

# HFA35HB60

PD-20379E

## Ultrafast, Soft Recovery Diode Thru-Hole (TO-254AA) 600V, 22A

### Features

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

### Product Summary

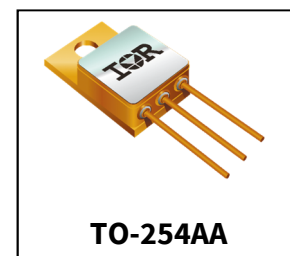
- $V_R$ : 600V
- $V_F$ : 1.75V
- $Q_{rr}$ : 575nC
- $di_{(rec)M}/dt$ : 270A/ $\mu$ S

### Potential Applications

- DC-DC converter
- Motor drives

### Product Validation

Qualified according to MIL-PRF-19500 for space applications



### Description

HFA35HB60 is part of the International Rectifier HiRel family of products. These 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 soft-ness of the recovery eliminates the need for a snubber in most applications. These devices are ideally suited for power converters, motor 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
HFA35HB60	TO-254AA	COTS
HFA35HB60SCV	TO-254AA	JANTXV-equivalent
HFA35HB60SCX	TO-254AA	JANTX-equivalent
HFA35HB60SCS	TO-254AA	S-level

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**Absolute Maximum Ratings**

# 1 Absolute Maximum Ratings

**Table 2 Absolute Maximum Ratings**

Symbol	Parameter	Value	Unit
$V_R$	DC Reverse Voltage	600	V
$I_F$	Continuous Forward Current, $T_C = 100\text{ }^\circ\text{C}$ <sup>1</sup>	22	A
$I_{FSM}$	Single pulse Forward Current, $T_C = 25\text{ }^\circ\text{C}$ <sup>2</sup>	225	A
$P_D @ T_C = 25\text{ }^\circ\text{C}$	Maximum Power Dissipation	83	W
$T_J$ $T_{STG}$	Operating Junction and Storage Temperature Range	-55 to 150	$^\circ\text{C}$
Wt	Weight	9.3 (Typical)	g

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<sup>1</sup> DC = 50% rect. wave

<sup>2</sup> ½ sine wave, 60 Hz, Pulse width = 8.33 ms

## Device Characteristics

## 2 Device Characteristics

### 2.1 Electrical Characteristics

Table 3 Electrical Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$V_{BR}$	Cathode Anode Breakdown Voltage	600	—	—	V	$I_R = 100\mu A$
$V_F$	Forward Voltage Drop See Fig. 1	—	—	1.55	V	$I_F = 22A, T_J = -55^\circ C$
		—	—	1.75		$I_F = 22A, T_J = 25^\circ C$
		—	—	2.25		$I_F = 45A, T_J = 25^\circ C$
		—	—	1.64		$I_F = 22A, T_J = 125^\circ C$
$I_R$	Reverse Leakage Current See Fig. 2	—	—	10	$\mu A$	$V_R = V_R \text{ Rated}$
		—	—	1.0	mA	$V_R = 480V, T_J = 125^\circ C$
$C_T$	Junction Capacitance See Fig. 3	—	56	59	pF	$V_R = 200V$
$L_S$	Series Inductance	—	8.7	—	nH	Measured from center of bond pad to end of anode bonding wire

### 2.2 Dynamic Recovery Characteristics

Table 4 Dynamic Recovery Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{rr1}$	Reverse Recovery Time See Fig. 5	—	60	97	ns	$T_J = 25^\circ C$
$t_{rr2}$		—	110	—		$T_J = 125^\circ C$
$I_{RRM1}$	Peak Recovery Current See Fig. 6	—	5.2	—	A	$T_J = 25^\circ C$
$I_{RRM2}$		—	8.5	—		$T_J = 125^\circ C$
$Q_{rr1}$	Reverse Recovery Charge See Fig. 7	—	190	575	nC	$T_J = 25^\circ C$
$Q_{rr2}$		—	560	—		$T_J = 125^\circ C$
$di_{(rec)M}/dt_1$	Peak Rate of Fall of Recovery Current During $t_b$ See Fig. 8	—	270	—	A/ $\mu s$	$T_J = 25^\circ C$
$di_{(rec)M}/dt_2$		—	170	—		$T_J = 125^\circ C$

### 2.3 Thermal-Mechanical Characteristics

Table 5 Thermal-Mechanical Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}$	Junction to Case, Single Leg Conducting	—	1.5	$^\circ C/W$

### 3 Electrical Characteristics Curves

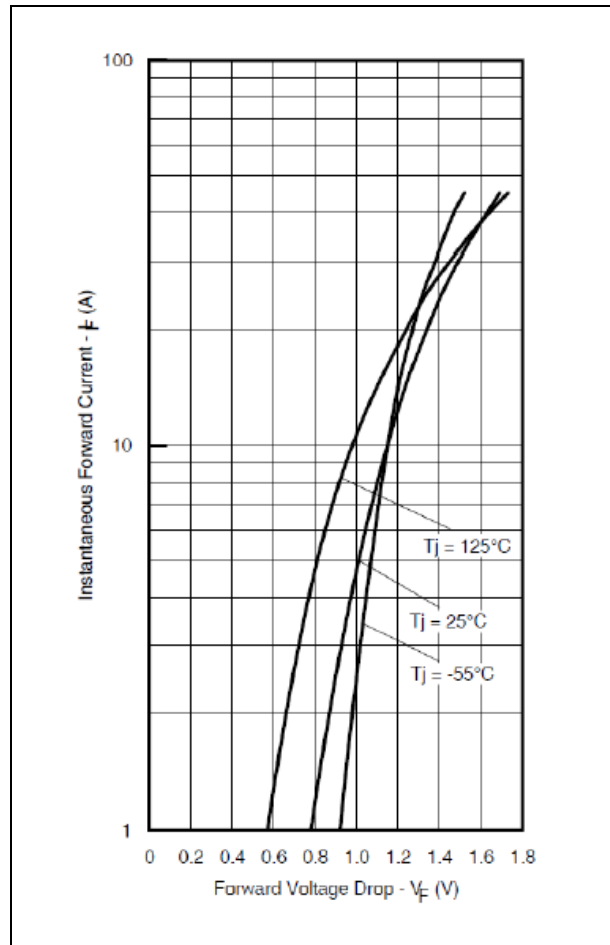


Figure 1 Maximum Forward Voltage Drop Characteristics

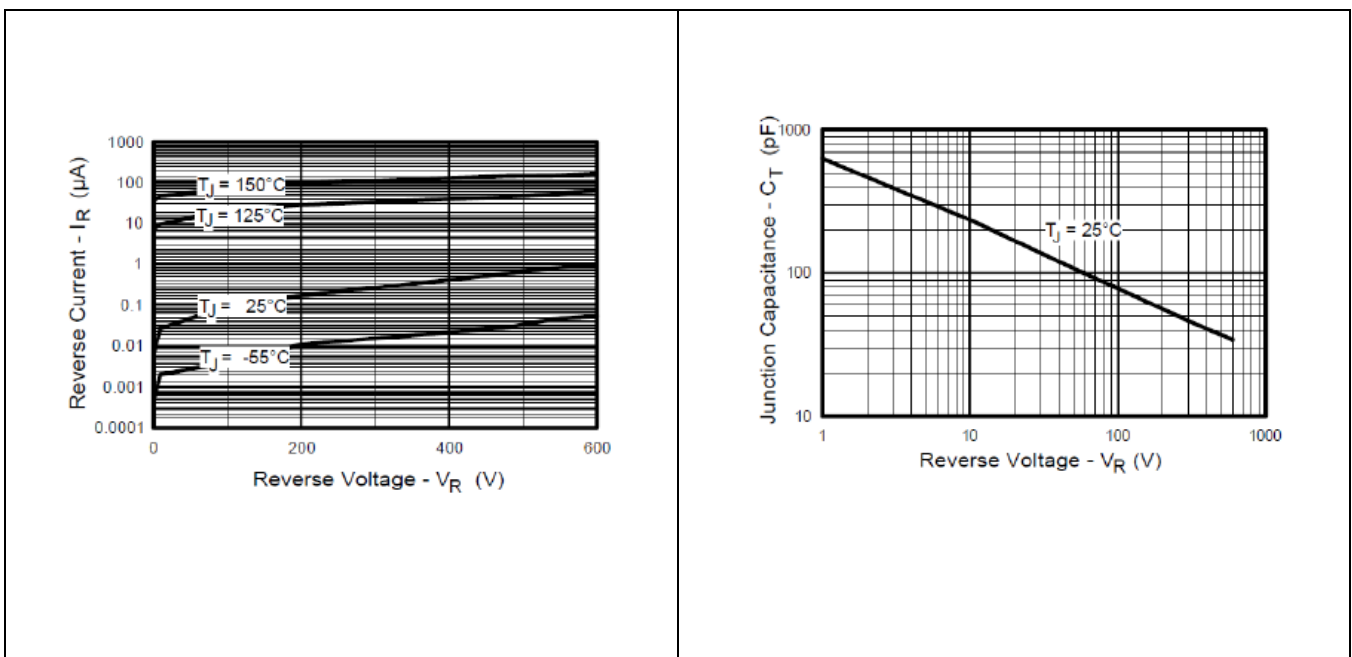
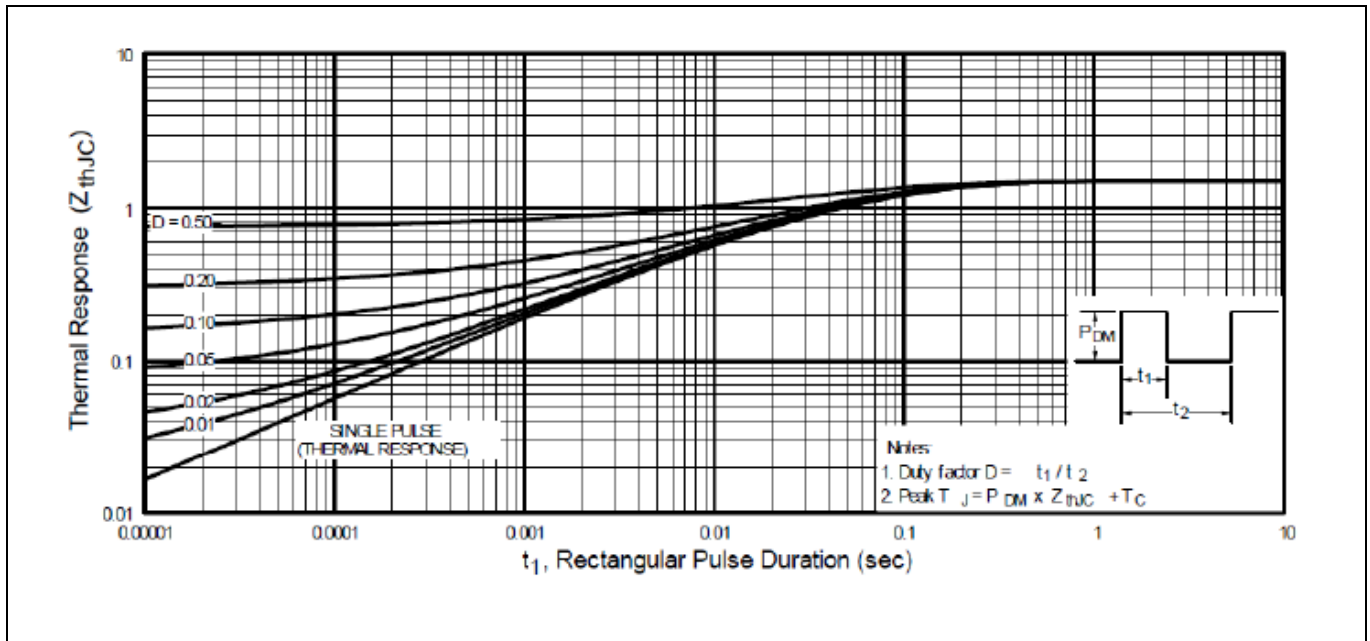


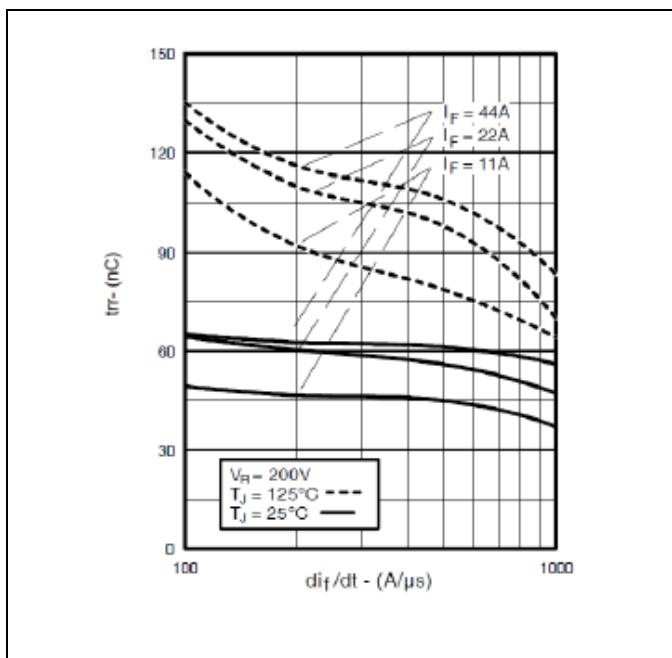
Figure 2 Typical Values of Reverse Current Vs. Reverse Voltage

Figure 3 Typical Junction Capacitance Vs. Reverse Voltage

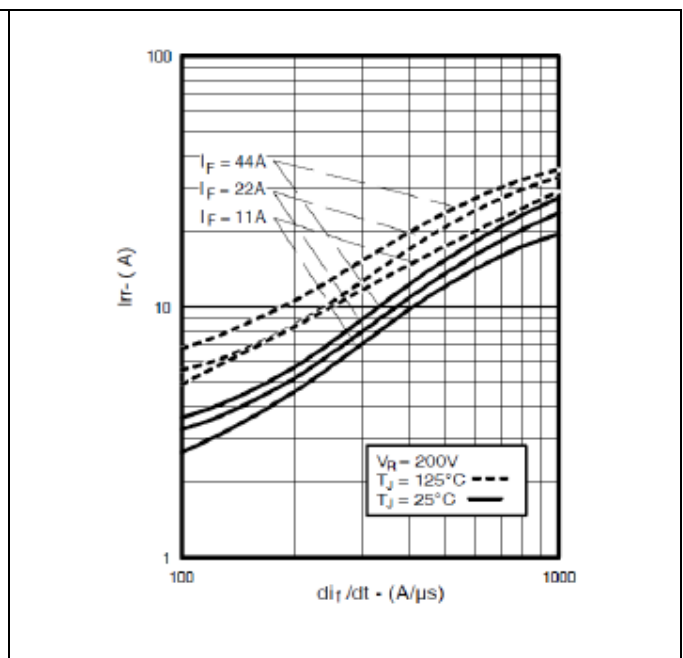
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**FRED Ultrafast, Soft Recovery Diode**  
**Electrical Characteristics Curves**



**Figure 4** Maximum Thermal Impedance  $Z_{thJC}$  Characteristics

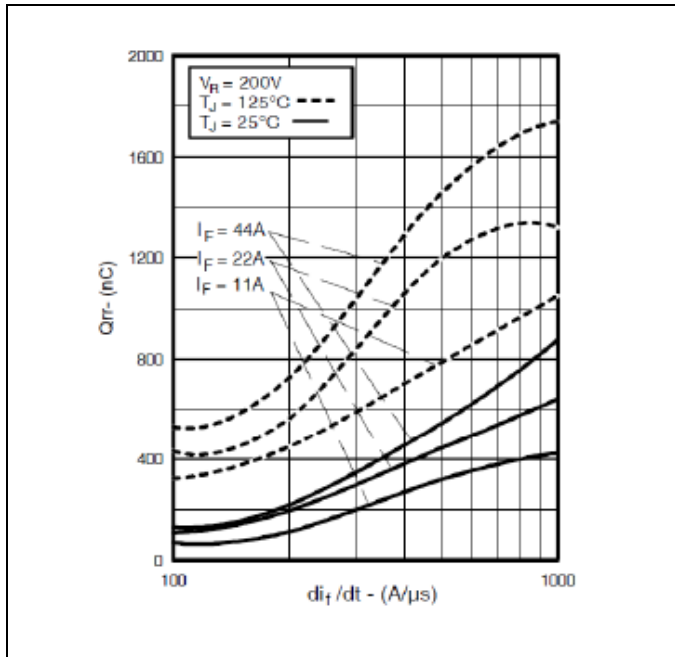


**Figure 5** Typical Reverse Recovery Vs.  $d_{if}/dt$

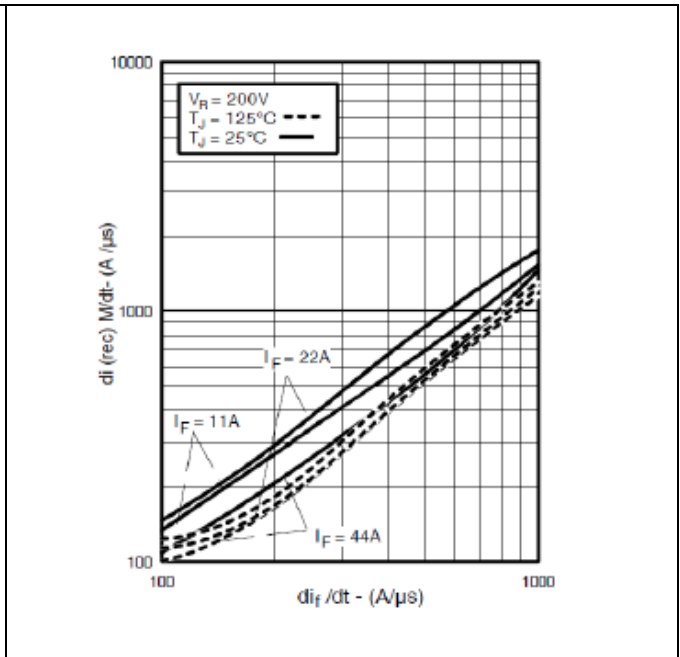


**Figure 6** Typical Recovery Current Vs.  $d_{if}/dt$

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**FRED Ultrafast, Soft Recovery Diode**  
**Electrical Characteristics Curves**



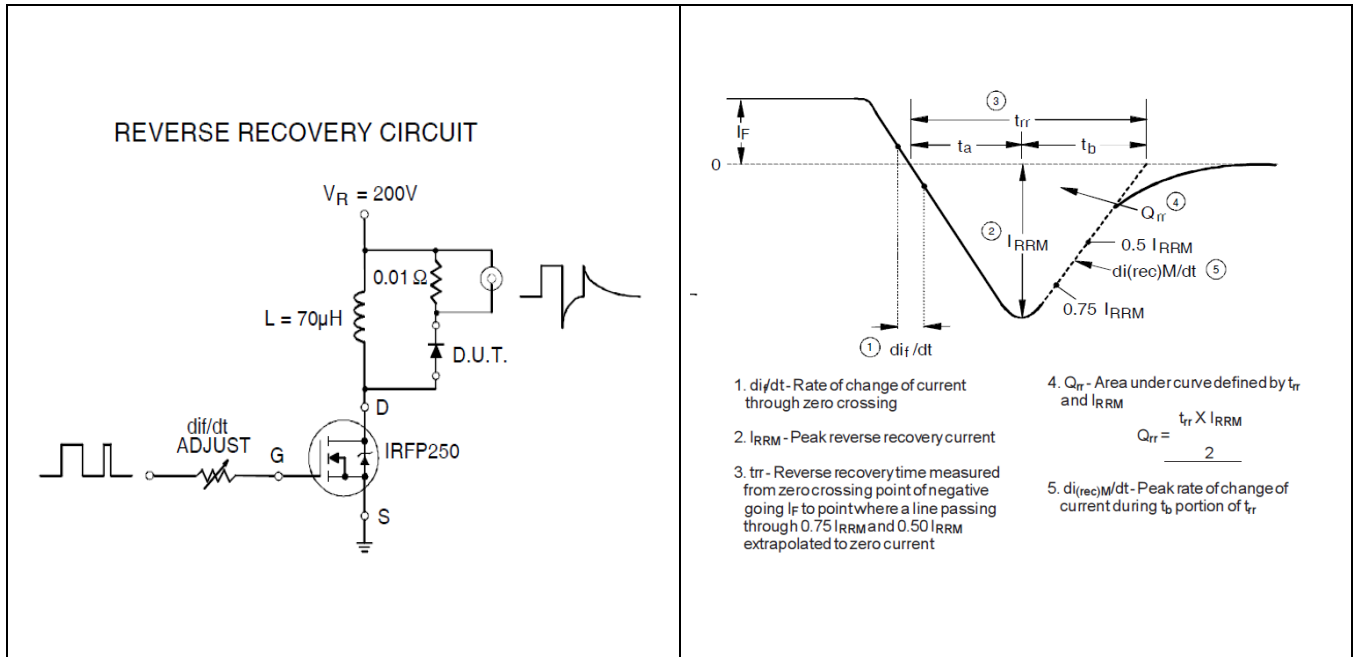
**Figure 7** Typical Stored Charge Vs.  $d_{if}/dt$



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

**Test Circuit**

**4 Test Circuit**



**Figure 9 Reverse Recovery Parameter Test Circuit**

**Figure 10 Reverse Recovery Waveform and Definitions**



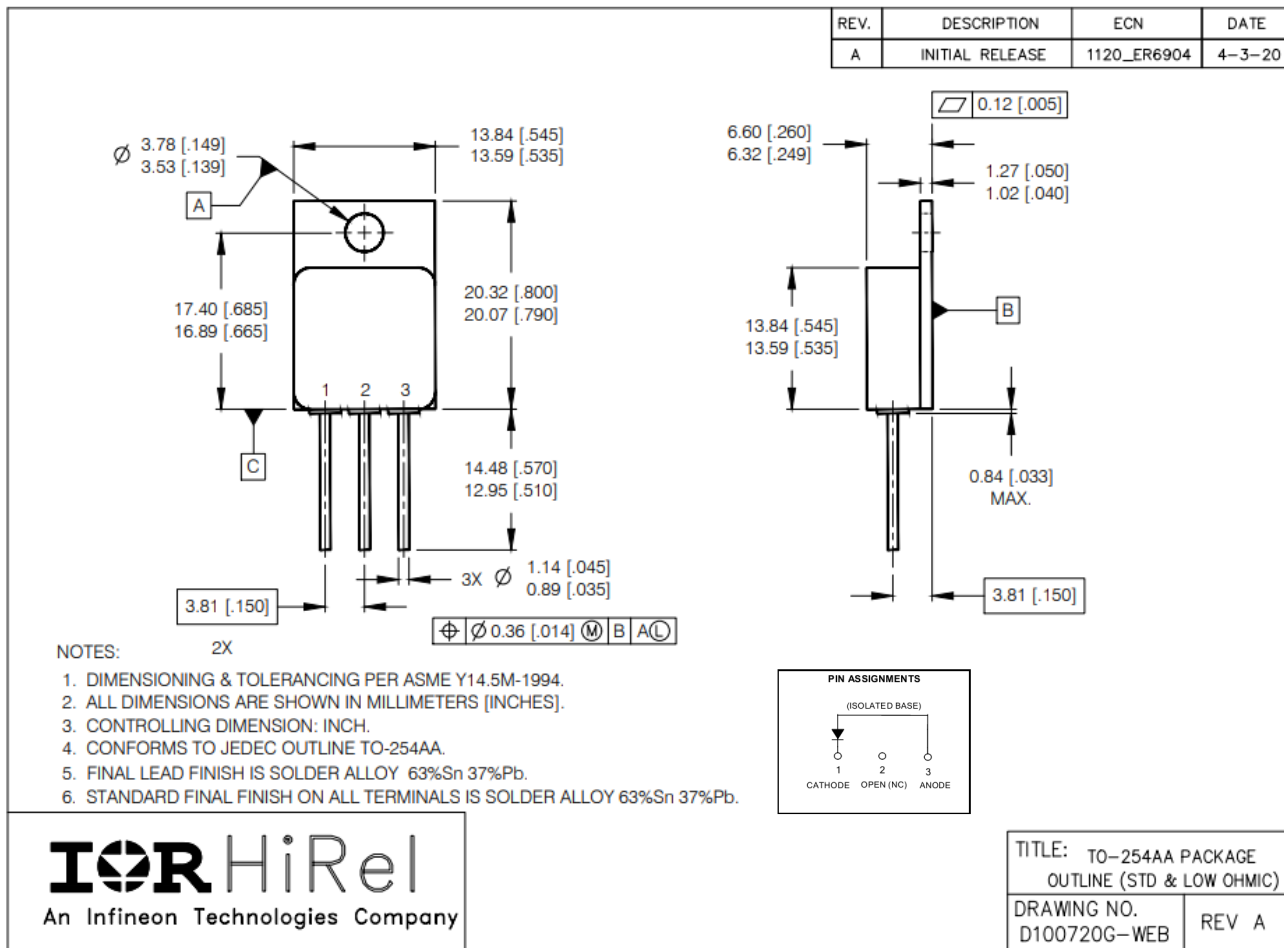
# HFA35HB60

## FRED Ultrafast, Soft Recovery Diode

### Package Outline

# 5 Package Outline

Note: For the most updated package outline, please see the website: [TO-254AA](http://TO-254AA)



**Revision history****Revision history**

<b>Document version</b>	<b>Date of release</b>	<b>Description of changes</b>
	12/24/2010	Final datasheet (PD-20379)
Rev A	03/07/2013	Updated per ECN-1120-00911
Rev B	09/23/2016	Updated per ECN-1120-04743
Rev C	03/02/2018	Updated per ECN-1120-06010
Rev D	05/03/2021	Updated per ECN-1120-08526
Rev E	06/02/2022	Updated per ECN-1120-08972

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