Zener Diodes, 24 and 40 Watt Peak Power

SOT−23 Dual Common Anode Zeners

MMBZHxxxALT1G Series, SZMMBZHxxxALT1G Series

These dual monolithic silicon Zener diodes are designed for applications requiring transient overvoltage ESD protection capability. They are intended for use in voltage and ESD sensitive equipment such as computers, printers, business machines, communication systems, medical equipment and other applications. Their dual junction common anode design protects two separate lines using only one package. These devices are ideal for situations where board space is at a premium.

Features

- SOT−23 Package Allows Either Two Separate Unidirectional Configurations or a Single Bidirectional Configuration
- Standard Zener Breakdown Voltage Range − 5.6 V to 47 V
- Peak Power − 24 or 40 W @ 1.0 ms (Unidirectional), per Figure 6 Waveform
- ESD Rating:
  - Class 3B (> 16 kV) per the Human Body Model
  - Class C (> 400 V) per the Machine Model
  - IEC61000−4−2 Level 4, ±30 kV Contact Discharge
- Low Leakage < 5.0 μA
- Flammability Rating UL 94 V−0
- 175°C $T_{J(MAX)}$ − Rated for High Temperature, Mission Critical Applications
- 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 case
FINISH: Corrosion resistant finish, easily solderable
MAXIMUM CASE TEMPERATURE FOR SOLDERING PURPOSES:
260°C for 10 Seconds
Package designed for optimal automated board assembly
Small package size for high density applications
Available in 8 mm Tape and Reel

Use the Device Number to order the 7 inch/3,000 unit reel.
Replace the “T1” with “T3” in the Device Number to order the 13 inch/10,000 unit reel.

ON Semiconductor®

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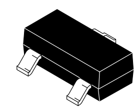
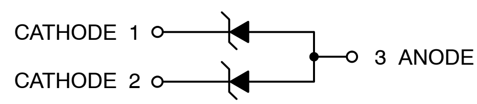
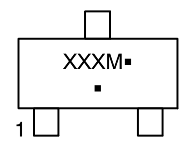


SOT−23
CASE 318
STYLE 12



MARKING DIAGRAM



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

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

DEVICE MARKING INFORMATION

See specific marking information in the device marking column of the table on page 3 of this data sheet.

January, 2020 − Rev. 0
Publication Order Number:
MMBZH5V6ALT1/D

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak Power Dissipation @ 1.0 ms (Note 1) @ $T_L \leq 25°C$ MMBZH5V6ALT1G thru MMBZH9V1ALT1G MMBZH12VALT1G thru MMBZH47VALT1G	P_{pk}	24 40	W
Total Power Dissipation on FR−5 Board (Note 2) @ $T_A = 25°C$ Derate above 25°C	P_D	 225 1.5	 mW mW/°C
Thermal Resistance Junction−to−Ambient	$R_{\theta JA}$	540	°C/W
Junction and Storage Temperature Range	T_J, T_{stg}	− 55 to +175	°C
Lead Solder Temperature − Maximum (10 Second Duration)	T_L	260	°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. Non−repetitive current pulse per Figure 6 and derate above $T_A = 25°C$ per Figure 7.
2. FR−5 = 1.0 x 0.75 x 0.62 in.

ORDERING INFORMATION

Device	Package	Shipping†
MMBZHxVxALT1G	SOT−23 (Pb−Free)	3,000 / Tape & Reel
SZMMBZHxVxALT1G*	SOT−23 (Pb−Free)	3,000 / Tape & Reel
MMBZHxVxALT3G	SOT−23 (Pb−Free)	10,000 / Tape & Reel
SZMMBZHxVxALT3G*	SOT−23 (Pb−Free)	10,000 / Tape & Reel
MMBZHxxVALT1G	SOT−23 (Pb−Free)	3,000 / Tape & Reel
SZMMBZHxxVALT1G*	SOT−23 (Pb−Free)	3,000 / Tape & Reel
MMBZHxxVALT3G	SOT−23 (Pb−Free)	10,000 / Tape & Reel
SZMMBZHxxVALT3G*	SOT−23 (Pb−Free)	10,000 / Tape & Reel

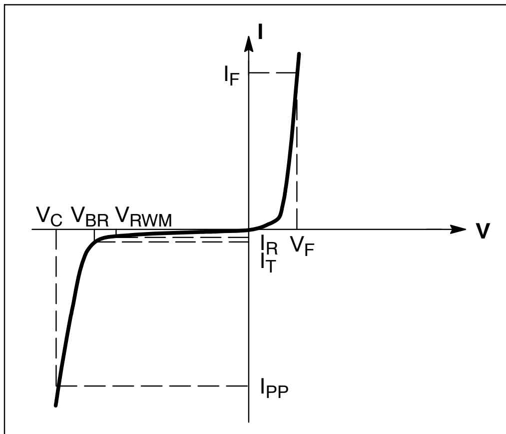
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted)
UNIDIRECTIONAL (Circuit tied to Pins 1 and 3 or 2 and 3)

Symbol	Parameter
I_{PP}	Maximum Reverse Peak Pulse Current
V_C	Clamping Voltage @ I_{PP}
V_{RWM}	Working Peak Reverse Voltage
I_R	Maximum Reverse Leakage Current @ V_{RWM}
V_{BR}	Breakdown Voltage @ I_T
I_T	Test Current
ΘV_{BR}	Maximum Temperature Coefficient of V_{BR}
I_F	Forward Current
V_F	Forward Voltage @ I_F
Z_{ZT}	Maximum Zener Impedance @ I_{ZT}
I_{ZK}	Reverse Current
Z_{ZK}	Maximum Zener Impedance @ I_{ZK}



Uni−Directional Zener

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

UNIDIRECTIONAL (Circuit tied to Pins 1 and 3 or Pins 2 and 3)

(V_F = 0.9 V Max @ I_F = 10 mA) (5% Tolerance) **24 WATTS**

Device*	Device Marking	V_{RWM}	I_R @ V_{RWM}	Breakdown Voltage V_{BR} (Note 3) (V)			@ I_T	Max Zener Impedance (Note 4) Z_{ZT} @ I_{ZT}	Z_{ZK} @ I_{ZK}		V_C @ I_{PP} (Note 5) V_C	I_{PP}	ΘV_{BR}
		Volts	µA	Min	Nom	Max	mA	Ω	Ω	mA	V	A	mV/°C
MMBZH5V6ALT1G**	5A6	3.0	5.0	5.32	5.6	5.88	20	11	1600	0.25	8.0	3.0	1.26
MMBZH6V2ALT1G**	6A2	3.0	0.5	5.89	6.2	6.51	1.0	–	–	–	8.7	2.76	2.80
MMBZH6V8ALT1G**	6A8	4.5	0.5	6.46	6.8	7.14	1.0	–	–	–	9.6	2.5	3.4
MMBZH9V1ALT1G**	9A1	6.0	0.3	8.65	9.1	9.56	1.0	–	–	–	14	1.7	7.5

(V_F = 0.9 V Max @ I_F = 10 mA) (5% Tolerance) **40 WATTS**

Device*	Device Marking	V_{RWM}	I_R @ V_{RWM}	Breakdown Voltage V_{BR} (Note 3) (V)			@ I_T	V_C @ I_{PP} (Note 5) V_C	I_{PP}	ΘV_{BR}
		Volts	nA	Min	Nom	Max	mA	V	A	mV/°C
MMBZH12VALT1G**	12A	8.5	200	11.40	12	12.60	1.0	17	2.35	7.5
MMBZH15VALT1G**	15A	12	50	14.25	15	15.75	1.0	21	1.9	12.3
MMBZH16VALT1G**	16A	13	50	15.20	16	16.80	1.0	23	1.7	13.8
MMBZH18VALT1G	ACJ	14.5	50	17.10	18	18.90	1.0	25	1.6	15.3
MMBZH20VALT1G**	20A	17	50	19.00	20	21.00	1.0	28	1.4	17.2
MMBZH27VALT1G**	27A	22	50	25.65	27	28.35	1.0	40	1.0	24.3
MMBZH33VALT1G**	33A	26	50	31.35	33	34.65	1.0	46	0.87	30.4
MMBZH47VALT1G**	47A	38	50	44.65	47	49.35	1.0	54	0.74	43.1

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.

3. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C.
4. 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 = 1.0 kHz.
5. Surge current waveform per Figure 6 and derate per Figure 7

* Includes SZ-prefix devices where applicable.
**AEC−Q release available upon request.

TYPICAL CHARACTERISTICS

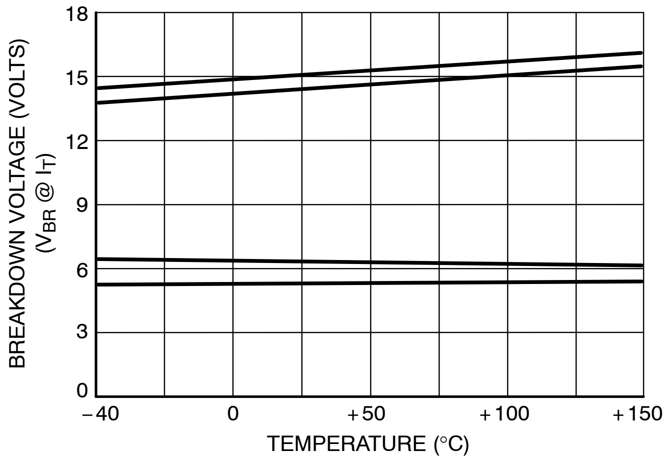


Figure 1. Typical Breakdown Voltage versus Temperature

(Upper curve for each voltage is bidirectional mode, lower curve is unidirectional mode)

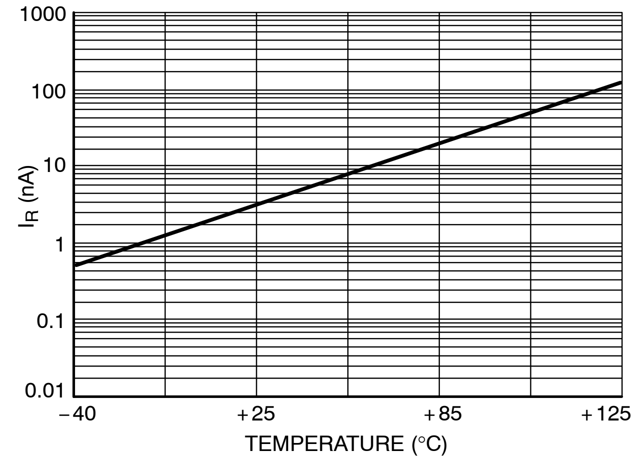


Figure 2. Typical Leakage Current versus Temperature

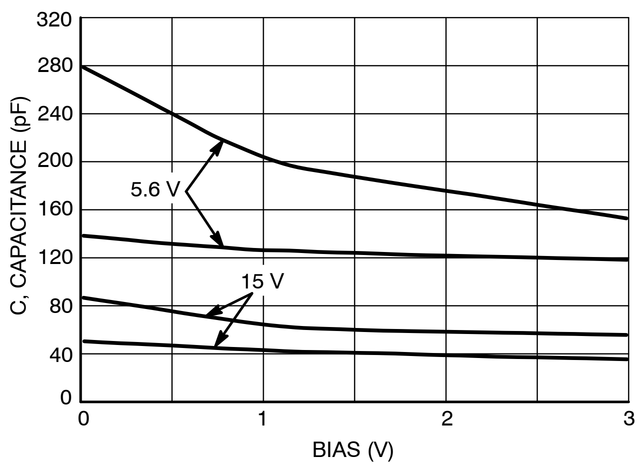


Figure 3. Typical Capacitance versus Bias Voltage

(Upper curve for each voltage is unidirectional mode, lower curve is bidirectional mode)

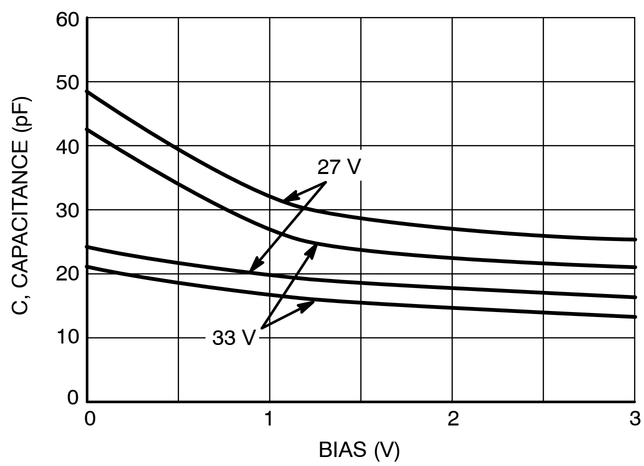


Figure 4. Typical Capacitance versus Bias Voltage

(Upper curve for each voltage is unidirectional mode, lower curve is bidirectional mode)

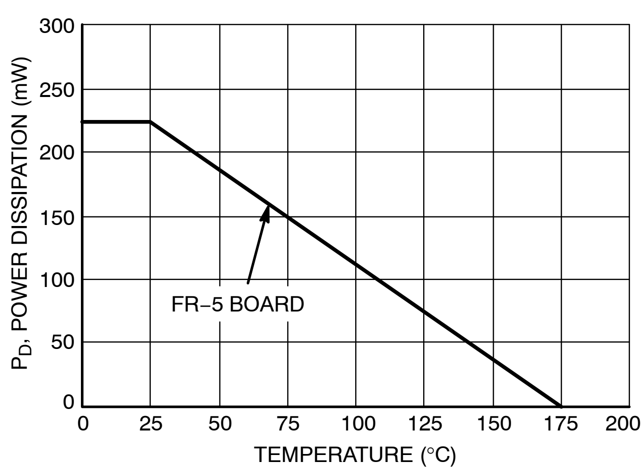


Figure 5. Steady State Power Derating Curve

TYPICAL CHARACTERISTICS

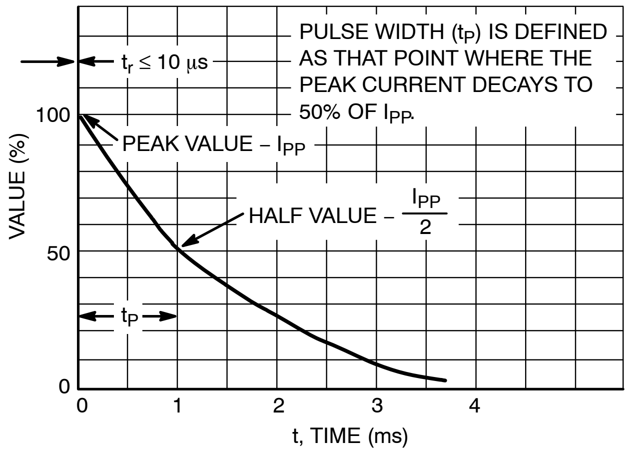


Figure 6. Pulse Waveform

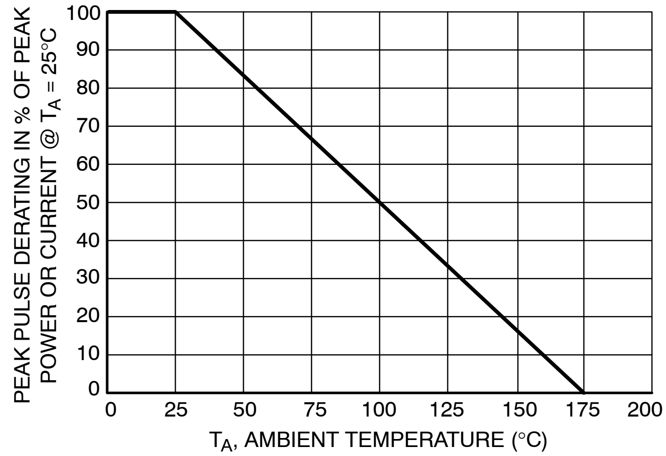


Figure 7. Pulse Derating Curve

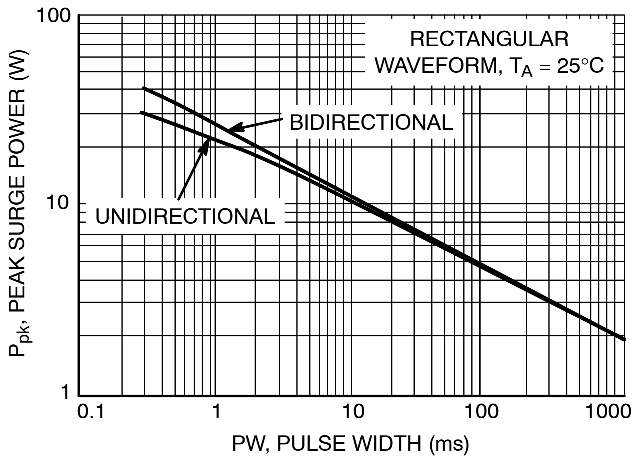


Figure 8. Maximum Non−repetitive Surge Power, P_{pk} versus PW

Power is defined as V_{RSM} x I_Z(pk) where V_{RSM} is the clamping voltage at I_Z(pk).

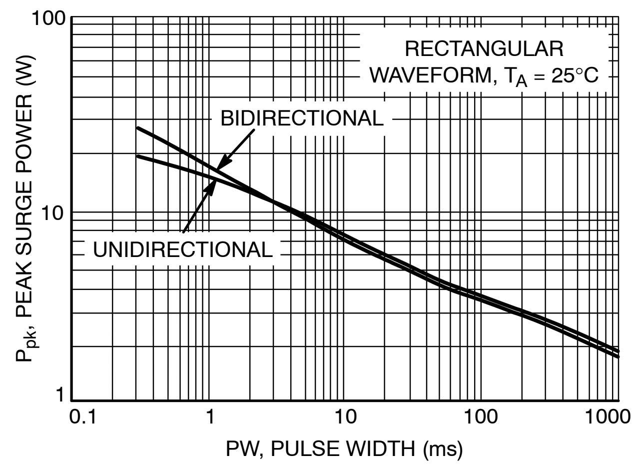


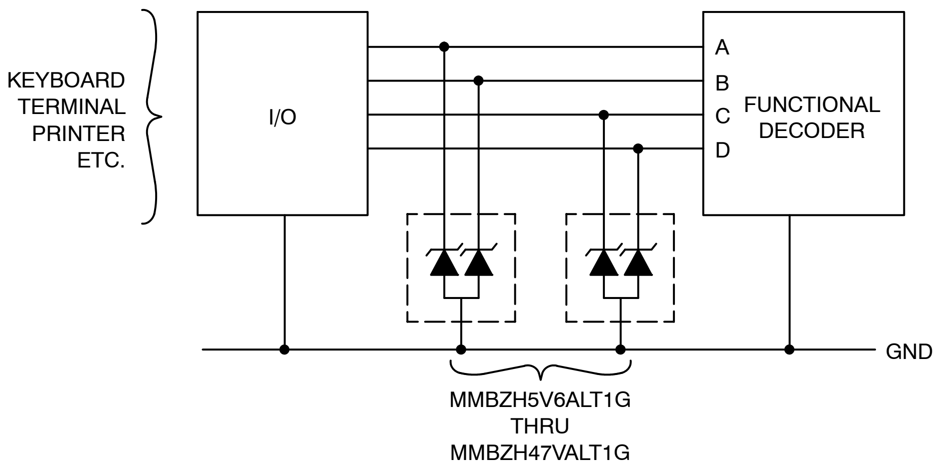
Figure 9. Maximum Non−repetitive Surge Power, P_{pk}(NOM) versus PW

Power is defined as V_Z(NOM) x I_Z(pk) where V_Z(NOM) is the nominal Zener voltage measured at the low test current used for voltage classification.

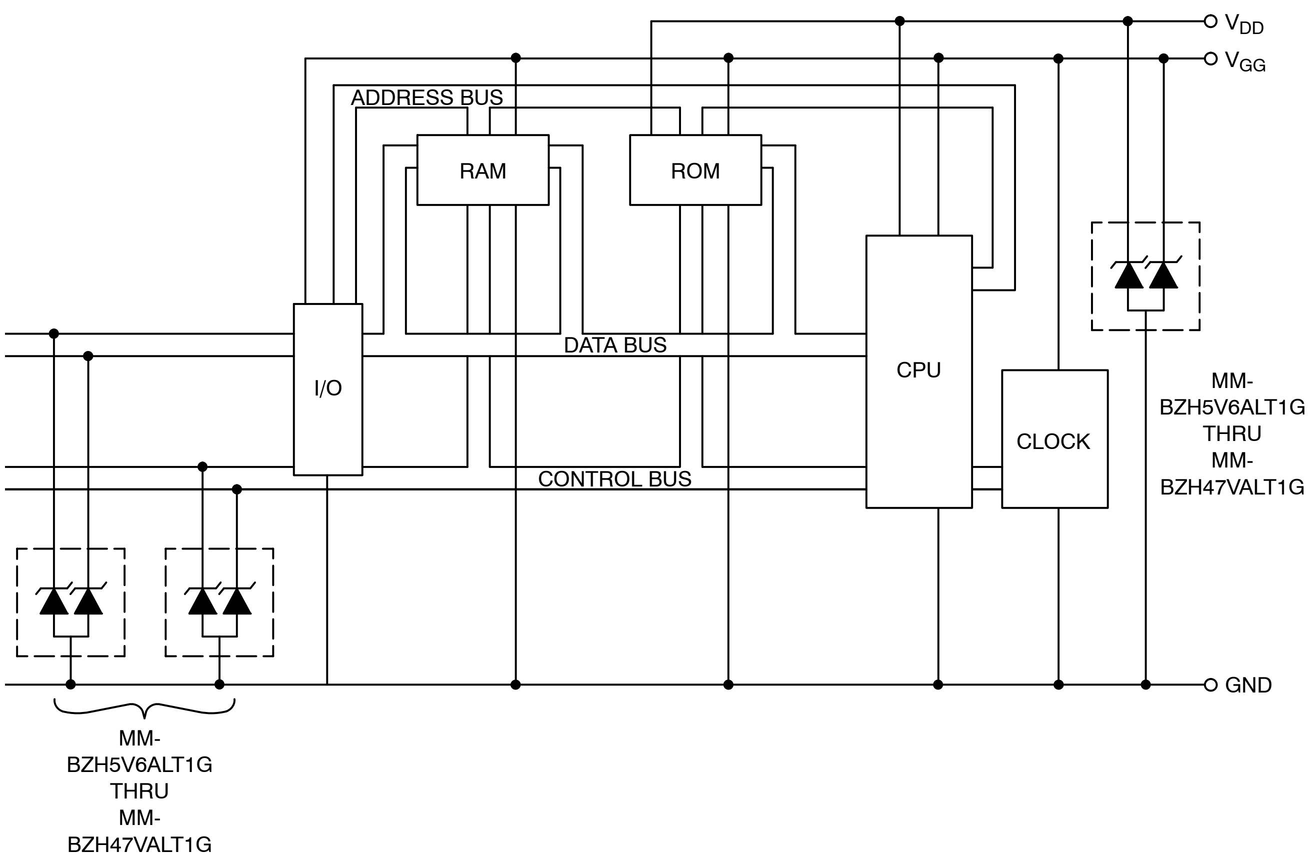
TYPICAL COMMON ANODE APPLICATIONS

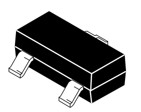
A dual junction common anode design in a SOT−23 package protects two separate lines using only one package. This adds flexibility and creativity to PCB design especially when board space is at a premium. Two simplified examples of ESD applications are illustrated below.

Computer Interface Protection



Microprocessor Protection

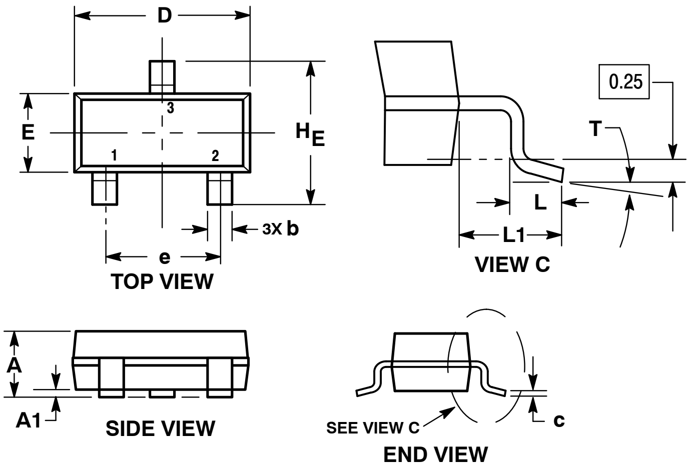




SCALE 4:1

SOT−23 (TO−236)
CASE 318−08
ISSUE AS

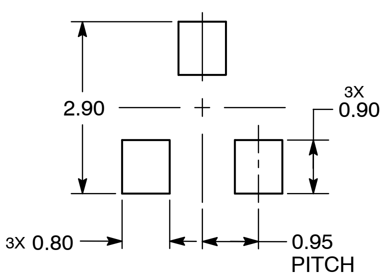
DATE 30 JAN 2018



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 THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

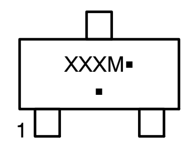
	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.039	0.044
A1	0.01	0.06	0.10	0.000	0.002	0.004
b	0.37	0.44	0.50	0.015	0.017	0.020
c	0.08	0.14	0.20	0.003	0.006	0.008
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.080
L	0.30	0.43	0.55	0.012	0.017	0.022
L1	0.35	0.54	0.69	0.014	0.021	0.027
H_E	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	---	10°	0°	---	10°

RECOMMENDED SOLDERING FOOTPRINT



DIMENSIONS: MILLIMETERS

GENERIC MARKING DIAGRAM*



XXX = Specific Device Code
M = Date Code
▪ = Pb−Free Package

*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.

STYLE 1 THRU 5:
CANCELLED

STYLE 6:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

STYLE 7:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

STYLE 8:
PIN 1. ANODE
2. NO CONNECTION
3. CATHODE

STYLE 9:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 10:
PIN 1. DRAIN
2. SOURCE
3. GATE

STYLE 11:
PIN 1. ANODE
2. CATHODE
3. CATHODE−ANODE

STYLE 12:
PIN 1. CATHODE
2. CATHODE
3. ANODE

STYLE 13:
PIN 1. SOURCE
2. DRAIN
3. GATE

STYLE 14:
PIN 1. CATHODE
2. GATE
3. ANODE

STYLE 15:
PIN 1. GATE
2. CATHODE
3. ANODE

STYLE 16:
PIN 1. ANODE
2. CATHODE
3. CATHODE

STYLE 17:
PIN 1. NO CONNECTION
2. ANODE
3. CATHODE

STYLE 18:
PIN 1. NO CONNECTION
2. CATHODE
3. ANODE

STYLE 19:
PIN 1. CATHODE
2. ANODE
3. CATHODE−ANODE

STYLE 20:
PIN 1. CATHODE
2. ANODE
3. GATE

STYLE 21:
PIN 1. GATE
2. SOURCE
3. DRAIN

STYLE 22:
PIN 1. RETURN
2. OUTPUT
3. INPUT

STYLE 23:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 24:
PIN 1. GATE
2. DRAIN
3. SOURCE

STYLE 25:
PIN 1. ANODE
2. CATHODE
3. GATE

STYLE 26:
PIN 1. CATHODE
2. ANODE
3. NO CONNECTION

STYLE 27:
PIN 1. CATHODE
2. CATHODE
3. CATHODE

STYLE 28:
PIN 1. ANODE
2. ANODE
3. ANODE

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DESCRIPTION:	**SOT−23 (TO−236)**	**PAGE 1 OF 1**

PUBLICATION ORDERING INFORMATION

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onsemi Website: www.onsemi.com

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Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:
Phone: 00421 33 790 2910
For additional information, please contact your local Sales Representative

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