

# Ultrafast Rectifier, 1 A FRED Pt<sup>®</sup>

 eSMP<sup>®</sup> Series


SMP (DO-220AA)

Cathode Anode


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

## FEATURES

- Very low profile - typical height of 1.0 mm
- Ideal for automated placement
- Low forward voltage drop, low power losses
- Low leakage current
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- For PFC, CRM snubber operation
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

## TYPICAL APPLICATIONS

For use in high frequency, freewheeling, DC/DC converters, PFC, and in snubber industrial and automotive applications.

## MECHANICAL DATA

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

Molding compound meets UL 94 V-0 flammability rating

**Terminals:** matte tin plated leads, solderable per J-STD-002, meets JESD 201 class 2 whisker test

**Polarity:** color band denotes cathode end

## LINKS TO ADDITIONAL RESOURCES



PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	1 A
$V_R$	100 V, 200 V
$V_F$ at $I_F$	0.69 V
$I_{FSM}$	40 A
$t_{rr}$ (typ.)	23 ns
$T_J$ max.	175 °C
Package	SMP (DO-220AA)
Circuit configuration	Single

ABSOLUTE MAXIMUM RATINGS					
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS	
Peak repetitive reverse voltage	VS-1ENH01-M3	$V_{RRM}$		100	V
	VS-1ENH02-M3			200	
Average rectified forward current	$I_{F(AV)}$	$T_C = 168$ °C	1	A	
Non-repetitive peak surge current	$I_{FSM}$	$T_J = 25$ °C, 10 ms sine pulse	40		
Operating junction and storage temperatures	$T_J, T_{Stg}$		-55 to +175	°C	

ELECTRICAL SPECIFICATIONS ( $T_J = 25$ °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS	
Breakdown voltage, blocking voltage	VS-1ENH01-M3	$V_{BR}, V_R$	$I_R = 100$ $\mu$ A	100	-	-	V
	VS-1ENH02-M3			200	-	-	
Forward voltage	$V_F$	$I_F = 1$ A	-	0.86	0.92		
		$I_F = 1$ A, $T_J = 150$ °C	-	0.69	0.74		
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	-	2	$\mu$ A	
		$T_J = 150$ °C, $V_R = V_R$ rated	-	-	20		
Junction capacitance	$C_T$	$V_R = 200$ V	-	8	-	pF	



DYNAMIC RECOVERY CHARACTERISTICS (T <sub>J</sub> = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 1.0 A, di <sub>F</sub> /dt = 100 A/μs, V <sub>R</sub> = 30 V	-	23	-	ns
		I <sub>F</sub> = 0.5 A, I <sub>R</sub> = 1 A, I <sub>rr</sub> = 0.25 A	-	-	28	
		T <sub>J</sub> = 25 °C	-	14	-	
		T <sub>J</sub> = 125 °C	-	22	-	
Peak recovery current	I <sub>RRM</sub>	T <sub>J</sub> = 25 °C	-	1.7	-	A
		T <sub>J</sub> = 125 °C	-	2.7	-	
Reverse recovery charge	Q <sub>rr</sub>	T <sub>J</sub> = 25 °C	-	10	-	nC
		T <sub>J</sub> = 125 °C	-	29	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	T <sub>J</sub> , T <sub>Stg</sub>		-55	-	175	°C
Thermal resistance, junction mount	R <sub>thJM</sub> <sup>(1)</sup>	Infinite heatsink	-	7	9	°C/W
Thermal resistance, junction to ambient	R <sub>thJA</sub>	PCB footprint 4.8 mm x 4.8 mm	-	107	-	
Approximate weight			0.024			g
Marking device	VS-1ENH01-M3	Case style SMP (DO-220AA)	1H1			
	VS-1ENH02-M3		1H2			

**Note**

(1) Thermal resistance junction to mount follows JEDEC® 51-14 transient dual interface test method (TDIM)

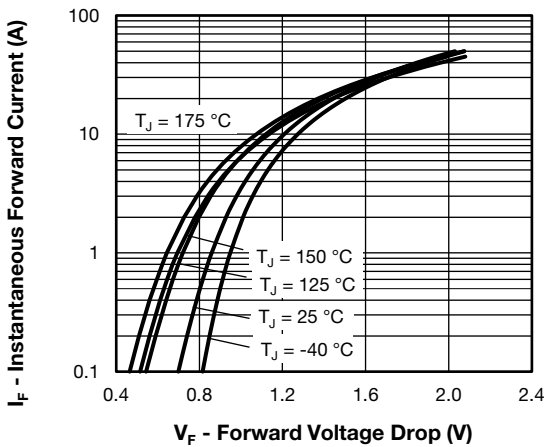


Fig. 1 - Typical Forward Voltage Drop Characteristics

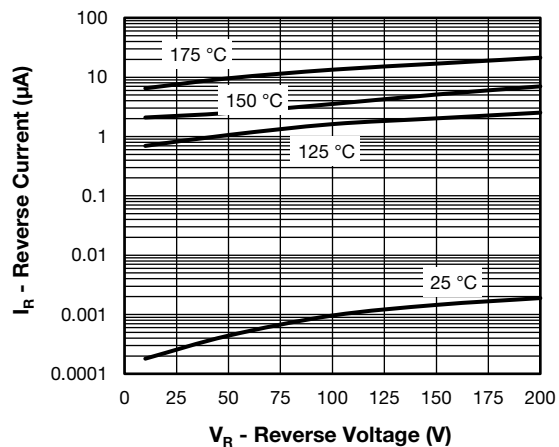


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

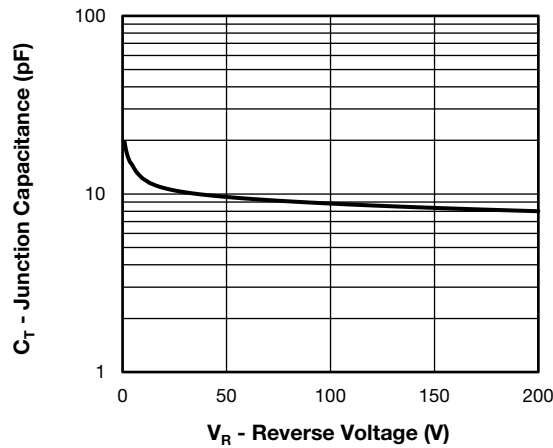


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

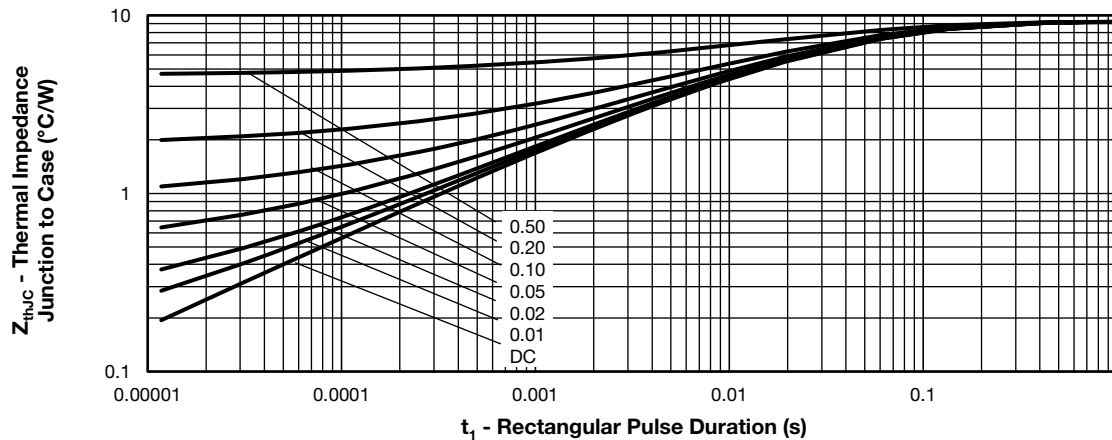


Fig. 4 - Transient Thermal Impedance, Junction to Case

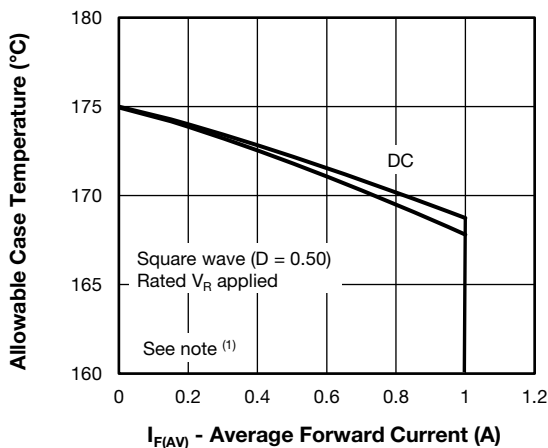


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

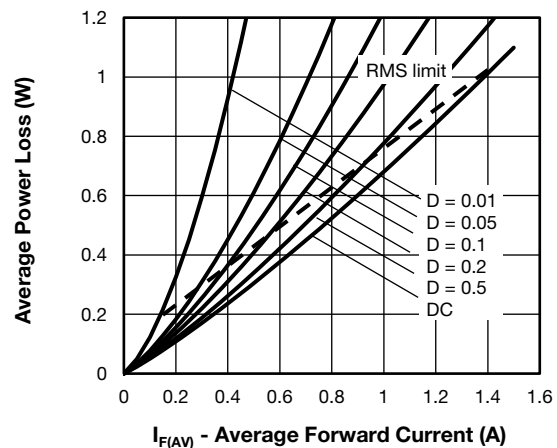


Fig. 6 - Forward Power Loss Characteristics

**Note**

- (1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$ ;  
 $P_d$  = forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 5);  
 $P_{dREV}$  = inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1}$  = rated  $V_R$

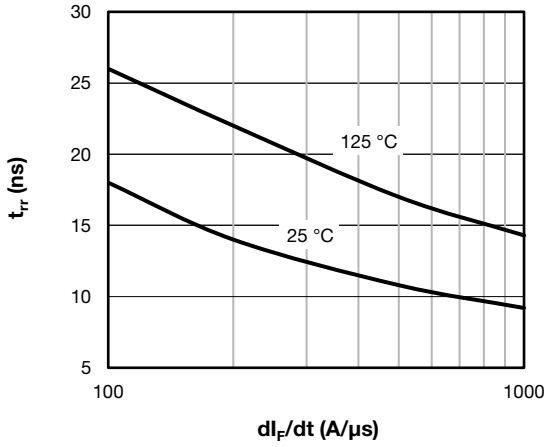


Fig. 7 - Typical Reverse Recovery Time vs.  $di_F/dt$

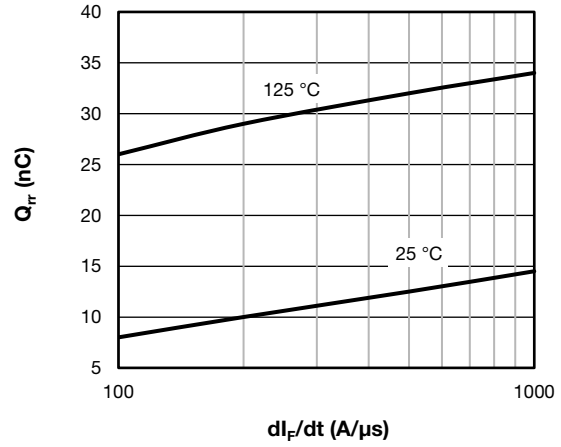
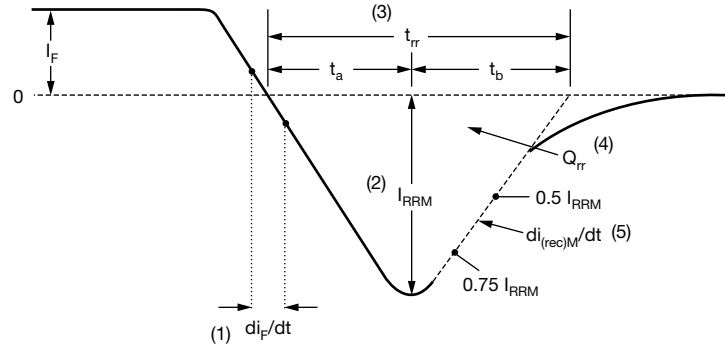


Fig. 8 - Typical Stored Charge vs.  $di_F/dt$



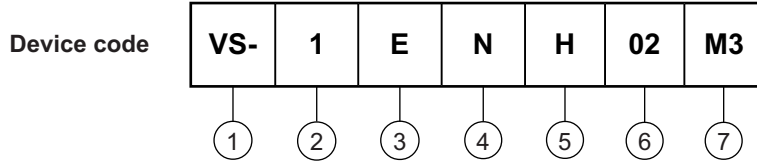
- (1)  $di_F/dt$  - rate of change of current through zero crossing
- (2)  $I_{RRM}$  - peak reverse recovery current
- (3)  $t_{rr}$  - reverse recovery time measured from zero crossing point of negative going  $I_F$  to point where a line passing through  $0.75 I_{RRM}$  and  $0.50 I_{RRM}$  extrapolated to zero current.
- (4)  $Q_{rr}$  - area under curve defined by  $t_{rr}$  and  $I_{RRM}$
- (5)  $di_{(rec)M'}/dt$  - peak rate of change of current during  $t_b$  portion of  $t_{rr}$

$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

Fig. 9 - Reverse Recovery Waveform and Definitions



ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - Current rating (1 = 1 A)
- 3** - Circuit configuration:  
E = single diode
- 4** - N = SMP package
- 5** - Process type,  
H = ultrafast recovery
- 6** - Voltage code (02 = 200 V)
- 7** - M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

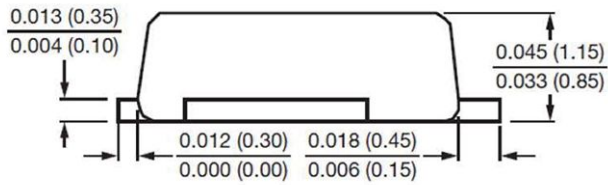
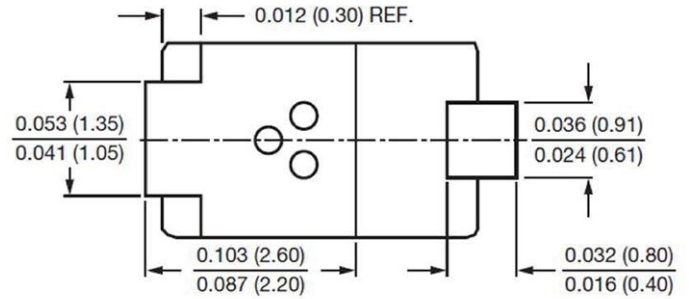
ORDERING INFORMATION (Example)			
PREFERRED P/N	PREFERRED PACKAGE CODE	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-1ENH01-M3/84A	84A	3000	7" diameter plastic tape and reel
VS-1ENH01-M3/85A	85A	10 000	13" diameter plastic tape and reel
VS-1ENH02-M3/84A	84A	3000	7" diameter plastic tape and reel
VS-1ENH02-M3/85A	85A	10 000	13" diameter plastic tape and reel

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?96547">www.vishay.com/doc?96547</a>
Part marking information	<a href="http://www.vishay.com/doc?96574">www.vishay.com/doc?96574</a>
Packaging information	<a href="http://www.vishay.com/doc?88869">www.vishay.com/doc?88869</a>
SPICE model	<a href="http://www.vishay.com/doc?96550">www.vishay.com/doc?96550</a>

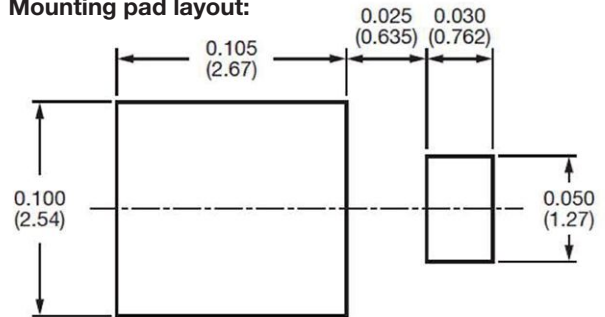


## SMP (DO-220AA)

**DIMENSIONS** in inches (millimeters)



### Mounting pad layout:





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