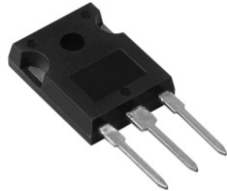
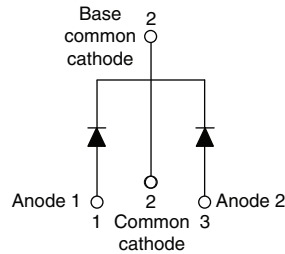


Ultrafast Rectifier, FRED Pt™, 2 x 30 A


TO-247AC


FEATURES

- Ultrafast recovery time
- Low forward voltage drop
- Low leakage current
- 175 °C operating junction temperature
- Fully lead (Pb)-free and RoHS compliant devices
- Designed and qualified for industrial level


**RoHS
COMPLIANT**

DESCRIPTION

60CPU02-F 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-to-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

t_{rr}	30 ns
$I_{F(AV)}$	2 x 30 A
V_R	200 V

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Repetitive peak reverse voltage	V_{RRM}		200	V
Average rectified forward current	$I_{F(AV)}$	per leg	30	A
		per device	Rated V_R , $T_C = 145\text{ °C}$	
Non-repetitive peak surge current per leg	I_{FSM}	$T_J = 25\text{ °C}$	300	
Peak repetitive forward current per leg	I_{FM}	Rated V_R , square wave, 20 kHz, $T_C = 137\text{ °C}$	60	
Operating junction and storage temperatures	T_J, T_{Stg}		- 65 to 175	°C

ELECTRICAL SPECIFICATIONS ($T_J = 25\text{ °C}$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	V_{BR}, V_R	$I_R = 100\text{ }\mu\text{A}$	200	-	-	V
Forward voltage	V_F	$I_F = 30\text{ A}$	-	0.92	1.1	
		$I_F = 30\text{ A}, T_J = 150\text{ °C}$	-	0.75	0.85	
Reverse leakage current	I_R	$V_R = V_R\text{ rated}$	-	-	50	μA
		$T_J = 150\text{ °C}, V_R = V_R\text{ rated}$	-	30	300	
Junction capacitance	C_T	$V_R = 200\text{ V}$	-	100	-	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	12	-	nH



DYNAMIC RECOVERY CHARACTERISTICS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS	
Reverse recovery time	t_{rr}	$I_F = 1.0\text{ A}$, $dI_F/dt = 100\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$	-	30	36	ns	
		$T_J = 25\text{ }^\circ\text{C}$	-	30	-		
		$T_J = 125\text{ }^\circ\text{C}$	-	47	-		
Peak recovery current	I_{RRM}	$I_F = 30\text{ A}$ $dI_F/dt = -200\text{ A}/\mu\text{s}$ $V_R = 160\text{ V}$	$T_J = 25\text{ }^\circ\text{C}$	-	3	-	A
			$T_J = 125\text{ }^\circ\text{C}$	-	6.5	-	
Reverse recovery charge	Q_{rr}	$I_F = 30\text{ A}$ $dI_F/dt = -200\text{ A}/\mu\text{s}$ $V_R = 160\text{ V}$	$T_J = 25\text{ }^\circ\text{C}$	-	42	-	nC
			$T_J = 125\text{ }^\circ\text{C}$	-	160	-	

THERMAL - MECHANICAL SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted)						
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}		-	0.6	1.0	$^\circ\text{C}/\text{W}$
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	-	0.5	-	
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	60CPU02			

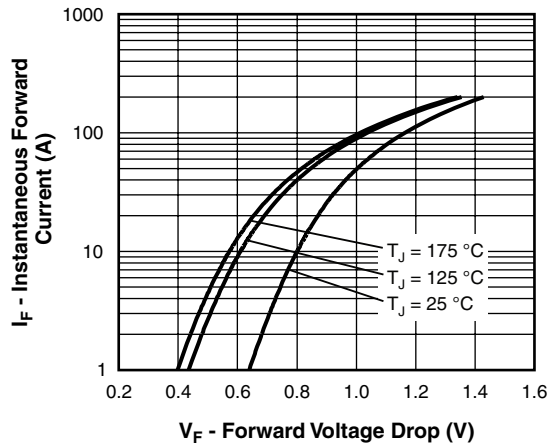


Fig. 1 - Typical Forward Voltage Drop Characteristics

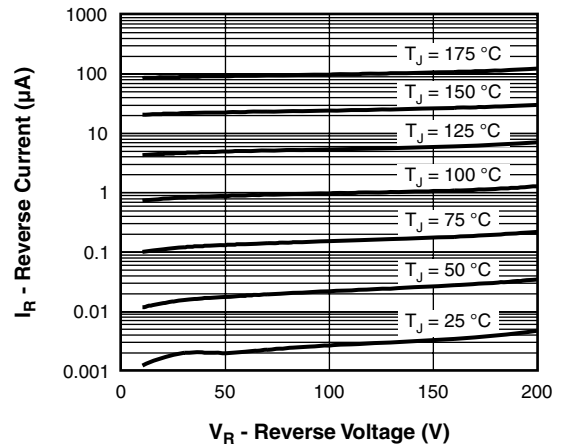


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

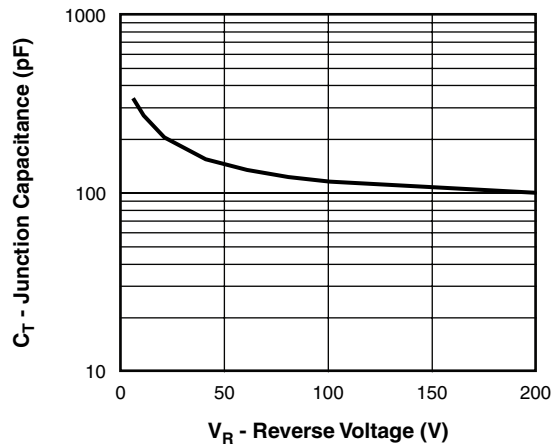
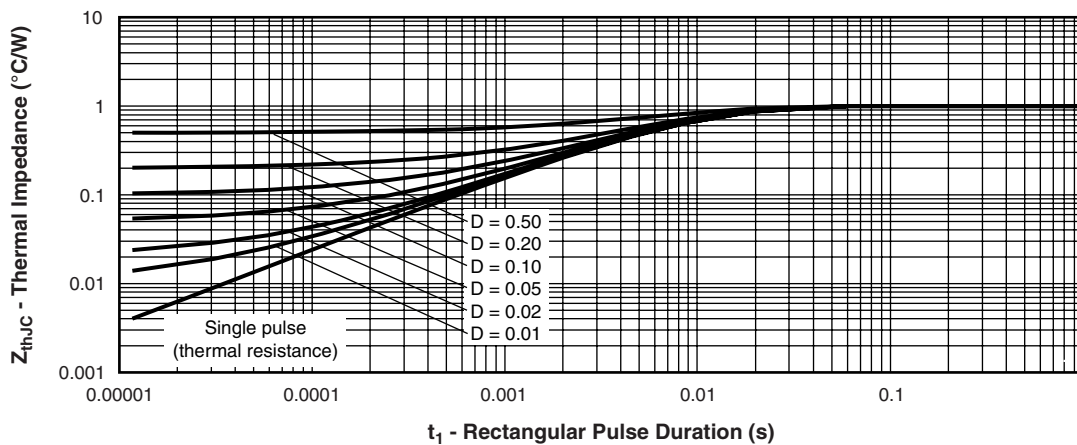


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage


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

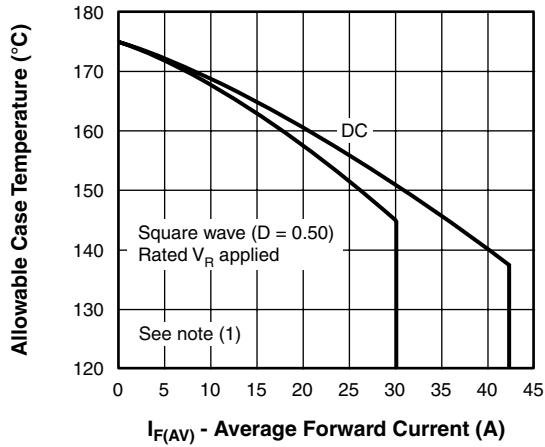


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

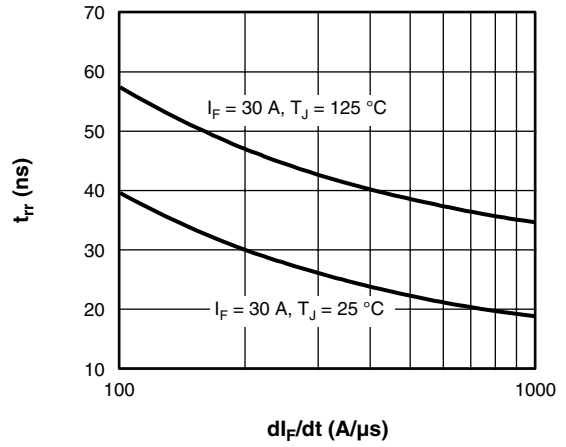


Fig. 7 - Typical Reverse Recovery Time vs. di/dt

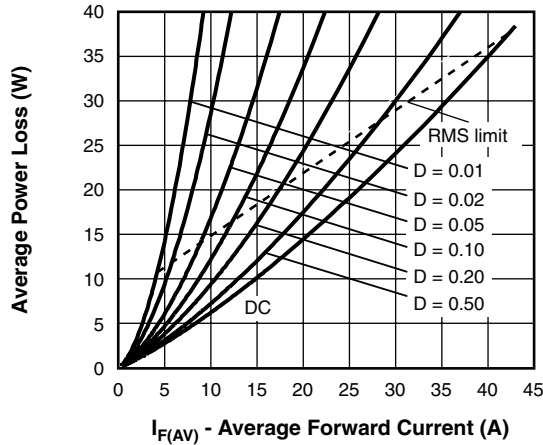


Fig. 6 - Forward Power Loss Characteristics

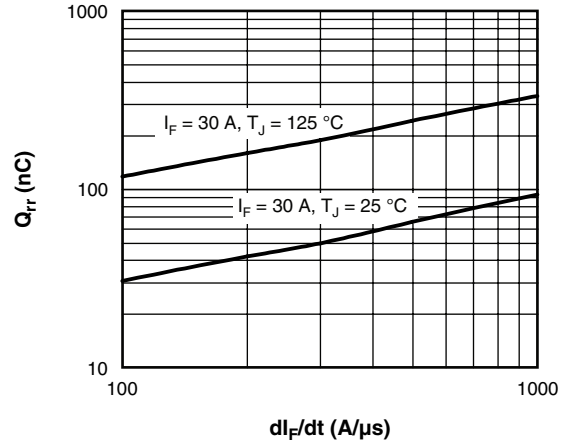


Fig. 8 - Typical Stored Charge vs. di/dt

Note

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

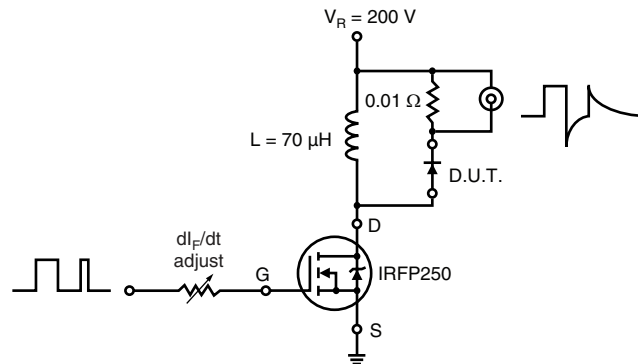
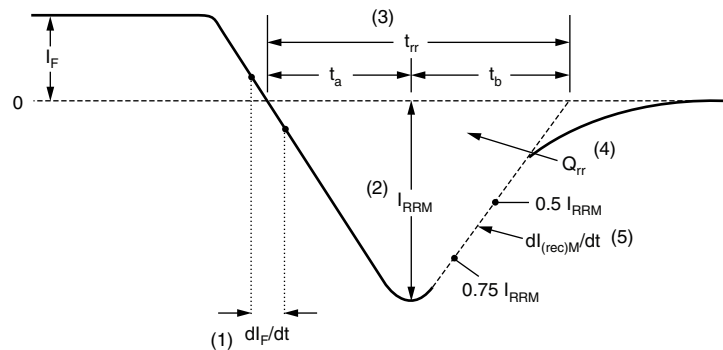


Fig. 9 - Reverse Recovery Parameter Test Circuit



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

Fig. 10 - Reverse Recovery Waveform and Definitions



ORDERING INFORMATION TABLE

Device code	60	C	P	U	02	-	F
	①	②	③	④	⑤		⑥

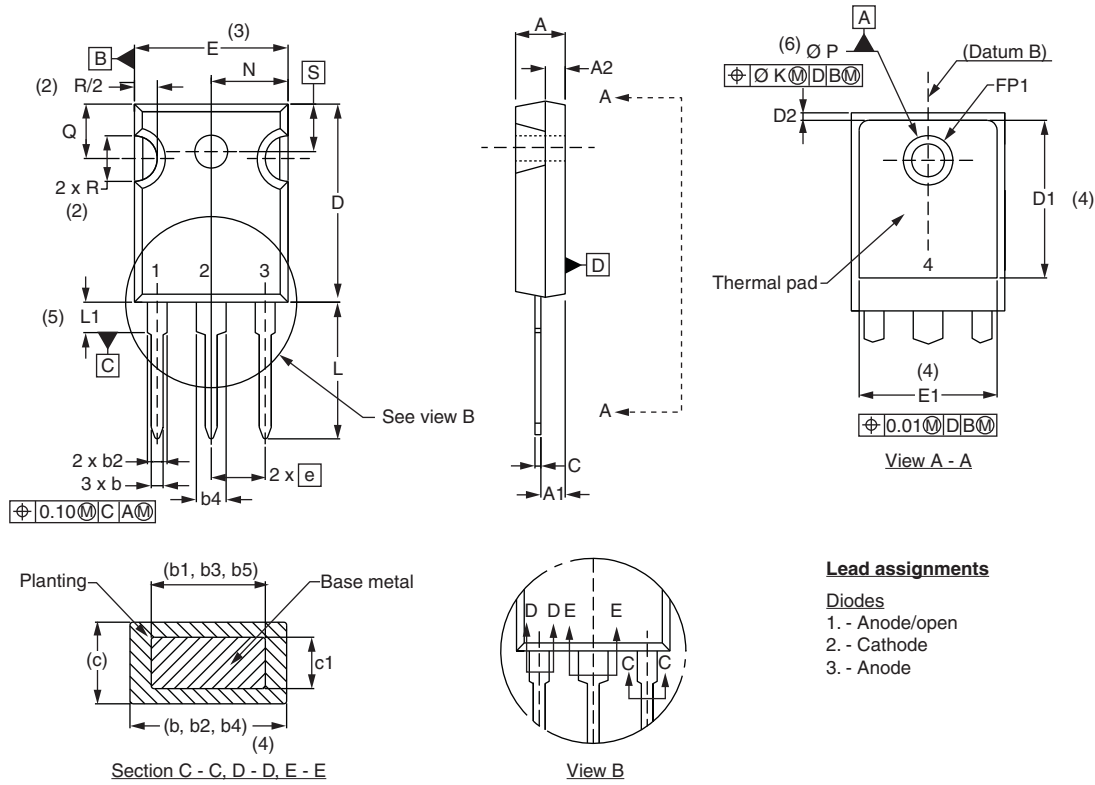
- 1** - Current rating (60 = 60 A)
- 2** - Circuit configuration:
C = Common cathode
- 3** - Package:
P = TO-247AC (modified)
- 4** - U = Ultrafast rectifier
- 5** - Voltage rating (02 = 200 V)
- 6** - RoHS compliant and totally lead (Pb)-free

Tube standard pack quantity: 25 pieces

LINKS TO RELATED DOCUMENTS	
Dimensions	http://www.vishay.com/doc?95223
Part marking information	http://www.vishay.com/doc?95007



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	13.72	-	0.540	-	
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		FK	2.54		0.010		
b2	1.65	2.39	0.065	0.094		L	14.20	16.10	0.559	0.634	
b3	1.65	2.37	0.065	0.094		L1	3.71	4.29	0.146	0.169	
b4	2.59	3.43	0.102	0.135		N	7.62 BSC		0.3		
b5	2.59	3.38	0.102	0.133		ΦP	3.56	3.66	0.14	0.144	
c	0.38	0.86	0.015	0.034		ΦP1	-	6.98	-	0.275	
c1	0.38	0.76	0.015	0.030		Q	5.31	5.69	0.209	0.224	
D	19.71	20.70	0.776	0.815	3	R	4.52	5.49	1.78	0.216	
D1	13.08	-	0.515	-	4	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 c



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