150 W Powermite, Small Surface Mount Transient Voltage Suppressor

UPT5e3–UPTR48e3, UPTB5e3–UPTB48e3

Product Overview

Microchip's unique Powermite UPT series of transient voltage suppressors feature oxide-passivated chips with high-temperature solder bonds for high surge capability and negligible electrical degradation under repeated surge conditions. Both unidirectional and bidirectional configurations are available. In addition to its size advantages, the Powermite package includes a fully metallic bottom side that eliminates the possibility of solder flux entrapment at assembly and a unique locking tab design serves as an integral heat sink. Its innovative design makes this device fully compatible for use with automatic insertion equipment.

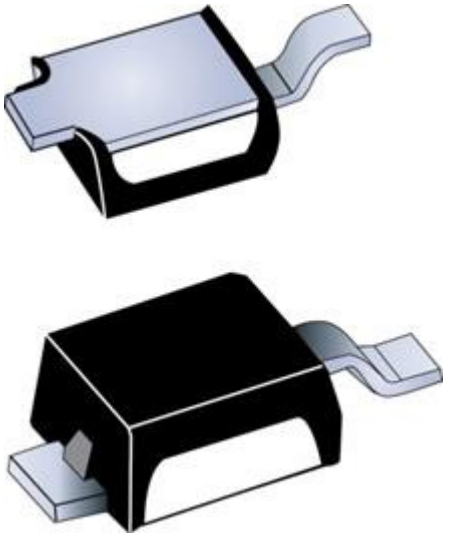
Features

- Powermite package with working standoff voltages 5 to 48V
- Both unidirectional and bidirectional polarities:
  - Anode to case bottom (UPT5e3 - UPT48e3)
  - Cathode to case bottom (UPT8Re3 - UPT48Re3)
  - Bidirectional (UPTB5e3 - UPTB48e3)
- Suppress transients up to 150 watts at 10\1000 µs (see Figure 4-1)
- Clamping time less than 100 pico-seconds for unidirectional and 5 nano-seconds for bidirectional
- 100% surge current testing of all parts
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020F.
- RoHS compliant versions available

Applications/Benefits

- Protects sensitive components such as IC's, CMOS, Bipolar, BiCMOS, ECL, DTL, T2L, and so on
- Protection from switching and induced RF transients
- Integral heat sink/locking tabs
- Fully metallic bottom side eliminates flux entrapment
- Compliant to IEC61000-4-2 and IEC61000-4-4 for ESD and EFT protection respectively
- Secondary lightning protection per IEC61000-4-5 with 42 Ohms source impedance:
  Class 1: UPT5 or UPTB8 to UPT17 or UPTB17
  Class 2: UPT5 or UPTB8 to UPT12 or UPTB12

Figure 1. DO-216AA Package



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1. Maximum Ratings

Table 1-1. Maximum Ratings at 25 °C Unless Otherwise Noted

Parameters/Test Conditions	Symbol	Value		Unit
Junction and storage temperature	T_J / T_{STG}	–65 to +150		°C
Thermal resistance, junction-to-ambient [1]	$R_{\Theta JA}$	240		°C/W
Thermal resistance junction-to-case (base tab)	$R_{\Theta JC}$	15		°C/W
Peak pulse power (see Figure 4-1 and Figure 4-2)	P_{PP}	at 8/20 µs	at 10/1000 µs	W
UPT5 – UPT48e3:		1000	150	
UPTB5 – UPTB48e3:		1000	150	
UPT8R – UPT48Re3:		1000	150	
Forward surge current (at 8.3 ms half-sine wave)	I_{FSM}	25		A
Average power dissipation (base tab < 112 °C)	$P_{M(AV)}$	2.5		W
Impulse repetition rate (duty factor)	—	0.01		%
Solder temperature at 10 seconds	T_{SP}	260		°C

Note:

1. When mounted on FR4 PC board with 1 oz copper.

1.1 Mechanical Packaging

- Case: Void-free transfer molded thermosetting epoxy compound meeting UL94V-0
- Terminals: Annealed matte-tin plating over copper and readily solderable per MIL-STD-750, method 2026
- Marking:
  Anode to TAB 1: "T" plus the V_{WM} of part number in two digit form underlined, for example, UPT5e3 is T05▪, UPT12e3 is AT12▪

  Anode to TAB 2: The V_{WM} of part number in two digit form plus an "R" underlined, for example, UPT8Re3 is U08▪, UPT12Re3 is U12▪

  Bipolar: "B" plus the V_{WM} of part number in two digit form underlined, for example, UPTB5e3 is B05▪, UPTB12e3 is B12▪, and so on.

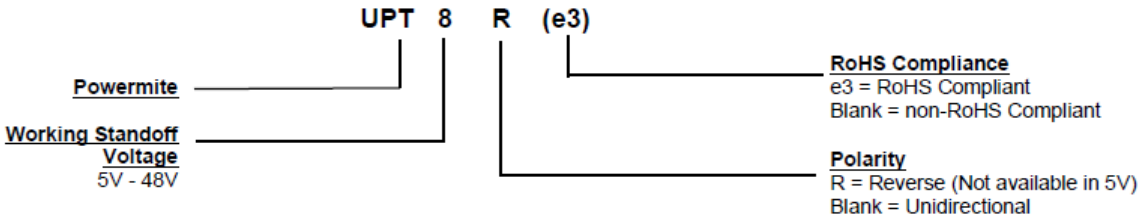
  Note: Please note dot suffix (for e3 suffix)
- Tape and reel option: Standard per EIA-481-B using 12 mm tape. Consult factory for quantities.
- Weight: Approximately 0.016 gram
- See Package Dimensions

2. Part Nomenclature

Part Nomenclature

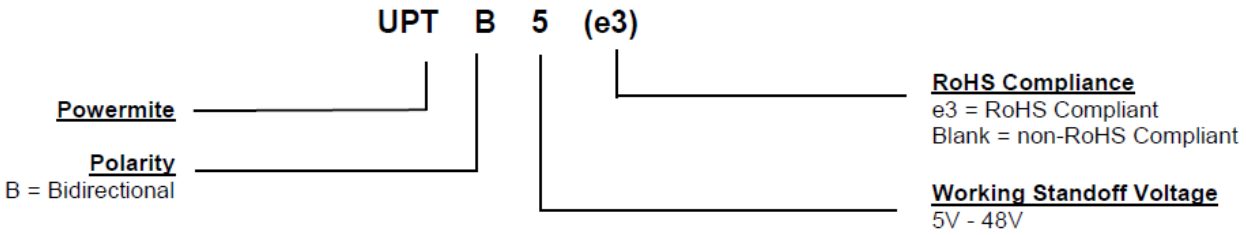
Applicable to unidirectional UPT5e3–UPT48e3, UPT8Re3–UPT48Re3 only:

Figure 2-1. UPT5e3–UPT48e3, UPT8Re3–UPT48Re3 Part Nomenclature



Applicable to bidirectional UPTB5e3–UPTB48e3 only:

Figure 2-2. UPTB5e3–UPTB48e3 Part Nomenclature



2.1 Symbols and Definitions

Table 2-1. Symbols and Definitions

Symbol	Definition
$\alpha_{V(BR)}$	Temperature coefficient of breakdown voltage: The change in breakdown voltage divided by the change in temperature that caused it expressed in %/°C or mV/°C.
C_T	Total capacitance: The total small signal capacitance between the diode terminals of a complete device.
$I_{(BR)}$	Breakdown current: The current used for measuring breakdown voltage $V_{(BR)}$.
I_D	Standby current: The current through the device at working standoff voltage.
I_{FSM}	Surge peak forward current: The forward current including all nonrepetitive transient currents but excluding all repetitive transients (ref JESD282-B).
I_{PP}	Peak impulse current: The peak current during an impulse.
P_{PP}	Peak pulse power: The peak power that can be applied for a specific pulse width and waveform. The product of I_{PP} and V_C.
$V_{(BR)}$	Breakdown voltage: The voltage across the device at a specified current $I_{(BR)}$ in the breakdown region.
V_C	Clamping voltage: The voltage across the device in a region of low differential resistance during the application of an impulse current (I_{PP}) for a specified waveform.
V_{WM}	Working standoff voltage: The maximum-rated value of dc or repetitive peak positive cathode-to-anode voltage that may be continuously applied over the standard operating temperature.

3. Electrical Characteristics

Table 3-1. Electrical Characteristics at 25 °C Unless Otherwise Stated

Device Type			Working Standoff Voltage V_{WM}	Minimum Breakdown Voltage $V_{(BR)}$ at 1 mA	Maximum Standby Current I_D at V_{WM}	Maximum Peak Pulse Current [1] I_{PP} at 10/1000 µs	Maximum Clamping Voltage V_C at I_{PP}	Maximum Temperature Coefficient of $V_{(BR)}$ $\alpha_{V(BR)}$
Unidirectional	**Bidirectional**	**Reverse**	**V**	**V**	**µA**	**A**	**V**	**%/°C**
UPT5	UPTB5	—	5	6.0	50	15.7	9.5	0.030
UPT8	UPTB8	UPT8R	8	9.0	2	10.9	13.7	0.040
UPT10	UPTB10	UPT10R	10	11.0	2	8.33	18.0	0.045
UPT12	UPTB12	UPT12R	12	13.8	1	6.94	21.6	0.050
UPT15	UPTB15	UPT15R	15	16.7	1	5.77	26.0	0.055
UPT17	UPTB17	UPT17R	17	19.0	1	5.14	29.2	0.060
UPT24	UPTB24	UPT24R	24	28.4	1	3.47	43.2	0.070
UPT28	UPTB28	UPT28R	28	31.0	1	3.13	47.8	0.075
UPT33	UPTB33	UPT33R	33	36.8	1	2.65	56.7	0.080
UPT48	UPTB48	UPT48R	48	54.0	1	1.78	84.3	0.090

Note:

1. See Figure 4-2 for I_{PP} waveform of 10/1000 µs test pulse.

4. Graphs

Figure 4-1. Power Pulse Power Vs. Pulse Duration

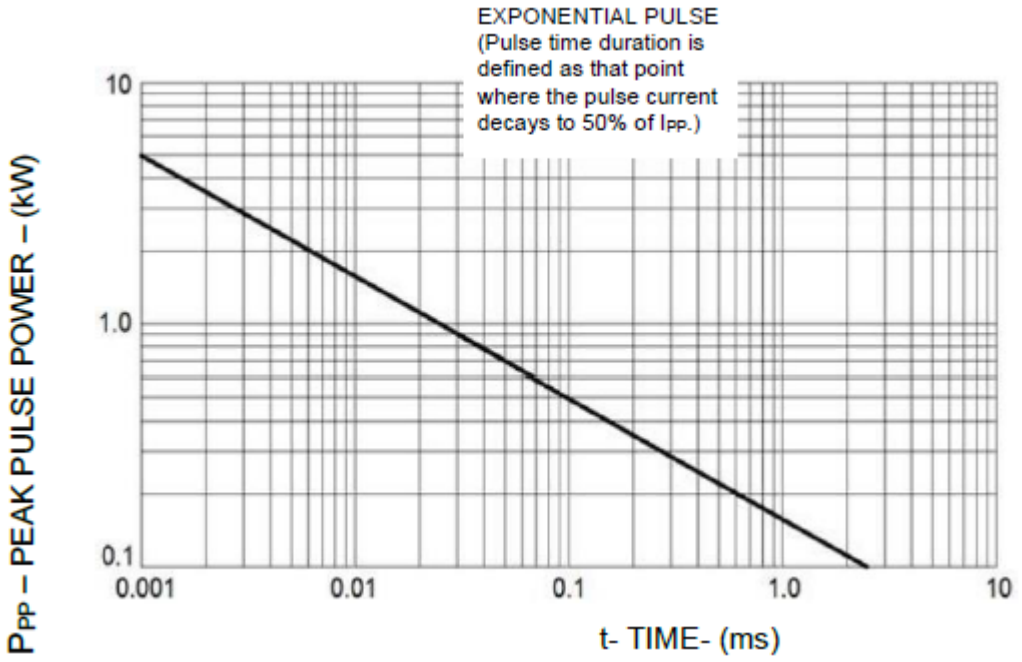


Figure 4-2. Pulse Waveform for 10/1000 µs Exponential Surge

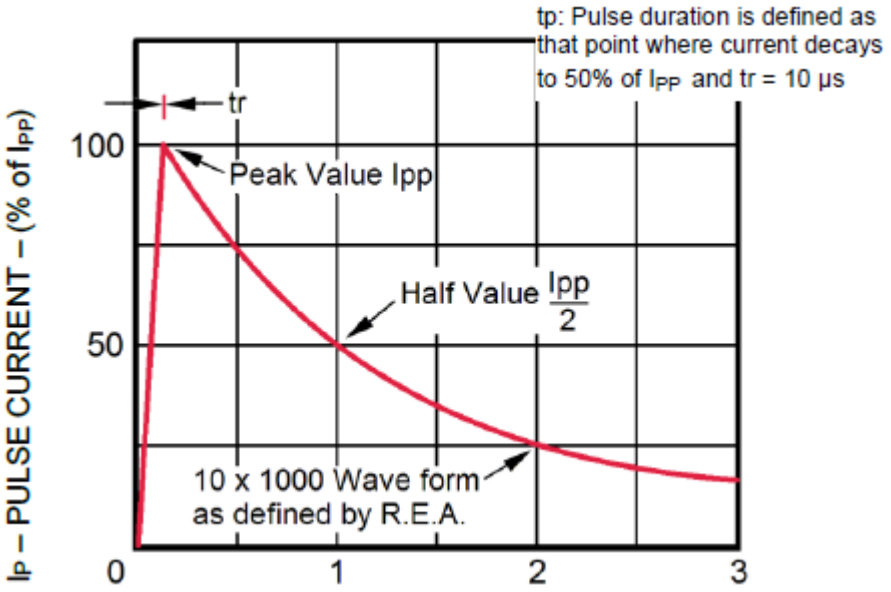


Figure 4-3. Derating Curve

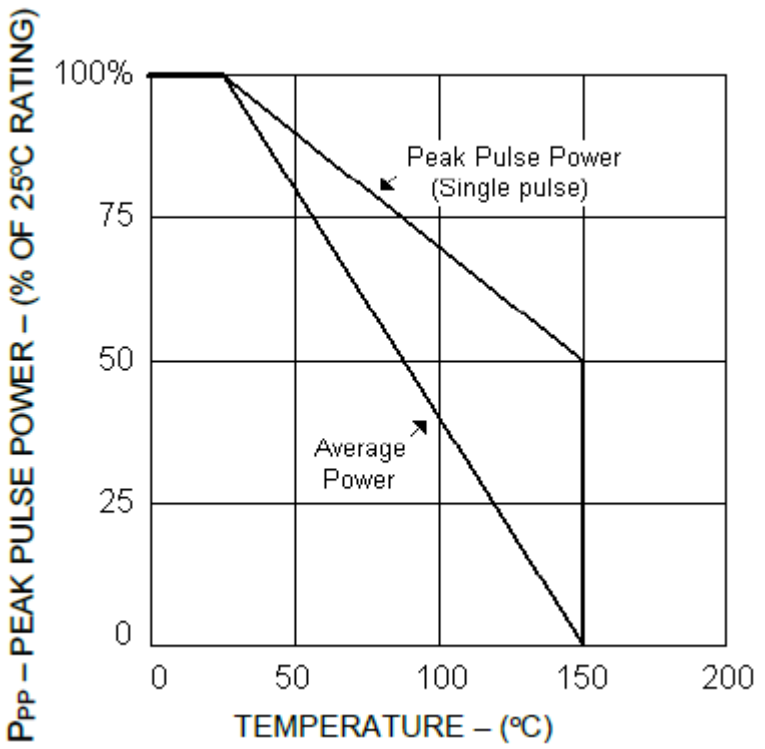
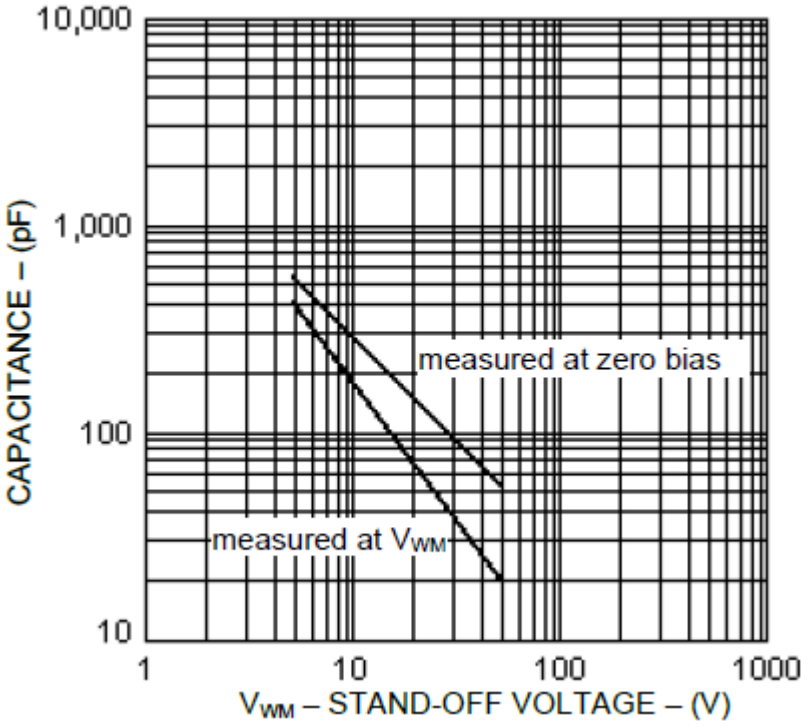


Figure 4-4. Typical Capacitance Vs. Stand-Off Voltage [1]

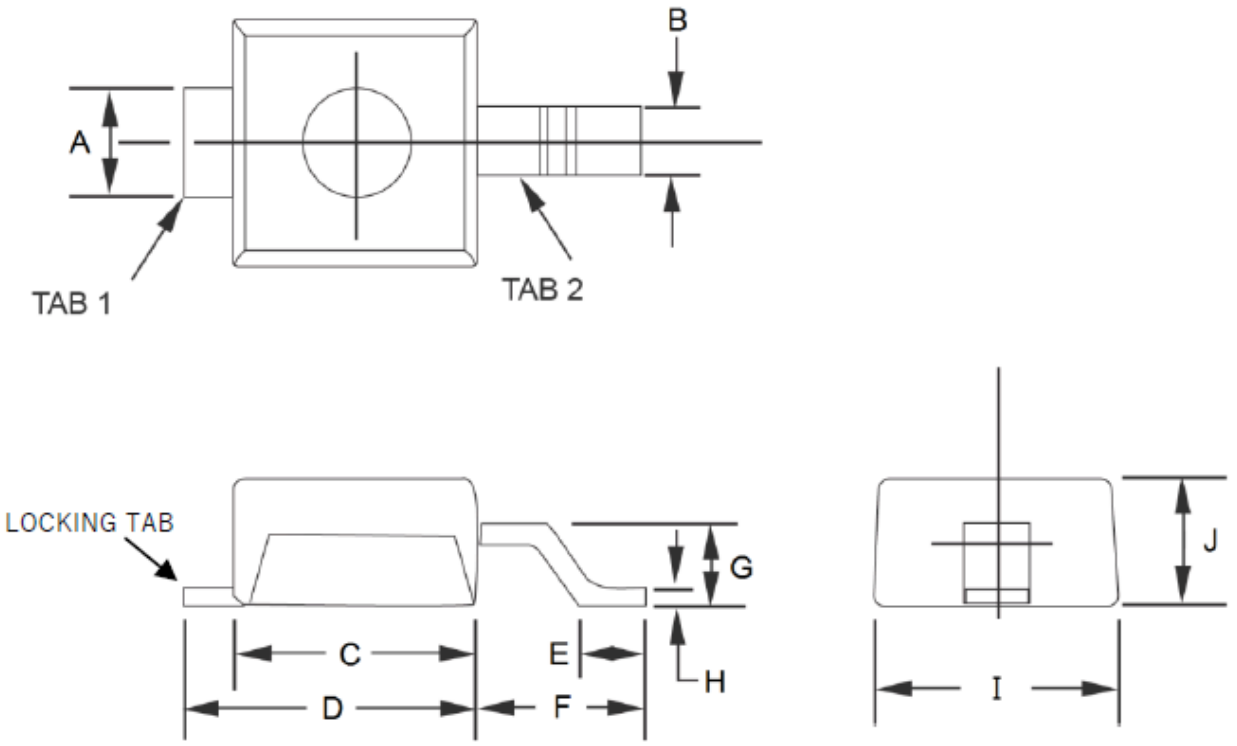


Note:

1. Bidirectional capacitance is half that shown.

5. Package Dimensions

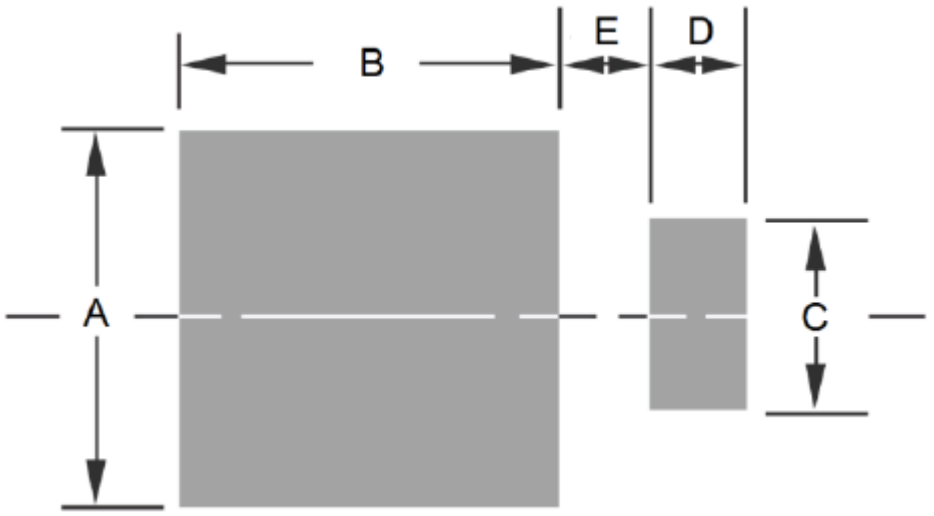
Figure 5-1. Package Dimensions



Ltr	Dimensions			
	Inch		Millimeters	
	Min.	Max.	Min.	Max.
A	0.029	0.039	0.73	0.99
B	0.016	0.026	0.40	0.66
C	0.070	0.080	1.77	2.03
D	0.087	0.097	2.21	2.46
E	0.020	0.030	0.50	0.76
F	0.051	0.061	1.29	1.54
G	0.021	0.031	0.53	0.78
H	0.004	0.008	0.10	0.20
I	0.070	0.080	1.77	2.03
J	0.035	0.045	0.89	1.14

6. Pad Layout

Figure 6-1. Pad Layout



Ltr	Dimensions	
	Inch	Millimeters
A	0.100	2.54
B	0.105	2.67
C	0.050	1.27
D	0.030	0.76
E	0.025	0.64

7. Revision History

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

Revision	Date	Description
A	02/2025	Document was converted to Microchip format and assigned literature number DS00005772.
Rev. C	04/2024	Microsemi document was created and assigned literature number RF01103.

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ISBN: 979-8-3371-0747-9

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