

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

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation at $T_A=25^{\circ}\text{C}$ by 10x1000 $\mu\text{s}$ waveform (Fig.1)(Note 1), (Note 2)	$P_{\text{PPM}}$	400	W
Power Dissipation on infinite heat sink at $T_A=50^{\circ}\text{C}$	$P_{\text{M(AV)}}$	3.3	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	$I_{\text{FSM}}$	40	A
Maximum Instantaneous Forward Voltage at 25A for Unidirectional only (Note 4)	$V_F$	3.5V/6.5	V
Operating Junction and Storage Temperature Range	$T_J, T_{\text{STG}}$	-65 to 150	$^{\circ}\text{C}$
Typical Thermal Resistance Junction to Lead	$R_{\text{wJL}}$	30	$^{\circ}\text{C/W}$
Typical Thermal Resistance Junction to Ambient	$R_{\text{wJA}}$	120	$^{\circ}\text{C/W}$

### Notes:

1. Non-repetitive current pulse, per Fig.3 and derated above  $T_A=25^{\circ}\text{C}$  per Fig. 2.
2. Mounted on 5.0x5.0mm copper pad to each terminal.
3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only.
4.  $V_F < 3.5\text{V}$  for  $V_{\text{BR}} < 200\text{V}$  and  $V_F < 6.5\text{V}$  for  $V_{\text{BR}} \geq 201\text{V}$ .

## Description

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


## Features

- Halogen-Free
- RoHS compliant
- For surface mounted applications to optimize board space
- Low profile package
- Built-in strain relief
- Glass passivated junction
- Low inductance
- Excellent clamping capability
- 400W Peak Pulsepower capability at 10 x 1000 $\mu\text{s}$  waveform, repetition rate (duty cycle): 0.01%
- Fast response time: typically less than 1.0ps from 0 Volts to  $V_{\text{BR}}$  min
- Typical  $I_{\text{R}}$  less than 1 $\mu\text{A}$  above 12V
- High temperature soldering: 260 $^{\circ}\text{C}$ /40 seconds at terminals
- Typical maximum temperature coefficient  $\Delta V_{\text{BR}} = 0.1\% \times V_{\text{BR}} @ 25^{\circ}\text{C} \times \Delta T$
- Plastic package has Underwriters Laboratory Flammability 94V-O
- Matte Tin Lead-free Plated

## Applications

TVS devices 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.

Electrical Characteristics

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 $V_C$ @ $I_{PP}$ (V)	Maximum Peak Pulse Current $I_{PP}$ (A)	Maximum Reverse Leakage $I_R$ @ $V_R$ ( $\mu A$ )	Agency Approval 
		UNI	BI		MIN	MAX					
SMAJ5.0A	SMAJ5.0CA	AE	WE	5.0	6.40	0700	10	9.2	43.5	800	X
SMAJ6.0A	SMAJ6.0CA	AG	WG	6.0	6.67	0737	10	10.3	38.8	800	X
SMAJ6.5A	SMAJ6.5CA	AK	WK	6.5	7.22	798	10	11.2	35.7	500	X
SMAJ7.0A	SMAJ7.0CA	AM	WM	7.0	7.78	8.60	10	12.0	33.3	200	X
SMAJ7.5A	SMAJ7.5CA	AP	WP	7.5	8.33	9.21	1	12.9	31.0	100	X
SMAJ8.0A	SMAJ8.0CA	AR	WR	8.0	8.89	9.83	1	13.6	29.4	50	X
SMAJ8.5A	SMAJ8.5CA	AT	WT	8.5	9.44	10.40	1	14.4	27.8	20	X
SMAJ9.0A	SMAJ9.0CA	AV	WV	9.0	10.00	11.10	1	15.4	26.0	10	X
SMAJ10A	SMAJ10CA	AX	WX	10.0	11.10	12.30	1	17.0	23.5	5	X
SMAJ11A	SMAJ11CA	AZ	WZ	11.0	12.20	13.50	1	18.2	22.0	1	X
SMAJ12A	SMAJ12CA	BE	XE	12.0	13.30	14.70	1	19.9	20.1	1	X
SMAJ13A	SMAJ13CA	BG	XG	13.0	14.40	15.90	1	21.5	18.6	1	X
SMAJ14A	SMAJ14CA	BK	XK	14.0	15.60	17.20	1	23.2	17.2	1	X
SMAJ15A	SMAJ15CA	BM	XM	15.0	16.70	18.50	1	24.4	16.4	1	X
SMAJ16A	SMAJ16CA	BP	XP	16.0	17.80	19.70	1	26.0	15.4	1	X
SMAJ17A	SMAJ17CA	BR	XR	17.0	18.90	20.90	1	27.6	14.5	1	X
SMAJ18A	SMAJ18CA	BT	XT	18.0	20.00	22.10	1	29.2	13.7	1	X
SMAJ20A	SMAJ20CA	BV	XV	20.0	22.20	24.50	1	32.4	12.3	1	X
SMAJ22A	SMAJ22CA	BX	XX	22.0	24.40	26.90	1	35.5	11.3	1	X
SMAJ24A	SMAJ24CA	BZ	XZ	24.0	26.70	29.50	1	38.9	10.3	1	X
SMAJ26A	SMAJ26CA	CE	YE	26.0	28.90	31.90	1	42.1	9.5	1	X
SMAJ28A	SMAJ28CA	CG	YG	28.0	31.10	34.40	1	45.4	8.8	1	X
SMAJ30A	SMAJ30CA	CK	YK	30.0	33.30	36.80	1	48.4	8.3	1	X
SMAJ33A	SMAJ33CA	CM	YM	33.0	36.70	40.60	1	53.3	7.5	1	X
SMAJ36A	SMAJ36CA	CP	YP	36.0	40.00	44.20	1	58.1	6.9	1	X
SMAJ40A	SMAJ40CA	CR	YR	40.0	44.40	49.10	1	64.5	6.2	1	X
SMAJ43A	SMAJ43CA	CT	YT	43.0	47.80	52.80	1	69.4	5.8	1	X
SMAJ45A	SMAJ45CA	CV	YV	45.0	50.00	55.30	1	72.7	5.5	1	X
SMAJ48A	SMAJ48CA	CX	YX	48.0	53.30	58.90	1	77.4	5.2	1	X
SMAJ51A	SMAJ51CA	CZ	YZ	51.0	56.70	62.70	1	82.4	4.9	1	X
SMAJ54A	SMAJ54CA	RE	ZE	54.0	60.00	66.30	1	87.1	4.6	1	X
SMAJ58A	SMAJ58CA	RG	ZG	58.0	64.40	71.20	1	93.6	4.3	1	X
SMAJ60A	SMAJ60CA	RK	ZK	60.0	66.70	73.70	1	96.8	4.1	1	X
SMAJ64A	SMAJ64CA	RM	ZM	64.0	71.10	78.60	1	103.0	3.9	1	X
SMAJ70A	SMAJ70CA	RP	ZP	70.0	77.80	86.00	1	113.0	3.5	1	X
SMAJ75A	SMAJ75CA	RR	ZR	75.0	83.30	92.10	1	121.0	3.3	1	X
SMAJ78A	SMAJ78CA	RT	ZT	78.0	86.70	95.80	1	126.0	3.2	1	X
SMAJ85A	SMAJ85CA	RV	ZV	85.0	94.40	104.00	1	137.0	2.9	1	X
SMAJ90A	SMAJ90CA	RX	ZX	90.0	100.00	111.00	1	146.0	2.7	1	X
SMAJ100A	SMAJ100CA	RZ	ZZ	100.0	111.00	123.00	1	162.0	2.5	1	X
SMAJ110A	SMAJ110CA	SE	VE	110.0	122.00	135.00	1	177.0	2.3	1	X
SMAJ120A	SMAJ120CA	SG	VG	120.0	133.00	147.00	1	193.0	2.1	1	X
SMAJ130A	SMAJ130CA	SK	VK	130.0	144.00	159.00	1	209.0	1.9	1	X
SMAJ150A	SMAJ150CA	SM	VM	150.0	167.00	185.00	1	243.0	1.6	1	X
SMAJ160A	SMAJ160CA	SP	VP	160.0	178.00	197.00	1	259.0	1.5	1	X
SMAJ170A	SMAJ170CA	SR	VR	170.0	189.00	209.00	1	275.0	1.5	1	X
SMAJ180A	SMAJ180CA	ST	VT	180.0	201.00	222.00	1	292.0	1.4	1	X
SMAJ200A	SMAJ200CA	SV	VV	200.0	224.00	247.00	1	324.0	1.2	1	X
SMAJ220A	SMAJ220CA	SX	VX	220.0	246.00	272.00	1	356.0	1.1	1	X
SMAJ250A	SMAJ250CA	SZ	VZ	250.0	279.00	309.00	1	405.0	1.0	1	X
SMAJ300A	SMAJ300CA	TE	UE	300.0	335.00	371.00	1	486.0	0.8	1	X
SMAJ350A	SMAJ350CA	TG	UG	350.0	391.00	432.00	1	567.0	0.7	1	X
SMAJ400A	SMAJ400CA	TK	UK	400.0	447.00	494.00	1	648.0	0.6	1	X
SMAJ440A	SMAJ440CA	TM	UM	440.0	492.00	543.00	1	713.0	0.6	1	X

For bidirectional type having  $V_{RWM}$  of 10 volts and less, the  $I_R$  limit is double.

For parts without A ( $V_{BR}$  is  $\pm 10\%$  and  $V_C$  is 5% higher than with A parts).

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

Figure 1 - Peak Pulse Power Rating Curve

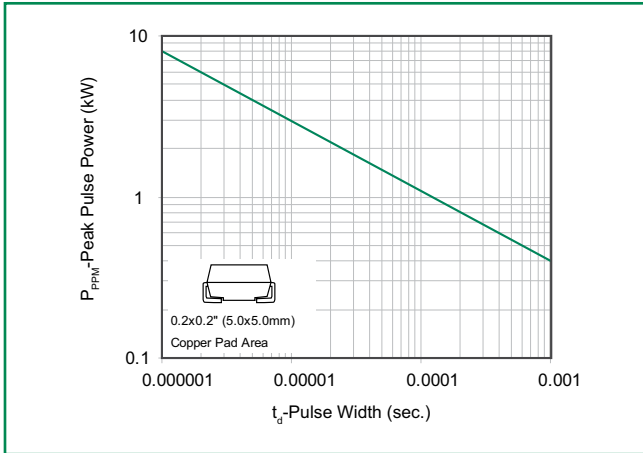


Figure 2 - Pulse Derating Curve

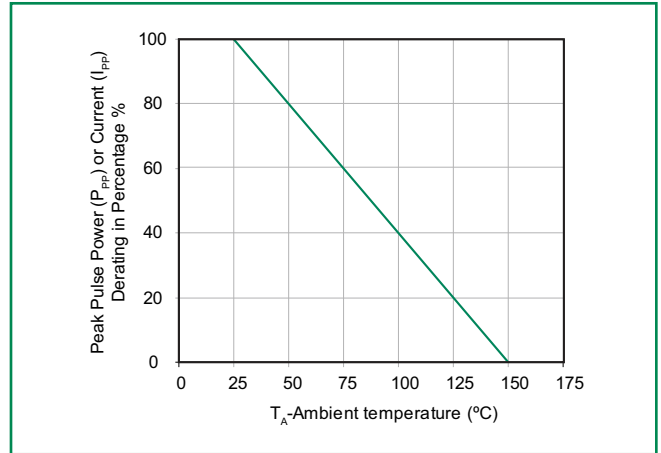


Figure 3 - Pulse Waveform

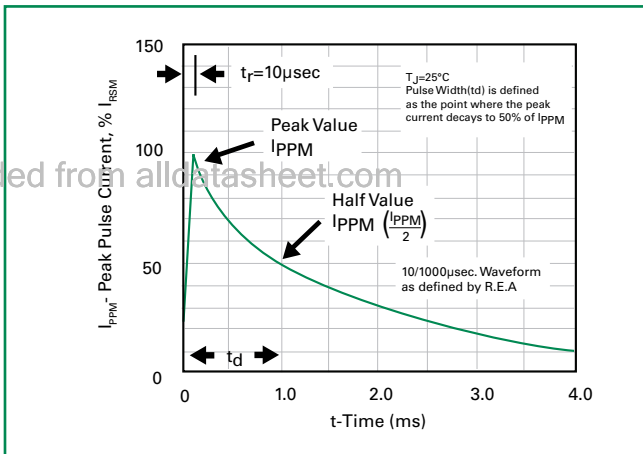


Figure 4 - Typical Junction Capacitance

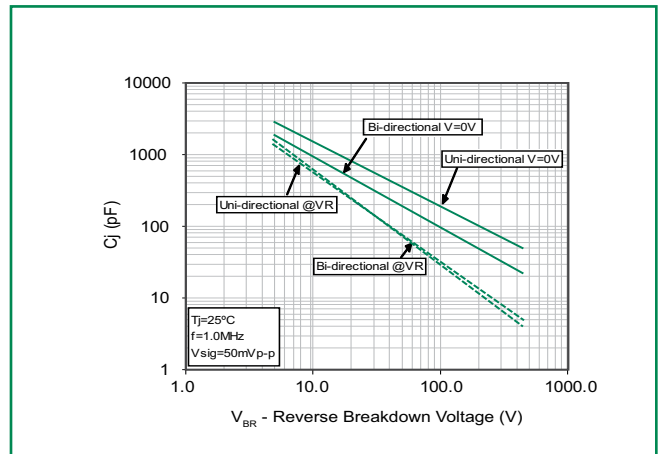


Figure 5 - Steady State Power Dissipation Derating Curve

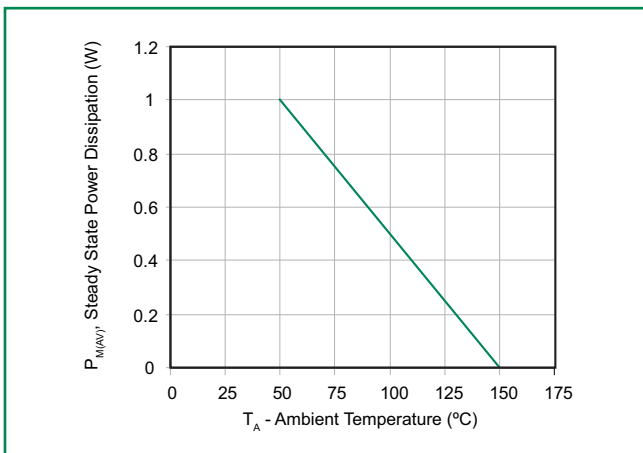
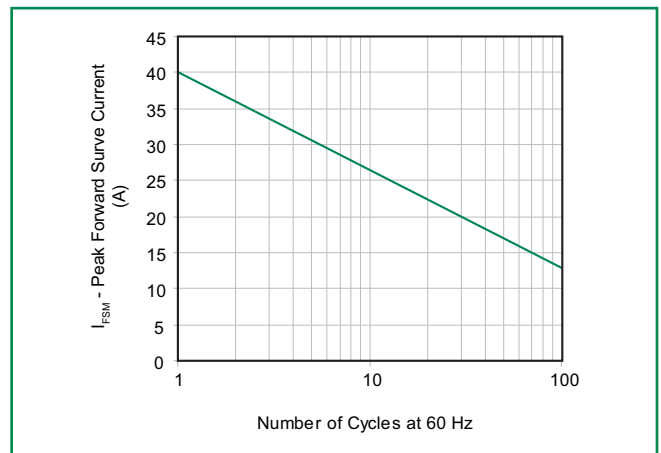
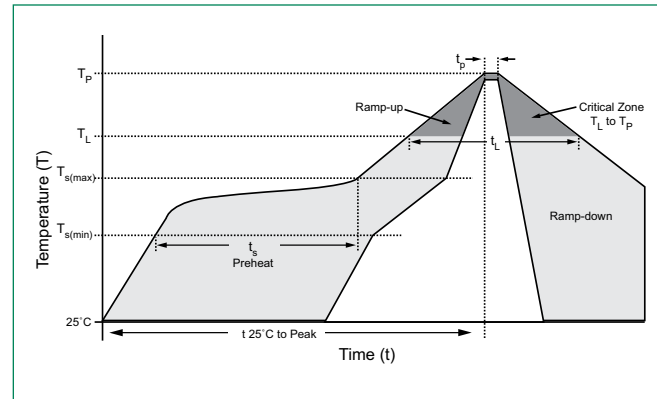


Figure 6 - Maximum Non-Repetitive Forward Surge Current Uni-Directional Only



**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 secs
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 <sup>+0/-5</sup> °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



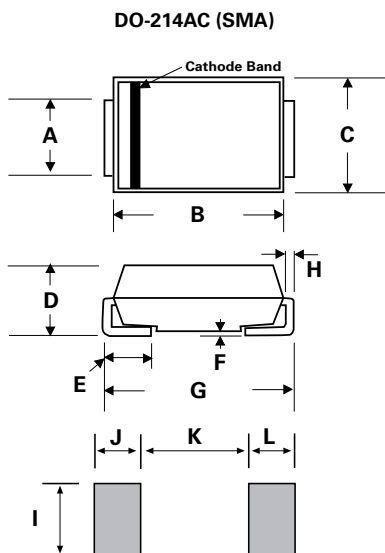
**Physical Specifications**

<b>Weight</b>	0.002 ounce, 0.061 gram
<b>Case</b>	JEDEC DO-214AC 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

**Dimensions**



Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.049	0.065	1.250	1.650
B	0.157	0.177	3.990	4.500
C	0.100	0.110	2.540	2.790
D	0.078	0.090	1.980	2.290
E	0.030	0.060	0.780	1.520
F	-	0.008	-	0.203
G	0.194	0.208	4.930	5.280
H	0.006	0.012	0.152	0.305
I	0.070	-	1.800	-
J	0.082	-	2.100	-
K	-	0.090	-	2.300
L	0.082	-	2.100	-