International
IOR Rectifier

PD-20378A

**PRELIMINARY**

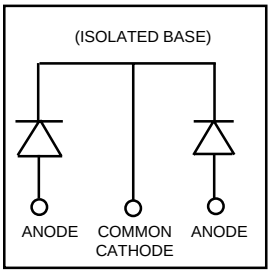
# HFA35HB60C

HEXFRED™

Ultrafast, Soft Recovery Diode

## Features

- Reduced RFI and EMI
- Reduced Snubbing
- Extensive Characterization of Recovery Parameters
- Hermetic
- Electrically Isolated
- Ceramic Eyelets




$V_R$ = 600V

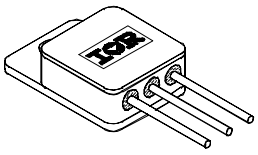
$V_F$ = 1.56V

$Q_{rr}$ = 270nC

$di_{(rec)M}/dt$ = 345A/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.



**TO-254AA**

## 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 | 30 | A |
| $I_{FSM}$ @ $T_C$ = 25°C | Single Pulse Forward Current ② | 150 | |
| $P_D$ @ $T_C$ = 25°C | Maximum Power Dissipation | 63 | W |
| $T_J$<br>$T_{STG}$ | Operating Junction and<br>Storage Temperature Range | -55 to +150 | °C |

## Thermal - Mechanical Characteristics

| | Parameter | Typ. | Max. | Units |
|---|---|---|---|---|
| $R_{\theta JC}$ | Junction-to-Case, Single Leg Conducting | — | 2.0 | °C/W |
| | Weight | 9.3 | — | g |

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



8/20/98

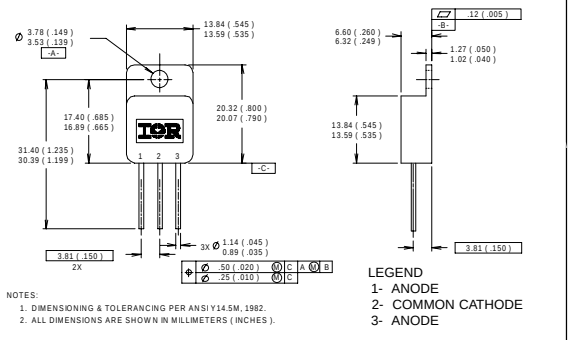
## Electrical Characteristics (per Leg) @ $T_J$ = 25°C (unless otherwise specified)

| | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $V_{BR}$ | Cathode Anode Breakdown Voltage | 600 | — | — | V | $I_R$ = 250µA |
| $V_{FM}$ | Max Forward Voltage | — | — | 1.56 | V | $I_F$ = 15A |
| | | — | — | 1.92 | | $I_F$ = 30A See Fig. 1 |
| | | — | — | 1.51 | | $I_F$ = 15A, $T_J$ = 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 | — | 24 | 36 | pF | $V_R$ = 200V See Fig. 3 |
| $L_S$ | Series Inductance | — | 8.7 | — | nH | Measured from center of bond pad to end of anode bonding wire |

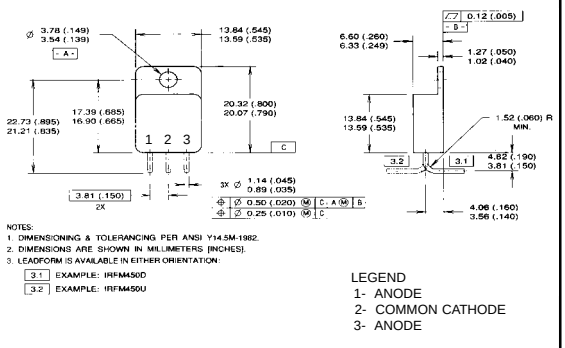
## Dynamic Recovery Characteristics (per Leg) @ $T_J$ = 25°C (unless otherwise specified)

| | Parameter | Min. | Typ. | Max. | Units | Test Conditions | | |
|---|---|---|---|---|---|---|---|---|
| $t_{rr1}$ | Reverse Recovery Time | — | 54 | 88 | ns | $T_J$ = 25°C | See Fig. | $I_F$ = 15A |
| $t_{rr2}$ | | — | 94 | 140 | | $T_J$ = 125°C | 5 | |
| $I_{RRM1}$ | Peak Recovery Current | — | 5.6 | 7.8 | A | $T_J$ = 25°C | See Fig. | |
| $I_{RRM2}$ | | — | 7.8 | 11.7 | | $T_J$ = 125°C | 6 | $V_R$ = 200V |
| $Q_{rr1}$ | Reverse Recovery Charge | — | 180 | 270 | nC | $T_J$ = 25°C | See Fig. | |
| $Q_{rr2}$ | | — | 435 | 650 | | $T_J$ = 125°C | 7 | $di_f/dt$ = 200A/µs |
| $di_{(rec)M}/dt1$ | Peak Rate of Fall of Recovery Current | — | 300 | 345 | A/µs | $T_J$ = 25°C | See Fig. | |
| $di_{(rec)M}/dt2$ | During $t_b$ | — | 190 | 285 | | $T_J$ = 125°C | 8 | |

## Case Outline and Dimensions — TO-254AA




Conforms to JEDEC Outline TO-254AA
Dimensions in Millimeters and ( Inches )




**CAUTION**

**BERYLLIA WARNING PER MIL- PRF-19500**

Package containing beryllia shall not be ground, sandblasted,machined, or have other operations performed on them which will produce beryllia or beryllium dust. Furthermore, beryllium oxide packages shall not be placed in acids that will produce fumes containing beryllium.

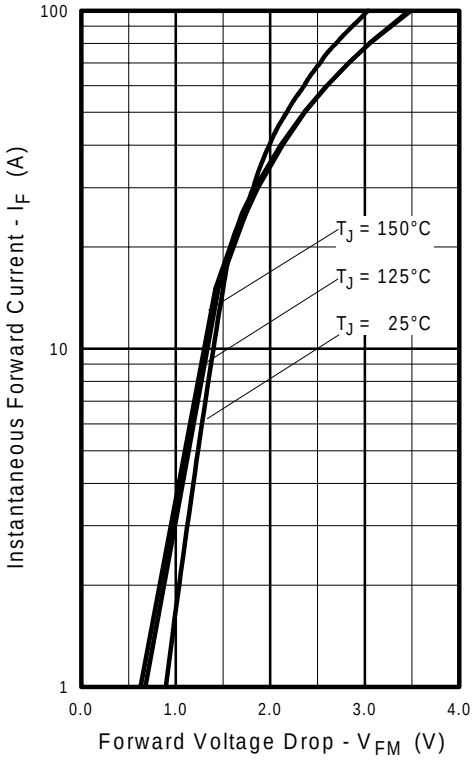



**Fig. 1** - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

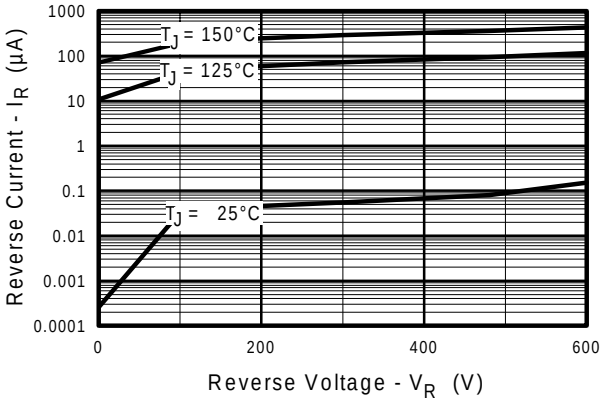



**Fig. 2** - Typical Reverse Current vs. Reverse Voltage

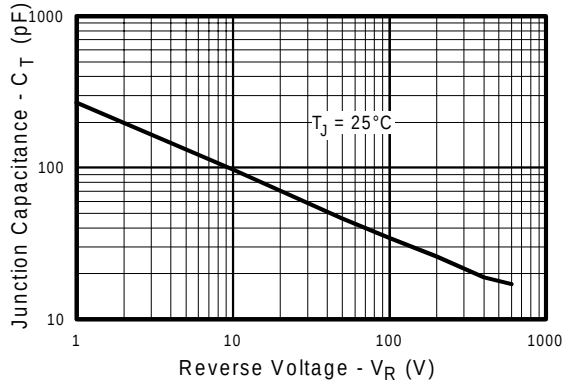



**Fig. 3** - Typical Junction Capacitance vs. Reverse Voltage

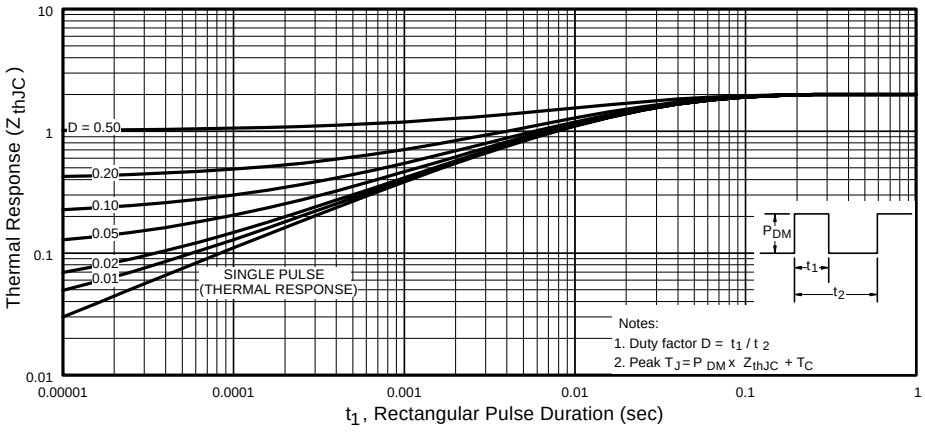



**Fig. 4** - Maximum Thermal Impedance $Z_{thjc}$ Characteristics

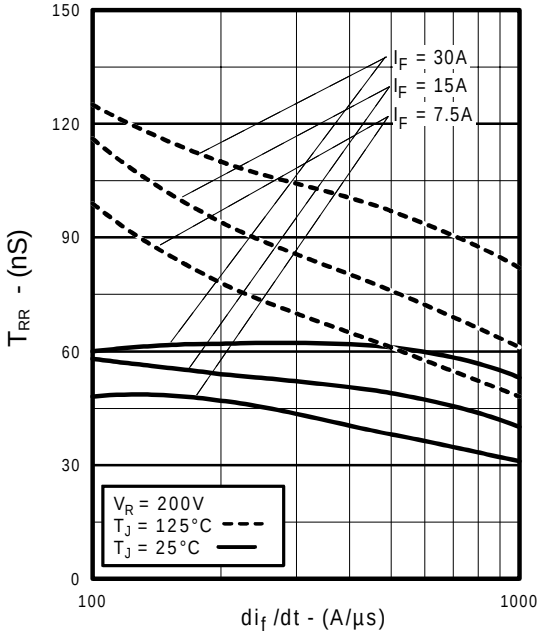



**Fig. 5** - Typical Reverse Recovery vs. $di_f/dt$

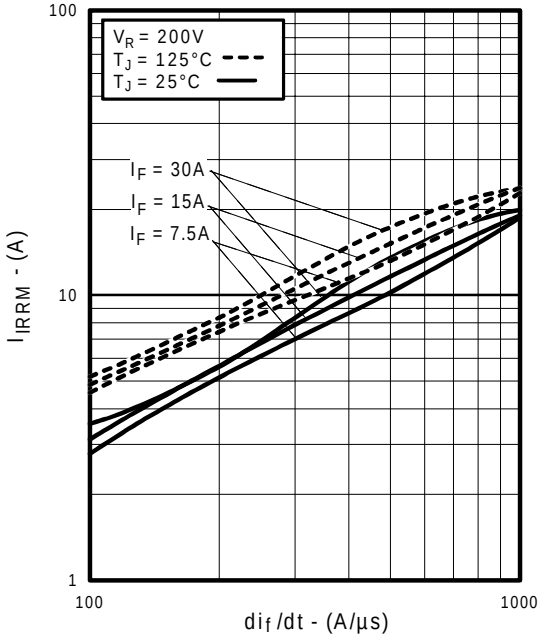



**Fig. 6** - Typical Recovery Current vs. $di_f/dt$

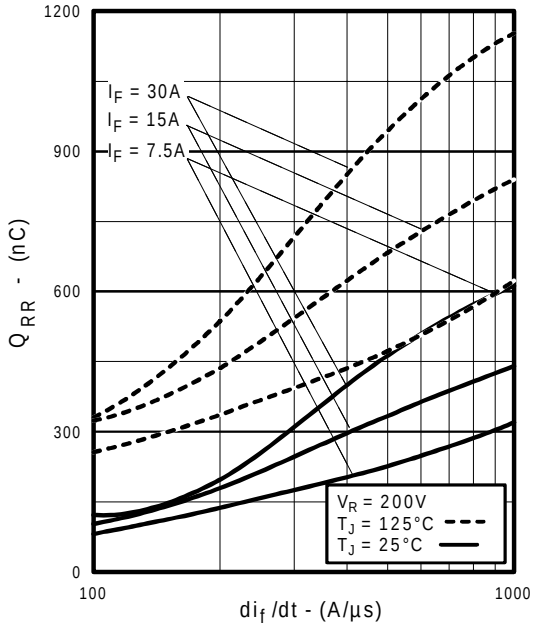



**Fig. 7** - Typical Stored Charge vs. $di_f/dt$

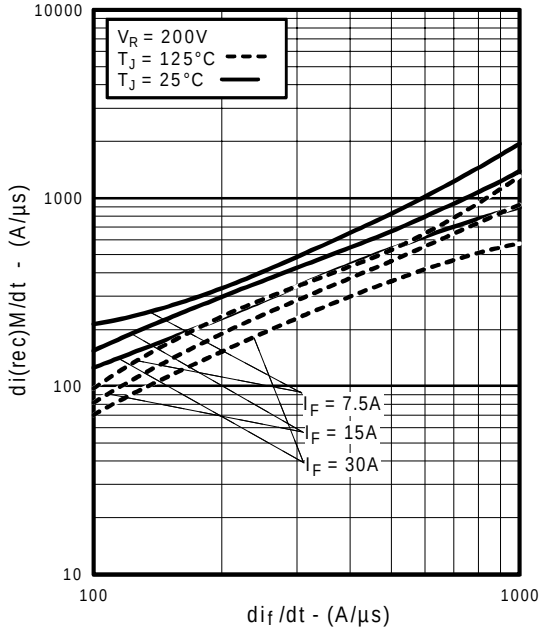



**Fig. 8** - Typical $di_{(rec)M}/dt$ vs. $di_f/dt$

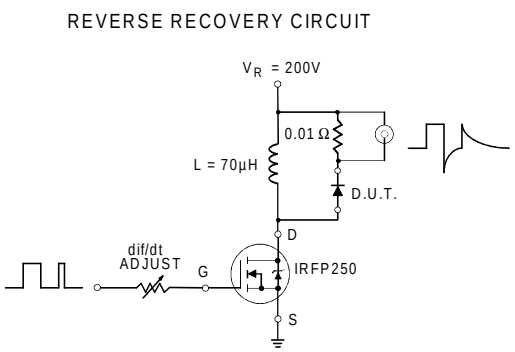
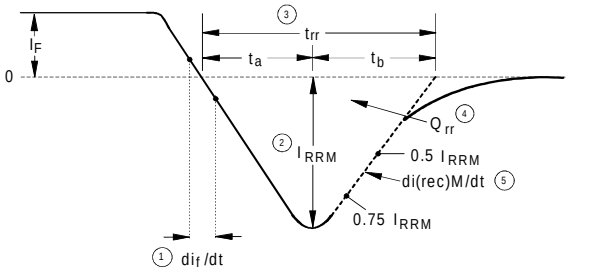



**Fig. 9** - Reverse Recovery Parameter Test Circuit




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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