

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

High Temperature Stability and High Reliability Conditions



DO-218AB

Cathode  Anode

## LINKS TO ADDITIONAL RESOURCES



## FEATURES

- Junction passivation optimized design passivated anisotropic rectifier technology
- $T_J = 175\text{ }^{\circ}\text{C}$  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  $245\text{ }^{\circ}\text{C}$
- 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 lightning, 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

| PRIMARY CHARACTERISTICS                |                               |
|----------------------------------------|-------------------------------|
| $V_{WM}$                               | 10 V to 43 V                  |
| $V_{BR}$                               | 11.1 V to 52.8 V              |
| $P_{PPM}$ (10 x 1000 $\mu\text{s}$ )   | 6600 W                        |
| $P_{PPM}$ (10 x 10 000 $\mu\text{s}$ ) | 5200 W                        |
| $P_D$                                  | 8 W                           |
| $I_{FSM}$                              | 700 A                         |
| $T_J$ max.                             | $175\text{ }^{\circ}\text{C}$ |
| Polarity                               | Unidirectional                |
| Package                                | DO-218AB                      |

| MAXIMUM RATINGS ( $T_A = 25\text{ }^{\circ}\text{C}$ unless otherwise noted)          |                 |                |                    |
|---------------------------------------------------------------------------------------|-----------------|----------------|--------------------|
| PARAMETER                                                                             | SYMBOL          | VALUE          | UNIT               |
| Peak pulse power dissipation                                                          | $P_{PPM}$       | 6600           | W                  |
|                                                                                       |                 | 5200           |                    |
| Power dissipation on infinite heatsink at $T_A = 25\text{ }^{\circ}\text{C}$ (fig. 1) | $P_D$           | 8.0            | W                  |
| Peak pulse current with 10/1000 $\mu\text{s}$ waveform                                | $I_{PPM}^{(1)}$ | See next table | A                  |
| Peak forward surge current 8.3 ms single half sine-wave                               | $I_{FSM}$       | 700            | A                  |
| Operating junction and storage temperature range                                      | $T_J, T_{STG}$  | -55 to +175    | $^{\circ}\text{C}$ |

### Note

(1) Non-repetitive current pulse at  $T_A = 25\text{ }^{\circ}\text{C}$

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$  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. |                         |                                |                                                             |                                                                                                 |                                                               |                                                 |                                                                            |
| SM8S10A     | 11.1                           | 11.7 | 12.3 | 5.0                     | 10.0                           | 15                                                          | 250                                                                                             | 388                                                           | 17.0                                            | 0.069                                                                      |
| SM8S11A     | 12.2                           | 12.9 | 13.5 | 5.0                     | 11.0                           | 10                                                          | 150                                                                                             | 363                                                           | 18.2                                            | 0.072                                                                      |
| SM8S12A     | 13.3                           | 14.0 | 14.7 | 5.0                     | 12.0                           | 10                                                          | 150                                                                                             | 332                                                           | 19.9                                            | 0.074                                                                      |
| SM8S13A     | 14.4                           | 15.2 | 15.9 | 5.0                     | 13.0                           | 10                                                          | 150                                                                                             | 307                                                           | 21.5                                            | 0.076                                                                      |
| SM8S14A     | 15.6                           | 16.4 | 17.2 | 5.0                     | 14.0                           | 10                                                          | 150                                                                                             | 284                                                           | 23.2                                            | 0.078                                                                      |
| SM8S15A     | 16.7                           | 17.6 | 18.5 | 5.0                     | 15.0                           | 10                                                          | 150                                                                                             | 270                                                           | 24.4                                            | 0.080                                                                      |
| SM8S16A     | 17.8                           | 18.8 | 19.7 | 5.0                     | 16.0                           | 10                                                          | 150                                                                                             | 254                                                           | 26.0                                            | 0.081                                                                      |
| SM8S17A     | 18.9                           | 19.9 | 20.9 | 5.0                     | 17.0                           | 10                                                          | 150                                                                                             | 239                                                           | 27.6                                            | 0.082                                                                      |
| SM8S18A     | 20.0                           | 21.1 | 22.1 | 5.0                     | 18.0                           | 10                                                          | 150                                                                                             | 226                                                           | 29.2                                            | 0.083                                                                      |
| SM8S20A     | 22.2                           | 23.4 | 24.5 | 5.0                     | 20.0                           | 10                                                          | 150                                                                                             | 204                                                           | 32.4                                            | 0.085                                                                      |
| SM8S22A     | 24.4                           | 25.7 | 26.9 | 5.0                     | 22.0                           | 10                                                          | 150                                                                                             | 186                                                           | 35.5                                            | 0.086                                                                      |
| SM8S24A     | 26.7                           | 28.1 | 29.5 | 5.0                     | 24.0                           | 10                                                          | 150                                                                                             | 170                                                           | 38.9                                            | 0.087                                                                      |
| SM8S26A     | 28.9                           | 30.4 | 31.9 | 5.0                     | 26.0                           | 10                                                          | 150                                                                                             | 157                                                           | 42.1                                            | 0.088                                                                      |
| SM8S28A     | 31.1                           | 32.8 | 34.4 | 5.0                     | 28.0                           | 10                                                          | 150                                                                                             | 145                                                           | 45.4                                            | 0.089                                                                      |
| SM8S30A     | 33.3                           | 35.1 | 36.8 | 5.0                     | 30.0                           | 10                                                          | 150                                                                                             | 136                                                           | 48.4                                            | 0.090                                                                      |
| SM8S33A     | 36.7                           | 38.7 | 40.6 | 5.0                     | 33.0                           | 10                                                          | 150                                                                                             | 124                                                           | 53.3                                            | 0.091                                                                      |
| SM8S36A     | 40.0                           | 42.1 | 44.2 | 5.0                     | 36.0                           | 10                                                          | 150                                                                                             | 114                                                           | 58.1                                            | 0.091                                                                      |
| SM8S40A     | 44.4                           | 46.8 | 49.1 | 5.0                     | 40.0                           | 10                                                          | 150                                                                                             | 102                                                           | 64.5                                            | 0.092                                                                      |
| SM8S43A     | 47.8                           | 50.3 | 52.8 | 5.0                     | 43.0                           | 10                                                          | 150                                                                                             | 95.1                                                          | 69.4                                            | 0.093                                                                      |

**Notes**

- For all types maximum  $V_F = 1.8\text{ V}$  at  $I_F = 100\text{ A}$  measured on  $300\text{ }\mu\text{s}$  square pulse width

(1) To calculate  $V_{BR}$  vs. junction temperature, use the following formula:  $V_{BR}$  at  $T_J = V_{BR}$  at  $25\text{ }^{\circ}\text{C} \times (1 + \alpha T \times (T_J - 25))$

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

| PARAMETER                  | SYMBOL              | VALUE | UNIT                 |
|----------------------------|---------------------|-------|----------------------|
| Typical thermal resistance | $R_{\theta JA}$ (1) | 55    | $^{\circ}\text{C/W}$ |
|                            | $R_{\theta JM}$ (2) | 0.35  | $^{\circ}\text{C/W}$ |

**Notes**

(1) Thermal resistance junction-to-ambient to follow JEDEC®51-2A, device mounted on FR4 PCB, 2 oz. standard footprint

(2) Thermal resistance junction-to-mount to follow JEDEC®51-14 using Transient Dual Interface Test Method (TDIM)



## ORDERING INFORMATION TABLE

Device code

|           |          |          |           |          |          |           |
|-----------|----------|----------|-----------|----------|----------|-----------|
| <b>SM</b> | <b>x</b> | <b>S</b> | <b>xx</b> | <b>A</b> | <b>H</b> | <b>E3</b> |
| 1         | 2        | 3        | 4         | 5        | 6        | 7         |

|          |   |                                                                                                         |
|----------|---|---------------------------------------------------------------------------------------------------------|
| <b>1</b> | - | Surface mount                                                                                           |
| <b>2</b> | - | Power dissipation $P_D$ (5 = 5 W, 6 = 6 W, 8 = 8 W)                                                     |
| <b>3</b> | - | Standard $V_F$ type                                                                                     |
| <b>4</b> | - | Stand-off voltage                                                                                       |
| <b>5</b> | - | Breakdown voltage tolerance and polarity (A $\pm$ 5 %, unidirectional)                                  |
| <b>6</b> | - | Quality grade (H = AEC-Q101 qualified, otherwise = industry grade)                                      |
| <b>7</b> | - | Material / Environment category (E3 = non halogen-free, RoHS-compliant, and termination lead (Pb)-free) |

| ORDERING INFORMATION (Example) |                 |                        |               |                                                                     |
|--------------------------------|-----------------|------------------------|---------------|---------------------------------------------------------------------|
| PREFERRED P/N                  | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                                                       |
| SM8S10AHE3_A/I <sup>(1)</sup>  | 2.605           | I                      | 750           | 13" diameter plastic tape and reel, anode towards the sprocket hole |

### Note

<sup>(1)</sup> AEC-Q101 qualified



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

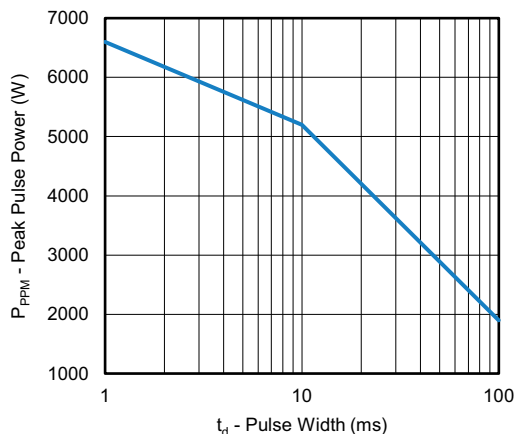


Fig. 1 - Peak Pulse Power Derating Curve

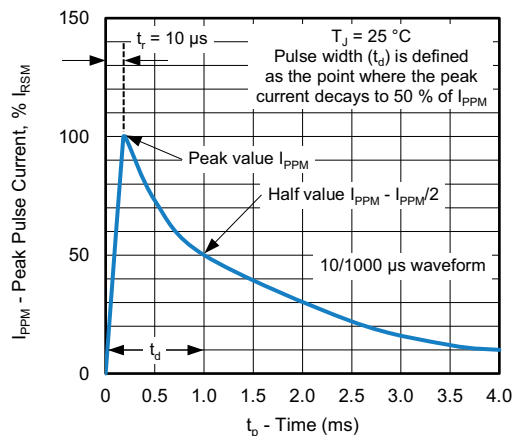


Fig. 4 - Pulse waveform

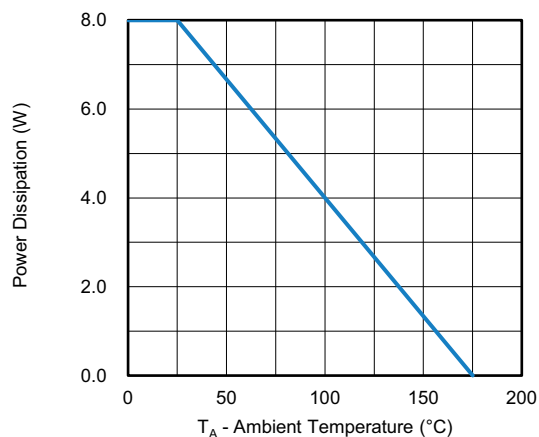


Fig. 2 - Power Derating Curve

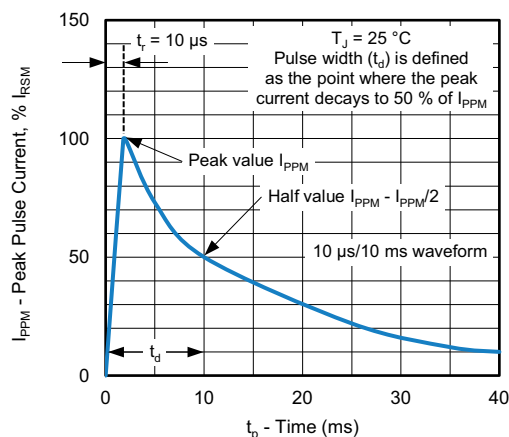


Fig. 5 - Pulse Waveform

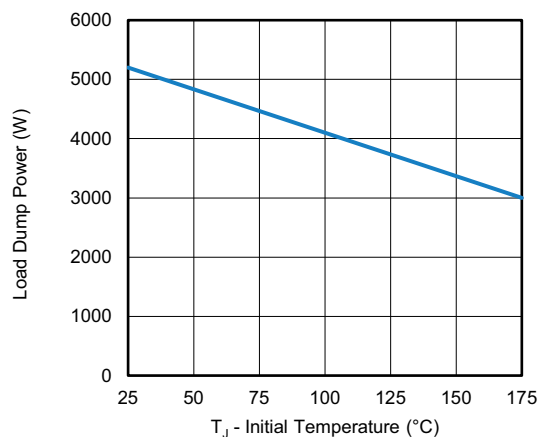


Fig. 3 - Load Dump Power Characteristics (10 ms Exponential Waveform)

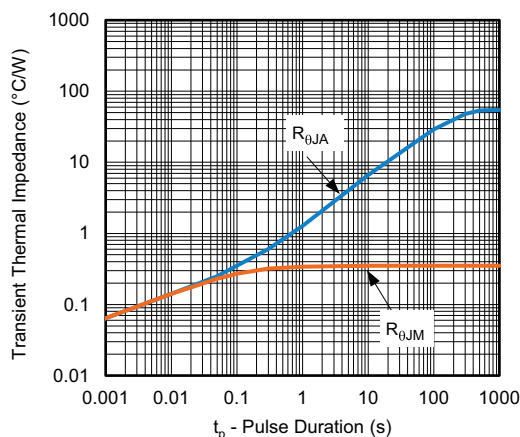


Fig. 6 - Typical Transient Thermal Impedance

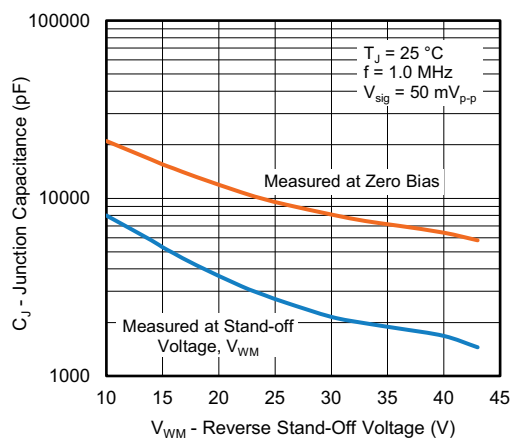
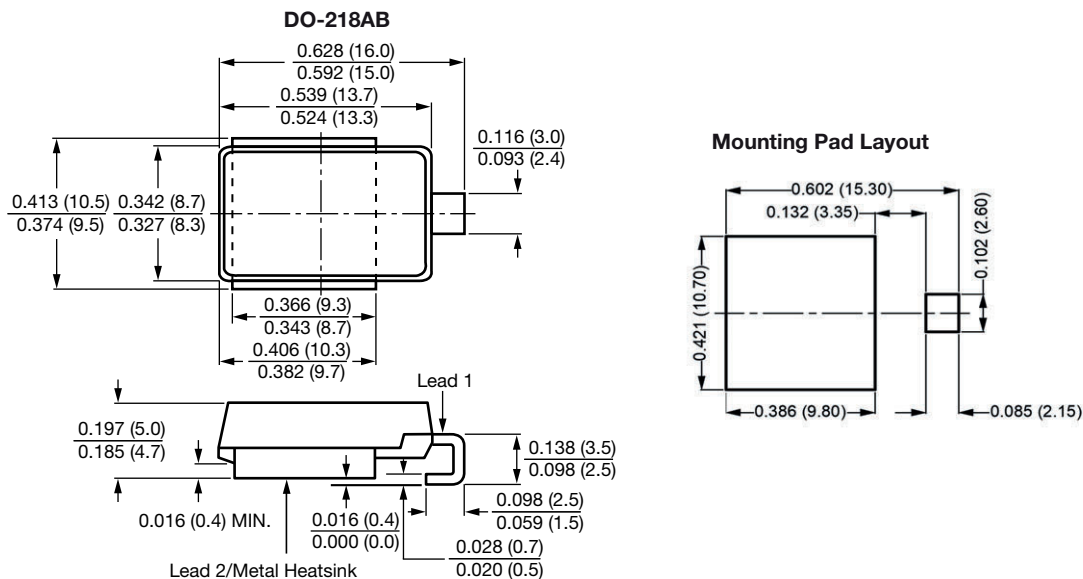


Fig. 7 - Junction Capacitance

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

**Note**

- Footprint in accordance with IPC 7351 standard



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