

Hyperfast Rectifier, 4 A FRED Pt[®]


D-PAK (TO-252AA)


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
- Compliant to RoHS Directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C


RoHS
 COMPLIANT
 HALOGEN
FREE

PRODUCT SUMMARY	
Package	D-PAK (TO-252AA)
$I_{F(AV)}$	4 A
V_R	200 V
V_F at I_F	0.95 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	μA
		$T_J = 150\text{ °C}$, $V_R = V_R$ 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



DYNAMIC RECOVERY CHARACTERISTICS (T _J = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t _{rr}	I _F = 1.0 A, dI _F /dt = 100 A/μs, V _R = 30 V	-	23	27	ns
		I _F = 1.0 A, dI _F /dt = 50 A/μs, V _R = 30 V	-	24	-	
		T _J = 25 °C	-	20	-	
		T _J = 125 °C	-	27	-	
Peak recovery current	I _{RRM}	T _J = 25 °C	-	2	-	A
		T _J = 125 °C	-	3.4	-	
Reverse recovery charge	Q _{rr}	T _J = 25 °C	-	20	-	nC
		T _J = 125 °C	-	46	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	T _J , T _{Stg}		- 65	-	175	°C
Thermal resistance, junction to case per leg	R _{thJC}		-	2.7	3.2	°C/W
Approximate weight			0.3			g
			0.01			oz.
Marking device		Case style D-PAK (TO-252AA)	4EWH02FN			

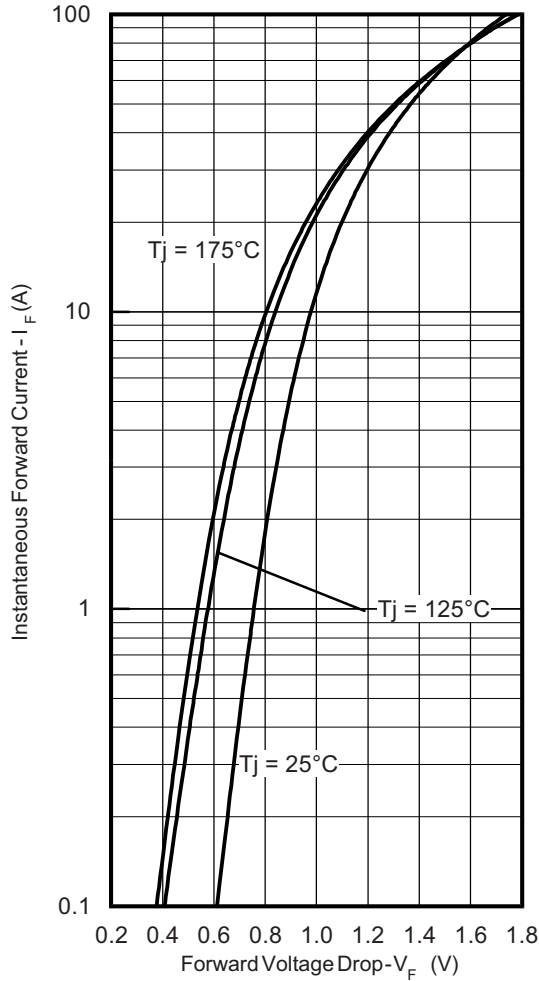


Fig. 1 - Typical Forward Voltage Drop Characteristics

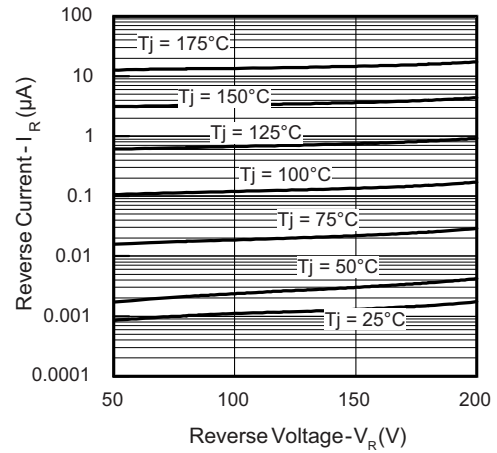


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

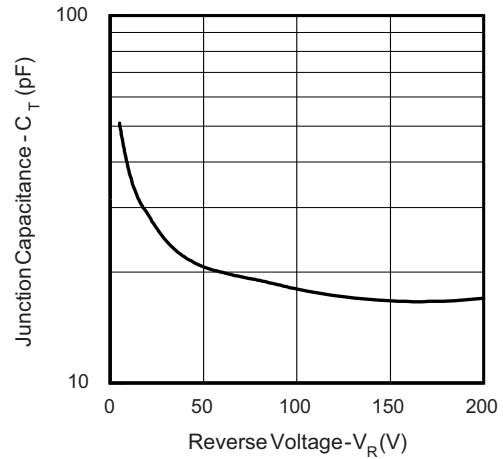


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

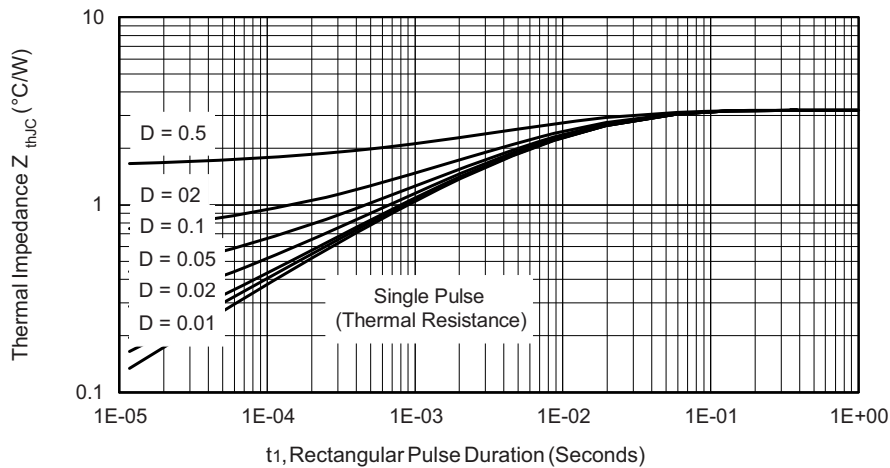


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

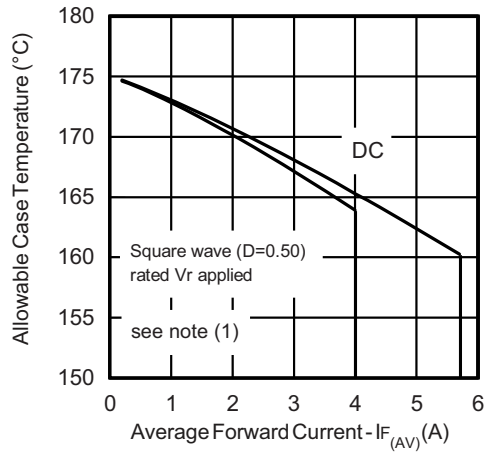


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

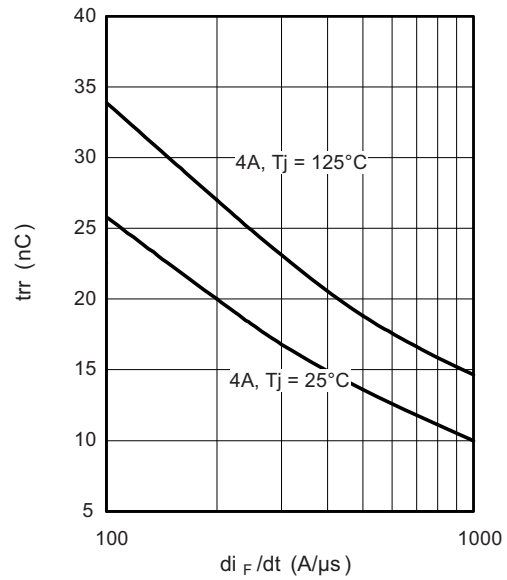


Fig. 7 - Typical Reverse Recovery Time vs. di_F/dt

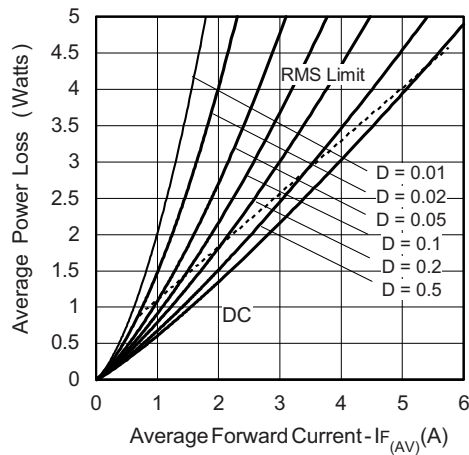


Fig. 6 - Forward Power Loss Characteristics

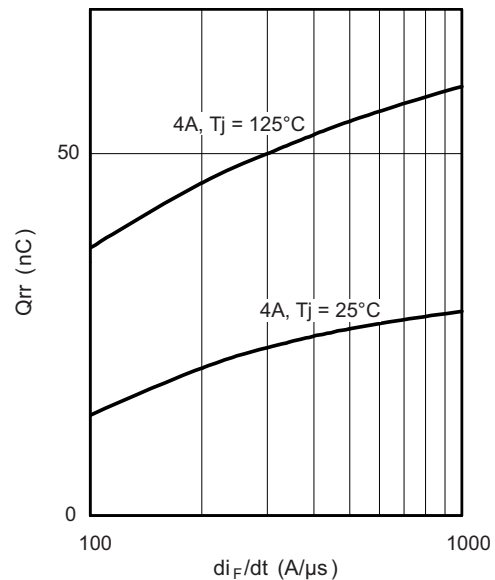


Fig. 8 - Typical Stored Charge vs. di_F/dt

Note

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

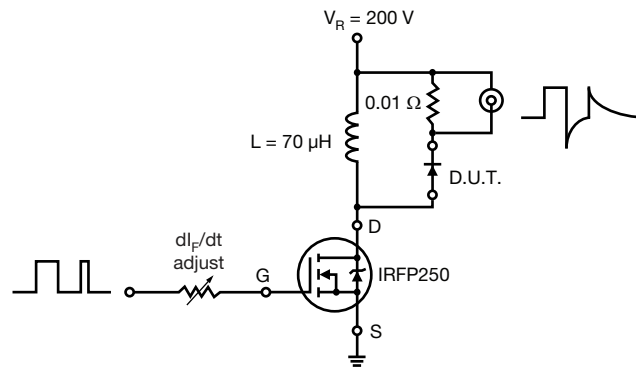
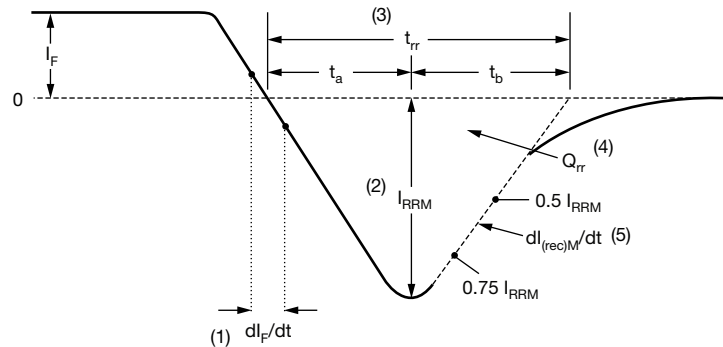


Fig. 9 - Reverse Recovery Parameter Test Circuit



(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}

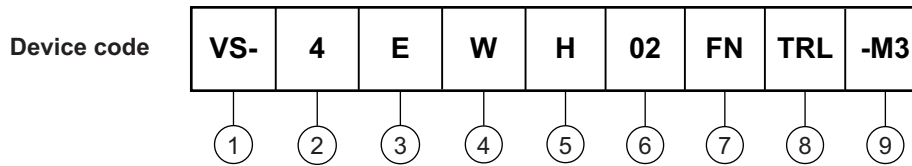
$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

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

Fig. 10 - 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** - 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-4EWH02FN-M3	75	3000	Antistatic plastic tube
VS-4EWH02FNTR-M3	2000	2000	13" diameter reel
VS-4EWH02FNTRL-M3	3000	3000	13" diameter reel
VS-4EWH02FNTRR-M3	3000	3000	13" diameter reel

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95016
Part marking information	www.vishay.com/doc?95176
Packaging information	www.vishay.com/doc?95033
SPIICE model	www.vishay.com/doc?95381

D-PAK (TO-252AA)

DIMENSIONS in millimeters and inches



SYMBOL	MILLIMETERS		INCHES		NOTES	SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.			MIN.	MAX.	MIN.	MAX.	
A	2.18	2.39	0.086	0.094		e	2.29 BSC		0.090 BSC		
A1	-	0.13	-	0.005		H	9.40	10.41	0.370	0.410	
b	0.64	0.89	0.025	0.035		L	1.40	1.78	0.055	0.070	
b2	0.76	1.14	0.030	0.045		L1	2.74 BSC		0.108 REF.		
b3	4.95	5.46	0.195	0.215	3	L2	0.51 BSC		0.020 BSC		
c	0.46	0.61	0.018	0.024		L3	0.89	1.27	0.035	0.050	3
c2	0.46	0.89	0.018	0.035		L4	-	1.02	-	0.040	
D	5.97	6.22	0.235	0.245	5	L5	1.14	1.52	0.045	0.060	2
D1	5.21	-	0.205	-	3	Ø	0°	10°	0°	10°	
E	6.35	6.73	0.250	0.265	5	Ø1	0°	15°	0°	15°	
E1	4.32	-	0.170	-	3	Ø2	25°	35°	25°	35°	

Notes

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Lead dimension uncontrolled in L5
- (3) Dimension D1, E1, L3 and b3 establish a minimum mounting surface for thermal pad
- (4) Section C - C dimension apply to the flat section of the lead between 0.13 and 0.25 mm (0.005 and 0.10") from the lead tip
- (5) Dimension D, and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body
- (6) Dimension b1 and c1 applied to base metal only
- (7) Datum A and B to be determined at datum plane H
- (8) Outline conforms to JEDEC outline TO-252AA



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