Surface-mount Transient Voltage Suppressor

PRODUCT SUMMARY

Voltage range 6.8 to 200 Volts
600 Watts Peak Power
3.0 Watts Steady state

FEATURES

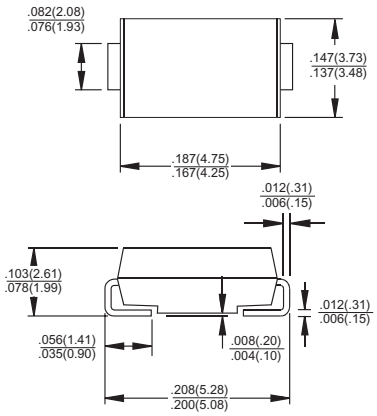
For surface-mount applications in order to optimize board space.
Low profile package.
Built-in strain relief.
Glass-passivated junction.
Excellent clamping capability.
Fast response time: typically less than 1.0ps from 0 volt to BV min.
Typical I_R less than 1 μA above 10V
High temperature soldering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

MECHANICAL DATA

Case: Molded plastic
Terminals: Matte-Sn plated
Polarity: Indicated by cathode band
Standard packaging: 12mm tape (EIA STD RS-481)
Weight: 0.093 gram

Pb-free, RoHS compliant.

SMB/DO-214AA



Dimensions in inches and (millimeters)

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Rating at 25°C ambient temperature unless otherwise specified.

Parameter	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 P6SMB6.8 thru P6SMB91 devices and V_F=5.0V on SMBJ100 thru SMBJ200 devices.
5. Measured on P.C.B. with 0.27" x 0.27"(7.0mm x 7.0mm) copper pad areas.

For bi-directional applications:

1. Change to C or CA suffix for types P6SMB6.8 through types P6SMB200A.
2. Electrical characteristics apply in both directions.

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

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 V_{WM} I_D (uA)	Maximum Peak Pulse Current I_{RSM} (Note 2)(Amps)	Maximum Clamping Voltage at I_{PPM} V_C(Volts)	Maximum Temperature Coefficient of V_{BR}(%/°C)
		Min	Max						
P6SMB6.8	KDJ	6.12	7.48	10	5.50	1000	58	10.8	0.057
P6SMB6.8A	KEJ	6.45	7.14	10	5.80	1000	60	10.5	0.057
P6SMB7.5	KFJ	6.75	8.25	10	6.05	500	53	11.7	0.061
P6SMB7.5A	KGJ	7.13	7.88	10	6.40	500	55	11.3	0.061
P6SMB8.2	KHJ	7.38	9.02	10	6.63	200	50	12.5	0.065
P6SMB8.2A	KKJ	7.79	8.61	10	7.02	200	52	12.1	0.065
P6SMB9.1	KLJ	8.19	10.0	1.0	7.37	50	45	13.8	0.068
P6SMB9.1A	KMJ	8.65	9.55	1.0	7.78	50	47	13.4	0.068
P6SMB10	KNJ	9.00	11.0	1.0	8.10	10	42	15.0	0.073
P6SMB10A	KPJ	9.50	10.5	1.0	8.55	10	43	14.5	0.073
P6SMB11	KQJ	9.90	12.1	1.0	8.92	5.0	38	16.2	0.075
P6SMB11A	KRJ	10.5	11.6	1.0	9.40	5.0	40	15.6	0.075
P6SMB12	KSJ	10.8	13.2	1.0	9.72	5.0	36	17.3	0.078
P6SMB12A	KTJ	11.4	12.6	1.0	10.2	5.0	37	16.7	0.078
P6SMB13	KUJ	11.7	14.3	1.0	10.5	5.0	33	19.0	0.081
P6SMB13A	KVJ	12.4	13.7	1.0	11.1	5.0	34	18.2	0.081
P6SMB15	KWJ	13.5	16.5	1.0	12.1	5.0	28	22.0	0.084
P6SMB15A	KXJ	14.3	15.8	1.0	12.8	5.0	29	21.2	0.084
P6SMB16	KYJ	14.4	17.6	1.0	12.9	5.0	26	23.5	0.086
P6SMB16A	KZJ	15.2	16.8	1.0	13.6	5.0	28	22.5	0.086
P6SMB18	LDJ	16.2	19.8	1.0	14.5	5.0	23	26.5	0.088
P6SMB18A	LEJ	17.1	18.9	1.0	15.3	5.0	25	25.2	0.088
P6SMB20	LFJ	18.0	22.0	1.0	16.2	5.0	21	29.1	0.090
P6SMB20A	LGJ	19.0	21.0	1.0	17.1	5.0	22	27.7	0.090
P6SMB22	LHJ	19.8	24.2	1.0	17.8	5.0	19	31.9	0.092
P6SMB22A	LKJ	20.9	23.1	1.0	18.8	5.0	20	30.6	0.092
P6SMB24	LLJ	21.6	26.4	1.0	19.4	5.0	18	34.7	0.094
P6SMB24A	LMJ	22.8	25.2	1.0	20.5	5.0	19	33.2	0.094
P6SMB27	LNJ	24.3	29.7	1.0	21.8	5.0	16	39.1	0.096
P6SMB27A	LPJ	25.7	28.4	1.0	23.1	5.0	16.8	37.5	0.096
P6SMB30	LQJ	27.0	33.0	1.0	24.3	5.0	14	43.5	0.097
P6SMB30A	LRJ	28.5	31.5	1.0	25.6	5.0	15	41.4	0.097
P6SMB33	LSJ	29.7	36.3	1.0	26.8	5.0	13.0	47.7	0.098
P6SMB33A	LTJ	31.4	34.7	1.0	28.2	5.0	13.8	45.7	0.098
P6SMB36	LUJ	32.4	39.6	1.0	29.1	5.0	12	52.0	0.099
P6SMB36A	LVJ	34.2	37.8	1.0	30.8	5.0	12.6	49.9	0.099
P6SMB39	LWJ	35.1	42.9	1.0	31.6	5.0	11.1	56.4	0.100
P6SMB39A	LXJ	37.1	41.0	1.0	33.3	5.0	11.6	53.9	0.100
P6SMB43	LYJ	38.7	47.3	1.0	34.8	5.0	10.0	61.9	0.101
P6SMB43A	LZJ	40.9	45.2	1.0	36.8	5.0	10.6	59.3	0.101
P6SMB47	MDJ	42.3	51.7	1.0	38.1	5.0	9.2	67.8	0.101
P6SMB47A	MEJ	44.7	49.4	1.0	40.2	5.0	9.7	64.8	0.101
P6SMB51	MFJ	45.9	56.1	1.0	41.3	5.0	8.5	73.5	0.102
P6SMB51A	MGJ	48.5	53.6	1.0	43.6	5.0	8.9	70.1	0.102
P6SMB56	MHJ	50.4	61.6	1.0	45.4	5.0	7.8	80.5	0.103
P6SMB56A	MKJ	53.2	58.8	1.0	47.8	5.0	8.1	77.0	0.103
P6SMB62	MLJ	55.8	68.2	1.0	50.2	5.0	7.0	89.0	0.104
P6SMB62A	MMJ	58.9	65.1	1.0	53.0	5.0	7.4	85.0	0.104
P6SMB68	MNJ	61.2	74.8	1.0	55.1	5.0	6.4	98.0	0.104
P6SMB68A	MPJ	64.6	71.4	1.0	58.1	5.0	6.8	92.0	0.104
P6SMB75	MQJ	67.5	82.5	1.0	60.7	5.0	5.8	108.0	0.105
P6SMB75A	MRJ	71.3	78.8	1.0	64.1	5.0	6.1	103.0	0.105
P6SMB82	MSJ	73.8	90.2	1.0	66.4	5.0	5.3	118.0	0.105
P6SMB82A	MTJ	77.9	86.1	1.0	70.1	5.0	5.5	113.0	0.105

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

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 V_{WM} I_D (uA)	Maximum Peak Pulse Current I_{RSM} (Note 2)(Amps)	Maximum Clamping Voltage at I_{PPM} V_C(Volts)	Maximum Temperature Coefficient of V_{BR}(%/°C)
		Min	Max						
P6SMB91	MUJ	81.9	100.0	1.0	73.7	5.0	4.8	131.0	0.106
P6SMB91A	MVJ	86.5	95.5	1.0	77.8	5.0	5.0	125.0	0.106
P6SMB100	MWJ	90.0	110.0	1.0	81.0	5.0	4.3	144.0	0.106
P6SMB100A	MXJ	95.0	105.0	1.0	85.5	5.0	4.5	137.0	0.106
P6SMB110	MYJ	99.0	121.0	1.0	89.2	5.0	3.9	158.0	0.107
P6SMB110A	MZJ	105.0	116.0	1.0	94.0	5.0	4.1	152.0	0.107
P6SMB120	NDJ	108.0	132.0	1.0	97.2	5.0	3.6	173.0	0.107
P6SMB120A	NEJ	114.0	126.0	1.0	102.0	5.0	3.8	165.0	0.107
P6SMB130	NFJ	117.0	143.0	1.0	105.0	5.0	3.3	187.0	0.107
P6SMB130A	NGJ	124.0	137.0	1.0	111.0	5.0	3.5	179.0	0.107
P6SMB150	NHJ	135.0	165.0	1.0	121.0	5.0	2.9	215.0	0.108
P6SMB150A	NKJ	143.0	158.0	1.0	128.0	5.0	3.0	207.0	0.108
P6SMB160	NLJ	144.0	176.0	1.0	130.0	5.0	2.7	230.0	0.108
P6SMB160A	NMJ	152.0	168.0	1.0	136.0	5.0	2.8	219.0	0.108
P6SMB170	NNJ	153.0	187.0	1.0	138.0	5.0	2.5	244.0	0.108
P6SMB170A	NPJ	162.0	179.0	1.0	145.0	5.0	2.6	234.0	0.108
P6SMB180	NQJ	162.0	198.0	1.0	146.0	5.0	2.4	258.0	0.108
P6SMB180A	NRJ	171.0	189.0	1.0	154.0	5.0	2.5	246.0	0.108
P6SMB200	NSJ	180.0	220.0	1.0	162.0	5.0	2.1	287.0	0.108
P6SMB200A	NTJ	190.0	210.0	1.0	171.0	5.0	2.2	274.0	0.108

Notes:

1. V_{BR} measured after I_T applied for 300us, I_T=square wave pulse or equivalent.
2. Surge current waveform per Figure 3 and derate per Figure 2.
3. For bi-directional types having V_{WM} of 10 volts and under, the I_D limit is doubled.
4. For bi-directional use, add C or CA suffix.
5. All terms and symbols are consistent with ANSI/IEEE C62.35.

RATINGS AND CHARACTERISTIC CURVES

FIG.1- PEAK PULSE POWER RATING CURVE

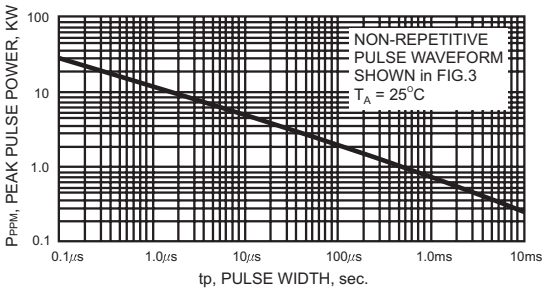


FIG.2- PULSE DERATING CURVE

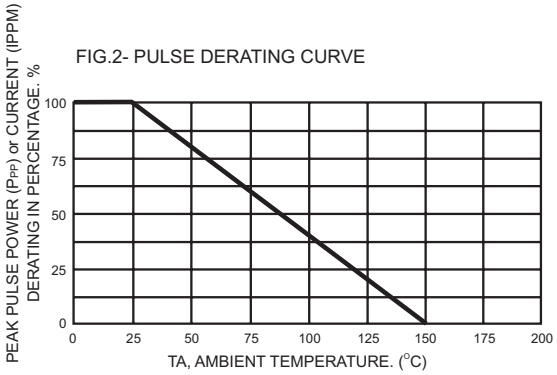


FIG.3- PULSE WAVEFORM

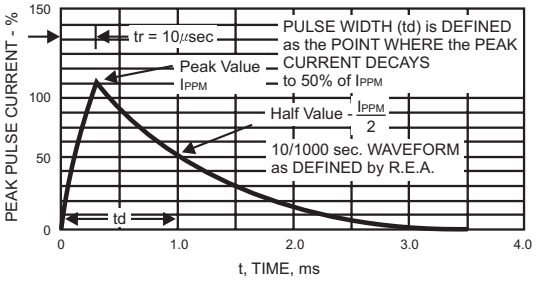


FIG.4- MAXIMUM NON-REPETITIVE FORWARD SURGE CURRENT UNIDIRECTIONAL ONLY

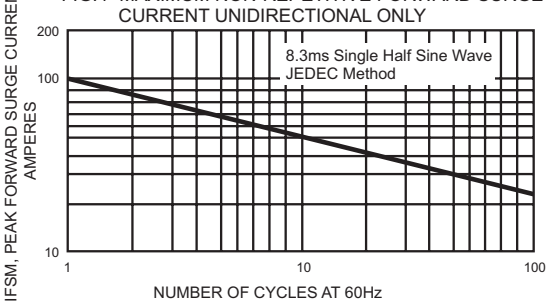


FIG.5- TYPICAL REVERSE LEAKAGE CHARACTERISTICS

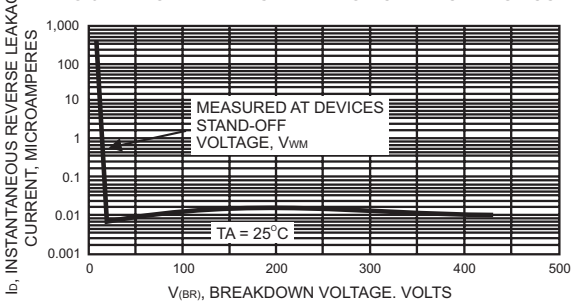
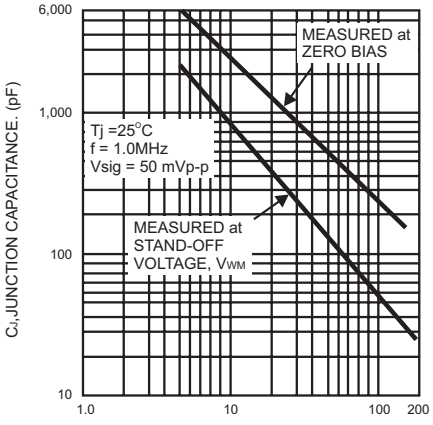


FIG.6- TYPICAL JUNCTION CAPACITANCE UNIDIRECTIONAL



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.

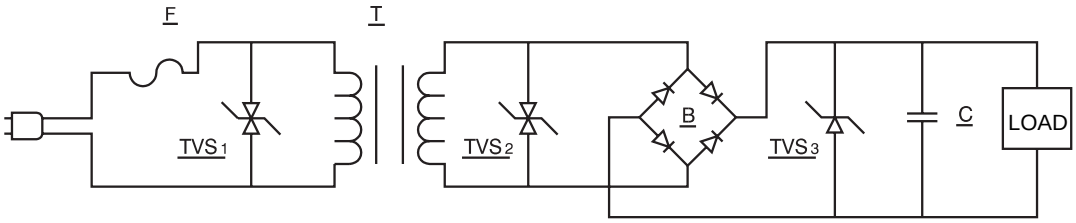


FIGURE 1

TVS1 provides the maximum protection. However, the system will probably also require replacement of the line fuse (F) since it provides the major portion of the series impedance when a surge is encountered. We do not recommend using the TVS diode in this way. Unless the electrical circuit impedance and the magnitude of the surge are well understood, the TVS diode may be easily destroyed by the voltage surge.

TVS2 provides execllent protection of the circuitry with the exception of the transformer (T). However, since the transformer represents a large part of the series impedance, the chance of the line fuse opening during the surge condition is reduced.

TVS3 provides the load with complete protection. It uses a unidirectional TVS which is a cost advantage. The series impedance now includes the line fuse, transformer, and bridge rectifier (B) so the chance of a failure of the line fuse is further reduced. If only TVS3 is used, then the bridge rectifier is unprotected and requires a higher voltage and current rating to prevent failure by transients.

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

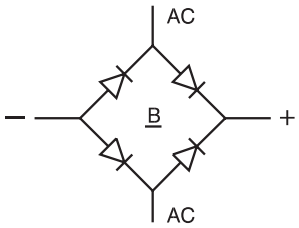


FIGURE 2