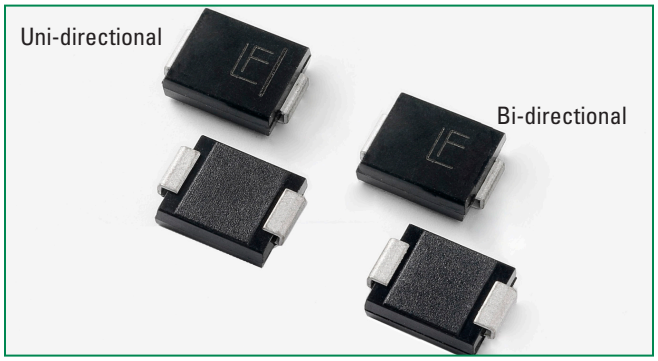
5.0SMDJxxS-HRA

Surface Mount – 5000W – DO-214AB



Agency Approvals

Agency	Agency File Number
	E230531

Maximum Ratings and Thermal Characteristics

(T_A=25°C unless otherwise noted)

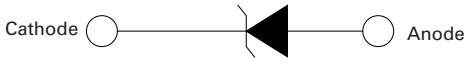
Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation by 10/1000µs Waveform (Fig.1)(Note 1), (Note 2)	P_{PPM}	5000	W
Power dissipation on infinite heatsink at T_A = 50 °C	$P_{M(AV)}$	6.5	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	I_{FSM}	300	A
Maximum Instantaneous Forward 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. 4 and derated above T_J (initial) =25°C per Fig. 3.
2. Voltage of 6.0V~60V products's peak pulse power dissipation is 5000W, and 64V and 70V is 4500W. Bidirectional products 33V~58V are also 4500W.
3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional components only,duty cycle=4 per minute maximum.
4. Mounted on copper pad area of 0.31x0.31" (8.0 x 8.0mm) to each terminal.

Functional Diagram

Bi-directional



Uni-directional

Description

The 5.0SMDJxxS-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 upscreening options for enhanced reliability.

Features

- 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)
- Glass passivated chip junction
- 5000W peak pulse power capability at 10/1000µs waveform, repetition rate (duty cycles):0.01 %
- Fast response time: typically less than 1.0ps from 0V to V_{BR} min
- Excellent clamping capability
- Low incremental surge resistance
- Typical I_R less than 2µA above 12V
- High Temperature soldering guaranteed: 260°C/40 seconds at terminals
- Plastic package has Underwriters laboratory flammability 94V-O
- Meet MSL level1, per J-STD-020, LF maximun peak of 260°C
- Matte tin lead–free plated
- Halogen free and RoHS compliant
- 2nd level interconnect is Pb-free per IPC/JEDEC J-STD-609A.01
- Recognized to UL 497B as an Isolated Loop Circuit Protector

Applications

5.0SMDJxxS-HRA components are ideal for the high reliability protection of I/O Interfaces, VCC bus and other vulnerable circuits.

Revised: F.W.06/28/22

5.0SMDJxxS-HRA

Surface Mount – 5000W – DO-214AB

Electrical Characteristics (T_A=25°C unless otherwise noted)

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					
5.0SMDJ6.0AS-HRA	5.0SMDJ6.0CAS-HRA	5PABH	5BABH	6.0	6.67	7.37	10	10.3	485.4	800.0	X
5.0SMDJ6.5AS-HRA	5.0SMDJ6.5CAS-HRA	5PAEH	5BAEH	6.5	7.22	7.98	10	11.2	446.4	500.0	X
5.0SMDJ7.0AS-HRA	5.0SMDJ7.0CAS-HRA	5PAFH	5BAFH	7.0	7.78	8.60	10	12.0	416.7	200.0	X
5.0SMDJ7.5AS-HRA	5.0SMDJ7.5CAS-HRA	5PAGH	5BAGH	7.5	8.33	9.21	1	12.9	387.6	100.0	X
5.0SMDJ8.0AS-HRA	5.0SMDJ8.0CAS-HRA	5PAKH	5BAKH	8.0	8.89	9.83	1	13.6	367.6	50.0	X
5.0SMDJ8.5AS-HRA	5.0SMDJ8.5CAS-HRA	5PAMH	5BAMH	8.5	9.44	10.4	1	14.4	347.2	20.0	X
5.0SMDJ9.0AS-HRA	5.0SMDJ9.0CAS-HRA	5PAPH	5BAPH	9.0	10.0	11.1	1	15.4	324.7	10.0	X
5.0SMDJ10AS-HRA	5.0SMDJ10CAS-HRA	5PARH	5BARH	10.0	11.1	12.3	1	17.0	294.1	5.0	X
5.0SMDJ11AS-HRA	5.0SMDJ11CAS-HRA	5PATH	5BATH	11.0	12.2	13.5	1	18.2	274.7	2.0	X
5.0SMDJ12AS-HRA	5.0SMDJ12CAS-HRA	5PAVH	5BAVH	12.0	13.3	14.7	1	19.9	251.3	2.0	X
5.0SMDJ13AS-HRA	5.0SMDJ13CAS-HRA	5PAXH	5BAXH	13.0	14.4	15.9	1	21.5	232.6	2.0	X
5.0SMDJ14AS-HRA	5.0SMDJ14CAS-HRA	5PAZH	5BAZH	14.0	15.6	17.2	1	23.2	215.5	2.0	X
5.0SMDJ15AS-HRA	5.0SMDJ15CAS-HRA	5PBEH	5BBEH	15.0	16.7	18.5	1	24.4	204.9	2.0	X
5.0SMDJ16AS-HRA	5.0SMDJ16CAS-HRA	5PBGH	5BBGH	16.0	17.8	19.7	1	26.0	192.3	2.0	X
5.0SMDJ17AS-HRA	5.0SMDJ17CAS-HRA	5PBKH	5BBKH	17.0	18.9	20.9	1	27.6	181.2	2.0	X
5.0SMDJ18AS-HRA	5.0SMDJ18CAS-HRA	5PBMH	5BBMH	18.0	20.0	22.1	1	29.2	171.2	2.0	X
5.0SMDJ20AS-HRA	5.0SMDJ20CAS-HRA	5PBPH	5BBPH	20.0	22.2	24.5	1	32.4	154.3	2.0	X
5.0SMDJ22AS-HRA	5.0SMDJ22CAS-HRA	5PBRH	5BBRH	22.0	24.4	26.9	1	35.5	140.8	2.0	X
5.0SMDJ24AS-HRA	5.0SMDJ24CAS-HRA	5PBTH	5BBTH	24.0	26.7	29.5	1	38.9	128.5	2.0	X
5.0SMDJ26AS-HRA	5.0SMDJ26CAS-HRA	5PBVH	5BBVH	26.0	28.9	31.9	1	42.1	118.8	2.0	X
5.0SMDJ28AS-HRA	5.0SMDJ28CAS-HRA	5PBXH	5BBXH	28.0	31.1	34.4	1	45.4	110.1	2.0	X
5.0SMDJ30AS-HRA	5.0SMDJ30CAS-HRA	5PBZH	5BBZH	30.0	33.3	36.8	1	48.4	103.3	2.0	X
5.0SMDJ33AS-HRA	-	5PCBH	-	33.0	36.7	40.6	1	53.3	93.9	2.0	X
	5.0SMDJ33CAS-HRA	-	5BCBH	33.0	36.7	40.6	1	53.3	84.4	2.0	X
5.0SMDJ36AS-HRA	-	5PCEH	-	36.0	40.0	44.2	1	58.1	86.1	2.0	X
-	5.0SMDJ36CAS-HRA	-	5BCEH	36.0	40.0	44.2	1	58.1	77.5	2.0	X
5.0SMDJ40AS-HRA	-	5PCFH	-	40.0	44.4	49.1	1	64.5	77.6	2.0	X
-	5.0SMDJ40CAS-HRA	-	5BCFH	40.0	44.4	49.1	1	64.5	69.8	2.0	X
5.0SMDJ43AS-HRA	-	5PCGH	-	43.0	47.8	52.8	1	69.4	72.1	2.0	X
-	5.0SMDJ43CAS-HRA	-	5BCGH	43.0	47.8	52.8	1	69.4	64.8	2.0	X
5.0SMDJ45AS-HRA	-	5PCKH	-	45.0	50.0	55.3	1	72.7	68.8	2.0	X
-	5.0SMDJ45CAS-HRA	-	5BCKH	45.0	50.0	55.3	1	72.7	61.9	2.0	X
5.0SMDJ48AS-HRA	-	5PCMH	-	48.0	53.3	58.9	1	77.4	64.7	2.0	X
-	5.0SMDJ48CAS-HRA	-	5BCMH	48.0	53.3	58.9	1	77.4	58.1	2.0	X
5.0SMDJ51AS-HRA	-	5PCPH	-	51.0	56.7	62.7	1	82.4	60.7	2.0	X
-	5.0SMDJ51CAS-HRA	-	5BCPH	51.0	56.7	62.7	1	82.4	54.6	2.0	X
5.0SMDJ54AS-HRA	-	5PCRH	-	54.0	60.0	66.3	1	87.1	57.5	2.0	X
-	5.0SMDJ54CAS-HRA	-	5BCRH	54.0	60.0	66.3	1	87.1	51.7	2.0	X
5.0SMDJ58AS-HRA	-	5PCTH	-	58.0	64.4	71.2	1	93.6	53.5	2.0	X
-	5.0SMDJ58CAS-HRA	-	5BCTH	58.0	64.4	71.2	1	93.6	48.1	2.0	X
5.0SMDJ60AS-HRA	-	5PCVH	-	60.0	66.7	73.7	1	96.8	51.7	2.0	X

Notes:
1. 5.0SMDJxxS-HRA voltage binning can be specified by customer's request via contacting Littelfuse service
2. For bidirectional type having V_R of 10 volts and less, the I_R limit is double.

5.0SMDJxxS-HRA

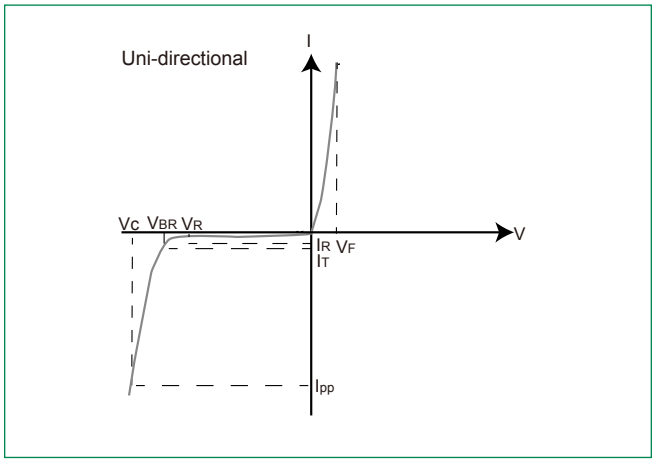
Surface Mount – 5000W – DO-214AB

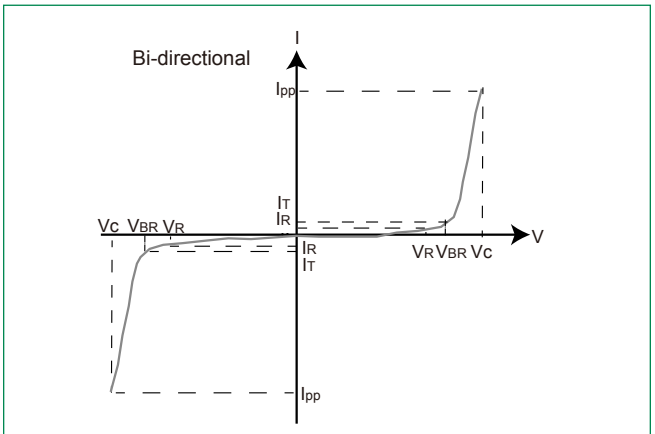
Screen Process

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=V_R (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 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

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

Figure 1:
TVS Transients Clamping Waveform

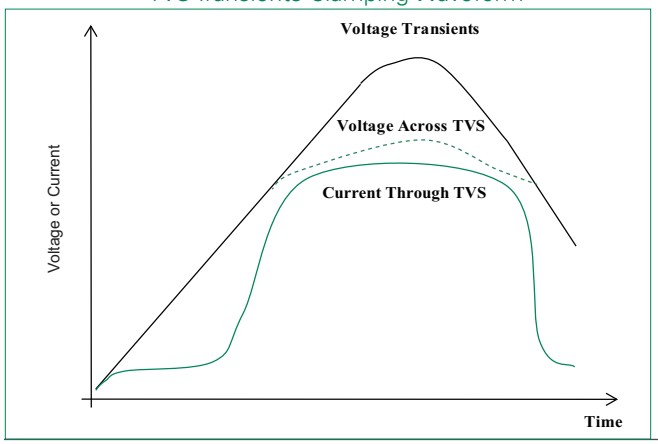
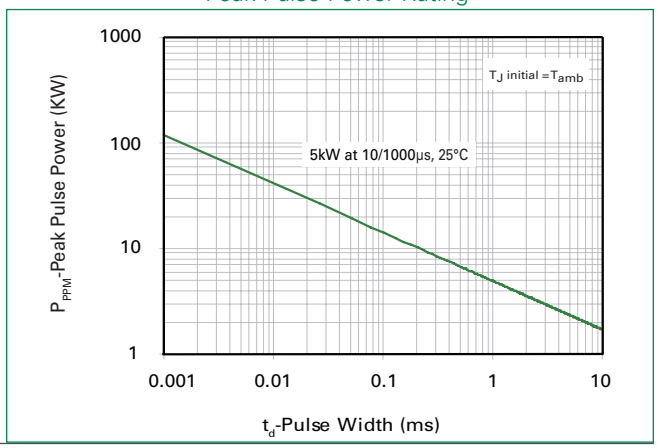


Figure 2:
Peak Pulse Power Rating



Littelfuse

Revised: F.W.06/28/22

5.0SMDJxxS-HRA

Surface Mount – 5000W – DO-214AB

Figure 3:
Peak Pulse Power Derating Curve

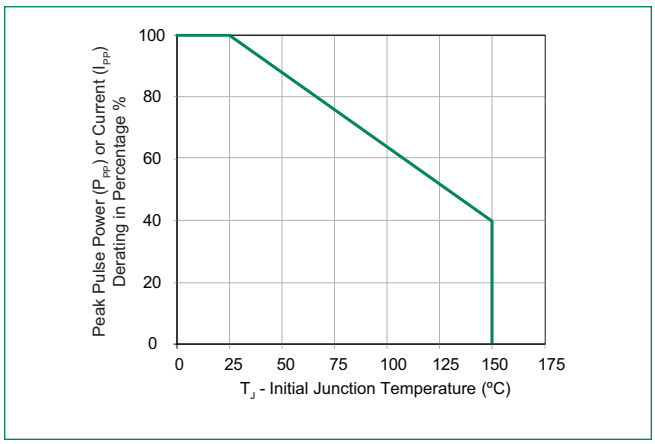


Figure 4:
Pulse Waveform

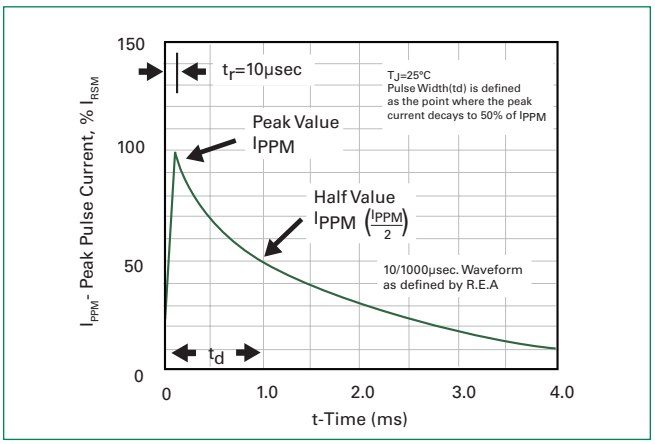


Figure 5:
Typical Junction Capacitance

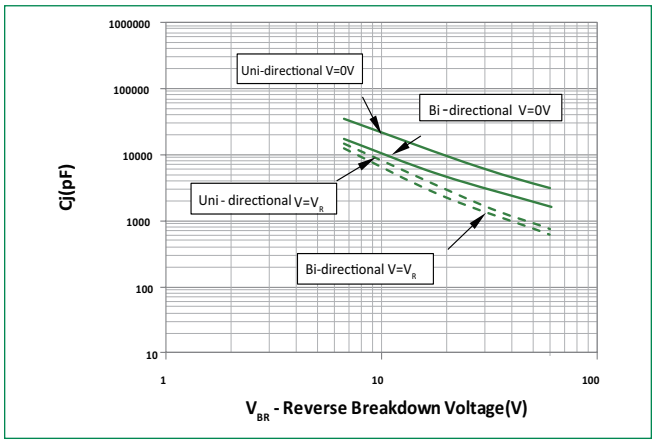
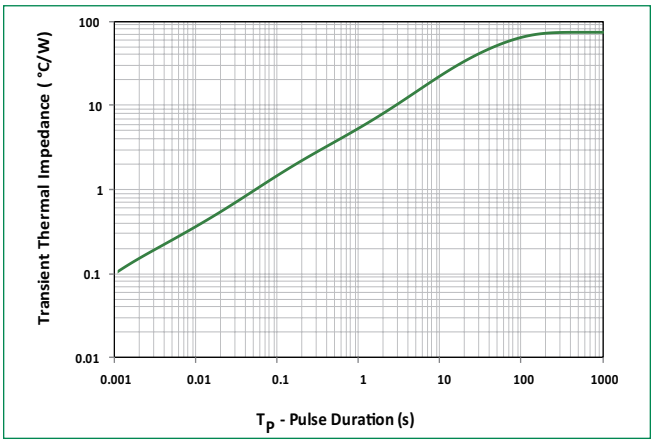


Figure 6:
Typical Transient Thermal Impedance

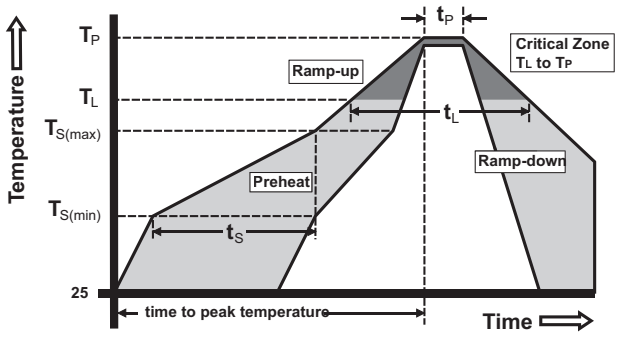


5.0SMDJxxS-HRA

Surface Mount – 5000W – DO-214AB

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 secs
Average ramp up rate (Liquidus Temp (T_L) to peak		3°C/second max
$T_{S(max)}$ to T_A - 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)		30 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

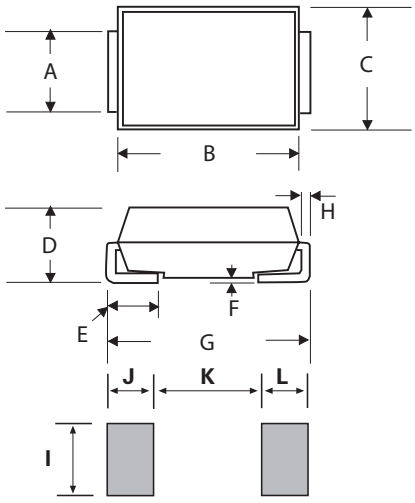
Weight	0.007 ounce, 0.21 grams
Case	JEDEC DO214AB. Molded plastic body over glass passivated junction
Terminal	Matte Tin-plated leads, Solderable per JESD22-B102

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)



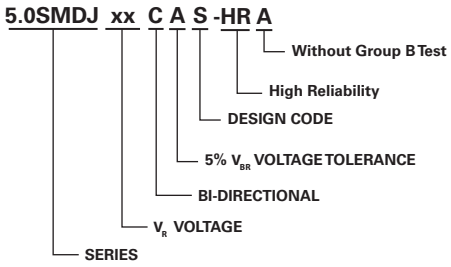
Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.114	0.126	2.900	3.200
B	0.260	0.280	6.600	7.110
C	0.220	0.245	5.590	6.220
D	0.079	0.103	2.060	2.620
E	0.030	0.060	0.760	1.520
F	-	0.008	-	0.203
G	0.305	0.320	7.750	8.130
H	0.006	0.012	0.152	0.305
I	0.129	-	3.300	-
J	0.094	-	2.400	-
K	-	0.165	-	4.200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

Revised: F.W.06/28/22

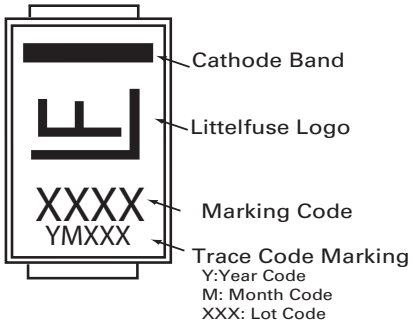
5.0SMDJxxS-HRA

Surface Mount – 5000W – DO-214AB

Part Numbering System



Part Marking System



Packing Options

Part Number	Component Package	Quantity	Packaging Option	Packaging Specification
5.0SMDJxxS-HRA	DO-214AB	3000	Tape & Reel - 16mm tape/13" reel	EIA STD RS-481
5.0SMDJxxSHRAT7	DO-214AB	500	Tape & Reel - 16mm tape/7" reel	EIA STD RS-481

Tape and Reel Specification