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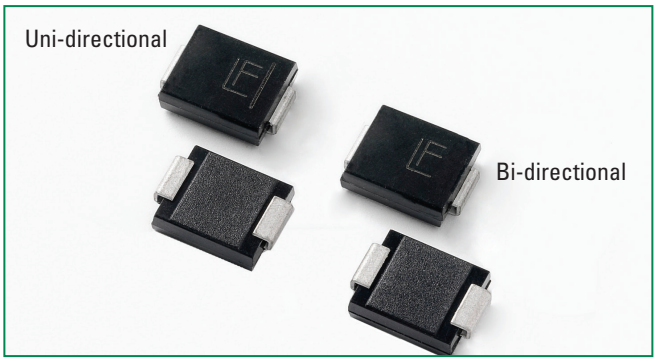
SMDJ-HRA Series



Description

The SMDJ-HRA High Reliability series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events. These are available with a variety of up-screening options for enhanced reliability.

Agency Approvals

AGENCY	AGENCY FILE NUMBER
	E230531

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

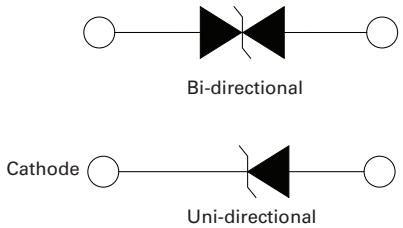
Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation at T_A=25°C by 10/1000µs waveform (Fig.1)(Note 1), (Note 2)	P_{PPM}	3000	W
Power Dissipation on infinite heat sink at T_A=50°C	$P_{M(AV)}$	6.5	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	I_{FSM}	300	A
Maximum Instantaneous Forward Voltage at 100A for Unidirectional only	V_F	3.5	V
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to 150	°C
Typical Thermal Resistance Junction to Lead	$R_{\theta JL}$	15	°C/W
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	75	°C/W

Notes:
1. Non-repetitive current pulse , per Fig. 3 and derated above T_A = 25°C per Fig. 2.
2. Mounted on copper pad area of 0.31x0.31" (8.0 x 8.0mm) to each terminal.
3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only, duty cycle=4 per minute maximum.

Features

- 3000W peak pulse power capability at 10/1000µs waveform, repetition rate (duty cycles):0.01 %
- High reliability devices with fabrication and assembly lots traceability
- Enhanced reliability screening options are available in reference to MIL-PRF-19500. Refer to screen process table for more detail on screening options
- For surface mounted applications in order to optimize board space
- Low profile package
- Built-in strain relief
- V_{BR} @ T_J= V_{BR}@25°C x (1+αT x (T_J - 25)) (αT:Temperature Coefficient, typical value is 0.1 %)
- Glass passivated chip junction
- Very fast response time
- Excellent clamping capability
- Low incremental surge resistance
- Typical I_R less than 2µA above 12V
- High Temperature soldering guaranteed: 260°C/10 seconds at terminals
- Plastic package is flammability rated V-0 per UL 94
- Meet MSL level1, per J-STD-020, LF maximun peak of 260°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)

Functional Diagram



Applications

SMDJ-HRA devices are ideal for the high reliability protection of I/O Interfaces, V_{CC} bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

Revised: 11/10/16

Electrical Characteristics

Part Number (Uni)	Part Number (Bi)	Marking		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 Approval
		UNI	BI		MIN	MAX					
SMDJ5.0A-HRA	SMDJ5.0CA-HRA	RDEH	DDEH	5.0	6.40	7.00	10	9.2	326.1	800	X
SMDJ6.0A-HRA	SMDJ6.0CA-HRA	RDGH	DDGH	6.0	6.67	7.37	10	10.3	291.3	800	X
SMDJ6.5A-HRA	SMDJ6.5CA-HRA	RDKH	DDKH	6.5	7.22	7.98	10	11.2	267.9	500	X
SMDJ7.0A-HRA	SMDJ7.0CA-HRA	PDMH	DDMH	7.0	7.78	8.60	10	12.0	250.0	200	X
SMDJ7.5A-HRA	SMDJ7.5CA-HRA	PDPH	DDPH	7.5	8.33	9.21	1	12.9	232.6	100	X
SMDJ8.0A-HRA	SMDJ8.0CA-HRA	PDRH	DDRH	8.0	8.89	9.83	1	13.6	220.6	50	X
SMDJ8.5A-HRA	SMDJ8.5CA-HRA	PDTH	DDTH	8.5	9.44	10.40	1	14.4	208.3	20	X
SMDJ9.0A-HRA	SMDJ9.0CA-HRA	PDVH	DDVH	9.0	10.00	11.10	1	15.4	194.8	10	X
SMDJ10A-HRA	SMDJ10CA-HRA	PDXH	DDXH	10.0	11.10	12.30	1	17.0	176.5	5	X
SMDJ11A-HRA	SMDJ11CA-HRA	PDZH	DDZH	11.0	12.20	13.50	1	18.2	164.8	2	X
SMDJ12A-HRA	SMDJ12CA-HRA	PEEH	DEEH	12.0	13.30	14.70	1	19.9	150.8	2	X
SMDJ13A-HRA	SMDJ13CA-HRA	PEGH	DEGH	13.0	14.40	15.90	1	21.5	139.5	2	X
SMDJ14A-HRA	SMDJ14CA-HRA	PEKH	DEKH	14.0	15.60	17.20	1	23.2	129.3	2	X
SMDJ15A-HRA	SMDJ15CA-HRA	PEMH	DEMH	15.0	16.70	18.50	1	24.4	123.0	2	X
SMDJ16A-HRA	SMDJ16CA-HRA	PEPH	DEPH	16.0	17.80	19.70	1	26.0	115.4	2	X
SMDJ17A-HRA	SMDJ17CA-HRA	PERH	DERH	17.0	18.90	20.90	1	27.6	108.7	2	X
SMDJ18A-HRA	SMDJ18CA-HRA	PETH	DETH	18.0	20.00	22.10	1	29.2	102.7	2	X
SMDJ20A-HRA	SMDJ20CA-HRA	PEVH	DEVH	20.0	22.20	24.50	1	32.4	92.6	2	X
SMDJ22A-HRA	SMDJ22CA-HRA	PEXH	DEXH	22.0	24.40	26.90	1	35.5	84.5	2	X
SMDJ24A-HRA	SMDJ24CA-HRA	PEZH	DEZH	24.0	26.70	29.50	1	38.9	77.1	2	X
SMDJ26A-HRA	SMDJ26CA-HRA	PFEH	DFEH	26.0	28.90	31.90	1	42.1	71.3	2	X
SMDJ28A-HRA	SMDJ28CA-HRA	PFGH	DFGH	28.0	31.10	34.40	1	45.4	66.1	2	X
SMDJ30A-HRA	SMDJ30CA-HRA	PFKH	DFKH	30.0	33.30	36.80	1	48.4	62.0	2	X
SMDJ33A-HRA	SMDJ33CA-HRA	PFMH	DFMH	33.0	36.70	40.60	1	53.3	56.3	2	X
SMDJ36A-HRA	SMDJ36CA-HRA	PFPH	DFPH	36.0	40.00	44.20	1	58.1	51.6	2	X
SMDJ40A-HRA	SMDJ40CA-HRA	PFRH	DFRH	40.0	44.40	49.10	1	64.5	46.5	2	X
SMDJ43A-HRA	SMDJ43CA-HRA	PFTH	DFTH	43.0	47.80	52.80	1	69.4	43.2	2	X
SMDJ45A-HRA	SMDJ45CA-HRA	PFVH	DFVH	45.0	50.00	55.30	1	72.7	41.3	2	X
SMDJ48A-HRA	SMDJ48CA-HRA	PFXH	DFXH	48.0	53.30	58.90	1	77.4	38.8	2	X
SMDJ51A-HRA	SMDJ51CA-HRA	PFZH	DFZH	51.0	56.70	62.70	1	82.4	36.4	2	X
SMDJ54A-HRA	SMDJ54CA-HRA	RGEH	DGEH	54.0	60.00	66.30	1	87.1	34.4	2	X
SMDJ58A-HRA		PGGH		58.0	64.40	71.20	1	93.6	32.1	2	X
SMDJ60A-HRA		PGKH		60.0	66.70	73.70	1	96.8	31.0	2	X
SMDJ64A-HRA		PGMH		64.0	71.10	78.60	1	103.0	29.1	2	X
SMDJ70A-HRA		PGPH		70.0	77.80	86.00	1	113.0	26.5	2	X
SMDJ75A-HRA		PGRH		75.0	83.30	92.10	1	121.0	24.8	2	X
SMDJ78A-HRA		PGTH		78.0	86.70	95.80	1	126.0	23.8	2	X
SMDJ85A-HRA		PGVH		85.0	94.40	104.00	1	137.0	21.9	2	X
SMDJ90A-HRA		PGXH		90.0	100.00	111.00	1	146.0	20.5	2	X
SMDJ100A-HRA		PGZH		100.0	111.00	123.00	1	162.0	18.5	2	X
SMDJ110A-HRA		PHEH		110.0	122.00	135.00	1	177.0	16.9	2	X
SMDJ120A-HRA		PHGH		120.0	133.00	147.00	1	193.0	15.5	2	X
SMDJ130A-HRA		PHKH		130.0	144.00	159.00	1	209.0	14.4	2	X

Note:

1. For bidirectional type having V_R of 10 volts and less, the I_R limit is double.
2. SMDJ-HRA voltage binning can be specified by customer's request via contacting Littlefuse service

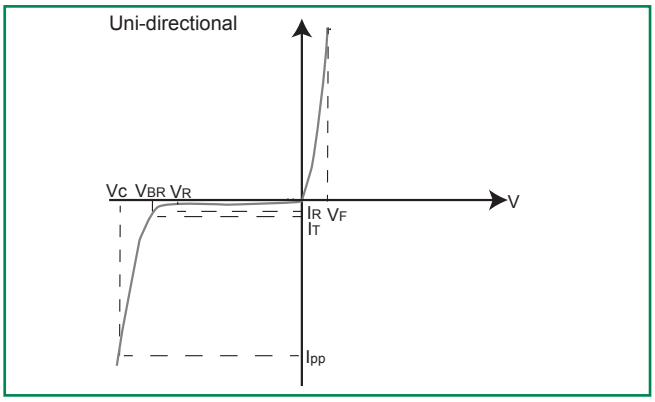
Revised: 11/10/16

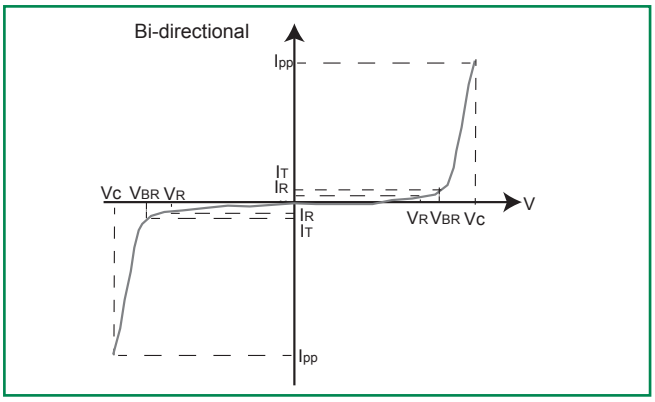
Screen Process

100% Vision Inspection	MIL-STD-750 method 2074
100% High Temperature Storage Life (168hrs,175°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% Reflow (2X)	JEDEC J-STD-020
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 though the TVS at a specified test current (I_T)
V_C Clamping Voltage – Peak voltage measured across the suppressor 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

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

Figure 1 - TVS Transients Clamping Waveform

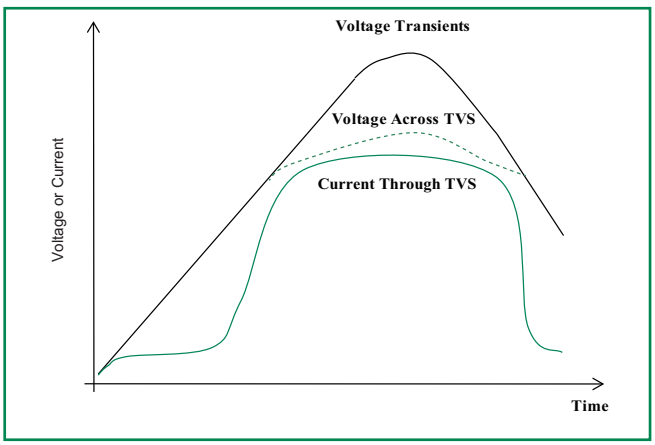
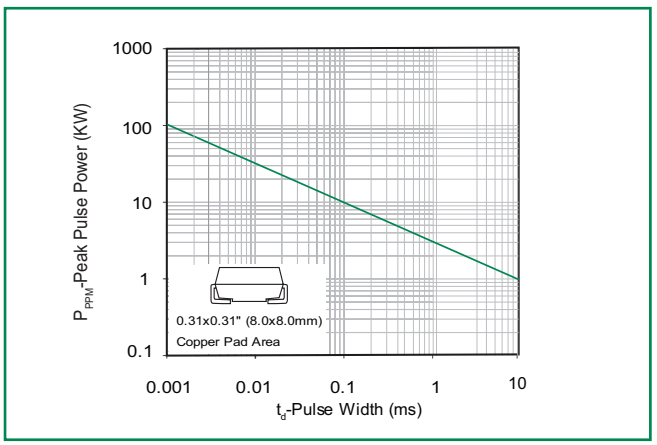


Figure 2 - Peak Pulse Power Rating



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

Figure 3 - Pulse Derating Curve

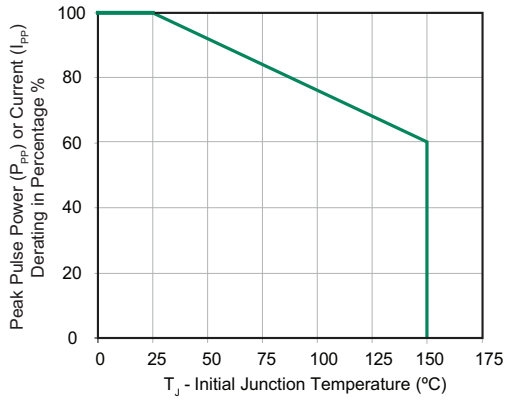


Figure 4 - Pulse Waveform

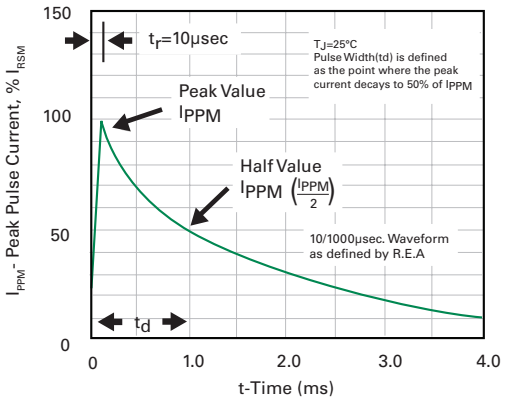


Figure 5 - Typical Junction Capacitance

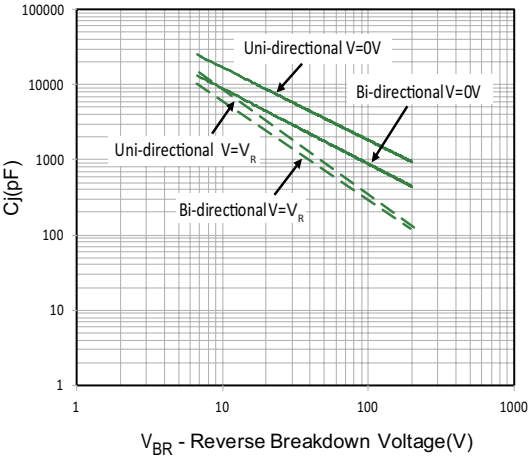


Figure 6 - Steady State Power Derating Curve

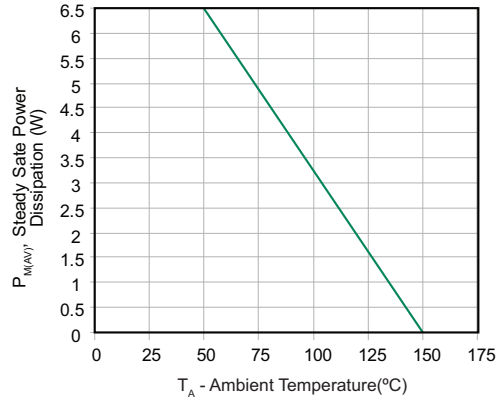
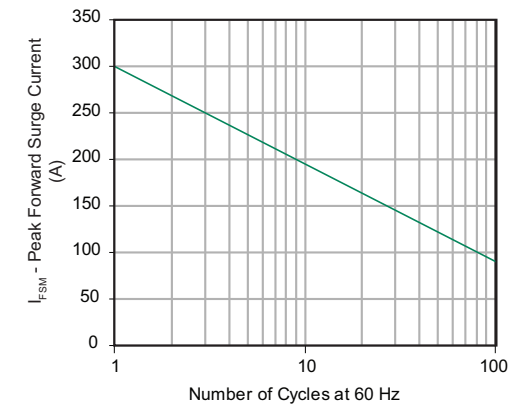
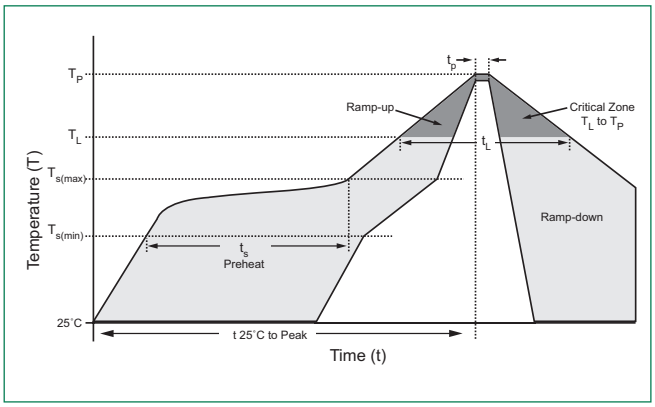


Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional only



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 – 180 secs
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)		$260^{+0/-5}$ °C
Time within 5°C of actual peak Temperature (t_p)		20 – 40 seconds
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes Max.
Do not exceed		260°C



Physical Specifications

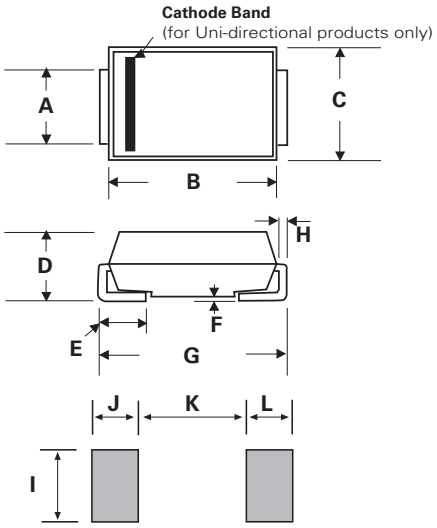
Weight	0.007 ounce, 0.21 grams
Case	JEDEC DO214AB. Molded plastic body over glass passivated junction
Polarity	Color band denotes positive end (cathode) except Bidirectional.
Terminal	Matte Tin-plated leads, Solderable per JESD22-B102

Environmental Specifications

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

Dimensions

DO-214AB (SMC J-Bend)



Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.114	0.126	2.900	3.200
B	0.260	0.280	6.600	7.110
C	0.220	0.245	5.590	6.220
D	0.079	0.103	2.060	2.620
E	0.030	0.060	0.760	1.520
F	0.002	0.008	0.051	0.203
G	0.305	0.320	7.750	8.130
H	0.006	0.012	0.152	0.305
I	0.129	-	3.300	-
J	0.094	-	2.400	-
K	-	0.165		4.200
L	0.094	-	2.400	-

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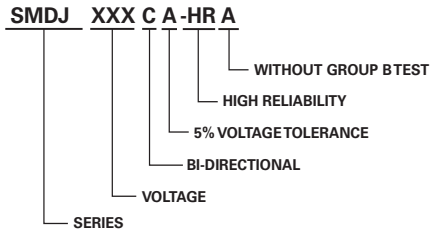
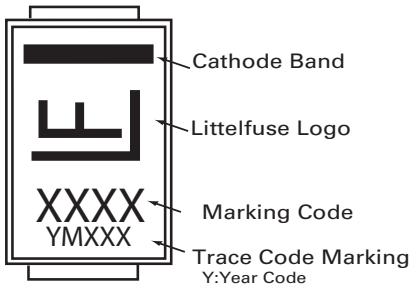
Part Numbering System



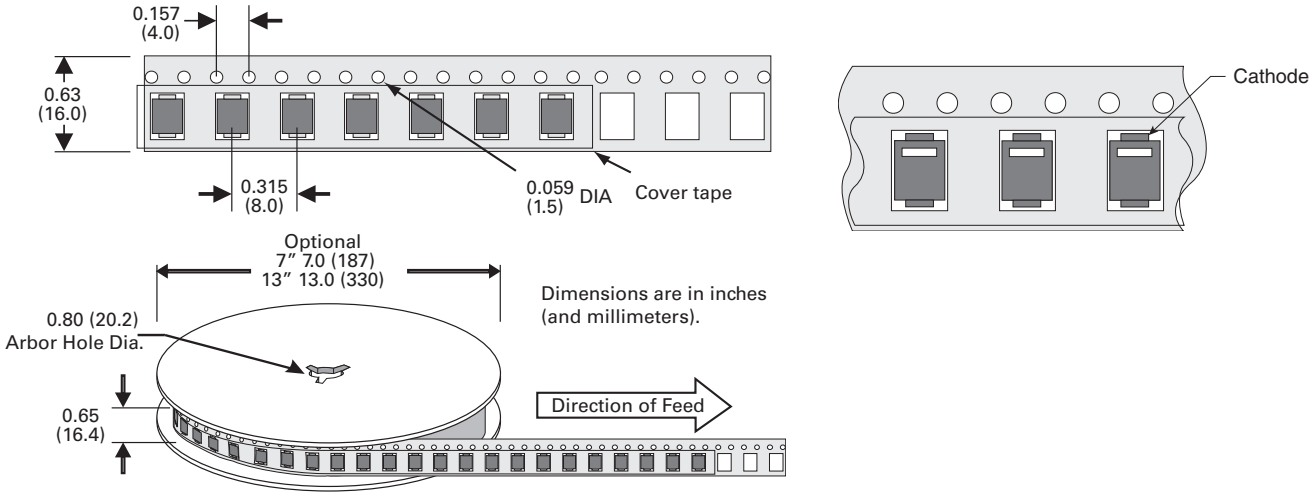
Part Marking System



Packaging

Part number	Component Package	Quantity	Packaging Option	Packaging Specification
SMDJxxxXX-HRA	DO-214AB	3000	Tape & Reel – 16mm tape /13" reel	EIA STD RS-481
SMDJxxxXX-HRAT7	DO-214AB	500	Tape & Reel – 16mm tape/7" reel	EIA STD RS-481

Tape and Reel Specification



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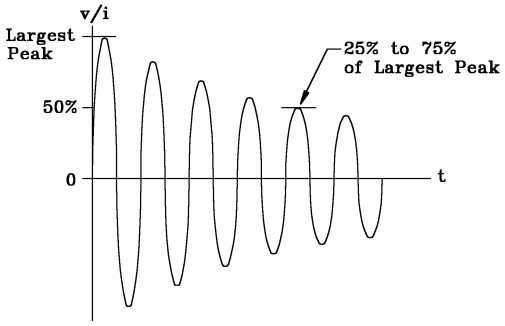
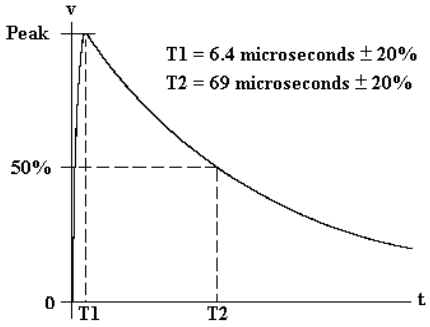
RTCA/DO-160G Wave 3

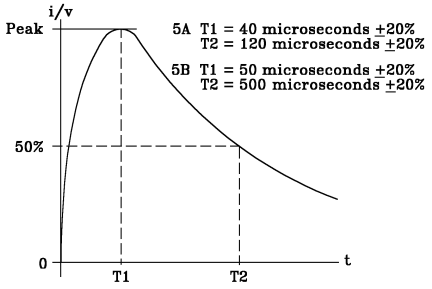


Notes:
1. *Voltage and current are not required to be in phase.*
2. *The waveshape may have either a damped sine or cosine waveshape.*

RTCA/DO-160G Wave 4



RTCA/DO-160G Wave 4 and Wave 5



Revised: 11/10/16

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	L3	L4	L5	L3	L4	L5	L3	L4	L5	L3	L4
		128A	60A	150A	320A	300A	750A	128A	60A	150A	320A	300A	750A	128A	60A	150A	320A	300A	750A
SMDJ5.0A-HRA	SMDJ5.0CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
SMDJ6.0A-HRA	SMDJ6.0CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass
SMDJ6.5A-HRA	SMDJ6.5CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-
SMDJ7.0A-HRA	SMDJ7.0CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-
SMDJ7.5A-HRA	SMDJ7.5CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-
SMDJ8.0A-HRA	SMDJ8.0CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-
SMDJ8.5A-HRA	SMDJ8.5CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-
SMDJ9.0A-HRA	SMDJ9.0CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-
SMDJ10A-HRA	SMDJ10CA-HRA	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-
SMDJ11A-HRA	SMDJ11CA-HRA	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	-	-
SMDJ12A-HRA	SMDJ12CA-HRA	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	-	-
SMDJ13A-HRA	SMDJ13CA-HRA	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	-	-
SMDJ14A-HRA	SMDJ14CA-HRA	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	-	-
SMDJ15A-HRA	SMDJ15CA-HRA	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	-	-
SMDJ16A-HRA	SMDJ16CA-HRA	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	-	-	pass	pass	pass	-	-	-
SMDJ17A-HRA	SMDJ17CA-HRA	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	-	-	pass	pass	pass	-	-	-
SMDJ18A-HRA	SMDJ18CA-HRA	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	-	-	pass	pass	pass	-	-	-
SMDJ20A-HRA	SMDJ20CA-HRA	pass	pass	pass	pass	pass	-	pass	pass	pass	pass	-	-	pass	pass	pass	-	-	-
SMDJ22A-HRA	SMDJ22CA-HRA	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-
SMDJ24A-HRA	SMDJ24CA-HRA	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-
SMDJ26A-HRA	SMDJ26CA-HRA	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-
SMDJ28A-HRA	SMDJ28CA-HRA	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-
SMDJ30A-HRA	SMDJ30CA-HRA	pass	pass	pass	-	-	-	pass	pass	pass	-	-		pass	pass	pass	-	-	-
SMDJ33A-HRA	SMDJ33CA-HRA	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-
SMDJ36A-HRA	SMDJ36CA-HRA	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-
SMDJ40A-HRA	SMDJ40CA-HRA	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-
SMDJ43A-HRA	SMDJ43CA-HRA	pass	pass	pass	-	-	-	pass	pass	pass	-	-	-	pass	pass	-	-	-	-
SMDJ45A-HRA	SMDJ45CA-HRA	pass	pass	pass	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-
SMDJ48A-HRA	SMDJ48CA-HRA	pass	pass	pass	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-
SMDJ51A-HRA	SMDJ51CA-HRA	pass	pass	pass	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-
SMDJ54A-HRA	SMDJ54CA-HRA	pass	pass	pass	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-
SMDJ58A-HRA		pass	pass	-	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-
SMDJ60A-HRA		pass	pass	-	-	-	-	pass	pass	-	-	-	-	pass	pass	-	-	-	-
SMDJ64A-HRA		pass	pass	-	-	-	-	pass	pass	-	-	-	-	pass	-	-	-	-	-
SMDJ70A-HRA		pass	pass	-	-	-	-	pass	pass	-	-	-	-	pass	-	-	-	-	-
SMDJ75A-HRA		pass	pass	-	-	-	-	pass	pass	-	-	-	-	pass	-	-	-	-	-
SMDJ78A-HRA		pass	pass	-	-	-	-	pass	pass	-	-	-	-	pass	-	-	-	-	-
SMDJ85A-HRA		pass	pass	-	-	-	-	pass	pass	-	-	-	-	pass	-	-	-	-	-
SMDJ90A-HRA		pass	pass	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-
SMDJ100A-HRA		pass	pass	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-
SMDJ110A-HRA		pass	pass	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-
SMDJ120A-HRA		pass	pass	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-
SMDJ130A-HRA		pass	pass	-	-	-	-	pass	-	-	-	-	-	pass	-	-	-	-	-

Note:

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

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