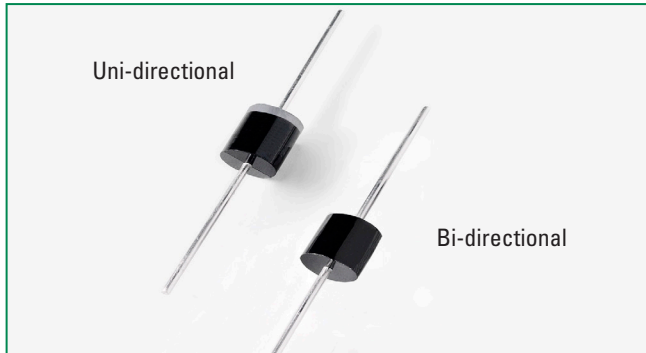


15KPA-HRA Series



Agency Approvals

AGENCY	AGENCY FILE NUMBER
	E230531

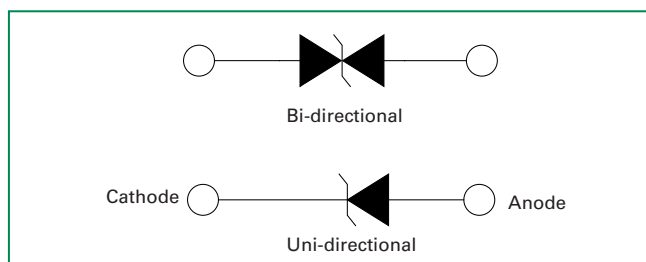
Maximum Ratings and Thermal Characteristics ($T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation by 10/1000 μs Test Waveform (Fig.2) (Note 1)	P_{PPM}	15000	W
Steady State Power Dissipation on Infinite Heat Sink at $T_L=75^\circ\text{C}$	P_D	8.0	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave Unidirectional Only (Note 2)	I_{FSM}	400	A
Operating Junction and Storage Temperature Range	T_J, 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°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-HRA High Reliability Series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.


Features

- 15000W peak pulse capability at 10/1000 μs 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 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 $V_{BR \text{ min}} > 36\text{V}$
- High temperature to reflow soldering guaranteed: $260^\circ\text{C}/10\text{sec} / 0.375''$ (9.5mm) lead length, 5 lbs., (2.3kg) tension
- $V_{BR} @ T_J = V_{BR} @ 25^\circ\text{C} \times (1 + \alpha T \times (T_J - 25))$ (αT : Temperature Coefficient, typical value is 0.1%)
- Plastic package is flammability rated V-0 per Underwriters Laboratories
- 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 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.

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

Note:

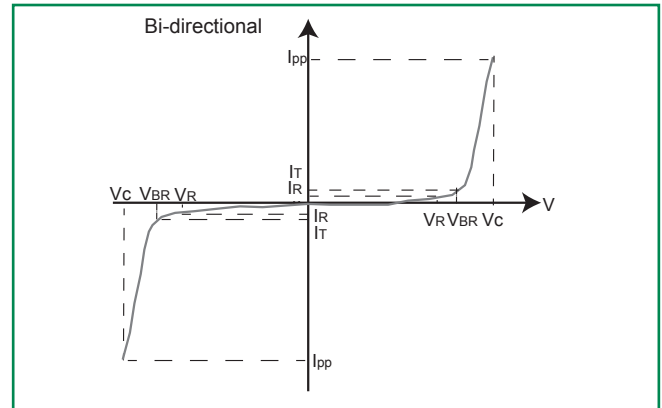
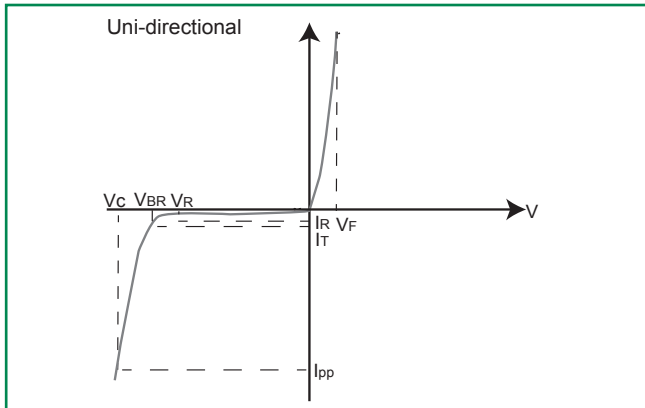
1. For bidirectional type having V_R of 30 volts and less, the I_R limit is double.

Screen Process

100% Vision Inspection	MIL-STD-750 method 2074
100% High Temperature Storage Life (168hrs,175°C)	MIL-STD-750 method 1031
100% Temperature Cycle Test (-55 to 150°C, 20 cycles, dwell time 15 min)	MIL-STD-750 method 1051
100% Surge Test (2x)	MIL-STD-750 method 4066
100% HTRB 150°C Bias=VR(80% breakdown voltage, 96hrs, and each direction at 96 hrs for Bi-directional products)	MIL-STD-750 method 1038
Final Electrical Test(100% 3 sigma limit, 100% dynamic test and PAT limit)	MIL-STD-750 method 4016.4021.4011

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

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 through the TVS at a specified test current (I_r)
- 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

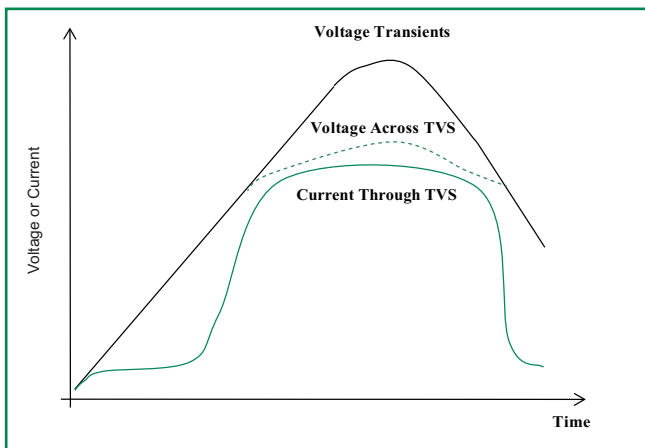
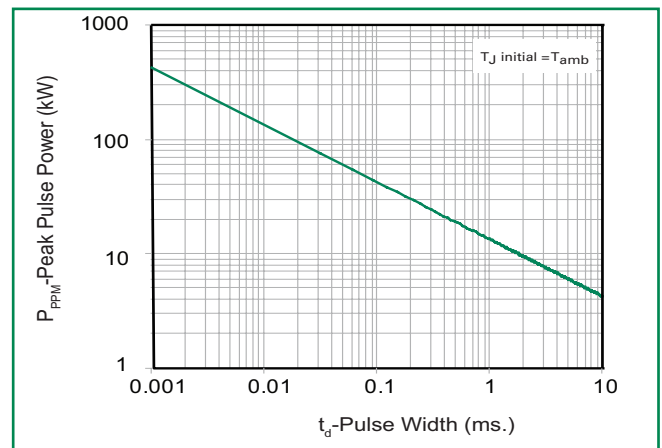


Figure 2 - Peak Pulse Power Rating Curve



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

Figure 3 - Peak Pulse Power Derating Curve

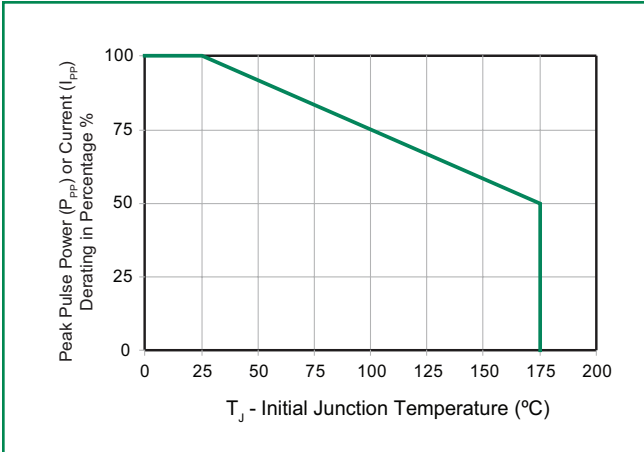


Figure 4 - Test Pulse Waveform

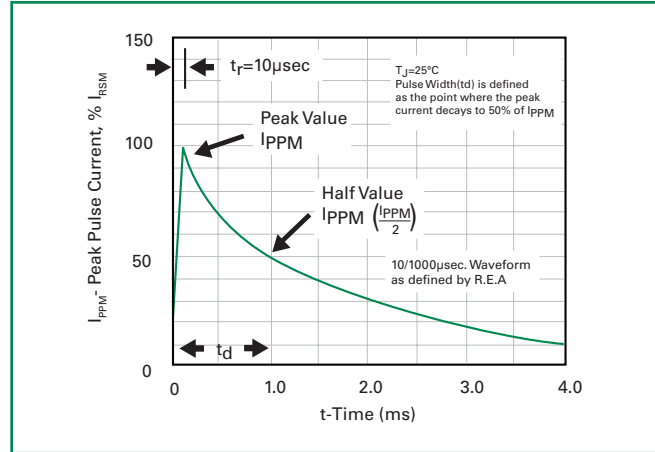


Figure 5 - Typical Junction Capacitance

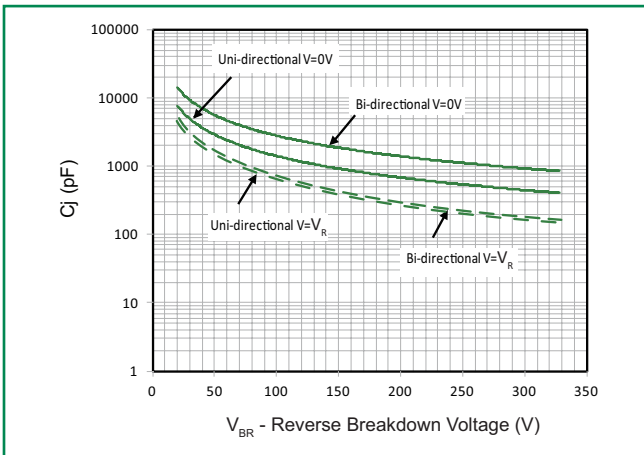


Figure 6 - Typical Transient Thermal Impedance

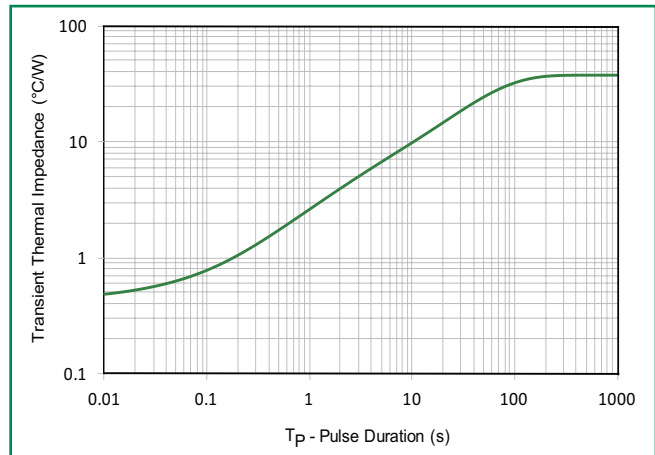


Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only

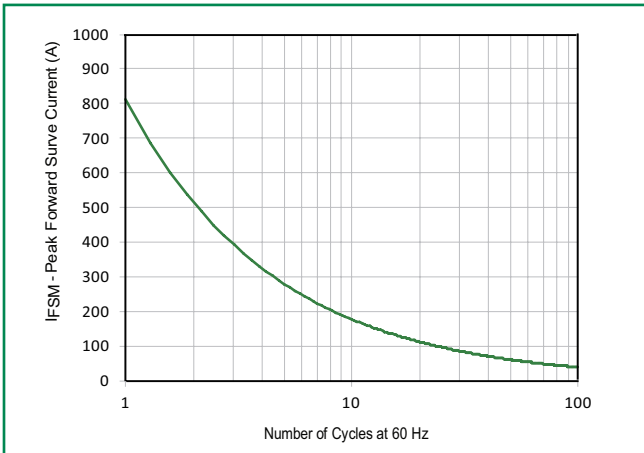
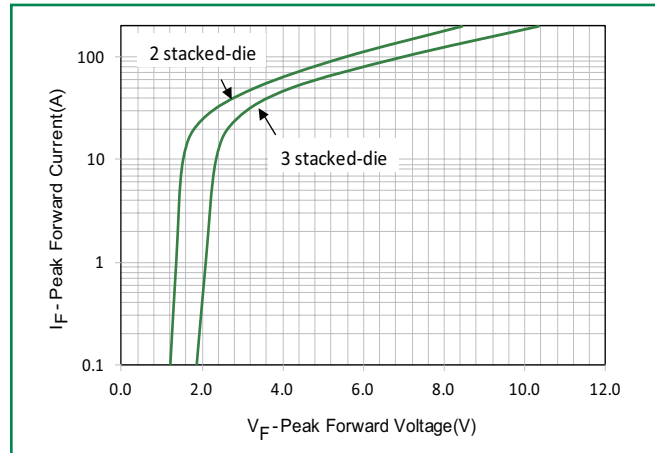


Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)



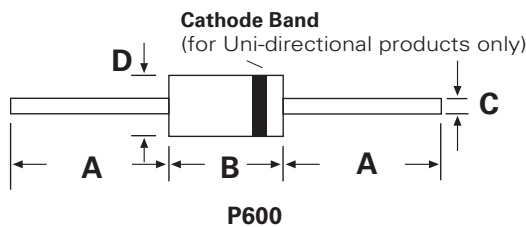
Physical Specifications

Weight	0.07oz., 2.5g
Case	P600 molded plastic body over passivated junction.
Polarity	Color band denotes the cathode except Bipolar.
Terminal	Matte Tin axial leads, solderable per JESD22-B102.

Environmental Specifications

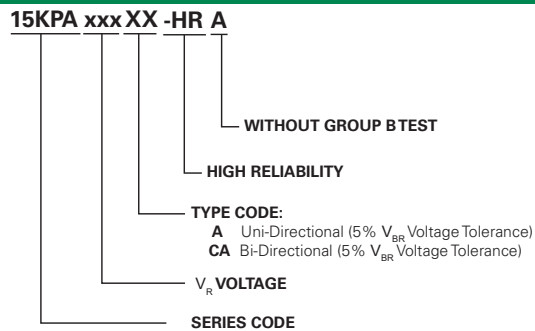
High Temp. Storage	JESD22-A103
HTRB	JESD22-A108
Temperature Cycling	JESD22-A104
H3TRB	JESD22-A101
RSH	JESD22-B106

Dimensions

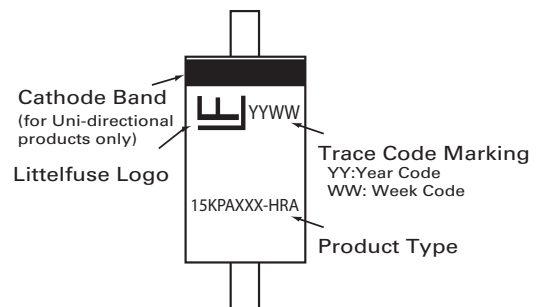


Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	1.000	-	25.40	-
B	0.340	0.360	8.60	9.10
C	0.048	0.052	1.22	1.32
D	0.340	0.360	8.60	9.10

Part Numbering System



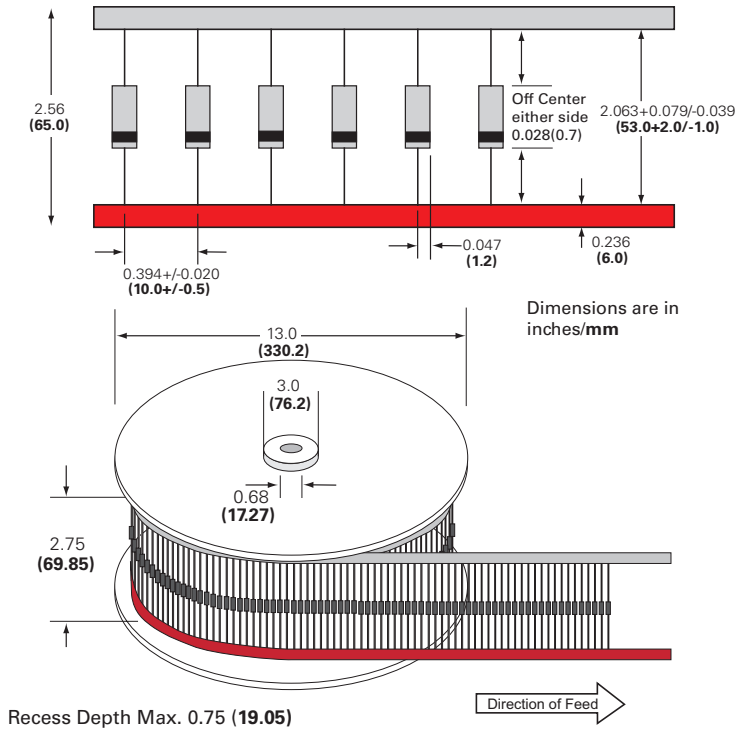
Part Marking System



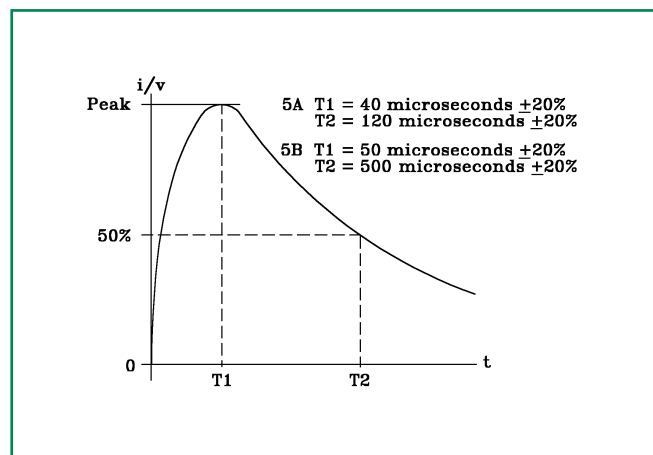
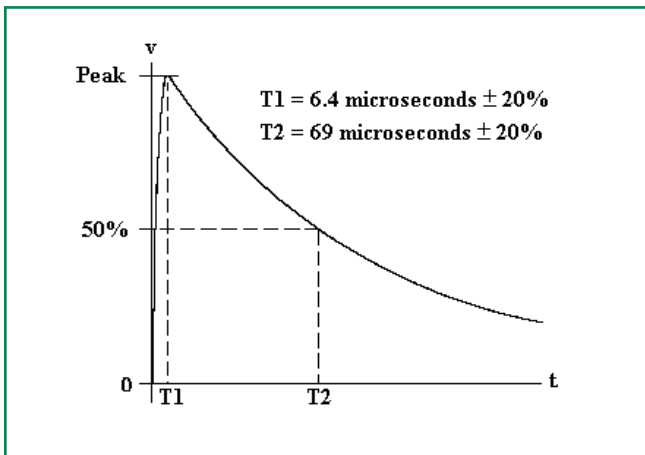
Packing Options

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

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	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-HRA	15KPA17CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
15KPA18A-HRA	15KPA18CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
15KPA20A-HRA	15KPA20CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
15KPA22A-HRA	15KPA22CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
15KPA24A-HRA	15KPA24CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-
15KPA26A-HRA	15KPA26CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-
15KPA28A-HRA	15KPA28CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-
15KPA30A-HRA	15KPA30CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-
15KPA33A-HRA	15KPA33CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-
15KPA36A-HRA	15KPA36CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-
15KPA40A-HRA	15KPA40CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-
15KPA43A-HRA	15KPA43CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-
15KPA45A-HRA	15KPA45CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-
15KPA48A-HRA	15KPA48CA-HRA	pass	pass	pass	pass	-	pass	pass	pass	pass	-	pass	pass	pass	pass	-
15KPA51A-HRA	15KPA51CA-HRA	pass	pass	pass	pass	-	pass	pass	pass	pass	-	pass	pass	pass	pass	-
15KPA54A-HRA	15KPA54CA-HRA	pass	pass	pass	pass	-	pass	pass	pass	pass	-	pass	pass	pass	pass	-
15KPA58A-HRA	15KPA58CA-HRA	pass	pass	pass	pass	-	pass	pass	pass	pass	-	pass	pass	pass	-	-
15KPA60A-HRA	15KPA60CA-HRA	pass	pass	pass	pass	-	pass	pass	pass	pass	-	pass	pass	pass	-	-
15KPA64A-HRA	15KPA64CA-HRA	pass	pass	pass	pass	-	pass	pass	pass	pass	-	pass	pass	pass	-	-
15KPA70A-HRA	15KPA70CA-HRA	pass	pass	pass	pass	-	pass	pass	pass	pass	-	pass	pass	pass	-	-
15KPA75A-HRA	15KPA75CA-HRA	pass	pass	pass	pass	-	pass	pass	pass	pass	-	pass	pass	pass	-	-
15KPA78A-HRA	15KPA78CA-HRA	pass	pass	pass	pass	-	pass	pass	pass	pass	-	pass	pass	pass	-	-
15KPA85A-HRA	15KPA85CA-HRA	pass	pass	pass	pass	-	pass	pass	pass	pass	-	pass	pass	pass	-	-
15KPA90A-HRA	15KPA90CA-HRA	pass	pass	pass	pass	-	pass	pass	pass	pass	-	pass	pass	pass	-	-
15KPA100A-HRA	15KPA100CA-HRA	pass	pass	pass	-	-	pass	pass	pass	pass	-	pass	pass	pass	-	-
15KPA110A-HRA	15KPA110CA-HRA	pass	pass	pass	-	-	pass	pass	pass	pass	-	pass	pass	pass	-	-
15KPA120A-HRA	15KPA120CA-HRA	pass	pass	pass	-	-	pass	pass	pass	pass	-	pass	pass	pass	-	-
15KPA130A-HRA	15KPA130CA-HRA	pass	pass	pass	-	-	pass	pass	pass	pass	-	pass	pass	-	-	-
15KPA150A-HRA	15KPA150CA-HRA	pass	pass	pass	-	-	pass	pass	pass	pass	-	pass	pass	-	-	-
15KPA160A-HRA	15KPA160CA-HRA	pass	pass	pass	-	-	pass	pass	-	-	-	pass	pass	-	-	-
15KPA170A-HRA	15KPA170CA-HRA	pass	pass	pass	-	-	pass	pass	-	-	-	pass	pass	-	-	-
15KPA180A-HRA	15KPA180CA-HRA	pass	pass	pass	-	-	pass	pass	-	-	-	pass	-	-	-	-
15KPA200A-HRA	15KPA200CA-HRA	pass	pass	pass	-	-	pass	pass	-	-	-	pass	-	-	-	-
15KPA220A-HRA	15KPA220CA-HRA	pass	pass	pass	-	-	pass	-	-	-	-	pass	-	-	-	-
15KPA240A-HRA	15KPA240CA-HRA	pass	pass	pass	-	-	pass	-	-	-	-	pass	-	-	-	-
15KPA260A-HRA	15KPA260CA-HRA	pass	pass	-	-	-	pass	-	-	-	-	pass	-	-	-	-
15KPA280A-HRA	15KPA280CA-HRA	pass	pass	-	-	-	pass	-	-	-	-	pass	-	-	-	-

Note:

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