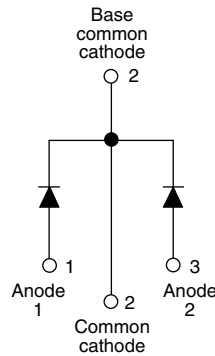


## Ultrafast Rectifier, 2 x 15 A FRED Pt®



TO-247AC



### FEATURES

- Ultrafast recovery time
- Low forward voltage drop
- 175 °C operating junction temperature
- Low leakage current
- Compliant to RoHS Directive 2002/95/EC
- Designed and qualified for industrial level



**RoHS**  
COMPLIANT

### DESCRIPTION/APPLICATIONS

FRED Pt® series are the state of the art ultrafast recovery rectifiers specifically 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, 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.

### PRODUCT SUMMARY

Package	TO-247AC
$I_{F(AV)}$	2 x 15 A
$V_R$	400 V
$V_F$ at $I_F$	1.25 V
$t_{rr}$ typ.	See Recovery table
$T_J$ max.	175 °C
Diode variation	Common cathode

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage	$V_{RRM}$		400	V
Average rectified forward current	$I_{F(AV)}$	per leg	15	A
		total device	Rated $V_R$ , $T_C = 149$ °C	
Non-repetitive peak surge current per leg	$I_{FSM}$	$T_C = 25$ °C	200	
Peak repetitive forward current per leg	$I_{FRM}$	Rated $V_R$ , $T_C = 149$ °C, square wave, 20 kHz	30	
Operating junction and storage temperatures	$T_J$ , $T_{Stg}$		- 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	$V_{BR}$ , $V_R$	$I_R = 100$ $\mu$ A	400	-	-	V
Forward voltage	$V_F$	$I_F = 15$ A	-	1.17	1.25	
		$I_F = 15$ A, $T_J = 150$ °C	-	0.93	1.12	
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	0.3	10	$\mu$ A
		$T_J = 150$ °C, $V_R = V_R$ rated	-	30	500	
Junction capacitance	$C_T$	$V_R = 400$ V	-	28	-	pF
Series inductance	$L_S$	Measured lead to lead 5 mm from package body	-	12	-	nH

<b>DYNAMIC RECOVERY CHARACTERISTICS</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time	$t_{rr}$	$I_F = 1\text{ A}$ , $di_F/dt = 50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$		-	36	60	ns
		$T_J = 25\text{ }^\circ\text{C}$	$I_F = 15\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ $V_R = 200\text{ V}$	-	46	-	
		$T_J = 125\text{ }^\circ\text{C}$		-	80	-	
Peak recovery current	$I_{RRM}$	$T_J = 25\text{ }^\circ\text{C}$	$I_F = 15\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ $V_R = 200\text{ V}$	-	3.6	-	A
		$T_J = 125\text{ }^\circ\text{C}$		-	8.7	-	
Reverse recovery charge	$Q_{rr}$	$T_J = 25\text{ }^\circ\text{C}$	$I_F = 15\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ $V_R = 200\text{ V}$	-	84	-	nC
		$T_J = 125\text{ }^\circ\text{C}$		-	345	-	

<b>THERMAL - MECHANICAL SPECIFICATIONS</b>							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	$T_J, T_{Stg}$			- 65	-	175	$^\circ\text{C}$
Thermal resistance, junction to case per leg	$R_{thJC}$			-	0.8	1.5	$^\circ\text{C}/\text{W}$
Thermal resistance, junction to ambient per leg	$R_{thJA}$	Typical socket mount		-	-	40	
Thermal resistance, case to heatsink	$R_{thCS}$	Mounting surface, flat, smooth and greased		-	0.4	-	
Weight				-	6.0	-	g
				-	0.21	-	oz.
Mounting torque				6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style TO-247AC		30CPU04			

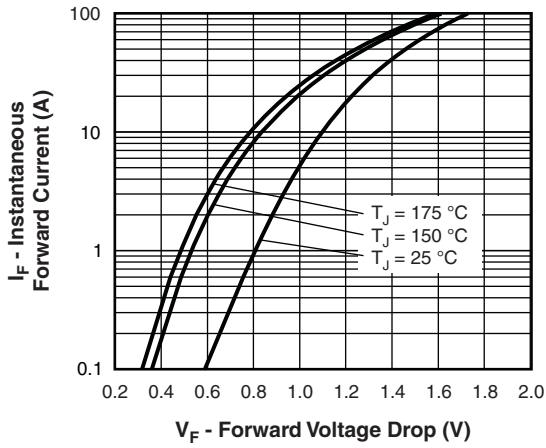


Fig. 1 - Typical Forward Voltage Drop Characteristics

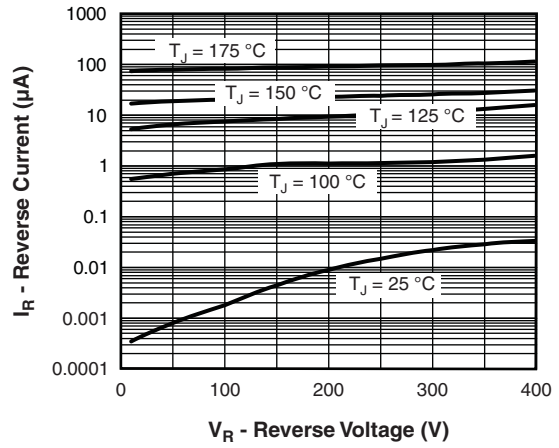


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

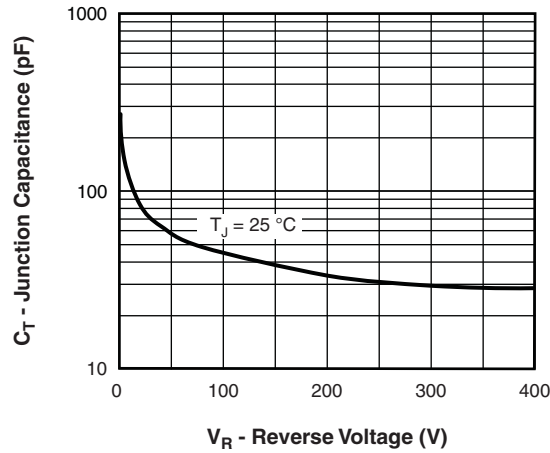
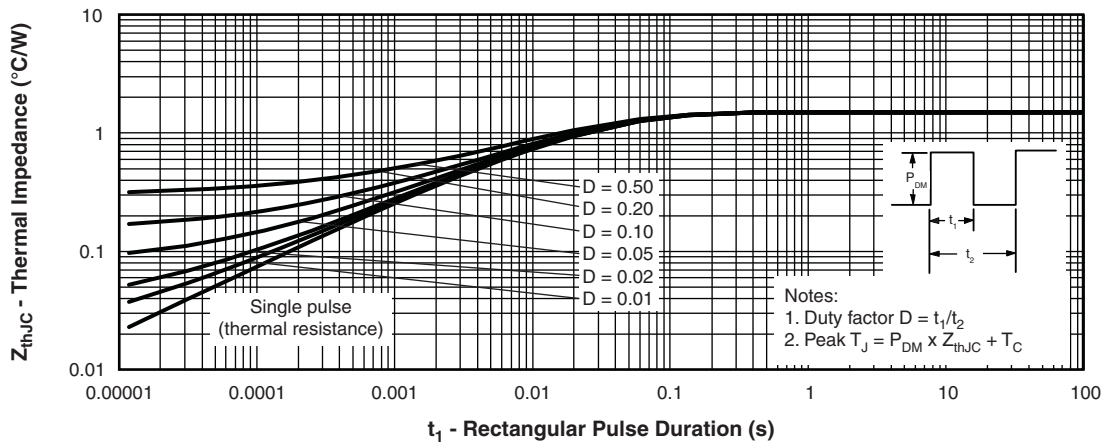


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage


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

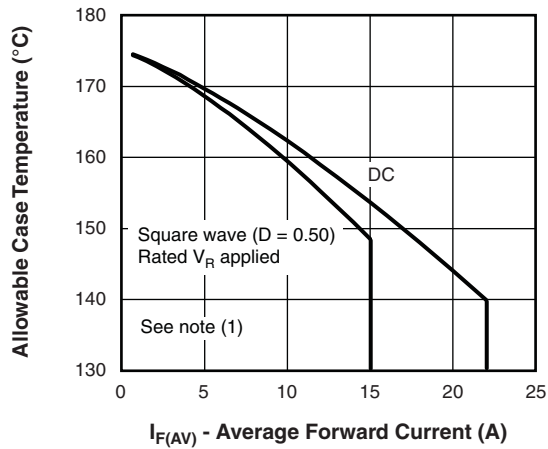


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

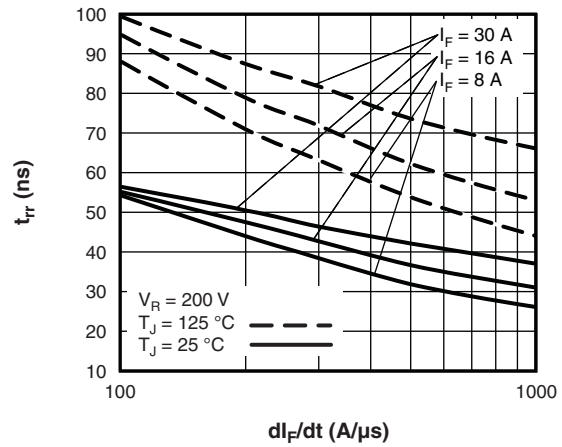


Fig. 7 - Typical Reverse Recovery Time vs.  $di_F/dt$

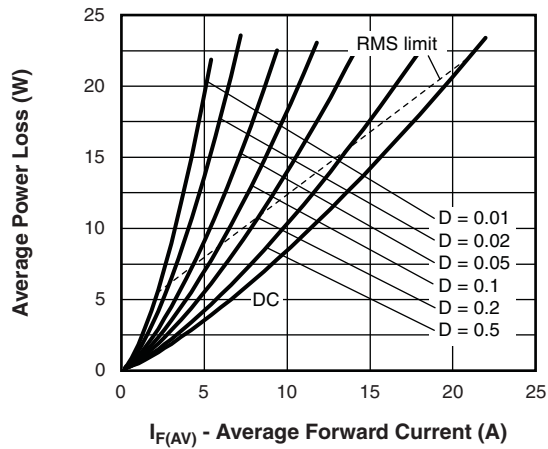


Fig. 6 - Forward Power Loss Characteristics

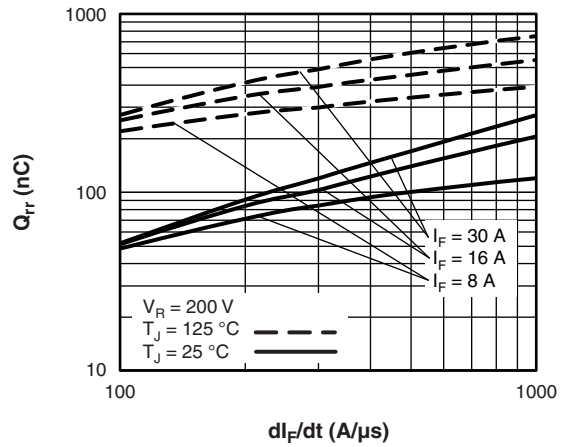


Fig. 8 - Typical Stored Charge vs.  $di_F/dt$

**Note**

- (1) Formula used:  $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$ ;  
 $Pd$  = Forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 6);  
 $Pd_{REV}$  = Inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1}$  = Rated  $V_R$

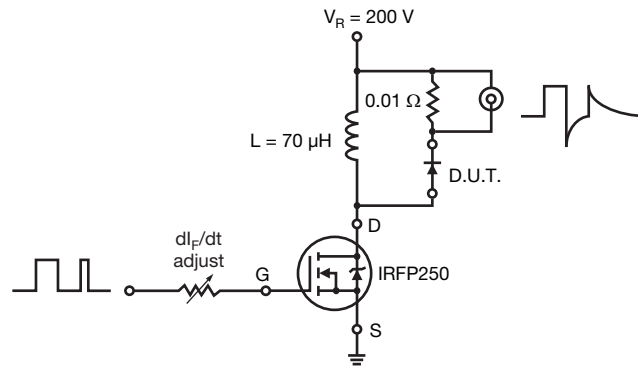
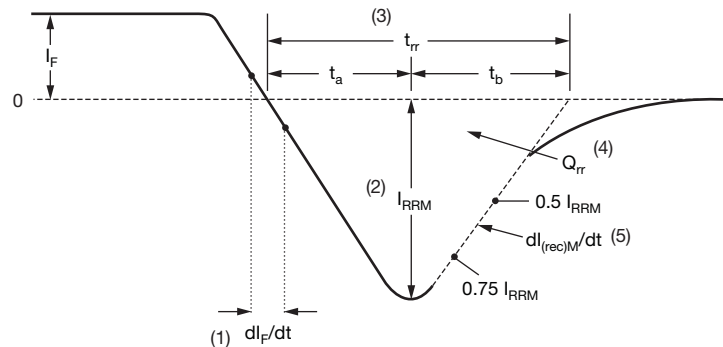


Fig. 9 - Reverse Recovery Parameter Test Circuit



- |   |   |
|---|---|
| <p>(1) <math>dl_F/dt</math> - rate of change of current through zero crossing</p> <p>(2) <math>I_{RRM}</math> - peak reverse recovery current</p> <p>(3) <math>t_{rr}</math> - reverse recovery time measured from zero crossing point of negative going <math>I_F</math> to point where a line passing through <math>0.75 I_{RRM}</math> and <math>0.50 I_{RRM}</math> extrapolated to zero current.</p> | <p>(4) <math>Q_{rr}</math> - area under curve defined by <math>t_{rr}</math> and <math>I_{RRM}</math></p> $Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$ <p>(5) <math>dl_{(rec)M}/dt</math> - peak rate of change of current during <math>t_b</math> portion of <math>t_{rr}</math></p> |
|---|---|

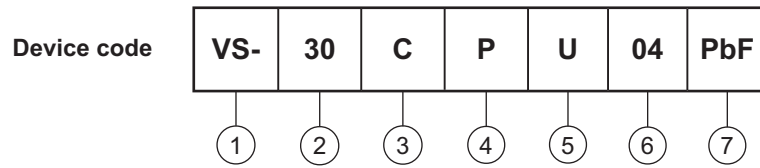
Fig. 10 - Reverse Recovery Waveform and Definitions

# VS-30CPU04PbF



Vishay Semiconductors Ultrafast Rectifier, 2 x 15 A FRED Pt®

## ORDERING INFORMATION TABLE



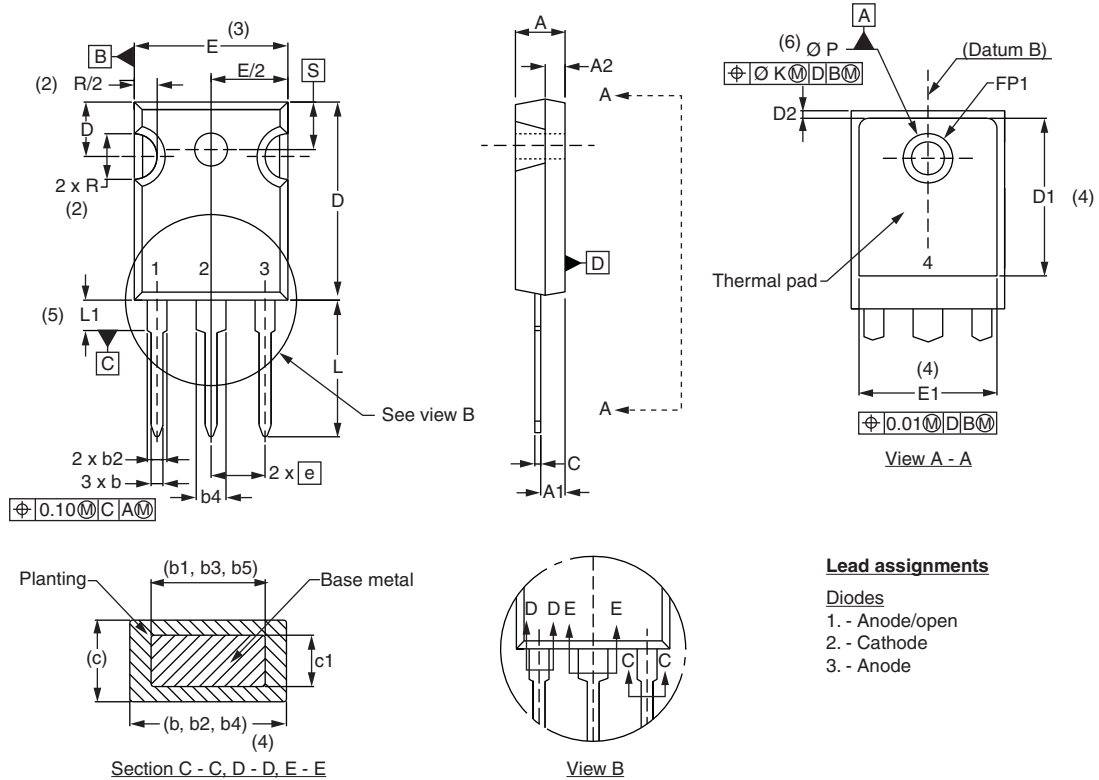
- 1** - Vishay Semiconductors product
- 2** - Current rating (30 = 30 A)
- 3** - Common cathode
- 4** - TO-247AC
- 5** - Ultrafast recovery
- 6** - Voltage rating (04 = 400 V)
- 7** - PbF = Lead (Pb)-free

Tube standard pack quantity: 25 pieces

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95223">www.vishay.com/doc?95223</a>
Part marking information	<a href="http://www.vishay.com/doc?95226">www.vishay.com/doc?95226</a>

## TO-247

**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	2.37	0.065	0.094	
b4	2.59	3.43	0.102	0.135	
b5	2.59	3.38	0.102	0.133	
c	0.38	0.86	0.015	0.034	
c1	0.38	0.76	0.015	0.030	
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	13.72	-	0.540	-	
e	5.46 BSC		0.215 BSC		
FK	2.54		0.10		
L	14.20	16.10	0.559	0.634	
L1	3.71	4.29	0.146	0.169	
N	7.62 BSC		3		
FP	3.56	3.66	0.14	0.144	
FP1	-	6.98	-	0.275	
Q	5.31	5.69	0.209	0.224	
R	4.52	5.49	1.78	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)  $\phi P$  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")
- (7) Outline conforms to JEDEC outline TO-247 with exception of dimension c



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