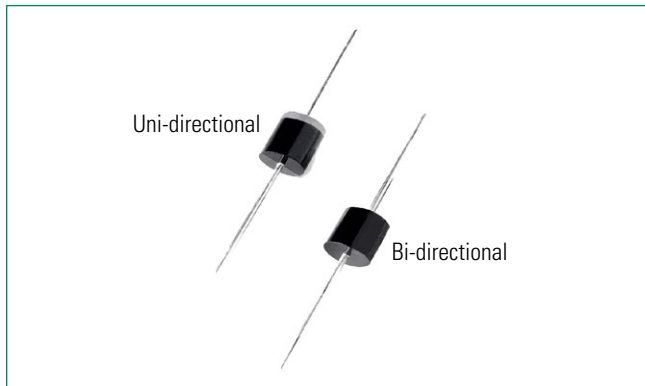


**15KPA-HR Series**



**Agency Approvals**

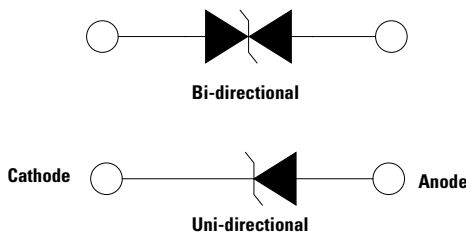
Agency	Agency File Number
	E230531

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

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation by 10/1000µs Test Waveform (Fig.2)(Note 1)	P <sub>PPM</sub>	15	kW
Steady State Power Dissipation on Infinite Heat Sink at T <sub>J</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>θJL</sub>	8.0	°C/W
Typical Thermal Resistance Junction to Ambient	R <sub>θJA</sub>	40	°C/W

- Notes:**
1. Non-repetitive current pulse per Fig. 4 and derated above T<sub>J</sub> (initial) =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**



**Descriptions**

The 15KPA-HR High Reliability Series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.


**Features**

- 15 kW peak pulse capability at 10/1000µs waveform, repetition rate (duty cycles):0.01 %
- Glass passivated chip junction in P600 package
- Fast response time: typically less than 1.0ps from 0 Volts to V<sub>BR</sub> 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)
- EFT protection of data lines in accordance with IEC 61000-4-4
- Low incremental surge resistance
- Typical I<sub>R</sub> less than 2µA when V<sub>BR</sub> min>36V
- High temperature soldering guaranteed: 260C/10 seconds / 0.375", (9.5mm) lead length, 5 lbs., (2.3kg) tension
- V<sub>BR</sub> @ T<sub>J</sub> = V<sub>BR</sub> @25°C x (1 + α T x (T<sub>J</sub> - 25)) (α T: Temperature Coefficient, typical value is 0.1%)
- UL Recognized compound meeting flammability rating V-0
- Lead-free matte tin plated package
- Halogen free and RoHS compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/ JEDEC J-STD-609A.01)

**Applications**

TVS Components 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<sub>A</sub>=25°C unless otherwise noted)

Part Number (Uni)	Part Number (Bi)	Reverse Stand off Voltage V <sub>R</sub> (Volts)	Breakdown Voltage V <sub>BR</sub> (Volts) @ I <sub>T</sub>		Test Current I <sub>T</sub> (mA)	Maximum Peak Pulse Current I <sub>PP</sub> (A)	Maximum Reverse Leakage I <sub>R</sub> @ V <sub>R</sub> (μA)	Maximum Clamping Voltage V <sub>C</sub> @ I <sub>PP</sub> (V)	Agency Recognition 
			MIN	MAX					
15KPA17A-HR	15KPA17CA-HR	17	18.99	20.79	50	515.4	5000	29.3	X
15KPA18A-HR	15KPA18CA-HR	18	20.11	22.01	50	488.7	5000	30.9	X
15KPA20A-HR	15KPA20CA-HR	20	22.34	24.46	20	440.2	1500	34.3	X
15KPA22A-HR	15KPA22CA-HR	22	24.57	26.91	10	407.0	500	37.1	X
15KPA24A-HR	15KPA24CA-HR	24	26.81	29.35	5	371.0	150	40.7	X
15KPA26A-HR	15KPA26CA-HR	26	29.04	31.80	5	343.2	50	44.0	X
15KPA28A-HR	15KPA28CA-HR	28	31.28	34.24	5	317.9	25	47.5	X
15KPA30A-HR	15KPA30CA-HR	30	33.51	36.7	5	297.8	15	50.7	X
15KPA33A-HR	15KPA33CA-HR	33	36.9	40.4	5	276.1	2	54.7	X
15KPA36A-HR	15KPA36CA-HR	36	40.2	44.0	5	252.5	2	59.8	X
15KPA40A-HR	15KPA40CA-HR	40	44.7	48.9	5	229.5	2	65.8	X
15KPA43A-HR	15KPA43CA-HR	43	48.0	52.6	5	216.3	2	69.8	X
15KPA45A-HR	15KPA45CA-HR	45	50.3	55.0	5	207.4	2	72.8	X
15KPA48A-HR	15KPA48CA-HR	48	53.6	58.7	5	194.3	2	77.7	X
15KPA51A-HR	15KPA51CA-HR	51	57.0	62.4	5	182.1	2	82.9	X
15KPA54A-HR	15KPA54CA-HR	54	60.3	66.0	5	172.2	2	87.7	X
15KPA58A-HR	15KPA58CA-HR	58	64.8	70.9	5	161.0	2	93.8	X
15KPA60A-HR	15KPA60CA-HR	60	67.0	73.4	5	155.0	2	97.4	X
15KPA64A-HR	15KPA64CA-HR	64	71.5	78.3	5	144.9	2	104.2	X
15KPA70A-HR	15KPA70CA-HR	70	78.2	85.6	5	132.9	2	113.6	X
15KPA75A-HR	15KPA75CA-HR	75	83.8	91.7	5	123.8	2	122.0	X
15KPA78A-HR	15KPA78CA-HR	78	87.1	95.4	5	119.7	2	126.1	X
15KPA85A-HR	15KPA85CA-HR	85	94.9	104.0	5	109.7	2	137.6	X
15KPA90A-HR	15KPA90CA-HR	90	100.5	110.1	5	103.7	2	145.6	X
15KPA100A-HR	15KPA100CA-HR	100	111.7	122.3	5	93.6	2	161.3	X
15KPA110A-HR	15KPA110CA-HR	110	122.9	134.5	5	84.5	2	178.6	X
15KPA120A-HR	15KPA120CA-HR	120	134.0	146.8	5	78.5	2	192.3	X
15KPA130A-HR	15KPA130CA-HR	130	145.2	159.0	5	72.5	2	208.3	X
15KPA150A-HR	15KPA150CA-HR	150	167.6	183.5	5	62.4	2	241.9	X
15KPA160A-HR	15KPA160CA-HR	160	178.7	195.7	5	58.4	2	258.6	X
15KPA170A-HR	15KPA170CA-HR	170	189.9	207.9	5	55.4	2	272.7	X
15KPA180A-HR	15KPA180CA-HR	180	201.1	220.1	5	52.3	2	288.5	X
15KPA200A-HR	15KPA200CA-HR	200	223.4	244.6	5	47.3	2	319.1	X
15KPA220A-HR	15KPA220CA-HR	220	245.7	269.1	5	42.4	2	356.0	X
15KPA240A-HR	15KPA240CA-HR	240	268.1	293.5	5	39.3	2	384.6	X
15KPA260A-HR	15KPA260CA-HR	260	290.4	318.0	5	36.2	2	416.7	X
15KPA280A-HR	15KPA280CA-HR	280	312.8	342.4	5	33.2	2	454.5	X

**Note:**

2. Each lot of parts will pass group B test requirement.

### Screen Process

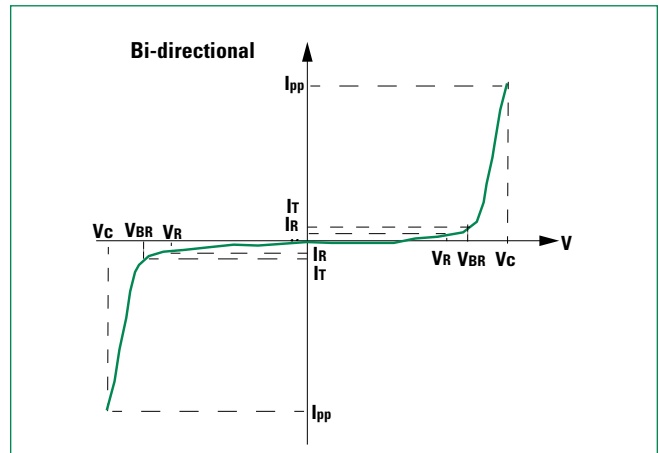
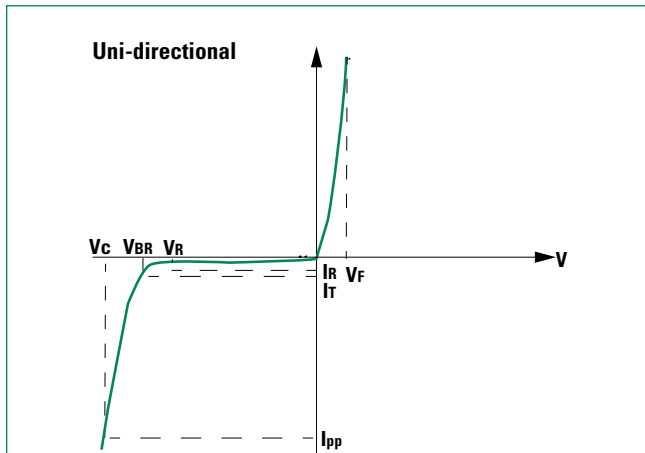
<b>100% Vision Inspection</b>	MIL-STD-750 method 2074
<b>100% High Temperature Storage Life (168hrs,175°C)</b>	MIL-STD-750 method 1031
<b>100% Temperature Cycle Test (-55 to150°C, 20 cycles, dwell time 15 min)</b>	MIL-STD-750 method 1051
<b>100% Surge Test (2x)</b>	MIL-STD-750 method 4066
<b>100% HTRB 150°C Bias=VR(80% breakdown voltage, 96hrs, and each direction 96hrs for Bi-directional products)</b>	MIL-STD-750 method 1038
<b>Final Electrical Test( 100% 3 sigma limit, 100% dynamic test and PAT limit)</b>	MIL-STD-750 method 4016,4021,4011

**Note:** Up-screen program can be specified by customer's request via contacting Littelfuse service

### Group B Test Requirement

Screen	Method	Condition	Requirement
Surge test	10/1000 $\mu$ s Peak Pulse Waveform	Maximum clamping Voltage ( $V_C$ ) @ Peak Pulse Current ( $I_{pp}$ )	Sample Size 45 perform 10x Accept 0 failures
Burn - In (HTRB)	MIL -STD-750, Method 1038.5	Applied voltage, 100% $V_R$ @150°C	Sample size 45 340 hours (680 hours for bi-direction products, each direction 340 hours) Accept 0 failures
Electrical test	–	$I_R$ @ $V_{R'}$ $V_{(BR)}$ @ $I_T$	Sample size 45 Accept 0 failures

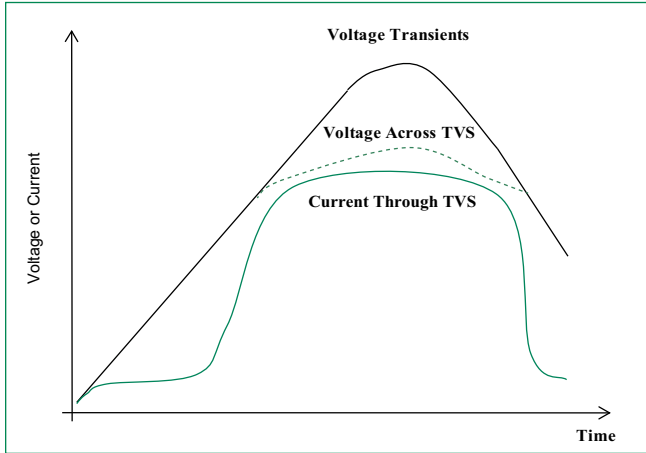
### I-V Curve Characteristics



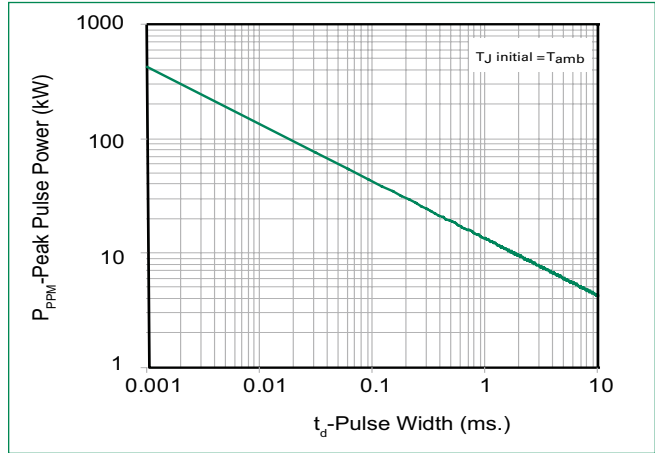
- $P_{PPM}$  Peak Pulse Power Dissipation** -- Max power dissipation
- $V_R$  Stand-off Voltage** -- Maximum voltage that can be applied to the TVS without operation
- $V_{BR}$  Breakdown Voltage** -- Maximum voltage that flows though the TVS at a specified test current ( $I_T$ )
- $V_C$  Clamping Voltage** -- 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**

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

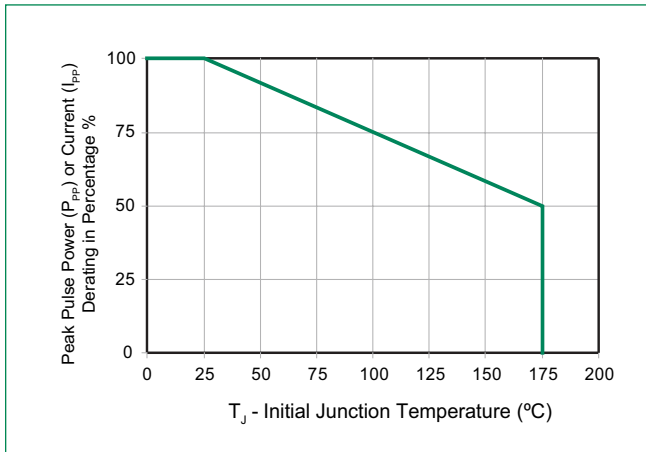
**Figure 1 - TVS Transients Clamping Waveform**



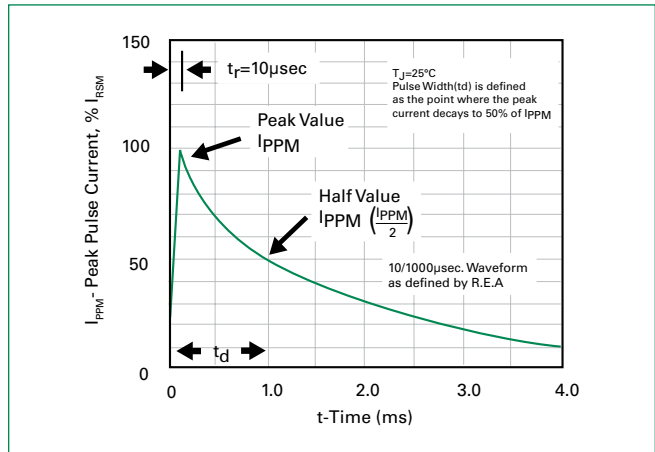
**Figure 2 - Peak Pulse Power Rating Curve**



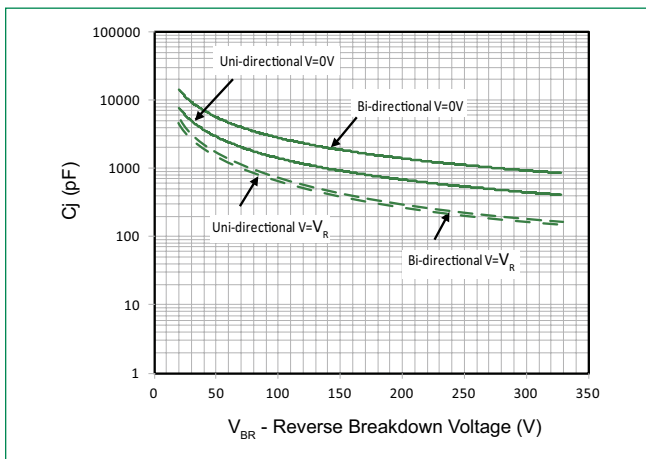
**Figure 3 - Peak Pulse Power Derating Curve**



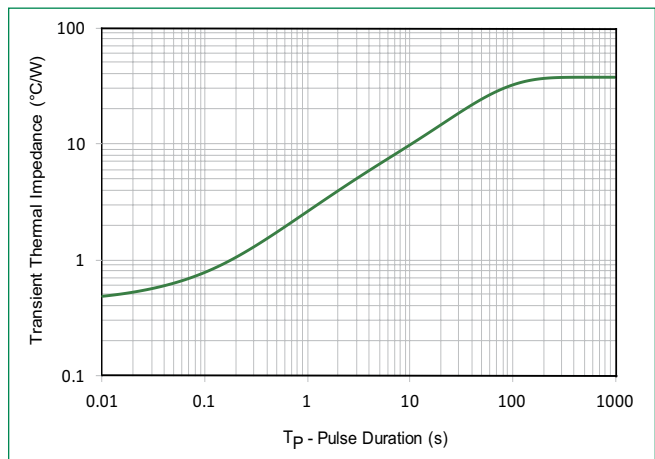
**Figure 4 - Test Pulse Waveform**



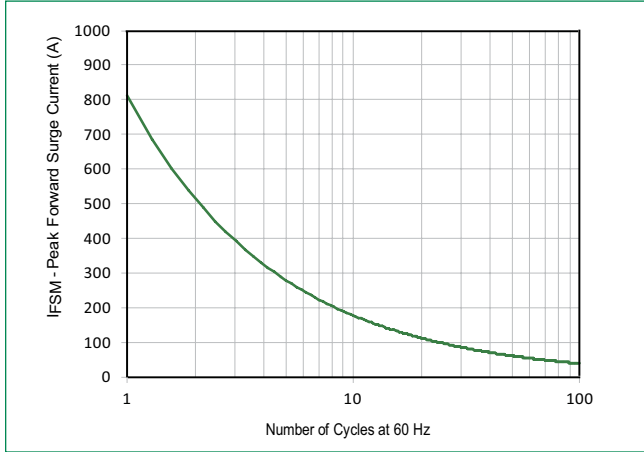
**Figure 5 - Typical Junction Capacitance**



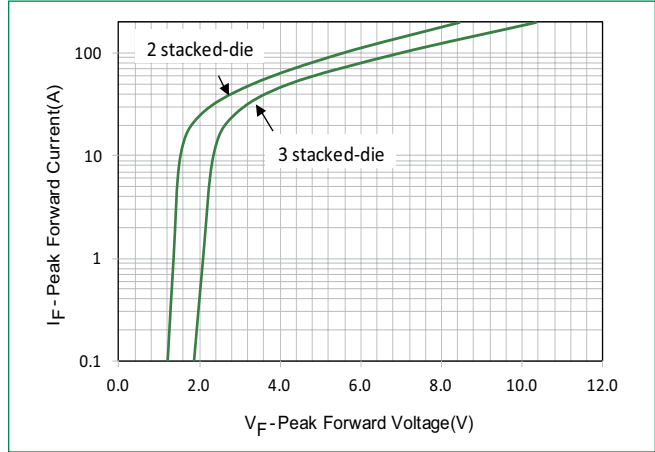
**Figure 6 - Typical Transient Thermal Impedance**



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



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



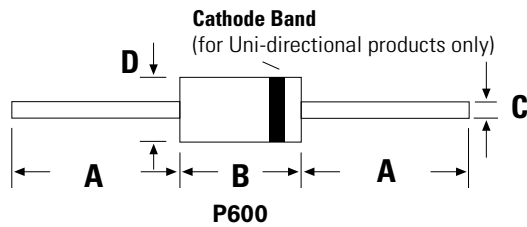
**Physical Specifications**

<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-B102.

**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

**Dimensions**

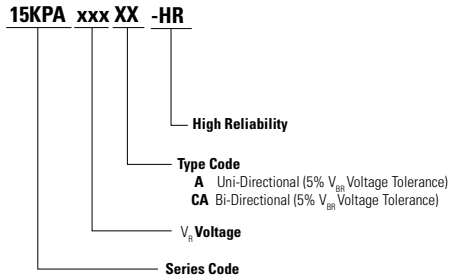


Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
<b>A</b>	1.000	-	25.40	-
<b>B</b>	0.340	0.360	8.60	9.10
<b>C</b>	0.048	0.054	1.22	1.36
<b>D</b>	0.340	0.360	8.60	9.10

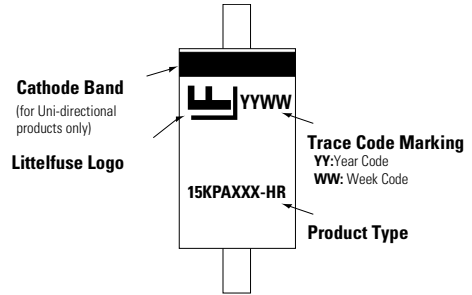
**Packing Options**

Part Number	Component Package	Quantity	Packaging Option	Packaging Specification
15KPAxxxXX-HR	P600	800	Tape & Reel	EIA STD RS-296

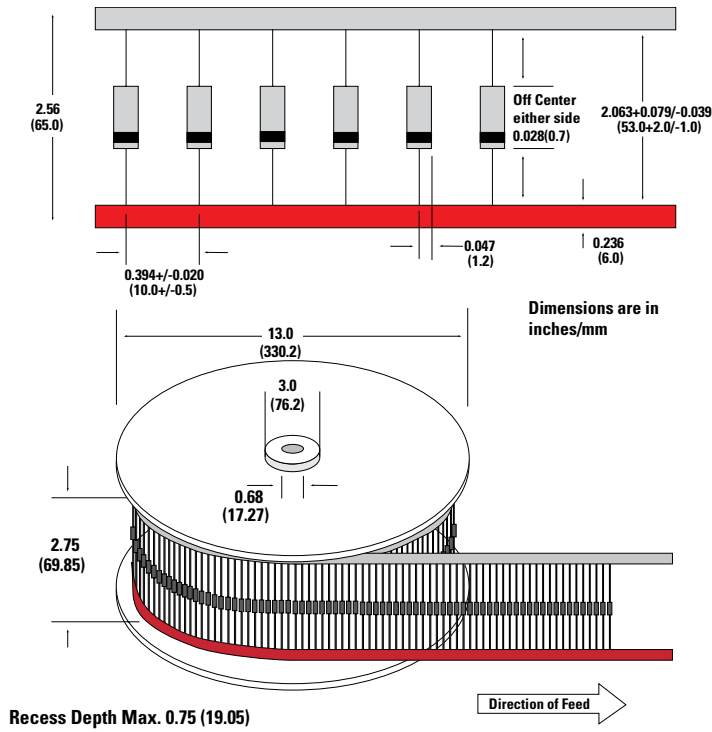
**Part Numbering System**



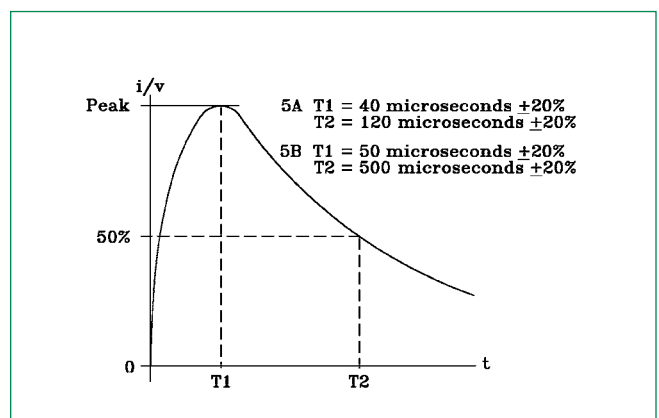
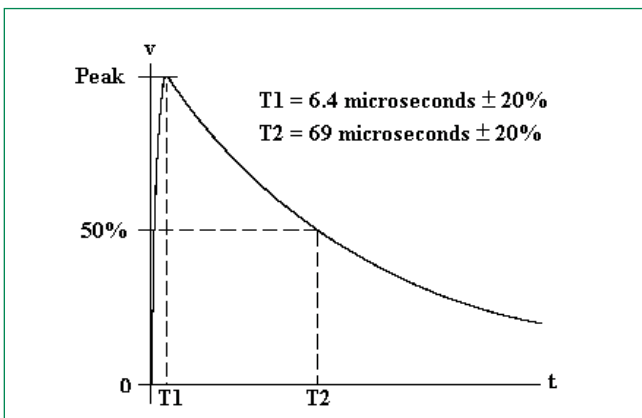
**Part Marking System**



**Tape and Reel Specification**



**RTCA/DO-160G Wave 4 and Wave 5**



### Pin Injection Protection Per RTCA/DO-160G

Part Number (Uni)	Part Number (Bi)	25C						70C					120C					
		Wave 4 (6.4/69us)			Wave 5a (40/120us)			Wave 4 (6.4/69us)			Wave 5a (40/120us)		Wave 4 (6.4/69us)			Wave 5a (40/120us)		
		L3	L4	L5	L3	L4	L5	L3	L4	L5	L3	L4	L3	L4	L5	L3	L4	
		60A	150A	320A	300A	750A		60A	150A	320A	300A	750A	60A	150A	320A	300A	750A	
15KPA17A-HR	15KPA17CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	
15KPA18A-HR	15KPA18CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	
15KPA20A-HR	15KPA20CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	
15KPA22A-HR	15KPA22CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	
15KPA24A-HR	15KPA24CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	
15KPA26A-HR	15KPA26CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	
15KPA28A-HR	15KPA28CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	
15KPA30A-HR	15KPA30CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	
15KPA33A-HR	15KPA33CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	
15KPA36A-HR	15KPA36CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	
15KPA40A-HR	15KPA40CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	
15KPA43A-HR	15KPA43CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	
15KPA45A-HR	15KPA45CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	
15KPA48A-HR	15KPA48CA-HR	pass	pass	pass	pass	-	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-	
15KPA51A-HR	15KPA51CA-HR	pass	pass	pass	pass	-	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-	
15KPA54A-HR	15KPA54CA-HR	pass	pass	pass	pass	-	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-	
15KPA58A-HR	15KPA58CA-HR	pass	pass	pass	pass	-	pass	pass	pass	pass	-	pass	pass	pass	pass	-	-	
15KPA60A-HR	15KPA60CA-HR	pass	pass	pass	pass	-	pass	pass	pass	-	-	pass	pass	pass	-	-	-	
15KPA64A-HR	15KPA64CA-HR	pass	pass	pass	pass	-	pass	pass	pass	-	-	pass	pass	pass	-	-	-	
15KPA70A-HR	15KPA70CA-HR	pass	pass	pass	pass	-	pass	pass	pass	-	-	pass	pass	pass	-	-	-	
15KPA75A-HR	15KPA75CA-HR	pass	pass	pass	pass	-	pass	pass	pass	-	-	pass	pass	pass	-	-	-	
15KPA78A-HR	15KPA78CA-HR	pass	pass	pass	pass	-	pass	pass	pass	-	-	pass	pass	pass	-	-	-	
15KPA85A-HR	15KPA85CA-HR	pass	pass	pass	pass	-	pass	pass	pass	-	-	pass	pass	pass	-	-	-	
15KPA90A-HR	15KPA90CA-HR	pass	pass	pass	pass	-	pass	pass	pass	-	-	pass	pass	pass	-	-	-	
15KPA100A-HR	15KPA100CA-HR	pass	pass	pass	-	-	pass	pass	pass	-	-	pass	pass	pass	-	-	-	
15KPA110A-HR	15KPA110CA-HR	pass	pass	pass	-	-	pass	pass	pass	-	-	pass	pass	pass	-	-	-	
15KPA120A-HR	15KPA120CA-HR	pass	pass	pass	-	-	pass	pass	pass	-	-	pass	pass	pass	-	-	-	
15KPA130A-HR	15KPA130CA-HR	pass	pass	pass	-	-	pass	pass	pass	-	-	pass	pass	-	-	-	-	
15KPA150A-HR	15KPA150CA-HR	pass	pass	pass	-	-	pass	pass	pass	-	-	pass	pass	-	-	-	-	
15KPA160A-HR	15KPA160CA-HR	pass	pass	pass	-	-	pass	pass	-	-	-	pass	pass	-	-	-	-	
15KPA170A-HR	15KPA170CA-HR	pass	pass	pass	-	-	pass	pass	-	-	-	pass	pass	-	-	-	-	
15KPA180A-HR	15KPA180CA-HR	pass	pass	pass	-	-	pass	pass	-	-	-	pass	-	-	-	-	-	
15KPA200A-HR	15KPA200CA-HR	pass	pass	pass	-	-	pass	pass	-	-	-	pass	-	-	-	-	-	
15KPA220A-HR	15KPA220CA-HR	pass	pass	pass	-	-	pass	-	-	-	-	pass	-	-	-	-	-	
15KPA240A-HR	15KPA240CA-HR	pass	pass	pass	-	-	pass	-	-	-	-	pass	-	-	-	-	-	
15KPA260A-HR	15KPA260CA-HR	pass	pass	-	-	-	pass	-	-	-	-	pass	-	-	-	-	-	
15KPA280A-HR	15KPA280CA-HR	pass	pass	-	-	-	pass	-	-	-	-	pass	-	-	-	-	-	

**Note:**

1. L1 = Level 1, L2 = Level 2, L3 = Level 3, L4 = Level 4, L5 = Level 5