International
IOR Rectifier

PD -2.451A

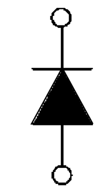
HFA180NH40R

HEXFRED™

Ultrafast, Soft Recovery Diode

Features

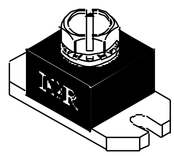
- Reduced RFI and EMI
- Reduced Snubbing
- Extensive Characterization of Recovery Parameters



V_R = 400V
V_F(typ.)③ = 1.1V
$I_{F(AV)}$ = 180A
Q_{rr} (typ.) = 420nC
I_{RRM}(typ.) = 8.7A
t_{rr}(typ.) = 45ns
$di_{(rec)M}/dt$ (typ.)③ = 280A/μs

Description

HEXFRED™ diodes are optimized to reduce losses and EMI/RFI in high frequency power conditioning systems. An extensive characterization of the recovery behavior for different values of current, temperature and di/dt simplifies the calculations of losses in the operating conditions. The softness of the recovery eliminates the need for a snubber in most applications. These devices are ideally suited for power converters, motors drives and other applications where switching losses are significant portion of the total losses.



HALF-PAK

Absolute Maximum Ratings

	Parameter	Max.	Units
V_R	Cathode-to-Anode Voltage	400	V
I_F @ T_C = 25°C	Continuous Forward Current	280	A
I_F @ T_C = 100°C	Continuous Forward Current	138	
I_{FSM}	Single Pulse Forward Current ①	1200	
I_{AS}	Maximum Single Pulse Avalanche Current ②	5.0	
E_{AS}	Non-Repetitive Avalanche Energy ②	1.4	mJ
P_D @ T_C = 25°C	Maximum Power Dissipation	521	W
P_D @ T_C = 100°C	Maximum Power Dissipation	208	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°C

Thermal - Mechanical Characteristics

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	———	———	0.24	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat , Greased Surface	———	0.15	———	K/W
Wt	Weight	———	26 (0.9)	———	g (oz)
	Mounting Torque	15 (1.7)	———	25 (2.8)	lbf•in
	Terminal Torque	20 (2.2)	———	40 (4.4)	(N•m)

Note: ① Limited by junction temperature
② L = 100μH, duty cycle limited by max T_J
③ 125°C

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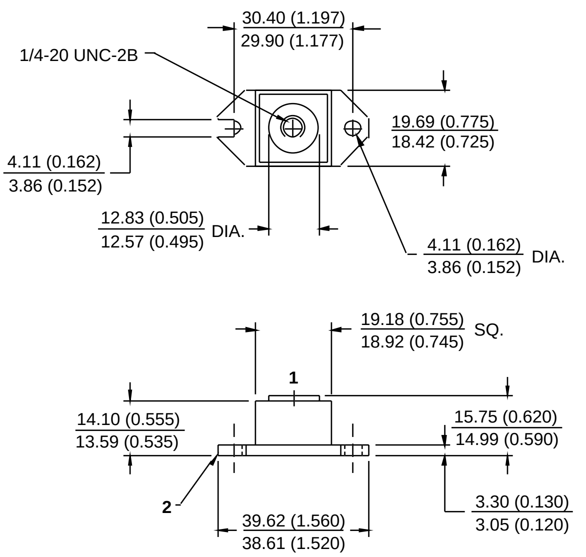
Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Test Conditions	
V_{BR}	Cathode Anode Breakdown Voltage	400	–––	–––	V	I_R = 100μA	
V_{FM}	Max Forward Voltage	–––	1.10	1.35	V	I_F = 180A	See Fig. 1
		–––	1.40	1.65		I_F = 360A	
		–––	1.10	1.30		I_F = 180A, T_J = 125°C	
I_{RM}	Max Reverse Leakage Current	–––	2.0	12	μA	V_R = V_R Rated	See Fig. 2
		–––	3.0	16	mA	T_J = 125°C, V_R = 320V	
C_T	Junction Capacitance	–––	370	500	pF	V_R = 200V	See Fig. 3
L_S	Series Inductance	–––	5.0	–––	nH	From top of terminal hole to mounting plane	

Dynamic Recovery Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Test Conditions		
t_{rr}	Reverse Recovery Time	–––	45	–––	ns	I_F = 1.0A, di_f/dt = 200A/μs, V_R = 30V		
t_{rr1}		–––	90	140		T_J = 25°C	See Fig. 5	I_F = 180A
t_{rr2}		–––	290	440		T_J = 125°C		
I_{RRM1}	Peak Recovery Current	–––	8.7	20	A	T_J = 25°C	See Fig. 6	V_R = 200V
I_{RRM2}		–––	18	30		T_J = 125°C		
Q_{rr1}	Reverse Recovery Charge	–––	420	1100	nC	T_J = 25°C	See Fig. 7	di_f/dt = 200A/μs
Q_{rr2}		–––	2600	7000		T_J = 125°C		
$di_{(rec)M}/dt1$	Peak Rate of Fall of Recovery Current	–––	300	–––	A/μs	T_J = 25°C	See Fig. 8	
$di_{(rec)M}/dt2$	During t_b	–––	280	–––		T_J = 125°C		



LEAD ASSIGNMENTS
1 - CATHODE
2 - ANODE

HALF-PAK
Dimensions in millimeters and inches

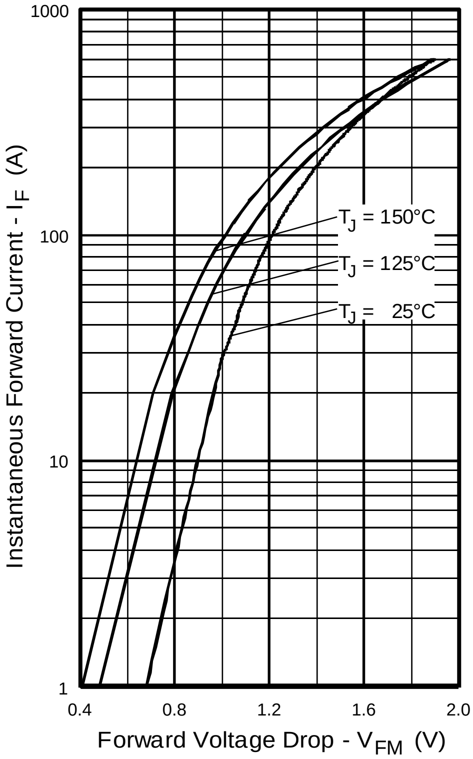


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

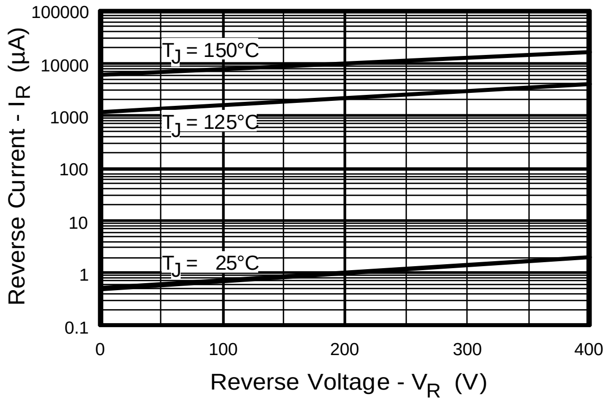


Fig. 2 - Typical Reverse Current vs. Reverse Voltage

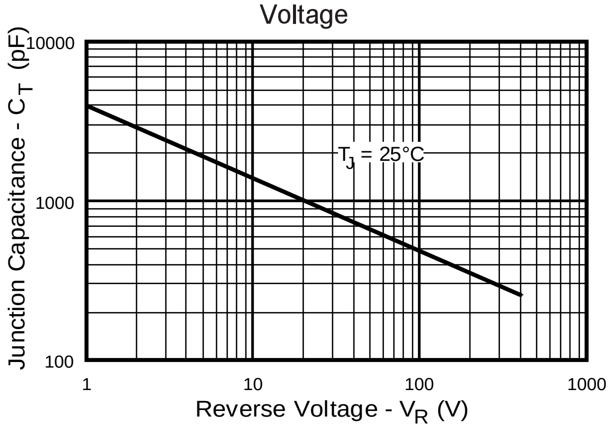


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

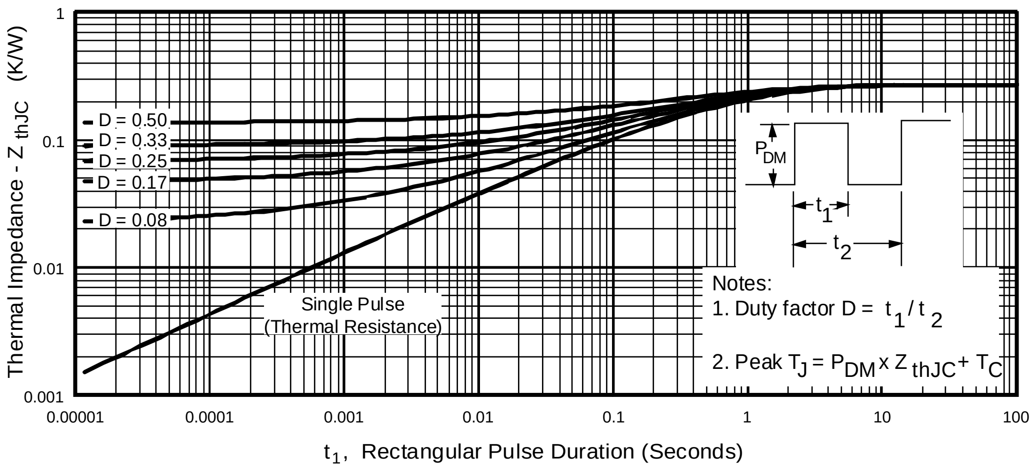


Fig. 4 - Maximum Thermal Impedance Z_{thjc} Characteristics

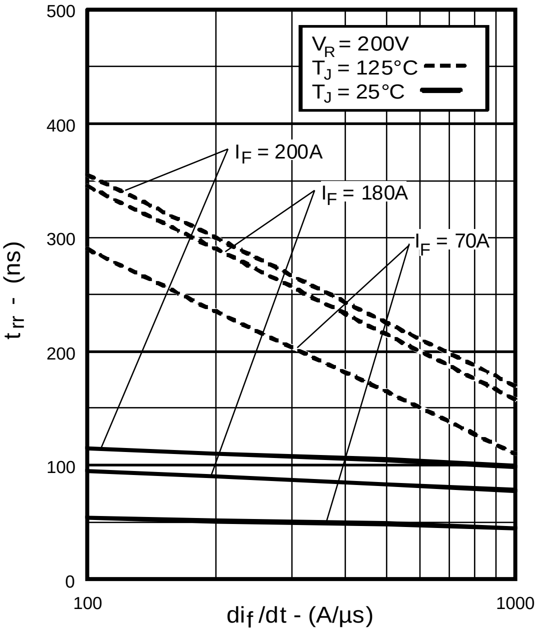


Fig. 5 - Typical Reverse Recovery vs. di_f/dt

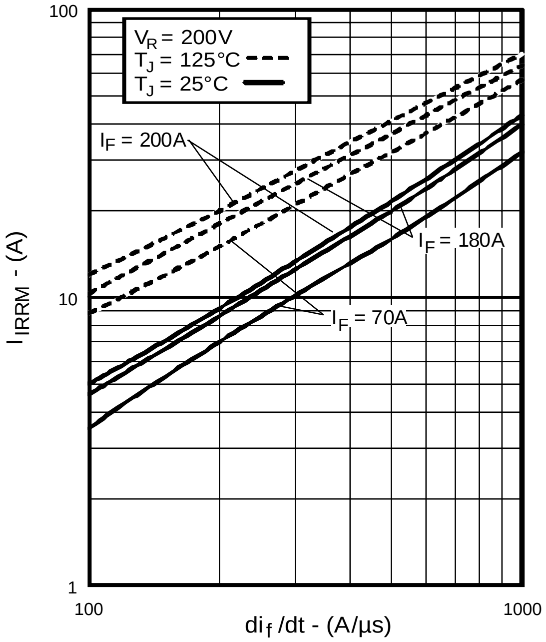


Fig. 6 - Typical Recovery Current vs. di_f/dt

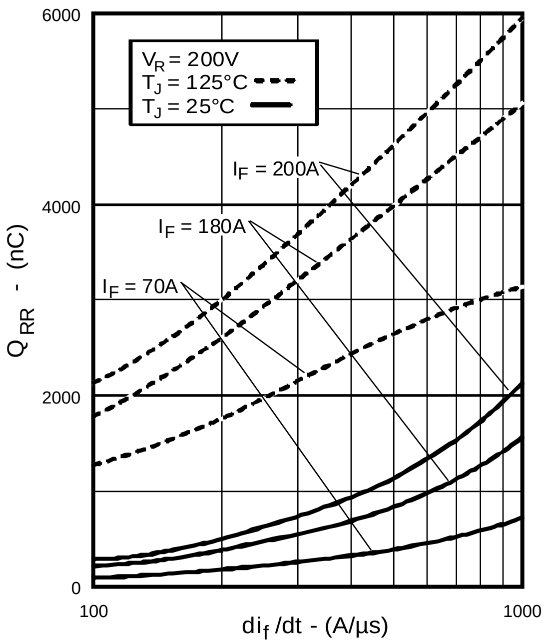


Fig. 7 - Typical Stored Charge vs. di_f/dt

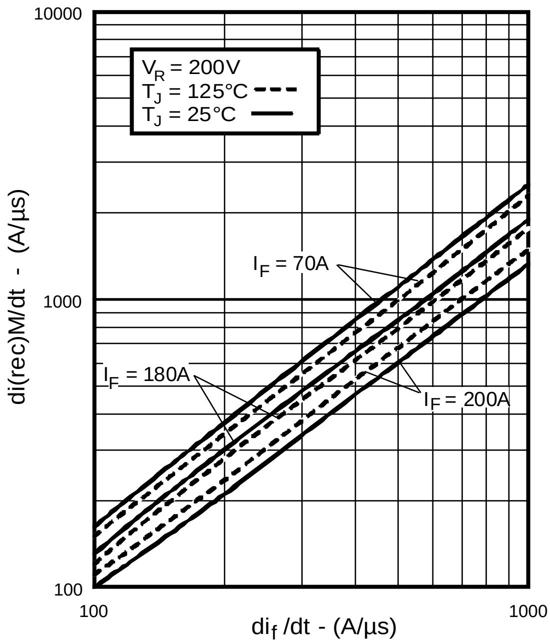


Fig. 8 - Typical $di_{(rec)M}/dt$ vs. di_f/dt

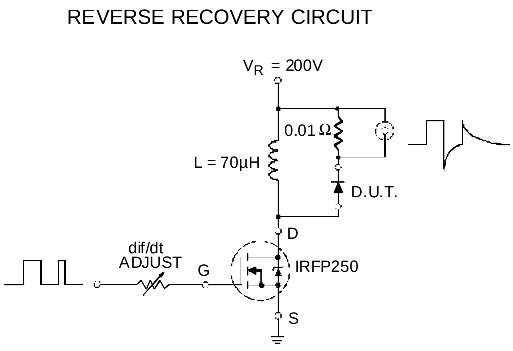
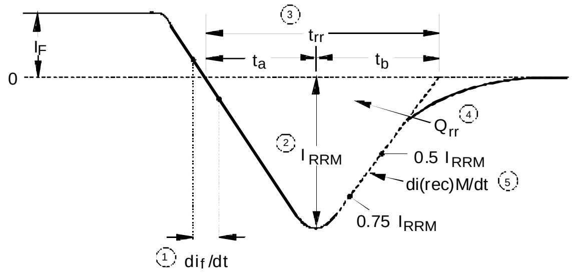


Fig. 9 - Reverse Recovery Parameter Test Circuit



1. di_f/dt - Rate of change of current through zero crossing
2. I_{RRM} - Peak reverse recovery current
3. trr - 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

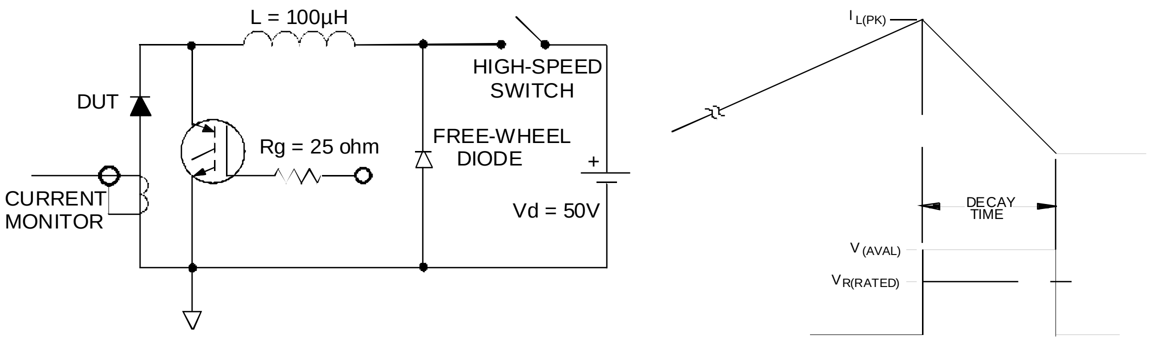


Fig. 11 - Avalanche Test Circuit and Waveforms

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