

**SMAJ-E Series**



**OBSOLETE** DATE: 08/21/2020 PCN/ECN# 41356  
REPLACED BY: SMAJ Series



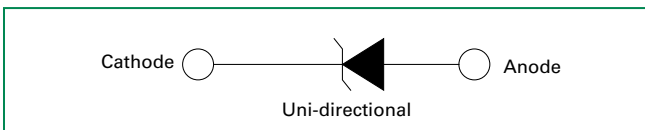
**Maximum Ratings and Thermal Characteristics**  
(T<sub>A</sub>=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation at T <sub>A</sub> =25°C by 10/1000µs Waveform (Fig.2)(Note 1), (Note 2)	P <sub>PPM</sub>	400	W
Power Dissipation on Infinite Heat Sink at T <sub>L</sub> =50°C	P <sub>D</sub>	3.3	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	I <sub>FSM</sub>	60	A
Maximum Instantaneous Forward Voltage at 25A for Unidirectional Only	V <sub>F</sub>	3.5	V
Operating Temperature Range	T <sub>J</sub>	-65 to 150	°C
Storage Temperature Range	T <sub>STG</sub>	-65 to 175	°C
Typical Thermal Resistance Junction to Lead	R <sub>θJL</sub>	30	°C/W
Typical Thermal Resistance Junction to Ambient	R <sub>θJA</sub>	120	°C/W

**Notes:**

1. Non-repetitive current pulse, per Fig.4 and derated above T<sub>J</sub> (initial) =25°C per Fig. 3.
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.

**Functional Diagram**



**Description**

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

**Features**

- Excellent clamping capability
- 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
- IEC 61000-4-2 ESD 30kV(Air), 30kV (Contact)
- EFT protection of data lines in accordance with IEC 61000-4-4
- Built-in strain relief
- 400W Peak pulse 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<sub>BR</sub> min
- Glass passivated junction
- Low inductance
- High temperature to reflow soldering guaranteed: 260°C/40sec
- V<sub>BR</sub> @ T<sub>J</sub>=V<sub>BR</sub>@25°C x (1+αT x (T<sub>J</sub> - 25)) (α:Temperature Coefficient, typical value is 0.1%)
- EPI silicon technology
- Meet MSL level1, per J-STD-020C, LF maximum peak of 260°C
- Matte tin lead-free Plated
- Halogen free and RoHS compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)

**Applications**

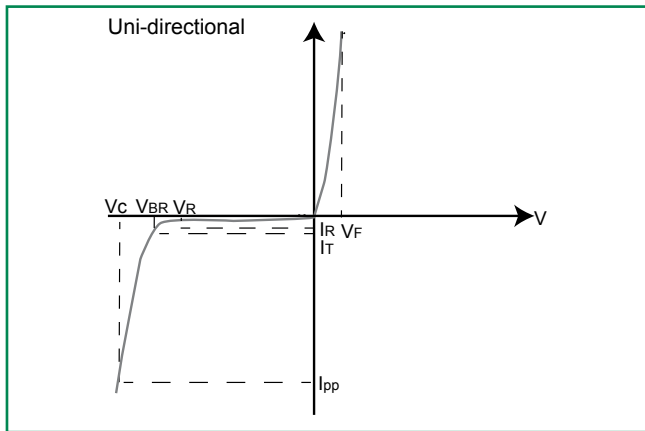
TVS devices are ideal for the protection of I/O Interfaces, V<sub>CC</sub> bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

### Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

Part Number (Uni)	Marking	Reverse Stand off Voltage V <sub>R</sub> (Volts)	Breakdown Voltage V <sub>BR</sub> (Volts) @ 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>R</sub> (μA)
			MIN	MAX				
SMAJ300A-E	XE	300	335.0	371.0	1	486.0	0.80	1
SMAJ350A-E	XG	350	391.0	432.0	1	567.0	0.70	1
SMAJ400A-E*	XK	400	447.0	494.0	1	648.0	0.60	1
SMAJ450A-E*	XM	440	492.0	543.0	1	713.0	0.60	1
SMAJ500A-E*	XN	500	558.0	618.0	1	810.0	0.50	1
SMAJ550A-E*	XP	550	614.0	680.0	1	891.0	0.46	1
SMAJ600A-E*	XR	600	670.0	741.0	1	971.0	0.42	1
SMAJ650A-E*	XS	650	726.0	803.0	1	1052.0	0.39	1
SMAJ700A-E*	XT	700	782.0	865.0	1	1133.0	0.36	1
SMAJ750A-E*	XU	750	837.0	927.0	1	1213.0	0.33	1
SMAJ850A-E*	XV	850	950.0	1050.0	1	1365.0	0.30	1

Note: for parts with \* are still under development

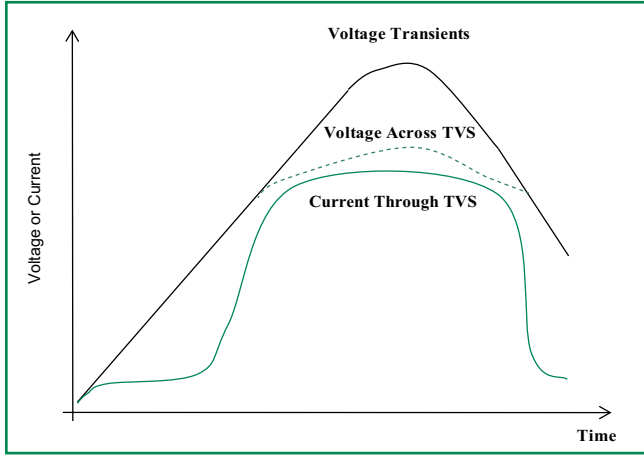
### I-V Curve Characteristics



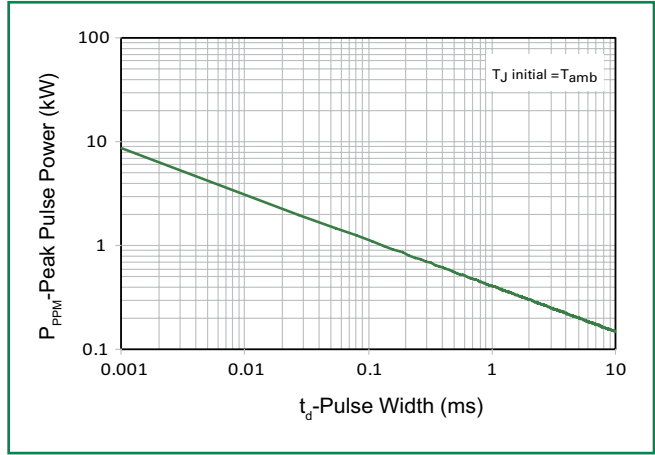
- P<sub>ppm</sub>** Peak Pulse Power Dissipation – Max power dissipation
- V<sub>r</sub>** Stand-off Voltage – Maximum voltage that can be applied to the TVS without operation
- V<sub>br</sub>** Breakdown Voltage – Maximum voltage that flows though the TVS at a specified test current (I<sub>t</sub>)
- V<sub>c</sub>** Clamping Voltage – Peak voltage measured across the TVS at a specified I<sub>ppm</sub> (peak impulse current)
- I<sub>r</sub>** Reverse Leakage Current – Current measured at V<sub>r</sub>
- V<sub>f</sub>** Forward Voltage Drop for Uni-directional

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

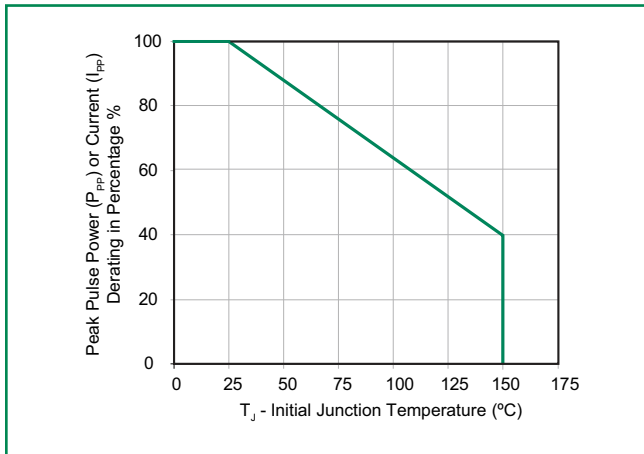
**Figure 1 - TVS Transients Clamping Waveform**



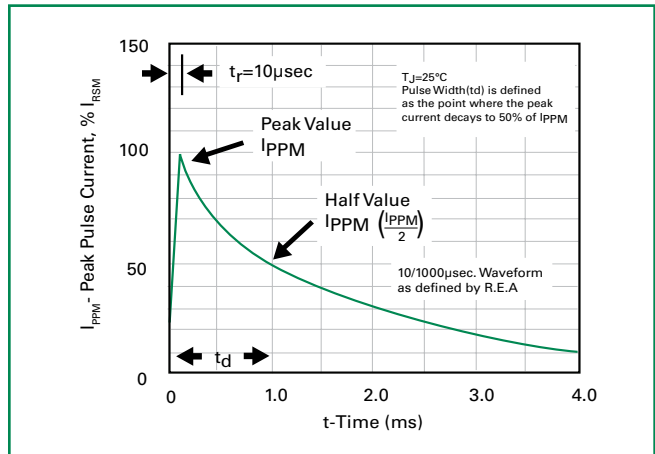
**Figure 2 - Peak Pulse Power Rating Curve**



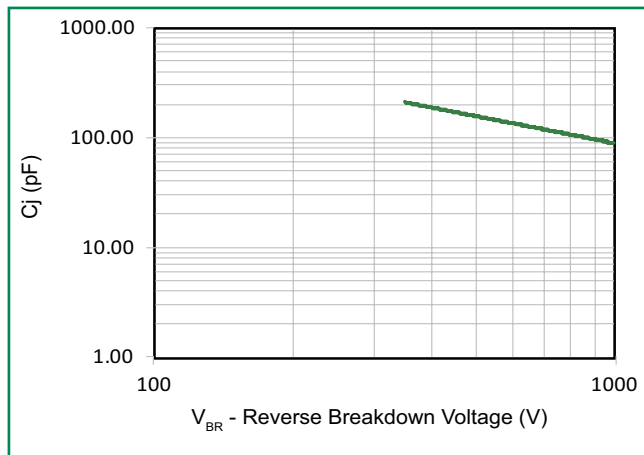
**Figure 3 - Peak Pulse Power Derating Curve**



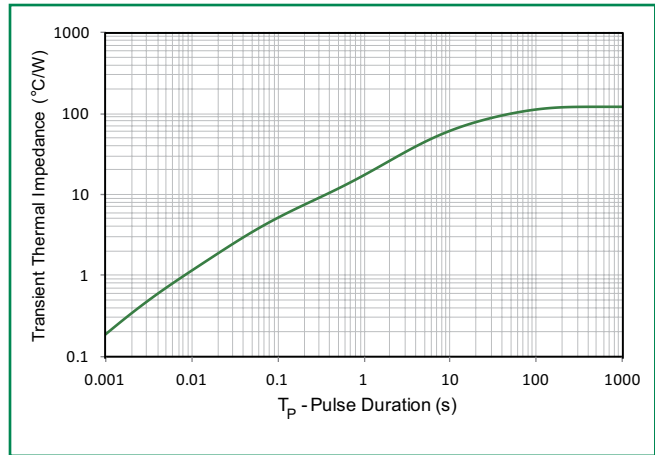
**Figure 4 - Pulse Waveform**



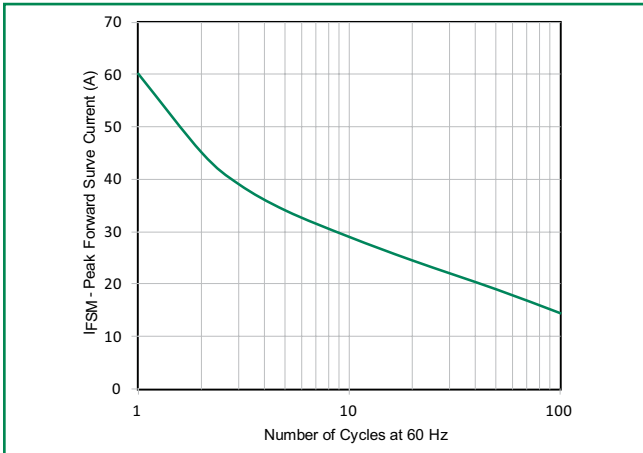
**Figure 5 - Typical Junction Capacitance**



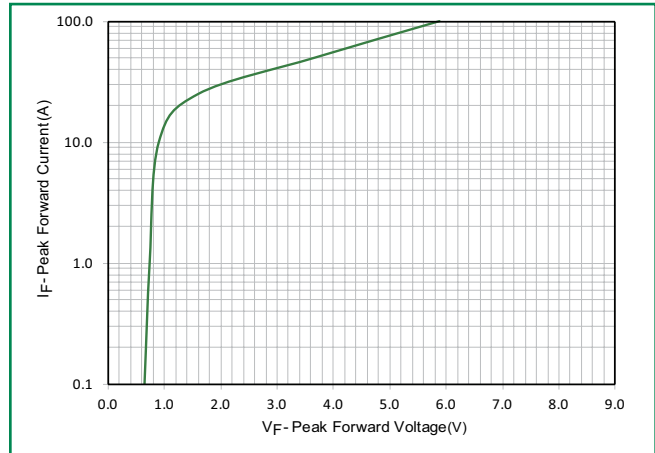
**Figure 6 - Typical Transient Thermal Impedance**



**Figure 7 - Maximum Non-Repetitive Forward Surge Current Uni-Directional Only**

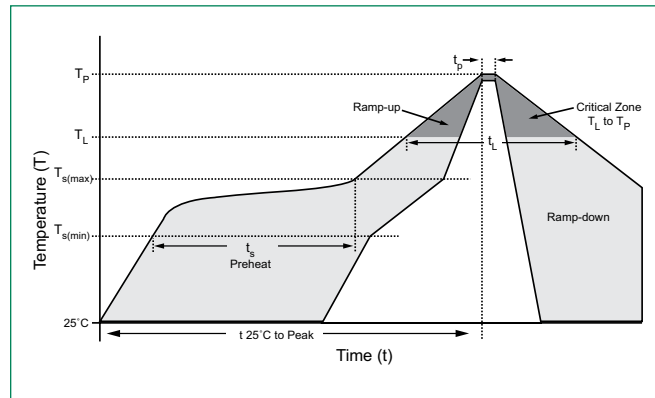


**Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)**



**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 ( $T_A$ ) to peak)		3°C/second max
$T_{s(max)}$ to $T_A$ - Ramp-up Rate		3°C/second max
Reflow	- Temperature ( $T_A$ ) (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		260°C



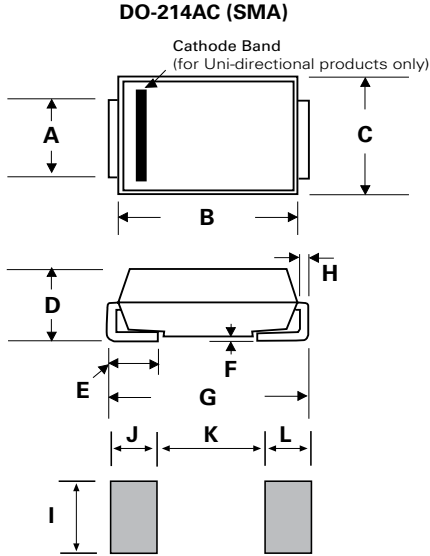
**Physical Specifications**

<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-B102

**Environmental Specifications**

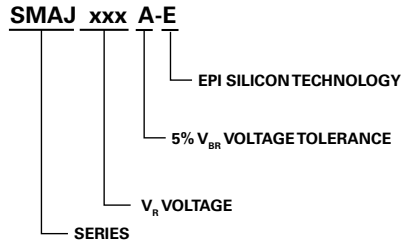
<b>High Temp. Storage</b>	JESD22-A103
<b>HTRB</b>	JESD22-A108
<b>Temperature Cycling</b>	JESD22-A104
<b>MSL</b>	JEDEC-J-STD-020, Level 1
<b>H3TRB</b>	JESD22-A101
<b>RSH</b>	JESD22-A111

**Dimensions**

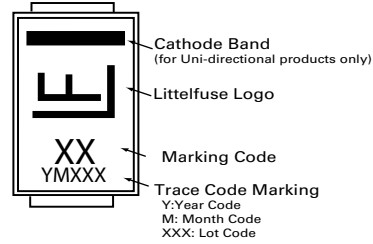


Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.049	0.065	1.250	1.650
B	0.157	0.181	3.990	4.600
C	0.095	0.110	2.400	2.790
D	0.075	0.090	1.900	2.290
E	0.030	0.060	0.780	1.520
F	-	0.008	-	0.203
G	0.189	0.208	4.800	5.280
H	0.006	0.012	0.152	0.305
I	0.070	-	1.800	-
J	0.082	-	2.100	-
K	-	0.090	-	2.300
L	0.082	-	2.100	-

**Part Numbering System**



**Part Marking System**



**Packaging**

Part number	Component Package	Quantity	Packaging Option	Packaging Specification
SMAJxxxA-E	DO-214AC	5000	Tape & Reel - 12mm tape/13" reel	EIA STD RS-481

**Tape and Reel Specification**

