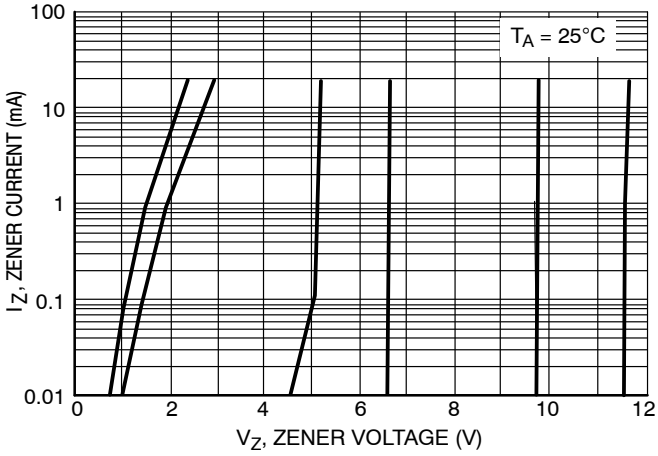


Figure 9. Zener Voltage versus Zener Current (V_Z Up to 12 V)

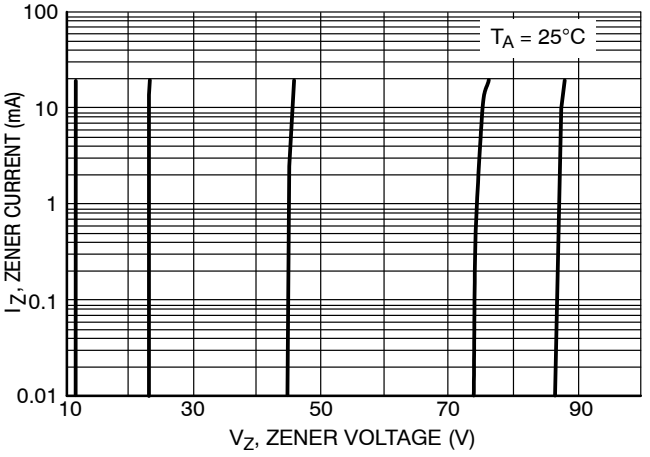


Figure 10. Zener Voltage versus Zener Current (12 V to 91 V)

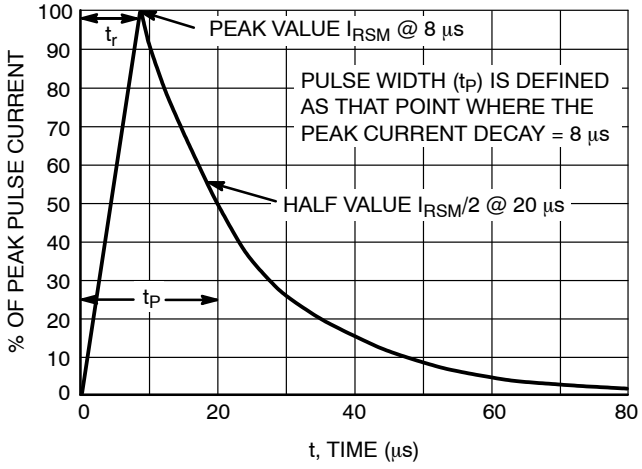
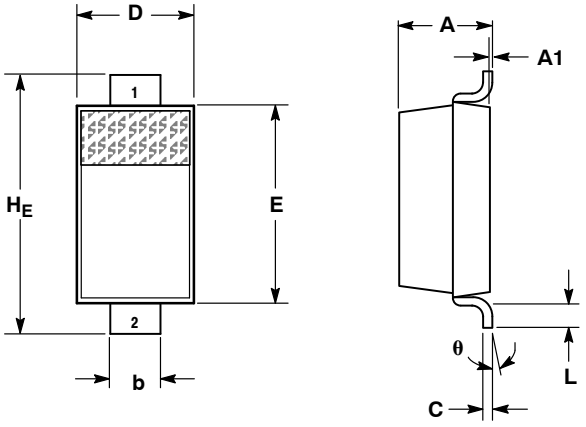


Figure 11. 8 × 20 μs Pulse Waveform

PACKAGE DIMENSIONS

SOD−123
CASE 425−04
ISSUE G

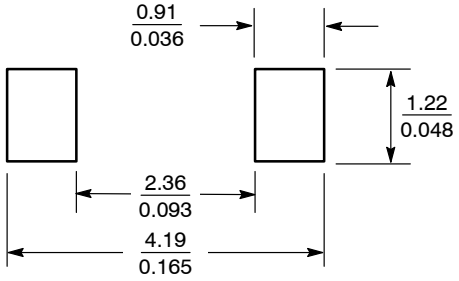


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.94	1.17	1.35	0.037	0.046	0.053
A1	0.00	0.05	0.10	0.000	0.002	0.004
b	0.51	0.61	0.71	0.020	0.024	0.028
c	---	---	0.15	---	---	0.006
D	1.40	1.60	1.80	0.055	0.063	0.071
E	2.54	2.69	2.84	0.100	0.106	0.112
H_E	3.56	3.68	3.86	0.140	0.145	0.152
L	0.25	---	---	0.010	---	---
θ	0°	---	10°	0°	---	10°

STYLE 1:
PIN 1. CATHODE
2. ANODE

SOLDERING FOOTPRINT*



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

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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

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Japan Customer Focus Center
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