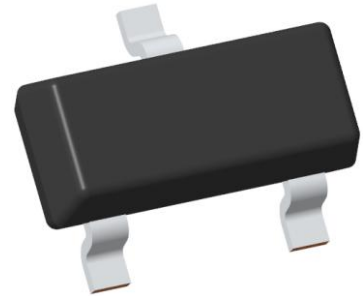


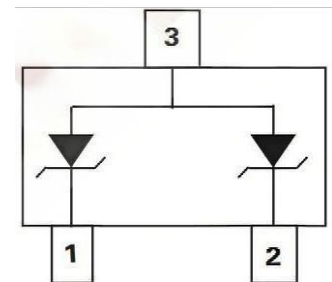
Description

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, printer, 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.



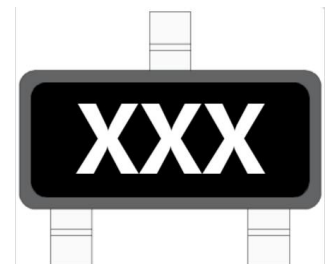
Features

- Pb-free Package are Available
- SOT-23 Package Allows Either Two Separate Unidirectional Configurations or a Single Bidirectional Configuration
- Working Peak Reverse Voltage Range 3V to 26V
- Standard Zener Breakdown Voltage Range 5.6V to 33V
- Peak Power 24 or 40 Watts @ 1.0ms(Unidirectional), per Figure 5 Waveform
- ESD Rating of Class N (exceeding 16KV) per the Human Body Model
- Maximum Clamping Voltage @ Peak Pulse Current



Mechanical Characteristics

- Package: SOT-23
- Material: Halogen free
- Quantity per reel: 3,000pcs
- Flammability Rating: UL 94V-0
- High temperature soldering guaranteed: 260°C/10s



Absolute Maximum Ratings (Ta=25°C unless otherwise noted)

Parameter	Symbols	Value	Units
Total Power Dissipation on FR-5 Board (Note 2) @ TA=25°C	PD	225	mW
Derate above 25°C		1.8	mW/°C
Thermal Resistance Junction-to-Ambient	RθJA	556	°C/W
Total Power Dissipation on Alumina Substrate (Note 3) @ TA=25°C	PD	300	mW
Derate above 25°C		2.4	mW/°C
Thermal Resistance Junction-to-Ambient	RθJA	417	°C/W
Peak Power Dissipation @ 1.0ms (Note 1) TL ≤ 25°C			
MMBZ5V6AL to MMBZ10VAL	PPK	24	W
MMBZ12VAL to MMBZ33VAL		40	
Junction and Storage temperature range	TJ, Tstg	-55-+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, Non-repetitive current pulse per Figure 5 and derate above TA=25°C per Figure 6;

2, FR-5 = 1.0 x 0.75 x 0.62 in;

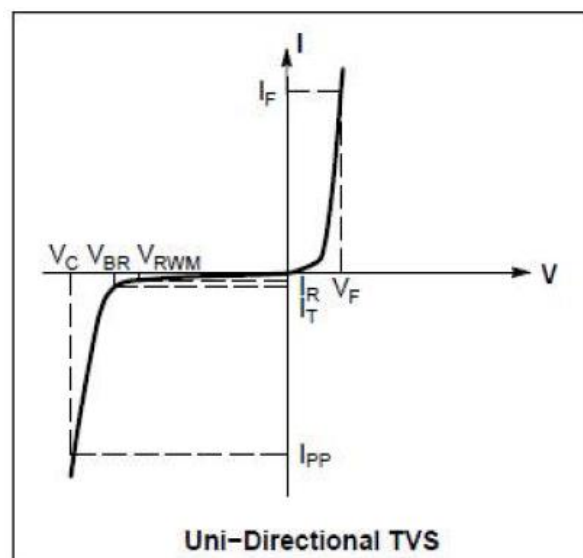
3, Alumina = 0.4 x 0.3 x 0.024 in, 99.5% alumina

* Other voltages may be available upon request.

Electrical Characteristics (Ta=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}



Device	Device Marking	V _{RWM}	I _R @ V _{RWM}	Breakdown Voltage				Max Zener Impedance(Note5)			VC@IPP(Note6)		θV _{BR}
				V _{BR} (V)(Note4)			@I _T	Z _{ZT} @I _{ZT}	Z _{ZK} @I _{ZK}		V _C	I _{PP}	
		Volts	uA	Min	Nom	Max	mA	Ω	Ω	mA	V	A	mV/°C
24WATTS													
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
40WATTS													
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	-	-	-	41	1.0	24.3
MMBZ33VAL	33A	26	50	31.35	33	34.65	1.0	-	-	-	46	0.87	30.4

4, VBR measured at pulse test current IT at an ambient temperature of 25°C

5, Zzt and Zzk are measured by dividing the AC voltage drop across the device by the AC current applied. The specified limits are for IZ(AC)=0.1 IZ(DC), with the AC frequency = 1.0kHz.

6, Surge current waveform per Figure 5 and derate Figure 6

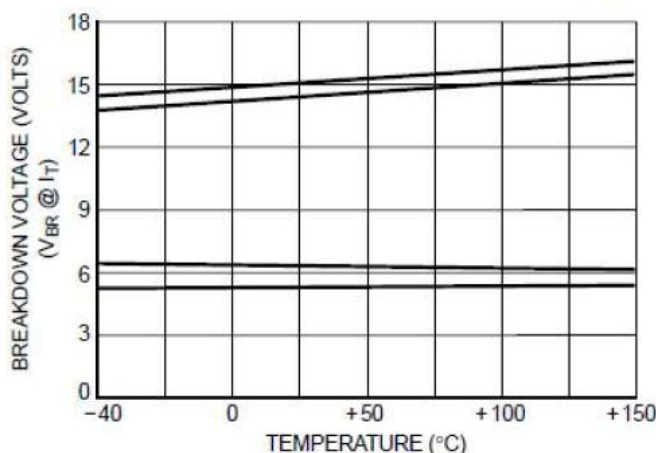
Typical Performance Characteristics (TA=25°C unless otherwise Specified)


Figure 1. Typical Breakdown Voltage versus Temperature

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

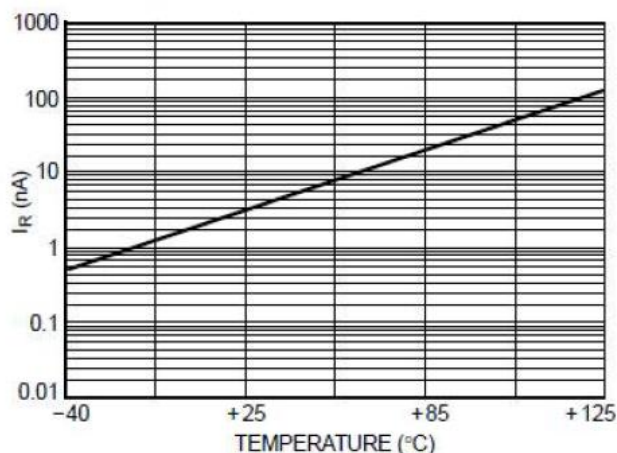


Figure 2. Typical Leakage Current versus Temperature

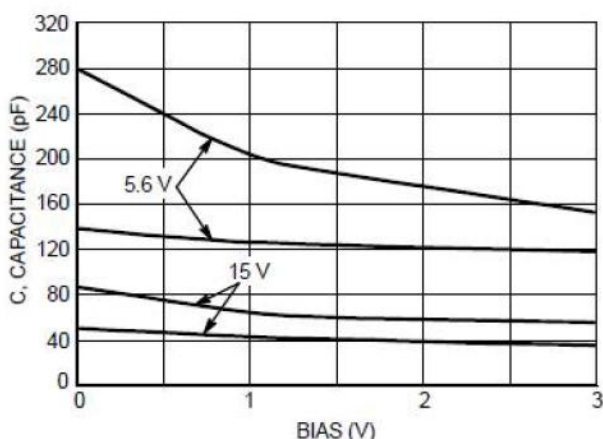


Figure 3. Typical Capacitance versus Bias Voltage

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

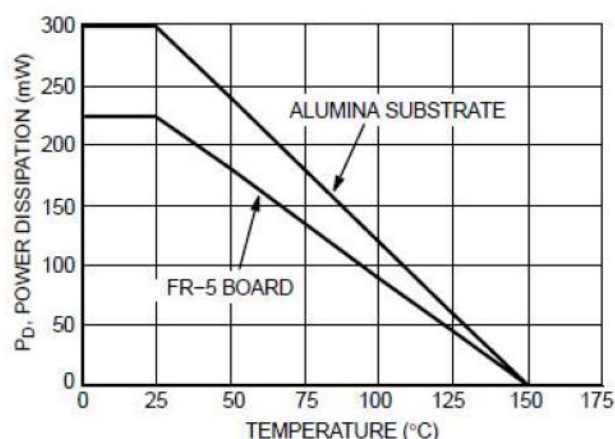


Figure 4. Steady State Power Derating Curve

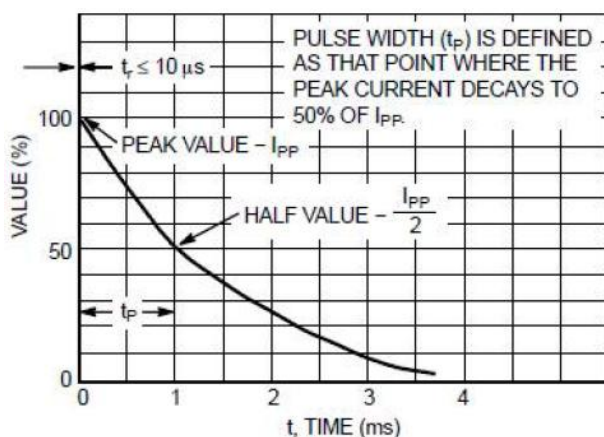


Figure 5. Pulse Waveform

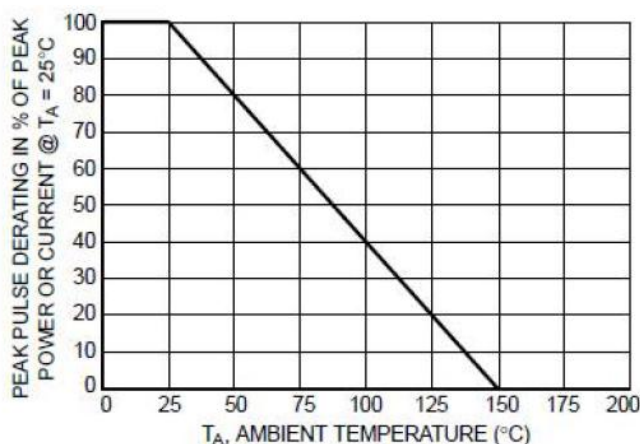


Figure 6. Pulse Derating Curve

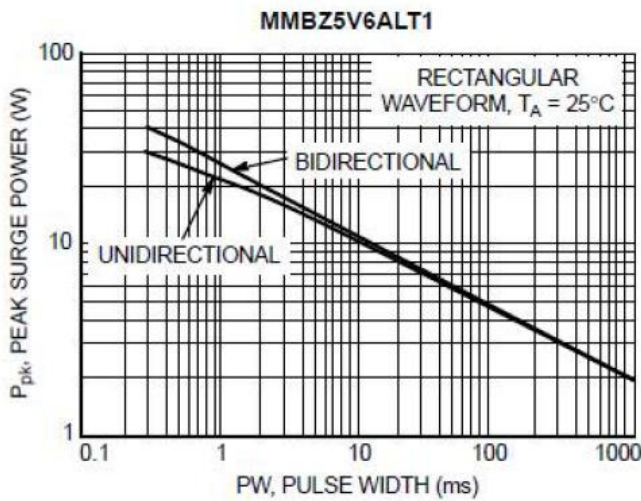


Figure 7. Maximum Non-repetitive Surge Power, P_{pk} versus PW

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

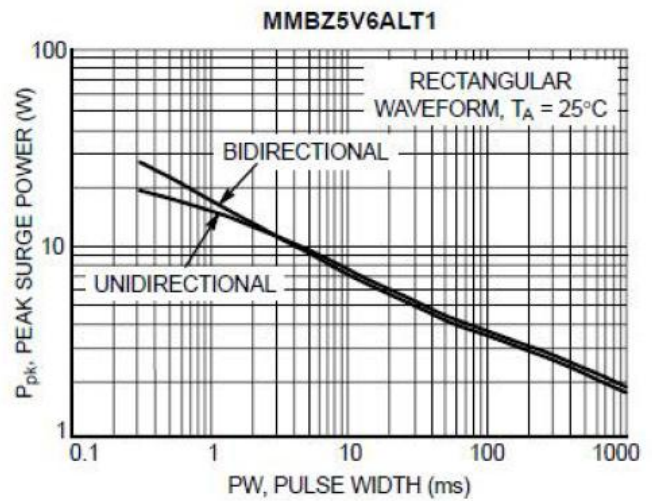
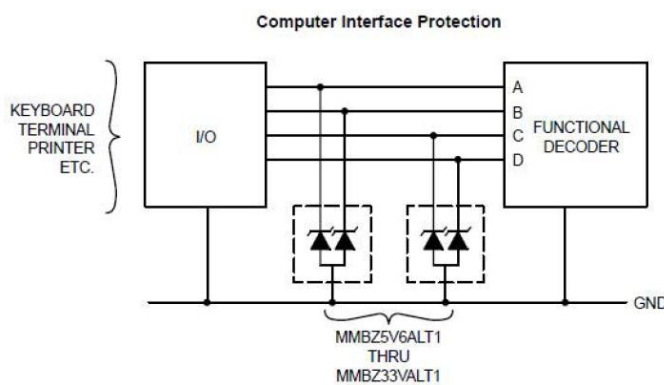
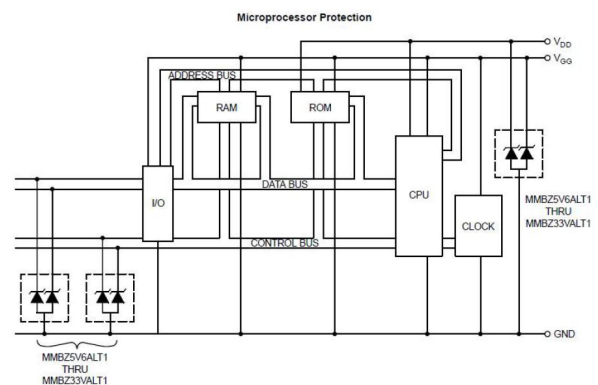


Figure 8. Maximum Non-repetitive Surge Power, $P_{pk(NOM)}$ versus PW

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

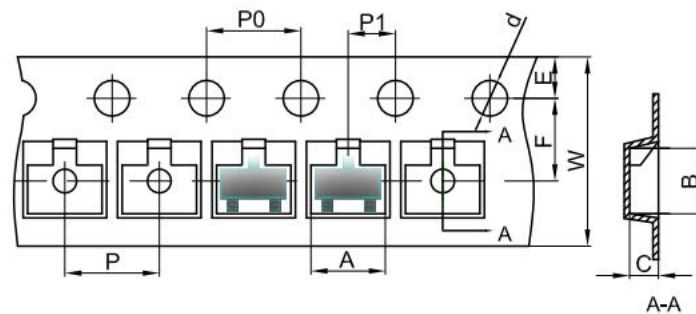
Typical Common Anode Applications

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.



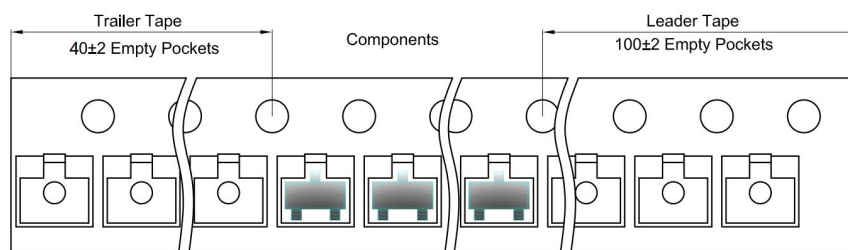
Package Information

Carrier Dimension(mm)

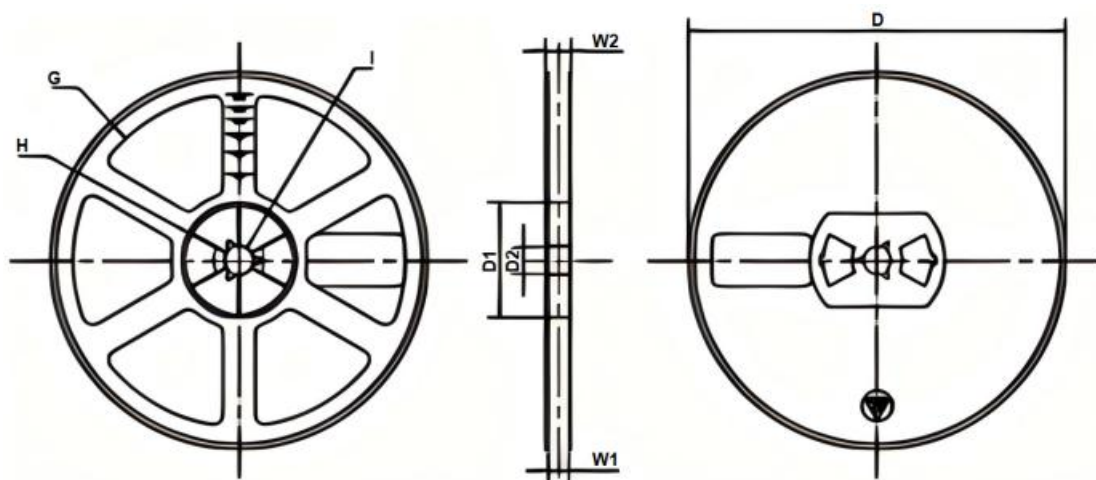


Dimensions are in millimeter

Pkg Type	A0	A1	B0	B1	K0	D0	D1	E	F	P0	P1	P2	10*P0	W	T
SOT-23	3.15	1.09	2.77	2.15	1.22	1.55	1.00	1.75	3.50	4.00	4.00	2.00	40.00	8.00	0.20
(Tolerance)	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.2	±0.1	±0.03



Reel Dimension(mm)



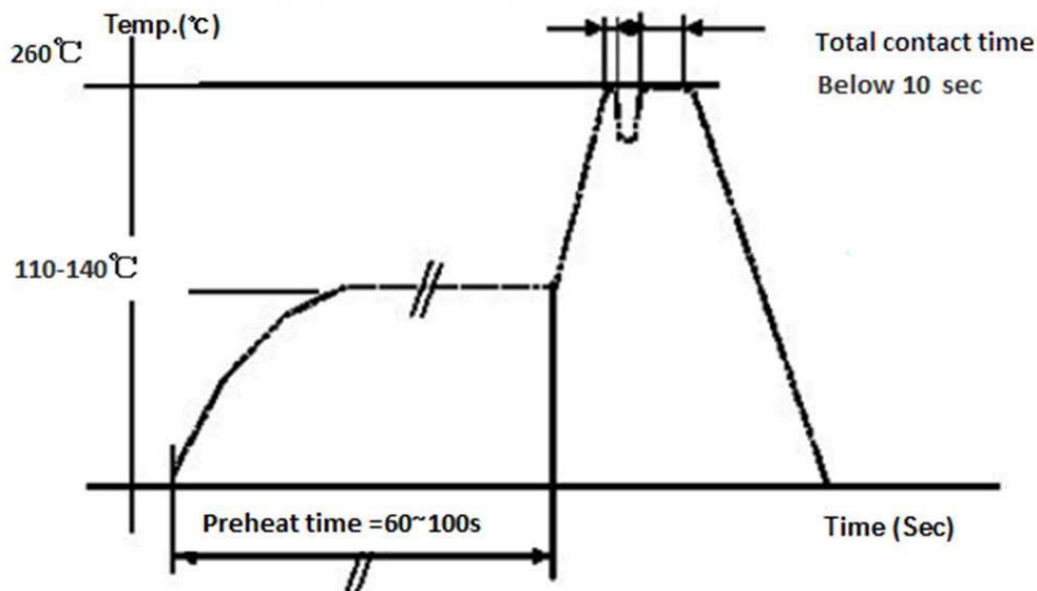
Reel Option	D	D1	D2	G	H	I	W1	W2
7"Dia	Φ178.00	54.40	13.00	R78.00	R25.60	R6.50	9.50	12.30
Tolerance	±2	±1	±1	±1	±1	±1	±1	±1

Package Specifications

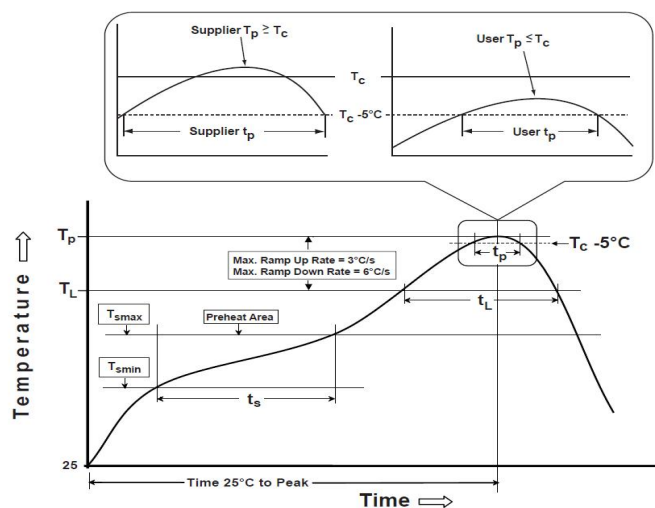
Package	Reel Size	Reel DIA. (mm)	Q'TY/Reel (Kpcs)	Box Size (mm)	QTY/Box (Kpcs)	Carton Size (mm)	Q'TY/Carton (Kpcs)
SOT23	7'	178	3	210*208*203	45	440*400*230	180

Recommended Soldering Profile for Rectifier Diodes (Pb Free)

a) Wave Soldering Profile



b) Reflow Soldering Profile (Pb Free Application), refer to IPC/JEDEC J-STD-020

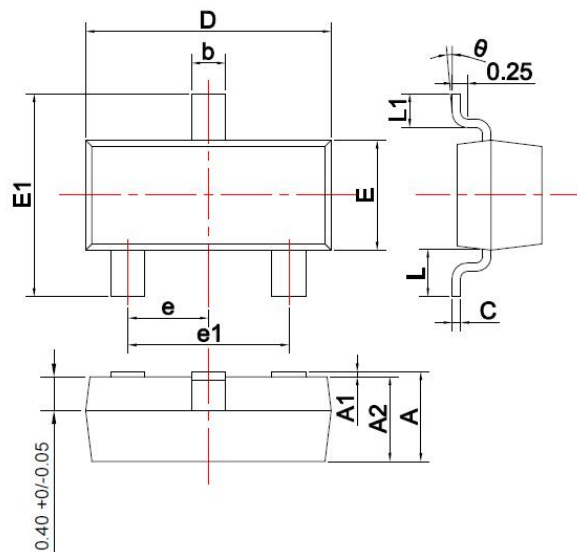


Preheat/Soak Temperature Min (T _{min}) Temperature Max (T _{max}) Time (ts) from (T _{min} to T _{max})	50 °C 200 °C 60-120 seconds
Melting Point of Solder (Sn Ag Cu)	217°C
Ramp-up Rate to 217°C (Melting Point of Solder)	3°C/sec
Time at Temp. > 217°C (Melting Point of Solder)	60~150 Sec
Peak Temperature	255±5°C
Time within 5°C below Peak Temp.	20~40 Sec
Cooling Rate	6°C/sec (max)
Time from 25°C to Peak Temp.	8min (max)

c) Manual Soldering

When using an electric soldering iron for manual soldering, it is recommended that the temperature does not exceed 300°C and the soldering time is less than 10 seconds.

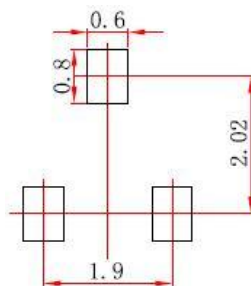
Package Mechanical Data



SYMBOL	DIMENSIONS	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
θ	0°	8°

Unit: mm

Suggested Pad Layout



Note:

1. Controlling dimension: In millimeters.
2. General tolerance: $\pm 0.05\text{mm}$.
3. The pad layout is for reference purposes only.

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