

# 7.5 kW, Unidirectional and Bidirectional TVS Protection Device

## DESCRIPTION

These 7.5 kW rated transient voltage suppressors (TVS) in a surface mount PLAD package are provided with design features to minimize thermal resistance and cumulative heating. These devices have the ability to clamp dangerous high voltage, short term transients such as those produced by electrostatic discharge, radiated RFI, inductive load dumps, and the secondary effects of lightning strikes before they reach sensitive component regions of a circuit. Typical applications include lightning and automotive load dump protection. They are particularly effective at meeting the multi-stroke lightning standard RTCA DO-160, section 22 for aircraft design. The all-metal bottom of this space-efficient, low profile package provides a very low thermal impedance path for heat to escape to the mounting substrate, keeping the junction temperature low. The PLAD7.5KP is offered with standoff voltages ( $V_{wm}$ ) from 10 to 48 volts in either unidirectional or bidirectional versions. For more information on PLAD packaged products and our broad range of TVS solutions, please see our website.

**Important:** For the latest information, visit our website <http://www.microsemi.com>.

## FEATURES

- Available in both unidirectional and bidirectional construction (bidirectional with CA suffix)
- High-reliable, with wafer fabrication and assembly lot traceability
- All parts 100% surge tested
- Low profile surface mount package
- Optional upscreaming is available with various screening and conformance inspection options based on MIL-PRF-19500. Refer to [Hi-Rel Non-Hermetic Products](#) brochure on our web site for more details on the screening options
- Suppresses transients up to 7,500 W @ 10/1000  $\mu$ s (see [Figure 1](#))
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020
- 3 $\sigma$  lot norm screening performed on standby current ( $I_b$ )
- RoHS compliant (2002/95/EC) devices available
- Halogen free (IEC 61249-2-21)

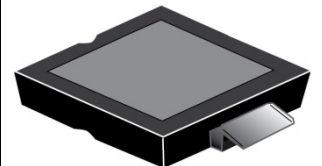
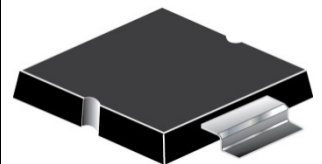
## APPLICATIONS / BENEFITS

- Protection from switching transients and induced RF
- Protection from ESD, and EFT per IEC 61000-4-2 and IEC 61000-4-4
- Secondary lightning protection per IEC 61000-4-5 with 42 ohms source impedance:  
Class 1,2,3,4,5: MPLAD7.5KP10A to 48CA
- Secondary lightning protection per IEC 61000-4-5 with 12 ohms source impedance:  
Class 1,2,3,4: MPLAD7.5KP10A to 48CA
- Secondary lightning protection per IEC 61000-4-5 with 2 ohms source impedance:  
Class 2,3: MPLAD7.5KP10A to 48CA  
Class 4: MPLAD7.5KP10A to 26CA
- Pin injection protection per RTCA/DO-160F for Waveform 4 (6.4/69  $\mu$ s at 25 °C)\*:  
Level 1,2,3,4,5: MPLAD7.5KP10A to 48CA
- Pin injection protection per RTCA/DO-160F for Waveform 5A (40/120  $\mu$ s at 25 °C)\*:  
Level 1, 2, 3: MPLAD7.5KP10A to 48CA  
Level 4: MPLAD7.5KP10A to 14CA
- Longer transient pulse width capability if well heat sunk for automotive load dump
- $I_{PP}$  rating of 97 amps to 441 amps
- $V_{WM}$  rating of 10 volts to 48 volts
- $V_{(BR)(min)}$  range of 11.1 volts to 53.3 volts
- $V_{C(MAX)}$  rating of 17 volts to 77.4 volts

\*See [MicroNote 132](#) for further temperature derating selection.

High-Reliability screening available in reference to MIL-PRF-19500

Tested in accordance with the requirements of AEC-Q101



mini-PLAD

(The cathode is the heatsink under the body of this device.)

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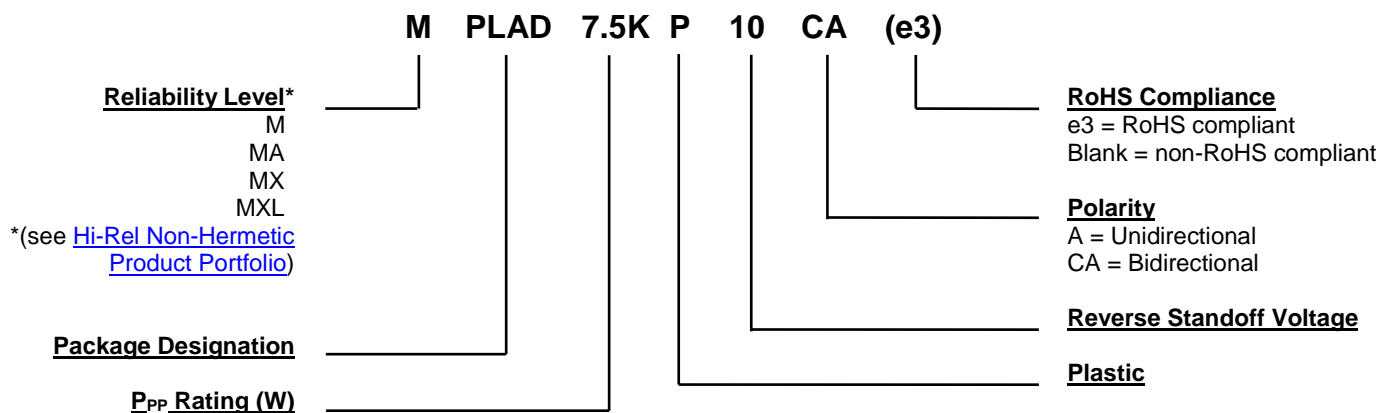
**MAXIMUM RATINGS @ 25 °C unless otherwise specified**

Parameters/Test Conditions	Symbol	Value	Unit	
Junction and Storage Temperature	T <sub>J</sub> and T <sub>STG</sub>	-55 to +150	°C/W	
Thermal Resistance Junction-to-Ambient <sup>(1)</sup>	R <sub>θJA</sub>	50	°C/W	
Thermal Resistance Junction-to-Case	R <sub>θJC</sub>	1.5	°C/W	
Peak Pulse Power @ 10/1000 μs <sup>(2)</sup>	P <sub>PP</sub>	7,500	W	
t <sub>clamping</sub> (0 volts to V <sub>(BR)</sub> min)	Unidirectional	<100	ps	
	Bidirectional	<5	ns	
Forward Clamping Voltage @ 400 Amps <sup>(3)</sup>	V <sub>FS</sub>	2.5	V	
Forward Surge Current <sup>(3)</sup>	I <sub>FSM</sub>	500	A	
Solder Temperature @ 10 s		260	°C	
Rated Average Power dissipation <sup>(5)</sup>	T <sub>A</sub> = 25 °C T <sub>C</sub> = 100 °C	P <sub>M(AV)</sub>	2.5 <sup>(1)</sup>	W
			33.3 <sup>(4)</sup>	W

- Notes:**
- When mounted on FR4 PC board with recommended mounting pad (see [pad layout](#)).
  - Also see [Figures 1 and 2](#). With impulse repetition rate (duty factor) of 0.05% or less.
  - At 8.3 ms half-sine wave (unidirectional devices only).
  - Case temperature controlled on heat sink as specified.
  - See MicroNote 134 for derating P<sub>PP</sub> when also applying steady-state power.

**MECHANICAL and PACKAGING**

- CASE: Epoxy, meets UL94V-0
- TERMINALS: Tin/lead or matte-tin (fully RoHS compliant) plating
- MARKING: Part number
- DELIVERY option: Tape and reel (13 inch)
- See [Package Dimensions](#) on last page.

**PART NOMENCLATURE**


**SYMBOLS & DEFINITIONS**

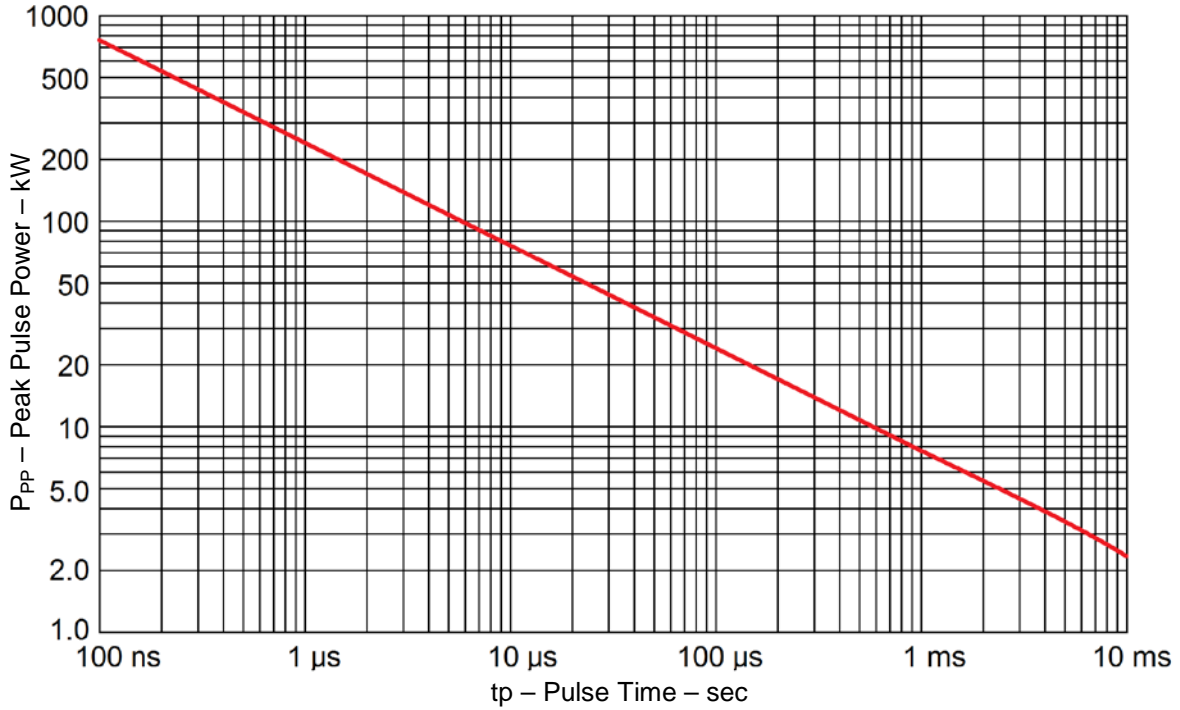
Symbol	Definition
$\alpha_{V(BR)}$	Temperature Coefficient of Breakdown Voltage: The change in breakdown voltage divided by the change in temperature that caused it expressed in %/°C or mV/°C.
$I_{(BR)}$	Breakdown Current: The current used for measuring Breakdown Voltage $V_{(BR)}$ .
$I_D$	Standby Current: The current through the device at rated stand-off voltage.
$I_{PP}$	Peak Impulse Current: The maximum rated random recurring peak impulse current or nonrepetitive peak impulse current that may be applied to a device. A random recurring or nonrepetitive transient current is usually due to an external cause, and it is assumed that its effect will have completely disappeared before the next transient arrives.
$V_{(BR)}$	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.

**ELECTRICAL CHARACTERISTICS @ 25 °C unless otherwise stated**

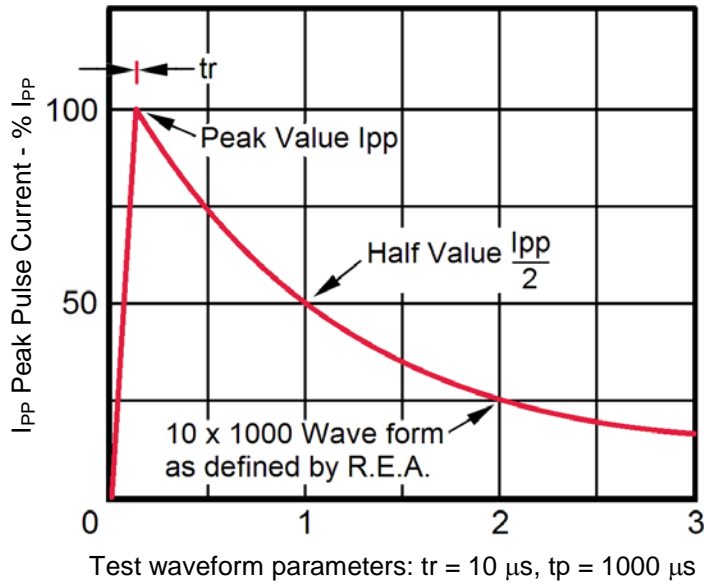
DEVICE*	REVERSE STAND-OFF VOLTAGE	BREAKDOWN VOLTAGE $V_{(BR)}$		MAXIMUM CLAMPING VOLTAGE	MAXIMUM STANDBY CURRENT	MAXIMUM PEAK PULSE CURRENT (FIG. 2)	MAXIMUM TEMPERATURE COEFFICIENT OF $V_{(BR)}$
	$V_{WM}$	$V_{(BR)}$ @	$I_{(BR)}$	$V_C$ @ $I_{PP}$	$I_D$ @ $V_{WM}$	$I_{PP}$	$\alpha_{V(BR)}$
	Volts	Volts	mA	Volts	$\mu A$	Amps	mV/°C
MPLAD7.5KP10A(e3)	10	11.1 - 12.3	5	17.0	15	441	9
MPLAD7.5KP11A(e3)	11	12.2 - 13.5	5	18.2	10	412	10
MPLAD7.5KP12A(e3)	12	13.3 - 14.7	5	19.9	10	377	11
MPLAD7.5KP13A(e3)	13	14.4 - 15.9	5	21.5	10	349	12
MPLAD7.5KP14A(e3)	14	15.6 - 17.2	5	23.2	10	323	13
MPLAD7.5KP15A(e3)	15	16.7 - 18.5	5	24.4	10	307	15
MPLAD7.5KP16A(e3)	16	17.8 - 19.7	5	26.0	10	288	16
MPLAD7.5KP17A(e3)	17	18.9 - 20.9	5	27.6	10	272	18
MPLAD7.5KP18A(e3)	18	20.0 - 22.1	5	29.2	10	257	19
MPLAD7.5KP20A(e3)	20	22.2 - 24.5	5	32.4	10	231	22
MPLAD7.5KP22A(e3)	22	24.4 - 26.9	5	35.5	10	211	24
MPLAD7.5KP24A(e3)	24	26.7 - 29.5	5	38.9	10	193	27
MPLAD7.5KP26A(e3)	26	28.9 - 31.9	5	42.1	10	178	29
MPLAD7.5KP28A(e3)	28	31.1 - 34.4	5	45.5	10	165	30
MPLAD7.5KP30A(e3)	30	33.3 - 36.8	5	48.4	10	155	35
MPLAD7.5KP33A(e3)	33	36.7 - 40.6	5	53.3	10	141	38
MPLAD7.5KP36A(e3)	36	40.0 - 44.2	5	58.1	10	129	40
MPLAD7.5KP40A(e3)	40	44.4 - 49.1	5	64.5	10	116	45
MPLAD7.5KP43A(e3)	43	47.8 - 52.8	5	69.4	10	108	49
MPLAD7.5KP45A(e3)	45	50.0 - 55.3	5	72.7	10	103	51
MPLAD7.5KP48A(e3)	48	53.3 - 58.9	5	77.4	10	97	54

\* See part nomenclature for additional screening prefixes.

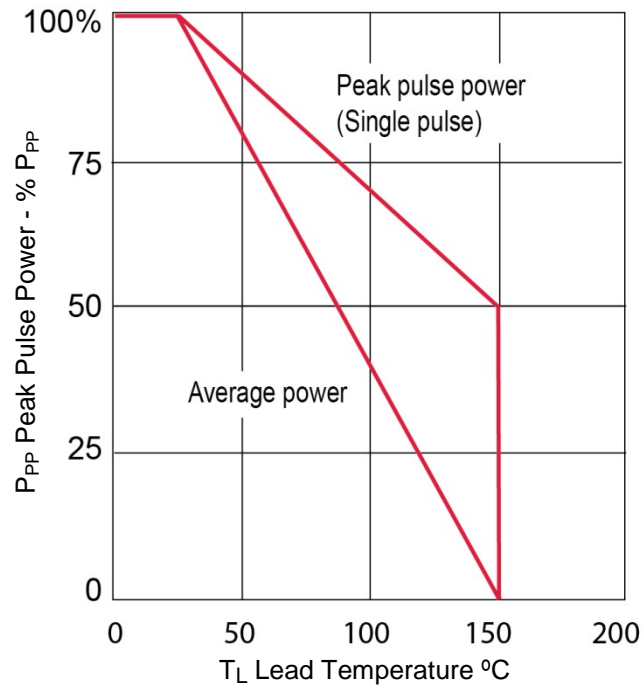
**GRAPHS**



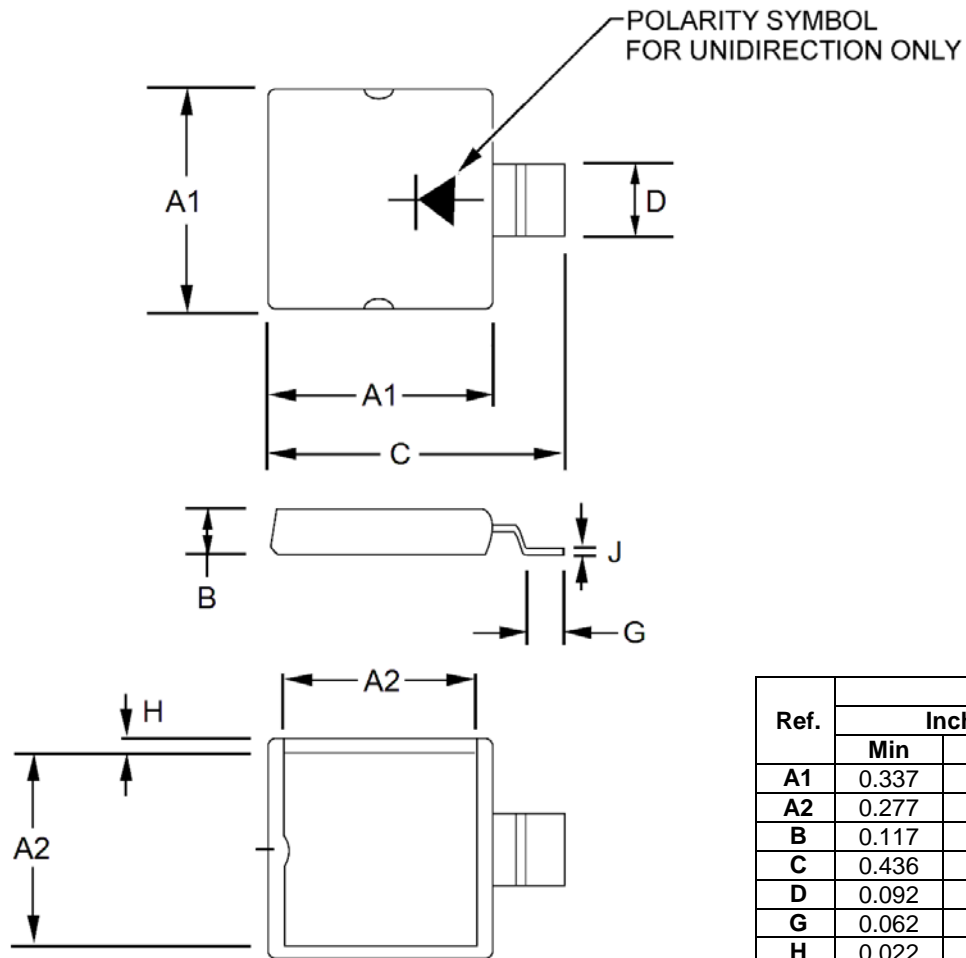
**FIGURE 1**  
Peak Pulse Power vs. Pulse Time  
 (to 50% of exponentially decaying pulse)



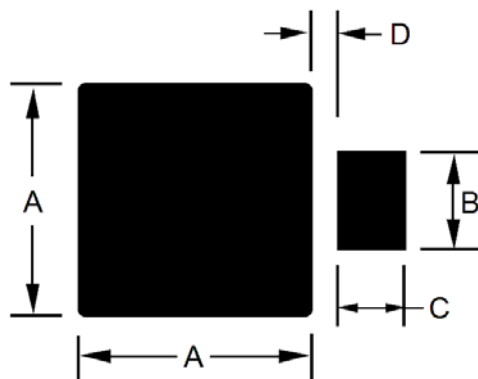
**FIGURE 2**  
Pulse Waveform



**FIGURE 3**  
Derating Curve

**PACKAGE DIMENSIONS**


Ref.	Dimensions			
	Inch		Millimeters	
	Min	Max	Min	Max
A1	0.337	0.353	8.56	8.97
A2	0.277	0.293	7.04	7.44
B	0.117	0.133	2.97	3.38
C	0.436	0.452	11.07	11.48
D	0.092	0.108	2.34	2.74
G	0.062	0.078	1.57	1.98
H	0.022	0.038	0.56	0.96
J	0.008	0.012	0.20	0.30

**PAD LAYOUT**


Ref.	Dimensions	
	Inch	Millimeters
	Typical	Typical
A	0.353	8.97
B	0.117	2.97
C	0.078	1.98
D	0.033	0.84