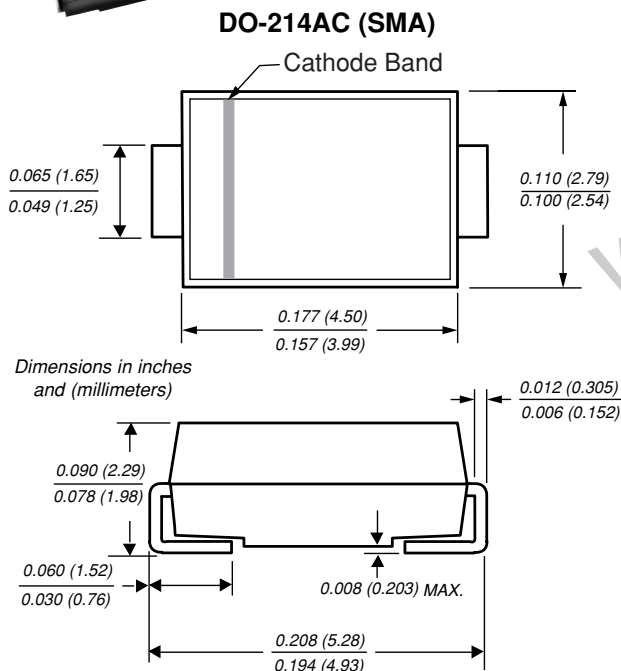




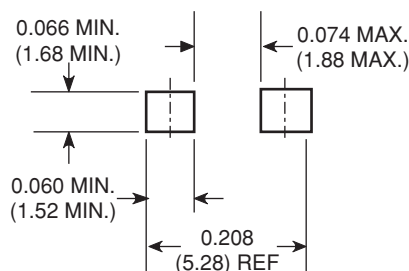
## Surface Mount TRANSZORB® Transient Voltage Suppressors

**Stand-off Voltage** 5.0 to 188V  
**Peak Pulse Power** 400W



Extended  
Voltage Range

### Mounting Pad Layout



### Features

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Ideal for ESD protection of data lines in accordance with IEC 1000-4-2 (IEC801-2)
- Ideal for EFT protection of data lines in accordance with IEC 1000-4-4 (IEC801-4)
- Low profile package with built-in strain relief for surface mounted applications
- Glass passivated junction
- Low incremental surge resistance, excellent clamping capability
- 400W peak pulse power capability with a 10/1000µs waveform, repetition rate (duty cycle): 0.01% (300W above 78V)
- Very fast response time
- High temperature soldering guaranteed: 250°C/10 seconds at terminals

### Mechanical Data

**Case:** JEDEC DO-214AC molded plastic over passivated chip

**Terminals:** Solder plated, solderable per MIL-STD-750, Method 2026

**Polarity:** For uni-directional types the band denotes the cathode, which is positive with respect to the anode under normal TVS operation

**Mounting Position:** Any **Weight:** 0.002 oz., 0.064 g

**Packaging Codes – Options (Antistatic):**

- 51 – 1K per Bulk box, 20K/carton
- 61 – 1.8K per 7" plastic Reel (12mm tape), 36K/carton
- 5A – 7.5K per 13" plastic Reel (12mm tape), 75K/carton

### Devices for Bidirectional Applications

For bi-directional devices, use suffix C or CA (e.g. SMAJ10C, SMAJ10CA). Electrical characteristics apply in both directions.

### Maximum Ratings & Thermal Characteristics

Ratings at 25°C ambient temperature unless otherwise specified.

| Parameter                                                                                  | Symbol                            | Value          | Unit |
|--------------------------------------------------------------------------------------------|-----------------------------------|----------------|------|
| Peak pulse power dissipation with a 10/1000µs waveform <sup>(1,2)</sup> (see fig. 1)       | PPPM                              | 400            | W    |
| Peak pulse current with a waveform <sup>(1)</sup>                                          | IPPM                              | See Next Table | A    |
| Peak forward surge current 8.3ms single half sine-wave uni-directional only <sup>(2)</sup> | IFSM                              | 40             | A    |
| Typical thermal resistance, junction to ambient <sup>(3)</sup>                             | R <sub>θJA</sub>                  | 120            | °C/W |
| Typical thermal resistance, junction to lead                                               | R <sub>θJL</sub>                  | 30             | °C/W |
| Operating junction and storage temperature range                                           | T <sub>J</sub> , T <sub>STG</sub> | –55 to +150    | °C   |

**Notes:** (1) Non-repetitive current pulse, per Fig. 3 and derated above T<sub>A</sub> = 25°C per Fig. 2. Rating is 300W above 78V

(2) Mounted on 0.2 x 0.2" (5.0 x 5.0mm) copper pads to each terminal

(3) Mounted on minimum recommended pad layout

# SMAJ5.0 thru 188CA

Vishay Semiconductors  
formerly General Semiconductor



## Electrical Characteristics

Ratings at 25°C ambient temperature unless otherwise specified.  $V_F = 3.5V$  at  $I_F = 25A$  (uni-directional only)

| Device Type             | Device Marking Code |    | Breakdown Voltage $V_{(BR)}$ at $I_T^{(1)}$ (V) |      | Test Current $I_T$ (mA) | Stand-off Voltage $V_{WM}$ (V) | Maximum Reverse Leakage at $V_{WM}$ $I_D$ ( $\mu A$ ) $^{(3)}$ | Maximum Peak Pulse Surge Current $I_{PPM}$ (A) $^{(2)}$ | Maximum Clamping Voltage at $I_{PPM}$ $V_C$ (V) |
|-------------------------|---------------------|----|-------------------------------------------------|------|-------------------------|--------------------------------|----------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------|
|                         | UNI                 | BI | Min                                             | Max  |                         |                                |                                                                |                                                         |                                                 |
| SMAJ5.0                 | AD                  | WD | 6.40                                            | 7.82 | 10                      | 5.0                            | 800                                                            | 41.7                                                    | 9.6                                             |
| SMAJ5.0A <sup>(5)</sup> | AE                  | WE | 6.40                                            | 7.07 | 10                      | 5.0                            | 800                                                            | 43.5                                                    | 9.2                                             |
| SMAJ6.0                 | AF                  | WF | 6.67                                            | 8.15 | 10                      | 6.0                            | 800                                                            | 35.1                                                    | 11.4                                            |
| SMAJ6.0A                | AG                  | WG | 6.67                                            | 7.37 | 10                      | 6.0                            | 800                                                            | 38.8                                                    | 10.3                                            |
| SMAJ6.5                 | AH                  | WH | 7.22                                            | 8.82 | 10                      | 6.5                            | 500                                                            | 32.5                                                    | 12.3                                            |
| SMAJ6.5A                | AK                  | WK | 7.22                                            | 7.98 | 10                      | 6.5                            | 500                                                            | 35.7                                                    | 11.2                                            |
| SMAJ7.0                 | AL                  | WL | 7.78                                            | 9.51 | 10                      | 7.0                            | 200                                                            | 30.1                                                    | 13.3                                            |
| SMAJ7.0A                | AM                  | WM | 7.78                                            | 8.60 | 10                      | 7.0                            | 200                                                            | 33.3                                                    | 12.0                                            |
| SMAJ7.5                 | AN                  | WN | 8.33                                            | 10.2 | 1.0                     | 7.5                            | 100                                                            | 28.0                                                    | 14.3                                            |
| SMAJ7.5A                | AP                  | WP | 8.33                                            | 9.21 | 1.0                     | 7.5                            | 100                                                            | 31.0                                                    | 12.9                                            |
| SMAJ8.0                 | AQ                  | WQ | 8.89                                            | 10.9 | 1.0                     | 8.0                            | 50                                                             | 26.7                                                    | 15.0                                            |
| SMAJ8.0A                | AR                  | WR | 8.89                                            | 9.83 | 1.0                     | 8.0                            | 50                                                             | 29.4                                                    | 13.6                                            |
| SMAJ8.5                 | AS                  | WS | 9.44                                            | 11.5 | 1.0                     | 8.5                            | 10                                                             | 25.2                                                    | 15.9                                            |
| SMAJ8.5A                | AT                  | WT | 9.44                                            | 10.4 | 1.0                     | 8.5                            | 10                                                             | 27.8                                                    | 14.4                                            |
| SMAJ9.0                 | AU                  | WU | 10.0                                            | 12.2 | 1.0                     | 9.0                            | 5.0                                                            | 23.7                                                    | 16.9                                            |
| SMAJ9.0A                | AV                  | WV | 10.0                                            | 11.1 | 1.0                     | 9.0                            | 5.0                                                            | 26.0                                                    | 15.4                                            |
| SMAJ10                  | AW                  | WW | 11.1                                            | 13.6 | 1.0                     | 10                             | 1.0                                                            | 21.3                                                    | 18.8                                            |
| SMAJ10A                 | AX                  | WX | 11.1                                            | 12.3 | 1.0                     | 10                             | 1.0                                                            | 23.5                                                    | 17.0                                            |
| SMAJ11                  | AY                  | WY | 12.2                                            | 14.9 | 1.0                     | 11                             | 1.0                                                            | 19.9                                                    | 20.1                                            |
| SMAJ11A                 | AZ                  | WZ | 12.2                                            | 13.5 | 1.0                     | 11                             | 1.0                                                            | 22.0                                                    | 18.2                                            |
| SMAJ12                  | BD                  | XD | 13.3                                            | 16.3 | 1.0                     | 12                             | 1.0                                                            | 18.2                                                    | 22.0                                            |
| SMAJ12A                 | BE                  | XE | 13.3                                            | 14.7 | 1.0                     | 12                             | 1.0                                                            | 20.1                                                    | 19.9                                            |
| SMAJ13                  | BF                  | XF | 14.4                                            | 17.6 | 1.0                     | 13                             | 1.0                                                            | 16.8                                                    | 23.8                                            |
| SMAJ13A                 | BG                  | XG | 14.4                                            | 15.9 | 1.0                     | 13                             | 1.0                                                            | 18.6                                                    | 21.5                                            |
| SMAJ14                  | BH                  | XH | 15.6                                            | 19.1 | 1.0                     | 14                             | 1.0                                                            | 15.5                                                    | 25.8                                            |
| SMAJ14A                 | BK                  | XK | 15.6                                            | 17.2 | 1.0                     | 14                             | 1.0                                                            | 17.2                                                    | 23.2                                            |
| SMAJ15                  | BL                  | XL | 16.7                                            | 20.4 | 1.0                     | 15                             | 1.0                                                            | 14.9                                                    | 26.9                                            |
| SMAJ15A                 | BM                  | XM | 16.7                                            | 18.5 | 1.0                     | 15                             | 1.0                                                            | 16.4                                                    | 24.4                                            |
| SMAJ16                  | BN                  | XN | 17.8                                            | 21.8 | 1.0                     | 16                             | 1.0                                                            | 13.9                                                    | 28.8                                            |
| SMAJ16A                 | BP                  | XP | 17.8                                            | 19.7 | 1.0                     | 16                             | 1.0                                                            | 15.4                                                    | 26.0                                            |
| SMAJ17                  | BQ                  | XQ | 18.9                                            | 23.1 | 1.0                     | 17                             | 1.0                                                            | 13.1                                                    | 30.5                                            |
| SMAJ17A                 | BR                  | XR | 18.9                                            | 20.9 | 1.0                     | 17                             | 1.0                                                            | 14.5                                                    | 27.6                                            |
| SMAJ18                  | BS                  | XS | 20.0                                            | 24.4 | 1.0                     | 18                             | 1.0                                                            | 12.4                                                    | 32.2                                            |
| SMAJ18A                 | BT                  | XT | 20.0                                            | 22.1 | 1.0                     | 18                             | 1.0                                                            | 13.7                                                    | 29.2                                            |
| SMAJ20                  | BU                  | XU | 22.2                                            | 27.1 | 1.0                     | 20                             | 1.0                                                            | 11.2                                                    | 35.8                                            |
| SMAJ20A                 | BV                  | XV | 22.2                                            | 24.5 | 1.0                     | 20                             | 1.0                                                            | 12.3                                                    | 32.4                                            |
| SMAJ22                  | BW                  | XW | 24.4                                            | 29.8 | 1.0                     | 22                             | 1.0                                                            | 10.2                                                    | 39.4                                            |
| SMAJ22A                 | BX                  | XX | 24.4                                            | 26.9 | 1.0                     | 22                             | 1.0                                                            | 11.3                                                    | 35.5                                            |
| SMAJ24                  | BY                  | XY | 26.7                                            | 32.6 | 1.0                     | 24                             | 1.0                                                            | 9.3                                                     | 43.0                                            |
| SMAJ24A                 | BZ                  | XZ | 26.7                                            | 29.5 | 1.0                     | 24                             | 1.0                                                            | 10.3                                                    | 38.9                                            |
| SMAJ26                  | CD                  | YD | 28.9                                            | 35.3 | 1.0                     | 26                             | 1.0                                                            | 8.6                                                     | 46.6                                            |
| SMAJ26A                 | CE                  | YE | 28.9                                            | 31.9 | 1.0                     | 26                             | 1.0                                                            | 9.5                                                     | 42.1                                            |
| SMAJ28                  | CF                  | YF | 31.1                                            | 38.0 | 1.0                     | 28                             | 1.0                                                            | 8.0                                                     | 50.0                                            |
| SMAJ28A                 | CG                  | YG | 31.1                                            | 34.4 | 1.0                     | 28                             | 1.0                                                            | 8.8                                                     | 45.4                                            |
| SMAJ30                  | CH                  | YH | 33.3                                            | 40.7 | 1.0                     | 30                             | 1.0                                                            | 7.5                                                     | 53.5                                            |
| SMAJ30A                 | CK                  | YK | 33.3                                            | 36.8 | 1.0                     | 30                             | 1.0                                                            | 8.3                                                     | 48.4                                            |

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

(2) Surge current waveform per Fig. 3 and derate per Fig. 2

(3) For bi-directional types having  $V_{WM}$  of 10 Volts and less, the  $I_D$  limit is doubled

(4) All terms and symbols are consistent with ANSI/IEEE C62.35

(5) For the bidirectional SMAJ5.0CA, the maximum  $V_{(BR)}$  is 7.25V.

**Electrical Characteristics**Ratings at 25°C ambient temperature unless otherwise specified.  $V_F = 3.5V$  at  $I_F = 25A$  (uni-directional only)

| Device Type | Device Marking Code |    | Breakdown Voltage $V_{(BR)}$ at $I_T^{(1)}$ (V) |      | Test Current $I_T$ (mA) | Stand-off Voltage $V_{WM}$ (V) | Maximum Reverse Leakage at $V_{WM}$ $I_D$ ( $\mu A$ ) <sup>(3)</sup> | Maximum Peak Pulse Surge Current $I_{PPM}$ (A) <sup>(2)</sup> | Maximum Clamping Voltage at $I_{PPM}$ $V_C$ (V) |
|-------------|---------------------|----|-------------------------------------------------|------|-------------------------|--------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------|-------------------------------------------------|
|             | UNI                 | BI | Min                                             | Max  |                         |                                |                                                                      |                                                               |                                                 |
| SMAJ33      | CL                  | YL | 36.7                                            | 44.9 | 1.0                     | 33                             | 1.0                                                                  | 6.8                                                           | 59.0                                            |
| SMAJ33A     | CM                  | YM | 36.7                                            | 40.6 | 1.0                     | 33                             | 1.0                                                                  | 7.5                                                           | 53.3                                            |
| SMAJ36      | CN                  | YN | 40.0                                            | 48.9 | 1.0                     | 36                             | 1.0                                                                  | 6.2                                                           | 64.3                                            |
| SMAJ36A     | CP                  | YP | 40.0                                            | 44.2 | 1.0                     | 36                             | 1.0                                                                  | 6.9                                                           | 58.1                                            |
| SMAJ40      | CQ                  | YQ | 44.4                                            | 54.3 | 1.0                     | 40                             | 1.0                                                                  | 5.6                                                           | 71.4                                            |
| SMAJ40A     | CR                  | YR | 44.4                                            | 49.1 | 1.0                     | 40                             | 1.0                                                                  | 6.2                                                           | 64.5                                            |
| SMAJ43      | CS                  | YS | 47.8                                            | 58.4 | 1.0                     | 43                             | 1.0                                                                  | 5.2                                                           | 76.7                                            |
| SMAJ43A     | CT                  | YT | 47.8                                            | 52.8 | 1.0                     | 43                             | 1.0                                                                  | 5.8                                                           | 69.4                                            |
| SMAJ45      | CU                  | YU | 50.0                                            | 61.1 | 1.0                     | 45                             | 1.0                                                                  | 5.0                                                           | 80.3                                            |
| SMAJ45A     | CV                  | YV | 50.0                                            | 55.3 | 1.0                     | 45                             | 1.0                                                                  | 5.5                                                           | 72.7                                            |
| SMAJ48      | CW                  | YW | 53.3                                            | 65.1 | 1.0                     | 48                             | 1.0                                                                  | 4.7                                                           | 85.5                                            |
| SMAJ48A     | CX                  | YX | 53.3                                            | 58.9 | 1.0                     | 48                             | 1.0                                                                  | 5.2                                                           | 77.4                                            |
| SMAJ51      | CY                  | YY | 56.7                                            | 69.3 | 1.0                     | 51                             | 1.0                                                                  | 4.4                                                           | 91.1                                            |
| SMAJ51A     | CZ                  | YZ | 56.7                                            | 62.7 | 1.0                     | 51                             | 1.0                                                                  | 4.9                                                           | 82.4                                            |
| SMAJ54      | RD                  | ZD | 60.0                                            | 73.3 | 1.0                     | 54                             | 1.0                                                                  | 4.2                                                           | 96.3                                            |
| SMAJ54A     | RE                  | ZE | 60.0                                            | 66.3 | 1.0                     | 54                             | 1.0                                                                  | 4.6                                                           | 87.1                                            |
| SMAJ58      | RF                  | ZF | 64.4                                            | 78.7 | 1.0                     | 58                             | 1.0                                                                  | 3.9                                                           | 103                                             |
| SMAJ58A     | RG                  | ZG | 64.4                                            | 71.2 | 1.0                     | 58                             | 1.0                                                                  | 4.3                                                           | 93.6                                            |
| SMAJ60      | RH                  | ZH | 66.7                                            | 81.5 | 1.0                     | 60                             | 1.0                                                                  | 3.7                                                           | 107                                             |
| SMAJ60A     | RK                  | ZK | 66.7                                            | 73.7 | 1.0                     | 60                             | 1.0                                                                  | 4.1                                                           | 96.8                                            |
| SMAJ64      | RL                  | ZL | 71.1                                            | 86.9 | 1.0                     | 64                             | 1.0                                                                  | 3.5                                                           | 114                                             |
| SMAJ64A     | RM                  | ZM | 71.1                                            | 78.6 | 1.0                     | 64                             | 1.0                                                                  | 3.9                                                           | 103                                             |
| SMAJ70      | RN                  | ZN | 77.8                                            | 95.1 | 1.0                     | 70                             | 1.0                                                                  | 3.2                                                           | 125                                             |
| SMAJ70A     | RP                  | ZP | 77.8                                            | 86.0 | 1.0                     | 70                             | 1.0                                                                  | 3.5                                                           | 113                                             |
| SMAJ75      | RQ                  | ZQ | 83.3                                            | 102  | 1.0                     | 75                             | 1.0                                                                  | 3.0                                                           | 134                                             |
| SMAJ75A     | RR                  | ZR | 83.3                                            | 92.1 | 1.0                     | 75                             | 1.0                                                                  | 3.3                                                           | 121                                             |
| SMAJ78      | RS                  | ZS | 86.7                                            | 106  | 1.0                     | 78                             | 1.0                                                                  | 2.9                                                           | 139                                             |
| SMAJ78A     | RT                  | ZT | 86.7                                            | 95.8 | 1.0                     | 78                             | 1.0                                                                  | 3.2                                                           | 126                                             |
| SMAJ85      | RU                  | ZU | 94.4                                            | 115  | 1.0                     | 85                             | 1.0                                                                  | 2.0                                                           | 151                                             |
| SMAJ85A     | RV                  | ZV | 94.4                                            | 104  | 1.0                     | 85                             | 1.0                                                                  | 2.2                                                           | 137                                             |
| SMAJ90      | RW                  | ZW | 100                                             | 122  | 1.0                     | 90                             | 1.0                                                                  | 1.9                                                           | 160                                             |
| SMAJ90A     | RX                  | ZX | 100                                             | 111  | 1.0                     | 90                             | 1.0                                                                  | 2.1                                                           | 146                                             |
| SMAJ100     | RY                  | ZY | 111                                             | 136  | 1.0                     | 100                            | 1.0                                                                  | 1.7                                                           | 179                                             |
| SMAJ100A    | RZ                  | ZZ | 111                                             | 123  | 1.0                     | 100                            | 1.0                                                                  | 1.9                                                           | 162                                             |
| SMAJ110     | VD                  | VD | 122                                             | 149  | 1.0                     | 110                            | 1.0                                                                  | 1.5                                                           | 196                                             |
| SMAJ110A    | SE                  | VE | 122                                             | 135  | 1.0                     | 110                            | 1.0                                                                  | 1.7                                                           | 177                                             |
| SMAJ120     | SF                  | VF | 133                                             | 163  | 1.0                     | 120                            | 1.0                                                                  | 1.4                                                           | 214                                             |
| SMAJ120A    | SG                  | VG | 133                                             | 147  | 1.0                     | 120                            | 1.0                                                                  | 1.6                                                           | 193                                             |
| SMAJ130     | SH                  | VH | 144                                             | 176  | 1.0                     | 130                            | 1.0                                                                  | 1.3                                                           | 231                                             |
| SMAJ130A    | SK                  | VK | 144                                             | 159  | 1.0                     | 130                            | 1.0                                                                  | 1.4                                                           | 209                                             |
| SMAJ150     | SL                  | VL | 167                                             | 204  | 1.0                     | 150                            | 1.0                                                                  | 1.1                                                           | 268                                             |
| SMAJ150A    | SM                  | VM | 167                                             | 185  | 1.0                     | 150                            | 1.0                                                                  | 1.2                                                           | 243                                             |
| SMAJ160     | SN                  | VN | 178                                             | 218  | 1.0                     | 160                            | 1.0                                                                  | 1.0                                                           | 287                                             |
| SMAJ160A    | SP                  | VP | 178                                             | 197  | 1.0                     | 160                            | 1.0                                                                  | 1.2                                                           | 259                                             |
| SMAJ170     | SQ                  | VQ | 189                                             | 231  | 1.0                     | 170                            | 1.0                                                                  | 0.99                                                          | 304                                             |
| SMAJ170A    | SR                  | VR | 189                                             | 209  | 1.0                     | 170                            | 1.0                                                                  | 1.09                                                          | 275                                             |
| SMAJ188     | ST                  | VT | 209                                             | 255  | 1.0                     | 188                            | 1.0                                                                  | 0.9                                                           | 344                                             |
| SMAJ188A    | SS                  | VS | 209                                             | 231  | 1.0                     | 188                            | 1.0                                                                  | 0.91                                                          | 328                                             |

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

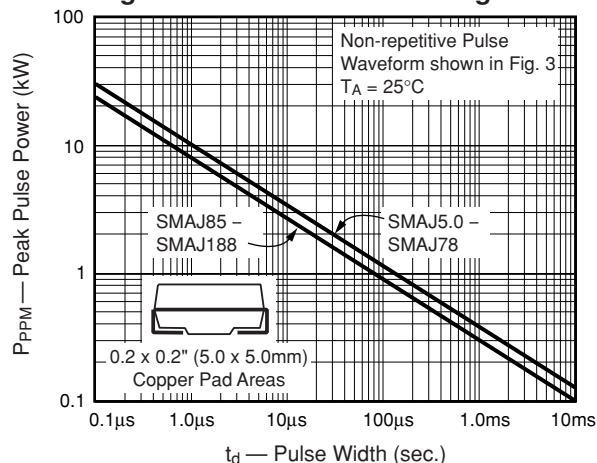
(2) Surge current waveform per Fig. 3 and derate per Fig. 2

(3) For bi-directional types having  $V_{WM}$  of 10 Volts and less, the  $I_D$  limit is doubled

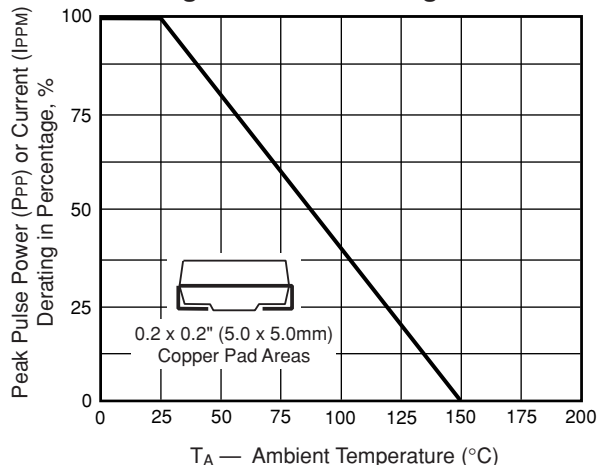
(4) All terms and symbols are consistent with ANSI/IEEE C62.35

## Ratings and Characteristic Curves ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

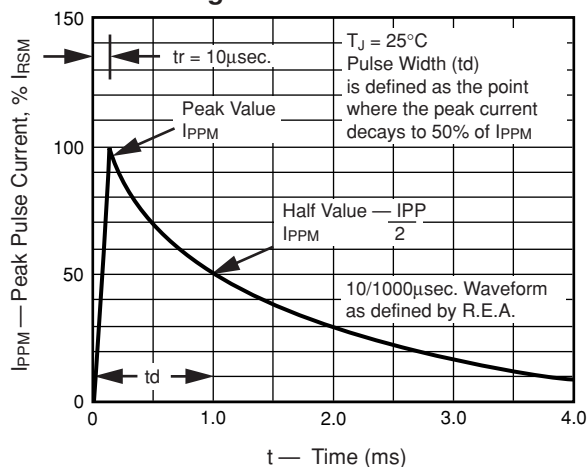
**Fig. 1 – Peak Pulse Power Rating Curve**



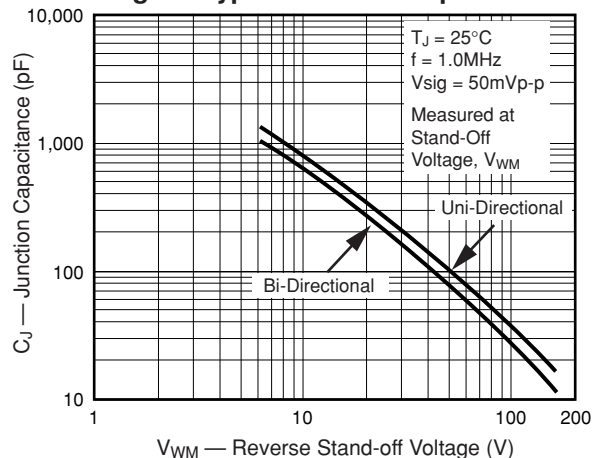
**Fig. 2 – Pulse Derating Curve**



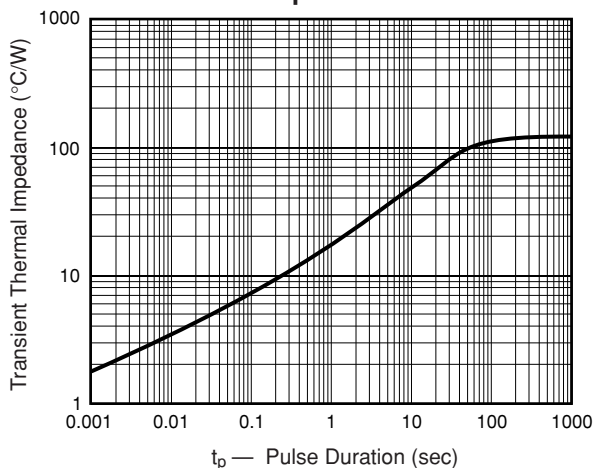
**Fig. 3 – Pulse Waveform**



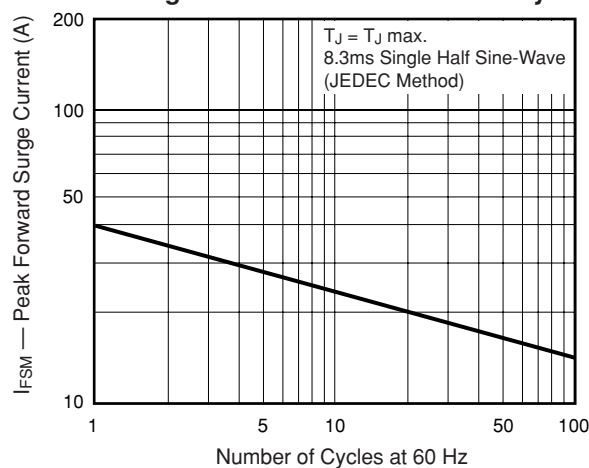
**Fig. 4 – Typical Junction Capacitance**



**Fig. 5 – Typical Transient Thermal Impedance**



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





### Notice

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