MMBZ5V6ALT1 Series

Preferred Device

24 and 40 Watt Peak Power Zener Transient Voltage Suppressors

SOT−23 Dual Common Anode Zeners for ESD Protection

These dual monolithic silicon Zener diodes are designed for applications requiring transient overvoltage 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
- Working Peak Reverse Voltage Range − 3 V to 26 V
- Standard Zener Breakdown Voltage Range − 5.6 V to 33 V
- Peak Power − 24 or 40 W @ 1.0 ms (Unidirectional), per Figure 5 Waveform
- ESD Rating:
  - − Class 3B (>16 kV) per the Human Body Model
  - − Class C (>400 V) per the Machine Model
- Maximum Clamping Voltage @ Peak Pulse Current
- Low Leakage < 5.0 μA
- Flammability Rating UL 94 V−0
- Pb−Free Packages are Available

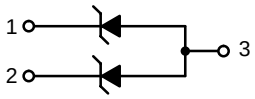
Mechanical Characteristics

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
Package designed for optimal automated board assembly
Small package size for high density applications
Available in 8 mm Tape and Reel

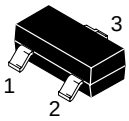
Use the Device Number to order the 7 inch/3,000 unit reel.
Replace the “T1” with “T3” in the Device Number to order the 13 inch/10,000 unit reel.

ON Semiconductor®

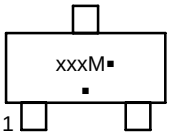
http://onsemi.com



MARKING DIAGRAM



SOT−23
CASE 318
STYLE 12



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 in the package dimensions section 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.

Preferred devices are recommended choices for future use and best overall value.

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak Power Dissipation @ 1.0 ms (Note 1) MMBZ5V6ALT1 thru MMBZ10VALT1 @ $T_L \le 25°C$ MMBZ12VALT1 thru MMBZ33VALT1	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 1.8	mW mW/°C
Thermal Resistance Junction−to−Ambient	$R_{\theta JA}$	556	°C/W
Total Power Dissipation on Alumina Substrate (Note 3) @ $T_A = 25°C$ Derate above 25°C	P_D	300 2.4	mW mW/°C
Thermal Resistance Junction−to−Ambient	$R_{\theta JA}$	417	°C/W
Junction and Storage Temperature Range	T_J, T_{stg}	− 55 to +150	°C
Lead Solder Temperature − Maximum (10 Second Duration)	T_L	260	°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. Non−repetitive current pulse per Figure 5 and derate above $T_A = 25°C$ per Figure 6.
2. FR−5 = 1.0 x 0.75 x 0.62 in.
3. Alumina = 0.4 x 0.3 x 0.024 in, 99.5% alumina.

*Other voltages may be available upon request.

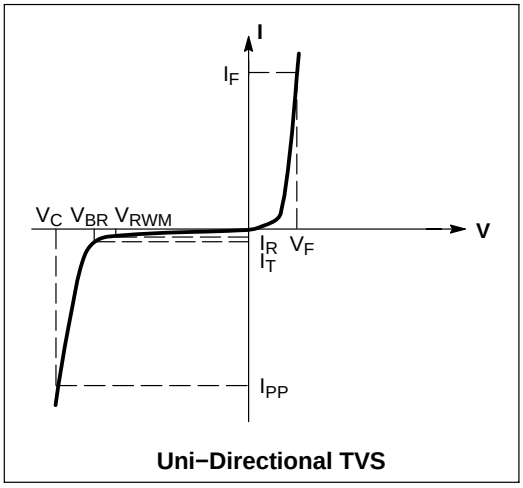
ORDERING INFORMATION

Device	Package	Shipping†
MMBZ5V6ALT1	SOT−23	3000 Tape & Reel
MMBZ5V6ALT1G	SOT−23 (Pb−Free)	3000 Tape & Reel
MMBZ5V6ALT3	SOT−23	10,000 Tape & Reel
MMBZ5V6ALT3G	SOT−23 (Pb−Free)	10,000 Tape & Reel
MMBZ6VxALT1	SOT−23	3000 Tape & Reel
MMBZ6VxALT1G	SOT−23 (Pb−Free)	3000 Tape & Reel
MMBZ6VxALT3	SOT−23	10,000 Tape & Reel
MMBZ6VxALT3G	SOT−23 (Pb−Free)	10,000 Tape & Reel
MMBZ9V1ALT1	SOT−23	3000 Tape & Reel
MMBZ9V1ALT1G	SOT−23 (Pb−Free)	3000 Tape & Reel
MMBZ9V1ALT3	SOT−23	10,000 Tape & Reel
MMBZ9V1ALT13G	SOT−23 (Pb−Free)	10,000 Tape & Reel
MMBZxxVALT1	SOT−23	3000 Tape & Reel
MMBZxxVALT1G	SOT−23 (Pb−Free)	3000 Tape & Reel
MMBZxxVALT3	SOT−23	10,000 Tape & Reel
MMBZxxVALT3G	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.

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 TVS

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) **24 WATTS**

Device	Device Marking	V_{RWM}	I_R @ V_{RWM}	Breakdown Voltage V_{BR} (Note 4) (V)			@ I_T	Max Zener Impedance (Note 5) Z_{ZT} @ I_{ZT}	Z_{ZK} @ I_{ZK}		V_C @ I_{PP} (Note 6) V_C	I_{PP}	ΘV_{BR}
		Volts	μA	Min	Nom	Max	mA	Ω	Ω	mA	V	A	mV/°C
MMBZ5V6AL	5A6	3.0	5.0	5.32	5.6	5.88	20	11	1600	0.25	8.0	3.0	1.26
MMBZ6V2AL	6A2	3.0	0.5	5.89	6.2	6.51	1.0	–	–	–	8.7	2.76	2.80
MMBZ6V8AL	6A8	4.5	0.5	6.46	6.8	7.14	1.0	–	–	–	9.6	2.5	3.4
MMBZ9V1AL	9A1	6.0	0.3	8.65	9.1	9.56	1.0	–	–	–	14	1.7	7.5
MMBZ10VAL	10A	6.5	0.3	9.50	10	10.5	1.0	–	–	–	14.2	1.7	7.5

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

Device	Device Marking	V_{RWM}	I_R @ V_{RWM}	Breakdown Voltage V_{BR} (Note 4) (V)			@ I_T	V_C @ I_{PP} (Note 6) V_C	I_{PP}	ΘV_{BR}
		Volts	nA	Min	Nom	Max	mA	V	A	mV/°C
MMBZ12VAL	12A	8.5	200	11.40	12	12.60	1.0	17	2.35	7.5
MMBZ15VAL	15A	12	50	14.25	15	15.75	1.0	21	1.9	12.3
MMBZ18VAL	18A	14.5	50	17.10	18	18.90	1.0	25	1.6	15.3
MMBZ20VAL	20A	17	50	19.00	20	21.00	1.0	28	1.4	17.2
MMBZ27VAL	27A	22	50	25.65	27	28.35	1.0	40	1.0	24.3
MMBZ33VAL	33A	26	50	31.35	33	34.65	1.0	46	0.87	30.4

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

TYPICAL CHARACTERISTICS

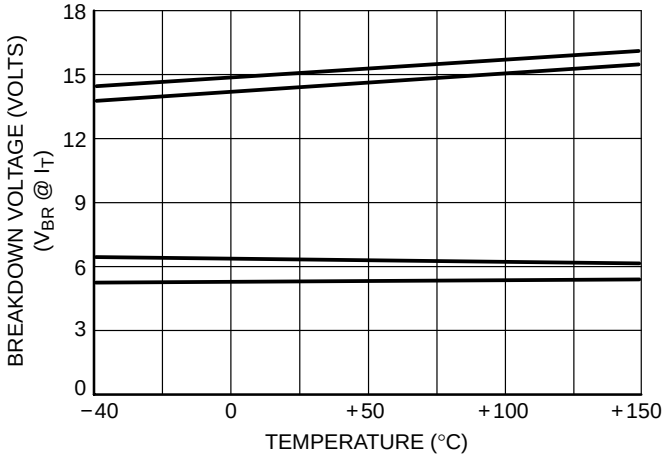


Figure 1. Typical Breakdown Voltage versus Temperature
(Upper curve for each voltage is bidirectional mode, lower curve is unidirectional mode)

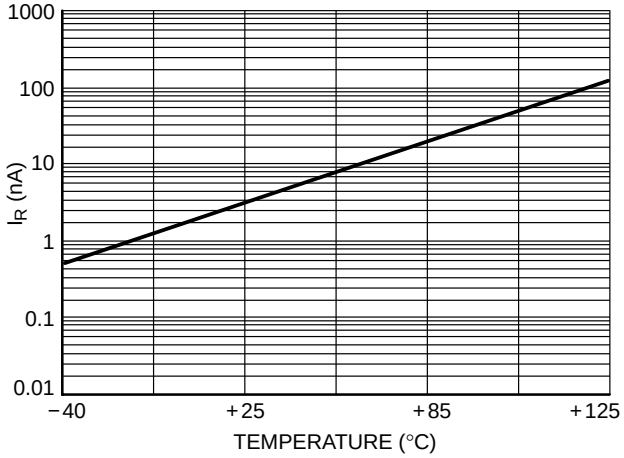


Figure 2. Typical Leakage Current versus Temperature

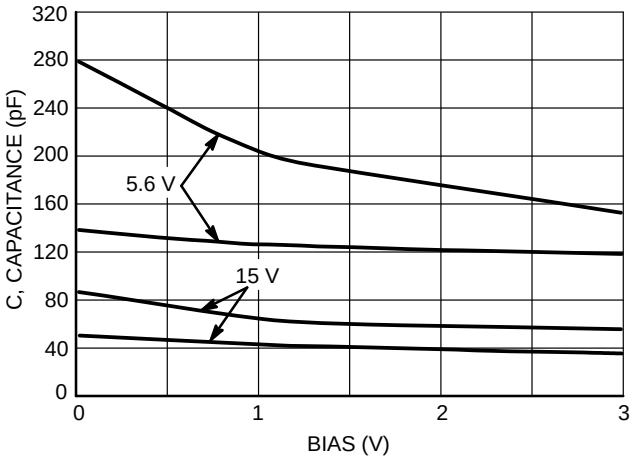


Figure 3. Typical Capacitance versus Bias Voltage
(Upper curve for each voltage is unidirectional mode, lower curve is bidirectional mode)

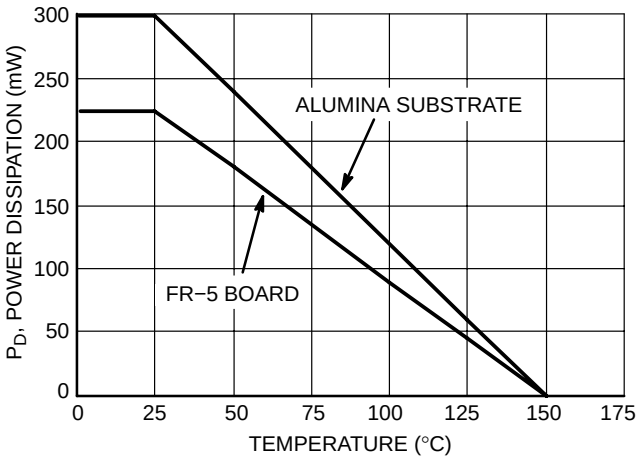


Figure 4. Steady State Power Derating Curve

TYPICAL CHARACTERISTICS

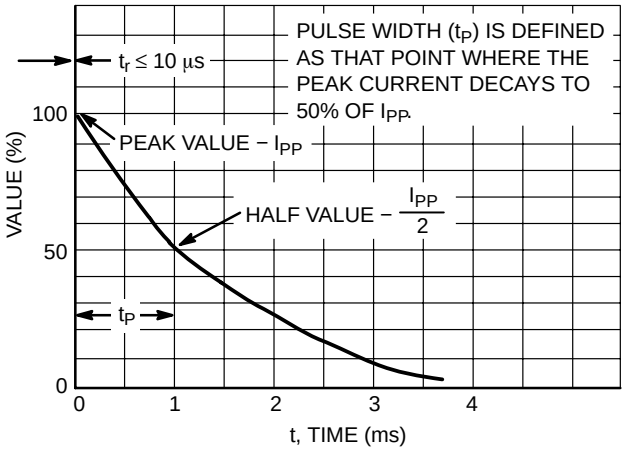


Figure 5. Pulse Waveform

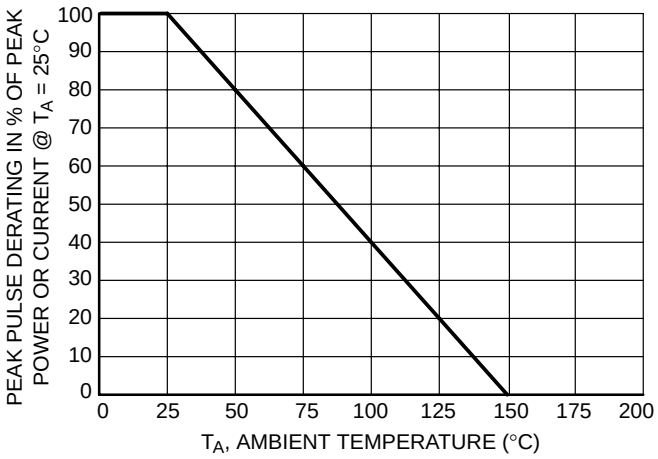


Figure 6. Pulse Derating Curve

MMBZ5V6ALT1

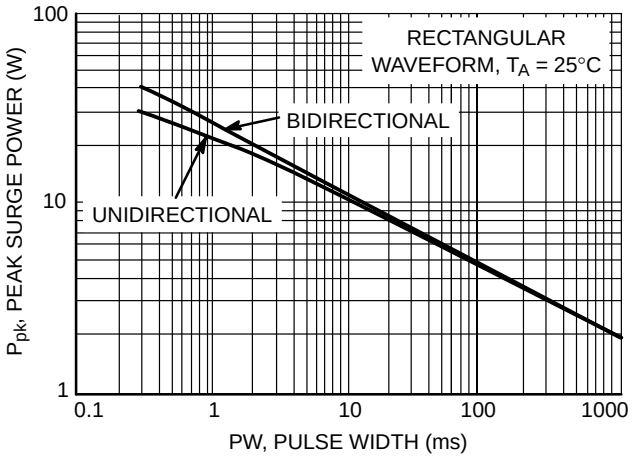


Figure 7. Maximum Non−repetitive Surge Power, P_{pk} versus PW

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

MMBZ5V6ALT1

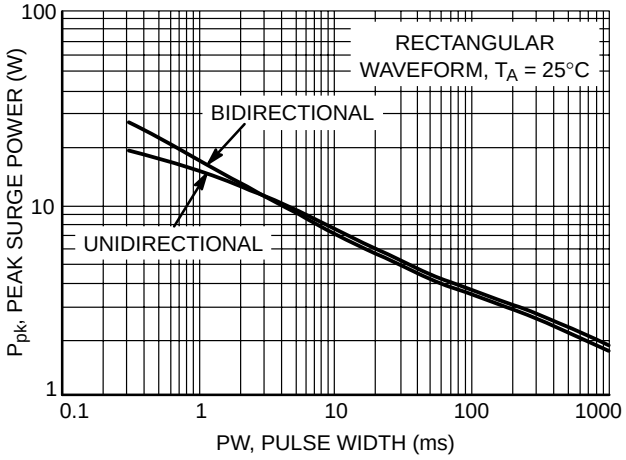


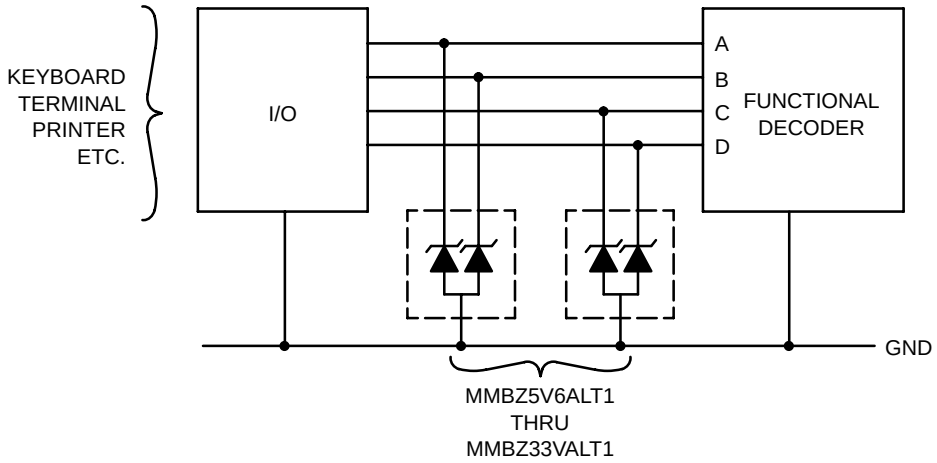
Figure 8. Maximum Non−repetitive Surge Power, P_{pk}(NOM) versus PW

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.

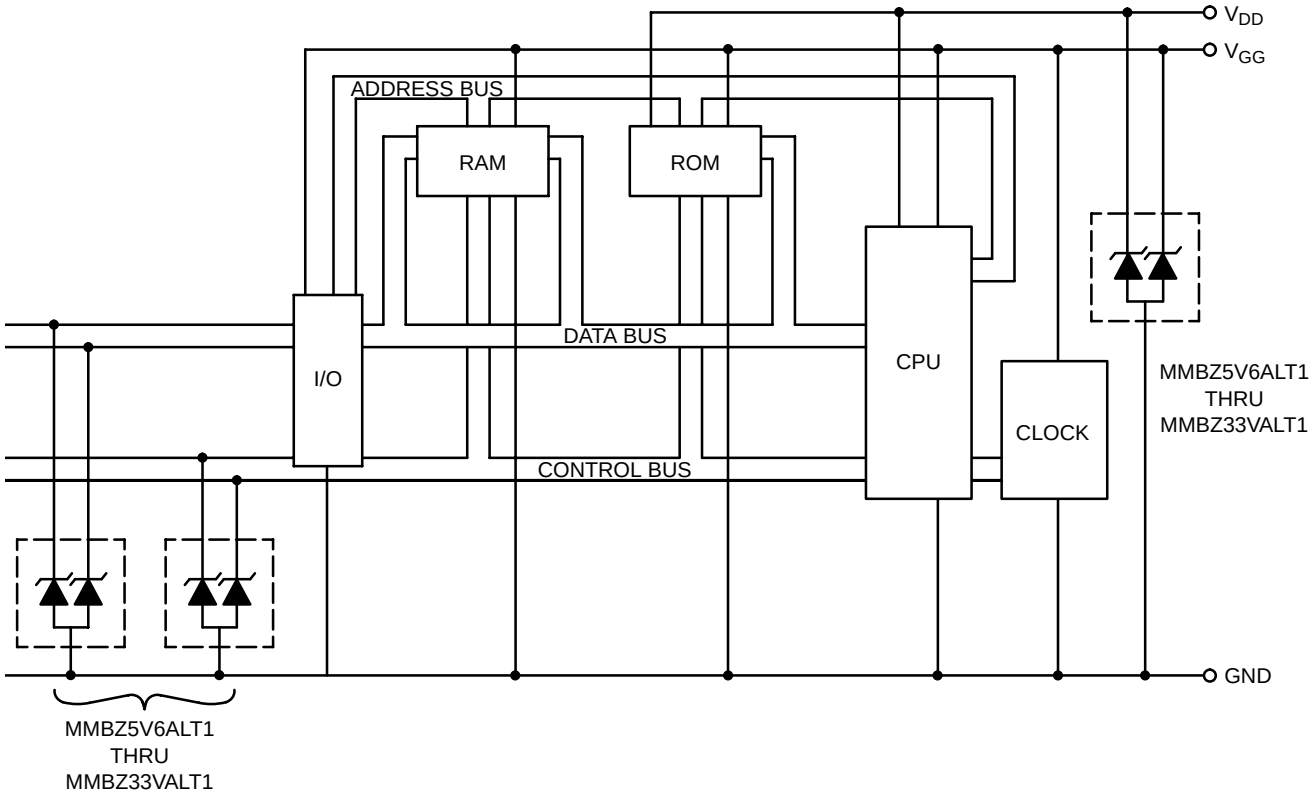
TYPICAL COMMON ANODE APPLICATIONS

A quad junction common anode design in a SOT−23 package protects four 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 TVS applications are illustrated below.

Computer Interface Protection



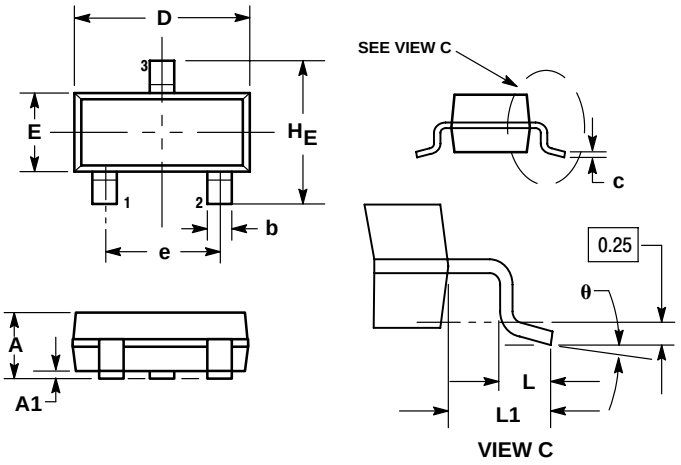
Microprocessor Protection



MMBZ5V6ALT1 Series

PACKAGE DIMENSIONS

SOT−23 (TO−236)
CASE 318−08
ISSUE AN

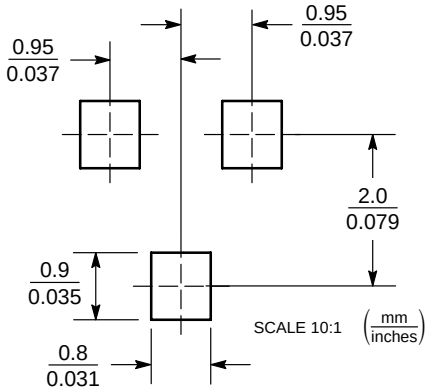


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318−01 THRU −07 AND −09 OBSOLETE, NEW STANDARD 318−08.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.040	0.044
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.37	0.44	0.50	0.015	0.018	0.020
c	0.09	0.13	0.18	0.003	0.005	0.007
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	0.081
L	0.10	0.20	0.30	0.004	0.008	0.012
L1	0.35	0.54	0.69	0.014	0.021	0.029
H_E	2.10	2.40	2.64	0.083	0.094	0.104

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

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.

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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Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5773−3850

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