

## Surface Mount Transient Voltage Suppressors (TVS)

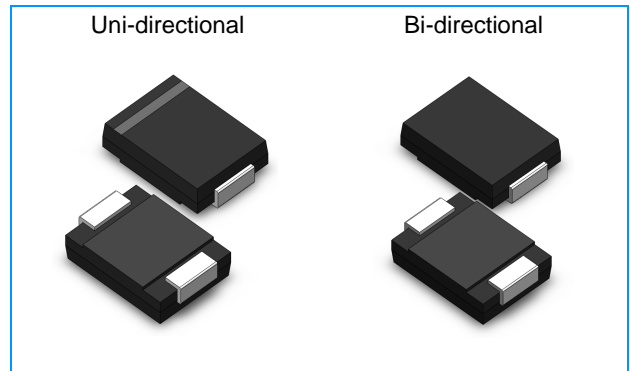
**1.5SMC Series 6.8 To 600 V 1500W**

### Description

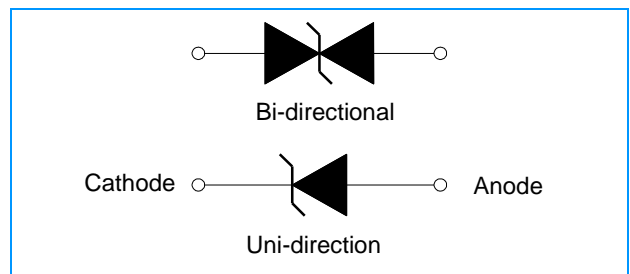
The 1.5SMC series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

### Features

- u For surface mounted applications in order to optimize board space
- u Low leakage
- u Uni and Bidirectional unit
- u Glass passivated junction
- u Low inductance
- u Excellent clamping capability
- u 1500W Peak power capability at 10 × 1000μs waveform Repetition rate (duty cycle):0.01%
- u Fast response time: typically less than 1.0ps from 0 Volts to  $V_{BR}$  min
- u Typical  $I_R$  less than 5μA above 12V.
- u High Temperature soldering: 260°C/40 seconds at terminals
- u Typical maximum temperature coefficient  $\Delta V_{BR} = 0.1\% \times V_{BR}@25^\circ\text{C} \times \Delta T$
- u Plastic package has Underwriters Laboratory Flammability 94V-0
- u Matte tin lead-free Plated
- u Halogen free and RoHS compliant
- u Typical failure mode is short from over-specified voltage or current
- u Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- u IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- u ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- u EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)



### Functional Diagram



### Applications

TVS devices are ideal for the protection of I/O interfaces,  $V_{CC}$  bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

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

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation with a 10/1000μs waveform (Fig.1)(Note 1), (Note 2)	$P_{PPM}$	1500	Watts
Peak Pulse Current with a 10/1000μs waveform.(Note1, Fig.3)	$I_{PP}$	See Next Table	Amps
Power Dissipation on Infinite Heat Sink at $T_L=75^\circ\text{C}$	$P_{M(AV)}$	6.5	Watt
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	$I_{FSM}$	200	Amps
Maximum Instantaneous Forward Voltage at 25A for Unidirectional Only (Note 4)	$V_F$	3.5/5.0	Voltage
Operating junction and Storage Temperature Range.	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

### Notes:

1. Non-repetitive current pulse, per Fig. 3 and derated above  $T_A = 25^\circ\text{C}$  per Fig. 2.
2. Mounted on 5.0mm x 5.0mm (0.03mm thick) Copper Pads to each terminal.
3. 8.3ms single half sine-wave, or equivalent square wave, Duty cycle = 4 pulses per minutes maximum.
4.  $V_F < 3.5\text{V}$  for  $V_{BR} < 200\text{V}$  and  $V_F < 6.5\text{V}$  for  $V_{BR} > 201\text{V}$ .

## Surface Mount Transient Voltage Suppressors (TVS)

**1.5SMC Series 6.8 To 600 V 1500W**
**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

Part Number		Marking		Reverse Stand-Off Voltage V <sub>RWM</sub> (V)	Breakdown Voltage V <sub>BR</sub> (V) @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>RWM</sub> (μA)
Uni	Bi	Uni	Bi		MIN	MAX				
1.5SMC6.8A	1.5SMC6.8CA	6V8A	6V8C	5.8	6.46	7.14	10	10.5	142.86	1000
1.5SMC7.5A	1.5SMC7.5CA	7V5A	7V5C	6.4	7.13	7.88	10	11.3	132.74	500
1.5SMC8.2A	1.5SMC8.2CA	8V2A	8V2C	7.0	7.79	8.61	10	12.1	123.97	200
1.5SMC9.1A	1.5SMC9.1CA	9V1A	9V1C	7.8	8.65	9.56	1	13.4	111.94	50
1.5SMC10A	1.5SMC10CA	10A	10C	8.6	9.50	10.50	1	14.5	103.45	10
1.5SMC11A	1.5SMC11CA	11A	11C	9.4	10.45	11.55	1	15.6	96.15	5
1.5SMC12A	1.5SMC12CA	12A	12C	10.2	11.40	12.60	1	16.7	89.82	5
1.5SMC13A	1.5SMC13CA	13A	13C	11.1	12.35	13.65	1	18.2	82.42	5
1.5SMC15A	1.5SMC15CA	15A	15C	12.8	14.25	15.75	1	21.2	70.75	5
1.5SMC16A	1.5SMC16CA	16A	16C	13.6	15.20	16.80	1	22.5	66.67	5
1.5SMC18A	1.5SMC18CA	18A	18C	15.3	17.10	18.90	1	25.2	59.52	5
1.5SMC20A	1.5SMC20CA	20A	20C	17.1	19.00	21.00	1	27.7	54.15	5
1.5SMC22A	1.5SMC22CA	22A	22C	18.8	20.90	23.10	1	30.6	49.02	5
1.5SMC24A	1.5SMC24CA	24A	24C	20.5	22.80	25.20	1	33.2	45.18	5
1.5SMC27A	1.5SMC27CA	27A	27C	23.1	25.65	28.35	1	37.5	40.00	5
1.5SMC30A	1.5SMC30CA	30A	30C	25.6	28.50	31.50	1	41.4	36.23	5
1.5SMC33A	1.5SMC33CA	33A	33C	28.2	31.35	34.65	1	45.7	32.82	5
1.5SMC36A	1.5SMC36CA	36A	36C	30.8	34.20	37.80	1	49.9	30.06	5
1.5SMC39A	1.5SMC39CA	39A	39C	33.3	37.05	40.95	1	53.9	27.83	5
1.5SMC43A	1.5SMC43CA	43A	43C	36.8	40.85	45.15	1	59.3	25.30	5
1.5SMC47A	1.5SMC47CA	47A	47C	40.2	44.65	49.35	1	64.8	23.15	5
1.5SMC51A	1.5SMC51CA	51A	51C	43.6	48.45	53.55	1	70.1	21.40	5
1.5SMC56A	1.5SMC56CA	56A	56C	47.8	53.20	58.80	1	77.0	19.48	5
1.5SMC62A	1.5SMC62CA	62A	62C	53.0	58.90	65.10	1	85.0	17.65	5
1.5SMC68A	1.5SMC68CA	68A	68C	58.1	64.60	71.40	1	92.0	16.30	5
1.5SMC75A	1.5SMC75CA	75A	75C	64.1	71.25	78.75	1	103.0	14.56	5
1.5SMC82A	1.5SMC82CA	82A	82C	70.1	77.90	86.10	1	113.0	13.27	5
1.5SMC91A	1.5SMC91CA	91A	91C	77.8	86.45	95.55	1	125.0	12.00	5
1.5SMC100A	1.5SMC100CA	100A	100C	85.5	95.00	105.00	1	137.0	10.95	5
1.5SMC110A	1.5SMC110CA	110A	110C	94.0	104.50	115.50	1	152.0	9.87	5
1.5SMC120A	1.5SMC120CA	120A	120C	102.0	114.00	126.00	1	165.0	9.09	5
1.5SMC130A	1.5SMC130CA	130A	130C	111.0	123.50	136.50	1	179.0	8.38	5
1.5SMC150A	1.5SMC150CA	150A	150C	128.0	142.50	157.50	1	207.0	7.25	5
1.5SMC160A	1.5SMC160CA	160A	160C	136.0	152.00	168.00	1	219.0	6.85	5
1.5SMC170A	1.5SMC170CA	170A	170C	145.0	161.50	178.50	1	234.0	6.41	5
1.5SMC180A	1.5SMC180CA	180A	180C	154.0	171.00	189.00	1	246.0	6.10	5
1.5SMC200A	1.5SMC200CA	200A	200C	171.0	190.00	210.00	1	274.0	5.47	5
1.5SMC220A	1.5SMC220CA	220A	220C	185.0	209.00	231.00	1	328.0	4.57	5
1.5SMC250A	1.5SMC250CA	250A	250C	214.0	237.50	262.50	1	344.0	4.36	5
1.5SMC300A	1.5SMC300CA	300A	300C	256.0	285.00	315.00	1	414.0	3.62	5
1.5SMC350A	1.5SMC350CA	350A	350C	299.3	332.50	367.50	1	482.0	3.11	5
1.5SMC380A	1.5SMC380CA	380A	380C	324.9	361.00	399.00	1	524.4	2.86	5
1.5SMC400A	1.5SMC400CA	400A	400C	342.0	380.00	420.00	1	552.0	2.72	5
1.5SMC440A	1.5SMC440CA	440A	440C	376.2	418.00	462.00	1	607.2	2.47	5
1.5SMC500A	1.5SMC500CA	500A	500C	427.5	475.00	525.00	1	690.0	2.17	5
1.5SMC520A	1.5SMC520CA	520A	520C	444.6	494.00	546.00	1	717.6	2.09	5
1.5SMC550A	1.5SMC550CA	550A	550C	470.3	522.50	577.50	1	759.0	1.98	5
1.5SMC600A	1.5SMC600CA	600A	600C	513.0	570.00	630.00	1	828.0	1.81	5

**Note:**

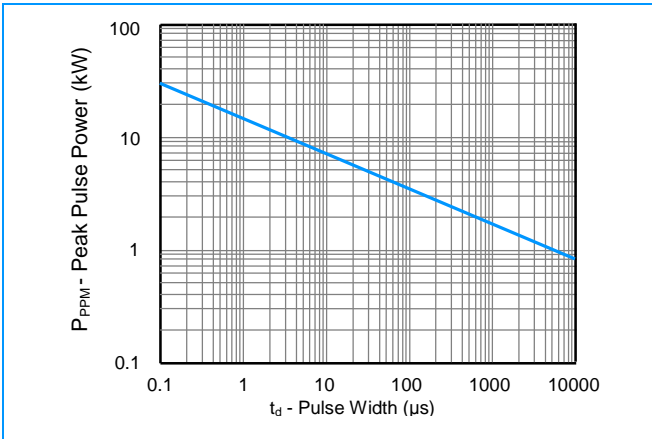
1. Suffix 'A' denotes 5% tolerance device. Without 'A' denotes 10% tolerance device
2. Add suffix 'C' or 'CA' after part number to specify Bi-directional devices
3. For Bi-Directional devices having V<sub>R</sub> of 10 volts and under, the I<sub>R</sub> limit is double

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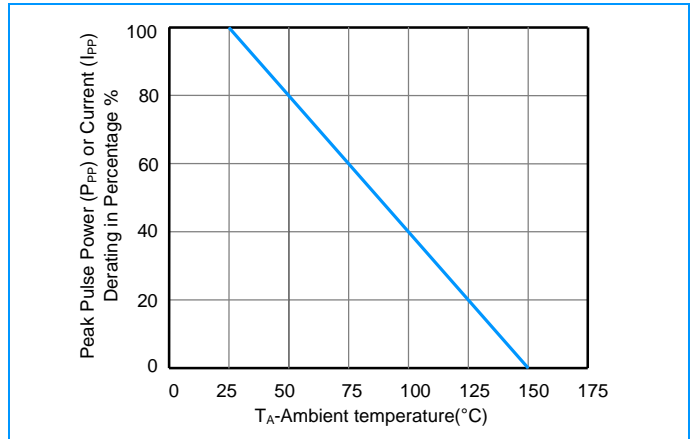
1.5SMC Series 6.8 To 600 V 1500W

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

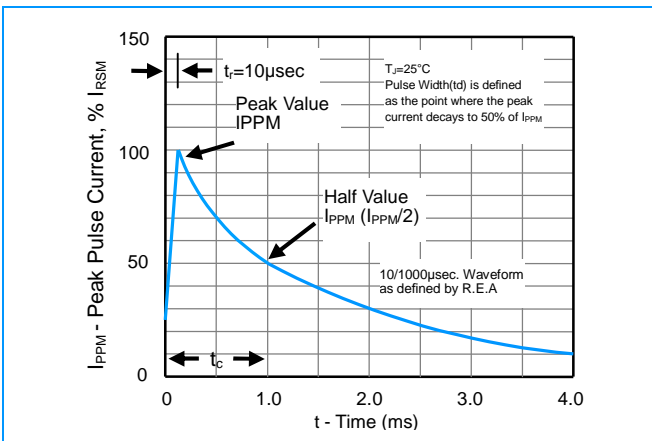
**Figure 1 - Peak Pulse Power Rating Curve**



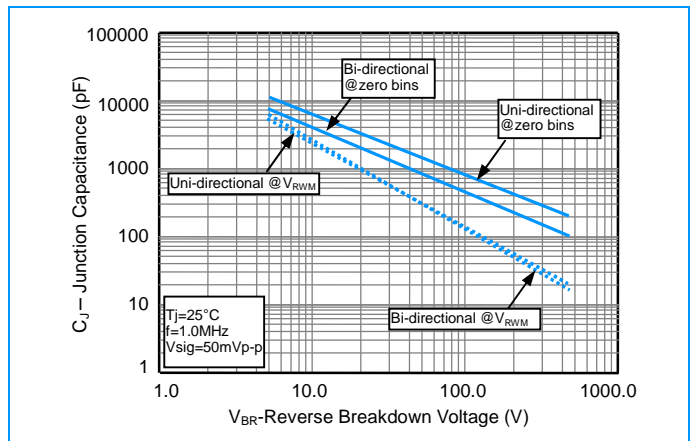
**Figure 2 - Pulse Derating Curve**



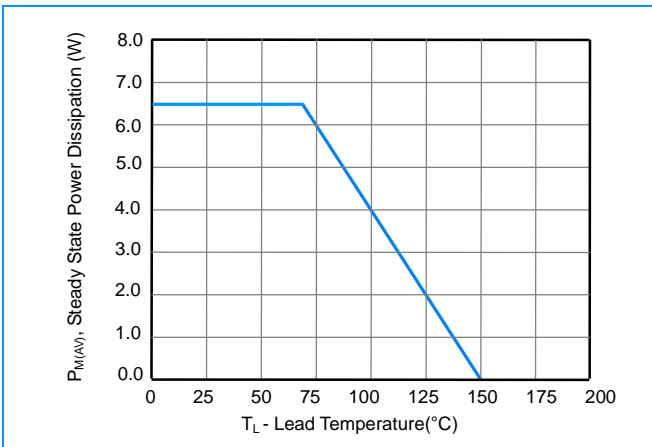
**Figure 3 - Pulse Waveform**



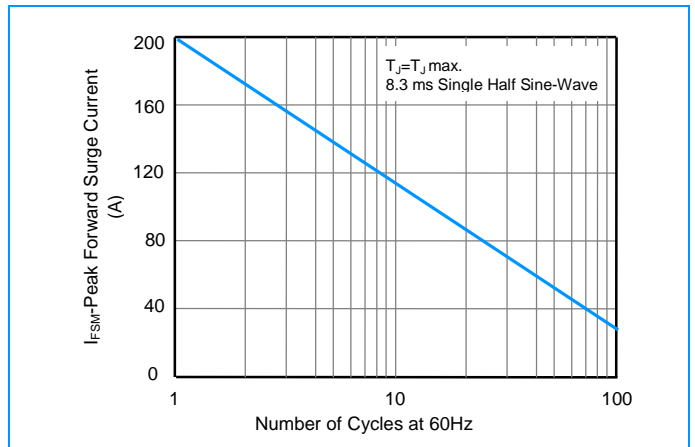
**Figure 4 - Typical Junction Capacitance**



**Figure 5 - Steady State Power Derating Curve**



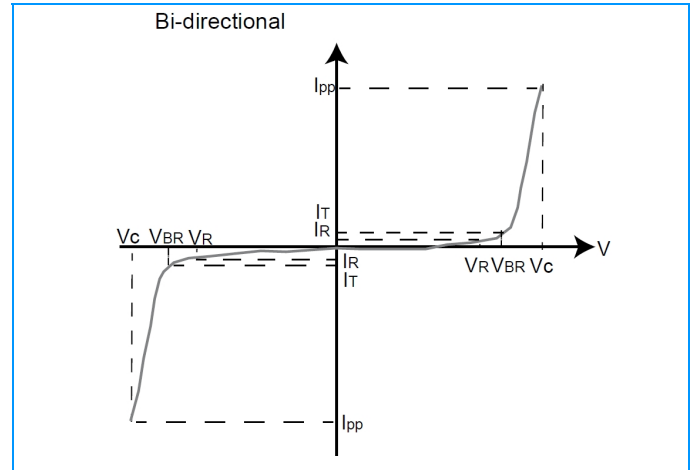
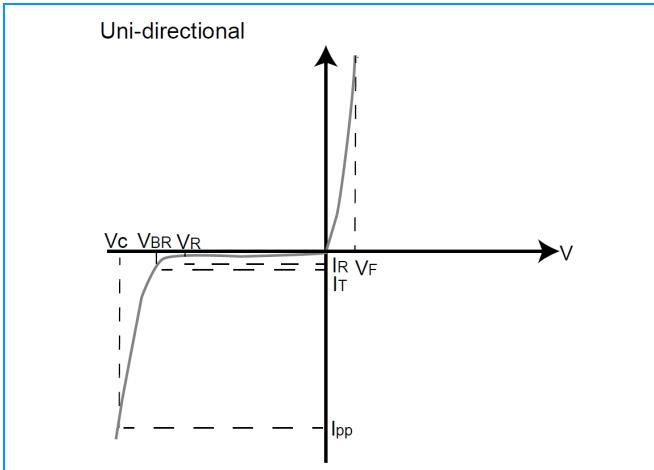
**Figure 6 - Maximum Non-Repetitive Surge Current**



## Surface Mount Transient Voltage Suppressors (TVS)

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### I-V Curve Characteristics



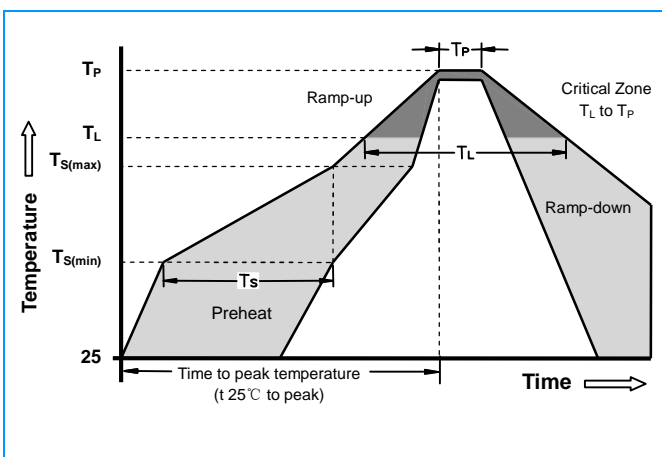
### Physical Specifications

<b>Weight</b>	0.007 ounce, 0.21 gram
<b>Case</b>	JEDEC DO-214AB Molded Plastic over glass passivated junction
<b>Polarity</b>	Color band denotes cathode except Bipolar
<b>Terminal</b>	Matte Tin-plated leads, Solderable per JESD22-B102D

### Environmental Specifications

<b>Temperature Cycle</b>	JESD22-A104
<b>Pressure Cooker</b>	JESD22-A102
<b>High Temp. Storage</b>	JESD22-A103
<b>HTRB</b>	JESD22-A108
<b>Thermal Shock</b>	JESD22-A106

### Soldering Parameters

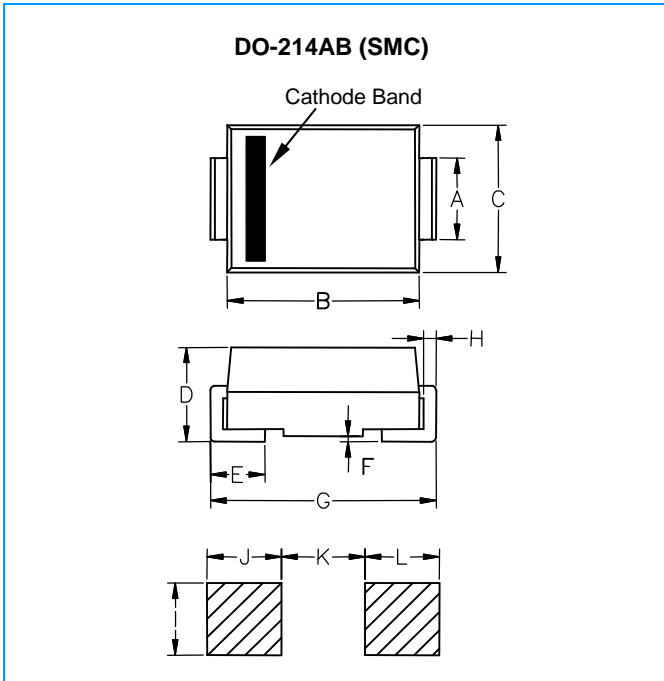


Reflow Condition		Lead-free assembly
Pre Heat	- Temperature Min ( $T_{S(min)}$ )	150°C
	- Temperature Max ( $T_{S(max)}$ )	200°C
	- Time (min to max) ( $t_s$ )	60 - 180 Seconds
Average ramp up rate (Liquidus Temp $T_L$ ) to peak		3°C/second max
$T_{S(max)}$ to $T_L$ - Ramp-up Rate		3°C/second max
Reflow	- Temperature ( $T_L$ ) (Liquidus)	217°C
	- Time (min to max) ( $t_s$ )	60 - 150 Seconds
Peak Temperature ( $T_P$ )		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		280°C

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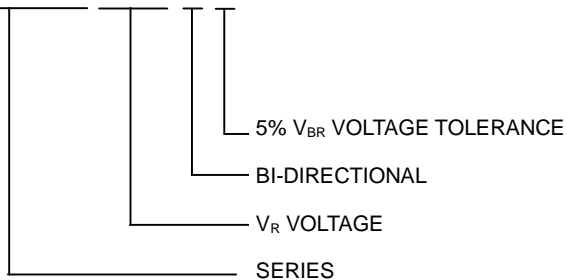
### Dimensions



Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.114	0.126	2.86	3.160
B	0.260	0.280	6.520	7.020
C	0.220	0.245	5.520	6.150
D	0.079	0.103	1.980	2.590
E	0.030	0.060	0.750	1.510
F	-	0.008	-	0.203
G	0.305	0.320	7.640	8.020
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	-

### Part Numbering

**1.5 S M C x x x C A**



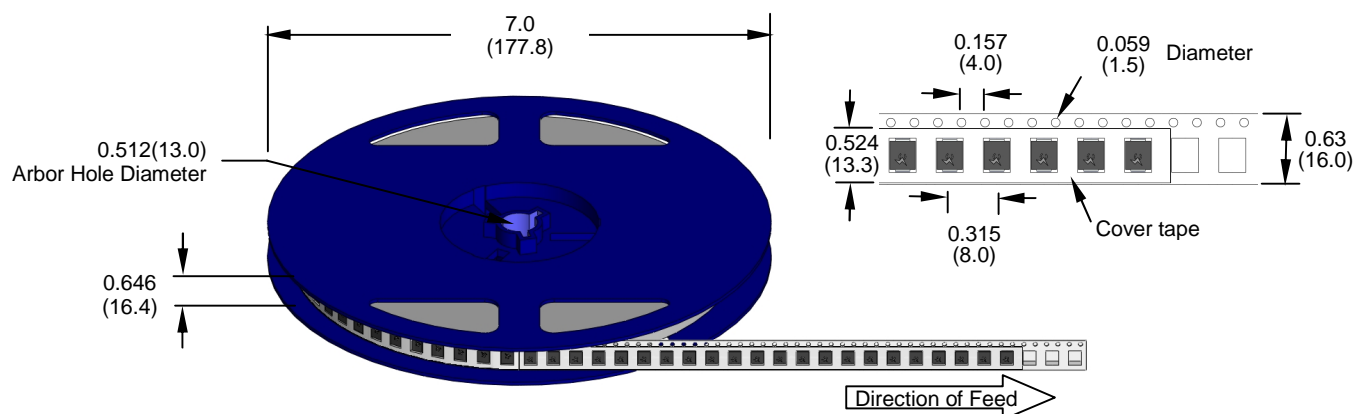
## Surface Mount Transient Voltage Suppressors (TVS)

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### Packaging

Part Number	Component Package	Quantity	Packaging Option	Packaging Specification
1.5SMCXXXXX	DO-214AB	500	Tape & Reel -16mm/7"tape	EIA STD RS-481

### Tape and Reel Specifications



Dimensions are in inches  
(and millimeters)