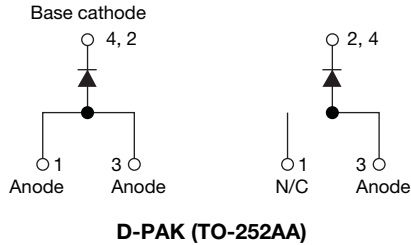


## Ultralow $V_F$ Ultrafast Rectifier, 15 A FRED Pt<sup>®</sup>



VS-15AWL06FN-M3 VS-15EWL06FN-M3



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



**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.

### PRODUCT SUMMARY

Package	D-PAK (TO-252AA)
$I_{F(AV)}$	15 A
$V_R$	600 V
$V_F$ at $I_F$	1.05 V
$t_{rr}$ (typ.)	60 ns
$T_J$ max.	175 °C
Diode variation	Single die

### 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	$V_F$	$I_F = 15\text{ A}$ $I_F = 15\text{ A}, T_J = 150\text{ °C}$	-	0.99 0.85	1.05 0.92	
Reverse leakage current	$I_R$	$V_R = V_R$ rated $T_J = 150\text{ °C}, V_R = V_R$ rated	-	-	10 120	$\mu\text{A}$
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

## VS-15AWL06FN-M3, VS-15EWL06FN-M3

Vishay Semiconductors Ultralow  $V_F$  Ultrafast Rectifier, 15 A FRED Pt<sup>®</sup>

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



# VS-15AWL06FN-M3, VS-15EWL06FN-M3

Ultralow  $V_F$  Ultrafast Rectifier, 15 A FRED Pt<sup>®</sup> Vishay Semiconductors

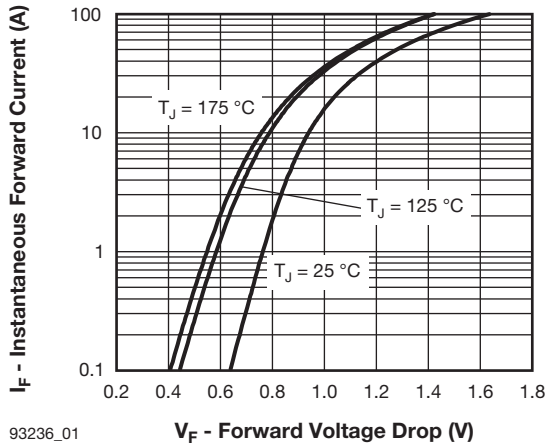


Fig. 1 - Typical Forward Voltage Drop Characteristics

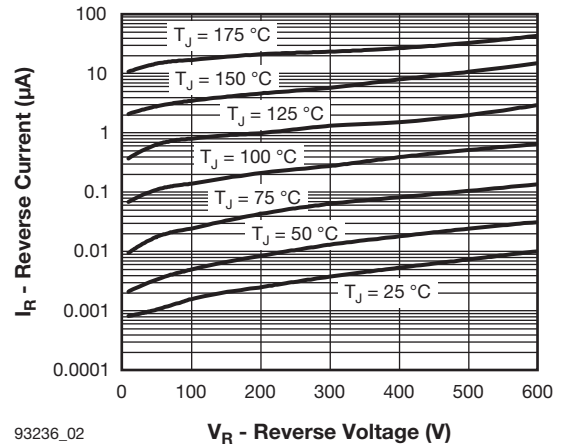


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

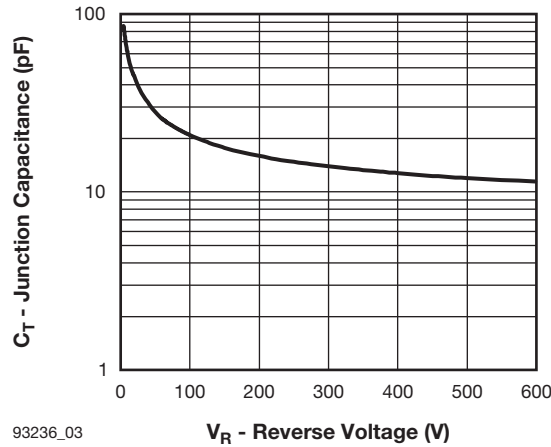


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

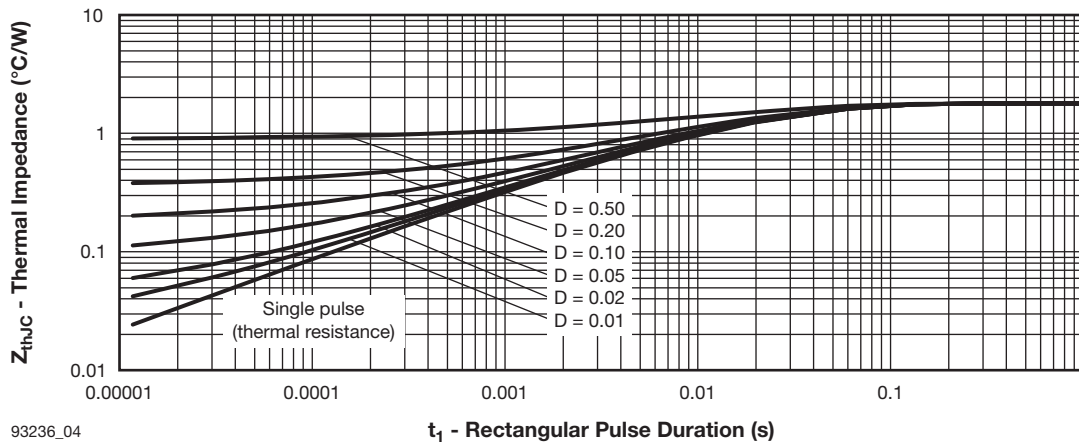
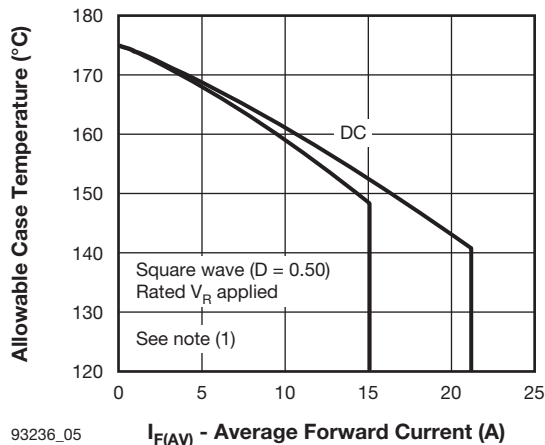


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

# VS-15AWL06FN-M3, VS-15EWL06FN-M3

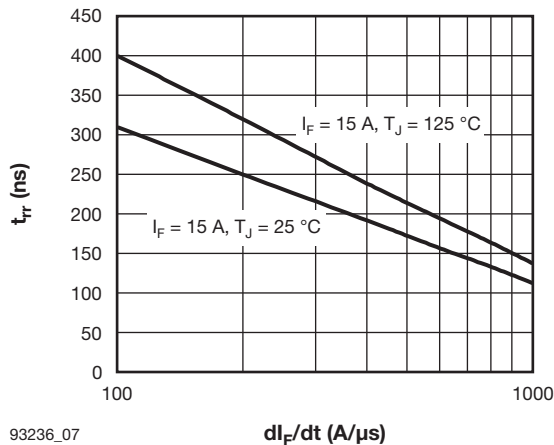


Vishay Semiconductors Ultralow  $V_F$  Ultrafast Rectifier, 15 A FRED Pt<sup>®</sup>



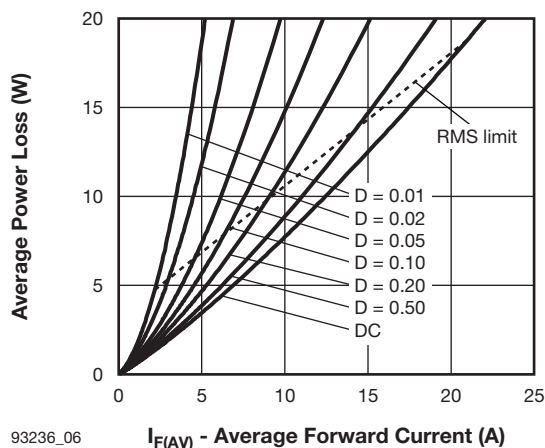
93236\_05

**$I_{F(AV)}$  - Average Forward Current (A)**  
 Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current



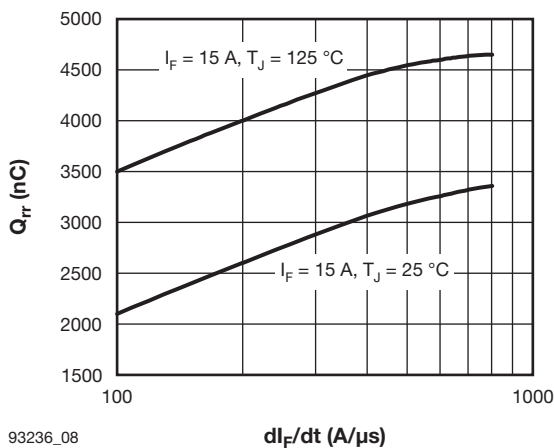
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**$di_F/dt$  (A/μs)**  
 Fig. 7 - Typical Reverse Recovery Time vs.  $di_F/dt$



93236\_06

**$I_{F(AV)}$  - Average Forward Current (A)**  
 Fig. 6 - Forward Power Loss Characteristics



93236\_08

**$di_F/dt$  (A/μs)**  
 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  $V_R$



# VS-15AWL06FN-M3, VS-15EWL06FN-M3

Ultralow  $V_F$  Ultrafast Rectifier, 15 A FRED Pt<sup>®</sup> Vishay Semiconductors

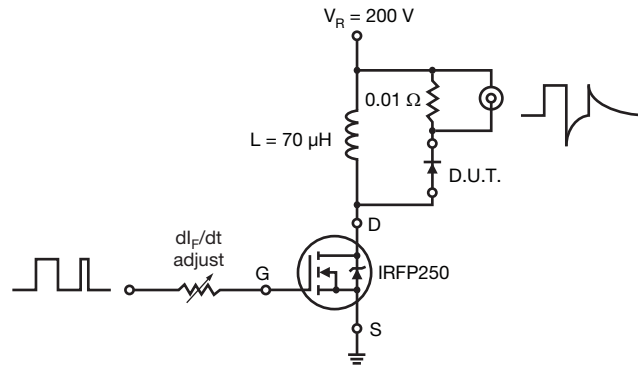
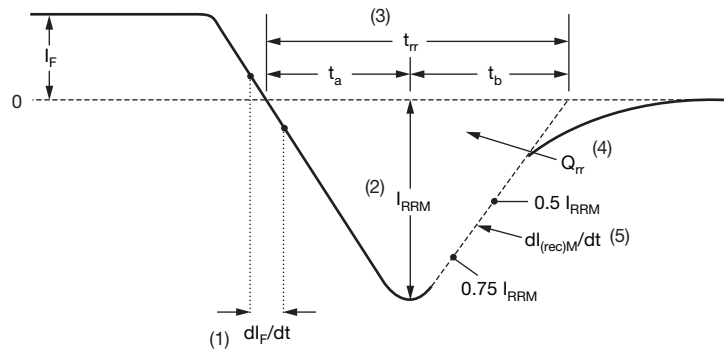


Fig. 9 - Reverse Recovery Parameter Test Circuit



- (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  $I_{RRM}$
- (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. 10 - Reverse Recovery Waveform and Definitions

# VS-15AWL06FN-M3, VS-15EWL06FN-M3



Vishay Semiconductors Ultralow  $V_F$  Ultrafast Rectifier, 15 A FRED Pt<sup>®</sup>

## ORDERING INFORMATION TABLE

Device code	VS-	15	A	W	L	06	FN	TRL	-M3
	①	②	③	④	⑤	⑥	⑦	⑧	⑨

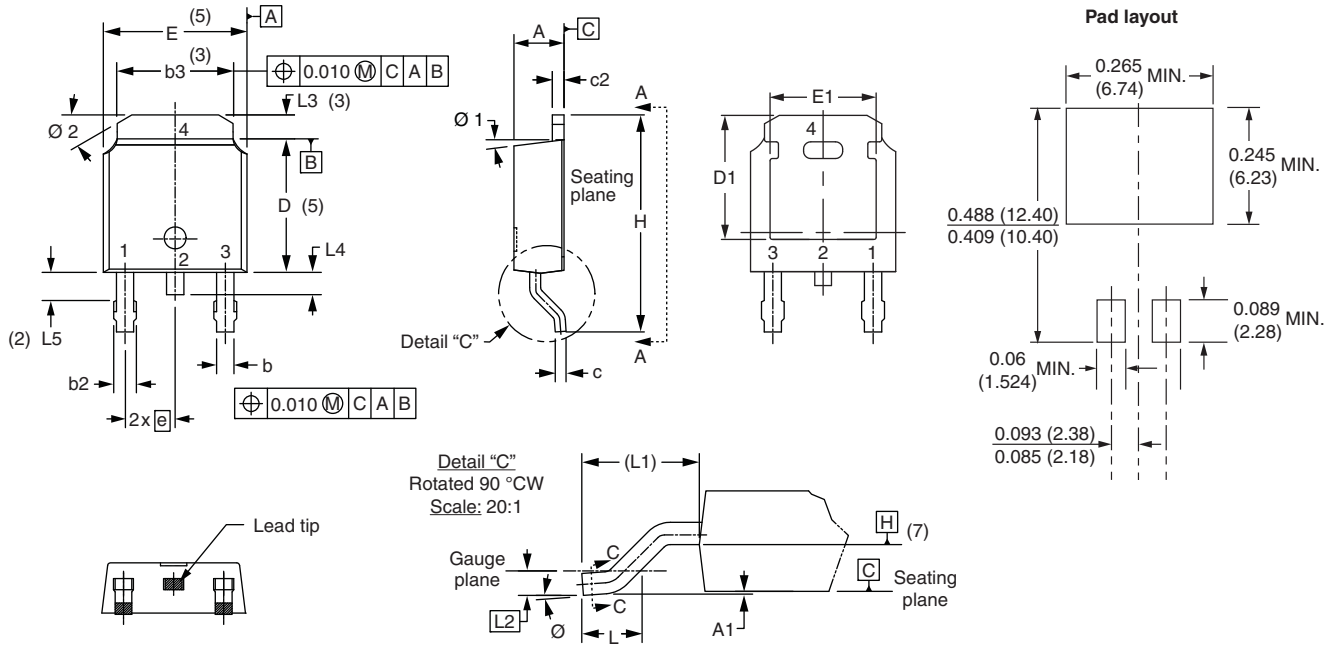
- 1** - Vishay Semiconductors product
- 2** - Current rating (15 = 15 A)
- 3** - Circuit configuration:
  - A = Single diode (2 anodes)
  - E = Single diode
- 4** - Package identifier:
  - W = D-PAK
- 5** - L = Hyperfast rectifier
- 6** - Voltage rating (06 = 600 V)
- 7** - FN = TO-252AA
- 8** -
  - 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-15AWL06FN-M3	75	3000	Antistatic plastic tube
VS-15EWL06FN-M3			
VS-15AWL06FNTR-M3	2000	2000	13" diameter reel
VS-15EWL06FNTR-M3			
VS-15AWL06FNTRL-M3	3000	3000	13" diameter reel
VS-15EWL06FNTRL-M3			
VS-15AWL06FNTRR-M3	3000	3000	13" diameter reel
VS-15EWL06FNTRR-M3			

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95016">www.vishay.com/doc?95016</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)

**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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**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**





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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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