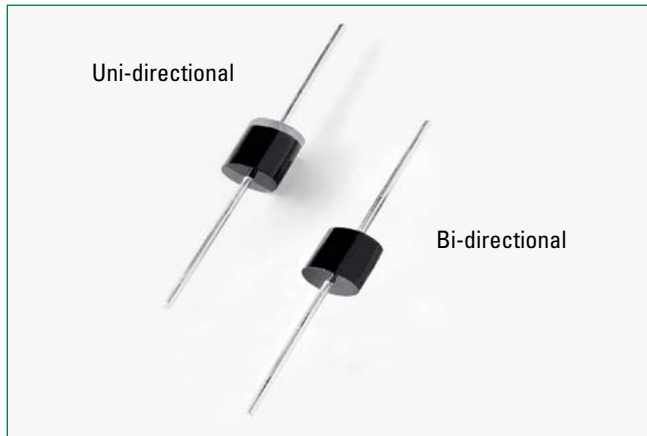


# TP5KP Series

## Axial Leaded – 5 kW



### Web Resources



Download ECAD models, order samples, and find technical resources at [www.littelfuse.com](http://www.littelfuse.com)

### Agency Approvals

Agency	Agency File Number
	E230531

### Maximum Ratings and Thermal Characteristics ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation by 10/1000 $\mu\text{s}$ Test Waveform (Fig.2)(Note 1)	$P_{PPM}$	5000	W
Steady State Power Dissipation on Infinite Heat Sink at $T_J = 75^\circ\text{C}$	$P_D$	8.0	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave Unidirectional Only (Note 2)	$I_{FSM}$	400	A
Maximum Instantaneous Forward Voltage at 100A for Unidirectional Only (Note 3)	$V_F$	3.5	V
Operating Junction Temperature Range	$T_J$	-55 to 150	$^\circ\text{C}$
Storage Temperature Range	$T_{STG}$	-55 to 175	$^\circ\text{C}$
Typical Thermal Resistance Junction to Lead	$R_{\theta JL}$	8.0	$^\circ\text{C/W}$
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	40	$^\circ\text{C/W}$

#### Notes:

1. Non-repetitive current pulse, per Fig. 4 and derated above  $T_J$  (initial)  $= 25^\circ\text{C}$  per Fig. 3.
2. Measured on 8.3ms single half sine wave or equivalent square wave, duty cycle=4 per minute maximum.

### Description

The TP5KP Series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

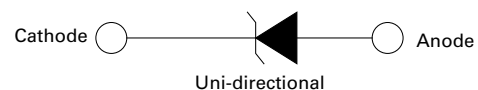
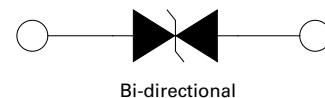
### Features & Benefits

- Hi reliability application and automotive grade AEC Q101 qualified
- Glass passivated chip junction in P600 package
- 5000W peak pulse capability at 10/1000 $\mu\text{s}$  waveform, repetition rate (duty cycles):0.01%
- Fast response time: typically less than 1.0ps from 0 Volts to BV min
- Excellent clamping capability
- Typical failure mode is short from over-specified voltage or current
- Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- IEC-61000-4-2 ESD 30kV(Air), 30kV (Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2
- EFT protection of data lines in accordance with IEC 61000-4-4
- Low incremental surge resistance
- Typical  $I_R$  less than 2 $\mu\text{A}$  when  $V_{BR \min} > 12\text{V}$
- High temperature to reflow soldering guaranteed: 260 $^\circ\text{C}/10\text{sec}$  / 0.375" (9.5mm) lead length, 5 lbs., (2.3kg) tension
- $V_{BR} @ T_J = V_{BR} @ 25^\circ\text{C} \times (1 + \alpha T \times (T_J - 25))$  ( $\alpha$ : Temperature Coefficient, typical value is 0.1%)
- Plastic package is flammability rated V-0 per Underwriters Laboratories
- Matte tin lead-free plated
- Halogen free and RoHS compliant
- Pb-free E3 means 2<sup>nd</sup> level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)

### Applications

TVS devices are ideal for the protection of I/O interfaces,  $V_{CC}$  bus and other vulnerable circuits used in telecom, computer, industrial and consumer electronic applications.

### Functional Diagram



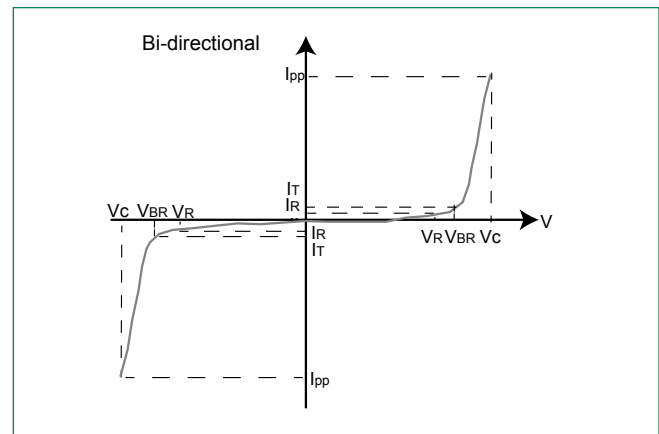
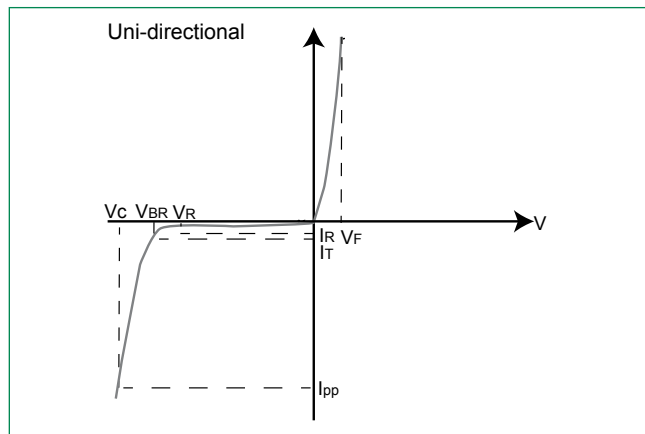
# TP5KP Series

## Axial Leaded – 5 kW

### Electrical Characteristics ( $T_A=25^\circ\text{C}$ unless otherwise noted)

Part Number (Uni)	Part Number (Bi)	Reverse Stand off Voltage $V_R$ (Volts)	Breakdown Voltage $V_{BR}$ (Volts) @ $I_T$		Test Current $I_T$ (mA)	Maximum Clamping Voltage $V_C$ @ $I_{PP}$ (V)	Maximum Peak Pulse Current $I_{PP}$ (A)	Maximum Reverse Leakage $I_R$ @ $V_R$ ( $\mu\text{A}$ )	Agency Approval
			MIN	MAX					
TP5KP11A	TP5KP11CA	11.0	12.20	13.50	5	18.2	280.2	2	X
TP5KP12A	TP5KP12CA	12.0	13.30	14.70	5	19.9	256.3	2	X
TP5KP13A	TP5KP13CA	13.0	14.40	15.90	5	21.5	237.2	2	X
TP5KP14A	TP5KP14CA	14.0	15.60	17.20	5	23.2	219.8	2	X
TP5KP15A	TP5KP15CA	15.0	16.70	18.50	5	24.4	209.0	2	X
TP5KP16A	TP5KP16CA	16.0	17.80	19.70	5	26.0	196.2	2	X
TP5KP17A	TP5KP17CA	17.0	18.90	20.90	5	27.6	184.8	2	X
TP5KP18A	TP5KP18CA	18.0	20.00	22.10	5	29.2	174.7	2	X
TP5KP20A	TP5KP20CA	20.0	22.20	24.50	5	32.4	157.4	2	X
TP5KP22A	TP5KP22CA	22.0	24.00	26.90	5	35.5	143.7	2	X
TP5KP24A	TP5KP24CA	24.0	26.70	29.50	5	38.9	131.1	2	X
TP5KP26A	TP5KP26CA	26.0	28.90	31.90	5	42.1	121.1	2	X
TP5KP28A	TP5KP28CA	28.0	31.10	34.40	5	45.4	112.3	2	X
TP5KP30A	TP5KP30CA	30.0	33.30	36.80	5	48.4	105.4	2	X
TP5KP33A	TP5KP33CA	33.0	36.70	40.60	5	53.3	95.7	2	X
TP5KP36A	TP5KP36CA	36.0	40.00	44.20	5	58.1	87.8	2	X
TP5KP40A	TP5KP40CA	40.0	44.40	49.10	5	64.5	79.1	2	X
TP5KP43A	TP5KP43CA	43.0	47.80	52.80	5	69.4	73.5	2	X
TP5KP45A	TP5KP45CA	45.0	50.00	55.30	5	72.7	70.2	2	X
TP5KP48A	TP5KP48CA	48.0	53.30	58.90	5	77.4	65.9	2	X
TP5KP51A	TP5KP51CA	51.0	56.70	62.70	5	82.4	61.9	2	X
TP5KP54A	TP5KP54CA	54.0	60.00	66.30	5	87.1	58.6	2	X
TP5KP58A	TP5KP58CA	58.0	64.40	71.20	5	93.6	54.5	2	X
TP5KP60A	TP5KP60CA	60.0	66.70	73.70	5	96.8	52.7	2	X
-	TP5KP64CA	64.0	71.1	78.6	5	103.0	49.5	2	X

### I-V Curve Characteristics



**$P_{PPM}$**  Peak Pulse Power Dissipation -- Max power dissipation  
 **$V_R$**  Stand-off Voltage -- Maximum voltage that can be applied to the TVS without operation  
 **$V_{BR}$**  Breakdown Voltage -- Maximum voltage that flows though the TVS at a specified test current ( $I_T$ )  
 **$V_C$**  Clamping Voltage -- Peak voltage measured across the TVS at a specified  $I_{PPM}$  (peak impulse current)  
 **$I_R$**  Reverse Leakage Current -- Current measured at  $V_R$   
 **$V_F$**  Forward Voltage Drop for Uni-directional

# TP5KP Series

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### Ratings and Characteristic Curves ( $T_A=25^\circ\text{C}$ unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform

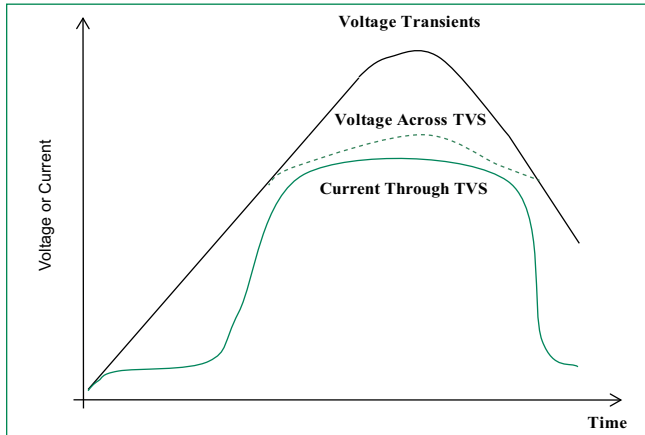


Figure 2 - Peak Pulse Power Rating Curve

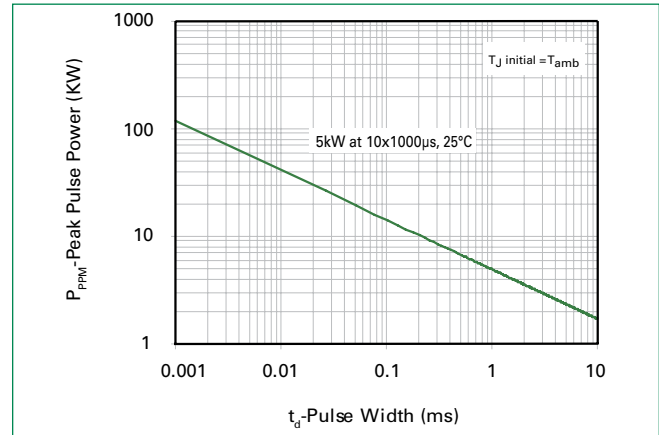


Figure 3 - Peak Pulse Power Derating Curve

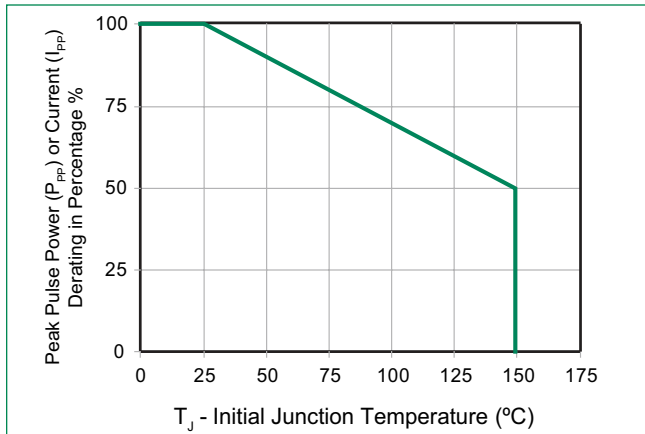


Figure 4 - Pulse Waveform

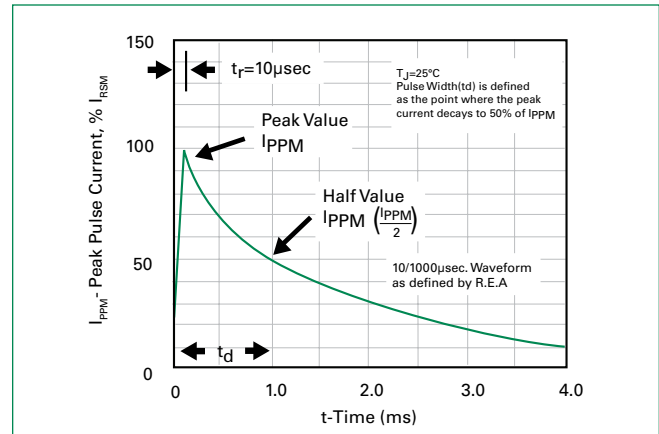


Figure 5 - Typical Junction Capacitance

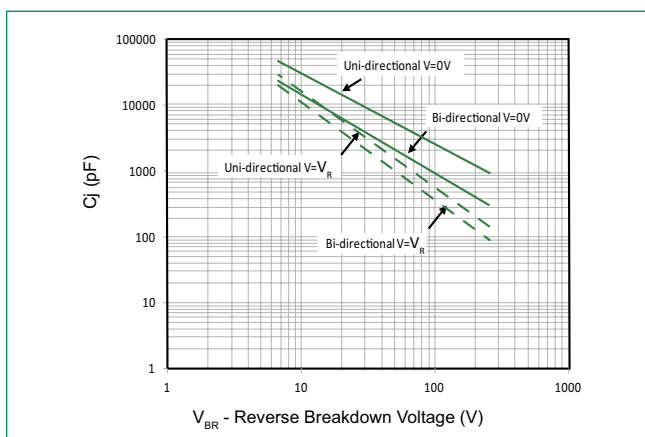
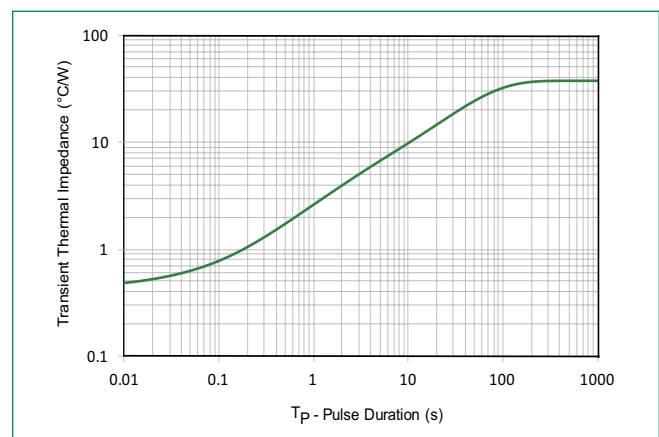


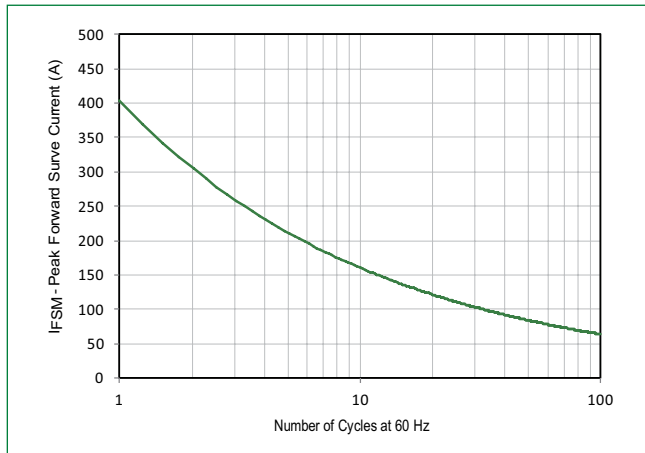
Figure 6 - Typical Transient Thermal Impedance



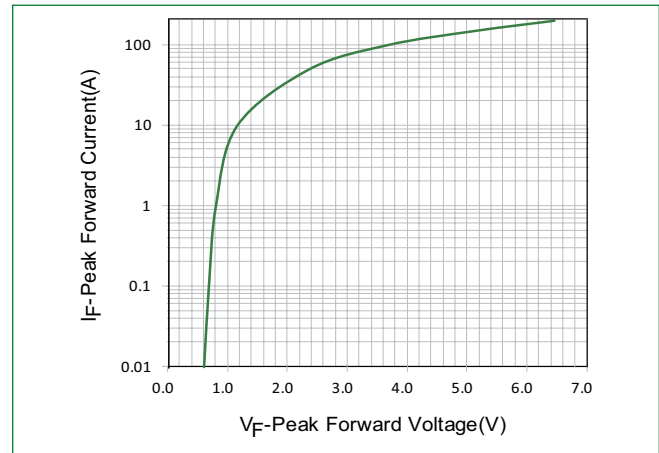
# TP5KP Series

## Axial Leaded – 5 kW

**Figure 7** - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only

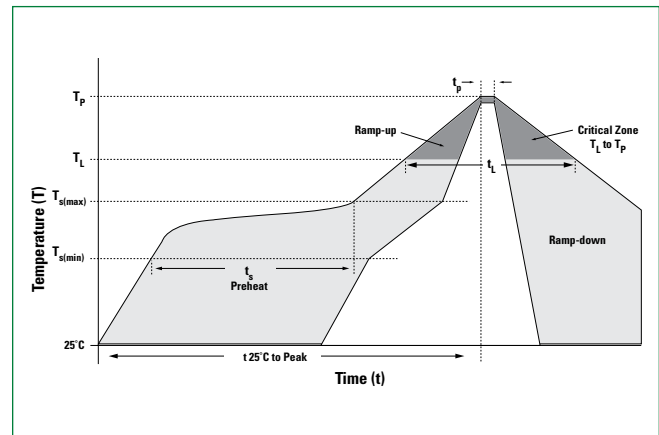


**Figure 8** - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)



### Soldering Parameters

<b>Reflow Condition</b>		Lead-free assembly
<b>Pre Heat</b>	- Temperature Min ( $T_{s(min)}$ )	150°C
	- Temperature Max ( $T_{s(max)}$ )	200°C
	- Time (min to max) ( $t_s$ )	60 - 120 secs
<b>Average ramp up rate (Liquidus Temp (<math>T_A</math>) to peak)</b>		3°C/second max
<b><math>T_{s(max)}</math> to <math>T_A</math> - Ramp-up Rate</b>		3°C/second max
<b>Reflow</b>	- Temperature ( $T_A$ ) (Liquidus)	217°C
	- Time (min to max) ( $t_s$ )	60 – 150 seconds
<b>Peak Temperature (<math>T_p</math>)</b>		260 <sup>+0/-5</sup> °C
<b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>		30 seconds
<b>Ramp-down Rate</b>		6°C/second max
<b>Time 25°C to peak Temperature (<math>T_p</math>)</b>		8 minutes Max.
<b>Do not exceed</b>		260°C



### Physical Specifications

<b>Weight</b>	0.07oz., 2.1g
<b>Case</b>	P600 molded plastic body over passivated junction.
<b>Polarity</b>	Color band denotes the cathode except Bipolar.
<b>Terminal</b>	Matte Tin axial leads, solderable per JESD22-B102.

### Flow/Wave Soldering (Solder Dipping)

<b>Peak Temperature :</b>	265°C
<b>Dipping Time :</b>	10 seconds
<b>Soldering :</b>	1 time

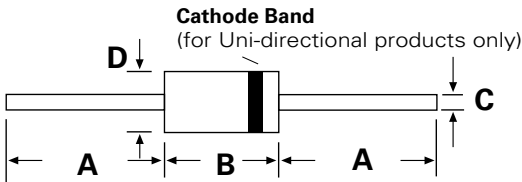
### Environmental Specifications

<b>High Temp. Storage</b>	JESD22-A103
<b>HTRB</b>	JESD22-A108
<b>Temperature Cycling</b>	JESD22-A104
<b>H3TRB</b>	JESD22-A101
<b>RSH</b>	JESD22-B106

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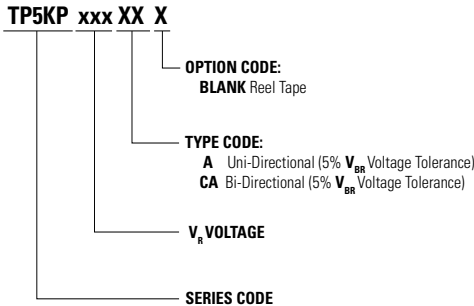
### Dimensions



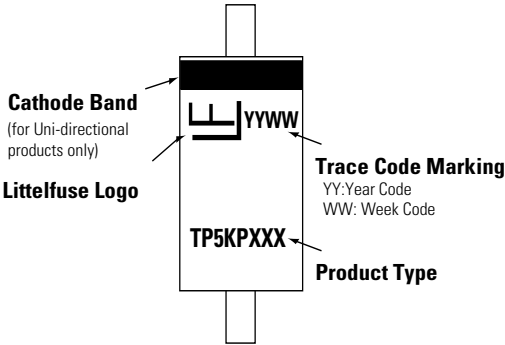
Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	1.000	-	25.40	-
B	0.340	0.360	8.60	9.10
C	0.048	0.052	1.22	1.32
D	0.340	0.360	8.60	9.10

P600

### Part Numbering System



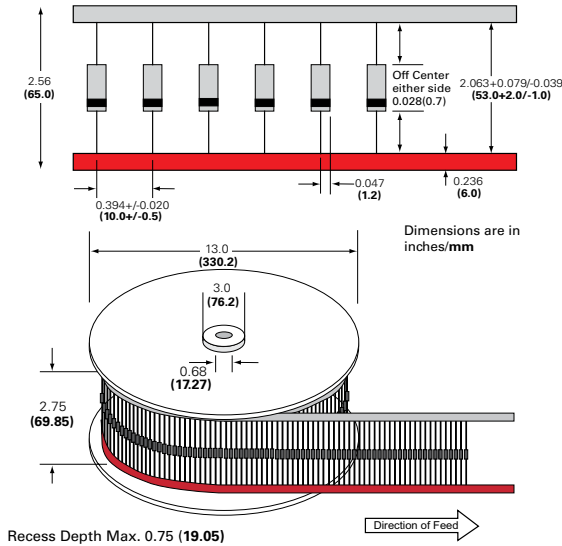
### Part Marking System



### Packing Options

Part Number	Component Package	Quantity	Packaging Option	Packaging Specification
TP5KPxxxXX	P600	800	Tape & Reel	EIA STD RS-296

### Tape and Reel Specification



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