**24W AND 40W PEAK POWER DUAL SURFACE MOUNT TVS**

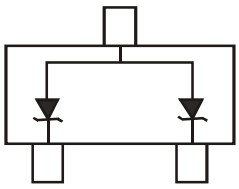
## Features

- Dual TVS in Common Anode Configuration
- 24W/40W Peak Power Dissipation Rating @ 1.0ms (Unidirectional)
- 225 mW Power Dissipation
- Ideally Suited for Automated Insertion
- Low Leakage
- **Lead, Halogen, and Antimony Free/RoHS Compliant (Note 5)**
- **"Green" Device (Note 6)**

## Mechanical Data

- Case: SOT-23
- 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
- Polarity: See Diagram
- Lead Free Plating (Matte Tin Finish annealed over Alloy 42 leadframe).
- ESD Rating Exceeding 16kV per the Human Body Model (Note 4)
- Marking Information: See Page 4
- Ordering Information: See Page 4
- Weight: 0.008 grams (approximate)

Top View



Device Schematic

## Maximum Ratings @$T_A$ = 25℃ unless otherwise specified

| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Peak Power Dissipation | MMBZ5V6AL - MMBZ10VAL | (Note 2) | $P_{pk}$ | 24 | W |
| Peak Power Dissipation | MMBZ15VAL - MMBZ33VAL | (Note 2) | $P_{pk}$ | 40 | W |

## Thermal Characteristics

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Power Dissipation | (Note 1) | $P_D$ | 225 | mW |
| Thermal Resistance, Junction to Ambient Air | (Note 1) | $R_{\theta JA}$ | 556 | ℃/W |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | –65 to +150 | ℃ |

## Electrical Characteristics @$T_A$ = 25℃ unless otherwise specified

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

| Type Number | Marking Code | $V_{RWM}$ | $I_R$ @ $V_{RWM}$ (Note 3) | Breakdown Voltage | | | | $V_C$ @ $I_{PP}$ (Note 2) | | Typical Temperature Coefficient |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | $V_{BR}$ (Note 3) (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 | $V_{RWM}$ | $I_R$ @ $V_{RWM}$ (Note 3) | Breakdown Voltage | | | | $V_C$ @ $I_{PP}$ (Note 2) | | Typical Temperature Coefficient |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | $V_{BR}$ (Note 3) (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 |

Notes:
1. Device mounted on FR-5 PCB 1.0 x 0.75 x 0.062 inch pad layout as shown on Diodes Inc. suggested pad layout AP02001, which can be found on our website at http://www.diodes.com/datasheets/ap02001.pdf. 200mW per element must not be exceeded.
2. Non-repetitive current pulse per Figure 2 and derate above $T_A$ = 25℃ per Figure 1.
3. Short duration pulse test used to minimize self-heating effect.
4. MMBZ5V6AL and MMBZ15VAL exceed 16kV ESD rating, all other voltages exceed 8kV ESD rating.
5. No purposefully added lead. Halogen and Antimony Free.
6. Product manufactured with Data Code V9 (week 33, 2008) and newer are built with Green Molding Compound. Product manufactured prior to Date Code V9 are built with Non-Green Molding Compound and may contain Halogens or $Sb_2O_3$ Fire Retardants.

## Electrical Characteristics (Continued) @$T_A$ = 25°C unless otherwise specified

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

| Type Number | Marking Code | $V_{RWM}$ | $I_R$ @ $V_{RWM}$ (Note 3) | Breakdown Voltage | | | | $V_C$ @ $I_{PP}$ (Note 2) | | Typical Temperature Coefficient |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | $V_{BR}$ (Note 3) (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 |

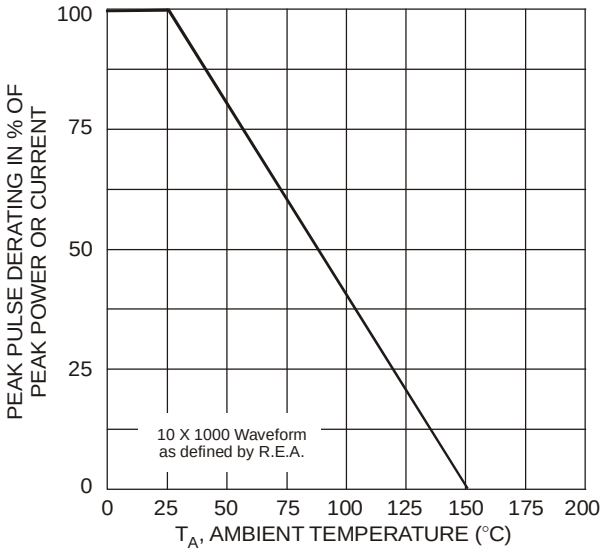



Fig. 1 Pulse Derating Curve

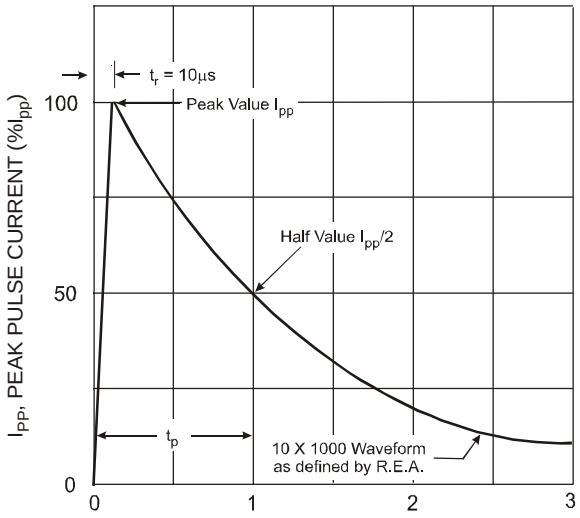



Fig. 2 Pulse Waveform

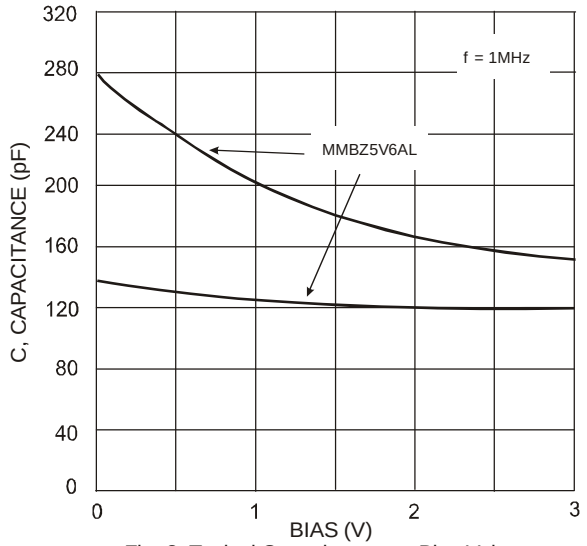



Fig. 3 Typical Capacitance vs. Bias Voltage
(Lower curve is Bidirectional mode,
Upper curve is Unidirectional mode)

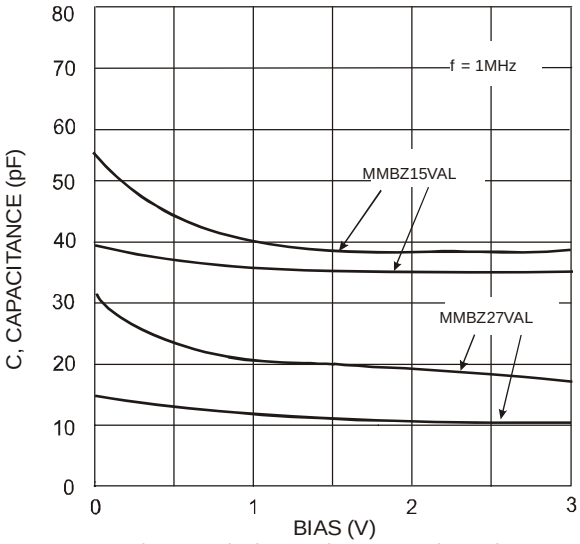



Fig. 4 Typical Capacitance vs. Bias Voltage
(Lower curve is Bidirectional mode,
Upper curve is Unidirectional mode)

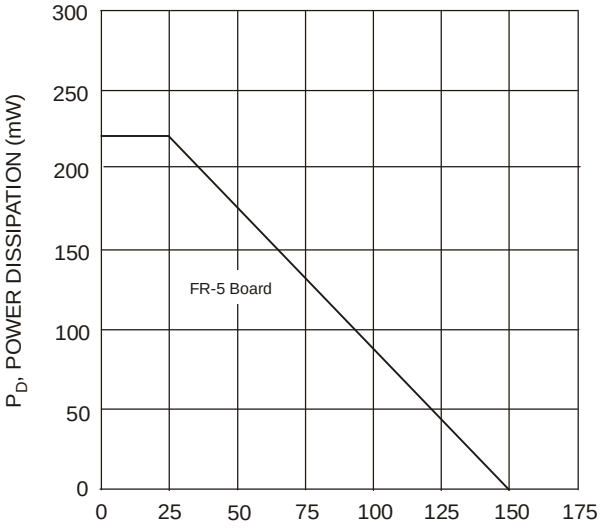



Fig. 5 Steady State Power Derating Curve

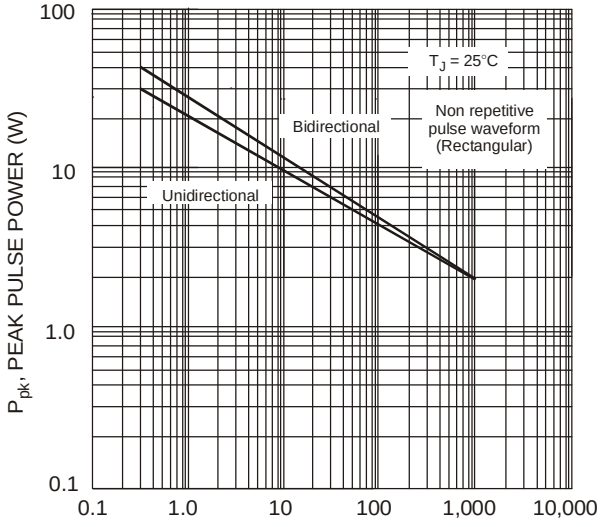



Fig. 6 Pulse Rating Curve,
$P_{pk}$ (W) vs. Pulse Width (ms)

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

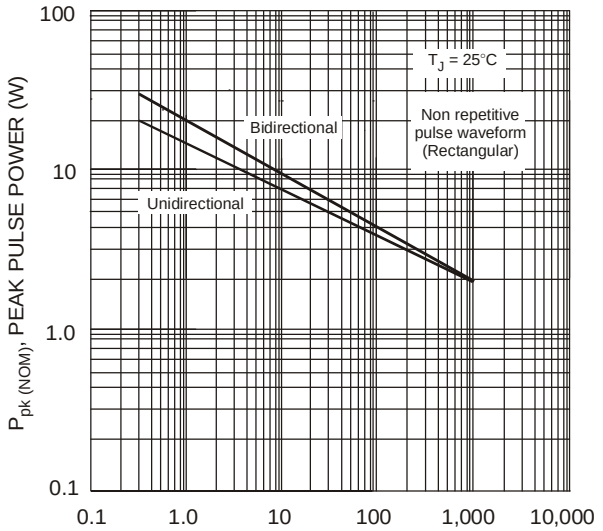



Fig. 7 Pulse Rating Curve,
$P_{pk\ (NOM)}$ (W) vs. Pulse Width (ms)

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

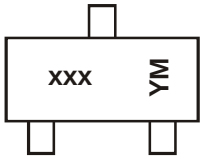
## Ordering Information (Note 7)

| Part Number | Case | Packaging |
|---|---|---|
| (Type Number)-7*-F | SOT-23 | 3000/Tape & Reel |

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

Notes: 7. For packaging details, go to our website at http://www.diodes.com/datasheets/ap02007.pdf.

## Marking Information



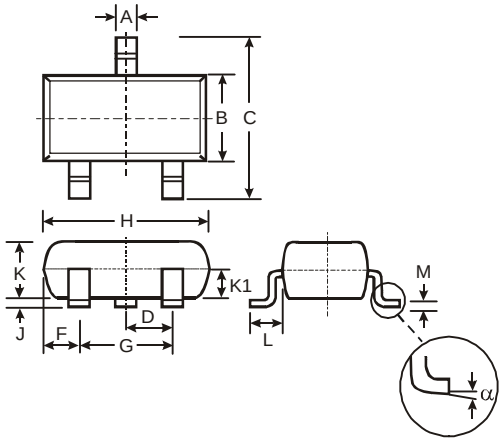

xxx = Product type marking code,
See Electrical Characteristics Table, Pages 1 & 2
YM = Date Code Marking
Y = Year (ex: T = 2006)
M = Month (ex: 9 = September)

Date Code Key

| Year | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| Code | T | U | V | W | X | Y | Z | A | B | C |

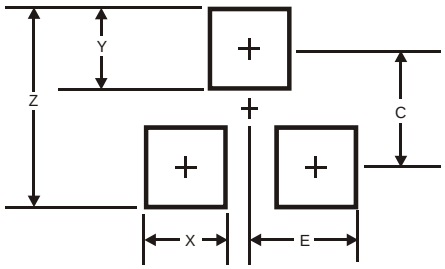
| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | O | N | D |

## Package Outline Dimensions




| SOT-23 | | | |
|---|---|---|---|
| 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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