AUTOMOTIVE

RoHS

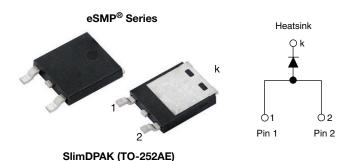
COMPLIANT HALOGEN

FREE



Vishay Semiconductors

Hyperfast Rectifier, 4 A FRED Pt®



LINKS TO ADDITIONAL RESOURCES



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			

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 <u>www.vishav.com/doc?99912</u>

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 °C	4	Δ
Non-repetitive peak surge current	I _{FSM}	$T_J = 25$ °C, 10 ms sine pulse wave	100	A
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	V_{BR} , V_{R}	I _R = 100 μA	200	-	-		
Forward voltage	V _F	I _F = 4 A	-	0.88	1.0	V	
Forward voltage		VF	VF	I _F = 4 A, T _J = 150 °C	-	0.71	0.80
Reverse leakage current		$V_R = V_R$ rated	-	-	3	μA	
neverse leakage current	I _R	$T_J = 150 ^{\circ}\text{C}, V_R = V_R \text{rated}$	-	-	80	μΑ	
Junction capacitance	C _T	V _R = 200 V	-	17	-	pF	



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DYNAMIC RECOVERY CHARACTERISTICS (T _J = 25 °C unless otherwise specified)							
PARAMETER	SYMBOL	TEST CO	TEST CONDITIONS		TYP.	MAX.	UNITS
		$I_F = 1.0 A, dI_F/dt =$	100 A/μs, V _R = 30 V	1	16	1	
Reverse recovery time	t _{rr}	$I_F = 0.5 \text{ A}, I_R = 1 \text{ A}, I_{RR} = 0.25 \text{ A}$		-	-	25	ns
neverse recovery time		T _J = 25 °C		-	20	-	115
		T _J = 125 °C		-	30	-	
Peak recovery current	I _{RRM}	T _J = 25 °C	l _F = 4 A dl _F /dt = 200 A/μs	-	2.5	-	Α
reak recovery current		T _J = 125 °C	$V_{R} = 160 \text{ V}$	-	4	-	_ ^
Reverse recovery charge	0	T _J = 25 °C		1	25	1	nC
neverse recovery criarge	Q _{rr}	T _J = 125 °C		-	60	-	110

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	T _J , T _{Stg}		-55	-	175	°C
Thermal resistance, junction to ambient	R _{thJA} (1)(2)		-	73	90	°C/W
Thermal resistance, junction to mount	R _{thJM} (3)		-	2.1	2.5	°C/W
Weight			-	0.20	-	g
Marking device		Case style SlimDPAK (TO-252AE)		4EV	H02	

Notes

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

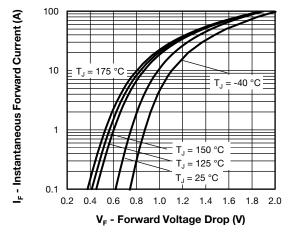


Fig. 1 - Typical Forward Voltage Drop Characteristics

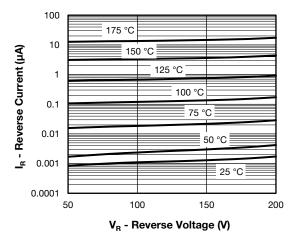


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage



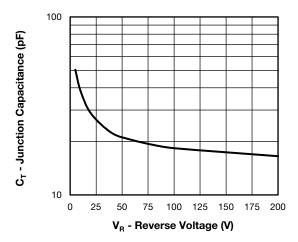


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

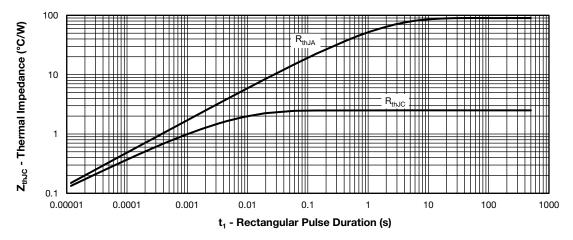


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

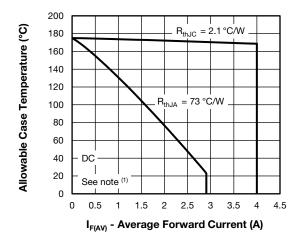


Fig. 5 - Maximum Allowable Case Temperature vs.
Average Forward Current

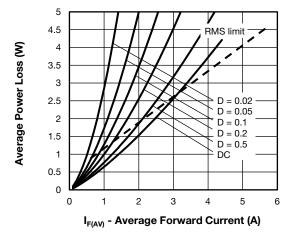


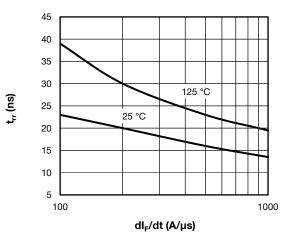
Fig. 6 - Forward Power Loss Characteristics

Note

⁽¹⁾ Formula used: T_C = T_J - (Pd + Pd_{REV}) x R_{thJC}; Pd = forward power loss = I_{F(AV)} x V_{FM} at (I_{F(AV)}/D) (see fig. 6); Pd_{REV} = inverse power loss = V_{R1} x I_R (1 - D); I_R at V_{R1} = rated V_R

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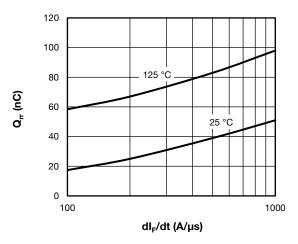
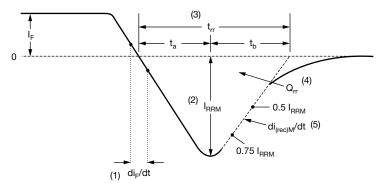


Fig. 8 - Typical Stored Charge vs. dl_F/dt



- (1) di_F/dt rate of change of current through zero crossing
- (2) $\mathrm{I}_{\mathrm{RRM}}$ peak reverse recovery current
- (3) $\rm t_{rr}$ reverse recovery time measured from zero crossing point of negative going $\rm I_F$ to point where a line passing through 0.75 $\rm I_{RRM}$ and 0.50 $\rm I_{RRM}$ extrapolated to zero current.
- (4) \mathbf{Q}_{rr} area under curve defined by \mathbf{t}_{rr} and \mathbf{I}_{RRM}

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

(5) di_{(rec)M}/dt - peak rate of change of current during t_b portion of t_{rr}

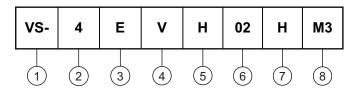
Fig. 9 - Reverse Recovery Waveform and Definitions



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ORDERING INFORMATION TABLE

Device code



1 - Vishay Semiconductors product

2 - Current rating (4 = 4 A)

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 <u>www.vishay.com/doc?96081</u>					
Part marking information	www.vishay.com/doc?96085				
Packaging information	www.vishay.com/doc?88869				
SPICE model	www.vishay.com/doc?97123				



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SlimDPAK

DIMENSIONS in inches (millimeters)





Mounting Pad Layout







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