P6SMB11CAT3 SERIES
600 WATT PEAK POWER

GENERAL DATA APPLICABLE TO ALL SERIES IN THIS GROUP

Zener Transient Voltage Suppressors

PLASTIC SURFACE MOUNT ZENER OVERVOLTAGE TRANSIENT SUPPRESSORS 6.8–200 VOLTS 600 WATT PEAK POWER

The SMB series is designed to protect voltage sensitive components from high voltage, high energy transients. They have excellent clamping capability, high surge capability, low zener impedance and fast response time. The SMB series is supplied in Motorola's exclusive, cost-effective, highly reliable Surmetic package and is ideally suited for use in communication systems, numerical controls, process controls, medical equipment, business machines, power supplies and many other industrial/consumer applications.

Specification Features:

- Standard Zener Breakdown Voltage Range — 6.8 to 200 V
- Stand-off Voltage Range — 5 to 170 V
- Peak Power — 600 Watts @ 1 ms
- Maximum Clamp Voltage @ Peak Pulse Current
- Low Leakage < 5 μA Above 10 V
- UL Recognition
- Response Time Typically < 1 ns

CASE 403A
PLASTIC

Mechanical Characteristics:

CASE: Void-free, transfer-molded, thermosetting plastic
FINISH: All external surfaces are corrosion resistant and leads are readily solderable
POLARITY: Cathode indicated by molded polarity notch. When operated in zener mode, will be positive with respect to anode
MOUNTING POSITION: Any
LEADS: Modified L-Bend providing more contact area to bond pad
MAXIMUM CASE TEMPERATURE FOR SOLDERING PURPOSES: 260°C for 10 seconds
WAFER FAB LOCATION: Phoenix, Arizona
ASSEMBLY/TEST LOCATION: Seremban, Malaysia

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak Power Dissipation (1) @ $T_L \le 25°C$	P_{PK}	600	Watts
Forward Surge Current (2) @ $T_A = 25°C$	I_{FSM}	100	Amps
Thermal Resistance from Junction to Lead (typical)	$R_{\theta JL}$	25	°C/W
Operating and Storage Temperature Range	T_J, T_{stg}	– 65 to +150	°C

NOTES: 1. Nonrepetitive current pulse per Figure 2 and derated above $T_A = 25°C$ per Figure 3.
2. 1/2 sine wave (or equivalent square wave), PW = 8.3 ms, duty cycle = 4 pulses per minute maximum.

REV 1

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted) V_F = 3.5 V Max, I_F** = 50 A for all types.

Device††	Breakdown Voltage* V_{BR} @ I_T Volts Min	Nom	Max	mA	Working Peak Reverse Voltage V_{RWM} Volts	Maximum Reverse Leakage @ V_{RWM} I_R μA	Maximum Reverse Surge Current I_{RSM}† Amps	Maximum Reverse Voltage @ I_{RSM} (Clamping Voltage) V_{RSM} Volts	Maximum Temperature Coefficient of V_{BR} %/°C	Device Marking
P6SMB11CAT3	10.5	11	11.6	1	9.4	5	38	15.6	0.075	11C
P6SMB12CAT3	11.4	12	12.6	1	10.2	5	36	16.7	0.078	12C
P6SMB13CAT3	12.4	13	13.7	1	11.1	5	33	18.2	0.081	13C
P6SMB15CAT3	14.3	15	15.8	1	12.8	5	28	21.2	0.084	15C
P6SMB16CAT3	15.2	16	16.8	1	13.6	5	27	22.5	0.086	16C
P6SMB18CAT3	17.1	18	18.9	1	15.3	5	24	25.2	0.088	18C
P6SMB20CAT3	19	20	21	1	17.1	5	22	27.7	0.09	20C
P6SMB22CAT3	20.9	22	23.1	1	18.8	5	20	30.6	0.092	22C
P6SMB24CAT3	22.8	24	25.2	1	20.5	5	18	33.2	0.094	24C
P6SMB27CAT3	25.7	27	28.4	1	23.1	5	16	37.5	0.096	27C
P6SMB30CAT3	28.5	30	31.5	1	25.6	5	14.4	41.4	0.097	30C
P6SMB33CAT3	***31.4***	***33***	***34.7***	***1***	***28.2***	***5***	***13.2***	***45.7***	***0.098***	***33C***
P6SMB36CAT3	34.2	36	37.8	1	30.8	5	12	49.9	0.099	36C
P6SMB39CAT3	37.1	39	41	1	33.3	5	11.2	53.9	0.1	39C
P6SMB43CAT3	40.9	43	45.2	1	36.8	5	10.1	59.3	0.101	43C
P6SMB47CAT3	44.7	47	49.4	1	40.2	5	9.3	64.8	0.101	47C
P6SMB51CAT3	48.5	51	53.6	1	43.6	5	8.6	70.1	0.102	51C
P6SMB56CAT3	53.2	56	58.8	1	47.8	5	7.8	77	0.103	56C
P6SMB62CAT3	58.9	62	65.1	1	53	5	7.1	85	0.104	62C
P6SMB68CAT3	64.6	68	71.4	1	58.1	5	6.5	92	0.104	68C
P6SMB75CAT3	71.3	75	78.8	1	64.1	5	5.8	103	0.105	75C
P6SMB82CAT3	77.9	82	86.1	1	70.1	5	5.3	113	0.105	82C
P6SMB91CAT3	86.5	91	95.5	1	77.8	5	4.8	125	0.106	91C

* V_{BR} measured at pulse test current I_T at an ambient temperaure of 25°C.

** 1/2 sine wave (or equivalent square wave), PW = 8.3 ms, duty cycle = 4 pulses per minute maximum.

† Surge current waveform per Figure 2 and derate per Figure 3 of the General Data — 600 Watt at the beginning of this group.

†† T3 suffix designates tape and reel of 2500 units.

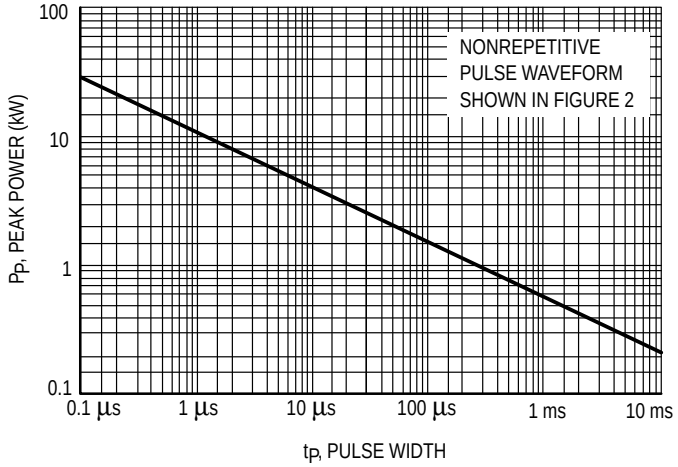


Figure 1. Pulse Rating Curve

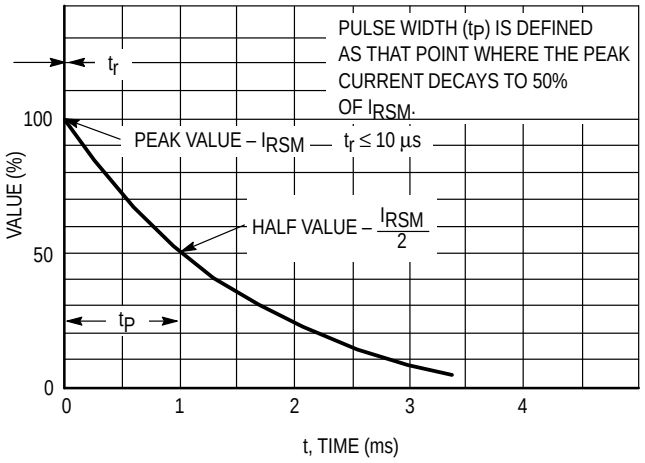


Figure 2. Pulse Waveform

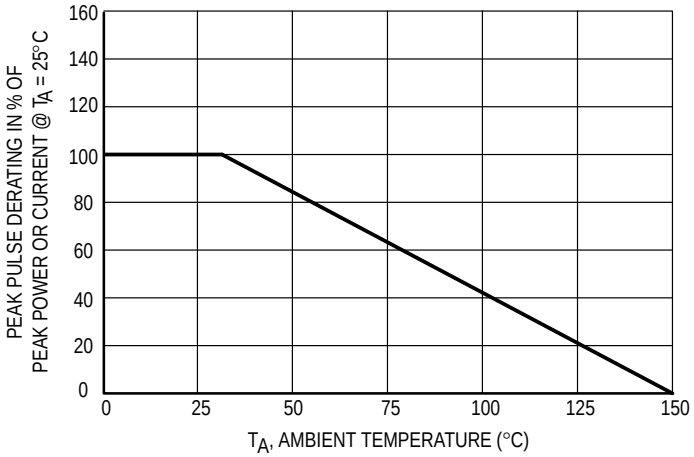
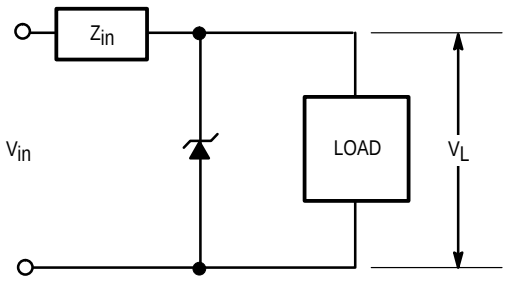


Figure 3. Pulse Derating Curve

TYPICAL PROTECTION CIRCUIT



APPLICATION NOTES

RESPONSE TIME

In most applications, the transient suppressor device is placed in parallel with the equipment or component to be protected. In this situation, there is a time delay associated with the capacitance of the device and an overshoot condition associated with the inductance of the device and the inductance of the connection method. The capacitive effect is of minor importance in the parallel protection scheme because it only produces a time delay in the transition from the operating voltage to the clamp voltage as shown in Figure 4.

The inductive effects in the device are due to actual turn-on time (time required for the device to go from zero current to full current) and lead inductance. This inductive effect produces an overshoot in the voltage across the equipment or component being protected as shown in Figure 5. Minimizing this overshoot is very important in the application, since the main purpose for adding a transient suppressor is to clamp voltage spikes. The SMB series have a very good response time, typically < 1 ns and negligible inductance. However, external inductive effects could produce unacceptable overshoot. Proper circuit layout, minimum lead lengths and placing the suppressor device as close as possible to the equipment or components to be protected will minimize this overshoot.

Some input impedance represented by Z_{in} is essential to prevent overstress of the protection device. This impedance should be as high as possible, without restricting the circuit operation.

DUTY CYCLE DERATING

The data of Figure 1 applies for non-repetitive conditions and at a lead temperature of 25°C. If the duty cycle increases, the peak power must be reduced as indicated by the curves of Figure 6. Average power must be derated as the lead or ambient temperature rises above 25°C. The average power derating curve normally given on data sheets may be normalized and used for this purpose.

At first glance the derating curves of Figure 6 appear to be in error as the 10 ms pulse has a higher derating factor than the 10 µs pulse. However, when the derating factor for a given pulse of Figure 6 is multiplied by the peak power value of Figure 1 for the same pulse, the results follow the expected trend.

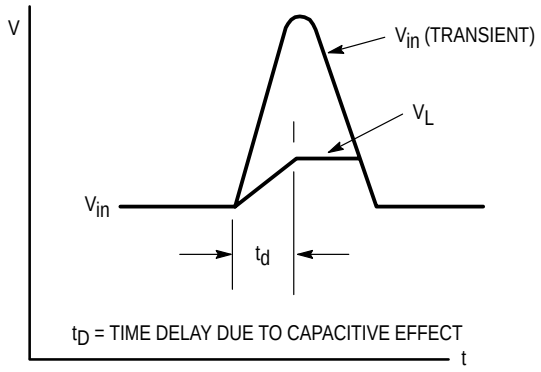


Figure 4.

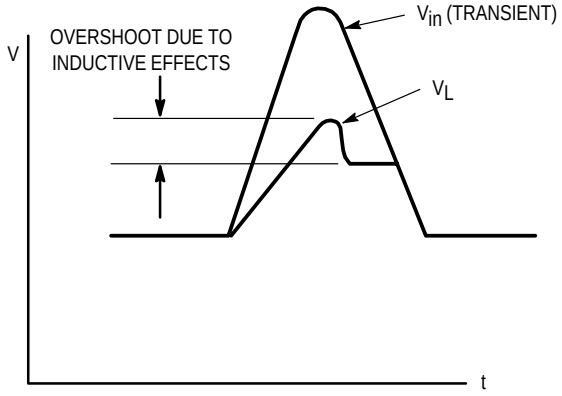


Figure 5.

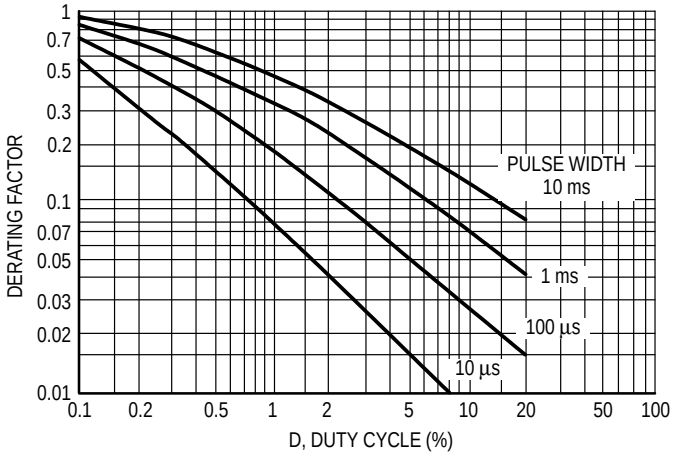


Figure 6. Typical Derating Factor for Duty Cycle

UL RECOGNITION

The entire series has *Underwriters Laboratory Recognition* for the classification of protectors (QVGV2) under the UL standard for safety 497B and File #116110. Many competitors only have one or two devices recognized or have recognition in a non-protective category. Some competitors have no recognition at all. With the UL497B recognition, our parts successfully passed several tests including Strike Voltage Breakdown test, Endurance Conditioning, Temperature test, Dielectric Voltage-Withstand test, Discharge test and several more.

Whereas, some competitors have only passed a flammability test for the package material, we have been recognized for much more to be included in their Protector category.

Transient Voltage Suppressors — Surface Mounted

600 Watt Peak Power

SMB Footprint

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. D DIMENSION SHALL BE MEASURED WITHIN DIMENSION P.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.160	0.180	4.06	4.57
B	0.130	0.150	3.30	3.81
C	0.075	0.095	1.90	2.41
D	0.077	0.083	1.96	2.11
H	0.0020	0.0060	0.051	0.152
J	0.006	0.012	0.15	0.30
K	0.030	0.050	0.76	1.27
P	0.020 REF		0.51 REF	
S	0.205	0.220	5.21	5.59

CASE 403A
PLASTIC

(Refer to Section 10 for Surface Mount, Thermal Data and Footprint Information.)

MULTIPLE PACKAGE QUANTITY (MPQ) REQUIREMENTS

Package Option	Type No. Suffix	MPQ (Units)
Tape and Reel	T3 (13 inch reel)	2.5K

(Refer to Section 10 for more information on Packaging Specifications.)