

# 5.0SMDJxxS-HRA

## Surface Mount – 5000W – DO-214AB



### Agency Approvals

Agency	Agency File Number
	E230531

### Maximum Ratings and Thermal Characteristics

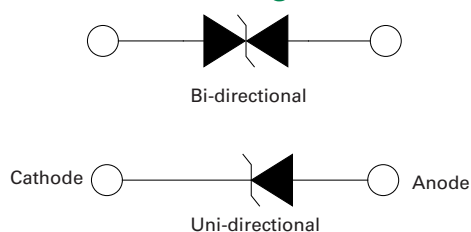
( $T_A=25^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation by 10/1000 $\mu\text{s}$ Waveform (Fig.1)(Note 1), (Note 2)	$P_{PPM}$	5000	W
Power dissipation on infinite heatsink at $T_A = 50^\circ\text{C}$	$P_{M(AV)}$	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	$^\circ\text{C}$
Typical Thermal Resistance Junction to Lead	$R_{\theta JL}$	15	$^\circ\text{C/W}$
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	75	$^\circ\text{C/W}$

#### Notes:

- Non-repetitive current pulse, per Fig. 4 and derated above  $T_J$  (initial) =  $25^\circ\text{C}$  per Fig. 3.
- 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.
- Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional components only, duty cycle=4 per minute maximum.
- Mounted on copper pad area of 0.31x0.31" (8.0 x 8.0mm) to each terminal.

### Functional Diagram



### 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
- $V_{BR} @ T_J = V_{BR} @ 25^\circ\text{C} \times (1 + \alpha T \times (T_J - 25))$  ( $\alpha$ : Temperature Coefficient)
- Glass passivated chip junction
- 5000W peak pulse power capability at 10/1000 $\mu\text{s}$  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 2 $\mu\text{A}$  above 12V
- High Temperature soldering guaranteed: 260 $^\circ\text{C}$ /40 seconds at terminals
- Plastic package has Underwriters laboratory flammability 94V-O
- Meet MSL level1, per J-STD-020, LF maximum peak of 260 $^\circ\text{C}$
- 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.

# 5.0SMDJxxS-HRA

## Surface Mount – 5000W – DO-214AB

### Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

Part Number (Uni)	Part Number (Bi)	Marking		Reverse Stand off Voltage V <sub>R</sub> (Volts)	Breakdown Voltage V <sub>BR</sub> (Volts) @ I <sub>T</sub>		Test Current I <sub>T</sub> (mA)	Maximum Clamping Voltage V <sub>C</sub> @ I <sub>pp</sub> (V)	Maximum Peak Pulse Current I <sub>pp</sub> (A)	Maximum Reverse Leakage I <sub>R</sub> @ V <sub>R</sub> (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:

- 5.0SMDJxxS-HRA voltage binning can be specified by customer's request via contacting Littelfuse service
- For bidirectional type having V<sub>R</sub> of 10 volts and less, the I<sub>R</sub> limit is double.

# 5.0SMDJxxS-HRA

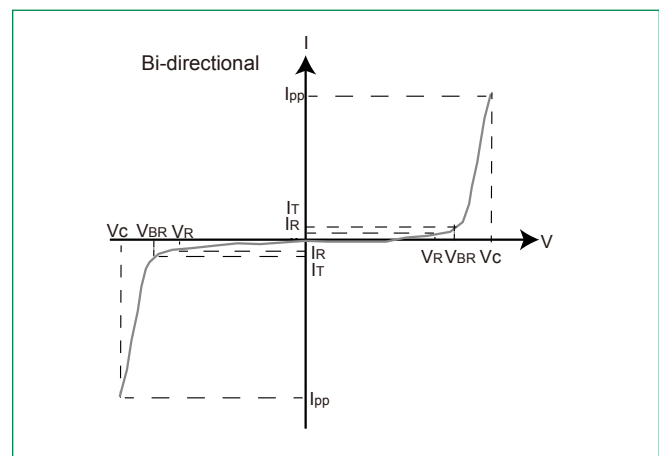
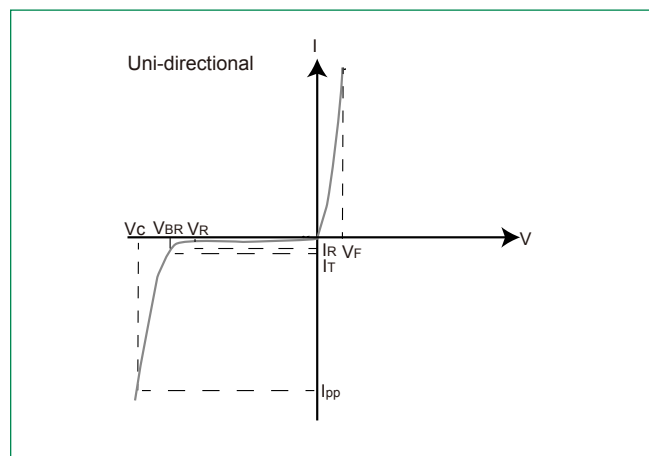
Surface Mount – 5000W – DO-214AB

## 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

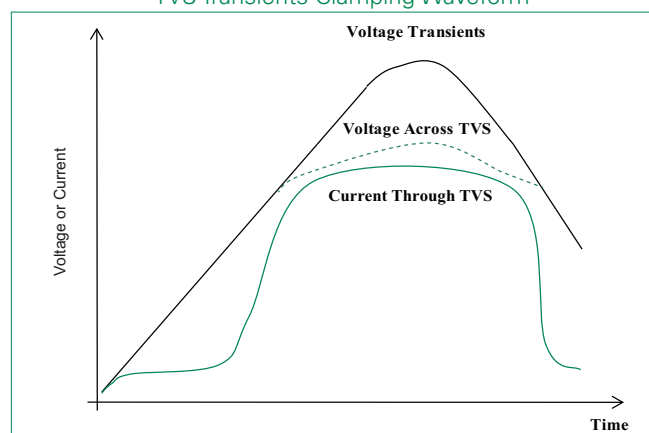
## I-V Curve Characteristics



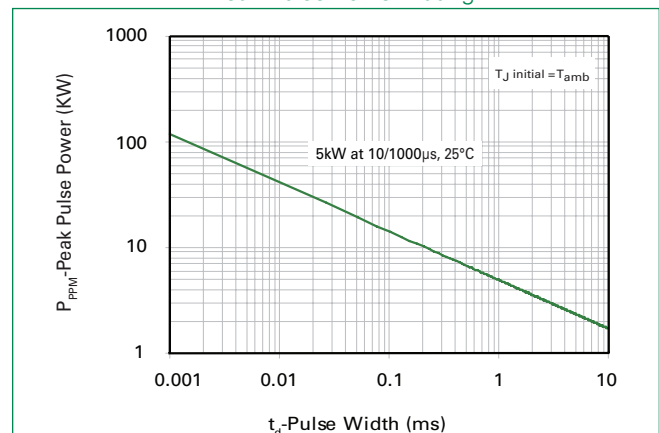
- $P_{PPM}$  **Peak Pulse Power Dissipation** – Max power dissipation
- $V_R$  **Stand-off Voltage** – Maximum voltage that can be applied to the TVS without operation
- $V_{BR}$  **Breakdown Voltage** – Maximum voltage that flows through the TVS at a specified test current ( $I_T$ )
- $V_C$  **Clamping 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 ( $T_A=25^\circ\text{C}$ unless otherwise noted)

**Figure 1:**  
TVS Transients Clamping Waveform



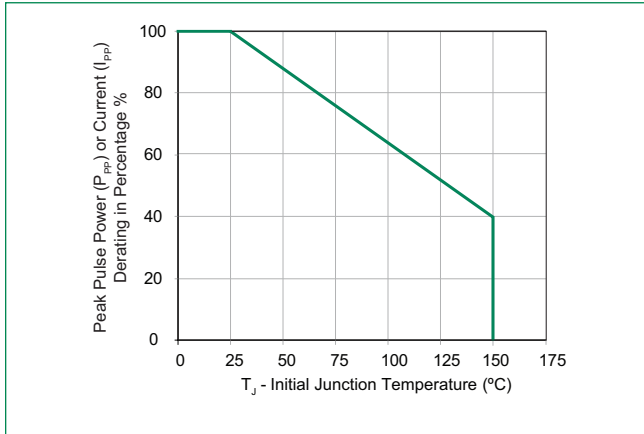
**Figure 2:**  
Peak Pulse Power Rating



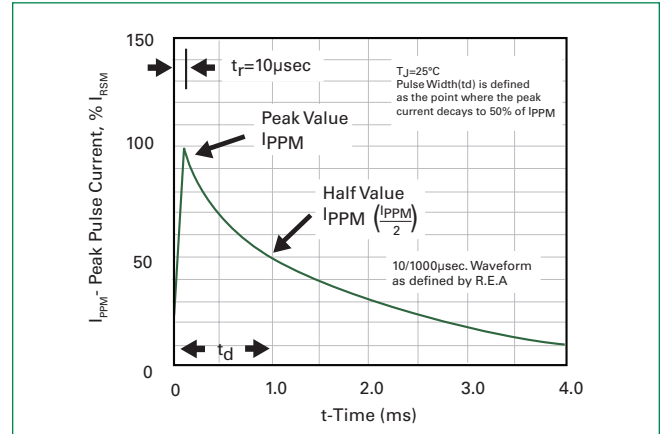
# 5.0SMDJxxS-HRA

Surface Mount – 5000W – DO-214AB

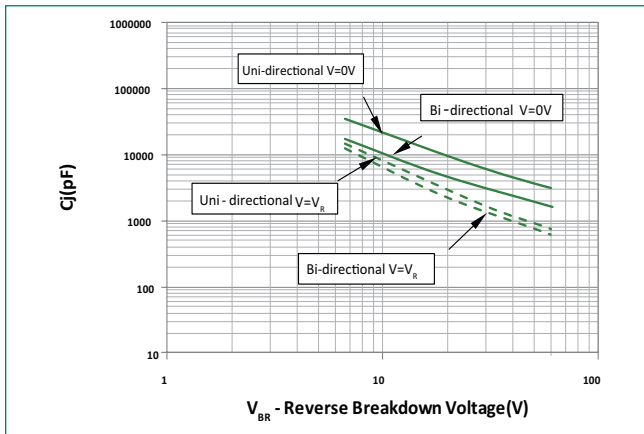
**Figure 3:**  
Peak Pulse Power Derating Curve



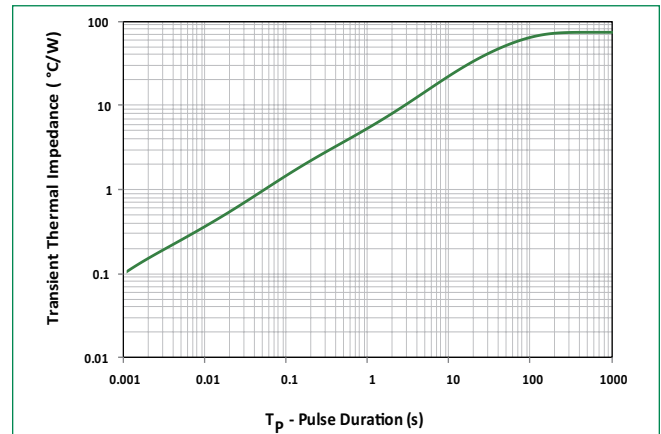
**Figure 4:**  
Pulse Waveform



**Figure 5:**  
Typical Junction Capacitance



**Figure 6:**  
Typical Transient Thermal Impedance

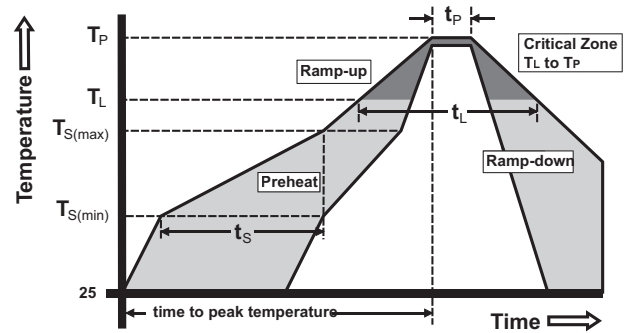


# 5.0SMDJxxS-HRA

## Surface Mount – 5000W – DO-214AB

### Soldering Parameters

<b>Reflow Condition</b>		Lead-free assembly
<b>Pre Heat</b>	- Temperature Min ( $T_{s(min)}$ )	150°C
	- Temperature Max ( $T_{s(max)}$ )	200°C
	- Time (min to max) ( $t_s$ )	60 – 120 secs
<b>Average ramp up rate (Liquidus Temp (<math>T_L</math>) to peak</b>		3°C/second max
<b><math>T_{s(max)}</math> to <math>T_A</math> - Ramp-up Rate</b>		3°C/second max
<b>Reflow</b>	- Temperature ( $T_L$ ) (Liquidus)	217°C
	- Time (min to max) ( $T_s$ )	60 – 150 seconds
<b>Peak Temperature (<math>T_p</math>)</b>		260 <sup>+0/-5</sup> °C
<b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>		30 seconds
<b>Ramp-down Rate</b>		6°C/second max
<b>Time 25°C to peak Temperature (<math>T_p</math>)</b>		8 minutes Max.
<b>Do not exceed</b>		260°C



### Physical Specifications

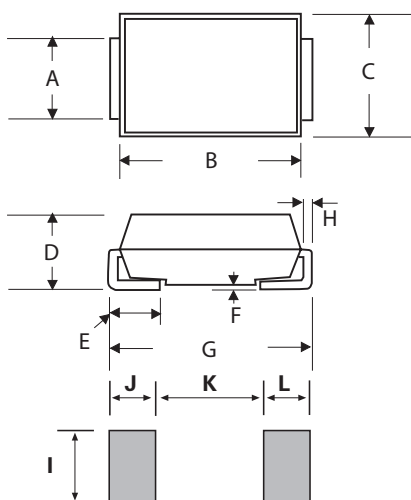
<b>Weight</b>	0.007 ounce, 0.21 grams
<b>Case</b>	JEDEC DO214AB. Molded plastic body over glass passivated junction
<b>Terminal</b>	Matte Tin-plated leads, Solderable per JESD22-B102

### Environmental Specifications

<b>High Temp. Storage</b>	JESD22-A103
<b>HTRB</b>	JESD22-A108
<b>Temperature Cycling</b>	JESD22-A104
<b>MSL</b>	JEDEC-J-STD-020, LEVEL 1
<b>H3TRB</b>	JESD22-A101
<b>RSH</b>	JESD22-A111

### Dimensions

DO-214AB (SMC J-Bend)

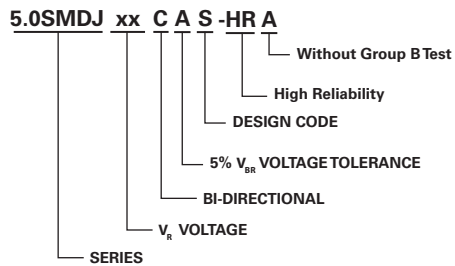


Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.114	0.126	2.900	3.200
B	0.260	0.280	6.600	7.110
C	0.220	0.245	5.590	6.220
D	0.079	0.103	2.060	2.620
E	0.030	0.060	0.760	1.520
F	-	0.008	-	0.203
G	0.305	0.320	7.750	8.130
H	0.006	0.012	0.152	0.305
I	0.129	-	3.300	-
J	0.094	-	2.400	-
K	-	0.165	-	4.200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

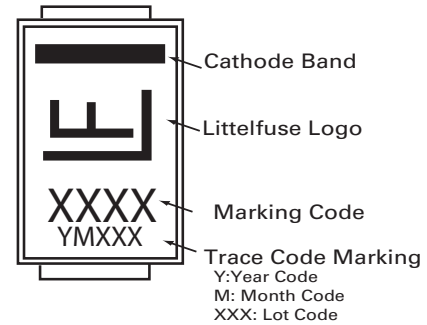
# 5.0SMDJxxS-HRA

## Surface Mount – 5000W – DO-214AB

### Part Numbering System



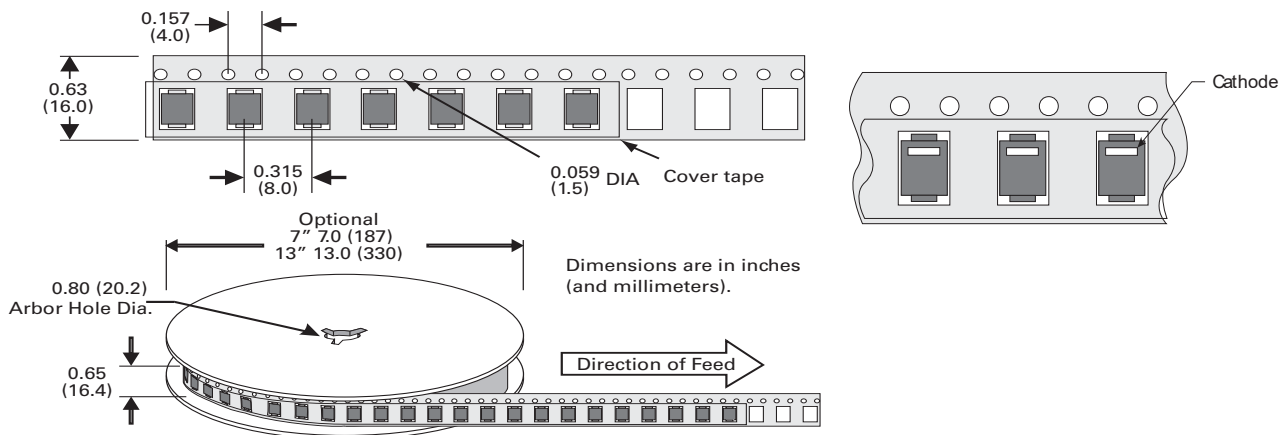
### Part Marking System



### 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



**Disclaimer Notice** - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at <http://www.littelfuse.com/disclaimer-electronics>.