

### FEATURES



- 400 Watts Peak Pulse Power per Line ( $t_p = 10/1000\mu s$ )
- Low Inductance
- Excellent Clamping Capability
- Unidirectional & Bidirectional Configurations
- Low Leakage Current:  $< 1\mu A$  (Typical)
- Fast Response Time
- Available in Multiple Voltages
- RoHS Compliant

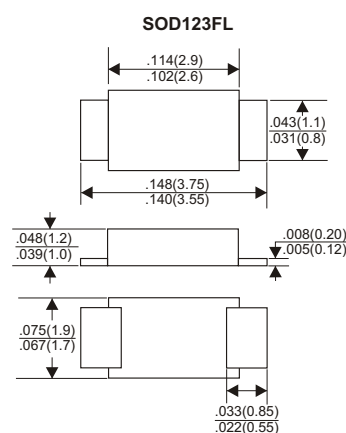
### MECHANICAL DATA

- Case: JEDEC SOD-123FL
- Terminals: Solder plated, solderable per MIL-STD-750 Method 202
- Polarity: For uni-directional types the band by laser denotes the cathode, which is positive with respect to the anode under normal TVS operation

### VOLTAGE RANGE

5.0 to 100 Volts

400 Watts Peak Power



- "GK" represents the brand name
- "XXX" represents the periodic code
- "YY" represents the product type marking

### MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Rating 25°C ambient temperature unless otherwise specified.  
Single phase half wave, 60Hz, resistive or inductive load.  
For capacitive load, derate current by 20%.

| PARAMETER                                                                        | SYMBOL          | UNIT         | Conditions                   | Max              |
|----------------------------------------------------------------------------------|-----------------|--------------|------------------------------|------------------|
| Peak power dissipation(1) (2) (Fig.1)                                            | $P_{PPM}$       | W            | with a 10/1000us waveform    | 400              |
| Peak pulse current(1)                                                            | $I_{PPM}$       | A            | with a 10/1000us waveform    | (See Next Table) |
| Power dissipation, on infinite heat sink                                         | $P_D$           | W            | $T_L = 75^\circ C$           | 0.8              |
| Peak forward surge current, 8.3 ms single half sine-wave unidirectional only (3) | $I_{FSM}$       | A            |                              | 30               |
| Operating junction and storage temperature range                                 | $T_J, T_{STG}$  | $^\circ C$   |                              | -55 to +150      |
| Thermal resistance                                                               | $R_{\theta JL}$ | $^\circ C/W$ | Between junction and lead    | 40               |
|                                                                                  | $R_{\theta JA}$ |              | Between junction and Ambient | 180              |

Notes:

- (1). Non repetitive current pulse, per Fig2 and derated above  $T_A = 25^\circ C$  per Fig3.
- (2).  $T_L = 30^\circ C$  unless otherwise noted,  $V_F \leq 1.25V @ 200mA$ .
- (3). Measured on 8.3 ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum
- (4). Thermal resistance from junction to ambient and from junction to lead mounted on P.C.B. with 0.2" x 0.2" (5.0 mm x 5.0 mm) copper pad areas

### DEVICES FOR BIDIRECTIONAL APPLICATIONS

- 1. For bi-directional use C suffix for Types .
- 2. Electrical characteristics apply in both directions.

RATING AND CHARACTERISTIC CURVES (SM4F SERIES)

FIG.1-PEAK PULSE POWER DERATING CURVE

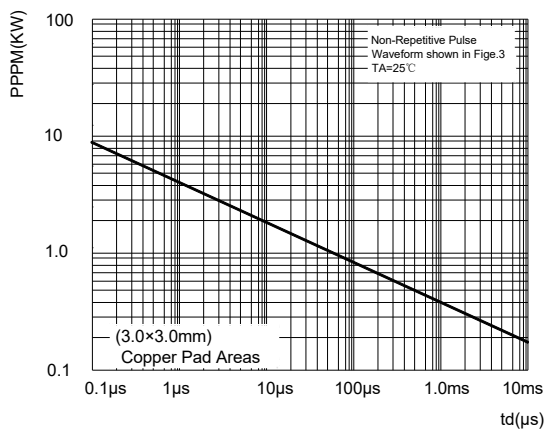


FIG.2-PULSE DERATING CURVE

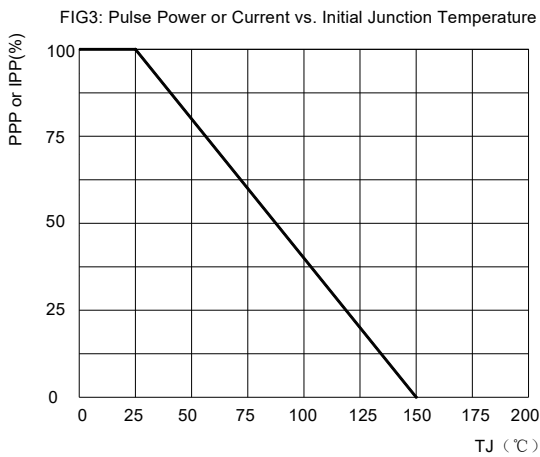


FIG.3-PULSE WAVE FORM

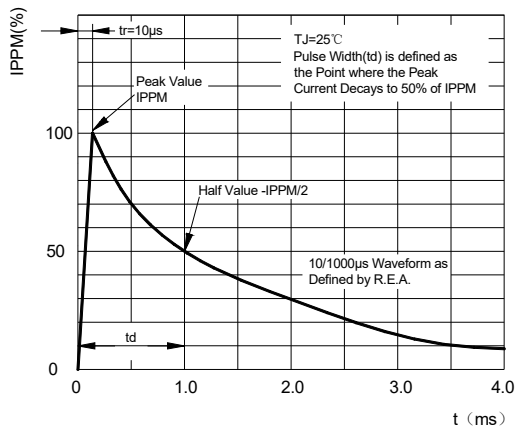
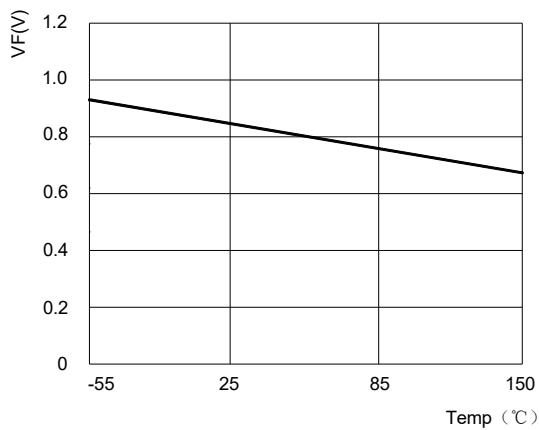


FIG4: Forward Voltage Curve



Characteristics at Ta = 25°C

| Part Number |           | Marking |        | Breakdown Voltage $V_{BR}@I_T$ |         |                  | Maximum Reverse Leakage<br>$I_R @ V_{RWM}$<br>( $\mu A$ ) | Working Peak Reverse Voltage<br>$V_{RWM}$ (V) | Maximum Reverse Surge Current<br>$I_{PP}^{(2)}$ (A) | Maximum Clamping Voltage<br>$V_C @ I_{PP}$ (V) |
|-------------|-----------|---------|--------|--------------------------------|---------|------------------|-----------------------------------------------------------|-----------------------------------------------|-----------------------------------------------------|------------------------------------------------|
| Uni         | Bi        | Uni     | Bi     | Min(V)                         | Max (V) | $I_T^{(1)}$ (mA) |                                                           |                                               |                                                     |                                                |
| SM4F5.0A    | SM4F5.0CA | F5.0A   | F5.0CA | 6.40                           | 7.07    | 10               | 800                                                       | 5.0                                           | 43.38                                               | 9.2                                            |
| SM4F6.0A    | SM4F6.0CA | F6.0A   | F6.0CA | 6.67                           | 7.37    | 10               | 800                                                       | 6.0                                           | 38.83                                               | 10.3                                           |
| SM4F6.5A    | SM4F6.5CA | F6.5A   | F6.5CA | 7.22                           | 7.98    | 10               | 500                                                       | 6.5                                           | 35.71                                               | 11.2                                           |
| SM4F7.0A    | SM4F7.0CA | F7.0A   | F7.0CA | 7.78                           | 8.60    | 10               | 200                                                       | 7.0                                           | 33.33                                               | 12.0                                           |
| SM4F7.5A    | SM4F7.5CA | F7.5A   | F7.5CA | 8.33                           | 9.21    | 1                | 100                                                       | 7.5                                           | 31.01                                               | 12.9                                           |
| SM4F8.0A    | SM4F8.0CA | F8.0A   | F8.0CA | 8.89                           | 9.83    | 1                | 50                                                        | 8.0                                           | 29.41                                               | 13.6                                           |
| SM4F8.5A    | SM4F8.5CA | F8.5A   | F8.5CA | 9.44                           | 10.40   | 1                | 10                                                        | 8.5                                           | 27.78                                               | 14.4                                           |
| SM4F9.0A    | SM4F9.0CA | F9.0A   | F9.0CA | 10.00                          | 11.10   | 1                | 5                                                         | 9.0                                           | 25.97                                               | 15.4                                           |
| SM4F10A     | SM4F10CA  | F10A    | F10CA  | 11.10                          | 12.30   | 1                | 2.5                                                       | 10.0                                          | 23.52                                               | 17.0                                           |
| SM4F11A     | SM4F11CA  | F11A    | F11CA  | 12.20                          | 13.50   | 1                | 2.5                                                       | 11.0                                          | 21.98                                               | 18.2                                           |
| SM4F12A     | SM4F12CA  | F12A    | F12CA  | 13.30                          | 14.70   | 1                | 2.5                                                       | 12.0                                          | 20.1                                                | 19.9                                           |
| SM4F13A     | SM4F13CA  | F13A    | F13CA  | 14.40                          | 15.90   | 1                | 1.0                                                       | 13.0                                          | 18.6                                                | 20.0                                           |
| SM4F14A     | SM4F14CA  | F14A    | F14CA  | 15.60                          | 17.20   | 1                | 1.0                                                       | 14.0                                          | 17.24                                               | 23.2                                           |
| SM4F15A     | SM4F15CA  | F15A    | F15CA  | 16.70                          | 18.50   | 1                | 1.0                                                       | 15.0                                          | 16.4                                                | 24.4                                           |
| SM4F16A     | SM4F16CA  | F16A    | F16CA  | 17.80                          | 19.70   | 1                | 1.0                                                       | 16.0                                          | 15.38                                               | 26.0                                           |
| SM4F17A     | SM4F17CA  | F17A    | F17CA  | 18.90                          | 20.90   | 1                | 1.0                                                       | 17.0                                          | 14.5                                                | 27.6                                           |
| SM4F18A     | SM4F18CA  | F18A    | F18CA  | 20.00                          | 22.10   | 1                | 1.0                                                       | 18.0                                          | 13.7                                                | 29.2                                           |
| SM4F19A     | SM4F19CA  | F19A    | F19CA  | 21.10                          | 23.30   | 1                | 1.0                                                       | 19.0                                          | 13.08                                               | 30.6                                           |
| SM4F20A     | SM4F20CA  | F20A    | F20CA  | 22.20                          | 24.50   | 1                | 1.0                                                       | 20.0                                          | 12.34                                               | 32.4                                           |
| SM4F22A     | SM4F22CA  | F22A    | F22CA  | 24.40                          | 26.90   | 1                | 1.0                                                       | 22.0                                          | 11.26                                               | 35.5                                           |
| SM4F24A     | SM4F24CA  | F24A    | F24CA  | 26.70                          | 29.50   | 1                | 1.0                                                       | 24.0                                          | 10.28                                               | 38.9                                           |
| SM4F26A     | SM4F26CA  | F26A    | F26CA  | 28.90                          | 31.90   | 1                | 1.0                                                       | 26.0                                          | 9.5                                                 | 42.1                                           |
| SM4F28A     | SM4F28CA  | F28A    | F28CA  | 31.10                          | 34.40   | 1                | 1.0                                                       | 28.0                                          | 8.82                                                | 45.4                                           |

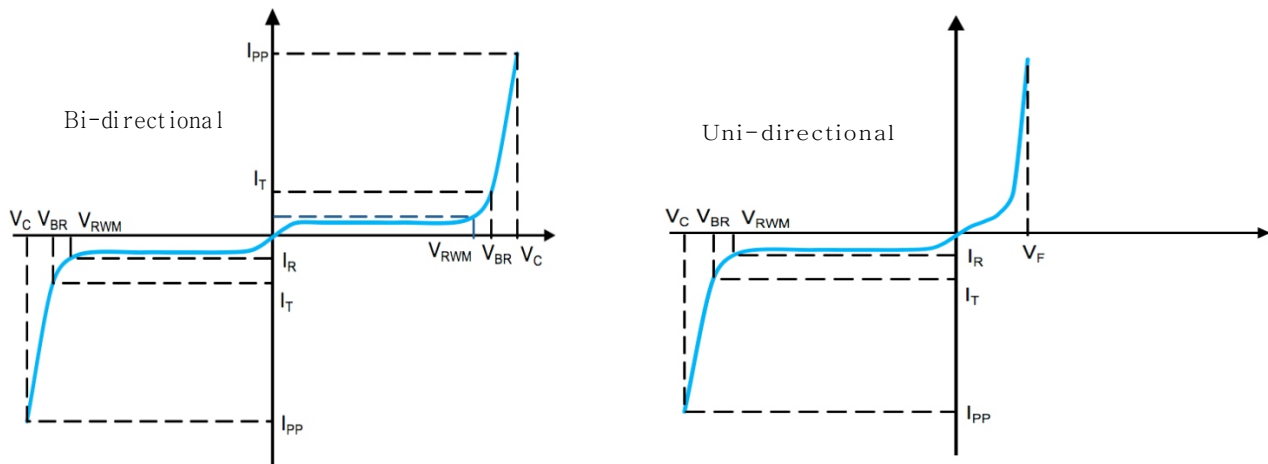
Characteristics at Ta = 25°C

| Part Number |          | Marking |       | Breakdown Voltage $V_{BR}@I_T$ |         |                  | Maximum Reverse Leakage<br>$I_R @ V_{RWM}$<br>( $\mu A$ ) | Working Peak Reverse Voltage<br>$V_{RWM}$ (V) | Maximum Reverse Surge Current<br>$I_{PP}^{(2)}$ (A) | Maximum Clamping Voltage<br>$V_C @ I_{PP}$ (V) |
|-------------|----------|---------|-------|--------------------------------|---------|------------------|-----------------------------------------------------------|-----------------------------------------------|-----------------------------------------------------|------------------------------------------------|
| Uni         | Bi       | Uni     | Bi    | Min(V)                         | Max (V) | $I_T^{(1)}$ (mA) |                                                           |                                               |                                                     |                                                |
| SM4F30A     | SM4F30CA | F30A    | F30CA | 33.30                          | 36.80   | 1                | 1.0                                                       | 30.0                                          | 8.26                                                | 48.4                                           |
| SM4F33A     | SM4F33CA | F33A    | F33CA | 36.70                          | 40.60   | 1                | 1.0                                                       | 33.0                                          | 7.5                                                 | 53.3                                           |
| SM4F36A     | SM4F36CA | F36A    | F36CA | 40.00                          | 44.20   | 1                | 1.0                                                       | 36.0                                          | 6.88                                                | 58.1                                           |
| SM4F40A     | SM4F40CA | F40A    | F40CA | 44.40                          | 49.10   | 1                | 1.0                                                       | 40.0                                          | 6.2                                                 | 64.5                                           |
| SM4F43A     | SM4F43CA | F43A    | F43CA | 47.80                          | 52.80   | 1                | 1.0                                                       | 43.0                                          | 5.76                                                | 69.4                                           |
| SM4F45A     | SM4F45CA | F45A    | F45CA | 50.00                          | 55.30   | 1                | 1.0                                                       | 45.0                                          | 5.5                                                 | 72.7                                           |
| SM4F48A     | /        | F48A    | /     | 53.30                          | 58.90   | 1                | 1.0                                                       | 48.0                                          | 5.16                                                | 77.4                                           |
| SM4F51A     | /        | F51A    | /     | 56.70                          | 62.70   | 1                | 1.0                                                       | 51.0                                          | 4.86                                                | 82.4                                           |
| SM4F54A     | /        | F54A    | /     | 60.00                          | 66.30   | 1                | 1.0                                                       | 54.0                                          | 4.6                                                 | 87.1                                           |
| SM4F58A     | /        | F58A    | /     | 64.40                          | 71.20   | 1                | 1.0                                                       | 58.0                                          | 4.28                                                | 93.6                                           |
| SM4F60A     | /        | F60A    | /     | 66.70                          | 73.70   | 1                | 1.0                                                       | 60.0                                          | 4.14                                                | 96.8                                           |
| SM4F64A     | /        | F64A    | /     | 71.10                          | 78.60   | 1                | 1.0                                                       | 64.0                                          | 3.88                                                | 103.0                                          |
| SM4F70A     | /        | F70A    | /     | 77.80                          | 86.00   | 1                | 1.0                                                       | 70.0                                          | 3.54                                                | 113.0                                          |
| SM4F75A     | /        | F75A    | /     | 83.30                          | 92.10   | 1                | 1.0                                                       | 75.0                                          | 3.3                                                 | 121.0                                          |
| SM4F78A     | /        | F78A    | /     | 86.70                          | 95.80   | 1                | 1.0                                                       | 78.0                                          | 3.18                                                | 126.0                                          |
| SM4F80A     | /        | F80A    | /     | 88.80                          | 97.60   | 1                | 1.0                                                       | 80.0                                          | 3.1                                                 | 129.0                                          |
| SM4F85A     | /        | F85A    | /     | 94.40                          | 104.00  | 1                | 1.0                                                       | 85.0                                          | 2.92                                                | 137.0                                          |
| SM4F90A     | /        | F90A    | /     | 100.00                         | 111.00  | 1                | 1.0                                                       | 90.0                                          | 2.74                                                | 146.0                                          |
| SM4F100A    | /        | F100A   | /     | 111.00                         | 123.00  | 1                | 1.0                                                       | 100.0                                         | 2.46                                                | 162.0                                          |

Notes:

(1)  $t_p \leq 50ms$  Pulse test:  $t_p \leq 50ms$ .

## I-V Curve Characteristics



|           |                                                                                                         |
|-----------|---------------------------------------------------------------------------------------------------------|
| $P_{PPM}$ | Peak Pulse Power Dissipation - Max power dissipation                                                    |
| $V_{RWM}$ | Reverse Stand-off Voltage - Maximum voltage that can be applied to TVS without operation                |
| $V_{BR}$  | Breakdown Voltage – Maximum voltage that flows through the TVS at a specified current ( $I_T$ )         |
| $V_C$     | Clamping Voltage – Peak voltage measured across the TVS at a specified $I_{PPM}$ (peak impulse current) |
| $I_R$     | Reverse Leakage Current – Current measured at $V_R$                                                     |
| $V_F$     | Forward Voltage Drop for Uni-directional                                                                |