

# Surface-Mount TRANSZORB® Transient Voltage Suppressors


**SMB (DO-214AA)**

**LINKS TO ADDITIONAL RESOURCES**


| PRIMARY CHARACTERISTICS         |                               |
|---------------------------------|-------------------------------|
| $V_{WM}$ (unidirectional)       | 5.8 V to 459 V                |
| $V_{WM}$ (bidirectional)        | 5.8 V to 185 V                |
| $V_{BR}$ (unidirectional)       | 6.8 V to 540 V                |
| $V_{BR}$ (bidirectional)        | 6.8 V to 220 V                |
| $P_{PPM}$                       | 600 W                         |
| $P_D$                           | 5.0 W                         |
| $I_{FSM}$ (unidirectional only) | 100 A                         |
| $T_J$ max.                      | 150 °C                        |
| Polarity                        | Unidirectional, bidirectional |
| Package                         | SMB (DO-214AA)                |

**DEVICES FOR BIDIRECTION APPLICATIONS**

For bidirectional devices use CA suffix (e.g. P6SMB10CA). Electrical characteristics apply in both directions.

**FEATURES**

- Low profile package
- Ideal for automated placement
- Glass passivated chip junction
- Available in unidirectional and bidirectional
- 600 W peak pulse power capability with a 10/1000  $\mu$ s waveform, repetitive rate (duty cycle): 0.01 %
- 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
- AEC-Q101 qualified available
  - Automotive ordering code: base P/NHE3 or P/NHM3
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**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:** SMB (DO-214AA)

Molding compound meets UL 94 V-0 flammability rating  
 Base P/N-E3 - RoHS-compliant, commercial grade  
 Base P/N-M3 - halogen-free, RoHS-compliant, commercial grade  
 Base P/NHE3\_X - RoHS-compliant and AEC-Q101 qualified  
 Base P/NHM3\_X - halogen-free, RoHS-compliant, and AEC-Q101 qualified  
 (“\_X” denotes revision code e.g. A, B, ...)

**Terminals:** matte tin plated leads, solderable per J-STD-002 and JESD 22-B102

E3, M3, HE3, and HM3 suffix meets JESD 201 class 2 whisker test

**Polarity:** for unidirectional types the band denotes cathode end, no marking on bidirectional types

| MAXIMUM RATINGS ( $T_A = 25$ °C unless otherwise noted)                                    |                |                |      |
|--|----------------|----------------|------|
| PARAMETER  | SYMBOL         | VALUE          | UNIT |
| Peak power dissipation with a 10/1000 $\mu$ s waveform <sup>(1)(2)</sup> (fig. 1)          | $P_{PPM}$      | 600            | W    |
| Peak pulse current with a 10/1000 $\mu$ s waveform <sup>(1)</sup>                          | $I_{PPM}$      | See next table | A    |
| Power dissipation on infinite heatsink at $T_A = 50$ °C                                    | $P_D$          | 5.0            | W    |
| Peak forward surge current 8.3 ms single half sine-wave unidirectional only <sup>(2)</sup> | $I_{FSM}$      | 100            | A    |
| Operating junction and storage temperature range   | $T_J, T_{STG}$ | -65 to +150    | °C   |

**Notes**

- <sup>(1)</sup> Non-repetitive current pulse, per fig. 3 and derated above  $T_A = 25$  °C per fig. 2  
<sup>(2)</sup> Mounted on 0.2" x 0.2" (5.0 mm x 5.0 mm) copper pads to each terminal



| ELECTRICAL CHARACTERISTICS (T <sub>A</sub> = 25 °C unless otherwise noted) |                     |      |  |      |                                  |                                       |   |  |   |   |
|--|---------------------|------|--|------|----------------------------------|---------------------------------------|---|--|---|---|
| PART NUMBER  | DEVICE MARKING CODE |      | BREAKDOWN VOLTAGE V <sub>BR</sub> AT I <sub>T</sub> <sup>(1)</sup> (V) |      | TEST CURRENT I <sub>T</sub> (mA) | STAND-OFF VOLTAGE V <sub>WM</sub> (V) | MAXIMUM REVERSE LEAKAGE AT V <sub>WM</sub> I <sub>D</sub> <sup>(3)</sup> (μA) | MAXIMUM PEAK PULSE CURRENT I <sub>PPM</sub> <sup>(2)</sup> (A) | MAXIMUM CLAMPING VOLTAGE AT I <sub>PPM</sub> V <sub>C</sub> (V) | MAXIMUM TEMPERATURE COEFFICIENT OF V <sub>BR</sub> (%/°C) |
|  | UNI                 | BI   | MIN.   | MAX. |                                  |                                       |   |  |   |   |
| P6SMB6.8A  | 6V8A                | 6V8C | 6.45   | 7.14 | 10                               | 5.80                                  | 1000  | 57.1   | 10.5  | 0.057   |
| P6SMB7.5A  | 7V5A                | 7V5C | 7.13   | 7.88 | 10                               | 6.40                                  | 500   | 53.1   | 11.3  | 0.061   |
| P6SMB8.2A  | 8V2A                | 8V2C | 7.79   | 8.61 | 10                               | 7.02                                  | 200   | 49.6   | 12.1  | 0.065   |
| P6SMB9.1A  | 9V1A                | 9V1C | 8.65   | 9.55 | 1.0                              | 7.78                                  | 50  | 44.8   | 13.4  | 0.068   |
| P6SMB10A   | 10A                 | 10C  | 9.50   | 10.5 | 1.0                              | 8.55                                  | 10  | 41.4   | 14.5  | 0.073   |
| P6SMB11A   | 11A                 | 11C  | 10.5   | 11.6 | 1.0                              | 9.40                                  | 5.0   | 38.5   | 15.6  | 0.075   |
| P6SMB12A   | 12A                 | 12C  | 11.4   | 12.6 | 1.0                              | 10.2                                  | 5.0   | 35.9   | 16.7  | 0.078   |
| P6SMB13A   | 13A                 | 13C  | 12.4   | 13.7 | 1.0                              | 11.1                                  | 5.0   | 33.0   | 18.2  | 0.081   |
| P6SMB15A   | 15A                 | 15C  | 14.3   | 15.8 | 1.0                              | 12.8                                  | 1.0   | 28.3   | 21.2  | 0.084   |
| P6SMB16A   | 16A                 | 16C  | 15.2   | 16.8 | 1.0                              | 13.6                                  | 1.0   | 26.7   | 22.5  | 0.086   |
| P6SMB18A   | 18A                 | 18C  | 17.1   | 18.9 | 1.0                              | 15.3                                  | 1.0   | 23.8   | 25.2  | 0.088   |
| P6SMB20A   | 20A                 | 20C  | 19.0   | 21.0 | 1.0                              | 17.1                                  | 1.0   | 21.7   | 27.7  | 0.090   |
| P6SMB22A   | 22A                 | 22C  | 20.9   | 23.1 | 1.0                              | 18.8                                  | 1.0   | 19.6   | 30.6  | 0.092   |
| P6SMB24A   | 24A                 | 24C  | 22.8   | 25.2 | 1.0                              | 20.5                                  | 1.0   | 18.1   | 33.2  | 0.094   |
| P6SMB27A   | 27A                 | 27C  | 25.7   | 28.4 | 1.0                              | 23.1                                  | 1.0   | 16.0   | 37.5  | 0.096   |
| P6SMB30A   | 30A                 | 30C  | 28.5   | 31.5 | 1.0                              | 25.6                                  | 1.0   | 14.5   | 41.4  | 0.097   |
| P6SMB33A   | 33A                 | 33C  | 31.4   | 34.7 | 1.0                              | 28.2                                  | 1.0   | 13.1   | 45.7  | 0.098   |
| P6SMB36A   | 36A                 | 36C  | 34.2   | 37.8 | 1.0                              | 30.8                                  | 1.0   | 12.0   | 49.9  | 0.099   |
| P6SMB39A   | 39A                 | 39C  | 37.1   | 41.0 | 1.0                              | 33.3                                  | 1.0   | 11.1   | 53.9  | 0.100   |
| P6SMB43A   | 43A                 | 43C  | 40.9   | 45.2 | 1.0                              | 36.8                                  | 1.0   | 10.1   | 59.3  | 0.101   |
| P6SMB47A   | 47A                 | 47C  | 44.7   | 49.4 | 1.0                              | 40.2                                  | 1.0   | 9.3  | 64.8  | 0.101   |
| P6SMB51A   | 51A                 | 51C  | 48.5   | 53.6 | 1.0                              | 43.6                                  | 1.0   | 8.6  | 70.1  | 0.102   |
| P6SMB56A   | 56A                 | 56C  | 53.2   | 58.8 | 1.0                              | 47.8                                  | 1.0   | 7.8  | 77.0  | 0.103   |
| P6SMB62A   | 62A                 | 62C  | 58.9   | 65.1 | 1.0                              | 53.0                                  | 1.0   | 7.1  | 85.0  | 0.104   |
| P6SMB68A   | 68A                 | 68C  | 64.6   | 71.4 | 1.0                              | 58.1                                  | 1.0   | 6.5  | 92.0  | 0.104   |
| P6SMB75A   | 75A                 | 75C  | 71.3   | 78.8 | 1.0                              | 64.1                                  | 1.0   | 5.8  | 103   | 0.105   |
| P6SMB82A   | 82A                 | 82C  | 77.9   | 86.1 | 1.0                              | 70.1                                  | 1.0   | 5.3  | 113   | 0.105   |
| P6SMB91A   | 91A                 | 91C  | 86.5   | 95.5 | 1.0                              | 77.8                                  | 1.0   | 4.8  | 125   | 0.106   |
| P6SMB100A  | 100A                | 100C | 95.0   | 105  | 1.0                              | 85.5                                  | 1.0   | 4.4  | 137   | 0.106   |
| P6SMB110A  | 110A                | 110C | 105  | 116  | 1.0                              | 94.0                                  | 1.0   | 3.9  | 152   | 0.107   |
| P6SMB120A  | 120A                | 120C | 114  | 126  | 1.0                              | 102                                   | 1.0   | 3.6  | 165   | 0.107   |
| P6SMB130A  | 130A                | 130C | 124  | 137  | 1.0                              | 111                                   | 1.0   | 3.4  | 179   | 0.107   |
| P6SMB150A  | 150A                | 150C | 143  | 158  | 1.0                              | 128                                   | 1.0   | 2.9  | 207   | 0.108   |
| P6SMB160A  | 160A                | 160C | 152  | 168  | 1.0                              | 136                                   | 1.0   | 2.7  | 219   | 0.108   |
| P6SMB170A  | 170A                | 170C | 162  | 179  | 1.0                              | 145                                   | 1.0   | 2.6  | 234   | 0.108   |
| P6SMB180A  | 180A                | 180C | 171  | 189  | 1.0                              | 154                                   | 1.0   | 2.4  | 246   | 0.108   |
| P6SMB200A  | 200A                | 200C | 190  | 210  | 1.0                              | 171                                   | 1.0   | 2.2  | 274   | 0.108   |
| P6SMB220A  | 220A                | 220C | 209  | 231  | 1.0                              | 185                                   | 1.0   | 1.8  | 328   | 0.108   |
| P6SMB250A  | 250A                | -    | 237  | 263  | 1.0                              | 214                                   | 1.0   | 1.74   | 344   | 0.110   |
| P6SMB300A  | 300A                | -    | 285  | 315  | 1.0                              | 256                                   | 1.0   | 1.45   | 414   | 0.110   |
| P6SMB350A  | 350A                | -    | 333  | 368  | 1.0                              | 300                                   | 1.0   | 1.24   | 482   | 0.110   |
| P6SMB400A  | 400A                | -    | 380  | 420  | 1.0                              | 342                                   | 1.0   | 1.10   | 548   | 0.110   |
| P6SMB440A  | 440A                | -    | 418  | 462  | 1.0                              | 376                                   | 1.0   | 1.00   | 602   | 0.110   |
| P6SMB480A  | 480A                | -    | 456  | 504  | 1.0                              | 408                                   | 1.0   | 0.91   | 658   | 0.110   |
| P6SMB510A  | 510A                | -    | 485  | 535  | 1.0                              | 434                                   | 1.0   | 0.86   | 698   | 0.110   |
| P6SMB540A  | 540A                | -    | 513  | 567  | 1.0                              | 459                                   | 1.0   | 0.81   | 740   | 0.110   |

Notes

- (1) Pulse test: t<sub>p</sub> ≤ 50 ms
- (2) Surge current waveform per fig. 3 and derate per fig. 2
- (3) For bi-directional types with V<sub>WM</sub> of 10 V and less, the I<sub>D</sub> limit is doubled
- (4) All terms and symbols are consistent with ANSI/IEEE CA62.35
- (5) V<sub>F</sub> = 3.5 V at I<sub>F</sub> = 50 A (unidirectional only)



| THERMAL CHARACTERISTICS (T <sub>A</sub> = 25 °C unless otherwise noted) |                  |       |       |
|---|------------------|-------|-------|
| PARAMETER   | SYMBOL           | VALUE | UNIT  |
| Typical thermal resistance, junction to ambient air <sup>(1)</sup>      | R <sub>θJA</sub> | 100   | °C/ W |
| Typical thermal resistance, junction to lead                            | R <sub>θJL</sub> | 20    |       |

Note

<sup>(1)</sup> Mounted on minimum recommended pad layout

ORDERING INFORMATION (Example)

| PREFERRED P/N                   | UNIT WEIGHT (g) | VOLTAGE RANGE (V) |            | PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                      |
|---------------------------------|-----------------|-------------------|------------|--------------|---------------|------------------------------------|
|                                 |                 | UNI               | BI         |              |               |                                    |
| P6SMB6.8A-E3/52                 | 0.106           | 6.8 to 220        | 6.8 to 220 | 52           | 750           | 7" diameter plastic tape and reel  |
| P6SMB6.8A-M3/52                 | 0.106           | 6.8 to 540        | 6.8 to 220 | 52           | 750           | 7" diameter plastic tape and reel  |
| P6SMB6.8A-E3/5B                 | 0.106           | 6.8 to 220        | 6.8 to 220 | 5B           | 3200          | 13" diameter plastic tape and reel |
| P6SMB6.8A-M3/5B                 | 0.106           | 6.8 to 540        | 6.8 to 220 | 5B           | 3200          | 13" diameter plastic tape and reel |
| P6SMB6.8AHE3_B/H <sup>(1)</sup> | 0.106           | 6.8 to 220        | 6.8 to 220 | H            | 750           | 7" diameter plastic tape and reel  |
| P6SMB6.8AHM3_B/H <sup>(1)</sup> |                 |                   |            |              |               |                                    |
| P6SMB6.8AHE3_B/I <sup>(1)</sup> | 0.106           | 6.8 to 220        | 6.8 to 220 | I            | 3200          | 13" diameter plastic tape and reel |
| P6SMB6.8AHM3_B/I <sup>(1)</sup> |                 |                   |            |              |               |                                    |
| P6SMB250AHM3_D/H <sup>(2)</sup> | 0.106           | 250 to 540        | -          | H            | 750           | 7" diameter plastic tape and reel  |
| P6SMB250AHM3_D/I <sup>(2)</sup> | 0.106           | 250 to 540        | -          | I            | 3200          | 13" diameter plastic tape and reel |

Notes

<sup>(1)</sup> \_B is available for P6SMB6.8(C)A to P6SMB220(C)A, AEC-Q101 qualified

<sup>(2)</sup> \_D is available for P6SMB250A to P6SMB540A, AEC-Q101 qualified

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

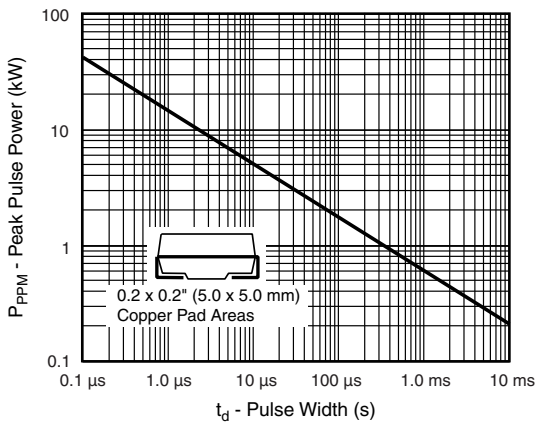


Fig. 1 - Peak Pulse Power Rating Curve

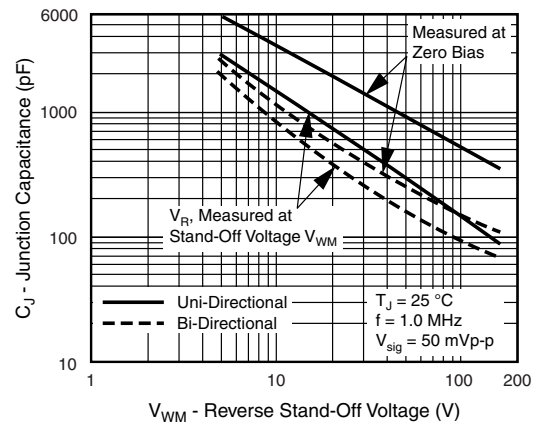


Fig. 4 - Typical Junction Capacitance

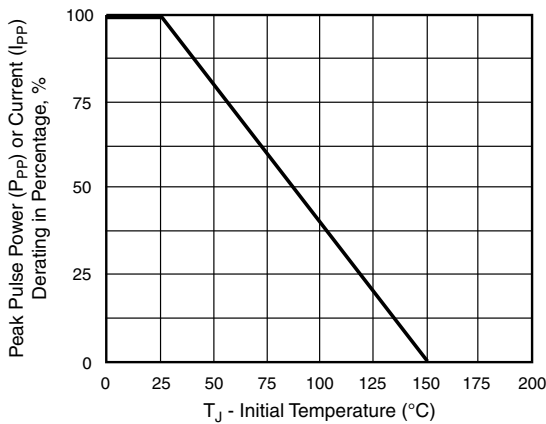


Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature

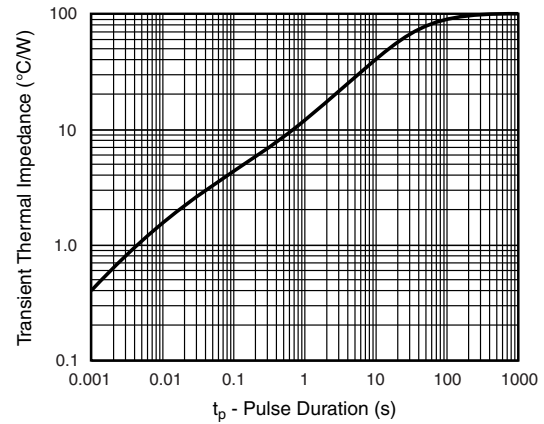


Fig. 5 - Typical Transient Thermal Impedance

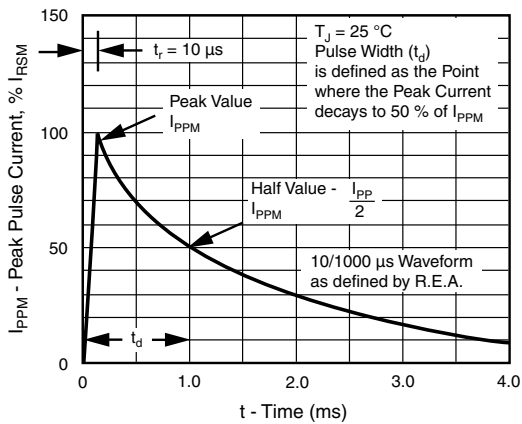


Fig. 3 - Pulse Waveform

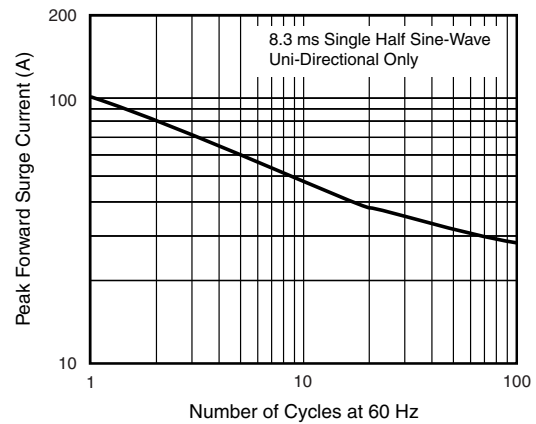
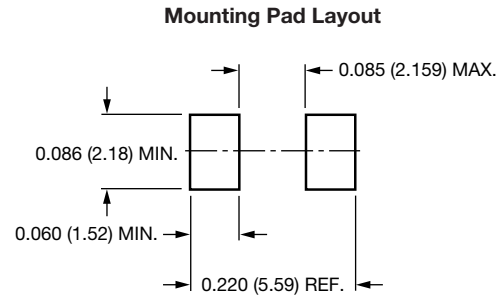
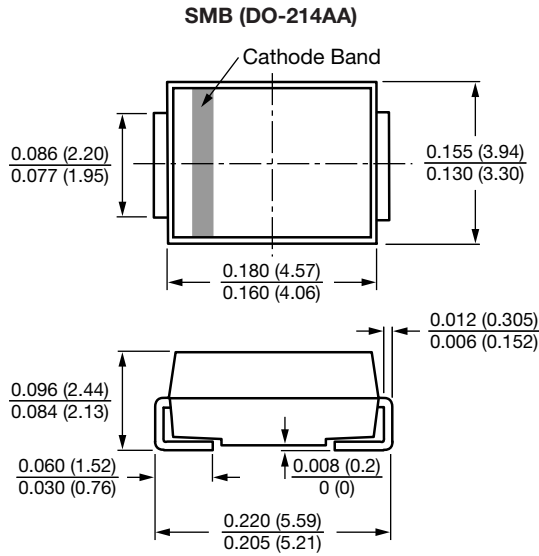


Fig. 6 - Maximum Non-Repetitive Peak Forward Surge Current



### PACKAGE OUTLINE DIMENSIONS in inches (millimeters)





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