International IQR Rectifier

30CPU04PbF

ULTRAFAST RECTIFIER

Features

- Ultrafast Recovery Time
- Low Forward Voltage Drop
- Low Leakage Current
- 175°C Operating Junction Temperature
- Lead-Free

t_{rr} = 60ns
$I_{F(AV)}$ = 30Amp
V_R = 400V

Description/ Applications

International Rectifier's FRED.. series are the state of the art Ultra fast recovery rectifiers specifically designed with optimized performance of forward voltage drop and ultra fast 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 free-wheeling diode 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 Ratings

	Parameters		Max	Units
V_{RRM}	Peak Repetitive Peak Reverse Voltage		400	V
$I_{F(AV)}$	Average Rectified Forward Current	Per Leg	15	A
	Total Device (Rated V_R), T_C = 149°C	Total Device	30	
I_{FSM}	Non Repetitive Peak Surge Current, @ 25°C	Per Leg	200	
I_{FRM}	Peak Repetitive Forward Current	Per Leg	30	
	(Rated V_R, Square wave, 20 KHz), T_C = 149°C			
T_J, T_{STG}	Operating Junction and Storage Temperatures		- 65 to 175	°C

Case Styles
30CPU04PbF   TO247AC   Base Common Cathode 2   Anode 1 — 1   Common Cathode 2   Anode 2 — 3
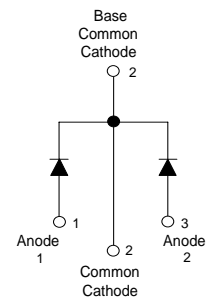
Electrical Characteristics @ T$_J$ = 25°C (unless otherwise specified)

	Parameters	Min	Typ	Max	Units	Test Conditions
V$_{BR}$, V$_r$	Breakdown Voltage, Blocking Voltage	400	-	-	V	I$_R$ = 100µA
V$_F$	Forward Voltage	-	1.17	1.25	V	I$_F$ = 15A
		-	0.93	1.12	V	I$_F$ = 15A, T$_J$ = 150°C
I$_R$	Reverse Leakage Current	-	0.3	10	µA	V$_R$ = V$_R$ Rated
		-	30	500	µA	T$_J$ = 150°C, V$_R$ = V$_R$ Rated
C$_T$	Junction Capacitance	-	28	-	pF	V$_R$ = 400V
L$_S$	Series Inductance	-	12	-	nH	Measured lead to lead 5mm from package body

Dynamic Recovery Characteristics @ T$_J$ = 25°C (unless otherwise specified)

	Parameters	Min	Typ	Max	Units	Test Conditions	
t$_{rr}$	Reverse Recovery Time	-	36	60	ns	I$_F$ = 1.0A, di$_F$/dt = 50A/µs, V$_R$ = 30V	
		-	46	-		T$_J$ = 25°C	
			80			T$_J$ = 125°C	I$_F$ = 15A V$_R$ = 200V di$_F$/dt = 200A/µs
I$_{RRM}$	Peak Recovery Current	-	3.6	-	A	T$_J$ = 25°C	
		-	8.7	-		T$_J$ = 125°C	
Q$_{rr}$	Reverse Recovery Charge	-	84	-	nC	T$_J$ = 25°C	
			-	345	-	T$_J$ = 125°C	

Thermal - Mechanical Characteristics

	Parameters		Min	Typ	Max	Units
T$_J$	Max. Junction Temperature Range		-	-	175	°C
T$_{Stg}$	Max. Storage Temperature Range		- 65	-	175	
R$_{thJC}$	Thermal Resistance, Junction to Case	Per Leg	-	0.8	1.5	°C/W
R$_{thJA}$ ①	Thermal Resistance, Junction to Ambient	Per Leg	-	-	40	
R$_{thCS}$ ②	Thermal Resistance, Case to Heatsink		-	0.4	-	
Wt	Weight		-	6.0	-	g
			-	0.21	-	(oz)
	Mounting Torque		6.0	-	12	Kg-cm
			5.0	-	10	lbf.in

① Typical Socket Mount
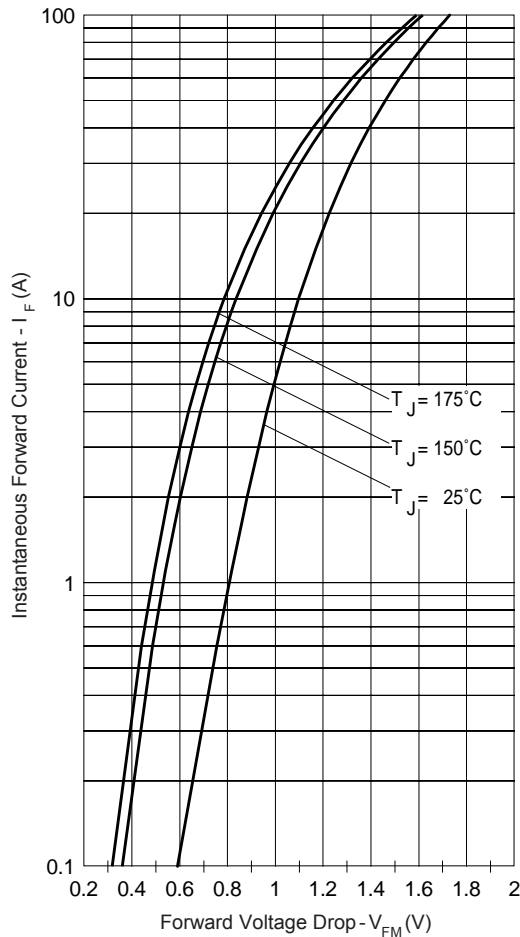② Mounting Surface, Flat, Smooth and Greased
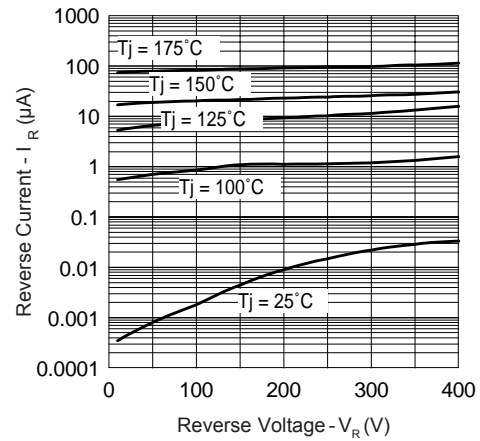
Fig. 1 - Typical Forward Voltage Drop Characteristics

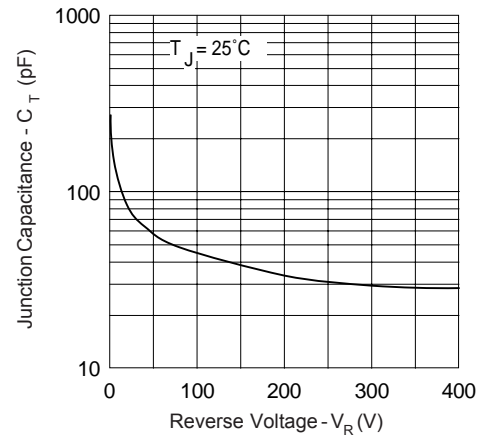Fig. 2 - Typical Values Of Reverse Current Vs. Reverse Voltage

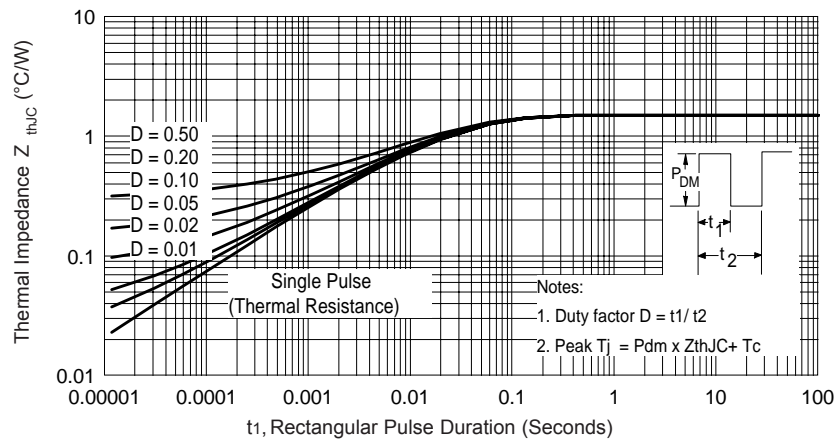Fig. 3 - Typical Junction Capacitance Vs. Reverse Voltage

Notes:

1. Duty factor D = t1/ t2

2. Peak Tj = Pdm x ZthJC+ Tc

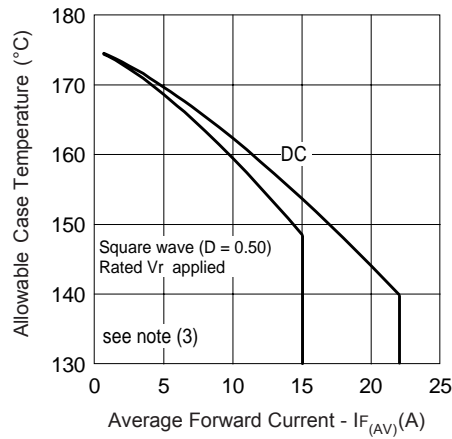Fig. 4 - Max. Thermal Impedance Z $_{thJC}$ Characteristics

Fig. 5 - Max. Allowable Case Temperature
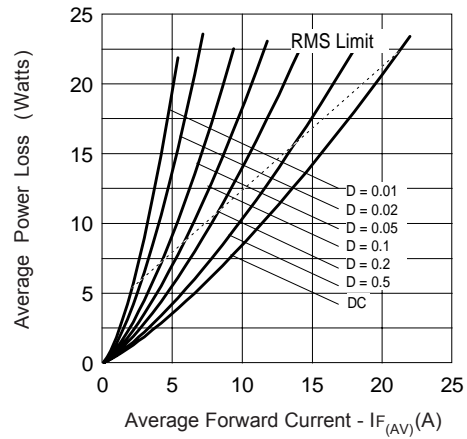Vs. Average Forward Current

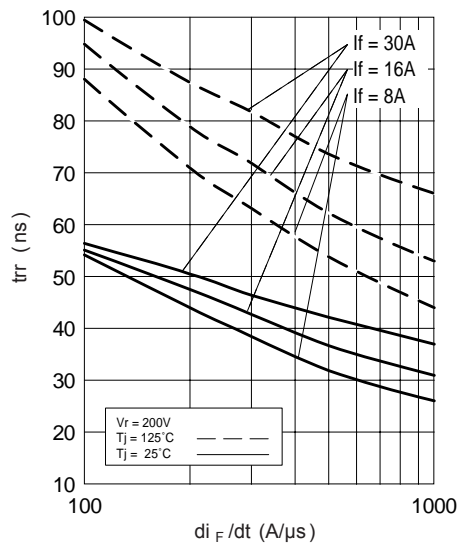Fig. 6 - Forward Power Loss Characteristics
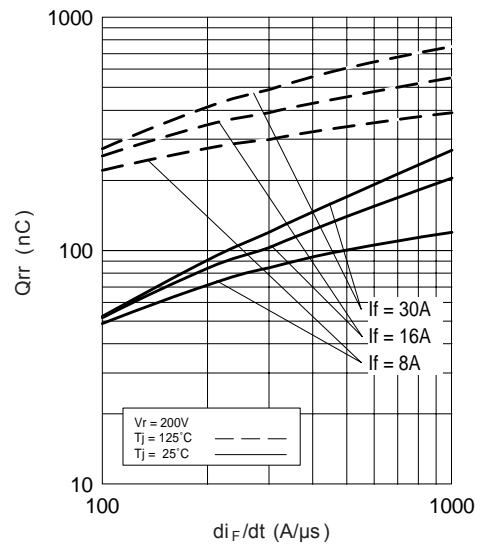

Fig. 7 - Typical Reverse Recovery vs. di$_F$/dt

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

(3) Formula used: $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$;
    Pd = Forward Power Loss = $I_{F(AV)} \times V_{FM}$ @ $(I_{F(AV)} / D)$ (see Fig. 6);
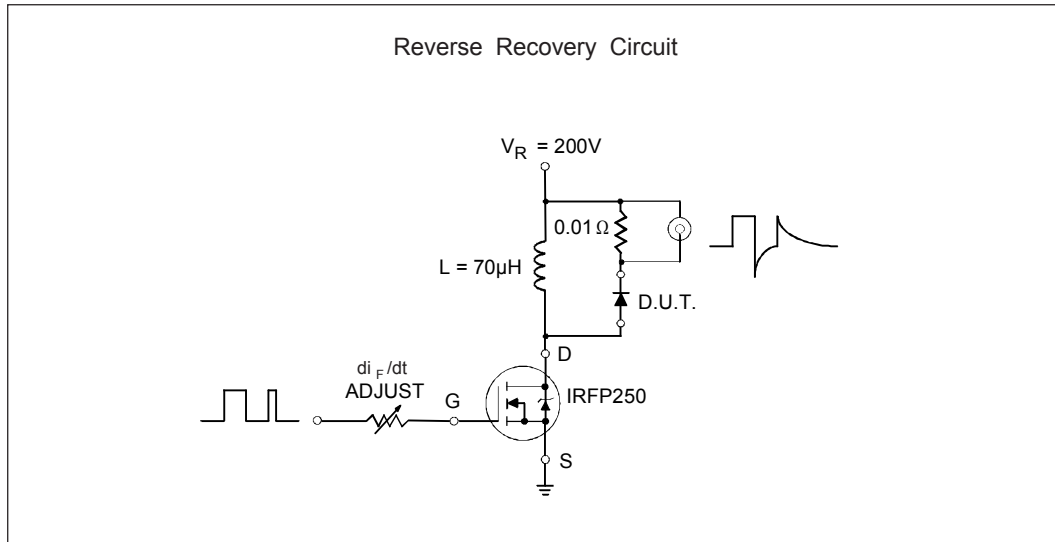 Pd_{REV} = Inverse Power Loss = $V_{R1} \times I_R (1 - D)$; I_R @ V_{R1} = rated V_R

Reverse Recovery Circuit

$V_R = 200V$

$0.01\,\Omega$

$L = 70\mu H$

D.U.T.

di_F/dt ADJUST

G — IRFP250

D

S

Fig. 9- Reverse Recovery Parameter Test Circuit

I_F

0

③ t_{rr}

t_a t_b

② I_{RRM}

④ Q_{rr}

0.5 I_{RRM}

di(rec)M/dt ⑤

0.75 I_{RRM}

① 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. 10 - Reverse Recovery Waveform and Definitions

Outline Table

15.90 (0.626)
15.30 (0.602)

3.65 (0.144)
3.55 (0.139) DIA.

5.70 (0.225)
5.30 (0.208)

20.30 (0.800)
19.70 (0.775)

5.50 (0.217)
4.50 (0.177)
(2 PLCS.)

1 2 3

14.80 (0.583)
14.20 (0.559)

4.30 (0.170)
3.70 (0.145)

1.40 (0.056)
1.00 (0.039)

2.20 (0.087)
MAX.

3.20 (0.126)
MAX.

5.47 (0.216)
5.43 (0.213)

5.30 (0.209)
4.70 (0.185)

2.5 (0.098)
1.5 (0.059)

2.40 (0.095)
MAX.

0.80 (0.032)
0.40 (0.213)

Base
Common
Cathode
2

Anode 1   1

Common
Cathode   2

Anode 2   3

Conforms to JEDEC Outline TO-247AC
Dimensions in millimeters and (inches)

Marking Information

EXAMPLE: THIS IS A 30CPU04
WITH ASSEMBLY
LOT CODE 5657
ASSEMBLED ON WW 35, 2000
IN THE ASSEMBLY LINE "H"

INTERNATIONAL
RECTIFIER
LOGO

ASSEMBLY
LOT CODE

PART NUMBER

30CPU04

IΩR P035H

56   57

DATE CODE
P = LEAD−FREE
YEAR 0 = 2000
WEEK 35
LINE H

Ordering Information Table

Device Code	30	C	P	U	04	PbF
	①	②	③	④	⑤	⑥

1	-	Current Rating (30 = 30A)
2	-	Common Cathode
3	-	TO-247AC
4	-	Ultrafast Recovery
5	-	Voltage Rating (04 = 400V)
6	-	Lead-Free

International IGR Rectifier

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