



## 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-020C, LF max peak of 260 °C
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



## MAJOR RATINGS AND CHARACTERISTICS

$I_{F(AV)}$	1 A
$V_{RRM}$	100 V, 150 V, 200 V
$t_{rr}$	25 ns
$V_F$	0.90 V
$T_j \text{ max.}$	175 °C

## 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-94V-0 flammability rating

**Terminals:** Matte tin plated leads, solderable per J-STD-002B and JESD22-B102D

E3 suffix for commercial grade, HE3 suffix for high reliability grade (AEC Q101 qualified)

**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 ( $T_A = 25\text{ °C}$  unless otherwise noted)

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



<b>ELECTRICAL CHARACTERISTICS</b> ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted)				
PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT
Maximum reverse recovery time	at $I_F = 0.5\text{ A}$ , $I_R = 1\text{ A}$ , $I_{rr} = 0.25\text{ A}$	$t_{rr}$	25	ns
Typical reverse recovery time	at $I_F = 1.0\text{ A}$ , $V_R = 30\text{ V}$ $di/dt = 50\text{ A}/\mu\text{s}$ , $I_{rr} = 10\%$ $I_{RM}$ $T_J = 25\text{ }^\circ\text{C}$	$t_{rr}$	25	ns
	at $I_F = 1.0\text{ A}$ , $V_R = 30\text{ V}$ $di/dt = 50\text{ A}/\mu\text{s}$ , $I_{rr} = 10\%$ $I_{RM}$ $T_J = 100\text{ }^\circ\text{C}$		35	
Typical reverse recovery time	at $I_F = 1.0\text{ A}$ , $V_R = 30\text{ V}$ $di/dt = 50\text{ A}/\mu\text{s}$ , $I_{rr} = 10\%$ $I_{RM}$ $T_J = 25\text{ }^\circ\text{C}$	$Q_{rr}$	10	nC
	at $I_F = 1.0\text{ A}$ , $V_R = 30\text{ V}$ $di/dt = 50\text{ A}/\mu\text{s}$ , $I_{rr} = 10\%$ $I_{RM}$ $T_J = 100\text{ }^\circ\text{C}$		15	
Typical junction capacitance	at 4.0 V, 1 MHz	$C_J$	25	pF

**Note:**

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

<b>THERMAL CHARACTERISTICS</b> ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted)					
PARAMETER	SYMBOL	ESH1PB	ESH1PC	ESH1PD	UNIT
Typical thermal resistance <sup>(1)</sup>	$R_{\theta JA}$		105		$^\circ\text{C}/\text{W}$
	$R_{\theta JL}$		15		
	$R_{\theta JC}$		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.  $R_{\theta JL}$  is measured at the terminal of cathode band.  $R_{\theta JC}$  is measured at the top centre of the body

<b>ORDERING INFORMATION</b> (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 & Reel
ESH1PB-E3/85A	0.024	85A	10000	13" Diameter Plastic Tape & Reel
ESH1PBHE3/84A <sup>(1)</sup>	0.024	84A	3000	7" Diameter Plastic Tape & Reel
ESH1PBHE3/85A <sup>(1)</sup>	0.024	85A	10000	13" Diameter Plastic Tape & Reel

**Note:**

(1) Automotive grade AEC Q101 qualified

**RATINGS AND CHARACTERISTICS CURVES**

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

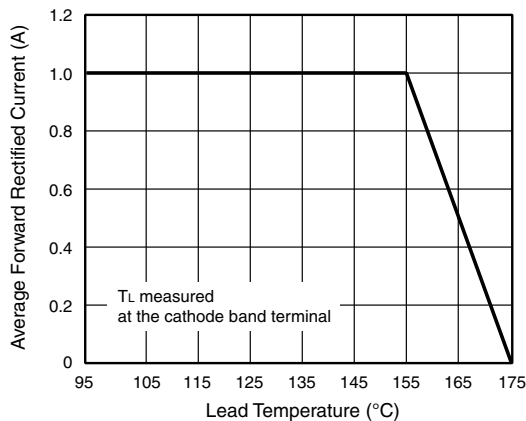


Figure 1. Forward Current Derating Curve

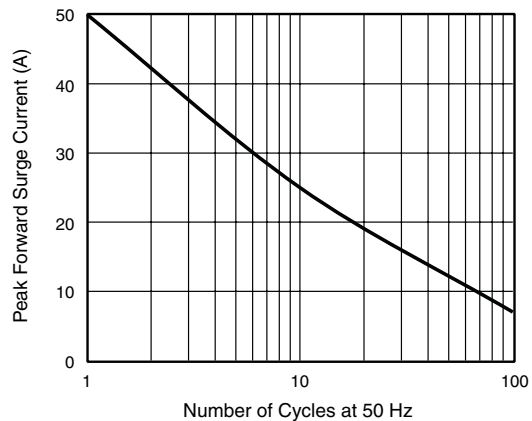


Figure 2. Maximum Non-Repetitive Peak Forward Surge Current

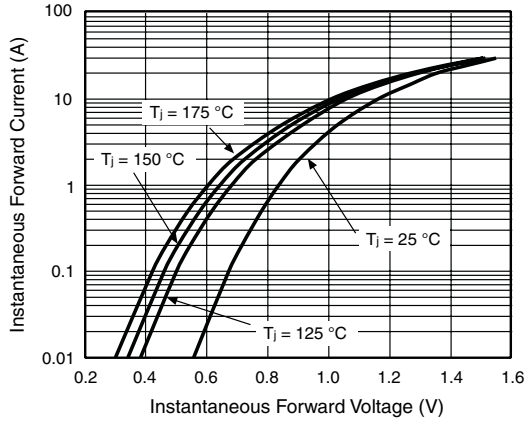


Figure 3. Typical Instantaneous Forward Characteristics

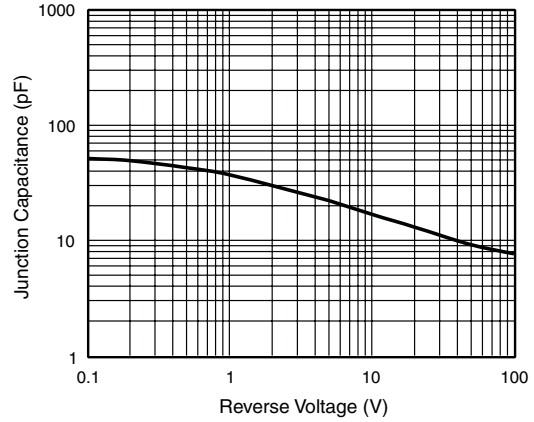


Figure 5. Typical Junction Capacitance

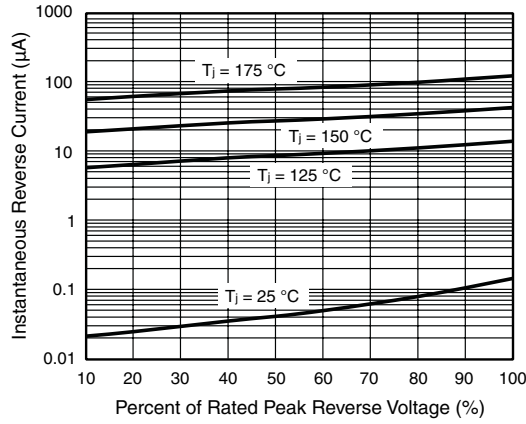


Figure 4. Typical Reverse Leakage Characteristics

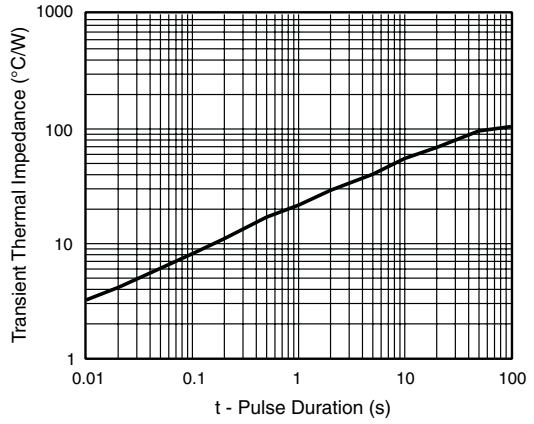
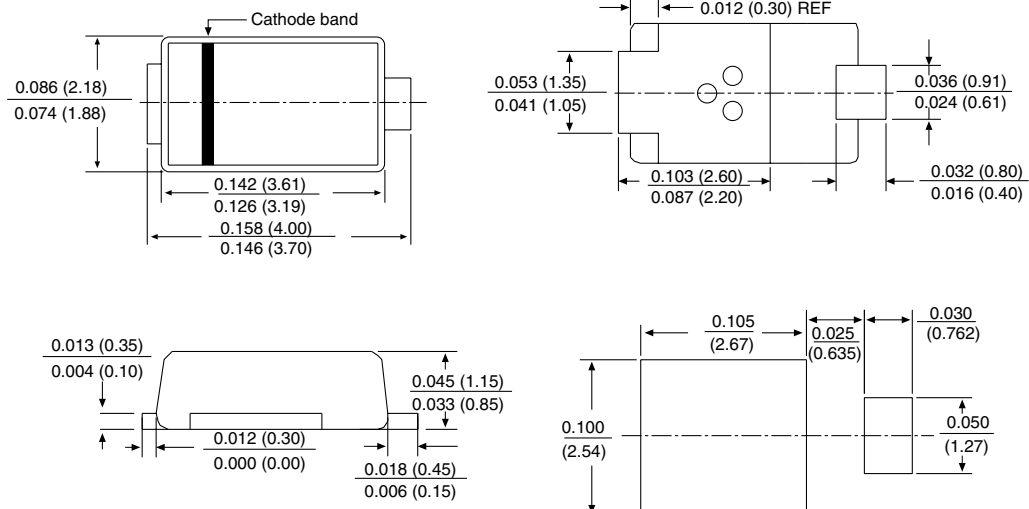


Figure 6. Typical Transient Thermal impedance

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

**DO-220AA (SMP)**





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