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International
IOR Rectifier

PD-20381

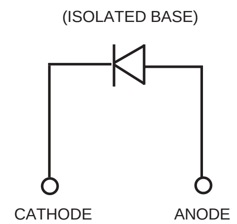
HFA40HF60

HEXFRED™

Ultrafast, Soft Recovery Diode

Features

- Reduced RFI and EMI
- Reduced Snubbing
- Extensive Characterization of Recovery Parameters
- Hermetic
- Surface Mount



V_R = 600V

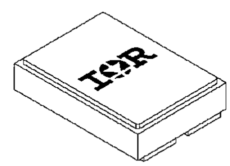
V_F = 1.75V

Q_{rr} = 290nC

$di_{(rec)M}/dt$ = 400A/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.



SMD-1

Absolute Maximum Ratings (per Leg)

	Parameter	Max.	Units
V_R	D.C. Reverse Voltage	600	V
I_F @ T_C = 100°C	Continuous Forward Current ①	22	A
I_{FSM} @ T_C = 25°C	Single Pulse Forward Current ②	225	
P_D @ T_C = 25°C	Maximum Power Dissipation	83	W
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°C

Thermal - Mechanical Characteristics

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case, Single Leg Conducting	—	1.5	°C/W
	Weight	2.4	—	g

Note: ① D.C. = 50% rect. wave
② 1/2 sine wave, 60 Hz , P.W. = 8.33 ms

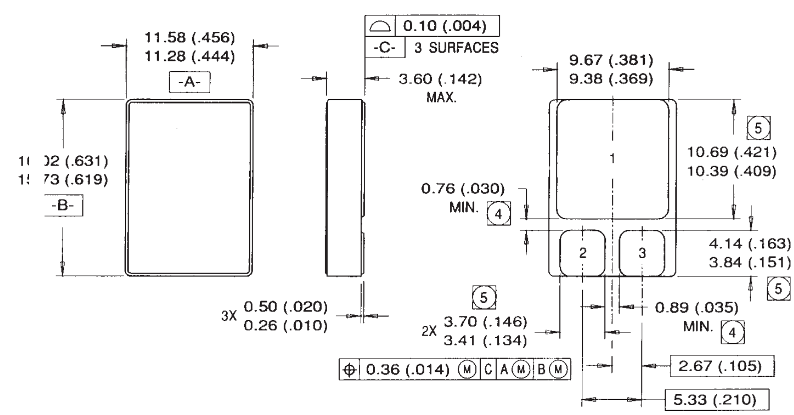
6/30/99

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	—	1.63	1.75	V	I_F = 22A	
		—	2.07	2.25		I_F = 45A	See Fig. 1
		—	1.52	1.64		I_F = 22A, T_J = 125°C	
I_{RM}	Max Reverse Leakage Current	—	—	10	µA	V_R = V_R Rated	See Fig. 2
		—	—	1.0	mA	T_J = 125°C, V_R = 480V	
C_T	Junction Capacitance	—	56	59	pF	V_R = 200V	See Fig. 3
L_S	Series Inductance	—	2.8	—	nH	Measured from center of bond pad to end of anode bonding wire	

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

	Parameter	Min.	Typ.	Max.	Units	Test Conditions		
t_{rr1}	Reverse Recovery Time	—	60	90	ns	T_J = 25°C	See Fig.	
t_{rr2}		—	110	165		T_J = 125°C	5	I_F = 22A
I_{RRM1}	Peak Recovery Current	—	5.2	7.8	A	T_J = 25°C	See Fig.	
I_{RRM2}		—	8.5	13		T_J = 125°C	6	V_R = 200V
Q_{rr1}	Reverse Recovery Charge	—	190	290	nC	T_J = 25°C	See Fig.	
Q_{rr2}		—	560	840		T_J = 125°C	7	di_f/dt = 200A/µs
$di_{(rec)M}/dt1$	Peak Rate of Fall of Recovery Current	—	270	400	A/µs	T_J = 25°C	See Fig.	
$di_{(rec)M}/dt2$	During t_b	—	170	250		T_J = 125°C	8	



NOTES:

1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M-1982
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).

4 DIMENSION INCLUDES METALLIZATION FLASH.

5 DIMENSION DOES NOT INCLUDE METALLIZATION FLASH.

Legend:
1 - Cathode
2 - N/C
3 - Anode

IR Case Style SMD-1

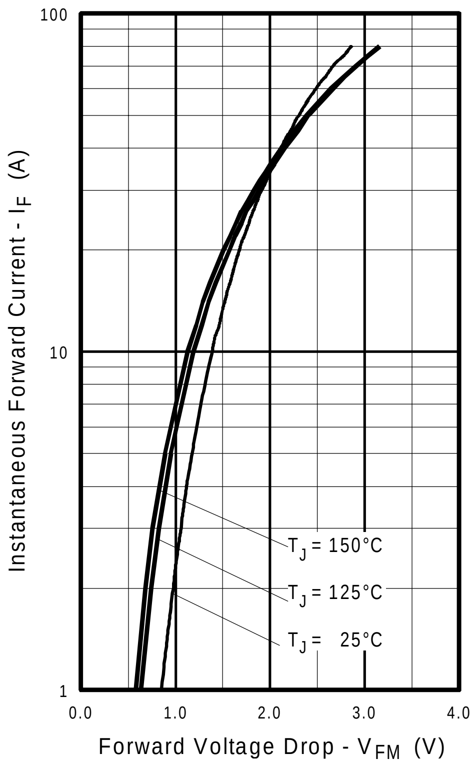


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

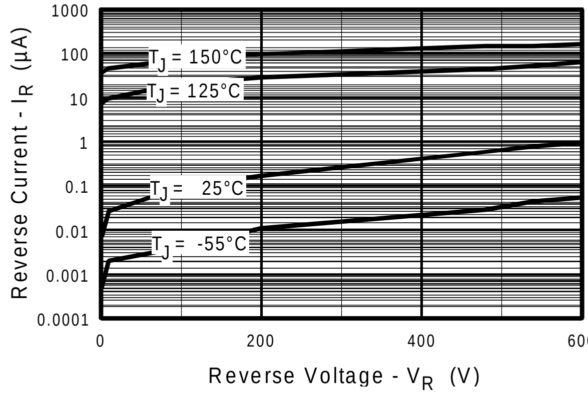


Fig. 2 - Typical Reverse Current vs. Reverse Voltage

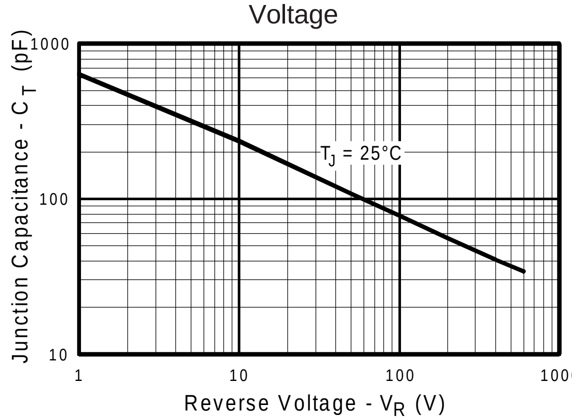


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

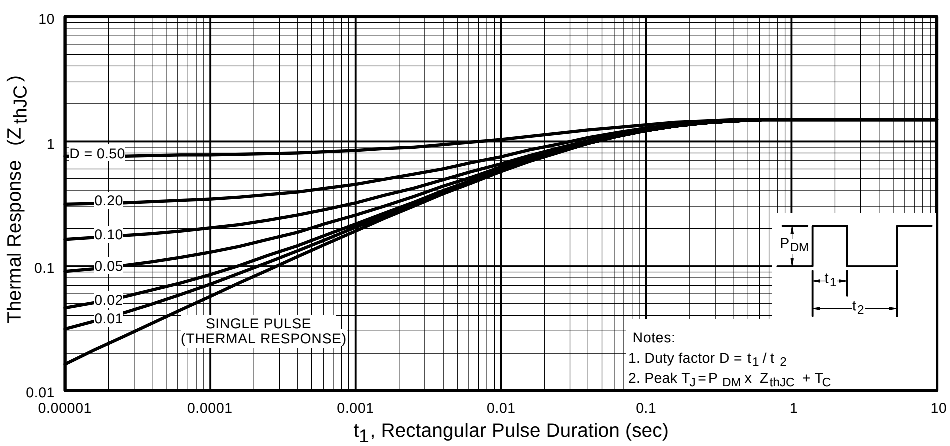


Fig. 4 - Maximum Thermal Impedance Z_{thjc} Characteristics

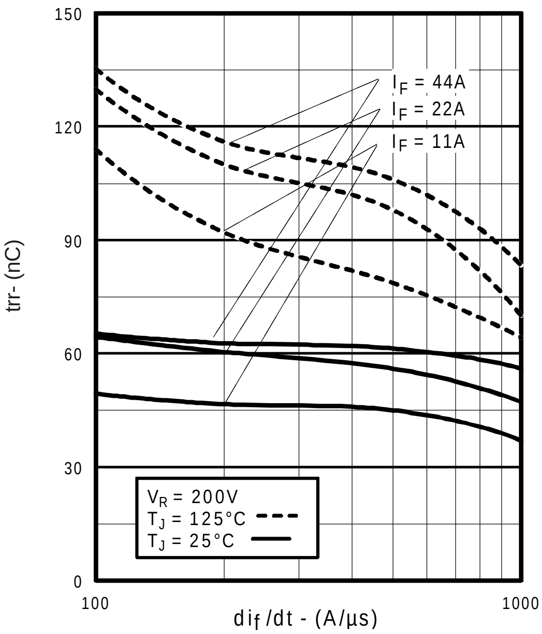


Fig. 5 - Typical Reverse Recovery vs. di_f/dt

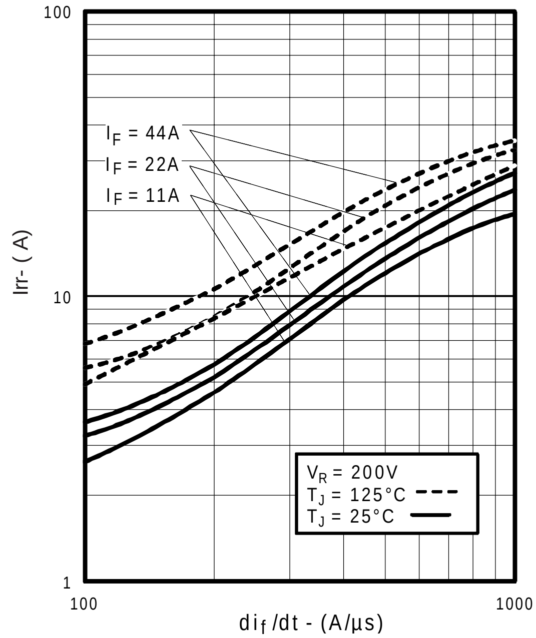


Fig. 6 - Typical Recovery Current vs. di_f/dt

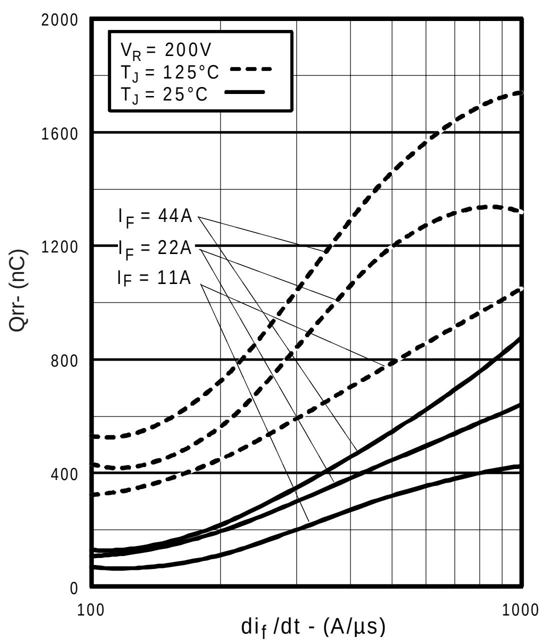


Fig. 7 - Typical Stored Charge vs. di_f/dt

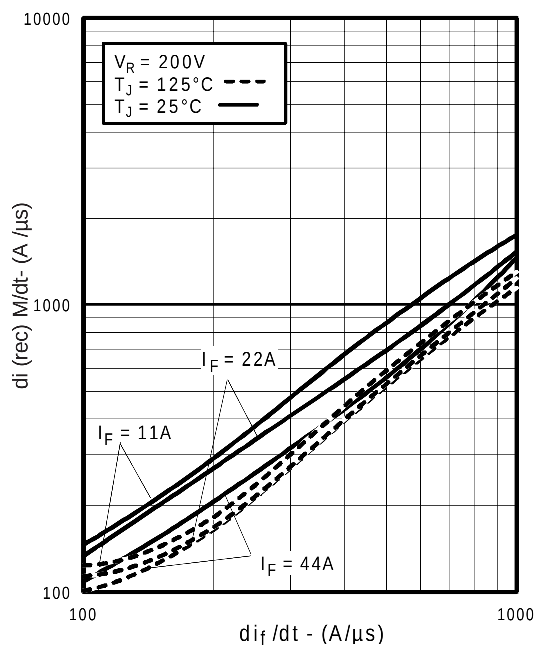


Fig. 8 - Typical $di_{(rec)M}/dt$ vs. di_f/dt

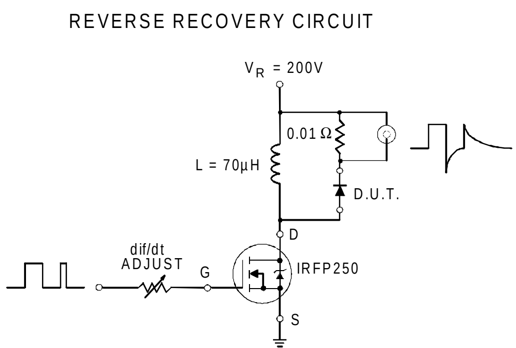
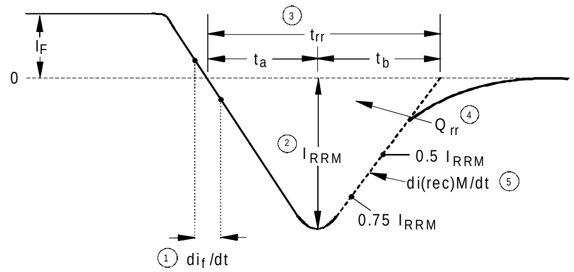


Fig. 9 - Reverse Recovery Parameter Test Circuit



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

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