



**THE DATASHEET OF**  
**5.0SMDJ51CA**



# 5.0SMDJ Series

## Surface Mount – 5000W



### Additional Information



Resources



Accessories



Samples

### Agency Approvals

Agency	Agency File Number
	E230531

### Maximum Ratings and Thermal Characteristics

( $T_A=25^{\circ}\text{C}$  unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation at $T_L=25^{\circ}\text{C}$ by 10/1000 $\mu\text{s}$ Waveform (Fig.2)(Note 1), (Note 2)	$P_{\text{PPM}}$	5000	W
Power Dissipation on Infinite Heat Sink at $T_L=50^{\circ}\text{C}$	$P_D$	6.5	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	$I_{\text{FSM}}$	300	A
Maximum Instantaneous Forward Voltage at 100A for Unidirectional Only	$V_F$	5.0	V
Operating Temperature Range	$T_J$	-65 to 150	$^{\circ}\text{C}$
Storage Temperature Range	$T_{\text{STG}}$	-65 to 175	$^{\circ}\text{C}$
Typical Thermal Resistance Junction to Lead	$R_{\theta\text{JL}}$	15	$^{\circ}\text{C/W}$
Typical Thermal Resistance Junction to Ambient	$R_{\theta\text{JA}}$	75	$^{\circ}\text{C/W}$

#### Notes:

- Non-repetitive current pulse, per Fig. 4 and derated above  $T_J$  (initial) =  $25^{\circ}\text{C}$  per Fig. 3.
- Mounted on copper pad area of 0.31x0.31" (8.0 x 8.0mm) to each terminal.
- Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional component only, duty cycle = 4 per minute maximum.

### Description

The 5.0SMDJ series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

### Features & Benefits

- 5000W peak pulse power capability at 10/1000 $\mu\text{s}$  waveform, repetition rate (duty cycles):0.01%
- SMD low profile surface mount package minimizing PCB footprint
- Typical failure mode is short from over-specified voltage or current
- Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- IEC 61000-4-2 ESD 30kV(Air), 30kV (Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2
- EFT protection of data lines in accordance with IEC 61000-4-4
- Built-in strain relief
- Glass passivated chip junction
- Fast response time: typically less than 1.0ps from 0V to BV min
- Excellent clamping capability
- Low incremental surge resistance
- Typical IR less than 5 $\mu\text{A}$  when  $V_{\text{BR min}} > 22\text{V}$
- High temperature to reflow soldering guaranteed: 260 $^{\circ}\text{C}/40\text{sec}$
- $V_{\text{BR}} @ T_J = V_{\text{BR}} @ 25^{\circ}\text{C} \times (1 + \alpha T \times (T_J - 25))$  ( $\alpha T$ : Temperature Coefficient,)
- UL Recognized compound meeting flammability rating V-0
- Meet MSL level1, per J-STD-020, LF maximum peak of 260 $^{\circ}\text{C}$
- Matte tin lead-free plated
- Halogen free and RoHS compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)
- Recognized to UL 497B as an Isolated Loop Circuit Protector

### Applications

TVS devices are ideal for the protection of I/O Interfaces, VCC bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

#### Functional Diagram



Bi-directional



Uni-directional

# 5.0SMDJ Series

## Surface Mount – 5000W

### Electrical Characteristics ( $T_A=25^\circ\text{C}$ unless otherwise noted)

Part Number (Uni)	Part Number (Bi)	Marking		Reverse Stand off Voltage $V_R$ (Volts)	Breakdown Voltage $V_{BR}$ (Volts) @ $I_T$		Test Current $I_T$ (mA)	Maximum Clamping Voltage $V_C @ I_{PP}$ (10/1000 $\mu\text{s}$ ) (V)	Maximum Peak Pulse Current $I_{PP}$ (10/1000 $\mu\text{s}$ ) (A)	Maximum Clamping Voltage $V_C @ I_{PP}$ (8/20 $\mu\text{s}$ ) (V)	Maximum Peak Pulse Current $I_{PP}$ (8/20 $\mu\text{s}$ ) (A)	Maximum Reverse Leakage $I_R @ V_R$ ( $\mu\text{A}$ )	Maximum Temperature Coefficient of $V_{BR}$ (%/C)	Agency Approval 
		Uni	Bi		Min.	Max.								
5.0SMDJ12A	5.0SMDJ12CA	5PEP	5BEP	12.0	13.3	14.7	10	19.9	252.0	25.7	1890.0	800	0.075	X
5.0SMDJ13A	5.0SMDJ13CA	5PEQ	5BEQ	13.0	14.4	15.9	10	21.5	233.0	27.8	1747.5	500	0.076	X
5.0SMDJ14A	5.0SMDJ14CA	5PER	5BER	14.0	15.6	17.2	10	23.2	216.0	30.0	1620.0	200	0.08	X
5.0SMDJ15A	5.0SMDJ15CA	5PES	5BES	15.0	16.7	18.5	1	24.4	205.0	31.5	1537.5	100	0.083	X
5.0SMDJ16A	5.0SMDJ16CA	5PET	5BET	16.0	17.8	19.7	1	26.0	193.0	33.6	1447.5	50	0.084	X
5.0SMDJ17A	5.0SMDJ17CA	5PEU	5BEU	17.0	18.9	20.9	1	27.6	181.0	35.7	1357.5	20	0.085	X
5.0SMDJ18A	5.0SMDJ18CA	5PEV	5BEV	18.0	20.0	22.1	1	29.2	172.0	37.7	1290.0	10	0.088	X
5.0SMDJ20A	5.0SMDJ20CA	5PEW	5BEW	20.0	22.2	24.5	1	32.4	155.0	41.9	850.0	5	0.091	X
5.0SMDJ22A	5.0SMDJ22CA	5PEX	5BEX	22.0	24.4	26.9	1	35.5	141.0	45.9	1057.5	5	0.092	X
5.0SMDJ24A	5.0SMDJ24CA	5PEZ	5BEZ	24.0	26.7	29.5	1	38.9	129.0	50.3	967.5	5	0.092	X
5.0SMDJ26A	5.0SMDJ26CA	5PFE	5BFE	26.0	28.9	31.9	1	42.1	119.0	54.4	892.5	5	0.093	X
5.0SMDJ28A	5.0SMDJ28CA	5PFG	5BFG	28.0	31.1	34.4	1	45.4	110.0	58.7	825.0	5	0.094	X
5.0SMDJ30A	5.0SMDJ30CA	5PFK	5BFK	30.0	33.3	36.8	1	48.4	103.0	62.5	772.5	5	0.096	X
5.0SMDJ33A	5.0SMDJ33CA	5PFM	5BFM	33.0	36.7	40.6	1	53.3	93.9	68.9	704.3	5	0.097	X
5.0SMDJ36A	5.0SMDJ36CA	5PFP	5BFP	36.0	40.0	44.2	1	58.1	86.1	75.1	645.8	5	0.098	X
5.0SMDJ40A	5.0SMDJ40CA	5PFR	5BFR	40.0	44.4	49.1	1	64.5	77.6	83.3	582.0	5	0.099	X
5.0SMDJ43A	5.0SMDJ43CA	5PFT	5BFT	43.0	47.8	52.8	1	69.4	72.1	89.7	540.8	5	0.1	X
5.0SMDJ45A	5.0SMDJ45CA	5PFV	5BFV	45.0	50.0	55.3	1	72.7	68.8	93.9	516.0	5	0.101	X
5.0SMDJ48A	5.0SMDJ48CA	5PFX	5BFX	48.0	53.3	58.9	1	77.4	64.7	100.0	485.3	5	0.101	X
5.0SMDJ51A	5.0SMDJ51CA	5PFZ	5BFZ	51.0	56.7	62.7	1	82.4	60.7	106.5	455.3	5	0.101	X
5.0SMDJ54A	5.0SMDJ54CA	5PGE	5BGE	54.0	60.0	66.3	1	87.1	57.5	112.5	431.3	5	0.102	X
5.0SMDJ58A	5.0SMDJ58CA	5PGG	5BGG	58.0	64.4	71.2	1	93.6	53.5	120.9	401.3	5	0.103	X
5.0SMDJ60A	5.0SMDJ60CA	5PGK	5BGK	60.0	66.7	73.7	1	96.8	51.7	125.1	387.8	5	0.103	X
5.0SMDJ64A	5.0SMDJ64CA	5PGM	5BGM	64.0	71.1	78.6	1	103.0	48.6	133.1	364.5	5	0.104	X
5.0SMDJ70A	5.0SMDJ70CA	5PGP	5BGP	70.0	77.8	86.0	1	113.0	44.3	146.0	332.3	5	0.105	X
5.0SMDJ75A	5.0SMDJ75CA	5PGR	5BGR	75.0	83.3	92.1	1	121.0	41.4	156.3	310.5	5	0.106	X
5.0SMDJ78A	5.0SMDJ78CA	5PGT	5BGT	78.0	86.7	95.8	1	126.0	39.7	162.8	297.8	5	0.106	X
5.0SMDJ85A	5.0SMDJ85CA	5PGV	5BGV	85.0	94.4	104.0	1	137.0	36.5	177.0	273.8	5	0.106	X
5.0SMDJ90A	5.0SMDJ90CA	5PGX	5BGX	90.0	100.0	111.0	1	146.0	34.3	188.6	257.3	5	0.107	X
5.0SMDJ100A	5.0SMDJ100CA	5PGZ	5BGZ	100.0	111.0	123.0	1	162.0	30.9	209.3	231.8	5	0.107	X
5.0SMDJ110A	5.0SMDJ110CA	5PHE	5BHE	110.0	122.0	135.0	1	177.0	28.3	228.7	212.3	5	0.107	X
5.0SMDJ120A	5.0SMDJ120CA	5PHG	5BHG	120.0	133.0	147.0	1	193.0	26.0	249.4	195.0	5	0.108	X
5.0SMDJ130A	5.0SMDJ130CA	5PHK	5BHK	130.0	144.0	159.0	1	209.0	24.0	270.0	180.0	5	0.108	X
5.0SMDJ140A	5.0SMDJ140CA	5PHL	5BHL	140.0	156.0	172.0	1	226.1	22.2	292.1	166.5	5	0.108	X
5.0SMDJ150A	5.0SMDJ150CA	5PHM	5BHM	150.0	167.0	185.0	1	243.0	20.6	314.0	154.5	5	0.108	X
5.0SMDJ160A	5.0SMDJ160CA	5PHP	5BHB	160.0	178.0	197.0	1	259.0	19.3	334.6	144.8	5	0.108	X
5.0SMDJ170A	5.0SMDJ170CA	5PHR	5BHR	170.0	189.0	209.0	1	275.0	18.2	355.3	136.5	5	0.108	X

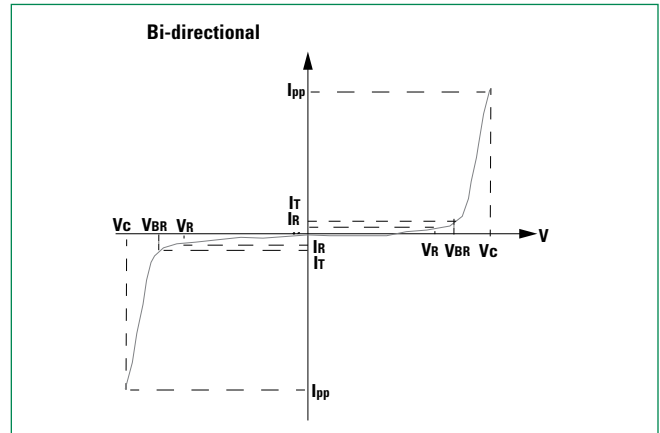
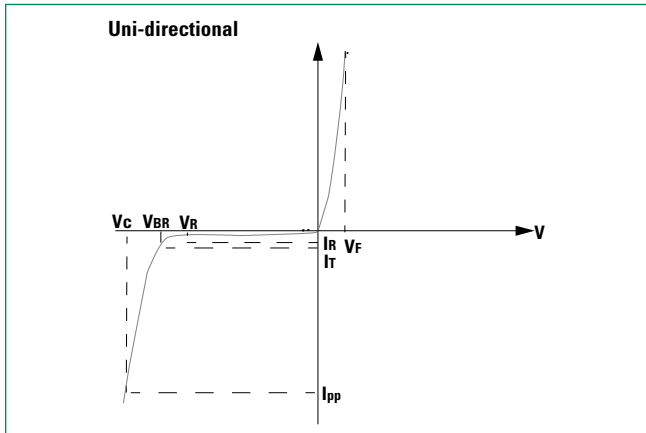
For bidirectional type having  $V_R$  of 20 volts and less, the  $I_R$  limit is double.

For parts without A, the  $V_{BR}$  is  $\pm 10\%$  and  $V_C$  is 5% higher than with A parts, the parts without A are currently available, but not recommended for new designs. The parts with A are preferred.

# 5.0SMDJ Series

## Surface Mount – 5000W

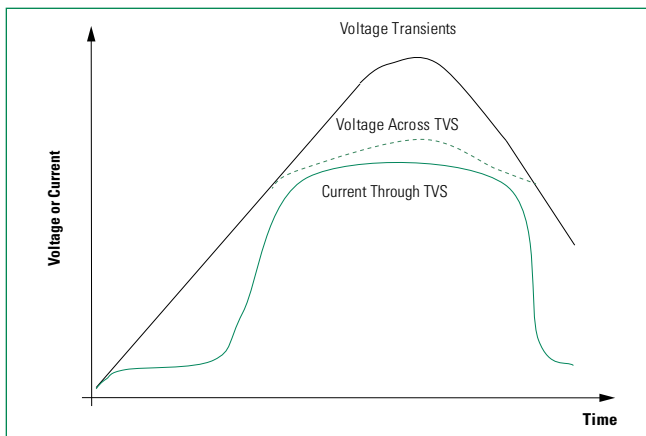
### I-V Curve Characteristics



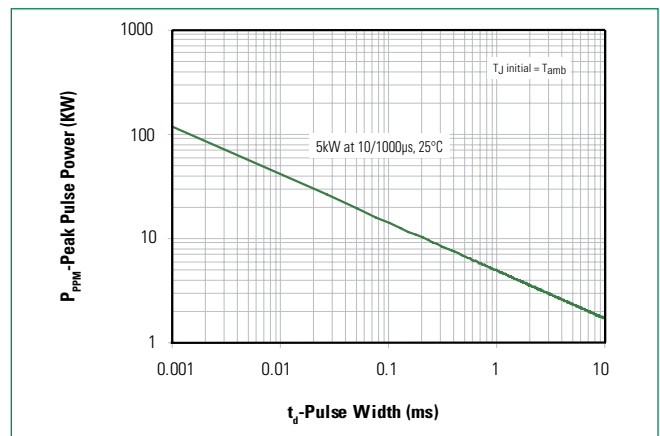
- $P_{PPM}$  Peak Pulse Power Dissipation** – Max power dissipation
- $V_R$  Stand-off Voltage** – Maximum voltage that can be applied to the TVS without operation
- $V_{BR}$  Breakdown Voltage** – Maximum voltage that flows through the TVS at a specified test current ( $I_R$ )
- $V_C$  Clamping Voltage** – Peak voltage measured across the TVS at a specified  $I_{ppm}$  (peak impulse current)
- $I_R$  Reverse Leakage Current** – Current measured at  $V_R$
- $V_F$  Forward Voltage Drop for Uni-directional**

### Ratings and Characteristic Curves ( $T_A=25^\circ C$ unless otherwise noted)

**Figure 1:**  
TVS Transients Clamping Waveform



**Figure 2:**  
Peak Pulse Power Rating

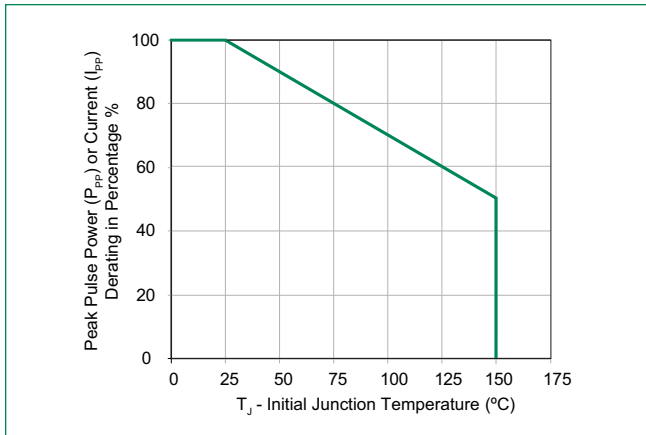


# 5.0SMDJ Series

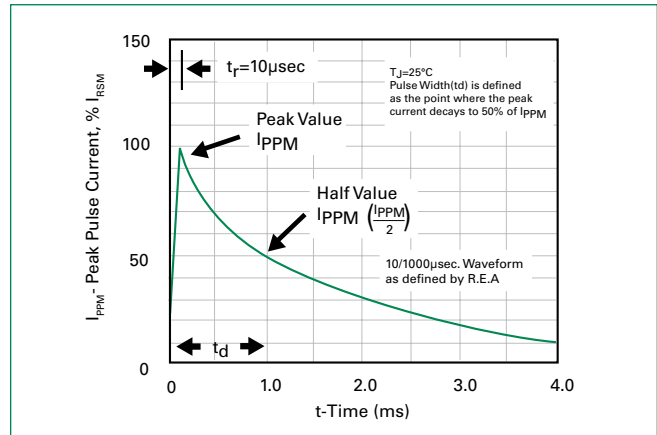
## Surface Mount – 5000W

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

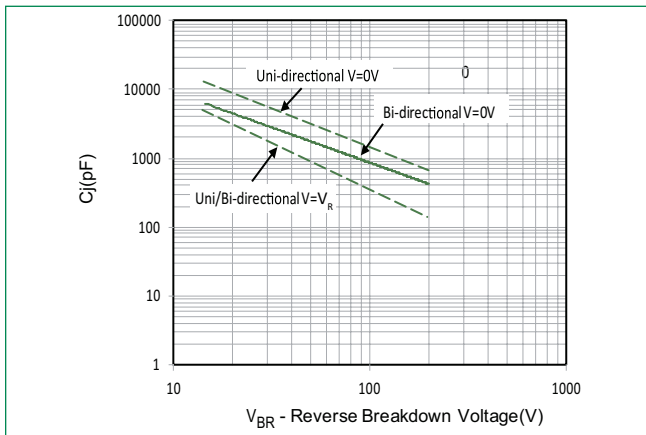
**Figure 3:**  
Peak Pulse Power Derating Curve



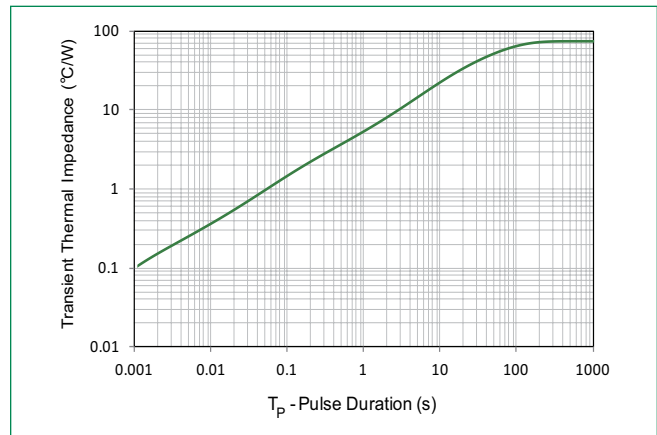
**Figure 4:**  
Pulse Waveform



**Figure 5:**  
Typical Junction Capacitance



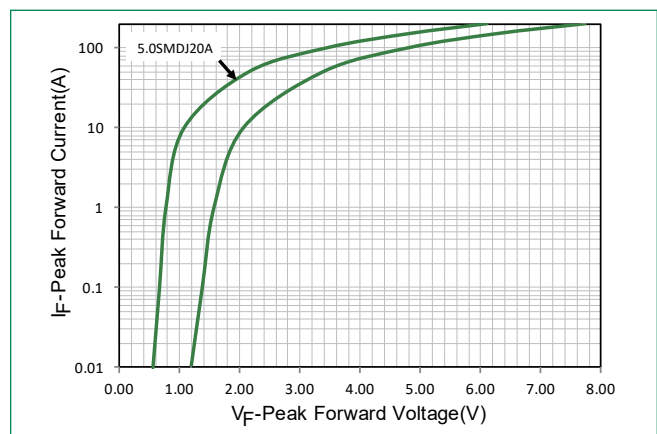
**Figure 6:**  
Typical Transient Thermal Impedance



**Figure 7:**  
Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only



**Figure 8:**  
Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)



# 5.0SMDJ Series

## Surface Mount – 5000W

### Soldering Parameters

<b>Reflow Condition</b>	Lead-free assembly	
<b>Pre Heat</b>	- Temperature Min ( $T_{s(min)}$ )	150°C
	- Temperature Max ( $T_{s(max)}$ )	200°C
	- Time (min to max) ( $t_s$ )	60 – 180 secs
<b>Average ramp up rate (Liquidus Temp (<math>T_L</math>) to peak)</b>	3°C/second max	
<b><math>T_{s(max)}</math> to <math>T_A</math> - Ramp-up Rate</b>	3°C/second max	
<b>Reflow</b>	- Temperature ( $T_L$ ) (Liquidus)	217°C
	- Time (min to max) ( $t_L$ )	60 – 150 seconds
<b>Peak Temperature (<math>T_p</math>)</b>	260 <sup>+0/-5</sup> °C	
<b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>	20 – 40 seconds	
<b>Ramp-down Rate</b>	6°C/second max	
<b>Time 25°C to peak Temperature (<math>T_p</math>)</b>	8 minutes Max.	
<b>Do not exceed</b>	280°C	



### Physical Specifications

<b>Weight</b>	0.007 ounce, 0.21 grams
<b>Case</b>	JEDEC DO214AB. Molded component over glass passivated junction
<b>Polarity</b>	Color band denotes positive end (cathode) except Bidirectional.
<b>Terminal</b>	Matte Tin-plated leads, Solderable per JESD22-B102

### Environmental Specifications

<b>High Temp. Storage</b>	JESD22-A103
<b>HTRB</b>	JESD22-A108
<b>Temperature Cycling</b>	JESD22-A104
<b>MSL</b>	JEDEC-J-STD-020, Level 1
<b>H3TRB</b>	JESD22-A101
<b>RSH</b>	JESD22-A111

### Dimensions



Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
<b>A</b>	0.114	0.126	2.900	3.200
<b>B</b>	0.260	0.280	6.600	7.110
<b>C</b>	0.220	0.245	5.590	6.220
<b>D</b>	0.079	0.103	2.060	2.620
<b>E</b>	0.030	0.060	0.760	1.520
<b>F</b>	-	0.008	-	0.203
<b>G</b>	0.305	0.320	7.750	8.130
<b>H</b>	0.006	0.012	0.152	0.305
<b>I</b>	0.129	-	3.300	-
<b>J</b>	0.094	-	2.400	-
<b>K</b>	-	0.165	-	4.200
<b>L</b>	0.094	-	2.400	-

# 5.0SMDJ Series

## Surface Mount – 5000W

### Part Numbering System



### Part Marking System



### Packaging Options

Part number	Component Package	Quantity	Packaging Option	Packaging Specification
5.0SMDJxxxXX	DO-214AB	3000	Tape & Reel - 16mm tape/13" reel	EIA STD RS-481
5.0SMDJxxxXX-T7	DO-214AB	500	Tape & Reel - 16mm tape/7" reel	EIA STD RS-481

### Tape and Reel Specification



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