

# HFA15TB60

Ultrafast, Soft Recovery Diode

## Features

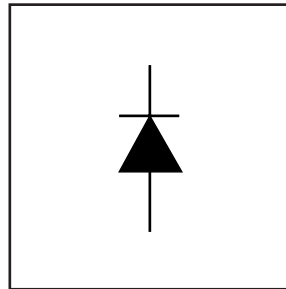
- Ultrafast Recovery
- Ultrasoft Recovery
- Very Low  $I_{RRM}$
- Very Low  $Q_{rr}$
- Guaranteed Avalanche
- Specified at Operating Conditions

## Benefits

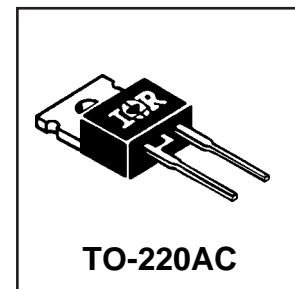
- Reduced RFI and EMI
- Reduced Power Loss in Diode and Switching Transistor
- Higher Frequency Operation
- Reduced Snubbing
- Reduced Parts Count

## Description

International Rectifier's HFA15TB60 is a state of the art ultra fast recovery diode. Employing the latest in epitaxial construction and advanced processing techniques it features a superb combination of characteristics which result in performance which is unsurpassed by any rectifier previously available. With basic ratings of 600 volts and 8 amps per Leg continuous current, the HFA15TB60 is especially well suited for use as the companion diode for IGBTs and MOSFETs. In addition to ultra fast recovery time, the HEXFRED product line features extremely low values of peak recovery current ( $I_{RRM}$ ) and does not exhibit any tendency to "snap-off" during the  $t_b$  portion of recovery. The HEXFRED features combine to offer designers a rectifier with lower noise and significantly lower switching losses in both the diode and the switching transistor. These HEXFRED advantages can help to significantly reduce snubbing, component count and heatsink sizes. The HEXFRED HFA15TB60 is ideally suited for applications in power supplies and power conversion systems (such as inverters), motor drives, and many other similar applications where high speed, high efficiency is needed.



|                                 |
|---------------------------------|
| $V_R = 600V$                    |
| $V_F = 1.7V$                    |
| $Q_{rr}^* = 84nC$               |
| $di_{(rec)M}/dt^* = 188A/\mu s$ |
| * 125°C                         |



## Absolute Maximum Ratings

|                           | Parameter   | Max.        | Units |
|---------------------------|---|-------------|-------|
| $V_R$                     | Cathode-to-Anode Voltage                            | 600         | V     |
| $I_F @ T_C = 25^\circ C$  | Continuous Forward Current                          |             | A     |
| $I_F @ T_C = 100^\circ C$ | Continuous Forward Current                          | 15          |       |
| $I_{FSM}$                 | Single Pulse Forward Current                        | 150         |       |
| $I_{FRM}$                 | Maximum Repetitive Forward Current                  | 60          |       |
| $E_{AS} \textcircled{D}$  | Maximum Single Pulse Avalanche Energy               | 28          | mJ    |
| $I_{AR} \textcircled{D}$  | Maximum Repetitive Avalanche Current                | 15          | A     |
| $P_D @ T_C = 25^\circ C$  | Maximum Power Dissipation                           | 74          | W     |
| $P_D @ T_C = 100^\circ C$ | Maximum Power Dissipation                           | 29          |       |
| $T_J$<br>$T_{STG}$        | Operating Junction and<br>Storage Temperature Range | -55 to +150 | C     |

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## Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise specified)

|                 | Parameter                       | Min. | Typ. | Max. | Units | Test Conditions   |
|-----------------|---------------------------------|------|------|------|-------|---|
| V <sub>BR</sub> | Cathode Anode Breakdown Voltage | 600  | —    | —    | V     | I <sub>R</sub> = 100μA  |
| V <sub>FM</sub> | Max Forward Voltage             | —    | 1.3  | 1.7  | V     | I <sub>F</sub> = 15A  |
|                 |                                 | —    | 1.5  | 2.0  |       | I <sub>F</sub> = 30A  |
|                 |                                 | —    | 1.2  | 1.6  |       | I <sub>F</sub> = 15A, T <sub>J</sub> = 125°C                        |
| I <sub>RM</sub> | Max Reverse Leakage Current     | —    | 1.0  | 10   | μA    | V <sub>R</sub> = V <sub>R</sub> Rated                               |
|                 |                                 | —    | 400  | 1000 |       | T <sub>J</sub> = 125°C, V <sub>R</sub> = 0.8 x V <sub>R</sub> Rated |
| C <sub>T</sub>  | Junction Capacitance            | —    | 25   | 50   | pF    | V <sub>R</sub> = 200V   |
| L <sub>S</sub>  | Series Inductance               | —    | 8.0  | —    | nH    | Measured lead to lead 5mm from package body                         |

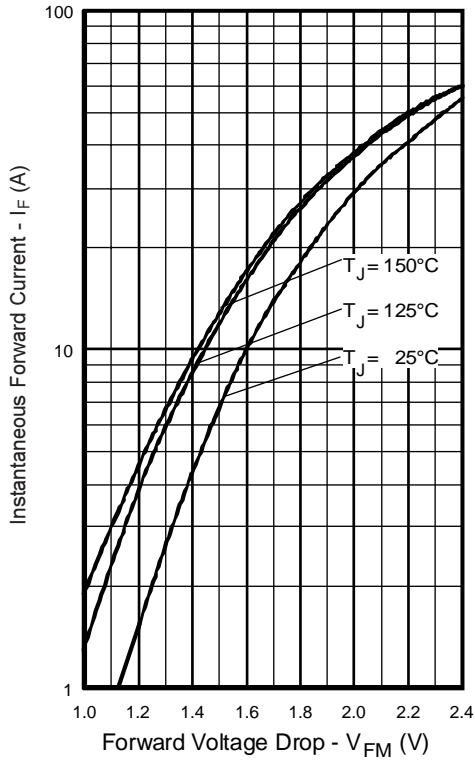
## Dynamic Recovery Characteristics @ T<sub>J</sub> = 25°C (unless otherwise specified)

|                           | Parameter                              | Min. | Typ. | Max. | Units | Test Conditions  |
|---------------------------|--|------|------|------|-------|--|
| t <sub>rr</sub>           | Reverse Recovery Time                  | —    | 19   | —    | ns    | I <sub>F</sub> = 1.0A, di <sub>F</sub> /dt = 200A/μs, V <sub>R</sub> = 30V |
| t <sub>rr1</sub>          | See Fig. 5, 6 & 16                     | —    | 42   | 60   |       | T <sub>J</sub> = 25°C  |
| t <sub>rr2</sub>          |  | —    | 74   | 120  |       | T <sub>J</sub> = 125°C   |
| I <sub>RRM1</sub>         | Peak Recovery Current                  | —    | 4.0  | 6.0  | A     | T <sub>J</sub> = 25°C  |
| I <sub>RRM2</sub>         | See Fig. 7 & 8                         | —    | 6.5  | 10   |       | T <sub>J</sub> = 125°C   |
| Q <sub>rr1</sub>          | Reverse Recovery Charge                | —    | 84   | 180  | nC    | T <sub>J</sub> = 25°C  |
| Q <sub>rr2</sub>          | See Fig. 9 & 10                        | —    | 241  | 600  |       | T <sub>J</sub> = 125°C   |
| di <sub>(rec)M</sub> /dt1 | Peak Rate of Fall of Recovery Current  | —    | 188  | —    | A/μs  | T <sub>J</sub> = 25°C  |
| di <sub>(rec)M</sub> /dt2 | During t <sub>b</sub> See Fig. 11 & 12 | —    | 160  | —    |       | T <sub>J</sub> = 125°C   |

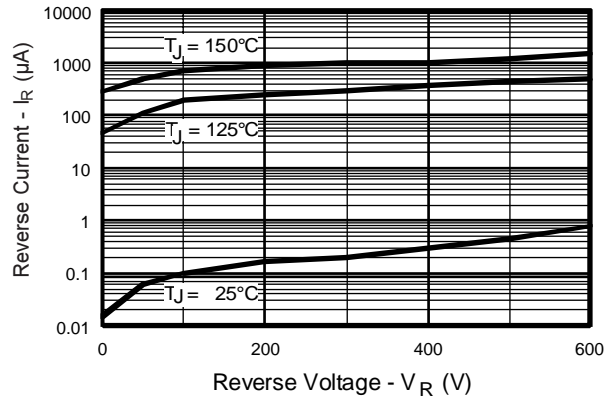
## Thermal - Mechanical Characteristics

|                     | Parameter                               | Min. | Typ. | Max. | Units  |
|---------------------|---|------|------|------|--------|
| T <sub>lead</sub> ⑤ | Lead Temperature                        | —    | —    | 300  | °C     |
| R <sub>θJC</sub>    | Thermal Resistance, Junction to Case    | —    | —    | 1.7  | K/W    |
| R <sub>θJA</sub> ④  | Thermal Resistance, Junction to Ambient | —    | —    | 80   |        |
| R <sub>θCS</sub> ③  | Thermal Resistance, Case to Heat Sink   | —    | 0.5  | —    |        |
| Wt                  | Weight                                  | —    | 2.0  | —    | g      |
|                     |   | —    | 0.07 | —    | (oz)   |
| T                   | Mounting Torque                         | 6.0  | —    | 12   | Kg-cm  |
|                     |   | 5.0  | —    | 10   | lbf-in |

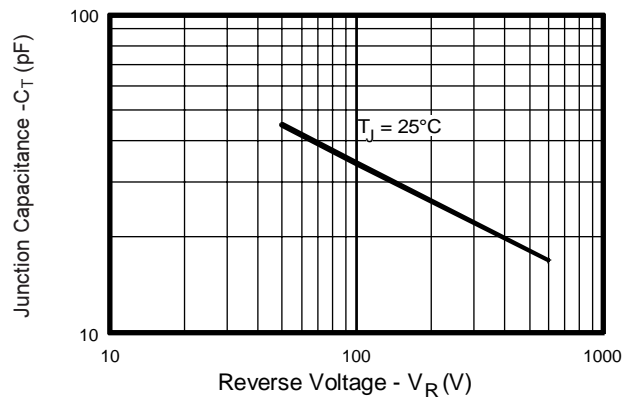
- ① I<sub>L</sub> = 15A, L = 250μH, T<sub>C</sub> = 100°C
- ② L = 100μH, duty cycle limited by max T<sub>J</sub>
- ③ 0.063 in. from Case (1.6mm) for 10 sec
- ④ Typical Socket Mount
- ⑤ Mounting Surface, Flat, Smooth and Greased



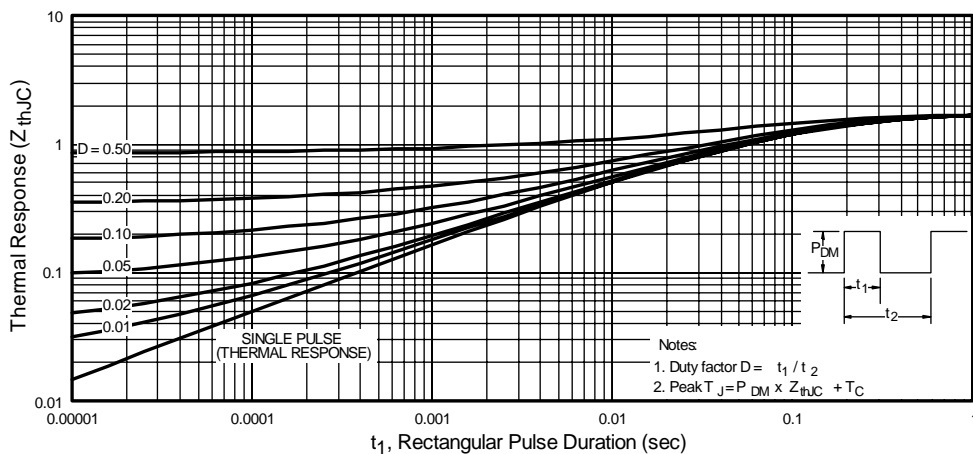
**Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current**



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



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



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

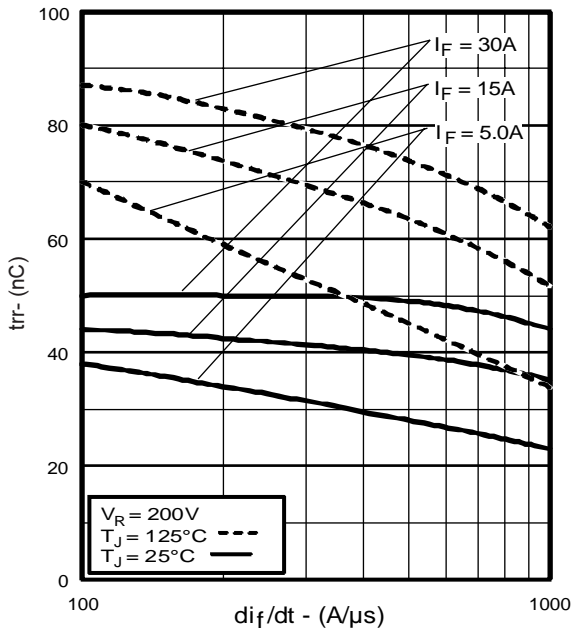


Fig. 5 - Typical Reverse Recovery vs.  $di_f/dt$

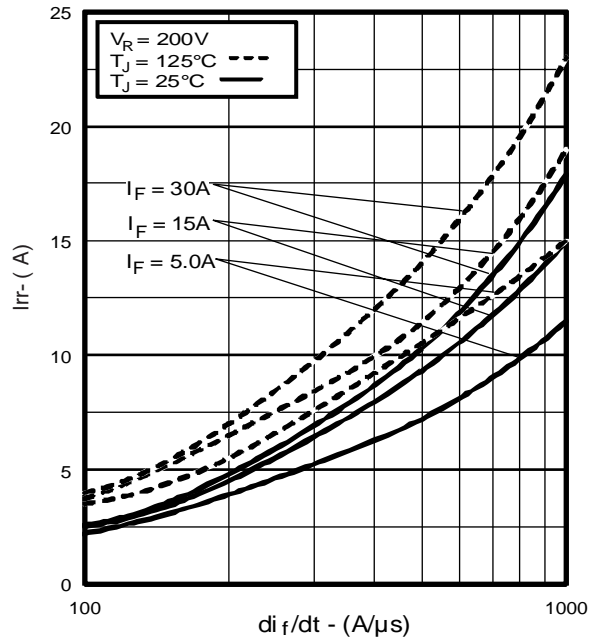


Fig. 6 - Typical Recovery Current vs.  $di_f/dt$

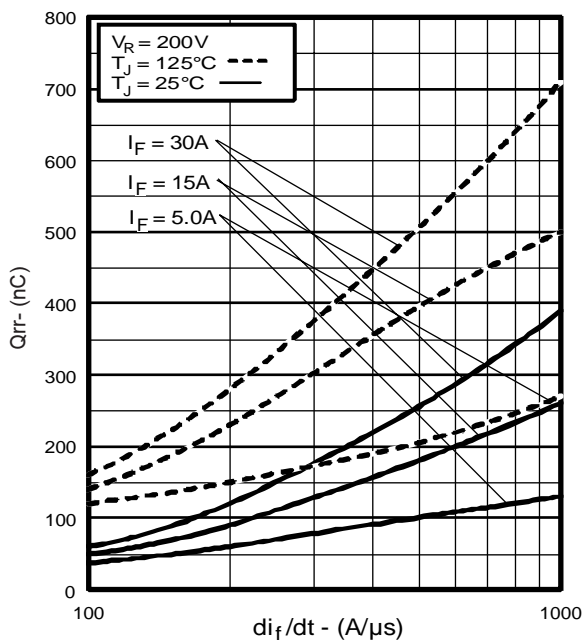


Fig. 7 - Typical Stored Charge vs.  $di_f/dt$

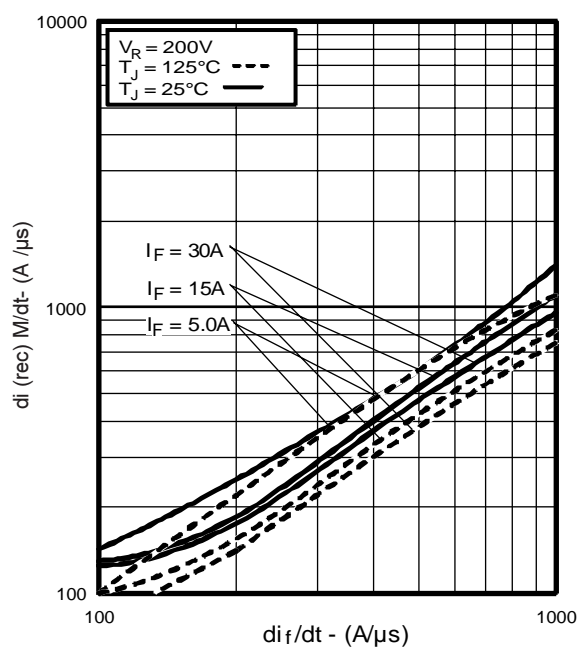
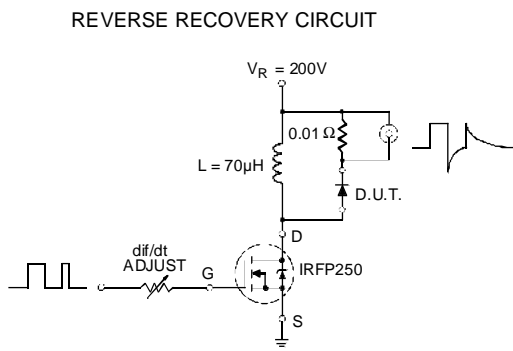
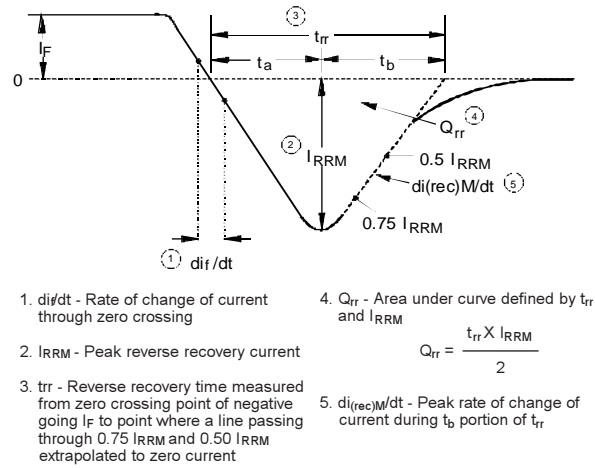


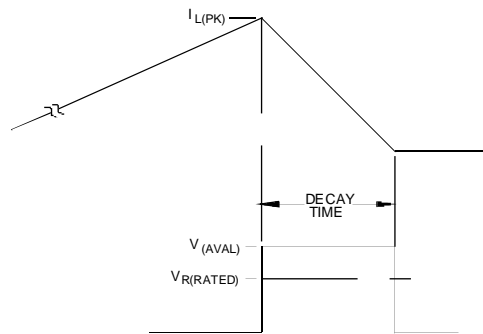
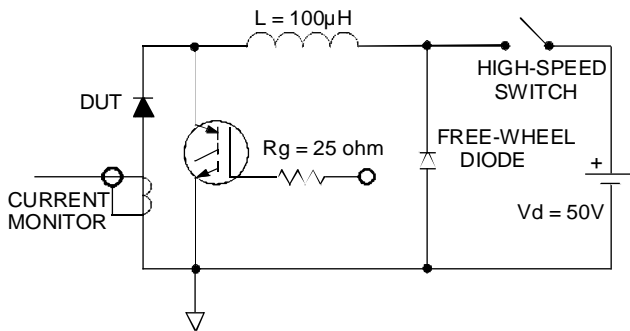
Fig. 8 - Typical  $di_{(rec)M}/dt$  vs.  $di_f/dt$



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



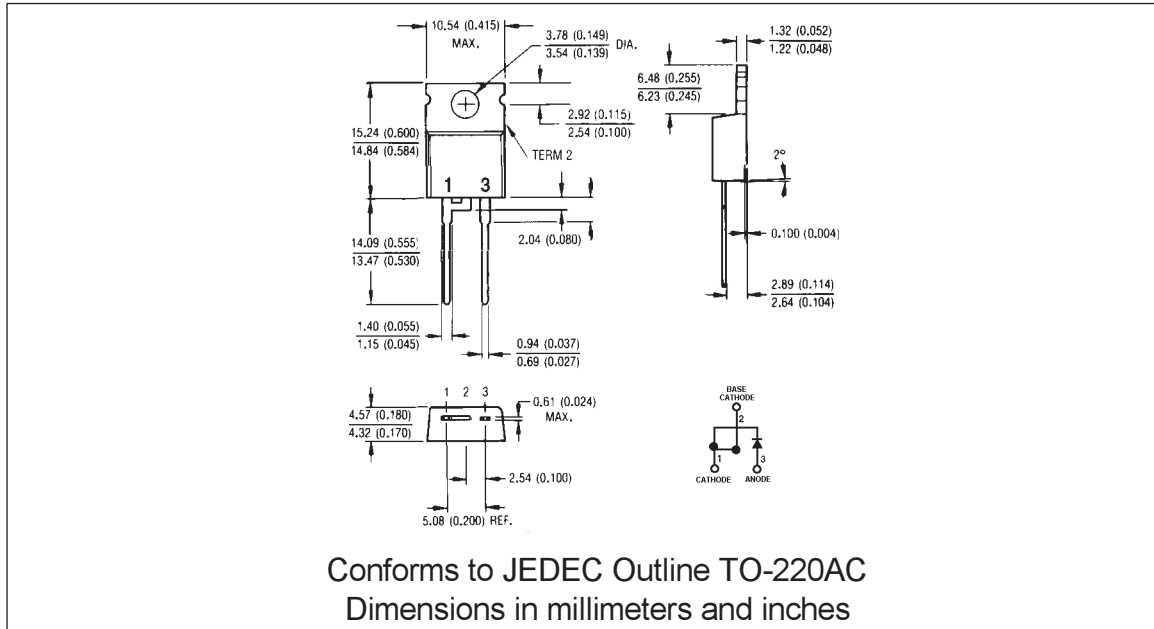
**Fig. 10 - Reverse Recovery Waveform and Definitions**



**Fig. 11 - Avalanche Test Circuit and Waveforms**

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