SZSMF6L Series

Automotive, Surface Mount 600 W in SOD-123FL

AUTOMOTIVE GRADE HF RoHS



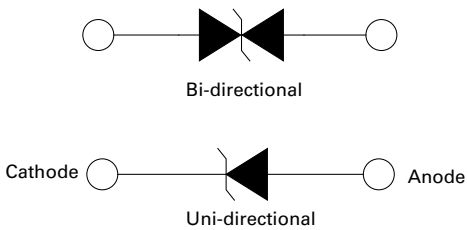
Maximum Ratings & Thermal Characteristics

Parameter	Symbol	Value	Unit
Maximum P_{PK} Dissipation (PW–10/1000 µs) (Note 1)	P_{PK}	600	W
DC Power Dissipation @ T_L = 75 °C Measured Zero Lead Length (Note 2) Derate Above 75 °C	P_D	3.85 38.5	W mW/°C
DC Power Dissipation @ T_A = 25 °C (Note 3) Derate Above 25 °C	P_D	462 3.1	mW mW/°C
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	65	°C/W
Thermal Resistance from Junction to Lead	$R_{\theta JL}$	26	°C/W
Forward Surge Current (Note 4) @ T_A = 25 °C	I_{FSM}	30	A
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to +175	°C

Stresses exceeding Maximum Ratings may damage the component. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect component reliability.

1. 10/1000 µs, non-repetitive current pulse at T_A = 25 °C
2. 1" square copper pad, FR–4 board
3. FR–4 board, using Littelfuse minimum recommended footprint
4. 1/2 sine wave (or equivalent square wave), PW = 8.3 ms, duty cycle = 4 pulses per minute maximum - for unidirectional only.

Functional Diagram



Description

The SZSMF6L series is designed to protect sensitive systems or components from high voltage, high energy transients. It offers a fast response time, low Zener impedance, high surge and excellent clamping capabilities. Because of its small size, it is ideal for use in automotive electronics applications.

Features

- Automotive grade, AEC-Q101 qualified and PPAP-capable
- Peak power – 600 W @ 1ms
- Working peak reverse voltage range - 5 V to 130 V for unidirectional and nd 10 V to 75 V for bi-directional
- Standard zener breakdown voltage range - 6.4 V to 159 V for uni-directional and 11.1 V to 92.1 V for bi-directional
- Planar chip design with low leakage current performance
- Compact design in SOD-123FL package
- ESD protection of data lines in accordance with IEC 61000-4-2 30 kV (Air), 30 kV (Contact)
- ESD rating of class 3 (> 16 KV) per human body model
- Zener transient overvoltage suppressors
- Excellent clamping capability
- V_{BR} @T_J = V_{BR} @ 25 °C x (1+αT x (T_J - 25)) (αT:Temperature Coefficient, typical value is 0.1 %)
- Maximum temperature coefficient specified
- Response time is typically < 1 ns
- Lead orientation in tape: cathode lead to sprocket holes
- These components are Pb-free and are ROHS-compliant

Applications

TVS components are ideal for the protection of I/O Interfaces, V_{CC} bus and other vulnerable circuits used in automotive electronic applications.

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Electrical Characteristics

Part Number (Uni)	Part Number (Bi)	Marking		Working Peak Reverse Voltage V_{RWM} (V) (Note 4)	Breakdown Voltage V_{BR} (V) @ I_T (Note 5)		Test Current I_T (mA)	Maximum Clamping Voltage V_C @ I_{PP} (V)	Maximum Peak Pulse Current I_{PP} (A)	Maximum Reverse Leakage I_R @ V_R (µA) (Note 6)
		Uni	Bi		Min	Max				
SZSMF6L5.0AT3G	-	AE	-	5.0	6.40	7.00	10	9.2	65.2	50
SZSMF6L6.0AT3G	-	AG	-	6.0	6.67	7.37	10	10.3	58.3	50
SZSMF6L6.5AT3G	-	AK	-	6.5	7.22	7.98	10	11.2	53.6	40
SZSMF6L7.0AT3G	-	AM	-	7.0	7.78	8.60	10	12.0	50.0	40
SZSMF6L7.5AT3G	-	AP	-	7.5	8.33	9.21	1	12.9	46.5	30
SZSMF6L8.0AT3G	-	AR	-	8.0	8.89	9.83	1	13.6	44.1	5
SZSMF6L8.5AT3G	-	AT	-	8.5	9.44	10.40	1	14.4	41.7	5
SZSMF6L9.0AT3G	-	AV	-	9.0	10.00	11.10	1	15.4	39.0	2
SZSMF6L10AT3G	SZSMF6L10CAT3G	AX	AXC	10	11.10	12.30	1	17.0	35.3	0.2
SZSMF6L11AT3G	SZSMF6L11CAT3G	AZ	AZC	11	12.20	13.50	1	18.2	33.0	0.2
SZSMF6L12AT3G	SZSMF6L12CAT3G	BE	BEC	12	13.30	14.70	1	19.9	30.2	0.2
SZSMF6L13AT3G	SZSMF6L13CAT3G	BG	BGC	13	14.40	15.90	1	21.5	27.9	0.2
SZSMF6L14AT3G	SZSMF6L14CAT3G	BK	BKC	14	15.60	17.20	1	23.2	25.8	0.2
SZSMF6L15AT3G	SZSMF6L15CAT3G	BM	BMC	15	16.70	18.50	1	24.4	24.0	0.2
SZSMF6L16AT3G	SZSMF6L16CAT3G	BP	BPC	16	17.80	19.70	1	26.0	23.1	0.2
SZSMF6L17AT3G	SZSMF6L17CAT3G	BR	BRC	17	18.90	20.90	1	27.6	21.7	0.2
SZSMF6L18AT3G	SZSMF6L18CAT3G	BT	BTC	18	20.00	22.10	1	29.2	20.5	0.2
SZSMF6L20AT3G	SZSMF6L20CAT3G	BV	BVC	20	22.20	24.50	1	32.4	18.5	0.2
SZSMF6L22AT3G	SZSMF6L22CAT3G	BX	BXC	22	24.40	26.90	1	35.5	16.9	0.2
SZSMF6L24AT3G	SZSMF6L24CAT3G	BZ	BZC	24	26.70	29.50	1	38.9	15.4	0.2
SZSMF6L26AT3G	SZSMF6L26CAT3G	CE	CEC	26	28.90	31.90	1	42.1	14.2	0.2
SZSMF6L28AT3G	SZSMF6L28CAT3G	CG	CGC	28	31.10	34.40	1	45.4	13.2	0.2
SZSMF6L30AT3G	SZSMF6L30CAT3G	CK	CKC	30	33.30	36.80	1	48.4	12.4	0.2
SZSMF6L33AT3G	SZSMF6L33CAT3G	CM	CMC	33	36.70	40.60	1	53.3	11.3	0.2
SZSMF6L36AT3G	SZSMF6L36CAT3G	CP	CPC	36	40.00	44.20	1	58.1	10.3	0.2
SZSMF6L40AT3G	SZSMF6L40CAT3G	CR	CRC	40	44.40	49.10	1	64.5	9.3	0.2
SZSMF6L43AT3G	SZSMF6L43CAT3G	CT	CTC	43	47.80	52.80	1	69.4	8.6	0.2
SZSMF6L45AT3G	SZSMF6L45CAT3G	CV	CVC	45	50.00	55.30	1	72.7	8.3	0.2
SZSMF6L48AT3G	SZSMF6L48CAT3G	CX	CXC	48	53.30	58.90	1	77.4	7.7	0.2
SZSMF6L51AT3G	SZSMF6L51CAT3G	CZ	CZC	51	56.70	62.70	1	82.4	7.3	0.2
SZSMF6L54AT3G	SZSMF6L54CAT3G	DE	DEC	54	60.00	66.30	1	87.1	6.9	0.2
SZSMF6L58AT3G	SZSMF6L58CAT3G	DG	DGC	58	64.40	71.20	1	93.6	6.4	0.2
SZSMF6L60AT3G	SZSMF6L60CAT3G	DK	DKC	60	66.70	73.70	1	96.8	6.2	0.2
SZSMF6L64AT3G	SZSMF6L64CAT3G	DM	DMC	64	71.10	78.60	1	103.0	5.8	0.2
SZSMF6L70AT3G	SZSMF6L70CAT3G	DP	DPC	70	77.80	86.00	1	113.0	5.3	0.2
SZSMF6L75AT3G	SZSMF6L75CAT3G	DR	DRC	75	83.30	92.10	1	121.0	4.9	0.2
SZSMF6L78AT3G	-	DT	-	78	86.7	95.8	1	126.0	4.8	0.2
SZSMF6L85AT3G	-	DV	-	85	94.4	104	1	137.0	4.4	0.2
SZSMF6L90AT3G	-	DX	-	90	100	111	1	146.0	4.1	0.2
SZSMF6L100AT3G	-	DZ	-	100	111	123	1	162.0	3.7	0.2
SZSMF6L110AT3G	-	EE	-	110	122	135	1	177.0	3.4	0.2
SZSMF6L120AT3G	-	EG	-	120	133	147	1	193.0	3.1	0.2
SZSMF6L130AT3G	-	EK	-	130	144	159	1	209.0	2.9	0.2

4. 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.
5. V_{BR} measured at pulse test current I_T at an ambient temperature of 25 °C.
6. For bidirectional type having V_R of 10 volts and less, the I_R limit is double.

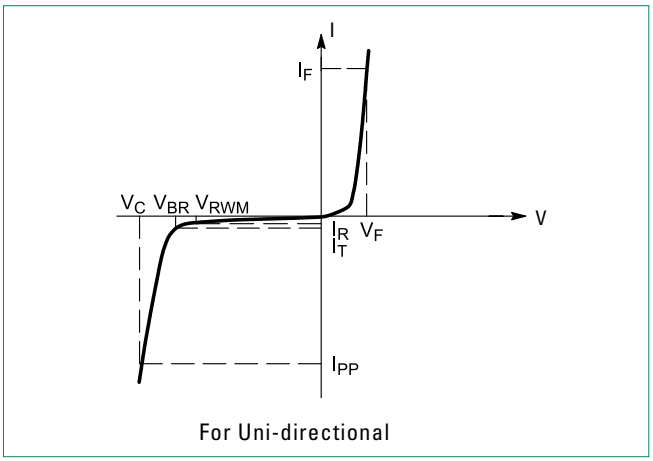
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I-V Curve Characteristics (T_A = 25 °C unless otherwise noted, V_F = 3.5 V Max. @ I_F = 30 A)* - For Uni-directional

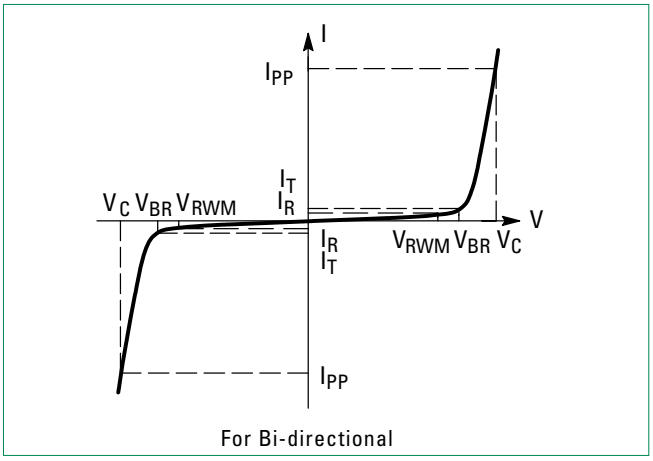


For Uni-directional

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	Breakdown Current Current
V_F	Forward Voltage @ I_F
I_F	Forward Current

*1/2 sine wave (or equivalent square wave), PW = 8.3 ms, non–repetitive duty cycle.

I-V Curve Characteristics (T_A = 25 °C unless otherwise noted) – For Bi-directional



For Bi-directional

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

Figure 1. Pulse Rating Curve

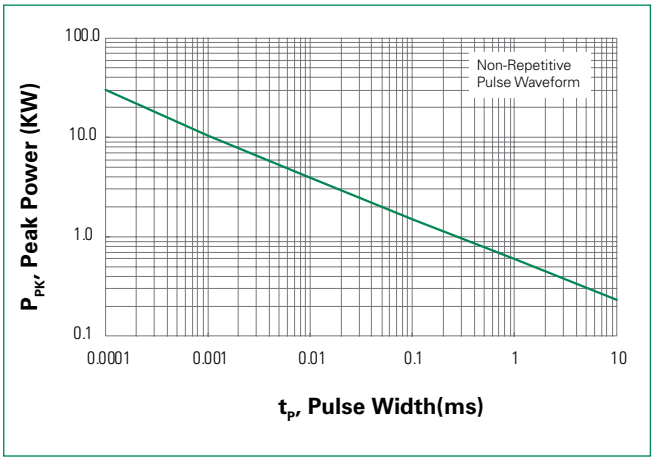
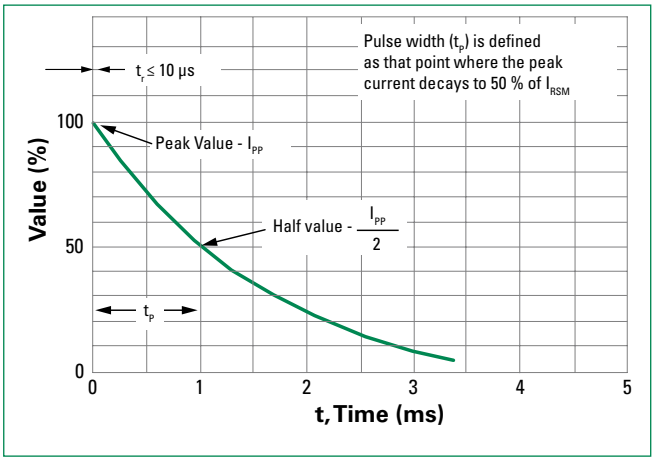


Figure 2. 10/1000 µs Pulse Waveform



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Figure 3. Surge Derating Curve

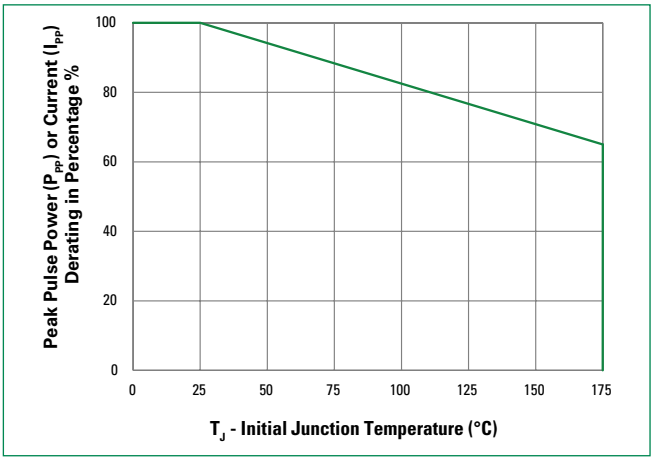
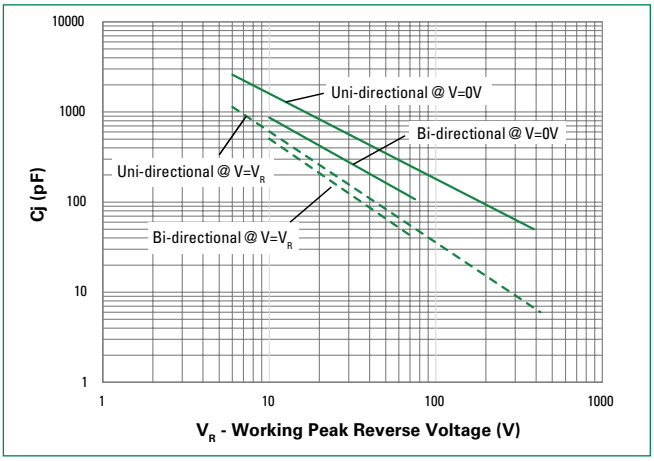
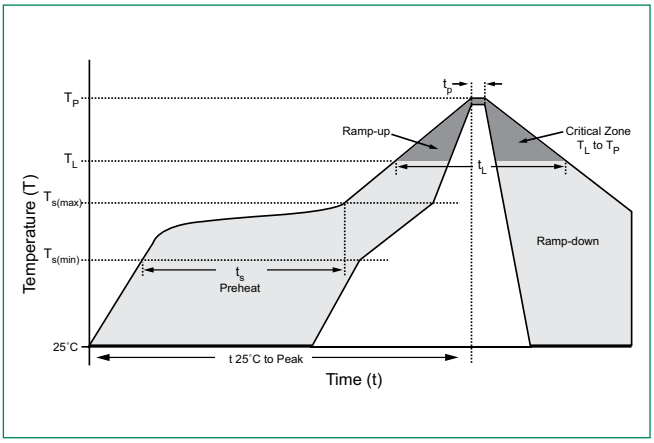


Figure 4. Typical Junction Capacitance vs. Bias Voltage



Soldering Parameters

Reflow Condition		Lead–free assembly
Pre Heat	**- Temperature Min ($T_{s(min)}$)**	150 °C
	- Temperature Max ($T_{s(max)}$)	200 °C
	- Time (min to max) (t_s)	60 – 120 seconds
Average Ramp Up Rate (Liquidus Temp (T_L) to Peak		3 °C/second max
$T_{S(max)}$ to T_L - Ramp-up Rate		3 °C/second max
Reflow	**- Temperature (T_L) (Liquidus)**	217 °C
	- Time (min to max) (t_s)	60 – 150 seconds
Peak Temperature (T_P)		$260^{+0/-5}$ °C
Time Within 5 °C of Actual Peak Temperature (t_p)		30 seconds max
Ramp-down Rate		6 °C/second max
Time 25 °C to Peak Temperature (T_P)		8 minutes max
Do Not Exceed		260 °C



Physical Specifications

Weight	0.006 ounce, 0.0171 grams
Case	JEDEC SOD–123FL
Polarity	Color band denotes cathode for unidirectional components
Terminal	Matte tin-plated leads, solderable per JESD22-B102

Environmental Specifications

High Temperature Storage	JESD22-A103
HTRB	JESD22-A108
Temperature Cycling	JESD22-A104
MSL	JEDEC-J-STD-020, Level 1
H3TRB	JESD22-A101
RSH	JESD22–A111

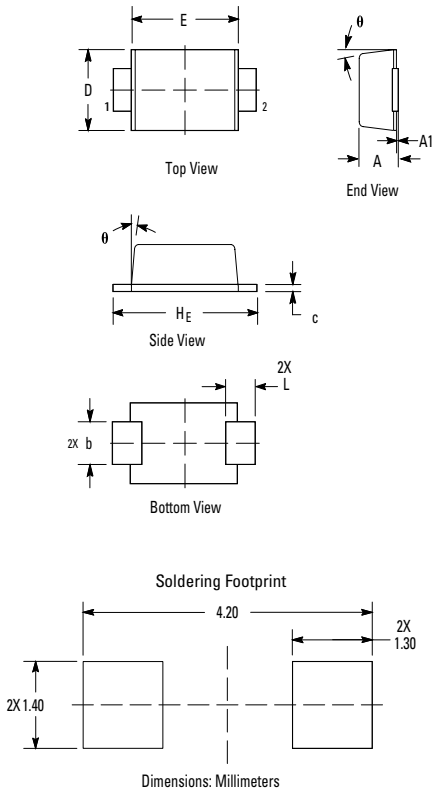
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Dimensions

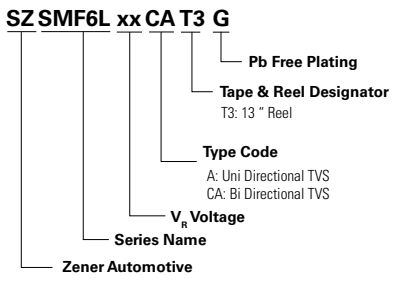


Dim	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
A	1.20	1.30	1.40	0.047	0.051	0.055
A1	0.00	0.05	0.10	0	0.002	0.004
b	1.10	1.20	1.30	0.043	0.047	0.051
c	0.10	0.17	0.25	0.004	0.007	0.01
D	2.25	2.35	2.45	0.089	0.093	0.096
E	3.25	3.35	3.45	0.128	0.132	0.136
L	0.35	0.47	0.60	0.014	0.019	0.024
HE	3.75	3.85	3.95	0.148	0.152	0.156
ϴ	2°	–	8°	2°	–	8°

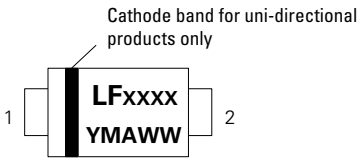
Ordering Information

Device	Package	Packaging Option	Quantity
SZSMF6LxxXXT3G	SOD–123FL (Pb–Free)	Tape & Reel - 12 mm tape / 13" reel	5,000

Part Numbering System



Part Marking System



XXX = Device Code
Y = Year
M = Month
A = Assembly Location
WW = Lot Code

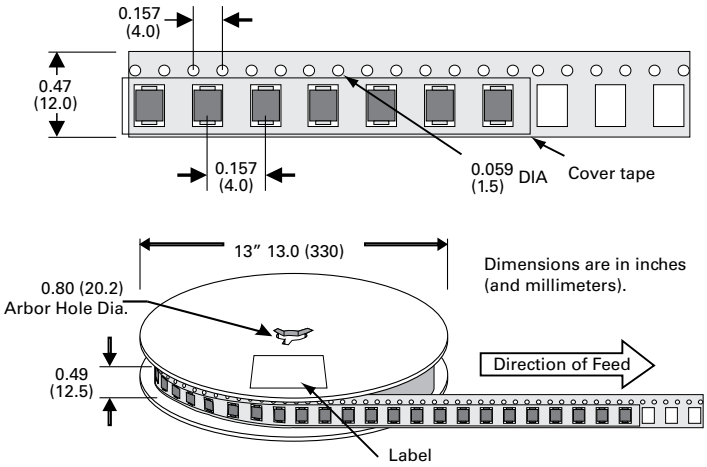
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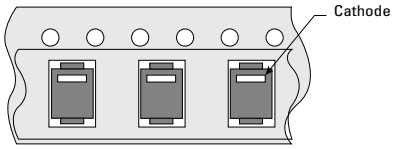
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Tape and Reel Specification





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