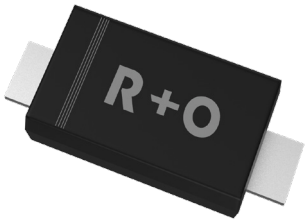
Transient Voltage Suppressors (TVS) Data Sheet

Description

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

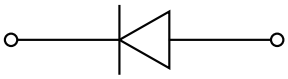
Breakdown Voltage
5 to 440 V
Peak Pulse Power
400 W

SMAF



Features

- For surface mounted applications in order to optimize board space
- Low leakage
- Glass passivated junction
- Low inductance
- Excellent clamping capability
- 400W 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% $\times V_{BR}$@25°C $\times \Delta T$
- 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 15KV(Air),8KV(contact)



Applications

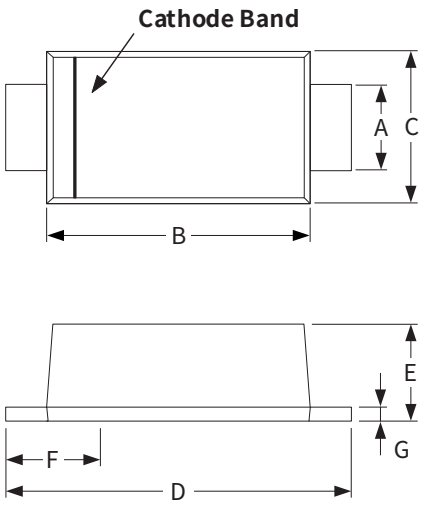
TVS devices are ideal for the protection of I/O interfaces, VCC bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications

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}	400	W
Peak Pulse Current with a 10/1000μs waveform.(Note1,Fig.3)	I_{PP}	See Next Table	A
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	I_{FSM}	60	A
Operating junction and Storage Temperature Range	T_J , T_{STG}	-55 to +150	°C
Typical thermal resistance junction to ambient	$R_{\theta J-A}$	150	°C /W

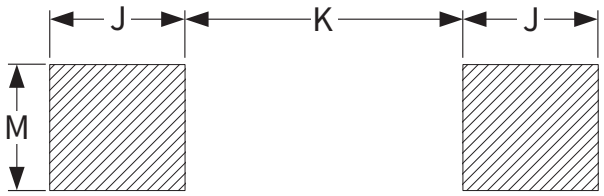
Note :
(1) Non-repetitive current pulse, per Fig. 3 and derated above Ta = 25°C per Fig. 2.
(2) Mounted on FR-4 PCB single-sided copper, mini pad.
(3) 8.3ms single half sine-wave, or equivalent square wave, Duty cycle = 4 pulses per minutes maximum.
(4) Peak pulse power waveform is 10/1000μS.

Package Outline Dimensions (SMAF)



Symbol	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.30	1.60	0.051	0.063
B	3.30	3.70	0.129	0.145
C	2.40	2.70	0.094	0.105
D	4.40	4.90	0.172	0.191
E	0.90	1.20	0.035	0.047
F	0.80	1.20	0.031	0.047
G	0.12	0.20	0.005	0.008

Suggested Pad Layout



Symbol	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
M	1.80	-	0.070	-
J	1.60	-	0.063	-
K	-	2.2	-	0.086

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)
SMAFJ5.0A	SMAFJ5.0CA	AE	WE	5	6.4	7	10	9.2	43.5	800
SMAFJ6.0A	SMAFJ6.0CA	AG	WG	6	6.67	7.37	10	10.3	38.8	800
SMAFJ6.5A	SMAFJ6.5CA	AK	WK	6.5	7.22	7.98	10	11.2	35.7	500
SMAFJ7.0A	SMAFJ7.0CA	AM	WM	7	7.88	8.6	10	12.0	33.3	200
SMAFJ7.5A	SMAFJ7.5CA	AP	WP	7.5	8.33	9.21	1	12.9	31.0	100
SMAFJ8.0A	SMAFJ8.0CA	AR	WR	8	8.89	9.83	1	13.6	29.4	50
SMAFJ8.5A	SMAFJ8.5CA	AT	WT	8.5	9.44	10.4	1	14.4	27.8	20
SMAFJ9.0A	SMAFJ9.0CA	AV	WV	9	10	11.1	1	15.4	26.0	10
SMAFJ10A	SMAFJ10CA	AX	WX	10	11.1	12.3	1	17.0	23.5	5
SMAFJ11A	SMAFJ11CA	AZ	WZ	11	12.2	13.5	1	18.2	22.0	1
SMAFJ12A	SMAFJ12CA	BE	XE	12	13.3	14.7	1	19.9	20.1	1
SMAFJ13A	SMAFJ13CA	BG	XG	13	14.4	15.9	1	21.5	18.6	1
SMAFJ14A	SMAFJ14CA	BK	XK	14	15.6	17.2	1	23.2	17.2	1
SMAFJ15A	SMAFJ15CA	BM	XM	15	16.7	18.5	1	24.4	46.4	1
SMAFJ16A	SMAFJ16CA	BP	XP	16	17.8	19.7	1	26.0	15.4	1
SMAFJ17A	SMAFJ17CA	BR	XR	17	18.9	20.9	1	27.6	14.5	1
SMAFJ18A	SMAFJ18CA	BT	XT	18	20	22.1	1	29.2	13.7	1
SMAFJ20A	SMAFJ20CA	BV	XV	20	22.2	24.5	1	32.4	12.3	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)
SMAFJ22A	SMAFJ22CA	BX	XX	22	24.4	26.9	1	35.5	11.3	1
SMAFJ24A	SMAFJ24CA	BZ	XZ	24	26.7	29.5	1	38.9	10.3	1
SMAFJ26A	SMAFJ26CA	CE	YE	26	28.9	31.9	1	42.1	9.5	1
SMAFJ28A	SMAFJ28CA	CG	YG	28	31.1	34.4	1	45.4	8.8	1
SMAFJ30A	SMAFJ30CA	CK	YK	30	33.3	36.8	1	48.4	8.3	1
SMAFJ33A	SMAFJ33CA	CM	YM	33	36.7	40.6	1	53.3	7.5	1
SMAFJ36A	SMAFJ36CA	CP	YP	36	40	44.2	1	58.1	6.9	1
SMAFJ40A	SMAFJ40CA	CR	YR	40	44.4	49.1	1	64.5	6.2	1
SMAFJ43A	SMAFJ43CA	CT	YT	43	47.8	52.8	1	69.4	5.8	1
SMAFJ45A	SMAFJ45CA	CV	YV	45	50	55.3	1	72.7	5.5	1
SMAFJ48A	SMAFJ48CA	CX	YX	48	53.3	58.9	1	77.4	5.2	1
SMAFJ51A	SMAFJ51CA	CZ	YZ	51	56.7	62.7	1	82.4	4.9	1
SMAFJ54A	SMAFJ54CA	RE	ZE	54	60	66.3	1	87.1	4.6	1
SMAFJ58A	SMAFJ58CA	RG	ZG	58	64.4	71.2	1	93.6	4.3	1
SMAFJ60A	SMAFJ60CA	RK	ZK	60	66.7	73.7	1	96.8	4.1	1
SMAFJ64A	SMAFJ64CA	RM	ZM	64	71.1	78.6	1	103.0	3.9	1
SMAFJ70A	SMAFJ70CA	RP	ZP	70	77.8	86	1	113.0	3.5	1
SMAFJ75A	SMAFJ75CA	RR	ZR	75	83.3	92.1	1	121.0	3.3	1
SMAFJ78A	SMAFJ78CA	RT	ZT	78	86.7	95.8	1	126.0	3.2	1
SMAFJ85A	SMAFJ85CA	RV	ZV	85	94.4	104	1	137.0	2.9	1
SMAFJ90A	SMAFJ90CA	RX	ZX	90	100	111	1	146.0	2.7	1
SMAFJ100A	SMAFJ100CA	RZ	ZZ	100	111	123	1	162.0	2.5	1
SMAFJ110A	SMAFJ110CA	SE	VE	110	122	135	1	177.0	2.3	1
SMAFJ120A	SMAFJ120CA	SG	VG	120	133	147	1	193.0	2.1	1
SMAFJ130A	SMAFJ130CA	SK	VK	130	144	159	1	209.0	1.9	1
SMAFJ150A	SMAFJ150CA	SM	VM	150	167	185	1	243.0	1.6	1
SMAFJ160A	SMAFJ160CA	SP	VP	160	178	197	1	259.0	1.5	1
SMAFJ170A	SMAFJ170CA	SR	VR	170	189	209	1	275.0	1.5	1
SMAFJ180A	SMAFJ180CA	ST	VT	180	201	222	1	292.0	1.4	1
SMAFJ200A	SMAFJ200CA	SV	VV	200	224	247	1	324.0	1.2	1
SMAFJ220A	SMAFJ220CA	SX	VX	220	246	272	1	356.0	1.1	1
SMAFJ250A	SMAFJ250CA	SZ	VZ	250	279	309	1	405.0	1.0	1
SMAFJ300A	SMAFJ300CA	TE	UE	300	335	371	1	486.0	0.8	1
SMAFJ350A	SMAFJ350CA	TG	UG	350	391	432	1	567.0	0.7	1
SMAFJ400A	SMAFJ400CA	TK	UK	400	447	494	1	648.0	0.6	1
SMAFJ440A	SMAFJ440CA	TM	UM	440	492	543	1	713.0	0.6	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)

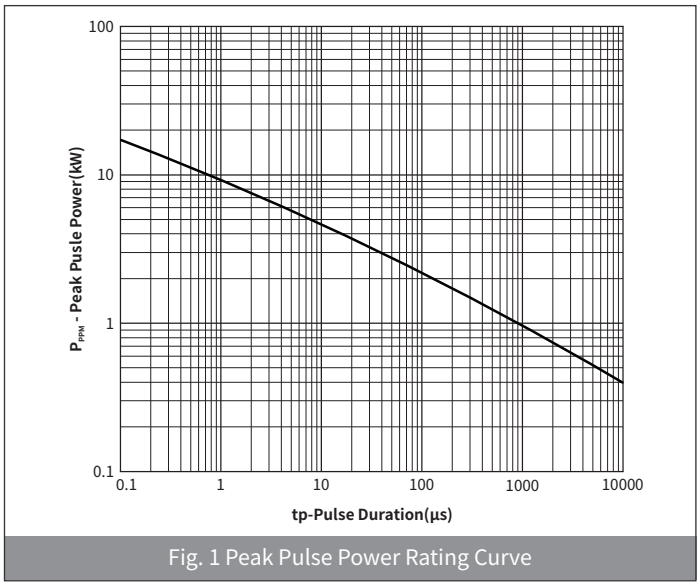


Fig. 1 Peak Pulse Power Rating Curve

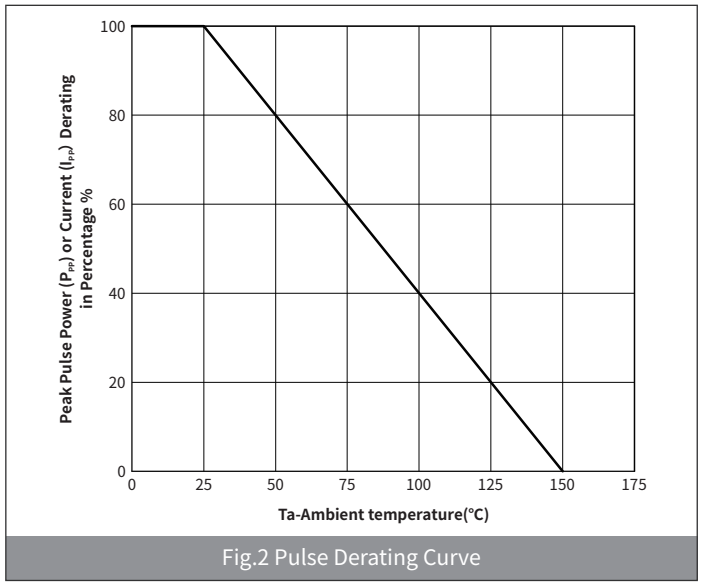


Fig.2 Pulse Derating Curve

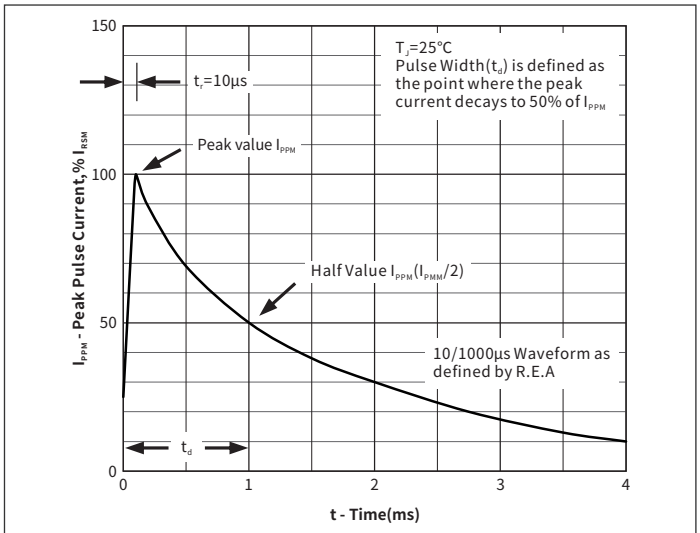


Fig.3 Pulse Waveform

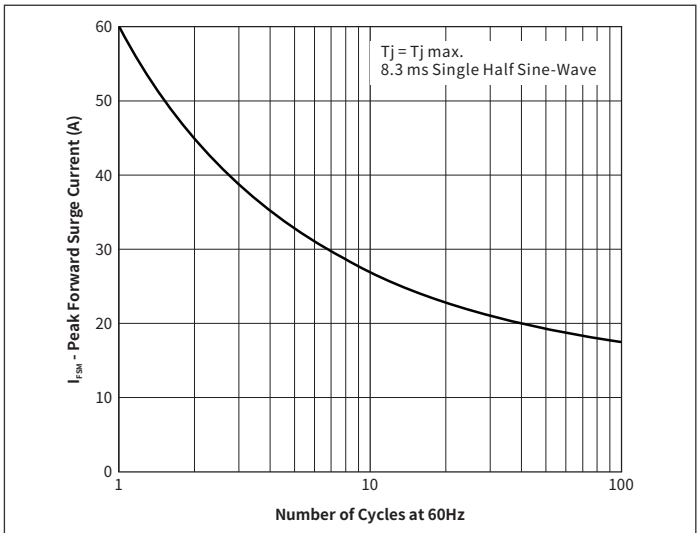
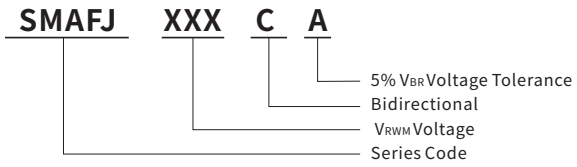


Fig.6 Maximum Non-Repetitive Forward Surge Current Uni-Directional Only

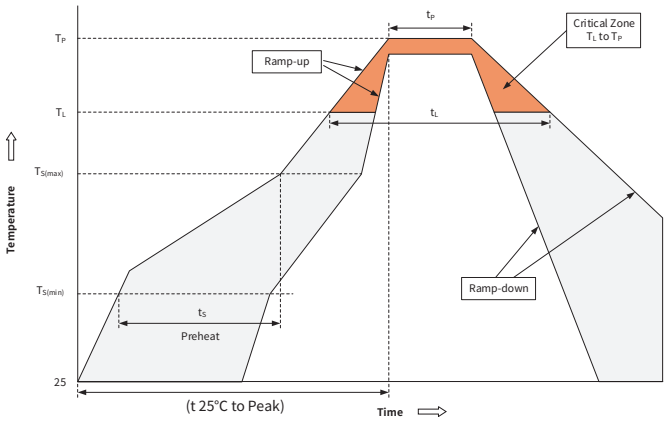
Ordering Information

PACKAGE	PACKAGE CODE	UNIT WEIGHT(g)	REEL(pcs)	BOX(pcs)	CARTON(pcs)	DELIVERY MODE
SMAF	R1	0.034	3000	18000	180000	7''
SMAF	R2	0.034	7500	15000	120000	11''
SMAF	R3	0.034	7500	/	120000	13''

Part Numbering

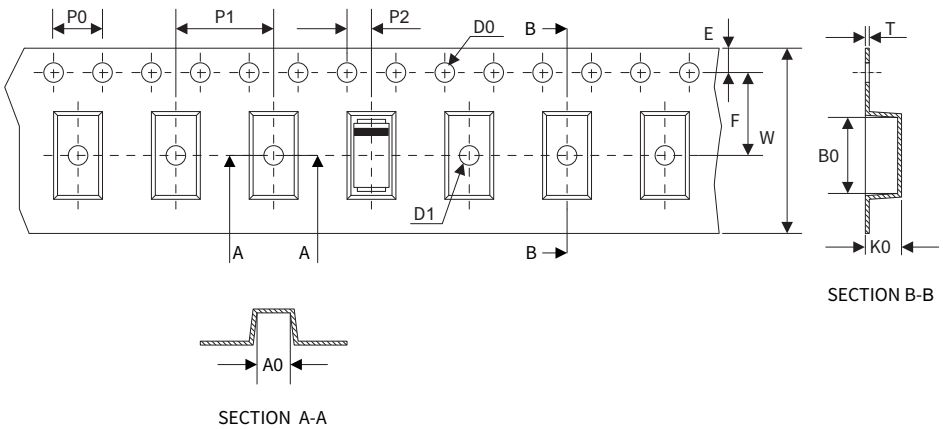


Soldering Parameters



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 (SMAF)



Symbol	Dimension (mm)
W	12.00±0.20
P0	4.00±0.10
P1	4.00±0.10
P2	2.00±0.10
D0	Φ1.5±0.10
D1	Φ1.5±0.10
E	1.75±0.10
F	5.50±0.05
A0	2.79±0.10
B0	5.33±0.10
K0	2.55±0.15
T	0.25±0.05