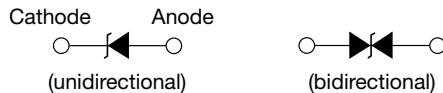


Surface-Mount TRANSZORB[®] Transient Voltage Suppressors


SMA (DO-214AC)


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} | 400 W, 300 W |
| P_D | 3.3 W |
| I_{FSM} (uni-directional only) | 40 A |
| T_J max. | 150 °C |
| Polarity | Unidirectional, bidirectional |
| Package | SMA (DO-214AC) |

DEVICES FOR BIDIRECTION APPLICATIONS

For bidirectional 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 unidirectional and bidirectional
- 400 W peak pulse power capability with a 10/1000 μ s 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
- AEC-Q101 qualified available
 - Automotive ordering code: P/NHE3 or P/NHM3
- Material categorization: for definitions of compliance please see 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: SMA (DO-214AC)

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 μ s waveform ⁽¹⁾⁽²⁾ (fig. 1) | P_{PPM} | 400 | W |
| Peak pulse current with a 10/1000 μ s waveform ⁽¹⁾ (fig. 3) | I_{PPM} | See next table | A |
| Power dissipation on infinite heatsink at $T_A = 50$ °C | P_D | 3.3 | W |
| Peak forward surge current 8.3 ms single half sine-wave unidirectional only ⁽²⁾ | I_{FSM} | 40 | A |
| Operating junction and storage temperature range | T_J, T_{STG} | -65 to +150 | °C |

Notes

- ⁽¹⁾ Non-repetitive current pulse, per fig. 3 and derated above $T_A = 25$ °C per fig. 2. Rating is 300 W above 91 V
⁽²⁾ Mounted on 0.2" x 0.2" (5.0 mm x 5.0 mm) copper pads to each terminal

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

| PART NUMBER | 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 ⁽⁴⁾ (μA) | MAXIMUM PEAK PULSE CURRENT I_{PPM} ⁽²⁾ (A) | MAXIMUM CLAMPING VOLTAGE AT I_{PPM} V_C (V) | MAXIMUM TEMPERATURE COEFFICIENT 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 | 29.9 | 13.4 | 0.068 |
| (+)P4SMA10A | 10A | 10C | 9.5 | 10.5 | 1.0 | 8.55 | 10 | 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 | 0.094 |
| (+)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 | 0.108 |
| (+)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 | 0.91 | 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 bidirectional types with V_R of 10 V and less, the I_D limit is doubled
- (5) $V_F = 3.5\text{ V}$ at $I_F = 25\text{ A}$ (unidirectional only)
- (+) Underwriters Laboratory Recognition for the classification of protectors (QVQG2) under the UL standard for safety 497B and file number E136766 for both unidirectional and bidirectional device

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

| PARAMETER | SYMBOL | VALUE | UNIT |
|--|-----------------|-------|------|
| Typical thermal resistance, junction to ambient air ⁽¹⁾ | $R_{\theta JA}$ | 120 | °C/W |
| Typical thermal resistance, junction to lead | $R_{\theta JL}$ | 30 | |

Note

⁽¹⁾ 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 - | | | |
| P4SMA6.8A-E3/61 | 0.064 | 6.8 to 220 | 6.8 to 220 | 61 | 1800 | 7" diameter plastic tape and reel |
| P4SMA6.8A-M3/61 | 0.064 | 6.8 to 540 | 6.8 to 220 | 61 | 1800 | 7" diameter plastic tape and reel |
| P4SMA6.8A-E3/5A | 0.064 | 6.8 to 220 | 6.8 to 220 | 5A | 7500 | 13" diameter plastic tape and reel |
| P4SMA6.8A-M3/5A | 0.064 | 6.8 to 540 | 6.8 to 220 | 5A | 7500 | 13" diameter plastic tape and reel |
| P4SMA6.8AHE3_A/H ⁽¹⁾ | 0.064 | 6.8 to 220 | 6.8 to 220 | H | 1800 | 7" diameter plastic tape and reel |
| P4SMA6.8AHM3_A/H ⁽¹⁾ | | | | | | |
| P4SMA6.8AHE3_A/I ⁽¹⁾ | 0.064 | 6.8 to 220 | 6.8 to 220 | I | 7500 | 13" diameter plastic tape and reel |
| P4SMA6.8AHM3_A/I ⁽¹⁾ | | | | | | |
| P4SMA250AHM3_B/H ⁽²⁾ | 0.064 | 250 to 540 | - | H | 1800 | 7" diameter plastic tape and reel |
| P4SMA250AHM3_B/I ⁽²⁾ | 0.064 | 250 to 540 | - | I | 7500 | 13" diameter plastic tape and reel |

Notes

⁽¹⁾ _A is available for P4SMA6.8(C)A to P4SMA220(C)A, AEC-Q101 qualified

⁽²⁾ _B is available for P4SMA250A to P4SMA540A, AEC-Q101 qualified

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

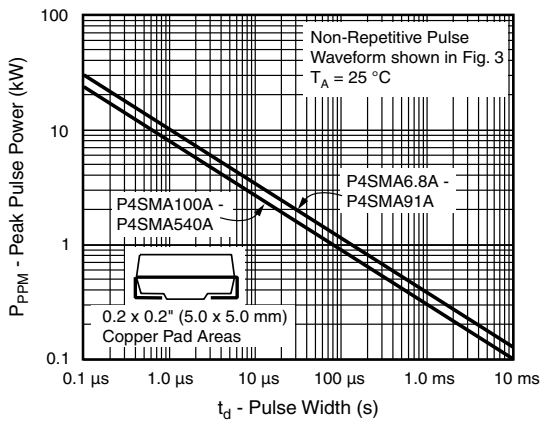


Fig. 1 - Peak Pulse Power Rating Curve

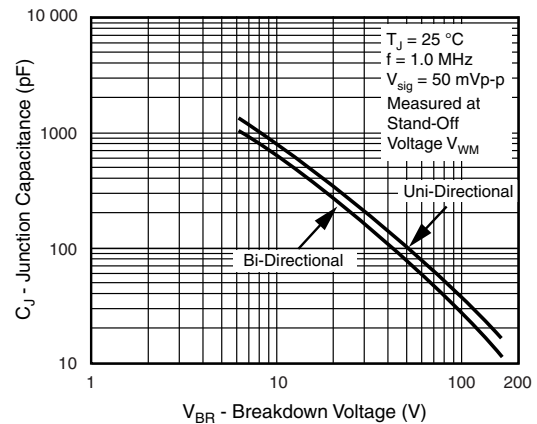


Fig. 4 - Typical Junction Capacitance

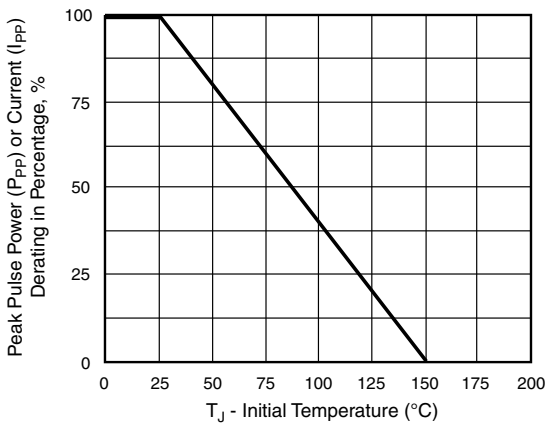


Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature

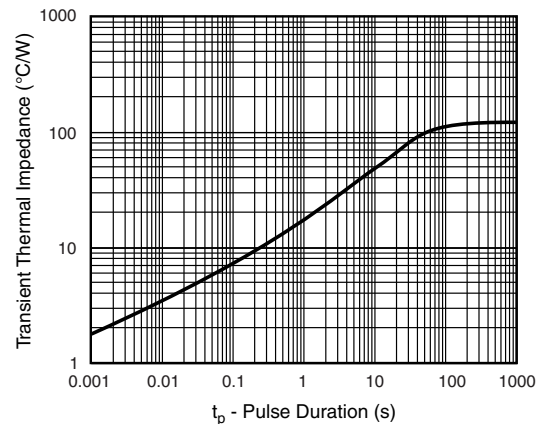


Fig. 5 - Typical Transient Thermal Impedance

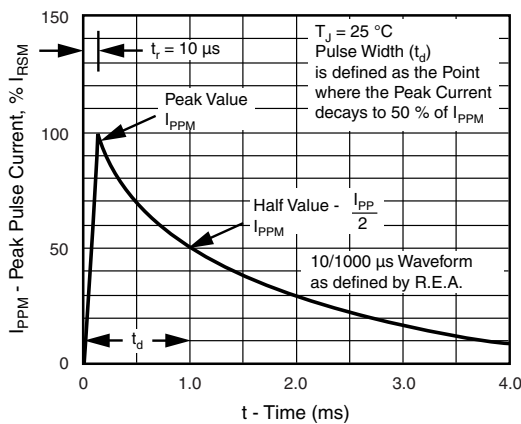


Fig. 3 - Pulse Waveform

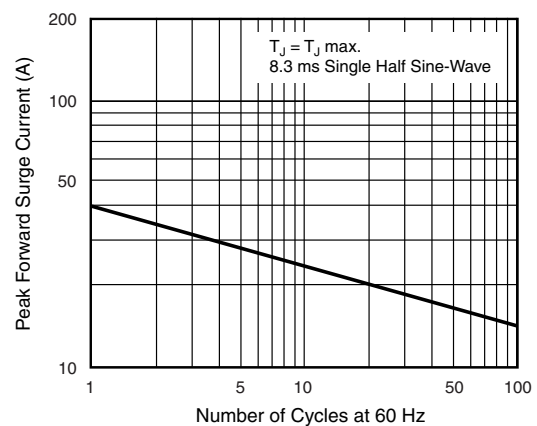


Fig. 6 - Maximum Non-Repetitive Forward Surge Current Uni-Directional Use Only



PACKAGE OUTLINE DIMENSIONS in inches (millimeters)





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