

Surface Mount Transient Voltage Suppressors (TVS)

SMAJ Series 5.0 To 440 V 400W

Description

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

Features

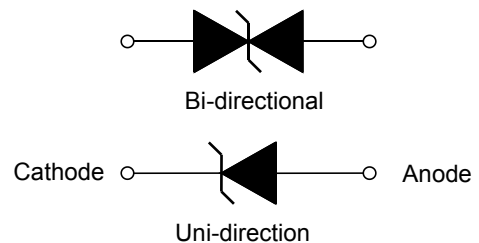
- ◆ For surface mounted applications in order to optimize board space
- ◆ Low leakage
- ◆ Uni and Bidirectional unit
- ◆ Glass passivated junction
- ◆ Low inductance
- ◆ Excellent clamping capability
- ◆ 400W Peak power capability at 10 × 1000μs waveform Repetition rate (duty cycle) 0.01%
- ◆ Fast response 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 $\Delta V_{BR} = 0.1\% \times V_{BR@25^\circ C} \times \Delta T$
- ◆ 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)

Uni-directional

Bi-directional



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

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation with a 10/1000μs waveform (Fig.1)(Note 1), (Note 2)	P_{PPM}	400	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 $T_L=75^\circ C$	$P_{M(AV)}$	1.0	Watt
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	I_{FSM}	40	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	$^\circ C$

Notes:

1. Non-repetitive current pulse, per Fig. 3 and derated above $T_A = 25^\circ C$ 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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SMAJ Series 5.0 To 440 V 400W

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

Part Number		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		MIN	MAX				
SMAJ3.3A	—	3.3	5.20	6.00	10	8.0	43.80	600
SMAJ5.0A	SMAJ5.0CA	5.0	6.40	7.00	10	9.2	43.48	800
SMAJ6.0A	SMAJ6.0CA	6.0	6.67	7.37	10	10.3	38.83	800
SMAJ6.5A	SMAJ6.5CA	6.5	7.22	7.98	10	11.2	35.71	500
SMAJ7.0A	SMAJ7.0CA	7.0	7.78	8.60	10	12.0	33.33	200
SMAJ7.5A	SMAJ7.5CA	7.5	8.33	9.21	1	12.9	31.01	100
SMAJ8.0A	SMAJ8.0CA	8.0	8.89	9.83	1	13.6	29.41	50
SMAJ8.5A	SMAJ8.5CA	8.5	9.44	10.40	1	14.4	27.78	10
SMAJ9.0A	SMAJ9.0CA	9.0	10.00	11.10	1	15.4	25.97	5
SMAJ10A	SMAJ10CA	10.0	11.10	12.30	1	17.0	23.53	5
SMAJ11A	SMAJ11CA	11.0	12.20	13.50	1	18.2	21.98	5
SMAJ12A	SMAJ12CA	12.0	13.30	14.70	1	19.9	20.10	5
SMAJ13A	SMAJ13CA	13.0	14.40	15.90	1	21.5	18.60	5
SMAJ14A	SMAJ14CA	14.0	15.60	17.20	1	23.2	17.24	5
SMAJ15A	SMAJ15CA	15.0	16.70	18.50	1	24.4	16.39	5
SMAJ16A	SMAJ16CA	16.0	17.80	19.70	1	26.0	15.38	5
SMAJ17A	SMAJ17CA	17.0	18.90	20.90	1	27.6	14.49	5
SMAJ18A	SMAJ18CA	18.0	20.00	22.10	1	29.2	13.70	5
SMAJ19A	SMAJ19CA	19.0	21.10	23.30	1	30.8	13.00	5
SMAJ20A	SMAJ20CA	20.0	22.20	24.50	1	32.4	12.35	5
SMAJ22A	SMAJ22CA	22.0	24.40	26.90	1	35.5	11.27	5
SMAJ24A	SMAJ24CA	24.0	26.70	29.50	1	38.9	10.28	5
SMAJ26A	SMAJ26CA	26.0	28.90	31.90	1	42.1	9.50	5
SMAJ28A	SMAJ28CA	28.0	31.10	34.40	1	45.4	8.81	5
SMAJ30A	SMAJ30CA	30.0	33.30	36.80	1	48.4	8.26	5
SMAJ33A	SMAJ33CA	33.0	36.70	40.60	1	53.3	7.50	5
SMAJ36A	SMAJ36CA	36.0	40.00	44.20	1	58.1	6.88	5
SMAJ40A	SMAJ40CA	40.0	44.40	49.10	1	64.5	6.20	5
SMAJ43A	SMAJ43CA	43.0	47.80	52.80	1	69.4	5.76	5

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

Part Number		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		MIN	MAX				
SMAJ45A	SMAJ45CA	45.0	50.00	55.30	1	72.7	5.50	5
SMAJ48A	SMAJ48CA	48.0	53.30	58.90	1	77.4	5.17	5
SMAJ51A	SMAJ51CA	51.0	56.70	62.70	1	82.4	4.85	5
SMAJ54A	SMAJ54CA	54.0	60.00	66.30	1	87.1	4.59	5
SMAJ58A	SMAJ58CA	58.0	64.40	71.20	1	93.6	4.27	5
SMAJ60A	SMAJ60CA	60.0	66.70	73.70	1	96.8	4.13	5
SMAJ64A	SMAJ64CA	64.0	71.10	78.60	1	103.0	3.88	5
SMAJ70A	SMAJ70CA	70.0	77.80	86.00	1	113.0	3.54	5
SMAJ75A	SMAJ75CA	75.0	83.30	92.10	1	121.0	3.31	5
SMAJ78A	SMAJ78CA	78.0	86.70	95.80	1	126.0	3.17	5
SMAJ80A	SMAJ80CA	80.0	88.80	97.60	1	129.6	3.09	5
SMAJ85A	SMAJ85CA	85.0	94.40	104.00	1	137.0	2.92	5
SMAJ90A	SMAJ90CA	90.0	100.00	111.00	1	146.0	2.74	5
SMAJ100A	SMAJ100CA	100.0	111.00	123.00	1	162.0	2.47	5
SMAJ110A	SMAJ110CA	110.0	122.00	135.00	1	177.0	2.26	5
SMAJ120A	SMAJ120CA	120.0	133.00	147.00	1	193.0	2.07	5
SMAJ130A	SMAJ130CA	130.0	144.00	159.00	1	209.0	1.91	5
SMAJ140A	SMAJ140CA	140.0	155.00	171.00	1	226.8	1.76	5
SMAJ150A	SMAJ150CA	150.0	167.00	185.00	1	243.0	1.65	5
SMAJ160A	SMAJ160CA	160.0	178.00	197.00	1	259.0	1.54	5
SMAJ170A	SMAJ170CA	170.0	189.00	209.00	1	275.0	1.45	5
SMAJ180A	SMAJ180CA	180.0	201.00	220.00	1	291.6	1.37	5
SMAJ190A	SMAJ190CA	190.0	211.00	232.00	1	307.8	1.30	5
SMAJ200A	SMAJ200CA	200.0	224.00	247.00	1	324.0	1.23	5
SMAJ220A	SMAJ220CA	220.0	246.00	272.00	1	356.0	1.12	5
SMAJ250A	SMAJ250CA	250.0	279.00	309.00	1	405.0	0.99	5
SMAJ300A	SMAJ300CA	300.0	335.00	371.00	1	486.0	0.82	5
SMAJ350A	SMAJ350CA	350.0	391.00	432.00	1	567.0	0.71	5
SMAJ400A	SMAJ400CA	400.0	447.00	494.00	1	648.0	0.62	5
SMAJ440A	SMAJ440CA	440.0	492.00	543.00	1	713.0	0.56	5

Note:

1. Suffix 'A' denotes 5% tolerance device.
2. Add suffix '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 ($T_A=25^\circ\text{C}$ unless otherwise noted)

Figure 1 - Peak Pulse Power Rating Curve

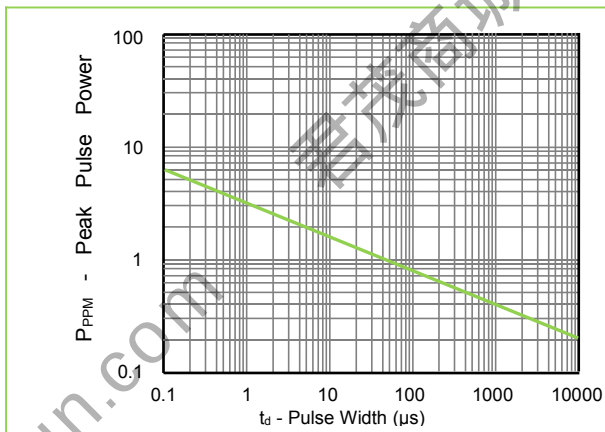


Figure 2 - Pulse Derating Curve

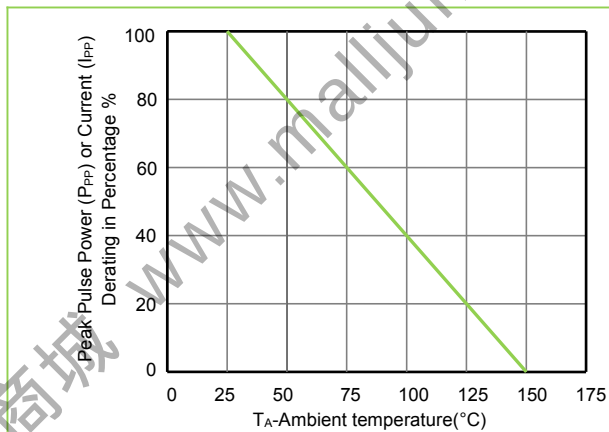


Figure 3 - Pulse Waveform

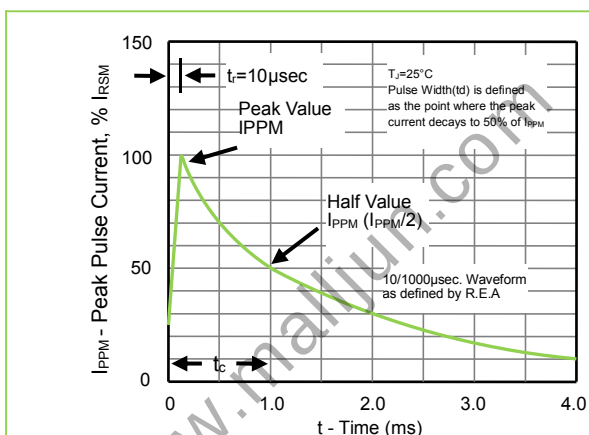


Figure 4 - Typical Junction Capacitance

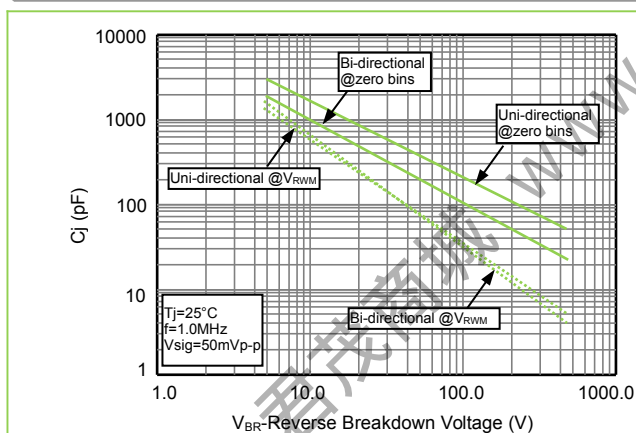


Figure 5 - Steady State Power Derating Curve

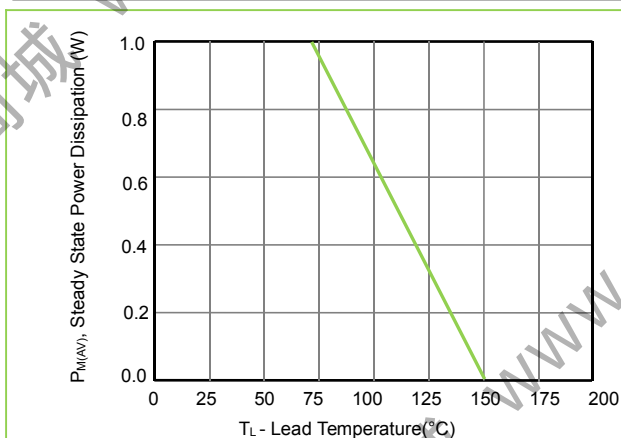
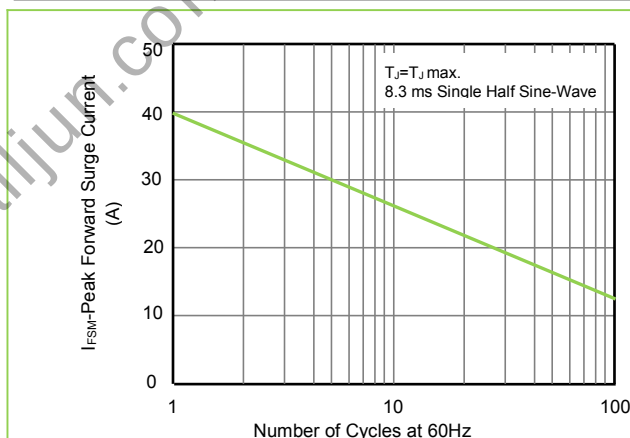


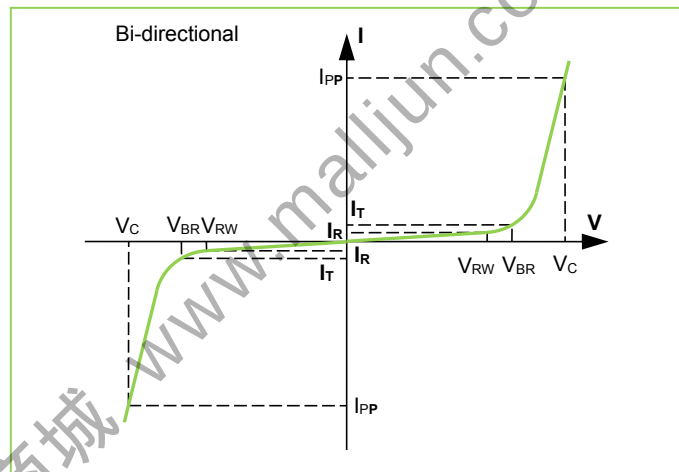
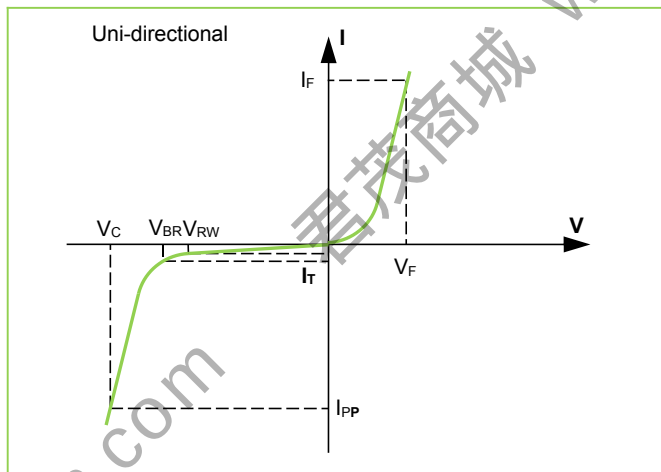
Figure 6 - Maximum Non-Repetitive Surge Current



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I-V Curve Characteristics



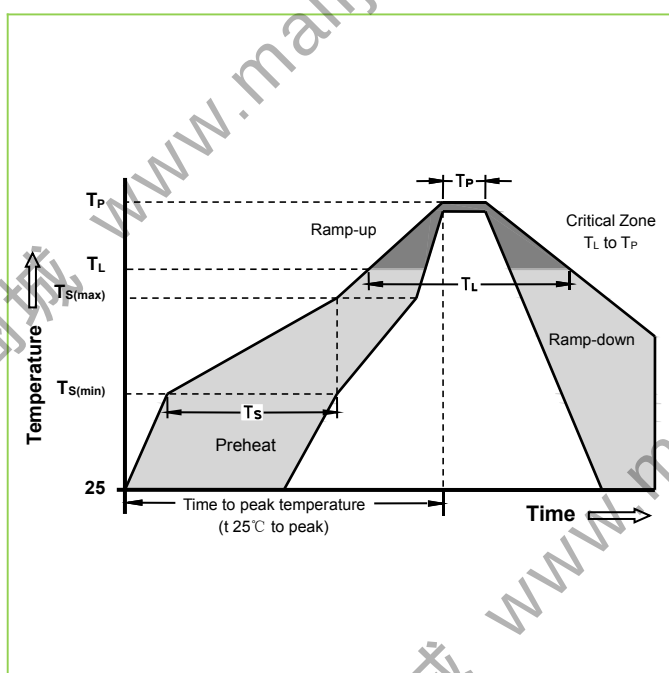
Physical Specifications

Weight	0.002 ounce, 0.061 gram
Case	JEDEC DO-214AC 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

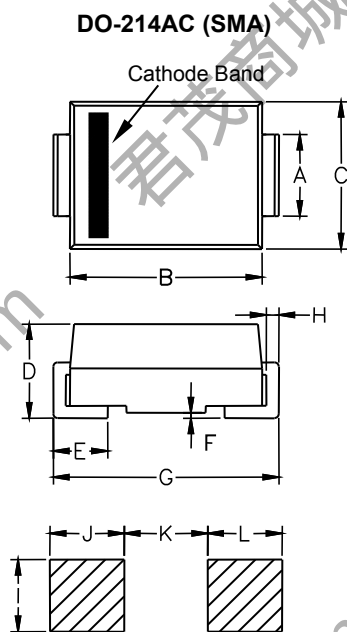


Reflow Condition		Lead-free assembly
Pre Heat	-Temperature Min ($T_{S(min)}$)	150°C
	-Temperature Max ($T_{S(max)}$)	200°C
	- Time (min to max) (T_S)	60 -180 Seconds
Average ramp up rate (Liquidus Temp T_L) to peak		3°C/second max
$T_{S(max)}$ to T_L - Ramp-up Rate		3°C/second max
Reflow	- Temperature (T_L) (Liquidus)	217°C
	- Time (min to max) (T_L)	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	0.053	0.065	1.35	1.65
B	0.167	0.183	4.25	4.65
C	0.098	0.114	2.50	2.90
D	0.078	0.095	1.98	2.41
E	0.030	0.060	0.76	1.52
F	0.002	0.008	0.051	0.203
G	0.194	0.208	4.93	5.28
H	0.006	0.012	0.15	0.31
I	0.067	-	1.70	-
J	0.082	-	2.10	-
K	-	0.090	-	2.30
L	0.082	-	2.10	-

Part Numbering

SMAJxxxCA

5% V_{BR} VOLTAGE TOLERANCE
BI-DIRECTIONAL
V_R VOLTAGE
SERIES

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Packaging

Part Number	Component Package	Quantity	Packaging Option	Reel Diameters (mm)
SMAJXXXXX	DO-214AC (SMA)	1000 pcs	Tape & Reel -12mm/7"tape	177.8
SMAJXXXXX	DO-214AC (SMA)	5000 pcs	Tape & Reel -12mm/13"tape	330.0

Tape and Reel Specifications

