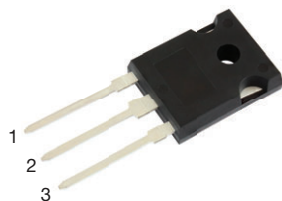
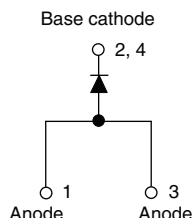


# **FRED Pt® Ultrafast Rectifier, 30 A**


**TO-247AD 3L**


## **FEATURES**

- Low forward voltage drop
- Ultrafast recovery time
- 175 °C operating junction temperature
- Designed and qualified according to commercial qualification
- Material categorization:  
for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

## **DESCRIPTION**

Ultralow  $V_F$ , soft-switching ultrafast rectifiers optimized for Discontinuous (Critical) Mode (DCM) Power Factor Correction (PFC).

The minimized conduction loss, optimized stored charge and low recovery current minimized 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.

## **APPLICATIONS**

AC/DC SMPS 70 W to 400 W

e.g. laptop and printer AC adapters, desktop PC, TV and monitor, games units, and DVD AC/DC power supplies.

## **PRODUCT SUMMARY**

Package	TO-247AD 3L
$I_{F(AV)}$	30 A
$V_R$	600 V
$V_F$ at $I_F$	1.15 V
$t_{rr}$ typ.	30 ns
$T_J$ max.	175 °C
Diode variation	Single die

## **ABSOLUTE MAXIMUM RATINGS**

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Repetitive peak reverse voltage	$V_{RRM}$		600	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 127\text{ °C}$	30	A
Non-repetitive peak surge current	$I_{FSM}$	$T_C = 25\text{ °C}$ , $t_p = 8.3\text{ ms}$ ; half sine wave, connecting two anode pins	250	
Operating junction and storage temperatures	$T_J$ , $T_{Stg}$		-55 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	$V_F$	$I_F = 30\text{ A}$	-	1.4	2	
		$I_F = 30\text{ A}$ , $T_J = 150\text{ °C}$	-	1.15	1.35	
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	0.2	30	$\mu\text{A}$
		$T_J = 150\text{ °C}$ , $V_R = V_R$ rated	-	-	250	
Junction capacitance	$C_T$	$V_R = 600\text{ V}$	-	20	-	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	$t_{rr}$	$I_F = 1\text{ A}$ , $dI_F/dt = 50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	30	-	ns
		$T_J = 25\text{ }^{\circ}\text{C}$	-	45	-	
		$T_J = 125\text{ }^{\circ}\text{C}$	-	100	-	
Peak recovery current	$I_{RRM}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	5.6	-	A
		$T_J = 125\text{ }^{\circ}\text{C}$	-	10	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	127	-	nC
		$T_J = 125\text{ }^{\circ}\text{C}$	-	580	-	

**THERMAL - MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	$T_J$ , $T_{Stg}$		-55	-	175	$^{\circ}\text{C}$
Thermal resistance, junction to case	$R_{thJC}$		-	0.7	1.1	$^{\circ}\text{C}/\text{W}$
Thermal resistance, junction to ambient per leg	$R_{thJA}$	Typical socket mount	-	-	70	
Thermal resistance, case to heat sink	$R_{thCS}$	Mounting surface, flat, smooth and greased	-	0.5	-	
Weight			-	2.0	-	g
			-	0.07	-	oz.
Mounting torque			1.2 (10)	-	2.4 (20)	kgf · cm (lbf · in)
		Case style: TO-247AD 3L	APU3006L			

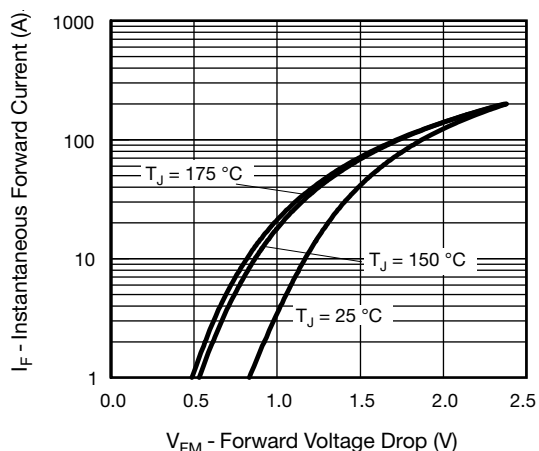


Fig. 1 - Typical Forward Voltage Drop Characteristics

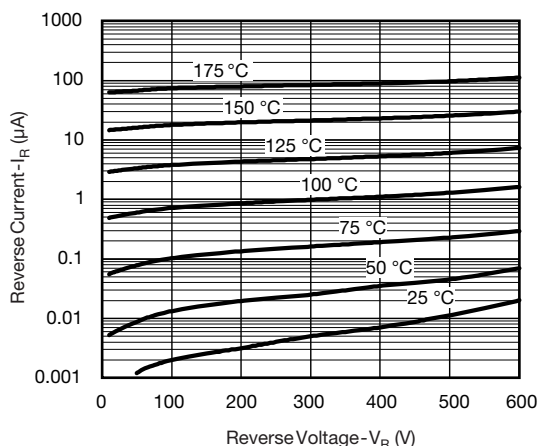


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

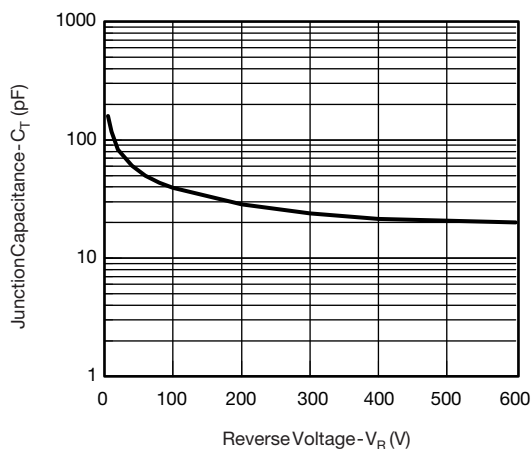
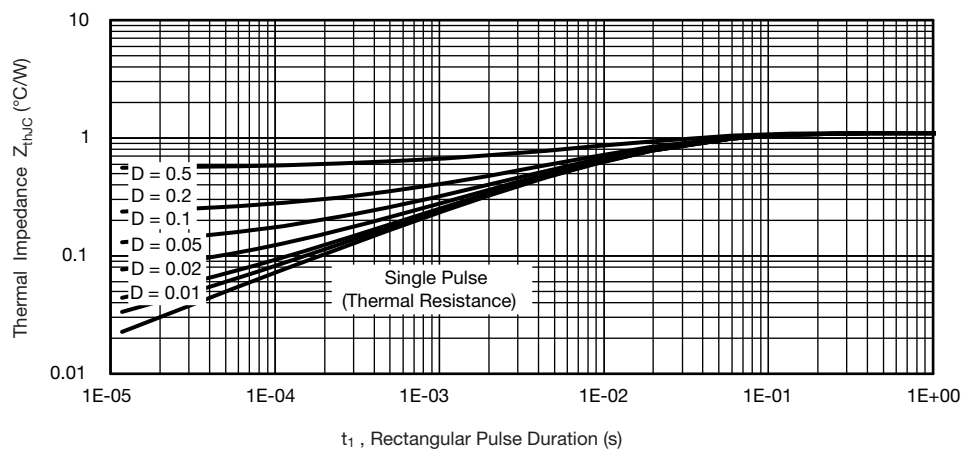


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage


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

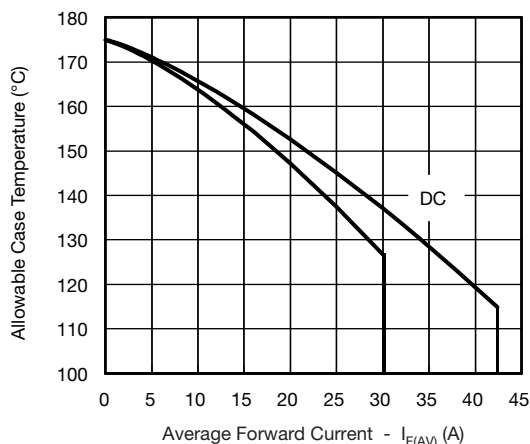


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

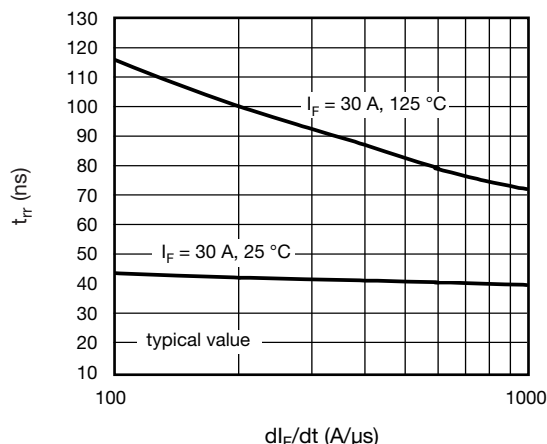


Fig. 7 - Typical Reverse Recovery Time vs.  $dI_F/dt$

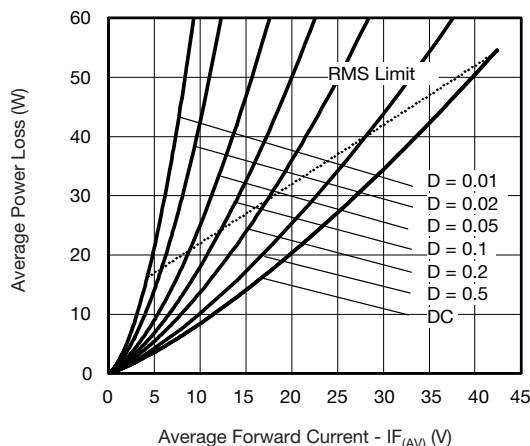


Fig. 6 - Forward Power Loss Characteristics

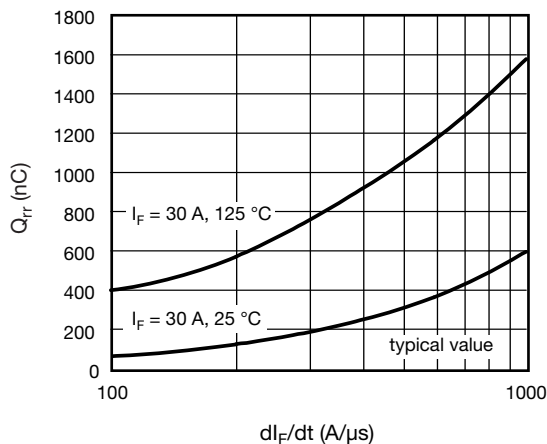
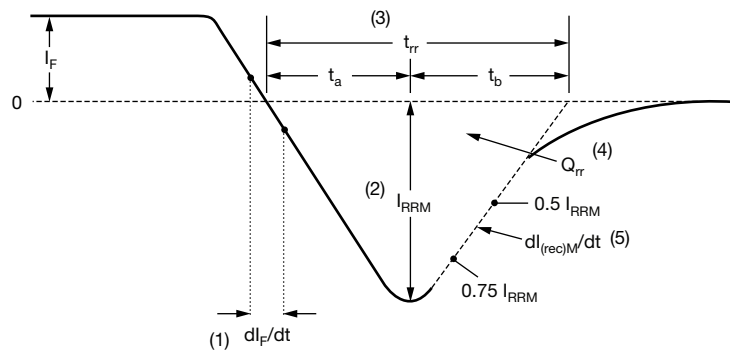


Fig. 8 - Typical Stored Charge vs.  $dI_F/dt$



- (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. 9 - Reverse Recovery Waveform and Definitions



ORDERING INFORMATION TABLE

Device code	VS-	A	P	U	30	06	L	-N3
	1	2	3	4	5	6	7	8
1	Vishay Semiconductors product							
2	Ultrafast A = single diode, 3 pin							
3	P = TO-247							
4	U = ultrafast recovery time							
5	Current code (30 = 30 A)							
6	Voltage code (06 = 600 V)							
7	L = long lead							
8	Environmental digit: -N3 = halogen-free, RoHS-compliant, and totally lead (Pb)-free							

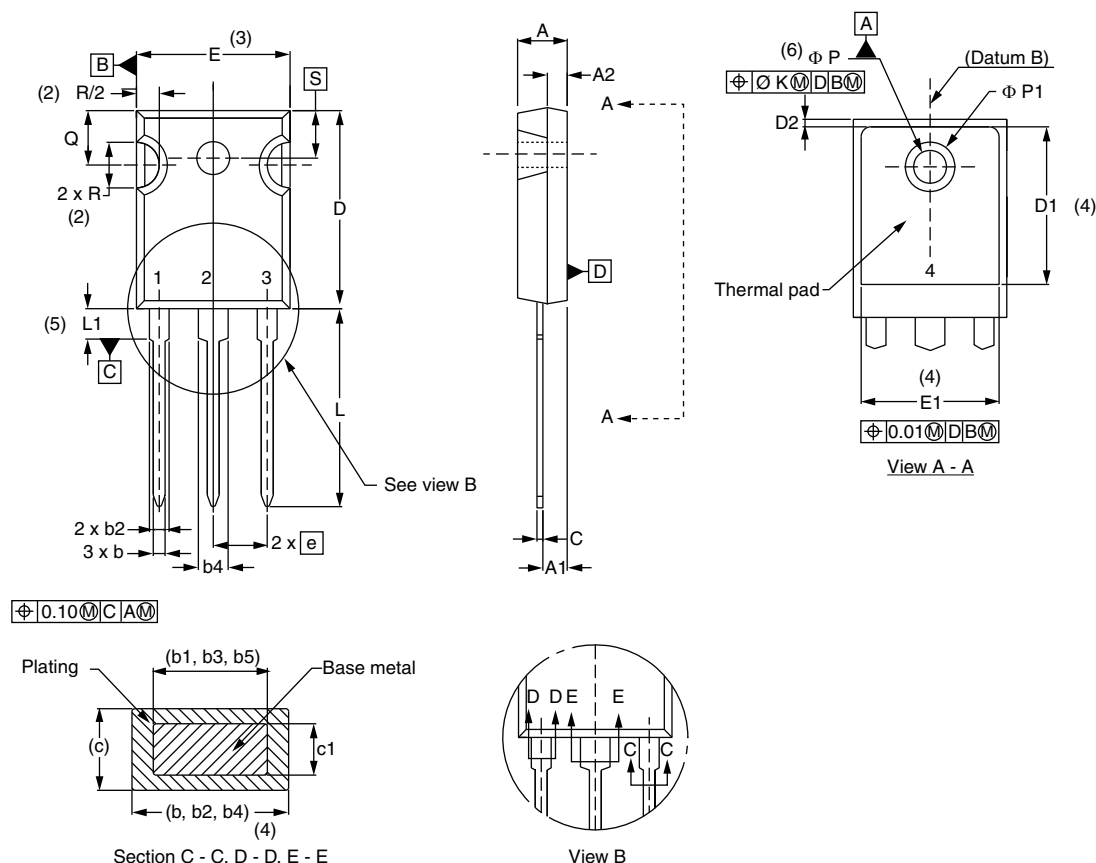
ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER TUBE	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-APU3006L-N3	25	500	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS		
Dimensions	TO-247AD 3L	<a href="http://www.vishay.com/doc?95626">www.vishay.com/doc?95626</a>
Part marking information	TO-247AD 3L	<a href="http://www.vishay.com/doc?95007">www.vishay.com/doc?95007</a>



### TO-247AD 3L

**DIMENSIONS** in millimeters and inches



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.65	5.31	0.183	0.209	
A1	2.21	2.59	0.087	0.102	
A2	1.50	2.49	0.059	0.098	
b	0.99	1.40	0.039	0.055	
b1	0.99	1.35	0.039	0.053	
b2	1.65	2.39	0.065	0.094	
b3	1.65	2.34	0.065	0.092	
b4	2.59	3.43	0.102	0.135	
b5	2.59	3.38	0.102	0.133	
c	0.38	0.89	0.015	0.035	
c1	0.38	0.84	0.015	0.033	
D	19.71	20.70	0.776	0.815	3
D1	13.08	-	0.515	-	4

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
D2	0.51	1.30	0.020	0.051	
E	15.29	15.87	0.602	0.625	3
E1	13.46	-	0.53	-	
e	5.46 BSC		0.215 BSC		
$\phi K$	0.254		0.010		
L	19.81	20.32	0.780	0.800	
L1	3.71	4.29	0.146	0.169	
$\phi P$	3.56	3.66	0.14	0.144	
$\phi P1$	-	6.98	-	0.275	
Q	5.31	5.69	0.209	0.224	
R	4.52	5.49	0.178	0.216	
S	5.51 BSC		0.217 BSC		

#### Notes

- Dimensioning and tolerancing per ASME Y14.5M-1994
- Contour of slot optional
- Dimension D and E do not include mold flash. These dimensions are measured at the outermost extremes of the plastic body
- Thermal pad contour optional with dimensions D1 and E1
- Lead finish uncontrolled in L1
- $\phi P$  to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")
- Outline conforms to JEDEC® outline TO-247 with exception of dimension A min., D, E min., Q min., S, and note 4



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