

# 1PMT5.0AT1/T3 Series

## Zener Transient Voltage Suppressor POWERMITE® Package

The 1PMT5.0AT1/T3 Series is designed to protect voltage sensitive components from high voltage, high energy transients. Excellent clamping capability, high surge capability, low Zener impedance and fast response time. The advanced packaging technique provides for a highly efficient micro miniature, space saving surface mount with its unique heatsink design. The POWERMITE has the same thermal performance as the SMA while being 50% smaller in footprint area, and delivering one of the lowest height profiles (1.1 mm) in the industry. Because of its small size, it is ideal for use in cellular phones, portable devices, business machines, power supplies and many other industrial/consumer applications.

### Specification Features:

- Stand-off Voltage: 5.0 V – 58 V
- Peak Power – 200 W @ 1 ms (1PMT5.0A – 1PMT36A)  
– 175 W @ 1 ms (1PMT40A – 1PMT58A)
- Maximum Clamp Voltage @ Peak Pulse Current
- Low Leakage
- Response Time is Typically < 1 ns
- ESD Rating of Class 3 (> 16 kV) per Human Body Model
- Low Profile – Maximum Height of 1.1 mm
- Integral Heatsink/Locking Tabs
- Full Metallic Bottom Eliminates Flux Entrapment
- Small Footprint – Footprint Area of 8.45 mm<sup>2</sup>
- POWERMITE is JEDEC Registered as DO-216AA
- Lead Orientation in Tape: Cathode (Short) Lead to Sprocket Holes
- Cathode Indicated by Polarity Band
- Pb-Free Packages are Available

### Mechanical Characteristics:

**CASE:** Void-free, transfer-molded, thermosetting plastic

**FINISH:** All external surfaces are corrosion resistant and leads are readily solderable

**MOUNTING POSITION:** Any

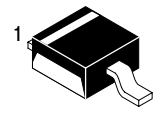
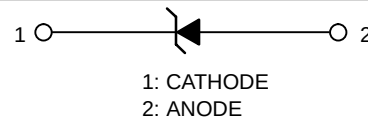
**MAXIMUM CASE TEMPERATURE FOR SOLDERING PURPOSES:**  
260°C for 10 Seconds



**ON Semiconductor®**

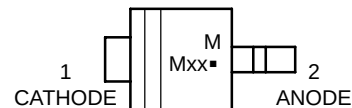
<http://onsemi.com>

### PLASTIC SURFACE MOUNT ZENER OVERVOLTAGE TRANSIENT SUPPRESSOR 5 – 58 V 200 W PEAK POWER



**POWERMITE  
CASE 457  
PLASTIC**

### MARKING DIAGRAM



- M = Date Code
- Mxx = Specific Device Code  
(See Table on Page 3)
- = Pb-Free Package

### ORDERING INFORMATION

| Device     | Package                | Shipping <sup>†</sup> |
|------------|------------------------|-----------------------|
| 1PMTxxAT1  | POWERMITE              | 3,000/Tape & Reel     |
| 1PMTxxAT1G | POWERMITE<br>(Pb-Free) | 3,000/Tape & Reel     |
| 1PMTxxAT3  | POWERMITE              | 12,000/Tape & Reel    |
| 1PMTxxAT3G | POWERMITE<br>(Pb-Free) | 12,000/Tape & Reel    |

<sup>†</sup>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.

# 1PMT5.0AT1/T3 Series

## MAXIMUM RATINGS

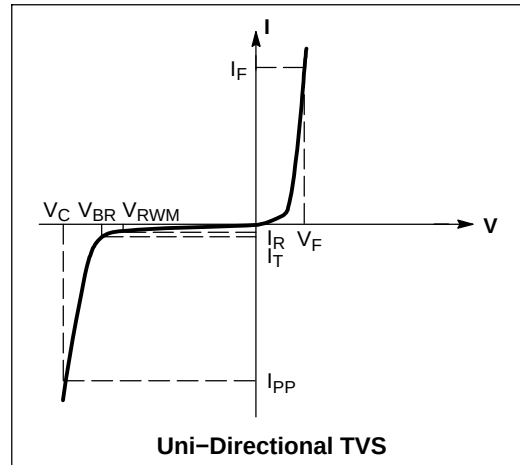
| Rating                                                                                      | Symbol                                | Value       | Unit                           |
|---------------------------------------------------------------------------------------------|---------------------------------------|-------------|--------------------------------|
| Maximum $P_{pk}$ Dissipation, (PW=10/1000 $\mu$ s) (Note 1) (1PMT5.0A – 1PMT36A)            | $P_{pk}$                              | 200         | W                              |
| Maximum $P_{pk}$ Dissipation, (PW=10/1000 $\mu$ s) (Note 1) (1PMT40A – 1PMT58A)             | $P_{pk}$                              | 175         | W                              |
| Maximum $P_{pk}$ Dissipation, (PW=8/20 $\mu$ s) (Note 1)                                    | $P_{pk}$                              | 1000        | W                              |
| DC Power Dissipation @ $T_A = 25^\circ\text{C}$ (Note 2)<br>Derate above $25^\circ\text{C}$ | $P_D$                                 | 500         | mW                             |
| Thermal Resistance, Junction-to-Ambient                                                     | $R_{\theta JA}$                       | 4.0         | $\text{mW}/^\circ\text{C}$     |
| Thermal Resistance, Junction-to-Lead (Anode)                                                | $R_{\theta J\text{anode}}$            | 248         | $^\circ\text{C}/\text{W}$      |
| Thermal Resistance, Junction-to-Lead (Anode)                                                | $R_{\theta J\text{anode}}$            | 35          | $^\circ\text{C}/\text{W}$      |
| Maximum DC Power Dissipation (Note 3)<br>Thermal Resistance, Junction-to-Tab (Cathode)      | $P_D$<br>$R_{\theta J\text{cathode}}$ | 3.2<br>23   | W<br>$^\circ\text{C}/\text{W}$ |
| Operating and Storage Temperature Range                                                     | $T_J, T_{stg}$                        | -55 to +150 | $^\circ\text{C}$               |

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. Nonrepetitive current pulse at  $T_A = 25^\circ\text{C}$ .
2. Mounted with recommended minimum pad size, DC board FR-4.
3. At Tab (Cathode) temperature,  $T_{\text{tab}} = 75^\circ\text{C}$

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted,  $V_F = 3.5\text{ V Max. @ } I_F$  (Note 4) = 35 A)

| 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                                |
| $I_F$     | Forward Current                             |
| $V_F$     | Forward Voltage @ $I_F$                     |



## 1PMT5.0AT1/T3 Series

**ELECTRICAL CHARACTERISTICS** ( $T_L = 30^\circ\text{C}$  unless otherwise noted,  $V_F = 1.25$  Volts @ 200 mA)

| Device*           | Marking | $V_{RWM}$ | $V_{BR} @ I_T$ (V) (Note 6) |       |      | $I_T$ | $I_R @ V_{RWM}$   | $V_C @ I_{PP}$ | $I_{PP}$ (A) |
|-------------------|---------|-----------|-----------------------------|-------|------|-------|-------------------|----------------|--------------|
|                   |         | (Note 5)  | Min                         | Nom   | Max  | (mA)  | ( $\mu\text{A}$ ) | (V)            | (Note 7)     |
| 1PMT5.0AT1, T3, G | MKE     | 5.0       | 6.4                         | 6.7   | 7.0  | 10    | 50                | 9.2            | 21.7         |
| 1PMT7.0AT1, T3, G | MKM     | 7.0       | 7.78                        | 8.2   | 8.6  | 10    | 30                | 12             | 16.7         |
| 1PMT12AT1, T3, G  | MLE     | 12        | 13.3                        | 14.0  | 14.7 | 1.0   | 1.0               | 19.9           | 10.1         |
| 1PMT16AT1, T3, G  | MLP     | 16        | 17.8                        | 18.75 | 19.7 | 1.0   | 1.0               | 26             | 7.7          |
| 1PMT18AT1, T3     | MLT     | 18        | 20.0                        | 21.0  | 22.1 | 1.0   | 1.0               | 29.2           | 6.8          |
| 1PMT22AT1, T3     | MLX     | 22        | 24.4                        | 25.6  | 26.9 | 1.0   | 1.0               | 35.5           | 5.6          |
| 1PMT24AT1, T3     | MLZ     | 24        | 26.7                        | 28.1  | 29.5 | 1.0   | 1.0               | 38.9           | 5.1          |
| 1PMT26AT1, T3     | MME     | 26        | 28.9                        | 30.4  | 31.9 | 1.0   | 1.0               | 42.1           | 4.8          |
| 1PMT28AT1, T3, G  | MMG     | 28        | 31.1                        | 32.8  | 34.4 | 1.0   | 1.0               | 45.4           | 4.4          |
| 1PMT30AT1, T3, G  | MMK     | 30        | 33.3                        | 35.1  | 36.8 | 1.0   | 1.0               | 48.4           | 4.1          |
| 1PMT33AT1, T3, G  | MMM     | 33        | 36.7                        | 38.7  | 40.6 | 1.0   | 1.0               | 53.3           | 3.8          |
| 1PMT36AT1, T3     | MMP     | 36        | 40.0                        | 42.1  | 44.2 | 1.0   | 1.0               | 58.1           | 3.4          |
| 1PMT40AT1, T3     | MMR     | 40        | 44.4                        | 46.8  | 49.1 | 1.0   | 1.0               | 64.5           | 2.7          |
| 1PMT48AT1, T3     | MMX     | 48        | 53.3                        | 56.1  | 58.9 | 1.0   | 1.0               | 77.4           | 2.3          |
| 1PMT51AT1, T3     | MMZ     | 51        | 56.7                        | 59.7  | 62.7 | 1.0   | 1.0               | 82.4           | 2.1          |
| 1PMT58AT1, T3     | MNG     | 58        | 64.4                        | 67.8  | 71.2 | 1.0   | 1.0               | 93.6           | 1.9          |

4. 1/2 sine wave (or equivalent square wave), PW = 8.3 ms, duty cycle = 4 pulses per minute maximum.

5. A transient suppressor is normally selected according to the Working Peak Reverse Voltage ( $V_{RWM}$ ) which should be equal to or greater than the DC or continuous peak operating voltage level.

6.  $V_{BR}$  measured at pulse test current  $I_T$  at ambient temperature of  $25^\circ\text{C}$ .

7. Surge current waveform per Figure 2 and derate per Figure 4.

\*The "G" suffix indicates Pb-Free package available.

# 1PMT5.0AT1/T3 Series

## TYPICAL PROTECTION CIRCUIT

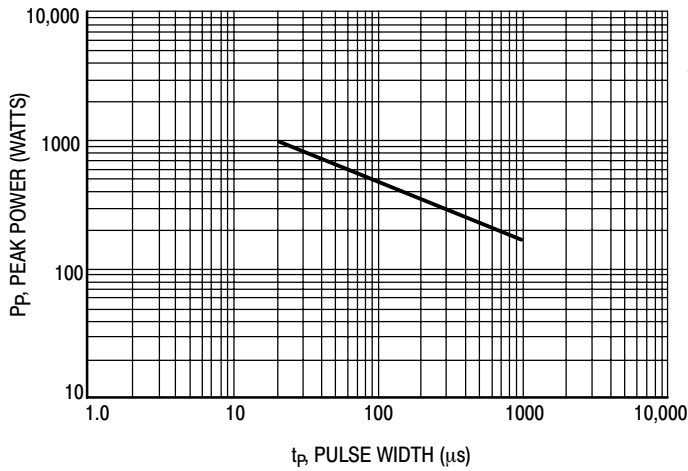
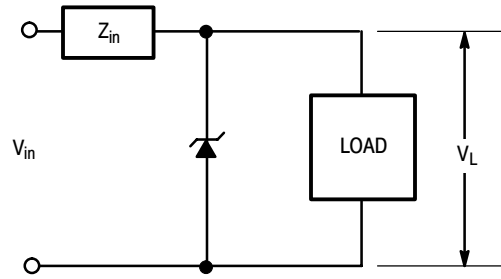


Figure 1. Pulse Rating Curve

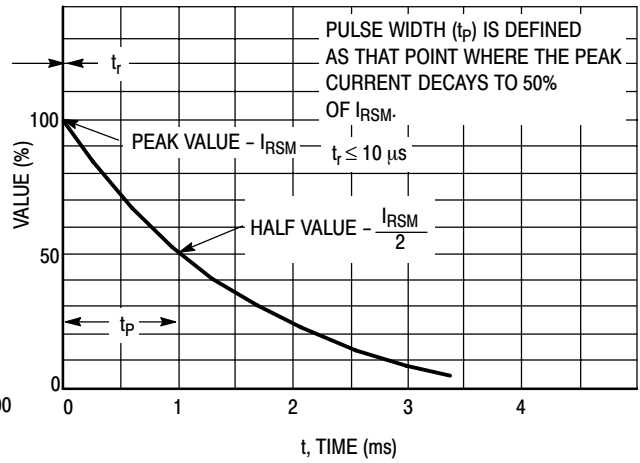


Figure 2. 10 X 1000  $\mu s$  Pulse Waveform

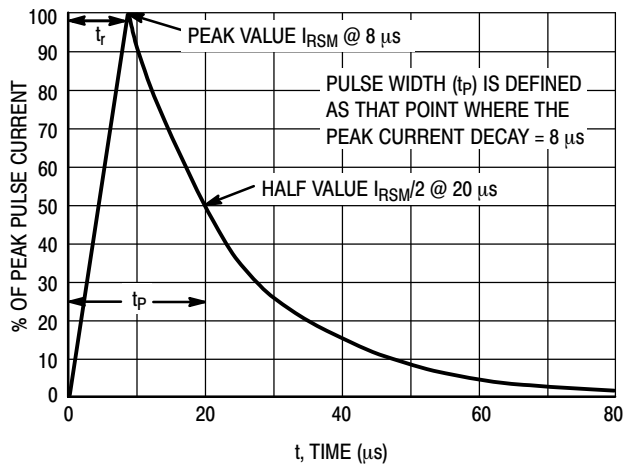


Figure 3. 8 X 20  $\mu s$  Pulse Waveform

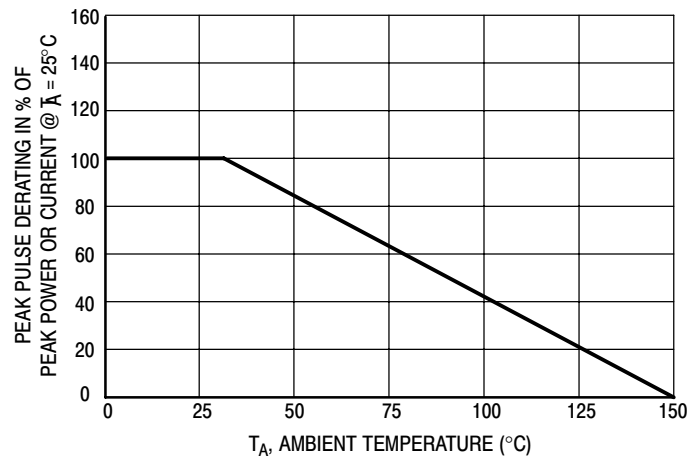


Figure 4. Pulse Derating Curve

# 1PMT5.0AT1/T3 Series

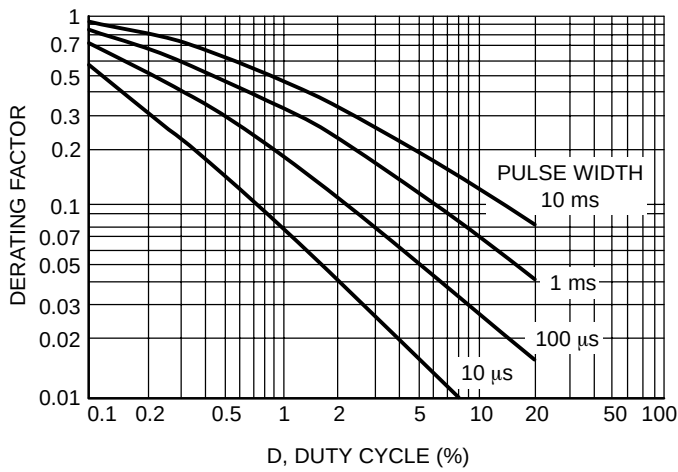


Figure 5. Typical Derating Factor for Duty Cycle

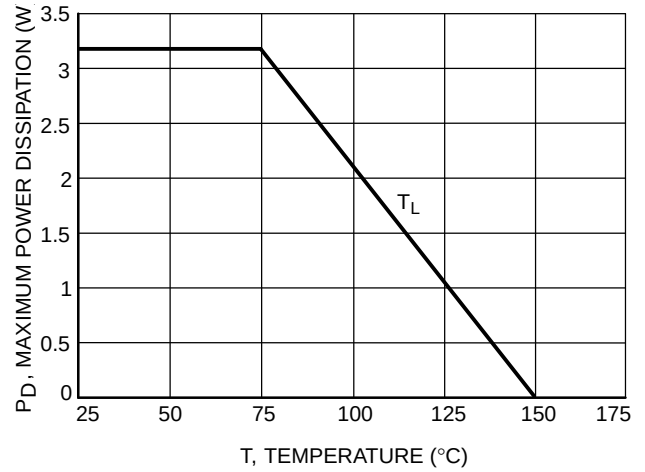


Figure 6. Steady State Power Derating

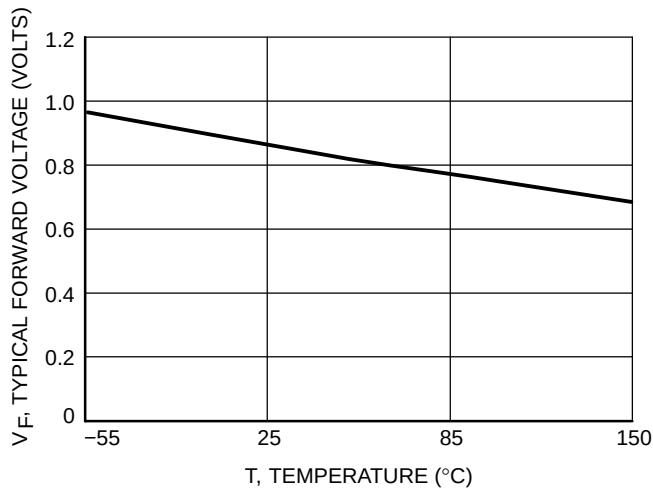


Figure 7. Forward Voltage

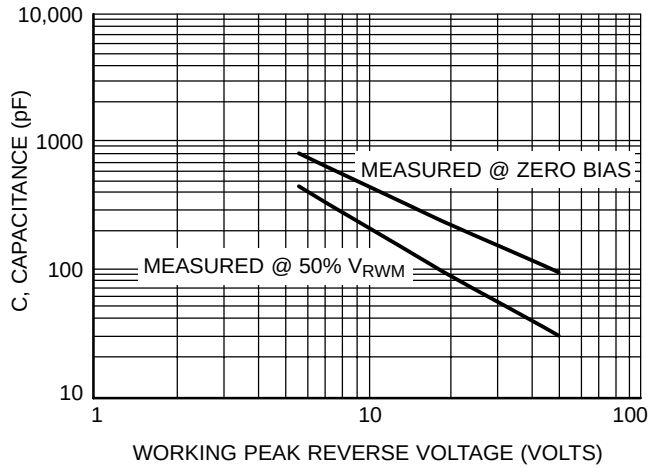
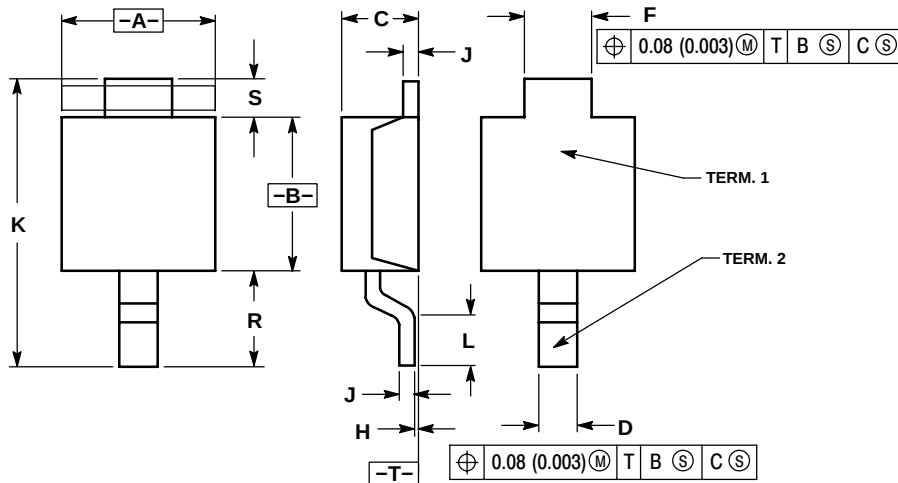


Figure 8. Capacitance versus Working Peak Reverse Voltage

# 1PMT5.0AT1/T3 Series

## OUTLINE DIMENSIONS

POWERMITE  
CASE 457-04  
ISSUE D

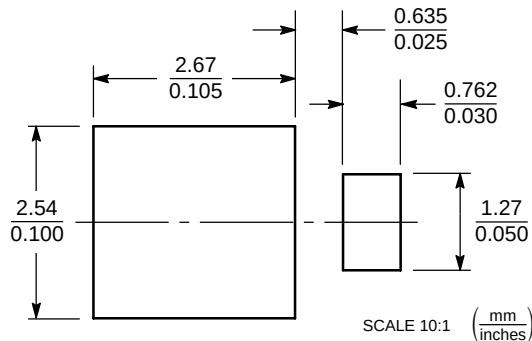


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.

| DIM | MILLIMETERS |       | INCHES |        |
|-----|-------------|-------|--------|--------|
|     | MIN         | MAX   | MIN    | MAX    |
| A   | 1.75        | 2.05  | 0.069  | 0.081  |
| B   | 1.75        | 2.18  | 0.069  | 0.086  |
| C   | 0.85        | 1.15  | 0.033  | 0.045  |
| D   | 0.40        | 0.69  | 0.016  | 0.027  |
| F   | 0.70        | 1.00  | 0.028  | 0.039  |
| H   | -0.05       | +0.10 | -0.002 | +0.004 |
| J   | 0.10        | 0.25  | 0.004  | 0.010  |
| K   | 3.60        | 3.90  | 0.142  | 0.154  |
| L   | 0.50        | 0.80  | 0.020  | 0.031  |
| R   | 1.20        | 1.50  | 0.047  | 0.059  |
| S   | 0.50        | REF   | 0.019  | REF    |

## 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.

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