



SMBJ5.0 thru SMBJ188CA

Vishay General Semiconductor

Surface Mount TRANSZORB® Transient Voltage Suppressors



DO-214AA (SMB J-Bend)

PRIMARY CHARACTERISTICS	
V_{WM}	5.0 V to 188 V
P_{PPM}	600 W
I_{FSM} (uni-directional only)	100 A
T_J max.	150 °C

DEVICES FOR BI-DIRECTION APPLICATIONS

For bi-directional devices use C or CA suffix (e.g. SMBJ10CA).

Electrical characteristics apply in both directions.

FEATURES

- Low profile package
- Ideal for automated placement
- Glass passivated chip junction
- Available in uni-directional and bi-directional
- 600 W peak pulse power capability with a **RoHS COMPLIANT** 10/1000 μ s waveform, repetitive rate (duty cycle): 0.01 %
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Solder dip 260 °C, 40 s
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



TYPICAL APPLICATIONS

Use in sensitive electronics protection against voltage transients induced by inductive load switching and lighting on ICs, MOSFET, signal lines of sensor units for consumer, computer, industrial, automotive and telecommunication.

MECHANICAL DATA

Case: DO-214AA (SMBJ)

Molding compound meets UL 94 V-0 flammability rating

Base P/N-E3 - RoHS compliant, commercial grade

Base P/NHE3 - RoHS compliant, high reliability/automotive grade (AEC Q101 qualified)

Terminals: Matte tin plated leads, solderable per J-STD-002 and JESD22-B102

E3 suffix meets JESD 201 class 1A whisker test, HE3 suffix meets JESD 201 class 2 whisker test

Polarity: For uni-directional types the band denotes cathode end, no marking on bi-directional types

MAXIMUM RATINGS ($T_A = 25$ °C unless otherwise noted)			
PARAMETER	SYMBOL	VALUE	UNIT
Peak pulse power dissipation with a 10/1000 μ s waveform ⁽¹⁾⁽²⁾ (Fig. 1)	P_{PPM}	600	W
Peak pulse current with a 10/1000 μ s waveform ⁽¹⁾	I_{PPM}	See next table	A
Peak forward surge current 8.3 ms single half sine-wave uni-directional only ⁽²⁾	I_{FSM}	100	A
Operating junction and storage temperature range	T_J, T_{STG}	- 55 to + 150	°C

Notes:

(1) Non-repetitive current pulse, per Fig. 3 and derated above $T_A = 25$ °C per Fig. 2

(2) Mounted on 0.2 x 0.2" (5.0 x 5.0 mm) copper pads to each terminal

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ELECTRICAL CHARACTERISTICS (T _A = 25 °C unless otherwise noted)									
DEVICE TYPE MODIFIED "J" BEND LEAD	DEVICE MARKING CODE		BREAKDOWN VOLTAGE V _{BR} AT I _T ⁽¹⁾ (V)		TEST CURRENT I _T (mA)	STAND-OFF VOLTAGE V _{WM} (V)	MAXIMUM REVERSE LEAKAGE AT V _{WM} I _D (μA) ⁽³⁾	MAXIMUM PEAK PULSE SURGE CURRENT I _{PPM} (A) ⁽²⁾	MAXIMUM CLAMPING VOLTAGE AT I _{PPM} V _C (V)
	UNI	BI	MIN.	MAX.					
(+)SMBJ5.0	KD	KD	6.40	7.82	10	5.0	800	62.5	9.6
(+)SMBJ5.0A ⁽⁵⁾	KE	KE	6.40	7.07	10	5.0	800	65.2	9.2
(+)SMBJ6.0	KF	KF	6.67	8.15	10	6.0	800	52.6	11.4
(+)SMBJ6.0A	KG	KG	6.67	7.37	10	6.0	800	58.3	10.3
(+)SMBJ6.5	KH	AH	7.22	8.82	10	6.5	500	48.8	12.3
(+)SMBJ6.5A	KK	AK	7.22	7.98	10	6.5	500	53.6	11.2
(+)SMBJ7.0	KL	KL	7.78	9.51	10	7.0	200	45.1	13.3
(+)SMBJ7.0A	KM	KM	7.78	8.60	10	7.0	200	50.0	12.0
(+)SMBJ7.5	KN	AN	8.33	10.2	1.0	7.5	100	42.0	14.3
(+)SMBJ7.5A	KP	AP	8.33	9.21	1.0	7.5	100	46.5	12.9
(+)SMBJ8.0	KQ	AQ	8.89	10.9	1.0	8.0	50	40.0	15.0
(+)SMBJ8.0A	KR	AR	8.89	9.83	1.0	8.0	50	44.1	13.6
(+)SMBJ8.5	KS	AS	9.44	11.5	1.0	8.5	20	37.7	15.9
(+)SMBJ8.5A	KT	AT	9.44	10.4	1.0	8.5	20	41.7	14.4
(+)SMBJ9.0	KU	AU	10.0	12.2	1.0	9.0	10	35.5	16.9
(+)SMBJ9.0A	KV	AV	10.0	11.1	1.0	9.0	10	39.0	15.4
(+)SMBJ10	KW	AW	11.1	13.6	1.0	10	5.0	31.9	18.8
(+)SMBJ10A	KX	AX	11.1	12.3	1.0	10	5.0	35.3	17.0
(+)SMBJ11	KY	KY	12.2	14.9	1.0	11	5.0	29.9	20.1
(+)SMBJ11A	KZ	KZ	12.2	13.5	1.0	11	5.0	33.0	18.2
(+)SMBJ12	LD	BD	13.3	16.3	1.0	12	5.0	27.3	22.0
(+)SMBJ12A	LE	BE	13.3	14.7	1.0	12	5.0	30.2	19.9
(+)SMBJ13	LF	LF	14.4	17.6	1.0	13	1.0	25.2	23.8
(+)SMBJ13A	LG	LG	14.4	15.9	1.0	13	1.0	27.9	21.5
(+)SMBJ14	LH	BH	15.6	19.1	1.0	14	1.0	23.3	25.8
(+)SMBJ14A	LK	BK	15.6	17.2	1.0	14	1.0	25.9	23.2
(+)SMBJ15	LL	BL	16.7	20.4	1.0	15	1.0	22.3	26.9
(+)SMBJ15A	LM	BM	16.7	18.5	1.0	15	1.0	24.6	24.4
(+)SMBJ16	LN	LN	17.8	21.8	1.0	16	1.0	20.8	28.8
(+)SMBJ16A	LP	LM	17.8	19.7	1.0	16	1.0	23.1	26.0
(+)SMBJ17	LQ	LQ	18.9	23.1	1.0	17	1.0	19.7	30.5
(+)SMBJ17A	LR	LR	18.9	20.9	1.0	17	1.0	21.7	27.6
(+)SMBJ18	LS	BS	20.0	24.4	1.0	18	1.0	18.6	32.2
(+)SMBJ18A	LT	BT	20.0	22.1	1.0	18	1.0	20.5	29.2
(+)SMBJ20	LU	LU	22.2	27.1	1.0	20	1.0	16.8	35.8
(+)SMBJ20A	LV	LV	22.2	24.5	1.0	20	1.0	18.5	32.4
(+)SMBJ22	LW	BW	24.4	29.8	1.0	22	1.0	15.2	39.4
(+)SMBJ22A	LX	BX	24.4	26.9	1.0	22	1.0	16.9	35.5
(+)SMBJ24	LY	BY	26.7	32.6	1.0	24	1.0	14.0	43.0
(+)SMBJ24A	LZ	BZ	26.7	29.5	1.0	24	1.0	15.4	38.9
(+)SMBJ26	MD	CD	28.9	35.3	1.0	26	1.0	12.9	46.6
(+)SMBJ26A	ME	CE	28.9	31.9	1.0	26	1.0	14.3	42.1
(+)SMBJ28	MF	MF	31.1	38.0	1.0	28	1.0	12.0	50.0
(+)SMBJ28A	MG	MG	31.1	34.4	1.0	28	1.0	13.2	45.4
(+)SMBJ30	MH	CH	33.3	40.7	1.0	30	1.0	11.2	53.5
(+)SMBJ30A	MK	CK	33.3	36.8	1.0	30	1.0	12.4	48.4
(+)SMBJ33	ML	CL	36.7	44.9	1.0	33	1.0	10.2	59.0
(+)SMBJ33A	MM	CM	36.7	40.6	1.0	33	1.0	11.3	53.3
(+)SMBJ36	MN	CN	40.0	48.9	1.0	36	1.0	9.3	64.3
(+)SMBJ36A	MP	CP	40.0	44.2	1.0	36	1.0	10.3	58.1
(+)SMBJ40	MQ	CQ	44.4	54.3	1.0	40	1.0	8.4	71.4
(+)SMBJ40A	MR	CR	44.4	49.1	1.0	40	1.0	9.3	64.5



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DEVICE TYPE MODIFIED "J" BEND LEAD	DEVICE MARKING CODE		BREAKDOWN VOLTAGE V _{BR} AT I _T (1) (V)		TEST CURRENT I _T (mA)	STAND-OFF VOLTAGE V _{WM} (V)	MAXIMUM REVERSE LEAKAGE AT V _{WM} I _D (μA) (3)	MAXIMUM PEAK PULSE SURGE CURRENT I _{PPM} (A) (2)	MAXIMUM CLAMPING VOLTAGE AT I _{PPM} V _C (V)
	UNI	BI	MIN.	MAX.					
(+)SMBJ43	MS	CS	47.8	58.4	1.0	43	1.0	7.8	76.7
(+)SMBJ43A	MT	CT	47.8	52.8	1.0	43	1.0	8.6	69.4
(+)SMBJ45	MU	MU	50.0	61.1	1.0	45	1.0	7.5	80.3
(+)SMBJ45A	MV	MV	50.0	55.3	1.0	45	1.0	8.3	72.7
(+)SMBJ48	MW	MW	53.3	65.1	1.0	48	1.0	7.0	85.5
(+)SMBJ48A	MX	MX	53.3	58.9	1.0	48	1.0	7.8	77.4
(+)SMBJ51	MY	MY	56.7	69.3	1.0	51	1.0	6.6	91.1
(+)SMBJ51A	MZ	MZ	56.7	62.7	1.0	51	1.0	7.3	82.4
(+)SMBJ54	ND	ND	60.0	73.3	1.0	54	1.0	6.2	96.3
(+)SMBJ54A	NE	NE	60.0	66.3	1.0	54	1.0	6.9	87.1
(+)SMBJ58	NF	NF	64.4	78.7	1.0	58	1.0	5.8	103
(+)SMBJ58A	NG	NG	64.4	71.2	1.0	58	1.0	6.4	93.6
(+)SMBJ60	NH	NH	66.7	81.5	1.0	60	1.0	5.6	107
(+)SMBJ60A	NK	NK	66.7	73.7	1.0	60	1.0	6.2	96.8
(+)SMBJ64	NL	NL	71.1	86.9	1.0	64	1.0	5.3	114
(+)SMBJ64A	NM	NM	71.1	78.6	1.0	64	1.0	5.8	103
(+)SMBJ70	NN	NN	77.8	95.1	1.0	70	1.0	4.8	125
(+)SMBJ70A	NP	NP	77.8	86.0	1.0	70	1.0	5.3	113
(+)SMBJ75	NQ	NQ	83.3	102	1.0	75	1.0	4.5	134
(+)SMBJ75A	NR	NR	83.3	92.1	1.0	75	1.0	5.0	121
(+)SMBJ78	NS	NS	86.7	106	1.0	78	1.0	4.3	139
(+)SMBJ78A	NT	NT	86.7	95.8	1.0	78	1.0	4.8	126
(+)SMBJ85	NU	NU	94.4	115	1.0	85	1.0	4.0	151
(+)SMBJ85A	NV	NV	94.4	104	1.0	85	1.0	4.4	137
(+)SMBJ90	NW	NW	100	122	1.0	90	1.0	3.8	160
(+)SMBJ90A	NX	NX	100	111	1.0	90	1.0	4.1	146
(+)SMBJ100	NY	NY	111	136	1.0	100	1.0	3.4	179
(+)SMBJ100A	NZ	NZ	111	123	1.0	100	1.0	3.7	162
(+)SMBJ110	PD	PD	122	149	1.0	110	1.0	3.1	196
(+)SMBJ110A	PE	PE	122	135	1.0	110	1.0	3.4	177
(+)SMBJ120	PF	PF	133	163	1.0	120	1.0	2.8	214
(+)SMBJ120A	PG	PG	133	147	1.0	120	1.0	3.1	193
(+)SMBJ130	PH	PH	144	176	1.0	130	1.0	2.6	231
(+)SMBJ130A	PK	PK	144	159	1.0	130	1.0	2.9	209
(+)SMBJ150	PL	PL	167	204	1.0	150	1.0	2.2	268
(+)SMBJ150A	PM	PM	167	185	1.0	150	1.0	2.5	243
(+)SMBJ160	PN	PN	178	218	1.0	160	1.0	2.1	287
(+)SMBJ160A	PP	PP	178	197	1.0	160	1.0	2.3	259
(+)SMBJ170	PQ	PQ	189	231	1.0	170	1.0	2.0	304
(+)SMBJ170A	PR	PR	189	209	1.0	170	1.0	2.2	275
SMBJ188	PT	PT	209	255	1.0	188	1.0	1.7	344
SMBJ188A	PS	PS	209	231	1.0	188	1.0	2.0	328

Notes:

- (1) Pulse test: tp ≤ 50 ms
- (2) Surge current waveform per Fig. 3 and derate per Fig. 2
- (3) For bi-directional types having V_{WM} of 10 V and less, the I_D limit is doubled
- (4) All terms and symbols are consistent with ANSI/IEEE C62.35
- (5) For the bi-directional SMBG/SMBJ5.0CA, the maximum V_{BR} is 7.25 V
- (6) V_F = 3.5 V at I_F = 50 A (uni-directional only)
- (+) Underwriters laboratory recognition for the classification of protectors (QVQG2) under the UL standard for safety 497B and file number E136766 for both uni-directional and bi-directional devices

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THERMAL CHARACTERISTICS (T _A = 25 °C unless otherwise noted)			
PARAMETER	SYMBOL	VALUE	UNIT
Typical thermal resistance, junction to ambient ⁽¹⁾	R _{θJA}	100	°C/W
Typical thermal resistance, junction to lead	R _{θJL}	20	°C/W

Note:

(1) Mounted on minimum recommended pad layout

ORDERING INFORMATION (Example)				
PREFERRED P/N	UNIT WEIGHT (g)	PREFERRED PACKAGE CODE	BASE QUANTITY	DELIVERY MODE
SMBJ5.0A-E3/52	0.096	52	750	7" diameter plastic tape and reel
SMBJ5.0A-E3/5B	0.096	5B	3200	13" diameter plastic tape and reel
SMBJ5.0AHE3/52 ⁽¹⁾	0.096	52	750	7" diameter plastic tape and reel
SMBJ5.0AHE3/5B ⁽¹⁾	0.096	5B	3200	13" diameter plastic tape and reel

Note:

(1) Automotive grade AEC Q101 qualified

RATINGS AND CHARACTERISTICS CURVES

(T_A = 25 °C unless otherwise noted)

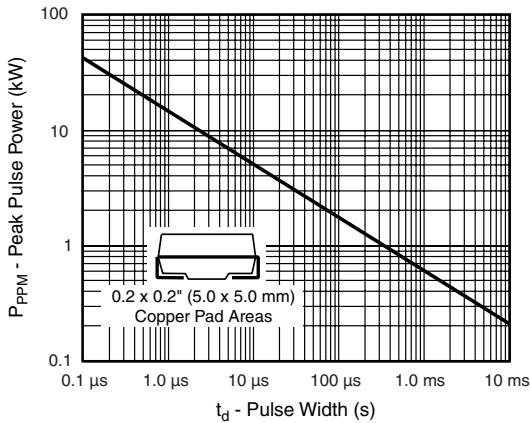


Figure 1. Peak Pulse Power Rating Curve

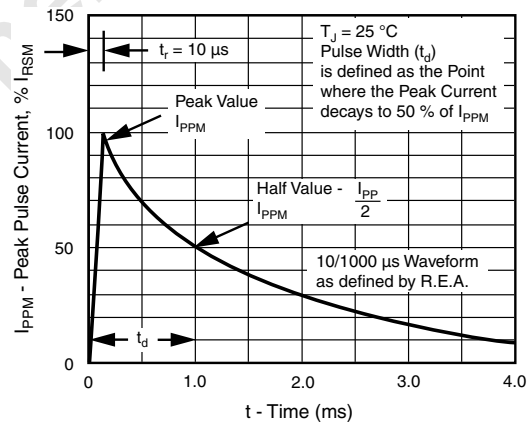


Figure 3. Pulse Waveform

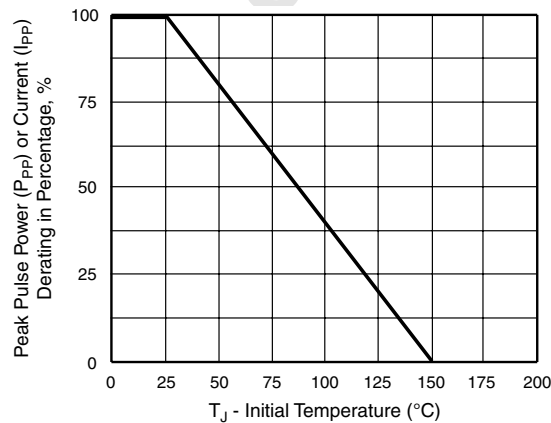


Figure 2. Pulse Power or Current vs. Initial Junction Temperature

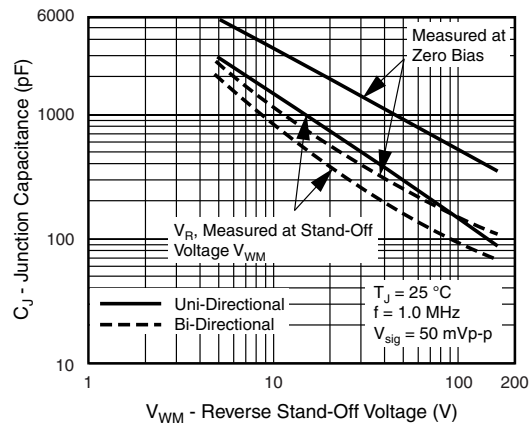


Figure 4. Typical Junction Capacitance



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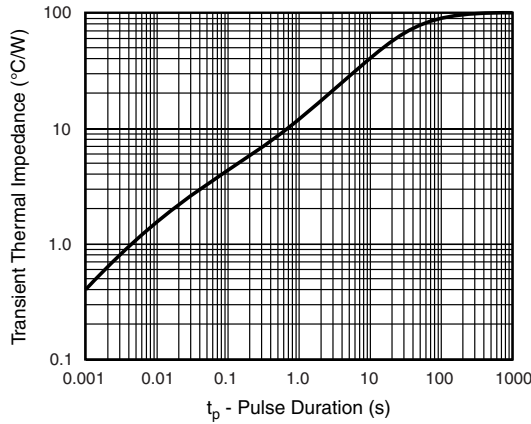


Figure 5. Typical Transient Thermal Impedance

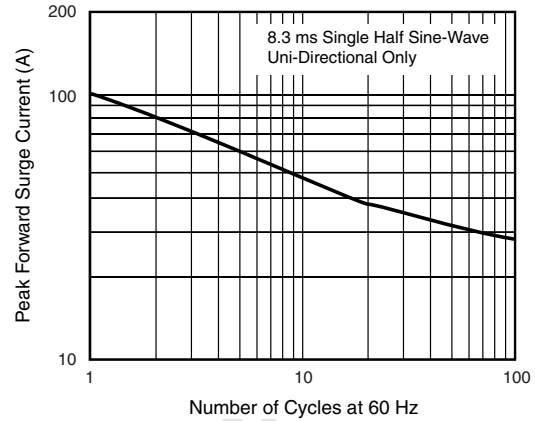
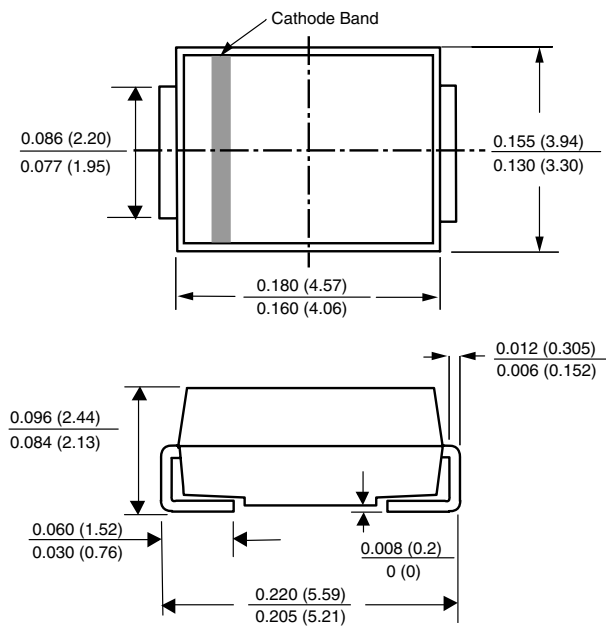


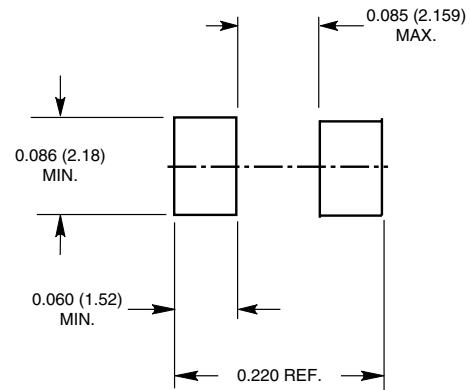
Figure 6. Maximum Non-Repetitive Peak Forward Surge Current

PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

DO-214AA (SMB-J-Bend)



Mounting Pad Layout





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