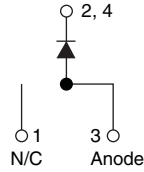


## Hyperfast Rectifier, 4 A FRED Pt®



TO-252AA (D-PAK)



### FEATURES

- Hyperfast recovery time
- 175 °C max. operating junction temperature
- Output rectification freewheeling
- Low forward voltage drop reduced  $Q_{rr}$  and soft recovery
- Low leakage current
- AEC-Q101 qualified
- Meets JESD 201 class 2 whisker test
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


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

PRODUCT SUMMARY	
Package	TO-252AA (D-PAK)
$I_{F(AV)}$	4 A
$V_R$	200 V
$V_F$ at $I_F$	0.71 V
$t_{rr}$ (typ.)	23 ns
$T_J$ max.	175 °C
Diode variation	Single die

### DESCRIPTION / APPLICATIONS

State of the art hyperfast recovery rectifiers specifically designed with optimized performance of forward voltage drop and hyperfast 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 the output rectification stage of SMPS, UPS, DC/DC converters as well as freewheeling diode in low voltage inverters and chopper motor drives.

Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage	$V_{RRM}$		200	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 164\text{ °C}$	4	A
Non-repetitive peak surge current	$I_{FSM}$	$T_J = 25\text{ °C}$	80	
Peak repetitive forward current	$I_{FM}$	$T_C = 164\text{ °C}$ , $f = 20\text{ kHz}$ , $d = 50\%$	8	
Operating junction and storage temperatures	$T_J, T_{Stg}$		-65 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	$V_F$	$I_F = 4\text{ A}$	-	0.87	0.95	
		$I_F = 4\text{ A}$ , $T_J = 150\text{ °C}$	-	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	-	2	20	
Junction capacitance	$C_T$	$V_R = 600\text{ V}$	-	17	-	pF
Series inductance	$L_S$	Measured lead to lead 5 mm from package body	-	8	-	nH



<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	$t_{rr}$	$I_F = 1.0\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	23	-	ns
		$I_F = 1.0\text{ A}$ , $di_F/dt = 50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	24	-	
		$T_J = 25\text{ }^\circ\text{C}$	-	20	-	
		$T_J = 125\text{ }^\circ\text{C}$	-	27	-	
Peak recovery current	$I_{RRM}$	$T_J = 25\text{ }^\circ\text{C}$	-	2	-	A
		$T_J = 125\text{ }^\circ\text{C}$	-	3.4	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^\circ\text{C}$	-	20	-	nC
		$T_J = 125\text{ }^\circ\text{C}$	-	46	-	

<b>THERMAL - MECHANICAL SPECIFICATIONS</b>						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	$T_J, T_{Stg}$		-65	-	175	$^\circ\text{C}$
Thermal resistance, junction to case per leg	$R_{thJC}$		-	2.7	3.2	$^\circ\text{C}/\text{W}$
Approximate weight			0.3			g
			0.01			oz.
Marking device		Case style TO-252AA (D-PAK)	4EWH02FNH			

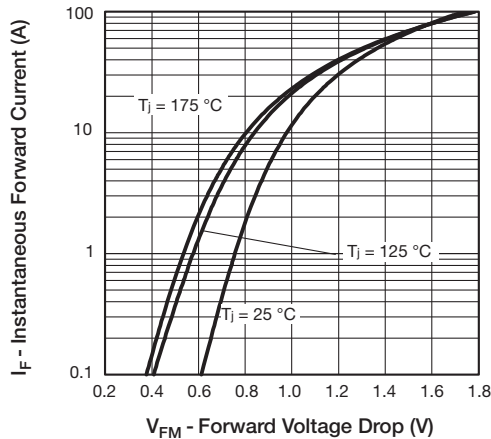


Fig. 1 - Typical Forward Voltage Drop Characteristics

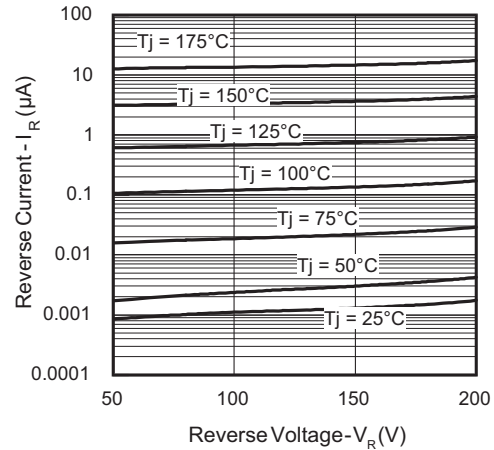


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

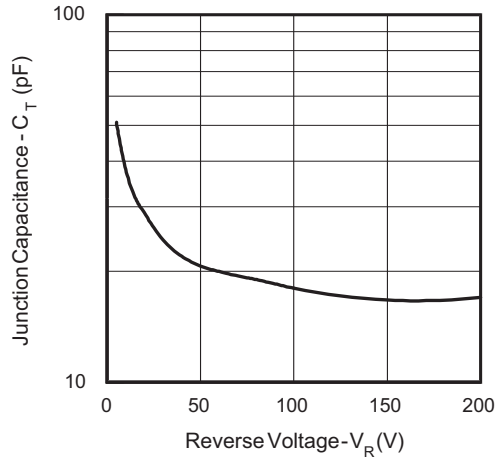


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

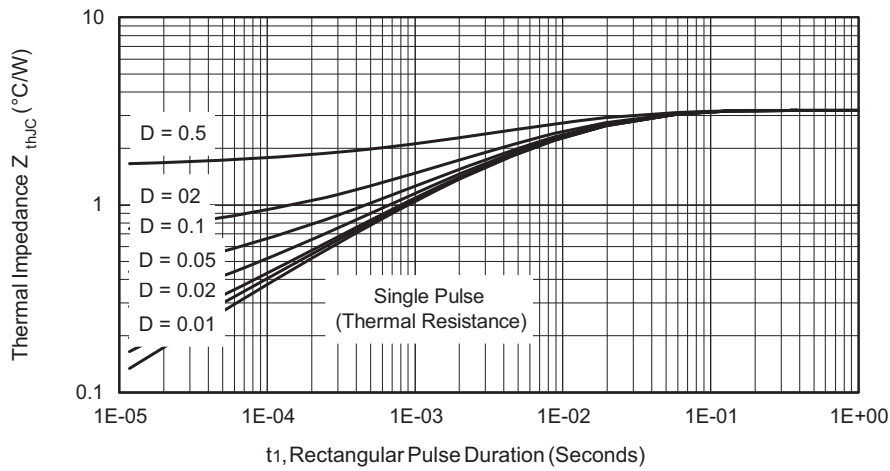


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

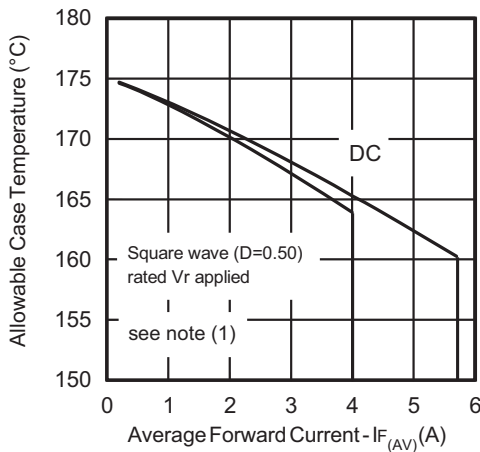


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

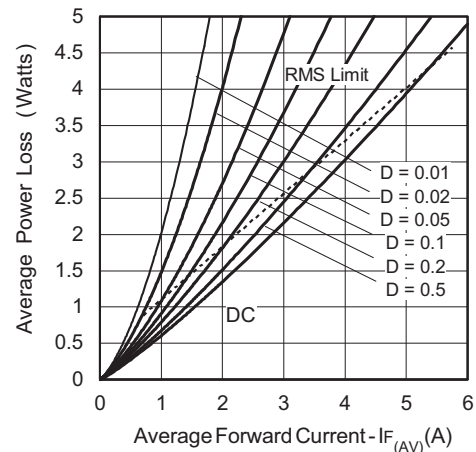


Fig. 6 - Forward Power Loss Characteristics

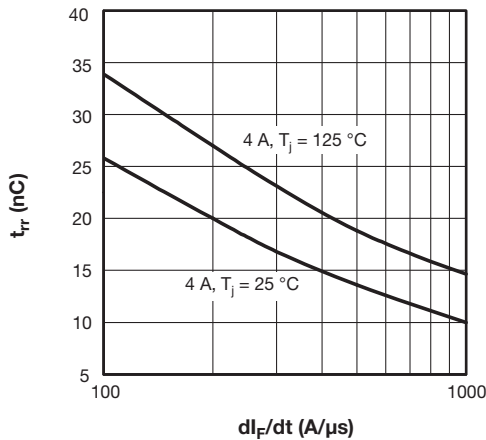


Fig. 7 - Typical Reverse Recovery Time vs.  $di_F/dt$

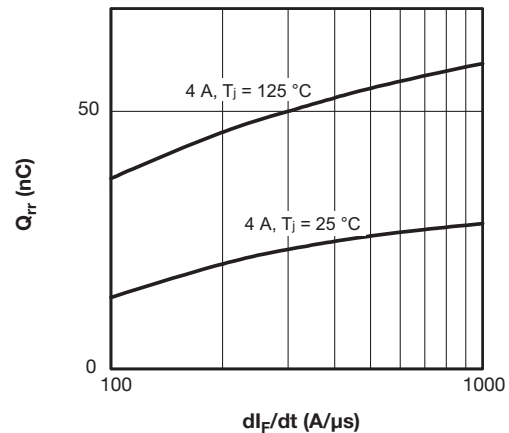
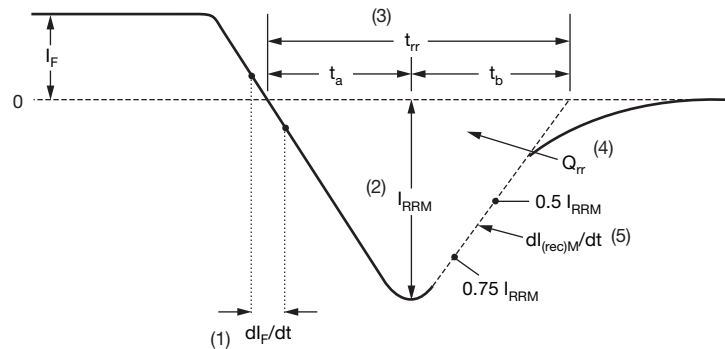


Fig. 8 - Typical Stored Charge vs.  $di_F/dt$

**Note**

- (1) Formula used:  $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$ ;  
 $Pd$  = Forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 6);  
 $Pd_{REV}$  = Inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1}$  = Rated  $V_R$



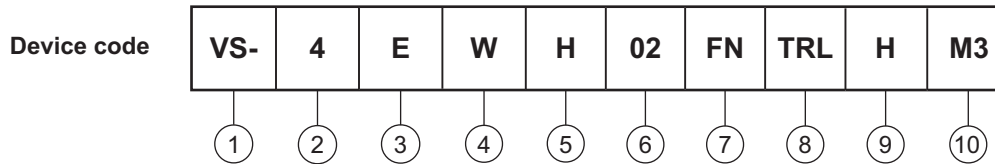
- (1)  $di_F/dt$  - rate of change of current through zero crossing
- (2)  $I_{RRM}$  - peak reverse recovery current
- (3)  $t_{rr}$  - reverse recovery time measured from zero crossing point of negative going  $I_F$  to point where a line passing through  $0.75 I_{RRM}$  and  $0.50 I_{RRM}$  extrapolated 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 (4 = 4 A)
- 3** - Circuit configuration:  
E = single diode
- 4** - Package identifier:  
W = D-PAK
- 5** - H = hyperfast recovery
- 6** - Voltage rating (02 = 200 V)
- 7** - FN = TO-252AA
- 8** -
  - None = tube
  - TR = tape and reel
  - TRL = tape and reel (left oriented)
  - TRR = tape and reel (right oriented)
- 9** - H = AEC-Q101 qualified
- 10** - Environmental digit:  
M3 = halogen-free, RoHS compliant, and terminations lead (Pb)-free

ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-4EWH02FNHM3	75	3000	Antistatic plastic tube
VS-4EWH02FNTRHM3	2000	2000	13" diameter reel
VS-4EWH02FNTRLHM3	3000	3000	13" diameter reel
VS-4EWH02FNTRRHM3	3000	3000	13" diameter reel

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95519">www.vishay.com/doc?95519</a>
Part marking information	<a href="http://www.vishay.com/doc?95518">www.vishay.com/doc?95518</a>
Packaging information	<a href="http://www.vishay.com/doc?95033">www.vishay.com/doc?95033</a>
SPIICE model	<a href="http://www.vishay.com/doc?95381">www.vishay.com/doc?95381</a>



## **Disclaimer**

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.