



# High Current Density Surface Mount Ultrafast Rectifiers

eSMP™ Series



DO-220AA (SMP)

## FEATURES

- Very low profile - typical height of 1.0 mm
- Ideal for automated placement
- Glass passivated 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
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



RoHS COMPLIANT

## TYPICAL APPLICATIONS

For use in secondary rectification and freewheeling for ultrafast switching speeds of ac-to-ac and dc-to-dc converters in high temperature conditions for both consumer and automotive applications.

## MECHANICAL DATA

Case: DO-220AA (SMP)

Epoxy meets UL 94 V-0 flammability rating

Terminals: Matte tin plated leads, solderable per J-STD-002 and JESD22-B102

E3 suffix for consumer grade, meets JESD 201 class 1A whisker test, HE3 suffix for high reliability grade (AEC Q101 qualified), meets JESD 201 class 2 whisker test

Polarity: Color band denotes cathode end

| PRIMARY CHARACTERISTICS |                     |
|-------------------------|---------------------|
| $I_{F(AV)}$             | 1.0 A               |
| $V_{RRM}$               | 100 V, 150 V, 200 V |
| $t_{rr}$                | 25 ns               |
| $V_F$                   | 0.90 V              |
| $T_J \text{ max.}$      | 175 °C              |

| 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 ( $T_A = 25\text{ °C}$ unless otherwise noted) |  |   |        |              |               |
|---|--|---|--------|--------------|---------------|
| PARAMETER   | TEST CONDITIONS                            |   | SYMBOL | VALUE        | UNIT          |
| Maximum instantaneous forward voltage <sup>(1)</sup>                      | $I_F = 0.7\text{ A}$<br>$I_F = 1\text{ A}$ | $T_J = 25\text{ °C}$                          | $V_F$  | 0.86<br>0.90 | V             |
| Maximum reverse current at rated $V_R$ voltage <sup>(2)</sup>             |  | $T_J = 25\text{ °C}$<br>$T_J = 125\text{ °C}$ | $I_R$  | 1.0<br>25    | $\mu\text{A}$ |
| Maximum reverse current   | $V_R = 20\text{ V}$                        | $T_J = 150\text{ °C}$                         | $I_R$  | 50           | $\mu\text{A}$ |



| ELECTRICAL CHARACTERISTICS (T <sub>A</sub> = 25 °C unless otherwise noted) |  |   |          |      |
|--|--|---|----------|------|
| PARAMETER  | TEST CONDITIONS  | SYMBOL  | VALUE    | UNIT |
| Maximum reverse recovery time  | I <sub>F</sub> = 0.5 A, I <sub>R</sub> = 1 A, I <sub>rr</sub> = 0.25 A                                 | t <sub>rr</sub>                                   | 25       | ns   |
| Typical reverse recovery time  | I <sub>F</sub> = 1.0 A, V <sub>R</sub> = 30 V, dl/dt = 50 A/μs, I <sub>rr</sub> = 10 % I <sub>RM</sub> | T <sub>J</sub> = 25 °C<br>T <sub>J</sub> = 100 °C | 25<br>35 | ns   |
| Typical stored charge  | I <sub>F</sub> = 1.0 A, V <sub>R</sub> = 30 V, dl/dt = 50 A/μs, I <sub>rr</sub> = 10 % I <sub>RM</sub> | T <sub>J</sub> = 25 °C<br>T <sub>J</sub> = 100 °C | 10<br>15 | nC   |
| Typical junction capacitance   | 4.0 V, 1 MHz   | C <sub>J</sub>                                    | 25       | pF   |

**Notes:**

- (1) Pulse test: 300 μs pulse width, 1 % duty cycle
- (2) Pulse test: Pulse width ≤ 40 ms

| THERMAL CHARACTERISTICS (T <sub>A</sub> = 25 °C unless otherwise noted) |                  |        |        |        |      |
|---|------------------|--------|--------|--------|------|
| PARAMETER   | SYMBOL           | ESH1PB | ESH1PC | ESH1PD | UNIT |
| Typical thermal resistance <sup>(1)</sup>                               | R <sub>θJA</sub> | 105    |        |        | °C/W |
|   | R <sub>θJL</sub> | 15     |        |        |      |
|   | R <sub>θJC</sub> | 20     |        |        |      |

**Note:**

- (1) Thermal resistance from junction to ambient and junction to lead mounted on P.C.B. with 5.0 x 5.0 mm copper pad areas. R<sub>θJL</sub> is measured at the terminal of cathode band. R<sub>θJC</sub> 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-E3/84A                  | 0.024           | 84A                    | 3000          | 7" diameter plastic tape and reel  |
| ESH1PB-E3/85A                  | 0.024           | 85A                    | 10 000        | 13" diameter plastic tape and reel |
| ESH1PBHE3/84A <sup>(1)</sup>   | 0.024           | 84A                    | 3000          | 7" diameter plastic tape and reel  |
| ESH1PBHE3/85A <sup>(1)</sup>   | 0.024           | 85A                    | 10 000        | 13" diameter plastic tape and reel |

**Note:**

- (1) Automotive grade AEC Q101 qualified

**RATINGS AND CHARACTERISTICS CURVES**

(T<sub>A</sub> = 25 °C unless otherwise noted)

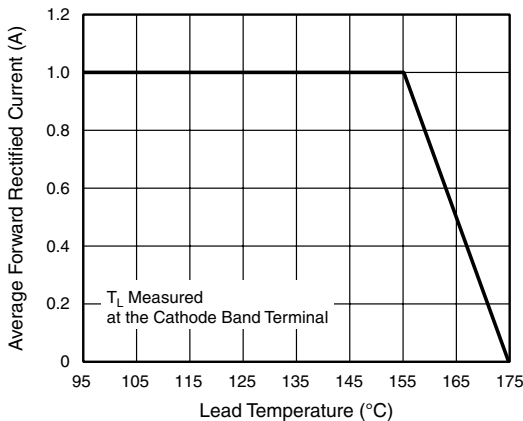


Figure 1. Forward Current Derating Curve

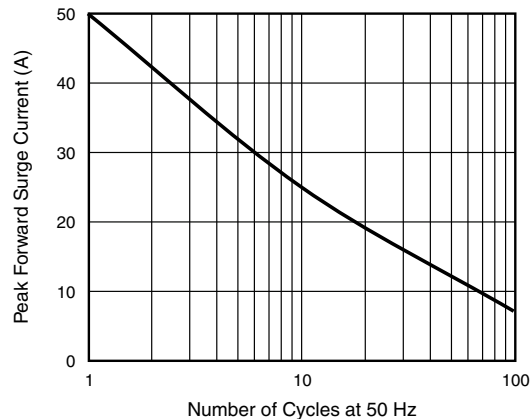


Figure 2. Maximum Non-Repetitive Peak Forward Surge Current

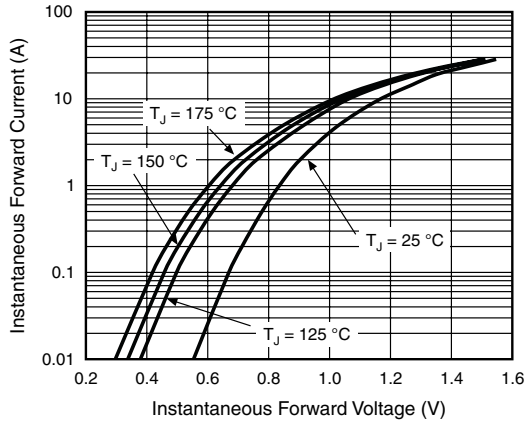


Figure 3. Typical Instantaneous Forward Characteristics

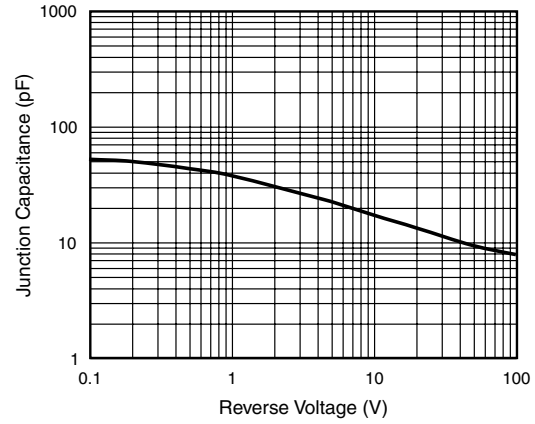


Figure 5. Typical Junction Capacitance

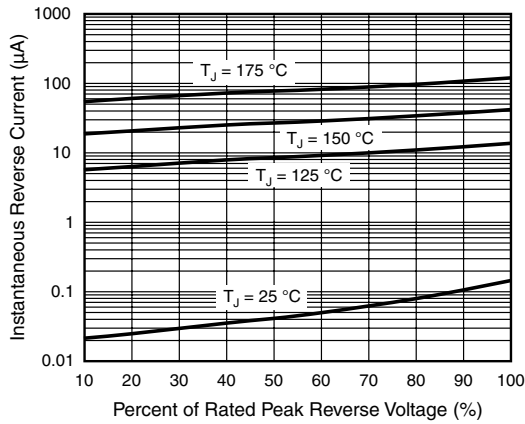


Figure 4. Typical Reverse Leakage Characteristics

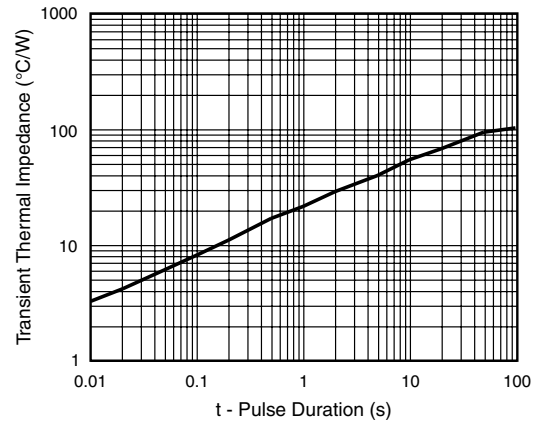
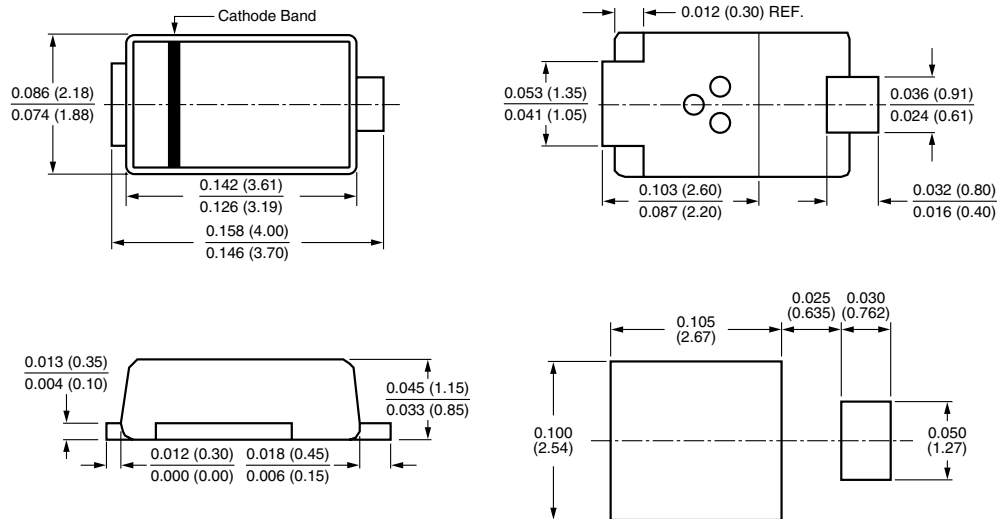


Figure 6. Typical Transient Thermal impedance

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

**DO-220AA (SMP)**





## Disclaimer

All product specifications and data are subject to change without notice.

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