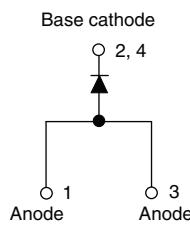
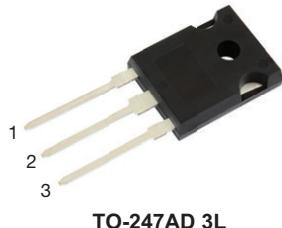


## Hyperfast Rectifier, 30 A FRED Pt®



### FEATURES

- Low forward voltage drop
- Hyperfast soft recovery time
- 175 °C operating junction temperature
- Designed and qualified according to commercial qualification
- AEC-Q101 qualified, meets JESD 201 class 2 whisker test
- 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

Hyperfast recovery rectifiers designed with optimized performance of forward voltage drop, hyperfast recovery time, and soft recovery.

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 PFC Boost stage in the AC/DC section of SMPS, inverters or as freewheeling diodes.

The 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-247AD 3L
$I_{F(AV)}$	30 A
$V_R$	600 V
$V_F$ at $I_F$	1.4 V
$t_{rr}$ typ.	26 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	$I_{F(AV)}$	$T_C = 112$ °C	30	A	
Non-repetitive peak surge current	$I_{FSM}$	$T_C = 25$ °C, $t_p = 8.3$ ms half sine wave; connecting two anode pins	240		
Operating junction and storage temperatures	$T_J, T_{Stg}$		-55 to +175	°C	

ELECTRICAL SPECIFICATIONS ( $T_J = 25$ °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	$V_{BR}, V_R$	$I_R = 100$ µA	600	-	-	V
Forward voltage	$V_F$	$I_F = 30$ A	-	2.0	2.65	
		$I_F = 30$ A, $T_J = 150$ °C	-	1.4	1.8	
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	0.02	30	µA
		$T_J = 150$ °C, $V_R = V_R$ rated	-	-	300	
Junction capacitance	$C_T$	$V_R = 600$ V	-	20	-	pF
Series inductance	$L_S$	Measured lead to lead 5 mm from package body	-	8.0	-	nH

DYNAMIC RECOVERY CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time	$t_{rr}$	$I_F = 1 \text{ A}$ , $dI_F/dt = 50 \text{ A}/\mu\text{s}$ , $V_R = 30 \text{ V}$		-	26	-	ns
		$T_J = 25^\circ\text{C}$	$I_F = 30 \text{ A}$ $dI_F/dt = 200 \text{ A}/\mu\text{s}$ $V_R = 200 \text{ V}$	-	26	-	
		$T_J = 125^\circ\text{C}$		-	70	-	
Peak recovery current	$I_{RRM}$	$T_J = 25^\circ\text{C}$		-	3.5	-	A
		$T_J = 125^\circ\text{C}$		-	7.6	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25^\circ\text{C}$		-	50	-	nC
		$T_J = 125^\circ\text{C}$		-	280	-	

THERMAL - MECHANICAL SPECIFICATIONS							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	$T_J$ , $T_{Stg}$			-55	-	175	°C
Thermal resistance, junction to case	$R_{thJC}$			-	0.7	1.1	°C/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				-	5.5	-	g
				-	0.2	-	oz.
Mounting torque				1.2 (10)	-	2.4 (20)	kgf · cm (lbf · in)
Marking device		Case style TO-247AD 3L		APH3006LH			

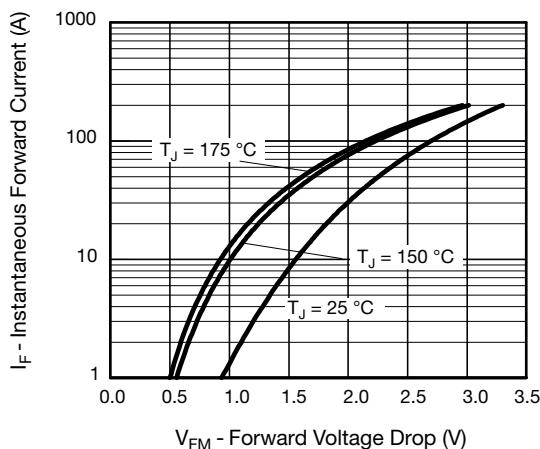


Fig. 1 - Typical Forward Voltage Drop Characteristics

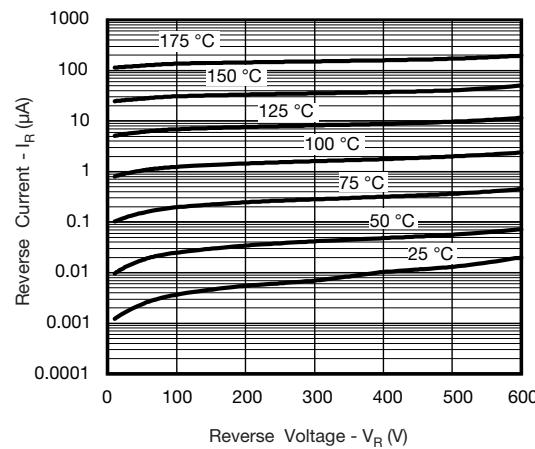


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

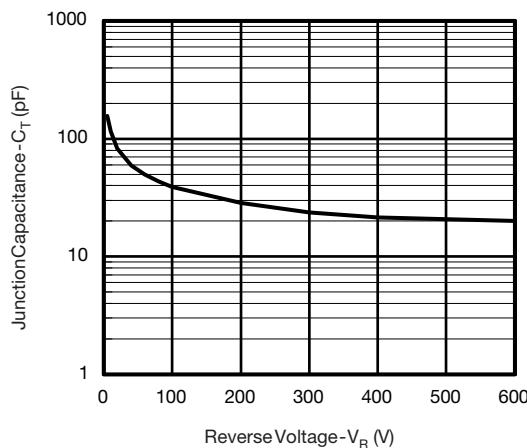


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

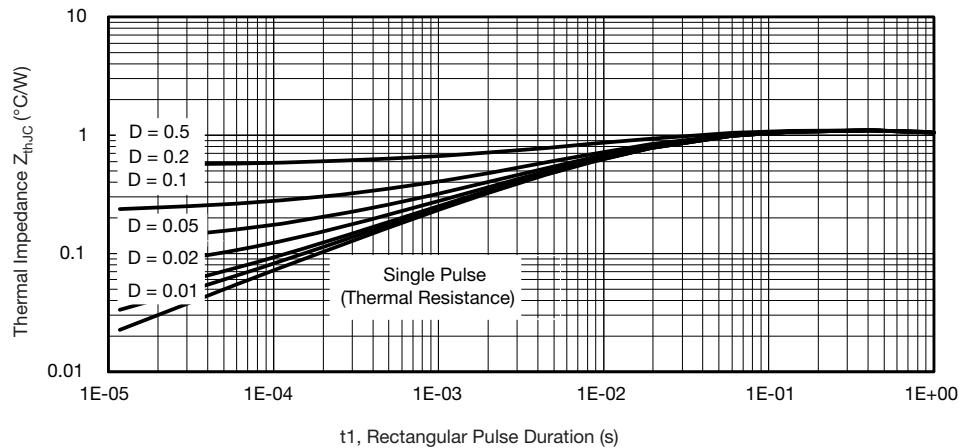


Fig. 4 - Max. Thermal Impedance  $Z_{thJC}$  Characteristics

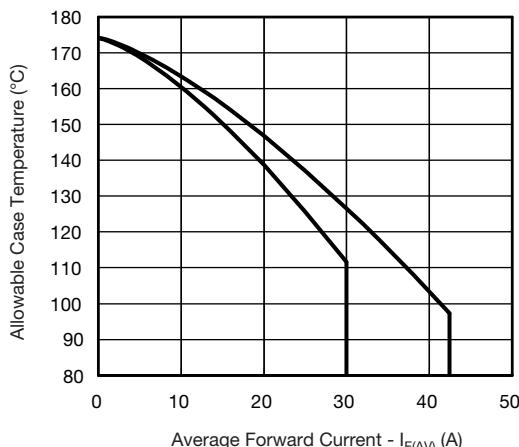


Fig. 5 - Maximum Allowable Case Temperature vs.  
Average Forward Current

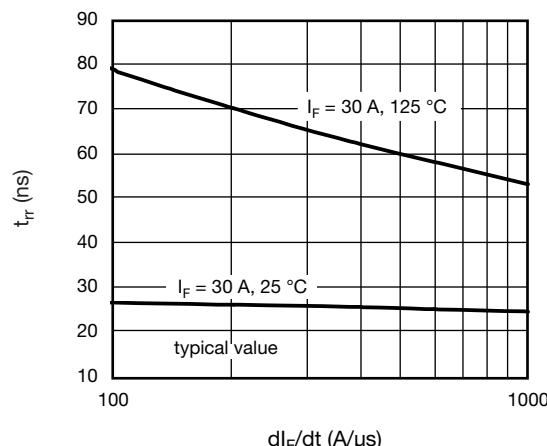


Fig. 7 - Typical Reverse Recovery Time vs.  $dI_F/dt$

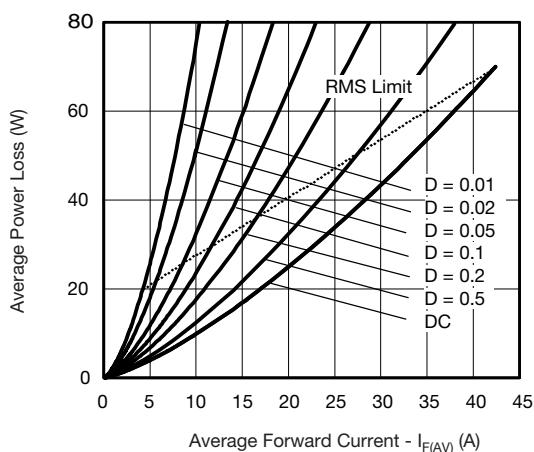


Fig. 6 - Forward Power Loss Characteristics

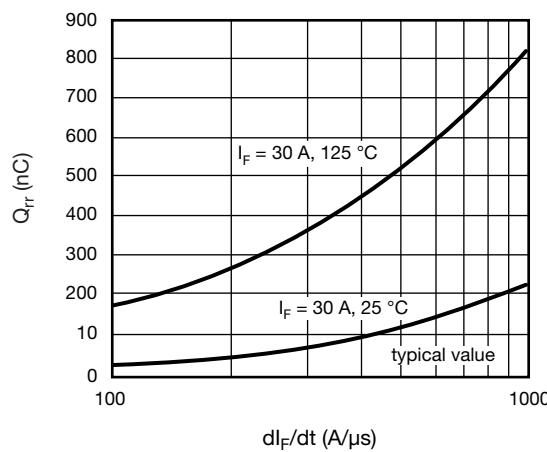
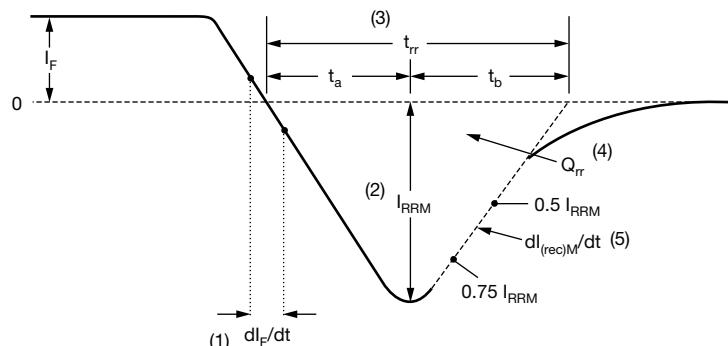


Fig. 8 - Typical Stored Charge vs.  $dI_F/dt$



(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	H	30	06	L	H	N3
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

- 1** - Vishay Semiconductors product
- 2** - Circuit configuration:  
A = single diode
- 3** - P = TO-247
- 4** - H = hyperfast recovery time
- 5** - Current code (30 = 30 A)
- 6** - Voltage code (06 = 600 V)
- 7** - L = long lead
- 8** - H = AEC-Q101 qualified
- 9** - Environmental digit:  
N3 = halogen-free, RoHS-compliant, and totally lead (Pb)-free

**ORDERING INFORMATION (Example)**

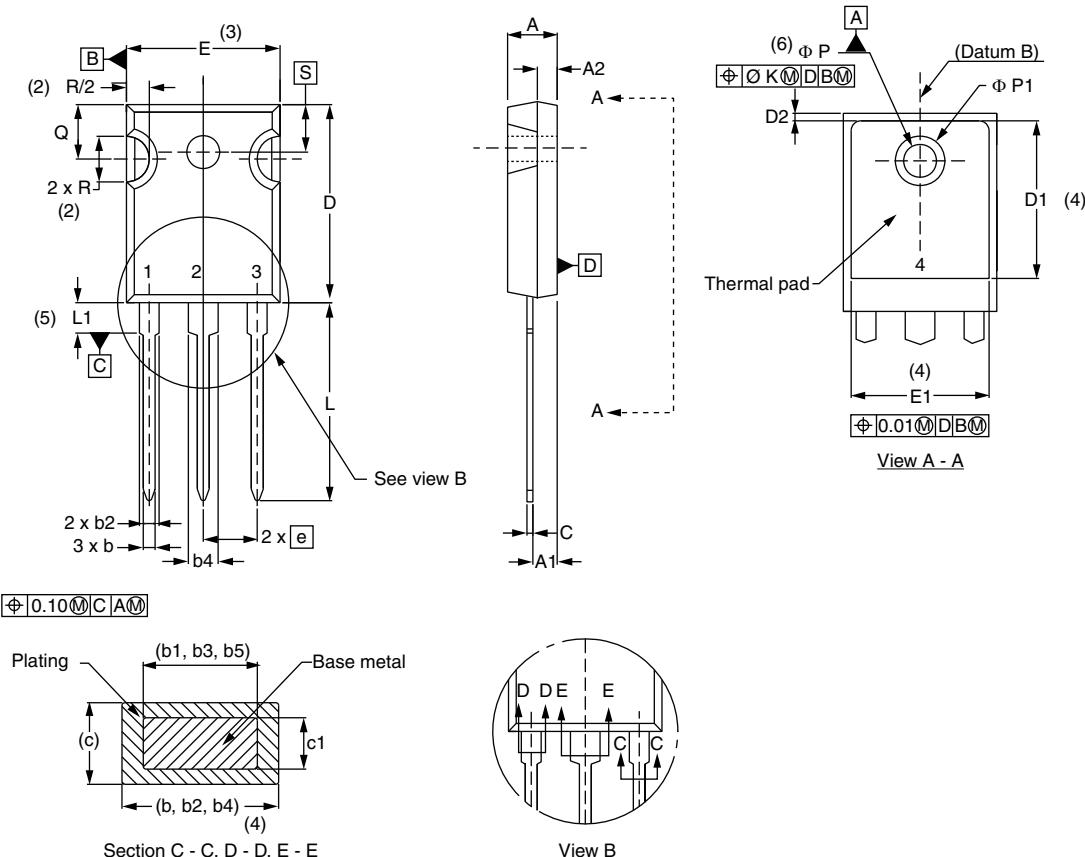
PREFERRED P/N	QUANTITY PER TUBE	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-APH3006LHN3	25	500	Antistatic plastic tube

**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		Symbol	Millimeters		Inches		Notes
	Min.	Max.	Min.	Max.				Min.	Max.	Min.	Max.	
A	4.65	5.31	0.183	0.209			D2	0.51	1.30	0.020	0.051	
A1	2.21	2.59	0.087	0.102			E	15.29	15.87	0.602	0.625	3
A2	1.50	2.49	0.059	0.098			E1	13.46	-	0.53	-	
b	0.99	1.40	0.039	0.055			e	5.46 BSC		0.215 BSC		
b1	0.99	1.35	0.039	0.053			Ø K	0.254		0.010		
b2	1.65	2.39	0.065	0.094			L	19.81	20.32	0.780	0.800	
b3	1.65	2.34	0.065	0.092			L1	3.71	4.29	0.146	0.169	
b4	2.59	3.43	0.102	0.135			Ø P	3.56	3.66	0.14	0.144	
b5	2.59	3.38	0.102	0.133			Ø P1	-	6.98	-	0.275	
c	0.38	0.89	0.015	0.035			Q	5.31	5.69	0.209	0.224	
c1	0.38	0.84	0.015	0.033			R	4.52	5.49	0.178	0.216	
D	19.71	20.70	0.776	0.815	3		S	5.51 BSC		0.217 BSC		
D1	13.08	-	0.515	-	4							

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## Notes

- (1) Dimensioning and tolerancing per ASME Y14.5M-1994
- (2) Contour of slot optional
- (3) Dimension D and E do not include mold flash. These dimensions are measured at the outermost extremes of the plastic body
- (4) Thermal pad contour optional with dimensions D1 and E1
- (5) Lead finish uncontrolled in L1
- (6) Ø 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")
- (7) 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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