

Hyperfast Rectifier, 60 A FRED Pt®



PRIMARY CHARACTERISTICS						
I _{F(AV)}	60 A					
V_{R}	300 V					
V _F at I _F	0.85 V					
t _{rr} typ.	28 ns					
T _J max.	175 °C					
Package	TO-247AC 3L					
Circuit configuration	Single					

FEATURES

- Hyperfast recovery time
- Low forward voltage drop
- · Low leakage current
- Soft recovery device
- 175 °C operating junction temperature
- Designed and qualified according to JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



DESCRIPTION / APPLICATIONS

VS-60APH03-N3 series are the state of the art ultrafast recovery rectifiers designed with optimized performance of forward voltage drop and ultrafast recovery time.

The planar structure and the platinum doped life time control guarantee the best overall performance, ruggedness and reliability characteristics.

These devices are intended for PDP and use in the output rectification stage for SMPS, UPS, DC/DC converters as well as freewheeling diodes in low voltage inverters.

Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

ABSOLUTE MAXIMUM RATINGS								
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS				
Cathode to anode voltage	V_R		300	V				
Continuous forward current	I _{F(AV)}	T _C = 103 °C	60	۸				
Single pulse forward current	I _{FSM}	$T_J = 25$ °C, $t_p = 10$ ms	450	Α				
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	Ι _R = 100 μΑ	300	-	ı		
		I _F = 30 A	ı	1.0	1.25		
	V _F	I _F = 60 A	-	-	1.45	V	
Forward voltage		I _F = 30 A, T _J = 125 °C	-	0.85	1.10		
		I _F = 60 A, T _J = 125 °C	-	-	1.30		
		V _R = V _R rated	-	-	10		
Reverse leakage current	I _R	T _J = 125 °C, V _R = V _R rated	-	-	100	μA	
Junction capacitance	C _T	V _R = 300 V	-	70	-	pF	
Series inductance	L _S	Measured lead to lead 5 mm from package body	1	3.5	-	nH	



DYNAMIC RECOVERY CHARACTERISTICS (T _J = 25 °C unless otherwise specified)								
PARAMETER	SYMBOL	TEST CO	MIN.	TYP.	MAX.	UNITS		
		$I_F = 1.0 \text{ A}, dI_F/dt = 10$	00 A/ μ s, V _R = 30 V	-	28	-		
Payaraa raaayan tima	+	$I_F = 1.0 \text{ A}, dI_F/dt = 50 \text{ A/}\mu\text{s}, V_R = 30 \text{ V}$		-	34	-		
Reverse recovery time	t _{rr}	T _J = 25 °C	I _F = 60 A dI _F /dt = 200 A/μs V _R = 200 V	-	42	-	ns - A	
		T _J = 125 °C		-	64	-		
Deals recovery as went	I _{RRM}	T _J = 25 °C		-	3.0	-		
Peak recovery current		T _J = 125 °C		-	8.5	-		
Reverse recovery charge	Q _{rr}	T _J = 25 °C		-	65	-	nC	
		T _J = 125 °C		-	273	-	IIC	

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}		1	0.56	0.80	°C/W		
Thermal resistance, junction to ambient	R _{thJA}	Typical socket mount	-	-	40	C/VV		
Typical thermal resistance, case to heatsink	R _{thCS}	Mounting surface, flat, smooth, and greased	-	0.4	-			
Approximate Weight			=	6.0	-	g		
Approximate Weight			-	0.22	-	OZ.		
Mounting torque			6.0	-	12	kgf. cm		
			(12)	-	(10)	(lbf.in)		
Marking device		Case style TO-247AC		60AI	PH03			

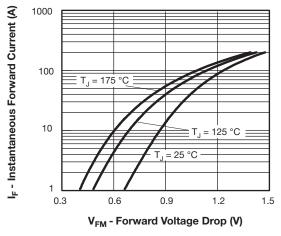


Fig. 1 - Typical Forward Voltage Drop Characteristics

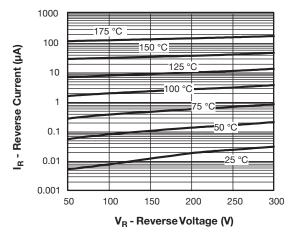


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage



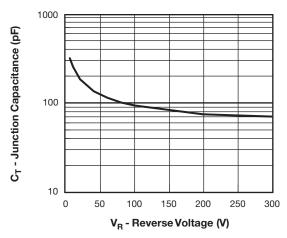


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

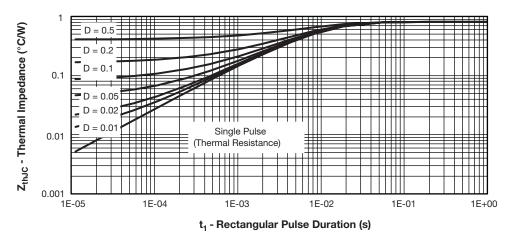


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

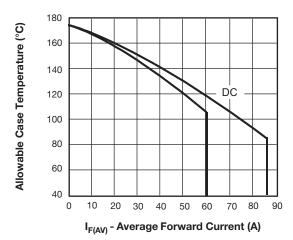


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

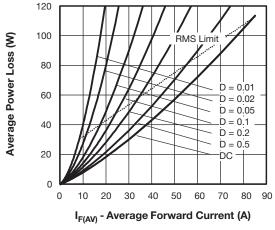


Fig. 6 - Forward Power Loss Characteristics



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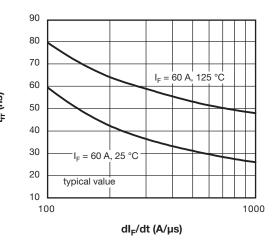


Fig. 7 - Typical Reverse Recovery vs. dl_F/dt

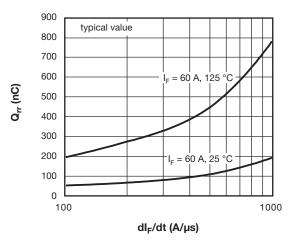
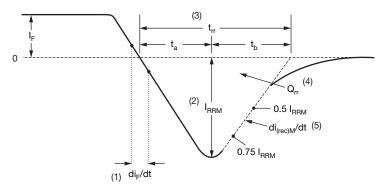


Fig. 8 - Typical Stored Charge vs. dl_F/dt



- (1) di_F/dt rate of change of current through zero crossing
- (2) I_{RRM} peak reverse recovery current
- (3) $\rm t_{rr}$ reverse recovery time measured from zero crossing point of negative going $\rm I_{rr}$ to point where a line passing through 0.75 $\rm I_{RRM}$ and 0.50 $\rm I_{RRM}$ extrapolated to zero current.
- (4) \mathbf{Q}_{rr} area under curve defined by \mathbf{t}_{rr} and \mathbf{I}_{RRM}

$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

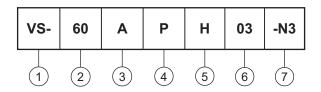
(5) di_{(rec)M}/dt - peak rate of change of current during t_b portion of t_{rr}

Fig. 9 - Reverse Recovery Waveform and Definitions



ORDERING INFORMATION TABLE

Device code



1 - Vishay Semiconductors product

2 - Current rating (60 = 60 A)

3 - Circuit configuration:

A = single diode, 3 pins

4 - P = TO-247 AC

5 - H = hyperfast rectifier

6 - Voltage code (03 = 300 V)

7 - -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-60APH03-N3	25	500	Antistatic plastic tube			

LINKS TO RELATED DOCUMENTS					
Dimensions <u>www.vishay.com/doc?96138</u>					
Part marking information	www.vishay.com/doc?95007				
SPICE model	www.vishay.com/doc?96075				



TO-247AC 3L

DIMENSIONS in millimeters and inches



SYMBOL	MILLIN	IETERS	INCHES		NOTES
STWIBOL	MIN.	MAX.	MIN.	MAX.	NOTES
Α	4.65	5.31	0.183	0.209	
A1	2.21	2.59	0.087	0.102	
A2	1.17	1.37	0.046	0.054	
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	
С	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		INC	INCHES		
STMBOL	MIN.	MAX.	MIN.	MAX.	NOTES	
D2	0.51	1.35	0.020	0.053		
E	15.29	15.87	0.602	0.625	3	
E1	13.46	-	0.53	-		
е	5.46	BSC	0.215	BSC		
ØK	0.2	254	0.010			
L	14.20	16.10	0.559	0.634		
L1	3.71	4.29	0.146	0.169		
ØΡ	3.56	3.66	0.14	0.144		
Ø P1	-	7.39	-	0.291		
Q	5.31	5.69	0.209	0.224		
R	4.52	5.49	0.178	0.216		
S	5.51	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. Mold flash shall not exceed 0.127 mm (0.005") per side. 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 Q



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