

## Transient Voltage Suppressors (TVS) Data Sheet

### Features

- For surface mounted applications in order to optimize board space
- Low profile package
- Built-in strain relief
- Glass passivated junction
- Low inductance
- Excellent clamping capability
- 600W peak pulse power capability at 10/1000µs waveform, repetition rate (duty cycle): 0.01%
- Fast response time
- Typical  $I_R$  less than 1µA above 12V
- High Temperature soldering: 260°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
- AEC-Q101 qualified



### Mechanical Data

- Case: JEDEC DO-214AA. 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: 0.10g

### Applications

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

### Maximum Ratings and Characteristics

Ratings at 25°C ambient temperature unless otherwise specified.

Rating	Symbol	Value	Units
Peak pulse power dissipation at 10/1000µs waveform (Note1, Note2, Fig.1)	$P_{PPM}$	Minimum 600	Watts
Peak pulse current of at 10/1000µs waveform (Note 1, Fig.3)	$I_{PPM}$	See Table	Amps
Steady state power dissipation at $T_A=50^\circ\text{C}$ (Fig.5)	$P_{M(AV)}$	5.0	Watts
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load, (JEDEC Method) (Note3, Fig.6)	$I_{FSM}$	100	Amps
Operating junction and Storage Temperature Range.	$T_J, T_{STG}$	-55 to +150	°C
Typical thermal resistance junction to lead	$R_{\theta JL}$	20	°C/W
Typical thermal resistance junction to ambient	$R_{\theta JA}$	100	°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 5.0mmx5.0mm (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 (SMB/DO-214AA)**

Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
L	4.06	4.57	0.160	0.180
D	3.30	3.94	0.130	0.155
D1	1.95	2.20	0.077	0.086
T	5.21	5.59	0.205	0.220
T1	0.76	1.52	0.030	0.060
d	-	0.203	-	0.008
H	2.15	2.65	0.085	0.104
H1	2.13	2.47	0.084	0.097

**Electrical Characteristics (T<sub>A</sub>=25°C)**

Part Number		Device Marking Code		Reverse Stand-Off Voltage	Breakdown Voltage @ I <sub>T</sub>	Test Current	Maximum Clamping Voltage @ I <sub>PP</sub>	Peak Pulse Current	Reverse Leakage @ V <sub>RWM</sub>
Unidirectional	Bidirectional	UNI	BI	V <sub>RWM</sub> (V)	V <sub>BR</sub> (V)	I <sub>T</sub> (mA)	V <sub>C</sub> (V)	I <sub>PP</sub> (A)	I <sub>R</sub> (μA)
SMBJ5.0A-AT	SMBJ5.0CA-AT	KE	AE	5.0	6.40~7.00	10	9.2	65.3	800
SMBJ6.0A-AT	SMBJ6.0CA-AT	KG	AG	6.0	6.67~7.37	10	10.3	58.3	800
SMBJ6.5A-AT	SMBJ6.5CA-AT	KK	AK	6.5	7.22~7.98	10	11.2	53.6	500
SMBJ7.0A-AT	SMBJ7.0CA-AT	KM	AM	7.0	7.78~8.60	10	12.0	50.0	200
SMBJ7.5A-AT	SMBJ7.5CA-AT	KP	AP	7.5	8.33~9.21	1	12.9	46.6	100
SMBJ8.0A-AT	SMBJ8.0CA-AT	KR	AR	8.0	8.89~9.83	1	13.6	44.2	50
SMBJ8.5A-AT	SMBJ8.5CA-AT	KT	AT	8.5	9.44~10.40	1	14.4	41.7	20
SMBJ9.0A-AT	SMBJ9.0CA-AT	KV	AV	9.0	10.00~11.10	1	15.4	39.0	10
SMBJ10A-AT	SMBJ10CA-AT	KX	AX	10.0	11.10~12.30	1	17.0	35.3	5
SMBJ11A-AT	SMBJ11CA-AT	KZ	AZ	11.0	12.20~13.50	1	18.2	33.0	1
SMBJ12A-AT	SMBJ12CA-AT	LE	BE	12.0	13.30~14.70	1	19.9	30.2	1
SMBJ13A-AT	SMBJ13CA-AT	LG	BG	13.0	14.40~15.90	1	21.5	28.0	1
SMBJ14A-AT	SMBJ14CA-AT	LK	BK	14.0	15.60~17.20	1	23.2	25.9	1
SMBJ15A-AT	SMBJ15CA-AT	LM	BM	15.0	16.70~18.50	1	24.4	24.6	1
SMBJ16A-AT	SMBJ16CA-AT	LP	BP	16.0	17.80~19.70	1	26.0	23.1	1
SMBJ17A-AT	SMBJ17CA-AT	LR	BR	17.0	18.90~20.90	1	27.6	21.8	1
SMBJ18A-AT	SMBJ18CA-AT	LT	BT	18.0	20.00~22.10	1	29.2	20.6	1
SMBJ20A-AT	SMBJ20CA-AT	LV	BV	20.0	22.20~24.50	1	32.4	18.6	1
SMBJ22A-AT	SMBJ22CA-AT	LX	BX	22.0	24.40~26.90	1	35.5	16.9	1

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	$V_{RWM}(V)$	$V_{BR}(V)$	$I_T(mA)$	$V_C(V)$	$I_{PP}(A)$	$I_R(\mu A)$
SMBJ24A-AT	SMBJ24CA-AT	LZ	BZ	24.0	26.70~29.50	1	38.9	15.5	1
SMBJ26A-AT	SMBJ26CA-AT	ME	CE	26.0	28.90~31.90	1	42.1	14.3	1
SMBJ28A-AT	SMBJ28CA-AT	MG	CG	28.0	31.10~34.40	1	45.4	13.3	1
SMBJ30A-AT	SMBJ30CA-AT	MK	CK	30.0	33.30~36.80	1	48.4	12.4	1
SMBJ33A-AT	SMBJ33CA-AT	MM	CM	33.0	36.70~40.60	1	53.3	11.3	1
SMBJ36A-AT	SMBJ36CA-AT	MP	CP	36.0	40.00~44.20	1	58.1	10.4	1
SMBJ40A-AT	SMBJ40CA-AT	MR	CR	40.0	44.40~49.10	1	64.5	9.3	1
SMBJ43A-AT	SMBJ43CA-AT	MT	CT	43.0	47.80~52.80	1	69.4	8.7	1
SMBJ45A-AT	SMBJ45CA-AT	MV	CV	45.0	50.00~55.30	1	72.7	8.3	1
SMBJ48A-AT	SMBJ48CA-AT	MX	CX	48.0	53.30~58.90	1	77.4	7.8	1
SMBJ51A-AT	SMBJ51CA-AT	MZ	CZ	51.0	56.70~62.70	1	82.4	7.3	1
SMBJ54A-AT	SMBJ54CA-AT	NE	DE	54.0	60.00~66.30	1	87.1	6.9	1
SMBJ58A-AT	SMBJ58CA-AT	NG	DG	58.0	64.40~71.20	1	93.6	6.5	1
SMBJ60A-AT	SMBJ60CA-AT	NK	DK	60.0	66.70~73.70	1	96.8	6.2	1
SMBJ64A-AT	SMBJ64CA-AT	NM	DM	64.0	71.10~78.60	1	103.0	5.9	1
SMBJ70A-AT	SMBJ70CA-AT	NP	DP	70.0	77.80~86.00	1	113.0	5.3	1
SMBJ75A-AT	SMBJ75CA-AT	NR	DR	75.0	83.30~92.10	1	121.0	5.0	1
SMBJ78A-AT	SMBJ78CA-AT	NT	DT	78.0	86.70~95.80	1	126.0	4.8	1
SMBJ85A-AT	SMBJ85CA-AT	NV	DV	85.0	94.40~104.00	1	137.0	4.4	1
SMBJ90A-AT	SMBJ90CA-AT	NX	DX	90.0	100.00~111.00	1	146.0	4.1	1
SMBJ100A-AT	SMBJ100CA-AT	NZ	DZ	100.0	111.00~123.00	1	162.0	3.7	1
SMBJ110A-AT	SMBJ110CA-AT	PE	EE	110.0	122.00~135.00	1	177.0	3.4	1
SMBJ120A-AT	SMBJ120CA-AT	PG	EG	120.0	133.00~147.00	1	193.0	3.1	1
SMBJ130A-AT	SMBJ130CA-AT	PK	EK	130.0	144.00~159.00	1	209.0	2.9	1
SMBJ150A-AT	SMBJ150CA-AT	PM	EM	150.0	167.00~185.00	1	243.0	2.5	1
SMBJ160A-AT	SMBJ160CA-AT	PP	EP	160.0	178.00~197.00	1	259.0	2.3	1
SMBJ170A-AT	SMBJ170CA-AT	PR	ER	170.0	189.00~209.00	1	275.0	2.2	1
SMBJ180A-AT	SMBJ180CA-AT	PT	ET	180.0	201.00~222.00	1	292.0	2.1	1
SMBJ190A-AT	SMBJ190CA-AT	PA	EC	190.0	211.00~233.00	1	308.0	2.0	1
SMBJ200A-AT	SMBJ200CA-AT	PV	EV	200.0	224.00~247.00	1	324.0	1.9	1
SMBJ210A-AT	SMBJ210CA-AT	PB	ED	210.0	237.00~263.00	1	340.0	1.8	1
SMBJ220A-AT	SMBJ220CA-AT	PX	EX	220.0	246.00~272.00	1	356.0	1.7	1
SMBJ250A-AT	SMBJ250CA-AT	PZ	EZ	250.0	279.00~309.00	1	405.0	1.5	1

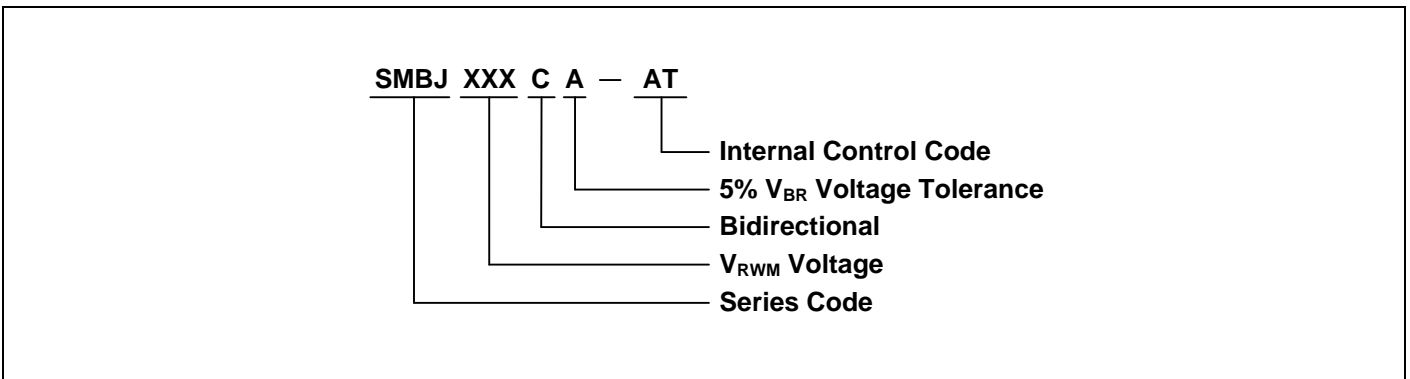
Part Number		Device Marking Code		Reverse Stand-Off Voltage	Breakdown Voltage @ $I_T$	Test Current	Maximum Clamping Voltage @ $I_{PP}$	Peak Pulse Current	Reverse Leakage @ $V_{RWM}$
Unidirectional	Bidirectional	UNI	BI	$V_{RWM}(V)$	$V_{BR}(V)$	$I_T(mA)$	$V_C(V)$	$I_{PP}(A)$	$I_R(\mu A)$
SMBJ300A-AT	SMBJ300CA-AT	QE	FE	300.0	335.00~371.00	1	486.0	1.3	1
SMBJ350A-AT	SMBJ350CA-AT	QG	FG	350.0	391.00~432.00	1	567.0	1.1	1
SMBJ400A-AT	SMBJ400CA-AT	QK	FK	400.0	447.00~494.00	1	648.0	0.9	1
SMBJ440A-AT	SMBJ440CA-AT	QM	FM	440.0	492.00~543.00	1	713.0	0.9	1

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

### Marking Code

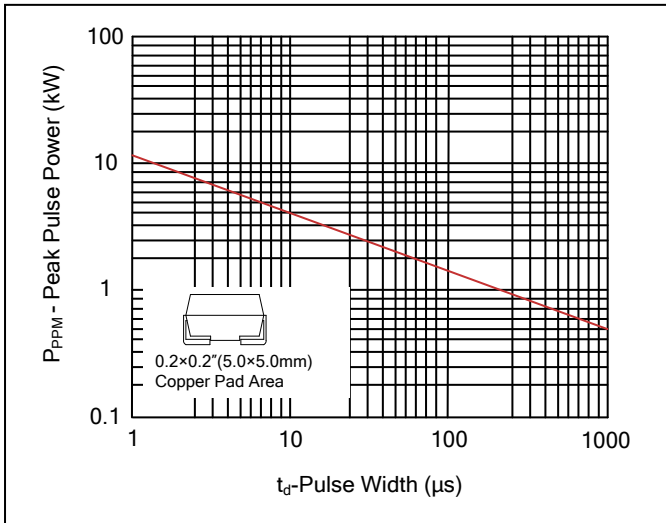


### Part Number Code

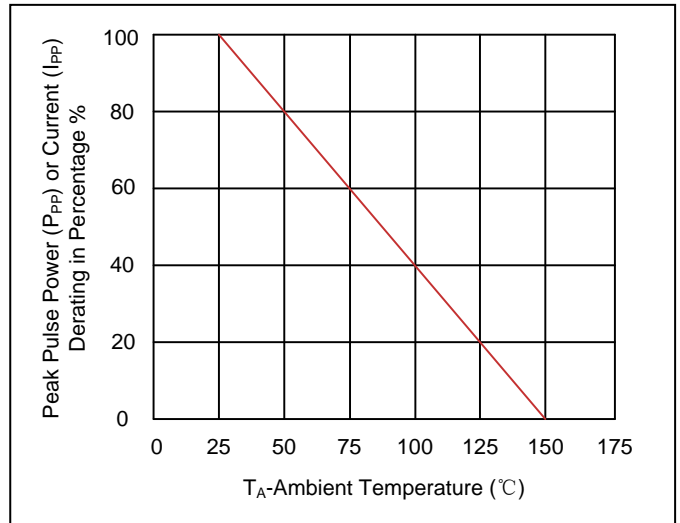


**Ratings and Characteristic Curves ( $T_A=25^\circ\text{C}$  unless otherwise noted)**

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



**Figure 2. Pulse Derating Curve**



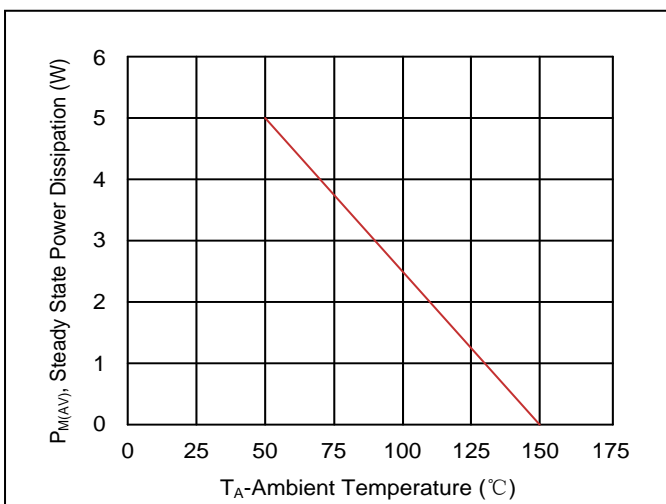
**Figure 3. Pulse Waveform**



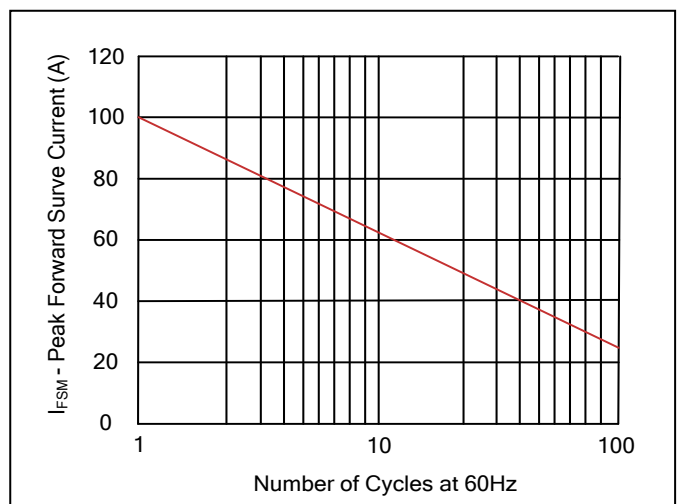
**Figure 4. Typical Junction Capacitance**



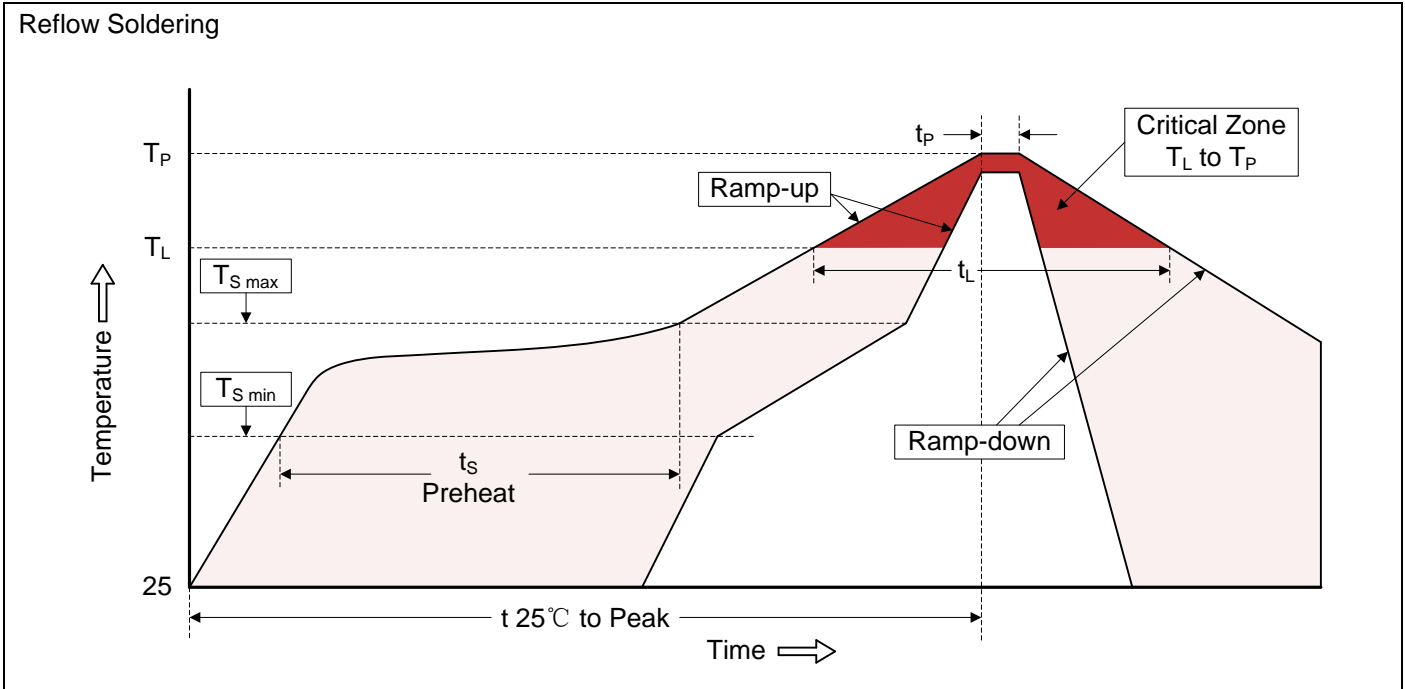
**Figure 5. Steady State Power Dissipation Derating Curve**



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



**Recommended Soldering Conditions**



Recommended Conditions

Profile Feature	Pb-Free Assembly
Average ramp-up rate (T <sub>L</sub> to T <sub>P</sub> )	3°C/second max.
Preheat -Temperature Min (T <sub>S min</sub> ) -Temperature Max (T <sub>S max</sub> ) -Time (min to max) (t <sub>s</sub> )	150°C 200°C 60-180 seconds
T <sub>S max</sub> to T <sub>L</sub> -Ramp-up Rate	3°C/second max.
Time maintained above: -Temperature (T <sub>L</sub> ) -Time (t <sub>L</sub> )	217°C 60-150 seconds
Peak Temperature (T <sub>P</sub> )	260°C
Time within 5°C of actual Peak Temperature (t <sub>p</sub> )	20-40 seconds
Ramp-down Rate	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.

### Ordering Code for Different Package

7 inch reel package: Add suffix "/TR7" at the end of the part number, such as SMBJ15A-AT/TR7

13 inch reel package: Add suffix "/TR13" at the end of the part number, such as SMBJ40CA-AT/TR13

### Packaging

Tape		Symbol	Dimension (mm)
		W	12.00±0.20
		P0	4.00±0.10
		P1	8.00±0.10
		P2	2.00±0.10
		D0	Φ1.55±0.10
		D1	Φ1.5±0.10
		E	1.75±0.10
		F	5.50±0.10
		A0	3.86±0.15
		B0	5.65±0.10
		K0	2.75±0.15
		T	0.25±0.05
		D2	Φ178.0±2.0
		D3	Φ50.0Min.
		D4	Φ13.0±0.5
		W1	16.0±2.0
Quantity: 500PCS			
		D5	Φ330.0±2.0
		D6	Φ13.5±0.5
		H	2.5±1.0
		W2	16.0±2.0
		Quantity: 3000PCS	

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