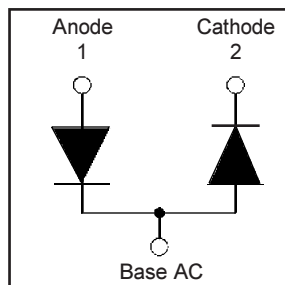


## HFA140NJ60D

Ultrafast, Soft Recovery Diode

### Features

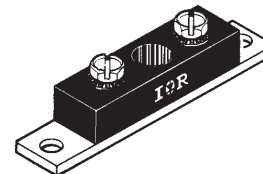
- Reduced RFI and EMI
- Reduced Snubbing
- Extensive Characterization of Recovery Parameters



|                                                             |
|-------------------------------------------------------------|
| $V_R = 600V$                                                |
| $V_F(\text{typ.})^{\textcircled{3}} = 1.2V$                 |
| $I_{F(AV)} = 140A$                                          |
| $Q_{rr}(\text{typ.}) = 340nC$                               |
| $I_{RRM}(\text{typ.}) = 8.5A$                               |
| $t_{rr}(\text{typ.}) = 33ns$                                |
| $di_{(rec)}/dt(\text{typ.})^{\textcircled{3}} = 220A/\mu s$ |

### 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-244AB

### Absolute Maximum Ratings (per Leg)

|                           | Parameter                                    | Max.        | Units   |
|---------------------------|----------------------------------------------|-------------|---------|
| $V_R$                     | Cathode-to-Anode Voltage                     | 600         | V       |
| $I_F @ T_C = 25^\circ C$  | Continuous Forward Current                   | 126         | A       |
| $I_F @ T_C = 100^\circ C$ | Continuous Forward Current                   | 63          |         |
| $I_{FSM}$                 | Single Pulse Forward Current <sup>①</sup>    | 400         |         |
| $E_{AS}$                  | Non-Repetitive Avalanche Energy <sup>②</sup> | 220         | $\mu J$ |
| $P_D @ T_C = 25^\circ C$  | Maximum Power Dissipation                    | 310         | W       |
| $P_D @ T_C = 100^\circ C$ | Maximum Power Dissipation                    | 125         |         |
| $T_J$                     | Operating Junction and                       | -55 to +150 | C       |
| $T_{STG}$                 | Storage Temperature Range                    |             |         |

### Thermal - Mechanical Characteristics

|            | Parameter                               | Min.     | Typ.     | Max.     | Units           |
|------------|-----------------------------------------|----------|----------|----------|-----------------|
| $R_{thJC}$ | Junction-to-Case, Single Leg Conducting | —        | —        | 0.48     | $^\circ C/W$    |
|            | Junction-to-Case, Both Legs Conducting  | —        | —        | 0.24     | $K/W$           |
| $R_{thCS}$ | Case-to-Sink, Flat, Greased Surface     | —        | 0.10     | —        |                 |
| $Wt$       | Weight                                  | —        | 79 (2.8) | —        | g (oz)          |
|            | Mounting Torque <sup>④</sup>            | 30 (3.4) | —        | 40 (4.6) | lbf•in<br>(N•m) |
|            | Mounting Torque Center Hole             | 12 (1.4) | —        | 18 (2.1) |                 |
|            | Terminal Torque                         | 30 (3.4) | —        | 40 (4.6) |                 |
|            | Vertical Pull                           | —        | —        | 80       | lbf•in          |
|            | 2 inch Lever Pull                       | —        | —        | 35       |                 |

**Note:** <sup>①</sup> Limited by junction temperature  
<sup>②</sup>  $L = 100\mu H$ , duty cycle limited by max  $T_J$   
<sup>③</sup>  $125^\circ C$

<sup>④</sup> Mounting surface must be smooth, flat, free of burrs or other protrusions. Apply a thin even film of thermal grease to mounting surface. Gradually tighten each mounting bolt in 5-10 lbf•in steps until desired or maximum torque limits are reached. Module

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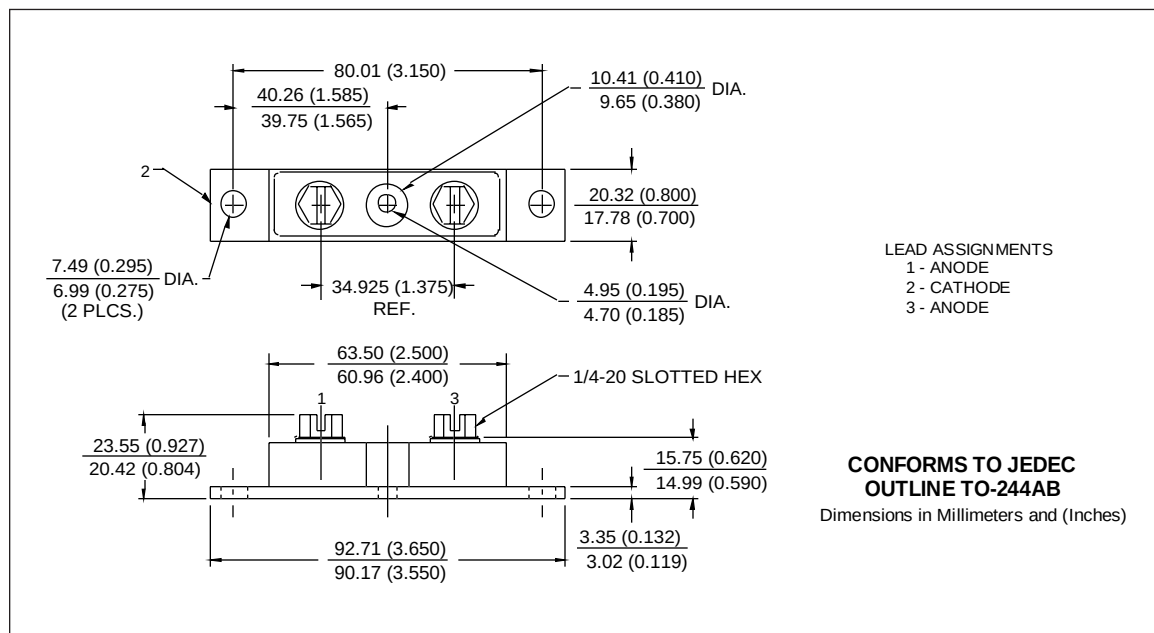
International  
IOR Rectifier

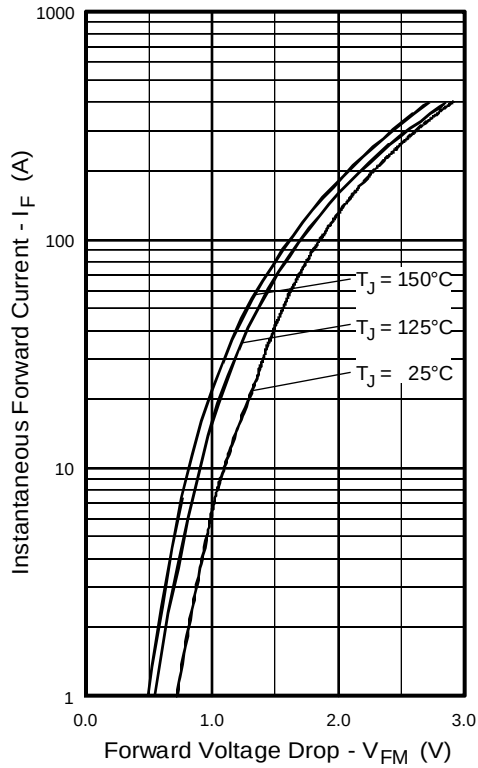
## Electrical Characteristics (per Leg) @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

| 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  | 1.5  | V             | $I_F = 70\text{A}$                           |
|                                          | —    | 1.5  | 1.7  |               | $I_F = 140\text{A}$ See Fig. 1               |
|                                          | —    | 1.2  | 1.4  |               | $I_F = 70\text{A}, T_J = 125^\circ\text{C}$  |
| $I_{RM}$ Max Reverse Leakage Current     | —    | 4.0  | 20   | $\mu\text{A}$ | $V_R = V_R$ Rated See Fig. 2                 |
|                                          | —    | 1.0  | 4.0  | $\text{mA}$   | $T_J = 125^\circ\text{C}, V_R = 480\text{V}$ |
| $C_T$ Junction Capacitance               | —    | 140  | 250  | $\text{pF}$   | $V_R = 200\text{V}$ See Fig. 3               |
| $L_S$ Series Inductance                  | —    | 7.0  | —    | $\text{nH}$   | From top of terminal hole to mounting plane  |

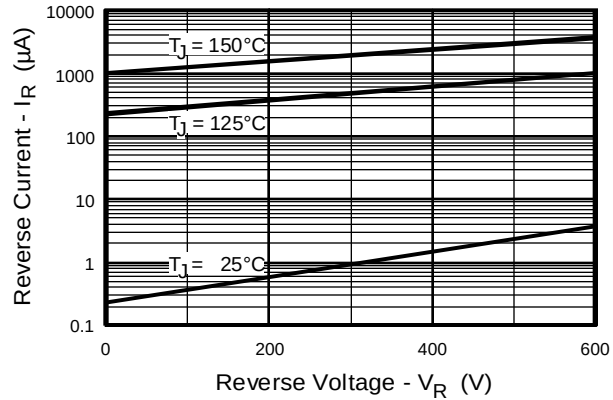
## Dynamic Recovery Characteristics (per Leg) @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

| Parameter                                               | Min. | Typ. | Max. | Units                  | Test Conditions                                                        |
|---------------------------------------------------------|------|------|------|------------------------|------------------------------------------------------------------------|
| $t_{rr}$ Reverse Recovery Time                          | —    | 33   | —    | ns                     | $I_F = 1.0\text{A}, di/dt = 200\text{A}/\mu\text{s}, V_R = 30\text{V}$ |
| $t_{rr1}$                                               | —    | 80   | 120  |                        | $T_J = 25^\circ\text{C}$                                               |
| $t_{rr2}$                                               | —    | 140  | 220  |                        | $T_J = 125^\circ\text{C}$                                              |
| $I_{RRM1}$ Peak Recovery Current                        | —    | 8.5  | 15   | A                      | $T_J = 25^\circ\text{C}$                                               |
|                                                         | —    | 14   | 25   |                        | $T_J = 125^\circ\text{C}$                                              |
| $Q_{rr1}$ Reverse Recovery Charge                       | —    | 340  | 900  | nC                     | $T_J = 25^\circ\text{C}$                                               |
| $Q_{rr2}$                                               | —    | 980  | 2300 |                        | $T_J = 125^\circ\text{C}$                                              |
| $di_{(rec)M}/dt1$ Peak Rate of Fall of Recovery Current | —    | 300  | —    | $\text{A}/\mu\text{s}$ | $T_J = 25^\circ\text{C}$                                               |
| $di_{(rec)M}/dt2$ During $t_b$                          | —    | 220  | —    |                        | $T_J = 125^\circ\text{C}$                                              |

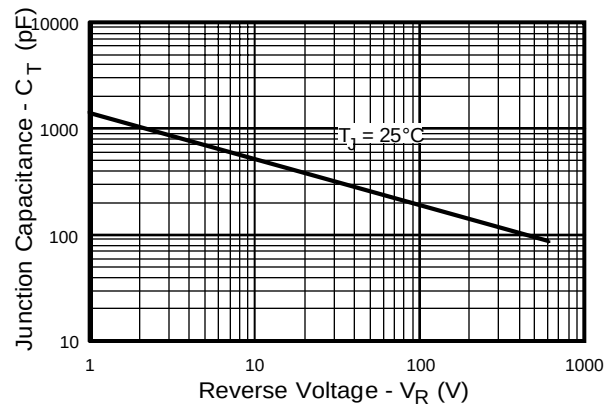




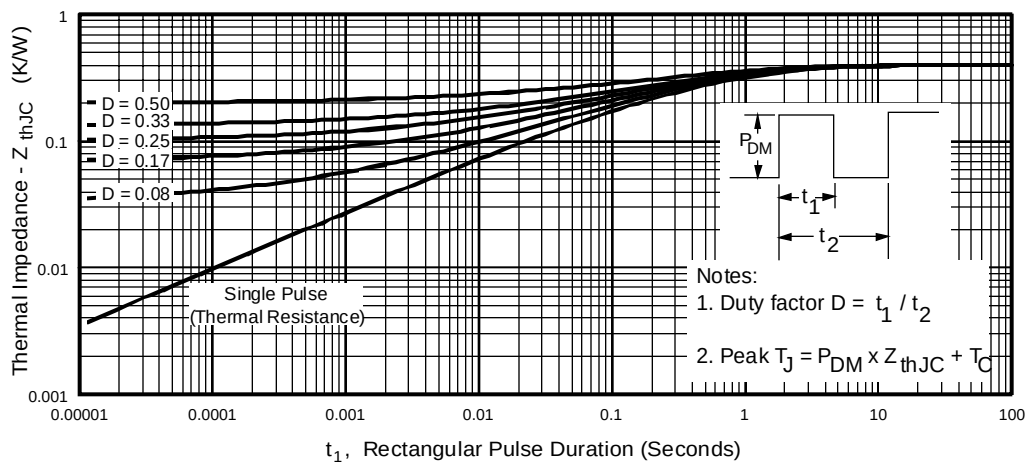
**Fig. 1** - Maximum Forward Voltage Drop vs. Instantaneous Forward Current, (per Leg)



**Fig. 2** - Typical Reverse Current vs. Reverse Voltage, (per Leg)



**Fig. 3** - Typical Junction Capacitance vs. Reverse Voltage, (per Leg)

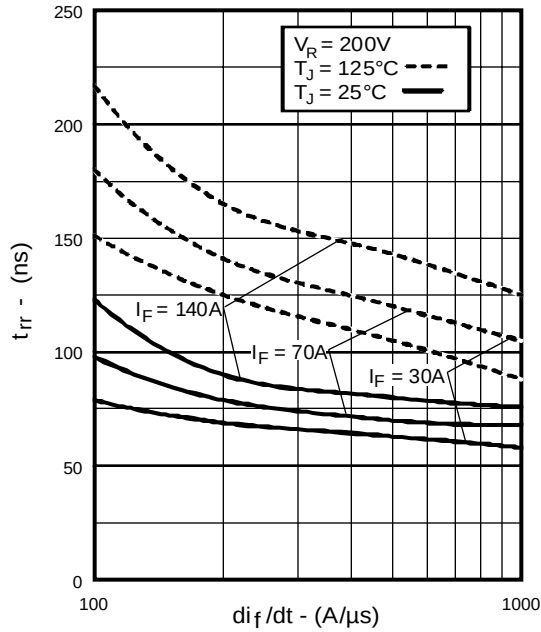


**Fig. 4** - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics, (per Leg)

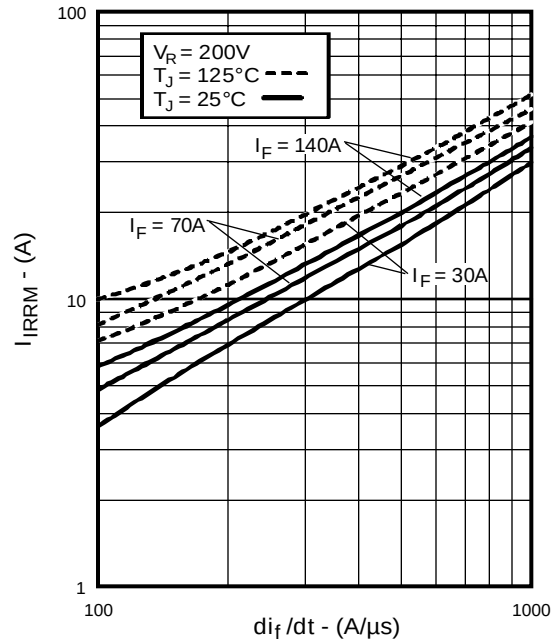
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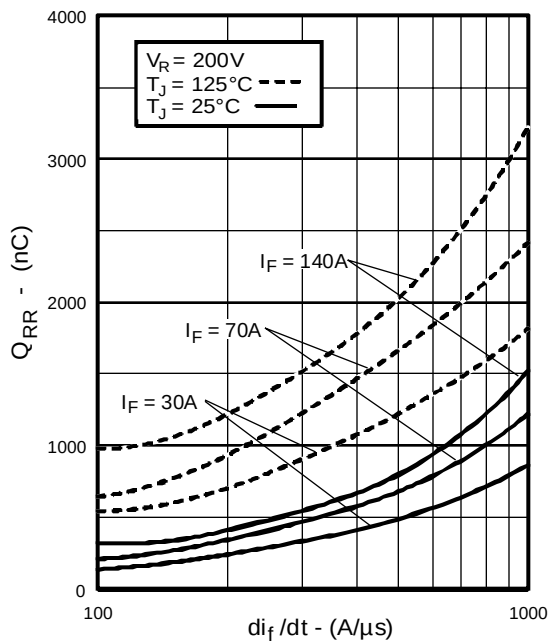
International  
IOR Rectifier



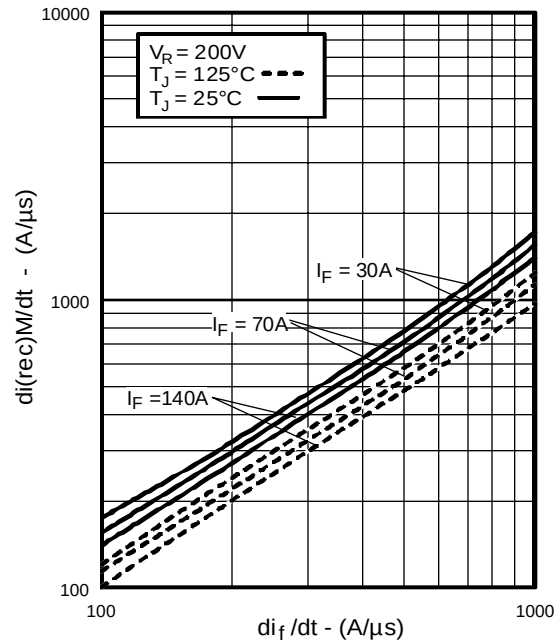
**Fig. 5** - Typical Reverse Recovery vs.  $di_f/dt$ , (per Leg)



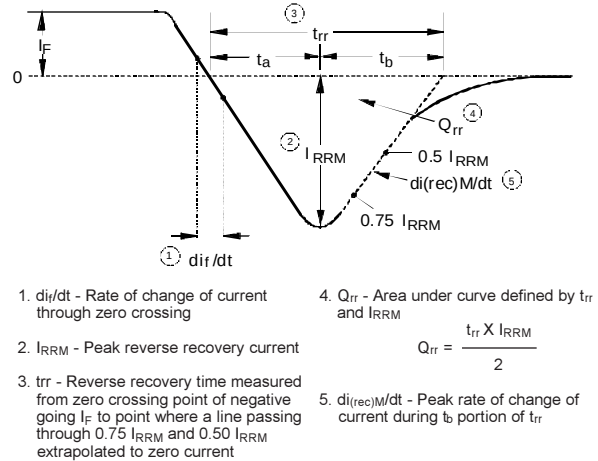
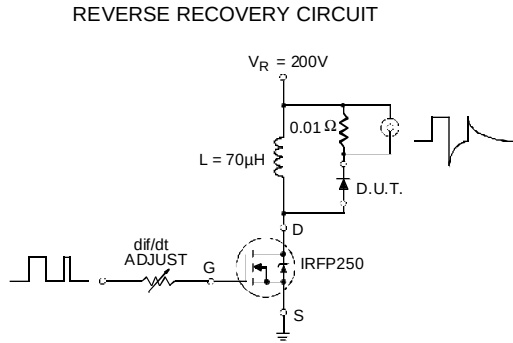
**Fig. 6** - Typical Recovery Current vs.  $di_f/dt$ , (per Leg)



**Fig. 7** - Typical Stored Charge vs.  $di_f/dt$ , (per Leg)

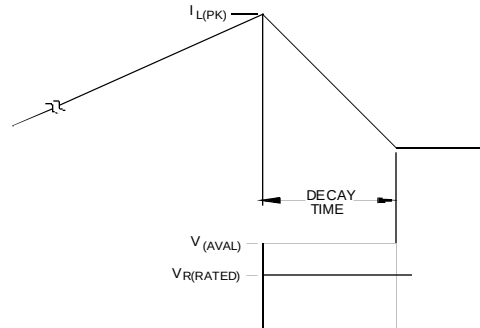
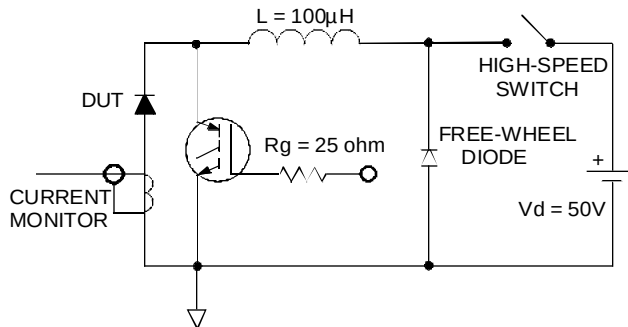


**Fig. 8** - Typical  $di_{(rec)M}/dt$  vs.  $di_f/dt$ , (per Leg)



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

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



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