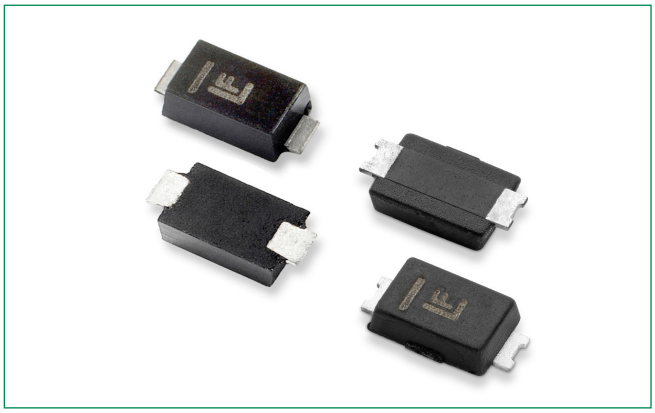
SMFA Asymmetric Series
Surface Mount TVS Diodes

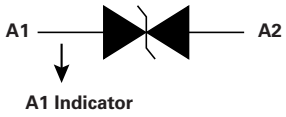


Maximum Ratings & Thermal Characteristics

Parameter	Symbol	Value	Unit
Power Dissipation on Infinite Heat Sink at T_L = 50 °C (Note 1)	P_D	1	W
Thermal Resistance, Junction to Lead (Note3)	$R_{\theta JL}$	100	°C/W
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	220	°C/W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C

Notes:
1. Mounted with recommended minimum pad size, DC board FR–4.

Functional Diagram



Description

The SMFA Asymmetric TVS Diode Series is designed specifically for SIC MOSFET gate protection for asymmetric voltages. It comes in SOD-123FL small and flat lead low-profile plastic package.

Features & Benefits

- SOD-123FL low-profile package: maximum height of 1.08 mm
- Low inductance, excellent clamping capability
- For surface-mounted applications to optimize board space
- 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 pass Class 1 and 2
- IEC 61000-4-2 ESD 30 kV(Air), 30 kV (Contact)
- Glass passivated chip junction
- Low dynamic resistance
- V_{BR} @ T_J = V_{BR} @ 25 °C x (1+αT x (T_J - 25)) (αT:temperature coefficient, typical value is 0.1%)
- Recognized compound meeting flammability rating UL94 V-0
- 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-STD609A.01)

Applications

- AI/data center server power supplies
- High-efficiency power for EVI
- High-reliability power supplies for semiconductor/ industrial equipment

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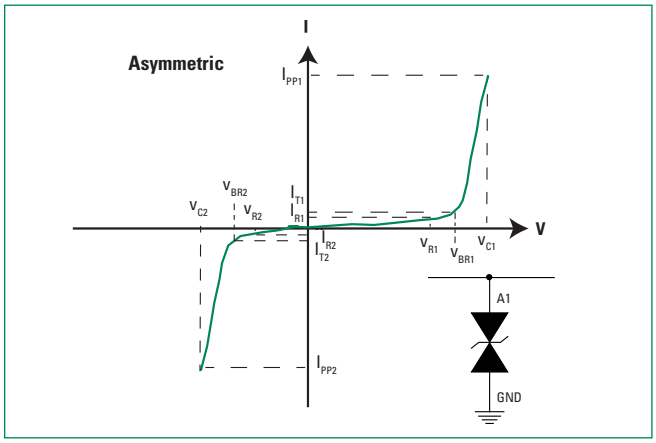
Electrical Characteristics (T_A = 25 °C unless otherwise noted)

Part Number	Marking	Maximum Reverse Leakage I_{R1} @ V_{R1} (µA)	Stand-off Voltage V_{R1} (V)	Breakdown Voltage V_{BR} (Volts) @ I_{T1}			Typical Clamping Voltage V_{C3}@I_{PP3} (V)	Typical Peak Pulse Current I_{PP3} (A)	Maximum Clamping Voltage V_{C1}@ I_{PP1} (V)	Maximum Peak Pulse Current I_{PP1} (A)	Test Current I_{T1} (mA)	Junction Capacitance Typ@ 1 MHz, 0 V Bias (pF)
				Min.	Nom.	Max.						
SMFA1505CA	FM	1	15	16.7	17.6	18.5	18.57	2	24.05	16.63	1	565
SMFA1805CA	FT	1	18	20.0	21.1	22.1	24.47	2	28.73	13.92	1	515
SMFA1905CA	FU	1	19	21.1	22.2	23.3	25.55	2	30.29	13.21	1	485
SMFA2005CA	FV	1	20	22.2	23.4	24.5	26.40	2	31.85	12.56	1	440

Part Number	Marking	Maximum Reverse Leakage I_{R2} @ V_{R2} (µA)	Stand-off Voltage V_{R2} (V)	Breakdown Voltage V_{BR} (Volts) @ I_{T2}			Typical Clamping Voltage V_{C4}@I_{PP4} (V)	Typical Peak Pulse Current I_{PP4} (A)	Maximum Clamping Voltage V_{C2}@ I_{PP2} (V)	Maximum Peak Pulse Current I_{PP2} (A)	Test Current I_{T2} (mA)	Junction Capacitance Typ@1 MHz, 0 V Bias (pF)
				Min.	Nom.	Max.						
SMFA1505CA	FM	400	5.5	6.82	7.15	7.48	7.85	2	10.5	33.0	10	565
SMFA1805CA	FT	400	5.5	6.82	7.15	7.48	7.85	2	10.5	33.0	10	515
SMFA1905CA	FU	400	5.5	6.82	7.15	7.48	7.85	2	10.5	33.0	10	485
SMFA2005CA	FV	400	5.5	6.82	7.15	7.48	7.85	2	10.5	33.0	10	440

I-V Curve Characteristics



P_{PPM} Peak Pulse Power Dissipation (I_{PP} x V_C) - Max power dissipation

V_{R1}/V_{R2} Stand-off Voltage - Maximum voltage that can be applied to the TVS without operation

V_{BR1}/V_{BR2} Breakdown Voltage - Maximum voltage that flows though the TVS at a specified test current (I_T)

V_{C1}/V_{C2} Clamping Voltage - Peak voltage measured across the TVS at a specified I_{PPM} (peak impulse current)

I_{R1}/I_{R2} Reverse Leakage Current - Current measured at V_R

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Figure 1. Pulse Rating Curve

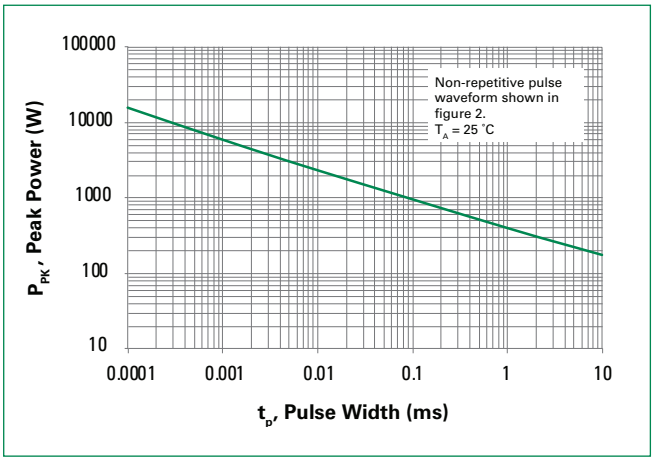


Figure 2. Surge Derating Curve

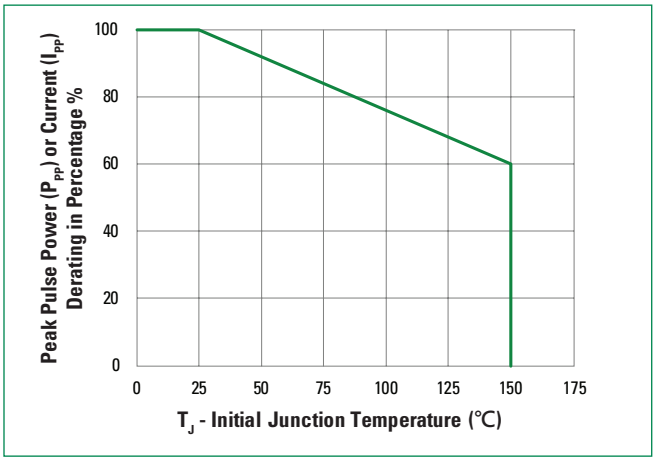


Figure 3. 10/1000 µs Pulse Waveform

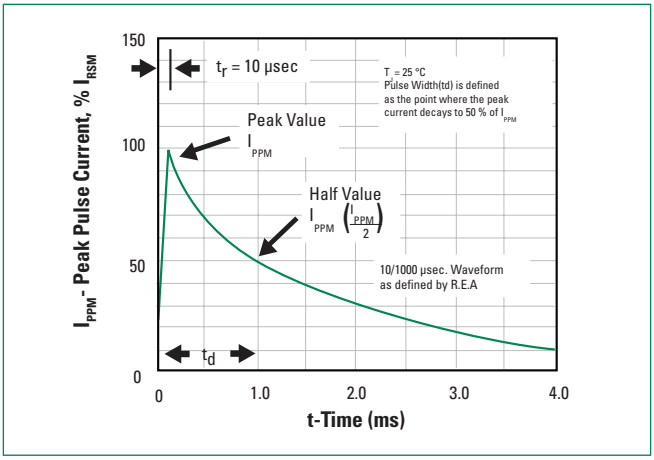
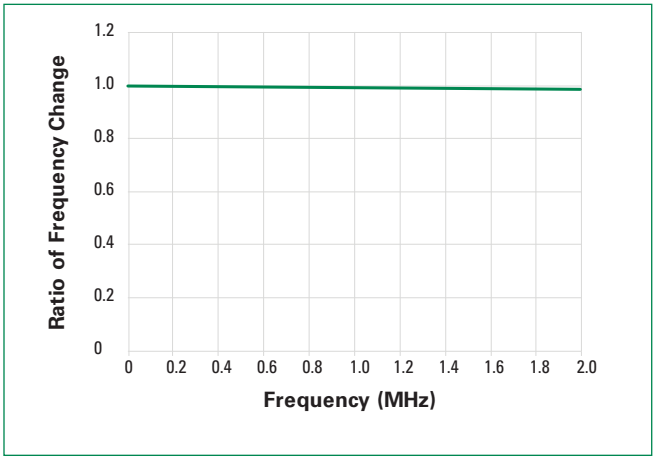


Figure 4. Normalized Typical Junction Capacitance vs. Frequency



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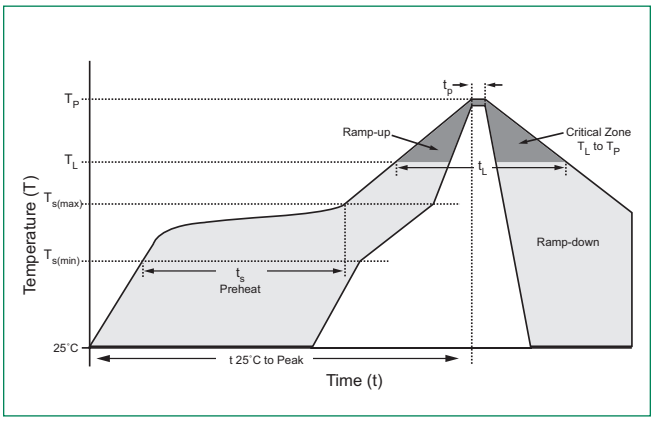
Soldering Parameters

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 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



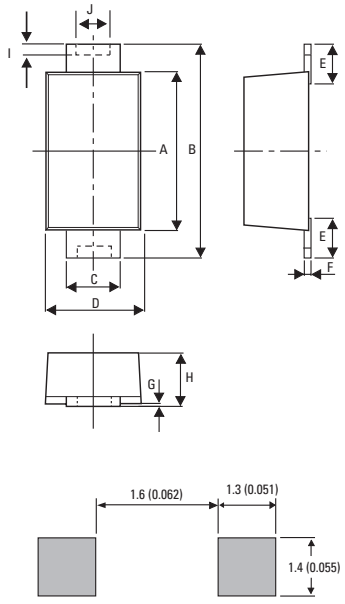
Physical Specifications

Weight	0.005 ounce,0.0155 grams
Case	SOD-123FL plastic over glass passivated junction
Polarity	High voltage A1 side is denoted with a indicator
Terminal	Matte tin-plated leads, solderable per JESD22-B102

Environmental Specifications

High Temperature Storage Life (HTSL)	JESD22-A103
High Temperature Voltage Blocking (HTRB)	100 % DC reverse voltage rated 150 °C, 1008 hours JEDEC, JESD22-A-108
Temperature Cycling (TC)	-55 °C to +150 °C, 15 min. dwell, 1000 cycles. JEDEC, JESD22-A104
Moisture Sensitivity Level (MSL)	85 %RH, +85 °C, 168 hours, 3 reflow cycles (+260 °C Peak). JEDEC, JEDEC-J-STD-020, Level 1
Biased Temperature & Humidity (H3TRB)	80 % breakdown voltage (+85 °C) 85 %RH, 1008 hours JEDEC, JESD22-A-101
Resistance to Solder Heat (RSH)	+260 °C, 30 seconds JEDEC, JEDEC JESD22-A-111

Dimensions



Mounting Pad Layout

Dimensions	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.70	3.10	0.106	0.122
B	3.50	3.90	0.138	0.154
C	0.85	1.05	0.033	0.041
D	1.70	2.00	0.067	0.079
E	0.43	0.83	0.017	0.033
F	0.10	0.25	0.004	0.010
G	0.00	0.10	0.000	0.004
H	0.90	1.08	0.035	0.043
I	0.00	0.20	0.000	0.008
J	0.40	0.60	0.016	0.024

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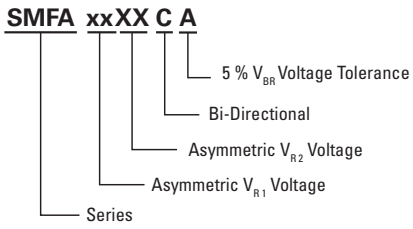
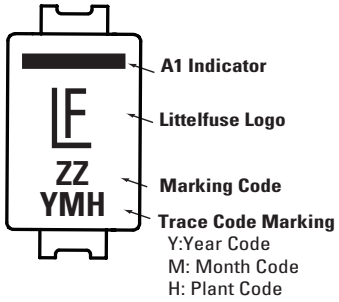
Part Numbering System



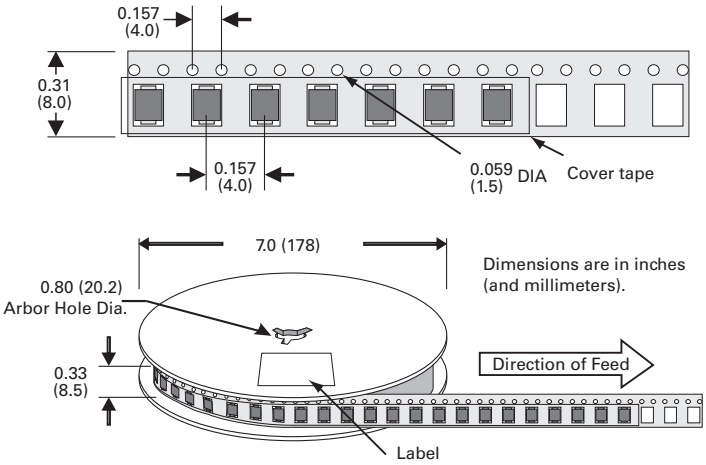
Part Marking System

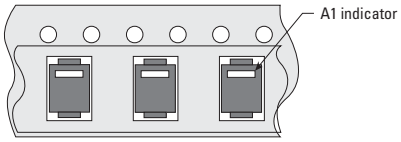


Packaging

Device	Component Package	Quantity	Packaging Option	Packaging Specification
SMFAxxXXCA	SOD–123FL	3000	Tape & Reel - 8 mm tape/7" reel	EIA STD RS-481

Tape and Reel Specification





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