

SM15KPA-HRA Series

Surface Mount – 15 kW



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

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation ($I_{PP} \times V_C$) by 10/1000 μs Test Waveform (Fig.2) (Note 1)	P_{PPM}	15	kW
Steady State Power Dissipation on Infinite Heat Sink at $T_L = 100\text{ }^{\circ}\text{C}$ (Fig. 6)	P_D	50	W
Peak Forward Surge Current, 8.3 ms Single Half Sine Wave Unidirectional Only (Note 2)	I_{FSM}	2500	A
Maximum Instantaneous Forward Voltage at 500 A for Unidirectional Only (Note 3)	V_F	2.0/3.5	V
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^{\circ}\text{C}$
Typical Thermal Resistance Junction to Case	$R_{\theta JC}$	1.0	$^{\circ}\text{C/W}$
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	20	$^{\circ}\text{C/W}$

Notes:

1. Non-repetitive current pulse per Fig. 4 and derated above T_J (initial) = $25\text{ }^{\circ}\text{C}$ per Fig. 3.
2. Measured on 8.3 ms single half sine wave or equivalent square wave, duty cycle = 4 per minute maximum.
3. $V_F < 2.0\text{ V}$ for single die parts and $V_F < 3.5\text{ V}$ for stacked-die parts.
4. For stacked die component details, please refer to part numbers labeled by * in Electrical Characteristics.
5. Case temperature controlled on heat sink as specified.

Description

The SM15KPA-HRA High Reliability Series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

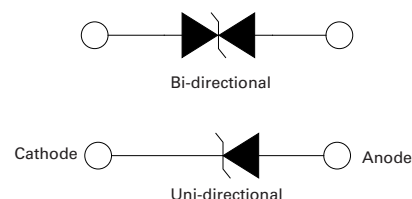
Features & Benefits

- 15 kW peak pulse capability at 10/1000 μs waveform, repetition rate (duty cycles):0.01 %
- Low profile package
- For surface mounted applications to optimize board space
- Typical failure mode is short from over-specified voltage or current
- Low incremental surge resistance
- Excellent clamping capability
- Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- ESD protection of data lines in accordance with IEC 61000-4-2, 30 kV(Air), 30 kV (Contact)
- EFT protection of data lines in accordance with IEC 61000-4-4
- Typical I_R less than $2\text{ }\mu\text{A}$ when $V_{BR\text{ min}} > 33.5\text{ V}$
- Fast response time: typically less than 1.0 ps from 0 volts to $V_{BR\text{ min}}$
- High temperature to reflow soldering guaranteed: $245\text{ }^{\circ}\text{C}/10\text{ sec}$
- $V_{BR} @ T_J = V_{BR} @ 25\text{ }^{\circ}\text{C} \times (1 + \alpha T \times (T_J - 25))$ (α : Temperature Coefficient, typical value is 0.1%)
- Meet MSL level 1, per J-STD-020, LF maximum peak of $245\text{ }^{\circ}\text{C}$
- Matte tin lead-free plated
- 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 avionics, aviation and EVTOL applications.

Functional Diagram



SM15KPA-HRA Series

Surface Mount – 15 kW

Electrical Characteristics

Part Number (Uni)	Part Number (Bi)	Marking		Reverse Stand off Voltage V_R (V)	Breakdown Voltage $V_{BR} @ I_T$ (V)		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)
		Uni	Bi		Min	Max				
SM15KPA20A-HRA	SM15KPA20CA-HRA	15020AH	15020CH	20	22.34	24.46	5	34.3	440.2	5
SM15KPA22A-HRA	SM15KPA22CA-HRA	15022AH	15022CH	22	24.57	26.91	5	37.1	407.0	5
SM15KPA24A-HRA	SM15KPA24CA-HRA	15024AH	15024CH	24	26.81	29.35	5	40.7	371.0	5
SM15KPA26A-HRA	SM15KPA26CA-HRA	15026AH	15026CH	26	29.04	31.80	5	44.0	343.2	5
SM15KPA28A-HRA	SM15KPA28CA-HRA	15028AH	15028CH	28	31.28	34.24	5	47.5	317.9	5
SM15KPA30A-HRA	SM15KPA30CA-HRA	15030AH	15030CH	30	33.51	36.70	5	50.7	297.8	2
SM15KPA33A-HRA	SM15KPA33CA-HRA	15033AH	15033CH	33	36.90	40.40	5	54.7	276.1	2
SM15KPA36A-HRA	SM15KPA36CA-HRA	15036AH	15036CH	36	40.20	44.00	5	59.8	252.5	2
SM15KPA40A-HRA	SM15KPA40CA-HRA	15040AH	15040CH	40	44.70	48.90	5	65.8	229.5	2
SM15KPA43A-HRA	SM15KPA43CA-HRA	15043AH	15043CH	43	48.00	52.60	5	69.8	216.3	2
SM15KPA45A-HRA	SM15KPA45CA-HRA	15045AH	15045CH	45	50.30	55.00	5	72.8	207.4	2
SM15KPA48A-HRA	SM15KPA48CA-HRA	15048AH	15048CH	48	53.60	58.70	5	77.7	194.3	2
SM15KPA51A-HRA	SM15KPA51CA-HRA	15051AH	15051CH	51	57.00	62.40	5	82.9	182.1	2
SM15KPA54A-HRA	SM15KPA54CA-HRA	15054AH	15054CH	54	60.30	66.00	5	87.7	172.2	2
SM15KPA58A-HRA	SM15KPA58CA-HRA	15058AH	15058CH	58	64.80	70.90	5	93.8	161.0	2
SM15KPA60A-HRA	SM15KPA60CA-HRA	15060AH	15060CH	60	67.00	73.40	5	97.4	155.0	2
SM15KPA64A-HRA	SM15KPA64CA-HRA	15064AH	15064CH	64	71.50	78.30	5	104.2	144.9	2
SM15KPA70A-HRA	SM15KPA70CA-HRA	15070AH	15070CH	70	78.20	85.60	5	113.6	132.9	2
SM15KPA75A-HRA	SM15KPA75CA-HRA	15075AH	15075CH	75	83.80	91.70	5	122.0	123.8	2
SM15KPA78A-HRA	SM15KPA78CA-HRA	15078AH	15078CH	78	87.10	95.40	5	126.1	119.7	2
SM15KPA85A-HRA	SM15KPA85CA-HRA	15085AH	15085CH	85	94.90	104.00	5	137.6	109.7	2
SM15KPA90A-HRA	SM15KPA90CA-HRA	15090AH	15090CH	90	100.50	110.10	5	145.6	103.7	2
SM15KPA100A-HRA	SM15KPA100CA-HRA	15100AH	15100CH	100	111.70	122.30	5	161.3	93.6	2
SM15KPA110A-HRA	SM15KPA110CA-HRA	15110AH	15110CH	110	122.90	134.50	5	178.6	84.5	2
SM15KPA120A-HRA	SM15KPA120CA-HRA	15120AH	15120CH	120	134.00	146.80	5	192.3	78.5	2
SM15KPA130A-HRA	SM15KPA130CA-HRA	15130AH	15130CH	130	145.20	159.00	5	208.3	72.5	2
SM15KPA150A-HRA	SM15KPA150CA-HRA	15150AH	15150CH	150	167.60	183.50	5	241.9	62.4	2
SM15KPA160A-HRA	SM15KPA160CA-HRA	15160AH	15160CH	160	178.70	195.70	5	258.6	58.4	2
SM15KPA170A-HRA	SM15KPA170CA-HRA	15170AH	15170CH	170	189.90	207.90	5	272.7	55.4	2
SM15KPA180A-HRA	SM15KPA180CA-HRA	15180AH	15180CH	180	201.10	220.10	5	288.5	52.3	2
SM15KPA200A-HRA	SM15KPA200CA-HRA	15200AH	15200CH	200	223.40	244.60	5	319.1	47.3	2
SM15KPA220A-HRA	SM15KPA220CA-HRA	15220AH	15220CH	220	245.70	269.10	5	356.0	42.4	2
SM15KPA240A-HRA	SM15KPA240CA-HRA	15240AH	15240CH	240	268.10	293.50	5	384.6	39.3	2
SM15KPA260A-HRA*	SM15KPA260CA-HRA*	15260AH	15260CH	260	290.40	318.00	5	416.7	36.2	2
SM15KPA280A-HRA*	SM15KPA280CA-HRA*	15280AH	15280CH	280	311.00	345.00	5	451.8	33.2	2
SM15KPA300A-HRA*	SM15KPA300CA-HRA*	15300AH	15300CH	300	333.00	369.00	5	482.3	31.1	2
SM15KPA350A-HRA*	SM15KPA350CA-HRA*	15350AH	15350CH	350	389.00	431.00	5	563.9	26.6	2
SM15KPA400A-HRA*	SM15KPA400CA-HRA*	15400AH	15400CH	400	444.00	492.00	5	643.8	23.3	2

Note:

For stack-die parts, use * to label the part number.

SM15KPA-HRA Series

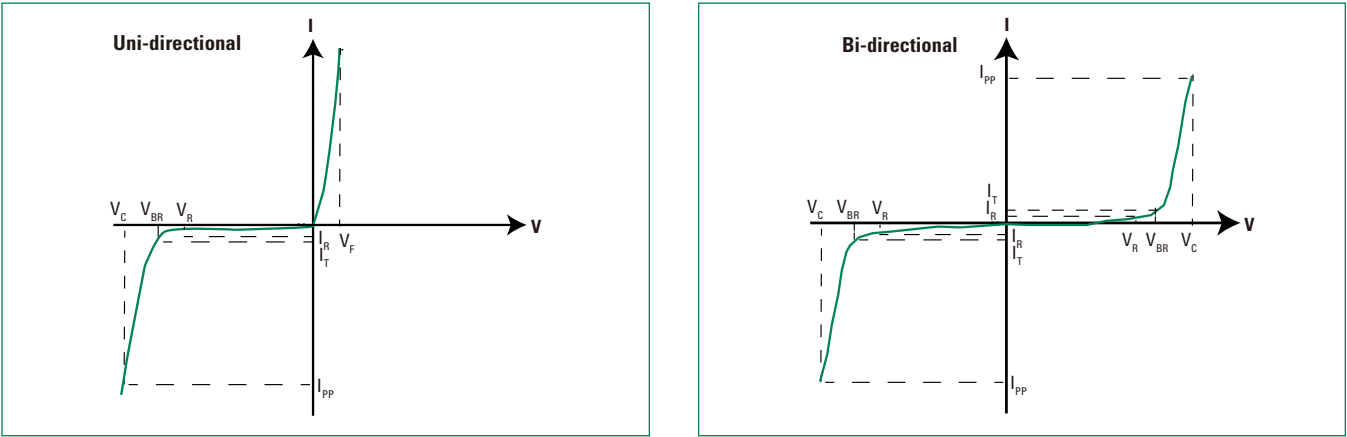
Surface Mount – 15 kW

Screen Process

100 % Vision Inspection	MIL-STD-750 method 2074
100 % High Temperature Storage Life (168 hrs,150 °C)	MIL-STD-750 method 1031
100 % X-RAY Inspection	MIL-STD-750 method 2076
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 = V_R (80 % breakdown voltage, 96 hrs, 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 ($I_{PP} \times V_C$)** – 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 suppressor 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

SM15KPA-HRA Series

Surface Mount – 15 kW

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

Figure 1 - TVS Transients Clamping Waveform

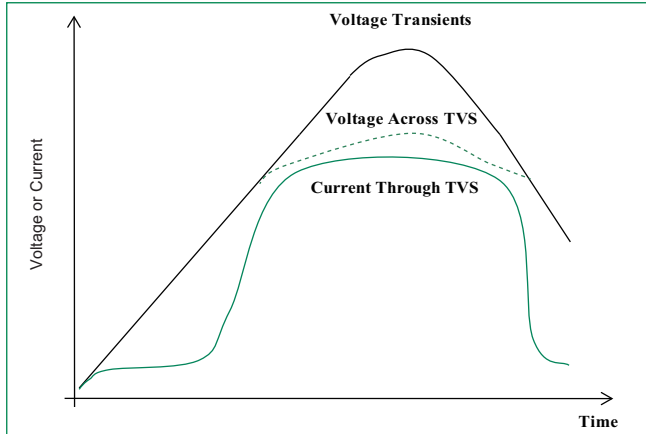


Figure 2 - Peak Pulse Power Rating Curve

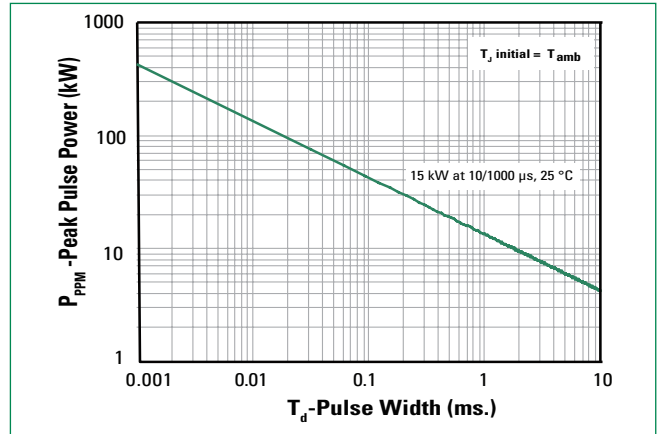


Figure 3 - Peak Pulse Power Derating Curve

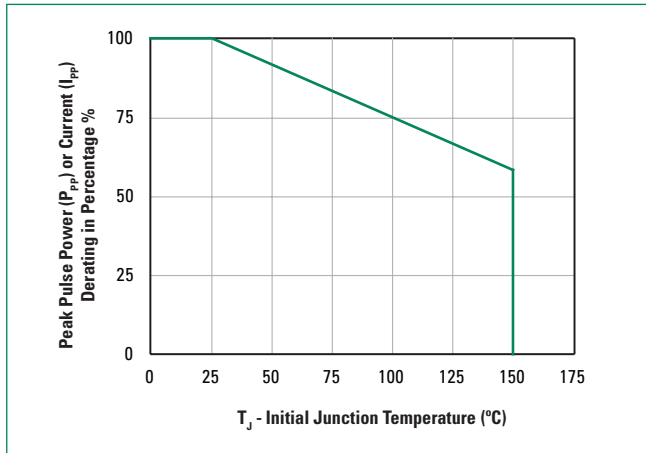


Figure 4 - Test Pulse Waveform

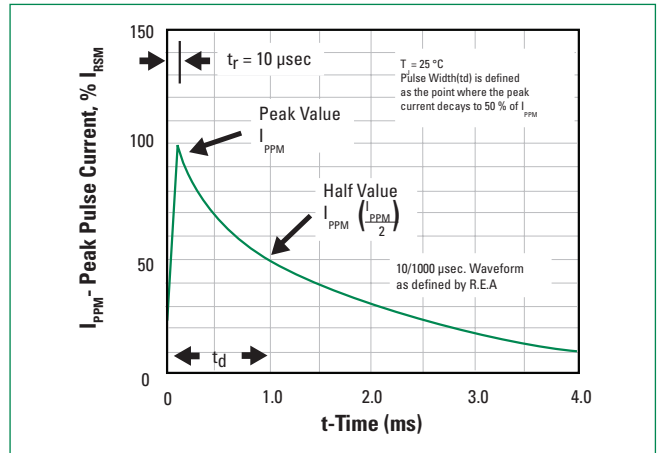


Figure 5 - Typical Junction Capacitance

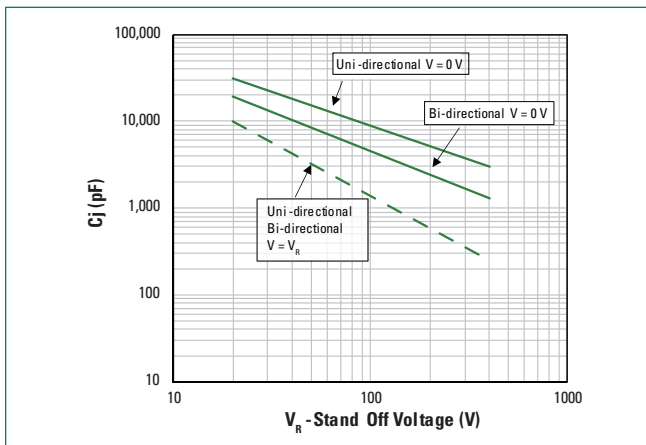
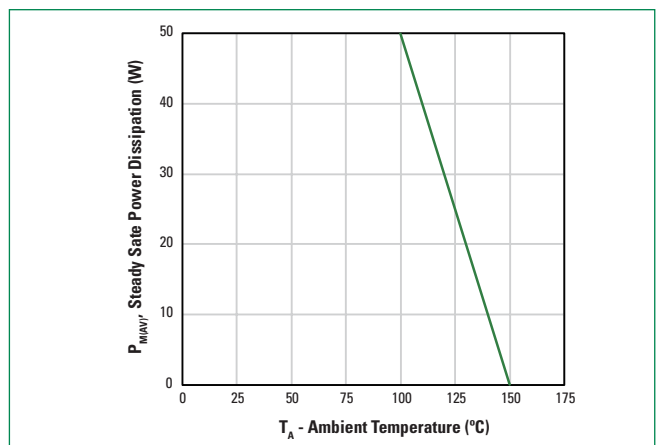


Figure 6 - Steady State Power Derating Curve

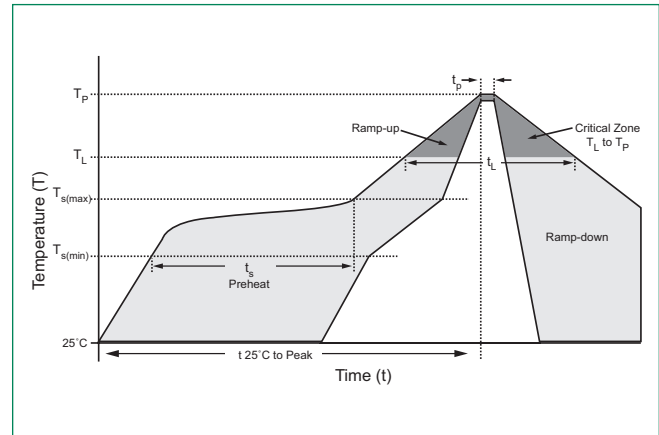


SM15KPA-HRA Series

Surface Mount – 15 kW

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 – 120 seconds
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)		245 ^{+0/-5} °C
Time Within 5 °C of Actual Peak Temperature (t_p)		30 seconds max
Ramp-down Rate		6°C/second max
Time 25°C to Peak Temperature (T_p)		8 minutes max
Do Not Exceed		245 °C



Physical Specifications

Weight	0.092 ounce, 2.6 grams
Case	Molded plastic body over glass passivated junction
Polarity	Color band denotes positive end (cathode) except bidirectional.
Terminal	Matte tin-plated leads, solderable per JESD22-B102

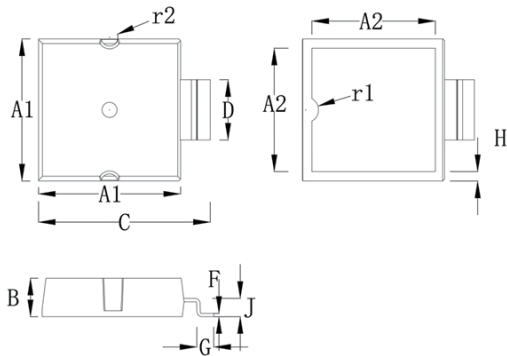
Environmental Specifications

High Temperature Storage	JESD22-A103
HTRB	JESD22-A108
Temperature Cycling	JESD22-A104
MSL	JEDEC-J-STD-020, Level 1
H3TRB	JESD22-A101
RSH	JESD22-A111

Packaging

Part number	Component Package	Quantity	Packaging Option	Packaging Specification
SM15KPAxxxXX-HRA	SPD4-1	500	Tape & Reel - 28 mm tape/ 7" reel	EIA STD RS-481

Dimensions



Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A1	0.488	0.498	12.40	12.66
A2	0.414	0.442	10.52	11.22
B	0.128	0.144	3.24	3.66
C	0.587	0.610	14.90	15.50
D	0.208	0.214	5.28	5.43
F	0.009	0.014	0.23	0.35
G	0.054	0.066	1.37	1.67
J	0.057	0.069	1.45	1.75
H	0.032 TYP		0.83 TYP	
r1	0.045 TYP		1.14 TYP	
r2	0.027 TYP		0.70 TYP	

SM15KPA-HRA Series

Surface Mount – 15 kW

Part Numbering System

SM15KPA xxx XX -HR A

Without Group B Test

High Reliability

Type Code

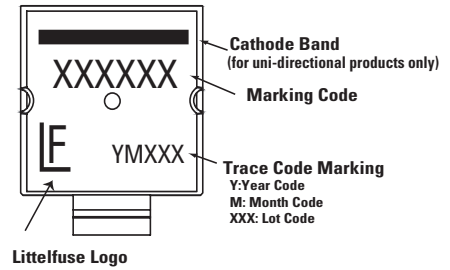
A Uni-Directional (5 % V_{BR} Voltage Tolerance)

CA Bi-Directional (5 % V_{BR} Voltage Tolerance)

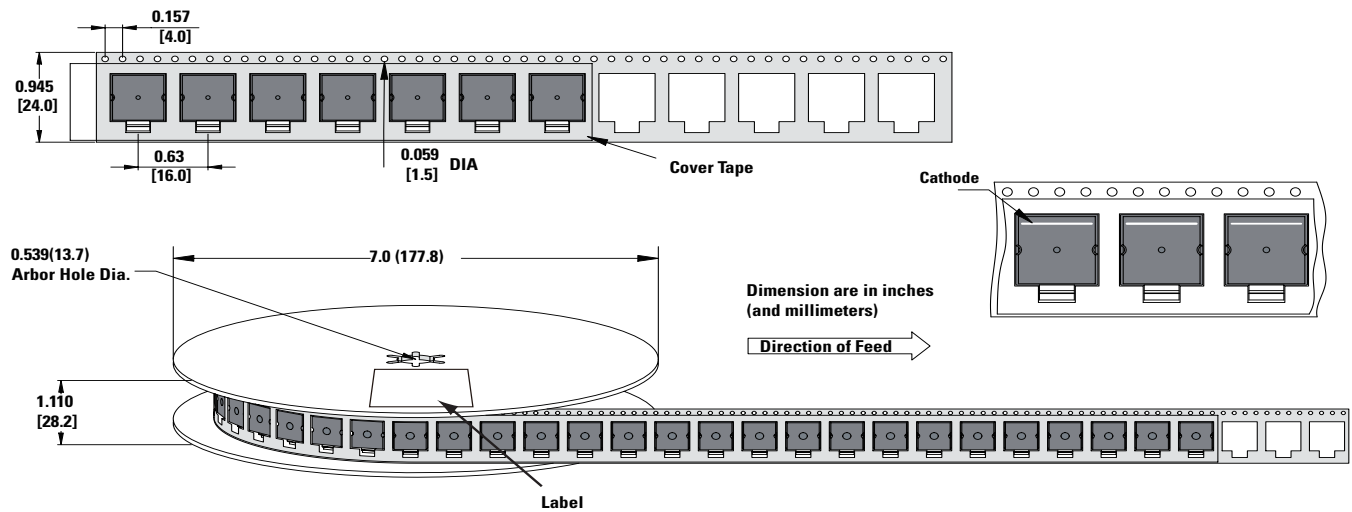
V_R Voltage

Series Code

Part Marking System



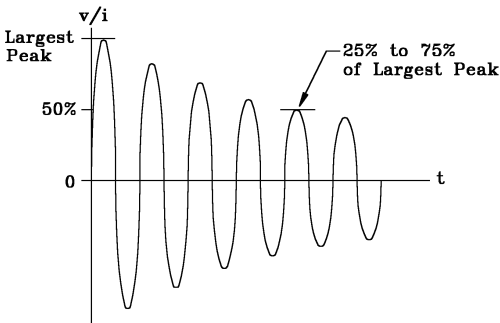
Tape and Reel Specification



SM15KPA-HRA Series

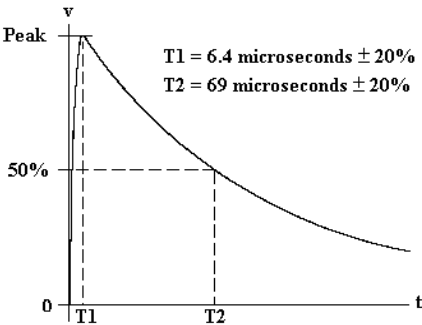
Surface Mount – 15 kW

RTCA/DO-160G Wave 3

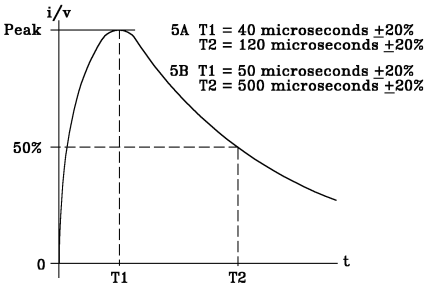


Notes:
1. Voltage and current are not required to be in phase.
2. The waveshape may have either a damped sine or cosine waveshape.

RTCA/DO-160G Wave 4



RTCA/DO-160G Wave 5



SM15KPA-HRA Series

Surface Mount – 15 kW

Pin Injection Protection Per RTCA/DO-160G

Part Number (Uni)	Part Number (Bi)	25 °C								70 °C								120 °C											
		Wave 3	Wave 4 (6.4/69 μs)				Wave 5 (40/120 μs)				Wave 3	Wave 4 (6.4/69 μs)				Wave 5 (40/120 μs)				Wave 3	Wave 4 (6.4/69 μs)				Wave 5 (40/120 μs)				
			L5	L3	L4	L5	L3	L4	L5	L5		L3	L4	L5	L3	L4	L5	L5	L3		L4	L5	L3	L4	L5				
			128A	60A	150A	320A	300A	750A	1600A	128A		60A	150A	320A	300A	750A	1600A	128A	60A		150A	320A	300A	750A	1600A				
SM15KPA20A-HRA	SM15KPA20CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
SM15KPA22A-HRA	SM15KPA22CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA24A-HRA	SM15KPA24CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA26A-HRA	SM15KPA26CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA28A-HRA	SM15KPA28CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA30A-HRA	SM15KPA30CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA33A-HRA	SM15KPA33CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA36A-HRA	SM15KPA36CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA40A-HRA	SM15KPA40CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA43A-HRA	SM15KPA43CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA45A-HRA	SM15KPA45CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA48A-HRA	SM15KPA48CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA51A-HRA	SM15KPA51CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA54A-HRA	SM15KPA54CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA58A-HRA	SM15KPA58CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA60A-HRA	SM15KPA60CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA64A-HRA	SM15KPA64CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA70A-HRA	SM15KPA70CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA75A-HRA	SM15KPA75CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA78A-HRA	SM15KPA78CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA85A-HRA	SM15KPA85CA-HRA	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	-	-	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	-	-	-
SM15KPA90A-HRA	SM15KPA90CA-HRA	Pass	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	-	-
SM15KPA100A-HRA	SM15KPA100CA-HRA	Pass	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	-	-
SM15KPA110A-HRA	SM15KPA110CA-HRA	Pass	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	-	-
SM15KPA120A-HRA	SM15KPA120CA-HRA	Pass	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	-	-
SM15KPA130A-HRA	SM15KPA130CA-HRA	Pass	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	-	-
SM15KPA150A-HRA	SM15KPA150CA-HRA	Pass	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	-	-
SM15KPA160A-HRA	SM15KPA160CA-HRA	Pass	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	-	-
SM15KPA170A-HRA	SM15KPA170CA-HRA	Pass	Pass	Pass	-	-	-	-	Pass	Pass	Pass	-	-	-	-	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	-	-
SM15KPA180A-HRA	SM15KPA180CA-HRA	Pass	Pass	Pass	-	-	-	-	Pass	Pass	Pass	-	-	-	-	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	-	-
SM15KPA200A-HRA	SM15KPA200CA-HRA	Pass	Pass	Pass	-	-	-	-	Pass	Pass	Pass	-	-	-	-	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	-	-
SM15KPA220A-HRA	SM15KPA220CA-HRA	Pass	Pass	Pass	-	-	-	-	Pass	Pass	Pass	-	-	-	-	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	-	-
SM15KPA240A-HRA	SM15KPA240CA-HRA	Pass	Pass	Pass	-	-	-	-	Pass	Pass	Pass	-	-	-	-	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	-	-
SM15KPA260A-HRA	SM15KPA260CA-HRA	Pass	Pass	Pass	-	-	-	-	Pass	Pass	Pass	-	-	-	-	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	-	-
SM15KPA280A-HRA	SM15KPA280CA-HRA	Pass	Pass	Pass	-	-	-	-	Pass	Pass	Pass	-	-	-	-	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	-	-
SM15KPA300A-HRA	SM15KPA300CA-HRA	Pass	Pass	Pass	-	-	-	-	Pass	Pass	Pass	-	-	-	-	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	-	-
SM15KPA350A-HRA	SM15KPA350CA-HRA	Pass	Pass	Pass	-	-	-	-	Pass	Pass	Pass	-	-	-	-	Pass	Pass	Pass	-	-	-	Pass	Pass	Pass	-	-	-	-	-
SM15KPA400A-HRA	SM15KPA400CA-HRA	Pass	Pass	Pass	-	-	-	-	Pass	Pass	Pass	-	-	-	-	Pass	Pass	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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