Zener Voltage Regulators

500 mW SOD−123 Surface Mount

MMSZxxxT1G Series, SZMMSZxxxT1G Series

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.

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
- 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

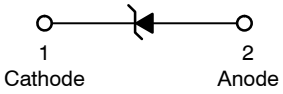
MAXIMUM RATINGS

Rating	Symbol	Max	Unit
Total Power Dissipation on FR−5 Board, (Note 1) @ T_L = 75°C Derated above 75°C	P_D	500 6.7	mW mW/°C
Thermal Resistance, Junction−to−Ambient (Note 2)	$R_{\theta JA}$	340	°C/W
Thermal Resistance, Junction−to−Lead (Note 2)	$R_{\theta JL}$	150	°C/W
Junction and Storage Temperature Range	T_J, T_{stg}	−55 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−5 = 3.5 X 1.5 inches.
2. Thermal Resistance measurement obtained via infrared Scan Method.

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

SOD−123
CASE 425
STYLE 1



MARKING DIAGRAM

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

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
MMSZxxxT1G	SOD−123 (Pb−Free)	3,000 / Tape & Reel
SZMMSZxxxT1G	SOD−123 (Pb−Free)	3,000 / Tape & Reel
MMSZxxxT3G	SOD−123 (Pb−Free)	10,000 / Tape & Reel
SZMMSZxxxT3G	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.

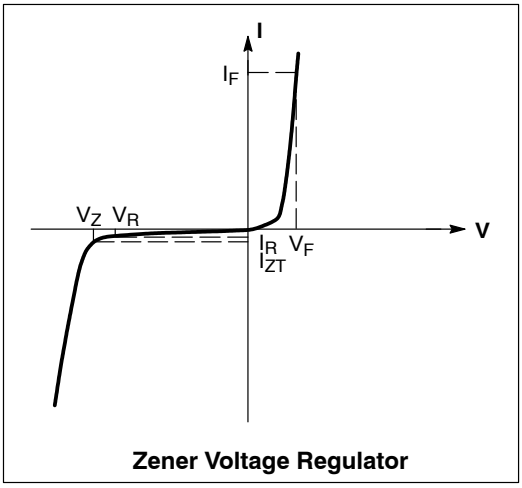
DEVICE MARKING INFORMATION

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

© Semiconductor Components Industries, LLC, 2012

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} (Volts) (Notes 3 and 4) @ I_{ZT1} = 5 mA			Z_{ZT1} (Note 5)	V_{Z2} (Volts) (Notes 3 and 4) @ I_{ZT2} = 1 mA		Z_{ZT2} (Note 5)	Max Reverse Leakage Current I_R @ V_R	
		Min	Nom	Max	Ω	Min	Max	Ω	μA	Volts
MMSZ2V4T1G	T1	2.28	2.4	2.52	100	1.7	2.1	600	50	1
MMSZ2V7T1G	T2	2.57	2.7	2.84	100	1.9	2.4	600	20	1
MMSZ3V0T1G	T3	2.85	3.0	3.15	95	2.1	2.7	600	10	1
MMSZ3V3T1G	T4	3.14	3.3	3.47	95	2.3	2.9	600	5	1
MMSZ3V6T1G	T5	3.42	3.6	3.78	90	2.7	3.3	600	5	1
MMSZ3V9T1G	U1	3.71	3.9	4.10	90	2.9	3.5	600	3	1
MMSZ4V3T1G	U2	4.09	4.3	4.52	90	3.3	4.0	600	3	1
MMSZ4V7T1G	U3	4.47	4.7	4.94	80	3.7	4.7	500	3	2
MMSZ5V1T1G	***U4***	***4.85***	***5.1***	***5.36***	***60***	***4.2***	***5.3***	***480***	***2***	***2***
MMSZ5V6T1G/T3G	***U5***	***5.32***	***5.6***	***5.88***	***40***	***4.8***	***6.0***	***400***	***1***	***2***
MMSZ6V2T1G	***V1***	***5.89***	***6.2***	***6.51***	***10***	***5.6***	***6.6***	***150***	***3***	***4***
MMSZ6V8T1G	V2	6.46	6.8	7.14	15	6.3	7.2	80	2	4
MMSZ7V5T1G	V3	7.13	7.5	7.88	15	6.9	7.9	80	1	5
MMSZ8V2T1G	V4	7.79	8.2	8.61	15	7.6	8.7	80	0.7	5
MMSZ9V1T1G	V5	8.65	9.1	9.56	15	8.4	9.6	100	0.5	6
MMSZ10T1G/T3G	A1	9.50	10	10.50	20	9.3	10.6	150	0.2	7
MMSZ11T1G	A2	10.45	11	11.55	20	10.2	11.6	150	0.1	8
MMSZ12T1G	A3	11.40	12	12.60	25	11.2	12.7	150	0.1	8
MMSZ13T1G	A4	12.35	13	13.65	30	12.3	14.0	170	0.1	8
MMSZ15T1G	A5	14.25	15	15.75	30	13.7	15.5	200	0.05	10.5
MMSZ16T1G	X1	15.20	16	16.80	40	15.2	17.0	200	0.05	11.2
MMSZ18T1G/T3G	***X2***	***17.10***	***18***	***18.90***	***45***	***16.7***	***19.0***	***225***	***0.05***	***12.6***
MMSZ20T1G	X3	19.00	20	21.00	55	18.7	21.1	225	0.05	14
MMSZ22T1G	X4	20.90	22	23.10	55	20.7	23.2	250	0.05	15.4
MMSZ24T1G	X5	22.80	24	25.20	70	22.7	25.5	250	0.05	16.8

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

*Include SZ-prefix devices where applicable.

Share Feedback
Your Opinion Matters

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

Device*	Device Marking	V_{Z1} (Volts) (Notes 6 and 7) @ I_{ZT1} = 2 mA			Z_{ZT1} (Note 8)	V_{Z2} (Volts) (Notes 6 and 7) @ I_{ZT2} = 0.1 mA		Z_{ZT2} (Note 8) @ I_{ZT2} = 0.5 mA	Max Reverse Leakage Current I_R @ V_R	
		Min	Nom	Max	Ω	Min	Max	Ω	μA	Volts
MMSZ27T1G/T3G	Y1	25.65	27	28.35	80	25	28.9	300	0.05	18.9
MMSZ30T1G	Y2	28.50	30	31.50	80	27.8	32	300	0.05	21
MMSZ33T1G	Y3	31.35	33	34.65	80	30.8	35	325	0.05	23.1
MMSZ36T1G	Y4	34.20	36	37.80	90	33.8	38	350	0.05	25.2
MMSZ39T1G	Y5	37.05	39	40.95	130	36.7	41	350	0.05	27.3
MMSZ43T1G	Z1	40.85	43	45.15	150	39.7	46	375	0.05	30.1
MMSZ47T1G	Z2	44.65	47	49.35	170	43.7	50	375	0.05	32.9
MMSZ51T1G	Z3	48.45	51	53.55	180	47.6	54	400	0.05	35.7
MMSZ56T1G/T3G	Z4	53.20	56	58.80	200	51.5	60	425	0.05	39.2

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

*Include SZ-prefix devices where applicable.

Share Feedback
Your Opinion Matters

TYPICAL CHARACTERISTICS

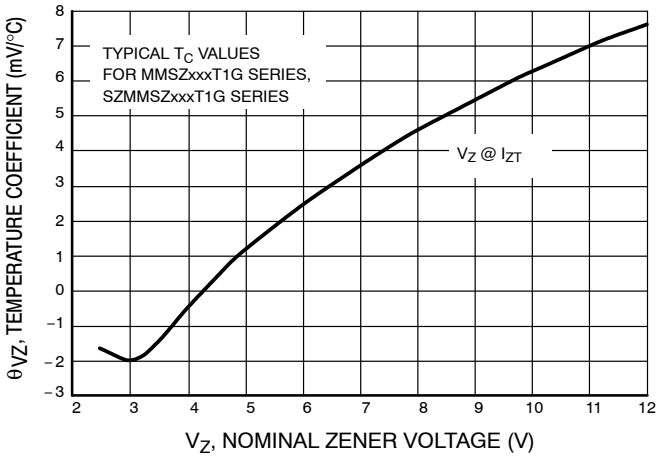


Figure 1. Temperature Coefficients (Temperature Range −55°C to +150°C)

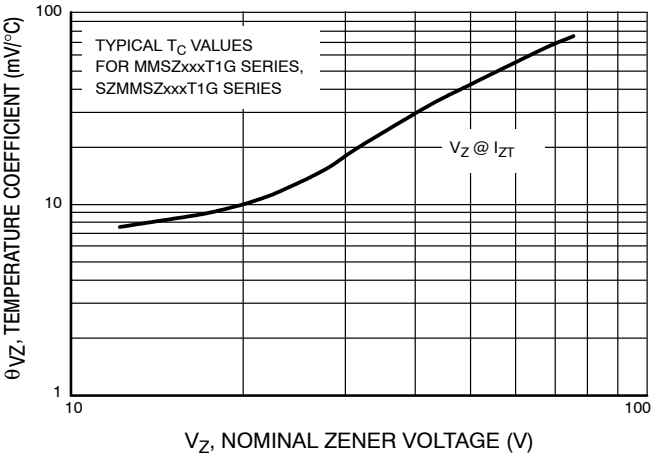


Figure 2. Temperature Coefficients (Temperature Range −55°C to +150°C)

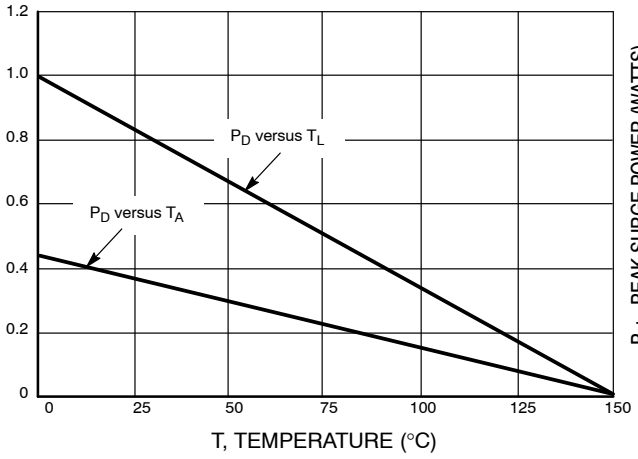


Figure 3. Steady State Power Derating

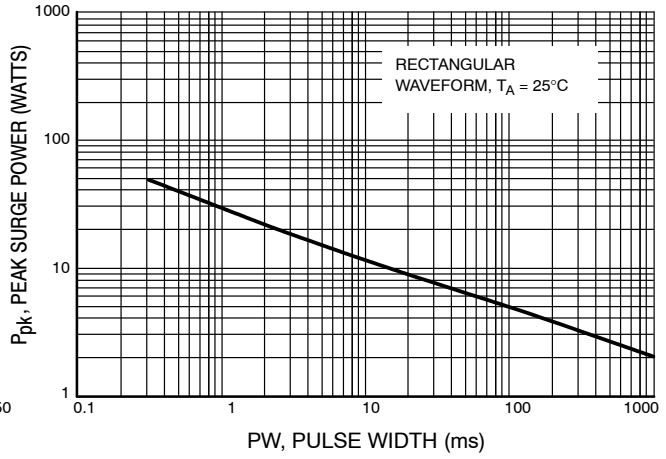


Figure 4. Maximum Nonrepetitive Surge Power

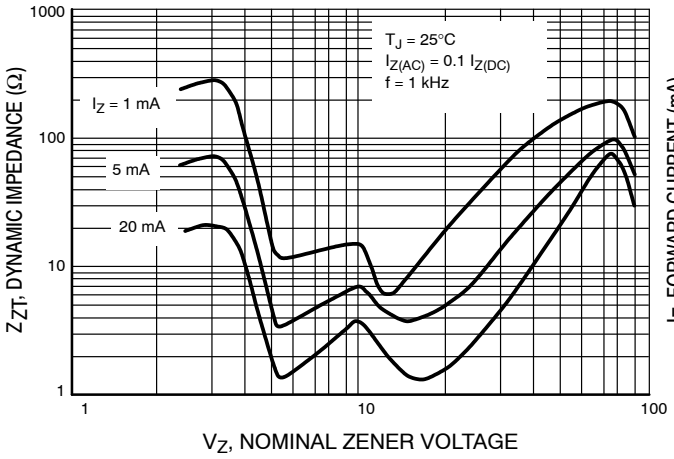


Figure 5. Effect of Zener Voltage on Zener Impedance

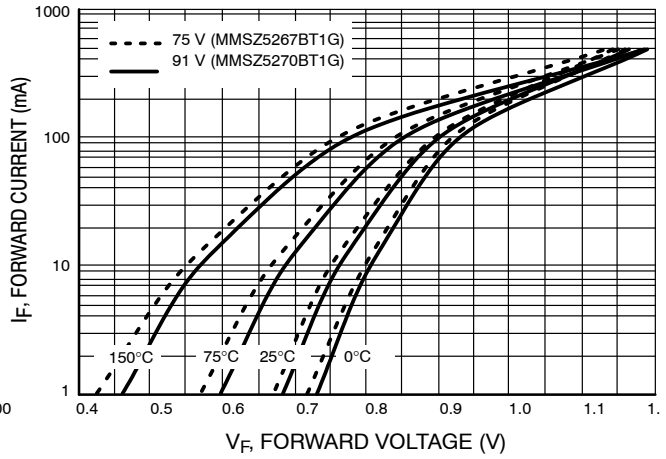


Figure 6. Typical Forward Voltage

Share Feedback
Your Opinion Matters

TYPICAL CHARACTERISTICS

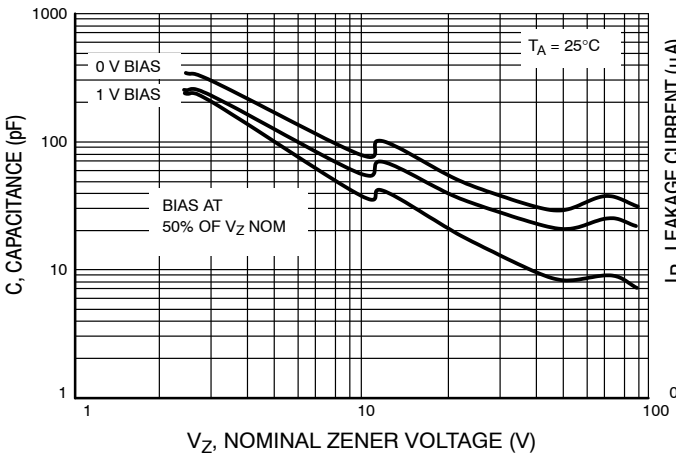


Figure 7. Typical Capacitance

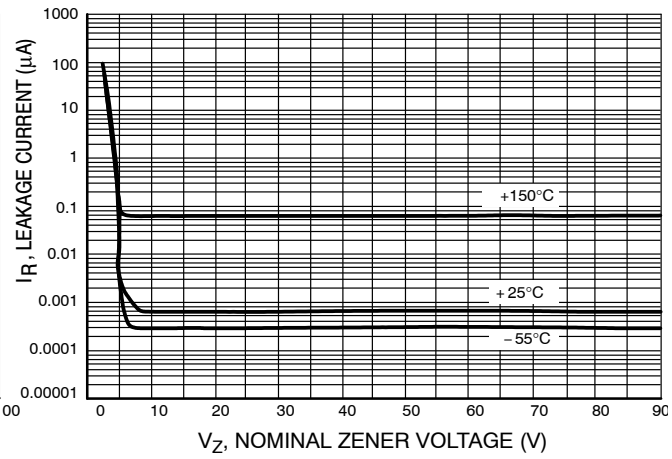


Figure 8. Typical Leakage Current

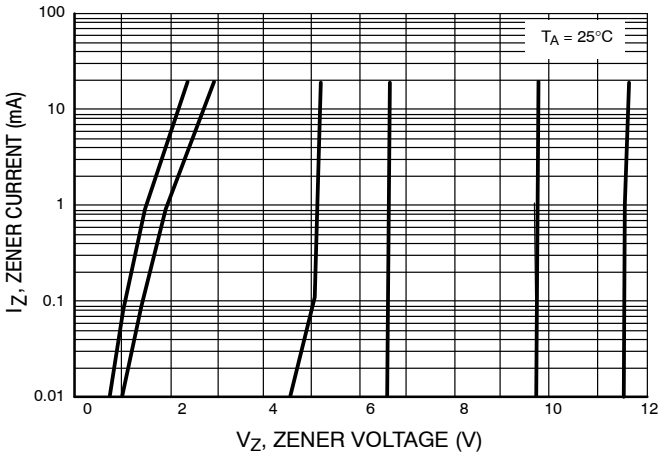


Figure 9. Zener Voltage versus Zener Current (V_Z Up to 12 V)

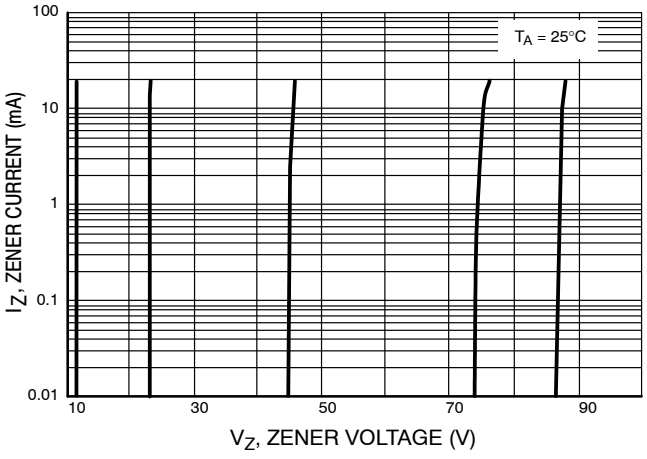
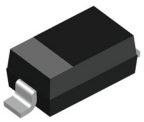


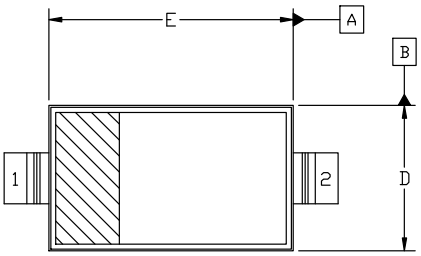
Figure 10. Zener Voltage versus Zener Current (12 V to 91 V)

Share Feedback
Your Opinion Matters

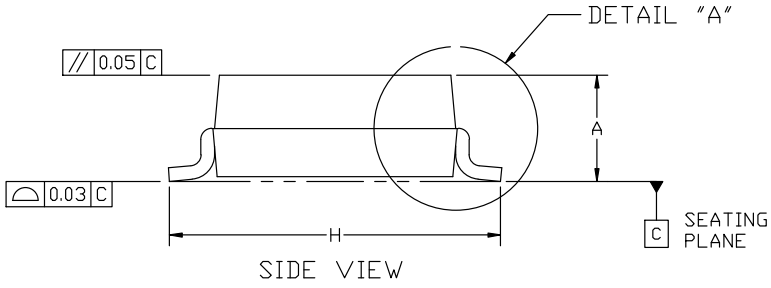


SOD−123 2−LEAD, 1.60x2.69x1.16
CASE 425
ISSUE H

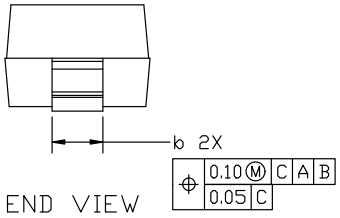
DATE 29 FEB 2024



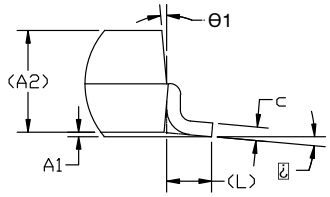
TOP VIEW



SIDE VIEW



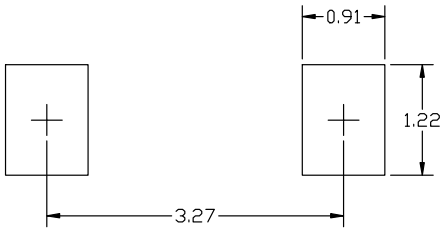
END VIEW



DETAIL "A"

NOTES:
1. DIMENSION AND TOLERANCING PER ASME Y14.5M, 2018
2. CONTROLLING DIMENSION: MILLIMETERS

	MILLIMETER		
DIM	MIN.	NOM.	MAX.
A	0.94	1.17	1.35
A1	0.00	0.05	0.10
A2		1.16 REF.	
b	0.51	0.61	0.71
c	–	–	0.15
D	1.40	1.60	1.80
E	2.54	2.69	2.84
H	3.56	3.68	3.86
L		0.25 REF.	
∠	0°		10°
θ1	0°		10°



RECOMMENDED MOUNTING FOOTPRINT

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

GENERIC MARKING DIAGRAM*

XXX = Specific Device Code
M = Date Code
▪ = Pb−Free Package
(Note: Microdot may be in either location)

*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
2. ANODE

DOCUMENT NUMBER:	**98ASB42927B**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	**SOD−123 2−LEAD, 1.60x2.69x1.16**	**PAGE 1 OF 1**

onsemi and ONSEMI are trademarks of Semiconductor Components Industries, LLC dba **onsemi** or its subsidiaries in the United States and/or other countries. **onsemi** reserves the right to make changes without further notice to any products herein. **onsemi** makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does **onsemi** 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. **onsemi** does not convey any license under its patent rights nor the rights of others.

onsemi, ONSEMI , and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent−Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as−is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** 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 **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** 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. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** 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 **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** 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 **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
Technical Library: www.onsemi.com/design/resources/technical−documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support
For additional information, please contact your local Sales Representative at
www.onsemi.com/support/sales