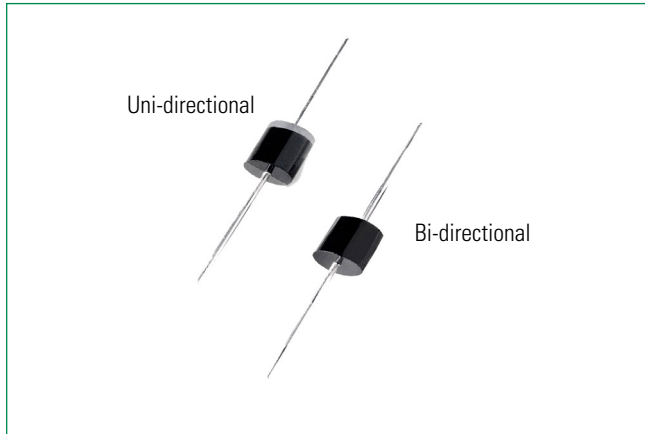


5KP-HRA Series

Axial Leaded – 5 kW



Additional Information



Resources



Accessories



Samples

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}	5	kW
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
Maximum Instantaneous Forward Voltage at 100A for Unidirectional Only (Note 3)	V_F	3.5/5.0	V
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175	$^\circ\text{C}$
Typical Thermal Resistance Junction to Lead	$R_{\theta\text{JL}}$	8.0	$^\circ\text{C/W}$
Typical Thermal Resistance Junction to Ambient	$R_{\theta\text{JA}}$	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.
3. $V_F < 3.5\text{V}$ for single die parts and $V_F < 5.0\text{V}$ for stacked-die parts.

Description

The 5KP-HRA High Reliability Series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

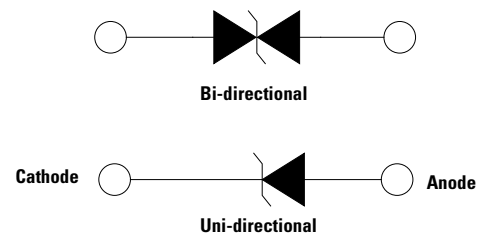
Features & Benefits

- 5 kW 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 VBR 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_R less than 2 μA when $V_{\text{BR min}} > 12\text{V}$
- High temperature to reflow soldering guaranteed: 260 $^\circ\text{C}$ /10sec / 0.375" (9.5mm) lead length, 5 lbs., (2.3kg) tension
- $V_{\text{BR}} @ T_J = V_{\text{BR}} @ 25^\circ\text{C} \times (1 + \alpha T \times (T_J - 25))$ (α : 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 indicates that 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)
- Recognized to UL 497B as an Isolated Loop Circuit Protector

Applications

TVS Components 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



5KP-HRA 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 (μA)	Agency Recognition 
			MIN	MAX					
5KP5.0A-HRA	5KP5.0CA-HRA	5.0	6.40	7.00	50	9.2	554.3	5000	X
5KP6.0A-HRA	5KP6.0CA-HRA	6.0	6.67	7.37	50	10.3	495.1	5000	X
5KP6.5A-HRA	5KP6.5CA-HRA	6.5	7.22	7.98	50	11.2	455.4	2000	X
5KP7.0A-HRA	5KP7.0CA-HRA	7.0	7.78	8.60	50	12.0	425.0	1000	X
5KP7.5A-HRA	5KP7.5CA-HRA	7.5	8.33	9.21	5	12.9	395.3	250	X
5KP8.0A-HRA	5KP8.0CA-HRA	8.0	8.89	9.83	5	13.6	375.0	150	X
5KP8.5A-HRA	5KP8.5CA-HRA	8.5	9.44	10.40	5	14.4	354.2	50	X
5KP9.0A-HRA	5KP9.0CA-HRA	9.0	10.00	11.10	5	15.4	331.2	20	X
5KP10A-HRA	5KP10CA-HRA	10.0	11.10	12.30	5	17.0	300.0	15	X
5KP11A-HRA	5KP11CA-HRA	11.0	12.20	13.50	5	18.2	280.2	2	X
5KP12A-HRA	5KP12CA-HRA	12.0	13.30	14.70	5	19.9	256.3	2	X
5KP13A-HRA	5KP13CA-HRA	13.0	14.40	15.90	5	21.5	237.2	2	X
5KP14A-HRA	5KP14CA-HRA	14.0	15.60	17.20	5	23.2	219.8	2	X
5KP15A-HRA	5KP15CA-HRA	15.0	16.70	18.50	5	24.4	209.0	2	X
5KP16A-HRA	5KP16CA-HRA	16.0	17.80	19.70	5	26.0	196.2	2	X
5KP17A-HRA	5KP17CA-HRA	17.0	18.90	20.90	5	27.6	184.8	2	X
5KP18A-HRA	5KP18CA-HRA	18.0	20.00	22.10	5	29.2	174.7	2	X
5KP20A-HRA	5KP20CA-HRA	20.0	22.20	24.50	5	32.4	157.4	2	X
5KP22A-HRA	5KP22CA-HRA	22.0	24.00	26.90	5	35.5	143.7	2	X
5KP24A-HRA	5KP24CA-HRA	24.0	26.70	29.50	5	38.9	131.1	2	X
5KP26A-HRA	5KP26CA-HRA	26.0	28.90	31.90	5	42.1	121.1	2	X
5KP28A-HRA	5KP28CA-HRA	28.0	31.10	34.40	5	45.4	112.3	2	X
5KP30A-HRA	5KP30CA-HRA	30.0	33.30	36.80	5	48.4	105.4	2	X
5KP33A-HRA	5KP33CA-HRA	33.0	36.70	40.60	5	53.3	95.7	2	X
5KP36A-HRA	5KP36CA-HRA	36.0	40.00	44.20	5	58.1	87.8	2	X
5KP40A-HRA	5KP40CA-HRA	40.0	44.40	49.10	5	64.5	79.1	2	X
5KP43A-HRA	5KP43CA-HRA	43.0	47.80	52.80	5	69.4	73.5	2	X
5KP45A-HRA	5KP45CA-HRA	45.0	50.00	55.30	5	72.7	70.2	2	X
5KP48A-HRA	5KP48CA-HRA	48.0	53.30	58.90	5	77.4	65.9	2	X
5KP51A-HRA	5KP51CA-HRA	51.0	56.70	62.70	5	82.4	61.9	2	X
5KP54A-HRA	5KP54CA-HRA	54.0	60.00	66.30	5	87.1	58.6	2	X
5KP58A-HRA	5KP58CA-HRA	58.0	64.40	71.20	5	93.6	54.5	2	X
5KP60A-HRA	5KP60CA-HRA	60.0	66.70	73.70	5	96.8	52.7	2	X
5KP64A-HRA	5KP64CA-HRA	64.0	71.10	78.60	5	103.0	49.5	2	X
5KP70A-HRA	5KP70CA-HRA	70.0	77.80	86.00	5	113.0	45.1	2	X
5KP75A-HRA	5KP75CA-HRA	75.0	83.30	92.10	5	121.0	42.1	2	X
5KP78A-HRA	5KP78CA-HRA	78.0	86.70	95.80	5	126.0	40.5	2	X
5KP85A-HRA	5KP85CA-HRA	85.0	94.40	104.00	5	137.0	37.2	2	X
5KP90A-HRA	5KP90CA-HRA	90.0	100.00	111.00	5	146.0	34.9	2	X
5KP100A-HRA	5KP100CA-HRA	100.0	110.00	123.00	5	162.0	31.5	2	X
5KP110A-HRA	5KP110CA-HRA	110.0	122.00	135.00	5	177.0	28.8	2	X
5KP120A-HRA	5KP120CA-HRA	120.0	133.00	147.00	5	193.0	26.4	2	X
5KP130A-HRA	5KP130CA-HRA	130.0	144.00	159.00	5	209.0	24.4	2	X
5KP150A-HRA	5KP150CA-HRA	150.0	167.00	185.00	5	243.0	21.0	2	X
5KP160A-HRA	5KP160CA-HRA	160.0	178.00	197.00	5	259.0	19.7	2	X
5KP170A-HRA	5KP170CA-HRA	170.0	189.00	209.00	5	275.0	18.5	2	X
5KP180A-HRA	5KP180CA-HRA	180.0	200.00	221.00	5	292.0	17.5	2	X
5KP190A-HRA	5KP190CA-HRA	190.0	211.00	233.00	5	310.0	16.5	2	-
5KP200A-HRA	5KP200CA-HRA	200.0	222.00	246.00	5	329.2	15.5	2	X
5KP210A-HRA	5KP210CA-HRA	210.0	233.00	258.00	5	349.5	14.6	2	-
5KP220A-HRA	5KP220CA-HRA	220.0	244.00	270.00	5	371.1	13.7	2	X

5KP-HRA Series

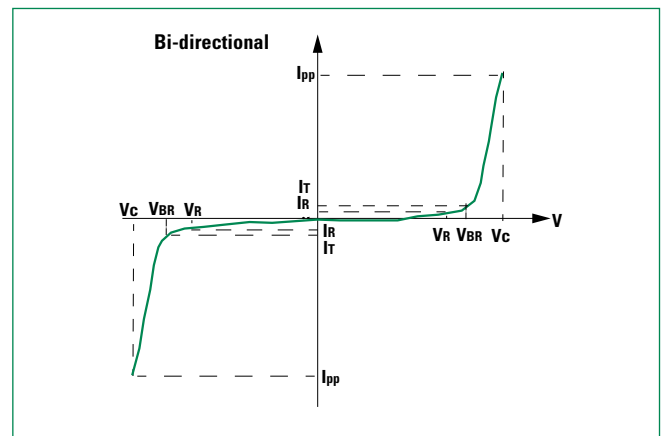
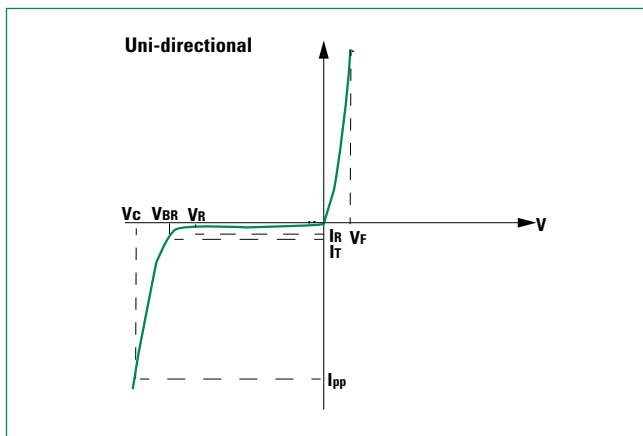
Axial Leaded – 5 kW

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 96hrs 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_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°C unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform

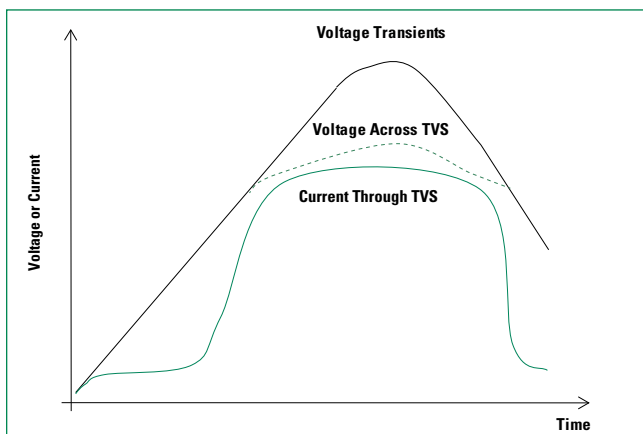
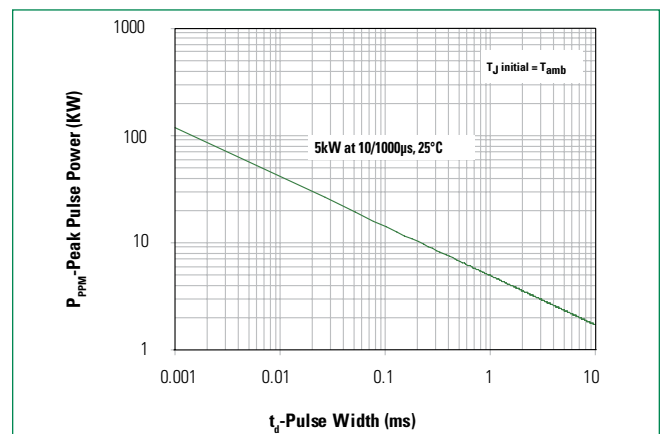


Figure 2 - Peak Pulse Power Rating Curve



5KP-HRA Series

Axial Leaded – 5 kW

Figure 3 - Peak Pulse Power Derating Curve

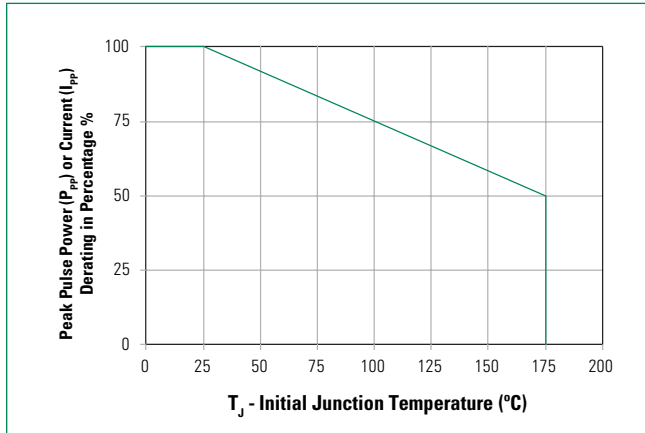


Figure 4 - Pulse Waveform

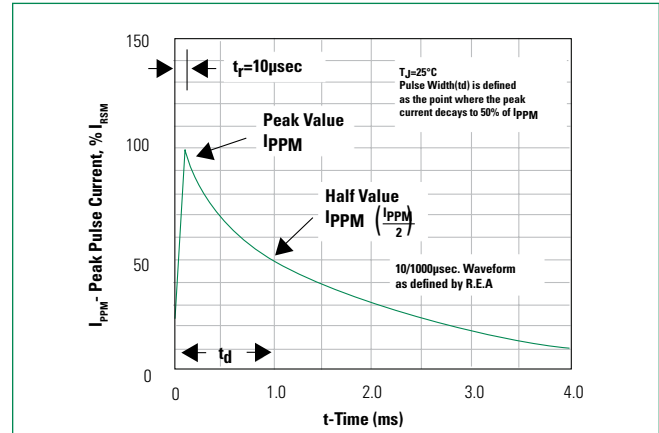


Figure 5 - Typical Junction Capacitance

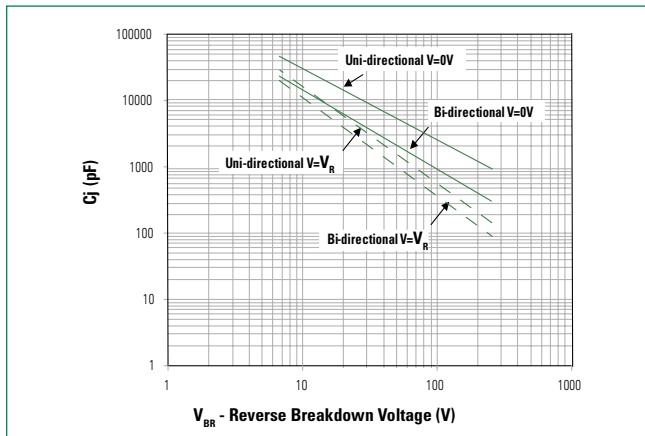


Figure 6 - Typical Transient Thermal Impedance

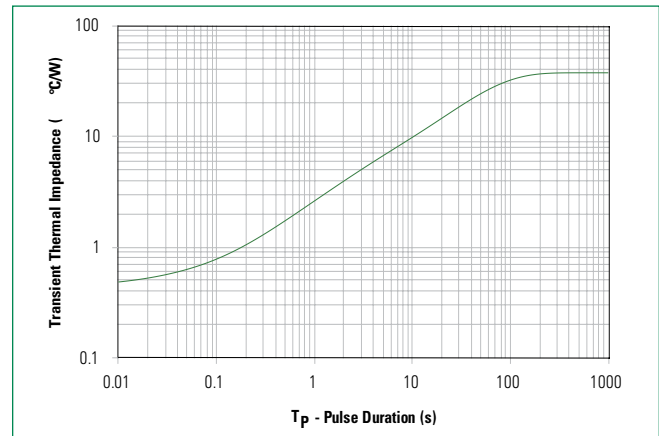


Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only

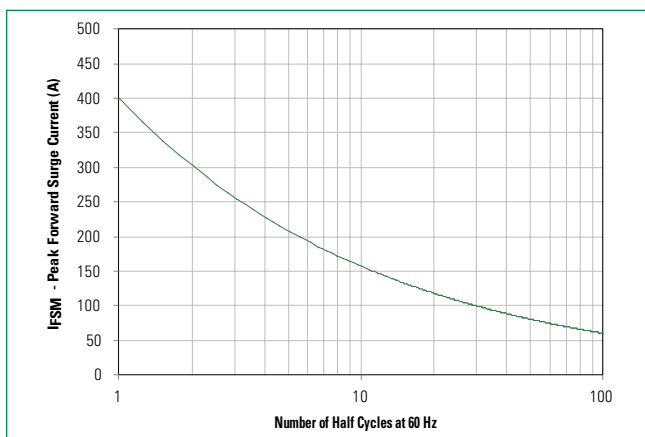
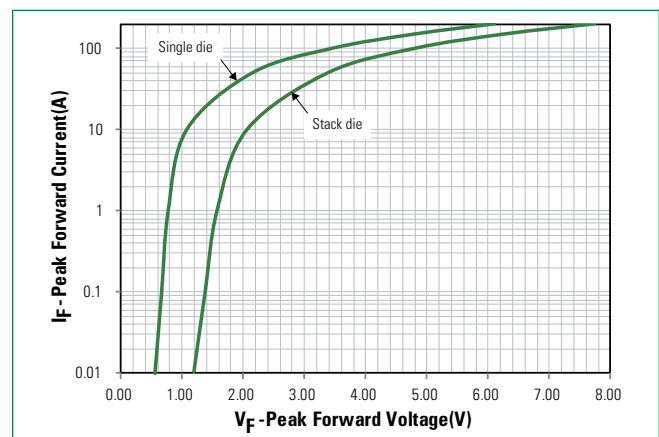


Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)



5KP-HRA Series

Axial Leaded – 5 kW

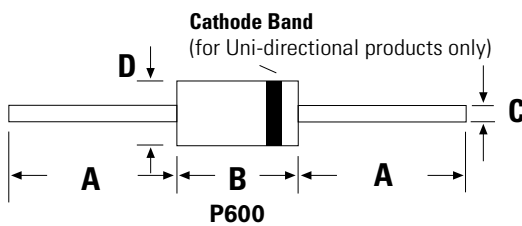
Physical Specifications

Weight	0.07oz., 2.1g
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

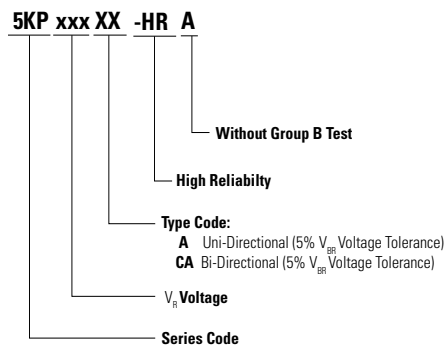
High Temp. Storage	JESD22-A103
HTRB	JESD22-A108
Temperature Cycling	JESD22-A104
H3TRB	JESD22-A101
RSH	JESD22-B106

Dimensions

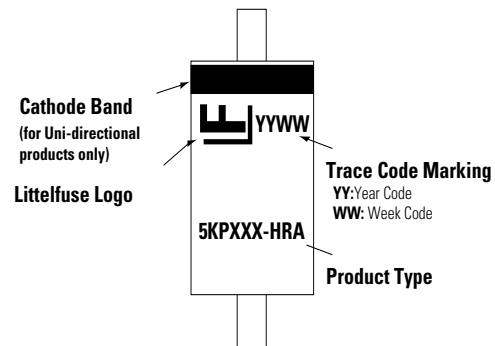


Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	1.000	-	25.40	-
B	0.340	0.360	8.60	9.10
C	0.048	0.054	1.22	1.36
D	0.340	0.360	8.60	9.10

Part Numbering System



Part Marking System



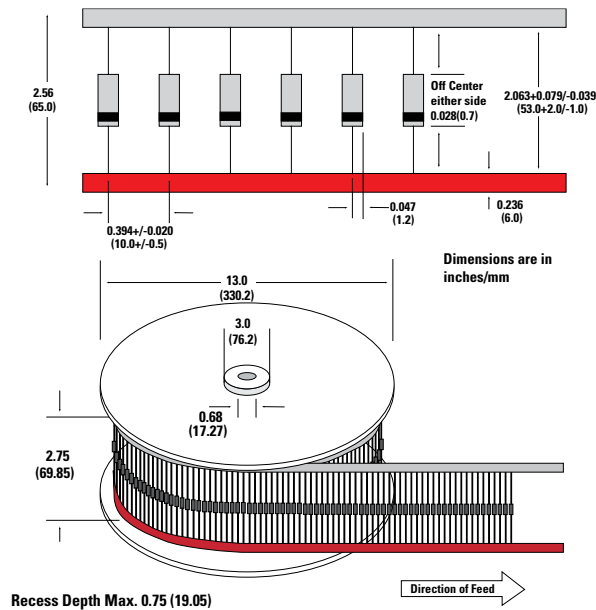
Packing Options

Part Number	Component Package	Quantity	Packaging Option	Packaging Specification
5KPxxxXX-HRA	P600	800	Tape & Reel	EIA STD RS-296

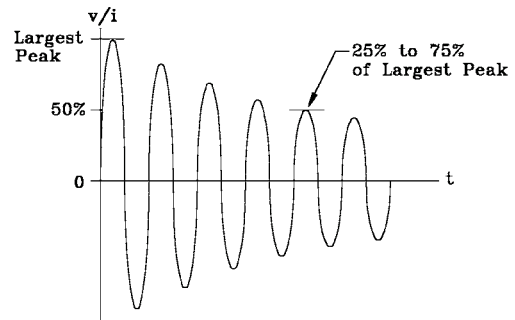
5KP-HRA Series

Axial Leaded – 5 kW

Tape and Reel Specification



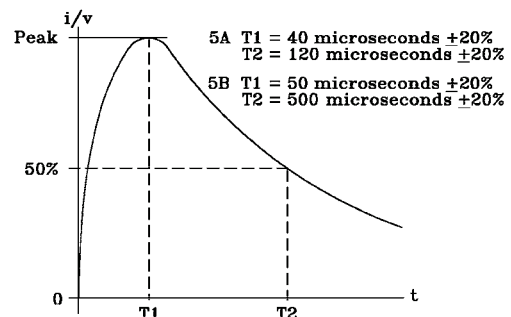
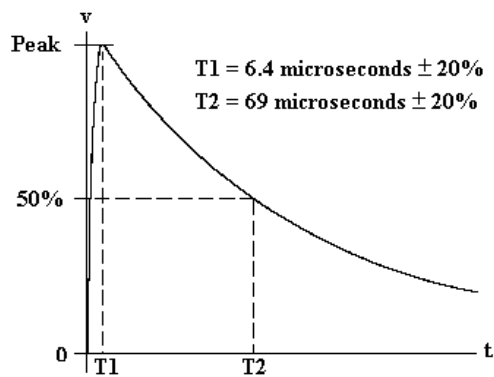
RTCA/DO-160G Wave 3



Notes:

1. Voltage and current are not required to be in phase.
2. The waveshape may have either a damped sine or cosine waveshape.

RTCA/DO-160G Wave 4 and Wave 5



5KP-HRA Series

Axial Leaded – 5 kW

Pin Injection Protection Per RTCA/DO-160G

Part Number (Uni)	Part Number (Bi)	25C								70C						120C								
		Wave 3	Wave 4 (6.4/69us)				Wave 5a (40/120us)			Wave 3	Wave 4 (6.4/69us)				Wave 5a (40/120us)			Wave 3	Wave 4 (6.4/69us)				Wave 5a (40/120us)	
		L5	L3	L4	L5	L3	L4	L5	L5	L3	L4	L5	L3	L4	L5	L5	L3	L4	L5	L3	L4			
		128A	60A	150A	320A	300A	750A	1600A	128A	60A	150A	320A	300A	750A	128A	60A	150A	320A	300A	750A				
5KP5.0A-HRA	5KP5.0CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass			
5KP6.0A-HRA	5KP6.0CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass			
5KP6.5A-HRA	5KP6.5CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass			
5KP7.0A-HRA	5KP7.0CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass			
5KP7.5A-HRA	5KP7.5CA-HRA	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass			
5KP8.0A-HRA	5KP8.0CA-HRA	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass			
5KP8.5A-HRA	5KP8.5CA-HRA	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass			
5KP9.0A-HRA	5KP9.0CA-HRA	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass			
5KP10A-HRA	5KP10CA-HRA	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass			
5KP11A-HRA	5KP11CA-HRA	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass			
5KP12A-HRA	5KP12CA-HRA	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-			
5KP13A-HRA	5KP13CA-HRA	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-			
5KP14A-HRA	5KP14CA-HRA	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-			
5KP15A-HRA	5KP15CA-HRA	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-			
5KP16A-HRA	5KP16CA-HRA	pass	pass	pass	pass	pass	-	-	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	-			
5KP17A-HRA	5KP17CA-HRA	pass	pass	pass	pass	pass	-	-	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	-			
5KP18A-HRA	5KP18CA-HRA	pass	pass	pass	pass	pass	-	-	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	-			
5KP20A-HRA	5KP20CA-HRA	pass	pass	pass	pass	pass	-	-	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-	-			
5KP22A-HRA	5KP22CA-HRA	pass	pass	pass	pass	pass	-	-	pass	pass	pass	pass	-	-	pass	pass	pass	pass	pass	-	-			
5KP24A-HRA	5KP24CA-HRA	pass	pass	pass	pass	pass	-	-	pass	pass	pass	pass	-	-	pass	pass	pass	pass	pass	-	-			
5KP26A-HRA	5KP26CA-HRA	pass	pass	pass	pass	pass	-	-	pass	pass	pass	pass	-	-	pass	pass	pass	pass	pass	-	-			
5KP28A-HRA	5KP28CA-HRA	pass	pass	pass	pass	pass	-	-	pass	pass	pass	pass	-	-	pass	pass	pass	pass	pass	-	-			
5KP30A-HRA	5KP30CA-HRA	pass	pass	pass	pass	pass	-	-	pass	pass	pass	pass	-	-	pass	pass	pass	pass	pass	-	-			
5KP33A-HRA	5KP33CA-HRA	pass	pass	pass	pass	-	-	-	pass	pass	pass	pass	-	-	pass	pass	pass	pass	-	-	-			
5KP36A-HRA	5KP36CA-HRA	pass	pass	pass	pass	-	-	-	pass	pass	pass	pass	-	-	pass	pass	pass	pass	-	-	-			
5KP40A-HRA	5KP40CA-HRA	pass	pass	pass	pass	-	-	-	pass	pass	pass	pass	-	-	pass	pass	pass	pass	pass	-	-			
5KP43A-HRA	5KP43CA-HRA	pass	pass	pass	pass	-	-	-	pass	pass	pass	pass	-	-	pass	pass	pass	pass	-	-	-			
5KP45A-HRA	5KP45CA-HRA	pass	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-	pass	pass	pass	pass	-	-	-			
5KP48A-HRA	5KP48CA-HRA	pass	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-	pass	pass	pass	pass	-	-	-			
5KP51A-HRA	5KP51CA-HRA	pass	pass	pass	pass	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-	-			
5KP54A-HRA	5KP54CA-HRA	pass	pass	pass	pass	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-	-			
5KP58A-HRA	5KP58CA-HRA	pass	pass	pass	pass	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-	-			
5KP60A-HRA	5KP60CA-HRA	pass	pass	pass	pass	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-	-			
5KP64A-HRA	5KP64CA-HRA	pass	pass	pass	pass	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-	-			
5KP70A-HRA	5KP70CA-HRA	pass	pass	pass	pass	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-	-			
5KP75A-HRA	5KP75CA-HRA	pass	pass	pass	-	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-	-			
5KP78A-HRA	5KP78CA-HRA	pass	pass	pass	-	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-	-			
5KP85A-HRA	5KP85CA-HRA	pass	pass	pass	-	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-	-			
5KP90A-HRA	5KP90CA-HRA	pass	pass	pass	-	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-	-			
5KP100A-HRA	5KP100CA-HRA	pass	pass	pass	-	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-	-			
5KP110A-HRA	5KP110CA-HRA	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-	-			
5KP120A-HRA	5KP120CA-HRA	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-	-			
5KP130A-HRA	5KP130CA-HRA	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-	-			
5KP150A-HRA	5KP150CA-HRA	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-	-			
5KP160A-HRA	5KP160CA-HRA	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-	-			
5KP170A-HRA	5KP170CA-HRA	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-	-			
5KP180A-HRA	5KP180CA-HRA	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-	-			
5KP190A-HRA	5KP190CA-HRA	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-	-			
5KP200A-HRA	5KP200CA-HRA	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-	-			
5KP210A-HRA	5KP210CA-HRA	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-	-			
5KP220A-HRA	5KP220CA-HRA	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-	-			

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

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