

## Transient Voltage Suppressors (TVS) Data Sheet

### Features

- For surface mounted applications in order to optimize board space
- Low profile package
- Glass passivated junction
- Low inductance
- Excellent clamping capability
- 400W peak pulse power capability at 10/1000 $\mu$ s waveform, repetition rate (duty cycle): 0.01%
- Fast response time
- Typical  $I_R$  less than 1 $\mu$ A above 10V
- High Temperature soldering: 260 $^{\circ}$ C/10 seconds at terminals
- Plastic package has underwriters laboratory flammability 94V-0
- Meets MSL level 1, per J-STD-020
- Safety certification: UL: E244458



### Mechanical Data

- Case: JEDEC DO-214AC. Molded plastic over glass passivated junction
- Terminal: Solder plated, solderable per MIL-STD-750, Method 2026
- Polarity: Color band denotes cathode except bi-directional models
- Standard Packaging: 12mm tape (EIA STD RS-481)
- Weight: 0.07g

### Applications

- I/O interface
- AC/DC power supply
- Low frequency signal transmission line (RS232, RS485, etc.)

### Maximum Ratings and Characteristics

Ratings at 25 $^{\circ}$ C ambient temperature unless otherwise specified.

Rating	Symbol	Value	Units
Peak pulse power dissipation at 10/1000 $\mu$ s waveform (Note1, Note2, Fig.1)	$P_{PPM}$	Minimum 400	Watts
Peak pulse current of at 10/1000 $\mu$ s waveform (Note 1, Fig.3)	$I_{PPM}$	See Table	Amps
Steady state power dissipation at $T_A=50^{\circ}$ C (Fig.5)	$P_{M(AV)}$	3.3	Watts
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load, (JEDEC Method) (Note3, Fig.6)	$I_{FSM}$	40	Amps
Operating junction and Storage Temperature Range.	$T_J, T_{STG}$	-65 to +150	$^{\circ}$ C
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. Non-repetitive current pulse, per Fig.3 and derated above  $T_A=25^{\circ}$ C per Fig.2.

2. Mounted on 5.0mm $\times$ 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.

**Dimensions (SMA/DO-214AC)**

	Symbol	Millimeters		Inches	
		Min.	Max.	Min.	Max.
	L	3.99	4.50	0.157	0.177
	D	2.54	2.79	0.100	0.110
	D1	1.25	1.65	0.049	0.065
	T	4.93	5.28	0.194	0.208
	T1	0.76	1.52	0.030	0.060
	d	-	0.203	-	0.008
	H	2.00	2.50	0.079	0.098
	H1	1.98	2.29	0.078	0.090

**Electrical Characteristics ( $T_A=25^\circ\text{C}$ )**

Part Number		Device Marking Code		Reverse Stand-Off Voltage	Breakdown Voltage @ $I_T$	Test Current	Maximum Clamping Voltage @ $I_{PP}$	Peak Pulse Current	Reverse Leakage @ $V_{RWM}$
Unidirectional	Bidirectional	UNI	BI	$V_{RWM}(V)$	$V_{BR}(V)$	$I_T(mA)$	$V_C(V)$	$I_{PP}(A)$	$I_R(\mu A)$
SMAJ5.0A	SMAJ5.0CA	AE	WE	5.0	6.40~7.00	10	9.2	43.5	800
SMAJ6.0A	SMAJ6.0CA	AG	WG	6.0	6.67~7.37	10	10.3	38.8	800
SMAJ6.5A	SMAJ6.5CA	AK	WK	6.5	7.22~7.98	10	11.2	35.7	500
SMAJ7.0A	SMAJ7.0CA	AM	WM	7.0	7.78~8.60	10	12.0	33.3	200
SMAJ7.5A	SMAJ7.5CA	AP	WP	7.5	8.33~9.21	1	12.9	31.0	100
SMAJ8.0A	SMAJ8.0CA	AR	WR	8.0	8.89~9.83	1	13.6	29.4	50
SMAJ8.5A	SMAJ8.5CA	AT	WT	8.5	9.44~10.40	1	14.4	27.8	20
SMAJ9.0A	SMAJ9.0CA	AV	WV	9.0	10.00~11.10	1	15.4	26.0	10
SMAJ10A	SMAJ10CA	AX	WX	10.0	11.10~12.30	1	17.0	23.5	5
SMAJ11A	SMAJ11CA	AZ	WZ	11.0	12.20~13.50	1	18.2	22.0	1
SMAJ12A	SMAJ12CA	BE	XE	12.0	13.30~14.70	1	19.9	20.1	1
SMAJ13A	SMAJ13CA	BG	XG	13.0	14.40~15.90	1	21.5	18.6	1
SMAJ14A	SMAJ14CA	BK	XK	14.0	15.60~17.20	1	23.2	17.2	1
SMAJ15A	SMAJ15CA	BM	XM	15.0	16.70~18.50	1	24.4	16.4	1
SMAJ16A	SMAJ16CA	BP	XP	16.0	17.80~19.70	1	26.0	15.4	1
SMAJ17A	SMAJ17CA	BR	XR	17.0	18.90~20.90	1	27.6	14.5	1
SMAJ18A	SMAJ18CA	BT	XT	18.0	20.00~22.10	1	29.2	13.7	1
SMAJ20A	SMAJ20CA	BV	XV	20.0	22.20~24.50	1	32.4	12.3	1
SMAJ22A	SMAJ22CA	BX	XX	22.0	24.40~26.90	1	35.5	11.3	1
SMAJ24A	SMAJ24CA	BZ	XZ	24.0	26.70~29.50	1	38.9	10.3	1

**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$ )**

Part Number		Device Marking Code		Reverse Stand-Off Voltage	Breakdown Voltage @ $I_T$	Test Current	Maximum Clamping Voltage @ $I_{PP}$	Peak Pulse Current	Reverse Leakage @ $V_{RWM}$
Unidirectional	Bidirectional	UNI	BI	$V_{RWM}(V)$	$V_{BR}(V)$	$I_T(mA)$	$V_C(V)$	$I_{PP}(A)$	$I_R(\mu A)$
SMAJ26A	SMAJ26CA	CE	YE	26.0	28.90~31.90	1	42.1	9.5	1
SMAJ28A	SMAJ28CA	CG	YG	28.0	31.10~34.40	1	45.4	8.8	1
SMAJ30A	SMAJ30CA	CK	YK	30.0	33.30~36.80	1	48.4	8.3	1
SMAJ33A	SMAJ33CA	CM	YM	33.0	36.70~40.60	1	53.3	7.5	1
SMAJ36A	SMAJ36CA	CP	YP	36.0	40.00~44.20	1	58.1	6.9	1
SMAJ40A	SMAJ40CA	CR	YR	40.0	44.40~49.10	1	64.5	6.2	1
SMAJ43A	SMAJ43CA	CT	YT	43.0	47.80~52.80	1	69.4	5.8	1
SMAJ45A	SMAJ45CA	CV	YV	45.0	50.00~55.30	1	72.7	5.5	1
SMAJ48A	SMAJ48CA	CX	YX	48.0	53.30~58.90	1	77.4	5.2	1
SMAJ51A	SMAJ51CA	CZ	YZ	51.0	56.70~62.70	1	82.4	4.9	1
SMAJ54A	SMAJ54CA	RE	ZE	54.0	60.00~66.30	1	87.1	4.6	1
SMAJ58A	SMAJ58CA	RG	ZG	58.0	64.40~71.20	1	93.6	4.3	1
SMAJ60A	SMAJ60CA	RK	ZK	60.0	66.70~73.70	1	96.8	4.1	1
SMAJ64A	SMAJ64CA	RM	ZM	64.0	71.10~78.60	1	103.0	3.9	1
SMAJ70A	SMAJ70CA	RP	ZP	70.0	77.80~86.00	1	113.0	3.5	1
SMAJ75A	SMAJ75CA	RR	ZR	75.0	83.30~92.10	1	121.0	3.3	1
SMAJ78A	SMAJ78CA	RT	ZT	78.0	86.70~95.80	1	126.0	3.2	1
SMAJ85A	SMAJ85CA	RV	ZV	85.0	94.40~104.00	1	137.0	2.9	1
SMAJ90A	SMAJ90CA	RX	ZX	90.0	100.00~111.00	1	146.0	2.7	1
SMAJ100A	SMAJ100CA	RZ	ZZ	100.0	111.00~123.00	1	162.0	2.5	1
SMAJ110A	SMAJ110CA	SE	VE	110.0	122.00~135.00	1	177.0	2.3	1
SMAJ120A	SMAJ120CA	SG	VG	120.0	133.00~147.00	1	193.0	2.1	1
SMAJ130A	SMAJ130CA	SK	VK	130.0	144.00~159.00	1	209.0	1.9	1
SMAJ150A	SMAJ150CA	SM	VM	150.0	167.00~185.00	1	243.0	1.6	1
SMAJ160A	SMAJ160CA	SP	VP	160.0	178.00~197.00	1	259.0	1.5	1
SMAJ170A	SMAJ170CA	SR	VR	170.0	189.00~209.00	1	275.0	1.5	1
SMAJ180A	SMAJ180CA	ST	VT	180.0	201.00~222.00	1	292.0	1.4	1
SMAJ190A	SMAJ190CA	SU	YU	190.0	211.00~233.00	1	308.0	1.3	1
SMAJ200A	SMAJ200CA	SV	VV	200.0	224.00~247.00	1	324.0	1.2	1
SMAJ210A	SMAJ210CA	SW	YW	210.0	237.00~263.00	1	340.0	1.2	1
SMAJ220A	SMAJ220CA	GE	VX	220.0	246.00~272.00	1	356.0	1.1	1
SMAJ250A	SMAJ250CA	SZ	VZ	250.0	279.00~309.00	1	405.0	1.0	1
SMAJ300A	SMAJ300CA	TE	UE	300.0	335.00~371.00	1	486.0	0.8	1
SMAJ350A	SMAJ350CA	TG	UG	350.0	391.00~432.00	1	567.0	0.7	1
SMAJ400A	SMAJ400CA	TK	UK	400.0	447.00~494.00	1	648.0	0.6	1
SMAJ440A	SMAJ440CA	TM	UM	440.0	492.00~543.00	1	713.0	0.6	1

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

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

**Figure 1. Peak Pulse Power Rating Curve**



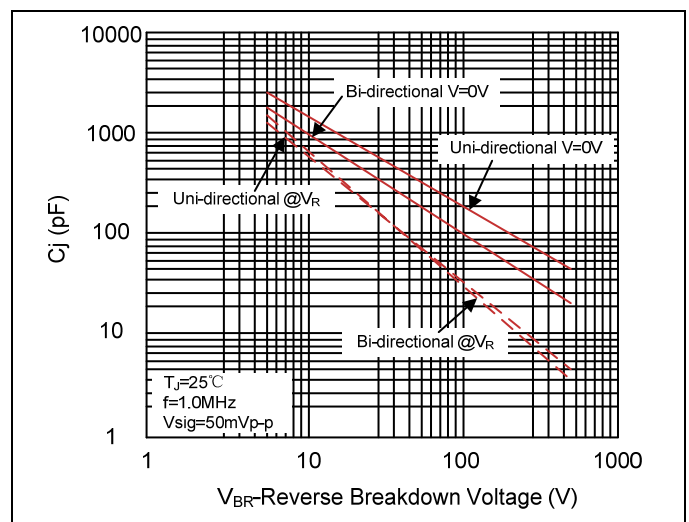
**Figure 2. Pulse Derating Curve**



**Figure 3. Pulse Waveform**



**Figure 4. Typical Junction Capacitance**



**Figure 5. Steady State Power Dissipation Derating Curve**

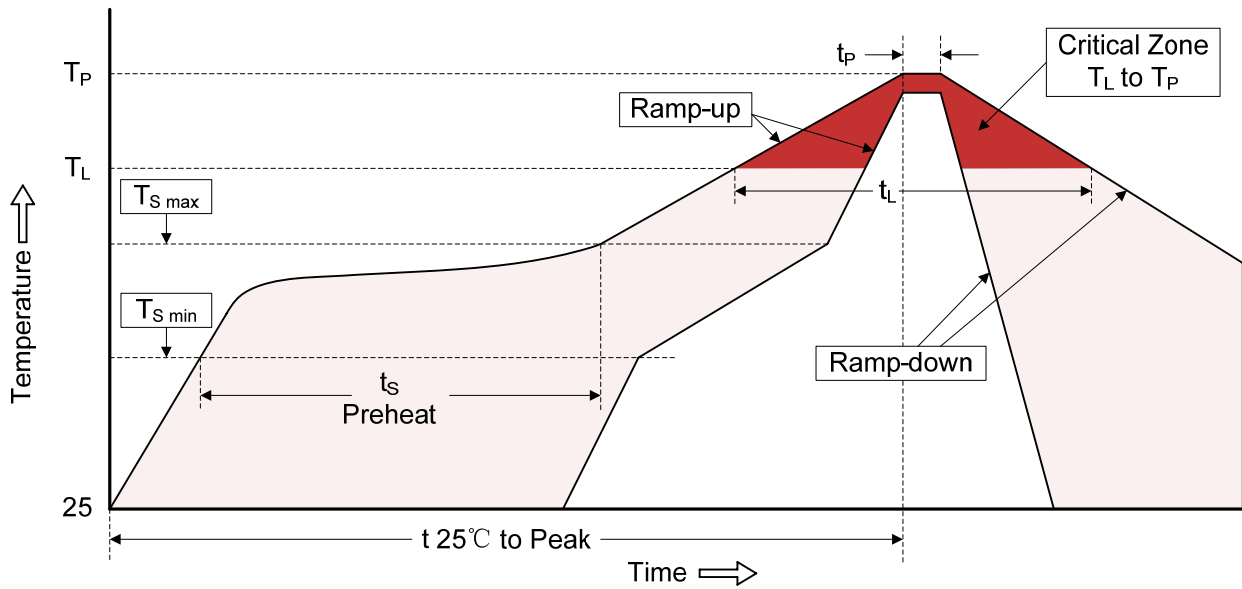


**Figure 6. Maximum Non-Repetitive Forward Surge Current Uni-Directional Only**



**Recommended Soldering Conditions**

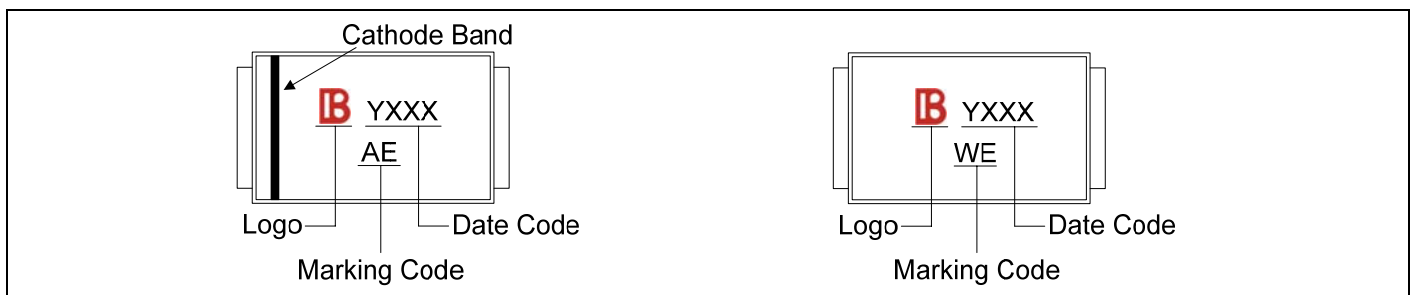
Reflow Soldering



Recommended Conditions

Profile Feature	Pb-Free Assembly
Average ramp-up rate ( $T_L$ to $T_P$ )	3°C/second max.
Preheat -Temperature Min ( $T_{S\ min}$ ) -Temperature Max ( $T_{S\ max}$ ) -Time (min to max) ( $t_s$ )	150°C 200°C 60-180 seconds
$T_{S\ max}$ to $T_L$ -Ramp-up Rate	3°C/second max.
Time maintained above: -Temperature ( $T_L$ ) -Time ( $t_L$ )	217°C 60-150 seconds
Peak Temperature ( $T_P$ )	260°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	8 minutes max.

**Marking Code**





**Packaging**

Tape	Symbol	Dimension (mm)
	W	12.00±0.20
	P0	4.00±0.10
	P1	4.00±0.10
	P2	2.00±0.10
	D0	Φ1.5±0.10
	D1	Φ1.5±0.10
	E	1.75±0.10
	F	5.50±0.05
	A0	2.79±0.10
	B0	5.33±0.10
	K0	2.55±0.15
	T	0.25±0.05
	7" Reel	D2
	D3	Φ50.0Min.
	D4	Φ13.0±0.5
	W1	16.0±2.0
	Quantity: 1000PCS	
13" Reel	D5	Φ330.0±2.0
	D6	Φ13.5±0.5
	H	2.5±1.0
	W2	16.0±2.0
	Quantity: 5000PCS	

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