# HFA35HB120C

PD-20371F

## Ultrafast, Soft Recovery Diode
## Thru-Hole (TO-254AA)
## 1200V, 15A

### Features

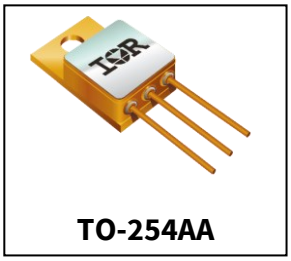
- Reduced RFI and EMI
- Reduced snubbing
- Extensive characterization of recovery parameters
- Hermetic package
- Ceramic eyelets

### Product Summary

- **$V_R$:** 1200V
- **$V_F$:** 4.4V
- **$t_{rr}$:** 100ns
- **$Q_{rr}$:** 370nC
- **$di_{(rec)M}/dt$:** 380A/µs

### Potential Applications

- DC-DC converter
- Motor drives



**TO-254AA**

### Product Validation

Qualified according to MIL-PRF-19500 for space applications

### 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.

### Ordering Information

**Table 1 Ordering options**

| Part number | Package | Screening Level |
|---|---|---|
| HFA35HB120C | TO-254AA | COTS |
| HFA35HB120SCV | TO-254AA | JANTXV-equivalent |
| HFA35HB120SCX | TO-254AA | JANTX-equivalent |
| HFA35HB120SCS | TO-254AA | S-level |

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# 1 Absolute Maximum Ratings

**Table 2 Absolute Maximum Ratings**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_R$ | DC Reverse Voltage | 1200 | V |
| $I_F$ | Continuous Forward Current, $T_C$ =100 °C [1] | 15 | A |
| $I_{FSM}$ | Single pulse Forward Current, $T_C$ = 25°C [2] (Per Leg) | 50 | A |
| $P_D$ @ $T_C$ = 25°C | Maximum Power Dissipation | 63 | W |
| $T_J$<br>$T_{STG}$ | Operating Junction and<br>Storage Temperature Range | -55 to 150 | °C |
| Wt | Weight | 9.3 (Typical) | g |

[1] DC = 50% rect. wave

[2] ½ sine wave, 60 Hz, Pulse width = 8.33 ms

# 2 Device Characteristics

## 2.1 Electrical Characteristics

**Table 3 Electrical Characteristics (Per Leg) @ $T_J$ =25°C (unless otherwise specified)**

| Symbol | Parameter | Min. | Typ. | Max. | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| $V_{BR}$ | Cathode Anode Breakdown Voltage | 1200 | — | — | V | $I_R$ = 250µA |
| $V_F$ | Forward Voltage Drop See Fig. 1 | — | — | 3.1 | V | $I_F$ = 7.0A, $T_J$ = -55°C |
| | | — | — | 3.3 | | $I_F$ = 7.0A, $T_J$ = 25°C |
| | | — | — | 4.4 | | $I_F$ = 15A, $T_J$ = 25°C |
| | | — | — | 2.8 | | $I_F$ = 7.0A, $T_J$ = 125°C |
| $I_R$ | Reverse Leakage Current See Fig. 2 | — | — | 10 | µA | $V_R$ = $V_R$ Rated |
| | | — | — | 1.0 | mA | $V_R$ = 960V, $T_J$ = 125°C |
| $C_T$ | Junction Capacitance See Fig. 3 | — | 10 | 15 | pF | $V_R$ = 200V |
| $L_S$ | Series Inductance | — | 8.7 | — | nH | Measured from anode lead to cathode lead, 6mm (0.25 in) from package |

## 2.2 Dynamic Recovery Characteristics

**Table 4 Dynamic Recovery Characteristics (Per Leg) @ $T_J$ =25°C (unless otherwise specified)**

| Symbol | Parameter | Min. | Typ. | Max. | Unit | Test Conditions | |
|---|---|---|---|---|---|---|---|
| $t_{rr1}$ | Reverse Recovery Time See Fig. 5 | — | 58 | 100 | ns | $T_J$ = 25°C | $I_F$ = 7A |
| $t_{rr2}$ | | — | 110 | 165 | | $T_J$ = 125°C | |
| $I_{RRM1}$ | Peak Recovery Current See Fig. 6 | — | 5.4 | 8.1 | A | $T_J$ = 25°C | $V_R$ = 200V |
| $I_{RRM2}$ | | — | 7.2 | 10.8 | | $T_J$ = 125°C | |
| $Q_{rr1}$ | Reverse Recovery Charge See Fig. 7 | — | 185 | 370 | nC | $T_J$ = 25°C | $di_f/dt$ = 200 A/ µs |
| $Q_{rr2}$ | | — | 395 | 590 | | $T_J$ = 125°C | |
| $di_{(rec)M}/dt_1$ | Peak Rate of Fall of Recovery Current During $t_b$ See Fig. 8 | — | 255 | 380 | A/ µs | $T_J$ = 25°C | |
| $di_{(rec)M}/dt_2$ | | — | 160 | 240 | | $T_J$ = 125°C | |

## 2.3 Thermal-Mechanical Characteristics

**Table 5 Thermal-Mechanical Characteristics**

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JC}$ | Junction to Case, Single Leg Conducting | — | 2.0 | °C/W |

# 3 Electrical Characteristics Curves

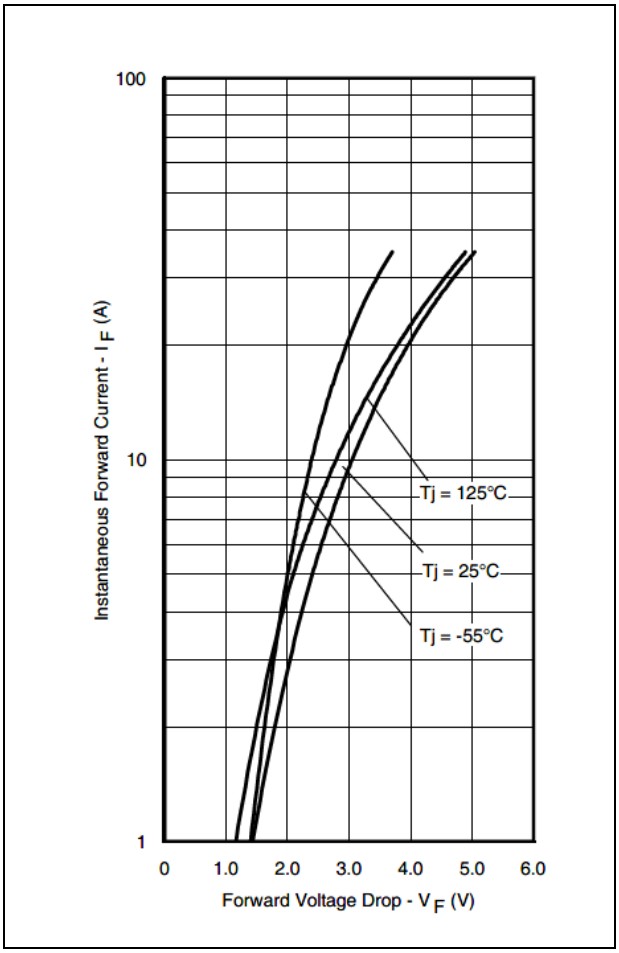



**Figure 1 Typical Forward Voltage Drop Vs. Instantaneous Forward Current (Per Leg)**

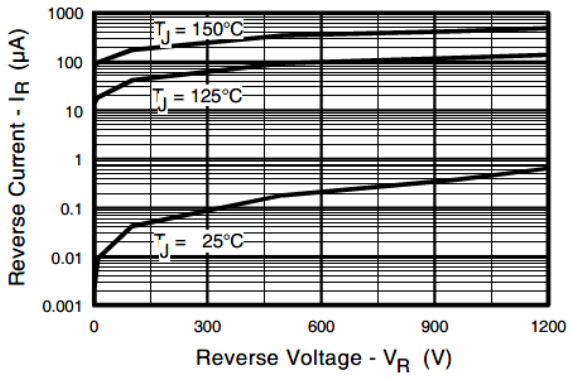



**Figure 2 Typical Reverse Current Vs. Reverse Voltage (Per Leg)**

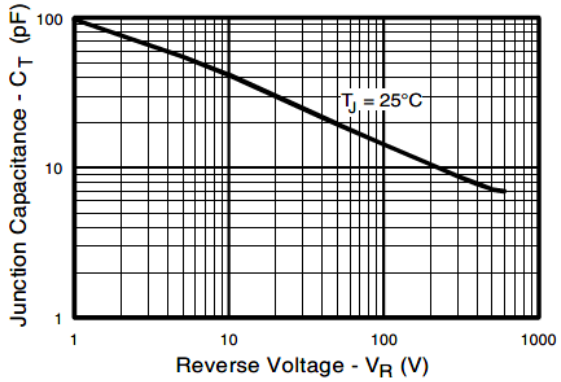



**Figure 3 Typical Junction Capacitance Vs. Reverse Voltage (Per Leg)**

## Electrical Characteristics Curves

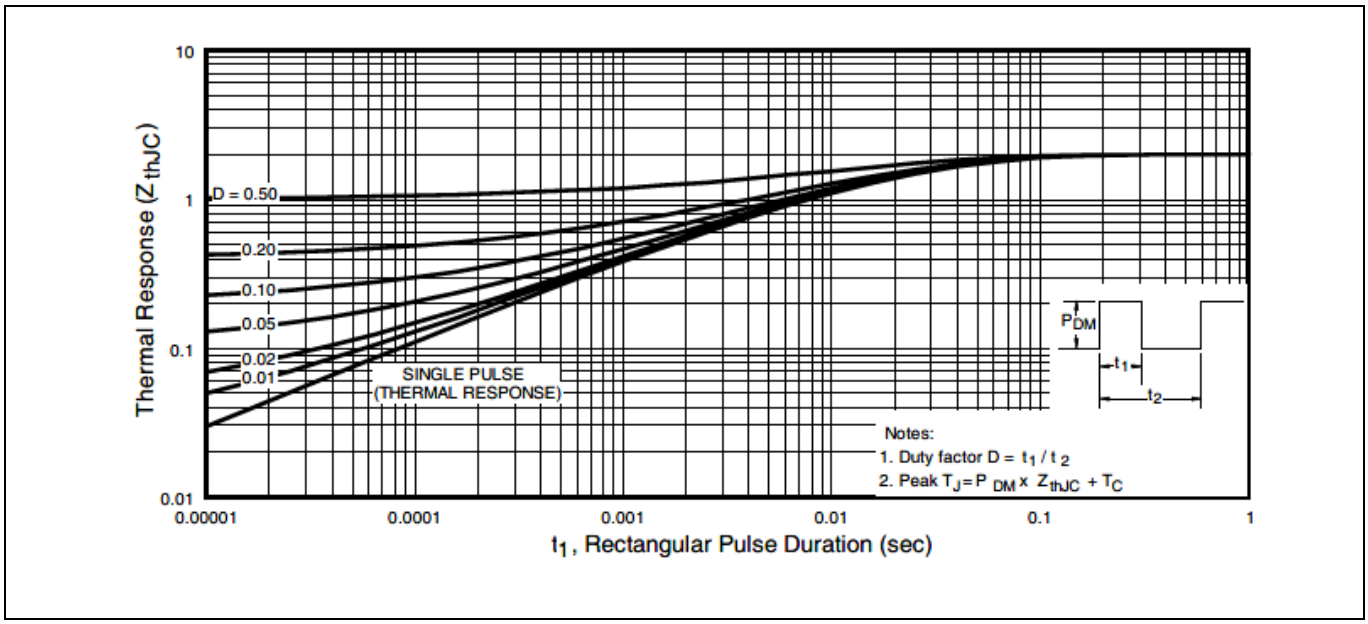



**Figure 4 Maximum Thermal Impedance $Z_{thJC}$ Characteristics (Per Leg)**

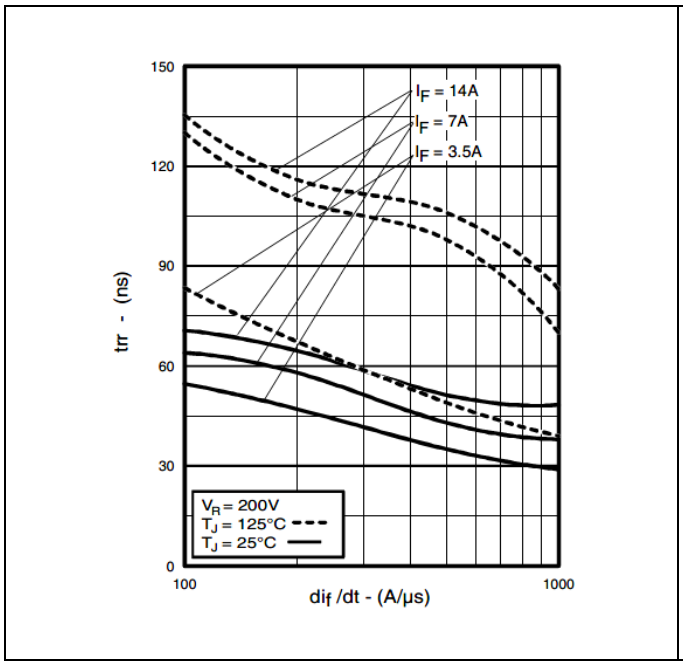



**Figure 5 Typical Reverse Recovery Vs. $d_{if}/dt$**

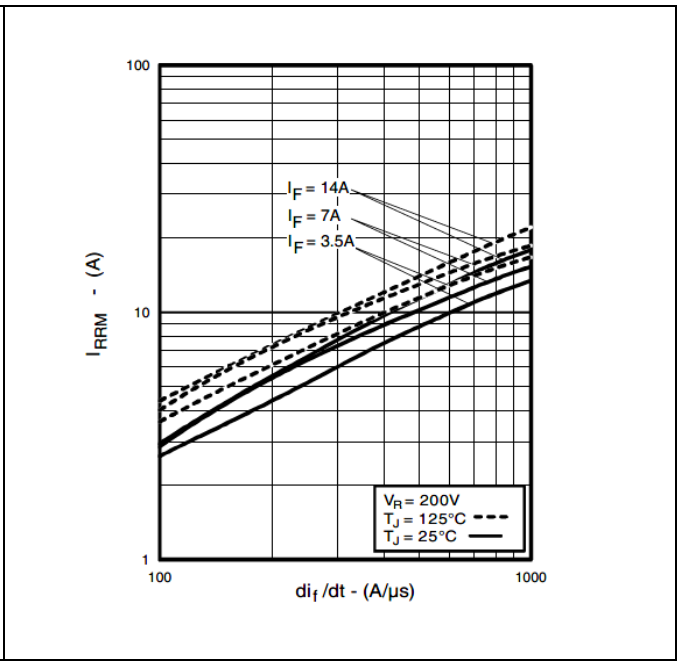



**Figure 6 Typical Recovery Current Vs. $d_{if}/dt$**

## Electrical Characteristics Curves

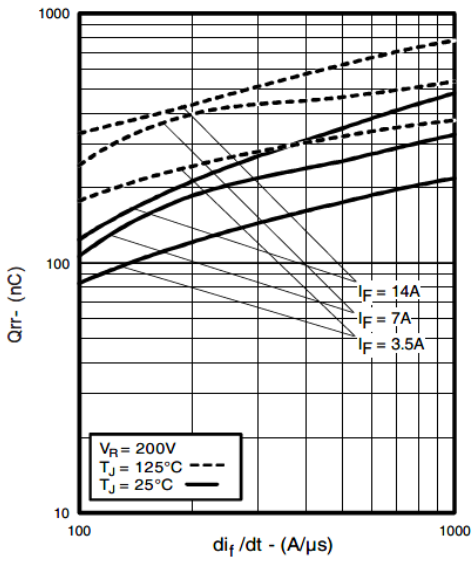



**Figure 7 Typical Stored Charge Vs. $d_{if}/dt$**

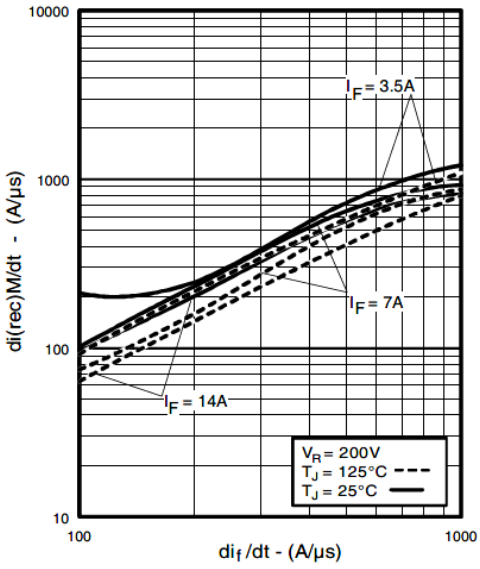



**Figure 8 Typical $di_{(rec)M}/dt$ Vs. $d_{if}/dt$**

# 4 Test Circuit

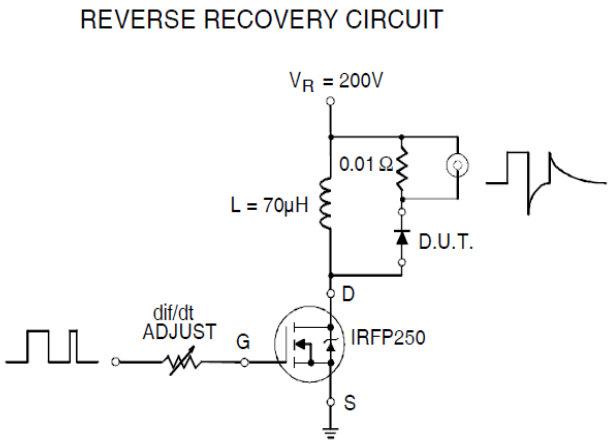
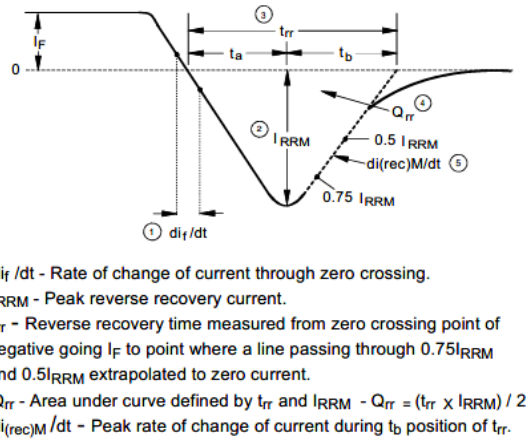



**Figure 9 Reverse Recovery Parameter Test Circuit**

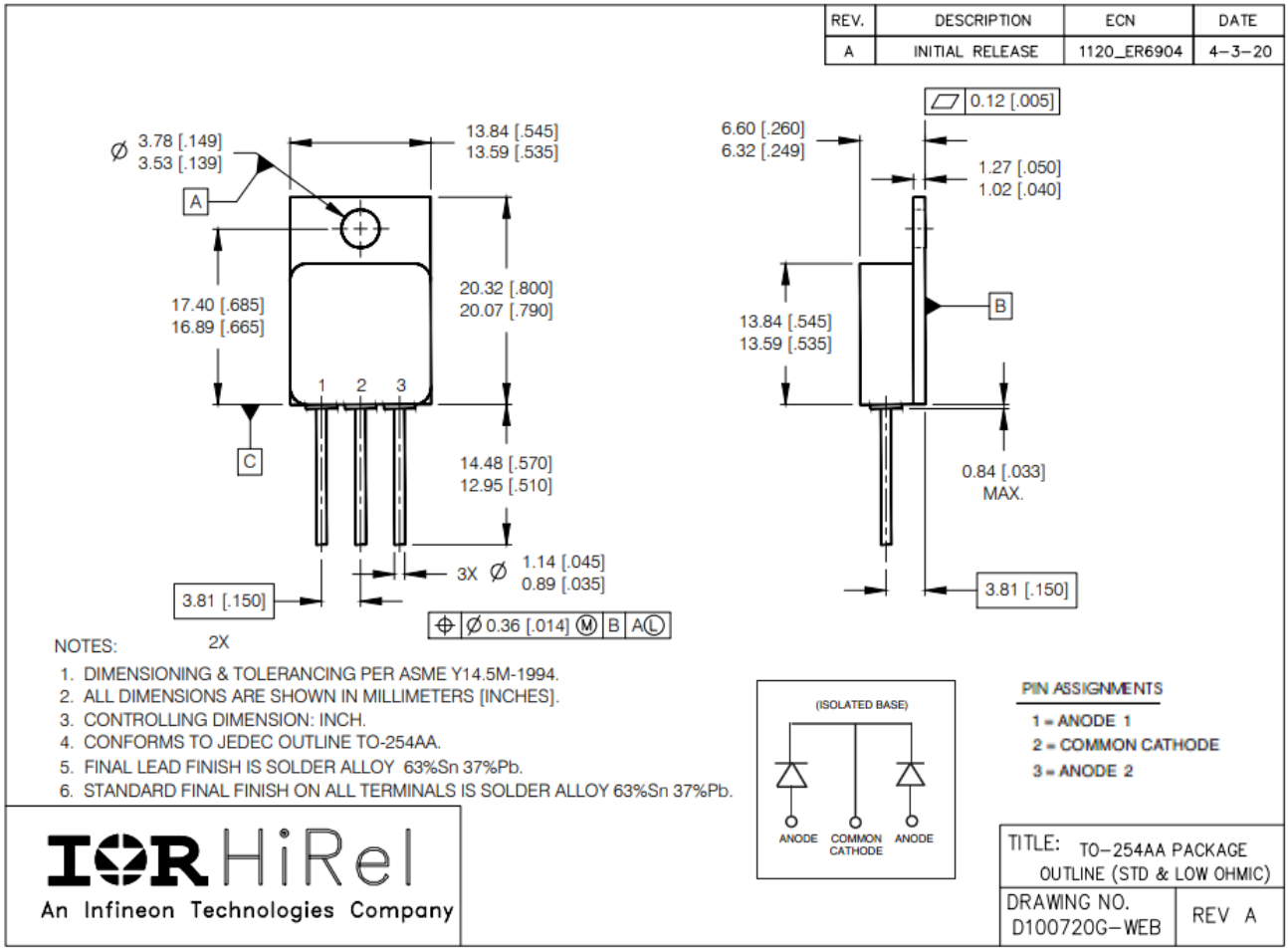



① $di_f/dt$ - Rate of change of current through zero crossing.
② $I_{RRM}$ - Peak reverse recovery current.
③ $t_{rr}$ - Reverse recovery time measured from zero crossing point of negative going $I_F$ to point where a line passing through 0.75$I_{RRM}$ and 0.5$I_{RRM}$ extrapolated to zero current.
④ $Q_{rr}$ - 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 $t_{rr}$.

**Figure 10 Reverse Recovery Waveform and Definitions**

# 5 Package Outline

**Note: For the most updated package outline, please see the website: TO-254AA**



# Revision history

| Document version | Date of release | Description of changes |
|---|---|---|
| | 8/20/1998 | Final datasheet (PD-20371A) |
| Rev B | 01/11/2002 | Updated Format |
| Rev C | 07/01/2002 | Updated IFSM @ 25C to 100A from 130A |
| Rev D | 08/29/2002 | Updated IFSM @ 25C to 80A from 100A |
| Rev E | 04/27/2015 | Updated per ECN-1120-03376 |
| Rev F | 05/31/2024 | Updated per ECN-1120-09961 |

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