



## 15,000 Watt Transient Voltage Suppressor (TVS) Protection Device



### DESCRIPTION

This device clamps dangerous high-voltage short-term transients such as those produced by the secondary effects of lightning strikes, providing circuit protection to several class levels in the IEC61000-4-5 specification. Clamping time is virtually instantaneous. It also provides protection from transients caused by inductive load dumps, induced RFI, and ESD, providing protection to IEC61000-4-2 and -4-4.

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

### FEATURES

- Available in both unidirectional and bidirectional configurations.
- 5% working voltage tolerance.
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B.
- RoHS compliant (2002/95/EC), MSL level 1 (J-STD-020).

### APPLICATIONS / BENEFITS

- Protection from transients caused by lightning strikes, switching transients, RFI, and ESD.
- Protection from ESD, and EFT per IEC 61000-4-2 and IEC 61000-4-4.
- Protection from the secondary effects of lightning per IEC61000-4-5.

### MAXIMUM RATINGS @ 25 °C unless otherwise noted

Parameters/Test Conditions	Symbol	Value	Unit
Junction and Storage Temperature	$T_J$ and $T_{STG}$	-55 to +175	°C
Thermal Resistance, Junction to Lead @ 3/8 inch (10 mm) lead length from body	$R_{\theta JL}$	8.0	°C/W
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	77.5	°C/W
Non Repetitive Peak Forward Surge Current <sup>(1)</sup>	$I_{FSM}$	400	A
Rated Average Power Dissipation @ $T_L = 75$ °C, (0.375 inch (9.5 mm) from body) <sup>(2)</sup>	$P_{M(AV)}$	8.0	W
Peak Pulse Power Dissipation with a 10/1000 $\mu$ s waveform (see <a href="#">Figure 1</a> )	$P_{PP}$	15000	W
Peak Pulse Current with a 10/1000 $\mu$ s waveform <sup>(3)</sup>	$I_{PP}$	See <a href="#">Electrical Table</a>	A
Solder Temperature @ 10 s		260	°C

- Notes:**
1. For Unidirectional devices only. Measured on 8.3 ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum. Also see [Figure 6](#).
  2. Mounted as shown in [Figure 5](#).
  3. Non-repetitive current pulse, per [Figure 3](#) and derated above  $T_A = 25$ °C per [Figure 2](#).



**P600 Package**

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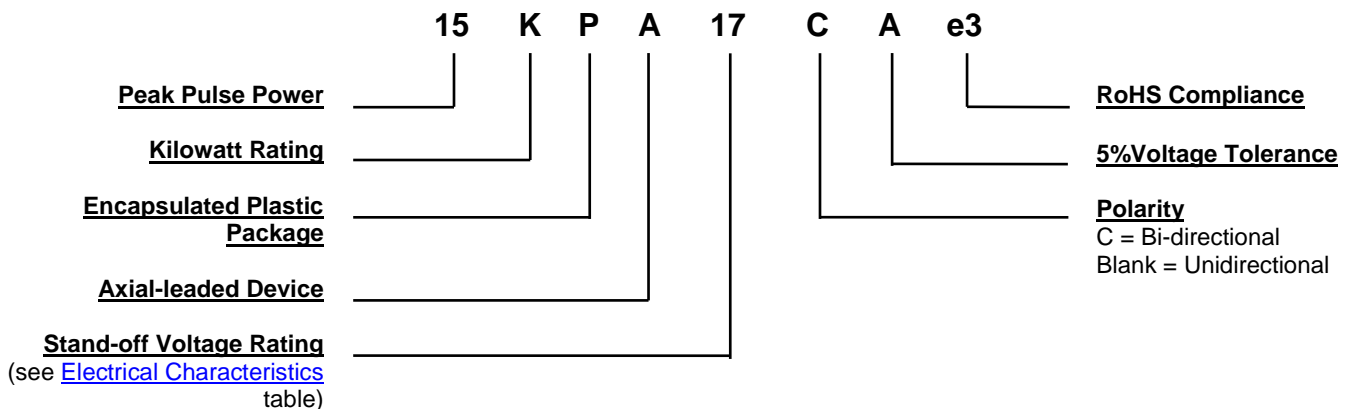
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**MECHANICAL and PACKAGING**

- CASE: Epoxy body meets UL94V-0.
- TERMINALS: Matte-tin plating, fully RoHS compliant. Solderable per MIL-STD-750, method 2026.
- MARKING: Manufacturer ID, date code and part number.
- POLARITY: For unidirectional types the color band denotes the cathode, which is positive with respect to the anode under normal TVS operation.
- TAPE & REEL option: Standard per EIA-296 (add "TR" suffix to part number). Consult factory for quantities.
- WEIGHT: Approximately 0.07 ounce (2.0 grams).
- 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.
$V_{WM}$	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.
$P_{PP}$	Peak Pulse Power. The rated random recurring peak impulse power or rated nonrepetitive peak impulse power. The impulse power is the maximum-rated value of 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.
$I_D$	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.
$V_C$	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.

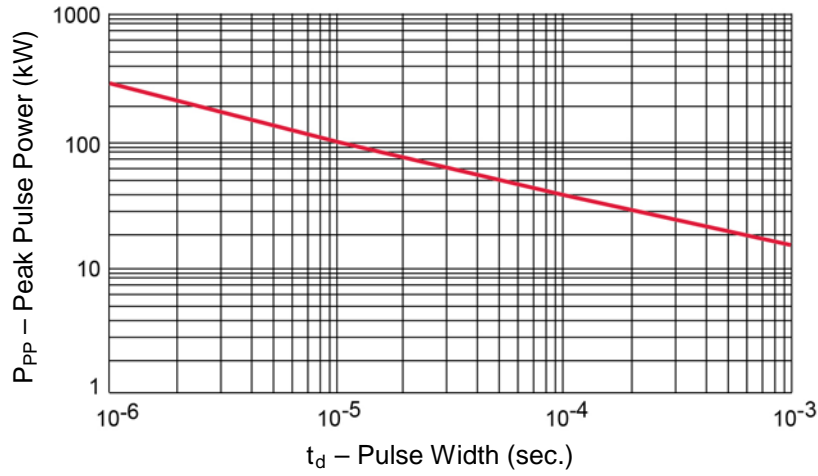
**ELECTRICAL CHARACTERISTICS @ 25 °C**

DEVICE	BREAKDOWN VOLTAGE <sup>(2)</sup> , V <sub>(BR)</sub> V <sub>(BR)</sub> @ I <sub>(BR)</sub> (Volts)		TEST CURRENT I <sub>(BR)</sub> (mA)	STAND-OFF VOLTAGE V <sub>WM</sub> (Volts)	MAXIMUM STANDBY CURRENT <sup>(4)</sup> I <sub>D</sub> @ V <sub>WM</sub> (µA)	MAXIMUM PEAK PULSE CURRENT <sup>(3)</sup> I <sub>PP</sub> (A)	MAXIMUM CLAMPING VOLTAGE V <sub>C</sub> @ I <sub>PP</sub> (Volts)	MAXIMUM TEMPERATURE COEFFICIENT α <sub>V(BR)</sub> (%/°C)
	Min	Max						
15KPA17Ae3 / 15KPA17CAe3	18.99	20.79	50	17	5000	515.4	29.3	0.1
15KPA18Ae3 / 15KPA18CAe3	20.11	22.01	50	18	5000	488.7	30.9	0.1
15KPA20Ae3 / 15KPA20CAe3	22.34	24.46	20	20	1500	440.2	34.3	0.1
15KPA22Ae3 / 15KPA22CAe3	24.57	26.91	10	22	500	407.0	37.1	0.1
15KPA24Ae3 / 15KPA24CAe3	26.81	29.35	5	24	150	371.0	40.7	0.1
15KPA26Ae3 / 15KPA26CAe3	29.04	31.80	5	26	50	343.2	44.0	0.1
15KPA28Ae3 / 15KPA28CAe3	31.28	34.24	5	28	25	317.9	47.5	0.1
15KPA30Ae3 / 15KPA30CAe3	33.51	36.70	5	30	15	297.8	50.7	0.1
15KPA33Ae3 / 15KPA33CAe3	36.90	40.40	5	33	2	276.1	54.7	0.1
15KPA36Ae3 / 15KPA36CAe3	40.20	44.00	5	36	2	252.5	59.8	0.1
15KPA40Ae3 / 15KPA40CAe3	44.70	48.90	5	40	2	229.5	65.8	0.1
15KPA43Ae3 / 15KPA43CAe3	48.00	52.60	5	43	2	216.3	69.8	0.1
15KPA45Ae3 / 15KPA45CAe3	50.30	55.00	5	45	2	207.4	72.8	0.1
15KPA48Ae3 / 15KPA48CAe3	53.60	58.70	5	48	2	194.3	77.7	0.1
15KPA51Ae3 / 15KPA51CAe3	57.00	62.40	5	51	2	182.1	82.9	0.1
15KPA54Ae3 / 15KPA54CAe3	60.30	66.00	5	54	2	172.2	87.7	0.1
15KPA58Ae3 / 15KPA58CAe3	64.80	70.90	5	58	2	161.0	93.8	0.1
15KPA60Ae3 / 15KPA60CAe3	67.00	73.40	5	60	2	155.0	97.4	0.1
15KPA64Ae3 / 15KPA64CAe3	71.50	78.30	5	64	2	144.9	104.2	0.1
15KPA70Ae3 / 15KPA70CAe3	78.20	85.60	5	70	2	132.9	113.6	0.1
15KPA75Ae3 / 15KPA75CAe3	83.80	91.70	5	75	2	123.8	122.0	0.1
15KPA78Ae3 / 15KPA78CAe3	87.10	95.40	5	78	2	119.7	126.1	0.1
15KPA85Ae3 / 15KPA85CAe3	94.90	104.00	5	85	2	109.7	137.6	0.1
15KPA90Ae3 / 15KPA90CAe3	100.50	110.10	5	90	2	103.7	145.6	0.1
15KPA100Ae3 / 15KPA100CAe3	111.70	122.30	5	100	2	93.6	161.3	0.1
15KPA110Ae3 / 15KPA110CAe3	122.90	134.50	5	110	2	84.5	178.6	0.1
15KPA120Ae3 / 15KPA120CAe3	134.00	146.80	5	120	2	78.5	192.3	0.1
15KPA130Ae3 / 15KPA130CAe3	145.20	159.00	5	130	2	72.5	208.3	0.1
15KPA150Ae3 / 15KPA150CAe3	167.60	183.50	5	150	2	62.4	241.9	0.1
15KPA160Ae3 / 15KPA160CAe3	178.70	195.70	5	160	2	58.4	258.6	0.1
15KPA170Ae3 / 15KPA170CAe3	189.90	207.90	5	170	2	55.4	272.7	0.1
15KPA180Ae3 / 15KPA180CAe3	201.10	220.10	5	180	2	52.3	288.5	0.1
15KPA200Ae3 / 15KPA200CAe3	223.40	244.60	5	200	2	47.3	319.1	0.1
15KPA220Ae3 / 15KPA220CAe3	245.70	269.10	5	220	2	35.2	356.0	0.1
15KPA240Ae3 / 15KPA240CAe3	268.10	293.50	5	240	2	39.3	384.6	0.1
15KPA260Ae3 / 15KPA260CAe3	290.40	318.00	5	260	2	36.2	416.7	0.1
15KPA280Ae3 / 15KPA280CAe3	312.80	342.40	5	280	2	33.2	454.5	0.1

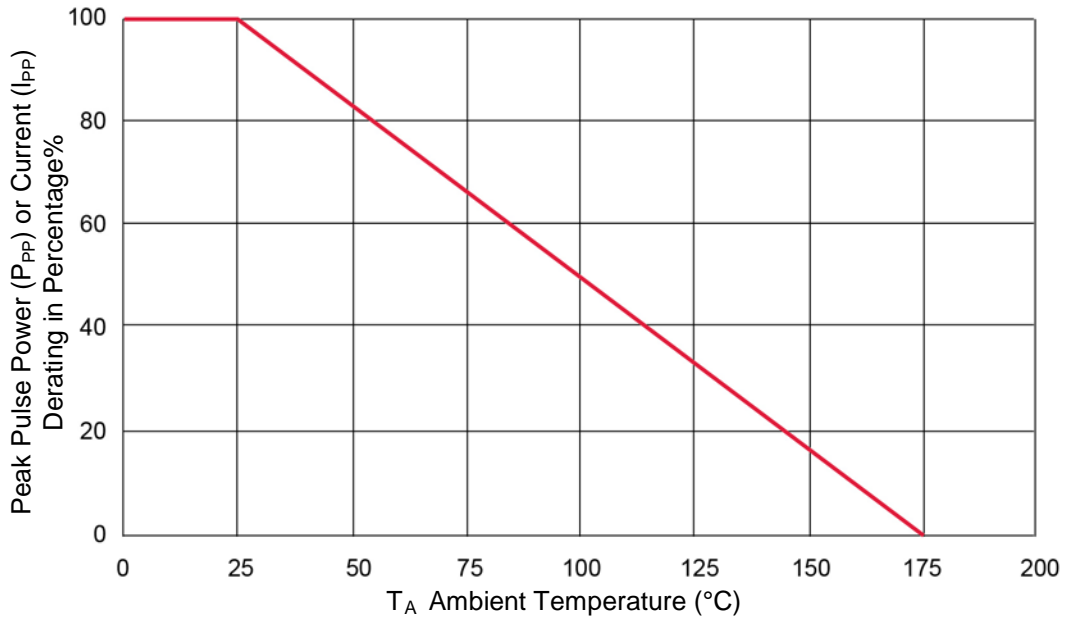
**NOTES:**

- (1) All ratings at 25 °C unless specified otherwise.
- (2) V<sub>(BR)</sub> measured after I<sub>(BR)</sub> applied for 300 µs, I<sub>(BR)</sub> = square wave pulse or equivalent.
- (3) Surge current waveform per [Figure 3](#) and derated per [Figure 2](#).
- (4) For bidirectional types with V<sub>WM</sub> of 30 volts and less, the I<sub>D</sub> limit is doubled.

GRAPHS

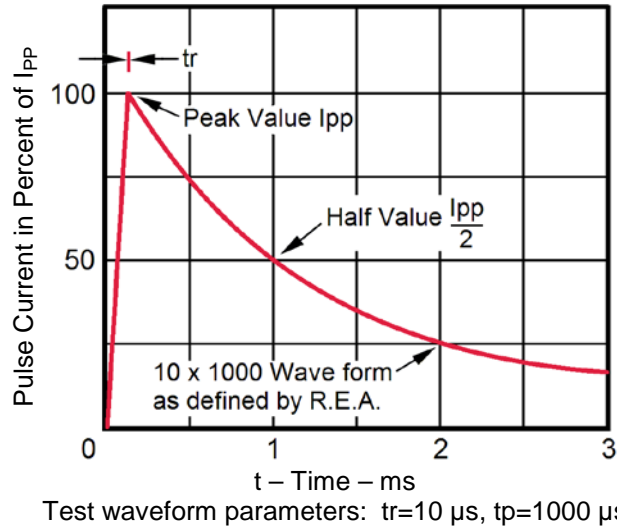


**FIGURE 1**  
Peak Pulse Power Rating Curve

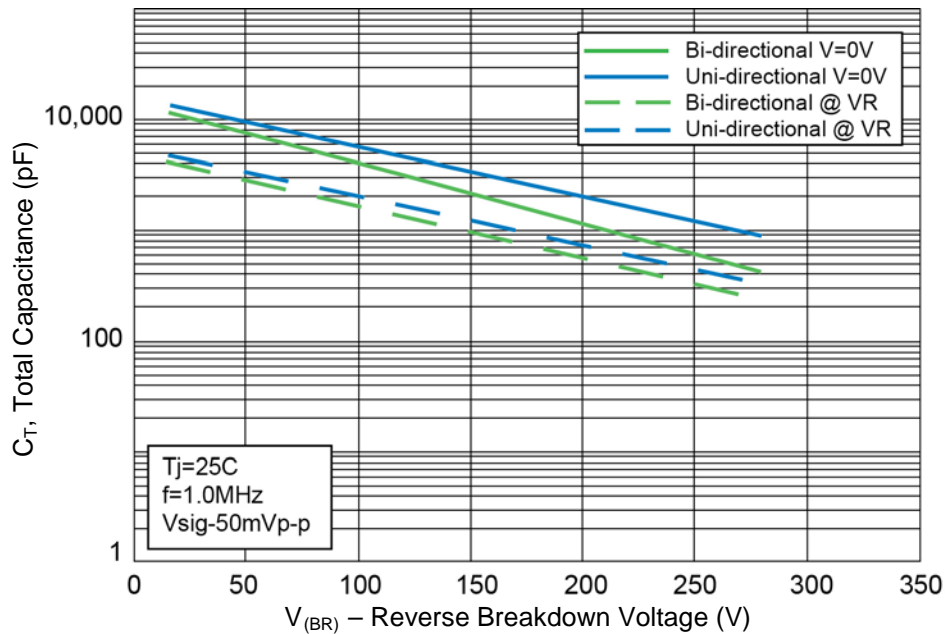


**FIGURE 2**  
Pulse Derating Curve

GRAPHS (continued)

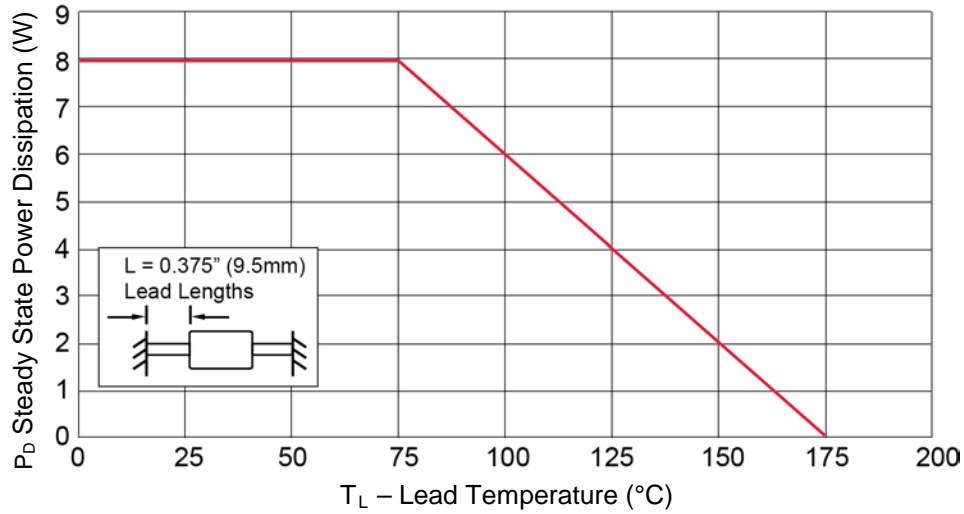


**FIGURE 3**  
Pulse Waveform for 10/1000 Exponential Surge

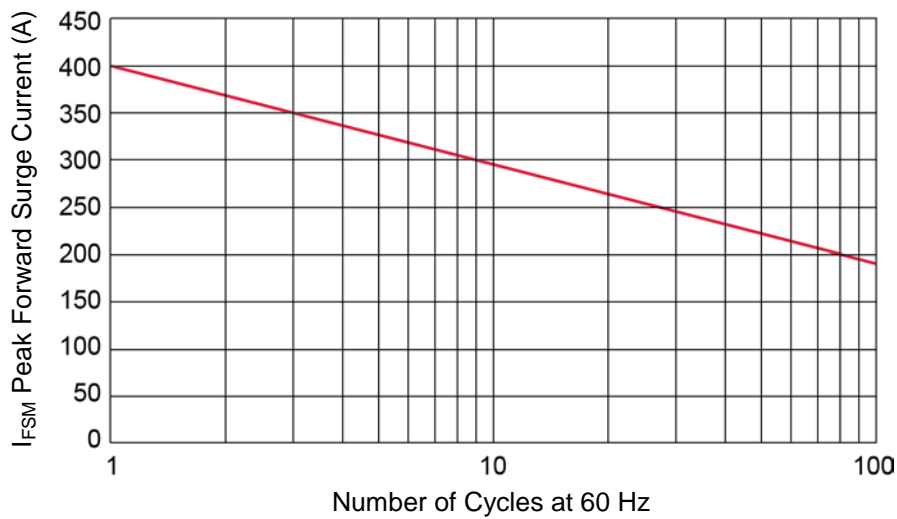


**FIGURE 4**  
Typical Junction Capacitance

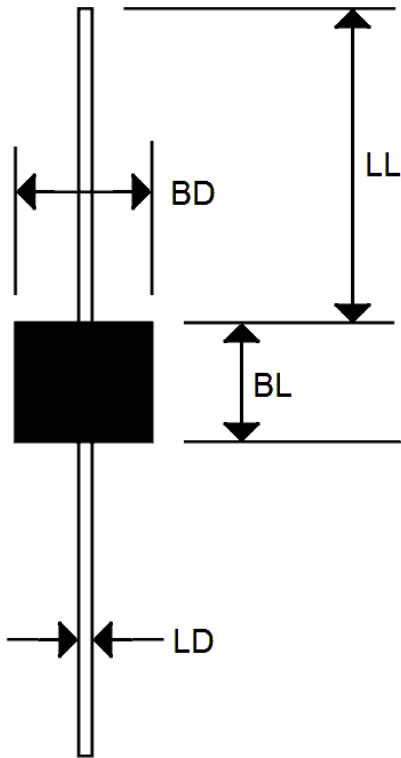
GRAPHS (continued)



**FIGURE 5**  
Steady State Power Derating Curve



**FIGURE 6**  
Maximum Non-repetitive Forward Surge Current  
(Unidirectional Devices Only)

**PACKAGE DIMENSIONS**


Dim	Dimensions			
	Inch		Millimeters	
	Min	Max	Min	Max
LL	0.750	-	19.05	-
BL	0.340	0.360	8.645	9.135
BD	0.340	0.360	8.645	9.135
LD	0.047	0.053	1.194	1.346