SMF Series
Surface Mount – 200W

Additional Information

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Agency Approvals

Agency	Agnecy File Number
	E230531

Maximum Ratings and Thermal Characteristics
(T_A=25°C unless otherwise noted)

Parameter		Symbol	Value	Unit
Peak Pulse Power Dissipation at T_A=25°C [1]	8/20µs	P_{PPM}	1000	W
	10/1000µs [2]		200	
Power Dissipation On Infinite Heat Sink at TL=50°C		P_D	1	W
Thermal Resistance Junction- to-Ambient		$R_{\Theta JA}$	220	°C/W
Thermal Resistance Junction- to- Lead		$R_{\Theta JL}$	100	°C/W
Operating Temperature Range		T_J	-65 to 150	°C
Storage Temperature Range		T_{STG}	-65 to 175	°C

Notes:
1. Non-repetitive current pulse, per Fig. 4 and derated above T_J (initial) =25°C per Fig. 3.
2. SMF90A~SMF100A Peak Pulse Power Dissipation is 170W min, 200W typical @ 10/1000us

Description

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

SMF package is 50% smaller in footprint when compare to SMA package and delivering one of the low height profiles (1.1mm) in the industry.

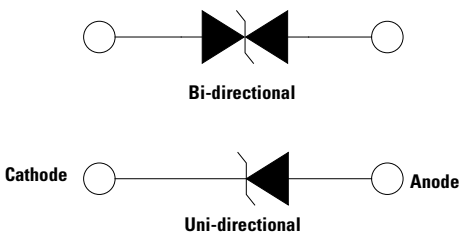
Features & Benefits

- 200W peak pulsepower capability at 10/1000µs waveform, repetition rate (duty cycle): 0.01%
- Compatible with industrial standard package SOD-123FL
- Low profile: maximum height of 1.1mm.
- Low inductance, excellent clamping capability
- For surface mounted applications to optimize board space
- High temperature to reflow soldering guaranteed: 260°C/30sec
- 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)
- ESD protection of data lines in accordance with IEC 61000-4-2
- EFT protection of data lines in accordance with IEC 61000-4-4
- Fast response time: typically less than 1.0ns from 0 Volts to V_{BR} min
- Glass passivated junction
- Built-in strain relief
- Plastic package is flammability rated V-0 per UL 94
- Meet MSL level1, per J-STD-020, LF maximun peak of 260°C
- Matte tin lead–free plated
- Halogen-free and RoHS compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/ JEDEC J-STD-609A.01)
- UL Recognized to UL 497B as an Isolated Loop Circuit Protector.

Applications

SMF series is ideal for the protection of I/O interfaces, V_{CC} bus and other vulnerable circuit used in cellular phones, portable electronics, business machines, power supplies and other consumer applications.

Functional Diagram



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Electrical Characteristics (T_A=25°C unless otherwise noted)

Part Number		Marking Code		Breakdown Voltage VBR (Volts) @ IT		Test Current IT (mA)	Reverse Stand off Voltage VR (V)	Maximum Reverse Leakage @ VR IR (µA)	Maximum Peak Pulse Current Ipp (A) 10*1000us	Maximum Clamping Voltage @Ipp VC (V) 10*1000us	Agency Approval	
Uni	Bi	Uni	Bi	MIN	MAX						Uni	Bi
SMF5.0A	SMF5.0CA	AE	HE	6.40	7.00	10	5.0	400	21.7	9.2	X	X
SMF6.0A	SMF6.0CA	AG	HG	6.67	7.37	10	6.0	400	19.4	10.3	X	X
SMF6.5A	SMF6.5CA	AK	HK	7.22	7.98	10	6.5	250	17.9	11.2	X	X
SMF7.0A	SMF7.0CA	AM	HM	7.78	8.60	10	7.0	100	16.7	12.0	X	X
SMF7.5A	SMF7.5CA	AP	HP	8.33	9.21	1	7.5	50	15.5	12.9	X	X
SMF8.0A	SMF8.0CA	AR	HR	8.89	9.83	1	8.0	25	14.7	13.6	X	X
SMF8.5A	SMF8.5CA	AT	HT	9.44	10.40	1	8.5	10	13.9	14.4	X	X
SMF9.0A	SMF9.0CA	AV	HV	10.00	11.10	1	9.0	2.5	13.0	15.4	X	X
SMF10A	SMF10CA	AX	HX	11.10	12.30	1	10	2.5	11.8	17.0	X	X
SMF11A	SMF11CA	AZ	HZ	12.20	13.50	1	11	2.5	11.0	18.2	X	X
SMF12A	SMF12CA	BE	IE	13.30	14.70	1	12	2.5	10.1	19.9	X	X
SMF13A	SMF13CA	BG	IG	14.40	15.90	1	13	1.0	9.3	21.5	X	X
SMF14A	SMF14CA	BK	IK	15.60	17.20	1	14	1.0	8.6	23.2	X	X
SMF15A	SMF15CA	BM	IM	16.70	18.50	1	15	1.0	8.2	24.4	X	X
SMF16A	SMF16CA	BP	IP	17.80	19.70	1	16	1.0	7.7	26.0	X	X
SMF17A	SMF17CA	BR	IR	18.90	20.90	1	17	1.0	7.2	27.6	X	X
SMF18A	SMF18CA	BT	IT	20.0 0	22.10	1	18	1.0	6.8	29.2	X	X
SMF20A	SMF20CA	BV	IV	22.20	24.50	1	20	1.0	6.2	32.4	X	X
SMF22A	SMF22CA	BX	IX	24.40	26.90	1	22	1.0	5.6	35.5	X	X
SMF24A	SMF24CA	BZ	IZ	26.70	29.50	1	24	1.0	5.1	38.9	X	X
SMF26A	SMF26CA	CE	JE	28.90	31.90	1	26	1.0	4.8	42.1	X	X
SMF28A	SMF28CA	CG	JG	31.10	34.40	1	28	1.0	4.4	45.4	X	X
SMF30A	SMF30CA	CK	JK	33.30	36.80	1	30	1.0	4.1	48.4	X	X
SMF33A	SMF33CA	CM	JM	36.70	40.60	1	33	1.0	3.8	53.3	X	X
SMF36A	SMF36CA	CP	JP	40.00	44.20	1	36	1.0	3.4	58.1	X	X
SMF40A	SMF40CA	CR	JR	44.40	49.10	1	40	1.0	3.1	64.5	X	X
SMF43A	SMF43CA	CT	JT	47.80	52.80	1	43	1.0	2.9	69.4	X	X
SMF45A	SMF45CA	CV	JV	50.00	55.30	1	45	1.0	2.8	72.7	X	X
SMF48A	SMF48CA	CX	JX	53.30	58.90	1	48	1.0	2.6	77.4	X	X
SMF51A	SMF51CA	CZ	JZ	56.70	62.70	1	51	1.0	2.4	82.4	X	X
SMF54A	SMF54CA	DE	KE	60.00	66.30	1	54	1.0	2.3	87.1	X	X
SMF58A	SMF58CA	RG	KG	64.40	71.20	1	58	1.0	2.1	93.6	X	X
SMF60A	SMF60CA	RK	KK	66.70	73.70	1	60	1.0	2.1	96.8	X	X
SMF64A	SMF64CA	RM	KM	71.10	78.60	1	64	1.0	1.9	103.0	X	X
SMF70A	SMF70CA	RP	KP	77.80	86.00	1	70	1.0	1.7	113.0	X	X
SMF75A	SMF75CA	RR	KR	83.30	92.10	1	75	1.0	1.6	121.0	X	X
SMF78A	SMF78CA	RT	KT	86.70	95.80	1	78	1.0	1.6	126.0	X	X
SMF85A	SMF85CA	RV	KV	94.40	104.00	1	85	1.0	1.5	137.0	X	X
SMF90A	-	RW	-	100.00	111.00	1	90	1.0	1.2	146.0	-	-
SMF100A	-	RX	-	111.00	123.00	1	100	1.0	1.1	162.0	-	-
SMF110A	-	SE	-	122.00	135.00	1	110	1.0	1.1	177.0	-	-
SMF120A	-	SG	-	133.00	147.00	1	120	1.0	1.0	193.0	-	-
SMF130A	-	SK	-	144.00	159.00	1	130	1.0	1.0	209.0	-	-
SMF150A	-	SM	-	167.00	185.00	1	150	1.0	0.8	243.0	-	-
SMF160A	-	SP	-	178.00	197.00	1	160	1.0	0.8	259.0	-	-
SMF170A	-	SR	-	189.00	209.00	1	170	1.0	0.7	275.0	-	-
SMF180A	-	ST	-	201.00	222.00	1	180	1.0	0.7	292.0	-	-
SMF188A	-	SV	-	209.00	231.00	1	188	1.0	0.7	304.0	-	-
SMF200A	-	SX	-	224.00	247.00	1	200	1.0	0.6	324.0	-	-
SMF220A	-	SZ	-	246.00	272.00	1	220	1.0	0.6	356.0	-	-
SMF250A	-	TE	-	279.00	309.00	1	250	1.0	0.5	405.0	-	-

Notes:
1. V_{BR} measured after I_T applied for 300µs, I_T = square wave pulse or equivalent.
2. Surge current waveform per 10/1000µs exponential wave and derated per Fig.2.
3. All terms and symbols are consistent with ANSI/IEEE C62.35.
4. For bidirectional type having VR of 10 volts and less, the IR limit is double.

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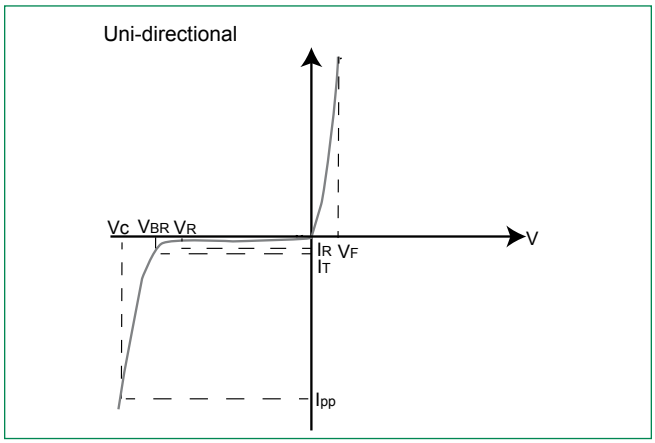
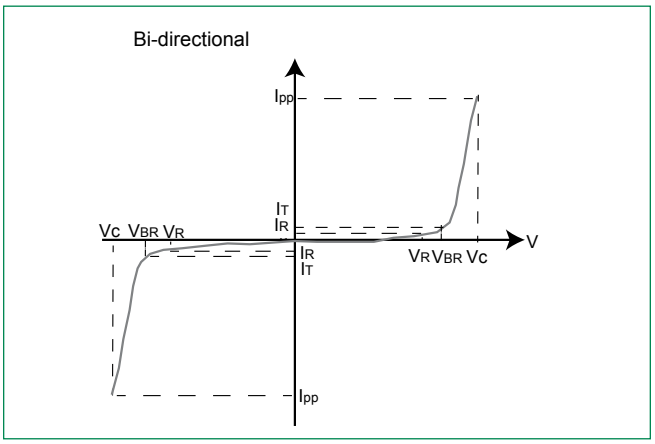
I-V Curve Characteristics





P_{PPM} Peak Pulse Power Dissipation -- Max 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 though the TVS at a specified test current (IT)
V_C Clamping Voltage -- Peak voltage measured across the TVS at a specified Ippm (peak impulse current)
I_R Reverse Leakage Current -- Current measured at VR
V_F Forward Voltage Drop for Uni-directional

Ratings and Characteristic Curves (T_A=25°C unless otherwise noted)

Figure 1: TVS Transients Clamping Waveform

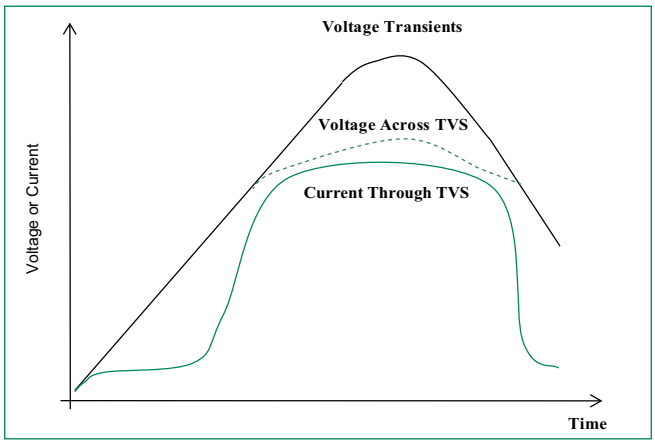
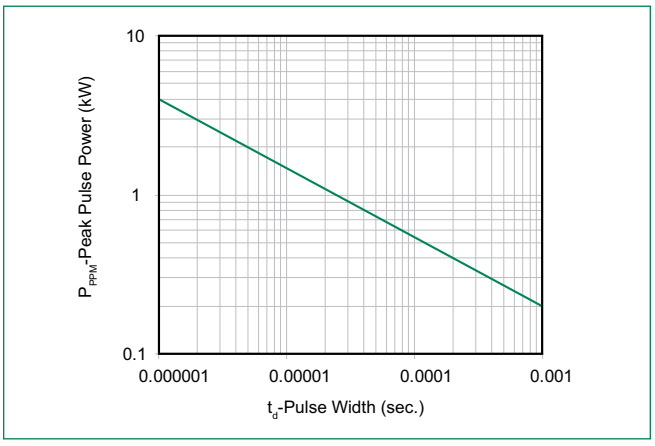


Figure 2: Peak Pulse Power Rating Curve



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Ratings and Characteristic Curves (T_A=25°C unless otherwise noted) (Continued)

Figure 3: Peak Pulse Power Derating Curve

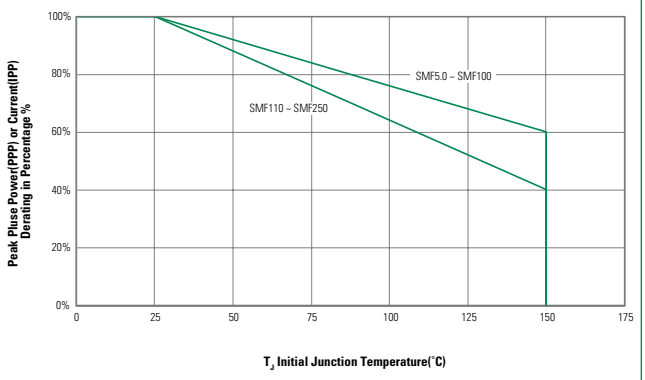


Figure 4: Pulse Waveform - 10/1000μS

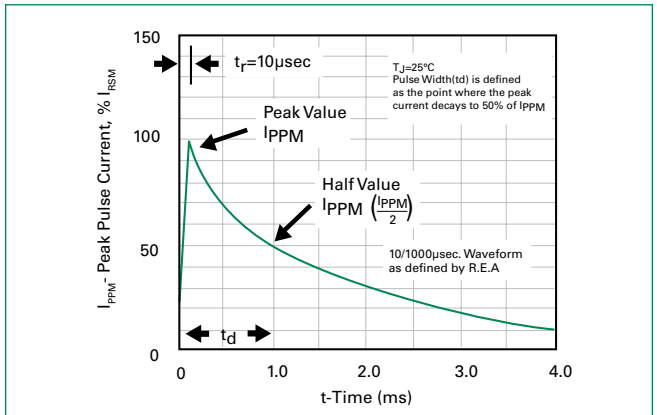


Figure 5: Forward Voltage

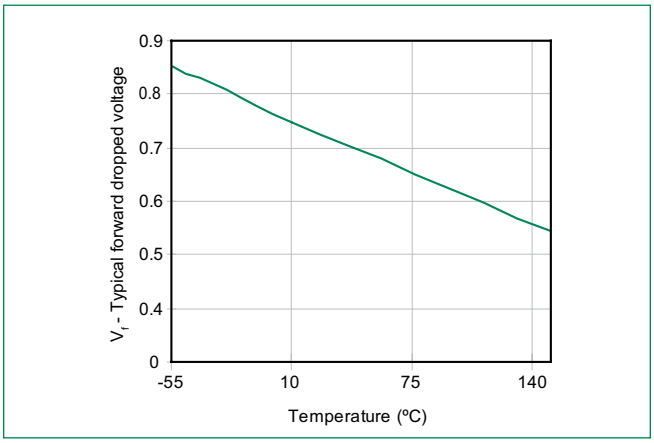


Figure 6: Typical Junction Capacitance

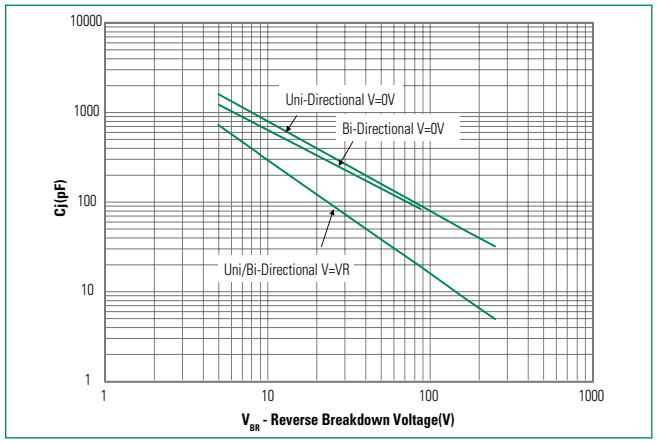


Figure 7: Peak Forward Voltage Drop vs. Peak Forward Current

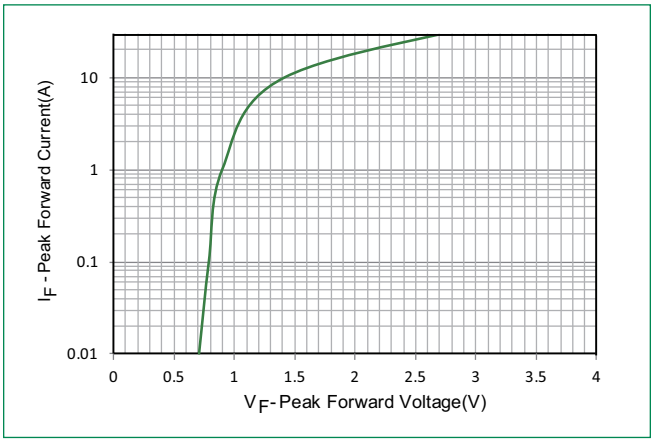
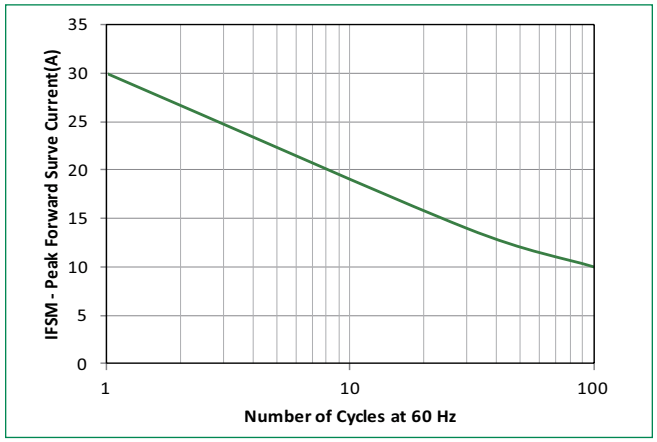


Figure 8: Maximum Non-Repetitive Forward Surge Current Uni-Directional Only



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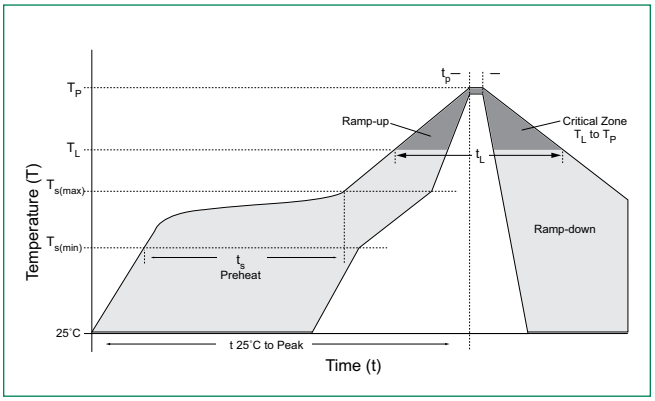
Soldering Parameters

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 secs
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_L)	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



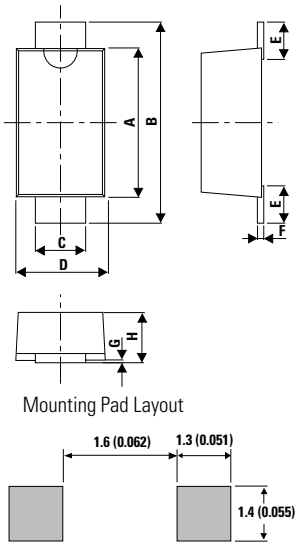
Physical Specifications

Case	SOD-123FL plastic over glass passivated junction
Polarity	Color band denotes cathode except bipolar
Terminal	Matte tin-plated leads, solderable per JESD22-B102

Environmental Specifications

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

Dimensions - SOD-123FL Package



Dimensions	Millimeters		Inches	
	Min	Max	Min	Max
A	2.50	3.10	0.0984	0.1220
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	0.00	0.10	0.000	0.0039
H	0.90	1.10	0.0354	0.0433

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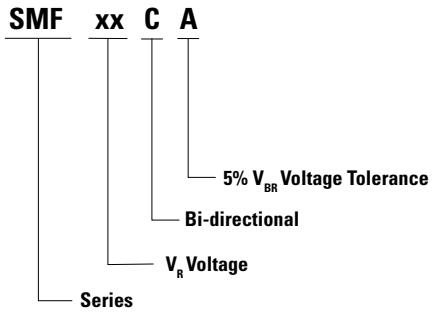
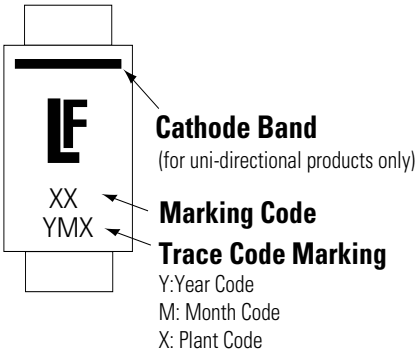
Part Numbering System



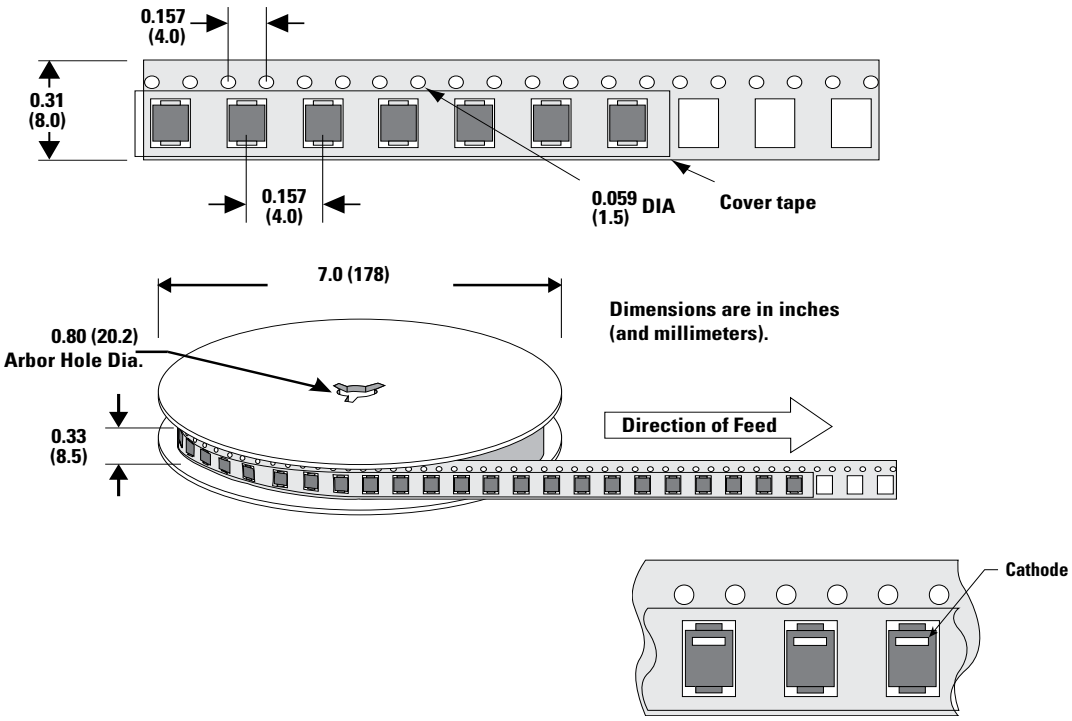
Part Marking System



Packaging Options

Part number	Component Package	Quantity	Packaging Option	Packaging Specification
SMFXXX	SOD-123FL	3000	Tape & Reel – 8mm tape/7" reel	EIA RS-481
SMFXXX-T13	SOD-123FL	10000	Tape & Reel – 8mm tape/13" reel	EIA RS-481

Tape and Reel Specification



Mouser Electronics

Authorized Distributor

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Littelfuse:

SMF5.0A SMF6.0A SMF6.5A SMF7.0A SMF7.5A SMF8.0A SMF8.5A SMF9.0A SMF10A SMF11A SMF12A SMF33A SMF20A SMF18A SMF54A SMF51A SMF22A SMF45A SMF40A SMF28A SMF26A SMF43A SMF16A SMF13A SMF30A SMF24A SMF15A SMF14A SMF36A SMF17A SMF48A SMF13A-T13 SMF17A-T13 SMF51A-T13 SMF8.0A-T13 SMF7.0A-T13 SMF16A-T13 SMF6.0A-T13 SMF8.5A-T13 SMF24A-T13 SMF22A-T13 SMF15A-T13 SMF5.0A-T13 SMF7.5A-T13 SMF9.0A-T13 SMF54A-T13 SMF14A-T13 SMF45A-T13 SMF26A-T13 SMF36A-T13 SMF6.5A-T13 SMF12A-T13 SMF43A-T13 SMF33A-T13 SMF20A-T13 SMF30A-T13 SMF11A-T13 SMF10A-T13 SMF48A-T13 SMF18A-T13 SMF28A-T13 SMF40A-T13 SMF58A SMF60A SMF64A SMF70A SMF75A SMF78A SMF85A SMF160A SMF20CA SMF48CA SMF5.0CA SMF150A SMF54CA SMF110A SMF51CA SMF9.0CA SMF43CA SMF6.0CA SMF60CA SMF8.0CA SMF10CA SMF18CA SMF24CA SMF58CA SMF78CA SMF12CA SMF16CA SMF17CA SMF170A SMF40CA SMF45CA SMF6.5CA SMF8.5CA SMF120A SMF64CA SMF22CA SMF85CA SMF11CA