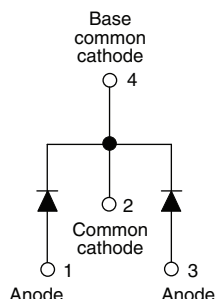


# Ultrafast Rectifier, 2 x 3 A FRED Pt®


**TO-252AA (D-PAK)**


## FEATURES

- Ultrafast recovery time
- Low forward voltage drop
- Low leakage current
- 175 °C operating junction temperature
- 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**

## DESCRIPTION / APPLICATIONS

Vishay Semiconductors' 200 V series are the 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.

## PRODUCT SUMMARY

Package	TO-252AA (D-PAK)
$I_{F(AV)}$	2 x 3 A
$V_R$	200 V
$V_F$ at $I_F$	0.9 V
$t_{rr}$ typ.	See Recovery table
$T_J$ max.	175 °C
Diode variation	Common cathode

## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Peak repetitive reverse voltage	$V_{RRM}$		200	V
Average rectified forward current per device	$I_{F(AV)}$	Total device, rated $V_R$ , $T_C = 159\text{ °C}$	6	A
Non-repetitive peak surge current	$I_{FSM}$		50	
Peak repetitive forward current per diode	$I_{FM}$	Rated $V_R$ , square wave, 20 kHz, $T_C = 159\text{ °C}$	6	
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	$V_F$	$I_F = 3\text{ A}$	-	-	1	
		$I_F = 3\text{ A}, T_J = 125\text{ °C}$	-	-	0.9	
		$I_F = 6\text{ A}$	-	-	1.2	
		$I_F = 6\text{ A}, T_J = 125\text{ °C}$	-	-	1.08	
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	-	5	$\mu\text{A}$
		$T_J = 125\text{ °C}, V_R = V_R$ rated	-	-	100	
Junction capacitance	$C_T$	$V_R = 200\text{ V}$	-	12	-	pF
Series inductance	$L_S$	Measured lead to lead 5 mm from package body	-	8.0	-	nH

**DYNAMIC RECOVERY CHARACTERISTICS** ( $T_J = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	$t_{rr}$	$I_F = 1.0\text{ A}$ , $dI_F/dt = 50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	-	35	ns
		$T_J = 25\text{ }^{\circ}\text{C}$	-	19	-	
		$T_J = 125\text{ }^{\circ}\text{C}$	-	26	-	
Peak recovery current	$I_{RRM}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	3.1	-	A
		$T_J = 125\text{ }^{\circ}\text{C}$	-	4.6	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	30	-	nC
		$T_J = 125\text{ }^{\circ}\text{C}$	-	60	-	

**THERMAL - MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	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	$R_{thJC}$	-	-	5	$^{\circ}\text{C}/\text{W}$
Thermal resistance, junction to ambient per leg	$R_{thJA}$	-	-	80	
Thermal resistance, case to heatsink	$R_{thCS}$	-	-	-	
Weight		-	0.3	-	g
		-	0.01	-	oz.
Mounting torque		6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style D-PAK		6CWH02FN	

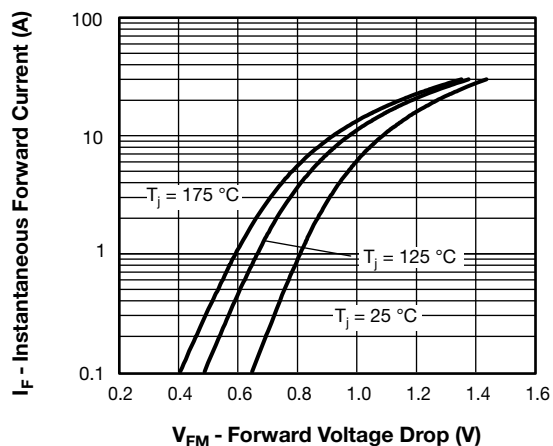


Fig. 1 - Maximum Forward Voltage Drop Characteristics

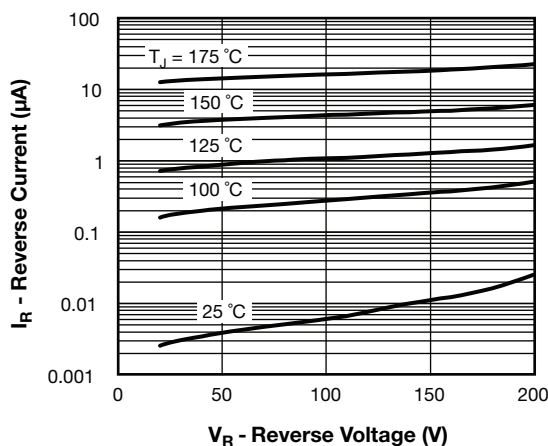


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

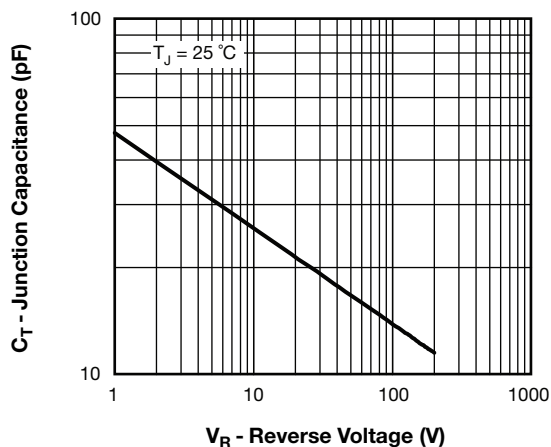
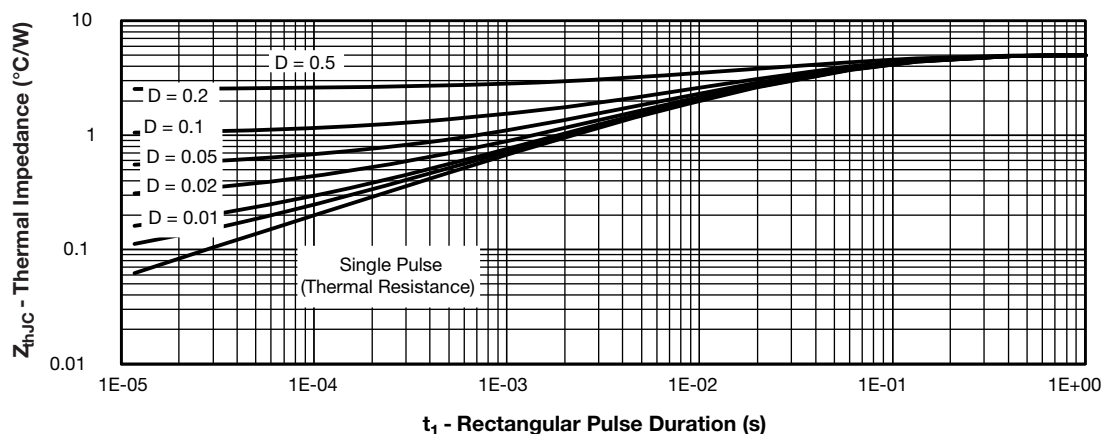


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage


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

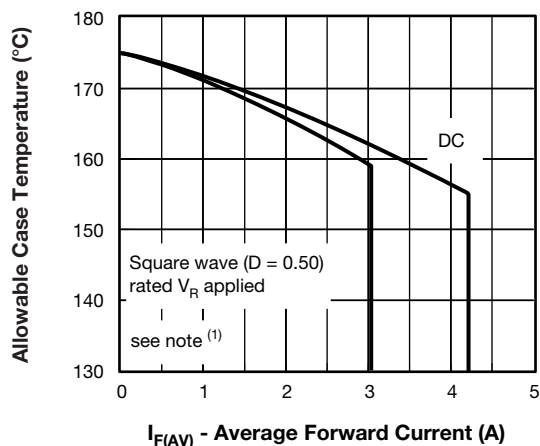


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

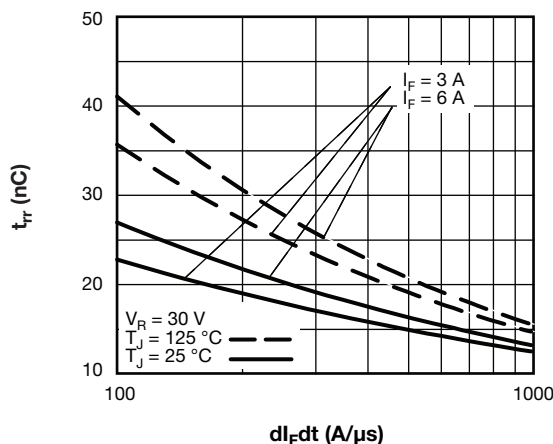


Fig. 7 - Typical Reverse Recovery vs.  $dI_F/dt$

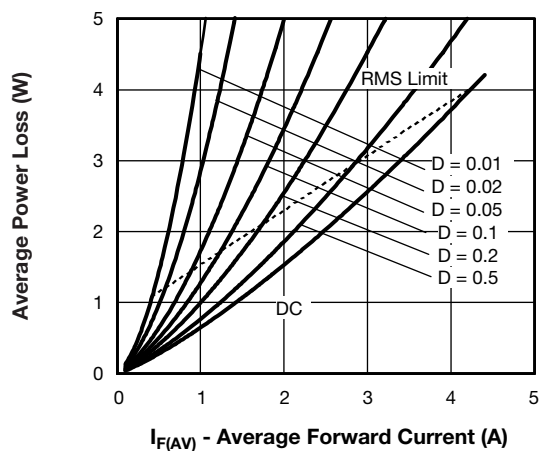


Fig. 6 - Forward Power Loss Characteristics

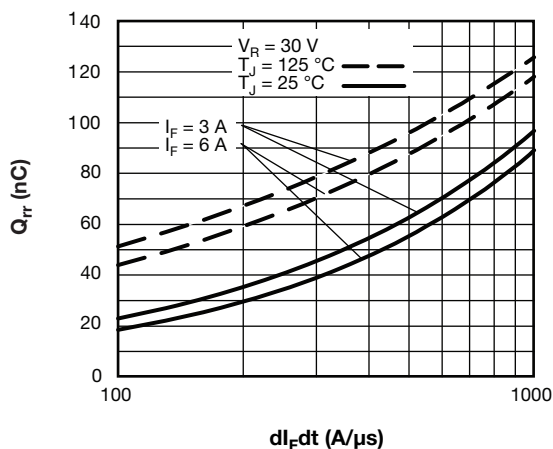


Fig. 8 - Typical Stored Charge vs.  $dI_F/dt$

#### Note

- (1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$ ;  
 $P_d$  = 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  $V_R$

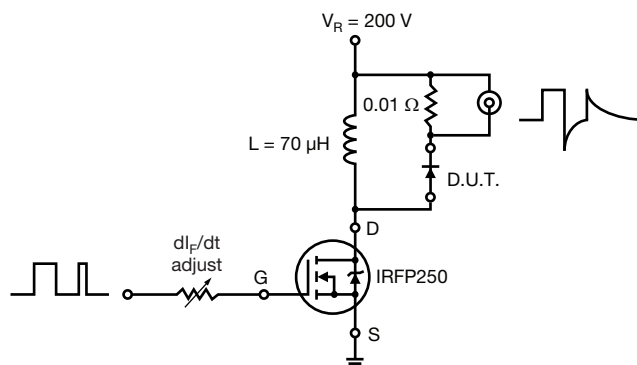


Fig. 9 - Reverse Recovery Parameter Test Circuit

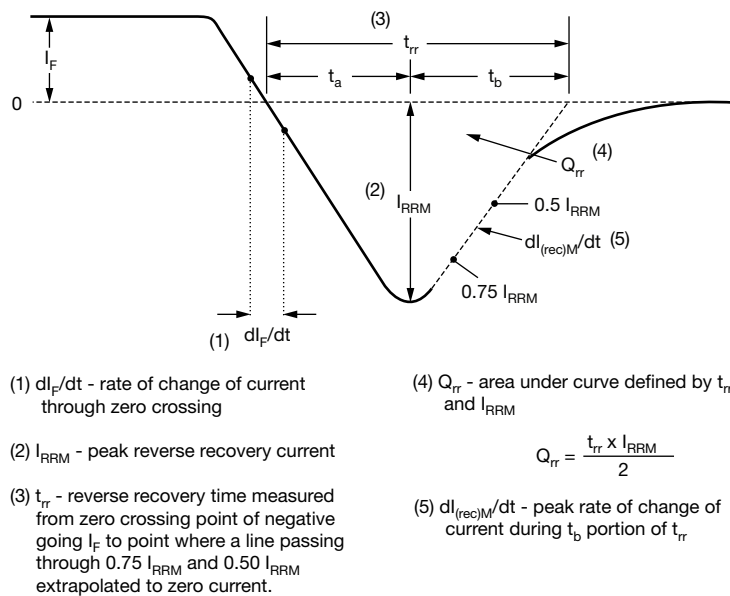


Fig. 10 - Reverse Recovery Waveform and Definitions

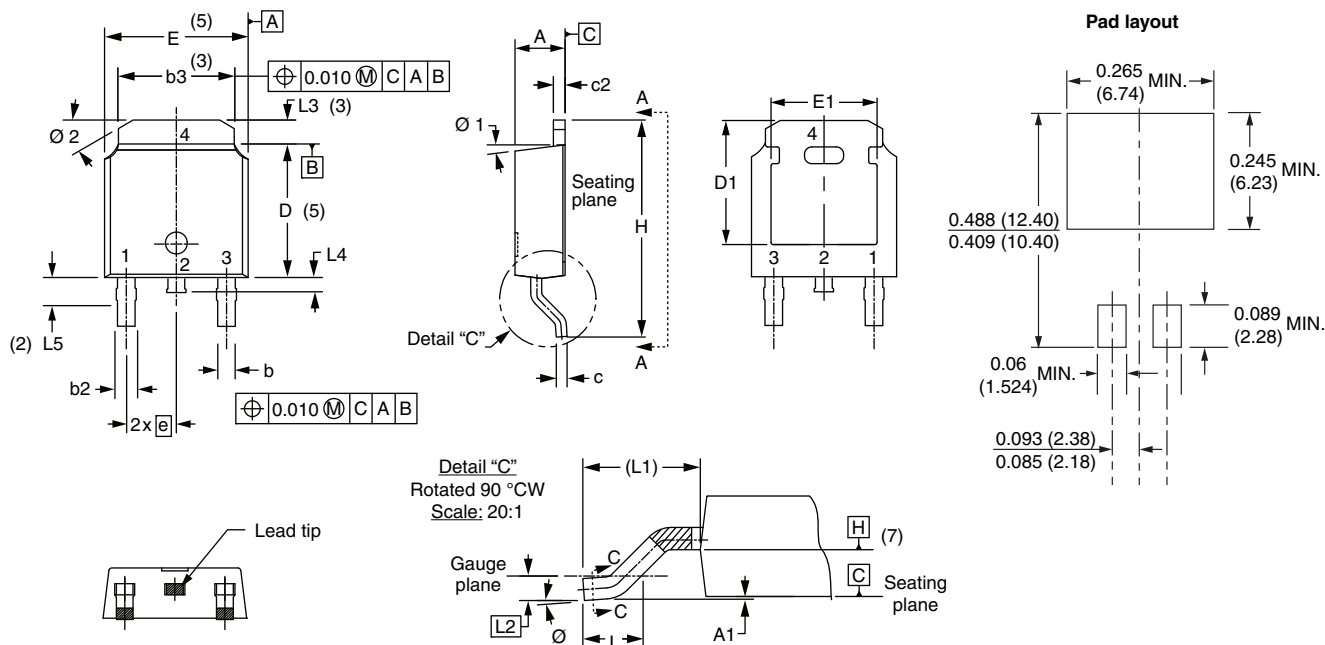
**ORDERING INFORMATION TABLE**

Device code	<b>VS-</b>	<b>6</b>	<b>C</b>	<b>W</b>	<b>H</b>	<b>02</b>	<b>FN</b>	<b>TRL</b>	<b>-M3</b>
	1	2	3	4	5	6	7	8	9

- |          |   |   |
|----------|---|---|
| <b>1</b> | - | Vishay Semiconductors product   |
| <b>2</b> | - | Current rating (6 = 6 A)  |
| <b>3</b> | - | Center tap configuration  |
| <b>4</b> | - | Package identifier:<br>W = D-PAK  |
| <b>5</b> | - | H = hyperfast recovery  |
| <b>6</b> | - | Voltage rating (02 = 200 V)   |
| <b>7</b> | - | FN = TO-252AA   |
| <b>8</b> | - | <ul style="list-style-type: none"><li>• None = tube (50 pieces)</li><li>• TR = tape and reel</li><li>• TRL = tape and reel (left oriented)</li><li>• TRR = tape and reel (right oriented)</li></ul> |
| <b>9</b> | - | Environmental digit:<br>-M3 = halogen-free, RoHS-compliant and terminations lead (Pb)-free  |

<b>ORDERING INFORMATION</b> (Example)			
<b>PREFERRED P/N</b>	<b>QUANTITY PER T/R</b>	<b>MINIMUM ORDER QUANTITY</b>	<b>PACKAGING DESCRIPTION</b>
VS-6CWH02FN-M3	75	3000	Antistatic plastic tube
VS-6CWH02FNTR-M3	2000	2000	13" diameter reel
VS-6CWH02FNTRL-M3	3000	3000	13" diameter reel
VS-6CWH02FNTRR-M3	3000	3000	13" diameter reel

<b>LINKS TO RELATED DOCUMENTS</b>	
Dimensions	<a href="http://www.vishay.com/doc?95627">www.vishay.com/doc?95627</a>
Part marking information	<a href="http://www.vishay.com/doc?95176">www.vishay.com/doc?95176</a>
Packaging information	<a href="http://www.vishay.com/doc?95033">www.vishay.com/doc?95033</a>

**D-PAK (TO-252AA) “M”****DIMENSIONS** in millimeters and inches

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	2.18	2.39	0.086	0.094	
A1	-	0.13	-	0.005	
b	0.64	0.89	0.025	0.035	
b2	0.76	1.14	0.030	0.045	
b3	4.95	5.46	0.195	0.215	3
c	0.46	0.61	0.018	0.024	
c2	0.46	0.89	0.018	0.035	
D	5.97	6.22	0.235	0.245	5
D1	5.21	-	0.205	-	3
E	6.35	6.73	0.250	0.265	5
E1	4.32	-	0.170	-	3

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
e	2.29 BSC		0.090 BSC		
H	9.40	10.41	0.370	0.410	
L	1.40	1.78	0.055	0.070	
L1	2.74 BSC		0.108 REF.		
L2	0.51 BSC		0.020 BSC		
L3	0.89	1.27	0.035	0.050	3
L4	-	1.02	-	0.040	
L5	1.14	1.52	0.045	0.060	2
Ø	0°	10°	0°	10°	
Ø1	0°	15°	0°	15°	
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 0.010") 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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