1.5SMC6.8AT3G Series, SZ1.5SMC6.8AT3G Series

1500 Watt Peak Power Zener Transient Voltage Suppressors

Unidirectional*

The SMC 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 SMC series is supplied in the exclusive, cost-effective, highly reliable Littelfuse package and is ideally suited for use in communication systems, automotive, numerical controls, process controls, medical equipment, business machines, power supplies and many other industrial/consumer applications.

Specification Features

- Working Peak Reverse Voltage Range – 5.8 to 77.8 V
- Standard Zener Breakdown Voltage Range – 6.8 to 91 V
- Peak Power – 1500 W @ 1.0 ms
- ESD Rating of Class 3 (> 16 kV) per Human Body Model
- Maximum Clamp Voltage @ Peak Pulse Current
- Low Leakage < 5.0 μA Above 10 V
- UL 497B for Isolated Loop Circuit Protection
- Maximum Temperature Coefficient Specified
- Response Time is Typically < 1.0 ns
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- These are Pb−Free Devices are Available**

Mechanical Characteristics

CASE: Void-free, transfer-molded, thermosetting plastic
FINISH: All external surfaces are corrosion resistant and leads are readily solderable
MAXIMUM CASE TEMPERATURE FOR SOLDERING PURPOSES: 260°C for 10 Seconds
LEADS: Modified L−Bend providing more contact area to bond pads
POLARITY: Cathode indicated by molded polarity bend
MOUNTING POSITION: Any

* Bidirectional devices will not be available in this series.

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SURFACE MOUNT ZENER OVERVOLTAGE TRANSIENT SUPPRESSORS 5.8 – 78 VOLTS 1500 WATT PEAK POWER



SMC
CASE 403



MARKING DIAGRAM



xxxA = Specific Device Code (See Table on Page 3)
A = Assembly Location
Y = Year
WW = Work Week
▪ = Pb−Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

Device***	Package	Shipping
1.5SMCxxxAT3G	SMC (Pb−Free)	2,500 / Tape & Reel
SZ1.5SMCxxxAT3G	SMC (Pb−Free)	2,500 / Tape & Reel

***The “T3” suffix refers to a 13 inch reel.

Individual devices are listed on page 3 of this data sheet.

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Publication Order Number:
1.5SMC6.8AT3/D

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak Power Dissipation (Note 1) @ T_L = 25°C, Pulse Width = 1 ms	P_{PK}	1500	W
DC Power Dissipation @ T_L = 75°C Measured Zero Lead Length (Note 2) Derate Above 75°C Thermal Resistance, Junction−to−Lead	P_D $R_{\theta JL}$	4.0 54.6 18.3	W mW/°C °C/W
DC Power Dissipation (Note 3) @ T_A = 25°C Derate Above 25°C Thermal Resistance from Junction−to−Ambient	P_D $R_{\theta JA}$	0.75 6.1 165	W mW/°C °C/W
Forward Surge Current (Note 4) @ T_A = 25°C	I_{FSM}	200	A
Operating and Storage Temperature Range	T_J, T_{stg}	−65 to +150	°C

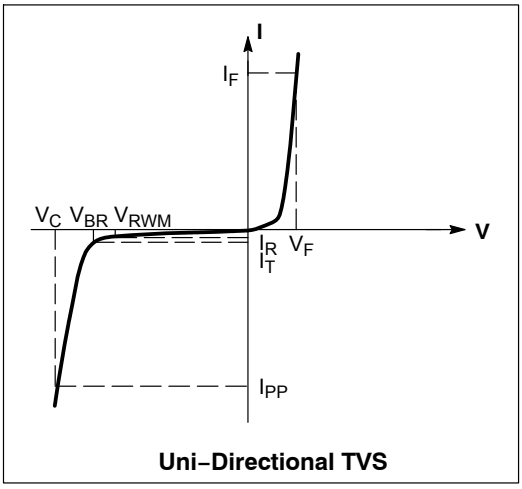
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. 10 X 1000 μs, non−repetitive
2. 1 in. square copper pad, FR−4 board
3. FR−4 board, using Littelfuse minimum recommended footprint, as shown in 403 case outline dimensions spec.
4. 1/2 sine wave (or equivalent square wave), PW = 8.3 ms, duty cycle = 4 pulses per minute maximum.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted, V_F = 3.5 V Max. @ I_F (Note 5) = 100 A)

Symbol	Parameter
I_{PP}	Maximum Reverse Peak Pulse Current
V_C	Clamping Voltage @ I_{PP}
V_{RWM}	Working Peak Reverse Voltage
I_R	Maximum Reverse Leakage Current @ V_{RWM}
V_{BR}	Breakdown Voltage @ I_T
I_T	Test Current
ΘV_{BR}	Maximum Temperature Coefficient of V_{BR}
I_F	Forward Current
V_F	Forward Voltage @ I_F

5. 1/2 sine wave or equivalent, PW = 8.3 ms non−repetitive duty cycle



Uni−Directional TVS

ELECTRICAL CHARACTERISTICS

Device*	Device Marking	V_{RWM} (Note 6)	I_R @ V_{RWM}	Breakdown Voltage				V_C @ I_{PP} (Note 8)		ΘV_{BR}
				V_{BR} V (Note 7)			@ I_T	V_C	I_{PP}	
		V	μA	Min	Nom	Max	mA	V	A	%/°C
1.5SMC6.8AT3G	6V8A	5.8	1000	6.45	6.8	7.14	10	10.5	143	0.057
1.5SMC7.5AT3G	7V5A	6.4	500	7.13	7.5	7.88	10	11.3	132	0.061
1.5SMC8.2AT3G	8V2A	7.02	200	7.79	8.2	8.61	10	12.1	124	0.065
1.5SMC10AT3G	10A	8.55	10	9.5	10	10.5	1	14.5	103	0.073
1.5SMC12AT3G	12A	10.2	5	11.4	12	12.6	1	16.7	90	0.078
1.5SMC13AT3G	13A	11.1	5	12.4	13	13.7	1	18.2	82	0.081
1.5SMC15AT3G	15A	12.8	5	14.3	15	15.8	1	21.2	71	0.084
1.5SMC16AT3G	16A	13.6	5	15.2	16	16.8	1	22.5	67	0.086
1.5SMC18AT3G	18A	15.3	5	17.1	18	18.9	1	25.2	59.5	0.088
1.5SMC20AT3G	20A	17.1	5	19	20	21	1	27.7	54	0.09
1.5SMC22AT3G	22A	18.8	5	20.9	22	23.1	1	30.6	49	0.092
1.5SMC24AT3G	24A	20.5	5	22.8	24	25.2	1	33.2	45	0.094
1.5SMC27AT3G	27A	23.1	5	25.7	27	28.4	1	37.5	40	0.096
1.5SMC30AT3G	30A	25.6	5	28.5	30	31.5	1	41.4	36	0.097
1.5SMC33AT3G	33A	28.2	5	31.4	33	34.7	1	45.7	33	0.098
1.5SMC36AT3G	36A	30.8	5	34.2	36	37.8	1	49.9	30	0.099
1.5SMC39AT3G	39A	33.3	5	37.1	39	41	1	53.9	28	0.1
1.5SMC43AT3G	43A	36.8	5	40.9	43	45.2	1	59.3	25.3	0.101
1.5SMC47AT3G	47A	40.2	5	44.7	47	49.4	1	64.8	23.2	0.101
1.5SMC51AT3G	51A	43.6	5	48.5	51	53.6	1	70.1	21.4	0.102
1.5SMC56AT3G	56A	47.8	5	53.2	56	58.8	1	77	19.5	0.103
1.5SMC62AT3G	62A	53	5	58.9	62	65.1	1	85	17.7	0.104
1.5SMC68AT3G	68A	58.1	5	64.6	68	71.4	1	92	16.3	0.104
1.5SMC75AT3G	75A	64.1	5	71.3	75	78.8	1	103	14.6	0.105
1.5SMC82AT3G	82A	70.1	5	77.9	82	86.1	1	113	13.3	0.105
1.5SMC91AT3G	91A	77.8	5	86.5	91	95.5	1	125	12	0.106

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

6. A transient suppressor is normally selected according to the working peak reverse voltage (V_{RWM}), which should be equal to or greater than the DC or continuous peak operating voltage level.
7. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C.
8. Surge current waveform per Figure 2 and derate per Figure 3 of the General Data − 1500 Watt at the beginning of this group.

* Include SZ-prefix devices where applicable.

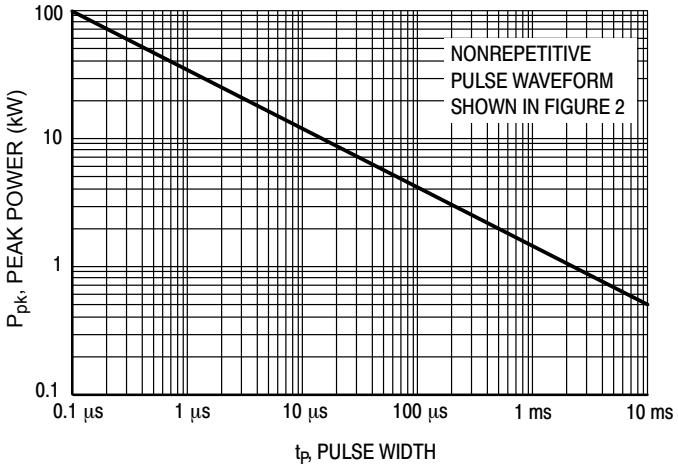


Figure 1. Pulse Rating Curve

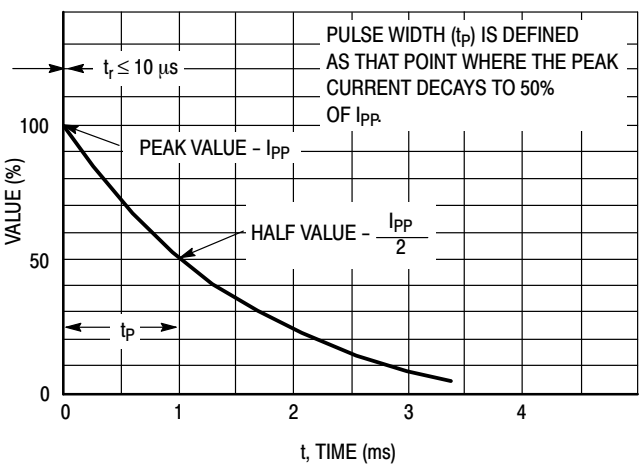


Figure 2. Pulse Waveform

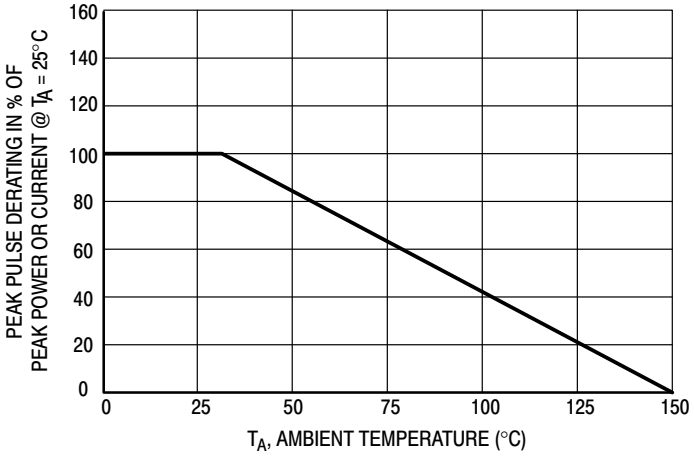


Figure 3. Pulse Derating Curve

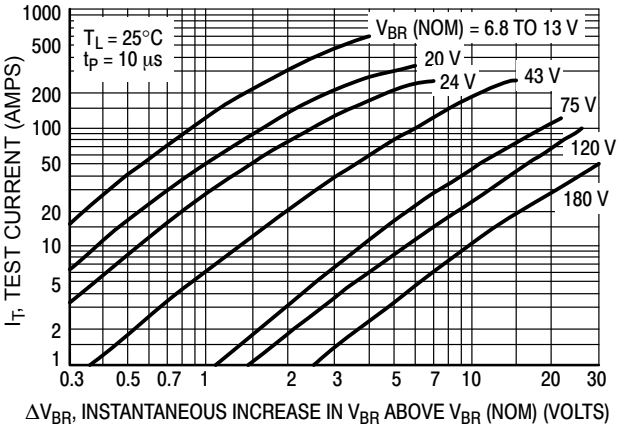


Figure 4. Dynamic Impedance

UL RECOGNITION

The entire series has *Underwriters Laboratory Recognition* for the classification of protectors (QVGQ2) under the UL standard for safety 497B and File #E128662. 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.

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 5.

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 6. Minimizing this overshoot is very important in the application, since the main purpose for adding a transient suppressor is to clamp voltage spikes. The SMC series have a very good response time, typically < 1.0 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.

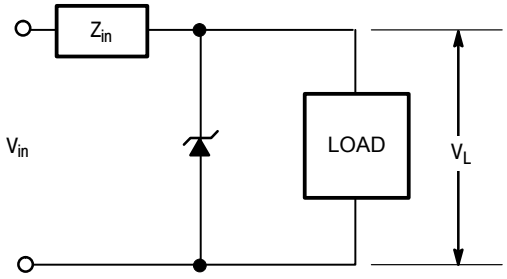
Some input impedance represented by Z_{in} is essential to prevent overstress of the protection device. This impedance should be as high as possible, without restricting the circuit operation.

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 7. 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 7 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 7 is multiplied by the peak power value of Figure 1 for the same pulse, the results follow the expected trend.

TYPICAL PROTECTION CIRCUIT



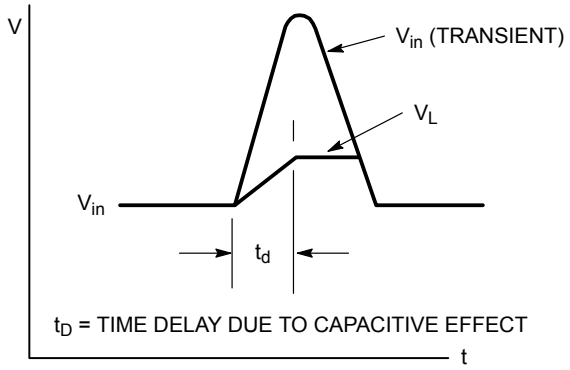


Figure 5.

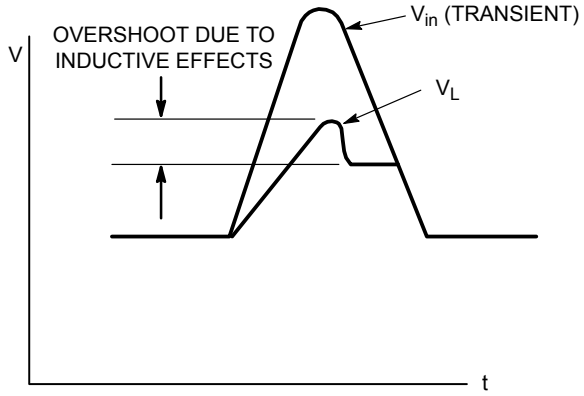


Figure 6.

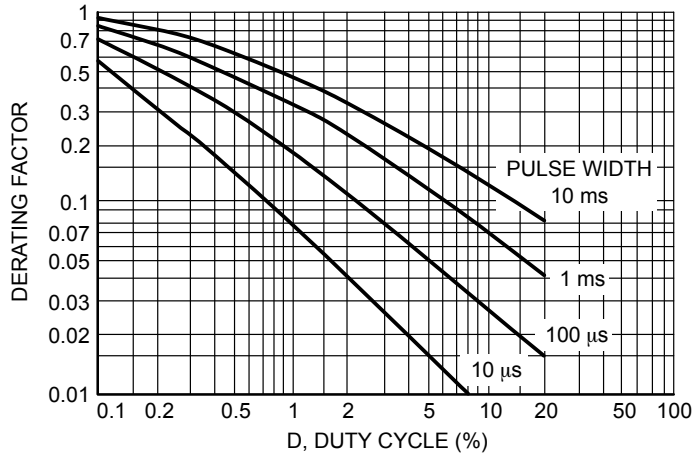
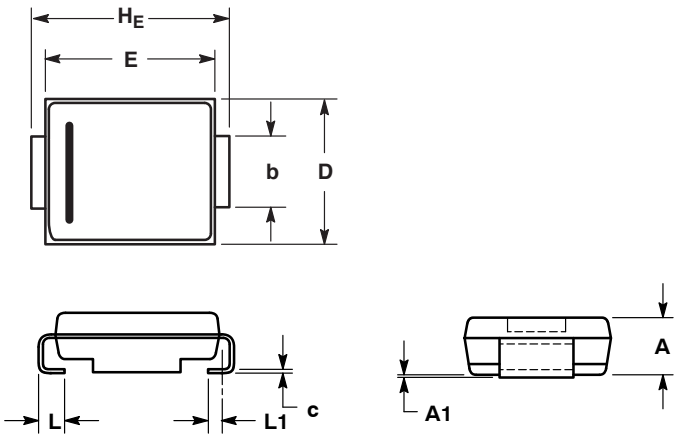


Figure 7. Typical Derating Factor for Duty Cycle

PACKAGE DIMENSIONS

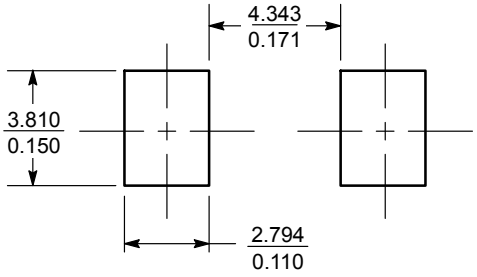
SMC
CASE 403−03
ISSUE E



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. D DIMENSION SHALL BE MEASURED WITHIN DIMENSION P.
4. 403−01 THRU −02 OBSOLETE, NEW STANDARD 403−03.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	1.90	2.13	2.41	0.075	0.084	0.095
A1	0.05	0.10	0.15	0.002	0.004	0.006
b	2.92	3.00	3.07	0.115	0.118	0.121
c	0.15	0.23	0.30	0.006	0.009	0.012
D	5.59	5.84	6.10	0.220	0.230	0.240
E	6.60	6.86	7.11	0.260	0.270	0.280
H_E	7.75	7.94	8.13	0.305	0.313	0.320
L	0.76	1.02	1.27	0.030	0.040	0.050
L1	0.51 REF			0.020 REF		

SOLDERING FOOTPRINT



SCALE 4:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and shall not be used for, any purpose (including, without limitation, military, aerospace, medical, life-saving, life-sustaining or nuclear facility applications, devices intended for surgical implant into the body, or any other application in which the failure or lack of desired operation of the product may result in personal injury, death, or property damage) other than those expressly set forth in applicable Littelfuse product documentation. Warranties granted by Littelfuse shall be deemed void for products used for any purpose not expressly set forth in applicable Littelfuse documentation. Littelfuse shall not be liable for any claims or damages arising out of products used in applications not expressly intended by Littelfuse as set forth in applicable Littelfuse documentation. The sale and use of Littelfuse products is subject to Littelfuse Terms and Conditions of Sale, unless otherwise agreed by Littelfuse.

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