24W AND 40W PEAK POWER DUAL SURFACE MOUNT TVS

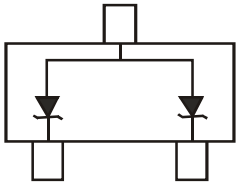
Features

- Dual TVS in Common Anode Configuration
- 24W/40W Peak Power Dissipation Rating @ 1.0ms (Unidirectional)
- 225mW Power Dissipation
- Ideally Suited for Automated Insertion
- Low Leakage
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Mechanical Data

- Case: SOT23
- Case Material: Molded Plastic "Green" Molding Compound. UL Flammability Classification 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Solderable per MIL-STD-202, Method 208 e3
- Polarity: See Diagram
- Lead Free Plating (Matte Tin Finish annealed over Alloy 42 leadframe).
- ESD Rating Exceeding 16kV per the Human Body Model (Note 8)
- Marking Information: See Below
- Ordering Information: See Below
- Weight: 0.008 grams (approximate)

Top View



Device Schematic

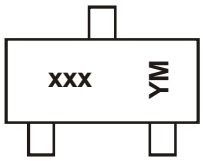
Ordering Information (Note 4)

Part Number	Qualification	Case	Packaging
(Type Number)-7*-F	Commercial	SOT23	3000/Tape & Reel
(Type Number)Q-7*-F	Automotive	SOT23	3000/Tape & Reel

* Example: 5.6V type = MMBZ5V6AL-7-F.

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. For packaging details, go to our website at http://www.diodes.com.

Marking Information



xxx = Product type marking code,
See Electrical Characteristics Table, Pages 2
YM = Date Code Marking
Y = Year (ex: A = 2013)
M = Month (ex: 9 = September)

Date Code Key

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Code	T	U	V	W	X	Y	Z	A	B	C	D	E	F

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Peak Power Dissipation	MMBZ5V6AL - MMBZ10VAL	(Note 6)	P_{pk}	24	W
Peak Power Dissipation	MMBZ15VAL - MMBZ33VAL	(Note 6)	P_{pk}	40	W

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Power Dissipation	(Note 5)	P_D	225	mW
Thermal Resistance, Junction to Ambient Air	(Note 5)	$R_{\theta JA}$	556	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-65 to +150	°C

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

24 Watt (V_F = 0.9V max @ I_F = 10mA)

Type Number	Marking Code	V_{RWM}	Max Reverse Current, I_R @ V_{RWM} (Note 7)	Breakdown Voltage				Max. Clamping Voltage, V_C @ I_{PP} (Note 6)		Typical Temperature Coefficient of Reverse Voltage
				V_{BR} (Note 7) (V)			@ I_T	V_C	I_{PP}	
		Volts	µA	Min	Nom	Max	mA	V	A	TC (mV/°C)
MMBZ5V6AL	K9A	3	5.0	5.32	5.6	5.88	20	8.0	3.0	1.8

24 Watt (V_F = 0.9V max @ I_F = 10mA)

Type Number	Marking Code	V_{RWM}	Max Reverse Current, I_R @ V_{RWM} (Note 7)	Breakdown Voltage				Max. Clamping Voltage, V_C @ I_{PP} (Note 6)		Typical Temperature Coefficient of Reverse Voltage
				V_{BR} (Note 7) (V)			@ I_T	V_C	I_{PP}	
		Volts	µA	Min	Nom	Max	mA	V	A	TC (%/°C)
MMBZ6V2AL	K9B	3.0	0.5	5.89	6.2	6.51	1.0	8.7	2.76	+0.04
MMBZ6V8AL	K9C	4.5	0.5	6.46	6.8	7.14	1.0	9.6	2.5	+0.045
MMBZ9V1AL	K9D	6.0	0.3	8.65	9.1	9.56	1.0	14	1.7	+0.065
MMBZ10VAL	K9E	6.5	0.3	9.50	10	10.5	1.0	14.2	1.7	+0.065

40 Watt (V_F = 0.9V max @ I_F = 10mA)

Type Number	Marking Code	V_{RWM}	Max. Reverse Current, I_R @ V_{RWM} (Note 7)	Breakdown Voltage				Max. Clamping Voltage, V_C @ I_{PP} (Note 6)		Typical Temperature Coefficient of Reverse Voltage
				V_{BR} (Note 7) (V)			@ I_T	V_C	I_{PP}	
		Volts	nA	Min	Nom	Max	mA	V	A	TC (%/°C)
MMBZ15VAL	K9K	12	50	14.25	15	15.75	1.0	21	1.9	+0.080
MMBZ18VAL	K9L	14.5	50	17.10	18	18.90	1.0	25	1.6	+0.090
MMBZ20VAL	K9N	17	50	19.00	20	21.00	1.0	28	1.4	+0.090
MMBZ27VAL	K9Q	22	50	25.65	27	28.35	1.0	40	1.0	+0.090
MMBZ33VAL	K9T	26	50	31.35	33	34.65	1.0	46	0.87	+0.090

Notes:
5. Device mounted on FR-4 PCB pad layout (2oz copper) as shown on Diodes, Inc. suggested pad layout AP02001, which can be found on our website at http://www.diodes.com.
6. Non-repetitive current pulse per Figure 2 and derate above T_A = +25°C per Figure 2.
7. Short duration pulse test used to minimize self-heating effect.
8. MMBZ5V6AL and MMBZ15VAL exceed 16kV ESD rating, all other voltages exceed 8kV ESD rating.

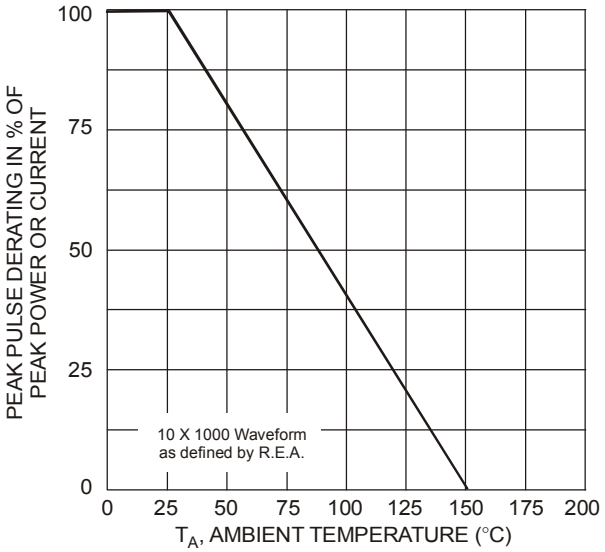


Fig. 1 Pulse Derating Curve

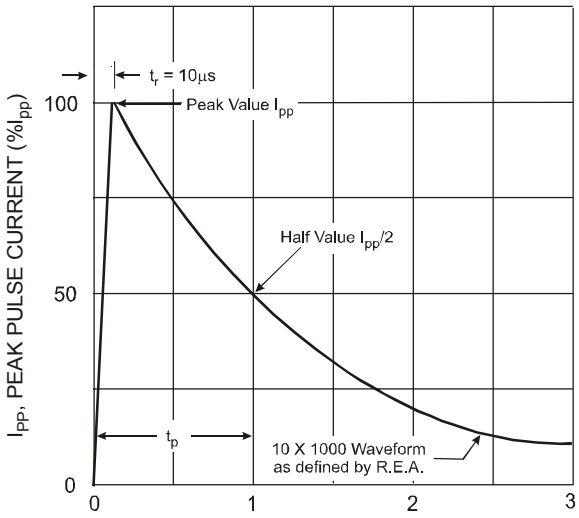


Fig. 2 Pulse Waveform

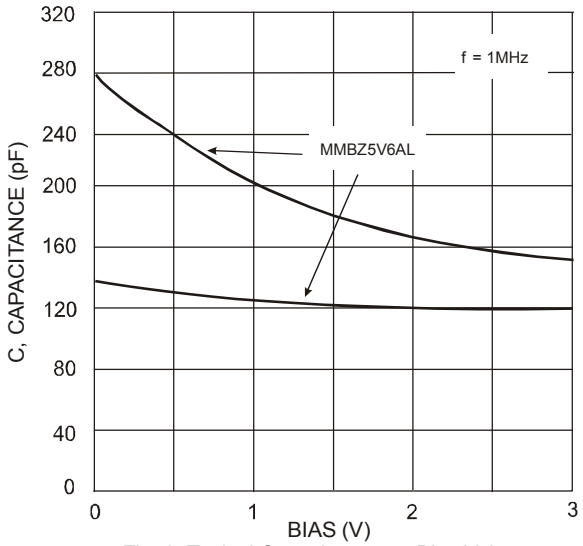


Fig. 3 Typical Capacitance vs. Bias Voltage
(Lower curve is Bidirectional mode,
Upper curve is Unidirectional mode)

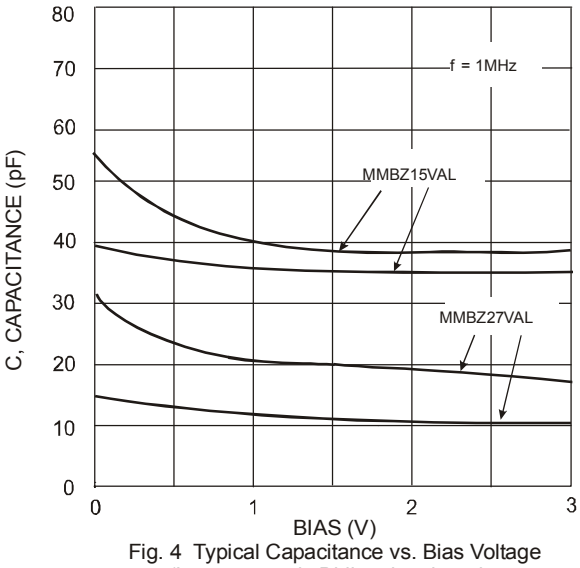


Fig. 4 Typical Capacitance vs. Bias Voltage
(Lower curve is Bidirectional mode,
Upper curve is Unidirectional mode)

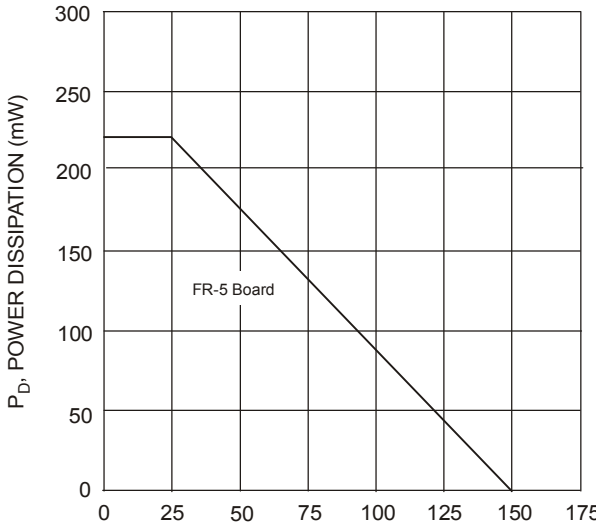


Fig. 5 Steady State Power Derating Curve

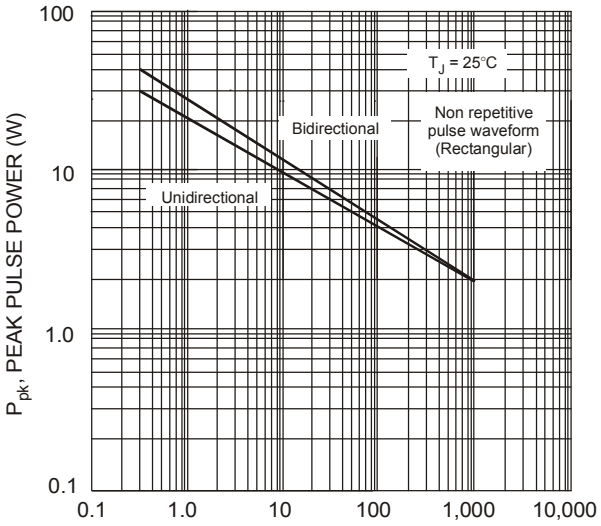


Fig. 6 Pulse Rating Curve,
P_{pk} (W) vs. Pulse Width (ms)

Power is defined as $P_{pk} = V_C \times I_{pp}$

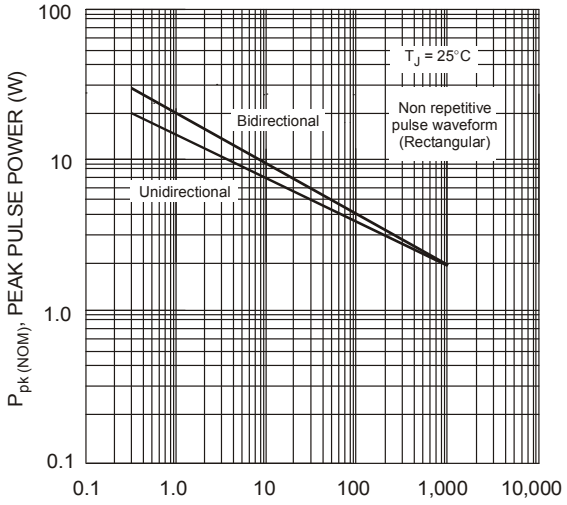
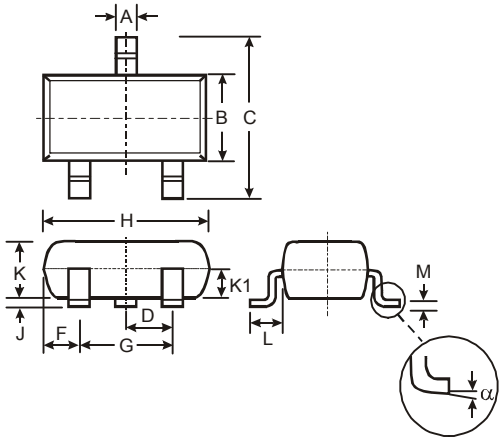


Fig. 7 Pulse Rating Curve,
$P_{pk\ (NOM)}$ (W) vs. Pulse Width (ms)

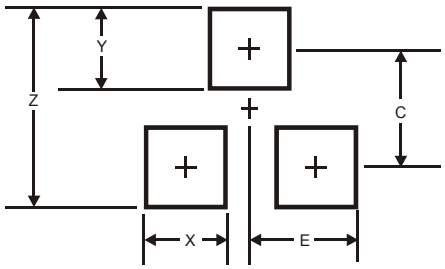
Power is defined as $P_{pk(NOM)} = V_{BR(NOM)} \times I_{pp}$
where $V_{BR(NOM)}$ is the nominal reverse breakdown voltage
measured at the low test current used
for voltage classification

Package Outline Dimensions



SOT23			
Dim	**Min**	**Max**	**Typ**
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.903	1.10	1.00
K1	-	-	0.400
L	0.45	0.61	0.55
M	0.085	0.18	0.11
α	0°	8°	-
All Dimensions in mm			

Suggested Pad Layout



Dimensions	Value (in mm)
Z	2.9
X	0.8
Y	0.9
C	2.0
E	1.35

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