

## TVS Diode – SMF Series

### Features

- Plastic package, excellent insulation strength.
- Glass passivated chip junction in SOD-123 package.
- Excellent voltage clamping capability.
- Low Zener impedance.
- 200W peak pulse power capability on 10/1000 $\mu$ s waveform.
- Typical leakage current less than 1 $\mu$ A above 13V.
- Very fast response time, typically less than 1.0ps from 0 volt to  $V_{BR}$  minimum.
- High temperature soldering guaranteed: 265°C/10 sec.
- MSL: JEDEC-J-STD-020, Level 1

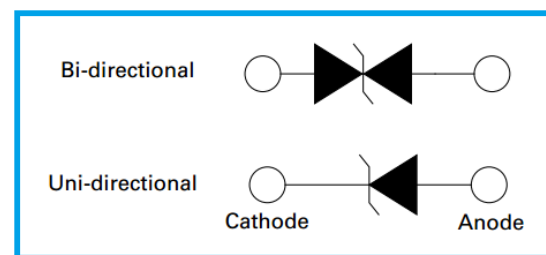


### Applications

- I/O interface,  $V_{CC}$  bus
- Telecom
- Industrial and consumer electronic applications.
- Relay and electromagnetic valve surge absorption.

### Agency Approval

- Pending



### Mechanical and Physical Data

- Case: JEDEC SMF molded plastic.
- Axial leaded, solderable per MIL-STD-750, Method 2026
- Polarity: Color band denoted cathode except bidirectional.

### Maximum Ratings and Thermal Characteristics

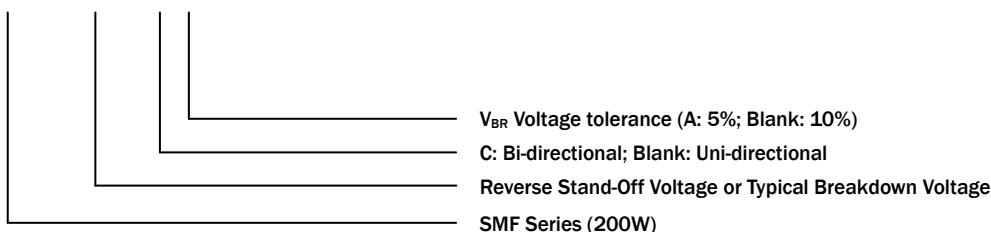
Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation on 10/1000 $\mu$ s waveform (Note 1, Fig.1).	$P_{PPM}$	Min 200	W
Peak Pulse Current of 10/1000 $\mu$ s waveform (Note 1, Fig.3).	$I_{PPM}$	See Table	A
Peak Forward Surge Current, 8.3 ms Single Half Sine Wave Superimposed on Rated Load (Note 2, Fig.6).	$I_{FSM}$	20	A
Operating Junction and Storage Temperature Range.	$T_J, T_{STG}$	-55~150	°C

Note:

1. Non-repetitive current pulse, per Fig.3 and derated above  $T_A = 25^\circ\text{C}$  per Fig.2.
2. 8.3ms single half sine wave, or equivalent square wave, Duty cycle = 4 pulses per minutes maximum.

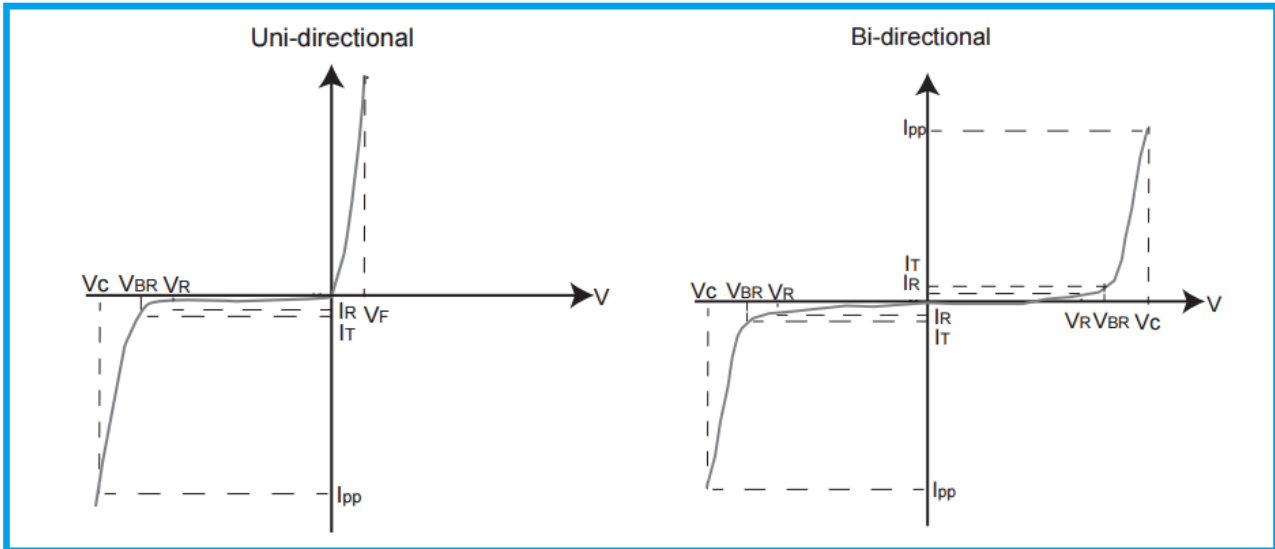
### Part Number Code

SMF  C A



## TVS Diode – SMF Series

### I-V Curve Characteristics



- $I_{PPM}$  Peak Pulse Power Dissipation – Maximum power dissipation
- $V_R$  Stand-off Voltage – Maximum voltage that can be applied to the TVS without operation
- $V_{BR}$  Breakdown Voltage – Maximum voltage that flows through the TVS at a specified test current ( $I_T$ )
- $V_C$  Clamping Voltage – Peak voltage measured across the TVS at a specified  $I_{PPM}$  (Peak Impulse Current)
- $I_R$  Reverse Leakage Current – Current measured at  $V_R$
- $V_F$  Forward Voltage Drop for Uni-directional

### Electrical Characteristics

Part Number		Marking		Reverse Stand Off Voltage $V_R$ (V)	Breakdown Voltage $V_{BR}$ (V) @ $I_T$		Test Current $I_T$ (mA)	Maximum Clamping Voltage $V_C$ (V) @ $I_{PP}$	Maximum Peak Pulse Current $I_{PP}$ (A)	Maximum Reverse Leakage $I_R$ ( $\mu$ A) @ $V_R$	UL
Uni	Bi	Uni	Bi		Min.	Max.					
SMF5.0A	SMF5.0CA	FE	KE	5.0	6.40	7.00	10	9.2	21.74	400	Pending
SMF6.0A	SMF6.0CA	FG	KG	6.0	6.67	7.37	10	10.3	19.42	400	Pending
SMF6.5A	SMF6.5CA	FK	KK	6.5	7.22	7.98	10	11.2	17.86	250	Pending
SMF7.0A	SMF7.0CA	FM	KM	7.0	7.78	8.60	10	12.0	16.67	100	Pending
SMF7.5A	SMF7.5CA	FP	KP	7.5	8.33	9.21	1	12.9	15.50	50	Pending
SMF8.0A	SMF8.0CA	FR	KR	8.0	8.89	9.83	1	13.6	14.71	25	Pending
SMF8.5A	SMF8.5CA	FT	KT	8.5	9.44	10.40	1	14.4	13.89	10	Pending
SMF9.0A	SMF9.0CA	FV	KV	9.0	10.00	11.10	1	15.4	12.99	5.0	Pending
SMF10A	SMF10CA	FX	KX	10	11.10	12.30	1	17.0	11.76	2.5	Pending
SMF11A	SMF11CA	FZ	KZ	11	12.20	13.50	1	18.2	10.99	2.5	Pending
SMF12A	SMF12CA	HE	LE	12	13.30	14.70	1	19.9	10.05	2.5	Pending
SMF13A	SMF13CA	HG	LG	13	14.40	15.90	1	21.5	9.30	1	Pending
SMF14A	SMF14CA	HK	LK	14	15.60	17.20	1	23.2	8.62	1	Pending
SMF15A	SMF15CA	HM	LM	15	16.70	18.50	1	24.4	8.20	1	Pending
SMF16A	SMF16CA	HP	LP	16	17.80	19.70	1	26.0	7.69	1	Pending
SMF17A	SMF17CA	HR	LR	17	18.90	20.90	1	27.6	7.25	1	Pending
SMF18A	SMF18CA	HT	LT	18	20.00	22.10	1	29.2	6.85	1	Pending

## TVS Diode – SMF Series

Part Number		Marking		Reverse Stand Off Voltage $V_R$ (V)	Breakdown Voltage $V_{BR}$ (V) @ $I_T$		Test Current $I_T$ (mA)	Maximum Clamping Voltage $V_C$ (V) @ $I_{PP}$	Maximum Peak Pulse Current $I_{PP}$ (A)	Maximum Reverse Leakage $I_R$ ( $\mu$ A) @ $V_R$	UL
Uni	Bi	Uni	Bi		Min.	Max.					
SMF19A	SMF19CA	HB	LB	19	21.10	23.30	1	30.6	6.54	1	Pending
SMF20A	SMF20CA	HV	LV	20	22.20	24.50	1	32.4	6.17	1	Pending
SMF22A	SMF22CA	HX	LX	22	24.40	26.90	1	35.5	5.63	1	Pending
SMF24A	SMF24CA	HZ	LZ	24	26.70	29.50	1	38.9	5.14	1	Pending
SMF26A	SMF26CA	JE	ME	26	28.90	31.90	1	42.1	4.75	1	Pending
SMF28A	SMF28CA	JG	MG	28	31.10	34.40	1	45.4	4.41	1	Pending
SMF30A	SMF30CA	JK	MK	30	33.30	36.80	1	48.4	4.13	1	Pending
SMF33A	SMF33CA	JM	MM	33	36.70	40.60	1	53.3	3.75	1	Pending
SMF36A	SMF36CA	JP	MP	36	40.00	44.20	1	58.1	3.44	1	Pending
SMF40A	SMF40CA	JR	MR	40	44.40	49.10	1	64.5	3.10	1	Pending
SMF43A	SMF43CA	JT	MT	43	47.80	52.80	1	69.4	2.88	1	Pending
SMF45A	SMF45CA	JV	MV	45	50.00	55.30	1	72.7	2.75	1	Pending
SMF48A	SMF48CA	JX	MX	48	53.30	58.90	1	77.4	2.58	1	Pending
SMF51A	SMF51CA	JZ	MZ	51	56.70	62.70	1	82.4	2.43	1	Pending
SMF54A	SMF54CA	XE	NE	54	60.00	66.30	1	87.1	2.30	1	Pending
SMF58A	SMF58CA	XG	NG	58	64.40	71.20	1	93.6	2.14	1	Pending
SMF60A	SMF60CA	XK	NK	60	66.70	73.70	1	96.8	2.07	1	Pending
SMF64A	SMF64CA	XM	NM	64	71.10	78.60	1	103.0	1.94	1	Pending
SMF70A	SMF70CA	XP	NP	70	77.80	86.00	1	113.0	1.77	1	Pending
SMF75A	SMF75CA	XR	NR	75	83.30	92.10	1	121.0	1.65	1	Pending
SMF78A	SMF78CA	XT	NT	78	86.70	95.80	1	126.0	1.59	1	Pending
SMF80A	SMF80CA	XB	NB	80	88.80	97.60	1	129.0	1.55	1	Pending
SMF85A	SMF85CA	XV	NV	85	94.40	104.0	1	137.0	1.46	1	Pending
SMF90A	SMF90CA	XX	NX	90	100.0	111.0	1	146.0	1.37	1	Pending
SMF100A	SMF100CA	XZ	NZ	100	111.0	123.0	1	162.0	1.23	1	Pending
SMF110A	SMF110CA	TE	PE	110	122.0	135.0	1	177.0	1.13	1	Pending
SMF120A	SMF120CA	TG	PG	120	133.0	147.0	1	193.0	1.04	1	Pending
SMF130A	SMF130CA	TK	PK	130	144.0	159.0	1	209.0	0.96	1	Pending
SMF140A	SMF140CA	TB	PB	140	155.0	171.0	1	224.0	0.89	1	Pending
SMF150A	SMF150CA	TM	PM	150	167.0	185.0	1	243.0	0.82	1	Pending
SMF160A	SMF160CA	TP	PP	160	178.0	197.0	1	259.0	0.77	1	Pending
SMF170A	SMF170CA	TR	PR	170	189.0	209.0	1	275.0	0.73	1	Pending
SMF180A	SMF180CA	TT	PT	180	200.0	220.0	1	292.0	0.68	1	Pending
SMF190A	SMF190CA	TV	PV	190	211.0	232.0	1	308.0	0.65	1	Pending
SMF200A	SMF200CA	TX	PX	200	224.0	247.0	1	324.0	0.62	1	Pending
SMF220A	SMF220CA	TZ	PZ	220	246.0	272.0	1	356.0	0.56	1	Pending

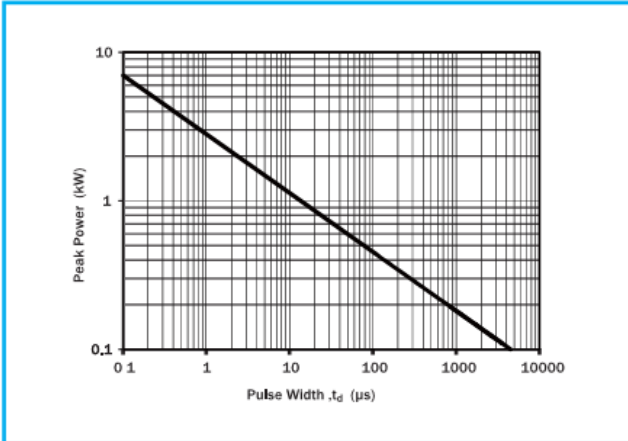
Note:

1. For bi-directional type having  $V_R$  of 10 volts and less, the  $I_R$  limit is double.

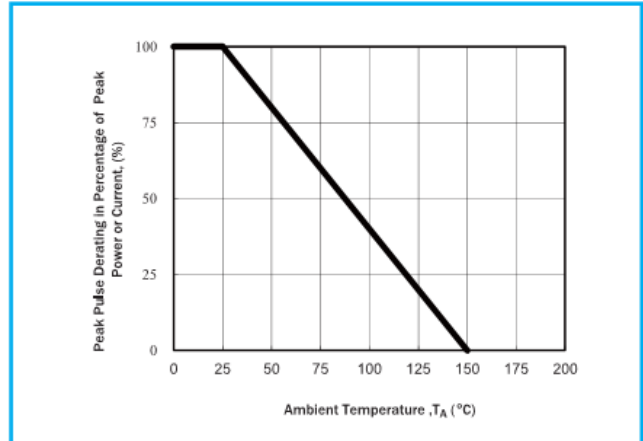
## TVS Diode – SMF Series

### Ratings and Characteristic Curves

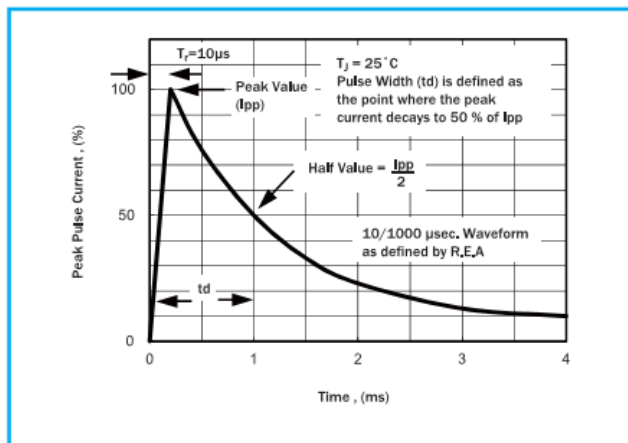
**Fig 1 - Peak Pulse Power Rating Curve**



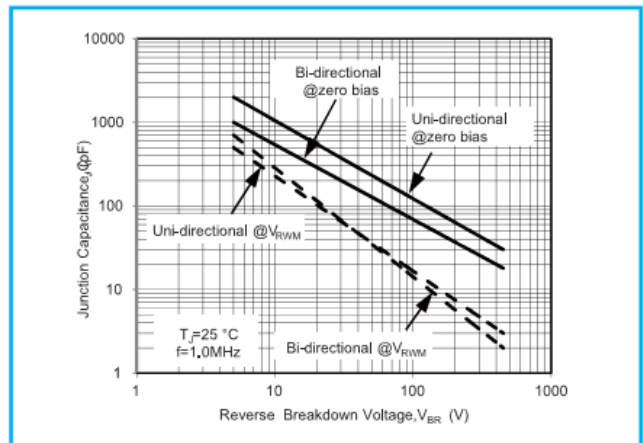
**Fig 2 - Pulse Derating Curve**



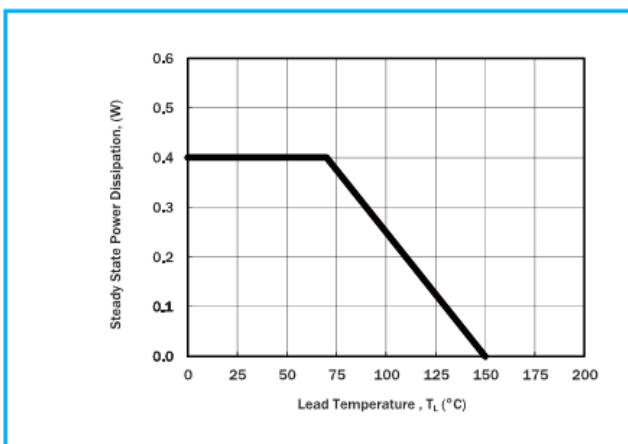
**Fig 3 - Pulse Waveform**



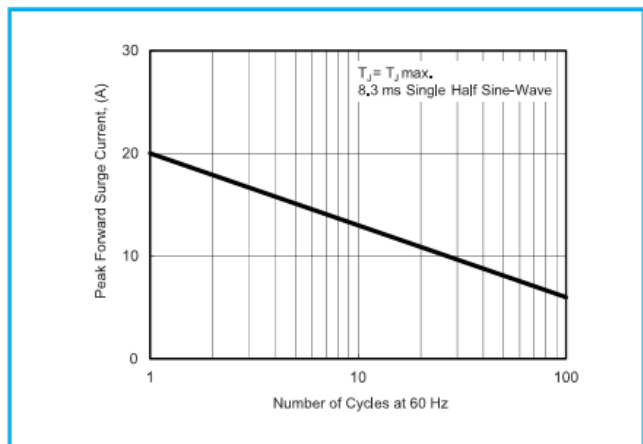
**Fig 4 - Typical Junction Capacitance Uni-directional**



**Fig 5 - Steady State Power Dissipation Derating Curve**

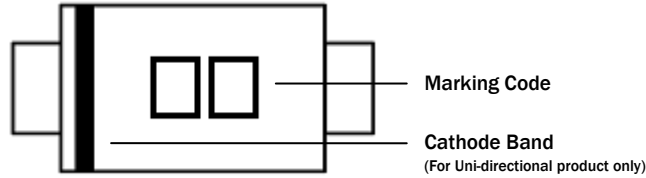


**Fig 6 - Maximum Non-Repetitive Forward Surge Current (Uni-directional Only)**

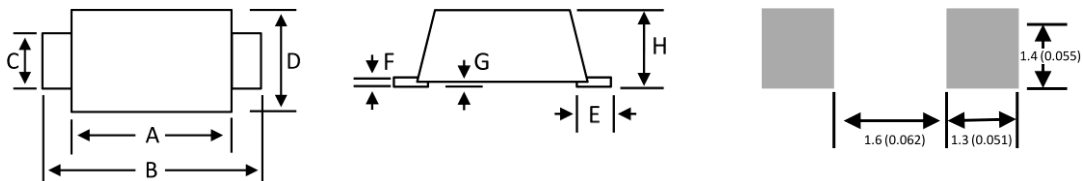


## TVS Diode – SMF Series

### Marking Definitions



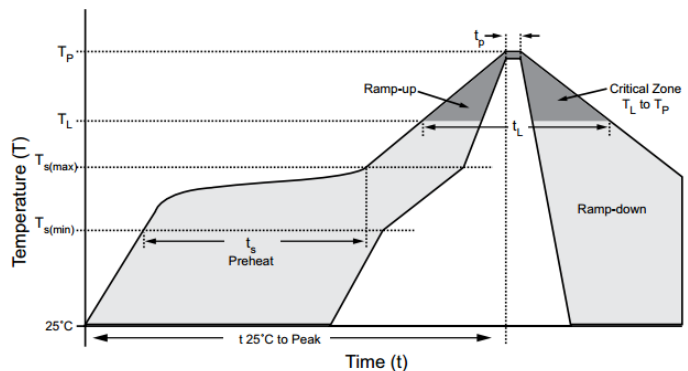
### Physical Dimensions



Dimension	Millimeters		Inches	
	Min	Max	Min	Max
A	2.50	2.90	0.0984	0.1142
B	3.40	3.90	0.1339	0.1535
C	0.70	1.20	0.0275	0.0472
D	1.50	2.00	0.0591	0.0787
E	0.35	0.90	0.0138	0.0354
F	0.05	0.26	0.0020	0.0102
G	-	0.10	-	0.0039
H	0.95	1.30	0.0374	0.0512

### Lead Free Reflow Soldering Recommendations

<b>Preheat</b>	
- Temperature Min ( $T_{s\_min}$ )	150°C
- Temperature Max ( $T_{s\_max}$ )	200°C
- Time ( $T_{s\_min}$ to $T_{s\_max}$ )	60-180 seconds
- Average Ramp-Up Rate	1~3°C/second
<b>Peak Temperature</b>	260°C max.
<b>Time within 5°C of actual Peak Temperature (<math>t_p</math>)</b>	40 seconds max.
<b>Ramp-Down Rate</b>	6 °C /second max.



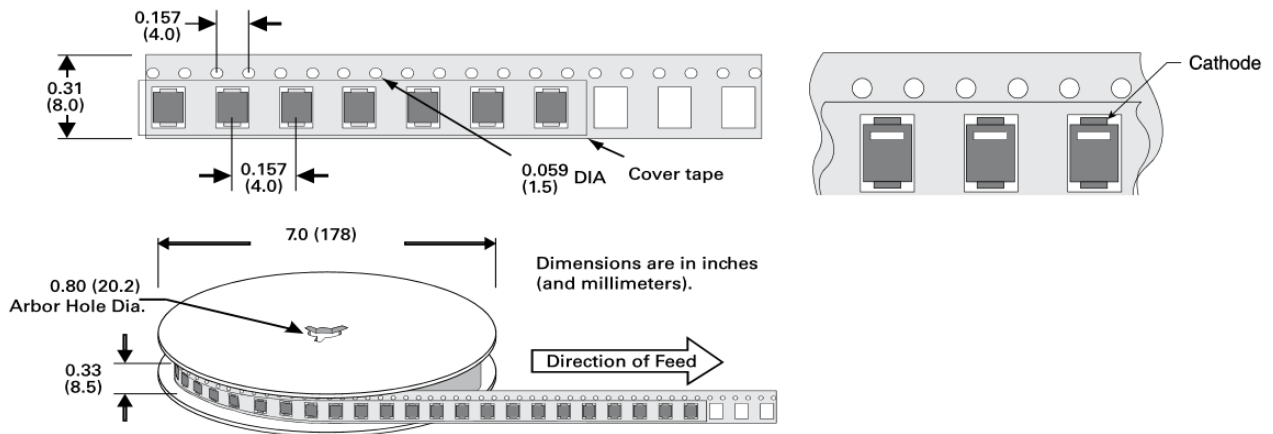
Note: If the soldering temperatures exceed the recommended profile, devices may not meet the performance requirements.

## TVS Diode – SMF Series

### Packaging Information

Part Number	Component Package	Quantity	Packaging Option	Packaging Specification
SMF Series	SOD-123	3000	Tape & Reel – 8mm tape/7" reel	EIA STD RS-481

### Tape and Reel Specifications



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