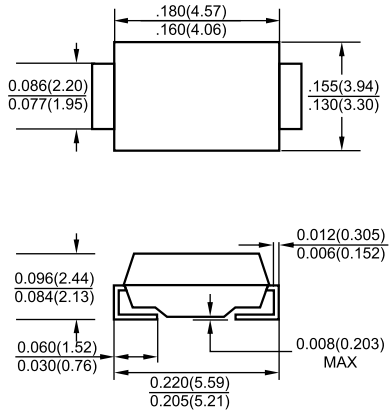
SMBJ SERIES

600 Watts Surface Mount
Transient Voltage Suppressor

SMB/DO-214AA



Dimensions in inches and (millimeters)

Features

- ✧ For surface mounted application
- ✧ Low profile package
- ✧ Built-in strain relief
- ✧ Glass passivated junction
- ✧ Excellent clamping capability
- ✧ Fast response time: Typically less than 1.0ps from 0 volt to BV min.
- ✧ Typical I_R less than 1 μA above 10V
- ✧ High temperature soldering guaranteed: 260°C / 10 seconds at terminals
- ✧ Plastic material used carries Underwriters Laboratory Flammability Classification 94V-0
- ✧ 600 watts peak pulse power capability with a 10 x 1000 us waveform by 0.01% duty cycle

Mechanical Data

- ✧ Case: Molded plastic
- ✧ Terminals: Pure tin plated lead free,
- ✧ Polarity: Indicated by cathode band except bipolar
- ✧ Weight: 0.093gram

Maximum Ratings and Electrical Characteristics

Rating at 25°C ambient temperature unless otherwise specified.

Type Number	Symbol	Value	Units
Peak Power Dissipation at T_A=25°C, Tp=1ms (Note 1)	P_{PK}	Minimum 600	Watts
Steady State Power Dissipation	Pd	3	Watts
Peak Forward Surge Current, 8.3 ms Single Half Sine-wave Superimposed on Rated Load (JEDEC method) (Note 2, 3) - Unidirectional Only	I_{FSM}	100	Amps
Maximum Instantaneous Forward Voltage at 50.0A for Unidirectional Only (Note 4)	V_F	3.5 / 5.0	Volts
Typical Thermal Resistance (Note 5)	$R_{\theta JC}$ $R_{\theta JA}$	10 55	°C/W
Operating and Storage Temperature Range	T_J, T_{STG}	-65 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 5.0mm^2 (.013 mm Thick) Copper Pads to Each Terminal.
3. 8.3ms Single Half Sine-wave or Equivalent Square Wave, Duty Cycle=4 pulses Per Minute Maximum.
4. V_F=3.5V on SMBJ5.0 thru SMBJ90 Devices and V_F=5.0V on SMBJ100 thru SMBJ170 Devices.
5. Measured on P.C.B. with 0.27 x 0.27" (7.0 x 7.0mm) Copper Pad Areas.

Devices for Bipolar Applications
1. For Bidirectional Use C or CA Suffix for Types SMBJ5.0 through Types SMBJ170.
2. Electrical Characteristics Apply in Both Directions.

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RATINGS AND CHARACTERISTIC CURVES (SMBJ SERIES)

FIG.1- PEAK PULSE POWER RATING CURVE

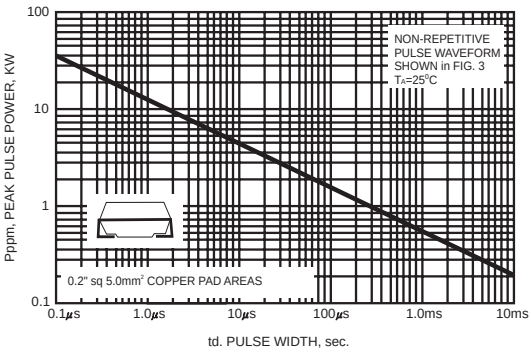


FIG.2- PULSE DERATING CURVE

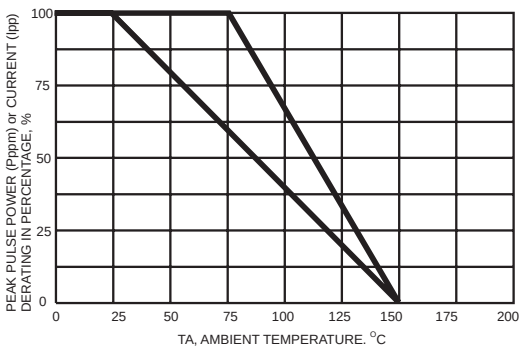


FIG.3- CLAMPING POWER PULSE WAVEFORM

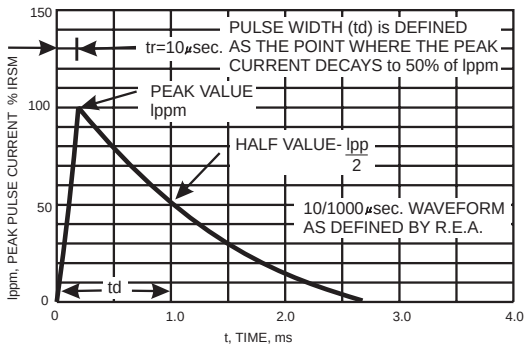


FIG.4- MAXIMUM NON-REPETITIVE FORWARD SURGE CURRENT

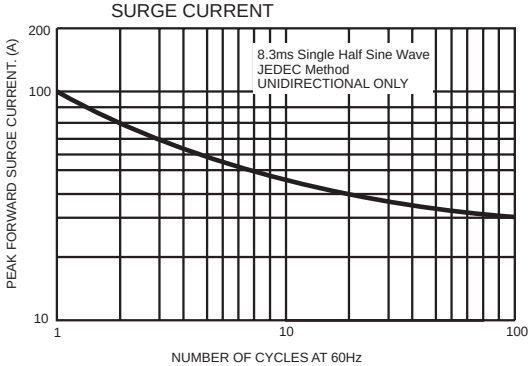
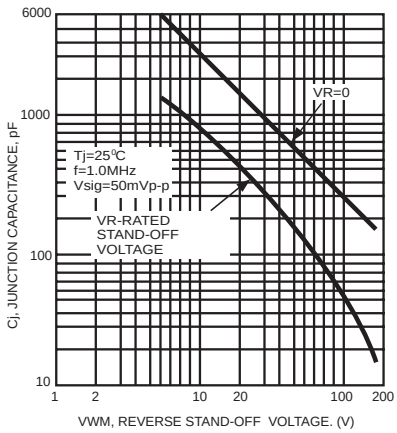


FIG.5- TYPICAL JUNCTION CAPACITANCE



SMBJ SERIES

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ELECTRICAL CHARACTERISTICS (T_A=25°C unless otherwise noted)

Device	Device Marking Code	Breakdown Voltage V_{BR} (Volts) (Note 1) Min	Breakdown Voltage V_{BR} (Volts) (Note 1) Max	Test Current @I_T(mA)	Stand-Off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at Vwm I_D (uA)	Maximum Peak Surge Current I_{PPM} (Note 2)(Amps)	Maximum Clamping Voltage at I_{PPM} V_C(Volts)
SMBJ5.0	SMBJ5.0	6.40	7.30	10	5.0	800.0	65	9.6
SMBJ5.0A	SMBJ5.0A	6.40	7.00	10	5.0	800.0	68	9.2
SMBJ6.0	SMBJ6.0	6.67	8.15	10	6.0	800.0	55	11.4
SMBJ6.0A	SMBJ6.0A	6.67	7.37	10	6.0	800.0	61	10.3
SMBJ6.5	SMBJ6.5	7.22	8.82	10	6.5	500.0	51	12.3
SMBJ6.5A	SMBJ6.5A	7.22	7.98	10	6.5	500.0	56	11.2
SMBJ7.0	SMBJ7.0	7.78	9.51	10	7.0	200.0	47	13.3
SMBJ7.0A	SMBJ7.0A	7.78	8.60	10	7.0	200.0	52	12.0
SMBJ7.5	SMBJ7.5	8.33	10.3	1.0	7.5	100.0	44	14.3
SMBJ7.5A	SMBJ7.5A	8.33	9.21	1.0	7.5	100.0	48	12.9
SMBJ8.0	SMBJ8.0	8.89	10.9	1.0	8.0	50.0	42	15.0
SMBJ8.0A	SMBJ8.0A	8.89	9.83	1.0	8.0	50.0	46	13.6
SMBJ8.5	SMBJ8.5	9.44	11.5	1.0	8.5	20.0	39	15.9
SMBJ8.5A	SMBJ8.5A	9.44	10.4	1.0	8.5	20.0	43	14.4
SMBJ9.0	SMBJ9.0	10.0	12.2	1.0	9.0	10.0	37	16.9
SMBJ9.0A	SMBJ9.0A	10.0	11.1	1.0	9.0	10.0	40	15.4
SMBJ10	SMBJ10	11.1	13.6	1.0	10	5.0	33	18.8
SMBJ10A	SMBJ10A	11.1	12.3	1.0	10	5.0	37	17.0
SMBJ11	SMBJ11	12.2	14.9	1.0	11	5.0	31	20.1
SMBJ11A	SMBJ11A	12.2	13.5	1.0	11	5.0	34	18.2
SMBJ12	SMBJ12	13.3	16.3	1.0	12	5.0	28	22.0
SMBJ12A	SMBJ12A	13.3	14.7	1.0	12	5.0	31	19.9
SMBJ13	SMBJ13	14.4	17.6	1.0	13	5.0	26	23.8
SMBJ13A	SMBJ13A	14.4	15.9	1.0	13	5.0	29	21.5
SMBJ14	SMBJ14	15.6	19.1	1.0	14	5.0	24.4	25.8
SMBJ14A	SMBJ14A	15.6	17.2	1.0	14	5.0	27	23.2
SMBJ15	SMBJ15	16.7	20.4	1.0	15	5.0	23.1	26.9
SMBJ15A	SMBJ15A	16.7	18.5	1.0	15	5.0	25.1	24.4
SMBJ16	SMBJ16	17.8	21.8	1.0	16	5.0	21.8	28.8
SMBJ16A	SMBJ16A	17.8	19.7	1.0	16	5.0	24.2	26.0
SMBJ17	SMBJ17	18.9	23.1	1.0	17	5.0	20.0	30.5
SMBJ17A	SMBJ17A	18.9	20.9	1.0	17	5.0	22.8	27.6
SMBJ18	SMBJ18	20.0	24.4	1.0	18	5.0	19.5	32.2
SMBJ18A	SMBJ18A	20.0	22.1	1.0	18	5.0	21.5	29.2
SMBJ20	SMBJ20	22.2	27.1	1.0	20	5.0	17.6	35.8
SMBJ20A	SMBJ20A	22.2	24.5	1.0	20	5.0	19.4	32.4
SMBJ22	SMBJ22	24.4	29.8	1.0	22	5.0	15.0	39.4
SMBJ22A	SMBJ22A	24.4	26.9	1.0	22	5.0	17.7	35.5
SMBJ24	SMBJ24	26.7	32.6	1.0	24	5.0	14.6	43.0
SMBJ24A	SMBJ24A	26.7	29.5	1.0	24	5.0	16.0	38.9
SMBJ26	SMBJ26	28.9	35.3	1.0	26	5.0	13.5	46.6
SMBJ26A	SMBJ26A	28.9	31.9	1.0	26	5.0	14.9	42.1
SMBJ28	SMBJ28	31.1	38.0	1.0	28	5.0	12.6	50.0
SMBJ28A	SMBJ28A	31.1	34.4	1.0	28	5.0	13.8	45.4
SMBJ30	SMBJ30	33.3	40.7	1.0	30	5.0	11.7	53.5
SMBJ30A	SMBJ30A	33.3	36.8	1.0	30	5.0	13.0	48.4
SMBJ33	SMBJ33	36.7	44.9	1.0	33	5.0	10.6	59.0
SMBJ33A	SMBJ33A	36.7	40.6	1.0	33	5.0	11.8	53.3
SMBJ36	SMBJ36	40.0	48.9	1.0	36	5.0	9.8	64.3
SMBJ36A	SMBJ36A	40.0	44.2	1.0	36	5.0	10.8	58.1
SMBJ40	SMBJ40	44.4	54.3	1.0	40	5.0	8.8	71.4
SMBJ40A	SMBJ40A	44.4	49.1	1.0	40	5.0	9.7	64.5
SMBJ43	SMBJ43	47.8	58.4	1.0	43	5.0	8.2	76.7
SMBJ43A	SMBJ43A	47.8	52.8	1.0	43	5.0	9.0	69.4

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Device	Device Marking Code	Breakdown Voltage V_{BR} (Volts) (Note 1)		Test Current @I_T(mA)	Stand-Off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at Vwm I_D (uA)	Maximum Peak Surge Current I_{PPM} (Note 2)(Amps)	Maximum Clamping Voltage at I_{PPM} V_C(volts)
		Min	Max					
SMBJ45	SMBJ45	50.0	61.1	1.0	45	5.0	7.8	80.3
SMBJ45A	SMBJ45A	50.0	55.3	1.0	45	5.0	8.6	72.7
SMBJ48	SMBJ48	53.3	65.1	1.0	48	5.0	7.3	85.5
SMBJ48A	SMBJ48A	53.3	58.9	1.0	48	5.0	8.1	77.4
SMBJ51	SMBJ51	56.7	69.3	1.0	51	5.0	6.9	91.1
SMBJ51A	SMBJ51A	56.7	62.7	1.0	51	5.0	7.6	82.4
SMBJ54	SMBJ54	60.0	73.3	1.0	54	5.0	6.5	96.3
SMBJ54A	SMBJ54A	60.0	66.3	1.0	54	5.0	7.2	87.1
SMBJ58	SMBJ58	64.4	78.7	1.0	58	5.0	6.1	103
SMBJ58A	SMBJ58A	64.4	71.2	1.0	58	5.0	6.7	93.6
SMBJ60	SMBJ60	66.7	81.5	1.0	60	5.0	5.8	107
SMBJ60A	SMBJ60A	66.7	73.7	1.0	60	5.0	6.5	96.8
SMBJ64	SMBJ64	71.1	86.9	1.0	64	5.0	5.5	114
SMBJ64A	SMBJ64A	71.1	78.6	1.0	64	5.0	6.1	103
SMBJ70	SMBJ70	77.8	95.1	1.0	70	5.0	5.0	125
SMBJ70A	SMBJ70A	77.8	86.0	1.0	70	5.0	5.5	113
SMBJ75	SMBJ75	83.3	102	1.0	75	5.0	4.7	134
SMBJ75A	SMBJ75A	83.3	92.1	1.0	75	5.0	5.2	121
SMBJ78	SMBJ78	86.7	106	1.0	78	5.0	4.5	139
SMBJ78A	SMBJ78A	86.7	95.8	1.0	78	5.0	5.0	126
SMBJ85	SMBJ85	94.4	115	1.0	85	5.0	4.1	151
SMBJ85A	SMBJ85A	94.4	104	1.0	85	5.0	4.6	137
SMBJ90	SMBJ90	100	122	1.0	90	5.0	3.9	160
SMBJ90A	SMBJ90A	100	111	1.0	90	5.0	4.3	146
SMBJ100	SMBJ100	111	136	1.0	100	5.0	3.5	179
SMBJ100A	SMBJ100A	111	123	1.0	100	5.0	3.8	162
SMBJ110	SMBJ110	122	149	1.0	110	5.0	3.2	196
SMBJ110A	SMBJ110A	122	135	1.0	110	5.0	3.5	177
SMBJ120	SMBJ120	133	163	1.0	120	5.0	2.9	214
SMBJ120A	SMBJ120A	133	147	1.0	120	5.0	3.2	193
SMBJ130	SMBJ130	144	176	1.0	130	5.0	2.7	231
SMBJ130A	SMBJ130A	144	159	1.0	130	5.0	3.0	209
SMBJ150	SMBJ150	167	204	1.0	150	5.0	2.3	268
SMBJ150A	SMBJ150A	167	185	1.0	150	5.0	2.5	243
SMBJ160	SMBJ160	178	218	1.0	160	5.0	2.2	287
SMBJ160A	SMBJ160A	178	197	1.0	160	5.0	2.4	259
SMBJ170	SMBJ170	189	231	1.0	170	5.0	2.0	304
SMBJ170A	SMBJ170A	189	209	1.0	170	5.0	2.2	275

Note:

1. V_{BR} measured after I_T applied for 300us, I_T=square wave pulse or equivatent.
2. Surge current waveform per Figure 3 and derate per Figure 2.
3. All terms and symbols are consistant with ANSI/IEEE C62.35.
4. For bidirectional use C or CA suffix for types SMBJ5.0 thorugh types SMBJ170.
5. For bipolar types having V_{WM} of 10 volts(SMBJ8.0C) and under the I_D limit is doubled.

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TVS APPLICATION NOTES:

Transient Voltage Suppressors may be used at various points in a circuit to provide various degrees of protection. The following is a typical linear power supply with transient voltage suppressor units placed at different points. All provide protection of the load.

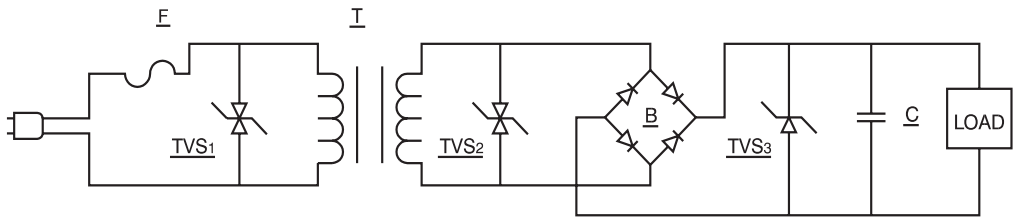

FIGURE 1

Transient Voltage Suppressors 1 provides maximum protection. However, the system will probably require replacement of the line fuse(F) since it provides a dominant portion of the series impedance when a surge is encountered.

However, we do not recommend to use the TVS diode here, unless we can know the electric circuit impedance and the magnitude of surge rushed into the circuit. Otherwise the TVS diode is easy to be destroyed by voltage surge.

Transient Voltage Suppressor 2 provides execllent protection of circuitry excluding the transformer(T). However, since the transformer is a large part of the series impedance, the chance of the line fuse opening during the surge condition is reduced.

Transient Voltage Suppressor 3 provides the load with complete protection. It uses a unidirectional Transient Voltage Suppressor, which is a cost advantage. The series impedance now includes the line fuse, transformer, and bridge rectifier(B) so failure of the line fuse is further reduced. If only Transient Voltage Suppressor 3 is in use, then the bridge rectifier is unprotected and would require a higher voltage and current rating to prevent failure by transients.

Any combination of these three, or any one of these applications, will prevent damage to the load. This would require varying trade-offs in power supply protection versus maintenance(changing the time fuse).

An additional method is to utilize the Transient Voltage Suppressor units as a controlled avalanche bridge. This reduces the parts count and incorporates the protection within the bridge rectifier.

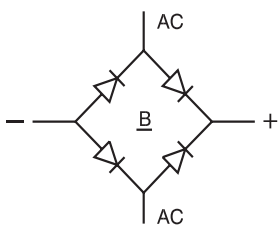

FIGURE 2

RECOMMENDED PAD SIZES

The pad dimensions should be 0.010"(0.25mm) longer than the contact size, in the lead axis.

This allows a solder fillet to form, see figure below. Contact factory for soldering methods.