

## 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
- 3000W peak pulse power capability at 10/1000 $\mu$ s waveform, repetition rate (duty cycle): 0.01%
- Fast response time
- Typical  $I_R$  less than 2 $\mu$ 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
- AEC-Q101 qualified



### Mechanical Data

- Case: JEDEC DO-214AB. 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: 16mm tape (EIA STD RS-481)
- Weight: 0.26g

### 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 3000	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)	$P_{M(AV)}$	6.5	Watts
Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load, (JEDEC Method) (Note3, Fig.6)	$I_{FSM}$	300	Amps
Operating junction and Storage Temperature Range.	$T_J, T_{STG}$	-55 to +150	$^{\circ}$ C
Typical thermal resistance junction to lead	$R_{\theta JL}$	15	$^{\circ}$ C/W
Typical thermal resistance junction to ambient	$R_{\theta JA}$	75	$^{\circ}$ 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 8.0mm $\times$ 8.0mm copper pads to each terminal.

3. 8.3ms single half sine-wave, or equivalent square wave, duty cycle=4 pulses per minutes maximum.

**Dimensions (SMC/DO-214AB)**

Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
L	6.60	7.11	0.260	0.280
D	5.59	6.22	0.220	0.245
D1	2.90	3.20	0.114	0.126
T	7.75	8.13	0.305	0.320
T1	0.76	1.52	0.030	0.060
d	-	0.203	-	0.008
H	2.20	2.80	0.087	0.110
H1	2.06	2.62	0.079	0.103

**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)
SMDJ5.0A-AT	SMDJ5.0CA-AT	RDE	DDE	5.0	6.40~7.00	10	9.2	326.1	800
SMDJ6.0A-AT	SMDJ6.0CA-AT	RDG	DDG	6.0	6.67~7.37	10	10.3	291.3	800
SMDJ6.5A-AT	SMDJ6.5CA-AT	RDK	DDK	6.5	7.22~7.98	10	11.2	267.9	500
SMDJ7.0A-AT	SMDJ7.0CA-AT	PDM	DDM	7.0	7.78~8.60	10	12.0	250.0	200
SMDJ7.5A-AT	SMDJ7.5CA-AT	PDP	DDP	7.5	8.33~9.21	1	12.9	232.6	100
SMDJ8.0A-AT	SMDJ8.0CA-AT	PDR	DDR	8.0	8.89~9.83	1	13.6	220.6	50
SMDJ8.5A-AT	SMDJ8.5CA-AT	PDT	DDT	8.5	9.44~10.40	1	14.4	208.3	20
SMDJ9.0A-AT	SMDJ9.0CA-AT	PDV	DDV	9.0	10.00~11.10	1	15.4	194.8	10
SMDJ10A-AT	SMDJ10CA-AT	PDX	DDX	10.0	11.10~12.30	1	17.0	176.5	5
SMDJ11A-AT	SMDJ11CA-AT	PDZ	DDZ	11.0	12.20~13.50	1	18.2	164.8	2
SMDJ12A-AT	SMDJ12CA-AT	PEE	DEE	12.0	13.30~14.70	1	19.9	150.8	2
SMDJ13A-AT	SMDJ13CA-AT	PEG	DEG	13.0	14.40~15.90	1	21.5	139.5	2
SMDJ14A-AT	SMDJ14CA-AT	PEK	DEK	14.0	15.60~17.20	1	23.2	129.3	2
SMDJ15A-AT	SMDJ15CA-AT	PEM	DEM	15.0	16.70~18.50	1	24.4	123.0	2
SMDJ16A-AT	SMDJ16CA-AT	PEP	DEP	16.0	17.80~19.70	1	26.0	115.4	2
SMDJ17A-AT	SMDJ17CA-AT	PER	DER	17.0	18.90~20.90	1	27.6	108.7	2
SMDJ18A-AT	SMDJ18CA-AT	PET	DET	18.0	20.00~22.10	1	29.2	102.7	2
SMDJ20A-AT	SMDJ20CA-AT	PEV	DEV	20.0	22.20~24.50	1	32.4	92.6	2
SMDJ22A-AT	SMDJ22CA-AT	PEX	DEX	22.0	24.40~26.90	1	35.5	84.5	2

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)
SMDJ24A-AT	SMDJ24CA-AT	PEZ	DEZ	24.0	26.70~29.50	1	38.9	77.1	2
SMDJ26A-AT	SMDJ26CA-AT	PFE	DFE	26.0	28.90~31.90	1	42.1	71.3	2
SMDJ28A-AT	SMDJ28CA-AT	PFG	DFG	28.0	31.10~34.40	1	45.4	66.1	2
SMDJ30A-AT	SMDJ30CA-AT	PFK	DFK	30.0	33.30~36.80	1	48.4	62.0	2
SMDJ33A-AT	SMDJ33CA-AT	PFM	DFM	33.0	36.70~40.60	1	53.3	56.3	2
SMDJ36A-AT	SMDJ36CA-AT	PFP	DFP	36.0	40.00~44.20	1	58.1	51.6	2
SMDJ40A-AT	SMDJ40CA-AT	PFR	DFR	40.0	44.40~49.10	1	64.5	46.5	2
SMDJ43A-AT	SMDJ43CA-AT	PFT	DFT	43.0	47.80~52.80	1	69.4	43.2	2
SMDJ45A-AT	SMDJ45CA-AT	PFV	DFV	45.0	50.00~55.30	1	72.7	41.3	2
SMDJ48A-AT	SMDJ48CA-AT	PFX	DFX	48.0	53.30~58.90	1	77.4	38.8	2
SMDJ51A-AT	SMDJ51CA-AT	PFZ	DFZ	51.0	56.70~62.70	1	82.4	36.4	2
SMDJ54A-AT	SMDJ54CA-AT	PGE	DGE	54.0	60.00~66.30	1	87.1	34.4	2
SMDJ58A-AT	SMDJ58CA-AT	PGG	DGG	58.0	64.40~71.20	1	93.6	32.1	2
SMDJ60A-AT	SMDJ60CA-AT	PGK	DGK	60.0	66.70~73.70	1	96.8	31.0	2
SMDJ64A-AT	SMDJ64CA-AT	PGM	DGM	64.0	71.10~78.60	1	103.0	29.1	2
SMDJ70A-AT	SMDJ70CA-AT	PGP	DGP	70.0	77.80~86.00	1	113.0	26.5	2
SMDJ75A-AT	SMDJ75CA-AT	PGR	DGR	75.0	83.30~92.10	1	121.0	24.8	2
SMDJ78A-AT	SMDJ78CA-AT	PGT	DGT	78.0	86.70~95.80	1	126.0	23.8	2
SMDJ85A-AT	SMDJ85CA-AT	PGV	DGV	85.0	94.40~104.00	1	137.0	21.9	2
SMDJ90A-AT	SMDJ90CA-AT	PGX	DGX	90.0	100.00~111.00	1	146.0	20.5	2
SMDJ100A-AT	SMDJ100CA-AT	PGZ	DGZ	100.0	111.00~123.00	1	162.0	18.5	2
SMDJ110A-AT	SMDJ110CA-AT	PHE	DHE	110.0	122.00~135.00	1	177.0	16.9	2
SMDJ120A-AT	SMDJ120CA-AT	PHG	DHG	120.0	133.00~147.00	1	193.0	15.5	2
SMDJ130A-AT	SMDJ130CA-AT	PHK	DHK	130.0	144.00~159.00	1	209.0	14.4	2
SMDJ150A-AT	SMDJ150CA-AT	PHM	DHM	150.0	167.00~185.00	1	243.0	12.3	2
SMDJ160A-AT	SMDJ160CA-AT	PHP	DHP	160.0	178.00~197.00	1	259.0	11.6	2
SMDJ170A-AT	SMDJ170CA-AT	PHR	DHR	170.0	189.00~209.00	1	275.0	10.9	2
SMDJ180A-AT	SMDJ180CA-AT	HHT	IHT	180.0	201.00~222.00	1	292.0	10.3	2
SMDJ190A-AT	SMDJ190CA-AT	HHV	IHV	190.0	211.00~233.00	1	308.0	9.7	2
SMDJ200A-AT	SMDJ200CA-AT	HHX	IHX	200.0	224.00~247.00	1	324.0	9.3	2
SMDJ210A-AT	SMDJ210CA-AT	HHZ	IHZ	210.0	237.00~263.00	1	340.0	8.8	2
SMDJ220A-AT	SMDJ220CA-AT	HIE	IIE	220.0	246.00~272.00	1	356.0	8.4	2

Notes: For bidirectional type having V<sub>RWM</sub> of 10V and less, the I<sub>R</sub> limit is double.

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

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



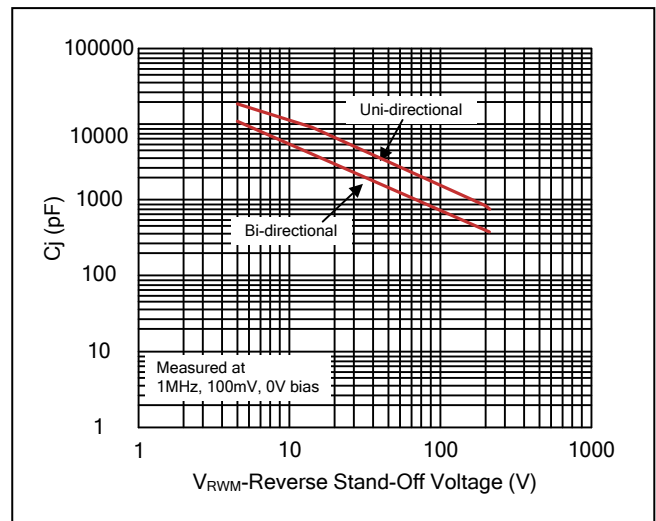
**Figure 2. Pulse Derating Curve**



**Figure 3. Pulse Waveform**



**Figure 4. Typical Junction Capacitance**



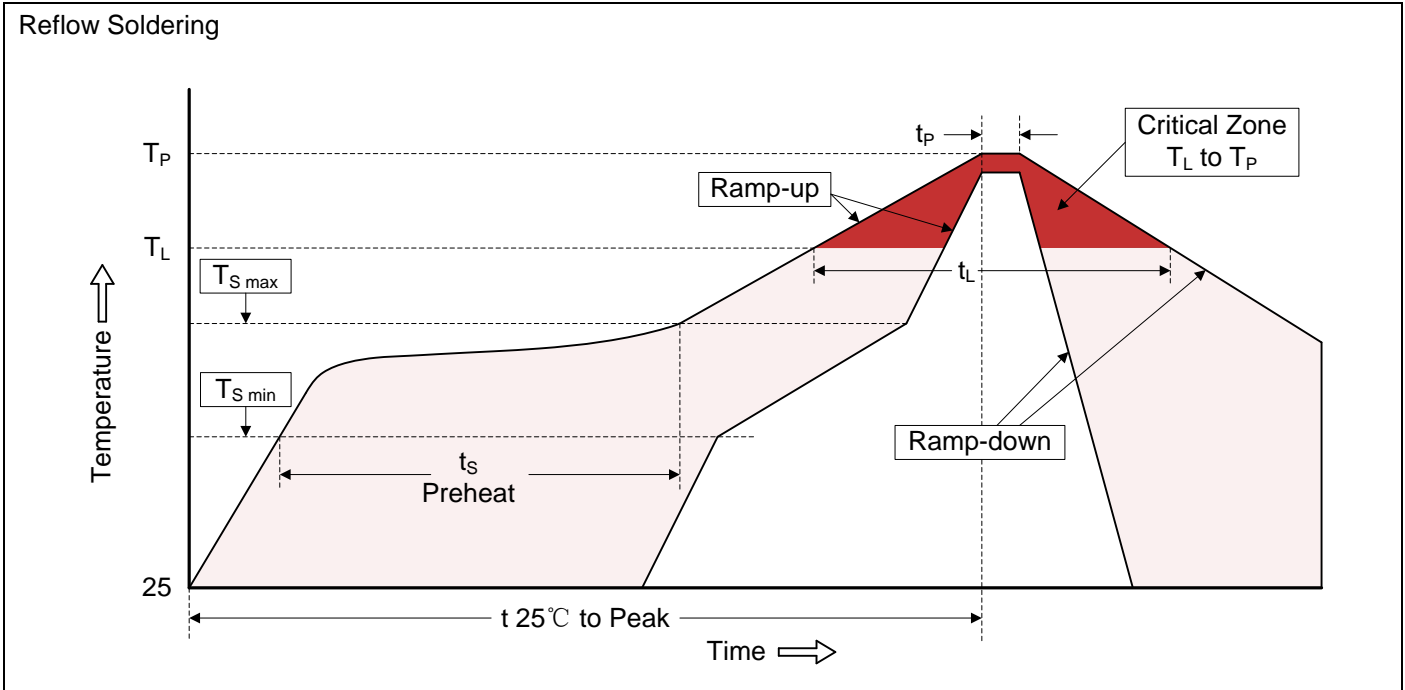
**Figure 5. Steady State Power Dissipation Derating Curve**



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



**Recommended Soldering Conditions**



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**



**Part Number Code**



**Ordering Code for Different Package**

7 inch reel package: Add suffix “/TR7” at the end of the part number, such as SMDJ5.0A-AT/TR7

13 inch reel package: Add suffix “/TR13” at the end of the part number, such as SMDJ120CA-AT/TR13

**Packaging**

Tape		Symbol	Dimension (mm)		
		W	16.00±0.20		
		P0	4.00±0.10		
		P1	8.00±0.10		
		P2	2.00±0.10		
		D0	Φ1.5 ±0.10		
		D1	Φ1.5 ±0.10		
		E	1.75±0.10		
		F	7.50±0.10		
		A0	6.27±0.15		
		B0	8.30±0.10		
		K0	3.15±0.15		
		T	0.30±0.05		
		7" Reel		D2	Φ178.0±2.0
				D3	Φ50.0Min.
				D4	Φ13.0±0.5
W1	20.0 ±2.0				
Quantity: 500PCS					
13" Reel		D5	Φ330.0±2.0		
		D6	Φ13.5±0.5		
		H	2.5±1.0		
		W2	20.0±2.0		
		Quantity: 3000PCS			

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