

# High Current Density Surface-Mount Ultrafast Rectifiers

## eSMP® Series



SMP (DO-220AA)

Cathode  Anode

## LINKS TO ADDITIONAL RESOURCES



3D Models

## PRIMARY CHARACTERISTICS

|                       |                     |
|-----------------------|---------------------|
| $I_{F(AV)}$           | 1.0 A               |
| $V_{RRM}$             | 100 V, 150 V, 200 V |
| $I_{FSM}$             | 50 A                |
| $t_{rr}$              | 25 ns               |
| $V_F$                 | 0.90 V              |
| $T_J \text{ max.}$    | 175 °C              |
| Package               | SMP (DO-220AA)      |
| Circuit configuration | Single              |

## 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 loss
- Low thermal resistance
- Meets MSL level 1 per J-STD-020, LF maximum peak of 260 °C
- AEC-Q101 qualified available
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

## TYPICAL APPLICATIONS

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

## 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 and HM3 suffix meets JESD 201 class 2 whisker test

**Polarity:** color band denotes cathode end

## MAXIMUM RATINGS ( $T_A = 25\text{ °C}$ unless otherwise noted)

| PARAMETER                                                                         | SYMBOL         | ESH1PB      | ESH1PC | ESH1PD | UNIT |
|-----------------------------------------------------------------------------------|----------------|-------------|--------|--------|------|
| Device marking code                                                               |                | PB          | PC     | PD     |      |
| Maximum repetitive peak reverse voltage                                           | $V_{RRM}$      | 100         | 150    | 200    | V    |
| Maximum average forward rectified current (fig. 1)                                | $I_{F(AV)}$    | 1.0         |        |        | 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   |

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

| PARAMETER                                      | TEST CONDITIONS                                                                                            | SYMBOL                              | VALUE       | UNIT          |
|------------------------------------------------|------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------|---------------|
| Maximum instantaneous forward voltage          | $I_F = 0.7\text{ A}$                                                                                       | $T_J = 25\text{ }^{\circ}\text{C}$  | $V_F^{(1)}$ | V             |
|                                                | $I_F = 1\text{ A}$                                                                                         |                                     |             |               |
| Maximum reverse current at rated $V_R$ voltage |                                                                                                            | $T_J = 25\text{ }^{\circ}\text{C}$  | $I_R^{(2)}$ | $\mu\text{A}$ |
|                                                |                                                                                                            | $T_J = 125\text{ }^{\circ}\text{C}$ |             |               |
| Maximum reverse current                        | $V_R = 20\text{ V}$                                                                                        | $T_J = 150\text{ }^{\circ}\text{C}$ | $I_R$       | $\mu\text{A}$ |
| Maximum reverse recovery time                  | $I_F = 0.5\text{ A}$ , $I_R = 1\text{ A}$ , $I_{rr} = 0.25\text{ A}$                                       |                                     | $t_{rr}$    | ns            |
| Typical reverse recovery time                  | $I_F = 1.0\text{ A}$ , $V_R = 30\text{ V}$ ,<br>$di/dt = 50\text{ A}/\mu\text{s}$ , $I_{rr} = 10\% I_{RM}$ | $T_J = 25\text{ }^{\circ}\text{C}$  | $t_{rr}$    | ns            |
|                                                |                                                                                                            | $T_J = 100\text{ }^{\circ}\text{C}$ |             |               |
| Typical stored charge                          | $I_F = 1.0\text{ A}$ , $V_R = 30\text{ V}$ ,<br>$di/dt = 50\text{ A}/\mu\text{s}$ , $I_{rr} = 10\% I_{RM}$ | $T_J = 25\text{ }^{\circ}\text{C}$  | $Q_{rr}$    | nC            |
|                                                |                                                                                                            | $T_J = 100\text{ }^{\circ}\text{C}$ |             |               |
| Typical junction capacitance                   | $4.0\text{ V}$ , $1\text{ MHz}$                                                                            | $C_J$                               | 25          | pF            |

**Notes**

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

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

| PARAMETER                  | SYMBOL                | ESH1PB | ESH1PC | ESH1PD | UNIT |
|----------------------------|-----------------------|--------|--------|--------|------|
| Typical thermal resistance | $R_{\theta JA}^{(1)}$ | 105    |        |        | °C/W |
|                            | $R_{\theta JM}^{(2)}$ | 15     |        |        |      |
|                            | $R_{\theta JC}^{(3)}$ | 20     |        |        |      |

**Notes**

- (1) Thermal resistance from junction to ambient on free air  
 (2) Mounted on 5 mm x 5 mm pad size from junction to mount  
 (3)  $R_{\theta JC}$  is measured at the top center of the body

**ORDERING INFORMATION** (Example)

| PREFERRED P/N                | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                      |
|------------------------------|-----------------|------------------------|---------------|------------------------------------|
| ESH1PB-M3/84A                | 0.024           | 84A                    | 3000          | 7" diameter plastic tape and reel  |
| ESH1PB-M3/85A                | 0.024           | 85A                    | 10 000        | 13" diameter plastic tape and reel |
| ESH1PBHM3/84A <sup>(1)</sup> | 0.024           | 84A                    | 3000          | 7" diameter plastic tape and reel  |
| ESH1PBHM3/85A <sup>(1)</sup> | 0.024           | 85A                    | 10 000        | 13" diameter plastic tape and reel |

**Note**

- (1) Automotive grade



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

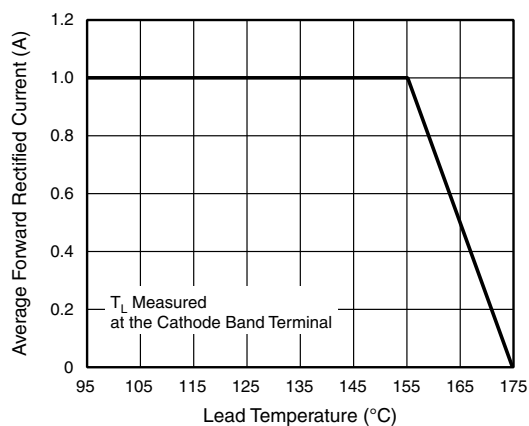


Fig. 1 - Forward Current Derating Curve

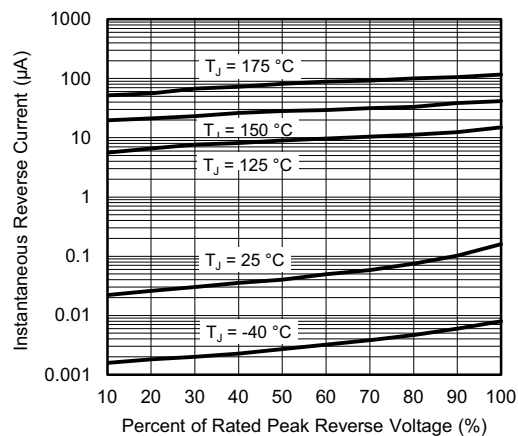


Fig. 4 - Typical Reverse Leakage Characteristics

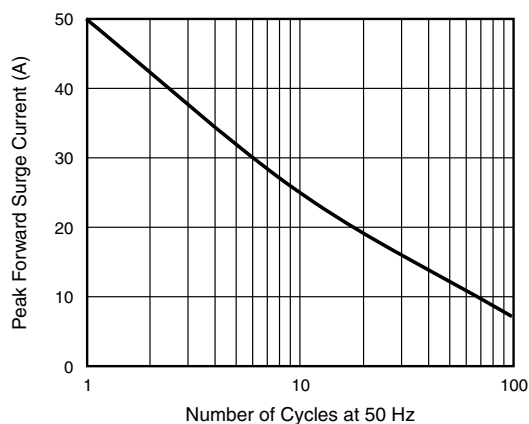


Fig. 2 - Maximum Non-Repetitive Peak Forward Surge Current

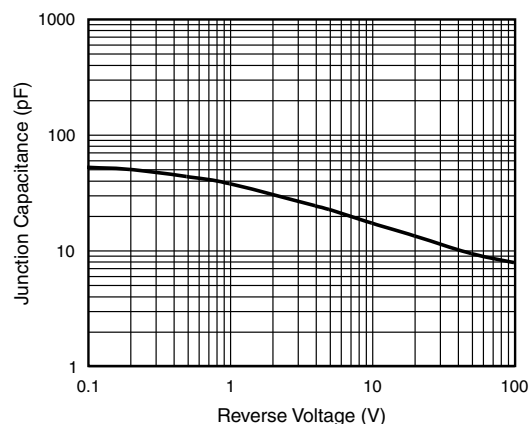


Fig. 5 - Typical Junction Capacitance

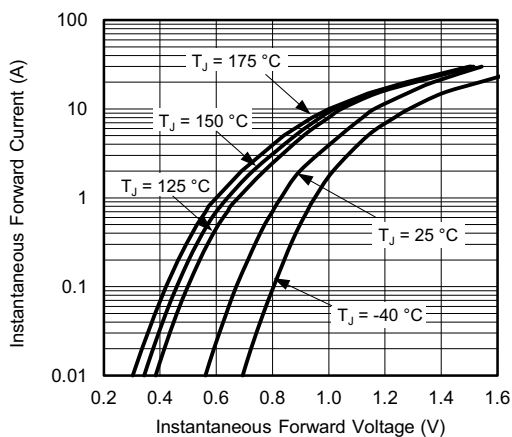


Fig. 3 - Typical Instantaneous Forward Characteristics

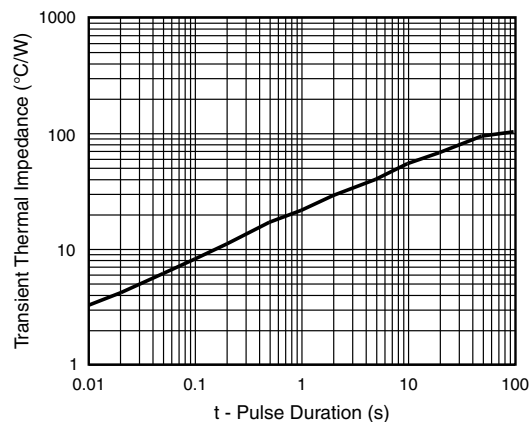
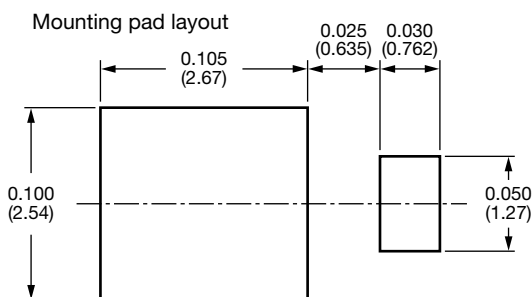
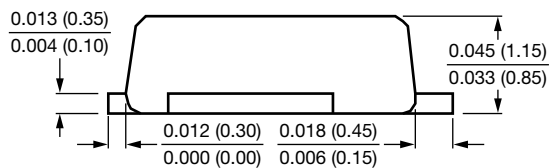
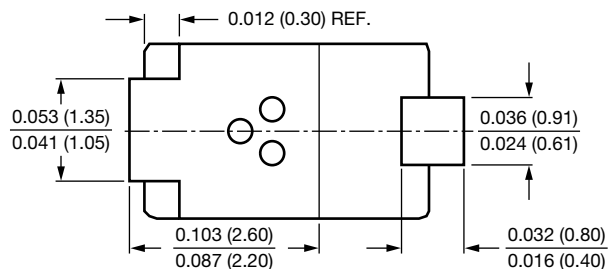
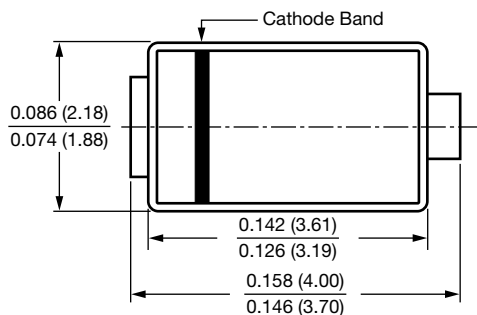


Fig. 6 - Typical Transient Thermal Impedance



## PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

### SMP (DO-220AA)





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