

# 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	$I_F = 0.7\text{ A}$	$T_J = 25\text{ }^{\circ}\text{C}$	$V_F^{(1)}$	0.86	V
	$I_F = 1\text{ A}$			0.90	
Maximum reverse current at rated $V_R$ voltage		$T_J = 25\text{ }^{\circ}\text{C}$	$I_R^{(2)}$	1.0	$\mu\text{A}$
		$T_J = 125\text{ }^{\circ}\text{C}$		25	
Maximum reverse current	$V_R = 20\text{ V}$	$T_J = 150\text{ }^{\circ}\text{C}$	$I_R$	50	$\mu\text{A}$
Maximum reverse recovery time	$I_F = 0.5\text{ A}$ , $I_R = 1\text{ A}$ , $I_{rr} = 0.25\text{ A}$		$t_{rr}$	25	ns
Typical reverse recovery time	$I_F = 1.0\text{ A}$ , $V_R = 30\text{ V}$ , $dI/dt = 50\text{ A}/\mu\text{s}$ , $I_{rr} = 10\% I_{RM}$	$T_J = 25\text{ }^{\circ}\text{C}$	$t_{rr}$	25	ns
		$T_J = 100\text{ }^{\circ}\text{C}$		35	
Typical stored charge	$I_F = 1.0\text{ A}$ , $V_R = 30\text{ V}$ , $dI/dt = 50\text{ A}/\mu\text{s}$ , $I_{rr} = 10\% I_{RM}$	$T_J = 25\text{ }^{\circ}\text{C}$	$Q_{rr}$	10	nC
		$T_J = 100\text{ }^{\circ}\text{C}$		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  $\leq 40\text{ ms}$

THERMAL CHARACTERISTICS (T <sub>A</sub> = 25 °C unless otherwise noted)					
PARAMETER	SYMBOL	ESH1PB	ESH1PC	ESH1PD	UNIT
Typical thermal resistance	R <sub>θJA</sub> <sup>(1)</sup>	105			°C/W
	R <sub>θJM</sub> <sup>(2)</sup>	15			
	R <sub>θJC</sub> <sup>(3)</sup>	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** ( $T_A = 25\text{ }^{\circ}\text{C}$  unless otherwise noted)

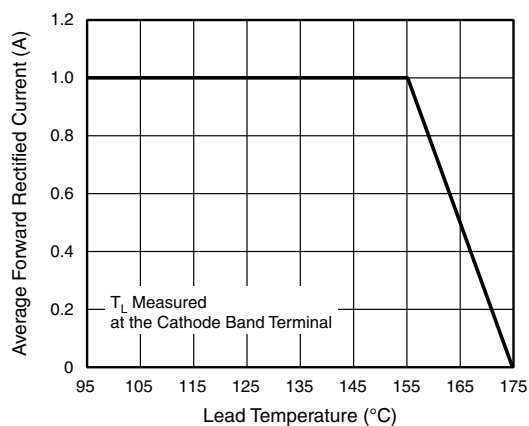


Fig. 1 - Forward Current Derating Curve

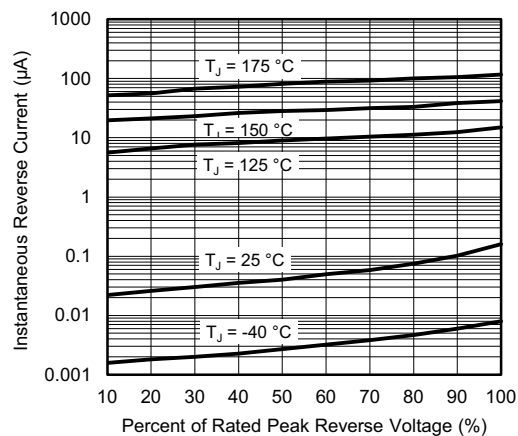


Fig. 4 - Typical Reverse Leakage Characteristics

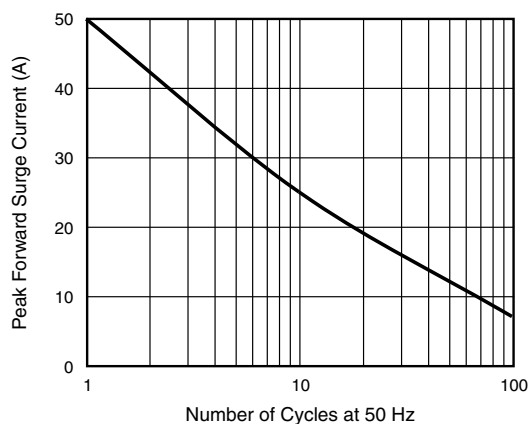


Fig. 2 - Maximum Non-Repetitive Peak Forward Surge Current

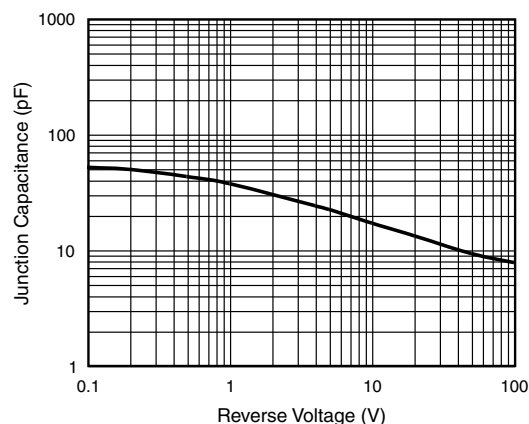


Fig. 5 - Typical Junction Capacitance

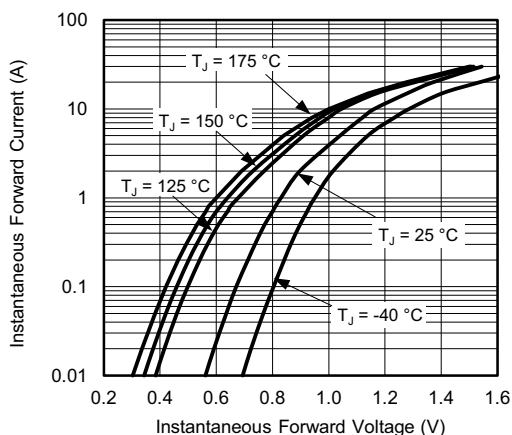


Fig. 3 - Typical Instantaneous Forward Characteristics

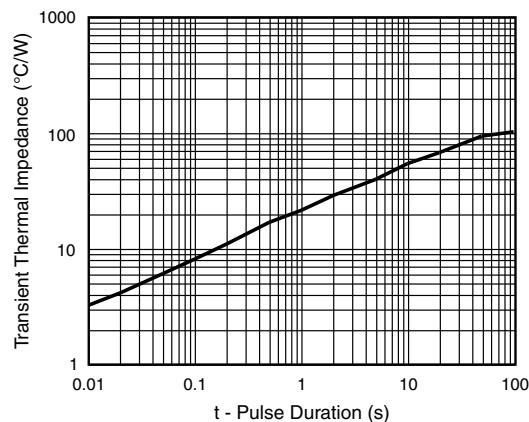
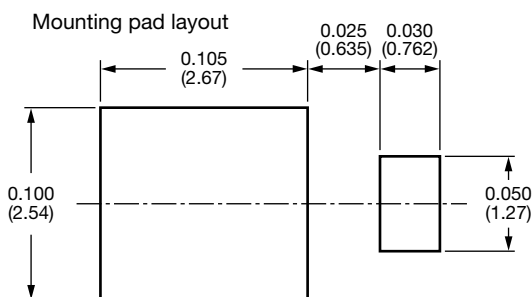
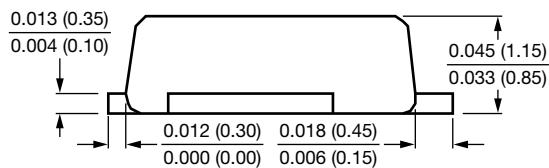
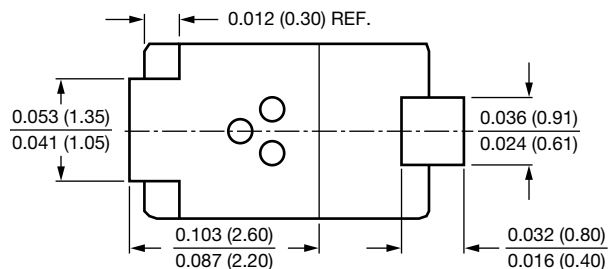
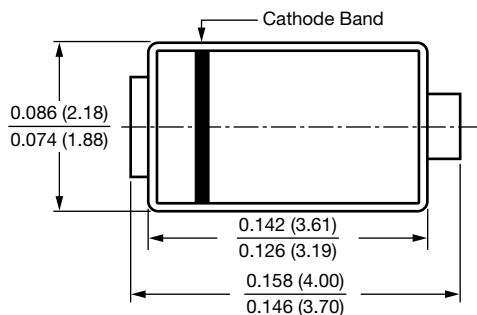


Fig. 6 - Typical Transient Thermal Impedance



## PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

### SMP (DO-220AA)





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