

## HFA25PB60PbF

Ultrafast, Soft Recovery Diode

### Features

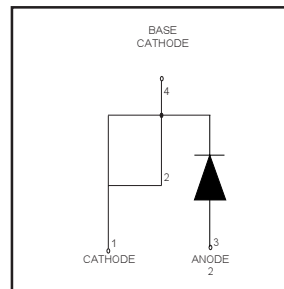
- Ultrafast Recovery
- Ultrasoft Recovery
- Very Low  $I_{RRM}$
- Very Low  $Q_{rr}$
- Specified at Operating Conditions
- Lead-Free

### Benefits

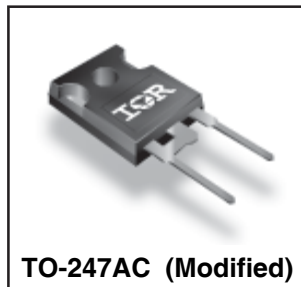
- Reduced RFI and EMI
- Reduced Power Loss in Diode and Switching Transistor
- Higher Frequency Operation
- Reduced Snubbing
- Reduced Parts Count

### Description

International Rectifier's HFA25PB60 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 25 amps continuous current, the HFA25PB60 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 HFA25PB60 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.



|                                            |
|--------------------------------------------|
| $V_R = 600V$                               |
| $V_F(\text{typ.})^* = 1.3V$                |
| $I_{F(AV)} = 25A$                          |
| $Q_{rr}(\text{typ.}) = 112nC$              |
| $I_{RRM} = 10A$                            |
| $t_{rr}(\text{typ.}) = 23ns$               |
| $di_{(rec)M}/dt(\text{typ.}) = 250A/\mu s$ |



### 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         | 25          |       |
| $I_{FSM}$                 | Single Pulse Forward Current       | 225         |       |
| $I_{FRM}$                 | Maximum Repetitive Forward Current | 100         |       |
| $P_D @ T_C = 25^\circ C$  | Maximum Power Dissipation          | 151         | W     |
| $P_D @ T_C = 100^\circ C$ | Maximum Power Dissipation          | 60          |       |
| $T_J$                     | Operating Junction and             | -55 to +150 | C     |
| $T_{STG}$                 | Storage Temperature Range          |             |       |

\*  $125^\circ C$

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**Electrical Characteristics @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)**

|          | Parameter                       | Min | Typ | Max  | Units         | Test Conditions                                               |
|----------|---------------------------------|-----|-----|------|---------------|---------------------------------------------------------------|
| $V_{BR}$ | Cathode Anode Breakdown Voltage | 600 | —   | —    | V             | $I_R = 100\mu\text{A}$                                        |
| $V_{FM}$ | Max Forward Voltage             | —   | —   | 1.3  | 1.7           | $I_F = 25\text{A}$                                            |
|          |                                 | —   | 1.5 | 2.0  | V             | $I_F = 50\text{A}$ See Fig. 1                                 |
|          |                                 | —   | 1.3 | 1.7  |               | $I_F = 25\text{A}, T_J = 125^\circ\text{C}$                   |
| $I_{RM}$ | Max Reverse Leakage Current     | —   | 1.5 | 20   | $\mu\text{A}$ | $V_R = V_R \text{ Rated}$ See Fig. 2                          |
|          |                                 | —   | 600 | 2000 |               | $T_J = 125^\circ\text{C}, V_R = 0.8 \times V_R \text{ Rated}$ |
| $C_T$    | Junction Capacitance            | —   | 55  | 100  | pF            | $V_R = 200\text{V}$ See Fig. 3                                |
| $L_S$    | Series Inductance               | —   | 12  | —    | nH            | Measured lead to lead 5mm from package body                   |

**Dynamic Recovery Characteristics @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)**

|                   | Parameter                                  | Min | Typ | Max  | Units            | Test Conditions                                                        |
|-------------------|--------------------------------------------|-----|-----|------|------------------|------------------------------------------------------------------------|
| $t_{rr}$          | Reverse Recovery Time                      | —   | 23  | —    | ns               | $I_F = 1.0\text{A}, di/dt = 200\text{A}/\mu\text{s}, V_R = 30\text{V}$ |
| $t_{rr1}$         | See Fig. 5 & 10                            | —   | 50  | 75   |                  | $T_J = 25^\circ\text{C}$                                               |
| $t_{rr2}$         |                                            | —   | 105 | 160  |                  | $T_J = 125^\circ\text{C}$                                              |
| $I_{RRM1}$        | Peak Recovery Current<br>See Fig. 6 & 10   | —   | 4.5 | 10   | A                | $T_J = 25^\circ\text{C}$                                               |
| $I_{RRM2}$        |                                            | —   | 8.0 | 15   |                  | $T_J = 125^\circ\text{C}$                                              |
| $Q_{rr1}$         | Reverse Recovery Charge<br>See Fig. 7 & 10 | —   | 112 | 375  | nC               | $T_J = 25^\circ\text{C}$                                               |
| $Q_{rr2}$         |                                            | —   | 420 | 1200 |                  | $T_J = 125^\circ\text{C}$                                              |
| $di_{(rec)M}/dt1$ | Peak Rate of Fall of Recovery Current      | —   | 250 | —    | A/ $\mu\text{s}$ | $T_J = 25^\circ\text{C}$                                               |
| $di_{(rec)M}/dt2$ | During $t_b$ See Fig. 8 & 10               | —   | 160 | —    |                  | $T_J = 125^\circ\text{C}$                                              |

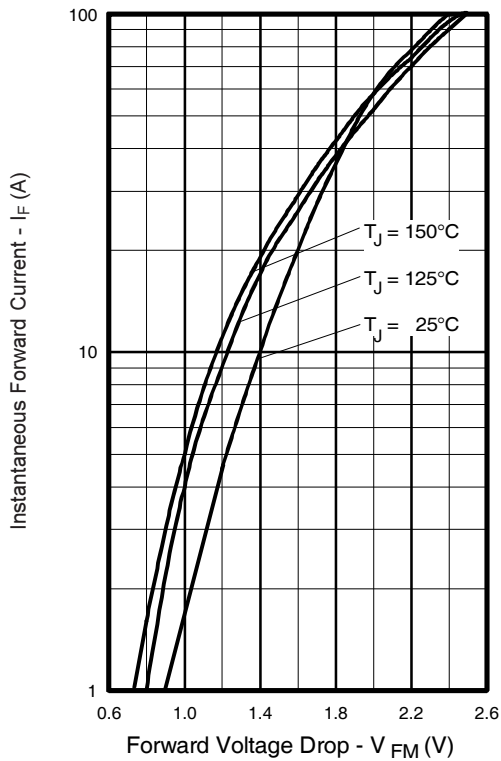
**Thermal - Mechanical Characteristics**

|                | Parameter                               | Min | Typ  | Max  | Units            |
|----------------|-----------------------------------------|-----|------|------|------------------|
| $T_{lead}^{①}$ | Lead Temperature                        | —   | —    | 300  | $^\circ\text{C}$ |
| $R_{thJC}$     | Thermal Resistance, Junction to Case    | —   | —    | 0.83 | K/W              |
| $R_{thJA}^{②}$ | Thermal Resistance, Junction to Ambient | —   | —    | 40   |                  |
| $R_{thCS}^{③}$ | Thermal Resistance, Case to Heat Sink   | —   | 0.25 | —    |                  |
| $Wt$           | Weight                                  | —   | 6.0  | —    | g                |
|                |                                         | —   | 0.21 | —    | (oz)             |
|                | Mounting Torque                         | 6.0 | —    | 12   | Kg-cm            |
|                |                                         | 5.0 | —    | 10   | lbf-in           |

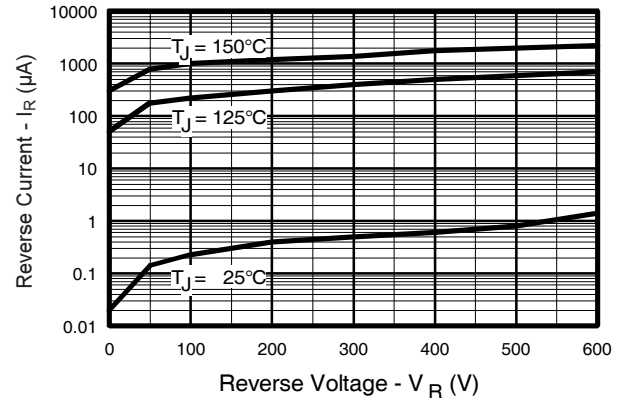
① 0.063 in. from Case (1.6mm) for 10 sec

② Typical Socket Mount

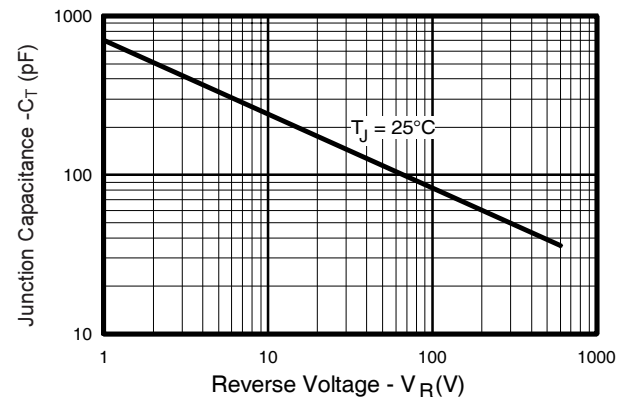
③ Mounting Surface, Flat, Smooth and Greased



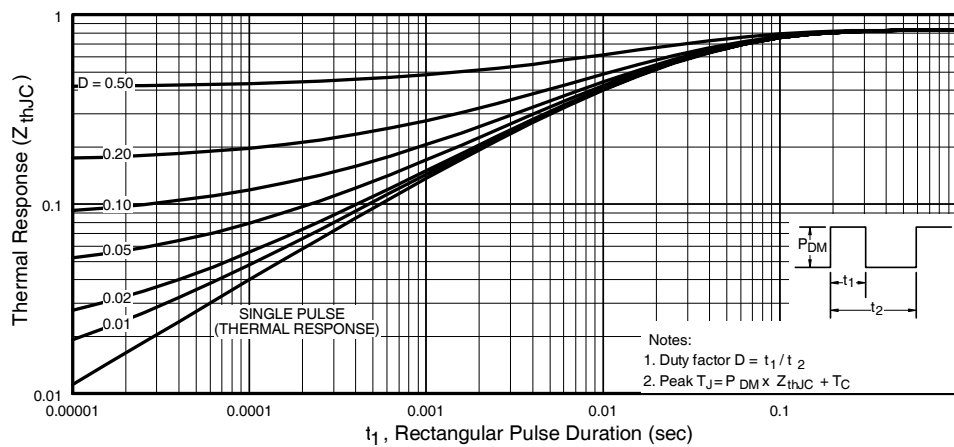
**Fig. 1** - Maximum Forward Voltage Drop vs. Instantaneous Forward Current



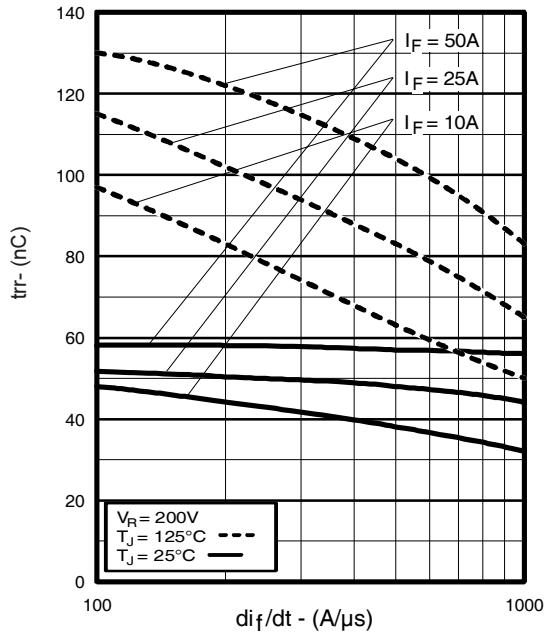
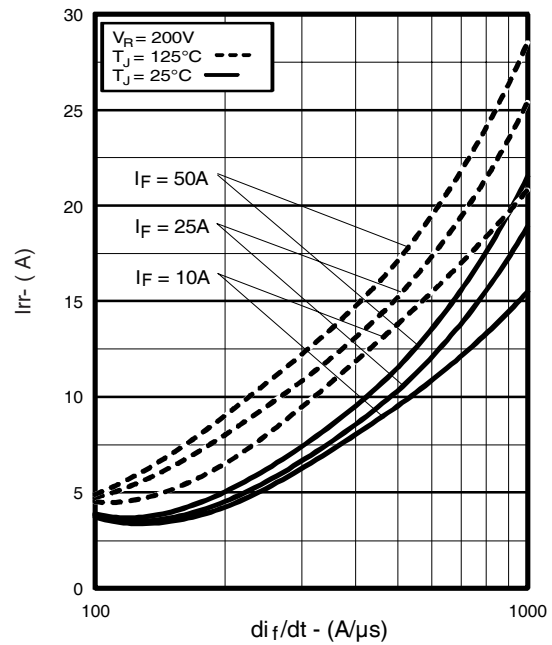
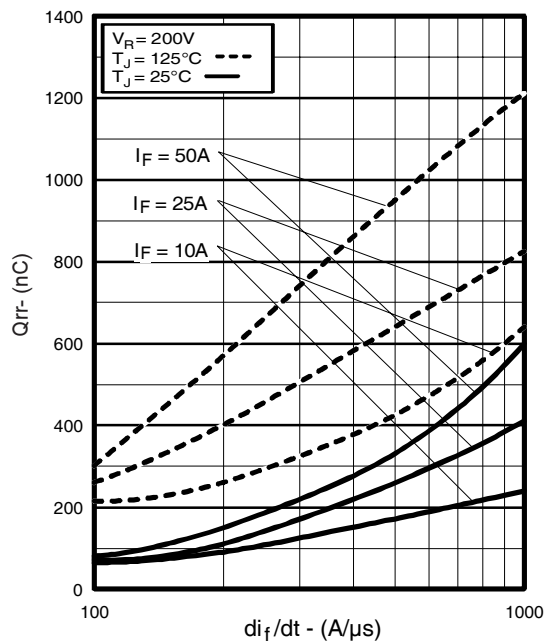
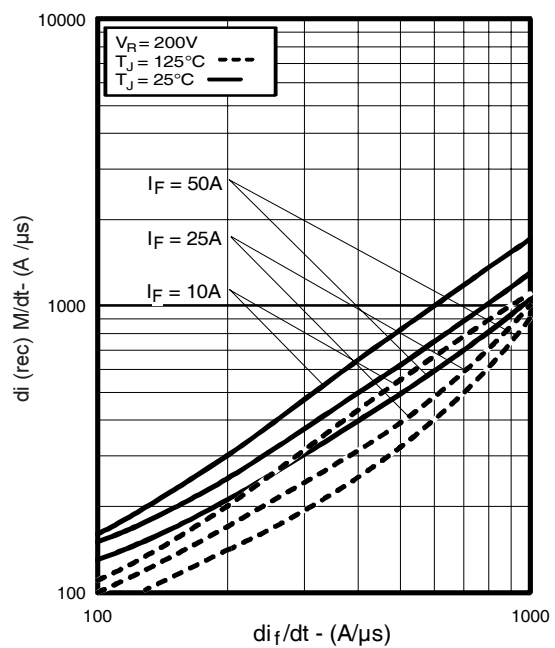
**Fig. 2** - Typical Reverse Current vs. Reverse Voltage

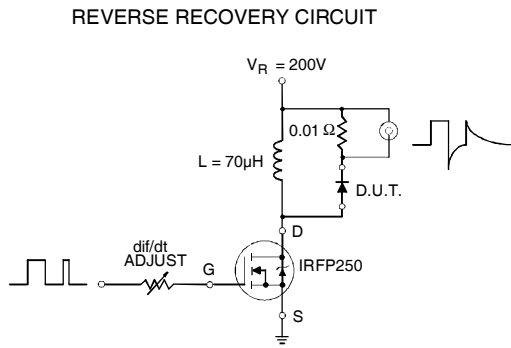


**Fig. 3** - Typical Junction Capacitance vs. Reverse Voltage

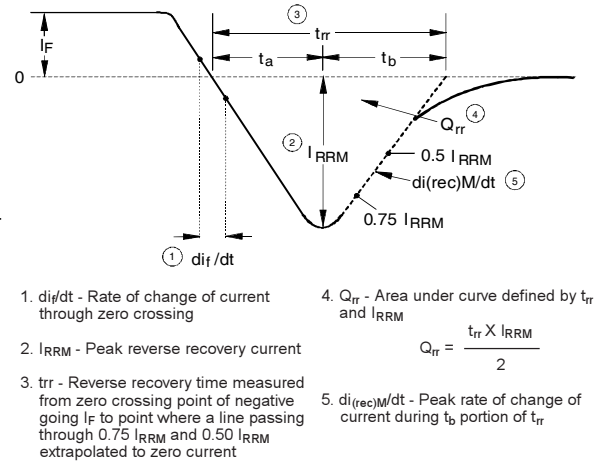


**Fig. 4** - Maximum Thermal Impedance  $Z_{thjc}$  Characteristics

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.  $di_f/dt$



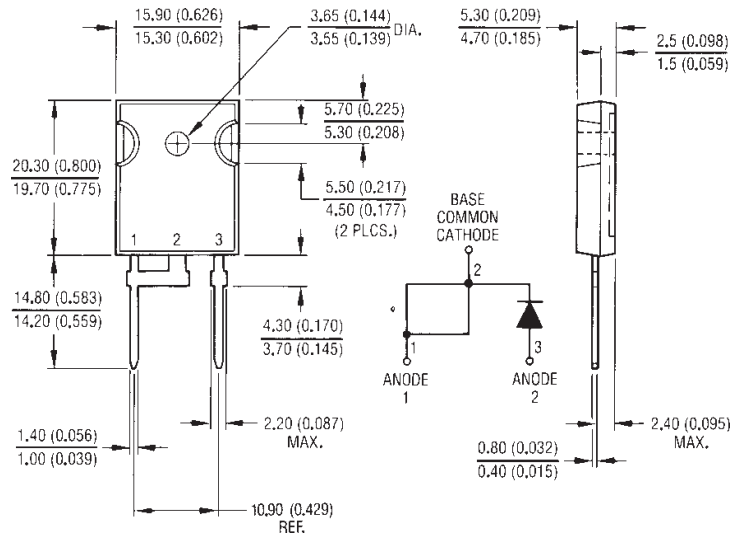
**Fig. 9 - Reverse Recovery Parameter Test Circuit**



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

HFA25PB60PbF

International  
**IR** Rectifier



Conforms to JEDEC Outline TO-247AC MODIFIED  
Dimensions in millimeters and inches

Note: Marking "P" indicates Lead-Free

International  
**IR** Rectifier

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