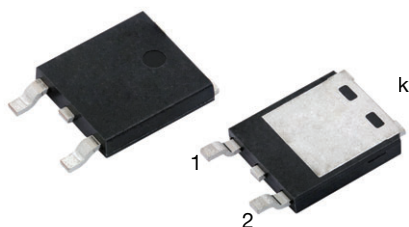


# Hyperfast Rectifier, 4 A FRED Pt®

## eSMP® Series



SlimDPAK (TO-252AE)



## FEATURES

- Hyperfast recovery time
- 175 °C max. operating junction temperature
- Low forward voltage drop reduced  $Q_{rr}$  and soft recovery
- Low leakage current
- Very low profile - typical height of 1.3 mm
- Ideal for automated placement
- Polyimide passivation for high reliability standard
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- AEC-Q101 qualified, meets JESD 201 class 2 whisker test
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
FREE

## LINKS TO ADDITIONAL RESOURCES



3D Models

## PRIMARY CHARACTERISTICS

$I_{F(AV)}$	4 A
$V_R$	200 V
$V_F$ at $I_F$	0.71 V
$t_{rr}$ (typ.)	16 ns
$T_J$ max.	175 °C
Package	SlimDPAK (TO-252AE)
Circuit configuration	Single

## DESCRIPTION / APPLICATIONS

State of the art hyper fast recovery rectifiers with optimized performance of forward voltage drop and hyper fast recovery time.

The planar structure and the platinum doped life time control guarantee the best overall performance, ruggedness, and reliability characteristics.

These devices are intended for use in PFC boost stage in the AC/DC section of SMPS inverters, or as freewheeling diodes. Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

## MECHANICAL DATA

**Case:** SlimDPAK (TO-252AE)

Molding compound meets UL 94 V-0 flammability rating  
Halogen-free, RoHS-compliant

**Terminals:** matte tin plated leads, solderable per J-STD-002

## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage	$V_{RRM}$		200	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 167\text{ °C}$	4	A
Non-repetitive peak surge current	$I_{FSM}$	$T_J = 25\text{ °C}$ , 10 ms sine pulse wave	100	
Operating junction and storage temperatures	$T_J, T_{Stg}$		-55 to +175	°C

## ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ °C}$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	$V_{BR}, V_R$	$I_R = 100\text{ }\mu\text{A}$	200	-	-	V
Forward voltage	$V_F$	$I_F = 4\text{ A}$	-	0.88	1.0	
		$I_F = 4\text{ A}$ , $T_J = 150\text{ °C}$	-	0.71	0.80	
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	-	3	$\mu\text{A}$
		$T_J = 150\text{ °C}$ , $V_R = V_R$ rated	-	-	80	
Junction capacitance	$C_T$	$V_R = 200\text{ V}$	-	17	-	pF

<b>DYNAMIC RECOVERY CHARACTERISTICS</b> ( $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	$t_{rr}$	$I_F = 1.0\text{ A}$ , $dI_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	16	-	ns
		$I_F = 0.5\text{ A}$ , $I_R = 1\text{ A}$ , $I_{RR} = 0.25\text{ A}$	-	-	25	
		$T_J = 25\text{ }^{\circ}\text{C}$	-	20	-	
		$T_J = 125\text{ }^{\circ}\text{C}$	-	30	-	
Peak recovery current	$I_{RRM}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	2.5	-	A
		$T_J = 125\text{ }^{\circ}\text{C}$	-	4	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	25	-	nC
		$T_J = 125\text{ }^{\circ}\text{C}$	-	60	-	

<b>THERMAL - MECHANICAL SPECIFICATIONS</b>						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	$T_J, T_{Stg}$		-55	-	175	$^{\circ}\text{C}$
Thermal resistance, junction to ambient	$R_{thJA}$ (1)(2)		-	73	90	$^{\circ}\text{C}/\text{W}$
Thermal resistance, junction to mount	$R_{thJM}$ (3)		-	2.1	2.5	$^{\circ}\text{C}/\text{W}$
Marking device		Case style SlimDPAK (TO-252AE)	4EVH02			

**Notes**

- (1) The heat generated must be less than thermal conductivity from junction to ambient;  $dP_D/dT_J < 1/R_{thJA}$   
(2) Free air, mounted or recommended copper pad area; thermal resistance  $R_{thJA}$  - junction to ambient  
(3) Mounted on infinite heatsink

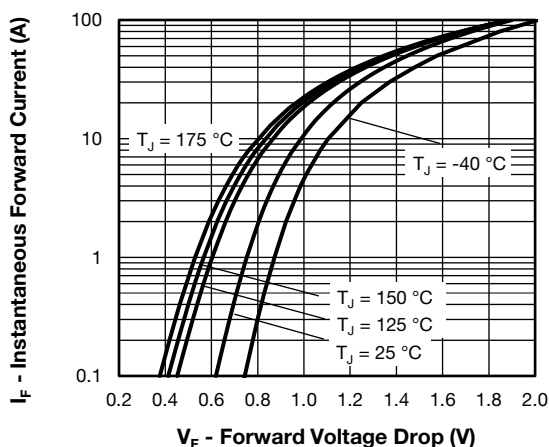


Fig. 1 - Typical Forward Voltage Drop Characteristics

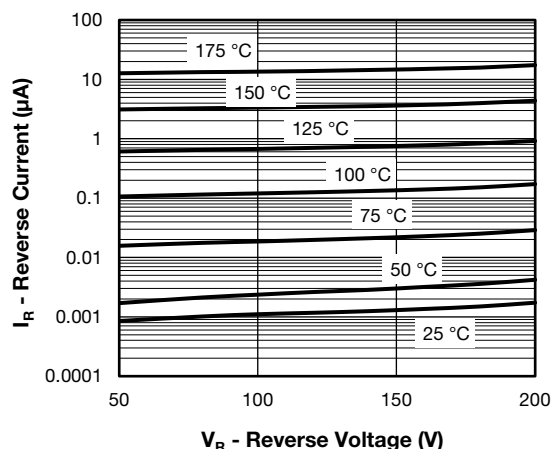


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

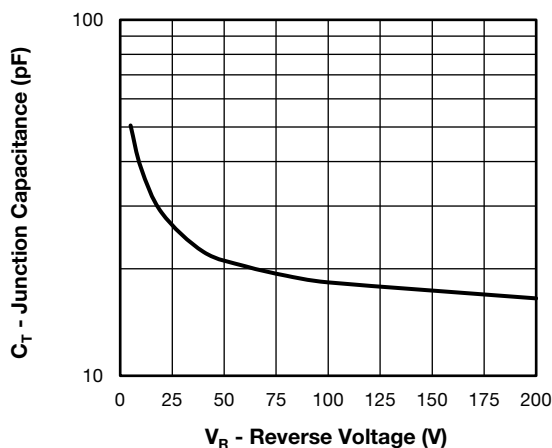


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

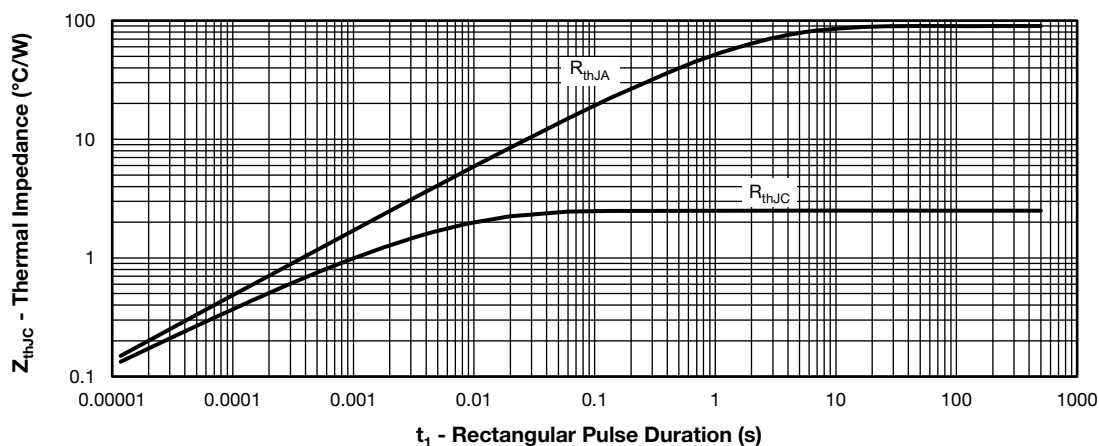
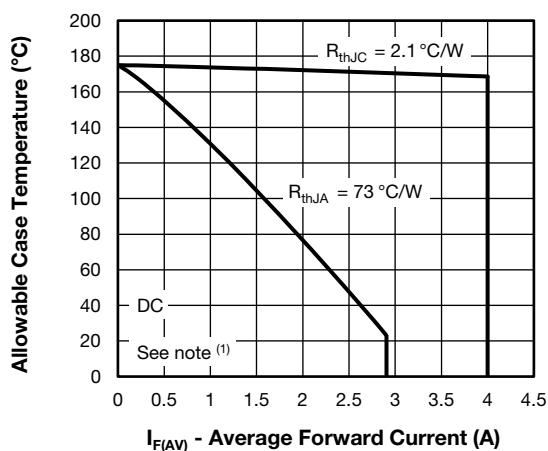

Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics


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

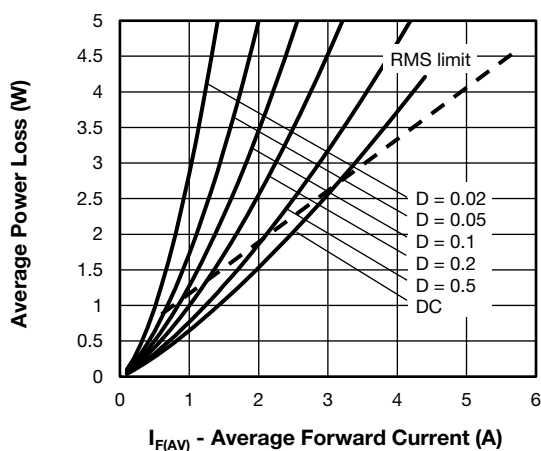


Fig. 6 - Forward Power Loss Characteristics

#### 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. 6);  
 $P_{dREV}$  = inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1}$  = rated  $V_R$

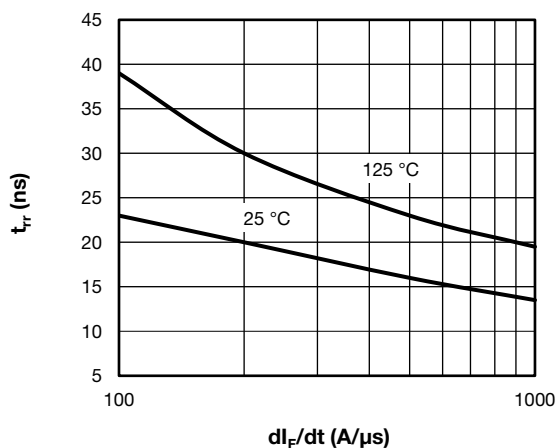
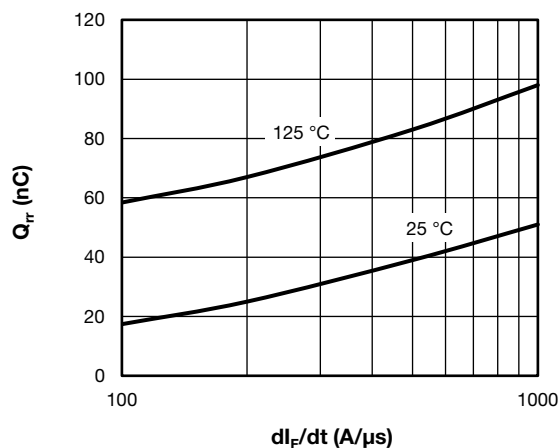
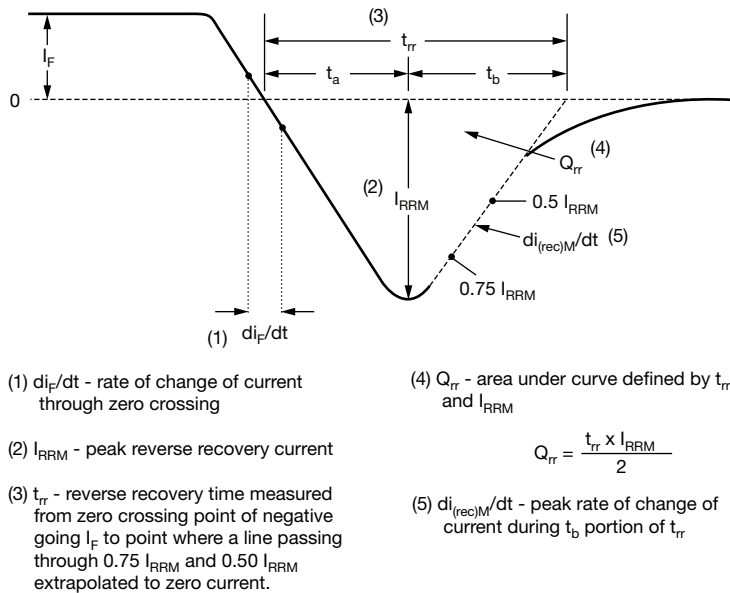

Fig. 7 - Typical Reverse Recovery Time vs.  $dI_F/dt$ 

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


Fig. 9 - Reverse Recovery Waveform and Definitions



## ORDERING INFORMATION TABLE

Device code	VS-	4	E	V	H	02	H	M3
	1	2	3	4	5	6	7	8
1	- Vishay Semiconductors product							
2	- Current rating (4 = 4 A)							
3	- Circuit configuration: E = single die							
4	- V = SlimDPAK							
5	- Process type: H = hyper fast recovery							
6	- Voltage code (02 = 200 V)							
7	- H = AEC-Q101 qualified							
8	- Environmental digit: M3 = halogen-free, RoHS compliant, and terminations lead (Pb)-free							

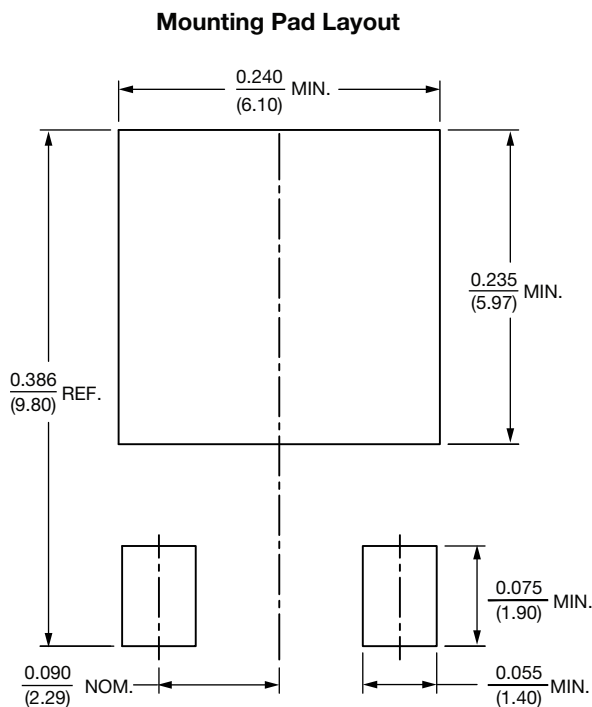
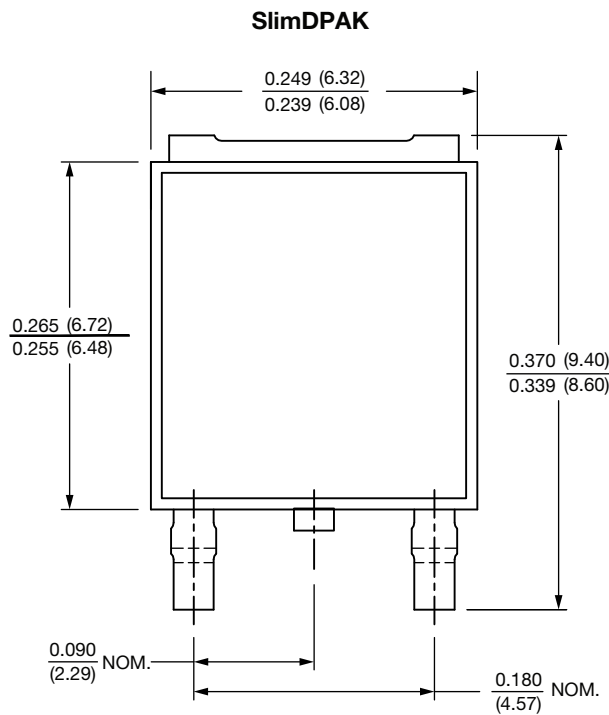
ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER REEL	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-4EVH02HM3/I	4500	4500	13" diameter plastic tape and reel

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?96081">www.vishay.com/doc?96081</a>
Part marking information	<a href="http://www.vishay.com/doc?96085">www.vishay.com/doc?96085</a>
Packaging information	<a href="http://www.vishay.com/doc?88869">www.vishay.com/doc?88869</a>



## SlimDPAK

**DIMENSIONS** in inches (millimeters)





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