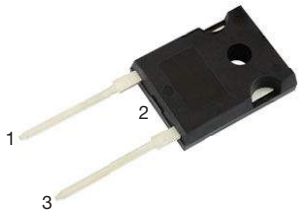
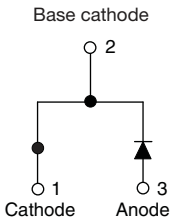
Hyperfast Rectifier, 60 A FRED Pt®



TO-247AD 2L



VS-EPH6007L-N3

FEATURES

- Low forward voltage drop
- Hyperfast soft recovery time
- 175 °C operating junction temperature
- Material categorization:
  for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
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.

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	60 A
V_R	650 V
V_F at I_F	1.6 V
t_{rr} typ.	40 ns
T_J max.	175 °C
Package	TO-247AD 2L
Circuit configuration	Single

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Repetitive peak reverse voltage	V_{RRM}		650	V
Average rectified forward current	$I_{F(AV)}$	T_C = 90 °C (d = 0.50)	60	A
Non-repetitive peak surge current	I_{FSM}	T_C = 25 °C, t_p = 8.3 ms; half sine wave	500	
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	650	-	-	V
Forward voltage	V_F	I_F = 60 A	-	2.1	2.5	
		I_F = 60 A, T_J = 150 °C	-	1.6	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 = 650 V	-	37	-	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	8.0	-	nH

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DYNAMIC RECOVERY CHARACTERISTICS (T_J = 25 °C unless otherwise specified)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNITS**
Reverse recovery time	t_{rr}	I_F = 1 A, dI_F/dt = 100 A/μs, V_R = 30 V		-	42	-	ns
		T_J = 25 °C	I_F = 60 A dI_F/dt = 1000 A/μs V_R = 400 V	-	40	-	
		T_J = 125 °C		-	90	-	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	19	-	A
		T_J = 125 °C		-	36	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	540	-	nC
		T_J = 125 °C		-	1850	-	

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}		-	-	0.65	°C/W
Thermal resistance, case to heatsink	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-247 2L	EPX6007L			

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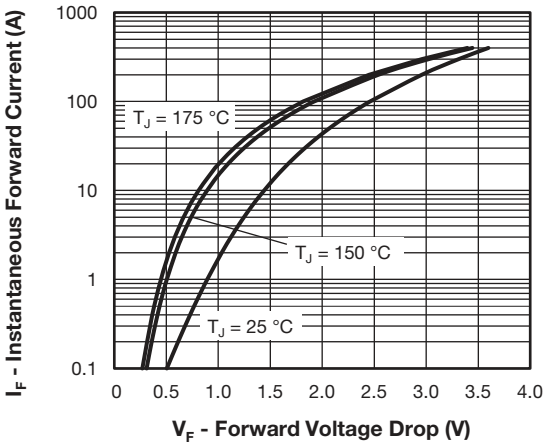

Fig. 1 - Typical Forward Voltage Drop Characteristics

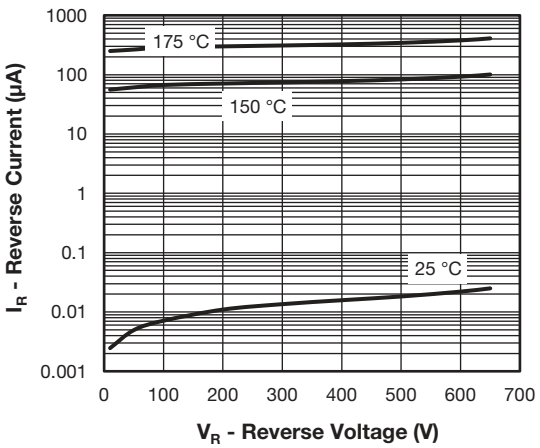

Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

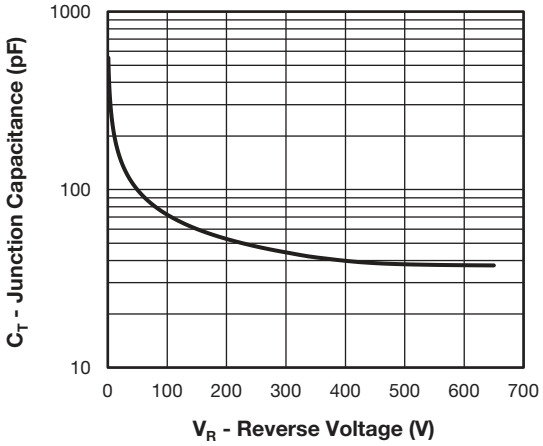

Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

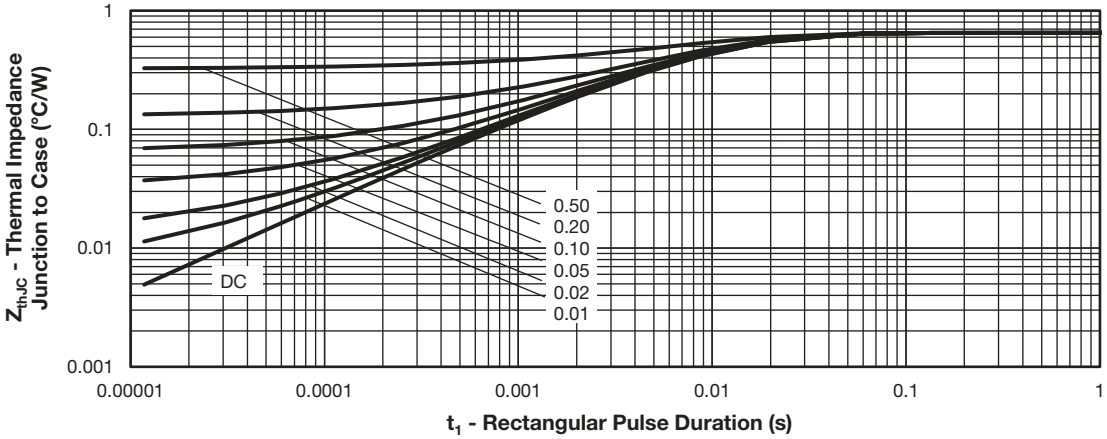

Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

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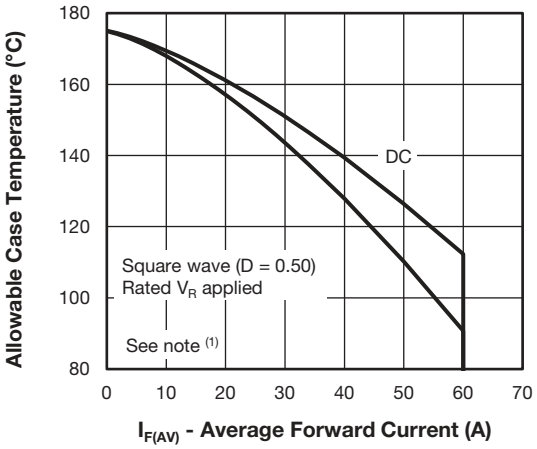


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

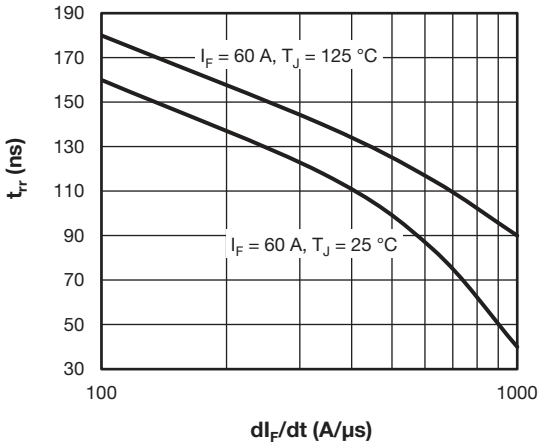


Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt

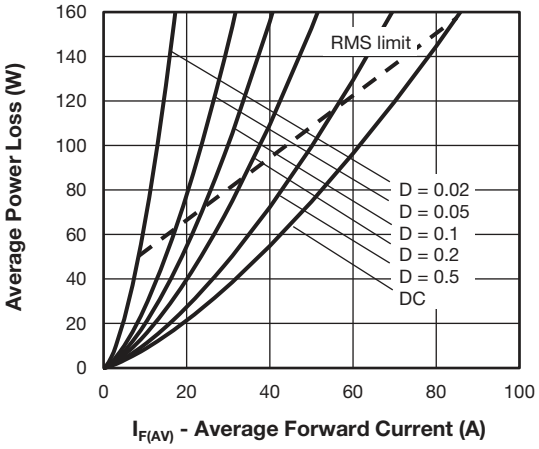


Fig. 6 - Forward Power Loss Characteristics

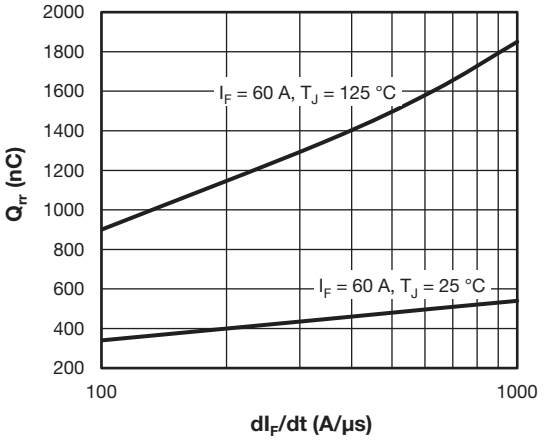
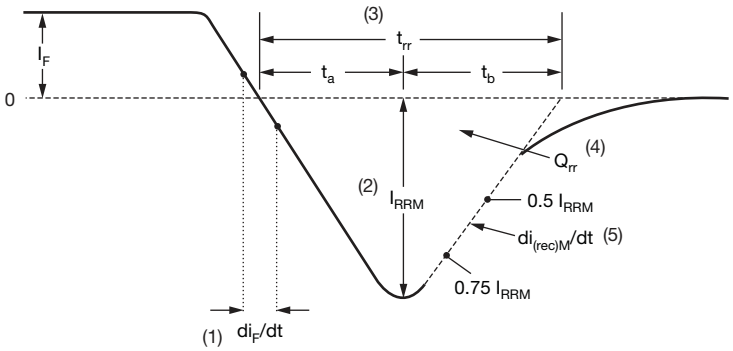


Fig. 8 - Typical Stored Charge vs. dI_F/dt



(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

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ORDERING INFORMATION TABLE

Device code	VS-	E	P	X	60	07	L	-N3
	1	2	3	4	5	6	7	8

1 - Vishay Semiconductors product
2 - E = single diode
3 - P = TO-247
4 - X = hyperfast recovery time
5 - Current code (60 = 60 A)
6 - Voltage code (07 = 650 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-EPX6007L-N3	25	500	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95536
Part marking information	www.vishay.com/doc?95648

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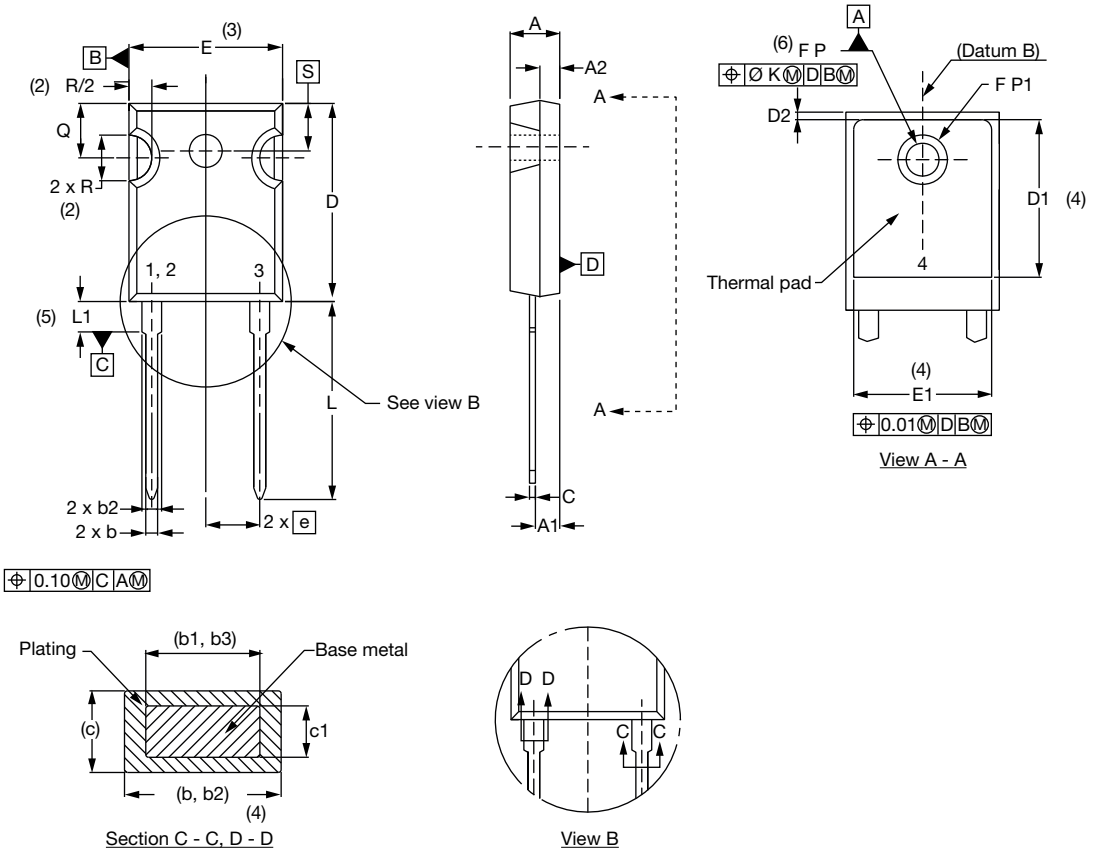
TO-247AD 2L

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	
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
D2	0.51	1.35	0.020	0.053	

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
E	15.29	15.87	0.602	0.625	3
E1	13.46	-	0.53	-	
e	5.46 BSC		0.215 BSC		
Ø K	0.254		0.010		
L	19.81	20.32	0.780	0.800	
L1	3.71	4.29	0.146	0.169	
Ø P	3.56	3.66	0.14	0.144	
Ø 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

(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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