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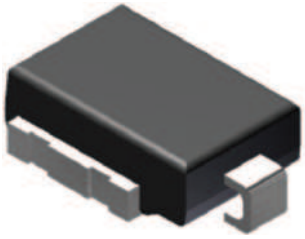
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# SM5S10AT thru SM5S43AT

Vishay General Semiconductor

## Surface Mount PAR® Transient Voltage Suppressors

High Temperature Stability and High Reliability Conditions



**DO-218 Compatible**




### FEATURES

- Junction passivation optimized design passivated anisotropic rectifier technology
- $T_J$ = 175 °C capability suitable for high reliability and automotive requirement
- Available in unidirectional polarity only
- Low leakage current
- Low forward voltage drop
- High surge capability
- Meets ISO7637-2 surge specification (varied by test condition)
- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- AEC-Q101 qualified available
  - Automotive ordering code: base P/NHE3
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

| PRIMARY CHARACTERISTICS | |
|---|---|
| $V_{WM}$ | 10 V to 43 V |
| $V_{BR}$ | 11.1 V to 52.8 V |
| $P_{PPM}$ (10 x 1000 µs) | 3600 W |
| $P_{PPM}$ (10 x 10 000 µs) | 2800 W |
| $P_D$ | 5 W |
| $I_{FSM}$ | 500 A |
| $T_J$ max. | 175 °C |
| Polarity | Unidirectional |
| Package | DO-218AC |

### TYPICAL APPLICATIONS

Use in sensitive electronics protection against voltage transients induced by inductive load switching and lighting, especially for automotive load dump protection application.

### MECHANICAL DATA

**Case:** DO-218AC
Molding compound meets UL 94 V-0 flammability rating
Base P/NHE3 - RoHS-compliant, AEC-Q101 qualified

**Terminals:** matte tin plated leads, solderable per J-STD-002 and JESD 22-B102
HE3 suffix meets JESD 201 class 2 whisker test

**Polarity:** heatsink is anode

**MAXIMUM RATINGS** ($T_A$ = 25 °C unless otherwise noted)

| PARAMETER | | SYMBOL | VALUE | UNIT |
|---|---|---|---|---|
| Peak pulse power dissipation | with 10/1000 µs waveform | $P_{PPM}$ | 3600 | W |
| | with 10/10 000 µs waveform | | 2800 | |
| Power dissipation on infinite heatsink at $T_C$ = 25 °C (fig. 1) | | $P_D$ | 5.0 | W |
| Peak pulse current with 10/1000 µs waveform | | $I_{PPM}$ (1) | See next table | A |
| Peak forward surge current 8.3 ms single half sine-wave | | $I_{FSM}$ | 500 | A |
| Operating junction and storage temperature range | | $T_J$, $T_{STG}$ | -55 to +175 | °C |

**Note**

(1) Non-repetitive current pulse at $T_A$ = 25 °C



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| ELECTRICAL CHARACTERISTICS ($T_A$ = 25 °C unless otherwise noted) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| DEVICE TYPE | BREAKDOWN VOLTAGE $V_{BR}$ (V) | | | TEST CURRENT $I_T$ (mA) | STAND-OFF VOLTAGE $V_{WM}$ (V) | MAXIMUM REVERSE LEAKAGE AT $V_{WM}$ $I_D$ (µA) | MAXIMUM REVERSE LEAKAGE AT $V_{WM}$ $T_J$ = 175 °C $I_D$ (µA) | MAX. PEAK PULSE CURRENT AT 10/1000 µs WAVEFORM (A) | MAXIMUM CLAMPING VOLTAGE AT $I_{PPM}$ $V_C$ (V) | TYPICAL TEMP. COEFFICIENT OF $V_{BR}$ [1] $\alpha T$ (%/°C) |
| | MIN. | NOM. | MAX. | | | | | | | |
| SM5S10AT | 11.1 | 11.7 | 12.3 | 5.0 | 10.0 | 15 | 250 | 212 | 17.0 | 0.069 |
| SM5S11AT | 12.2 | 12.9 | 13.5 | 5.0 | 11.0 | 10 | 150 | 198 | 18.2 | 0.072 |
| SM5S12AT | 13.3 | 14.0 | 14.7 | 5.0 | 12.0 | 10 | 150 | 181 | 19.9 | 0.074 |
| SM5S13AT | 14.4 | 15.2 | 15.9 | 5.0 | 13.0 | 10 | 150 | 167 | 21.5 | 0.076 |
| SM5S14AT | 15.6 | 16.4 | 17.2 | 5.0 | 14.0 | 10 | 150 | 155 | 23.2 | 0.078 |
| SM5S15AT | 16.7 | 17.6 | 18.5 | 5.0 | 15.0 | 10 | 150 | 148 | 24.4 | 0.080 |
| SM5S16AT | 17.8 | 18.8 | 19.7 | 5.0 | 16.0 | 10 | 150 | 138 | 26.0 | 0.081 |
| SM5S17AT | 18.9 | 19.9 | 20.9 | 5.0 | 17.0 | 10 | 150 | 130 | 27.6 | 0.082 |
| SM5S18AT | 20.0 | 21.1 | 22.1 | 5.0 | 18.0 | 10 | 150 | 123 | 29.2 | 0.083 |
| SM5S20AT | 22.2 | 23.4 | 24.5 | 5.0 | 20.0 | 10 | 150 | 111 | 32.4 | 0.085 |
| SM5S22AT | 24.4 | 25.7 | 26.9 | 5.0 | 22.0 | 10 | 150 | 101 | 35.5 | 0.086 |
| SM5S24AT | 26.7 | 28.1 | 29.5 | 5.0 | 24.0 | 10 | 150 | 93 | 38.9 | 0.087 |
| SM5S26AT | 28.9 | 30.4 | 31.9 | 5.0 | 26.0 | 10 | 150 | 86 | 42.1 | 0.088 |
| SM5S28AT | 31.1 | 32.8 | 34.4 | 5.0 | 28.0 | 10 | 150 | 79 | 45.4 | 0.089 |
| SM5S30AT | 33.3 | 35.1 | 36.8 | 5.0 | 30.0 | 10 | 150 | 74 | 48.4 | 0.090 |
| SM5S33AT | 36.7 | 38.7 | 40.6 | 5.0 | 33.0 | 10 | 150 | 68 | 53.3 | 0.091 |
| SM5S36AT | 40.0 | 42.1 | 44.2 | 5.0 | 36.0 | 10 | 150 | 62 | 58.1 | 0.091 |
| SM5S40AT | 44.4 | 46.8 | 49.1 | 5.0 | 40.0 | 10 | 150 | 56 | 64.5 | 0.092 |
| SM5S43AT | 47.8 | 50.3 | 52.8 | 5.0 | 43.0 | 10 | 150 | 52 | 69.4 | 0.093 |

**Notes**

- For all types maximum $V_F$ = 2.0 V at $I_F$ = 100 A measured on 8.3 ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum

[1] To calculate $V_{BR}$ vs. junction temperature, use the following formula: $V_{BR}$ at $T_J$ = $V_{BR}$ at 25 °C x (1 + $\alpha T$ x ($T_J$ - 25))

| THERMAL CHARACTERISTICS ($T_A$ = 25 °C unless otherwise noted) | | | |
|---|---|---|---|
| PARAMETER | SYMBOL | VALUE | UNIT |
| Typical thermal resistance, junction to case | $R_{\theta JC}$ | 1.0 | °C/W |

| ORDERING INFORMATION (Example) | | | | |
|---|---|---|---|---|
| PREFERRED P/N | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE |
| SM5S10ATHE3/I [1] | 2.505 | I | 750 | 13" diameter plastic tape and reel, anode towards the sprocket hole |

**Note**

[1] AEC-Q101 qualified


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## RATINGS AND CHARACTERISTICS CURVES ($T_A$ = 25 °C unless otherwise noted)

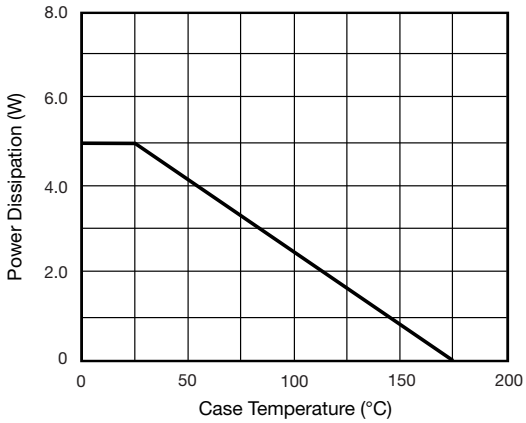



Fig. 1 - Power Derating Curve

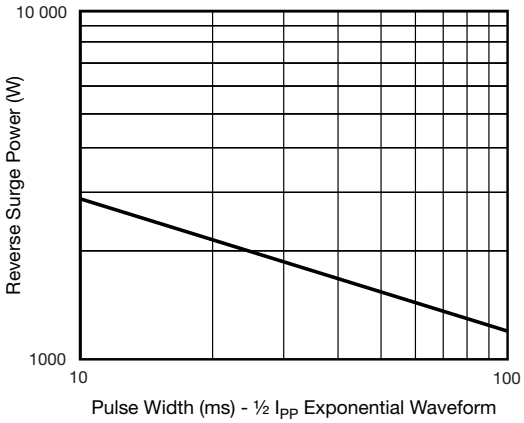



Fig. 4 - Reverse Power Capability

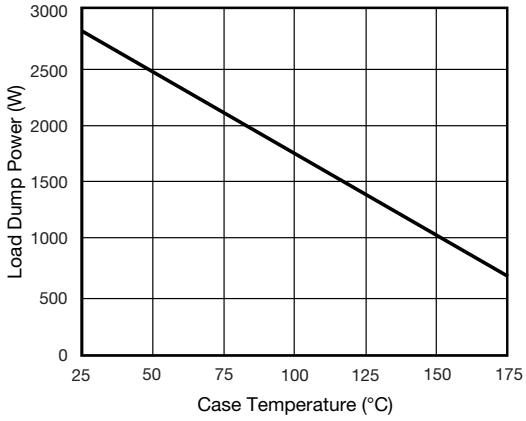



Fig. 2 - Load Dump Power Characteristics
(10 ms Exponential Waveform)

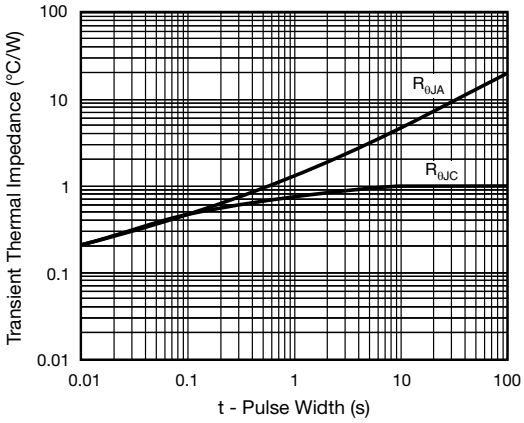



Fig. 5 - Typical Transient Thermal Impedance

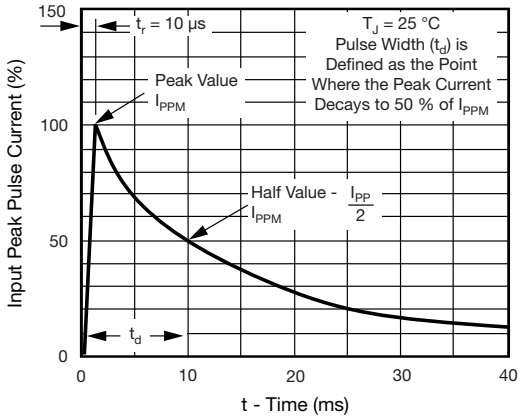


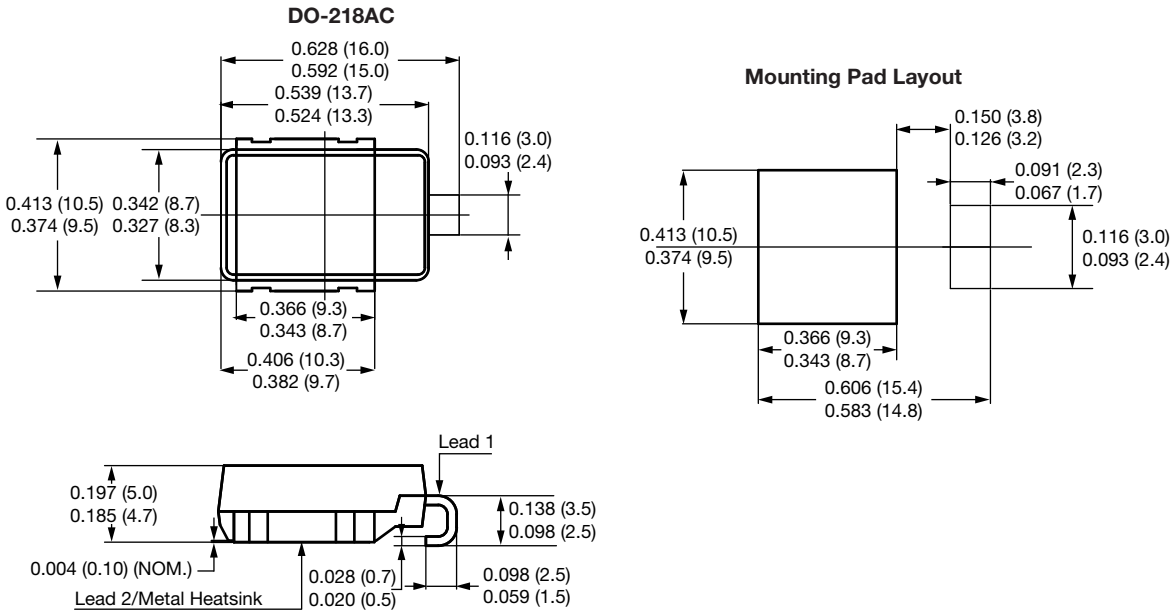

Fig. 3 - Pulse Waveform



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**PACKAGE OUTLINE DIMENSIONS** in inches (millimeters)






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