

### DESCRIPTION:

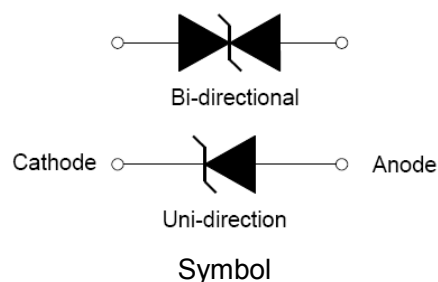
TVS diodes can be used in a wide range of applications which like consumer electronic products, automotive industries, munitions, telecommunications, aerospace industries, and intelligent control systems.



SMA

### FEATURES:

- ✧ Glass passivated or planar junction
- ✧ Excellent clamping capability
- ✧ Repetition rate (duty cycle): 0.01%
- ✧ Typical  $I_R$  less than  $1\mu A$  above 10V.
- ✧ Low profile package and low inductance
- ✧ 400W Peak Pulse power capability at  $10 \times 1000\mu s$  waveform.
- ✧ Fast response time: typically less than 1.0ps from 0V to  $V_{BR}$  min.
- ✧ High temperature soldering:  $260^\circ C/10s$  at terminals.
- ✧ Plastic package has Underwriters Laboratory Flammability 94V-0.
- ✧ For surface mounted applications in order to optimize board space
- ✧ AEC-Q101 qualified.



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

| Parameter   | Symbol      | Value       | Unit       |
|---|-------------|-------------|------------|
| Storage temperature range                                       | $T_{stg}$   | -55 to +125 | $^\circ C$ |
| Operating junction temperature range                            | $T_j$       | -55 to +125 | $^\circ C$ |
| Steady state power dissipation at $T_L=75^\circ C$              | $P_{M(AV)}$ | 3.3         | W          |
| Peak pulse power dissipation on 10/1000 $\mu s$ waveform        | $P_{PP}$    | 400         | W          |
| Maximum Instantaneous Forward Voltage at 30A for Unidirectional | $V_F$       | 5.0         | V          |

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

| Part Number |           | $V_R$ | $I_R@V_R$     | $V_{BR}@I_T$ |        | $I_T$ | $V_C@I_{PP}$ | $I_{PP}^{\text{①}}$ |
|-------------|-----------|-------|---------------|--------------|--------|-------|--------------|---------------------|
| Uni-Polar   | Bi-Polar  | V     | $\mu\text{A}$ | min(V)       | max(V) | mA    | max(V)       | A                   |
| SMAJ5.0A    | SMAJ5.0CA | 5.0   | 100           | 6.40         | 7.00   | 10    | 9.2          | 43.5                |
| SMAJ6.0A    | SMAJ6.0CA | 6.0   | 100           | 6.67         | 7.37   | 10    | 10.3         | 38.8                |
| SMAJ6.5A    | SMAJ6.5CA | 6.5   | 50            | 7.22         | 7.98   | 10    | 11.2         | 35.7                |
| SMAJ7.0A    | SMAJ7.0CA | 7.0   | 50            | 7.78         | 8.60   | 10    | 12.0         | 33.3                |
| SMAJ7.5A    | SMAJ7.5CA | 7.5   | 50            | 8.33         | 9.21   | 1     | 12.9         | 31.0                |
| SMAJ8.0A    | SMAJ8.0CA | 8.0   | 20            | 8.89         | 9.83   | 1     | 13.6         | 29.4                |
| SMAJ8.5A    | SMAJ8.5CA | 8.5   | 10            | 9.44         | 10.40  | 1     | 14.4         | 27.8                |
| SMAJ9.0A    | SMAJ9.0CA | 9.0   | 5             | 10.00        | 11.10  | 1     | 15.4         | 26.0                |
| SMAJ10A     | SMAJ10CA  | 10.0  | 2             | 11.10        | 12.30  | 1     | 17.0         | 23.5                |
| SMAJ11A     | SMAJ11CA  | 11.0  | 1             | 12.20        | 13.50  | 1     | 18.2         | 22.0                |
| SMAJ12A     | SMAJ12CA  | 12.0  | 1             | 13.30        | 14.70  | 1     | 19.9         | 20.1                |
| SMAJ13A     | SMAJ13CA  | 13.0  | 1             | 14.40        | 15.90  | 1     | 21.5         | 18.6                |
| SMAJ14A     | SMAJ14CA  | 14.0  | 1             | 15.60        | 17.20  | 1     | 23.2         | 17.3                |
| SMAJ15A     | SMAJ15CA  | 15.0  | 1             | 16.70        | 18.50  | 1     | 24.4         | 16.4                |
| SMAJ16A     | SMAJ16CA  | 16.0  | 1             | 17.80        | 19.70  | 1     | 26.0         | 15.4                |
| SMAJ17A     | SMAJ17CA  | 17.0  | 1             | 18.90        | 20.90  | 1     | 27.6         | 14.5                |
| SMAJ18A     | SMAJ18CA  | 18.0  | 1             | 20.00        | 22.10  | 1     | 29.2         | 13.7                |
| SMAJ20A     | SMAJ20CA  | 20.0  | 1             | 22.20        | 24.50  | 1     | 32.4         | 12.4                |
| SMAJ22A     | SMAJ22CA  | 22.0  | 1             | 24.40        | 26.90  | 1     | 35.5         | 11.3                |
| SMAJ24A     | SMAJ24CA  | 24.0  | 1             | 26.70        | 29.50  | 1     | 38.9         | 10.3                |
| SMAJ26A     | SMAJ26CA  | 26.0  | 1             | 28.90        | 31.90  | 1     | 42.1         | 9.5                 |
| SMAJ28A     | SMAJ28CA  | 28.0  | 1             | 31.10        | 34.40  | 1     | 45.4         | 8.8                 |
| SMAJ30A     | SMAJ30CA  | 30.0  | 1             | 33.30        | 36.80  | 1     | 48.4         | 8.3                 |
| SMAJ33A     | SMAJ33CA  | 33.0  | 1             | 36.70        | 40.60  | 1     | 53.3         | 7.5                 |
| SMAJ36A     | SMAJ36CA  | 36.0  | 1             | 40.00        | 44.20  | 1     | 58.1         | 6.9                 |
| SMAJ40A     | SMAJ40CA  | 40.0  | 1             | 44.40        | 49.10  | 1     | 64.5         | 6.2                 |
| SMAJ43A     | SMAJ43CA  | 43.0  | 1             | 47.80        | 52.80  | 1     | 69.4         | 5.8                 |
| SMAJ45A     | SMAJ45CA  | 45.0  | 1             | 50.00        | 55.30  | 1     | 72.7         | 5.5                 |
| SMAJ48A     | SMAJ48CA  | 48.0  | 1             | 53.30        | 58.90  | 1     | 77.4         | 5.2                 |
| SMAJ51A     | SMAJ51CA  | 51.0  | 1             | 56.70        | 62.70  | 1     | 82.4         | 4.9                 |

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

| Part Number |           | $V_R$ | $I_R@V_R$     | $V_{BR}@I_T$ |        | $I_T$ | $V_C@I_{PP}$ | $I_{PP}^{①}$ |
|-------------|-----------|-------|---------------|--------------|--------|-------|--------------|--------------|
| Uni-Polar   | Bi-Polar  | V     | $\mu\text{A}$ | min(V)       | max(V) | mA    | max(V)       | A            |
| SMAJ54A     | SMAJ54CA  | 54.0  | 1             | 60.00        | 66.30  | 1     | 87.1         | 4.6          |
| SMAJ58A     | SMAJ58CA  | 58.0  | 1             | 64.40        | 71.20  | 1     | 93.6         | 4.3          |
| SMAJ60A     | SMAJ60CA  | 60.0  | 1             | 66.70        | 73.70  | 1     | 96.8         | 4.1          |
| SMAJ64A     | SMAJ64CA  | 64.0  | 1             | 71.10        | 78.60  | 1     | 103.0        | 3.9          |
| SMAJ70A     | SMAJ70CA  | 70.0  | 1             | 77.80        | 86.00  | 1     | 113.0        | 3.6          |
| SMAJ75A     | SMAJ75CA  | 75.0  | 1             | 83.30        | 92.10  | 1     | 121.0        | 3.3          |
| SMAJ78A     | SMAJ78CA  | 78.0  | 1             | 86.70        | 95.80  | 1     | 126.0        | 3.2          |
| SMAJ85A     | SMAJ85CA  | 85.0  | 1             | 94.40        | 104.0  | 1     | 137.0        | 2.9          |
| SMAJ90A     | SMAJ90CA  | 90.0  | 1             | 100.0        | 111.0  | 1     | 146.0        | 2.8          |
| SMAJ100A    | SMAJ100CA | 100.0 | 1             | 111.0        | 123.0  | 1     | 162.0        | 2.5          |
| SMAJ110A    | SMAJ110CA | 110.0 | 1             | 122.0        | 135.0  | 1     | 177.0        | 2.3          |
| SMAJ120A    | SMAJ120CA | 120.0 | 1             | 133.0        | 147.0  | 1     | 193.0        | 2.1          |
| SMAJ130A    | SMAJ130CA | 130.0 | 1             | 144.0        | 159.0  | 1     | 209.0        | 1.9          |
| SMAJ150A    | SMAJ150CA | 150.0 | 1             | 167.0        | 185.0  | 1     | 243.0        | 1.7          |
| SMAJ160A    | SMAJ160CA | 160.0 | 1             | 178.0        | 197.0  | 1     | 259.0        | 1.6          |
| SMAJ170A    | SMAJ170CA | 170.0 | 1             | 189.0        | 209.0  | 1     | 275.0        | 1.5          |
| SMAJ180A    | SMAJ180CA | 180.0 | 1             | 201.0        | 222.0  | 1     | 292.0        | 1.4          |
| SMAJ200A    | SMAJ200CA | 200.0 | 1             | 224.0        | 247.0  | 1     | 324.0        | 1.3          |
| SMAJ220A    | SMAJ220CA | 220.0 | 1             | 246.0        | 272.0  | 1     | 356.0        | 1.1          |
| SMAJ250A    | SMAJ250CA | 250.0 | 1             | 279.0        | 309.0  | 1     | 405.0        | 1.0          |
| SMAJ300A    | SMAJ300CA | 300.0 | 1             | 335.0        | 371.0  | 1     | 486.0        | 0.8          |
| SMAJ350A    | SMAJ350CA | 350.0 | 1             | 391.0        | 432.0  | 1     | 567.0        | 0.7          |
| SMAJ400A    | SMAJ400CA | 400.0 | 1             | 447.0        | 494.0  | 1     | 648.0        | 0.6          |
| SMAJ440A    | SMAJ440CA | 440.0 | 1             | 492.0        | 543.0  | 1     | 713.0        | 0.6          |

① Surge waveform: 10/1000 $\mu\text{s}$

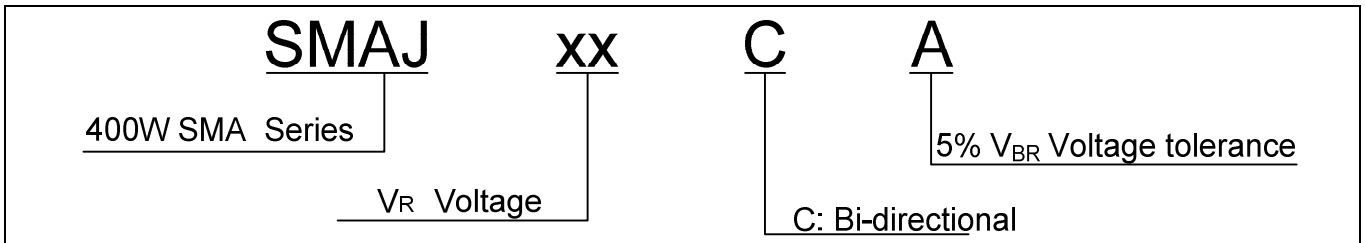
$V_R$  : Stand-off Voltage -- Maximum voltage that can be applied

$V_{BR}$ : Breakdown Voltage

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

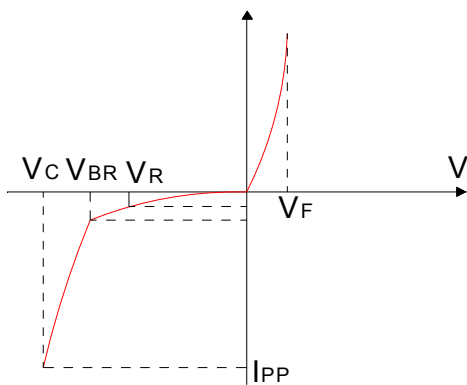
$I_R$ : Reverse Leakage Current

**ORDERING INFORMATION**

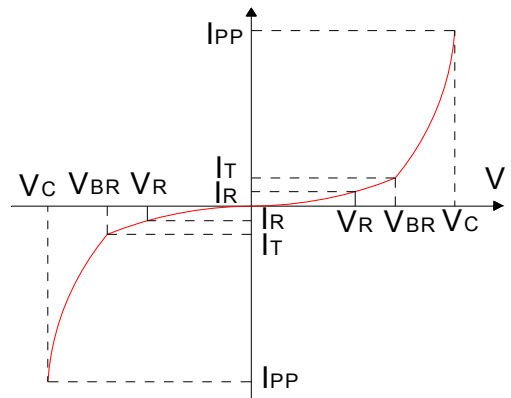


**RATINGS AND V-I CHARACTERISTICS CURVES** ( $T_A=25^\circ\text{C}$ , unless otherwise noted)

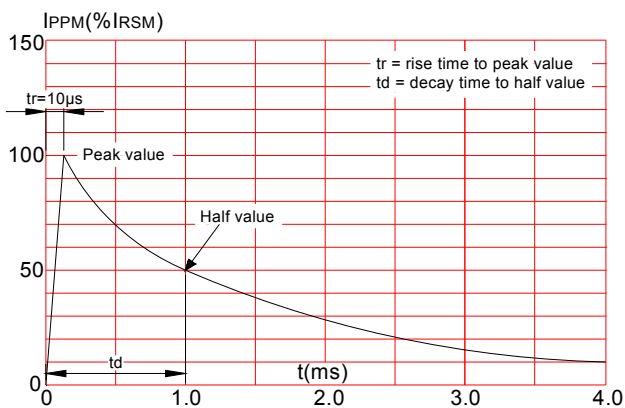
**FIG.1: V- I curve characteristics (Uni-directional)**



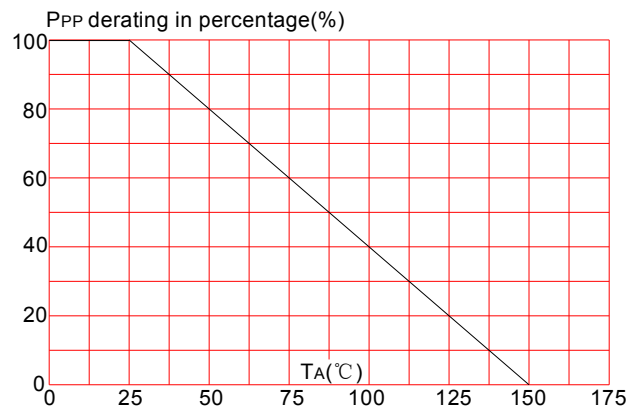
**FIG.2: V- I curve characteristics (Bi-directional)**



**FIG.3: Pulse waveform**

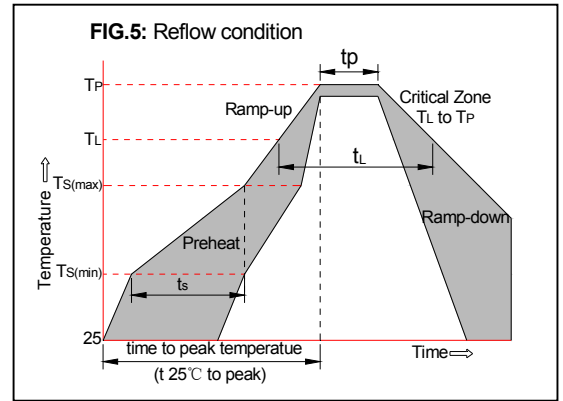


**FIG.4: Pulse derating curve**

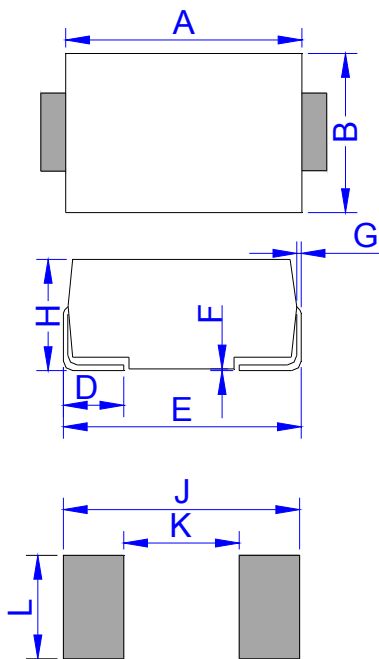


**SOLDERING PARAMETERS**

|   |                                   |                                 |
|---|-----------------------------------|---------------------------------|
| Reflow Condition  |                                   | Pb-Free assembly<br>(see FIG.5) |
| 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 (Liquid us Temp ( $T_L$ ) to peak) |                                   | 3°C/sec. Max                    |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate                    |                                   | 3°C/sec. Max                    |
| Reflow  | -Temperature( $T_L$ )(Liquid us)  | +217°C                          |
|   | -Temperature( $t_L$ )             | 60-150 secs.                    |
| Peak Temp ( $T_p$ )                                     |                                   | +260(+0/-5)°C                   |
| Time within 5°C of actual Peak Temp ( $t_p$ )           |                                   | 30 secs. Max                    |
| Ramp-down Rate  |                                   | 6°C/sec. Max                    |
| Time 25°C to Peak Temp ( $T_p$ )                        |                                   | 8 min. Max                      |
| Do not exceed   |                                   | +260°C                          |



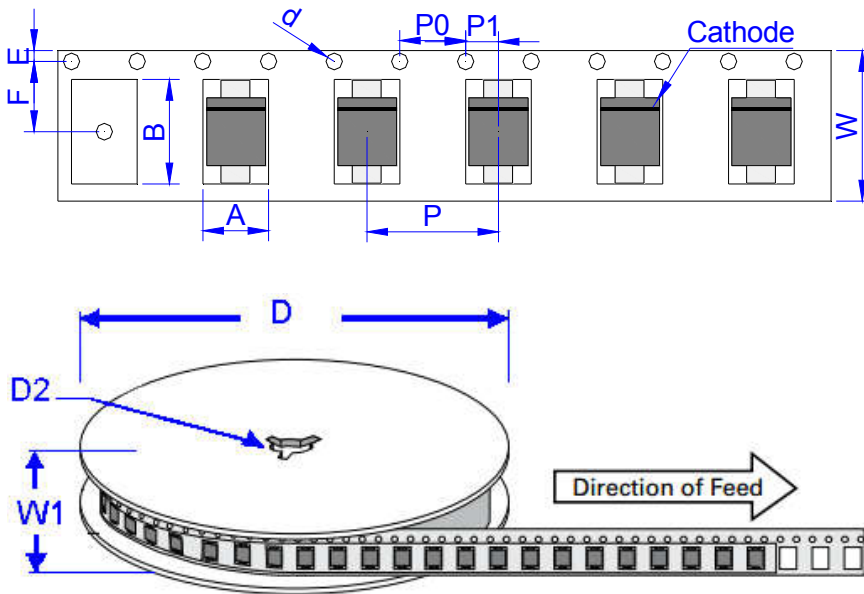
**PACKAGE MECHANICAL DATA**



DO-214AC (SMA)

| Ref. | Dimensions  |       |        |       |
|------|-------------|-------|--------|-------|
|      | Millimeters |       | Inches |       |
|      | Min.        | Max.  | Min.   | Max.  |
| A    | 4.25        | 4.65  | 0.167  | 0.183 |
| B    | 2.50        | 2.90  | 0.098  | 0.114 |
| C    | 1.35        | 1.65  | 0.053  | 0.065 |
| D    | 0.76        | 1.52  | 0.030  | 0.060 |
| E    | 4.93        | 5.28  | 0.194  | 0.208 |
| F    | 0.051       | 0.203 | 0.002  | 0.008 |
| G    | 0.15        | 0.31  | 0.006  | 0.012 |
| H    | 1.98        | 2.41  | 0.078  | 0.095 |
| J    | 6.50        |       | 0.256  |       |
| K    |             | 2.30  |        | 0.090 |
| L    | 1.70        |       | 0.067  |       |

## TAPE AND REEL SPECIFICATION-SMA



| Ref. | Dimensions  |               |
|------|-------------|---------------|
|      | Millimeters | Inches        |
| A    | 2.79 ± 0.3  | 0.110 ± 0.012 |
| B    | 5.33 ± 0.3  | 0.210 ± 0.012 |
| d    | 1.5 ± 0.1   | 0.059 ± 0.004 |
| D    | 330.0       | 13.0          |
| D2   | 13 ± 1      | 0.512 ± 0.039 |
| E    | 1.5 ± 0.2   | 0.059 ± 0.008 |
| F    | 5.65 ± 0.2  | 0.222 ± 0.008 |
| P    | 4.0 ± 0.2   | 0.157 ± 0.008 |
| P0   | 4.0 ± 0.2   | 0.157 ± 0.008 |
| P1   | 2.0 ± 0.2   | 0.079 ± 0.008 |
| W    | 12.0 ± 0.2  | 0.472 ± 0.008 |
| W1   | 16.8 ± 2.0  | 0.661 ± 0.079 |

| OUTLINE | REEL (PCS) | PER CARTON (PCS) | REEL DIAMETERS (mm) |
|---------|------------|------------------|---------------------|
| TAPING  | 5,000      | 80,000           | 330                 |