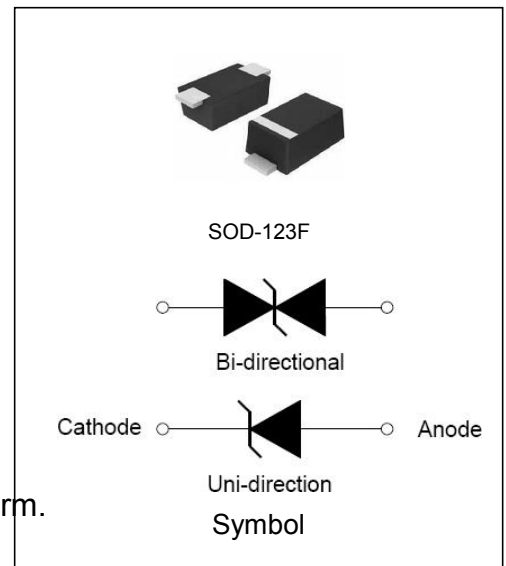


### DESCRIPTION:

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.

### FEATURES:

- ✧ Low profile package.
- ✧ Low inductance.
- ✧ Excellent clamping capability.
- ✧ 200W 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-STD020, LF maximum peak of 260°C.
- ✧ For surface mounted applications in order to optimize board space.



### ABSOLUTE MAXIMUM RATINGS (TA=25°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   |
| Steady state power dissipation at $T_L=75^\circ\text{C}$        | $P_{M(AV)}$     | 2.8         | W    |
| Peak pulse power dissipation on 10/1000μs waveform              | $P_{PP}$        | 200         | W    |
| Maximum instantaneous forward voltage at 20A for unidirectional | $V_F$           | 3.5         | V    |
| 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



KE : Device Marking Code

**ELECTRICAL CHARACTERISTICS (TA=25°C)**

| Part Number |          | Marking |     | V <sub>R</sub> | I <sub>R</sub> @<br>V <sub>R</sub> | V <sub>BR</sub> @I <sub>T</sub> |        | I <sub>T</sub> | V <sub>C</sub> @I <sub>PP</sub> | I <sub>PP</sub> ① |
|-------------|----------|---------|-----|----------------|------------------------------------|---------------------------------|--------|----------------|---------------------------------|-------------------|
| Uni-Polar   | Bi-Polar | Uni     | Bi  | V              | μA                                 | min(V)                          | max(V) | mA             | max(V)                          | A                 |
| SMF5.0A     | SMF5.0CA | KE      | 5C  | 5.0            | 400                                | 6.40                            | 7.00   | 10             | 9.2                             | 21.7              |
| SMF6.0A     | SMF6.0CA | KG      | 6C  | 6.0            | 400                                | 6.67                            | 7.37   | 10             | 10.3                            | 19.4              |
| SMF6.5A     | SMF6.5CA | KK      | 6VC | 6.5            | 250                                | 7.22                            | 7.98   | 10             | 11.2                            | 17.9              |
| SMF7.0A     | SMF7.0CA | KM      | 7C  | 7.0            | 100                                | 7.78                            | 8.60   | 10             | 12.0                            | 16.7              |
| SMF7.5A     | SMF7.5CA | KP      | 7VC | 7.5            | 50                                 | 8.33                            | 9.21   | 1              | 12.9                            | 15.5              |
| SMF8.0A     | SMF8.0CA | KR      | 8C  | 8.0            | 25                                 | 8.89                            | 9.83   | 1              | 13.6                            | 14.7              |
| SMF8.5A     | SMF8.5CA | KT      | 8VC | 8.5            | 10                                 | 9.44                            | 10.40  | 1              | 14.4                            | 13.8              |
| SMF9.0A     | SMF9.0CA | KV      | 9C  | 9.0            | 5                                  | 10.00                           | 11.10  | 1              | 15.4                            | 13.0              |
| SMF10A      | SMF10CA  | KX      | 10C | 10.0           | 2                                  | 11.10                           | 12.30  | 1              | 17.0                            | 11.8              |
| SMF11A      | SMF11CA  | KZ      | 11C | 11.0           | 2                                  | 12.20                           | 13.50  | 1              | 18.2                            | 11.0              |
| SMF12A      | SMF12CA  | LE      | 12C | 12.0           | 2                                  | 13.30                           | 14.70  | 1              | 19.9                            | 10.1              |
| SMF13A      | SMF13CA  | LG      | 13C | 13.0           | 1                                  | 14.40                           | 15.90  | 1              | 21.5                            | 9.3               |
| SMF14A      | SMF14CA  | LK      | 14C | 14.0           | 1                                  | 15.60                           | 17.20  | 1              | 23.2                            | 8.6               |
| SMF15A      | SMF15CA  | LM      | 15C | 15.0           | 1                                  | 16.70                           | 18.50  | 1              | 24.4                            | 8.2               |
| SMF16A      | SMF16CA  | LP      | 16C | 16.0           | 1                                  | 17.80                           | 19.70  | 1              | 26.0                            | 7.7               |
| SMF17A      | SMF17CA  | LR      | 17C | 17.0           | 1                                  | 18.90                           | 20.90  | 1              | 27.6                            | 7.2               |
| SMF18A      | SMF18CA  | LT      | 18C | 18.0           | 1                                  | 20.00                           | 22.10  | 1              | 29.2                            | 6.8               |
| SMF20A      | SMF20CA  | LV      | 20C | 20.0           | 1                                  | 22.20                           | 24.50  | 1              | 32.4                            | 6.2               |
| SMF22A      | SMF22CA  | LX      | 22C | 22.0           | 1                                  | 24.40                           | 26.90  | 1              | 35.5                            | 5.6               |
| SMF24A      | SMF24CA  | LZ      | 24C | 24.0           | 1                                  | 26.70                           | 29.50  | 1              | 38.9                            | 5.1               |
| SMF26A      | SMF26CA  | ME      | 26C | 26.0           | 1                                  | 28.90                           | 31.90  | 1              | 42.1                            | 4.8               |
| SMF28A      | SMF28CA  | MG      | 28C | 28.0           | 1                                  | 31.10                           | 34.40  | 1              | 45.4                            | 4.4               |
| SMF30A      | SMF30CA  | MK      | 30C | 30.0           | 1                                  | 33.30                           | 36.80  | 1              | 48.4                            | 4.1               |
| SMF33A      | SMF33CA  | MM      | 33C | 33.0           | 1                                  | 36.70                           | 40.60  | 1              | 53.3                            | 3.8               |
| SMF36A      | SMF36CA  | MP      | 36C | 36.0           | 1                                  | 40.00                           | 44.20  | 1              | 58.1                            | 3.4               |
| SMF40A      | SMF40CA  | MR      | 40C | 40.0           | 1                                  | 44.40                           | 49.10  | 1              | 64.5                            | 3.1               |
| SMF43A      | SMF43CA  | MT      | 43C | 43.0           | 1                                  | 47.80                           | 52.80  | 1              | 69.4                            | 2.8               |
| SMF45A      | SMF45CA  | MV      | 45C | 45.0           | 1                                  | 50.00                           | 55.30  | 1              | 72.7                            | 2.7               |
| SMF48A      | SMF48CA  | MX      | 48C | 48.0           | 1                                  | 53.30                           | 58.90  | 1              | 77.4                            | 2.6               |

**ELECTRICAL CHARACTERISTICS (TA=25°C,continued)**

| Part Number |          | Marking |      | V <sub>R</sub> | I <sub>R</sub> @<br>V <sub>R</sub> | V <sub>BR</sub> @I <sub>T</sub> |        | I <sub>T</sub> | V <sub>C</sub> @I <sub>PP</sub> | I <sub>PP</sub> ① |
|-------------|----------|---------|------|----------------|------------------------------------|---------------------------------|--------|----------------|---------------------------------|-------------------|
| Uni-Polar   | Bi-Polar | Uni     | Bi   | V              | μA                                 | min(V)                          | max(V) | mA             | max(V)                          | A                 |
| SMF51A      | SMF51CA  | MZ      | 51C  | 51.0           | 1                                  | 56.70                           | 62.70  | 1              | 82.4                            | 2.4               |
| SMF54A      | SMF54CA  | NE      | 54C  | 54.0           | 1                                  | 60.00                           | 66.30  | 1              | 87.1                            | 2.3               |
| SMF58A      | SMF58CA  | NG      | 58C  | 58.0           | 1                                  | 64.40                           | 71.20  | 1              | 93.6                            | 2.1               |
| SMF60A      | SMF60CA  | NK      | 60C  | 60.0           | 1                                  | 66.70                           | 73.70  | 1              | 96.8                            | 2.0               |
| SMF64A      | SMF64CA  | NM      | 64C  | 64.0           | 1                                  | 71.10                           | 78.60  | 1              | 103.0                           | 1.9               |
| SMF70A      | SMF70CA  | NP      | 70C  | 70.0           | 1                                  | 77.80                           | 86.00  | 1              | 113.0                           | 1.8               |
| SMF75A      | SMF75CA  | NR      | 75C  | 75.0           | 1                                  | 83.30                           | 92.10  | 1              | 121.0                           | 1.7               |
| SMF78A      | SMF78CA  | NV      | 78C  | 78.0           | 1                                  | 86.70                           | 95.80  | 1              | 126.0                           | 1.6               |
| SMF85A      | SMF85CA  | NX      | 85C  | 85.0           | 1                                  | 94.40                           | 104.0  | 1              | 137.0                           | 1.5               |
| SMF90A      | SMF90CA  | NZ      | 90C  | 90.0           | 1                                  | 100.0                           | 111.0  | 1              | 146.0                           | 1.4               |
| SMF100A     | SMF100CA | PE      | 100C | 100.0          | 1                                  | 111.0                           | 123.0  | 1              | 162.0                           | 1.2               |
| SMF110A     | SMF110CA | PG      | 110C | 110.0          | 1                                  | 122.0                           | 135.0  | 1              | 177.0                           | 1.1               |
| SMF120A     | SMF120CA | PK      | 120C | 120.0          | 1                                  | 133.0                           | 147.0  | 1              | 193.0                           | 1.0               |
| SMF130A     | SMF130CA | PM      | 130C | 130.0          | 1                                  | 144.0                           | 159.0  | 1              | 209.0                           | 0.9               |
| SMF150A     | SMF150CA | PR      | 150C | 150.0          | 1                                  | 167.0                           | 185.0  | 1              | 243.0                           | 0.8               |
| SMF160A     | SMF160CA | PV      | 160C | 160.0          | 1                                  | 178.0                           | 197.0  | 1              | 259.0                           | 0.8               |
| SMF170A     | SMF170CA | PX      | 170C | 170.0          | 1                                  | 189.0                           | 209.0  | 1              | 275.0                           | 0.7               |
| SMF180A     | SMF180CA | PZ      | 180C | 180.0          | 1                                  | 201.0                           | 222.0  | 1              | 292.0                           | 0.7               |
| SMF200A     | SMF200CA | QE      | 200C | 200.0          | 1                                  | 224.0                           | 247.0  | 1              | 324.0                           | 0.6               |
| SMF220A     | SMF220CA | QR      | 220C | 220.0          | 1                                  | 246.0                           | 272.0  | 1              | 356.0                           | 0.5               |

① Surge waveform:10/1000μs

V<sub>R</sub>: Stand-off voltage -- maximum voltage that can be applied

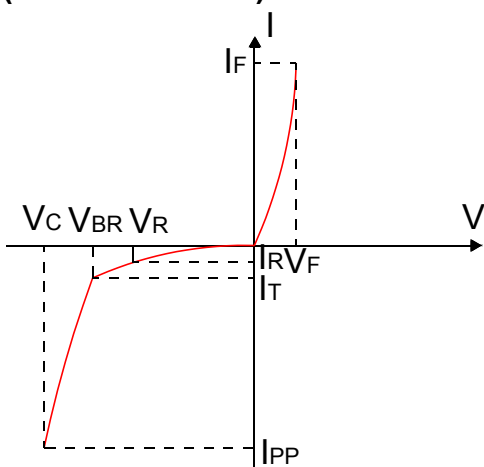
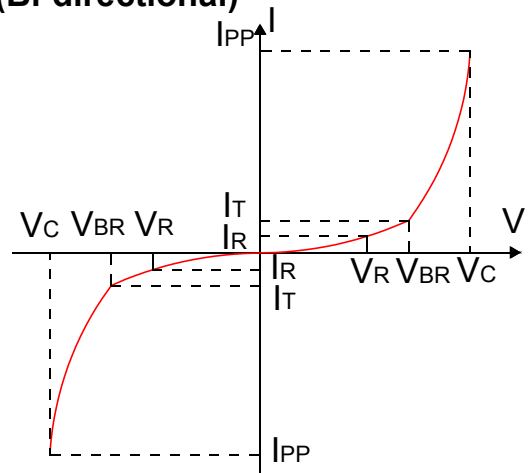
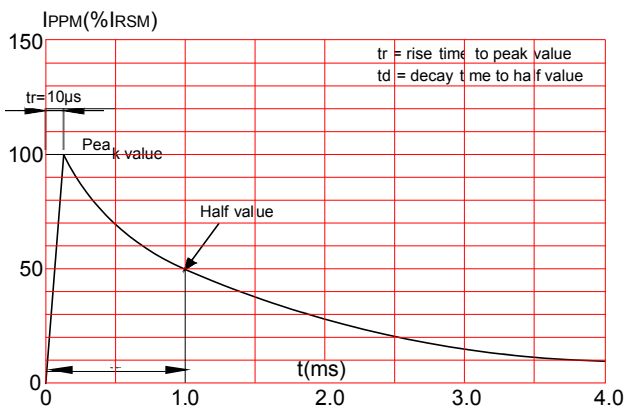
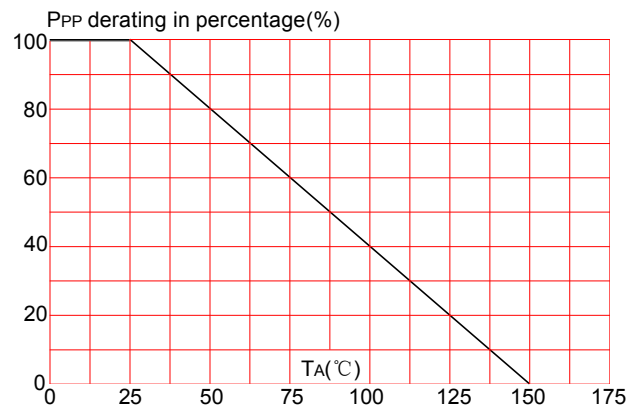
V<sub>BR</sub>: Breakdown voltage

V<sub>C</sub>: Clamping voltage -- peak voltage measured across the suppressor at a specified I<sub>PP</sub>

I<sub>R</sub>: Reverse leakage current

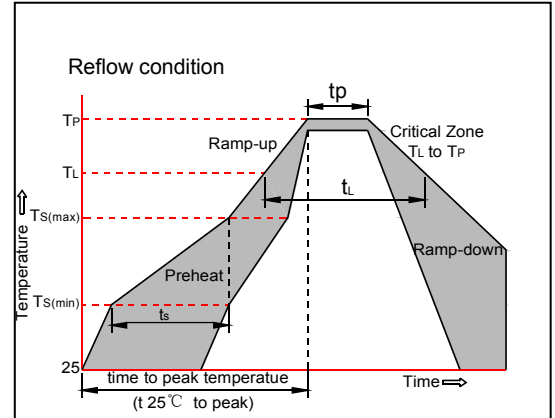
**ORDERING INFORMATION**

|                                     |                            |                               |   |
|-------------------------------------|----------------------------|-------------------------------|---|
| <b>SMF</b><br>200W SOD-123FL Series | <b>XX</b><br>$V_R$ Voltage | <b>C</b><br>C: Bi-directional | <b>A</b><br>5% $V_{BR}$ voltage tolerance |
|-------------------------------------|----------------------------|-------------------------------|---|

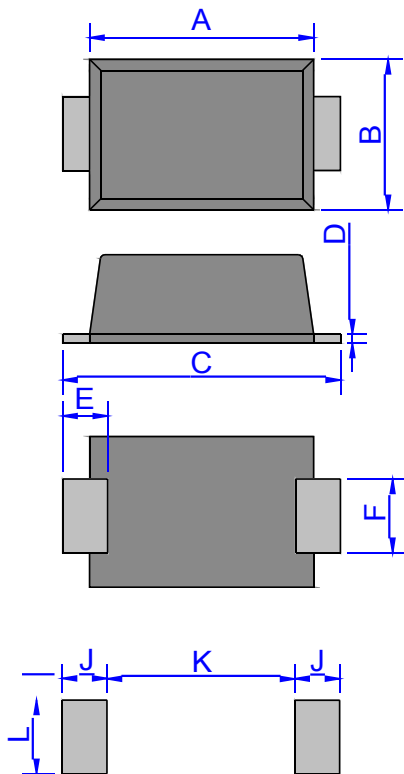
**RATINGS AND V-I CHARACTERISTICS CURVES ( $T_A=25^\circ\text{C}$ , unless otherwise noted)**
**FIG.1: V- I curve characteristics (Uni-directional)**

**FIG.2: V- I curve characteristics (Bi-directional)**

**FIG.3: Pulse waveform**

**FIG.4: Pulse derating curve**


## SOLDERING PARAMETERS

|  |                                   |   |
|--|-----------------------------------|---|
| Reflow Condition                                       |                                   | Pb-Free assembly<br>(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                                    |



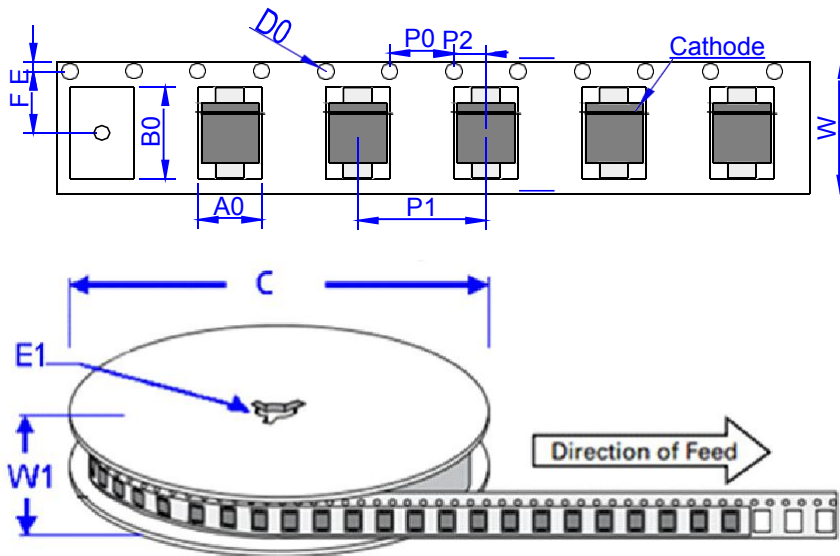
## PACKAGE MECHANICAL DATA



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    | 0.95        | 1.35 | 0.037  | 0.053 |
| 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 |

| OUTLINE | UNIT WEIGHT<br>(g/PCS) typ. | PACKAGE TYPE | QUANTITY | DESCRIPTION       |
|---------|-----------------------------|--------------|----------|-------------------|
| TAPING  | 0.0136                      | SOD-123FL    | 3000     | 7 inch reel pack  |
| TAPING  | 0.0136                      | SOD-123FL    | 10000    | 13 inch reel pack |

Website: <http://www.jksemi.com>

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