



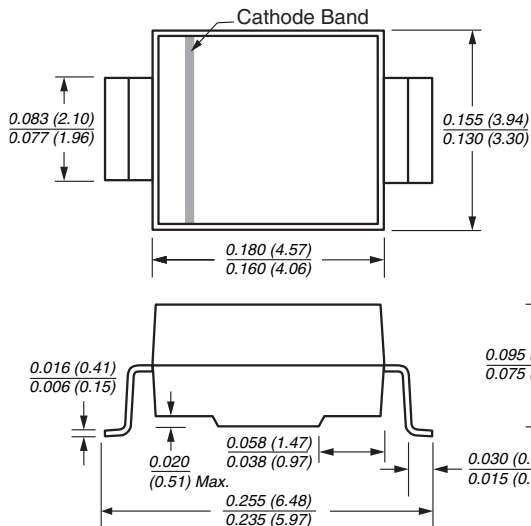
SMBG5.0 thru 188CA

Vishay Semiconductors
formerly General Semiconductor

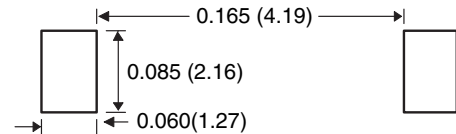
Surface Mount TRANSZORB® Transient Voltage Suppressors

Stand-off Voltage 5.0 to 188V
Peak Pulse Power 600W

DO-215AA (SMBG)



Mounting Pad Layout



Features

- Underwriters Laboratory Recognition under UL standard for safety 497B: Isolated Loop Circuit Protection
- Low profile package with built-in strain relief for surface mounted applications
- Glass passivated junction
- Low incremental surge resistance, excellent clamping capability
- 600W peak pulse power capability with a 10/1000 μ s waveform, repetition rate (duty cycle): 0.01%
- Very fast response time
- High temperature soldering guaranteed: 250°C/10 seconds at terminals

Mechanical Data

Case: JEDEC DO-215AA molded plastic over passivated junction

Terminals: Solder plated, solderable per MIL-STD-750, Method 2026

Polarity: For unidirectional types the band denotes the cathode, which is positive with respect to the anode under normal TVS operation

Weight: 0.003 oz., 0.093 g

Flammability: Epoxy is rated UL 94V-0

Packaging Codes – Options (Antistatic):

51 – 2K per Bulk box, 20K/carton

52 – 750 per 7" plastic Reel (12mm tape), 15K/carton

5B – 3.2K per 13" plastic Reel (12mm tape), 32K/carton

Devices for Bidirectional Applications

For bi-directional devices, use suffix C or CA (e.g. SMBJ10C, SMBJ10CA). Electrical characteristics apply in both directions.

Maximum Ratings & Thermal Characteristics

Ratings at 25°C ambient temperature unless otherwise specified.

Parameter	Symbol	Value	Unit
Peak pulse power dissipation with a 10/1000 μ s waveform ⁽¹⁾⁽²⁾ (Fig. 1)	PPPM	Minimum 600	W
Peak pulse current with a 10/1000 μ s waveform ⁽¹⁾	IPPM	See Table Below	A
Peak forward surge current 8.3ms single half sine-wave uni-directional only ⁽²⁾	IFSM	100	A
Typical thermal resistance, junction to ambient ⁽⁴⁾	R θ JA	100	°C/W
Typical thermal resistance, junction to lead	R θ JL	20	°C/W
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 5.0mm) copper pads to each terminal

(3) Mounted on minimum recommended pad layout

Electrical Characteristics

Ratings at 25°C ambient temperature unless otherwise specified. $V_F = 3.5V$ at $I_F = 50A$ (uni-directional only)

Device Type Modified Gull Wing	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					
+SMBG5.0	KD	KD	6.40	7.82	10	5.0	800	62.5	9.6
+SMBG5.0A ⁽⁵⁾	KE	KE	6.40	7.07	10	5.0	800	65.2	9.2
+SMBG6.0	KF	KF	6.67	8.15	10	6.0	800	52.6	11.4
+SMBG6.0A	KG	KG	6.67	7.37	10	6.0	800	58.3	10.3
+SMBG6.5	KH	AH	7.22	8.82	10	6.5	500	48.8	12.3
+SMBG6.5A	KK	AK	7.22	7.98	10	6.5	500	53.6	11.2
+SMBG7.0	KL	KL	7.78	9.51	10	7.0	200	45.1	13.3
+SMBG7.0A	KM	KM	7.78	8.60	10	7.0	200	50.0	12.0
+SMBG7.5	KN	AN	8.33	10.2	1.0	7.5	100	42.0	14.3
+SMBG7.5A	KP	AP	8.33	9.21	1.0	7.5	100	46.5	12.9
+SMBG8.0	KQ	AQ	8.89	10.9	1.0	8.0	50	40.0	15.0
+SMBG8.0A	KR	AR	8.89	9.83	1.0	8.0	50	44.1	13.6
+SMBG8.5	KS	AS	9.44	11.5	1.0	8.5	20	37.7	15.9
+SMBG8.5A	KT	AT	9.44	10.4	1.0	8.5	20	41.7	14.4
+SMBG9.0	KU	AU	10.0	12.2	1.0	9.0	10	35.5	16.9
+SMBG9.0A	KV	AV	10.0	11.1	1.0	9.0	10	39.0	15.4
+SMBG10	KW	AW	11.1	13.6	1.0	10	5.0	31.9	18.8
+SMBG10A	KX	AX	11.1	12.3	1.0	10	5.0	35.3	17.0
+SMBG11	KY	KY	12.2	14.9	1.0	11	5.0	29.9	20.1
+SMBG11A	KZ	KZ	12.2	13.5	1.0	11	5.0	33.0	18.2
+SMBG12	LD	BD	13.3	16.3	1.0	12	5.0	27.3	22.0
+SMBG12A	LE	BE	13.3	14.7	1.0	12	5.0	30.2	19.9
+SMBG13	LF	LF	14.4	17.6	1.0	13	1.0	25.2	23.8
+SMBG13A	LG	LG	14.4	15.9	1.0	13	1.0	27.9	21.5
+SMBG14	LH	BH	15.6	19.1	1.0	14	1.0	23.3	25.8
+SMBG14A	LK	BK	15.6	17.2	1.0	14	1.0	25.9	23.2
+SMBG15	LL	BL	16.7	20.4	1.0	15	1.0	22.3	26.9
+SMBG15A	LM	BM	16.7	18.5	1.0	15	1.0	24.6	24.4
+SMBG16	LN	LN	17.8	21.8	1.0	16	1.0	20.8	28.8
+SMBG16A	LP	LM	17.8	19.7	1.0	16	1.0	23.1	26.0
+SMBG17	LQ	LQ	18.9	23.1	1.0	17	1.0	19.7	30.5
+SMBG17A	LR	LR	18.9	20.9	1.0	17	1.0	21.7	27.6
+SMBG18	LS	BS	20.0	24.4	1.0	18	1.0	18.6	32.2
+SMBG18A	LT	BT	20.0	22.1	1.0	18	1.0	20.5	29.2
+SMBG20	LU	LU	22.2	27.1	1.0	20	1.0	16.8	35.8
+SMBG20A	LV	LV	22.2	24.5	1.0	20	1.0	18.5	32.4
+SMBG22	LW	BW	24.4	29.8	1.0	22	1.0	15.2	39.4
+SMBG22A	LX	BX	24.4	26.9	1.0	22	1.0	16.9	35.5
+SMBG24	LY	BY	26.7	32.6	1.0	24	1.0	14.0	43.0
+SMBG24A	LZ	BZ	26.7	29.5	1.0	24	1.0	15.4	38.9
+SMBG26	MD	CD	28.9	35.3	1.0	26	1.0	12.9	46.6
+SMBG26A	ME	CE	28.9	31.9	1.0	26	1.0	14.3	42.1
+SMBG28	MF	MF	31.1	38.0	1.0	28	1.0	12.0	50.0
+SMBG28A	MG	MG	31.1	34.4	1.0	28	1.0	13.2	45.4
+SMBG30	MH	CH	33.3	40.7	1.0	30	1.0	11.2	53.5
+SMBG30A	MK	CK	33.3	36.8	1.0	30	1.0	12.4	48.4

Notes: (1) Pulse test: $t_p \leq 50ms$

(2) Surge current waveform per Fig. 3 and derate per Fig. 2

(3) For bi-directional types having V_{WM} of 10 Volts and less, the I_D limit is doubled

(4) All terms and symbols are consistent with ANSI/IEEE C62.35

(5) For the bidirectional SMBG/SMBJ5.0CA, the maximum V_{BR} is 7.25V

+ Underwriters Laboratory Recognition for the classification of protectors (QVGQ2) under the UL standard for safety 497B and file number E136766 for both uni-directional and bi-directional devices

**Electrical Characteristics** Ratings at 25°C ambient temperature unless otherwise specified. $V_F = 3.5V$ at $I_F = 50A$ (uni-directional only)

Device Type Modified Gull Wing	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					
+SMBG33	ML	CL	36.7	44.9	1.0	33	1.0	10.2	59.0
+SMBG33A	MM	CM	36.7	40.6	1.0	33	1.0	11.3	53.3
+SMBG36	MN	CN	40.0	48.9	1.0	36	1.0	9.3	64.3
+SMBG36A	MP	CP	40.0	44.2	1.0	36	1.0	10.3	58.1
+SMBG40	MQ	CQ	44.4	54.3	1.0	40	1.0	8.4	71.4
+SMBG40A	MR	CR	44.4	49.1	1.0	40	1.0	9.3	64.5
+SMBG43	MS	CS	47.8	58.4	1.0	43	1.0	7.8	76.7
+SMBG43A	MT	CT	47.8	52.8	1.0	43	1.0	8.6	69.4
+SMBG45	MU	MU	50.0	61.1	1.0	45	1.0	7.5	80.3
+SMBG45A	MV	MV	50.0	55.3	1.0	45	1.0	8.3	72.7
+SMBG48	MW	MW	53.3	65.1	1.0	48	1.0	7.0	85.5
+SMBG48A	MX	MX	53.3	58.9	1.0	48	1.0	7.8	77.4
+SMBG51	MY	MY	56.7	69.3	1.0	51	1.0	6.6	91.1
+SMBG51A	MZ	MZ	56.7	62.7	1.0	51	1.0	7.3	82.4
+SMBG54	ND	ND	60.0	73.3	1.0	54	1.0	6.2	96.3
+SMBG54A	NE	NE	60.0	66.3	1.0	54	1.0	6.9	87.1
+SMBG58	NF	NF	64.4	78.7	1.0	58	1.0	5.8	103
+SMBG58A	NG	NG	64.4	71.2	1.0	58	1.0	6.4	93.6
+SMBG60	NH	NH	66.7	81.5	1.0	60	1.0	5.6	107
+SMBG60A	NK	NK	66.7	73.7	1.0	60	1.0	6.2	96.8
+SMBG64	NL	NL	71.1	86.9	1.0	64	1.0	5.3	114
+SMBG64A	NM	NM	71.1	78.6	1.0	64	1.0	5.8	103
+SMBG70	NN	NN	77.8	95.1	1.0	70	1.0	4.8	125
+SMBG70A	NP	NP	77.8	86.0	1.0	70	1.0	5.3	113
+SMBG75	NQ	NQ	83.3	102	1.0	75	1.0	4.5	134
+SMBG75A	NR	NR	83.3	92.1	1.0	75	1.0	5.0	121
+SMBG78	NS	NS	86.7	106	1.0	78	1.0	4.3	139
+SMBG78A	NT	NT	86.7	95.8	1.0	78	1.0	4.8	126
+SMBG85	NU	NU	94.4	115	1.0	85	1.0	4.0	151
+SMBG85A	NV	NV	94.4	104	1.0	85	1.0	4.4	137
+SMBG90	NW	NW	100	122	1.0	90	1.0	3.8	160
+SMBG90A	NX	NX	100	111	1.0	90	1.0	4.1	146
+SMBG100	NY	NY	111	136	1.0	100	1.0	3.4	179
+SMBG100A	NZ	NZ	111	123	1.0	100	1.0	3.7	162
+SMBG110	PD	PD	122	149	1.0	110	1.0	3.1	196
+SMBG110A	PE	PE	122	135	1.0	110	1.0	3.4	177
+SMBG120	PF	PF	133	163	1.0	120	1.0	2.8	214
+SMBG120A	PG	PG	133	147	1.0	120	1.0	3.1	193
+SMBG130	PH	PH	144	176	1.0	130	1.0	2.6	231
+SMBG130A	PK	PK	144	159	1.0	130	1.0	2.9	209
+SMBG150	PL	PL	167	204	1.0	150	1.0	2.2	268
+SMBG150A	PM	PM	167	185	1.0	150	1.0	2.5	243
+SMBG160	PN	PN	178	218	1.0	160	1.0	2.1	287
+SMBG160A	PP	PP	178	197	1.0	160	1.0	2.3	259
+SMBG170	PQ	PQ	189	231	1.0	170	1.0	2.0	304
+SMBG170A	PR	PR	189	209	1.0	170	1.0	2.2	275
SMBG188	PT	PT	209	255	1.0	188	1.0	1.7	344
SMBG188A	PS	PS	209	231	1.0	188	1.0	2.0	328

Notes: (1) Pulse test: $t_p \leq 50ms$

(2) Surge current waveform per Fig. 3 and derate per Fig. 2

(3) For bi-directional types having V_{WM} of 10 Volts and less, the I_D limit is doubled

(4) All terms and symbols are consistent with ANSI/IEEE C62.35

+ Underwriters Laboratory Recognition for the classification of protectors (QVGQ2) under the UL standard for safety 497B and file number E136766 for both uni-directional and bi-directional devices

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

Fig. 1 – Peak Pulse Power Rating Curve

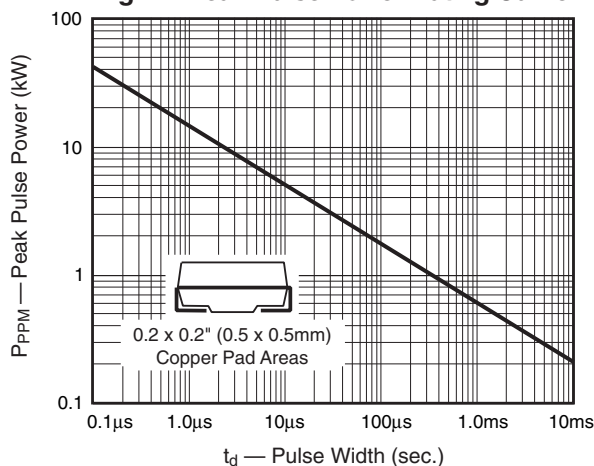


Fig. 2 – Pulse Derating Curve

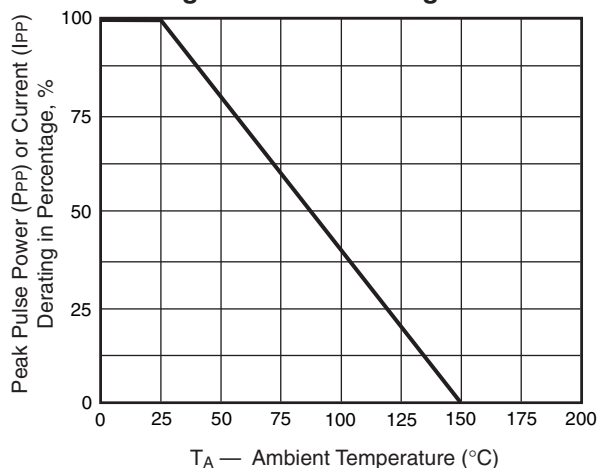


Fig. 3 – Pulse Waveform

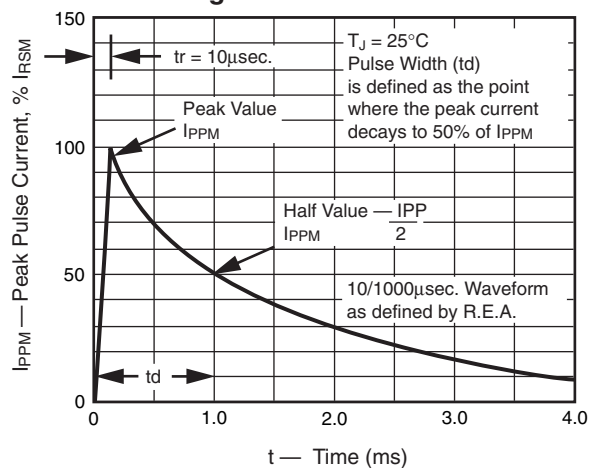


Fig. 4 – Typical Junction Capacitance

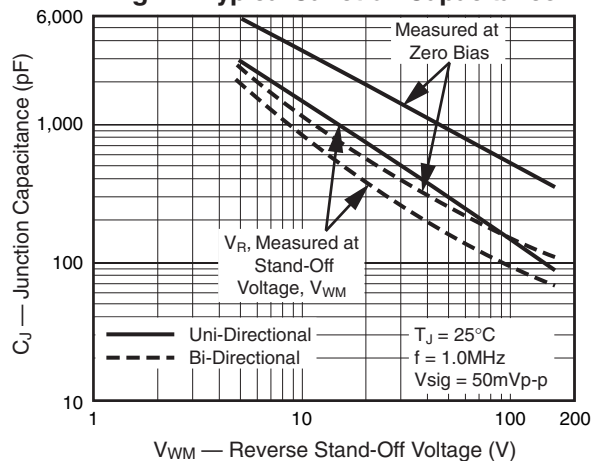


Fig. 5 – Typical Transient Thermal Impedance

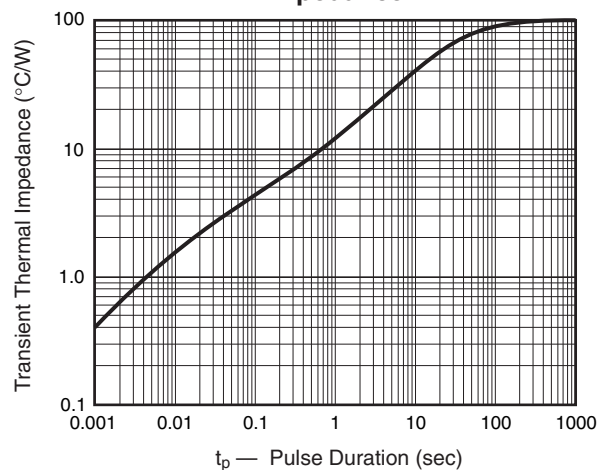
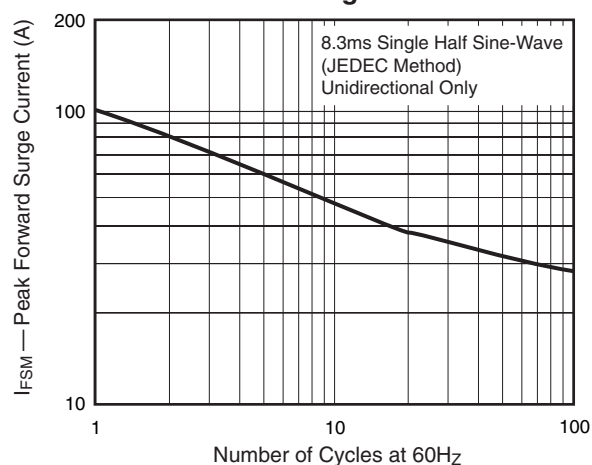


Fig. 6 – Maximum Non-Repetitive Peak Forward Surge Current





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