

# High Current Density Surface Mount Ultrafast Rectifiers

**eSMP® Series**

**SMP (DO-220AA)**

**FEATURES**

- Very low profile - typical height of 1.0 mm
- Ideal for automated placement
- Glass passivated pellet chip junction
- Ultrafast recovery times for high frequency
- Low forward voltage drop, low power losses
- Low thermal resistance
- Meets MSL level 1 per J-STD-020, LF maximum peak of 260 °C
- AEC-Q101 qualified
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

 AUTOMOTIVE  
GRADE  
Available

**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**
**DESIGN SUPPORT TOOLS**
[click logo to get started](#)
**3D**  
Models  
Available

**TYPICAL APPLICATIONS**

For use in secondary rectification and freewheeling for ultrafast switching speeds of AC/DC and DC/DC converters in high temperature for both consumer and automotive applications.

| PRIMARY CHARACTERISTICS |                     |
|-------------------------|---------------------|
| $I_{F(AV)}$             | 2.0 A               |
| $V_{RRM}$               | 100 V, 150 V, 200 V |
| $t_{rr}$                | 25 ns               |
| $V_F$ at $I_F = 2$ A    | 0.75 V              |
| $T_J$ max.              | 175 °C              |
| Package                 | SMP (DO-220AA)      |
| Circuit configuration   | Single              |

**MECHANICAL DATA**
**Case:** SMP (DO-220AA)

Molding compound meets UL 94 V-0 flammability rating  
Base P/N-M3 - halogen-free, RoHS-compliant, and commercial grade

Base P/NHM3 - halogen-free, RoHS-compliant, and automotive grade

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

M3 suffix meets JESD 201 class 2 whisker test, HM3 suffix meets JESD 201 class 2 whisker test

**Polarity:** color band denotes the cathode end

| MAXIMUM RATINGS ( $T_A = 25$ °C unless otherwise noted)                           |                |             |        |        |      |
|---|----------------|-------------|--------|--------|------|
| PARAMETER   | SYMBOL         | ESH2PB      | ESH2PC | ESH2PD | UNIT |
| Device marking code   |                | P2B         | P2C    | P2D    |      |
| Maximum repetitive peak reverse voltage   | $V_{RRM}$      | 100         | 150    | 200    | V    |
| Maximum average forward rectified current (fig. 1)                                | $I_{F(AV)}$    | 2.0         |        |        | A    |
| Peak forward surge current 10 ms single half sine-wave superimposed on rated load | $I_{FSM}$      | 50          |        |        | A    |
| Operating junction and storage temperature range                                  | $T_J, T_{STG}$ | -55 to +175 |        |        | °C   |



| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted) |  |                                   |             |      |      |               |
|--|--|-----------------------------------|-------------|------|------|---------------|
| PARAMETER  | TEST CONDITIONS  |                                   | SYMBOL      | TYP. | MAX. | UNIT          |
| Maximum instantaneous forward voltage  | $I_F = 2\text{ A}$   | $T_J = 25\text{ }^\circ\text{C}$  | $V_F^{(1)}$ | 0.90 | 0.98 | V             |
|  |  | $T_J = 125\text{ }^\circ\text{C}$ |             | 0.75 | 0.82 |               |
| Maximum reverse current at rated $V_R$   |  | $T_J = 25\text{ }^\circ\text{C}$  | $I_R^{(2)}$ | 0.2  | 1.0  | $\mu\text{A}$ |
|  |  | $T_J = 125\text{ }^\circ\text{C}$ |             | 12.6 | 25   |               |
| Maximum reverse recovery time  | $I_F = 0.5\text{ A}$ , $I_R = 1\text{ A}$ , $I_{rr} = 0.25\text{ A}$                                       |                                   | $t_{rr}$    | -    | 25   | ns            |
| Typical reverse recovery time  | $I_F = 1.0\text{ A}$ , $V_R = 30\text{ V}$ ,<br>$dI/dt = 50\text{ A}/\mu\text{s}$ , $I_{rr} = 10\% I_{RM}$ | $T_J = 25\text{ }^\circ\text{C}$  | $t_{rr}$    | 25   | -    | ns            |
|  |  | $T_J = 100\text{ }^\circ\text{C}$ |             | 35   | -    |               |
| Typical stored charge  | $I_F = 1.0\text{ A}$ , $V_R = 30\text{ V}$ ,<br>$dI/dt = 50\text{ A}/\mu\text{s}$ , $I_{rr} = 10\% I_{RM}$ | $T_J = 25\text{ }^\circ\text{C}$  | $Q_{rr}$    | 10   | -    | nC            |
|  |  | $T_J = 100\text{ }^\circ\text{C}$ |             | 15   | -    |               |
| Typical junction capacitance   | 4.0 V, 1 MHz   |                                   | $C_J$       | 25   | -    | pF            |

**Notes**

- (1) Pulse test: 300  $\mu\text{s}$  pulse width, 1 % duty cycle  
(2) Pulse test: Pulse width  $\leq 40\text{ ms}$

| <b>THERMAL CHARACTERISTICS</b> ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted) |                       |        |        |        |                           |
|---|-----------------------|--------|--------|--------|---------------------------|
| PARAMETER   | SYMBOL                | ESH2PB | ESH2PC | ESH2PD | UNIT                      |
| Typical thermal resistance  | $R_{\theta JA}^{(1)}$ | 80     |        |        | $^\circ\text{C}/\text{W}$ |
|   | $R_{\theta JL}^{(1)}$ | 15     |        |        |                           |
|   | $R_{\theta JC}^{(1)}$ | 22     |        |        |                           |

**Note**

- (1) Thermal resistance from junction to ambient and junction to lead mounted on PCB with 6.0 mm x 6.0 mm copper pad areas.  $R_{\theta JL}$  is measured at the terminal of cathode band.  $R_{\theta JC}$  is measured at the top center of the body

| <b>ORDERING INFORMATION</b> (Example) |                 |                        |               |                                    |
|---------------------------------------|-----------------|------------------------|---------------|------------------------------------|
| PREFERRED P/N                         | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                      |
| ESH2PB-M3/84A                         | 0.024           | 84A                    | 3000          | 7" diameter plastic tape and reel  |
| ESH2PB-M3/85A                         | 0.024           | 85A                    | 10 000        | 13" diameter plastic tape and reel |
| ESH2PBHM3/84A <sup>(1)</sup>          | 0.024           | 84A                    | 3000          | 7" diameter plastic tape and reel  |
| ESH2PBHM3/85A <sup>(1)</sup>          | 0.024           | 85A                    | 10 000        | 13" diameter plastic tape and reel |

**Note**

- (1) Automotive grade



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

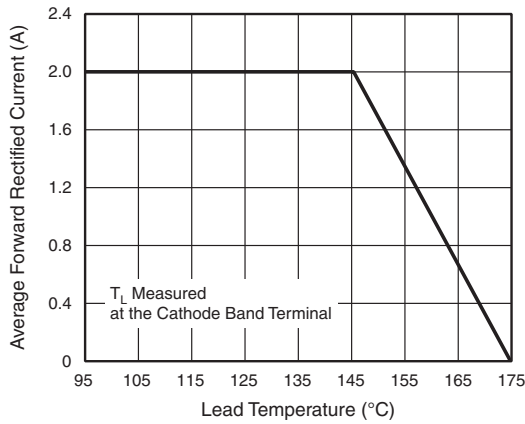


Fig. 1 - Maximum Forward Current Derating Curve

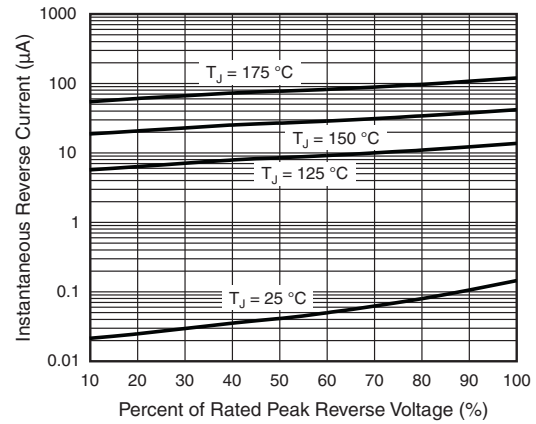


Fig. 4 - Typical Reverse Leakage Characteristics

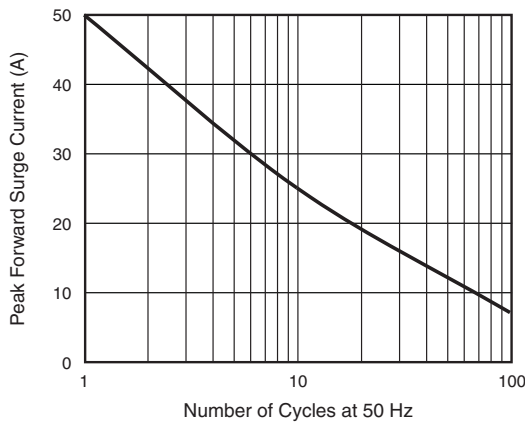


Fig. 2 - Maximum Non-Repetitive Peak Forward Surge Current

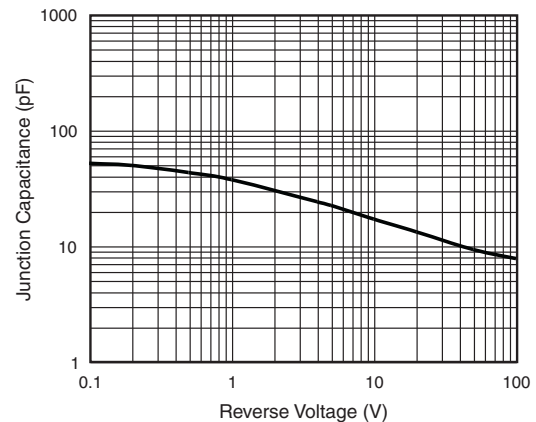


Fig. 5 - Typical Junction Capacitance

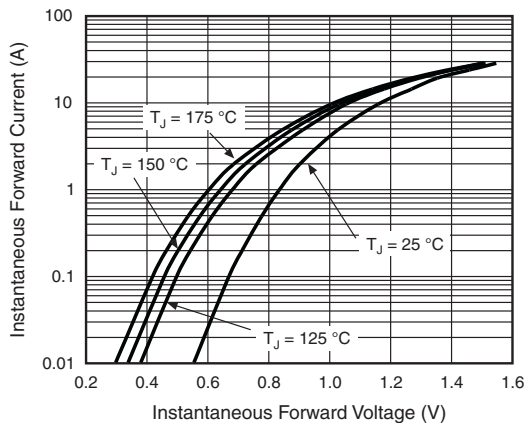
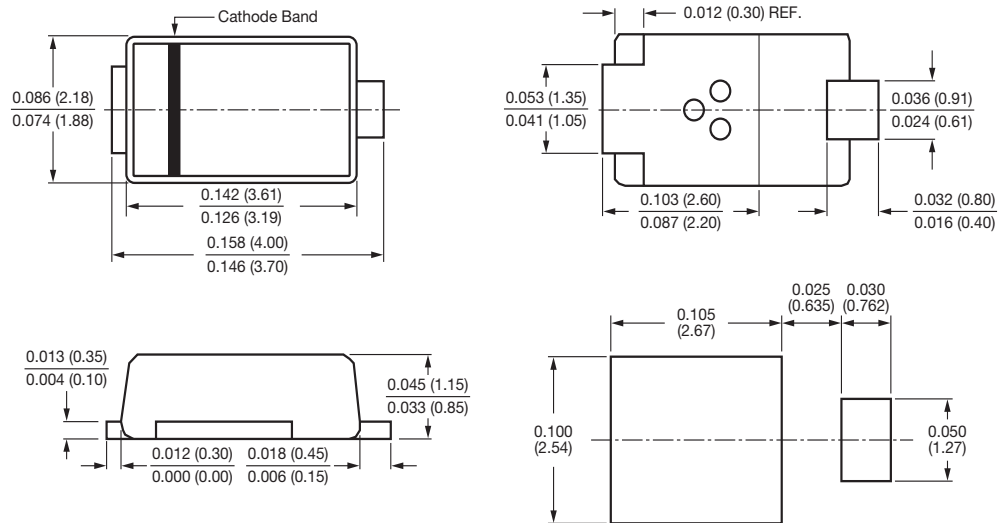


Fig. 3 - Typical Instantaneous Forward Characteristics



### PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

#### SMP (DO-220AA)





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