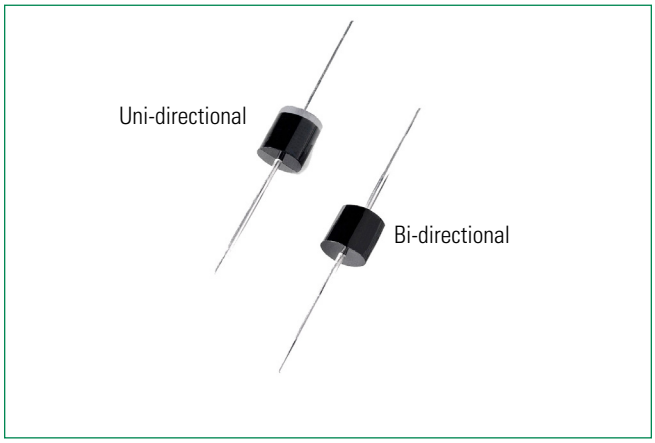
5KP-HR Series
Axial Leaded – 5 kW



Agency Approvals

Agency	Agency File Number
	E230531

Maximum Ratings and Thermal Characteristics
(T_A=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation by 10/1000µs Test Waveform (Fig.2)(Note 1)	P_{PPM}	5	kW
Steady State Power Dissipation on Infinite Heat Sink at T_L=75°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	°C
Typical Thermal Resistance Junction to Lead	$R_{\theta JL}$	8.0	°C/W
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	40	°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 < 3.5V for single die parts and V_F< 5.0V for stacked-die parts.

Description

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

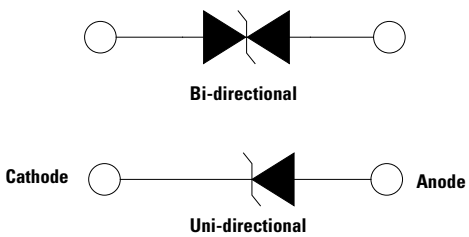
Features & Benefits

- 5 kW peak pulse capability at 10/1000µs 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_{BR} 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 2µA when V_{BR} min>12V
- High temperature soldering guaranteed: 260C/10 seconds / 0.375", (9.5mm) lead length, 5 lbs., (2.3kg) tension
- V_{BR} @ T_J= V_{BR}@25°C x (1+αT x (T_J - 25))(αT: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_{CC} bus and other vulnerable circuits used in telecom, computer, industrial and consumer electronic applications.

Functional Diagram



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5KP-HR Series
Axial Leaded – 5 kW

Electrical Characteristics (T_A=25°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 (µ A)	Agency Recognition
			MIN	MAX					
5KP5.0A-HR	5KP5.0CA-HR	5.0	6.40	7.00	50	9.2	554.3	5000	X
5KP6.0A-HR	5KP6.0CA-HR	6.0	6.67	7.37	50	10.3	495.1	5000	X
5KP6.5A-HR	5KP6.5CA-HR	6.5	7.22	7.98	50	11.2	455.4	2000	X
5KP7.0A-HR	5KP7.0CA-HR	7.0	7.78	8.60	50	12.0	425.0	1000	X
5KP7.5A-HR	5KP7.5CA-HR	7.5	8.33	9.21	5	12.9	395.3	250	X
5KP8.0A-HR	5KP8.0CA-HR	8.0	8.89	9.83	5	13.6	375.0	150	X
5KP8.5A-HR	5KP8.5CA-HR	8.5	9.44	10.40	5	14.4	354.2	50	X
5KP9.0A-HR	5KP9.0CA-HR	9.0	10.00	11.10	5	15.4	331.2	20	X
5KP10A-HR	5KP10CA-HR	10.0	11.10	12.30	5	17.0	300.0	15	X
5KP11A-HR	5KP11CA-HR	11.0	12.20	13.50	5	18.2	280.2	2	X
5KP12A-HR	5KP12CA-HR	12.0	13.30	14.70	5	19.9	256.3	2	X
5KP13A-HR	5KP13CA-HR	13.0	14.40	15.90	5	21.5	237.2	2	X
5KP14A-HR	5KP14CA-HR	14.0	15.60	17.20	5	23.2	219.8	2	X
5KP15A-HR	5KP15CA-HR	15.0	16.70	18.50	5	24.4	209.0	2	X
5KP16A-HR	5KP16CA-HR	16.0	17.80	19.70	5	26.0	196.2	2	X
5KP17A-HR	5KP17CA-HR	17.0	18.90	20.90	5	27.6	184.8	2	X
5KP18A-HR	5KP18CA-HR	18.0	20.00	22.10	5	29.2	174.7	2	X
5KP20A-HR	5KP20CA-HR	20.0	22.20	24.50	5	32.4	157.4	2	X
5KP22A-HR	5KP22CA-HR	22.0	24.00	26.90	5	35.5	143.7	2	X
5KP24A-HR	5KP24CA-HR	24.0	26.70	29.50	5	38.9	131.1	2	X
5KP26A-HR	5KP26CA-HR	26.0	28.90	31.90	5	42.1	121.1	2	X
5KP28A-HR	5KP28CA-HR	28.0	31.10	34.40	5	45.4	112.3	2	X
5KP30A-HR	5KP30CA-HR	30.0	33.30	36.80	5	48.4	105.4	2	X
5KP33A-HR	5KP33CA-HR	33.0	36.70	40.60	5	53.3	95.7	2	X
5KP36A-HR	5KP36CA-HR	36.0	40.00	44.20	5	58.1	87.8	2	X
5KP40A-HR	5KP40CA-HR	40.0	44.40	49.10	5	64.5	79.1	2	X
5KP43A-HR	5KP43CA-HR	43.0	47.80	52.80	5	69.4	73.5	2	X
5KP45A-HR	5KP45CA-HR	45.0	50.00	55.30	5	72.7	70.2	2	X
5KP48A-HR	5KP48CA-HR	48.0	53.30	58.90	5	77.4	65.9	2	X
5KP51A-HR	5KP51CA-HR	51.0	56.70	62.70	5	82.4	61.9	2	X
5KP54A-HR	5KP54CA-HR	54.0	60.00	66.30	5	87.1	58.6	2	X
5KP58A-HR	5KP58CA-HR	58.0	64.40	71.20	5	93.6	54.5	2	X
5KP60A-HR	5KP60CA-HR	60.0	66.70	73.70	5	96.8	52.7	2	X
5KP64A-HR	5KP64CA-HR	64.0	71.10	78.60	5	103.0	49.5	2	X
5KP70A-HR	5KP70CA-HR	70.0	77.80	86.00	5	113.0	45.1	2	X
5KP75A-HR	5KP75CA-HR	75.0	83.30	92.10	5	121.0	42.1	2	X
5KP78A-HR	5KP78CA-HR	78.0	86.70	95.80	5	126.0	40.5	2	X
5KP85A-HR	5KP85CA-HR	85.0	94.40	104.00	5	137.0	37.2	2	X
5KP90A-HR	5KP90CA-HR	90.0	100.00	111.00	5	146.0	34.9	2	X
5KP100A-HR	5KP100CA-HR	100.0	110.00	123.00	5	162.0	31.5	2	X
5KP110A-HR	5KP110CA-HR	110.0	122.00	135.00	5	177.0	28.8	2	X
5KP120A-HR	5KP120CA-HR	120.0	133.00	147.00	5	193.0	26.4	2	X
5KP130A-HR	5KP130CA-HR	130.0	144.00	159.00	5	209.0	24.4	2	X
5KP150A-HR	5KP150CA-HR	150.0	167.00	185.00	5	243.0	21.0	2	X
5KP160A-HR	5KP160CA-HR	160.0	178.00	197.00	5	259.0	19.7	2	X
5KP170A-HR	5KP170CA-HR	170.0	189.00	209.00	5	275.0	18.5	2	X
5KP180A-HR	5KP180CA-HR	180.0	200.00	221.00	5	292.0	17.5	2	X
5KP190A-HR	5KP190CA-HR	190.0	211.00	233.00	5	310.0	16.5	2	-
5KP200A-HR	5KP200CA-HR	200.0	222.00	246.00	5	329.2	15.5	2	X
5KP210A-HR	5KP210CA-HR	210.0	233.00	258.00	5	349.5	14.6	2	-
5KP220A-HR	5KP220CA-HR	220.0	244.00	270.00	5	371.1	13.7	2	X

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

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Screen Process

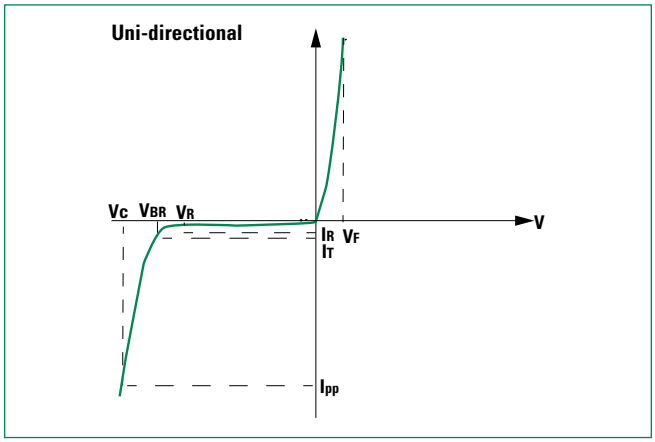
100% Vision Inspection	MIL-STD-750 method 2074
100% High Temperature Storage Life (168hrs,175°C)	MIL-STD-750 method 1031
100% Temperature Cycle Test (-55 to150°C, 20 cycles, dwell time 15 min)	MIL-STD-750 method 1051
100% Surge Test (2x)	MIL-STD-750 method 4066
100% HTRB 150°C Bias=VR(80% breakdown voltage, 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

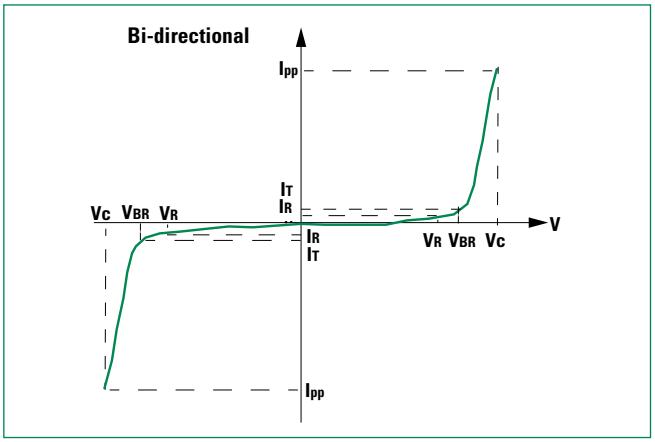
Note: Up-screen program can be specified by customer's request via contacting Littelfuse service

Group B Test Requirement

Screen	Method	Condition	Requirement
Surge test	10/1000 µs 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 (IT)
V_C **Clamping Voltage** – Peak voltage measured across the TVS at a specified Ippm (peak impulse current)
I_R **Reverse Leakage Current** – Current measured at V_R
V_F **Forward Voltage Drop for Uni-directional**

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Axial Leaded – 5 kW

Ratings and Characteristic Curves (T_A=25°C unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform

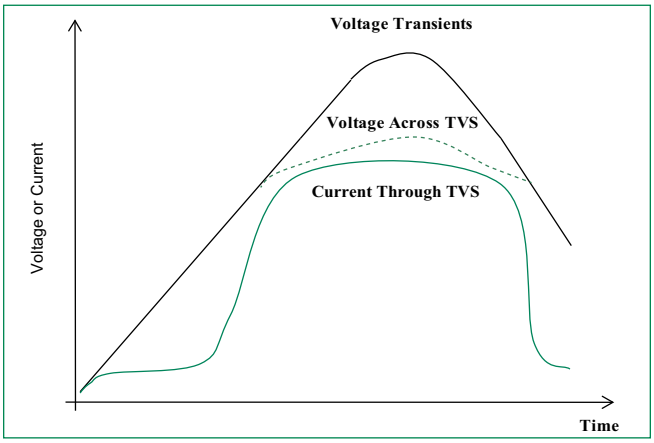

Figure 2 - Peak Pulse Power Rating Curve

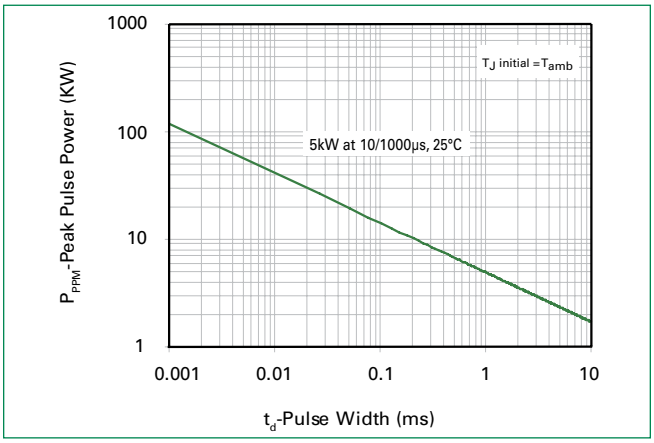

Figure 3 - Peak Pulse Power Derating Curve

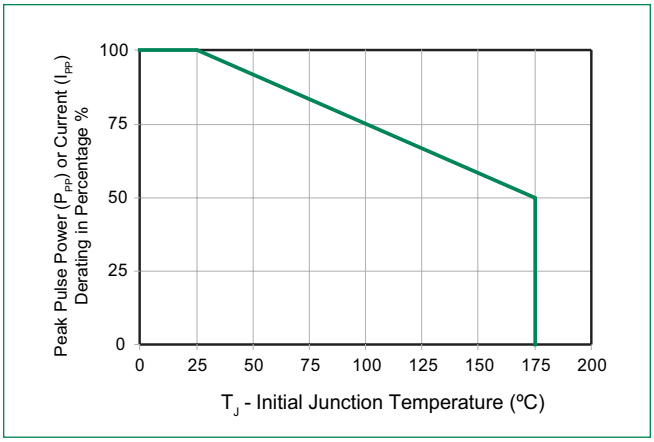

Figure 4 - Pulse Waveform

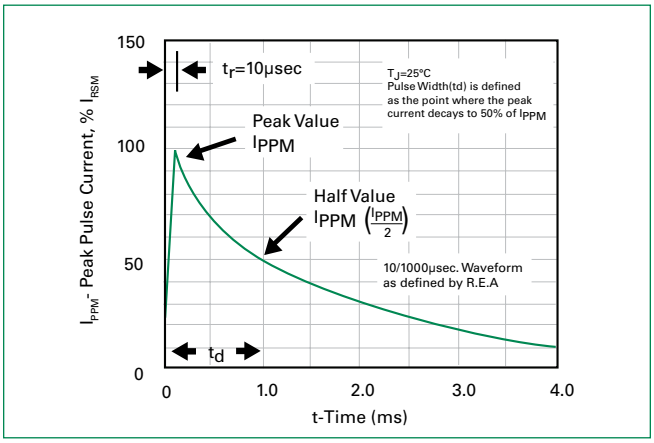

Figure 5 - Typical Junction Capacitance

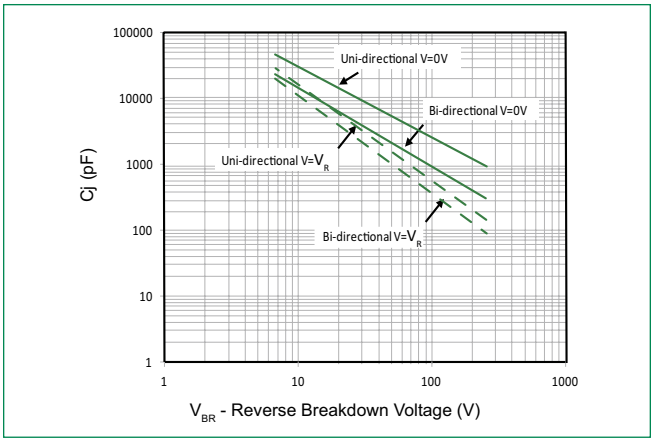

Figure 6 - Typical Transient Thermal Impedance

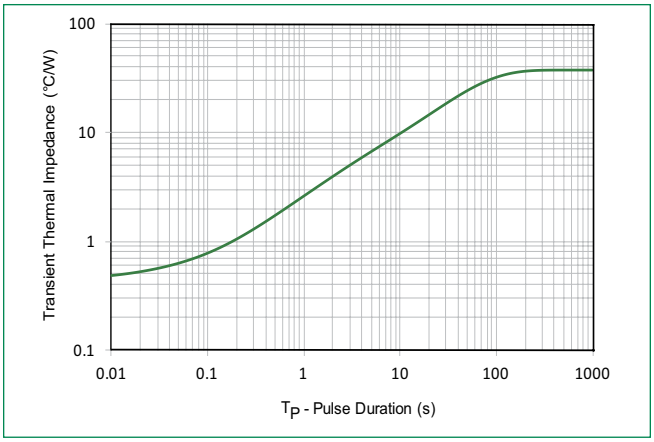

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Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only

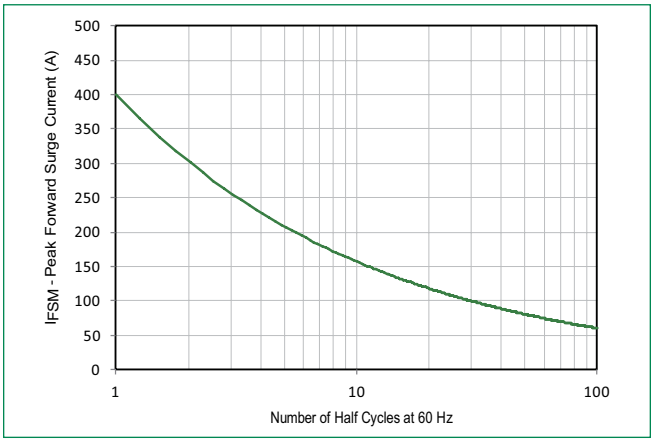
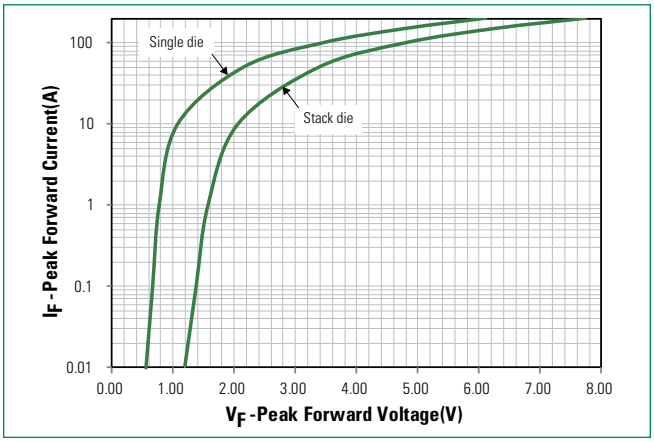


Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)



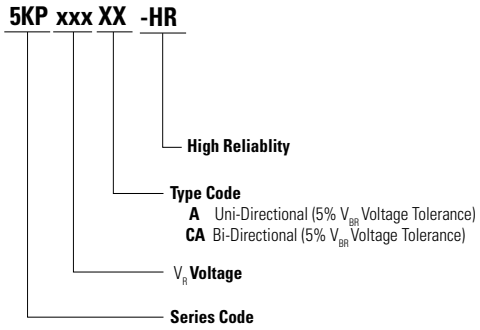
Physical Specifications

Weight	0.07oz., 2.1g
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.

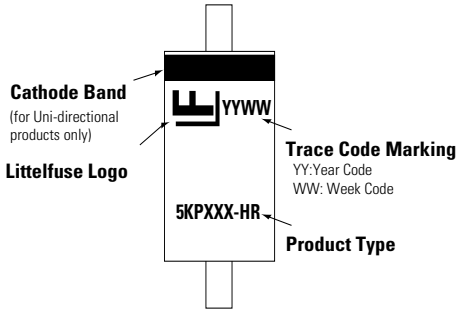
Environmental Specifications

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

Part Numbering System



Part Marking System



Packing Options

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

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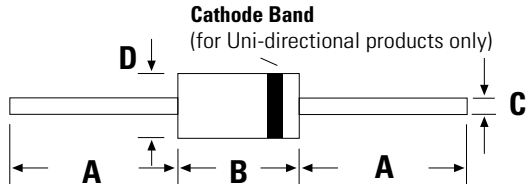
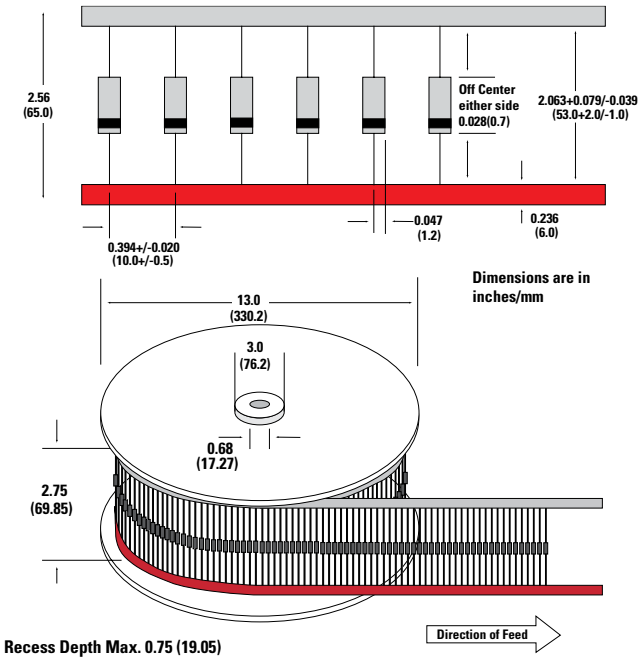
Dimensions



P600

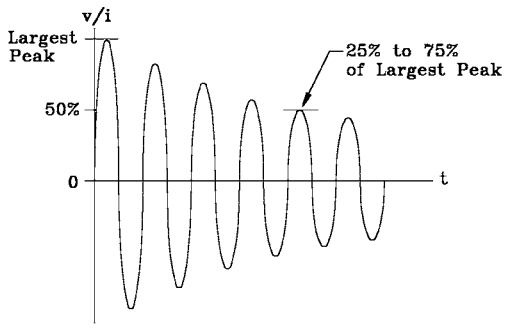
Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	1.000	-	25.40	-
B	0.340	0.360	8.60	9.10
C	0.048	0.054	1.22	1.36
D	0.340	0.360	8.60	9.10

Tape and Reel Specification



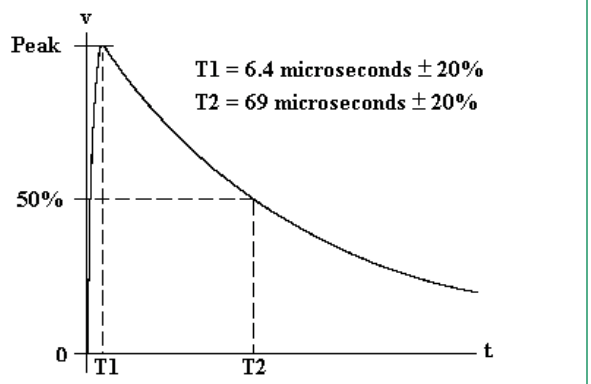
Recess Depth Max. 0.75 (19.05)

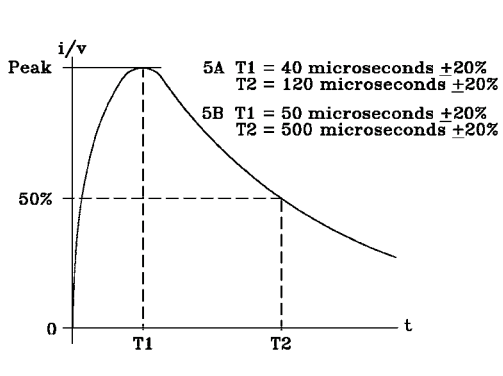
RTCA/DO-160G Wave 3



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





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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	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-HR	5KP5.0CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
5KP6.0A-HR	5KP6.0CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
5KP6.5A-HR	5KP6.5CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
5KP7.0A-HR	5KP7.0CA-HR	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
5KP7.5A-HR	5KP7.5CA-HR	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
5KP8.0A-HR	5KP8.0CA-HR	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
5KP8.5A-HR	5KP8.5CA-HR	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
5KP9.0A-HR	5KP9.0CA-HR	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
5KP10A-HR	5KP10CA-HR	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
5KP11A-HR	5KP11CA-HR	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
5KP12A-HR	5KP12CA-HR	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-
5KP13A-HR	5KP13CA-HR	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-
5KP14A-HR	5KP14CA-HR	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-
5KP15A-HR	5KP15CA-HR	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-
5KP16A-HR	5KP16CA-HR	pass	pass	pass	pass	pass	-	-	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-
5KP17A-HR	5KP17CA-HR	pass	pass	pass	pass	pass	-	-	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-
5KP18A-HR	5KP18CA-HR	pass	pass	pass	pass	pass	-	-	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-
5KP20A-HR	5KP20CA-HR	pass	pass	pass	pass	pass	-	-	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	-	-
5KP22A-HR	5KP22CA-HR	pass	pass	pass	pass	pass	-	-	pass	pass	pass	pass	-	-	pass	pass	pass	pass	-	-
5KP24A-HR	5KP24CA-HR	pass	pass	pass	pass	pass	-	-	pass	pass	pass	pass	-	-	pass	pass	pass	pass	-	-
5KP26A-HR	5KP26CA-HR	pass	pass	pass	pass	pass	-	-	pass	pass	pass	pass	-	-	pass	pass	pass	pass	-	-
5KP28A-HR	5KP28CA-HR	pass	pass	pass	pass	pass	-	-	pass	pass	pass	pass	-	-	pass	pass	pass	pass	-	-
5KP30A-HR	5KP30CA-HR	pass	pass	pass	pass	pass	-	-	pass	pass	pass	pass	-	-	pass	pass	pass	pass	-	-
5KP33A-HR	5KP33CA-HR	pass	pass	pass	pass	-	-	-	pass	pass	pass	pass	-	-	pass	pass	pass	-	-	-
5KP36A-HR	5KP36CA-HR	pass	pass	pass	pass	-	-	-	pass	pass	pass	pass	-	-	pass	pass	pass	-	-	-
5KP40A-HR	5KP40CA-HR	pass	pass	pass	pass	-	-	-	pass	pass	pass	pass	-	-	pass	pass	pass	-	-	-
5KP43A-HR	5KP43CA-HR	pass	pass	pass	pass	-	-	-	pass	pass	pass	pass	-	-	pass	pass	pass	-	-	-
5KP45A-HR	5KP45CA-HR	pass	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-
5KP48A-HR	5KP48CA-HR	pass	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-
5KP51A-HR	5KP51CA-HR	pass	pass	pass	pass	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-
5KP54A-HR	5KP54CA-HR	pass	pass	pass	pass	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-
5KP58A-HR	5KP58CA-HR	pass	pass	pass	pass	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-
5KP60A-HR	5KP60CA-HR	pass	pass	pass	pass	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-
5KP64A-HR	5KP64CA-HR	pass	pass	pass	pass	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-
5KP70A-HR	5KP70CA-HR	pass	pass	pass	pass	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-
5KP75A-HR	5KP75CA-HR	pass	pass	pass	-	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-
5KP78A-HR	5KP78CA-HR	pass	pass	pass	-	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-
5KP85A-HR	5KP85CA-HR	pass	pass	pass	-	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-
5KP90A-HR	5KP90CA-HR	pass	pass	pass	-	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-
5KP100A-HR	5KP100CA-HR	pass	pass	pass	-	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-
5KP110A-HR	5KP110CA-HR	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-
5KP120A-HR	5KP120CA-HR	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-
5KP130A-HR	5KP130CA-HR	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-
5KP150A-HR	5KP150CA-HR	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-
5KP160A-HR	5KP160CA-HR	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-
5KP170A-HR	5KP170CA-HR	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-
5KP180A-HR	5KP180CA-HR	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-
5KP190A-HR	5KP190CA-HR	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-
5KP200A-HR	5KP200CA-HR	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-
5KP210A-HR	5KP210CA-HR	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-
5KP220A-HR	5KP220CA-HR	pass	pass	-	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-

Note:
1. L1 = Level1, L2 = Level 2, L3 = Level 3, L4 = Level 4, L5 = Level 5

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