International
IOR Rectifier

PD-20376

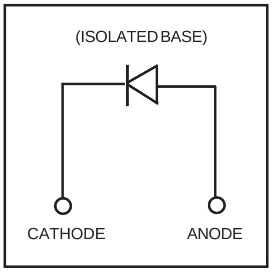
# HFA40HF120

HEXFRED™

## Ultrafast, Soft Recovery Diode

## Features

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



$V_R$ = 1200V

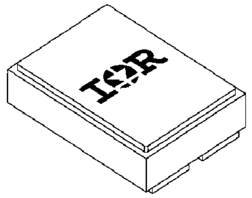
$V_F$ = 3.1V

$Q_{rr}$ = 510 nC

$di_{(rec)M}/dt$ = 350A/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 | 1200 | V |
| $I_F$ @ $T_C$ = 100°C | Continuous Forward Current ① | 11 | A |
| $I_{FSM}$ @ $T_C$ = 25°C | Single Pulse Forward Current ② | 190 | |
| $P_D$ @ $T_C$ = 25°C | Maximum Power Dissipation | 83 | W |
| $T_J$<br>$T_{STG}$ | 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 | 2.6 | — | g |

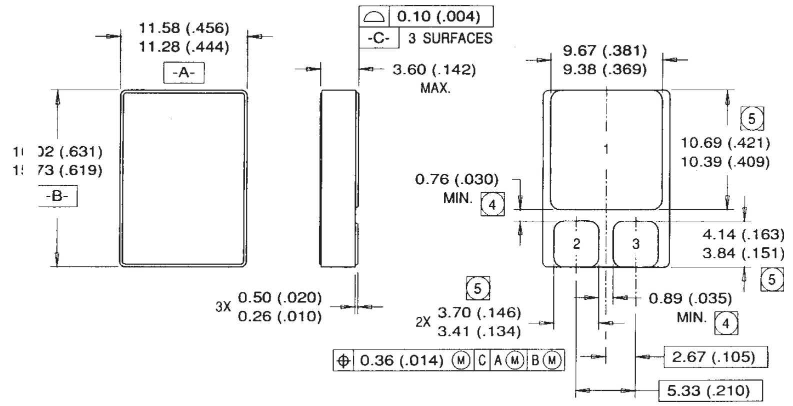
**Note:** ① D.C. = 50% rect. wave
② 1/2 sine wave, 60 Hz , P.W. = 8.33 ms

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

| | Parameter | Min. | Typ. | Max. | Units | Test Conditions | |
|---|---|---|---|---|---|---|---|
| $V_{BR}$ | Cathode Anode Breakdown Voltage | 1200 | — | — | V | $I_R$ = 100µA | |
| $V_{FM}$ | Max Forward Voltage | — | — | 3.1 | V | $I_F$ = 11A | |
| | | — | — | 4.0 | | $I_F$ = 22A | See Fig. 1 |
| | | — | — | 2.7 | | $I_F$ = 11A, $T_J$ = 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, $V_R$ = 960V | |
| $C_T$ | Junction Capacitance | — | 28 | 42 | 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 | — | 80 | 120 | ns | $T_J$ = 25°C | See Fig. | |
| $t_{rr2}$ | | — | 130 | 195 | | $T_J$ = 125°C | 5 | $I_F$ = 11A |
| $I_{RRM1}$ | Peak Recovery Current | — | 7.25 | 10.9 | A | $T_J$ = 25°C | See Fig. | |
| $I_{RRM2}$ | | — | 10.2 | 15.3 | | $T_J$ = 125°C | 6 | $V_R$ = 200V |
| $Q_{rr1}$ | Reverse Recovery Charge | — | 340 | 510 | nC | $T_J$ = 25°C | See Fig. | |
| $Q_{rr2}$ | | — | 825 | 1240 | | $T_J$ = 125°C | 7 | $di_f/dt$ = 200A/µs |
| $di_{(rec)M}/dt1$ | Peak Rate of Fall of Recovery Current | — | 230 | 350 | A/µs | $T_J$ = 25°C | See Fig. | |
| $di_{(rec)M}/dt2$ | During $t_b$ | — | 160 | 240 | | $T_J$ = 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**

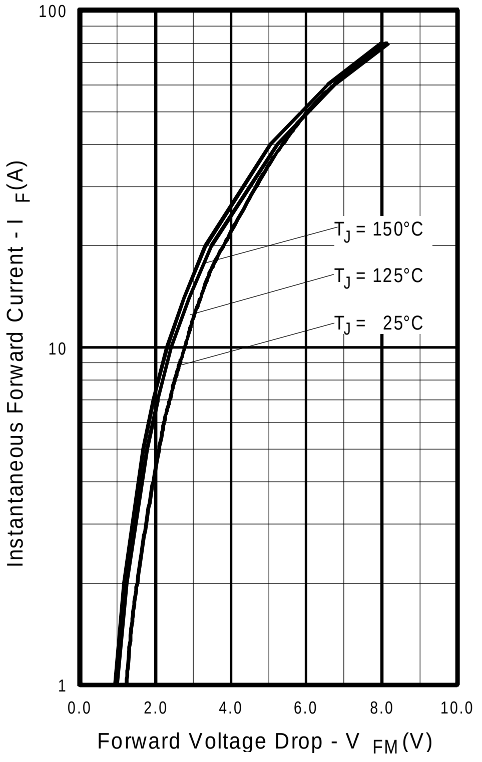


**Fig. 1** - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

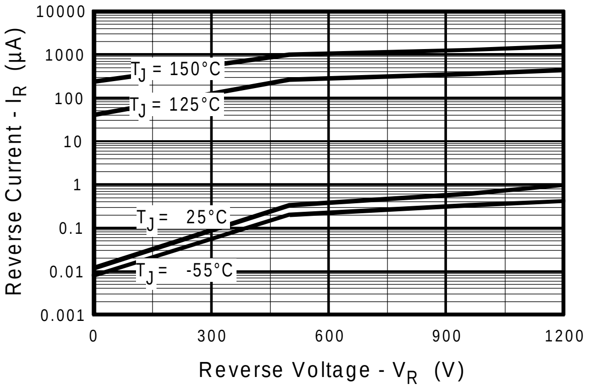


**Fig. 2** - Typical Reverse Current vs. Reverse Voltage

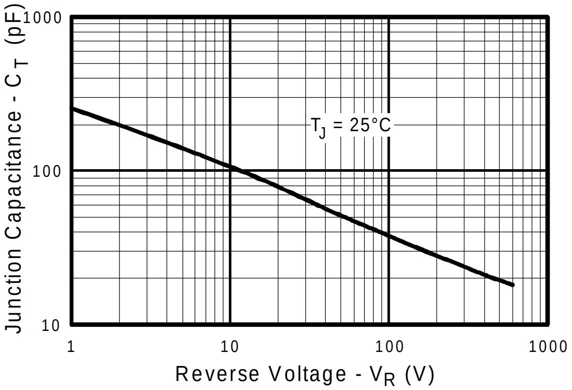


**Fig. 3** - Typical Junction Capacitance vs. Reverse Voltage

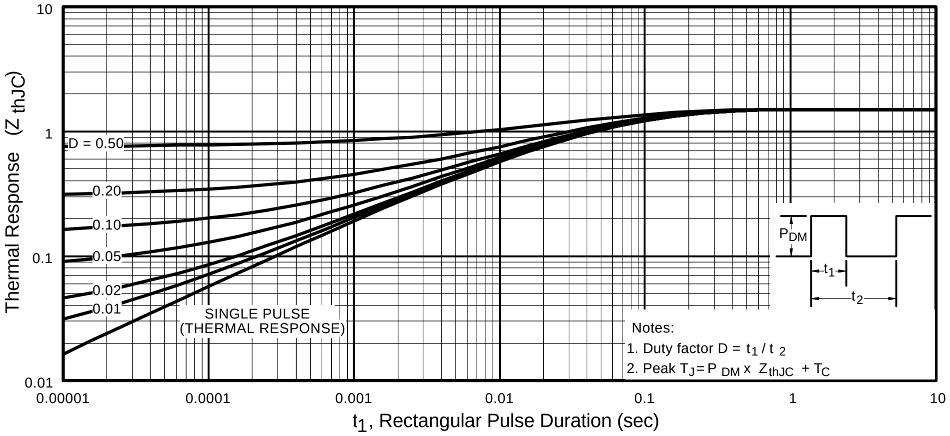


**Fig. 4** - Maximum Thermal Impedance $Z_{thjc}$ Characteristics

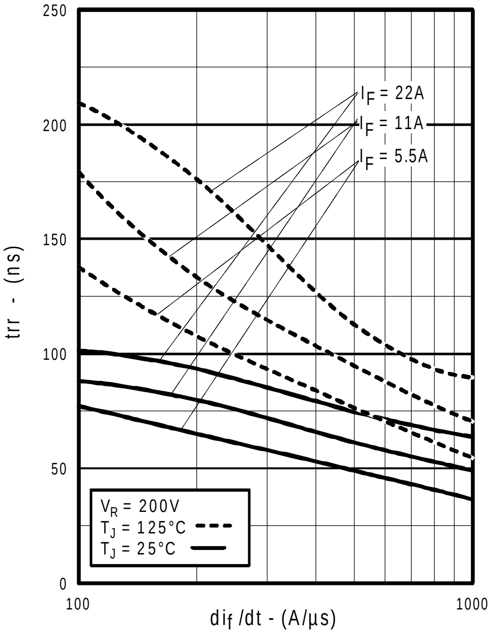


**Fig. 5** - Typical Reverse Recovery vs. di$_f$/dt,

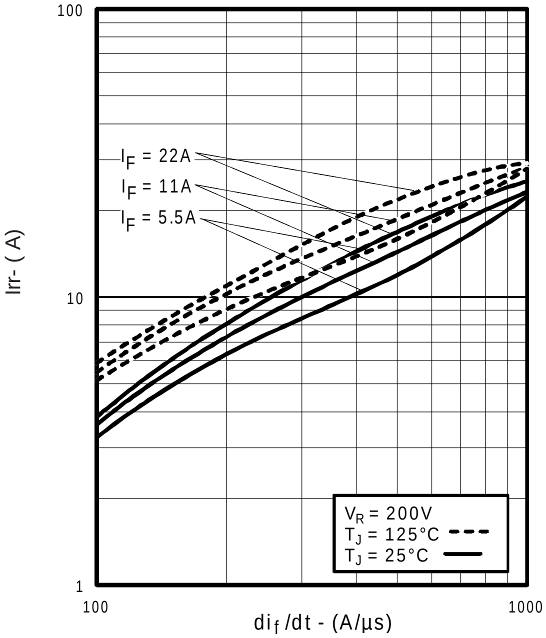


**Fig. 6** - Typical Recovery Current vs. di$_f$/dt,

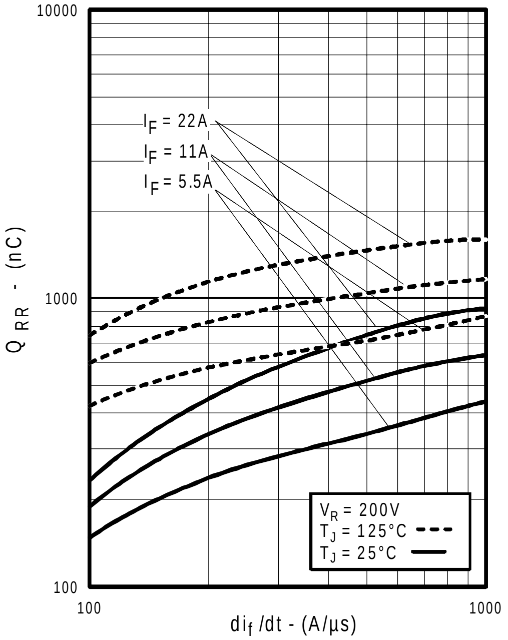


**Fig. 7** - Typical Stored Charge vs. di$_f$/dt

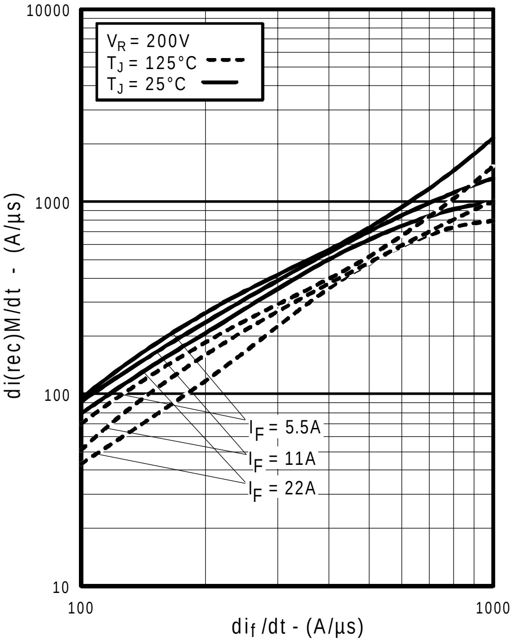


**Fig. 8** - Typical di$_{(rec)M}$/dt vs. di$_f$/dt

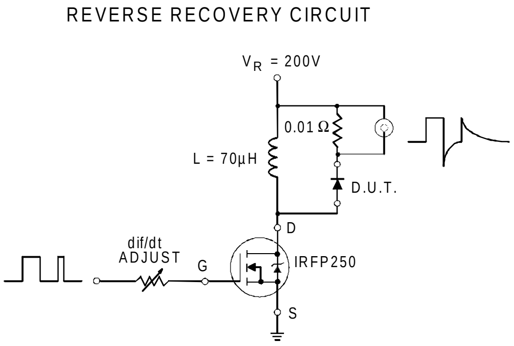
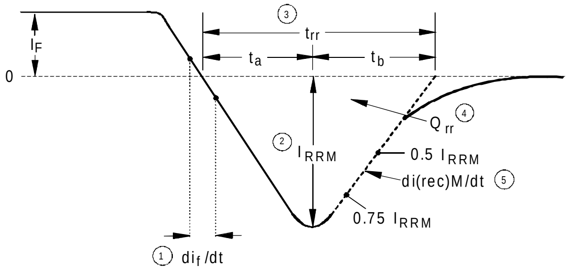


**Fig. 9 -** Reverse Recovery Parameter Test Circuit



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

International Rectifier

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