# HFB60HF20

## HEXFRED
## ULTRAFAST, SOFT RECOVERY DIODE

$V_R$ = 200V
$I_{F(AV)}$ = 60A
$t_{rr}$ = 50ns

### Features

- Reduced RFI and EMI
- Reduced Snubbing
- Extensive Characterization of Recovery Parameters
- Hermetically Sealed
- Surface Mount

### Description

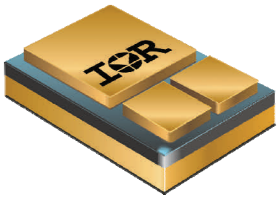
These Ultrafast, soft recovery diodes are optimized to reduce losses and EMI/RFI in high frequency power conditioning systems. An extensive characterization of the recovery behavior for different values of current, temperature and di/dt simplifies the calculations of losses in the operating conditions. 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

| Characteristics | Parameter | Max. | Units |
|---|---|---|---|
| $V_R$ | Cathode to Anode Voltage | 200 | V |
| $I_{F\ (AV)}$ | Continuous Forward Current, $T_C$ = 55°C ① | 60 | A |
| $I_{FSM}$ | Single Pulse Forward Current , $T_C$ = 25°C ② | 500 | A |
| $P_D$ @ $T_C$ = 25°C | Maximum Power Dissipation | 70 | W |
| $T_J$, $T_{STG}$ | Operating Junction and Storage Temperature Range | -55 to 150 | °C |

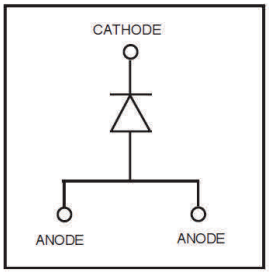
**Notes:**
① D.C. = 50% rectangle wave
② 1/2 sine wave, 60Hz, Pulse Width = 8.33ms

**CASE STYLE**



**SMD-1**

**PIN ASSIGNMENTS**



## Electrical Characteristics @ $T_J$ = 25°C (unless otherwise specified)

| Symbol | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $V_{BR}$ | Cathode Anode Breakdown Voltage | 200 | —— | —— | V | $I_R$ = 100µA |
| $V_{FM}$ | Max Forward Voltage See Fig. 1 | —— | —— | 1.15 | V | $I_F$ = 30A, $T_J$ = -55°C |
| | | —— | —— | 0.97 | | $I_F$ = 30A, $T_J$ = 25°C |
| | | —— | —— | 1.08 | | $I_F$ = 60A, $T_J$ = 25°C |
| | | —— | —— | 1.30 | | $I_F$ = 120A, $T_J$ = 25°C |
| | | —— | —— | 0.8 | | $I_F$ = 30A, $T_J$ = 125°C |
| $I_{RM}$ | Max Reverse Leakage Current | —— | —— | 50 | µA | $V_R = V_R$ Rated |
| | See Fig. 2 | | | 1.0 | mA | $V_R = V_R$ Rated, $T_J$ = 125°C |
| $C_T$ | Junction Capacitance, See Fig. 3 | —— | —— | 200 | pF | $V_R$ = 200V |
| $L_S$ | Series Inductance | —— | 5.9 | —— | nH | Measured from center of cathode pad to center of anode pad |

## Dynamic Recovery Characteristics @ $T_J$ = 25°C (unless otherwise specified)

| Symbol | Parameter | Min. | Typ. | Max. | Units | Test Conditions | |
|---|---|---|---|---|---|---|---|
| $t_{rr1}$ | Reverse Recovery Time | —— | 45 | 50 | ns | $T_J$ = 25°C | $I_F$ = 60A |
| $t_{rr2}$ | See Fig. 5 | —— | 71 | —— | | $T_J$ = 125°C | |
| $I_{RRM1}$ | Peak Recovery Current | —— | 5.3 | —— | A | $T_J$ = 25°C | $V_R$ = 160V |
| $I_{RRM2}$ | See Fig. 6 | —— | 10.3 | —— | | $T_J$ = 125°C | |
| $Q_{rr1}$ | Reverse Recovery Charge | —— | 120 | —— | nC | $T_J$ = 25°C | $di_f/dt$ = 200A/µs |
| $Q_{rr2}$ | See Fig. 7 | —— | 366 | —— | | $T_J$ = 125°C | |
| $di_{(rec)M}/dt1$ | Peak Rate of Fall of Recovery Current | —— | 590 | —— | A/µs | $T_J$ = 25°C | |
| $di_{(rec)M}/dt1$ | During tb - See Fig. 8 | —— | 1290 | —— | | $T_J$ = 125°C | |

## Thermal - Mechanical Characteristics

| Symbol | Parameter | Typ. | Max. | Units |
|---|---|---|---|---|
| $R_{\theta JC}$ | Junction-to-Case, See Fig. 4 | —— | 1.76 | °C/W |
| Wt | Weight | 2.6 | —— | g |

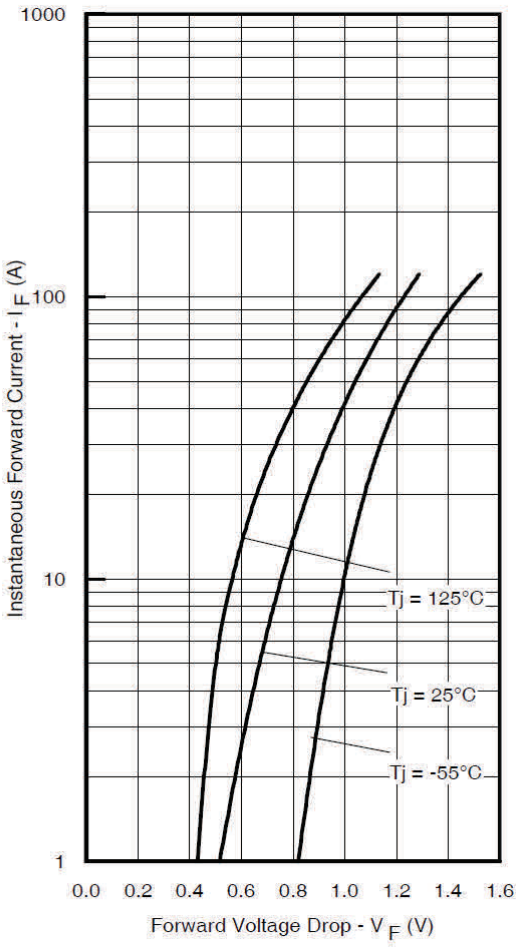



**Fig. 1** Maximum Forward Voltage Drop Vs. Instantaneous Forward Current

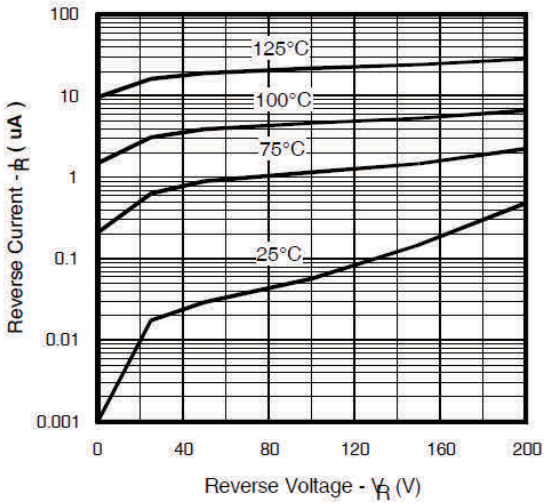



**Fig. 2** Typical Values of Reverse Current Vs. Reverse Voltage

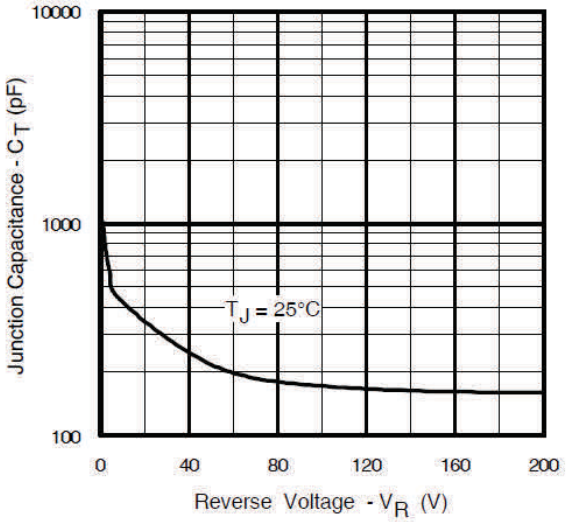



**Fig. 3** Typical Junction Capacitance Vs. Reverse Voltage

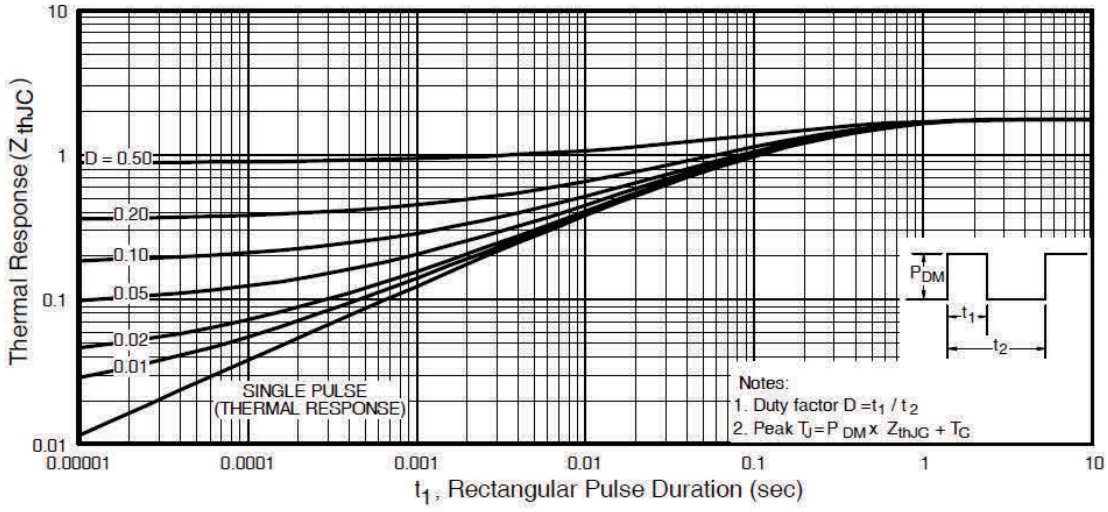



**Fig. 4** Max. Thermal Impedance ZthJC Characteristics

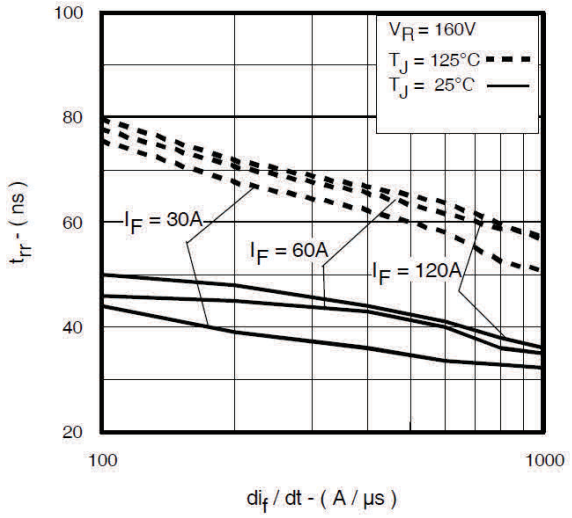



**Fig. 5** Typical Reverse Recovery Vs $di_f/dt$

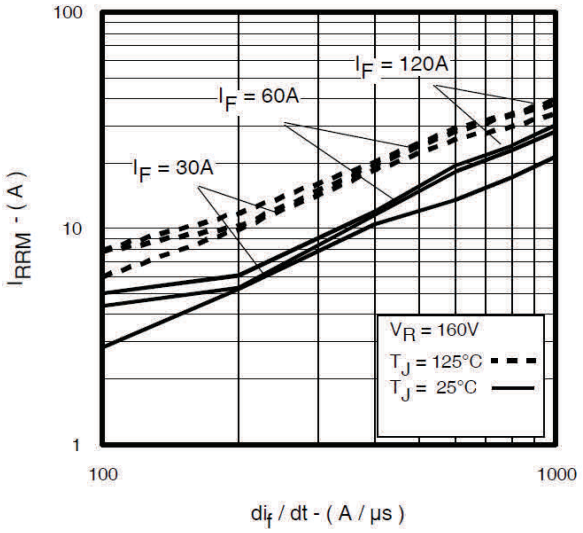



**Fig. 6** Typical Recovery Current Vs $di_f/dt$

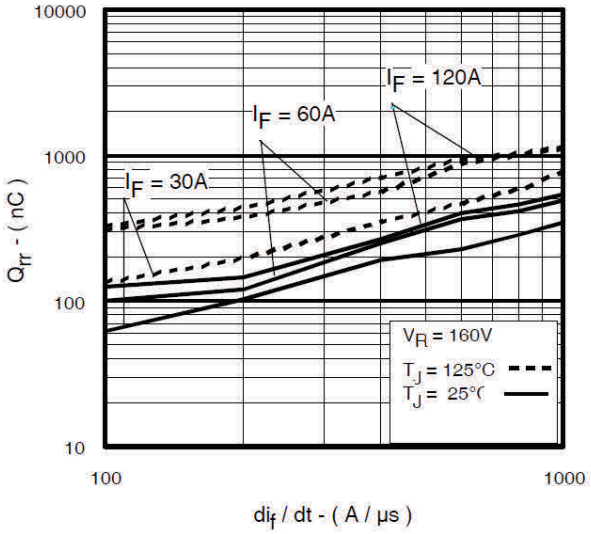



**Fig. 7** Typical Stored Charge Vs $di_f/dt$

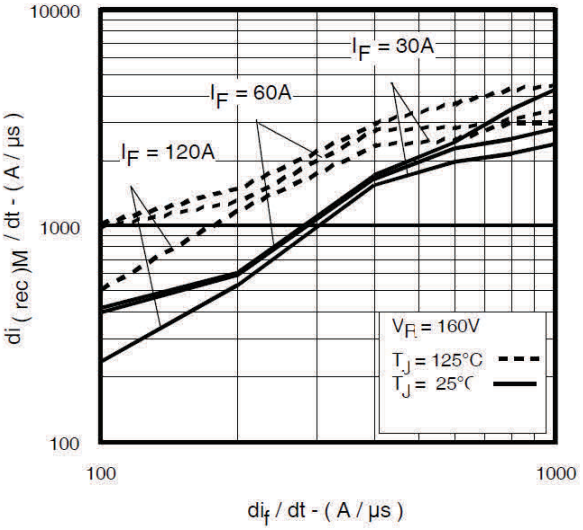



**Fig. 8** Typical $di_{(rec)M}/dt$ Vs $di_f/dt$

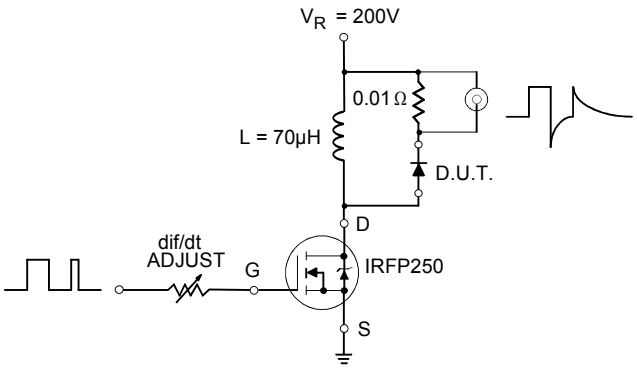
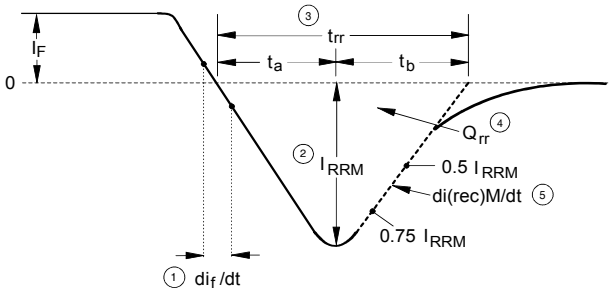


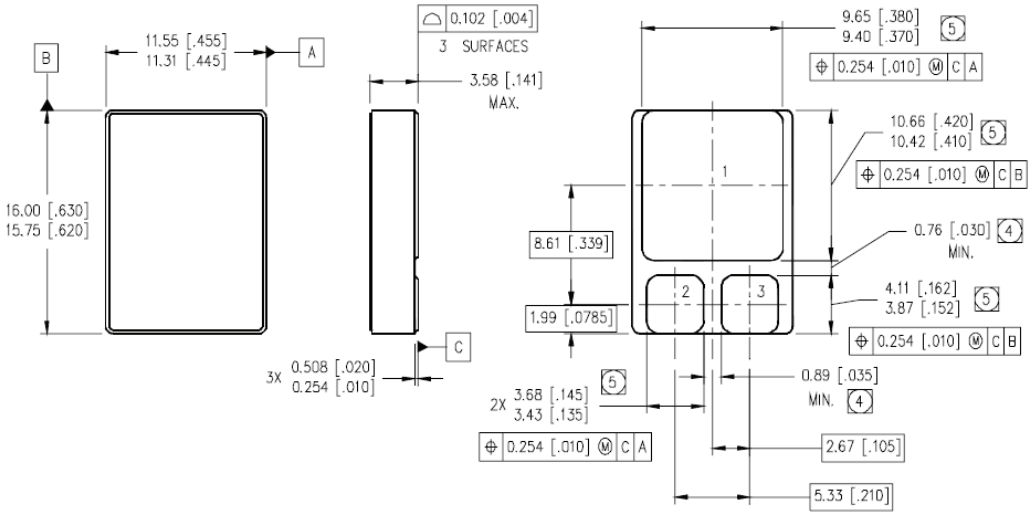

**Fig. 9** Typical Reverse Recovery Parameter Test Circuit




① $di_f/dt$ - Rate of change of current through zero crossing.
② $I_{RRM}$ - Peak reverse recovery current.
③ $t_{rr}$ - Reverse recovery time measured from zero crossing point of negative going $I_F$ to point where a line passing through $0.75I_{RRM}$ and $0.5I_{RRM}$ extrapolated to zero current.
④ $Q_{rr}$ - Area under curve defined by $t_{rr}$ and $I_{RRM}$ - $Q_{rr} = (t_{rr} \times I_{RRM}) / 2$
⑤ $di_{(rec)M}/dt$ - Peak rate of change of current during $t_b$ position of $t_{rr}$.

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

## Case Outline and Dimensions — SMD-1




NOTES:

1. DIMENSIONING & TOLERANCING PER ASME Y14.5M–1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. DIMENSION INCLUDES METALLIZATION FLASH.
5. DIMENSION DOES NOT INCLUDE METALLIZATION FLASH.

PAD ASSIGNMENTS

1 = CATHODE
2 = COMMON ANODE
3 = COMMON ANODE

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