

## Transient Voltage Suppressor

### Description

SM4F Series transient voltage suppressors are excellent overvoltage protective devices. The Series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

### Features

- ◆Excellent clamping capability
- ◆Low leakage current
- ◆High surge capability
- ◆Glass passivated chip
- ◆Epoxy resin package
- ◆Built-in strain relief
- ◆Will not fatigue
- ◆RoHS Compliant
- ◆Fast response time: typically less than 1.0ps from 0 Volts to VBR min

### Mechanical Characteristics

- ◆Package: SOD-123FL plastic package.
- ◆Lead Finish: Matte Tin
- ◆Case Material: Epoxy Molding Compound.
- ◆UL Flammability Classification Rating 94V-0
- ◆Moisture Sensitivity: Level 1 per J-STD-020

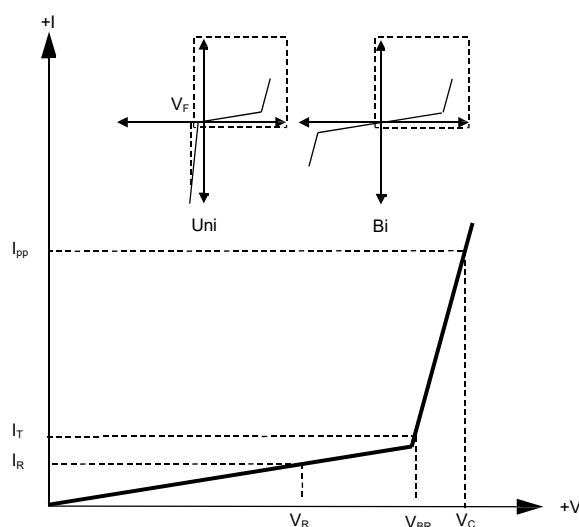
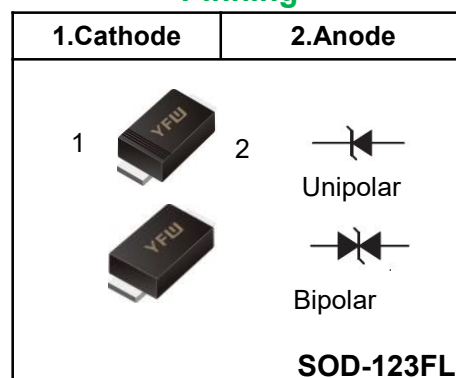
### Applications

- ◆Cellular phones
- ◆Portable devices
- ◆Business machines
- ◆Power supplies
- ◆Consumer applications

### Electrical Parameters

| Parameter | Definition                                                                                                     |
|-----------|----------------------------------------------------------------------------------------------------------------|
| $C_J$     | Junction Capacitance - typical capacitance measured with 0V or $V_R$ bias                                      |
| $I_{PP}$  | Peak Pulse Current - maximum rated peak impulse current                                                        |
| $V_C$     | Clamping Voltage - Peak voltage measured across the suppressor at a specified $I_{ppm}$ (peak impulse current) |
| $V_{BR}$  | Breakdown Voltage - Maximum voltage that flows though the TVS at a specified test current ( $I_T$ )            |
| $I_R$     | Leakage Current - maximum peak off-state current measured at $V_R$                                             |
| $V_R$     | Peak Off-state Voltage - maximum voltage that can be applied while maintaining off state                       |

### Pinning



## Absolute Maximum Ratings (TA=25°C unless otherwise noted)

| Parameter                                      | Symbol          | Value      | Units | Remarks        |
|------------------------------------------------|-----------------|------------|-------|----------------|
| Peak Pulse Power Dissipation                   | $P_{PPM}$       | 400        | W     | (Note1)(Note2) |
| Steady State Power Dissipation                 | $P_D$           | 1          | W     | (Note3)        |
| Peak Forward Surge Current                     | $I_{FSM}$       | 30         | A     | (Note4)        |
| Maximum Instantaneous Forward Voltage at 10A   | $V_{FM}$        | 3.5        | V     | (Note5)        |
| Typical Thermal Resistance Junction to Lead    | $R_{\theta JL}$ | 100        | °C/W  |                |
| Typical Thermal Resistance Junction to Ambient | $R_{\theta JA}$ | 220        | °C/W  |                |
| Operating Temperature Range                    | $T_J$           | -55 to 150 | °C    |                |
| Storage Temperature Range                      | $T_{STG}$       | -55 to 150 | °C    |                |

Notes1: Non-repetitive current pulse , 10/1000us Waveform.

Notes2: Mounted on copper pad area of 3×3mm to each terminal.

Notes3: Infinite HeatSink at  $T_L=50^{\circ}\text{C}$

Notes4: Measured on 8.3ms single half sine wave or equivalent square wave, duty cycle=4 perminute maximum.

Notes5: For UnidirectionalOnly.

## Electrical Characteristics (TA=25°C unless otherwise)

| Part Number (Uni) | Part Number (Bi) | Marking Code |      | Reverse Stand off Voltage $V_R$ (V) | Breakdown Voltage $V_{BR} @ I_T(V)$ |      | Test Current $I_T(mA)$ | Maximum Clamping Voltage $V_C @ I_{PP} (V)$ | Maximum Peak Pulse Current $I_{PP} (A)$ | Maximun Reverse Leakage $I_R @ V_R (\mu A)$ |
|-------------------|------------------|--------------|------|-------------------------------------|-------------------------------------|------|------------------------|---------------------------------------------|-----------------------------------------|---------------------------------------------|
|                   |                  | Uni          | Bi   |                                     | Min                                 | Max  |                        |                                             |                                         |                                             |
| SM4F5.0A          | SM4F5.0CA        | 5.0A         | 5.0C | 5                                   | 6.4                                 | 7    | 10                     | 9.2                                         | 43.5                                    | 800                                         |
| SM4F6.0A          | SM4F6.0CA        | 6.0A         | 6.0C | 6                                   | 6.67                                | 7.37 | 10                     | 10.3                                        | 38.8                                    | 800                                         |
| SM4F6.5A          | SM4F6.5CA        | 6.5A         | 6.5C | 6.5                                 | 7.22                                | 7.98 | 10                     | 11.2                                        | 35.7                                    | 500                                         |
| SM4F7.0A          | SM4F7.0CA        | 7.0A         | 7.0C | 7                                   | 7.78                                | 8.6  | 10                     | 12                                          | 33.3                                    | 200                                         |
| SM4F7.5A          | SM4F7.5CA        | 7.5A         | 7.5C | 7.5                                 | 8.33                                | 9.21 | 1                      | 12.9                                        | 31                                      | 100                                         |
| SM4F8.0A          | SM4F8.0CA        | 8.0A         | 8.0C | 8                                   | 8.89                                | 9.83 | 1                      | 13.6                                        | 29.4                                    | 50                                          |
| SM4F8.5A          | SM4F8.5CA        | 8.5A         | 8.5C | 8.5                                 | 9.44                                | 10.4 | 1                      | 14.4                                        | 27.8                                    | 20                                          |
| SM4F9.0A          | SM4F9.0CA        | 9.0A         | 9.0C | 9                                   | 10                                  | 11.1 | 1                      | 15.4                                        | 26                                      | 10                                          |
| SM4F10A           | SM4F10CA         | 10A          | 10C  | 10                                  | 11.1                                | 12.3 | 1                      | 17                                          | 23.5                                    | 5                                           |
| SM4F11A           | SM4F11CA         | 11A          | 11C  | 11                                  | 12.2                                | 13.5 | 1                      | 18.2                                        | 22                                      | 1                                           |
| SM4F12A           | SM4F12CA         | 12A          | 12C  | 12                                  | 13.3                                | 14.7 | 1                      | 19.9                                        | 20.1                                    | 1                                           |
| SM4F13A           | SM4F13CA         | 13A          | 13C  | 13                                  | 14.4                                | 15.9 | 1                      | 21.5                                        | 18.6                                    | 1                                           |
| SM4F14A           | SM4F14CA         | 14A          | 14C  | 14                                  | 15.6                                | 17.2 | 1                      | 23.2                                        | 17.2                                    | 1                                           |
| SM4F15A           | SM4F15CA         | 15A          | 15C  | 15                                  | 16.7                                | 18.5 | 1                      | 24.4                                        | 16.4                                    | 1                                           |
| SM4F16A           | SM4F16CA         | 16A          | 16C  | 16                                  | 17.8                                | 19.7 | 1                      | 26                                          | 15.4                                    | 1                                           |
| SM4F17A           | SM4F17CA         | 17A          | 17C  | 17                                  | 18.9                                | 20.9 | 1                      | 27.6                                        | 14.5                                    | 1                                           |
| SM4F18A           | SM4F18CA         | 18A          | 18C  | 18                                  | 20                                  | 22.1 | 1                      | 29.2                                        | 13.7                                    | 1                                           |
| SM4F20A           | SM4F20CA         | 20A          | 20C  | 20                                  | 22.2                                | 24.5 | 1                      | 32.4                                        | 12.3                                    | 1                                           |

## Electrical Characteristics (TA=25°C unless otherwise noted)

| Part Number (Uni) | Part Number (Bi) | Marking Code |      | Reverse Stand off Voltage<br>$V_R$ (V) | Breakdown Voltage<br>$V_{BR}$ @ $I_T$ (V) |      | Test Current<br>$I_T$ (mA) | Maximum Clamping Voltage<br>$V_C$ @ $I_{PP}$ (V) | Maximum Peak Pulse Current<br>$I_{PP}$ (A) | Maximum Reverse Leakage<br>$I_R$ @ $V_R$ (μA) |
|-------------------|------------------|--------------|------|----------------------------------------|-------------------------------------------|------|----------------------------|--------------------------------------------------|--------------------------------------------|-----------------------------------------------|
|                   |                  | Uni          | Bi   |                                        | Min                                       | Max  |                            |                                                  |                                            |                                               |
| SM4F22A           | SM4F22CA         | 22A          | 22C  | 22                                     | 24.4                                      | 26.9 | 1                          | 35.5                                             | 11.3                                       | 1                                             |
| SM4F24A           | SM4F24CA         | 24A          | 24C  | 24                                     | 26.7                                      | 29.5 | 1                          | 38.9                                             | 10.3                                       | 1                                             |
| SM4F26A           | SM4F26CA         | 26A          | 26C  | 26                                     | 28.9                                      | 31.9 | 1                          | 42.1                                             | 9.5                                        | 1                                             |
| SM4F28A           | SM4F28CA         | 28A          | 28C  | 28                                     | 31.1                                      | 34.4 | 1                          | 45.4                                             | 8.8                                        | 1                                             |
| SM4F30A           | SM4F30CA         | 30A          | 30C  | 30                                     | 33.3                                      | 36.8 | 1                          | 48.4                                             | 8.3                                        | 1                                             |
| SM4F33A           | SM4F33CA         | 33A          | 33C  | 33                                     | 36.7                                      | 40.6 | 1                          | 53.3                                             | 7.5                                        | 1                                             |
| SM4F36A           | SM4F36CA         | 36A          | 36C  | 36                                     | 40                                        | 44.2 | 1                          | 58.1                                             | 6.9                                        | 1                                             |
| SM4F40A           | SM4F40CA         | 40A          | 40C  | 40                                     | 44.4                                      | 49.1 | 1                          | 64.5                                             | 6.2                                        | 1                                             |
| SM4F43A           | SM4F43CA         | 43A          | 43C  | 43                                     | 47.8                                      | 52.8 | 1                          | 69.4                                             | 5.8                                        | 1                                             |
| SM4F45A           | SM4F45CA         | 45A          | 45C  | 45                                     | 50                                        | 55.3 | 1                          | 72.7                                             | 5.5                                        | 1                                             |
| SM4F48A           | SM4F48CA         | 48A          | 48C  | 48                                     | 53.3                                      | 58.9 | 1                          | 77.4                                             | 5.2                                        | 1                                             |
| SM4F51A           | SM4F51CA         | 51A          | 51C  | 51                                     | 56.7                                      | 62.7 | 1                          | 82.4                                             | 4.9                                        | 1                                             |
| SM4F54A           | SM4F54CA         | 54A          | 54C  | 54                                     | 60                                        | 66.3 | 1                          | 87.1                                             | 4.6                                        | 1                                             |
| SM4F58A           | SM4F58CA         | 58A          | 58C  | 58                                     | 64.4                                      | 71.2 | 1                          | 93.6                                             | 4.3                                        | 1                                             |
| SM4F60A           | SM4F60CA         | 60A          | 60C  | 60                                     | 66.7                                      | 73.7 | 1                          | 96.8                                             | 4.1                                        | 1                                             |
| SM4F64A           | SM4F64CA         | 64A          | 64C  | 64                                     | 71.1                                      | 78.6 | 1                          | 103                                              | 3.9                                        | 1                                             |
| SM4F70A           | SM4F70CA         | 70A          | 70C  | 70                                     | 77.8                                      | 86   | 1                          | 113                                              | 3.5                                        | 1                                             |
| SM4F75A           | SM4F75CA         | 75A          | 75C  | 75                                     | 83.3                                      | 92.1 | 1                          | 121                                              | 3.3                                        | 1                                             |
| SM4F78A           | SM4F78CA         | 78A          | 78C  | 78                                     | 86.7                                      | 95.8 | 1                          | 126                                              | 3.2                                        | 1                                             |
| SM4F85A           | SM4F85CA         | 85A          | 85C  | 85                                     | 94.4                                      | 104  | 1                          | 137                                              | 2.9                                        | 1                                             |
| SM4F90A           | SM4F90CA         | 90A          | 90C  | 90                                     | 100                                       | 111  | 1                          | 146                                              | 2.7                                        | 1                                             |
| SM4F100A          | SM4F100CA        | 100A         | 100C | 100                                    | 111                                       | 123  | 1                          | 162                                              | 2.5                                        | 1                                             |
| SM4F110A          | SM4F110CA        | 110A         | 110C | 110                                    | 122                                       | 135  | 1                          | 177                                              | 2.3                                        | 1                                             |
| SM4F120A          | SM4F120CA        | 120A         | 120C | 120                                    | 133                                       | 147  | 1                          | 193                                              | 2.1                                        | 1                                             |
| SM4F130A          | SM4F130CA        | 130A         | 130C | 130                                    | 144                                       | 159  | 1                          | 209                                              | 1.9                                        | 1                                             |
| SM4F150A          | SM4F150CA        | 150A         | 150C | 150                                    | 167                                       | 185  | 1                          | 243                                              | 1.6                                        | 1                                             |
| SM4F160A          | SM4F160CA        | 160A         | 160C | 160                                    | 178                                       | 197  | 1                          | 259                                              | 1.5                                        | 1                                             |
| SM4F170A          | SM4F170CA        | 170A         | 170C | 170                                    | 189                                       | 209  | 1                          | 275                                              | 1.5                                        | 1                                             |
| SM4F180A          | SM4F180CA        | 180A         | 180C | 180                                    | 201                                       | 222  | 1                          | 292                                              | 1.4                                        | 1                                             |
| SM4F200A          | SM4F200CA        | 200A         | 200C | 200                                    | 224                                       | 247  | 1                          | 324                                              | 1.2                                        | 1                                             |
| SM4F220A          | SM4F220CA        | 220A         | 220C | 220                                    | 246                                       | 272  | 1                          | 356                                              | 1.1                                        | 1                                             |

**Rating And Characteristic Curves (TA=25°C unless otherwise noted)**

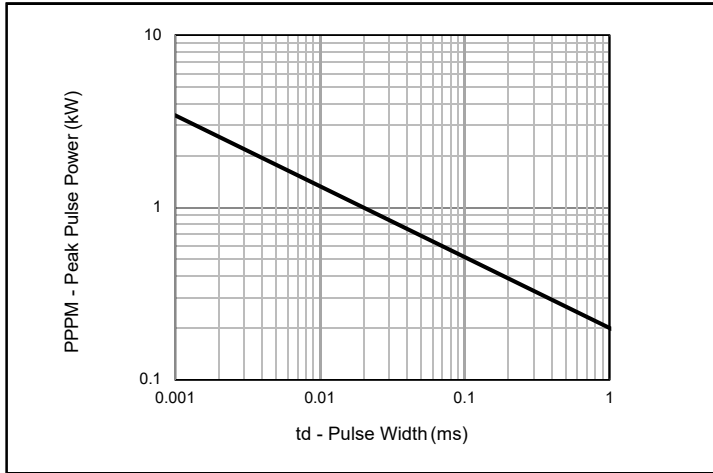


Fig.1 - Peak Pulse Power Rating

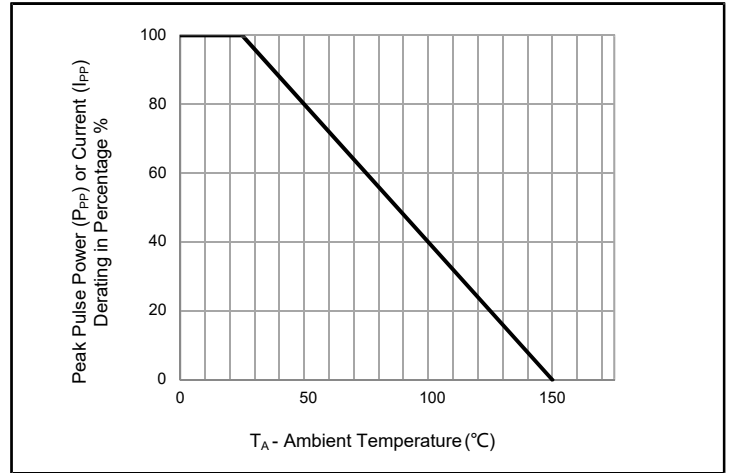


Fig.2 - Pulse Derating Curve

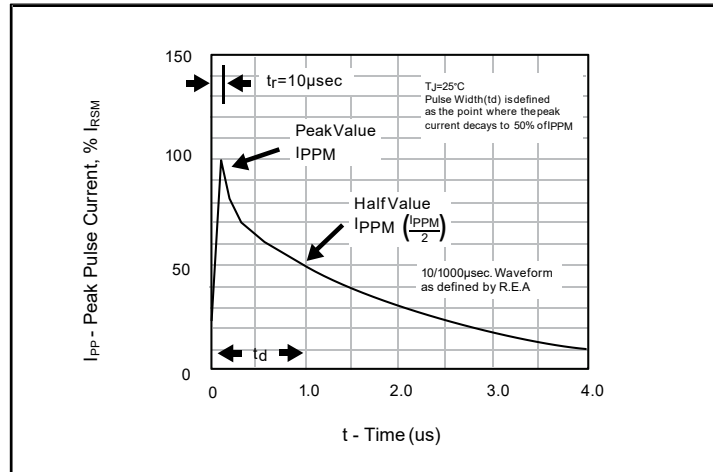


Fig.3 - Pulse Waveform

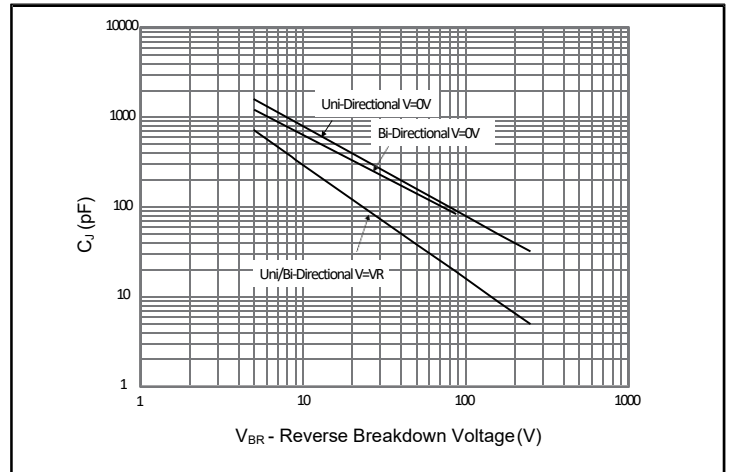


Fig.4 - Typical Junction Capacitance

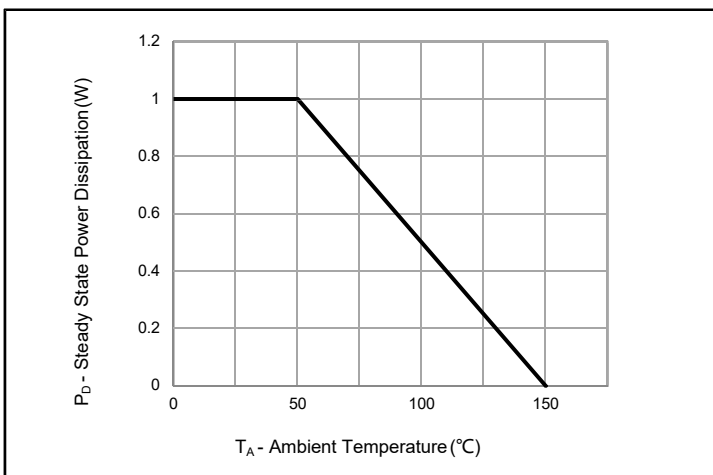


Fig.5 - Steady State Power Dissipation Derating Curve

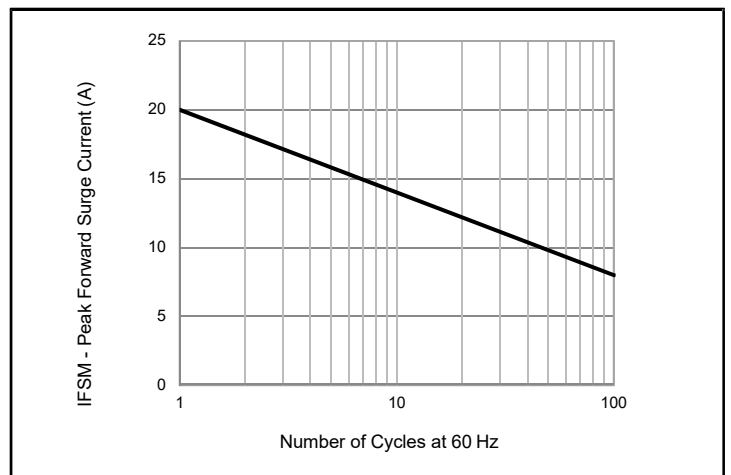
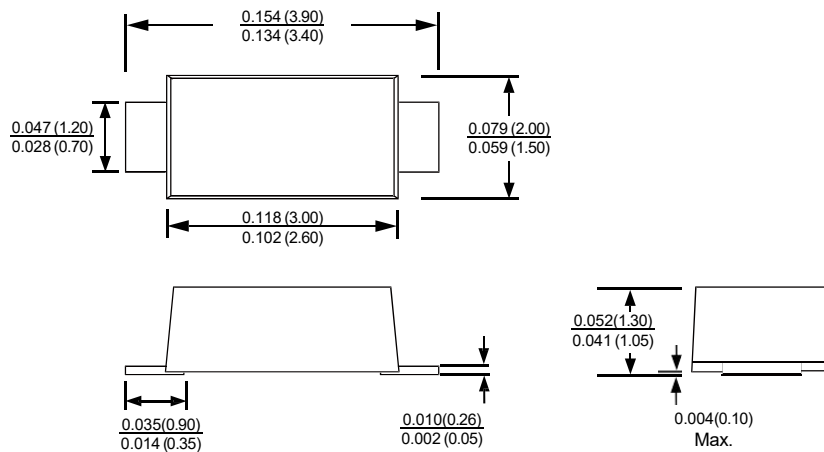


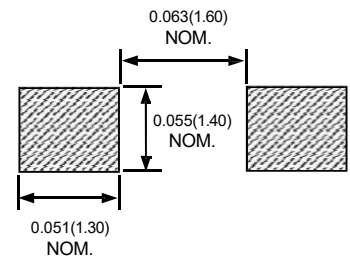
Fig.6 - Maximum Non-Repetitive Peak Forward Surge Current  
Uni-Directional Only

Package Outline

SOD-123FL



Mounting Pad Layout



Summary of Packing Options

| Package   | Packing Description | Packing Quantity | Industry Standard |
|-----------|---------------------|------------------|-------------------|
| SOD-123FL | Tape/Reel, 13" reel | 10000            | EIA-481-1         |
|           | Tape/Reel, 7" reel  | 3000             | EIA-481-1         |

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