

International  
**IOR** Rectifier

FRED™

**IRUD400CW60**

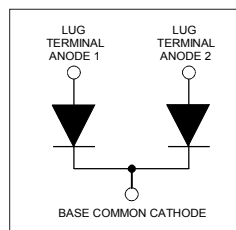
Ultrafast, Soft Recovery Diode

#### Features

- Ultrafast Recovery
- Lead-Free

#### Benefits

- Reduced RFI and EMI
- Higher Frequency Operation
- Reduced Snubbing
- Reduced Parts Count



$$V_R = 600V$$

$$I_{F(AV)} = 400A$$

#### Description/ Applications

These diodes are optimized to reduce losses and EMI/ RFI in high frequency power conditioning systems. The softness of the recovery eliminates the need for a snubber in most applications. These devices are ideally suited for HF welding, power converters and other applications where switching losses are significant portion of the total losses.

#### Absolute Maximum Ratings

| Parameters (*) |                              |                      | Max  | Units |
|----------------|------------------------------|----------------------|------|-------|
| $V_R$          | Cathode-to-Anode Voltage     |                      | 600  | V     |
| $I_{F(AV)}$    | Continuous Forward Current   | @ $T_C = 25^\circ C$ | 330  | A     |
|                |                              | @ $T_C = 85^\circ C$ | 230  |       |
|                |                              | @ $T_C = 97^\circ C$ | 200  |       |
| $I_{FSM}$      | Single Pulse Forward Current |                      | 1200 |       |
| $P_D$          | Maximum Power Dissipation    | @ $T_C = 25^\circ C$ | 660  | W     |
|                |                              | @ $T_C = 97^\circ C$ | 280  |       |

#### Case Styles

IRUD400CW60



TO-244

(\*) Per Leg unless otherwise specified

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

| Parameters                              | Min | Typ  | Max  | Units | Test Conditions                                               |
|-----------------------------------------|-----|------|------|-------|---------------------------------------------------------------|
| V <sub>BR</sub> Breakdown Voltage,      | 600 | -    | -    | V     | I <sub>R</sub> = 100μA                                        |
| V <sub>FM</sub> Forward Voltage         | -   | 1.45 | 2.0  |       | I <sub>F</sub> = 200A                                         |
|                                         | -   | 1.67 | 2.3  |       | I <sub>F</sub> = 400A                                         |
|                                         | -   | 1.13 | 1.4  |       | I <sub>F</sub> = 200A @ T <sub>J</sub> = 150°C                |
|                                         | -   | 1.39 | 1.8  |       | I <sub>F</sub> = 400A @ T <sub>J</sub> = 150°C                |
| I <sub>RM</sub> Reverse Leakage Current | -   | 0.3  | 1.38 | mA    | T <sub>J</sub> = 150°C, V <sub>R</sub> = V <sub>R</sub> Rated |
| L <sub>S</sub> Series Inductance        | -   | 5    | -    | nH    | from top of terminal hole to mounting plane                   |

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

| Parameters                              | Min | Typ  | Max | Units | Test Conditions                                                                         |
|-----------------------------------------|-----|------|-----|-------|-----------------------------------------------------------------------------------------|
| t <sub>rr</sub> Reverse Recovery Time   | -   | 90   | -   | ns    | I <sub>F</sub> = 200A, dif/dt = 200A/μs, V <sub>r</sub> = 200V                          |
|                                         | -   | 240  | -   |       | I <sub>F</sub> = 200A, dif/dt = 200A/μs, V <sub>r</sub> = 200V @ T <sub>J</sub> = 150°C |
| I <sub>RRM</sub> Peak Recovery Current  | -   | 8.3  | -   | A     | I <sub>F</sub> = 200A, dif/dt = 200A/μs, V <sub>r</sub> = 200V                          |
|                                         | -   | 24   | -   |       | I <sub>F</sub> = 200A, dif/dt = 200A/μs, V <sub>r</sub> = 200V @ T <sub>J</sub> = 150°C |
| Q <sub>rr</sub> Reverse Recovery Charge | -   | 830  | -   | nC    | I <sub>F</sub> = 200A, dif/dt = 200A/μs, V <sub>r</sub> = 200V                          |
|                                         | -   | 4730 | -   |       | I <sub>F</sub> = 200A, dif/dt = 200A/μs, V <sub>r</sub> = 200V @ T <sub>J</sub> = 150°C |

**Thermal - Mechanical Characteristics**

| Parameters                                             | Min      | Typ      | Max      | Units           |
|--------------------------------------------------------|----------|----------|----------|-----------------|
| T <sub>J</sub> Max. Junction Temperature Range         | - 40     | -        | 150      | °C              |
| T <sub>Stg</sub> Max. Storage Temperature Range        | - 40     | -        | 150      |                 |
| R <sub>thJC</sub> Thermal Resistance, Junction to Case | -        | -        | 0.19     | °C/W            |
| Per Leg                                                |          |          | 0.095    |                 |
| R <sub>thCS</sub> Thermal Resistance, Case to Heatsink | -        | 0.10     | -        |                 |
| Wt Weight                                              | -        | 68 (2.4) | -        | g (oz)          |
| T Mounting Torque                                      | 30 (3.4) | -        | 40 (4.6) | lbf.in<br>(N.m) |
|                                                        | 12 (1.4) | -        | 18 (2.1) |                 |
|                                                        | 30 (3.4) | -        | 40 (4.6) |                 |
| Vertical Pull                                          | -        | -        | 80       | lbf.in          |
| 2 inch. Lever Pull                                     | -        | -        | 35       |                 |

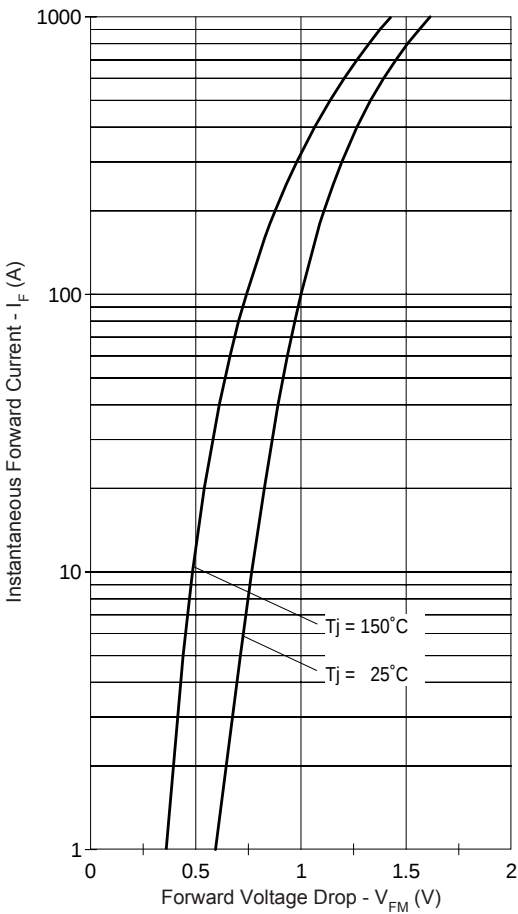


Fig. 1 - Typical Forward Voltage Drop vs. Instantaneous Forward Current (per Leg)

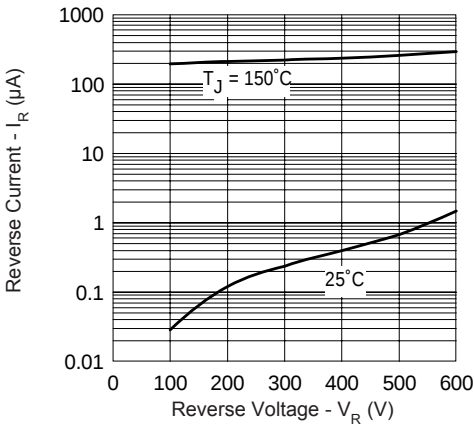


Fig. 2 - Typical Reverse Current vs. Reverse Voltage (per Leg)

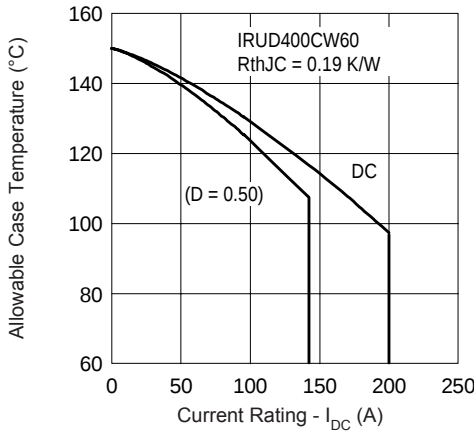


Fig. 3 - Max. Current Rating Capability (per Leg)

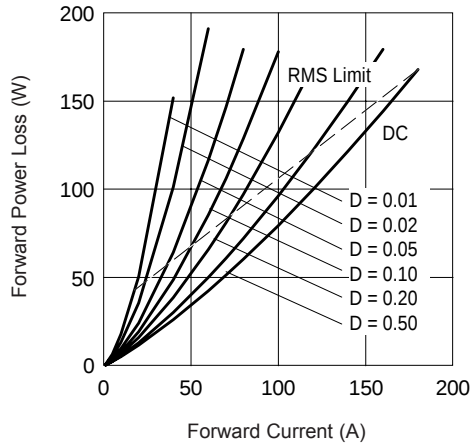


Fig. 4 - Typical Recovery Current vs.  $di_f/dt$  (per Leg)

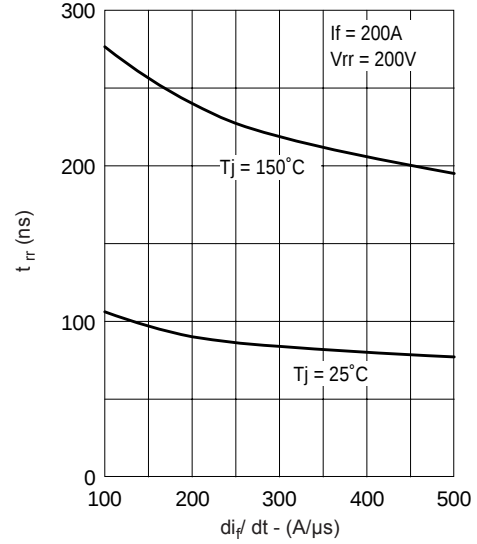


Fig. 5 - Typical Reverse Recovery Time vs.  $di_f/dt$  (per Leg)

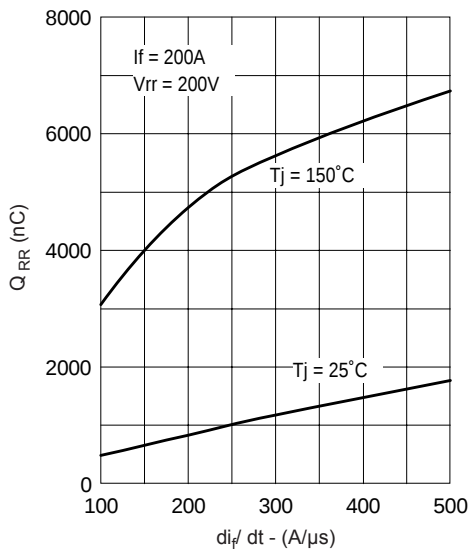


Fig. 6 - Typical Reverse Recovery Charge vs.  $di_f/dt$  (per Leg)

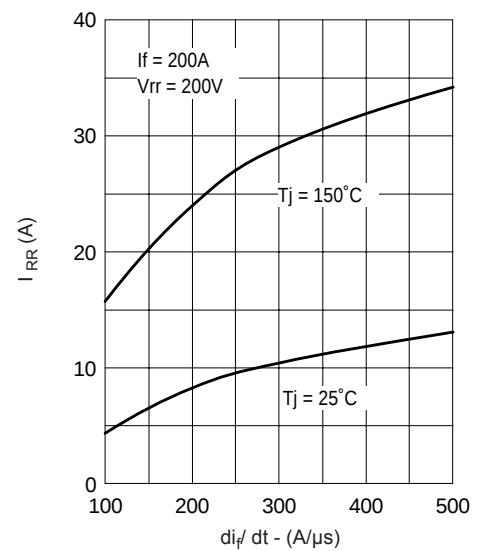
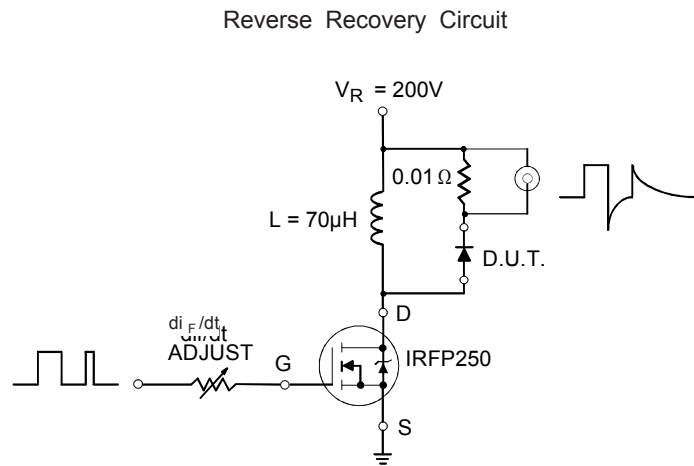
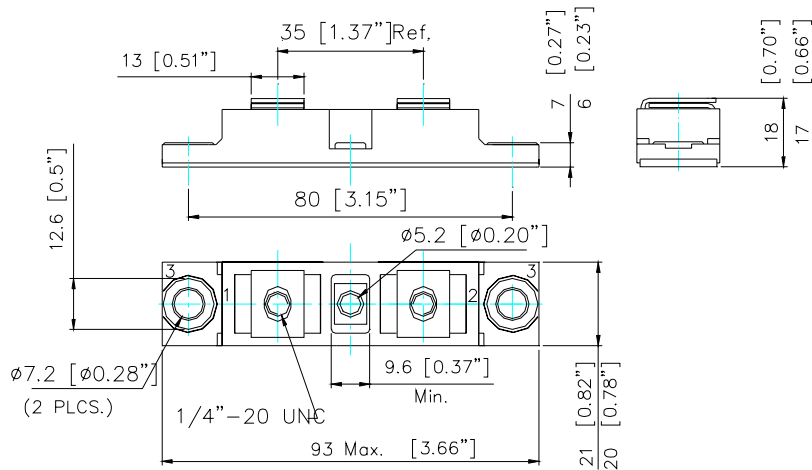


Fig. 7 - Typical Reverse Recovery Current vs.  $di_f/dt$  (per Leg)



**Fig. 8 - Reverse Recovery Parameter Test Circuit**

## Outline Table



**Conforms to JEDEC Outline TO-244**  
Dimensions in millimeters and (inches)

## Ordering Information Table

| Device Code |    |                                            |   |   |    |
|-------------|----|--------------------------------------------|---|---|----|
| IR          | UD | 400                                        | C | W | 60 |
| 1           | 2  | 3                                          | 4 | 5 | 6  |
| 1           | -  | International Rectifier                    |   |   |    |
| 2           | -  | UD = Fred                                  |   |   |    |
| 3           | -  | Current Rating (400 = 400A)                |   |   |    |
| 4           | -  | Circuit Configuration (C = Common Cathode) |   |   |    |
| 5           | -  | W = TO-244 Wire Bondable not Isolated      |   |   |    |
| 6           | -  | Voltage Rating (60 = 600V)                 |   |   |    |

Data and specifications subject to change without notice.  
This product has been designed for Industrial Level.  
Qualification Standards can be found on IR's Web site.

International  
**IR** Rectifier

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Visit us at [www.irf.com](http://www.irf.com) for sales contact information. 05/05