

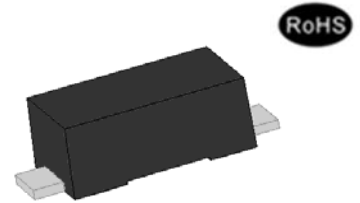


SMFxxCAL Series 400W Transient Voltage Suppressor

Rev.1.4

DESCRIPTION:

TVS diodes can be used in a wide range of applications which like consumer electronic products, automotive industries, munitions, telecommunications, aerospace industries, and intelligent control systems.



RoHS

SOD-123FL



Bi-directional

Symbol

FEATURES:

- ✧ Low profile package.
- ✧ Low inductance.
- ✧ Excellent clamping capability.
- ✧ 400W peak pulse power capability at 10/1000μs waveform.
- ✧ Typical I_R less than 1μA above 10V.
- ✧ Fast response time: typically less than 1.0ps from 0V to V_{BR} min.
- ✧ High temperature reflow soldering: 260°C/40s at terminals.
- ✧ Plastic package has underwriters laboratory flammability 94V-0.
- ✧ Meets MSL level 1, per J-STD-020, LF maximum peak of 260°C.
- ✧ Terminal: solder plated, solderable per J-STD-002.
- ✧ For surface mounted applications in order to optimize board space.
- ✧ IEC61000-4-2 (ESD) ±30kV (air), ±30kV (contact).

ABSOLUTE MAXIMUM RATINGS($T_A=25^{\circ}C$, RH=45%-75%, unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|--|-----------------|-------------|------|
| Storage and operating junction temperature range | T_{STG}/T_J | -55 to +150 | °C |
| Peak pulse power dissipation at 10/1000μs waveform | P_{PP} | 400 | W |
| Typical thermal resistance junction to lead | $R_{\theta JL}$ | 100 | °C/W |
| Typical thermal resistance junction to ambient | $R_{\theta JA}$ | 220 | °C/W |

MARKING



5CL : Device Marking Code

ELECTRICAL CHARACTERISTICS (T_A=25°C)

| Part Number | Marking | V _R | I _R @V _R | V _{BR} @I _T | | I _T | V _C @I _{PP} | I _{PP} ^① |
|-------------|---------|----------------|--------------------------------|---------------------------------|--------|----------------|---------------------------------|------------------------------|
| | | | | min(V) | max(V) | | | |
| Bi-Polar | Bi | V | max(μA) | min(V) | max(V) | mA | max(V) | A |
| SMF5.0CAL | 5CL | 5.0 | 120 | 6.40 | 7.00 | 10 | 9.2 | 40.1 |
| SMF6.0CAL | 6CL | 6.0 | 120 | 6.67 | 7.37 | 10 | 10.3 | 35.9 |
| SMF6.5CAL | 6VCL | 6.5 | 80 | 7.22 | 7.98 | 10 | 11.2 | 33.1 |
| SMF7.0CAL | 7CL | 7.0 | 50 | 7.78 | 8.60 | 10 | 12.0 | 30.9 |
| SMF7.5CAL | 7VCL | 7.5 | 50 | 8.33 | 9.21 | 1 | 12.9 | 28.7 |
| SMF8.0CAL | 8CL | 8.0 | 20 | 8.89 | 9.83 | 1 | 13.6 | 27.2 |
| SMF9.0CAL | 9CL | 9.0 | 5 | 10.00 | 11.10 | 1 | 15.4 | 24.1 |
| SMF10CAL | 10CL | 10.0 | 2 | 11.10 | 12.30 | 1 | 17.0 | 23.5 |
| SMF11CAL | 11CL | 11.0 | 1 | 12.20 | 13.50 | 1 | 18.2 | 22.0 |
| SMF12CAL | 12CL | 12.0 | 1 | 13.30 | 14.70 | 1 | 19.9 | 20.1 |
| SMF13CAL | 13CL | 13.0 | 1 | 14.40 | 15.90 | 1 | 21.5 | 18.6 |
| SMF14CAL | 14CL | 14.0 | 1 | 15.60 | 17.20 | 1 | 23.2 | 17.2 |
| SMF15CAL | 15CL | 15.0 | 1 | 16.70 | 18.50 | 1 | 24.4 | 16.4 |
| SMF18CAL | 18CL | 18.0 | 1 | 20.00 | 22.10 | 1 | 29.2 | 13.7 |
| SMF20CAL | 20CL | 20.0 | 1 | 22.20 | 24.50 | 1 | 32.4 | 12.3 |
| SMF22CAL | 22CL | 22.0 | 1 | 24.40 | 26.90 | 1 | 35.5 | 11.3 |
| SMF24CAL | 24CL | 24.0 | 1 | 26.70 | 29.50 | 1 | 38.9 | 10.3 |
| SMF26CAL | 26CL | 26.0 | 1 | 28.90 | 31.90 | 1 | 42.1 | 9.5 |
| SMF28CAL | 28CL | 28.0 | 1 | 31.10 | 34.40 | 1 | 45.4 | 8.8 |
| SMF30CAL | 30CL | 30.0 | 1 | 33.30 | 36.80 | 1 | 48.4 | 8.3 |
| SMF33CAL | 33CL | 33.0 | 1 | 36.70 | 40.60 | 1 | 53.3 | 7.5 |
| SMF36CAL | 36CL | 36.0 | 1 | 40.00 | 44.20 | 1 | 58.1 | 6.9 |
| SMF40CAL | 40CL | 40.0 | 1 | 44.40 | 49.10 | 1 | 64.5 | 6.2 |
| SMF43CAL | 43CL | 43.0 | 1 | 47.80 | 52.80 | 1 | 69.4 | 5.8 |

ELECTRICAL CHARACTERISTICS ($T_A=25^{\circ}\text{C}$, continued)

| Part Number | Marking | V_R | $I_R@V_R$ | $V_{BR}@I_T$ | | I_T | $V_C@I_{PP}$ | $I_{PP}^{①}$ |
|-------------|---------|-------|----------------------|--------------|--------|-------|--------------|--------------|
| Bi-Polar | Bi | V | max(μA) | min(V) | max(V) | mA | max(V) | A |
| SMF45CAL | 45CL | 45.0 | 1 | 50.00 | 55.30 | 1 | 72.7 | 5.5 |
| SMF48CAL | 48CL | 48.0 | 1 | 53.30 | 58.90 | 1 | 77.4 | 5.2 |

① Surge waveform: 10/1000 μs

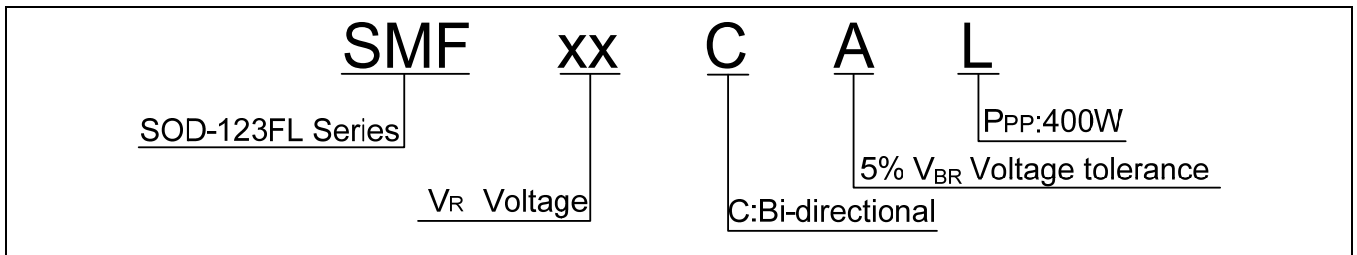
V_R : Stand-off voltage -- maximum voltage that can be applied

V_{BR} : Breakdown voltage

V_C : Clamping voltage -- peak voltage measured across the suppressor at a specified I_{PP}

I_R : Reverse leakage current

ORDERING INFORMATION



RATINGS AND V-I CHARACTERISTICS CURVES ($T_A=25^{\circ}\text{C}$, unless otherwise noted)

FIG.1: V- I curve characteristics (Bi-directional)

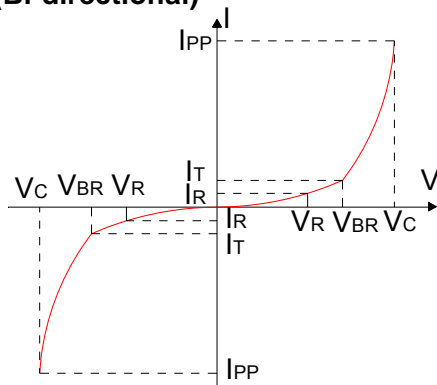


FIG.2: Pulse waveform

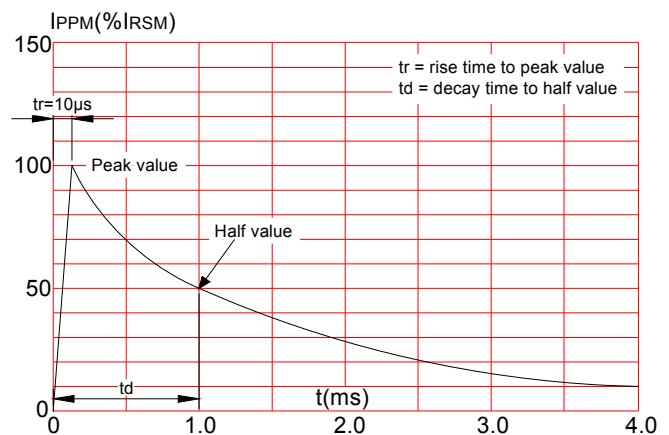
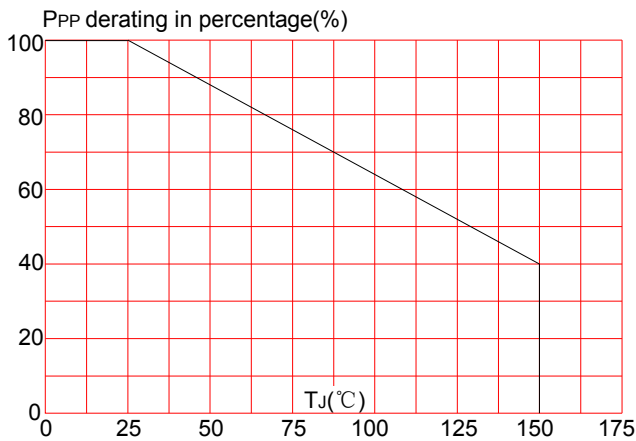
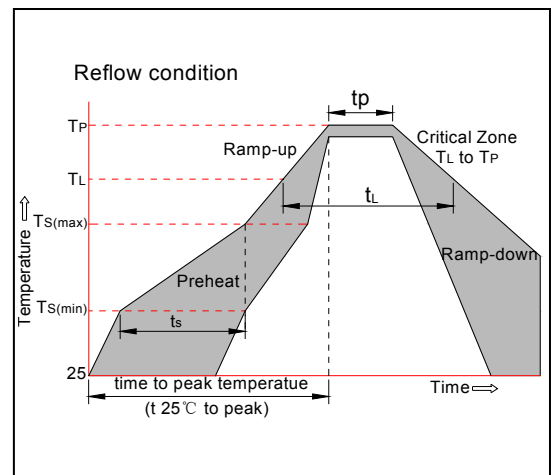


FIG.3: Pulse derating curve

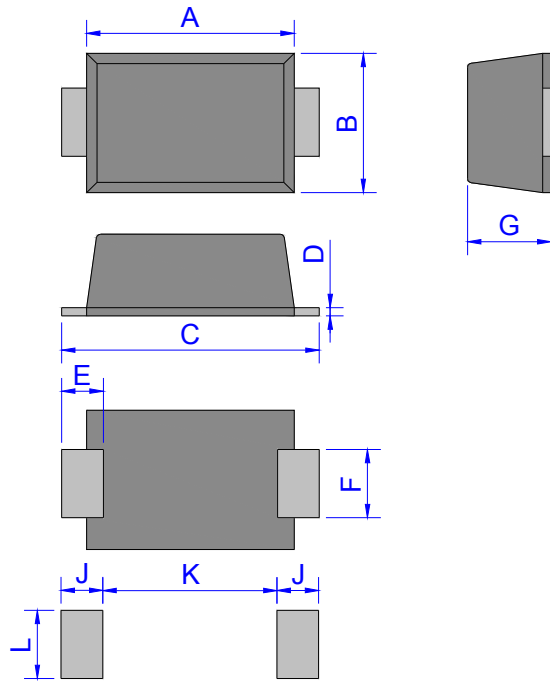


SOLDERING PARAMETERS

| | | |
|--|-----------------------------------|---|
| Reflow Condition | | Pb-Free assembly (see figure at right) |
| 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 (Liquidus 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) (Liquidus) | +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) | | 20-40secs. |
| Ramp-down Rate | | 6°C/sec. Max |
| Time 25°C to Peak Temp (T_p) | | 8 min. Max |
| Do not exceed | | +260°C |



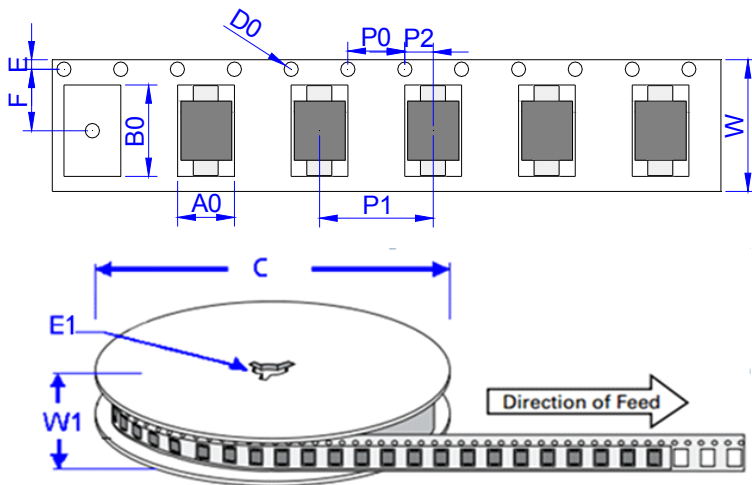
PACKAGE MECHANICAL DATA



SOD-123FL

| Ref. | Dimensions | | | |
|------|-------------|------|--------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 2.60 | 3.00 | 0.102 | 0.118 |
| B | 1.60 | 2.00 | 0.063 | 0.079 |
| C | 3.45 | 3.95 | 0.136 | 0.156 |
| D | 0.10 | 0.25 | 0.004 | 0.01 |
| E | 0.3 | 0.9 | 0.012 | 0.035 |
| F | 0.80 | 1.20 | 0.031 | 0.047 |
| G | 0.70 | 1.00 | 0.028 | 0.039 |
| J | 1.30 | | 0.051 | |
| K | | 1.70 | | 0.067 |
| L | 1.30 | | 0.051 | |

TAPE AND REEL SPECIFICATION-SOD-123FL



| Ref. | Dimensions | |
|------|-------------|---------------|
| | Millimeters | Inches |
| A0 | 1.95 ± 0.3 | 0.077± 0.012 |
| B0 | 3.95 ± 0.3 | 0.156 ± 0.012 |
| C | 178 | 7.0 |
| D0 | 1.55 ± 0.1 | 0.061 ± 0.004 |
| E | 1.75 ± 0.2 | 0.069 ± 0.008 |
| E1 | 13.3 ± 0.3 | 0.524± 0.012 |
| F | 3.50 ± 0.2 | 0.138 ± 0.008 |
| P0 | 4.00 ± 0.2 | 0.157 ± 0.008 |
| P1 | 4.00 ± 0.2 | 0.157 ± 0.008 |
| P2 | 2.00 ± 0.2 | 0.079 ± 0.008 |
| W | 8.0± 0.2 | 0.315 ± 0.008 |
| W1 | 11.5 ± 1.0 | 0.453 ± 0.039 |

| PART No. | UNIT WEIGHT (g/PCS) typ. | REEL (PCS) | PER CARTON (PCS) | DESCRIPTION |
|----------|--------------------------|------------|------------------|------------------|
| SMFxxCAL | 0.0144 | 3000 | 150,000 | 7 inch reel pack |

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