International
IOR Rectifier

PD -2.446 rev. B 03/99

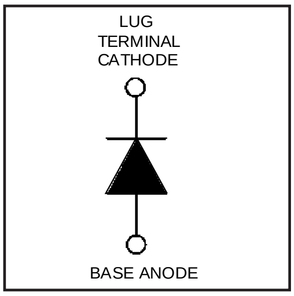
HFA140NH60R

HEXFRED™

Ultrafast, Soft Recovery Diode

Features

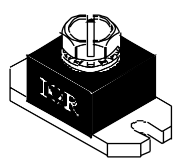
- Reduced RFI and EMI
- Reduced Snubbing
- Extensive Characterization of Recovery Parameters



V_R = 600V
V_F(typ.)③ = 1.3V
$I_{F(AV)}$ = 140A
Q_{rr} (typ.) = 490nC
I_{RRM}(typ.) = 9.3A
t_{rr}(typ.) = 39ns
$di_{(rec)M}/dt$ (typ.)③ = 200A/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 (per Leg)

	Parameter	Max.	Units
V_R	Cathode-to-Anode Voltage	600	V
I_F @ T_C = 25°C	Continuous Forward Current	193	A
I_F @ T_C = 100°C	Continuous Forward Current	96	
I_{FSM}	Single Pulse Forward Current ①	800	
E_{AS}	Non-Repetitive Avalanche Energy ②	220	µJ
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_{thJC}	Junction-to-Case	——	——	0.24	°C/W K/W
R_{thCS}	Case-to-Sink, Flat, Greased Surface	——	0.15	——	
Wt	Weight	——	26 (0.9)	——	g (oz)
	Mounting Torque ④	15 (1.7)	——	25 (2.8)	lbf•in (N•m)
	Terminal Torque	30 (3.4)	——	40 (4.6)	
	Vertical Pull	——	——	80	lbf•in
	2 inch Lever Pull	——	——	40	

Note: ① Limited by junction temperature
② L = 100µH, duty cycle limited by max T_J
③ 125°C
④ Mounting surface must be smooth, flat, free or burrs or other protrusions. Apply a thin even film or thermal grease to mounting surface. Gradually tighten each mounting bolt in 5-10 lbf•in steps until desired or maximum torque limits are reached. Module

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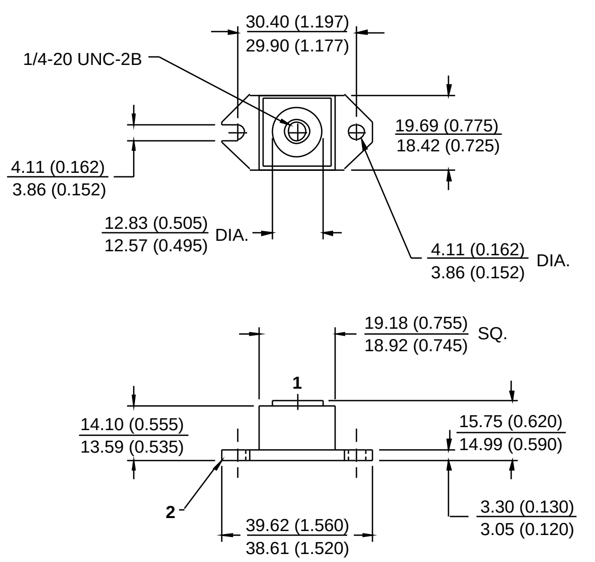
Electrical Characteristics (per Leg) @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
V_{BR}	Cathode Anode Breakdown Voltage	600	——	——	V	I_R = 100µA
V_{FM}	Max Forward Voltage	——	1.4	1.6	V	I_F = 140A
	See Fig. 1	——	1.6	1.8		I_F = 280A
		——	1.3	1.5		I_F = 140A, T_J = 125°C
I_{RM}	Max Reverse Leakage Current	——	8.0	40	µA	V_R = V_R Rated
	See Fig. 2	——	2.0	8.0	mA	T_J = 125°C, V_R = 480V
C_T	Junction Capacitance See Fig. 3	——	280	400	pF	V_R = 200V
L_S	Series Inductance	——	5.0	——	nH	From top of terminal hole to mounting plane

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

	Parameter	Min.	Typ.	Max.	Units	Test Conditions	
t_{rr}	Reverse Recovery Time	——	39	——	ns	I_F = 1.0A, di_f/dt = 200A/µs, V_R = 30V	
t_{rr1}	See Fig. 5	——	92	140		T_J = 25°C	I_F = 140A
t_{rr2}		——	180	270		T_J = 125°C	
I_{RRM1}	Peak Recovery Current	——	9.3	17	A	T_J = 25°C	V_R = 200V
I_{RRM2}	See Fig. 6	——	16	30		T_J = 125°C	
Q_{rr1}	Reverse Recovery Charge	——	490	1200	nC	T_J = 25°C	di_f/dt = 200A/µs
Q_{rr2}	See Fig. 7	——	1400	4000		T_J = 125°C	
$di_{(rec)M}/dt1$	Peak Rate of Fall of Recovery Current	——	290	——	A/µs	T_J = 25°C	
$di_{(rec)M}/dt2$	During t_b See Fig. 8	——	200	——		T_J = 125°C	



LEAD ASSIGNMENTS
1 - CATHODE
2 - ANODE

HALF-PAK
Dimensions in millimeters and inches

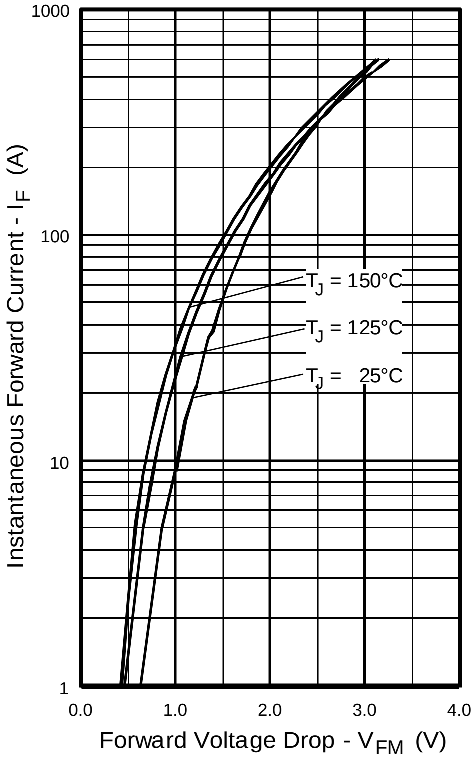


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

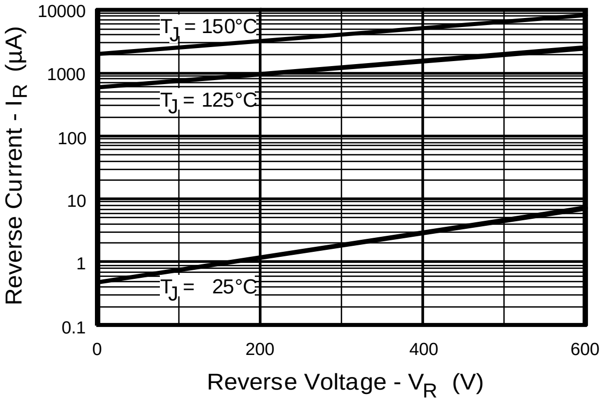


Fig. 2 - Typical Reverse Current vs. Reverse Voltage

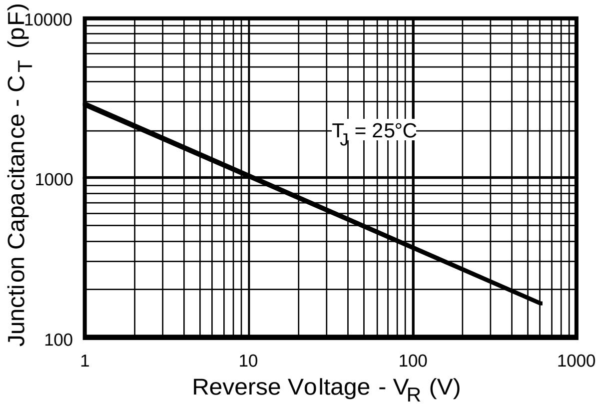


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

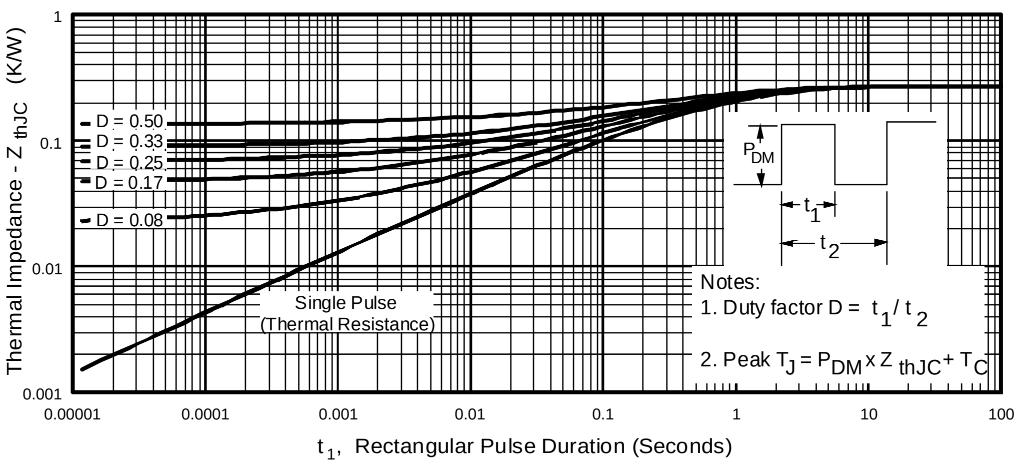


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

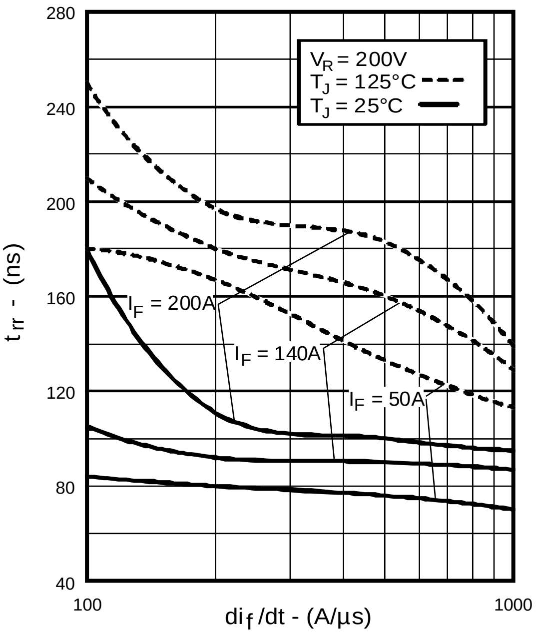


Fig. 5 - Typical Reverse Recovery vs. di_f/dt

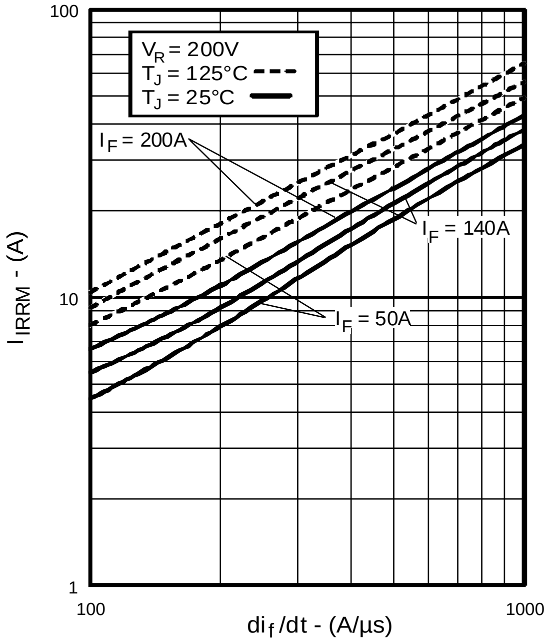


Fig. 6 - Typical Recovery Current vs. di_f/dt

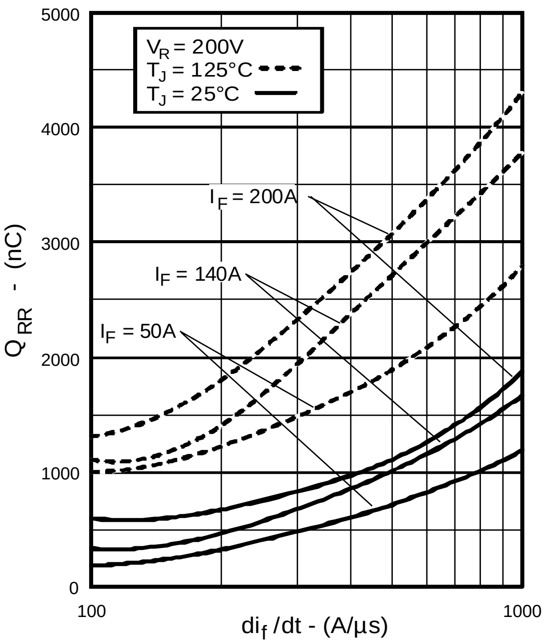


Fig. 7 - Typical Stored Charge vs. di_f/dt

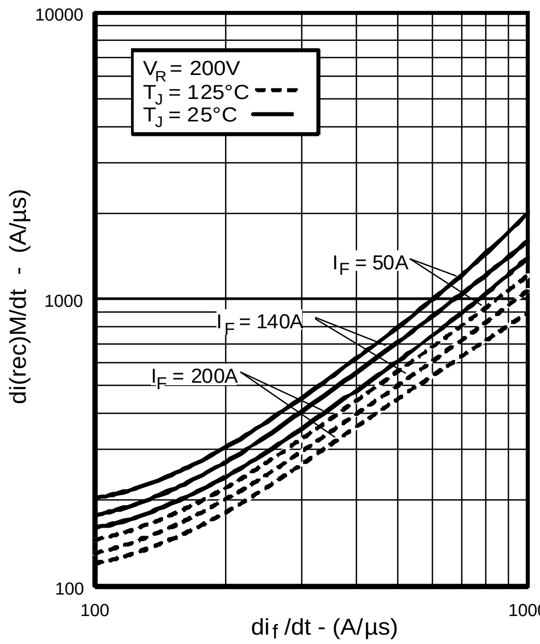


Fig. 8 - Typical $di_{(rec)M}$/dt vs. di_f/dt

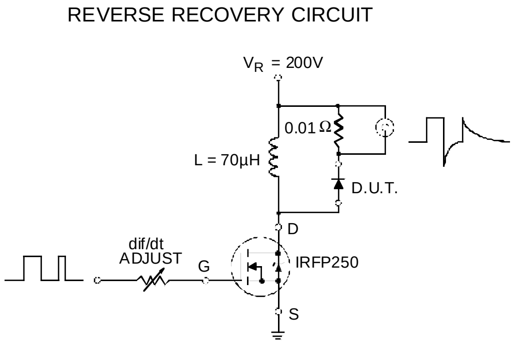
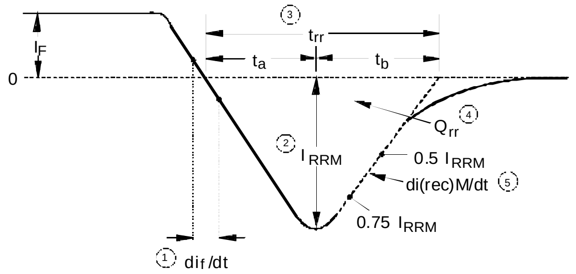


Fig. 9 - Reverse Recovery Parameter Test Circuit



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

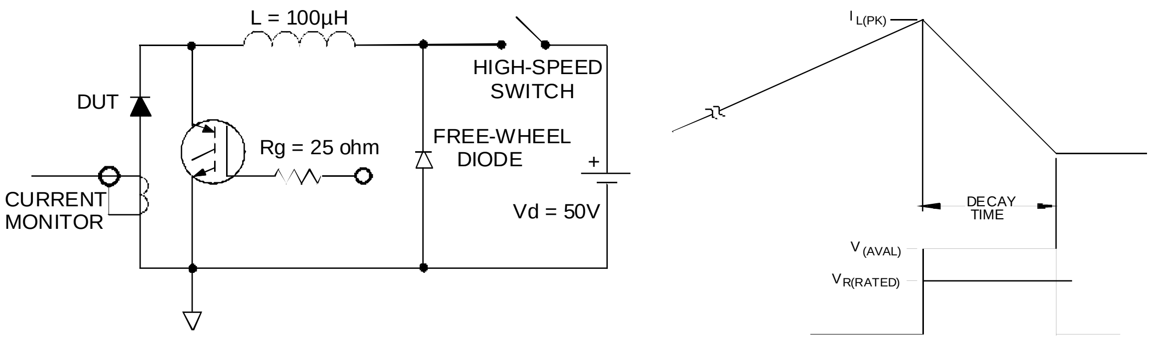


Fig. 11 - Avalanche Test Circuit and Waveforms

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