

# 1.5SMB Series

## Surface Mount – 1500W



### 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.2) (Note 1), (Note 2)	$P_{\text{PPM}}$	1500	W
Power Dissipation on Infinite Heat Sink at $T_c=50^\circ\text{C}$	$P_D$	5.0	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	$I_{\text{FSM}}$	120	A
Maximum Instantaneous Forward Voltage at 50A for Unidirectional Only	$V_F$	5.0	V
Operating Temperature Range	$T_J$	-65 to 150	$^\circ\text{C}$
Storage Temperature Range	$T_{\text{STG}}$	-65 to 175	$^\circ\text{C}$
Typical Thermal Resistance Junction to Lead	$R_{\theta\text{JL}}$	20	$^\circ\text{C/W}$
Typical Thermal Resistance Junction to Ambient	$R_{\theta\text{JA}}$	100	$^\circ\text{C/W}$

#### Notes:

1. Non-repetitive current pulse, per Fig. 4 and derated above  $T_J$  (initial) =  $25^\circ\text{C}$  per Fig. 3.
2. Mounted on copper pad area of 0.2x0.2" (5.0 x 5.0mm) to each terminal.
3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional component only, duty cycle=4 per minute maximum.

## Description

The 1.5SMB Series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

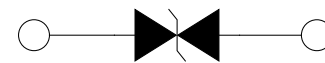
## Features & Benefits

- For surface mounted applications to optimize board space
- Low profile package
- 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
- ESD protection of data lines in accordance with IEC 61000-4-2, 30kV(Air), 30kV (Contact)
- EFT protection of data lines in accordance with IEC 61000-4-4
- Built-in strain relief
- Glass passivated chip junction
- 1500W peak pulse power capability at 10/1000 $\mu\text{s}$  waveform, repetition rate (duty cycles):0.01%
- $V_{\text{BR}} @ T_J = V_{\text{BR}} @ 25^\circ\text{C} \times (1 + \alpha_T \times (T_J - 25))$  ( $\alpha_T$ : Temperature Coefficient, typical value is 0.1%)
- Excellent clamping capability
- Low incremental surge resistance
- Meet MSL level 1 per J-STD-020, and high temperature soldering guaranteed: 260C/10sec
- Matte tin lead-free Plated
- Halogen free and RoHS compliant
- Pb-free E3 means 2<sup>nd</sup> 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,  $V_{\text{CC}}$  bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

### Functional Diagram



Bi-directional



Uni-directional

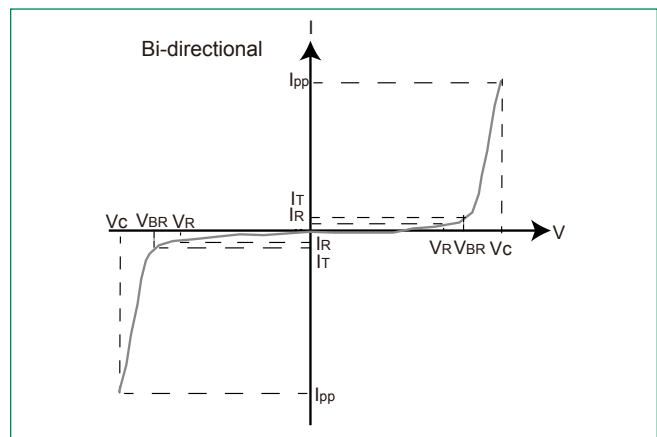
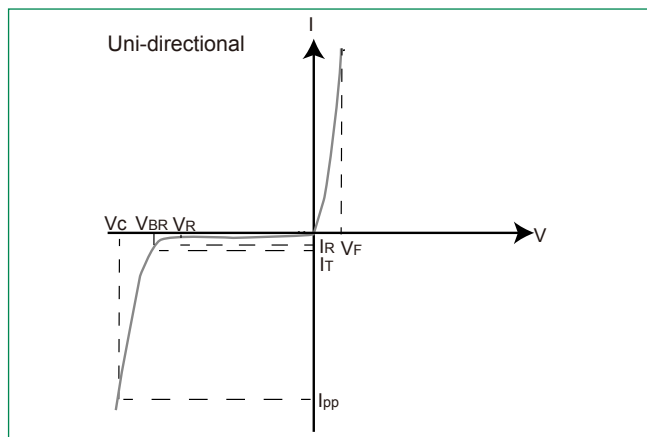
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### Electrical Characteristics ( $T_A=25^\circ\text{C}$ unless otherwise noted)

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 $V_C$ @ $I_{PP}$ (10/1000 $\mu\text{s}$ ) (V)	Maximum Peak Pulse Current $I_{PP}$ (10/1000 $\mu\text{s}$ ) (A)	Maximum Clamping Voltage $V_C$ @ $I_{PP}$ (8/20 $\mu\text{s}$ ) (V)	Maximum Peak Pulse Current $I_{PP}$ (8/20 $\mu\text{s}$ ) (A)	Maximum Reverse Leakage $I_R$ @ $V_R$ ( $\mu\text{A}$ )	Maximum Temperature coefficient of $V_{BR}$ (%/C)
		UNI	BI		MIN	MAX							
1.5SMB20A	1.5SMB20CA	H15I	B15I	17.1	19.0	21.0	1	27.7	54.9	34.8	302.0	20	0.085
1.5SMB22A	1.5SMB22CA	H15K	B15K	18.8	20.9	23.1	1	30.6	49.7	35.0	273.4	10	0.088
1.5SMB23A	1.5SMB23CA	H10L	B10L	20.0	22.0	24.2	1	33.2	45.0	35.0	250.0	1	0.088
1.5SMB24A	1.5SMB24CA	H15N	B15N	20.5	22.8	25.2	1	33.2	45.0	42.9	249.0	1	0.091
1.5SMB27A	1.5SMB27CA	H15P	B15P	23.1	25.7	28.4	1	37.5	40.5	48.4	222.8	1	0.092
1.5SMB30A	1.5SMB30CA	H15S	B15S	25.6	28.5	31.5	1	41.4	36.7	53.5	201.9	1	0.093
1.5SMB33A	1.5SMB33CA	H15V	B15V	28.2	31.4	34.7	1	45.7	33.3	59.0	183.2	1	0.094
1.5SMB36A	1.5SMB36CA	H15Z	B15Z	30.8	34.2	37.8	1	49.9	30.5	64.5	167.8	1	0.096
1.5SMB39A	1.5SMB39CA	N15B	C15B	33.3	37.1	41.0	1	53.9	28.2	69.6	155.1	1	0.097
1.5SMB43A	1.5SMB43CA	N15D	C15D	36.8	40.9	45.2	1	59.3	25.6	76.6	140.8	1	0.098
1.5SMB47A	1.5SMB47CA	N15F	C15F	40.2	44.7	49.4	1	64.8	23.5	83.7	129.3	1	0.099
1.5SMB51A	1.5SMB51CA	N15G	C15G	43.6	48.5	53.6	1	70.1	21.7	90.6	119.4	1	0.100
1.5SMB56A	1.5SMB56CA	N15I	C15I	47.8	53.2	58.8	1	77.0	19.7	99.5	108.4	1	0.101
1.5SMB62A	1.5SMB62CA	N15K	C15K	53.0	58.9	65.1	1	85.0	17.9	109.8	98.5	1	0.102
1.5SMB68A	1.5SMB68CA	N15L	C15L	58.1	64.6	71.4	1	92.0	16.5	118.9	90.8	1	0.103
1.5SMB75A	1.5SMB75CA	N15N	C15N	64.1	71.3	78.8	1	103.0	14.8	133.1	81.4	1	0.104
1.5SMB82A	1.5SMB82CA	N15P	C15P	70.1	77.9	86.1	1	113.0	13.5	146.0	74.3	1	0.105
1.5SMB91A	1.5SMB91CA	N15S	C15S	77.8	86.5	95.5	1	125.0	12.2	161.5	67.1	1	0.106
1.5SMB100A	1.5SMB100CA	N15V	C15V	85.5	95.0	105.0	1	137.0	11.1	177.0	61.1	1	0.106

### 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  $V_R$

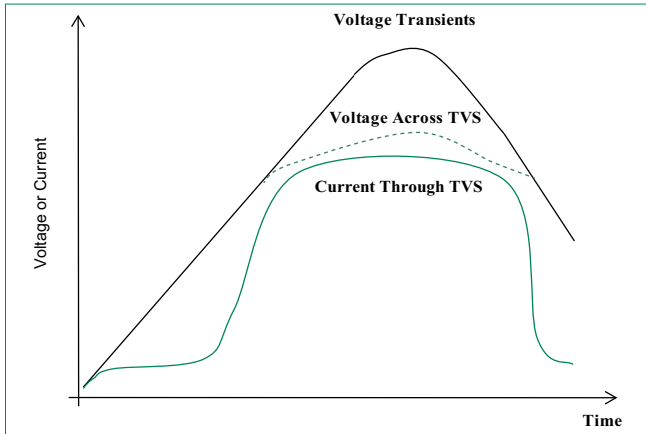
$V_F$  Forward Voltage Drop for Uni-directional

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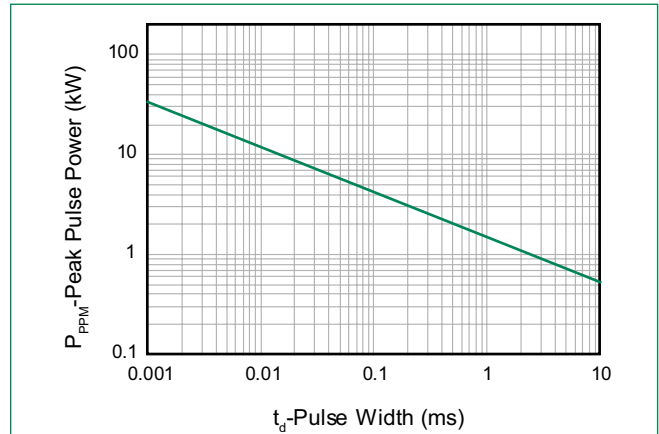
## Surface Mount – 1500W

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

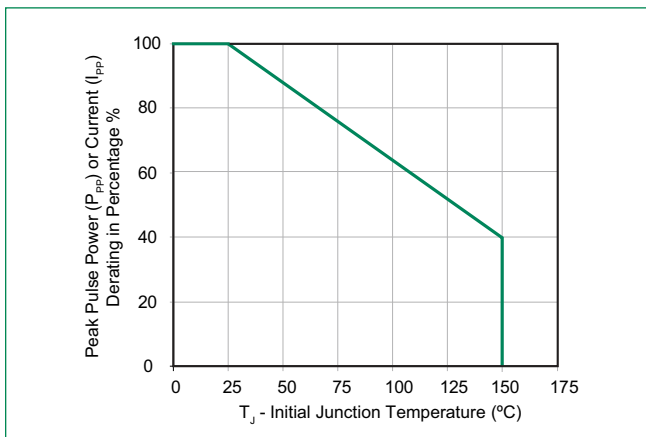
**Figure 1 - TVS Transients Clamping Waveform**



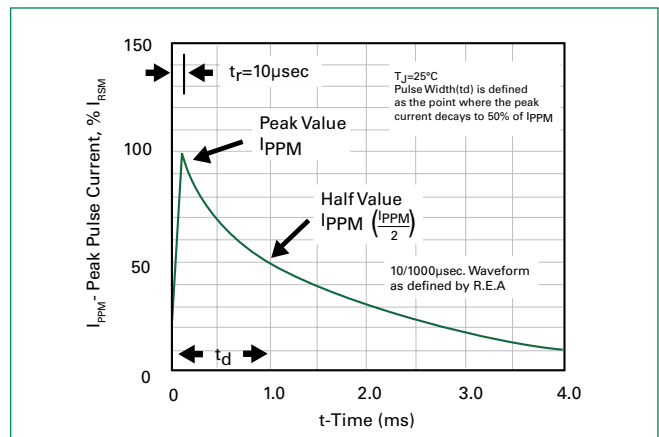
**Figure 2 - Peak Pulse Power Rating Curve**



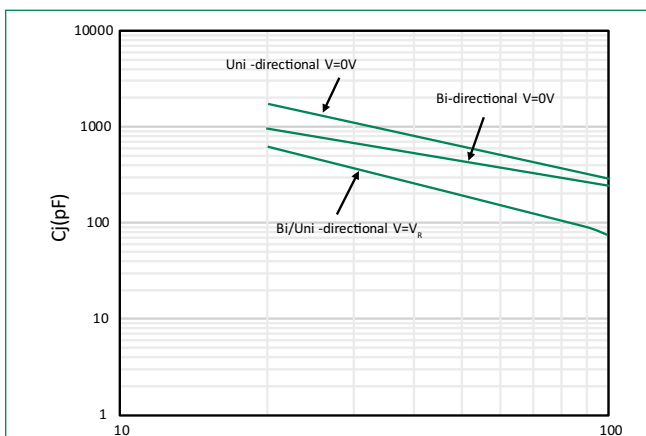
**Figure 3 - Peak Pulse Power Derating Curve**



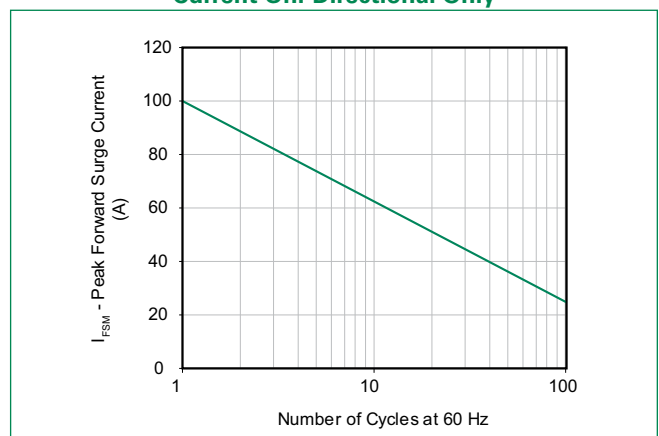
**Figure 4 - Pulse Waveform**



**Figure 5 - Typical Junction Capacitance**



**Figure 6 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only**



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Figure 7 - Typical Transient Thermal Impedance

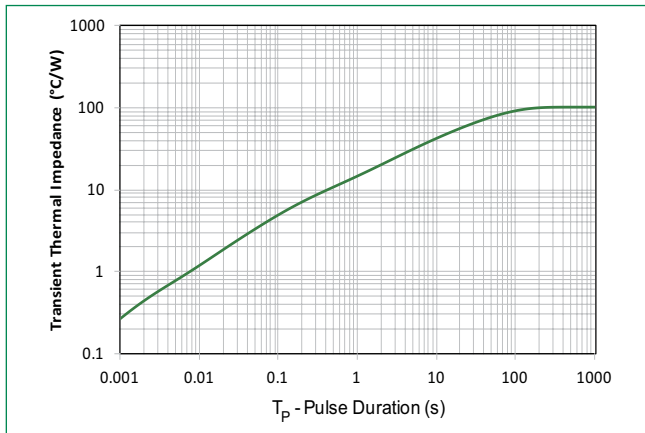
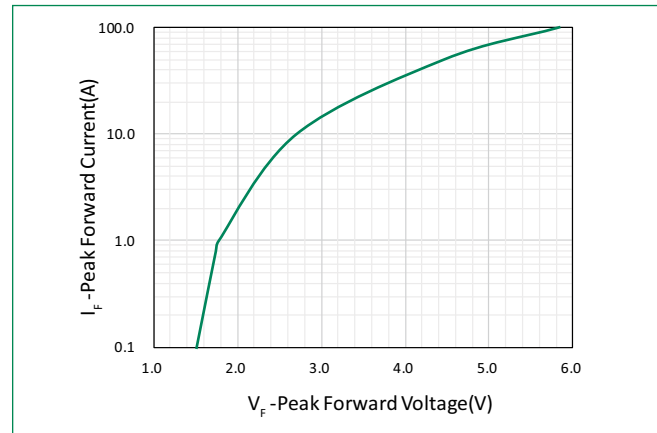
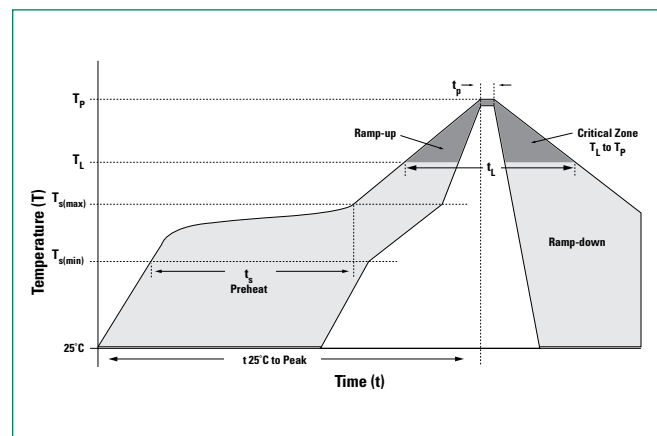


Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)



### 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) ( $t_c$ )	60 – 180 secs
<b>Average ramp up rate (Liquidus Temp (<math>T_A</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) ( $t_L$ )	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>		20 – 40 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>	0.003 ounce, 0.093 grams
<b>Case</b>	JEDEC DO214AA. Molded plastic body over glass passivated junction
<b>Polarity</b>	Color band denotes cathode except Bidirectional.
<b>Terminal</b>	Matte Tin-plated leads, Solderable per JESD22-B102

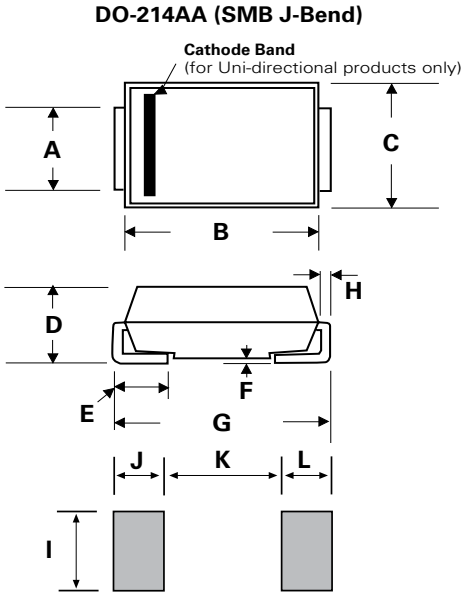
### Environmental Specifications

<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

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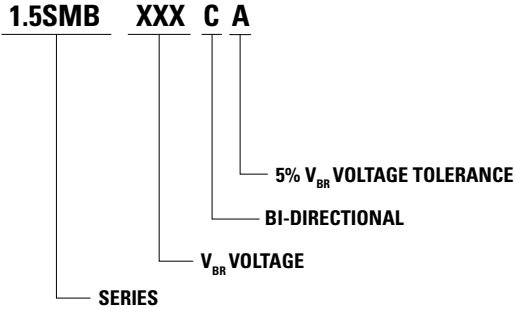
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### Dimensions

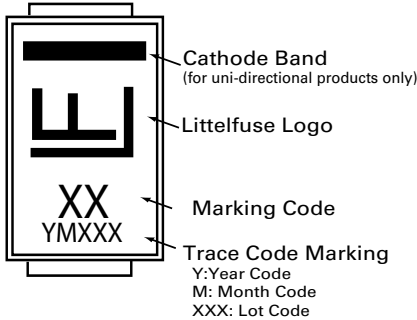


Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.077	0.086	1.950	2.200
B	0.160	0.180	4.060	4.570
C	0.130	0.155	3.300	3.940
D	0.084	0.096	2.130	2.440
E	0.030	0.060	0.760	1.520
F	-	0.008	-	0.203
G	0.205	0.220	5.210	5.590
H	0.006	0.012	0.152	0.305
I	0.089	-	2.260	-
J	0.085	-	2.160	-
K	-	0.107	-	2.740
L	0.085	-	2.160	-

### Part Numbering System



### Part Marking System



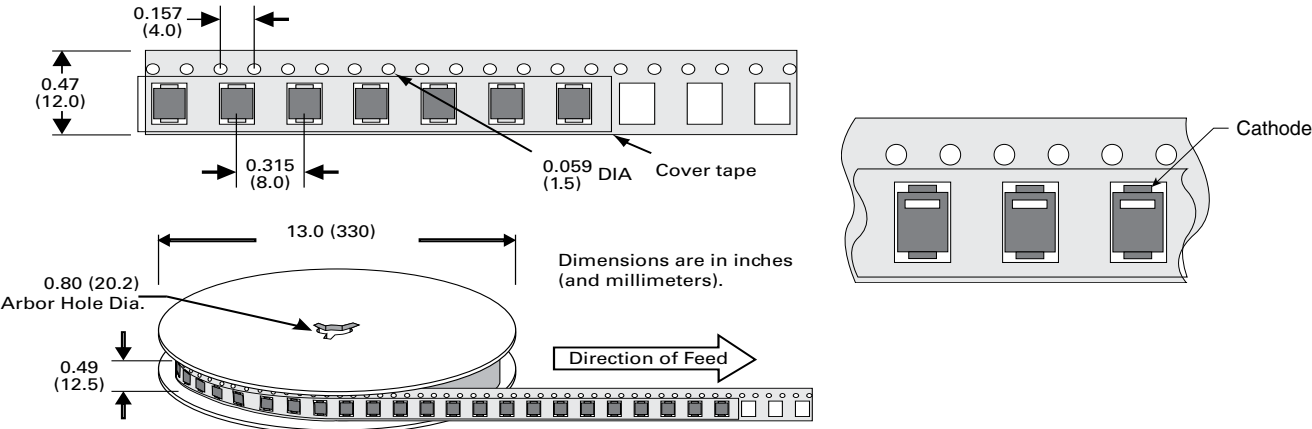
### Packaging

Part number	Component Package	Quantity	Packaging Option	Packaging Specification
1.5SMBxxxXX	DO-214AA	3000	Tape & Reel - 12mm tape/13" reel	EIA STD RS-481

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### Tape and Reel Specification



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