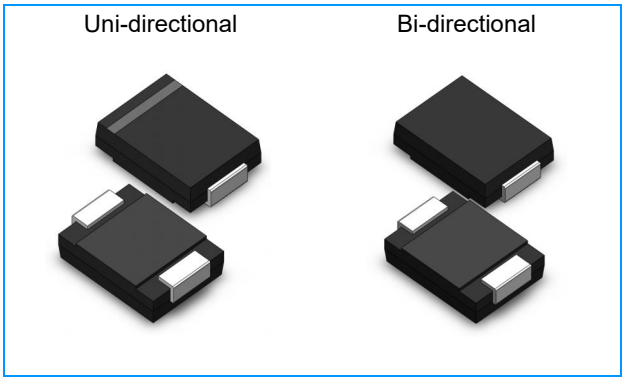
Surface Mount Transient Voltage Suppressors (TVS)

SMCJ Series 5.0 To 440 V 1500W

Description

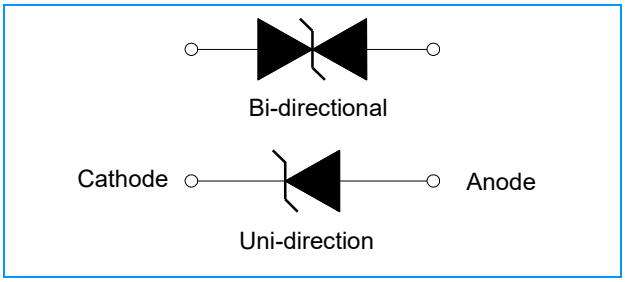
The SMCJ series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.



Features

- For surface mounted applications in order to optimize board space
- Low leakage
- Uni and Bidirectional unit
- Glass passivated junction
- Low inductance
- Excellent clamping capability
- 1500W Peak power capability at 10 × 1000μs waveform Repetition rate (duty cycle):0.01%
- Fast response time: typically less than 1.0ps from 0 Volts to V_{BR} min
- Typical I_R less than 5μA above 12V.
- High Temperature soldering: 260°C/40 seconds at terminals
- Typical maximum temperature coefficient ΔV_{BR} = 0.1% × V_{BR}@25°C× ΔT
- Plastic package has Underwriters Laboratory Flammability 94V-0
- Matte tin lead–free Plated
- Halogen free and RoHS compliant
- 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
- IEC-61000-4-2 ESD 15kV(Air), 8kV (Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- 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℃ 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	W
Peak Pulse Current with a 10/1000μs waveform.(Note1,Fig.3)	I_{PP}	See Next Table	A
Power Dissipation on Infinite Heat Sink at T_L=75°C	$P_{M(AV)}$	6.5	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	I_{FSM}	200	A
Maximum Instantaneous Forward Voltage at 25A for Unidirectional Only (Note 4)	V_F	3.5/5.0	V
Junction and Storage Temperature Range.	T_J , T_{STG}	-55 to +150	°C
Operating Temperature Range.	T_{OP}	-40 to +125	°C

Notes:

1. Non-repetitive current pulse, per Fig. 3 and derated above T_A = 25°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 < 3.5V for V_{BR} < 200V and V_F< 6.5V for V_{BR} > 201V.

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Electrical Characteristics (T_A=25℃ unless otherwise noted)

Part Number		Marking		Reverse Stand-Off Voltage V_{RWM} (V)	Breakdown Voltage V_{BR} (V) @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_{RWM} (μA)
Uni	Bi	Uni	Bi		MIN	MAX				
SMCJ5.0	SMCJ5.0C	GDD	BDD	5.0	6.40	7.30	10	9.6	156.25	1000
SMCJ5.0A	SMCJ5.0CA	GDE	BDE	5.0	6.40	7.00	10	9.2	163.04	1000
SMCJ6.0	SMCJ6.0C	GDF	BDF	6.0	6.67	8.15	10	11.4	131.58	1000
SMCJ6.0A	SMCJ6.0CA	GDG	BDG	6.0	6.67	7.37	10	10.3	145.63	1000
SMCJ6.5	SMCJ6.5C	GDH	BDH	6.5	7.22	8.82	10	12.3	121.95	500
SMCJ6.5A	SMCJ6.5CA	GDK	BDK	6.5	7.22	7.98	10	11.2	133.93	500
SMCJ7.0	SMCJ7.0C	GDL	BDL	7.0	7.78	9.51	10	13.3	112.78	200
SMCJ7.0A	SMCJ7.0CA	GDM	BDM	7.0	7.78	8.60	10	12.0	125.00	200
SMCJ7.5	SMCJ7.5C	GDN	BDN	7.5	8.33	10.20	1	14.3	104.90	100
SMCJ7.5A	SMCJ7.5CA	GDP	BDP	7.5	8.33	9.21	1	12.9	116.28	100
SMCJ8.0	SMCJ8.0C	GDQ	BDQ	8.0	8.89	10.90	1	15.0	100.00	50
SMCJ8.0A	SMCJ8.0CA	GDR	BDR	8.0	8.89	9.83	1	13.6	110.29	50
SMCJ8.5	SMCJ8.5C	GDS	BDS	8.5	9.44	11.50	1	15.9	94.34	20
SMCJ8.5A	SMCJ8.5CA	GDT	BDT	8.5	9.44	10.40	1	14.4	104.17	20
SMCJ9.0	SMCJ9.0C	GDU	BDU	9.0	10.00	12.20	1	16.9	88.76	10
SMCJ9.0A	SMCJ9.0CA	GDV	BDV	9.0	10.00	11.10	1	15.4	97.40	10
SMCJ10	SMCJ10C	GDW	BDW	10.0	11.10	13.60	1	18.8	79.79	5
SMCJ10A	SMCJ10CA	GDX	BDX	10.0	11.10	12.30	1	17.0	88.24	5
SMCJ11	SMCJ11C	GDY	BDY	11.0	12.20	14.90	1	20.1	74.63	5
SMCJ11A	SMCJ11CA	GDZ	BDZ	11.0	12.20	13.50	1	18.2	82.42	5
SMCJ12	SMCJ12C	GED	BED	12.0	13.30	16.30	1	22.0	68.18	1
SMCJ12A	SMCJ12CA	GEE	BEE	12.0	13.30	14.70	1	19.9	75.38	1
SMCJ13	SMCJ13C	GEF	BEF	13.0	14.40	17.60	1	23.8	63.03	1
SMCJ13A	SMCJ13CA	GEG	BEG	13.0	14.40	15.90	1	21.5	69.77	1
SMCJ14	SMCJ14C	GEH	BEH	14.0	15.60	19.10	1	25.8	58.14	1
SMCJ14A	SMCJ14CA	GEK	BEK	14.0	15.60	17.20	1	23.2	64.66	1
SMCJ15	SMCJ15C	GEL	BEL	15.0	16.70	20.40	1	26.9	55.76	1
SMCJ15A	SMCJ15CA	GEM	BEM	15.0	16.70	18.50	1	24.4	61.48	1
SMCJ16	SMCJ16C	GEN	BEN	16.0	17.80	21.80	1	28.8	52.08	1
SMCJ16A	SMCJ16CA	GEP	BEP	16.0	17.80	19.70	1	26.0	57.69	1
SMCJ17	SMCJ17C	GEQ	BEQ	17.0	18.90	23.10	1	30.5	49.18	1
SMCJ17A	SMCJ17CA	GER	BER	17.0	18.90	20.90	1	27.6	54.35	1
SMCJ18	SMCJ18C	GES	BES	18.0	20.00	24.40	1	32.2	46.58	1
SMCJ18A	SMCJ18CA	GET	BET	18.0	20.00	22.10	1	29.2	51.37	1
SMCJ19	SMCJ19C	GEA	BEA	19.0	21.13	25.76	1	34.0	44.10	1
SMCJ19A	SMCJ19CA	GEB	BEB	19.0	21.10	23.30	1	30.8	48.73	1
SMCJ20	SMCJ20C	GEU	BEU	20.0	22.20	27.10	1	35.8	41.90	1
SMCJ20A	SMCJ20CA	GEV	BEV	20.0	22.20	24.50	1	32.4	46.30	1
SMCJ22	SMCJ22C	GEW	BEW	22.0	24.40	29.80	1	39.4	38.07	1
SMCJ22A	SMCJ22CA	GEX	BEX	22.0	24.40	26.90	1	35.5	42.25	1
SMCJ24	SMCJ24C	GEY	BEY	24.0	26.70	32.60	1	43.0	34.88	1
SMCJ24A	SMCJ24CA	GEZ	BEZ	24.0	26.70	29.50	1	38.9	38.56	1
SMCJ26	SMCJ26C	GFD	BFD	26.0	28.90	35.30	1	46.6	32.19	1
SMCJ26A	SMCJ26CA	GFE	BFE	26.0	28.90	31.90	1	42.1	35.63	1
SMCJ28	SMCJ28C	GFF	BFF	28.0	31.10	38.00	1	50.0	30.00	1
SMCJ28A	SMCJ28CA	GFG	BFG	28.0	31.10	34.40	1	45.4	33.04	1
SMCJ30	SMCJ30C	GFH	BFH	30.0	33.30	40.70	1	53.5	28.04	1
SMCJ30A	SMCJ30CA	GFK	BFK	30.0	33.30	36.80	1	48.4	30.99	1
SMCJ33	SMCJ33C	GFL	BFL	33.0	36.70	44.90	1	59.0	25.42	1
SMCJ33A	SMCJ33CA	GFM	BFM	33.0	36.70	40.60	1	53.3	28.14	1
SMCJ36	SMCJ36C	GFN	BFN	36.0	40.00	48.90	1	64.3	23.33	1
SMCJ36A	SMCJ36CA	GFP	BFP	36.0	40.00	44.20	1	58.1	25.82	1
SMCJ40	SMCJ40C	GFQ	BFQ	40.0	44.40	54.30	1	71.4	21.01	1
SMCJ40A	SMCJ40CA	GFR	BFR	40.0	44.40	49.10	1	64.5	23.26	1
SMCJ43	SMCJ43C	GFS	BFS	43.0	47.80	58.40	1	76.7	19.56	1
SMCJ43A	SMCJ43CA	GFT	BFT	43.0	47.80	52.80	1	69.4	21.61	1

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Electrical Characteristics (T_A=25℃ unless otherwise noted) (Continue)

Part Number		Marking		Reverse Stand-Off Voltage V_{RWM} (V)	Breakdown Voltage V_{BR} (V) @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_{RWM} (μA)
Uni	Bi	Uni	Bi		MIN	MAX				
SMCJ45	SMCJ45C	GFU	BFU	45.0	50.00	61.10	1	80.3	18.68	1
SMCJ45A	SMCJ45CA	GFV	BFV	45.0	50.00	55.30	1	72.7	20.63	1
SMCJ48	SMCJ48C	GFW	BFW	48.0	53.30	65.10	1	85.5	17.54	1
SMCJ48A	SMCJ48CA	GFX	BFX	48.0	53.30	58.90	1	77.4	19.38	1
SMCJ51	SMCJ51C	GFY	BFY	51.0	56.70	69.30	1	91.1	16.47	1
SMCJ51A	SMCJ51CA	GFZ	BFZ	51.0	56.70	62.70	1	82.4	18.20	1
SMCJ54	SMCJ54C	GGD	BGD	54.0	60.00	73.30	1	96.3	15.58	1
SMCJ54A	SMCJ54CA	GGE	BGE	54.0	60.00	66.30	1	87.1	17.22	1
SMCJ58	SMCJ58C	GGF	BGF	58.0	64.40	78.70	1	103.0	14.56	1
SMCJ58A	SMCJ58CA	GGG	BGG	58.0	64.40	71.20	1	93.6	16.03	1
SMCJ60	SMCJ60C	GGH	BGH	60.0	66.70	81.50	1	107.0	14.02	1
SMCJ60A	SMCJ60CA	GGK	BGK	60.0	66.70	73.70	1	96.8	15.50	1
SMCJ64	SMCJ64C	GGL	BGL	64.0	71.10	86.90	1	114.0	13.16	1
SMCJ64A	SMCJ64CA	GGM	BGM	64.0	71.10	78.60	1	103.0	14.56	1
SMCJ70	SMCJ70C	GGN	BGN	70.0	77.80	95.10	1	125.0	12.00	1
SMCJ70A	SMCJ70CA	GGP	BGP	70.0	77.80	86.00	1	113.0	13.27	1
SMCJ75	SMCJ75C	GGQ	BGQ	75.0	83.30	102.00	1	134.0	11.19	1
SMCJ75A	SMCJ75CA	GGR	BGR	75.0	83.30	92.10	1	121.0	12.40	1
SMCJ78	SMCJ78C	GGS	BGS	78.0	86.70	106.00	1	139.0	10.79	1
SMCJ78A	SMCJ78CA	GGT	BGT	78.0	86.70	95.80	1	126.0	11.90	1
SMCJ80	SMCJ80C	GGA	BGA	80.0	88.96	108.80	1	143.2	10.47	1
SMCJ80A	SMCJ80CA	GGB	BGB	80.0	88.80	97.60	1	129.6	11.57	1
SMCJ85	SMCJ85C	GGU	BGU	85.0	94.40	115.00	1	151.0	9.93	1
SMCJ85A	SMCJ85CA	GGV	BGV	85.0	94.40	104.00	1	137.0	10.95	1
SMCJ90	SMCJ90C	GGW	BGW	90.0	100.00	122.00	1	160.0	9.38	1
SMCJ90A	SMCJ90CA	GGX	BGX	90.0	100.00	111.00	1	146.0	10.27	1
SMCJ100	SMCJ100C	GGY	BGY	100.0	111.00	136.00	1	179.0	8.38	1
SMCJ100A	SMCJ100CA	GGZ	BGZ	100.0	111.00	123.00	1	162.0	9.26	1
SMCJ110	SMCJ110C	GHD	BHD	110.0	122.00	149.00	1	196.0	7.65	1
SMCJ110A	SMCJ110CA	GHE	BHE	110.0	122.00	135.00	1	177.0	8.47	1
SMCJ120	SMCJ120C	GHF	BHF	120.0	133.00	163.00	1	214.0	7.01	1
SMCJ120A	SMCJ120CA	GHG	BHG	120.0	133.00	147.00	1	193.0	7.77	1
SMCJ130	SMCJ130C	GHH	BHH	130.0	144.00	176.00	1	231.0	6.49	1
SMCJ130A	SMCJ130CA	GHK	BHK	130.0	144.00	159.00	1	209.0	7.18	1
SMCJ140	SMCJ140C	GHA	BHA	140.0	155.68	190.40	1	250.6	5.99	1
SMCJ140A	SMCJ140CA	GHB	BHB	140.0	155.00	171.00	1	226.8	6.61	1
SMCJ150	SMCJ150C	GHL	BHL	150.0	167.00	204.00	1	268.0	5.60	1
SMCJ150A	SMCJ150CA	GHM	BHM	150.0	167.00	185.00	1	243.0	6.17	1
SMCJ160	SMCJ160C	GHN	BHN	160.0	178.00	218.00	1	287.0	5.23	1
SMCJ160A	SMCJ160CA	GHP	BHP	160.0	178.00	197.00	1	259.0	5.79	1
SMCJ170	SMCJ170C	GHQ	BHQ	170.0	189.00	231.00	1	304.0	4.93	1
SMCJ170A	SMCJ170CA	GHR	BHR	170.0	189.00	209.00	1	275.0	5.45	1
SMCJ180	SMCJ180C	GHS	BHS	180.0	201.00	244.80	1	322.2	4.66	1
SMCJ180A	SMCJ180CA	GHT	BHT	180.0	201.00	220.00	1	291.6	5.14	1
SMCJ190	SMCJ190C	GHU	BHU	190.0	211.21	258.40	1	340.1	4.41	1
SMCJ190A	SMCJ190CA	GHV	BHV	190.0	211.00	232.00	1	307.8	4.87	1
SMCJ200A	SMCJ200CA	GHW	BHW	200.0	224.00	247.00	1	324.0	4.60	1
SMCJ220A	SMCJ220CA	GHX	BHX	220.0	246.00	272.00	1	356.0	4.20	1
SMCJ250A	SMCJ250CA	GHZ	BHZ	250.0	279.00	309.00	1	405.0	3.70	1
SMCJ300A	SMCJ300CA	GJE	BJE	300.0	335.00	371.00	1	486.0	3.10	1
SMCJ350A	SMCJ350CA	GJG	BJG	350.0	391.00	432.00	1	567.0	2.60	1
SMCJ400A	SMCJ400CA	GJK	BJK	400.0	447.00	494.00	1	648.0	2.30	1
SMCJ440A	SMCJ440CA	GJM	BJM	440.0	492.00	543.00	1	713.0	2.10	1

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_R of 10 volts and under, the I_R limit is double

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

Figure 1 - Peak Pulse Power Rating Curve

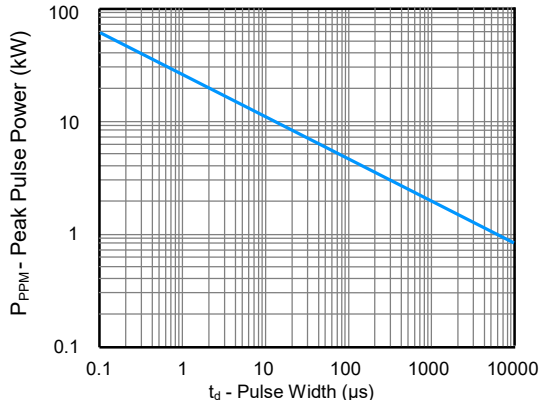


Figure 2 - Pulse Derating Curve

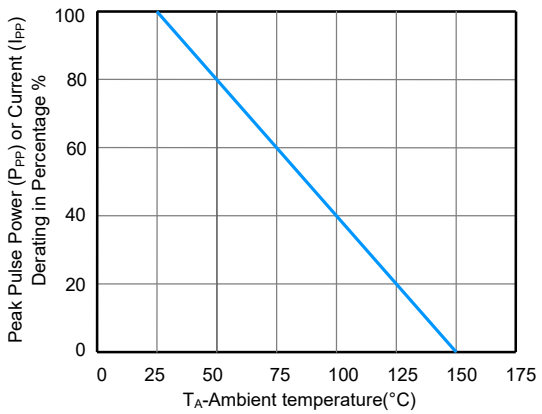


Figure 3 - Pulse Waveform

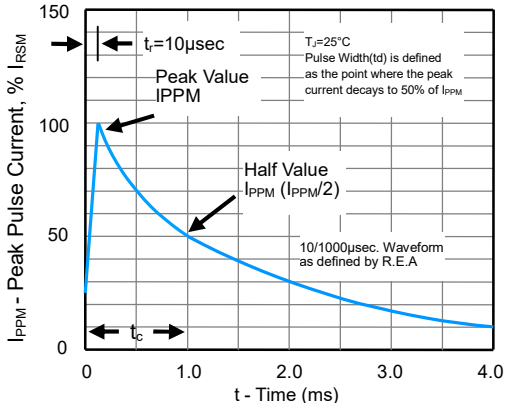


Figure 4 - Typical Junction Capacitance

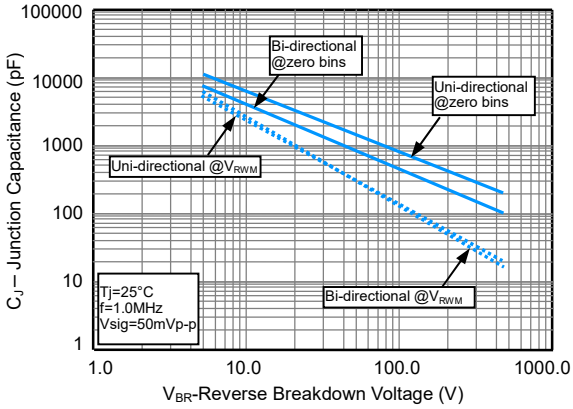


Figure 5 - Steady State Power Derating Curve

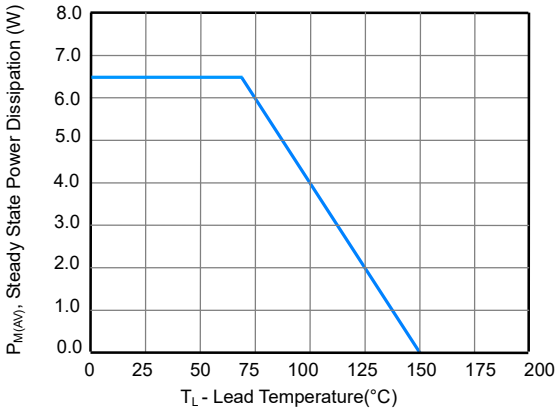
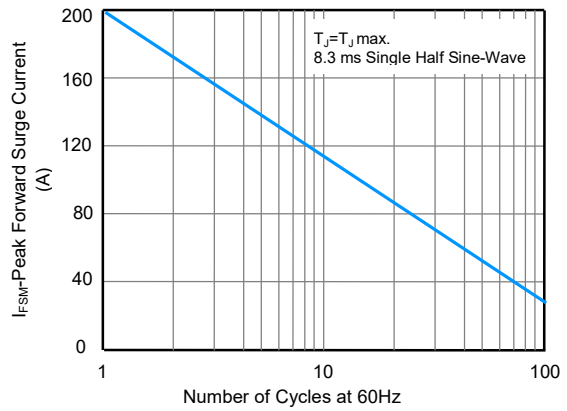


Figure 6 - Maximum Non-Repetitive Surge Current



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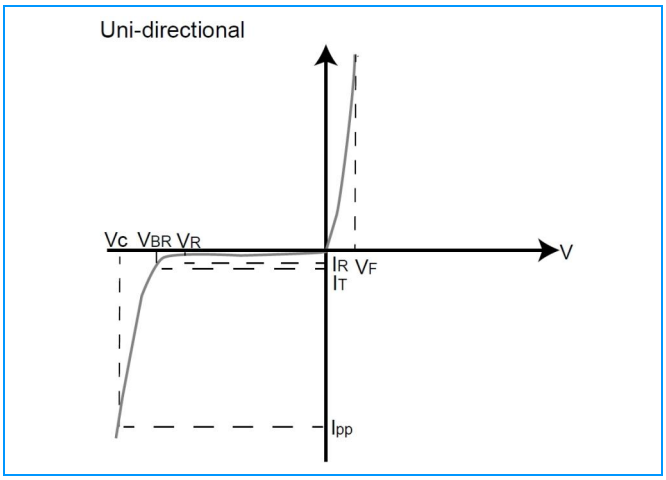
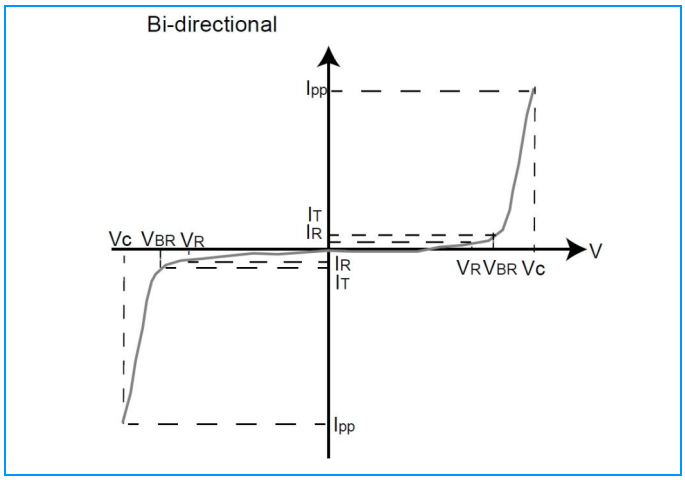
I-V Curve Characteristics





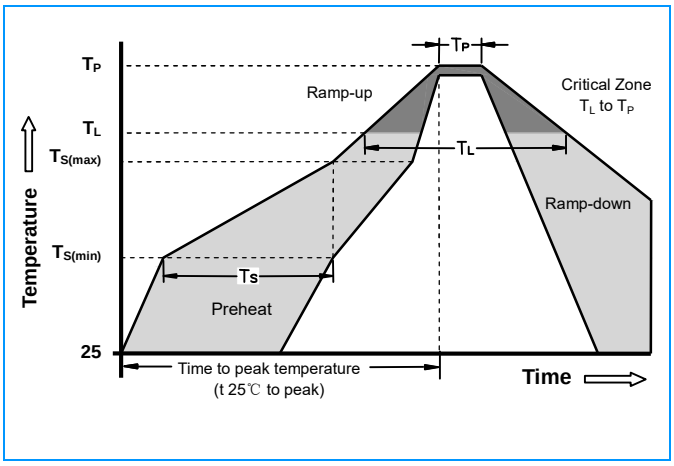
Physical Specifications

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

Environmental Specifications

Temperature Cycle	JESD22-A104
Pressure Cooker	JESD22-A102
High Temp. Storage	JESD22-A103
HTRB	JESD22-A108
Thermal Shock	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 TL - 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

Surface Mount Transient Voltage Suppressors (TVS)

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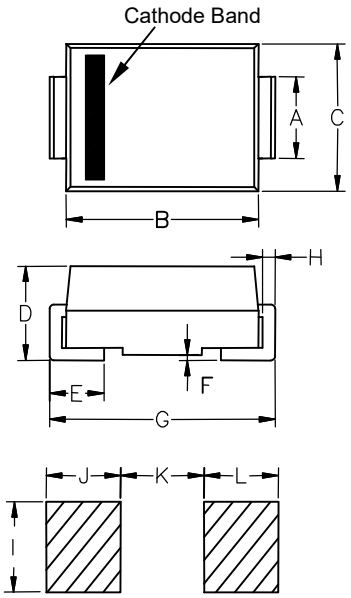
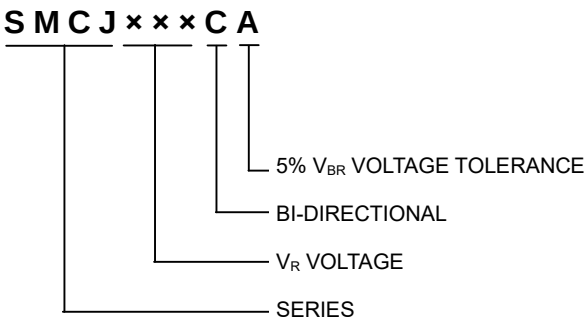
Dimensions

DO-214AB (SMC)



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



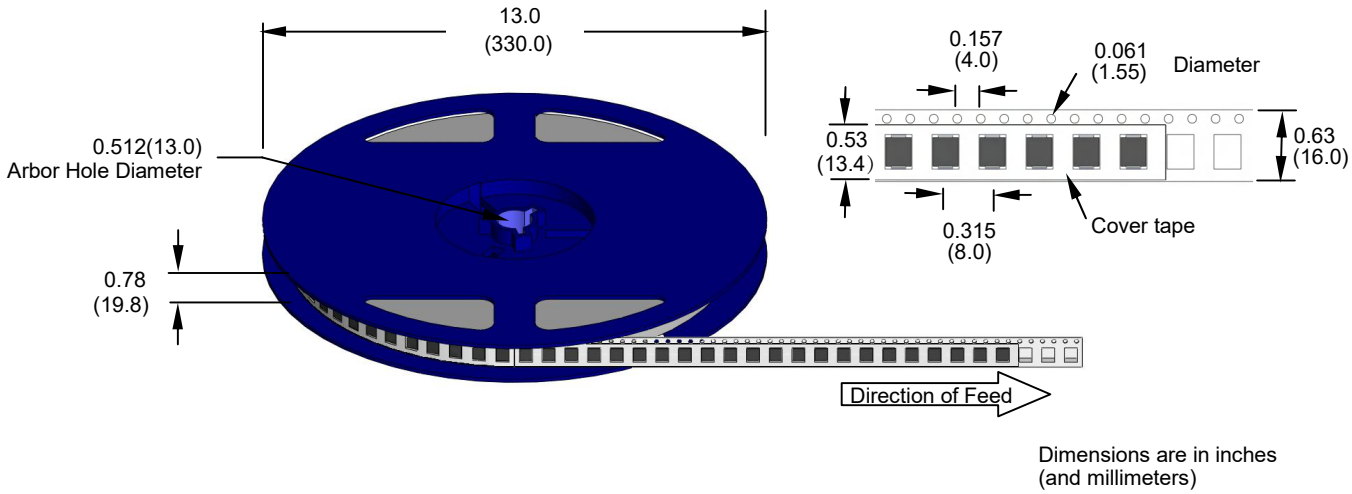
Surface Mount Transient Voltage Suppressors (TVS)

SMCJ Series 5.0 To 440 V 1500W

Ordering Information

Part Number	Component Package	Quantity	Packaging Option	Packaging Specification
SMCJXXXXX	DO-214AB	3,000	Tape & Reel -16mm/13″tape	EIA STD RS-481

Tape and Reel Specifications



Dimensions are in inches
(and millimeters)