



## 5.0SMDJ Series 5000W Transient Voltage Suppressor

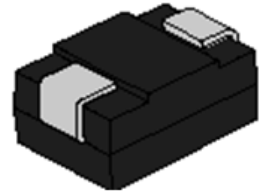
Rev.4.4

### 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.
- ✧ 5000W peak pulse power capability at 10/1000μs waveform.
- ✧ Typical  $I_R$  less than 1μA above 30V.
- ✧ Fast response time: typically less than 1.0ps from 0V to  $V_{BR}$  min.
- ✧ High temperature to reflow soldering: 260°C/40s at terminals.
- ✧ Plastic package has under writers laboratory flammability 94V-0.
- ✧ Meets MSL level 1, per J-STD-020, LF maximum peak of 260°C.
- ✧ Terminal: solder plated, solderable per J-STD-002.
- ✧ For surface mounted applications in order to optimize board space.
- ✧ UL 497B item recognized. (File No.:E480698).
- ✧ IEC61000-4-2 (ESD) ±30kV (air), ±30kV (contact).



SMC



Bi-directional



Uni-directional

Symbol

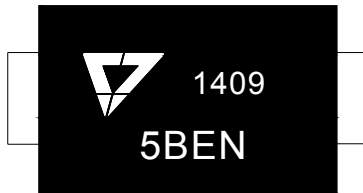
### ABSOLUTE MAXIMUM RATINGS ( $T_A=25^\circ\text{C}$ , RH=45%-75%, unless otherwise noted)

| Parameter   | Symbol          | Value       | Unit |
|---|-----------------|-------------|------|
| Operating junction and storage temperature range                      | $T_J/T_{STG}$   | -55 to +150 | °C   |
| Peak pulse power dissipation at 10/1000μs waveform                    | $P_{PP}$        | 5000        | W    |
| Steady state power dissipation at $T_L=75^\circ\text{C}$              | $P_{M(AV)}$     | 6.5         | W    |
| Maximum instantaneous forward voltage at 100A for unidirectional only | $V_F$           | 5.0         | V    |
| Peak forward surge current, 8.3ms single half sine wave(Note 1)       | $I_{FSM}$       | 300         | A    |
| Typical thermal resistance junction to lead                           | $R_{\theta JL}$ | 15          | °C/W |
| Typical thermal resistance junction to ambient                        | $R_{\theta JA}$ | 75          | °C/W |

### Notes:

1. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only, duty cycle=4 per minute maximum

## MARKING



5BEN: Device Marking Code  
1409: In ninth week, 2014

ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C)

| Part Number |             | Marking |      | V <sub>R</sub> | I <sub>R@V<sub>R</sub></sub> | V <sub>BR@I<sub>T</sub></sub> |        | I <sub>T</sub> | V <sub>C@I<sub>PP</sub></sub> | I <sub>PP</sub> <sup>①</sup> |
|-------------|-------------|---------|------|----------------|------------------------------|-------------------------------|--------|----------------|-------------------------------|------------------------------|
| Uni-Polar   | Bi-Polar    | Uni     | Bi   | V              | max(μA)                      | min(V)                        | max(V) | mA             | max(V)                        | A                            |
| 5.0SMDJ11A  | 5.0SMDJ11CA | 5PEN    | 5BEN | 11             | 5                            | 12.20                         | 13.50  | 10             | 18.2                          | 275.0                        |
| 5.0SMDJ12A  | 5.0SMDJ12CA | 5PEP    | 5BEP | 12             | 5                            | 13.30                         | 14.70  | 10             | 19.9                          | 252.0                        |
| 5.0SMDJ13A  | 5.0SMDJ13CA | 5PEQ    | 5BEQ | 13             | 5                            | 14.40                         | 15.90  | 10             | 21.5                          | 233.0                        |
| 5.0SMDJ14A  | 5.0SMDJ14CA | 5PER    | 5BER | 14             | 5                            | 15.60                         | 17.20  | 10             | 23.2                          | 216.0                        |
| 5.0SMDJ15A  | 5.0SMDJ15CA | 5PES    | 5BES | 15             | 5                            | 16.70                         | 18.50  | 1              | 24.4                          | 205.0                        |
| 5.0SMDJ16A  | 5.0SMDJ16CA | 5PET    | 5BET | 16             | 5                            | 17.80                         | 19.70  | 1              | 26.0                          | 193.0                        |
| 5.0SMDJ17A  | 5.0SMDJ17CA | 5PEU    | 5BEU | 17             | 5                            | 18.90                         | 20.90  | 1              | 27.6                          | 181.0                        |
| 5.0SMDJ18A  | 5.0SMDJ18CA | 5PEV    | 5BEV | 18             | 5                            | 20.00                         | 22.10  | 1              | 29.2                          | 172.0                        |
| 5.0SMDJ20A  | 5.0SMDJ20CA | 5PEW    | 5BEW | 20             | 5                            | 22.20                         | 24.50  | 1              | 32.4                          | 155.0                        |
| 5.0SMDJ22A  | 5.0SMDJ22CA | 5PEX    | 5BEX | 22             | 5                            | 24.40                         | 26.90  | 1              | 35.5                          | 141.0                        |
| 5.0SMDJ24A  | 5.0SMDJ24CA | 5PEZ    | 5BEZ | 24             | 5                            | 26.70                         | 29.50  | 1              | 38.9                          | 129.0                        |
| 5.0SMDJ26A  | 5.0SMDJ26CA | 5PFE    | 5BFE | 26             | 5                            | 28.90                         | 31.90  | 1              | 42.1                          | 119.0                        |
| 5.0SMDJ28A  | 5.0SMDJ28CA | 5PFG    | 5BFG | 28             | 5                            | 31.10                         | 34.40  | 1              | 45.4                          | 110.0                        |
| 5.0SMDJ30A  | 5.0SMDJ30CA | 5PFK    | 5BFK | 30             | 5                            | 33.30                         | 36.80  | 1              | 48.4                          | 103.0                        |
| 5.0SMDJ33A  | 5.0SMDJ33CA | 5PFM    | 5BFM | 33             | 1                            | 36.70                         | 40.60  | 1              | 53.3                          | 93.9                         |
| 5.0SMDJ36A  | 5.0SMDJ36CA | 5PFP    | 5BFP | 36             | 1                            | 40.00                         | 44.20  | 1              | 58.1                          | 86.1                         |
| 5.0SMDJ40A  | 5.0SMDJ40CA | 5PFR    | 5BFR | 40             | 1                            | 44.40                         | 49.10  | 1              | 64.5                          | 77.6                         |
| 5.0SMDJ43A  | 5.0SMDJ43CA | 5PFT    | 5BFT | 43             | 1                            | 47.80                         | 52.80  | 1              | 69.4                          | 72.1                         |
| 5.0SMDJ45A  | 5.0SMDJ45CA | 5PFV    | 5BFV | 45             | 1                            | 50.00                         | 55.30  | 1              | 72.7                          | 68.8                         |
| 5.0SMDJ48A  | 5.0SMDJ48CA | 5PFX    | 5BFX | 48             | 1                            | 53.30                         | 58.90  | 1              | 77.4                          | 64.7                         |
| 5.0SMDJ51A  | 5.0SMDJ51CA | 5PFZ    | 5BFZ | 51             | 1                            | 56.70                         | 62.70  | 1              | 82.4                          | 60.7                         |
| 5.0SMDJ54A  | 5.0SMDJ54CA | 5PGE    | 5BGE | 54             | 1                            | 60.00                         | 66.30  | 1              | 87.1                          | 57.5                         |
| 5.0SMDJ58A  | 5.0SMDJ58CA | 5PGG    | 5BGG | 58             | 1                            | 64.40                         | 71.20  | 1              | 93.6                          | 53.5                         |

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

| Part Number |              | Marking |      | $V_R$ | $I_R@V_R$            | $V_{BR}@I_T$ |        | $I_T$ | $V_C@I_{PP}$ | $I_{PP}^{①}$ |
|-------------|--------------|---------|------|-------|----------------------|--------------|--------|-------|--------------|--------------|
| Uni-Polar   | Bi-Polar     | Uni     | Bi   | V     | max( $\mu\text{A}$ ) | min(V)       | max(V) | mA    | max(V)       | A            |
| 5.0SMDJ60A  | 5.0SMDJ60CA  | 5PGK    | 5BGK | 60    | 1                    | 66.70        | 73.70  | 1     | 96.8         | 51.7         |
| 5.0SMDJ64A  | 5.0SMDJ64CA  | 5PGM    | 5BGM | 64    | 1                    | 71.10        | 78.60  | 1     | 103.0        | 48.6         |
| 5.0SMDJ70A  | 5.0SMDJ70CA  | 5PGP    | 5BGP | 70    | 1                    | 77.80        | 86.00  | 1     | 113.0        | 44.3         |
| 5.0SMDJ75A  | 5.0SMDJ75CA  | 5PGR    | 5BGR | 75    | 1                    | 83.30        | 92.10  | 1     | 121.0        | 41.4         |
| 5.0SMDJ78A  | 5.0SMDJ78CA  | 5PGT    | 5BGT | 78    | 1                    | 86.70        | 95.80  | 1     | 126.0        | 39.7         |
| 5.0SMDJ85A  | 5.0SMDJ85CA  | 5PGV    | 5BGV | 85    | 1                    | 94.40        | 104.0  | 1     | 137.0        | 36.5         |
| 5.0SMDJ90A  | 5.0SMDJ90CA  | 5PGX    | 5BGX | 90    | 1                    | 100.0        | 111.0  | 1     | 146.0        | 34.3         |
| 5.0SMDJ100A | 5.0SMDJ100CA | 5PGZ    | 5BGZ | 100   | 1                    | 111.0        | 123.0  | 1     | 162.0        | 30.9         |
| 5.0SMDJ110A | 5.0SMDJ110CA | 5PHE    | 5BHE | 110   | 1                    | 122.0        | 135.0  | 1     | 177.0        | 28.3         |
| 5.0SMDJ120A | 5.0SMDJ120CA | 5PHG    | 5BHG | 120   | 1                    | 133.0        | 147.0  | 1     | 193.0        | 26.0         |
| 5.0SMDJ130A | 5.0SMDJ130CA | 5PHK    | 5BHK | 130   | 1                    | 144.0        | 159.0  | 1     | 209.0        | 24.0         |
| 5.0SMDJ150A | 5.0SMDJ150CA | 5PHM    | 5BHM | 150   | 1                    | 167.0        | 185.0  | 1     | 243.0        | 20.6         |
| 5.0SMDJ160A | 5.0SMDJ160CA | 5PHP    | 5BHP | 160   | 1                    | 178.0        | 197.0  | 1     | 259.0        | 19.3         |
| 5.0SMDJ170A | 5.0SMDJ170CA | 5PHR    | 5BHR | 170   | 1                    | 189.0        | 209.0  | 1     | 275.0        | 18.2         |

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

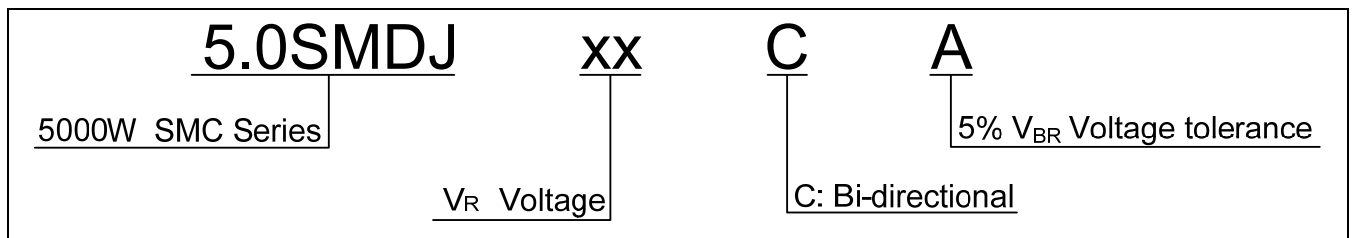
$V_R$ : Stand-off voltage -- Maximum voltage that can be applied

$V_{BR}$ : 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)

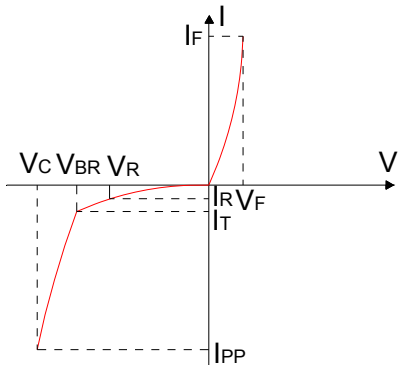


FIG.2:V- I curve characteristics (Bi-directional)

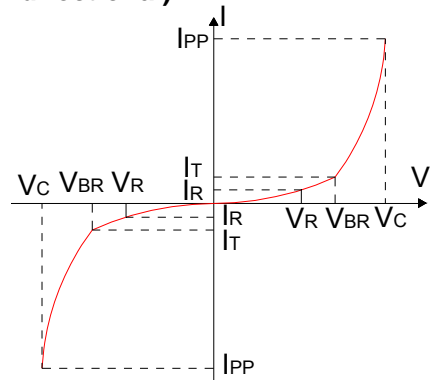


FIG.3: Pulse waveform

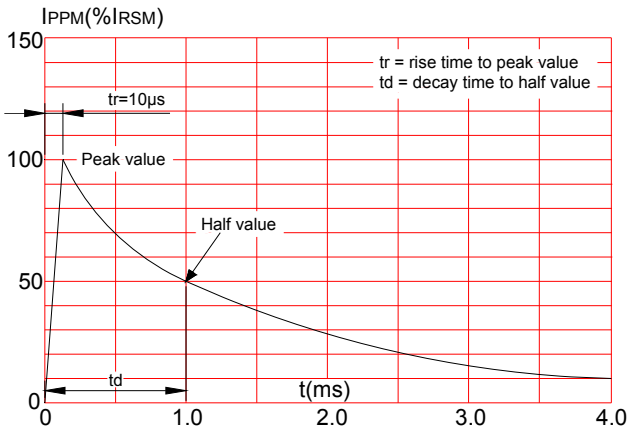


FIG.4: Pulse derating curve

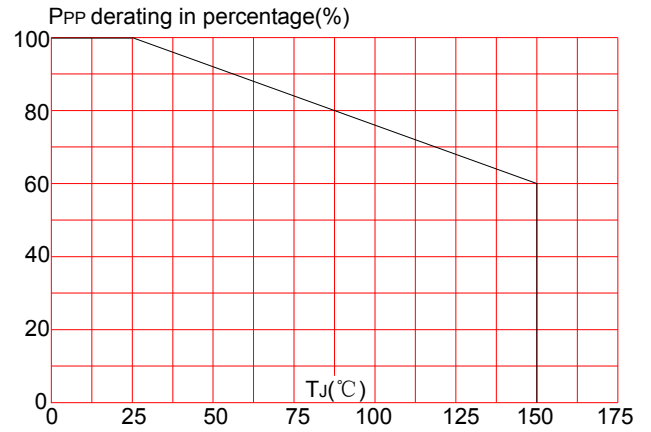


FIG.5: Typical junction capacitance

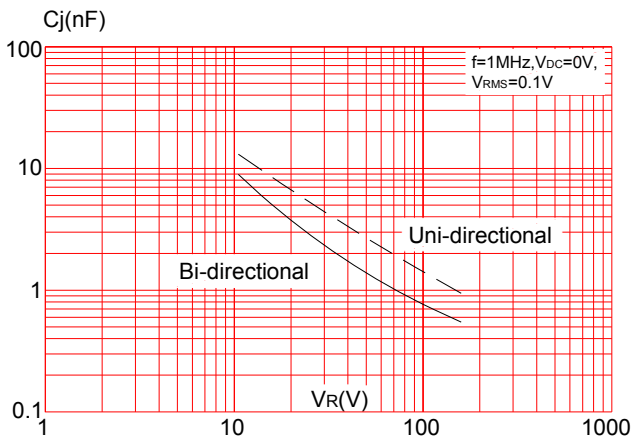
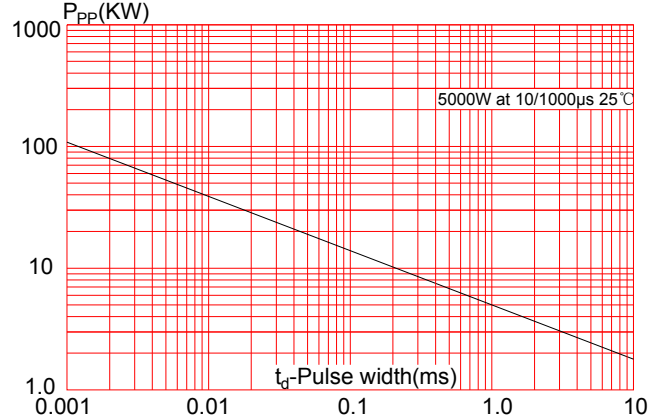
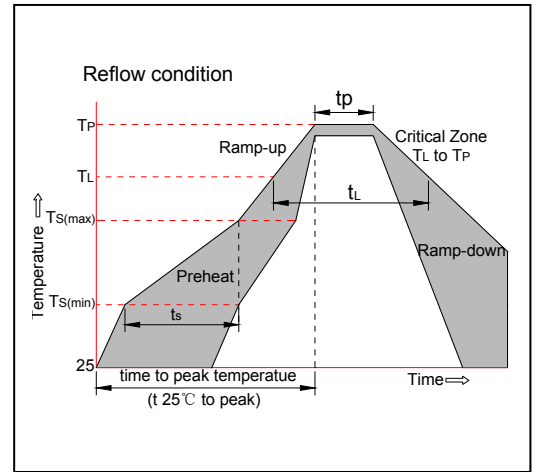


FIG.6:Peak pulse power dissipation vs. pulse width

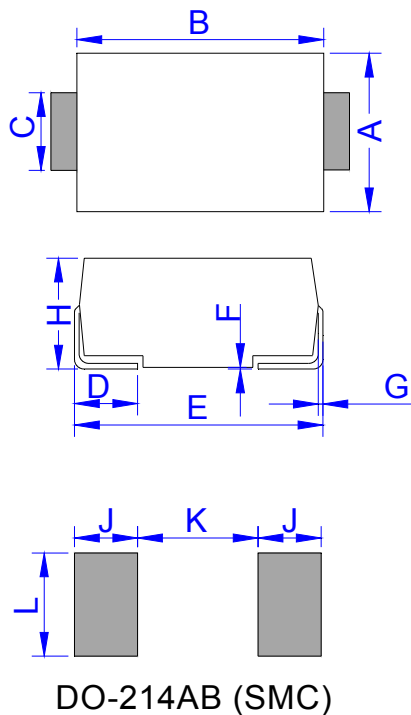


**SOLDERING PARAMETERS**

|  |                                   |   |
|--|-----------------------------------|---|
| 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                                    |

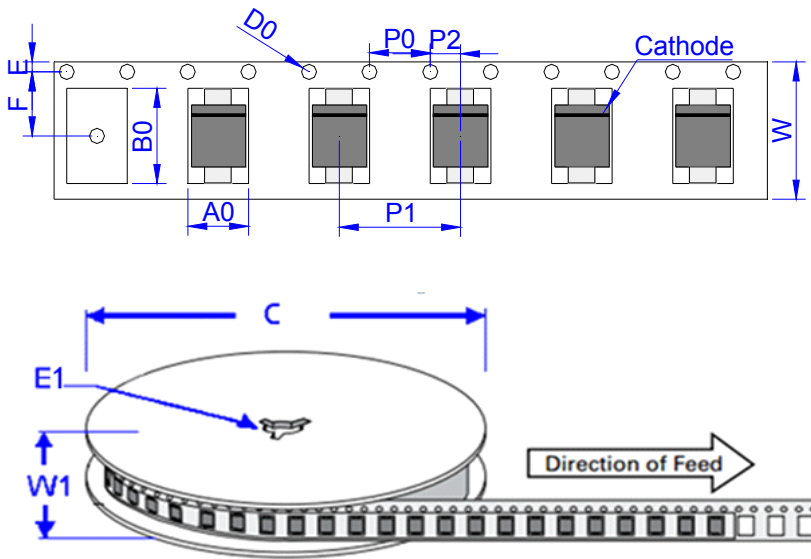


**PACKAGE MECHANICAL DATA**



| Ref. | Dimensions  |       |        |       |
|------|-------------|-------|--------|-------|
|      | Millimeters |       | Inches |       |
|      | Min.        | Max.  | Min.   | Max.  |
| A    | 5.75        | 6.25  | 0.226  | 0.246 |
| B    | 6.90        | 7.40  | 0.272  | 0.291 |
| C    | 2.75        | 3.25  | 0.108  | 0.128 |
| D    | 0.95        | 1.52  | 0.037  | 0.060 |
| E    | 7.70        | 8.20  | 0.303  | 0.323 |
| F    | 0.051       | 0.203 | 0.002  | 0.008 |
| G    | 0.15        | 0.31  | 0.006  | 0.012 |
| H    | 2.15        | 2.62  | 0.085  | 0.103 |
| J    | 2.40        |       | 0.094  |       |
| K    |             | 4.20  |        | 0.165 |
| L    | 3.30        |       | 0.130  |       |

TAPE AND REEL SPECIFICATION-SMC



| Ref. | Dimensions  |                |
|------|-------------|----------------|
|      | Millimeters | Inches         |
| A0   | 6.05 ± 0.3  | 0.238 ± 0.012  |
| B0   | 8.31 ± 0.3  | 0.327 ± 0.012  |
| C    | 330.0       | 13.0           |
| 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    | 7.50 ± 0.2  | 0.295 ± 0.008  |
| P0   | 4.00 ± 0.2  | 0.157 ± 0.008  |
| P1   | 8.00 ± 0.2  | 0.3145 ± 0.008 |
| P2   | 2.00 ± 0.2  | 0.079 ± 0.008  |
| W    | 16.0 ± 0.2  | 0.630 ± 0.008  |
| W1   | 19.7 ± 2.0  | 0.776 ± 0.079  |

| PART No.      | UNIT WEIGHT<br>(g/PCS) typ. | REEL<br>(PCS) | PER CARTON<br>(PCS) | DESCRIPTION       |
|---------------|-----------------------------|---------------|---------------------|-------------------|
| 5.0SMDJxxCA/A | 0.294/0.342<br>(NOTE)       | 3,000         | 48,000              | 13 inch reel pack |

Notes: 0.342g/PCS for single die; 0.294g/PCS for stacked dies

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