HFB35HB20

PD-94100E

Ultrafast, Soft Recovery Diode
Thru-Hole (TO-254AA)
200V, 35A

Features

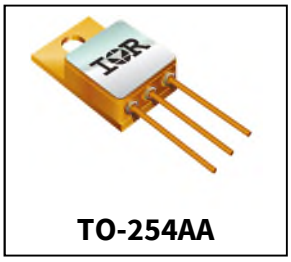
- Single devices configuration
- Reduced RFI and EMI
- Reduced snubbing
- Extensive characterization of recovery parameters
- Hermetically sealed
- Ceramic eyelets
- ESD Rating: Class 3B per MIL-STD-750, Method 1020

Product Summary

- **V_R :** 200V
- **V_F:** 1.41V
- **t_{rr} :** 50ns
- **$di_{(rec)M}/dt$:** 236A/µs

Potential Applications

- DC-DC converter
- Motor drives



TO-254AA

Product Validation

Qualified according to MIL-PRF-19500 for space applications

Description

HEXFRED™ 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, 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
HFB35HB20	TO-254AA	COTS
HFB35HB20SCS	TO-254AA	S-level

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1 Absolute Maximum Ratings

Table 2 Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_R	Cathode to anode voltage	200	V
$I_{F(AV)}$	Continuous forward current, T_C = 80°C [1]	35	A
I_{FSM}	Single pulse forward current, T_C = 25°C [2]	150	A
P_D @ T_C = 25°C	Maximum power dissipation	125	W
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to 150	°C
Wt	Weight	9.3 (Typical)	g

[1] DC = 50% rectangle wave

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

2 Device Characteristics

2.1 Electrical Characteristics

Table 3 Electrical Characteristics @ T_J =25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
V_{BR}	Cathode Anode Breakdown Voltage	200	—	—	V	I_R = 100µA
V_F	Max Forward Voltage Drop See Fig. 1	—	—	1.25	V	I_F = 20A, T_J = -55°C
		—	—	1.15	V	I_F = 20A, T_J = 25°C
		—	—	1.41	V	I_F = 35A, T_J = 25°C
		—	—	1.92	V	I_F = 70A, T_J = 25°C
		—	—	1.01	V	I_F = 20A, T_J = 125°C
I_R	Max Reverse Leakage Current See Fig. 2	—	—	10	µA	V_R = V_R Rated
		—	—	1.0	mA	V_R = V_R Rated, T_J = 125°C
C_J	Junction Capacitance See Fig. 3	—	—	200	pF	V_R = 200V
L_S	Series Inductance	—	7.8	—	nH	Measured from anode lead to Cathode lead, 6mm (0.25 in) from package

2.2 Dynamic Recovery Characteristics

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

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	
t_{rr1}	Reverse Recovery Time See Fig. 5	—	45	50	ns	T_J = 25°C	I_F = 35A V_R = 160V d_{if}/dt = 200 A/ µs
t_{rr2}		—	68	—		T_J = 125°C	
I_{RRM1}	Peak Recovery Current See Fig. 6	—	3.3	—	A	T_J = 25°C	
I_{RRM2}		—	7.6	—		T_J = 125°C	
Q_{rr1}	Reverse Recovery Charge See Fig. 7	—	76	—	nC	T_J = 25°C	
Q_{rr2}		—	270	—		T_J = 125°C	
$di_{(rec)M}/dt_1$	Peak Rate of Fall of Recovery Current During t_b See Fig. 8	—	236	—	A/ µs	T_J = 25°C	
$di_{(rec)M}/dt_2$		—	1020	—		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, See Fig .4	—	1.0	°C/W

3 Electrical Characteristics Curves

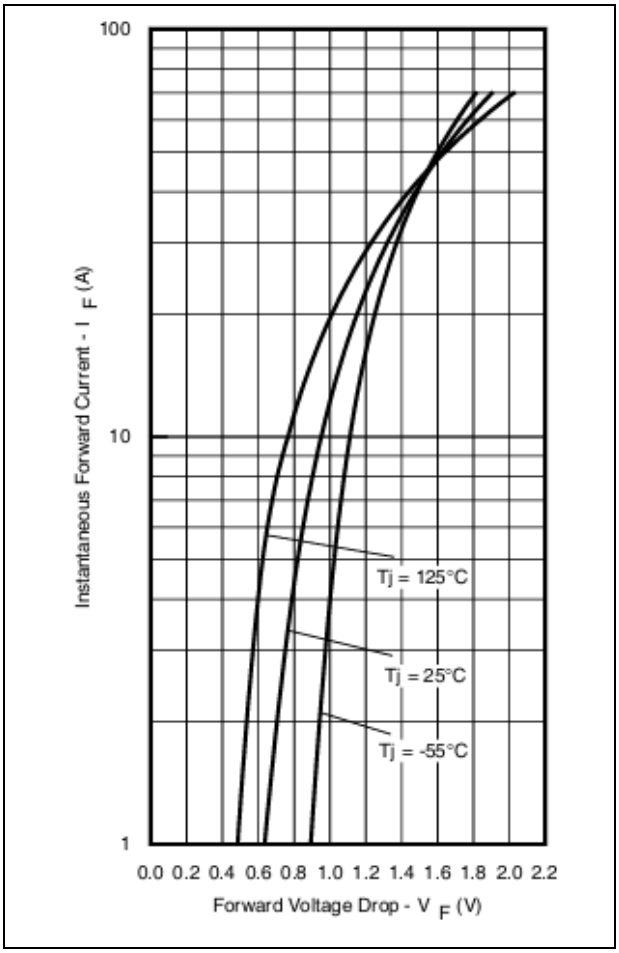


Figure 1 Maximum Forward Voltage Drop Characteristics

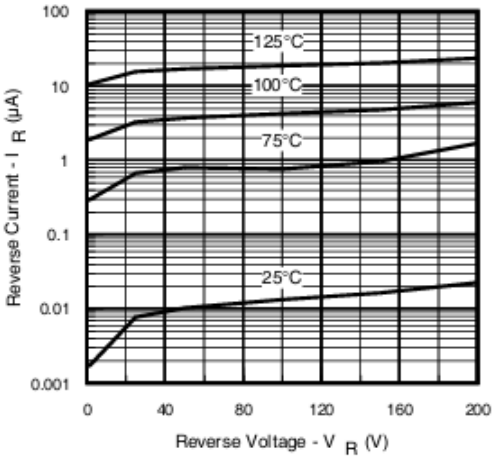


Figure 2 Typical Values of Reverse Current Vs. Reverse Voltage

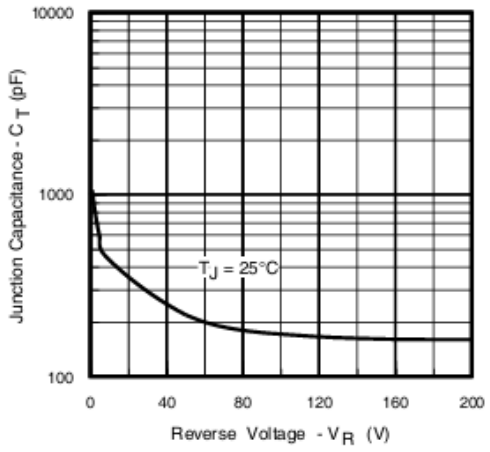


Figure 3 Typical Junction Capacitance Vs. Reverse Voltage

Electrical Characteristics Curves

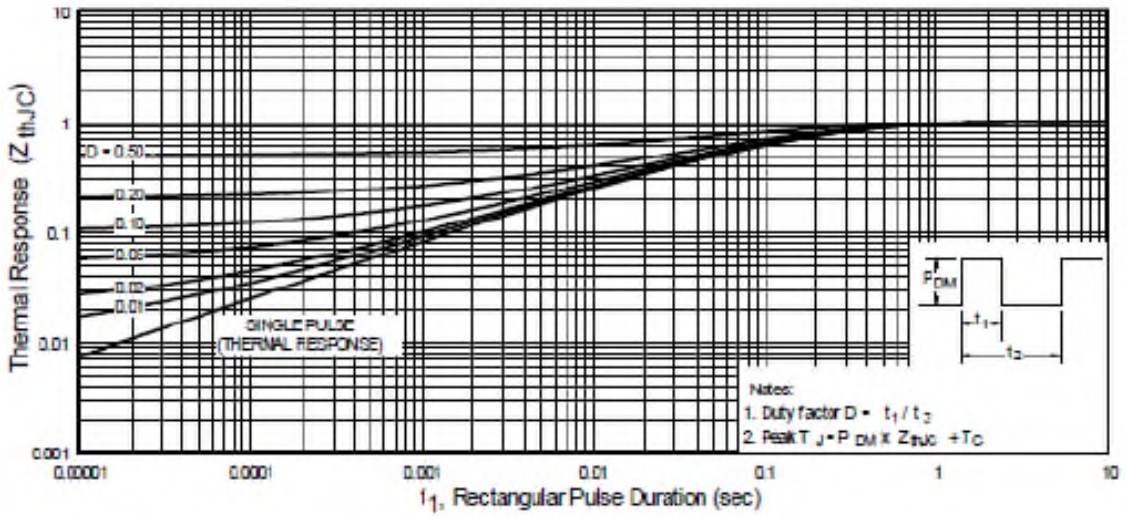


Figure 4 Maximum Thermal Impedance Z_{thJC} Characteristics

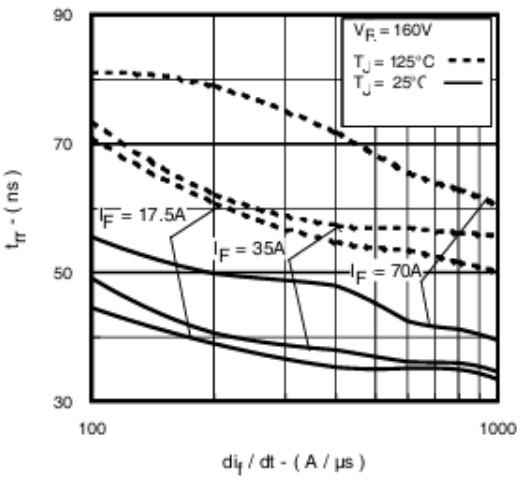


Figure 5 Typical Reverse Recovery Vs. di_f/dt

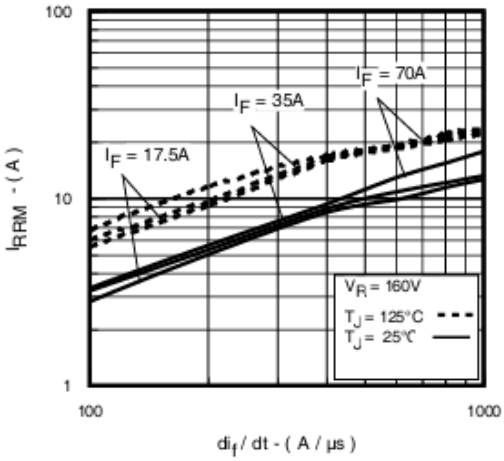


Figure 6 Typical Recovery Current Vs. di_f/dt

Electrical Characteristics Curves

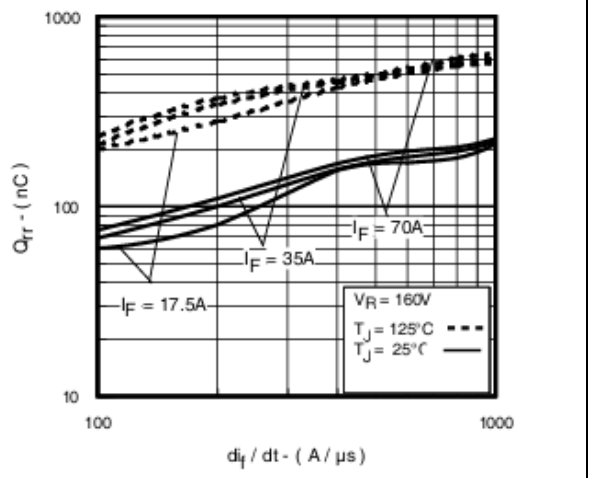


Figure 7 Typical Stored Charge Vs. di_f/dt

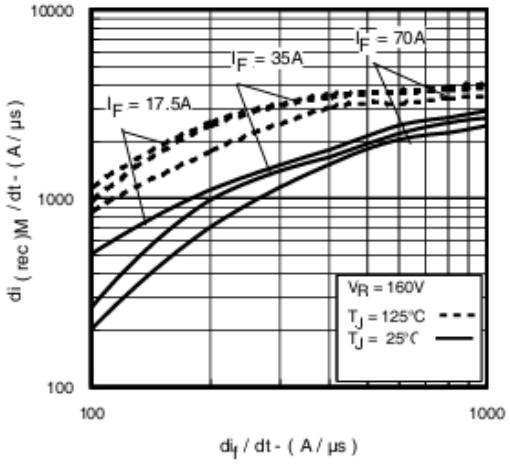


Figure 8 Typical $di_{(rec)M}/dt$ Vs. di_f/dt

4 Test Circuit

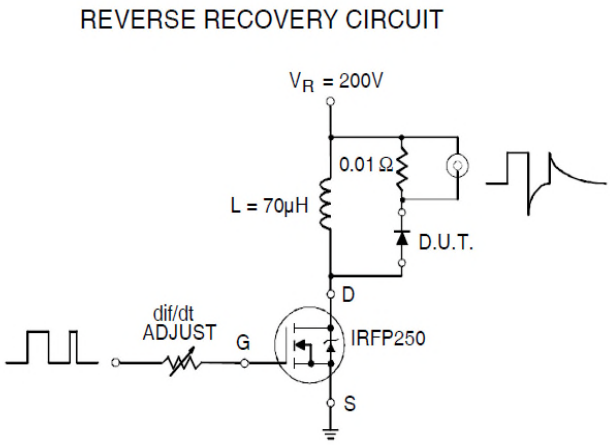
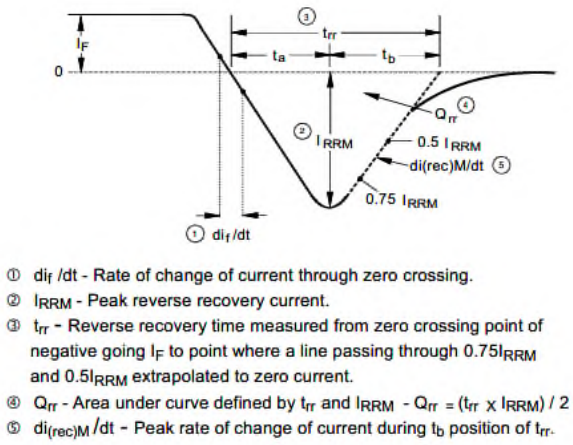


Figure 9 Reverse Recovery Parameter Test Circuit

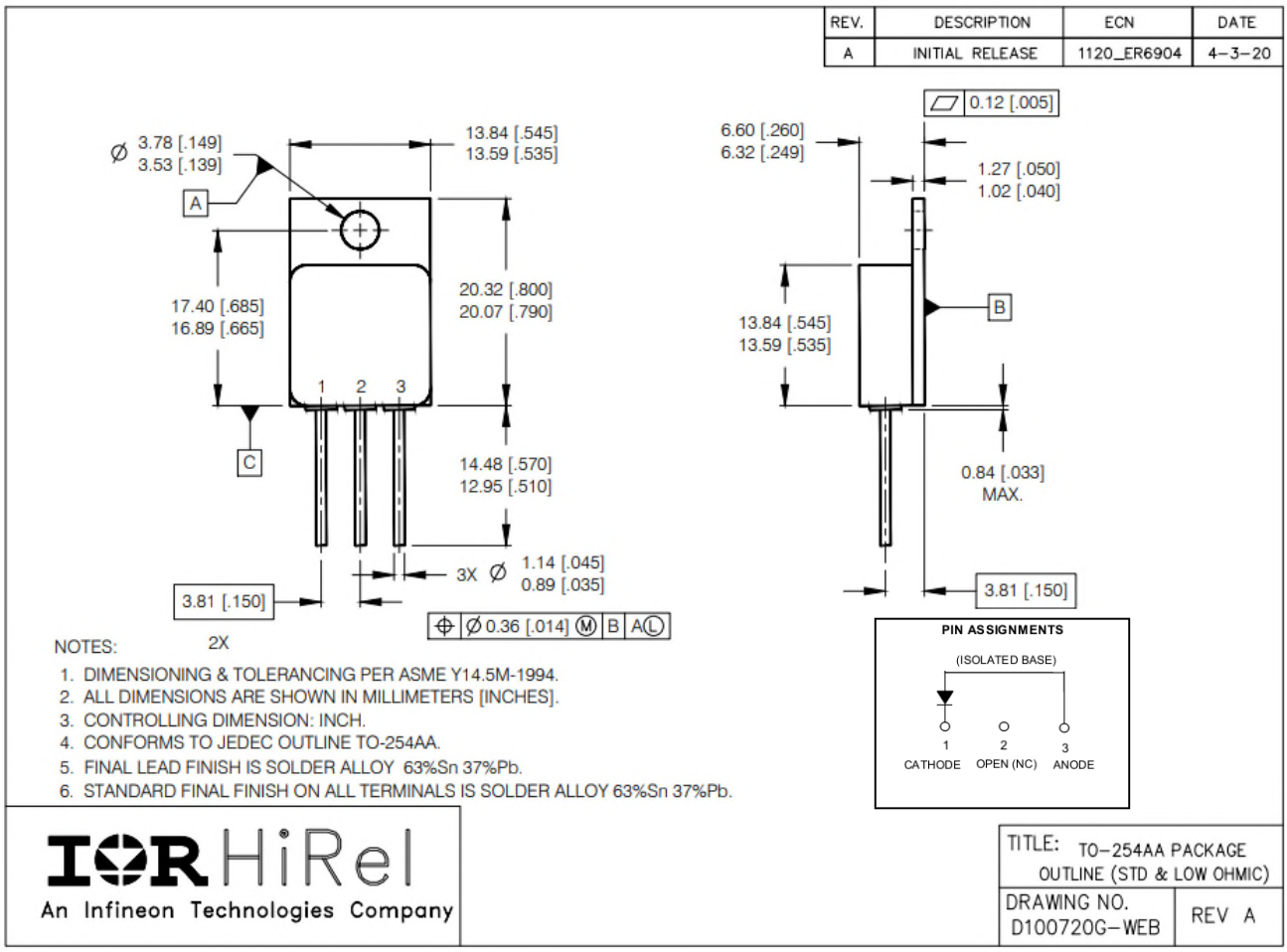


① di_f/dt - Rate of change of current through zero crossing.
② I_{RRM} - Peak reverse recovery current.
③ t_{rr} - Reverse recovery time measured from zero crossing point of negative going I_F to point where a line passing through $0.75I_{RRM}$ and $0.5I_{RRM}$ extrapolated to zero current.
④ Q_{rr}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

Figure 10 Reverse Recovery Waveform and Definitions

5 Package Outline

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



BERYLLIA WARNING PER MIL-PRF-19500

Package containing beryllia shall not be ground, sandblasted, machined, or have other operations performed on them which will produce beryllia or beryllium dust. Furthermore, beryllium oxide packages shall not be placed in acids that will produce fumes containing beryllium.

Revision history

Document version	Date of release	Description of changes
	3/23/2001	Final datasheet (PD-94100)
Rev A	7/26/2006	Updated per ECN-14107
Rev B	10/3/2016	Updated per ECN-1120-04401
Rev C	8/13/2019	Updated per ECN-1120-07208
Rev D	04/29/2021	Updated per ECN-1120-08526
Rev E	05/02/2023	Updated per ECN-1120-09532

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