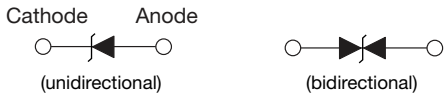
THE DATASHEET OF

SMBG90CA-E3/5B

Surface Mount TRANSZORB® Transient Voltage Suppressors

SMBG (DO-215AA)



LINKS TO ADDITIONAL RESOURCES

3D Models

PRIMARY CHARACTERISTICS	
V_{WM}	5.0 V to 188 V
V_{BR} (unidirectional)	6.4 V to 231 V
V_{BR} (bidirectional)	6.4 V to 231 V
P_{PPM}	600 W
I_{FSM} (unidirectional only)	100 A
T_J max.	150 °C
Polarity	Unidirectional, bidirectional
Package	SMBG (DO-215AA)

DEVICES FOR BIDIRECTION APPLICATIONS

For bidirectional devices use CA suffix (e.g. SMBG10CA).

Electrical characteristics apply in both directions.

FEATURES

AUTOMOTIVE GRADE

RoHS COMPLIANT

HALOGEN FREE Available

- Low profile package
- Ideal for automated placement
- Glass passivated chip junction
- Available in unidirectional and bidirectional
- 600 W peak pulse power capability with a 10/1000 µs 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
- AEC-Q101 qualified
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

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: SMBG (DO-215AA)
Molding compound meets UL 94 V-0 flammability rating

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

Base P/N-M3 - halogen-free, RoHS compliant, and industrial grade

Base P/NHE3 - RoHS compliant, AEC-Q101 qualified

Base P/NHM3 - halogen-free, RoHS compliant, and AEC-Q101 qualified

Terminals: matte tin plated leads, solderable per J-STD-002 and JESD 22-B102

E3, M3, HE3, and HM3 suffix meets JESD 201 class 2 whisker test

Polarity: for unidirectional types the band denotes cathode end, no marking on bidirectional types

MAXIMUM RATINGS (T_A = 25 °C unless otherwise noted)			
PARAMETER	**SYMBOL**	**VALUE**	**UNIT**
Peak pulse power dissipation with a 10/1000 µs waveform (1)(2) (fig. 1)	P_{PPM}	600	W
Peak pulse current with a 10/1000 µs waveform (1)	I_{PPM}	See next table	A
Peak forward surge current 8.3 ms single half sine-wave unidirectional 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 mm 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 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.					
(+)SMBG5.0A (5)	KE	KE	6.40	7.07	10	5.0	800	65.2	9.2
(+)SMBG6.0A	KG	KG	6.67	7.37	10	6.0	800	58.3	10.3
(+)SMBG6.5A	KK	AK	7.22	7.98	10	6.5	500	53.6	11.2
(+)SMBG7.0A	KM	KM	7.78	8.60	10	7.0	200	50.0	12.0
(+)SMBG7.5A	KP	AP	8.33	9.21	1.0	7.5	100	46.5	12.9
(+)SMBG8.0A	KR	AR	8.89	9.83	1.0	8.0	50	44.1	13.6
(+)SMBG8.5A	KT	AT	9.44	10.4	1.0	8.5	20	41.7	14.4
(+)SMBG9.0A	KV	AV	10.0	11.1	1.0	9.0	10	39.0	15.4
(+)SMBG10A	KX	AX	11.1	12.3	1.0	10	5.0	35.3	17.0
(+)SMBG11A	KZ	KZ	12.2	13.5	1.0	11	5.0	33.0	18.2
(+)SMBG12A	LE	BE	13.3	14.7	1.0	12	5.0	30.2	19.9
(+)SMBG13A	LG	LG	14.4	15.9	1.0	13	1.0	27.9	21.5
(+)SMBG14A	LK	BK	15.6	17.2	1.0	14	1.0	25.9	23.2
(+)SMBG15A	LM	BM	16.7	18.5	1.0	15	1.0	24.6	24.4
(+)SMBG16A	LP	LM	17.8	19.7	1.0	16	1.0	23.1	26.0
(+)SMBG17A	LR	LR	18.9	20.9	1.0	17	1.0	21.7	27.6
(+)SMBG18A	LT	BT	20.0	22.1	1.0	18	1.0	20.5	29.2
(+)SMBG20A	LV	LV	22.2	24.5	1.0	20	1.0	18.5	32.4
(+)SMBG22A	LX	BX	24.4	26.9	1.0	22	1.0	16.9	35.5
(+)SMBG24A	LZ	BZ	26.7	29.5	1.0	24	1.0	15.4	38.9
(+)SMBG26A	ME	CE	28.9	31.9	1.0	26	1.0	14.3	42.1
(+)SMBG28A	MG	MG	31.1	34.4	1.0	28	1.0	13.2	45.4
(+)SMBG30A	MK	CK	33.3	36.8	1.0	30	1.0	12.4	48.4
(+)SMBG33A	MM	CM	36.7	40.6	1.0	33	1.0	11.3	53.3
(+)SMBG36A	MP	CP	40.0	44.2	1.0	36	1.0	10.3	58.1
(+)SMBG40A	MR	CR	44.4	49.1	1.0	40	1.0	9.3	64.5
(+)SMBG43A	MT	CT	47.8	52.8	1.0	43	1.0	8.6	69.4
(+)SMBG45A	MV	MV	50.0	55.3	1.0	45	1.0	8.3	72.7
(+)SMBG48A	MX	MX	53.3	58.9	1.0	48	1.0	7.8	77.4
(+)SMBG51A	MZ	MZ	56.7	62.7	1.0	51	1.0	7.3	82.4
(+)SMBG54A	NE	NE	60.0	66.3	1.0	54	1.0	6.9	87.1
(+)SMBG58A	NG	NG	64.4	71.2	1.0	58	1.0	6.4	93.6
(+)SMBG60A	NK	NK	66.7	73.7	1.0	60	1.0	6.2	96.8
(+)SMBG64A	NM	NM	71.1	78.6	1.0	64	1.0	5.8	103
(+)SMBG70A	NP	NP	77.8	86.0	1.0	70	1.0	5.3	113
(+)SMBG75A	NR	NR	83.3	92.1	1.0	75	1.0	5.0	121
(+)SMBG78A	NT	NT	86.7	95.8	1.0	78	1.0	4.8	126
(+)SMBG85A	NV	NV	94.4	104	1.0	85	1.0	4.4	137
(+)SMBG90A	NX	NX	100	111	1.0	90	1.0	4.1	146
(+)SMBG100A	NZ	NZ	111	123	1.0	100	1.0	3.7	162
(+)SMBG110A	PE	PE	122	135	1.0	110	1.0	3.4	177
(+)SMBG120A	PG	PG	133	147	1.0	120	1.0	3.1	193
(+)SMBG130A	PK	PK	144	159	1.0	130	1.0	2.9	209
(+)SMBG150A	PM	PM	167	185	1.0	150	1.0	2.5	243
(+)SMBG160A	PP	PP	178	197	1.0	160	1.0	2.3	259
(+)SMBG170A	PR	PR	189	209	1.0	170	1.0	2.2	275
SMBG188A	PS	PS	209	231	1.0	188	1.0	2.0	328

Notes

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

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

(3) For bidirectional 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 bidirectional SMBG5.0CA, the maximum V_{BR} is 7.25 V

(6) V_F = 3.5 V at I_F = 50 A (unidirectional only)

(+) Underwriters laboratory recognition for the classification of protectors (QVGQ2) under the UL standard for safety 497B and file number E136766 for both unidirectional and bidirectional 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)	$R_{\theta JA}$	100	°C/ W
Typical thermal resistance, junction to lead	$R_{\theta JL}$	20	

Note

(1) Mounted on minimum recommended pad layout

ORDERING INFORMATION (Example)				
PREFERRED P/N	**UNIT WEIGHT (g)**	**PREFERRED PACKAGE CODE**	**BASE QUANTITY**	**DELIVERY MODE**
SMBG5.0A-E3/52	0.096	52	750	7" diameter plastic tape and reel
SMBG5.0A-M3/52	0.096	52	750	7" diameter plastic tape and reel
SMBG5.0A-E3/5B	0.096	5B	3200	13" diameter plastic tape and reel
SMBG5.0A-M3/5B	0.096	5B	3200	13" diameter plastic tape and reel
SMBG5.0AHE3/52 (1)	0.096	52	750	7" diameter plastic tape and reel
SMBG5.0AHM3/52 (1)	0.096	52	750	7" diameter plastic tape and reel
SMBG5.0AHE3/5B (1)	0.096	5B	3200	13" diameter plastic tape and reel
SMBG5.0AHM3/5B (1)	0.096	5B	3200	13" diameter plastic tape and reel

Note

(1) AEC-Q101 qualified

RATINGS AND CHARACTERISTICS CURVES (T_A = 25 °C unless otherwise noted)

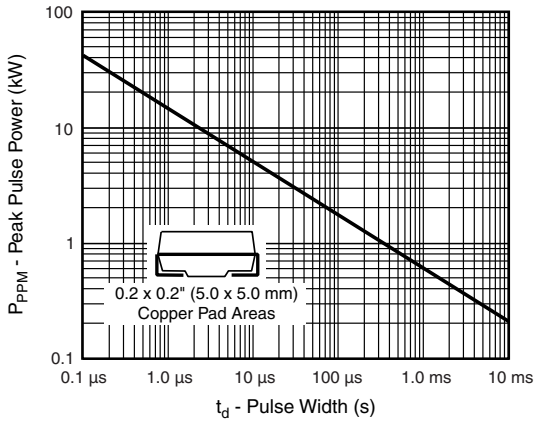

Fig. 1 - Peak Pulse Power Rating Curve

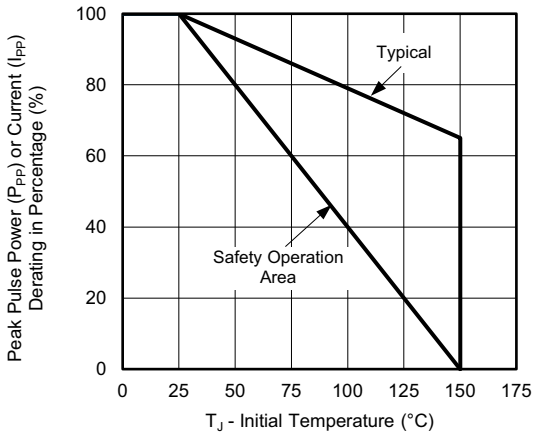

Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature

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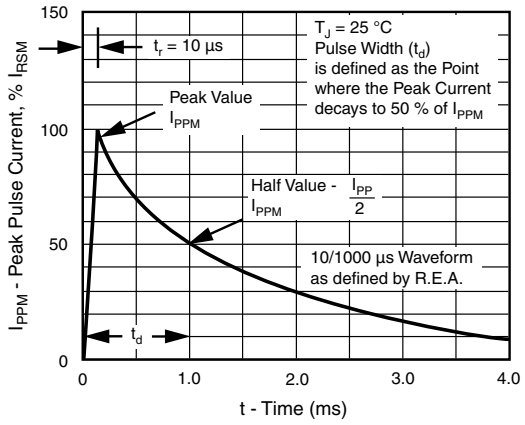

Fig. 3 - Pulse Waveform

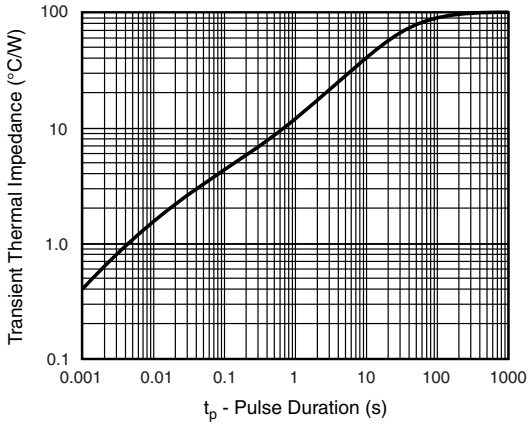

Fig. 5 - Typical Transient Thermal Impedance

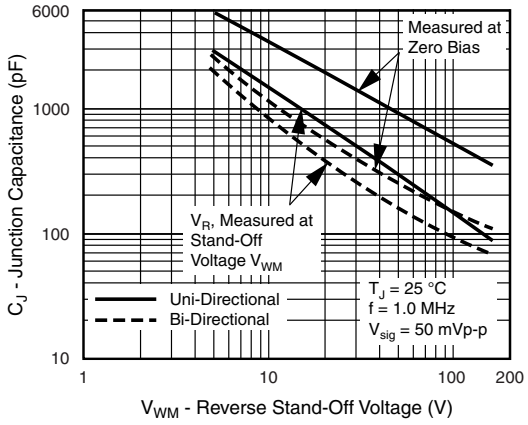

Fig. 4 - Typical Junction Capacitance

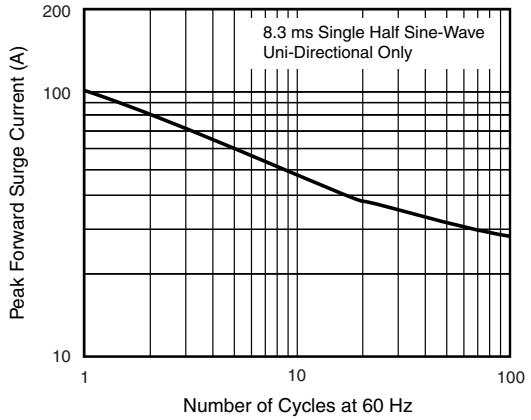

Fig. 6 - Maximum Non-Repetitive Peak Forward Surge Current

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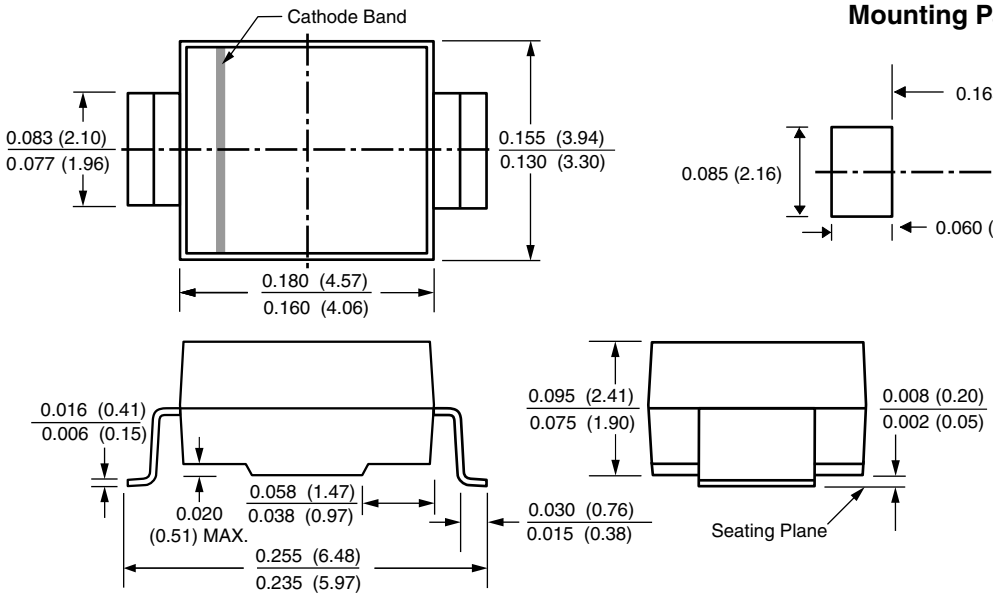
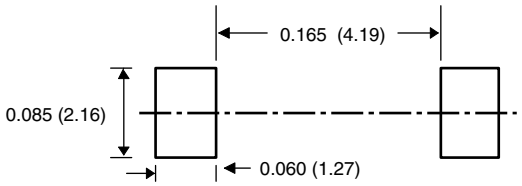
PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

SMBG (DO-215AA)



Mounting Pad Layout



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