

Features

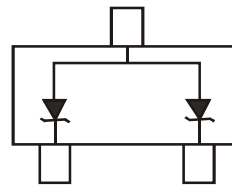
- Dual TVS in Common Anode Configuration
- 24W/40W Peak Power Dissipation Rating @ 1.0ms (Unidirectional)
- 225mW Power Dissipation
- Ideally Suited for Automated Insertion
- Low Leakage
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **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 9)
- Marking Information: See Below
- Ordering Information: See Below
- Weight: 0.008 grams (Approximate)



Top View



Device Schematic

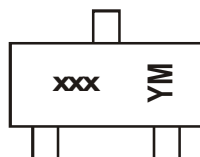
Ordering Information (Note 5)

| Part Number | Qualification | Case | Packaging |
|------------------------------|---------------|-------|--------------------|
| (Type Number)-7*-F | Commercial | SOT23 | 3,000/Tape & Reel |
| (Type Number)Q-7*-F (Note 4) | Automotive | SOT23 | 3,000/Tape & Reel |
| MMBZ27VALQ-13-F (Note 4) | Automotive | SOT23 | 10,000/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. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to <https://www.diodes.com/quality/product-compliance-definitions/>.
 5. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

Marking Information



xxx = Product type marking code,
See Electrical Characteristics Table, Pages 2
YM = Date Code Marking
Y = Year (ex: F = 2018)
M = Month (ex: 9 = September)

Date Code Key

| Year | 2006 | 2007 | 2008 | 2009 | | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|------|------|------|------|------|-------|------|------|------|------|------|------|------|------|
| Code | T | U | V | W | | F | G | H | I | J | K | L | M |

| 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 7) | P _{PK} | 24 | W |
| Peak Power Dissipation: MMBZ15VAL - MMBZ33VAL (Note 7) | P _{PK} | 40 | W |

Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|--|-----------------------------------|-------------|------|
| Power Dissipation (Note 6) | P _D | 225 | mW |
| Thermal Resistance, Junction to Ambient Air (Note 6) | R _{θJA} | 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 8) | Breakdown Voltage | | | @ I _T | Max. Clamping Voltage, V _C @ I _{PP} (Note 7) | | Typical Temperature Coefficient of Reverse Voltage T _C (mV/°C) |
|-------------|--------------|------------------|---|------------------------------|-----|------|------------------|--|-----------------|--|
| | | | | V _{BR} (Note 8) (V) | | | | V _C | I _{PP} | |
| | | | | Volts | μA | Min | | Nom | Max | |
| 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 8) | Breakdown Voltage | | | @ I _T | Max. Clamping Voltage, V _C @ I _{PP} (Note 7) | | Typical Temperature Coefficient of Reverse Voltage T _C (%/°C) |
|-------------|--------------|------------------|---|------------------------------|-----|------|------------------|--|-----------------|---|
| | | | | V _{BR} (Note 8) (V) | | | | V _C | I _{PP} | |
| | | | | Volts | μA | Min | | Nom | Max | |
| 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 8) | Breakdown Voltage | | | @ I _T | Max. Clamping Voltage, V _C @ I _{PP} (Note 7) | | Typical Temperature Coefficient of Reverse Voltage T _C (%/°C) |
|-------------|--------------|------------------|--|------------------------------|----|-------|------------------|--|-----------------|---|
| | | | | V _{BR} (Note 8) (V) | | | | V _C | I _{PP} | |
| | | | | Volts | nA | Min | | Nom | Max | |
| 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: 6. Device mounted on FR-4 PCB pad layout (2oz copper) as shown on Diodes website at <http://www.diodes.com/package-outlines.html>.

7. Non-repetitive current pulse per Figure 2 and derate above T_A = +25°C per Figure 2.

8. Short duration pulse test used to minimize self-heating effect.

9. MMBZ5V6AL and MMBZ15VAL exceed 16kV ESD rating, all other voltages exceed 8kV ESD rating.

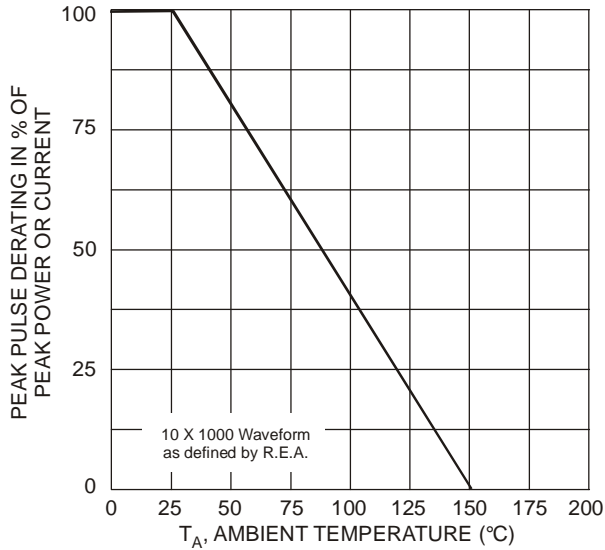


Fig. 1 Pulse Derating Curve

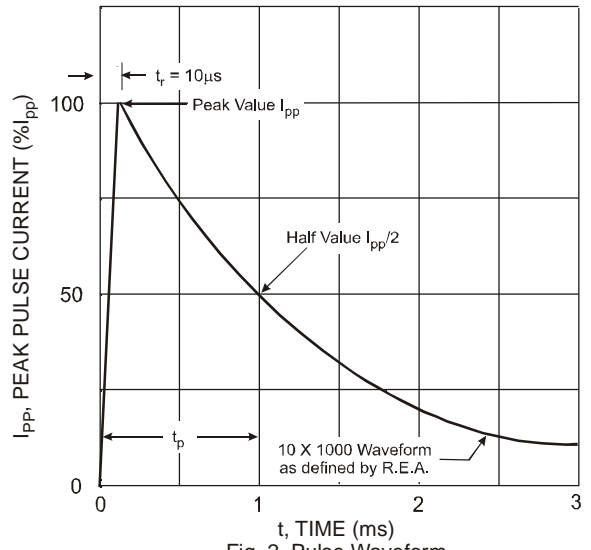


Fig. 2 Pulse Waveform

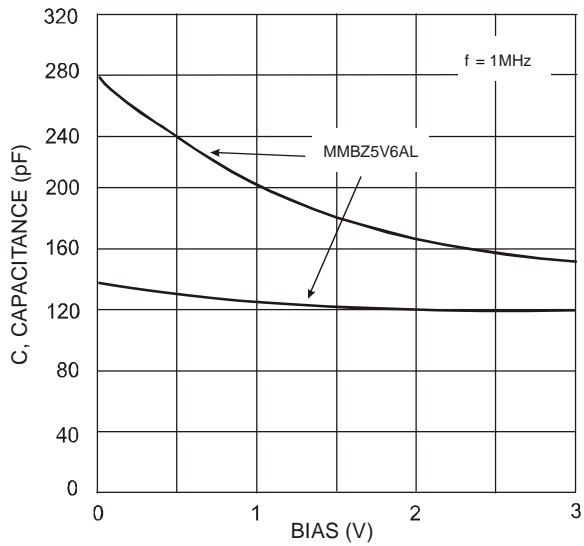


Fig. 3 Typical Capacitance vs. Bias Voltage
(Lower curve is Bidirectional mode,
Upper curve is Unidirectional mode)

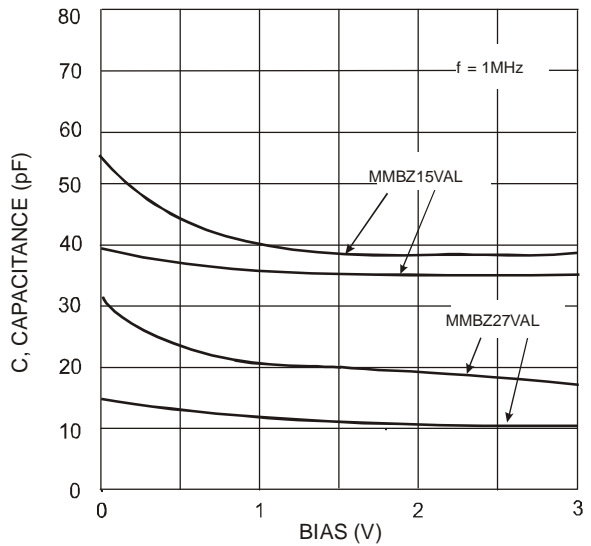


Fig. 4 Typical Capacitance vs. Bias Voltage
(Lower curve is Bidirectional mode,
Upper curve is Unidirectional mode)

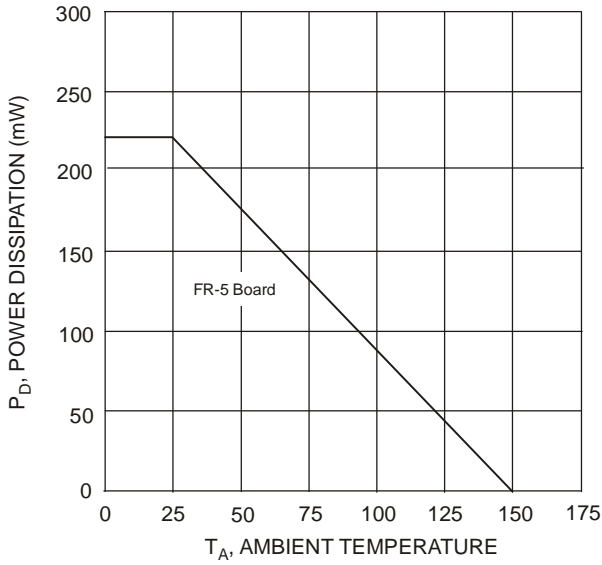


Fig. 5 Steady State Power Derating Curve

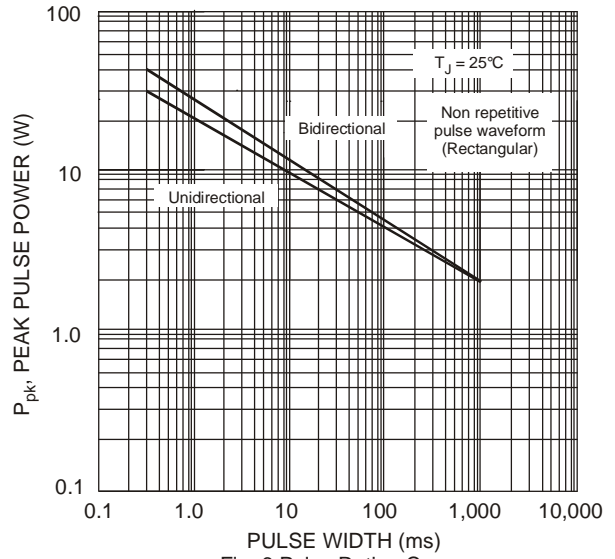


Fig. 6 Pulse Rating Curve, P_{pk} (W) vs. Pulse Width (ms)

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

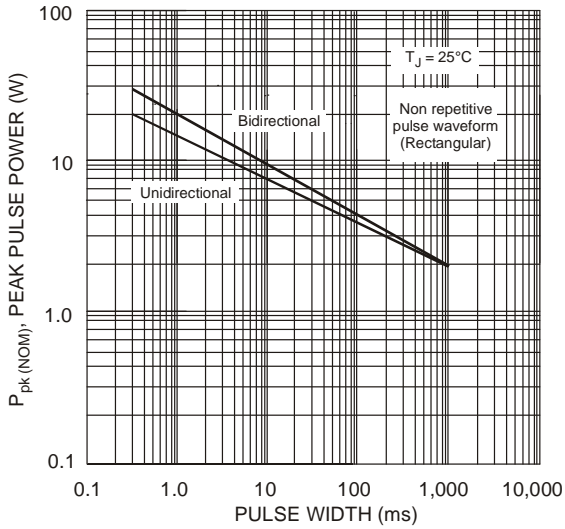


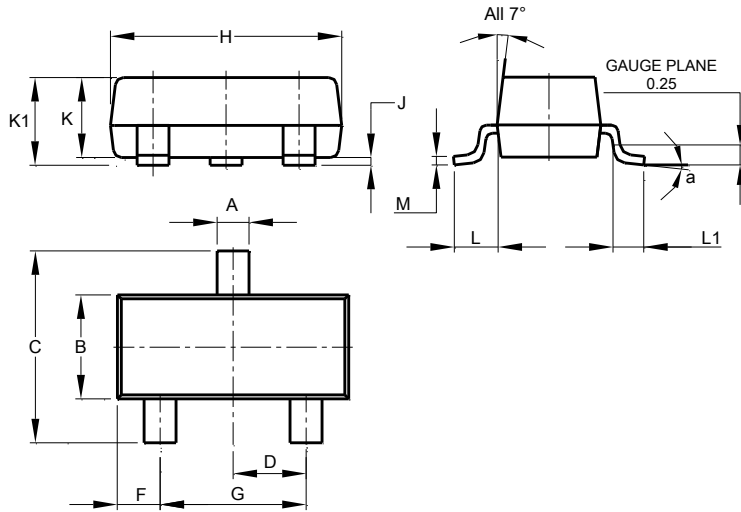
Fig. 7 Pulse Rating Curve, $P_{pk(NOM)}$ (W) vs. Pulse Width (ms)

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

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT23

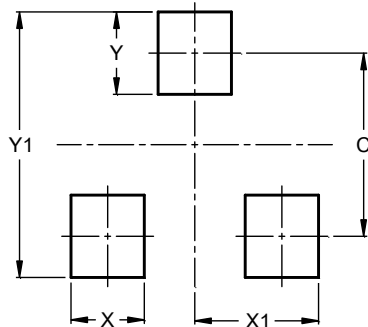


| SOT23 | | | |
|----------------------|-------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.37 | 0.51 | 0.40 |
| B | 1.20 | 1.40 | 1.30 |
| C | 2.30 | 2.50 | 2.40 |
| D | 0.89 | 1.03 | 0.915 |
| F | 0.45 | 0.60 | 0.535 |
| G | 1.78 | 2.05 | 1.83 |
| H | 2.80 | 3.00 | 2.90 |
| J | 0.013 | 0.10 | 0.05 |
| K | 0.890 | 1.00 | 0.975 |
| K1 | 0.903 | 1.10 | 1.025 |
| L | 0.45 | 0.61 | 0.55 |
| L1 | 0.25 | 0.55 | 0.40 |
| M | 0.085 | 0.150 | 0.110 |
| a | 0° | 8° | -- |
| All Dimensions in mm | | | |

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

SOT23



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 2.0 |
| X | 0.8 |
| X1 | 1.35 |
| Y | 0.9 |
| Y1 | 2.9 |

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