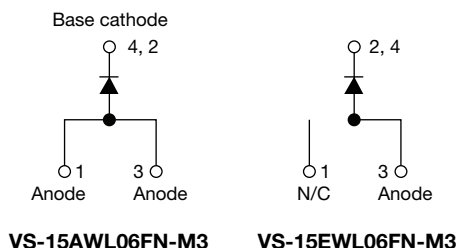


# Ultralow $V_F$ Ultrafast Rectifier, 15 A FRED Pt®


**DPAK (TO-252AA)**


## FEATURES

- Ultrafast recovery time, extremely low  $V_F$  and soft recovery
- 175 °C maximum operating junction temperature
- For PFC DCM operation
- Low leakage current
- 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

State of the art, ultralow  $V_F$ , soft-switching hyperfast rectifiers optimized for Discontinuous (Critical) Mode (DCM) Power Factor Correction (PFC).

The minimized conduction loss, optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

The device is also intended for use as a freewheeling diode in power supplies and other power switching applications.

## PRIMARY CHARACTERISTICS

$I_{F(AV)}$	15 A
$V_R$	600 V
$V_F$ at $I_F$	0.85 V
$t_{rr}$ (typ.)	60 ns
$T_J$ max.	175 °C
Package	DPAK (TO-252AA)
Circuit configuration	Single

## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage	$V_{RRM}$		600	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 148\text{ °C}$	15	A
Non-repetitive peak surge current	$I_{FSM}$	$T_J = 25\text{ °C}$	180	
Peak repetitive forward current	$I_{FM}$	$T_C = 148\text{ °C}$ , $f = 20\text{ kHz}$ , $d = 50\%$	30	
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	$V_{BR}, V_R$	$I_R = 100\text{ }\mu\text{A}$	600	-	-	V
Forward voltage	$V_F$	$I_F = 15\text{ A}$	-	0.99	1.05	
		$I_F = 15\text{ A}$ , $T_J = 150\text{ °C}$	-	0.85	0.92	
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	-	10	$\mu\text{A}$
		$T_J = 150\text{ °C}$ , $V_R = V_R$ rated	-	-	120	
Junction capacitance	$C_T$	$V_R = 600\text{ V}$	-	11	-	pF
Series inductance	$L_S$	Measured lead to lead 5 mm from package body	-	8	-	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	$t_{rr}$	$I_F = 1\text{ A}$ , $dI_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	60	120	ns
		$I_F = 15\text{ A}$ , $dI_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	190	-	
		$T_J = 25\text{ }^{\circ}\text{C}$	-	220	-	
		$T_J = 125\text{ }^{\circ}\text{C}$	-	290	-	
Peak recovery current	$I_{RRM}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	21	-	A
		$T_J = 125\text{ }^{\circ}\text{C}$	-	25	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	2.6	-	$\mu\text{C}$
		$T_J = 125\text{ }^{\circ}\text{C}$	-	4	-	

**THERMAL - MECHANICAL SPECIFICATIONS**

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	$R_{thJC}$		-	1.4	1.8	$^{\circ}\text{C}/\text{W}$
Thermal resistance, junction to ambient	$R_{thJA}$		-	-	70	
Approximate weight			0.3			g
			0.01			oz.
Marking device		Case style DPAK (TO-252AA)	15AWL06FN			
			15EWL06FN			

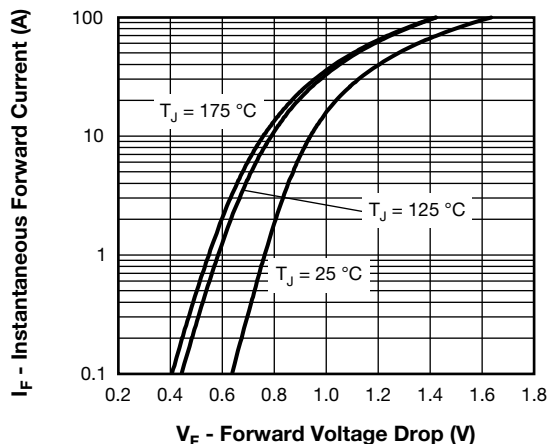


Fig. 1 - Typical Forward Voltage Drop Characteristics

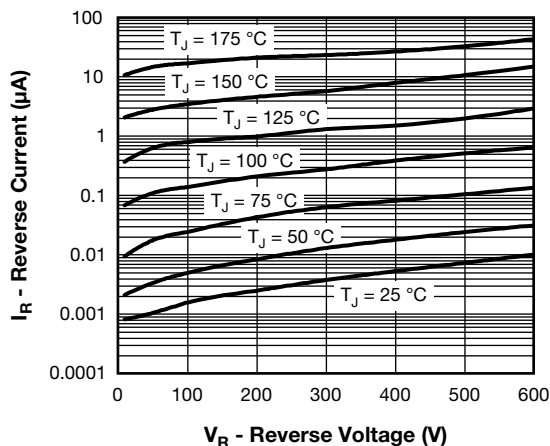


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

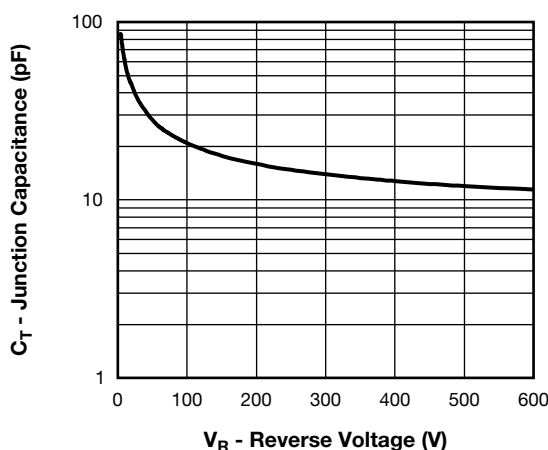


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

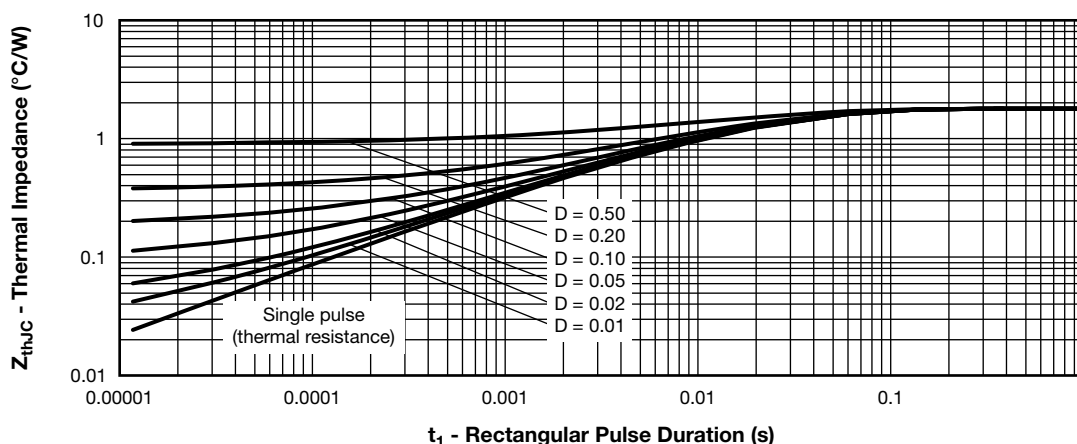
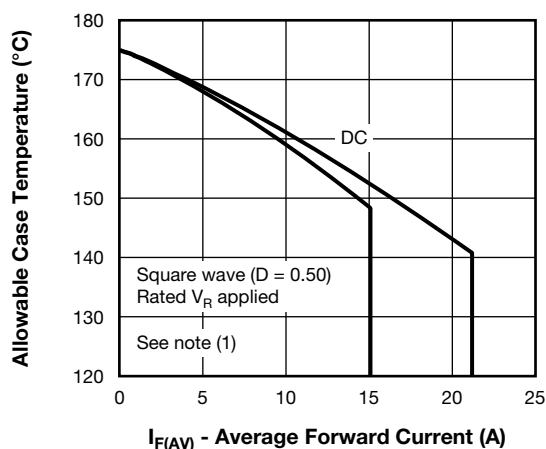

Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics


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

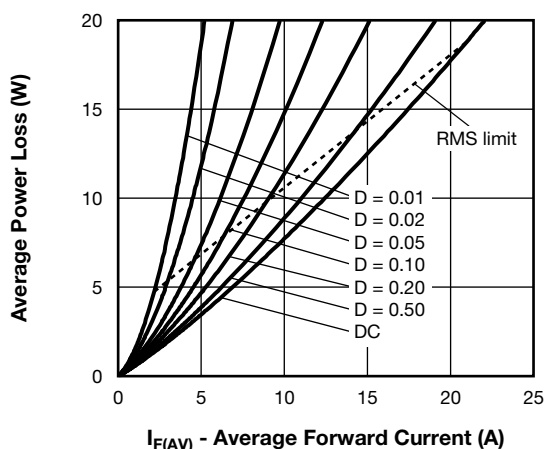


Fig. 6 - Forward Power Loss Characteristics

**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  $V_R$

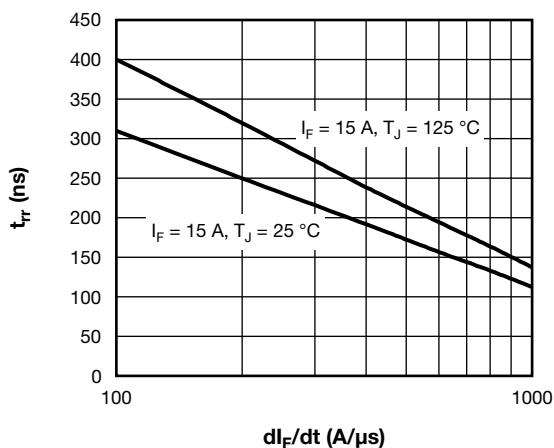
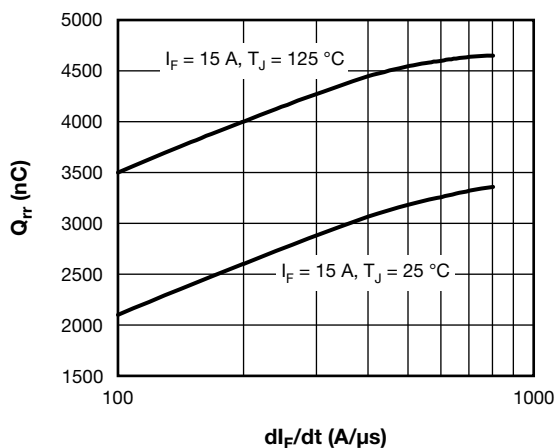
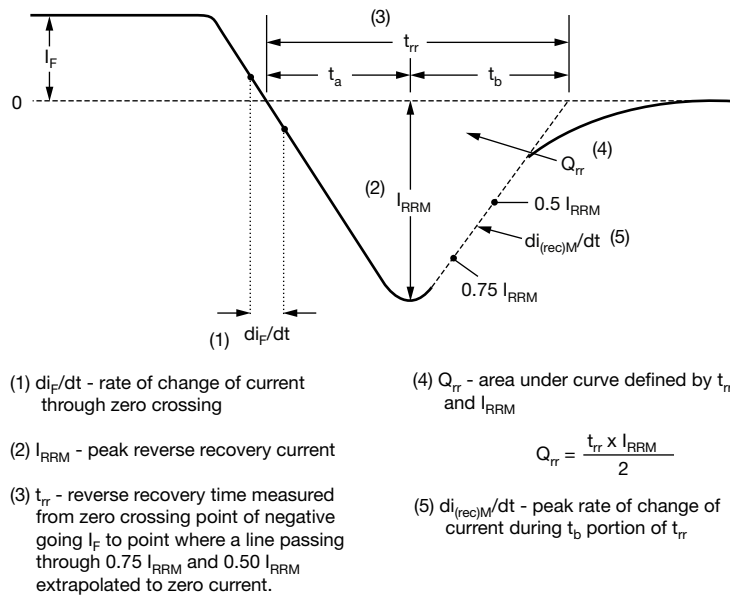

Fig. 7 - Typical Reverse Recovery Time vs.  $di_F/dt$ 

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


Fig. 9 - Reverse Recovery Waveform and Definitions

**ORDERING INFORMATION TABLE**

Device code	<b>VS-</b>	<b>15</b>	<b>A</b>	<b>W</b>	<b>L</b>	<b>06</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 (15 = 15 A)  |
| <b>3</b> | - | Circuit configuration: <ul style="list-style-type: none"><li>• A = single diode (2 anodes)</li><li>• E = single diode</li></ul>   |
| <b>4</b> | - | Package identifier:<br>W = DPAK   |
| <b>5</b> | - | L = hyperfast rectifier   |
| <b>6</b> | - | Voltage rating (06 = 600 V)   |
| <b>7</b> | - | FN = TO-252AA   |
| <b>8</b> | - | <ul style="list-style-type: none"><li>• None = tube</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 (Example)</b>		
<b>PREFERRED P/N</b>	<b>BASE QUANTITY</b>	<b>PACKAGING DESCRIPTION</b>
VS-15AWL06FN-M3	75	Antistatic plastic tube
VS-15EWL06FN-M3		
VS-15AWL06FNTR-M3	2000	13" diameter reel
VS-15EWL06FNTR-M3		
VS-15AWL06FNTRL-M3	3000	13" diameter reel
VS-15EWL06FNTRL-M3		
VS-15AWL06FNTRR-M3	3000	13" diameter reel
VS-15EWL06FNTRR-M3		

<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>
SPIICE model	<a href="http://www.vishay.com/doc?95372">www.vishay.com/doc?95372</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 0.10") 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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