

# Transient Voltage Suppressors

**SMBJ Series**

## Transient Voltage Suppressors - SMBJ Series

### Features

- Very fast response time
- Halogen free and RoHS compliant
- Low incremental surge resistance
- Optimized for LAN protection applications
- Matte tin lead-free Plated
- Halogen free and RoHS compliant
- Typical  $I_R$  less than  $1\mu A$  above 12V
- For surface mounted applications to optimize board space
- ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)
- 600W peak pulse power capability with at 10/1000 $\mu s$  waveform, repetition rate (duty cycle): 0.01%
- High temperature soldering : 260°C/ 40 seconds at terminals



### Description

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

### Mechanical Characteristics

Rating	Symbol	Value	Units
Peak Pulse Power Dissipation at $T_A=25^\circ C$ by 10/1000 $\mu s$ Waveform (Fig.2)(Note 1), (Note 2)	$P_{PPM}$	600	Watts
Power Dissipation on Infinite Heat Sink at $T_A=50^\circ C$	$P_D$	5.0	Watts
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	$I_{FSM}$	100	A
Maximum Instantaneous Forward Voltage at 25A for Unidirectional Only (Note 4)	$V_F$	3.5/5.0	V
Operating junction and Storage Temperature Range.	$T_J, T_{STG}$	-55°C to 150°C	°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.4 and derated above  $T_A=25^\circ C$  per Fig. 3.
2. Mounted on 5.0x5.0mm copper pad to each terminal.
3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only, duty cycle=4 per minute maximum.
4.  $V_F < 3.5V$  for single die parts and  $V_F < 5.0V$  for stacked-die parts

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### Electrical Characteristics

Type 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>
UNI	BI	UNI	BI	V <sub>RWM</sub> (V)	V <sub>BR MIN.</sub> (V)	V <sub>BR MAX.</sub> (V)	I <sub>T</sub> (mA)	VC(V)	I <sub>PP</sub> (A)	I <sub>R</sub> (μA)
SMBJ5.0A	SMBJ5.0CA	KE	AE	5.0	6.40	7.25	10	9.2	65.3	800
SMBJ6.0A	SMBJ6.0CA	KG	AG	6.0	6.67	7.67	10	10.3	58.3	800
SMBJ6.5A	SMBJ6.5CA	KK	AK	6.5	7.22	8.30	10	11.2	53.6	500
SMBJ7.0A	SMBJ7.0CA	KM	AM	7.0	7.78	8.95	10	12.0	50.0	200
SMBJ7.5A	SMBJ7.5CA	KP	AP	7.5	8.33	9.58	1	12.9	46.6	100
SMBJ8.0A	SMBJ8.0CA	KR	AR	8.0	8.89	10.23	1	13.6	44.1	50
SMBJ8.5A	SMBJ8.5CA	KT	AT	8.5	9.44	10.82	1	14.4	41.7	20
SMBJ9.0A	SMBJ9.0CA	KV	AV	9.0	10.00	11.50	1	15.4	39.0	10
SMBJ10A	SMBJ10CA	KX	AX	10.0	11.10	12.80	1	17.0	35.3	5
SMBJ11A	SMBJ11CA	KZ	AZ	11.0	12.20	14.00	1	18.2	33.0	1
SMBJ12A	SMBJ12CA	LE	BE	12.0	13.30	15.30	1	19.9	30.2	1
SMBJ13A	SMBJ13CA	LG	BG	13.0	14.40	16.50	1	21.5	27.9	1
SMBJ14A	SMBJ14CA	LK	BK	14.0	15.60	17.90	1	23.2	25.8	1
SMBJ15A	SMBJ15CA	LM	BM	15.0	16.70	19.20	1	24.4	24.6	1
SMBJ16A	SMBJ16CA	LP	BP	16.0	17.80	20.50	1	26.0	23.1	1
SMBJ17A	SMBJ17CA	LR	BR	17.0	18.90	21.70	1	27.6	21.7	1
SMBJ18A	SMBJ18CA	LT	BT	18.0	20.00	23.30	1	29.2	20.5	1
SMBJ20A	SMBJ20CA	LV	BV	20.0	22.20	25.50	1	32.4	18.5	1
SMBJ22A	SMBJ22CA	LX	BX	22.0	24.40	28.00	1	35.5	16.9	1
SMBJ24A	SMBJ24CA	LZ	BZ	24.0	26.70	30.70	1	38.9	15.2	1
SMBJ26A	SMBJ26CA	ME	CE	26.0	28.90	33.20	1	42.1	14.2	1
SMBJ28A	SMBJ28CA	MG	CG	28.0	31.10	35.80	1	45.4	13.2	1
SMBJ30A	SMBJ30CA	MK	CK	30.0	33.30	38.30	1	48.4	12.4	1
SMBJ33A	SMBJ33CA	MM	CM	33.0	36.70	42.20	1	53.3	11.3	1
SMBJ36A	SMBJ36CA	MP	CP	36.0	40.00	46.00	1	58.1	10.3	1
SMBJ40A	SMBJ40CA	MR	CR	40.0	44.40	51.10	1	64.5	9.3	1
SMBJ43A	SMBJ43CA	MT	CT	43.0	47.80	54.90	1	69.4	8.6	1
SMBJ45A	SMBJ45CA	MV	CV	45.0	50.00	57.50	1	72.7	8.3	1
SMBJ48A	SMBJ48CA	MX	CX	48.0	53.30	61.30	1	77.4	7.7	1
SMBJ51A	SMBJ51CA	MZ	CZ	51.0	56.70	65.20	1	82.4	7.3	1
SMBJ54A	SMBJ54CA	NE	DE	54.0	60.00	69.00	1	87.1	6.9	1
SMBJ58A	SMBJ58CA	NG	DG	58.0	64.40	74.10	1	93.6	6.4	1
SMBJ60A	SMBJ60CA	NK	DK	60.0	66.70	76.70	1	96.8	6.2	1
SMBJ64A	SMBJ64CA	NM	DM	64.0	71.10	81.80	1	103.0	5.8	1
SMBJ70A	SMBJ70CA	NP	DP	70.0	77.80	89.50	1	113.0	5.3	1
SMBJ75A	SMBJ75CA	NR	DR	75.0	83.30	95.80	1	121.0	4.9	1
SMBJ78A	SMBJ78CA	NT	DT	78.0	86.70	99.70	1	126.0	4.7	1
SMBJ85A	SMBJ85CA	NV	DV	85.0	94.40	108.20	1	137.0	4.4	1
SMBJ90A	SMBJ90CA	NX	DX	90.0	100.00	115.50	1	146.0	4.1	1
SMBJ100A	SMBJ100CA	NZ	DZ	100.0	111.00	128.00	1	162.0	3.7	1
SMBJ110A	SMBJ110CA	PE	EE	110.0	122.00	140.50	1	177.0	3.4	1
SMBJ120A	SMBJ120CA	PG	EG	120.0	133.00	153.00	1	193.0	3.1	1
SMBJ130A	SMBJ130CA	PK	EK	130.0	144.00	165.50	1	209.0	2.9	1
SMBJ150A	SMBJ150CA	PM	EM	150.0	167.00	192.60	1	243.0	2.5	1
SMBJ160A	SMBJ160CA	PP	EP	160.0	178.00	197.00	1	259.0	2.3	1
SMBJ170A	SMBJ170CA	PR	ER	170.0	189.00	209.00	1	275.0	2.2	1
SMBJ180A	SMBJ180CA	PT	ET	180.0	201.00	222.00	1	292.0	2.1	1
SMBJ190A	SMBJ190CA	PV	EV	190.0	209.00	243.20	1	308.0	2.0	1
SMBJ200A	SMBJ200CA	PX	EX	200.0	220.00	247.00	1	324.0	1.9	1
SMBJ210A	SMBJ210CA	PZ	EZ	210.0	231.00	268.80	1	340.0	1.8	1
SMBJ220A	SMBJ220CA	QE	FE	220.0	242.00	281.60	1	356.0	1.7	1

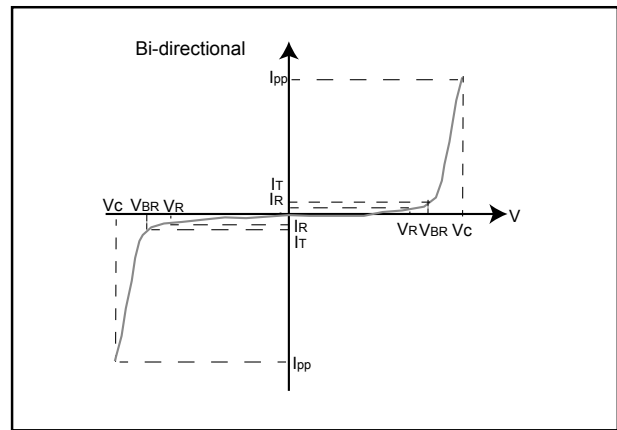
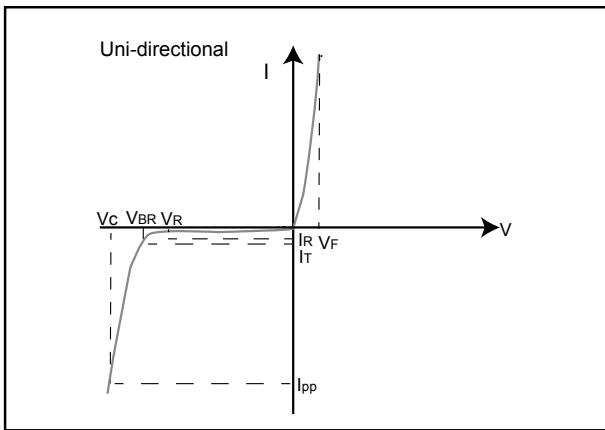
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### Electrical Characteristics

Type 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>
UNI	BI	UNI	BI	V <sub>RWM</sub> (V)	V <sub>BR MIN.</sub> (V)	V <sub>BR MAX.</sub> (V)	I <sub>T</sub> (mA)	V <sub>C</sub> (V)	I <sub>PP</sub> (A)	I <sub>R</sub> (μA)	
SMBJ250A	SMBJ250CA	QG	FG	250.0	279.0	309.0	1	405.0	1.5	1	
SMBJ300A	SMBJ300CA	QK	FK	300.0	335.0	371.0	1	486.0	1.3	1	
SMBJ350A	SMBJ350CA	QM	FM	350.0	391.0	432.0	1	567.0	1.1	1	
SMBJ400A	SMBJ400CA	QP	FP	400.0	447.0	494.0	1	648.0	0.9	1	
SMBJ440A	SMBJ440CA	QR	FR	440.0	492.0	543.0	1	713.0	0.9	1	

For bidirectional type having VR of 10 volts and less, the IR limit is double.

### I-V Curve Characteristics



**PPPM Peak Pulse Power Dissipation** -- Max power dissipation

**VR Stand-off Voltage** -- Maximum voltage that can be applied to the TVS without operation

**VBR Breakdown Voltage** -- Maximum voltage that flows through the TVS at a specified test current (IT)

**VC Clamping Voltage** -- Peak voltage measured across the TVS at a specified IPPM (peak impulse current)

**IR Reverse Leakage Current** -- Current measured at VR

**VF Forward Voltage Drop for Uni-directional**

#### Ratings and Characteristic Curves (T<sub>A</sub>=25° C unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform

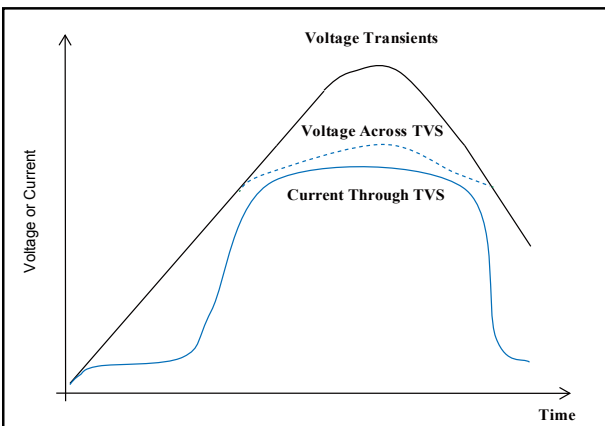
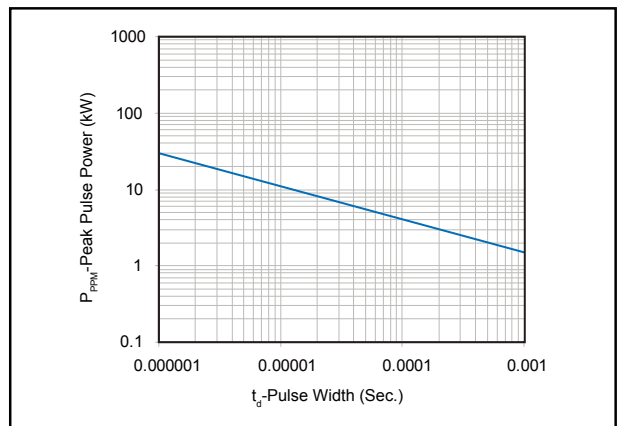


Figure 2 - Peak Pulse Power Rating



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### Ratings and Characteristic Curves (TA=25°C unless otherwise noted)

Figure 3 - Pulse Derating Curve



Figure 4 - Pulse Waveform

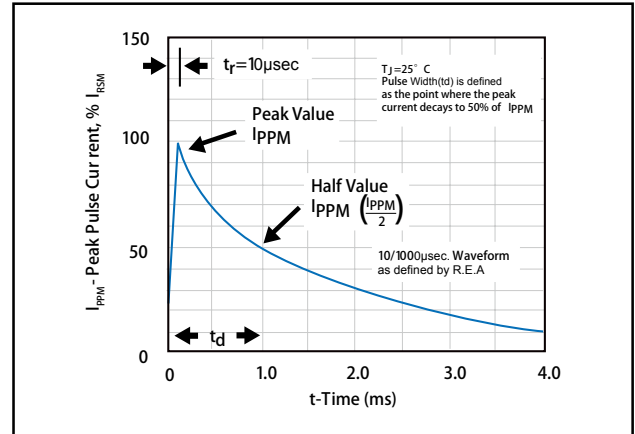


Figure 5 - Typical Junction Capacitance



Figure 6 - Steady State Power Dissipation Derating Curve

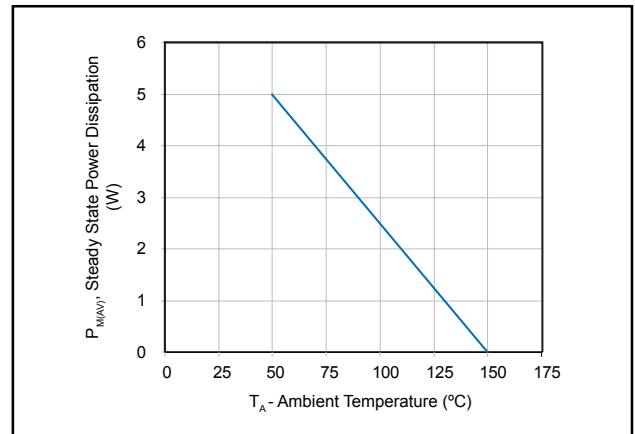


Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only



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### Soldering Parameters

Reflow Condition		Lead-free assembly
Pre Heat	- Temperature Min (T <sub>s(min)</sub> )	150°C
	- Temperature Max (T <sub>s(max)</sub> )	200°C
	- Time (min to max) (t <sub>s</sub> )	60-180 secs
Average ramp up rate (Liquidus Temp (T <sub>A</sub> ) to peak)		3°C/second max
T <sub>S(max)</sub> to T <sub>A</sub> - Ramp-up Rate		3°C/second max
Reflow	- Temperature (T <sub>A</sub> ) (Liquidus)	217°C
	- Time (min to max) (t <sub>s</sub> )	60-150 seconds
Peak Temperature (T <sub>p</sub> )		260 <sup>+0/-5</sup> °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 (T <sub>p</sub> )		8 minutes Max.
Do not exceed		280°C

### Physical Specifications

Weight	0.003 ounce, 0.093 grams
Case	JEDEC DO-214AA Molded Plastic over
Polarity	glass passivated junction
Termina	Matte Tin axial leads, solderable per JESD22-B102D.



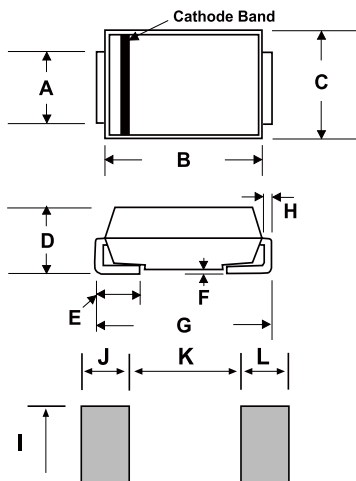
### Environmental Specifications

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

### Flow/Wave Soldering

Peak Temperature :	265°C
Dipping Time :	10 seconds
Soldering :	1 time

### Dimensions DO-214AA/SMB



DIM	Inches		Millimeters	
	Min	Max	Min	Max
A	0.077	0.086	1.950	2.200
B	0.160	0.180	4.060	4.570
C	0.130	0.155	3.300	3.940
D	0.084	0.096	2.130	2.440
E	0.030	0.060	0.760	1.520
F	-	0.008	-	0.203
G	0.205	0.220	5.210	5.590
H	0.006	0.012	0.152	0.305
I	0.089	-	2.260	-
J	0.085	-	2.160	-
K	-	0.107	-	2.740
L	0.085	-	2.160	-

## Transient Voltage Suppressors - SMBJ Series

### Product Name



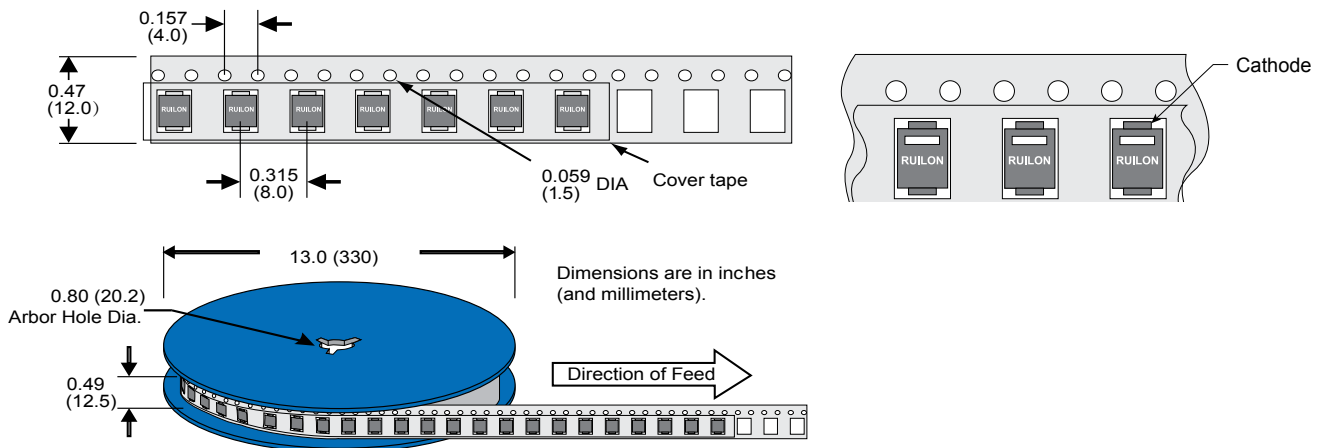
### Part Marking System



### Packaging

Part Number	Component Package	Quantity	Packaging Option	Packaging Specification
SMBJxxxXX	DO-214AC	500	Tape & Reel	EIA RS-481

### Tape and Reel Specification



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