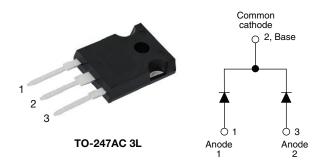


Ultrafast Rectifier, FRED Pt®, 2 x 30 A



PRIMARY CHARACTERISTICS						
I _{F(AV)}	2 x 30 A					
V _R	200 V					
V _F at I _F	0.75 V					
t _{rr} typ.	30 ns					
T _J max.	175 °C					
Package	TO-247AC 3L					
Circuit configuration	Common cathode					

FEATURES

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



FREE

DESCRIPTION / APPLICATIONS

VS-60CPU02... 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 use in the output rectification stage of SMPS, welding, UPS, DC/DC converters as well as freewheeling diodes in low voltage inverters and chopper motor drives.

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 RA	TINGS				
PARAMETER		SYMBOL	TEST CONDITIONS	VALUES	UNITS
Repetitive peak reverse voltage		V _{RRM}		200	V
Average rectified forward current	per leg	I _{F(AV)}		30	
Average rectified forward current —	per device		Rated V _R , T _C = 145 °C	60	
Non-repetitive peak surge current pe	er leg	I _{FSM}	$T_J = 25 ^{\circ}\text{C}, t_p = 10 \text{ms}$	300	Α
Peak repetitive forward current per le	eg	I _{FM}	Rated V _R , square wave, 20 kHz, T _C = 137 °C	60	
Operating junction and storage temp	eratures	T _J , T _{Stg}		-65 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	200	ı	ı		
Forward voltage	V _F	I _F = 30 A	-	0.92	1.1	V	
Forward voitage		I _F = 30 A, T _J = 150 °C	-	0.75	0.85		
Poverse leakage current		$V_R = V_R$ rated	-	-	50	μΑ	
Reverse leakage current	I _R	T _J = 150 °C, V _R = V _R rated	-	30	300		
Junction capacitance	C _T	V _R = 200 V	-	100	=	pF	
Series inductance	L _S	Measured lead to lead 5 mm from package body	-	12	-	nΗ	



DYNAMIC RECOVERY CHARACTERISTICS (T _J = 25 °C unless otherwise specified)								
PARAMETER	SYMBOL	TEST CO	MIN.	TYP.	MAX.	UNITS		
	t _{rr}	$I_F = 1.0 \text{ A}, \text{ di}_F/\text{dt} = 100 \text{ A/}\mu\text{s}, \text{ V}_R = 30 \text{ V}$		-	30	36		
Reverse recovery time		T _J = 25 °C		-	30	-	ns	
		T _J = 125 °C	I _F = 30 A di _F /dt = - 200 A/μs V _R = 160 V	-	47	-		
Peak recovery current	I _{RRM}	T _J = 25 °C		-	3	-	А	
		T _J = 125 °C		-	6.5	-		
Reverse recovery charge	Q _{rr}	T _J = 25 °C		-	42	-	0	
		T _J = 125 °C		-	160	-	nC	

THERMAL - MECHANICAL SPECIFICATIONS (T _J = 25 °C unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS	
Maximum junction and storage temperature range	T _J , T _{Stg}		-65	-	175	°C	
Thermal resistance, junction to case per leg	R _{thJC}		-	0.6	1.0		
Thermal resistance, junction to ambient per leg	R _{thJA}	Typical socket mount	-	-	40	°C/W	
Thermal resistance, case to heatsink	R _{thCS}	Mounting surface, flat, smooth and greased	-	0.5	-		
Weight			-	6.0	-	g	
vveigni			-	0.21	-	OZ.	
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)	
Marking device		Case style TO-247AC 3L	60CPU02				

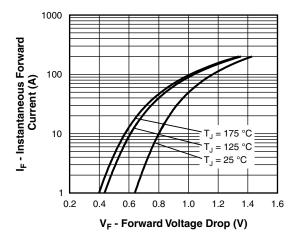


Fig. 1 - Typical Forward Voltage Drop Characteristics

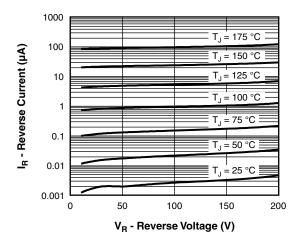


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

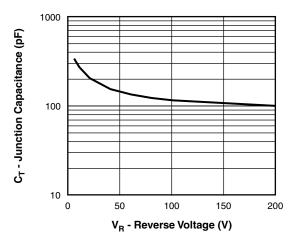


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

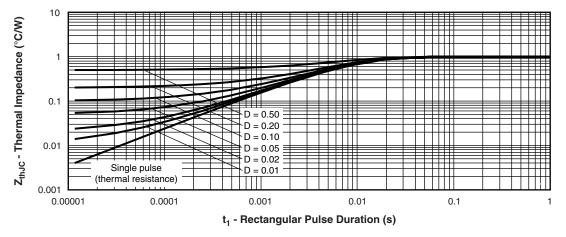


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

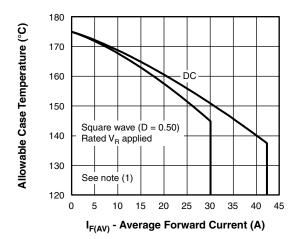


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

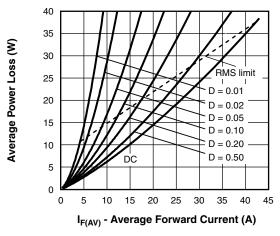


Fig. 6 - Forward Power Loss Characteristics

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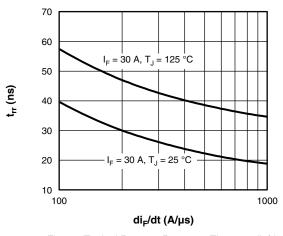


Fig. 7 - Typical Reverse Recovery Time vs. di_{F}/dt

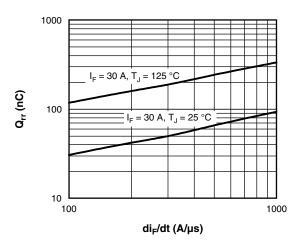
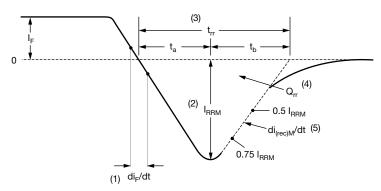


Fig. 8 - Typical Stored Charge vs. di_F/dt

Note

 $\begin{array}{ll} \text{(1)} & \text{Formula used: } T_C = T_J - (\text{Pd} + \text{Pd}_{\text{REV}}) \times R_{\text{thJC}}; \\ \text{Pd} = \text{forward power loss} = I_{\text{F(AV)}} \times V_{\text{FM}} \text{ at } (I_{\text{F(AV)}}/D) \text{ (see fig. 6)}; \\ \text{Pd}_{\text{REV}} = \text{inverse power loss} = V_{\text{R1}} \times I_{\text{R}} \text{ (1 - D)}; I_{\text{R}} \text{ at } V_{\text{R1}} = \text{rated } V_{\text{R}} \\ \end{array}$



- (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 $\rm I_F$ 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}

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

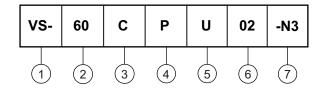
(5) di_{(rec)M}/dt - peak rate of change of current during t_b portion of t_{rr}

Fig. 9 - Reverse Recovery Waveform and Definitions



ORDERING INFORMATION TABLE

Device code



1 - Vishay Semiconductors product

Current rating (60 = 60 A)

3 - Circuit configuration:

C = common cathode

- Package:

P = TO-247AC (modified)

5 - U = ultrafast rectifier

- Voltage rating (02 = 200 V)

7 - Environmental digit:

-N3 = halogen-free, RoHS-compliant, and totally lead (Pb)-free

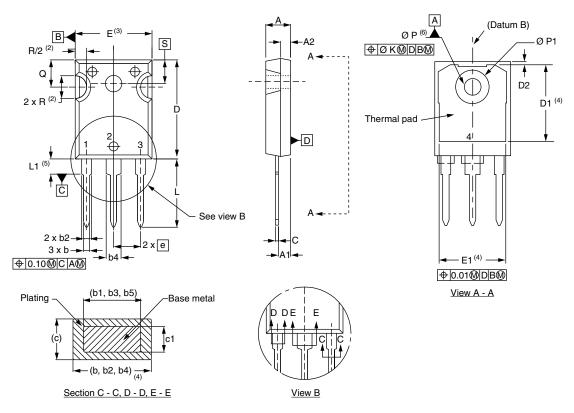
ORDERING INFORMATION (Example)						
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION			
VS-60CPU02-N3	25	500	Antistatic plastic tube			

LINKS TO RELATED DOCUMENTS					
Dimensions	www.vishay.com/doc?96138				
Part marking information	www.vishay.com/doc?95007				



TO-247AC 3L

DIMENSIONS in millimeters and inches



SYMBOL	MILLIN	IETERS	INCHES		NOTES
STINIDUL	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	MILLIN	MILLIMETERS		INCHES		
STWIBOL	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 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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