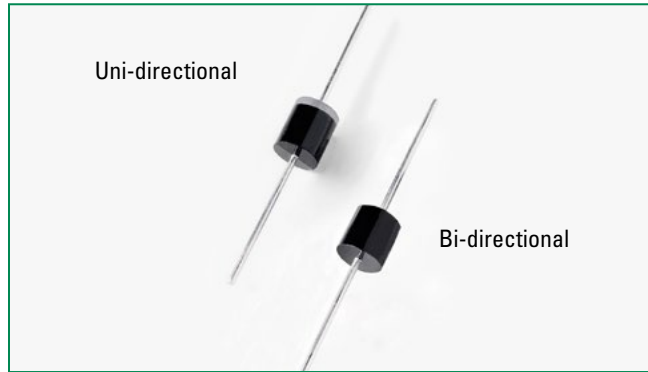



## 20KPA Series



### Agency Approvals

AGENCY	AGENCY FILE NUMBER
	E230531

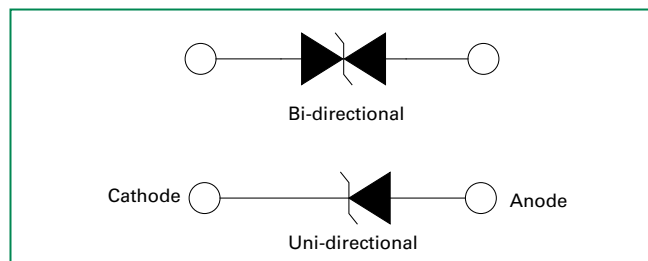
### Maximum Ratings and Thermal Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation by 10x1000µs Test Waveform (Fig.2) (Note 1)	P <sub>PPM</sub>	20000	W
Steady State Power Dissipation on Infinite Heat Sink at T <sub>L</sub> =75°C (Fig. 6)	P <sub>D</sub>	8.0	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave Unidirectional Only (Note 2)	I <sub>FSM</sub>	400	A
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to 175	°C
Typical Thermal Resistance Junction to Lead	R <sub>wJL</sub>	8.0	°C/W
Typical Thermal Resistance Junction to Ambient	R <sub>wJA</sub>	40	°C/W

#### Notes:

1. Non-repetitive current pulse, per Fig. 4 and derated above T<sub>A</sub> = 25°C per Fig. 3.
2. Measured on 8.3ms single half sine wave or equivalent square wave, duty cycle=4 per minute maximum.

### Functional Diagram



### Description

The 20KPA Series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.


### Features

- Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR@25^\circ C} \times \Delta T$
- Glass passivated chip junction in P600 package
- 20000W peak pulse capability at 10x1000µs 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 15kV(Air), 8kV (Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)
- Low incremental surge resistance
- Typical I<sub>R</sub> less than 2µA above 49V
- High temperature soldering guaranteed: 260°C/40 seconds / 0.375"(9.5mm) lead length, 5 lbs., (2.3kg) tension
- Plastic package has underwriters laboratory flammability classification 94V-0
- Matte tin lead-free plated
- Halogen free and RoHS compliant

### Applications

TVS devices are ideal for the protection of I/O interfaces, V<sub>CC</sub> bus and other vulnerable circuits used in telecom, computer, industrial and consumer electronic applications.

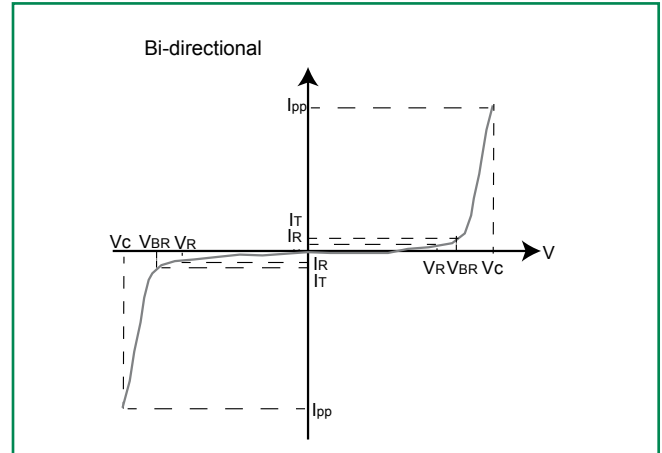
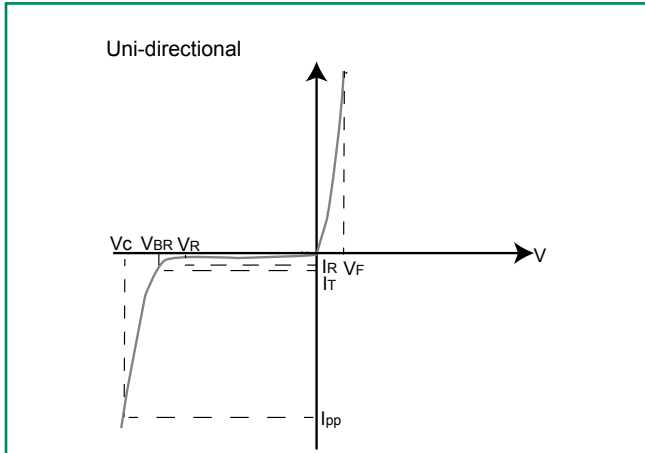
### Electrical Characteristics ( $T_A=25^\circ\text{C}$ unless otherwise noted)

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 Peak Pulse Current $I_{PP}$ (A)	Maximum Reverse Leakage $I_R$ @ $V_R$ ( $\mu\text{A}$ )	Maximum Clamping Voltage $V_C$ @ $I_{PP}$ (V)	Agency Approval 
			MIN					
20KPA20A	20KPA20CA	20	22.34	50	548.9	5000	36.8	X
20KPA24A	20KPA24CA	24	26.81	50	490.3	5000	41.2	X
20KPA26A	20KPA26CA	26	29.04	50	451.9	2000	44.7	X
20KPA28A	20KPA28CA	28	31.28	50	420.8	1000	48.0	X
20KPA30A	20KPA30CA	30	33.51	5	392.2	250	51.5	X
20KPA32A	20KPA32CA	32	35.74	5	372.0	150	54.3	X
20KPA34A	20KPA34CA	34	38.00	5	351.3	50	57.5	X
20KPA36A	20KPA36CA	36	40.20	5	328.5	20	61.5	X
20KPA40A	20KPA40CA	40	44.70	5	297.9	15	67.8	X
20KPA44A	20KPA44CA	44	49.10	5	277.9	2	72.7	X
20KPA48A	20KPA48CA	48	53.60	5	254.4	2	79.4	X
20KPA52A	20KPA52CA	52	58.10	5	235.4	2	85.8	X
20KPA56A	20KPA56CA	56	62.60	5	218.1	2	92.6	X
20KPA60A	20KPA60CA	60	67.00	5	207.0	2	97.6	X
20KPA64A	20KPA64CA	64	71.50	5	194.2	2	104.0	X
20KPA68A	20KPA68CA	68	76.00	5	183.6	2	110.0	X
20KPA72A	20KPA72CA	72	80.40	5	174.1	2	116.0	X
20KPA80A	20KPA80CA	80	89.40	5	155.4	2	130.0	X
20KPA88A	20KPA88CA	88	98.30	5	142.3	2	142.0	X
20KPA96A	20KPA96CA	96	107.20	5	130.3	2	155.0	X
20KPA104A	20KPA104CA	104	116.20	5	120.2	2	168.0	X
20KPA112A	20KPA112CA	112	125.10	5	111.0	2	182.0	X
20KPA120A	20KPA120CA	120	134.00	5	104.1	2	194.0	X
20KPA132A	20KPA132CA	132	147.40	5	94.8	2	213.0	X
20KPA144A	20KPA144CA	144	160.80	5	87.1	2	232.0	X
20KPA160A	20KPA160CA	160	178.70	5	78.3	2	258.0	X
20KPA172A	20KPA172CA	172	192.10	5	72.9	2	277.0	X
20KPA180A	20KPA180CA	180	201.10	5	69.4	2	291.0	X
20KPA192A	20KPA192CA	192	214.50	5	65.4	2	309.0	X
20KPA204A	20KPA204CA	204	227.90	5	61.4	2	329.0	X
20KPA216A	20KPA216CA	216	241.30	5	58.0	2	348.0	X
20KPA232A	20KPA232CA	232	259.10	5	54.0	2	374.0	X
20KPA240A	20KPA240CA	240	268.10	5	52.2	2	387.0	X
20KPA256A	20KPA256CA	256	286.00	5	49.0	2	412.0	X
20KPA280A	20KPA280CA	280	312.80	5	44.8	2	451.0	X
20KPA300A	20KPA300CA	300	335.10	5	41.8	2	483.0	X

For bidirectional type having  $V_{RWM}$  of 40 volts and less, the  $I_R$  limit is double.

For parts without A, the  $V_{BR}$  is + 10% and  $V_C$  is 5% higher than with A parts.

## I-V Curve Characteristics



**P<sub>PPM</sub> Peak Pulse Power Dissipation** – Max power dissipation

**V<sub>r</sub> Stand-off Voltage** – Maximum voltage that can be applied to the TVS without operation

**V<sub>BR</sub> Breakdown Voltage** – Maximum current that flows through the TVS at a specified test current (I<sub>T</sub>)

**V<sub>c</sub> Clamping Voltage** – Peak voltage measured across the suppressor at a specified I<sub>ppm</sub> (peak impulse current)

**I<sub>r</sub> Reverse Leakage Current** – Current measured at V<sub>r</sub>

**V<sub>F</sub> Forward Voltage Drop for Uni-directional**

## Ratings and Characteristic Curves (T<sub>A</sub>=25°C unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform

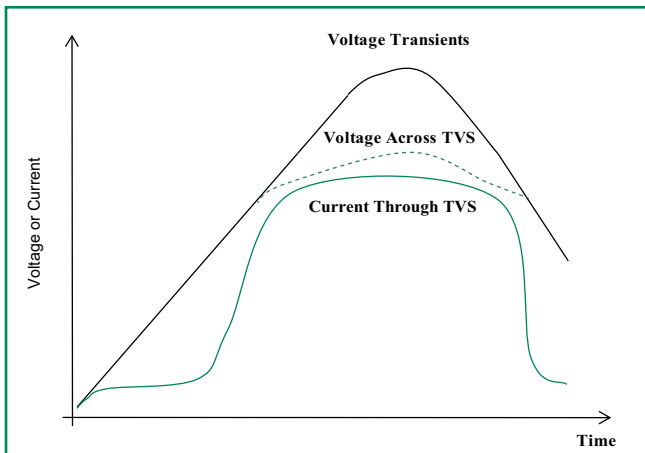
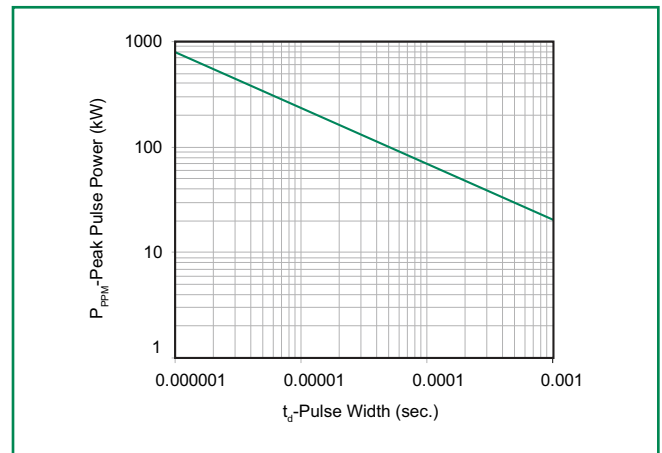


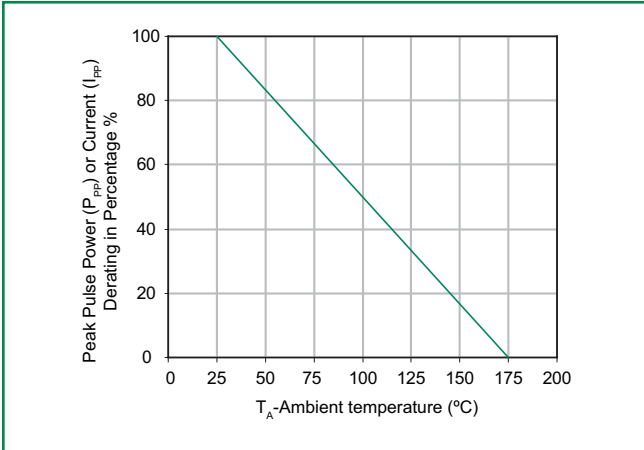
Figure 2 - Peak Pulse Power Rating Curve



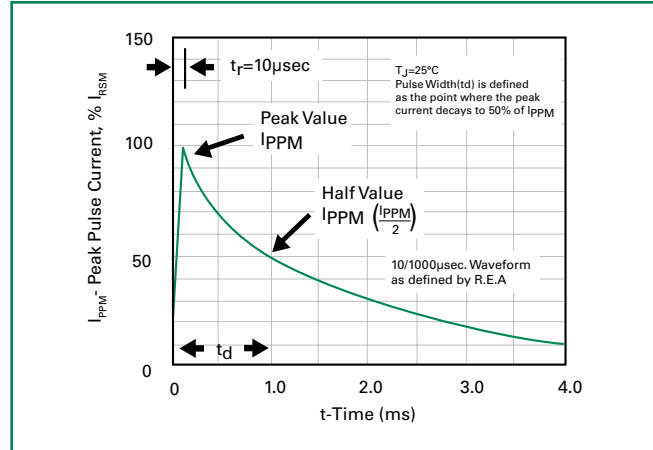
continues on next page.

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

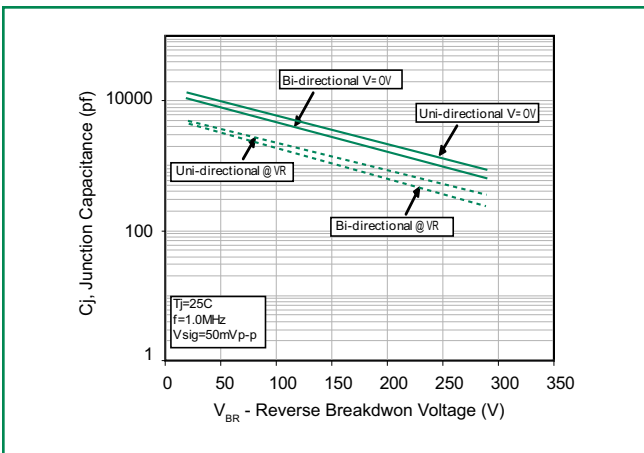
**Figure 3 - Pulse Derating Curve**



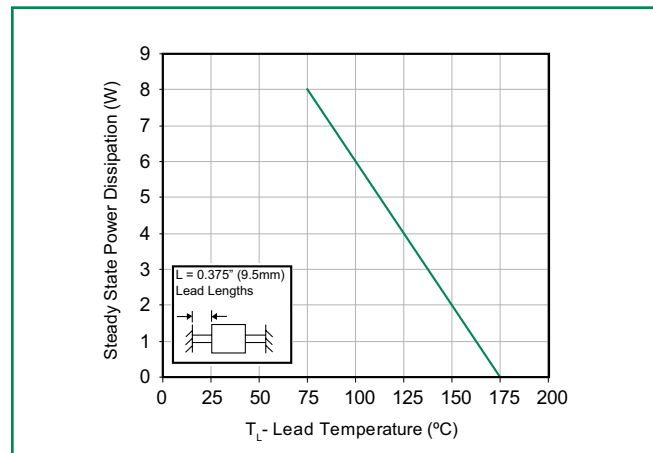
**Figure 4 - Pulse Waveform**



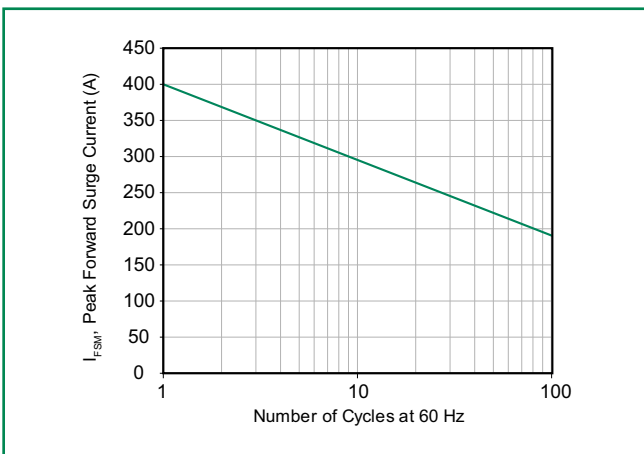
**Figure 5 - Typical Junction Capacitance**



**Figure 6 - Steady State Power Derating Curve**

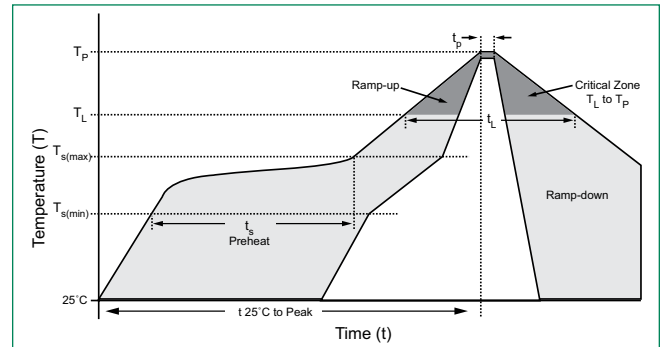


**Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current**



## Soldering Parameters

Reflow Condition		Lead-free assembly
Pre Heat	- Temperature Min ( $T_{s(min)}$ )	150°C
	- Temperature Max ( $T_{s(max)}$ )	200°C
	- Time (min to max) ( $t_s$ )	60 – 180 secs
Average ramp up rate (Liquidus Temp ( $T_L$ ) to peak)		3°C/second max
$T_{s(max)}$ to $T_L$ - Ramp-up Rate		3°C/second max
Reflow	- Temperature ( $T_L$ ) (Liquidus)	217°C
	- Time (min to max) ( $t_s$ )	60 – 150 seconds
Peak Temperature ( $T_p$ )		260 <sup>+0/-5</sup> °C
Time within 5°C of actual peak Temperature ( $t_p$ )		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature ( $T_p$ )		8 minutes Max.
Do not exceed		280°C



## Flow/Wave Soldering (Solder Dipping)

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

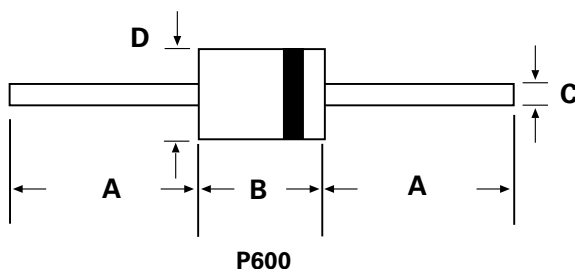
## Physical Specifications

<b>Weight</b>	0.07oz., 2.5g
<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-B102D.

## Environmental Specifications

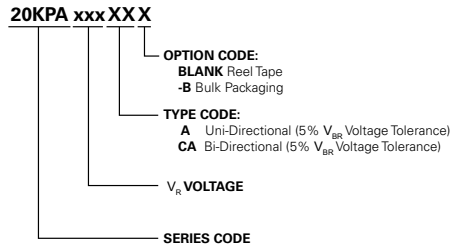
<b>Temperature Cycle</b>	JESD22-A104
<b>Pressure Cooker</b>	JESD 22-A102
<b>High Temp. Storage</b>	JESD22-A103
<b>HTRB</b>	JESD22-A108
<b>Thermal Shock</b>	JESD22-A106

## Dimensions

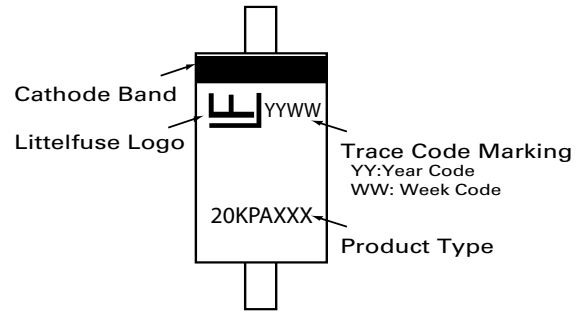


Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	1.000	-	25.40	-
B	0.340	0.360	8.60	9.10
C	0.048	0.052	1.22	1.32
D	0.340	0.360	8.60	9.10

### Part Numbering System



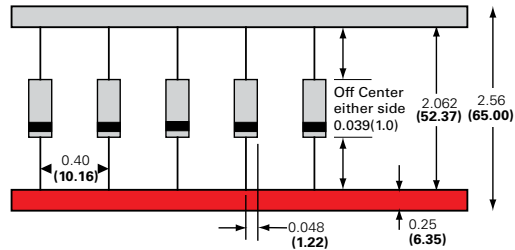
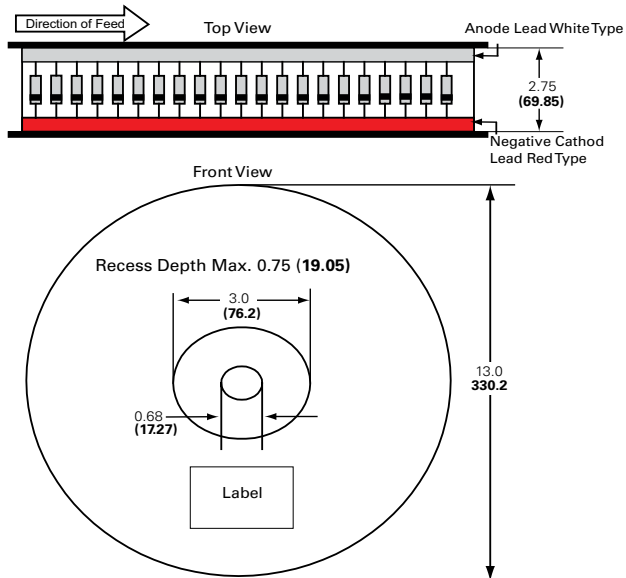
### Part Marking System



### Packing Options

Part Number	Component Package	Quantity	Packaging Option	Packaging Specification
20KPAxxxXX	P600	800	Tape & Reel	EIA STD RS-296E
20KPAxxxXX-B	P600	100	Bulk	Littelfuse Concord Packing Spec. DM-0016

### Tape and Reel Specification



Dimensions are in inches/mm