

# Surface Mount PAR<sup>®</sup> Transient Voltage Suppressors

High Temperature Stability and High Reliability Conditions



DO-218AB

| PRIMARY CHARACTERISTICS         |                  |
|---------------------------------|------------------|
| $V_{WM}$                        | 10 V to 36 V     |
| $V_{BR}$                        | 11.1 V to 44.2 V |
| $P_{PPM}$ (10 x 1000 $\mu$ s)   | 3600 W           |
| $P_{PPM}$ (10 x 10 000 $\mu$ s) | 2800 W           |
| $P_D$                           | 5 W              |
| $I_{FSM}$                       | 500 A            |
| $T_J$ max.                      | 175 °C           |
| Polarity                        | Uni-directional  |
| Package                         | DO-218AB         |

## FEATURES

- Junction passivation optimized design passivated anisotropic rectifier technology
- $T_J = 175$  °C capability suitable for high reliability and automotive requirement
- Available in uni-directional 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
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT

## 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-218AB

Molding compound meets UL 94 V-0 flammability rating Base P/NHE3\_X - 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

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                                     | $P_{PPM}$       | with 10/1000 $\mu$ s waveform   | 3600 |
|                                                                  |                 | with 10/10 000 $\mu$ s 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 $\mu$ s 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**

<sup>(1)</sup> Non-repetitive current pulse at  $T_A = 25$  °C



| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_A = 25\text{ }^\circ\text{C}$ 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 $V_{WM}$ $I_D$ ( $\mu\text{A}$ ) | MAXIMUM REVERSE LEAKAGE AT $V_{WM}$ $T_J = 175\text{ }^\circ\text{C}$ $I_D$ ( $\mu\text{A}$ ) | MAX. PEAK PULSE CURRENT AT 10/1000 $\mu\text{s}$ WAVEFORM (A) | MAXIMUM CLAMPING VOLTAGE AT $I_{PPM}$ $V_C$ (V) | TYPICAL TEMP. COEFFICIENT OF $V_{BR}$ $\alpha T$ ( $\%/^\circ\text{C}$ ) |
|                                                                                              | MIN.                           | NOM. | MAX. |                         |                                |                                                             |                                                                                               |                                                               |                                                 |                                                                          |
| SM5S10A                                                                                      | 11.1                           | 11.7 | 12.3 | 5.0                     | 10.0                           | 15                                                          | 250                                                                                           | 212                                                           | 17.0                                            | 0.069                                                                    |
| SM5S11A                                                                                      | 12.2                           | 12.9 | 13.5 | 5.0                     | 11.0                           | 10                                                          | 150                                                                                           | 198                                                           | 18.2                                            | 0.072                                                                    |
| SM5S12A                                                                                      | 13.3                           | 14.0 | 14.7 | 5.0                     | 12.0                           | 10                                                          | 150                                                                                           | 181                                                           | 19.9                                            | 0.074                                                                    |
| SM5S13A                                                                                      | 14.4                           | 15.2 | 15.9 | 5.0                     | 13.0                           | 10                                                          | 150                                                                                           | 167                                                           | 21.5                                            | 0.076                                                                    |
| SM5S14A                                                                                      | 15.6                           | 16.4 | 17.2 | 5.0                     | 14.0                           | 10                                                          | 150                                                                                           | 155                                                           | 23.2                                            | 0.078                                                                    |
| SM5S15A                                                                                      | 16.7                           | 17.6 | 18.5 | 5.0                     | 15.0                           | 10                                                          | 150                                                                                           | 148                                                           | 24.4                                            | 0.080                                                                    |
| SM5S16A                                                                                      | 17.8                           | 18.8 | 19.7 | 5.0                     | 16.0                           | 10                                                          | 150                                                                                           | 138                                                           | 26.0                                            | 0.081                                                                    |
| SM5S17A                                                                                      | 18.9                           | 19.9 | 20.9 | 5.0                     | 17.0                           | 10                                                          | 150                                                                                           | 130                                                           | 27.6                                            | 0.082                                                                    |
| SM5S18A                                                                                      | 20.0                           | 21.1 | 22.1 | 5.0                     | 18.0                           | 10                                                          | 150                                                                                           | 123                                                           | 29.2                                            | 0.083                                                                    |
| SM5S20A                                                                                      | 22.2                           | 23.4 | 24.5 | 5.0                     | 20.0                           | 10                                                          | 150                                                                                           | 111                                                           | 32.4                                            | 0.085                                                                    |
| SM5S22A                                                                                      | 24.4                           | 25.7 | 26.9 | 5.0                     | 22.0                           | 10                                                          | 150                                                                                           | 101                                                           | 35.5                                            | 0.086                                                                    |
| SM5S24A                                                                                      | 26.7                           | 28.1 | 29.5 | 5.0                     | 24.0                           | 10                                                          | 150                                                                                           | 93                                                            | 38.9                                            | 0.087                                                                    |
| SM5S26A                                                                                      | 28.9                           | 30.4 | 31.9 | 5.0                     | 26.0                           | 10                                                          | 150                                                                                           | 86                                                            | 42.1                                            | 0.088                                                                    |
| SM5S28A                                                                                      | 31.1                           | 32.8 | 34.4 | 5.0                     | 28.0                           | 10                                                          | 150                                                                                           | 79                                                            | 45.4                                            | 0.089                                                                    |
| SM5S30A                                                                                      | 33.3                           | 35.1 | 36.8 | 5.0                     | 30.0                           | 10                                                          | 150                                                                                           | 74                                                            | 48.4                                            | 0.090                                                                    |
| SM5S33A                                                                                      | 36.7                           | 38.7 | 40.6 | 5.0                     | 33.0                           | 10                                                          | 150                                                                                           | 68                                                            | 53.3                                            | 0.091                                                                    |
| SM5S36A                                                                                      | 40.0                           | 42.1 | 44.2 | 5.0                     | 36.0                           | 10                                                          | 150                                                                                           | 62                                                            | 58.1                                            | 0.091                                                                    |

**Notes**

- For all types maximum  $V_F = 2.0\text{ V}$  at  $I_F = 100\text{ A}$  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  $25\text{ }^\circ\text{C} \times (1 + \alpha T \times (T_J - 25))$

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

| <b>ORDERING INFORMATION</b> (Example) |                 |                        |               |                                                                     |
|---------------------------------------|-----------------|------------------------|---------------|---------------------------------------------------------------------|
| PREFERRED P/N                         | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                                                       |
| SM5S10AHE3_A/I (1)                    | 2.505           | I                      | 750           | 13" diameter plastic tape and reel, anode towards the sprocket hole |

**Note**

- (1) AEC-Q101 qualified



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

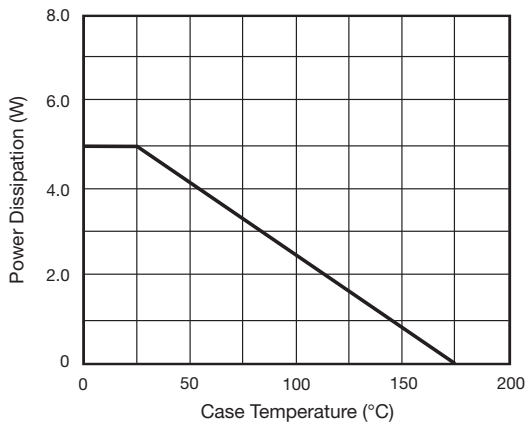


Fig. 1 - Power Derating Curve

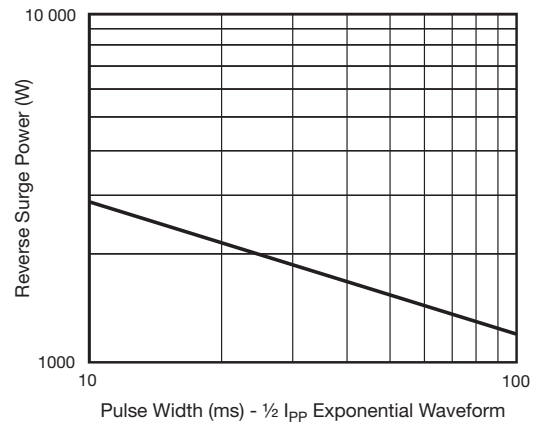


Fig. 4 - Reverse Power Capability

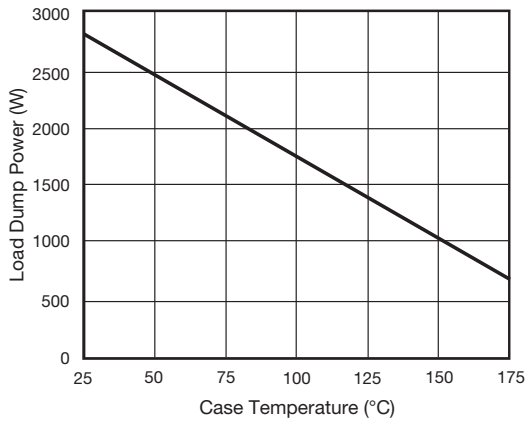


Fig. 2 - Load Dump Power Characteristics (10 ms Exponential Waveform)

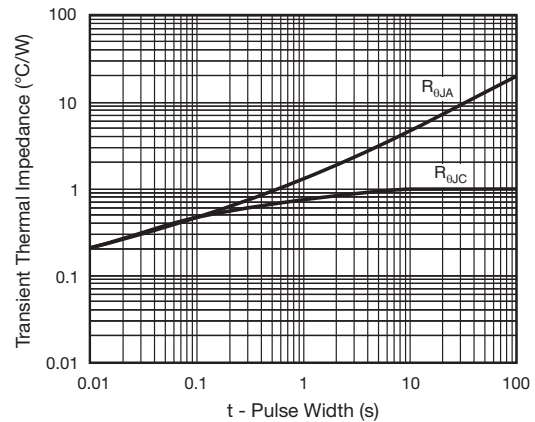


Fig. 5 - Typical Transient Thermal Impedance

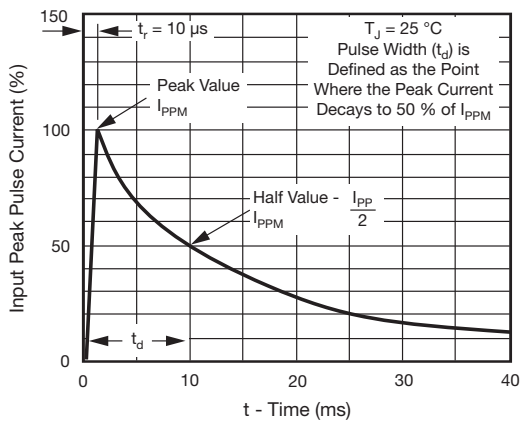
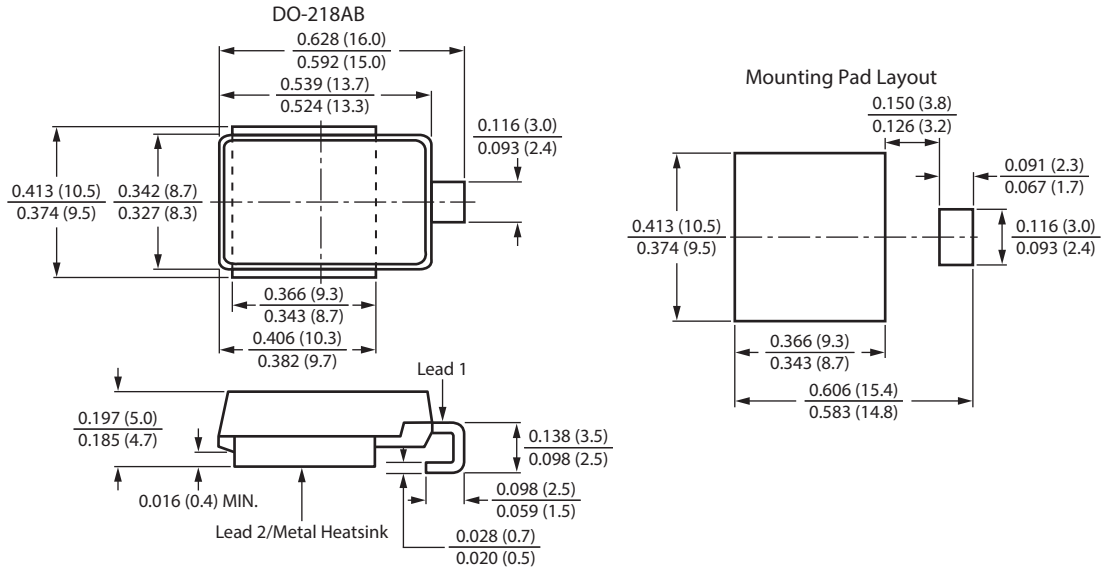


Fig. 3 - Pulse Waveform



### PACKAGE OUTLINE DIMENSIONS in inches (millimeters)





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