

FRED

HFB50HC20C

Ultrafast, Soft Recovery Diode

**Features**

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

$$V_R = 200V$$

$$I_{F(AV)} = 50A$$

$$t_{rr} = 35ns$$

**Description**

These Ultrafast, soft recovery 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.

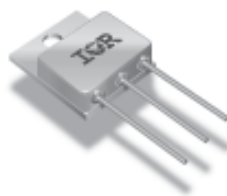
**Absolute Maximum Ratings**

|                          | Parameter                                                      | Max.        | Units      |
|--------------------------|----------------------------------------------------------------|-------------|------------|
| $V_R$                    | Cathode to Anode Voltage ( Per Leg )                           | 200         | V          |
| $I_{F(AV)}$              | Continuous Forward Current, ① $T_C = 107^\circ C$              | 50          | A          |
| $I_{FSM}$                | Single Pulse Forward Current, ② $T_C = 25^\circ C$ ( Per Leg ) | 300         |            |
| $P_D @ T_C = 25^\circ C$ | Maximum Power Dissipation                                      | 130         | W          |
| $T_J, T_{STG}$           | Operating Junction and Storage Temperature Range               | -55 to +150 | $^\circ C$ |

**Note:** ① D.C. = 50% rect. wave

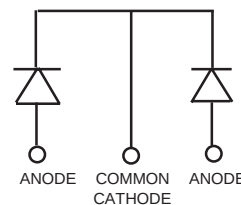
② 1/2 sine wave, 60 Hz , P.W. = 8.33 ms

**CASE STYLE**



**TO-258AA**

**(ISOLATED BASE)**



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

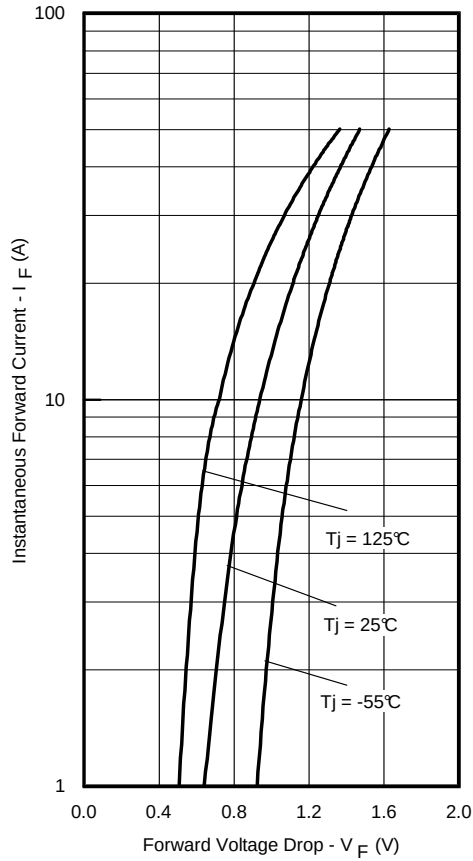
|                 | Parameter                             | Min. | Typ. | Max. | Units | Test Conditions                                                         |
|-----------------|---------------------------------------|------|------|------|-------|-------------------------------------------------------------------------|
| V <sub>BR</sub> | Cathode Anode Breakdown Voltage       | 200  | —    | —    | V     | I <sub>R</sub> = 100μA                                                  |
| V <sub>F</sub>  | Forward Voltage<br>See Fig. 1         | —    | —    | 1.36 | V     | I <sub>F</sub> = 25A, T <sub>J</sub> = -55°C                            |
|                 |                                       | —    | —    | 1.20 |       | I <sub>F</sub> = 25A, T <sub>J</sub> = 25°C                             |
|                 |                                       | —    | —    | 1.49 |       | I <sub>F</sub> = 50A, T <sub>J</sub> = 25°C                             |
|                 |                                       | —    | —    | 0.99 |       | I <sub>F</sub> = 25A, T <sub>J</sub> = 125°C                            |
| I <sub>R</sub>  | Reverse Leakage Current<br>See Fig. 2 | —    | —    | 10   | μA    | V <sub>R</sub> = V <sub>R</sub> Rated                                   |
|                 |                                       | —    | —    | 100  | μA    | V <sub>R</sub> = V <sub>R</sub> Rated, T <sub>J</sub> = 125°C           |
| C <sub>T</sub>  | Junction Capacitance, See Fig. 3      | —    | —    | 200  | pF    | V <sub>R</sub> = 200V                                                   |
| L <sub>S</sub>  | Series Inductance                     | —    | 8.7  | —    | nH    | Measured from anode lead to cathode lead , 6mm ( 0.025 in) from package |

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

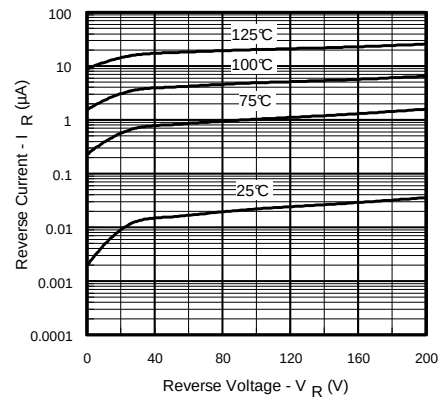
|                           | Parameter                             | Min. | Typ. | Max. | Units | Test Conditions                                              |
|---------------------------|---------------------------------------|------|------|------|-------|--------------------------------------------------------------|
| t <sub>rr</sub>           | Reverse Recovery Time                 | —    | —    | 35   | ns    | I <sub>F</sub> = 0.5A, V <sub>R</sub> = 30V, di/dt = 300A/μs |
| t <sub>rr1</sub>          | Reverse Recovery Time                 | —    | 46   | —    | ns    | T <sub>J</sub> = 25°C See Fig. 5                             |
| t <sub>rr2</sub>          |                                       | —    | 84   | —    |       | T <sub>J</sub> = 125°C                                       |
| I <sub>RRM1</sub>         | Peak Recovery Current                 | —    | 5.7  | —    | A     | T <sub>J</sub> = 25°C See Fig. 6                             |
| I <sub>RRM2</sub>         |                                       | —    | 12.5 | —    |       | T <sub>J</sub> = 125°C                                       |
| Q <sub>rr1</sub>          | Reverse Recovery Charge               | —    | 150  | —    | nC    | T <sub>J</sub> = 25°C See Fig. 7                             |
| Q <sub>rr2</sub>          |                                       | —    | 595  | —    |       | T <sub>J</sub> = 125°C                                       |
| di <sub>(rec)</sub> M/dt1 | Peak Rate of Fall of Recovery Current | —    | 530  | —    | A/μs  | T <sub>J</sub> = 25°C See Fig. 8                             |
| di <sub>(rec)</sub> M/dt2 | During t <sub>b</sub>                 | —    | 1130 | —    |       | T <sub>J</sub> = 125°C                                       |

**Thermal - Mechanical Characteristics**

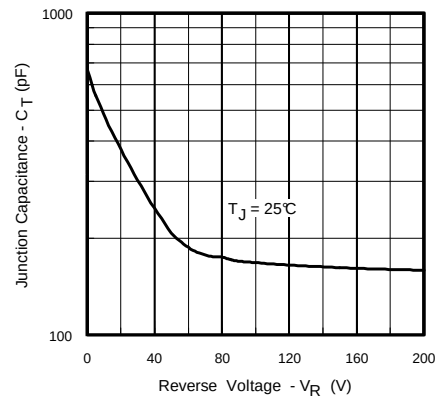
|                   | Parameter                               | Typ. | Max. | Units |
|-------------------|-----------------------------------------|------|------|-------|
| R <sub>thJC</sub> | Junction-to-Case, Single Leg Conducting | —    | 0.96 | °C/W  |
| Wt                | Weight                                  | 10.9 | —    | g     |



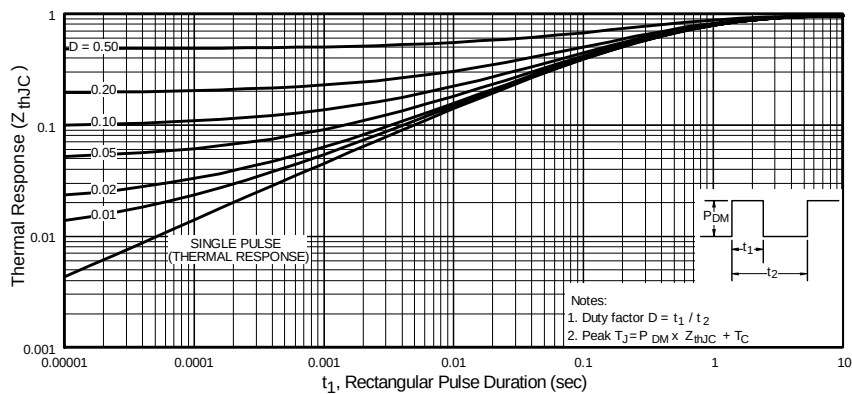
**Fig. 1** - Maximum Forward Voltage Drop Vs. Instantaneous Forward Current ( Per Leg )



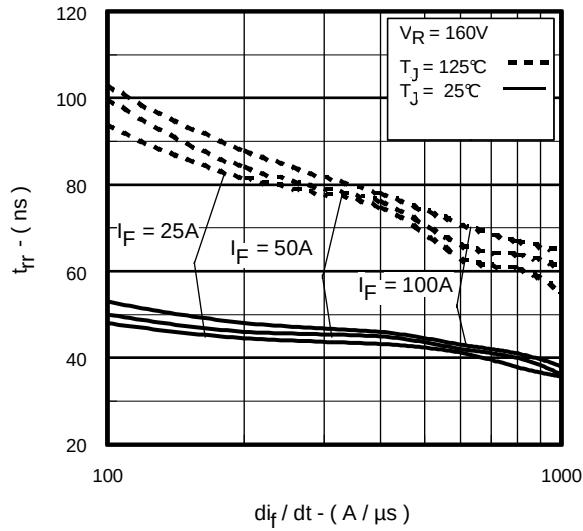
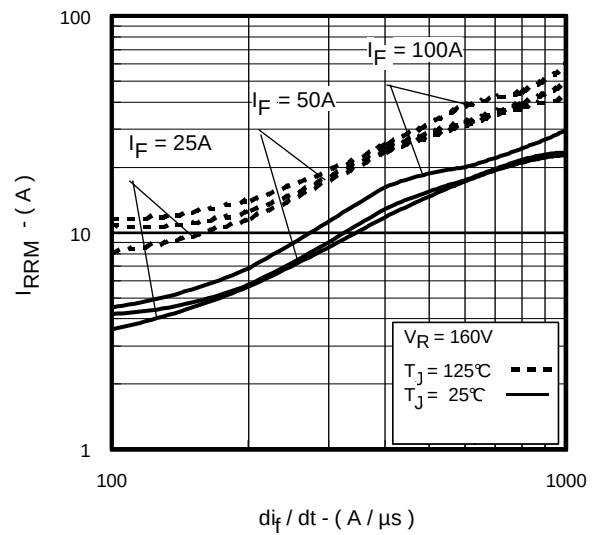
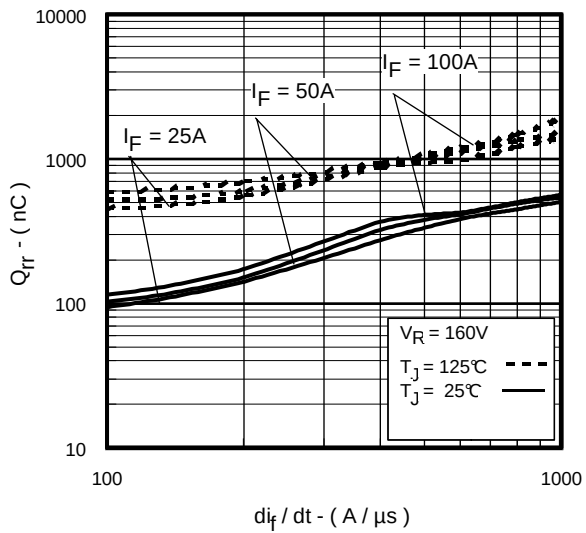
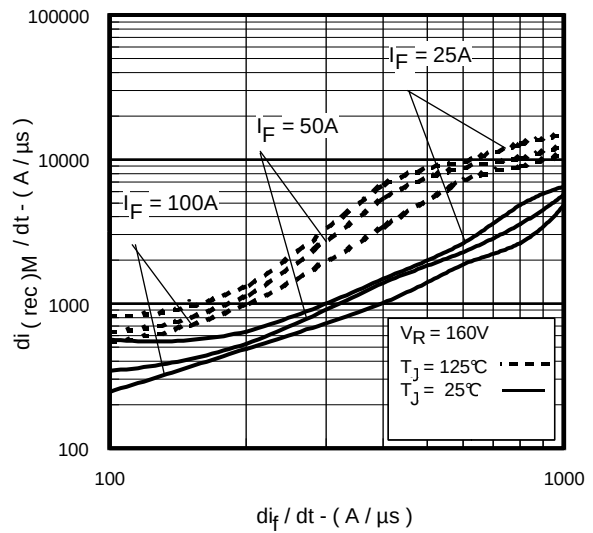
**Fig. 2** - Typical Reverse Current Vs. Reverse Voltage ( Per Leg )

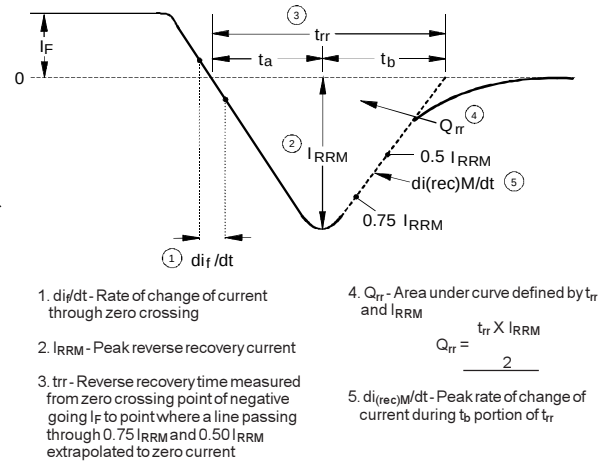
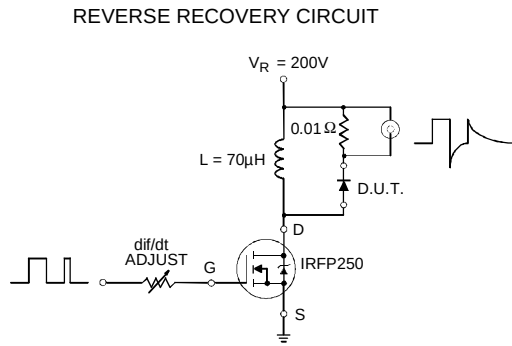


**Fig. 3** - Typical Junction Capacitance Vs. Reverse Voltage ( Per Leg )



**Fig. 4** - Maximum Thermal Impedance  $Z_{thjc}$  Characteristics ( Per Leg )

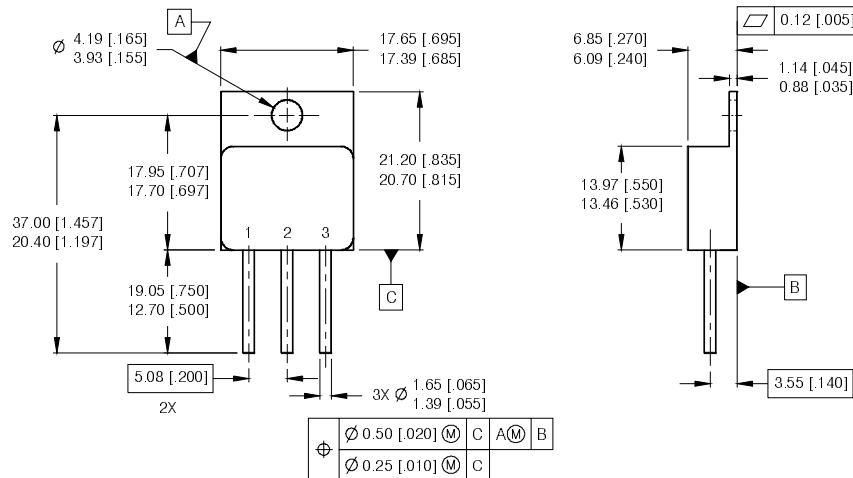
Fig. 5 - Typical Reverse Recovery Vs.  $di_f/dt$  (Per Leg)Fig. 6 - Typical Recovery Current Vs.  $di_f/dt$  (Per Leg)Fig. 7 - Typical Stored Charge Vs.  $di_f/dt$  (Per Leg)Fig. 8 - Typical  $di_{(rec)M}/dt$  Vs.  $di_f/dt$  (Per Leg)



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

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

## Case Outline and Dimensions — TO-258AA



**NOTES:**

1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
3. CONTROLLING DIMENSION: INCH.
4. CONFORMS TO JEDEC OUTLINE TO-258AA.

**PIN ASSIGNMENTS**

- 1 = ANODE 1
- 2 = COMMON CATHODE
- 3 = ANODE 2