

# Surface Mount TRANSZORB® Transient Voltage Suppressors



DO-214AC (SMA)

| PRIMARY CHARACTERISTICS                 |                |
|---|----------------|
| V <sub>BR</sub> uni-directional         | 6.8 V to 540 V |
| V <sub>BR</sub> bi-directional          | 6.8 V to 220 V |
| P <sub>PPM</sub>                        | 400 W, 300 W   |
| P <sub>D</sub>                          | 3.3 W          |
| I <sub>FSM</sub> (uni-directional only) | 40 A           |
| T <sub>J</sub> max.                     | 150 °C         |

## DEVICES FOR BI-DIRECTION APPLICATIONS

For bi-directional devices use CA suffix (e.g. P4SMA10CA).

Electrical characteristics apply in both directions.

## FEATURES

- Low profile package
- Ideal for automated placement
- Glass passivated chip junction
- Available in uni-directional and bi-directional 400 W peak pulse power capability with a 10/1000 μs waveform, repetitive rate (duty cycle): 0.01 % (300 W above 91 V)
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Solder dip 260 °C, 40 s
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC


**RoHS COMPLIANT**

## TYPICAL APPLICATIONS

Use in sensitive electronics protection against voltage transients induced by inductive load switching and lighting on ICs, MOSFET, signal lines of sensor units for consumer, computer, industrial and telecommunication.

## MECHANICAL DATA

**Case:** DO-214AC (SMA)

Molding compound meets UL 94 V-0 flammability rating

Base P/N-E3 - RoHS compliant, commercial grade

Base P/NHE3 - RoHS compliant, high reliability/automotive grade (AEC Q101 qualified)

**Terminals:** Matte tin plated leads, solderable per J-STD-002 and JESD22-B102

E3 suffix meets JESD 201 class 1A whisker test, HE3 suffix meets JESD 201 class 2 whisker test

**Polarity:** For uni-directional types the band denotes cathode end, no marking on bi-directional types

| MAXIMUM RATINGS (T <sub>A</sub> = 25 °C unless otherwise noted)                             |                                   |                |      |
|---|-----------------------------------|----------------|------|
| PARAMETER   | SYMBOL                            | VALUE          | UNIT |
| Peak power dissipation with a 10/1000 μs waveform <sup>(1)(2)</sup> (Fig. 1)                | P <sub>PPM</sub>                  | 400            | W    |
| Peak pulse current with a 10/1000 μs waveform <sup>(1)</sup> (Fig. 3)                       | I <sub>PPM</sub>                  | See next table | A    |
| Power dissipation on infinite heatsink, T <sub>A</sub> = 50 °C                              | P <sub>D</sub>                    | 3.3            | W    |
| Peak forward surge current 8.3 ms single half sine-wave uni-directional only <sup>(2)</sup> | I <sub>FSM</sub>                  | 40             | A    |
| Operating junction and storage temperature range  | T <sub>J</sub> , T <sub>STG</sub> | - 65 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 300 W above 91 V

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



| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted) |                     |      |  |      |                         |                                |  |   |   |  |
|--|---------------------|------|--|------|-------------------------|--------------------------------|--|---|---|--|
| PART NUMBER  | DEVICE MARKING CODE |      | BREAKDOWN VOLTAGE $V_{BR}$ AT $I_T$ <sup>(1)</sup> |      | TEST CURRENT $I_T$ (mA) | STAND-OFF VOLTAGE $V_{WM}$ (V) | MAXIMUM REVERSE LEAKAGE AT $V_{WM}$ $I_D$ <sup>(4)</sup> ( $\mu\text{A}$ ) | MAXIMUM PEAK PULSE CURRENT $I_{PPM}$ <sup>(2)</sup> (A) | MAXIMUM CLAMPING VOLTAGE AT $I_{PPM}$ $V_C$ (V) | MAXIMUM TEMPERATURE OF $V_{BR}$ (%/ $^\circ\text{C}$ ) |
|  | UNI                 | BI   | MIN.   | MAX. |                         |                                |  |   |   |  |
| P4SMA6.8A  | 6V8A                | 6V8C | 6.45   | 7.14 | 10                      | 5.80                           | 1000   | 38.1  | 10.5  | 0.057  |
| P4SMA7.5A  | 7V5A                | 7V5C | 7.13   | 7.88 | 10                      | 6.40                           | 500  | 35.4  | 11.3  | 0.061  |
| P4SMA8.2A  | 8V2A                | 8V2C | 7.79   | 8.61 | 10                      | 7.02                           | 200  | 33.1  | 12.1  | 0.065  |
| P4SMA9.1A  | 9V1A                | 9V1C | 8.65   | 9.55 | 1.0                     | 7.78                           | 50.0   | 29.9  | 13.4  | 0.068  |
| P4SMA10A   | 10A                 | 10C  | 9.5  | 10.5 | 1.0                     | 8.55                           | 10.0   | 27.6  | 14.5  | 0.073  |
| P4SMA11A   | 11A                 | 11C  | 10.5   | 11.6 | 1.0                     | 9.40                           | 5.0  | 25.6  | 15.6  | 0.075  |
| P4SMA12A   | 12A                 | 12C  | 11.4   | 12.6 | 1.0                     | 10.2                           | 1.0  | 24.0  | 16.7  | 0.078  |
| P4SMA13A   | 13A                 | 13C  | 12.4   | 13.7 | 1.0                     | 11.1                           | 1.0  | 22.0  | 18.2  | 0.081  |
| P4SMA15A   | 15A                 | 15C  | 14.3   | 15.8 | 1.0                     | 12.8                           | 1.0  | 18.9  | 21.2  | 0.084  |
| P4SMA16A   | 16A                 | 16C  | 15.2   | 16.8 | 1.0                     | 13.6                           | 1.0  | 17.8  | 22.5  | 0.086  |
| P4SMA18A   | 18A                 | 18C  | 17.1   | 18.9 | 1.0                     | 15.3                           | 1.0  | 15.9  | 25.2  | 0.089  |
| P4SMA20A   | 20A                 | 20C  | 19.0   | 21.0 | 1.0                     | 17.1                           | 1.0  | 14.4  | 27.7  | 0.090  |
| P4SMA22A   | 22A                 | 22C  | 20.9   | 23.1 | 1.0                     | 18.8                           | 1.0  | 13.1  | 30.6  | 0.092  |
| P4SMA24A   | 24A                 | 24C  | 22.8   | 25.2 | 1.0                     | 20.5                           | 1.0  | 12.0  | 33.2  | 0.090  |
| P4SMA27A   | 27A                 | 27C  | 25.7   | 28.4 | 1.0                     | 23.1                           | 1.0  | 10.7  | 37.5  | 0.096  |
| P4SMA30A   | 30A                 | 30C  | 28.5   | 31.5 | 1.0                     | 25.6                           | 1.0  | 9.7   | 41.4  | 0.097  |
| P4SMA33A   | 33A                 | 33C  | 31.4   | 34.7 | 1.0                     | 28.2                           | 1.0  | 8.8   | 45.7  | 0.098  |
| P4SMA36A   | 36A                 | 36C  | 34.2   | 37.8 | 1.0                     | 30.8                           | 1.0  | 8.0   | 49.9  | 0.099  |
| P4SMA39A   | 39A                 | 39C  | 37.1   | 41.0 | 1.0                     | 33.3                           | 1.0  | 7.4   | 53.9  | 0.100  |
| P4SMA43A   | 43A                 | 43C  | 40.9   | 45.2 | 1.0                     | 36.8                           | 1.0  | 6.7   | 59.3  | 0.101  |
| P4SMA47A   | 47A                 | 47C  | 44.7   | 49.4 | 1.0                     | 40.2                           | 1.0  | 6.2   | 64.8  | 0.101  |
| P4SMA51A   | 51A                 | 51C  | 48.5   | 53.6 | 1.0                     | 43.6                           | 1.0  | 5.7   | 70.1  | 0.102  |
| P4SMA56A   | 56A                 | 56C  | 53.2   | 58.8 | 1.0                     | 47.8                           | 1.0  | 5.2   | 77.0  | 0.103  |
| P4SMA62A   | 62A                 | 62C  | 58.9   | 65.1 | 1.0                     | 53.0                           | 1.0  | 4.7   | 85.0  | 0.104  |
| P4SMA68A   | 68A                 | 68C  | 64.6   | 71.4 | 1.0                     | 58.1                           | 1.0  | 4.3   | 92.0  | 0.104  |
| P4SMA75A   | 75A                 | 75C  | 71.3   | 78.8 | 1.0                     | 64.1                           | 1.0  | 3.9   | 104   | 0.105  |
| P4SMA82A   | 82A                 | 82C  | 77.9   | 86.1 | 1.0                     | 70.1                           | 1.0  | 3.5   | 113   | 0.105  |
| P4SMA91A   | 91A                 | 91C  | 86.5   | 95.5 | 1.0                     | 77.8                           | 1.0  | 3.2   | 125   | 0.106  |
| P4SMA100A  | 100A                | 100C | 95.0   | 105  | 1.0                     | 85.5                           | 1.0  | 2.2   | 137   | 0.106  |
| P4SMA110A  | 110A                | 110C | 105  | 116  | 1.0                     | 94.0                           | 1.0  | 2.0   | 152   | 0.107  |
| P4SMA120A  | 120A                | 120C | 114  | 126  | 1.0                     | 102                            | 1.0  | 1.8   | 165   | 0.107  |
| P4SMA130A  | 130A                | 130C | 124  | 137  | 1.0                     | 111                            | 1.0  | 1.7   | 179   | 0.107  |
| P4SMA150A  | 150A                | 150C | 143  | 158  | 1.0                     | 128                            | 1.0  | 1.4   | 207   | 0.106  |
| P4SMA160A  | 160A                | 160C | 152  | 168  | 1.0                     | 136                            | 1.0  | 1.4   | 219   | 0.108  |
| P4SMA170A  | 170A                | 170C | 162  | 179  | 1.0                     | 145                            | 1.0  | 1.3   | 234   | 0.108  |
| P4SMA180A  | 180A                | 180C | 171  | 189  | 1.0                     | 154                            | 1.0  | 1.2   | 246   | 0.108  |
| P4SMA200A  | 200A                | 200C | 190  | 210  | 1.0                     | 171                            | 1.0  | 1.1   | 274   | 0.108  |
| P4SMA220A  | 220A                | 220C | 209  | 231  | 1.0                     | 185                            | 1.0  | 0.90  | 328   | 0.108  |
| P4SMA250A  | 250A                | -    | 237  | 263  | 1.0                     | 214                            | 1.0  | 0.87  | 344   | 0.110  |
| P4SMA300A  | 300A                | -    | 285  | 315  | 1.0                     | 256                            | 1.0  | 0.73  | 414   | 0.110  |
| P4SMA350A  | 350A                | -    | 333  | 368  | 1.0                     | 300                            | 1.0  | 0.62  | 482   | 0.110  |
| P4SMA400A  | 400A                | -    | 380  | 420  | 1.0                     | 342                            | 1.0  | 0.55  | 548   | 0.110  |
| P4SMA440A  | 440A                | -    | 418  | 462  | 1.0                     | 376                            | 1.0  | 0.50  | 602   | 0.110  |
| P4SMA480A  | 480A                | -    | 456  | 504  | 1.0                     | 408                            | 1.0  | 0.46  | 658   | 0.110  |
| P4SMA510A  | 510A                | -    | 485  | 535  | 1.0                     | 434                            | 1.0  | 0.43  | 698   | 0.110  |
| P4SMA540A  | 540A                | -    | 513  | 567  | 1.0                     | 459                            | 1.0  | 0.41  | 740   | 0.110  |

**Notes:**

- (1) Pulse test:  $t_p \leq 50\text{ ms}$
- (2) Surge current waveform per Fig. 3 and derate per Fig. 2
- (3) All terms and symbols are consistent with ANSI/IEEE CA62.35
- (4) For bi-directional types with  $V_R$  10 V and less, the  $I_D$  limit is doubled
- (5)  $V_F = 3.5\text{ V}$  at  $I_F = 25\text{ A}$  (uni-directional only)

| THERMAL CHARACTERISTICS ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted) |                 |       |                    |
|--|-----------------|-------|--------------------|
| PARAMETER  | SYMBOL          | VALUE | UNIT               |
| Thermal resistance, junction to ambient air <sup>(1)</sup>                         | $R_{\theta JA}$ | 120   | $^\circ\text{C/W}$ |
| Thermal resistance, junction to leads  | $R_{\theta JL}$ | 30    | $^\circ\text{C/W}$ |

**Note:**

(1) Mounted on minimum recommended pad layout

| ORDERING INFORMATION (Example) |                 |                        |               |                                    |
|--------------------------------|-----------------|------------------------|---------------|------------------------------------|
| PREFERRED P/N                  | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                      |
| P4SMA6.8A-E3/61                | 0.064           | 61                     | 1800          | 7" diameter plastic tape and reel  |
| P4SMA6.8A-E3/5A                | 0.064           | 5A                     | 7500          | 13" diameter plastic tape and reel |
| P4SMA6.8AHE3/61 <sup>(1)</sup> | 0.064           | 61                     | 1800          | 7" diameter plastic tape and reel  |
| P4SMA6.8AHE3/5A <sup>(1)</sup> | 0.064           | 5A                     | 7500          | 13" diameter plastic tape and reel |

**Note:**

(1) Automotive grade AEC Q101 qualified

### RATINGS AND CHARACTERISTICS CURVES

( $T_A = 25\text{ }^\circ\text{C}$  unless otherwise noted)

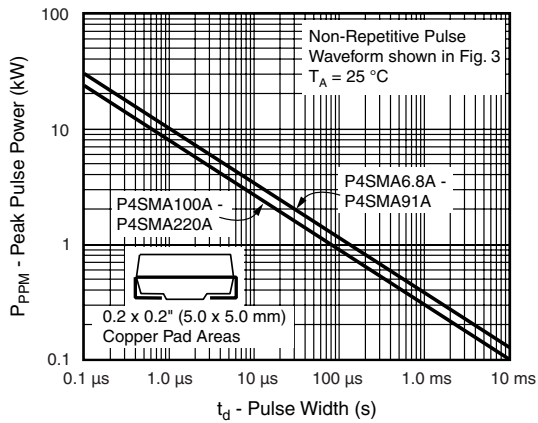


Figure 1. Peak Pulse Power Rating Curve

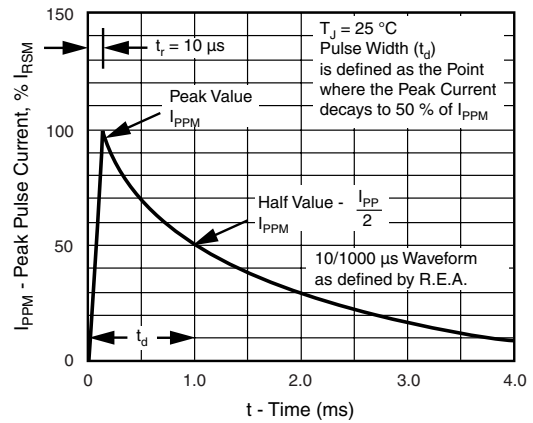


Figure 3. Pulse Waveform

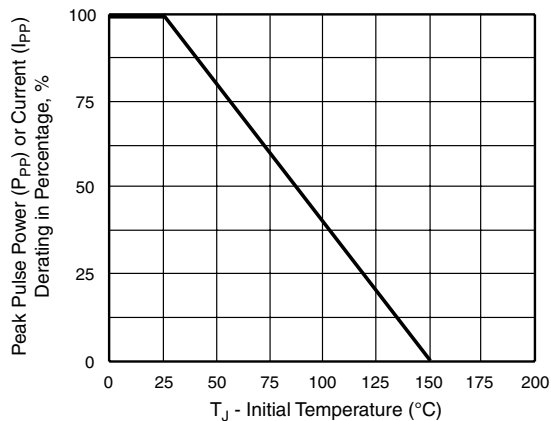


Figure 2. Pulse Power or Current vs. Initial Junction Temperature

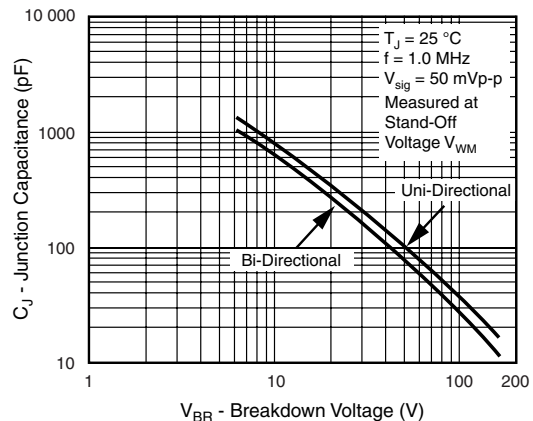


Figure 4. Typical Junction Capacitance

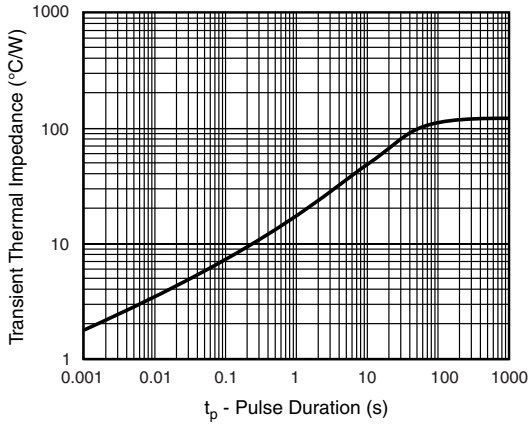


Figure 5. Typical Transient Thermal Impedance

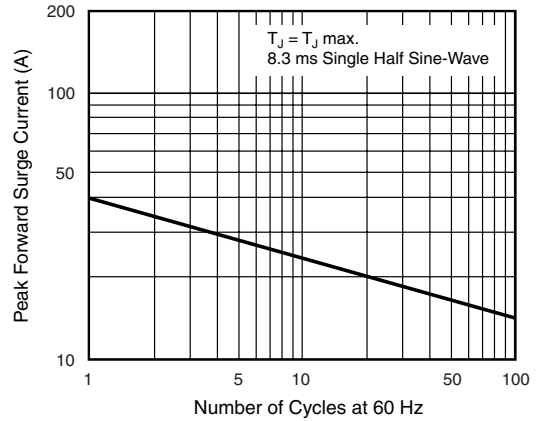
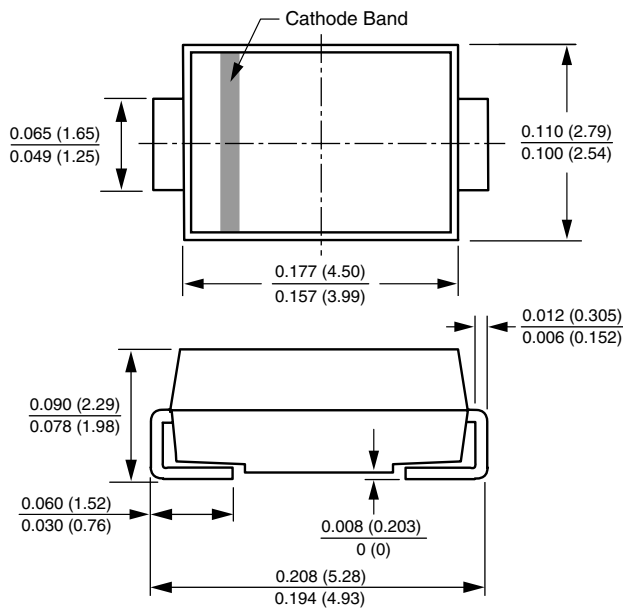


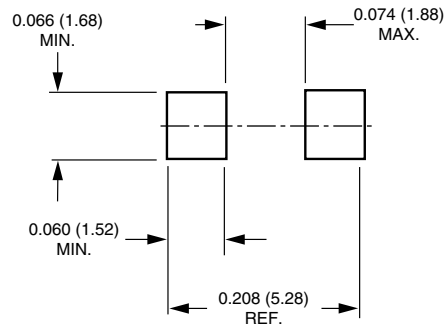
Figure 6. Maximum Non-Repetitive Forward Surge Current  
Uni-Directional Only

## PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

### DO-214AC (SMA)



### Mounting Pad Layout





## Disclaimer

All product specifications and data are subject to change without notice.

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