

Transient Voltage Suppressors (TVS) Data Sheet

Description

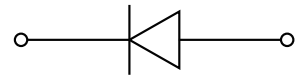
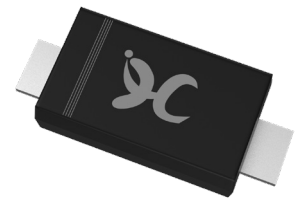
The SMF series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events

Features

- For surface mounted applications in order to optimize board space
- Low leakage
- Glass passivated junction
- Low inductance
- Excellent clamping capability
- 200W peak pulse power capability at 10/1000μs waveform
- Fast response time
- Typical IR less than 5μA above 12V
- High Temperature soldering: 260°C /40 seconds at terminals
- Typical maximum temperature coefficient $\Delta V_{BR} = 0.1\% \times V_{BR}@25^{\circ}\text{C} \times \Delta T$
- Plastic package has Underwriters Laboratory Flammability 94V-0
- Matte tin lead-free Plated
- Halogen free and RoHS compliant
- 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)

Breakdown Voltage
3.3 to 250 V
Peak Pulse Power
200 W

SOD-123FL



Applications

TVS devices are ideal for the protection of I/O interfaces, VCC bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications

Maximum Ratings (Ta=25°C Unless otherwise specified)

| PARAMETER | SYMBOL | VALUE | SYMBOL |
|--|------------------|----------------|--------|
| Peak Pulse Power Dissipation with a 10/1000μs waveform (Fig.1)(Note 1), (Note 2) | P_{PPM} | 200 | W |
| Peak Pulse Current with a 10/1000μs waveform.(Note1, Fig.3) | I_{PP} | See Next Table | A |
| Power Dissipation on Infinite Heat Sink at TL=75° C | $P_{M(AV)}$ | 0.4 | W |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3) | I_{FSM} | 30 | A |
| Maximum Instantaneous Forward Voltage at 25A for Unidirectional Only(Note 4) | V_F | 3.5 | V |
| Operating junction and Storage Temperature Range | T_J, T_{STG} | -55 to +150 | °C |
| Typical thermal resistance junction to lead | $R_{\theta J-L}$ | 100 | °C /W |
| Typical thermal resistance junction to ambient | $R_{\theta J-A}$ | 220 | °C /W |

Note :

- (1) Non-repetitive current pulse, per Fig. 3 and derated above Ta = 25°C per Fig. 2.
- (2) Mounted on 5.0mm x 5.0mm (0.03mm thick) Copper Pads to each terminal.
- (3) 8.3ms single half sine-wave, or equivalent square wave, Duty cycle = 4 pulses per minutes maximum.
- (4) $V_F < 3.5V$ for $V_{BR} < 200V$ and $V_F < 6.5V$ for $V_{BR} > 201V$.

● Package Outline Dimensions (SOD-123FL)

| Symbol | Dimensions | | | |
|--------|-------------|------|--------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 0.90 | 1.10 | 0.035 | 0.430 |
| B | 2.55 | 2.85 | 0.100 | 0.111 |
| C | 1.60 | 1.90 | 0.063 | 0.074 |
| D | 3.60 | 3.90 | 0.031 | 0.043 |
| E | 1.00 | 1.20 | 0.031 | 0.035 |
| F | 0.40 | 0.90 | 0.047 | 0.055 |
| G | 0.10 | 0.25 | 0.003 | 0.007 |

● Electrical Characteristics (Ta=25°C Unless otherwise specified)

| Part Number | | Marking | | Reverse Stand-Off Voltage | Breakdown Voltage V_{BR} (V) @ I_T | | Test Current | Maximum Clamping Voltage@ I_{PP} | Peak Pulse Current | Reverse Leakage @ V_{RWM} |
|-------------|----------|---------|----|---------------------------|--|------|--------------|------------------------------------|--------------------|-----------------------------|
| Uni | Bi | Uni | Bi | V_{RWM} (V) | Min. | Max. | I_T (mA) | V_C (V) | I_{PP} (A) | I_R (μ A) |
| SMF3.3A | SMF3.3CA | AD | HD | 3.3 | 4.3 | 5.3 | 10 | 7.3 | 27.4 | 500 |
| SMF5.0A | SMF5.0CA | AE | HE | 5 | 6.4 | 7 | 10 | 9.2 | 21.7 | 400 |
| SMF6.0A | SMF6.0CA | AG | HG | 6 | 6.67 | 7.37 | 10 | 10.3 | 19.4 | 400 |
| SMF6.5A | SMF6.5CA | AK | HK | 6.5 | 7.22 | 7.98 | 10 | 11.2 | 17.9 | 250 |
| SMF7.0A | SMF7.0CA | AM | HM | 7 | 7.78 | 8.6 | 10 | 12.0 | 16.7 | 100 |
| SMF7.5A | SMF7.5CA | AP | HP | 7.5 | 8.33 | 9.21 | 1 | 12.9 | 15.5 | 50 |
| SMF8.0A | SMF8.0CA | AR | HR | 8 | 8.89 | 9.83 | 1 | 13.6 | 14.7 | 25 |
| SMF8.5A | SMF8.5CA | AT | HT | 8.5 | 9.44 | 10.4 | 1 | 14.4 | 13.9 | 10 |
| SMF9.0A | SMF9.0CA | AV | HV | 9 | 10 | 11.1 | 1 | 15.4 | 13.0 | 5 |
| SMF10A | SMF10CA | AX | HX | 10 | 11.1 | 12.3 | 1 | 17.0 | 11.8 | 2.5 |
| SMF11A | SMF11CA | AZ | HZ | 11 | 12.2 | 13.5 | 1 | 18.2 | 11.0 | 2.5 |
| SMF12A | SMF12CA | BE | IE | 12 | 13.3 | 14.7 | 1 | 19.9 | 10.1 | 2.5 |
| SMF13A | SMF13CA | BG | IG | 13 | 14.4 | 15.9 | 1 | 21.5 | 9.3 | 1 |
| SMF14A | SMF14CA | BK | IK | 14 | 15.6 | 17.2 | 1 | 23.2 | 8.6 | 1 |
| SMF15A | SMF15CA | BM | IM | 15 | 16.7 | 18.5 | 1 | 24.4 | 8.2 | 1 |
| SMF16A | SMF16CA | BP | IP | 16 | 17.8 | 19.7 | 1 | 26.0 | 7.7 | 1 |
| SMF17A | SMF17CA | BR | IR | 17 | 18.9 | 20.9 | 1 | 27.6 | 7.2 | 1 |
| SMF18A | SMF18CA | BT | IT | 18 | 20 | 22.1 | 1 | 29.2 | 6.8 | 1 |
| SMF20A | SMF20CA | BV | IV | 20 | 22.2 | 24.5 | 1 | 32.4 | 6.2 | 1 |
| SMF22A | SMF22CA | BX | IX | 22 | 24.4 | 26.9 | 1 | 35.5 | 5.6 | 1 |
| SMF24A | SMF24CA | BZ | IZ | 24 | 26.7 | 29.5 | 1 | 38.9 | 5.1 | 1 |
| SMF26A | SMF26CA | CE | JE | 26 | 28.9 | 31.9 | 1 | 42.1 | 4.8 | 1 |
| SMF28A | SMF28CA | CG | JG | 28 | 31.1 | 34.4 | 1 | 45.4 | 4.4 | 1 |
| SMF30A | SMF30CA | CK | JK | 30 | 33.3 | 36.8 | 1 | 48.4 | 4.1 | 1 |
| SMF33A | SMF33CA | CM | JM | 33 | 36.7 | 40.6 | 1 | 53.3 | 3.8 | 1 |
| SMF36A | SMF36CA | CP | JP | 36 | 40 | 44.2 | 1 | 58.1 | 3.4 | 1 |
| SMF40A | SMF40CA | CR | JR | 40 | 44.4 | 49.1 | 1 | 64.5 | 3.1 | 1 |

● Electrical Characteristics (Ta=25°C Unless otherwise specified)

| Part Number | | Marking | | Reverse Stand-Off Voltage | Breakdown Voltage V_{BR} (V) @ I_T | | Test Current | Maximum Clamping Voltage@ I_{PP} | Peak Pulse Current | Reverse Leakage @ V_{RWM} |
|-------------|----------|---------|----|---------------------------|--|------|--------------|------------------------------------|--------------------|-----------------------------|
| Uni | Bi | Uni | Bi | V_{RWM} (V) | Min. | Max. | I_T (mA) | V_C (V) | I_{PP} (A) | I_R (μ A) |
| SMF43A | SMF43CA | CT | JT | 43 | 47.8 | 52.8 | 1 | 69.4 | 2.9 | 1 |
| SMF45A | SMF45CA | CV | JV | 45 | 50 | 55.3 | 1 | 72.7 | 2.8 | 1 |
| SMF48A | SMF48CA | CX | JX | 48 | 53.3 | 58.9 | 1 | 77.4 | 2.6 | 1 |
| SMF51A | SMF51CA | CZ | JZ | 51 | 56.7 | 62.7 | 1 | 82.4 | 2.4 | 1 |
| SMF54A | SMF54CA | DE | KE | 54 | 60 | 66.3 | 1 | 87.1 | 2.3 | 1 |
| SMF58A | SMF58CA | RG | KG | 58 | 64.4 | 71.2 | 1 | 93.6 | 2.1 | 1 |
| SMF60A | SMF60CA | RK | KK | 60 | 66.7 | 73.7 | 1 | 96.8 | 2.1 | 1 |
| SMF64A | SMF64CA | RM | KM | 64 | 71.1 | 78.6 | 1 | 103 | 1.9 | 1 |
| SMF70A | SMF70CA | RP | KP | 70 | 77.8 | 86 | 1 | 113 | 1.7 | 1 |
| SMF75A | SMF75CA | RR | KR | 75 | 83.3 | 92.1 | 1 | 121 | 1.6 | 1 |
| SMF78A | SMF78CA | RT | KT | 78 | 86.7 | 95.8 | 1 | 126 | 1.6 | 1 |
| SMF85A | SMF85CA | RV | KV | 85 | 94.4 | 104 | 1 | 137 | 1.5 | 1 |
| SMF90A | SMF90CA | RW | KX | 90 | 100 | 111 | 1 | 146 | 1.2 | 1 |
| SMF100A | SMF100CA | RX | KZ | 100 | 111 | 123 | 1 | 162 | 1.1 | 1 |
| SMF110A | SMF110CA | SE | LE | 110 | 122 | 135 | 1 | 177 | 1.1 | 1 |
| SMF120A | SMF120CA | SG | LG | 120 | 133 | 147 | 1 | 193 | 1.0 | 1 |
| SMF130A | SMF130CA | SK | LK | 130 | 144 | 159 | 1 | 209 | 1.0 | 1 |
| SMF150A | SMF150CA | SM | LM | 150 | 167 | 185 | 1 | 243 | 0.8 | 1 |
| SMF160A | SMF160CA | SP | LP | 160 | 178 | 197 | 1 | 259 | 0.8 | 1 |
| SMF170A | SMF170CA | SR | LR | 170 | 189 | 209 | 1 | 275 | 0.7 | 1 |
| SMF180A | SMF180CA | ST | LT | 180 | 201 | 222 | 1 | 292 | 0.7 | 1 |
| SMF188A | SMF188CA | SV | LV | 188 | 209 | 231 | 1 | 304 | 0.7 | 1 |
| SMF200A | SMF200CA | SX | LX | 200 | 224 | 247 | 1 | 324 | 0.6 | 1 |
| SMF220A | SMF220CA | SZ | LZ | 220 | 246 | 272 | 1 | 356 | 0.6 | 1 |
| SMF250A | SMF250CA | TE | ME | 250 | 279 | 309 | 1 | 405 | 0.5 | 1 |

Note :

(1)Suffix 'A' denotes 5% tolerance device.

(2)Add suffix ' CA ' after part number to specify Bi-directional devices.

(3)For Bi-Directional devices having VR of 10 volts and under, the IR limit is double.

● Ratings And Characteristics Curves (Ta=25°C Unless otherwise specified)

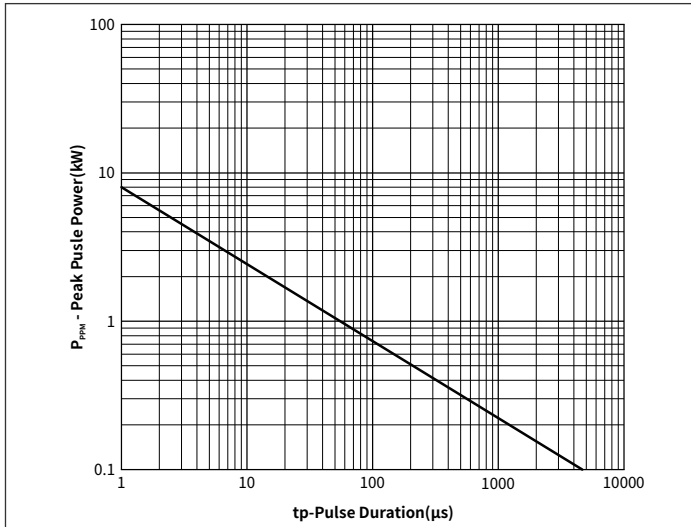


Fig. 1 Peak Pulse Power Rating Curve

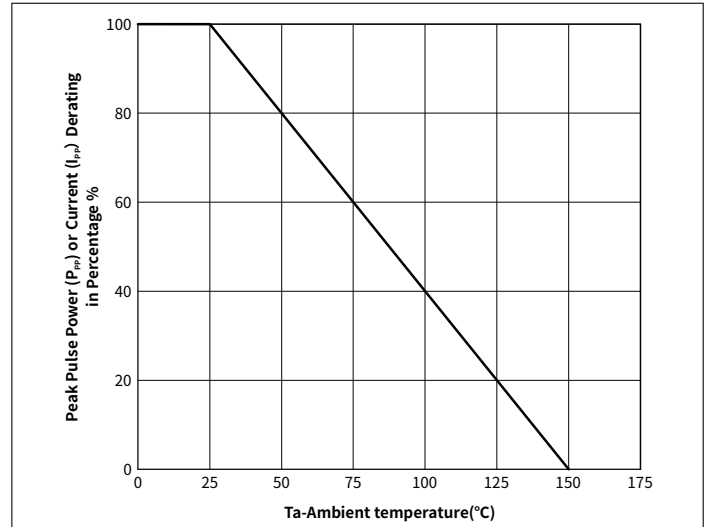


Fig. 2 Pulse Derating Curve

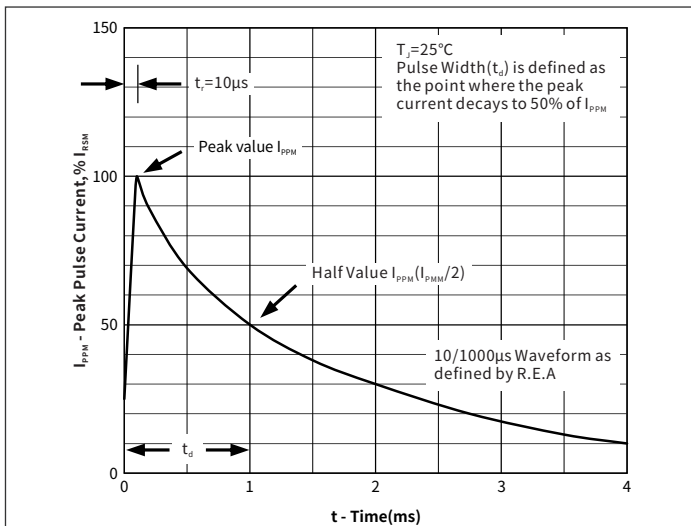


Fig. 3 Pulse Waveform

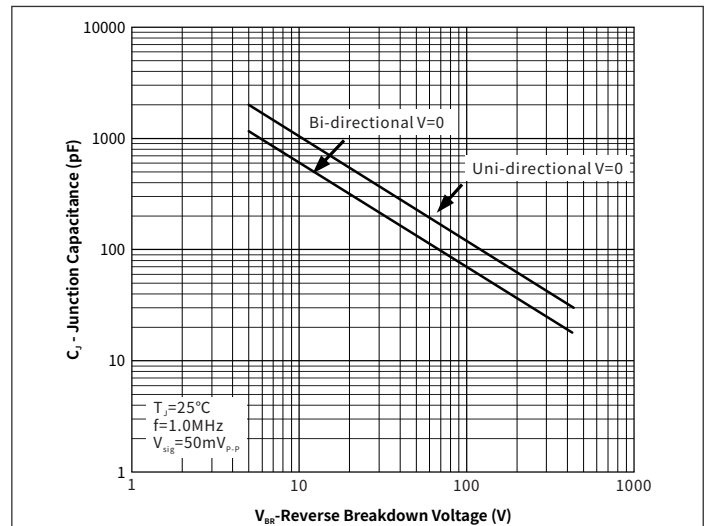


Fig. 4 Typical Junction Capacitance

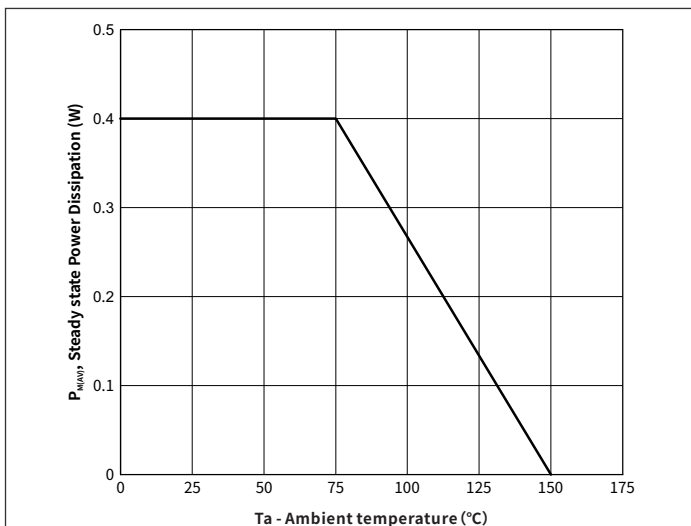


Fig. 5 Steady State Power Dissipation Derating Curve

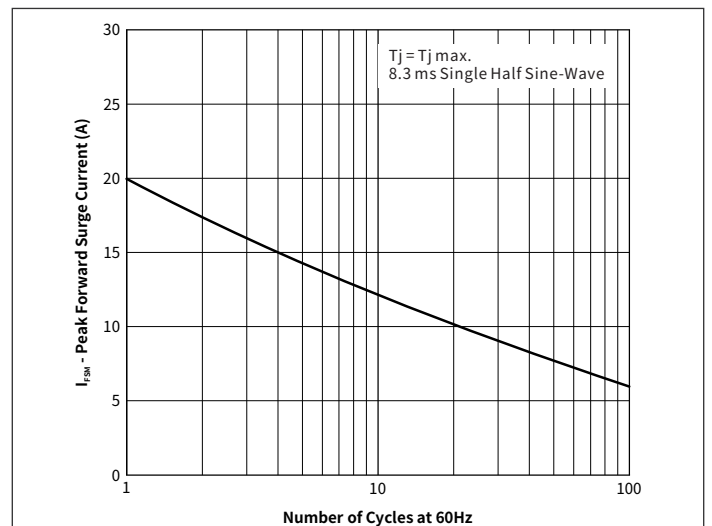
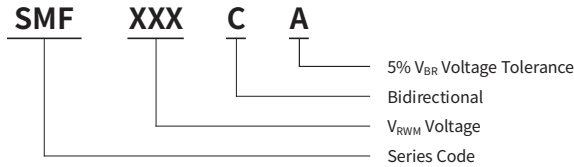


Fig. 6 Maximum Non-Repetitive Forward Surge Current Uni-Directional Only

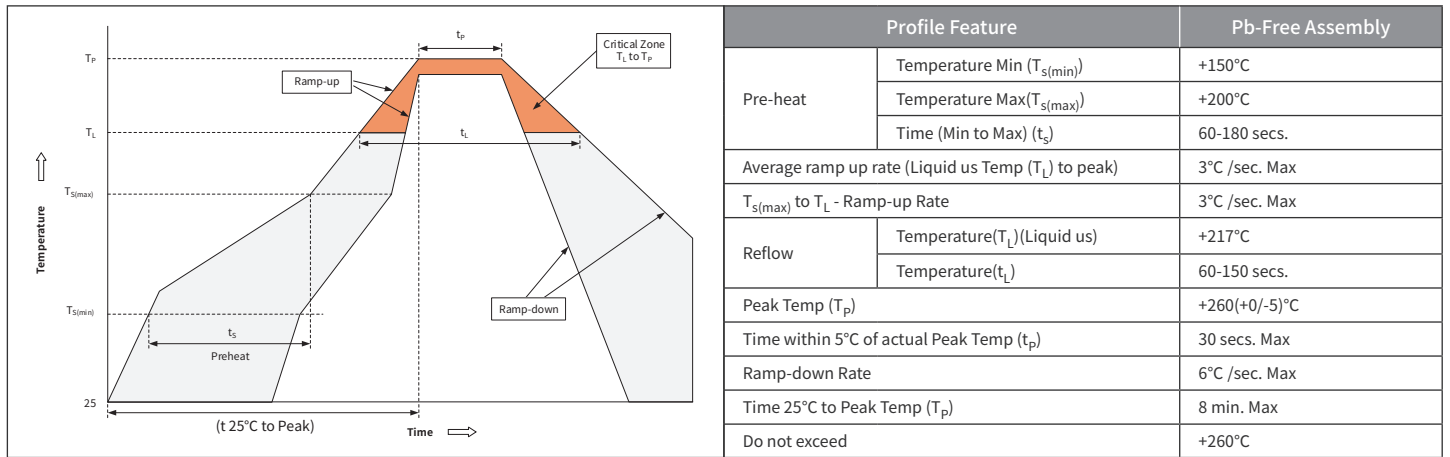
Ordering Information

| PACKAGE | PACKAGE CODE | UNIT WEIGHT(g) | REEL(pcs) | BOX(pcs) | CARTON(pcs) | DELIVERY MODE |
|-----------|--------------|----------------|-----------|----------|-------------|---------------|
| SOD-123FL | R1 | 0.0169 | 3000 | 15000 | 150000 | 7" |

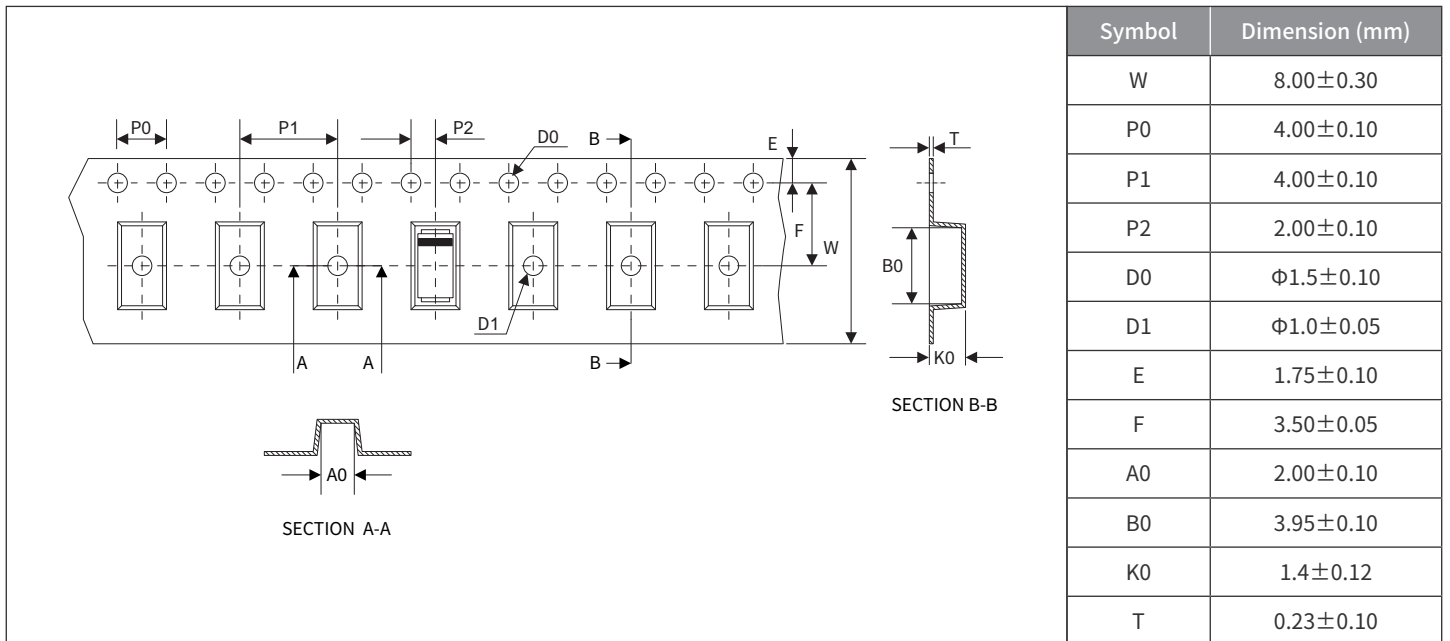
Part Numbering



Soldering Parameters



Packaging (SOD-123FL)



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[P6KE13CA](#) [P6KE43CA](#) [P6KE6.8CA](#) [P6KE8.2](#) [P6SMBJ20CA](#) [JANTX1N6072A](#) [SR2835ESKG](#) [SA90CA](#)