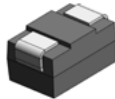


# SMAJE

## 400 W Transient voltage suppressor



### Product features

- Low profile SMA package
- Excellent clamping capability
- 400 W peak pulse power capability at 10/1000  $\mu$ s waveform
- Typical  $I_R$  less than 1  $\mu$ A above 10 V
- Fast response time: typically less than 1.0 ps from 0 V to  $V_{BR}$  minimum
- High temperature reflow soldering: +260 °C /40 s at terminal
- Plastic package meets UL 94 V-0 flammability rating
- Meets moisture sensitivity level (MSL) level 1
- Terminal: Solder plated leads, solderable per J-STD-002
- For surface mounted applications in order to optimize board space
- UL 497B recognized.  
File No. : E198449 Guide QVGQ2

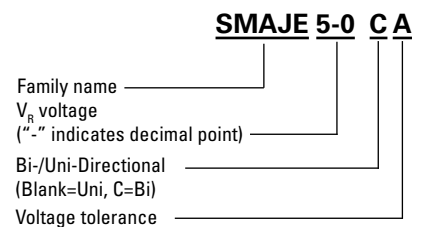
### Applications

- Consumer electronics
- Telecommunications
- Computing and servers
- Appliances
- Industrial automation
- Mobile and wearables

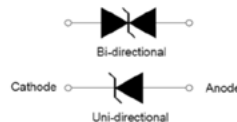
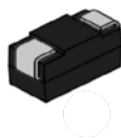
### Environmental compliance and general specifications



### Ordering part number



### PIN configuration



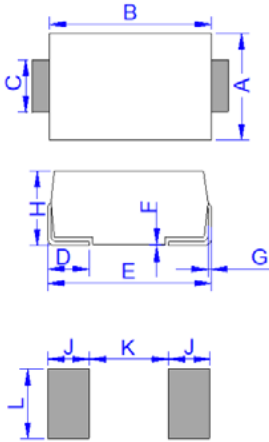
**Absolute maximum ratings**

(+25 °C, RH=45%-75%, unless otherwise noted)

Parameter	Symbol	Value	Unit
Storage operating junction temperature range	$T_{STG}/T_J$	-55 to +150	°C
Steady state power dissipation at $T_L = +75$ °C	$P_{M(AV)}$	3.3	W
Peak pulse power dissipation on 10/1000 $\mu$ s waveform	$P_{PP}$	400	W
Maximum instantaneous forward voltage at 100 A for unidirectional	$V_F$	5.0	V
Peak forward surge current, 8.3 ms single half sine wave <sup>1</sup>	$I_{FSM}$	60	A
Typical thermal resistance junction to lead	$R_{\theta JL}$	30	°C/W
Typical thermal resistance junction to ambient	$R_{\theta JA}$	120	°C/W

1. Measured on 8.3 ms single half sine wave or equivalent square wave for unidirectional device only, duty cycle = 4 per minute maximum

**Mechanical parameters, pad layout- mm**



Dimension	Millimeters		Inches	
	Minimum	Maximum	Minimum	Maximum
A	2.60	3.00	0.102	0.118
B	4.15	4.65	0.163	0.183
C	1.25	1.65	0.049	0.065
D	0.95	1.52	0.037	0.060
E	4.90	5.30	0.193	0.209
F	0.051	0.203	0.002	0.008
G	0.15	0.31	0.006	0.012
H	2.00	2.44	0.079	0.096
J	2.00		0.079	
K		2.30		0.091
L	1.80		0.071	

**Part marking**



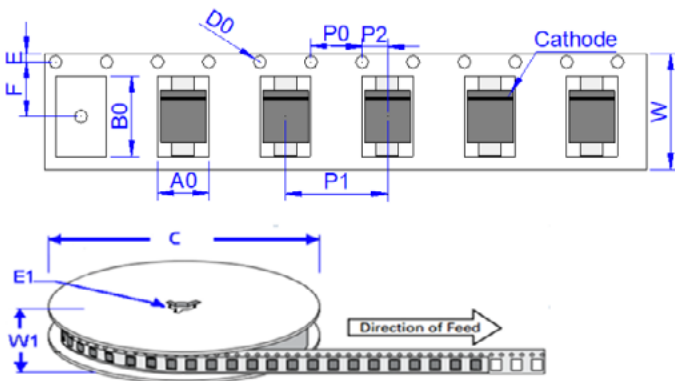
Cathode band (Uni-polar only)

Part marking: xxxx = Date code  
yy- Refer to marking designator listed in Electrical Characteristics table

**Packaging information (mm)**

Drawing not to scale.

Supplied in tape and reel packaging, 5,000 parts per 13" diameter reel (EIA-481 compliant)



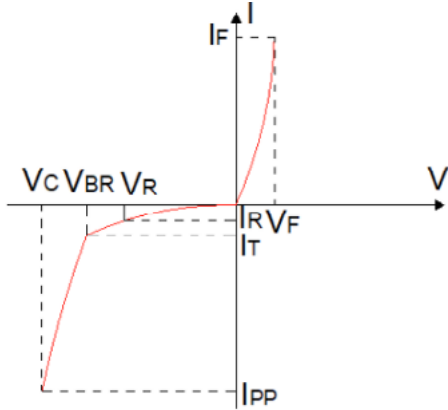
Dimension	Millimeters	Inches
A0	2.79 ± 0.3	0.110 ± 0.012
B0	5.33 ± 0.3	0.210 ± 0.012
C	330.0	13.0
D0	1.55 ± 0.1	0.061 ± 0.004
E	1.75 ± 0.2	0.069 ± 0.008
E1	13.3 ± 0.3	0.524 ± 0.012
F	5.50 ± 0.2	0.217 ± 0.008
P0	4.00 ± 0.2	0.157 ± 0.008
P1	4.00 ± 0.2	0.157 ± 0.008
P2	2.00 ± 0.2	0.079 ± 0.008
W	12.0 ± 0.2	0.472 ± 0.008
W1	15.7 ± 2.0	0.618 ± 0.079

Electrical characteristics (+25 °C)

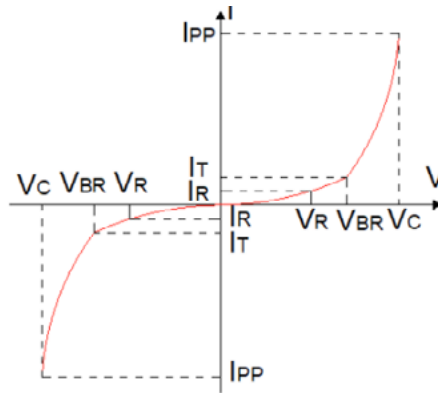
Part number	Marking		$V_R$ (V)	$I_R @ V_R$ ( $\mu$ A)	$V_{BR} @ I_T$ min (V)	max (V)	$I_T$ (mA)	$V_C @ I_{PP}$ max (V)	$I_{PP}$ (A)	
	Uni-polar	Bi-polar								Uni
SMAJE5-0A	SMAJE5-0CA	HE	TE	5	120	6.4	7	10	9.2	43.5
SMAJE6-0A	SMAJE6-0CA	HG	TG	6	120	6.67	7.37	10	10.3	38.8
SMAJE6-5A	SMAJE6-5CA	HK	TK	6.5	80	7.22	7.98	10	11.2	35.7
SMAJE7-0A	SMAJE7-0CA	HM	TM	7	50	7.78	8.6	10	12	33.3
SMAJE7-5A	SMAJE7-5CA	HP	TP	7.5	50	8.33	9.21	1	12.9	31
SMAJE8-0A	SMAJE8-0CA	HR	TR	8	20	8.89	9.83	1	13.6	29.4
SMAJE8-5A	SMAJE8-5CA	HT	TT	8.5	10	9.44	10.4	1	14.4	27.8
SMAJE9-0A	SMAJE9-0CA	HV	TV	9	5	10	11.1	1	15.4	26
SMAJE10A	SMAJE10CA	HX	TX	10	2	11.1	12.3	1	17	23.5
SMAJE11A	SMAJE11CA	HZ	TZ	11	1	12.2	13.5	1	18.2	22
SMAJE12A	SMAJE12CA	IE	UE	12	1	13.3	14.7	1	19.9	20.1
SMAJE13A	SMAJE13CA	IG	UG	13	1	14.4	15.9	1	21.5	18.6
SMAJE14A	SMAJE14CA	IK	UK	14	1	15.6	17.2	1	23.2	17.3
SMAJE15A	SMAJE15CA	IM	UM	15	1	16.7	18.5	1	24.4	16.4
SMAJE16A	SMAJE16CA	IP	UP	16	1	17.8	19.7	1	26	15.4
SMAJE17A	SMAJE17CA	IR	UR	17	1	18.9	20.9	1	27.6	14.5
SMAJE18A	SMAJE18CA	IT	UT	18	1	20	22.1	1	29.2	13.7
SMAJE20A	SMAJE20CA	IV	UV	20	1	22.2	24.5	1	32.4	12.4
SMAJE22A	SMAJE22CA	IX	UX	22	1	24.4	26.9	1	35.5	11.3
SMAJE24A	SMAJE24CA	IZ	UZ	24	1	26.7	29.5	1	38.9	10.3
SMAJE26A	SMAJE26CA	JE	VE	26	1	28.9	31.9	1	42.1	9.5
SMAJE28A	SMAJE28CA	JG	VG	28	1	31.1	34.4	1	45.4	8.8
SMAJE30A	SMAJE30CA	JK	VK	30	1	33.3	36.8	1	48.4	8.3
SMAJE33A	SMAJE33CA	JM	VM	33	1	36.7	40.6	1	53.3	7.5
SMAJE36A	SMAJE36CA	JP	VP	36	1	40	44.2	1	58.1	6.9
SMAJE40A	SMAJE40CA	JR	VR	40	1	44.4	49.1	1	64.5	6.2
SMAJE43A	SMAJE43CA	JT	VT	43	1	47.8	52.8	1	69.4	5.8
SMAJE45A	SMAJE45CA	JV	VV	45	1	50	55.3	1	72.7	5.5
SMAJE48A	SMAJE48CA	JX	VX	48	1	53.3	58.9	1	77.4	5.2
SMAJE51A	SMAJE51CA	JZ	VZ	51	1	56.7	62.7	1	82.4	4.9
SMAJE54A	SMAJE54CA	RE	WE	54	1	60	66.3	1	87.1	4.6
SMAJE58A	SMAJE58CA	RG	WG	58	1	64.4	71.2	1	93.6	4.3
SMAJE60A	SMAJE60CA	RK	WK	60	1	66.7	73.7	1	96.8	4.1
SMAJE64A	SMAJE64CA	RM	WM	64	1	71.1	78.6	1	103	3.9
SMAJE70A	SMAJE70CA	RP	WP	70	1	77.8	86	1	113	3.6
SMAJE75A	SMAJE75CA	RR	WR	75	1	83.3	92.1	1	121	3.3
SMAJE78A	SMAJE78CA	RT	WT	78	1	86.7	95.8	1	126	3.2
SMAJE85A	SMAJE85CA	RV	VV	85	1	94.4	104	1	137	2.9
SMAJE90A	SMAJE90CA	RX	WX	90	1	100	111	1	146	2.8
SMAJE100A	SMAJE100CA	RZ	WZ	100	1	111	123	1	162	2.5
SMAJE110A	SMAJE110CA	SE	XE	110	1	122	135	1	177	2.3
SMAJE120A	SMAJE120CA	SG	XG	120	1	133	147	1	193	2.1
SMAJE130A	SMAJE130CA	SK	XK	130	1	144	159	1	209	1.9
SMAJE150A	SMAJE150CA	SM	XM	150	1	167	185	1	243	1.7
SMAJE160A	SMAJE160CA	SP	XP	160	1	178	197	1	259	1.6
SMAJE170A	SMAJE170CA	SR	XR	170	1	189	209	1	275	1.5
SMAJE180A	SMAJE180CA	ST	XT	180	1	201	222	1	292	1.4
SMAJE200A	SMAJE200CA	SX	XX	200	1	224	247	1	324	1.3
SMAJE220A	SMAJE220CA	ZE	YE	220	1	246	272	1	356	1.1
SMAJE250A	SMAJE250CA	ZG	YG	250	1	279	309	1	405	1
SMAJE300A	SMAJE300CA	ZK	YK	300	1	335	371	1	486	0.8
SMAJE350A	SMAJE350CA	ZM	YM	350	1	391	432	1	567	0.7
SMAJE400A	SMAJE400CA	ZP	YP	400	1	447	494	1	648	0.6
SMAJE440A	SMAJE440CA	ZR	YR	440	1	492	543	1	713	0.6

**Ratings and V-I characteristic curves** (+25 °C unless otherwise noted)

**V- I curve characteristics (Uni-directional)**



**V- I curve characteristics (Bi-directional)**



Surge waveform: 10/1000  $\mu$ s

$V_R$ : Stand-off voltage – Maximum voltage that can be applied

$V_{BR}$ : Breakdown voltage

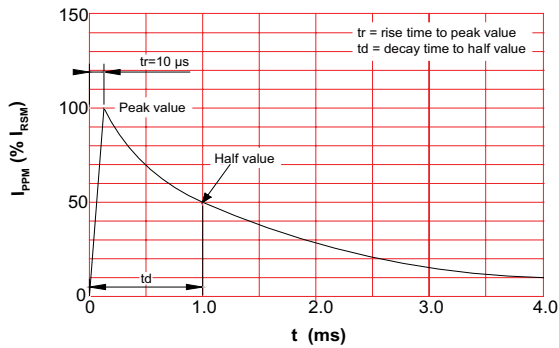
$V_C$ : Clamping voltage – Peak voltage measured across the suppressor at a specified  $I_{PP}$

$I_R$ : Reverse leakage current

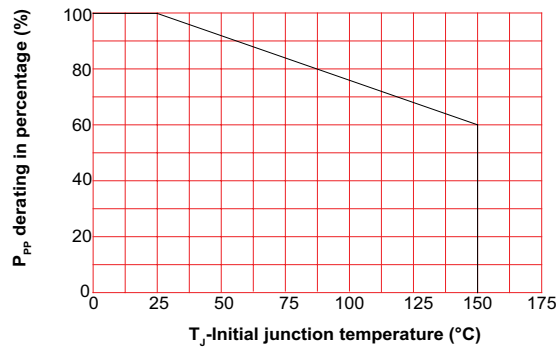
$I_T$ : Test current

$V_F$ : Forward voltage drop for Uni-directional TVS diode

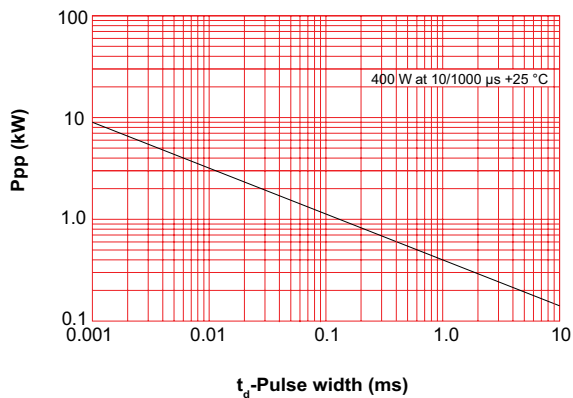
**Pulse waveform**



**Pulse derating curve**



**Peak pulse power dissipation vs. pulse width**



Solder reflow profile

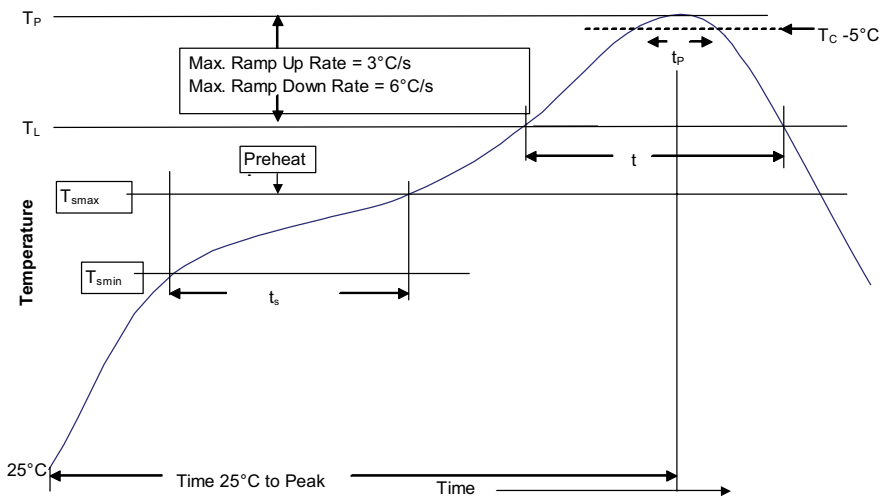


Table 1 - Standard SnPb solder ( $T_C$ )

Package thickness	Volume $\text{mm}^3$ <350	Volume $\text{mm}^3$ $\geq$ 350
<2.5 mm	235 °C	220 °C
$\geq$ 2.5 mm	220 °C	220 °C

Table 2 - Lead (Pb) free solder ( $T_C$ )

Package thickness	Volume $\text{mm}^3$ <350	Volume $\text{mm}^3$ 350 - 2000	Volume $\text{mm}^3$ >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 – 2.5 mm	260 °C	250 °C	245 °C
>2.5 mm	250 °C	245 °C	245 °C

Reference J-STD-020

Profile feature	Standard SnPb solder	Lead (Pb) free solder
Preheat and soak	<ul style="list-style-type: none"> <li>Temperature min. (<math>T_{smin}</math>)</li> <li>Temperature max. (<math>T_{smax}</math>)</li> <li>Time (<math>T_{smin}</math> to <math>T_{smax}</math>) (<math>t_s</math>)</li> </ul>	<ul style="list-style-type: none"> <li>100 °C</li> <li>150 °C</li> <li>60-120 seconds</li> </ul>
Ramp up rate $T_L$ to $T_p$	3 °C/ second max.	3 °C/ second max.
Liquidous temperature ( $T_L$ ) Time ( $t_L$ ) maintained above $T_L$	<ul style="list-style-type: none"> <li>183 °C</li> <li>60-150 seconds</li> </ul>	<ul style="list-style-type: none"> <li>217 °C</li> <li>60-150 seconds</li> </ul>
Peak package body temperature ( $T_p$ )*	Table 1	Table 2
Time ( $t_p$ )* within 5 °C of the specified classification temperature ( $T_C$ )	20 seconds*	40 seconds*
Ramp-down rate ( $T_p$ to $T_L$ )	6 °C/ second max.	6 °C/ second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

\* Tolerance for peak profile temperature ( $T_p$ ) is defined as a supplier minimum and a user maximum.

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