

SMF4L Series









Agency Approvals

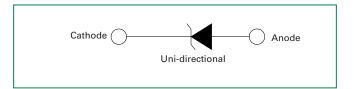
| AGENCY | AGENCY FILE NUMBER |
|-----------|--------------------|
| 7U | E230531 |

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

| Parameter | | Symbol | Value | Unit |
|-------------------------------------|--------------------|------------------|-------|------|
| Peak Pulse Power Dissipation at | 8/20µs (Note 2) | P _{PPM} | 2000 | W |
| $T_A = 25^{\circ}\text{C (Note 1)}$ | 10/1000µs (Note 3) | PPM | 400 | W |
| Thermal Resistanc Ambient | R _{eja} | 220 | °C/W | |
| Thermal Resistanc | $R_{\theta JL}$ | 100 | °C/W | |
| Operating and Stor Range | $T_{J}T_{STG}$ | -55 to 150 | °C | |

- 1. Non-repetitive current pulse, per Fig. 4 and derated above T_J (initial) =25°C per Fig. 3.
- 2. SMF4L5.0A~SMF4L9.0A Peak Pulse Power Dissipation is 1850W min. 2000W typical @8/20us
- 3. SMF4L5.0A~SMF4L9.0A Peak Pulse Power Dissipation is 370W min, 400W typical @ 10/1000µs

Functional Diagram



Description

The SMF4L series of SOD-123FL small and flat lead lowprofile plastic package is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

Features

- 400W peak pulsepower capability at 10/1000µs waveform, repetition rate (duty cycle): 0.01%
- Compatible with industrial standard package SOD-123FL
- 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
- 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
- High temperature soldering: 260°C/40 seconds at terminals
- Glass passivated junction
- Built-in strain relief
- Plastic package is flammability rated V-0 per Underwriters Laboratories
- 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)

Applications

SMF4L devices are ideal for the protection of portable devices/hard drives, notebooks, $V_{\rm cc}$ busses, POS terminal, SSDs, power supplies, monitors, and vulnerable circuit used in other consumer applications.

TVS Diodes Surface Mount – 400W > SMF4L Series

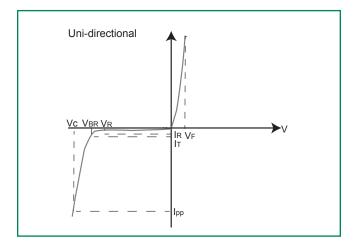
Electrical Characteristics (T_A=25°C unless otherwise noted)

| Part Number | Marking Code | Breako Voltag (Volts) | e V _{BB} | Test Current | Reverse Stand off Voltage | Maximum Reverse Leakage @ V _B | Maximum Peak Pulse Current I _{pp} | Maximum Clamping Voltage | Agency Approval |
|----------------|-----------------|-----------------------------|-------------------|------------------------|------------------------------|--|--|--------------------------------|--------------------|
| | | MIN | MAX | I _T (mA) | V _R (V) | I _R (μA) | (A) | @ V _c (V) | <i>71</i> 2 |
| SMF4L5.0A | KE | 6.40 | 7.00 | 10 | 5.0 | 800 | 40.1 | 9.2 | X |
| SMF4L6.0A | KG | 6.67 | 7.37 | 10 | 6.0 | 800 | 35.9 | 10.3 | X |
| SMF4L6.5A | KK | 7.22 | 7.98 | 10 | 6.5 | 500 | 33.1 | 11.2 | X |
| SMF4L7.0A | KM | 7.78 | 8.60 | 10 | 7.0 | 200 | 30.9 | 12.0 | X |
| SMF4L7.5A | KP | 8.33 | 9.21 | 1 | 7.5 | 100 | 28.7 | 12.9 | X |
| SMF4L8.0A | KR | 8.89 | 9.83 | 1 | 8.0 | 50 | 27.2 | 13.6 | X |
| SMF4L8.5A | KT | 9.44 | 10.40 | 1 | 8.5 | 20 | 25.7 | 14.4 | X |
| SMF4L9.0A | KV | 10.00 | 11.10 | 1 | 9.0 | 10 | 24.1 | 15.4 | X |
| SMF4L10A | KX | 11.10 | 12.30 | 1 | 10 | 5 | 23.5 | 17.0 | X |
| SMF4L11A | KZ | 12.20 | 13.50 | 1 | 11 | 1 | 22.0 | 18.2 | X |
| SMF4L12A | LE | 13.30 | 14.70 | 1 | 12 | 1 | 20.1 | 19.9 | X |
| SMF4L13A | LG | 14.40 | 15.90 | 1 | 13 | 1 | 18.6 | 21.5 | X |
| SMF4L14A | LK | 15.60 | 17.20 | 1 | 14 | 1 | 17.2 | 23.2 | X |
| SMF4L15A | LM | 16.70 | 18.50 | 1 | 15 | 1 | 16.4 | 24.4 | X |
| SMF4L16A | LP | 17.80 | 19.70 | 1 | 16 | 1 | 15.4 | 26.0 | X |
| SMF4L17A | LR | 18.90 | 20.90 | 1 | 17 | 1 | 14.5 | 27.6 | X |
| SMF4L18A | LT | 20.00 | 22.10 | 1 | 18 | 1 | 13.7 | 29.2 | X |
| SMF4L20A | LV | 22.20 | 24.50 | 1 | 20 | 1 | 12.3 | 32.4 | X |
| SMF4L22A | LX | 24.40 | 26.90 | 1 | 22 | 1 | 11.3 | 35.5 | X |
| SMF4L24A | LZ | 26.70 | 29.50 | 1 | 24 | 1 | 10.3 | 38.9 | X |
| SMF4L26A | ME | 28.90 | 31.90 | 1 | 26 | 1 | 9.5 | 42.1 | X |
| SMF4L28A | MG | 31.10 | 34.40 | 1 | 28 | 1 | 8.8 | 45.4 | X |
| SMF4L30A | MK | 33.30 | 36.80 | 1 | 30 | 1 | 8.3 | 48.4 | X |
| SMF4L33A | MM | 36.70 | 40.60 | 1 | 33 | 1 | 7.5 | 53.3 | X |
| SMF4L36A | MP | 40.00 | 44.20 | 1 | 36 | 1 | 6.9 | 58.1 | X |
| SMF4L40A | MR | 44.40 | 49.10 | 1 | 40 | 1 | 6.2 | 64.5 | X |
| SMF4L43A | MT | 47.80 | 52.80 | 1 | 43 | 1 | 5.8 | 69.4 | X |
| SMF4L45A | MV | 50.00 | 55.30 | 1 | 45 | 1 | 5.5 | 72.7 | X |
| SMF4L48A | MX | 53.30 | 58.90 | 1 | 48 | 1 | 5.2 | 77.4 | X |
| SMF4L51A | MZ | 56.70 | 62.70 | 1 | 51 | 1 | 4.9 | 82.4 | X |
| SMF4L54A | NE | 60.00 | 66.30 | 1 | 54 | 1 | 4.6 | 87.1 | X |
| SMF4L58A | NG | 64.40 | 71.20 | 1 | 58 | 1 | 4.3 | 93.6 | X |
| SMF4L60A | NK | 66.70 | 73.70 | 1 | 60 | 1 | 4.1 | 96.8 | X |
| SMF4L64A | NM | 71.10 | 78.60 | 1 | 64 | 1 | 3.9 | 103.0 | X |
| SMF4L70A | NP | 77.80 | 86.00 | 1 | 70 | 1 | 3.5 | 113.0 | X |
| SMF4L75A | NR | 83.30 | 92.10 | 1 | 75 | 1 | 3.3 | 121.0 | X |
| SMF4L78A | NT | 86.70 | 95.80 | 1 | 78 | 1 | 3.2 | 126.0 | X |
| SMF4L85A | NV | 94.40 | 104.00 | 1 | 85 | 1 | 2.9 | 137.0 | X |

- 1. $V_{\rm gR}$ measured after $I_{\rm T}$ applied for 300 μ s, $I_{\rm T}$ = square wave pulse or equivalent. 2. Surge current waveform per 10/1000 μ s exponential wave and derated per Fig.2. 3. All terms and symbols are consistent with ANSI/IEEE C62.35.



I-V Curve Characteristics



- P_PPM Peak Pulse Power Dissipation Max power dissipation
- $\mathbf{V}_{_{R}}$ **Stand-off Voltage** -- Maximum voltage that can be applied to the TVS without operation
- V_{ss} Breakdown Voltage Maximum voltage that flows though the TVS at a specified test current (I₇)
- V_{ϵ} Clamping Voltage Peak voltage measured across the TVS at a specified Ippm (peak impulse current)
- I_{R} Reverse Leakage Current -- Current measured at V_{R}
- V, Forward Voltage Drop for Uni-directional

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

Figure 1 - TVS Transients Clamping Waveform

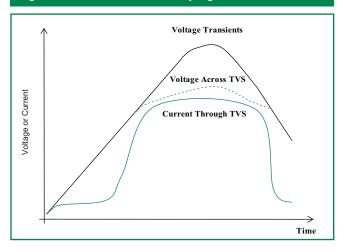
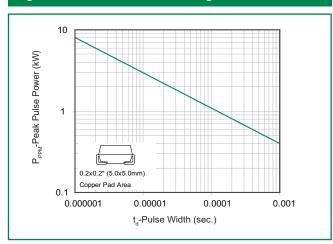


Figure 2 - Peak Pulse Power Rating Curve



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

Figure 3 - Peak Pulse Power Derating Curve

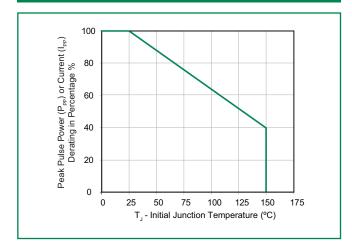


Figure 5 - Forward Voltage

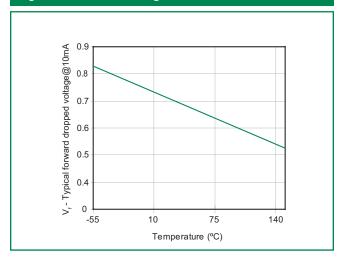


Figure 7 - Peak Forward Voltage Drop vs. Peak Forward Current

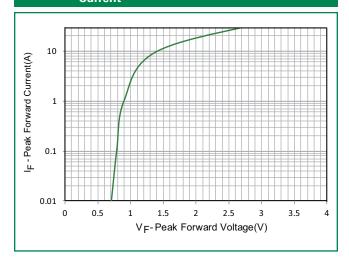


Figure 4 - Pulse Waveform - 10/1000µS

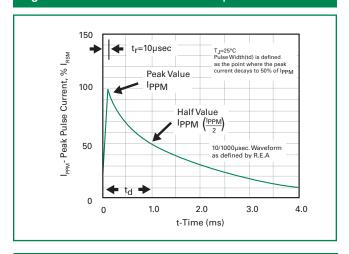


Figure 6 - Typical Junction Capacitance

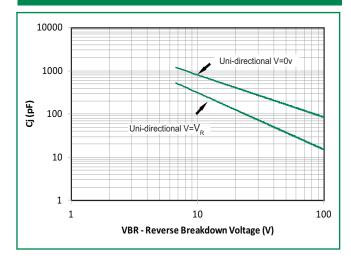
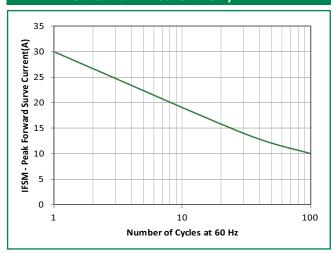


Figure 8 - Maximum Non-Repetitive Forward Surge Current Uni-Directional Only



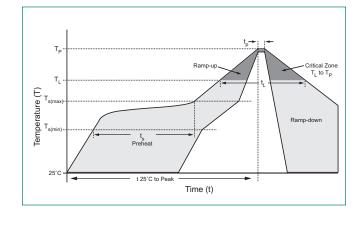
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Specifications are subject to change without notice.



Soldering Parameters

| Reflow Co | ndition | Lead-free assembly | |
|-------------------------|--|-------------------------|--|
| | -Temperature Min (T _{s(min)}) | 150°C | |
| Pre Heat | -Temperature Max (T _{s(max)}) | 200°C | |
| | -Time (min to max) (t _s) | 60 – 180 secs | |
| Average ra to peak | mp up rate (Liquidus Temp (T _A) | 3°C/second max | |
| $T_{S(max)}$ to T_A | - Ramp-up Rate | 3°C/second max | |
| Reflow | -Temperature (T _A) (Liquidus) | 217°C | |
| nellow | -Time (min to max) (t _s) | 60 – 150 seconds | |
| Peak Temp | erature (T _P) | 260+ ^{0/-5} °C | |
| Time withi Temperatu | n 5°C of actual peak re (t _p) | 20 - 40 seconds | |
| Ramp-dow | n Rate | 6°C/second max | |
| Time 25°C | to peak Temperature (T _P) | 8 minutes Max. | |
| Do not exc | eed | 260°C | |



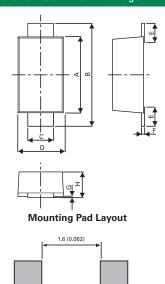
Physical Specifications

| 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 |

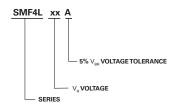
Dimensions - SOD-123FL Package



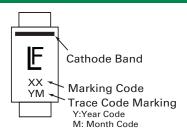
| Dimensions | Millim | neters | Inches | | |
|------------|--------|--------|--------|-------|--|
| Dimensions | Min | Max | Min | Max | |
| А | 2.90 | 3.10 | 0.114 | 0.122 | |
| В | 3.50 | 3.90 | 0.138 | 0.154 | |
| С | 0.85 | 1.05 | 0.033 | 0.041 | |
| D | 1.70 | 2.00 | 0.067 | 0.079 | |
| Е | 0.43 | 0.83 | 0.017 | 0.033 | |
| F | 0.10 | 0.25 | 0.004 | 0.010 | |
| G | 0.00 | 0.10 | 0.000 | 0.004 | |
| Н | 0.90 | 1.08 | 0.035 | 0.043 | |



Part Numbering System



Part Marking System



Packaging Options

| Part number | Component Package | Quantity | Packaging Option | Packaging Specification |
|-------------|----------------------|----------|--------------------------------|----------------------------|
| SMF4LXXX | SOD-123FL | 3000 | Tape & Reel – 8mm tape/7" reel | EIA RS-481 |

Tape and Reel Specification

