

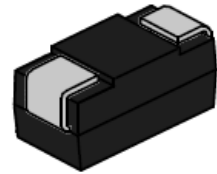


## SMAJ Series 400W Transient Voltage Suppressor

Rev.4.5

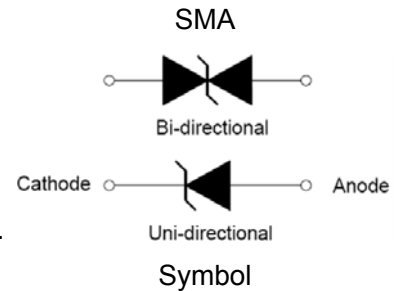
### DESCRIPTION:

TVS diodes can be used in a wide range of applications which like consumer electronic products, automotive industries, munitions, telecommunications, aerospace industries, and intelligent control systems.



### FEATURES:

- ✧ Low profile package.
- ✧ Low inductance.
- ✧ Excellent clamping capability.
- ✧ 400W peak pulse power capability at 10/1000 $\mu$ s waveform.
- ✧ Typical  $I_R$  less than 1 $\mu$ A above 10V.
- ✧ Fast response time: typically less than 1.0ps from 0V to  $V_{BR}$  min.
- ✧ High temperature to reflow soldering: 260 $^{\circ}$ C/40s at terminals.
- ✧ Plastic package has underwriters laboratory flammability 94V-0.
- ✧ Meets MSL level 1, per J-STD-020, LF maximum peak of 260 $^{\circ}$ C.
- ✧ Terminal: solder plated, solderable per J-STD-002.
- ✧ For surface mounted applications in order to optimize board space.
- ✧ UL 497B item recognized. (File No.: E480698).
- ✧ IEC61000-4-2 (ESD)  $\pm$ 30kV (air),  $\pm$ 30kV (contact).



### ABSOLUTE MAXIMUM RATINGS ( $T_A=25^{\circ}$ C, RH=45%-75%, unless otherwise noted)

Parameter	Symbol	Value	Unit
Operating junction and storage temperature range	$T_J/T_{STG}$	-55 to +150	$^{\circ}$ C
Peak pulse power dissipation at 10/1000 $\mu$ s waveform	$P_{PP}$	400	W
Steady state power dissipation at $T_L=75^{\circ}$ C	$P_{M(AV)}$	3.3	W
Maximum instantaneous forward voltage at 25A for unidirectional	$V_F$	5.0	V
Peak forward surge current, 8.3ms single half sine wave(Note 1)	$I_{FSM}$	60	A
Typical thermal resistance junction to lead	$R_{\theta JL}$	30	$^{\circ}$ C/W
Typical thermal resistance junction to ambient	$R_{\theta JA}$	120	$^{\circ}$ C/W

### Notes:

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

## MARKING



TE: Device Marking Code  
2009: In ninth week, 2020

ELECTRICAL CHARACTERISTICS ( $T_A=25^{\circ}\text{C}$ )

Part Number		Marking		$V_R$	$I_R@V_R$	$V_{BR}@I_T$		$I_T$	$V_C@I_{PP}$	$I_{PP}^{\text{①}}$
Uni-Polar	Bi-Polar	Uni	Bi	V	max( $\mu\text{A}$ )	min(V)	max(V)	mA	max(V)	A
SMAJ5.0A	SMAJ5.0CA	HE	TE	5.0	120	6.40	7.00	10	9.2	43.5
SMAJ6.0A	SMAJ6.0CA	HG	TG	6.0	120	6.67	7.37	10	10.3	38.8
SMAJ6.5A	SMAJ6.5CA	HK	TK	6.5	80	7.22	7.98	10	11.2	35.7
SMAJ7.0A	SMAJ7.0CA	HM	TM	7.0	50	7.78	8.60	10	12.0	33.3
SMAJ7.5A	SMAJ7.5CA	HP	TP	7.5	50	8.33	9.21	1	12.9	31.0
SMAJ8.0A	SMAJ8.0CA	HR	TR	8.0	20	8.89	9.83	1	13.6	29.4
SMAJ8.5A	SMAJ8.5CA	HT	TT	8.5	10	9.44	10.40	1	14.4	27.8
SMAJ9.0A	SMAJ9.0CA	HV	TV	9.0	5	10.00	11.10	1	15.4	26.0
SMAJ10A	SMAJ10CA	HX	TX	10.0	2	11.10	12.30	1	17.0	23.5
SMAJ11A	SMAJ11CA	HZ	TZ	11.0	1	12.20	13.50	1	18.2	22.0
SMAJ12A	SMAJ12CA	IE	UE	12.0	1	13.30	14.70	1	19.9	20.1
SMAJ13A	SMAJ13CA	IG	UG	13.0	1	14.40	15.90	1	21.5	18.6
SMAJ14A	SMAJ14CA	IK	UK	14.0	1	15.60	17.20	1	23.2	17.3
SMAJ15A	SMAJ15CA	IM	UM	15.0	1	16.70	18.50	1	24.4	16.4
SMAJ16A	SMAJ16CA	IP	UP	16.0	1	17.80	19.70	1	26.0	15.4
SMAJ17A	SMAJ17CA	IR	UR	17.0	1	18.90	20.90	1	27.6	14.5
SMAJ18A	SMAJ18CA	IT	UT	18.0	1	20.00	22.10	1	29.2	13.7
SMAJ20A	SMAJ20CA	IV	UV	20.0	1	22.20	24.50	1	32.4	12.4
SMAJ22A	SMAJ22CA	IX	UX	22.0	1	24.40	26.90	1	35.5	11.3
SMAJ24A	SMAJ24CA	IZ	UZ	24.0	1	26.70	29.50	1	38.9	10.3
SMAJ26A	SMAJ26CA	JE	VE	26.0	1	28.90	31.90	1	42.1	9.5
SMAJ28A	SMAJ28CA	JG	VG	28.0	1	31.10	34.40	1	45.4	8.8
SMAJ30A	SMAJ30CA	JK	VK	30.0	1	33.30	36.80	1	48.4	8.3
SMAJ33A	SMAJ33CA	JM	VM	33.0	1	36.70	40.60	1	53.3	7.5

ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C, continued)

Part Number		Marking		V <sub>R</sub>	I <sub>R</sub> @V <sub>R</sub>	V <sub>BR</sub> @I <sub>T</sub>		I <sub>T</sub>	V <sub>C</sub> @I <sub>PP</sub>	I <sub>PP</sub> <sup>①</sup>
Uni-polar	Bi-polar	Uni	Bi	V	max(μA)	min(V)	max(V)	mA	V	A
SMAJ36A	SMAJ36CA	JP	VP	36.0	1	40.00	44.20	1	58.1	6.9
SMAJ40A	SMAJ40CA	JR	VR	40.0	1	44.40	49.10	1	64.5	6.2
SMAJ43A	SMAJ43CA	JT	VT	43.0	1	47.80	52.80	1	69.4	5.8
SMAJ45A	SMAJ45CA	JV	VV	45.0	1	50.00	55.30	1	72.7	5.5
SMAJ48A	SMAJ48CA	JX	VX	48.0	1	53.30	58.90	1	77.4	5.2
SMAJ51A	SMAJ51CA	JZ	VZ	51.0	1	56.70	62.70	1	82.4	4.9
SMAJ54A	SMAJ54CA	RE	WE	54.0	1	60.00	66.30	1	87.1	4.6
SMAJ58A	SMAJ58CA	RG	WG	58.0	1	64.40	71.20	1	93.6	4.3
SMAJ60A	SMAJ60CA	RK	WK	60.0	1	66.70	73.70	1	96.8	4.1
SMAJ64A	SMAJ64CA	RM	WM	64.0	1	71.10	78.60	1	103.0	3.9
SMAJ70A	SMAJ70CA	RP	WP	70.0	1	77.80	86.00	1	113.0	3.6
SMAJ75A	SMAJ75CA	RR	WR	75.0	1	83.30	92.10	1	121.0	3.3
SMAJ78A	SMAJ78CA	RT	WT	78.0	1	86.70	95.80	1	126.0	3.2
SMAJ85A	SMAJ85CA	RV	WV	85.0	1	94.40	104.0	1	137.0	2.9
SMAJ90A	SMAJ90CA	RX	WX	90.0	1	100.0	111.0	1	146.0	2.8
SMAJ100A	SMAJ100CA	RZ	WZ	100.0	1	111.0	123.0	1	162.0	2.5
SMAJ110A	SMAJ110CA	SE	XE	110.0	1	122.0	135.0	1	177.0	2.3
SMAJ120A	SMAJ120CA	SG	XG	120.0	1	133.0	147.0	1	193.0	2.1
SMAJ130A	SMAJ130CA	SK	XK	130.0	1	144.0	159.0	1	209.0	1.9
SMAJ150A	SMAJ150CA	SM	XM	150.0	1	167.0	185.0	1	243.0	1.7
SMAJ160A	SMAJ160CA	SP	XP	160.0	1	178.0	197.0	1	259.0	1.6
SMAJ170A	SMAJ170CA	SR	XR	170.0	1	189.0	209.0	1	275.0	1.5
SMAJ180A	SMAJ180CA	ST	XT	180.0	1	201.0	222.0	1	292.0	1.4
SMAJ200A	SMAJ200CA	SX	XX	200.0	1	224.0	247.0	1	324.0	1.3
SMAJ220A	SMAJ220CA	ZE	YE	220.0	1	246.0	272.0	1	356.0	1.1
SMAJ250A	SMAJ250CA	ZG	YG	250.0	1	279.0	309.0	1	405.0	1.0
SMAJ300A	SMAJ300CA	ZK	YK	300.0	1	335.0	371.0	1	486.0	0.8
SMAJ350A	SMAJ350CA	ZM	YM	350.0	1	391.0	432.0	1	567.0	0.7

**ELECTRICAL CHARACTERISTICS** ( $T_A=25^{\circ}\text{C}$ , continued)

Part Number		Marking		$V_R$	$I_R@V_R$	$V_{BR}@I_T$		$I_T$	$V_C@I_{PP}$	$I_{PP}^{①}$
Uni-polar	Bi-polar	Uni	Bi	V	max( $\mu\text{A}$ )	min(V)	max(V)	mA	V	A
SMAJ400A	SMAJ400CA	ZP	YP	400.0	1	447.0	494.0	1	648.0	0.6
SMAJ440A	SMAJ440CA	ZR	YR	440.0	1	492.0	543.0	1	713.0	0.6

① Surge waveform: 10/1000 $\mu\text{s}$

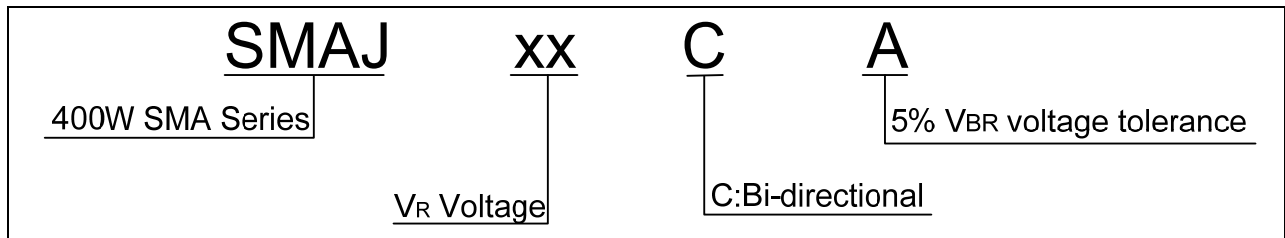
$V_R$ : Stand-off voltage -- Maximum voltage that can be applied

$V_{BR}$ : Breakdown voltage

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

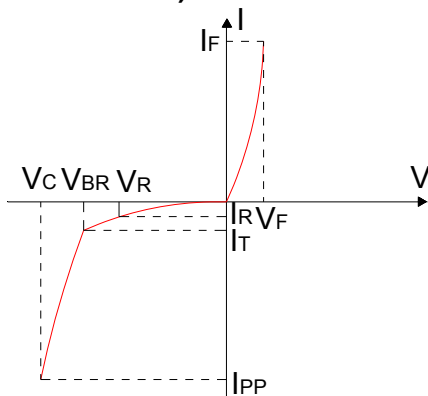
$I_R$ : Reverse leakage current

**ORDERING INFORMATION**



**RATINGS AND V-I CHARACTERISTICS CURVES** ( $T_A=25^{\circ}\text{C}$ , unless otherwise noted)

**FIG.1:V- I curve characteristics (Uni-directional)**



**FIG.2:V- I curve characteristics (Bi-directional)**

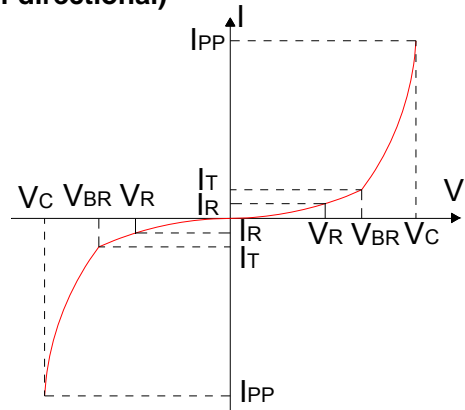


FIG.3: Pulse waveform

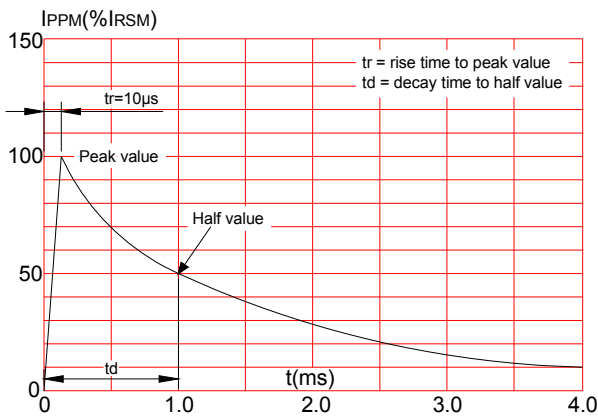


FIG.4: Pulse derating curve

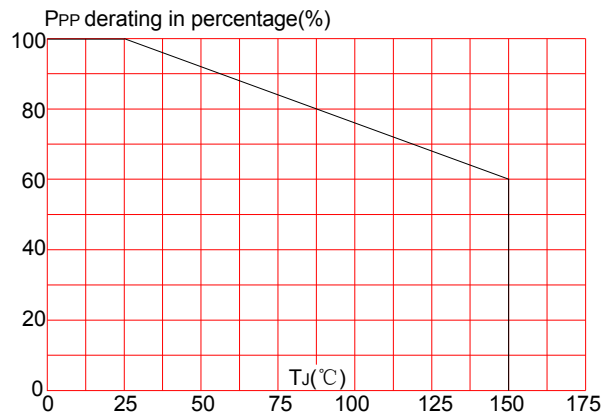
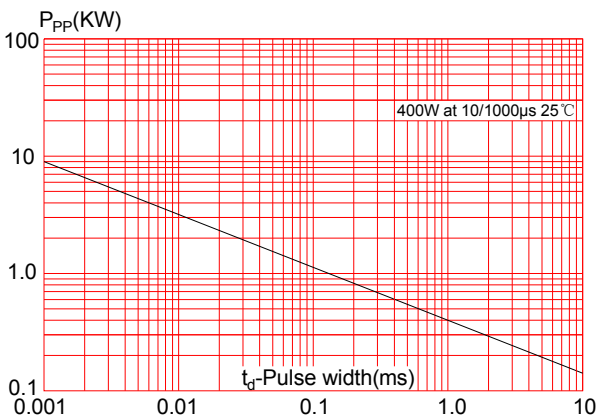
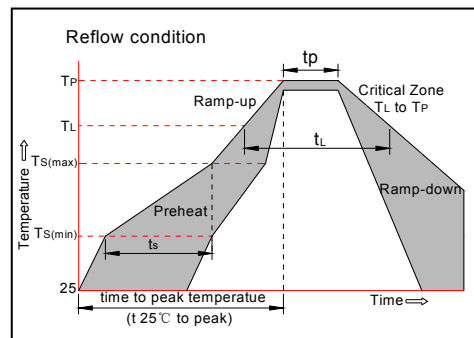


FIG.5: Peak pulse power dissipation vs. pulse width

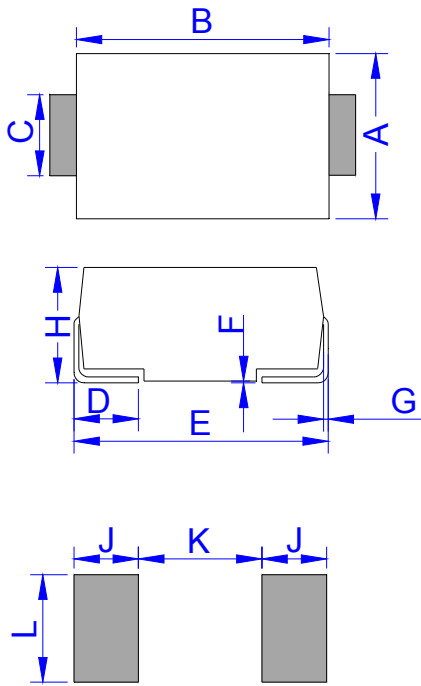


SOLDERING PARAMETERS

Reflow Condition		Pb-Free assembly (see figure at right)
Pre Heat	-Temperature Min ( $T_{s(min)}$ )	+150°C
	-Temperature Max( $T_{s(max)}$ )	+200°C
	-Time (Min to Max) (ts)	60-180 secs.
Average ramp up rate (Liquidus Temp ( $T_L$ ) to peak)		3°C/sec. Max
$T_{s(max)}$ to $T_L$ - Ramp-up Rate		3°C/sec. Max
Reflow	-Temperature( $T_L$ )(Liquidus)	+217°C
	-Temperature( $t_L$ )	60-150 secs.
Peak Temp ( $T_p$ )		+260(+0/-5)°C
Time within 5°C of actual Peak Temp ( $t_p$ )		20-40secs.
Ramp-down Rate		6°C/sec. Max
Time 25°C to Peak Temp ( $T_p$ )		8 min. Max
Do not exceed		+260°C



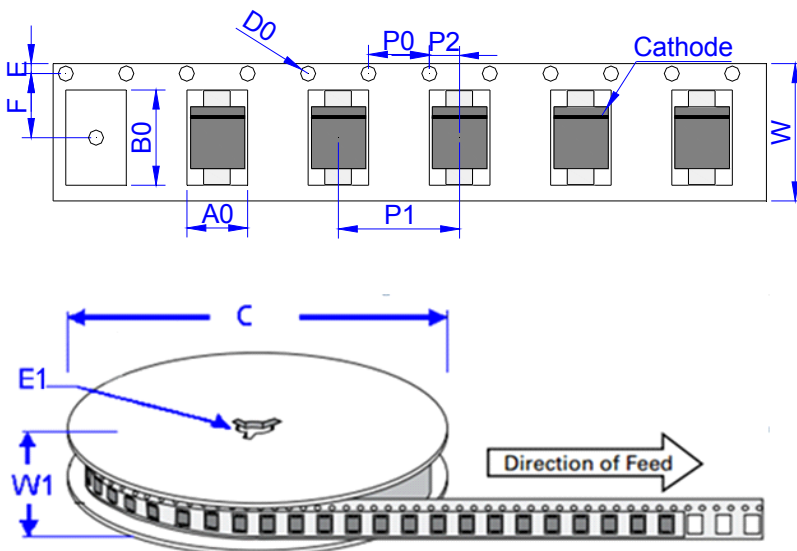
PACKAGE MECHANICAL DATA



DO-214AC (SMA)

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
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	

TAPE AND REEL SPECIFICATION-SMA




Ref.	Dimensions	
	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	5.5 ± 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

PART No.	UNIT WEIGHT (g/PCS) typ.	REEL (PCS)	PER CARTON (PCS)	DESCRIPTION
SMAJxxA/CA	0.067	7,500	120,000	13 inch reel pack

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