Transient Voltage Suppressors (TVS) Data Sheet

Description

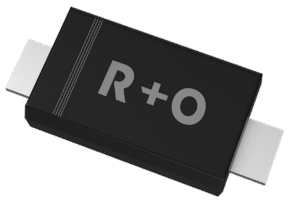
The SMF series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events

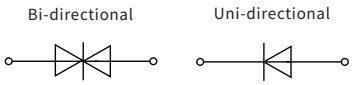
Breakdown Voltage
3.3 to 250 V
Peak Pulse Power
200 W

Features

- For surface mounted applications in order to optimize board space
- Low leakage
- Glass passivated junction
- Low inductance
- Excellent clamping capability
- 200W peak pulse power capability at 10/1000μs waveform
- Fast response time
- Typical IR less than 5μA above 12V
- High Temperature soldering: 260°C /40 seconds at terminals
- Typical maximum temperature coefficient ΔV_{BR} = 0.1% ×V_{BR}@25°C ×ΔT
- Plastic package has Underwriters Laboratory Flammability 94V-0
- Matte tin lead–free Plated
- Halogen free and RoHS compliant
- Typical failure mode is short from over-specified voltage or current
- Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- IEC 61000-4-2 ESD 30KV(Air),30KV(contact)

SOD-123FL





Applications

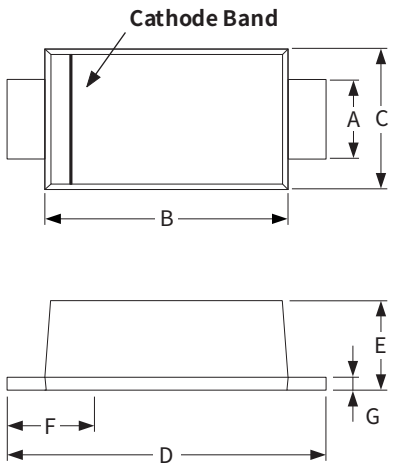
TVS devices are ideal for the protection of I/O interfaces, VCC bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications

Maximum Ratings (Ta=25°C Unless otherwise specified)

PARAMETER	SYMBOL	VALUE	SYMBOL
Peak Pulse Power Dissipation with a 10/1000μs waveform (Fig.1)(Note 1), (Note 2)	P_{PPM}	200	W
Peak Pulse Current with a 10/1000μs waveform.(Note1,Fig.3)	I_{PP}	See Next Table	A
Power Dissipation on Infinite Heat Sink at TL=75° C	$P_{M(AV)}$	0.4	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	I_{FSM}	30	A
Maximum Instantaneous Forward Voltage at 25A for Unidirectional Only(Note 4)	V_F	3.5	V
Operating junction and Storage Temperature Range	T_J , T_{STG}	-55 to +150	°C
Typical thermal resistance junction to lead	$R_{\theta J-L}$	100	°C /W
Typical thermal resistance junction to ambient	$R_{\theta J-A}$	220	°C /W

Note :
(1) Non-repetitive current pulse, per Fig. 3 and derated above Ta = 25°C per Fig. 2.
(2) Mounted on 5.0mm x 5.0mm (0.03mm thick) Copper Pads to each terminal.
(3) 8.3ms single half sine-wave, or equivalent square wave, Duty cycle = 4 pulses per minutes maximum.
(4) VF<3.5V for VBR<200V and VF< 6.5V for VBR>201V.

Package Outline Dimensions (SOD-123FL)



Symbol	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	0.90	1.10	0.035	0.430
B	2.55	2.85	0.100	0.111
C	1.60	1.90	0.063	0.074
D	3.60	3.90	0.031	0.043
E	1.00	1.20	0.031	0.035
F	0.40	0.90	0.047	0.055
G	0.10	0.25	0.003	0.007

Electrical Characteristics (Ta=25°C Unless otherwise specified)

Part Number		Marking		Reverse Stand-Off Voltage	Breakdown Voltage V_{BR} (V) @I_T		Test Current	Maximum Clamping Voltage@I_{PP}	Peak Pulse Current	Reverse Leakage @V_{RWM}
Uni	Bi	Uni	Bi	V_{RWM}(V)	Min.	Max.	I_T(mA)	V_C(V)	I_{PP} (A)	I_R(μA)
SMF3.3A	SMF3.3CA	AD	HD	3.3	5.2	6.5	10	8.8	22.7	500
SMF5.0A	SMF5.0CA	AE	HE	5	6.4	7	10	9.2	21.7	400
SMF6.0A	SMF6.0CA	AG	HG	6	6.67	7.37	10	10.3	19.4	400
SMF6.5A	SMF6.5CA	AK	HK	6.5	7.22	7.98	10	11.2	17.9	250
SMF7.0A	SMF7.0CA	AM	HM	7	7.78	8.6	10	12.0	16.7	100
SMF7.5A	SMF7.5CA	AP	HP	7.5	8.33	9.21	1	12.9	15.5	50
SMF8.0A	SMF8.0CA	AR	HR	8	8.89	9.83	1	13.6	14.7	25
SMF8.5A	SMF8.5CA	AT	HT	8.5	9.44	10.4	1	14.4	13.9	10
SMF9.0A	SMF9.0CA	AV	HV	9	10	11.1	1	15.4	13.0	5
SMF10A	SMF10CA	AX	HX	10	11.1	12.3	1	17.0	11.8	2.5
SMF11A	SMF11CA	AZ	HZ	11	12.2	13.5	1	18.2	11.0	2.5
SMF12A	SMF12CA	BE	IE	12	13.3	14.7	1	19.9	10.1	2.5
SMF13A	SMF13CA	BG	IG	13	14.4	15.9	1	21.5	9.3	1
SMF14A	SMF14CA	BK	IK	14	15.6	17.2	1	23.2	8.6	1
SMF15A	SMF15CA	BM	IM	15	16.7	18.5	1	24.4	8.2	1
SMF16A	SMF16CA	BP	IP	16	17.8	19.7	1	26.0	7.7	1
SMF17A	SMF17CA	BR	IR	17	18.9	20.9	1	27.6	7.2	1
SMF18A	SMF18CA	BT	IT	18	20	22.1	1	29.2	6.8	1
SMF20A	SMF20CA	BV	IV	20	22.2	24.5	1	32.4	6.2	1
SMF22A	SMF22CA	BX	IX	22	24.4	26.9	1	35.5	5.6	1
SMF24A	SMF24CA	BZ	IZ	24	26.7	29.5	1	38.9	5.1	1
SMF26A	SMF26CA	CE	JE	26	28.9	31.9	1	42.1	4.8	1
SMF28A	SMF28CA	CG	JG	28	31.1	34.4	1	45.4	4.4	1
SMF30A	SMF30CA	CK	JK	30	33.3	36.8	1	48.4	4.1	1
SMF33A	SMF33CA	CM	JM	33	36.7	40.6	1	53.3	3.8	1
SMF36A	SMF36CA	CP	JP	36	40	44.2	1	58.1	3.4	1
SMF40A	SMF40CA	CR	JR	40	44.4	49.1	1	64.5	3.1	1

Electrical Characteristics (Ta=25°C Unless otherwise specified)

Part Number		Marking		Reverse Stand-Off Voltage	Breakdown Voltage V_{BR} (V) @I_T		Test Current	Maximum Clamping Voltage@I_{PP}	Peak Pulse Current	Reverse Leakage @V_{RWM}
Uni	Bi	Uni	Bi	V_{RWM}(V)	Min.	Max.	I_T(mA)	V_C(V)	I_{PP} (A)	I_R(μA)
SMF43A	SMF43CA	CT	JT	43	47.8	52.8	1	69.4	2.9	1
SMF45A	SMF45CA	CV	JV	45	50	55.3	1	72.7	2.8	1
SMF48A	SMF48CA	CX	JX	48	53.3	58.9	1	77.4	2.6	1
SMF51A	SMF51CA	CZ	JZ	51	56.7	62.7	1	82.4	2.4	1
SMF54A	SMF54CA	DE	KE	54	60	66.3	1	87.1	2.3	1
SMF58A	SMF58CA	RG	KG	58	64.4	71.2	1	93.6	2.1	1
SMF60A	SMF60CA	RK	KK	60	66.7	73.7	1	96.8	2.1	1
SMF64A	SMF64CA	RM	KM	64	71.1	78.6	1	103	1.9	1
SMF70A	SMF70CA	RP	KP	70	77.8	86	1	113	1.7	1
SMF75A	SMF75CA	RR	KR	75	83.3	92.1	1	121	1.6	1
SMF78A	SMF78CA	RT	KT	78	86.7	95.8	1	126	1.6	1
SMF85A	SMF85CA	RV	KV	85	94.4	104	1	137	1.5	1
SMF90A	SMF90CA	RW	KX	90	100	111	1	146	1.2	1
SMF100A	SMF100CA	RX	KZ	100	111	123	1	162	1.1	1
SMF110A	SMF110CA	SE	LE	110	122	135	1	177	1.1	1
SMF120A	SMF120CA	SG	LG	120	133	147	1	193	1.0	1
SMF130A	SMF130CA	SK	LK	130	144	159	1	209	1.0	1
SMF150A	SMF150CA	SM	LM	150	167	185	1	243	0.8	1
SMF160A	SMF160CA	SP	LP	160	178	197	1	259	0.8	1
SMF170A	SMF170CA	SR	LR	170	189	209	1	275	0.7	1
SMF180A	SMF180CA	ST	LT	180	201	222	1	292	0.7	1
SMF188A	SMF188CA	SV	LV	188	209	231	1	304	0.7	1
SMF200A	SMF200CA	SX	LX	200	224	247	1	324	0.6	1
SMF220A	SMF220CA	SZ	LZ	220	246	272	1	356	0.6	1
SMF250A	SMF250CA	TE	ME	250	279	309	1	405	0.5	1

Note :
(1)Suffix 'A ' denotes 5% tolerance device.
(2)Add suffix ' CA ' after part number to specify Bi-directional devices.
(3)For Bi-Directional devices having VR of 10 volts and under, the IR limit is double.

Ratings And Characteristics Curves (Ta=25°C Unless otherwise specified)

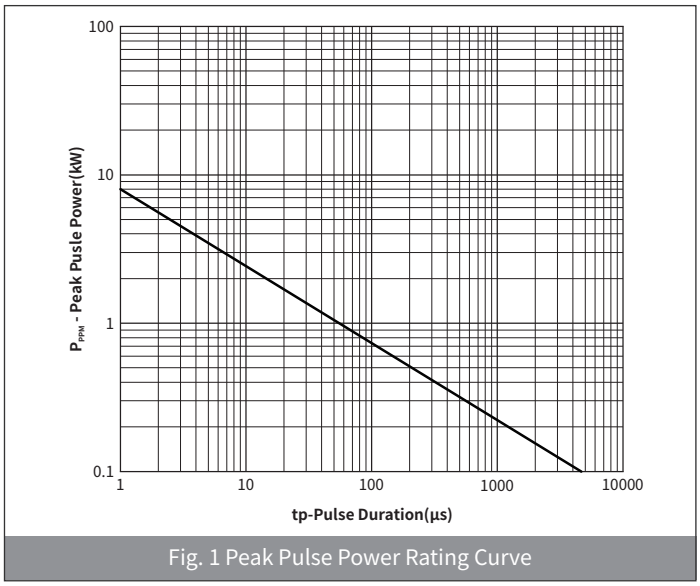


Fig. 1 Peak Pulse Power Rating Curve

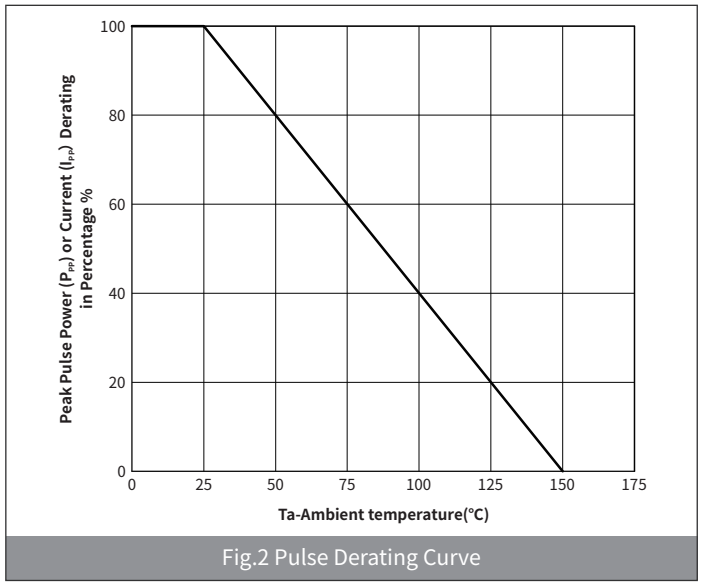


Fig.2 Pulse Derating Curve

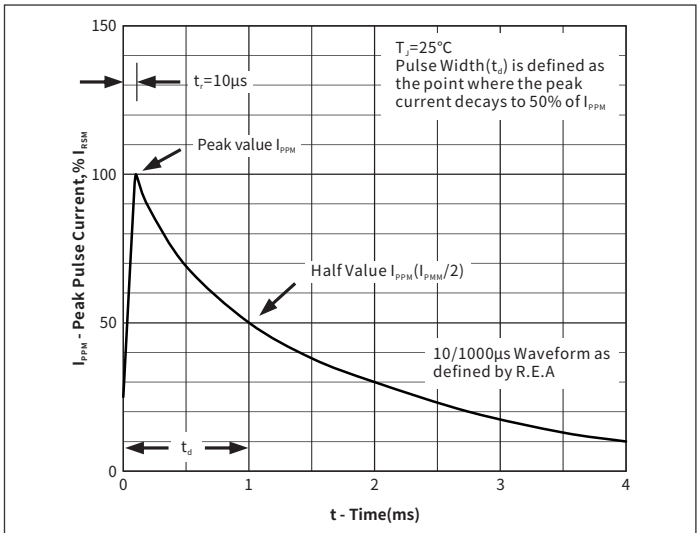


Fig.3 Pulse Waveform

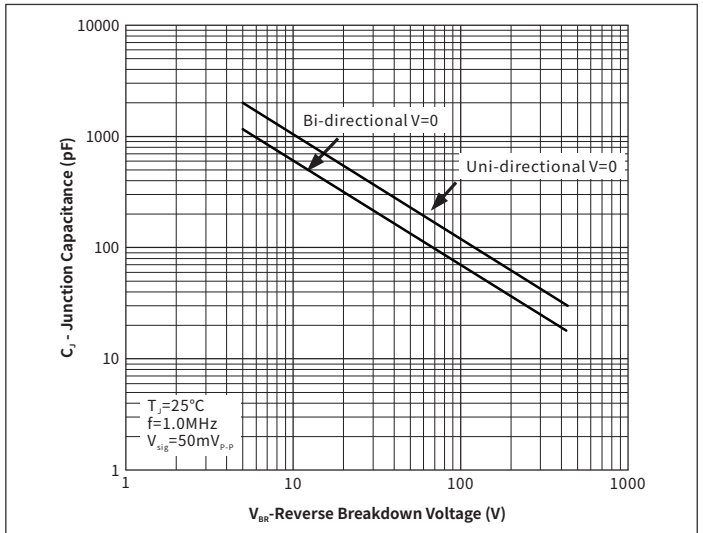


Fig.4 Typical Junction Capacitance

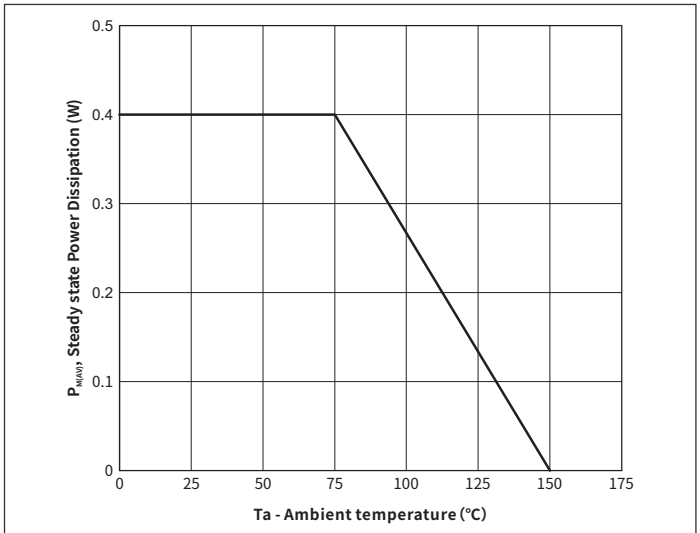


Fig.5 Steady State Power Dissipation Derating Curve

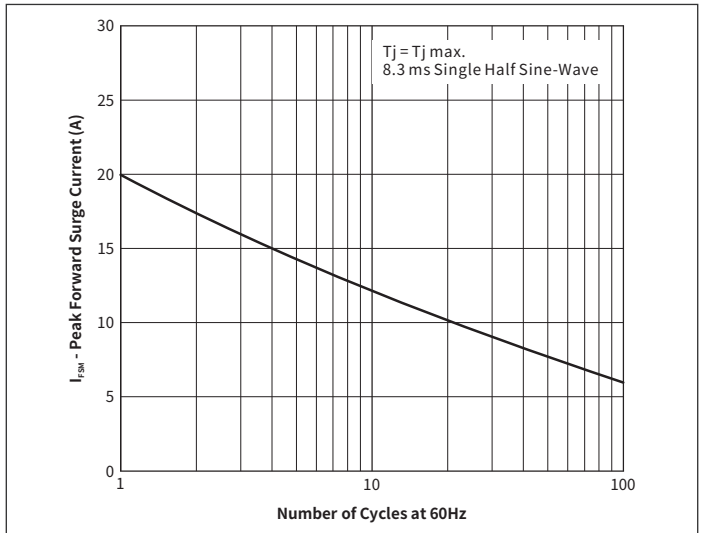
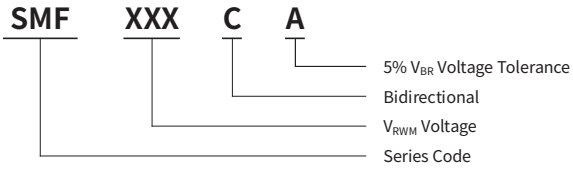


Fig.6 Maximum Non-Repetitive Forward Surge Current Uni-Directional Only

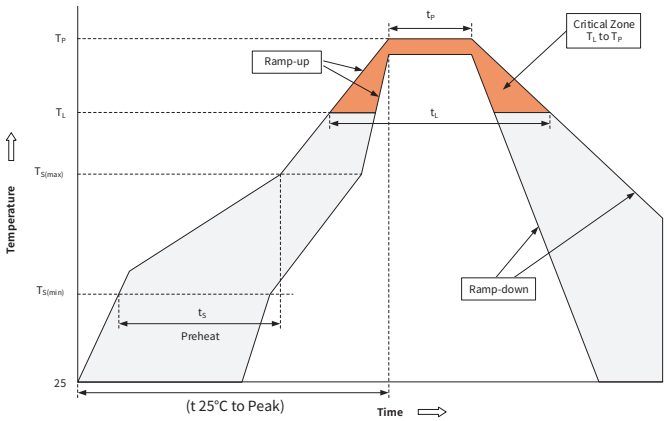
Ordering Information

PACKAGE	PACKAGE CODE	UNIT WEIGHT(g)	REEL(pcs)	BOX(pcs)	CARTON(pcs)	DELIVERY MODE
SOD-123FL	R1	0.0169	3000	15000	150000	7''

Part Numbering

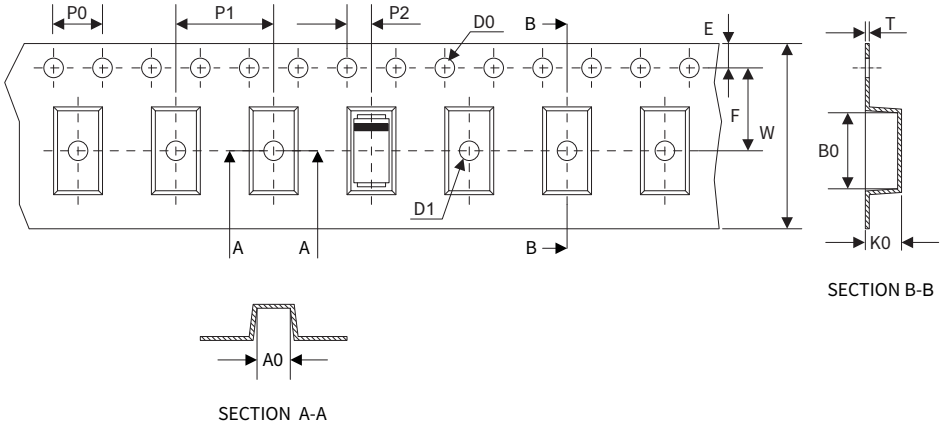


Soldering Parameters



Profile Feature		Pb-Free Assembly
Pre-heat	Temperature Min ($T_{s(min)}$)	+150°C
	Temperature Max($T_{s(max)}$)	+200°C
	Time (Min to Max) (t_s)	60-180 secs.
Average ramp up rate (Liquid us Temp (T_L) to peak)		3°C /sec. Max
$T_{s(max)}$ to T_L - Ramp-up Rate		3°C /sec. Max
Reflow	Temperature(T_L)(Liquid us)	+217°C
	Temperature(t_L)	60-150 secs.
Peak Temp (T_P)		+260(+0/-5)°C
Time within 5°C of actual Peak Temp (t_P)		30 secs. Max
Ramp-down Rate		6°C /sec. Max
Time 25°C to Peak Temp (T_P)		8 min. Max
Do not exceed		+260°C

Packaging (SOD-123FL)



Symbol	Dimension (mm)
W	8.00±0.30
P0	4.00±0.10
P1	4.00±0.10
P2	2.00±0.10
D0	Φ1.5±0.10
D1	Φ1.0±0.05
E	1.75±0.10
F	3.50±0.05
A0	2.00±0.10
B0	3.95±0.10
K0	1.4±0.12
T	0.23±0.10