

# HFA45HC60C

PD-20368C

## Ultrafast, Soft Recovery Diode Thru-Hole (TO-258AA) 600V, 45A

### Features

- Dual common cathode configuration
- Reduced RFI and EMI
- Reduced snubbing
- Extensive characterization of recovery parameters
- Hermetic package
- ESD Rating: Class 3B per MIL-STD-750, Method 1020

### Potential Applications

- DC-DC converter
- Motor drives

### 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
HFA45HC60C	TO-258AA	COTS
HFA45HC60CSCV	TO-258AA	JANTXV-equivalent
HFA45HC60CSCX	TO-258AA	JANTX-equivalent
HFA45HC60CSCS	TO-258AA	S-level

### Product Summary

- **V<sub>R</sub> (per leg):** 600V
- **V<sub>F</sub>:** 1.47V
- **t<sub>tr</sub>:** 97ns @ 22A
- **di<sub>(rec)M</sub>/dt:** 400A/μs



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**Absolute Maximum Ratings**

# 1 Absolute Maximum Ratings

**Table 2 Absolute Maximum Ratings**

Symbol	Parameter	Value	Unit
$V_R$	Cathode to anode voltage (per leg)	600	V
$I_{F(AV)}$	Continuous forward current, $T_C = 80^\circ\text{C}$ <sup>1</sup>	45	A
$I_{FSM}$	Single pulse forward current, $T_C = 25^\circ\text{C}$ (per leg) <sup>2</sup>	225	A
$P_D @ T_C = 25^\circ\text{C}$	Maximum power dissipation	104	W
$T_J$ $T_{STG}$	Operating Junction and Storage Temperature Range	-55 to 150	$^\circ\text{C}$
Wt	Weight	10.9 (Typical)	g

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

<sup>2</sup> 1/2 sine wave, 60 Hz, Pulse width = 8.33 ms

## Device Characteristics

## 2 Device Characteristics

### 2.1 Electrical Characteristics

**Table 3 Electrical Characteristics @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)**

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$V_{BR}$	Cathode Anode Breakdown Voltage	600	—	—	V	$I_R = 100\mu\text{A}$
$V_F$	Forward Voltage Drop (Per Leg) See Fig. 1	—	—	1.37	V	$I_F = 22.5\text{A}, T_J = -55^\circ\text{C}$
		—	—	1.47	V	$I_F = 22.5\text{A}, T_J = 25^\circ\text{C}$
		—	—	1.81	V	$I_F = 45\text{A}, T_J = 25^\circ\text{C}$
		—	—	1.37	V	$I_F = 22.5\text{A}, T_J = 125^\circ\text{C}$
$I_R$	Reverse Leakage Current (Per Leg) See Fig. 2	—	—	10	$\mu\text{A}$	$V_R = V_R \text{ Rated}$
		—	—	1	mA	$V_R = V_R \text{ Rated}, T_J = 125^\circ\text{C}$
$C_J$	Junction Capacitance (Per Leg) See Fig. 3	—	—	65	pF	$V_R = 200\text{V}$
$L_S$	Series Inductance (Per Leg)	—	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 @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)**

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{rr}$	Reverse Recovery Time (Per Leg)	—	—	97	ns	$I_F = 22\text{A}, V_R = 200\text{V}, di_f/dt = 200\text{A}/\mu\text{s}$
$t_{rr1}$	Reverse Recovery Time (Per Leg) See Fig. 5	—	74	—	ns	$T_J = 25^\circ\text{C}$
$t_{rr2}$		—	194	—		$T_J = 125^\circ\text{C}$
$I_{RRM1}$	Peak Recovery Current (Per Leg) See Fig. 6	—	7.5	—	A	$T_J = 25^\circ\text{C}$
$I_{RRM2}$		—	12	—		$T_J = 125^\circ\text{C}$
$Q_{rr1}$	Reverse Recovery Charge (Per Leg) See Fig. 7	—	270	—	nC	$T_J = 25^\circ\text{C}$
$Q_{rr2}$		—	1210	—		$T_J = 125^\circ\text{C}$
$di_{(rec)M}/dt_1$	Peak Rate of Fall of Recovery Current During $t_b$ (Per Leg) See Fig. 8	—	400	—	A/ $\mu\text{s}$	$T_J = 25^\circ\text{C}$
$di_{(rec)M}/dt_2$		—	100	—		$T_J = 125^\circ\text{C}$

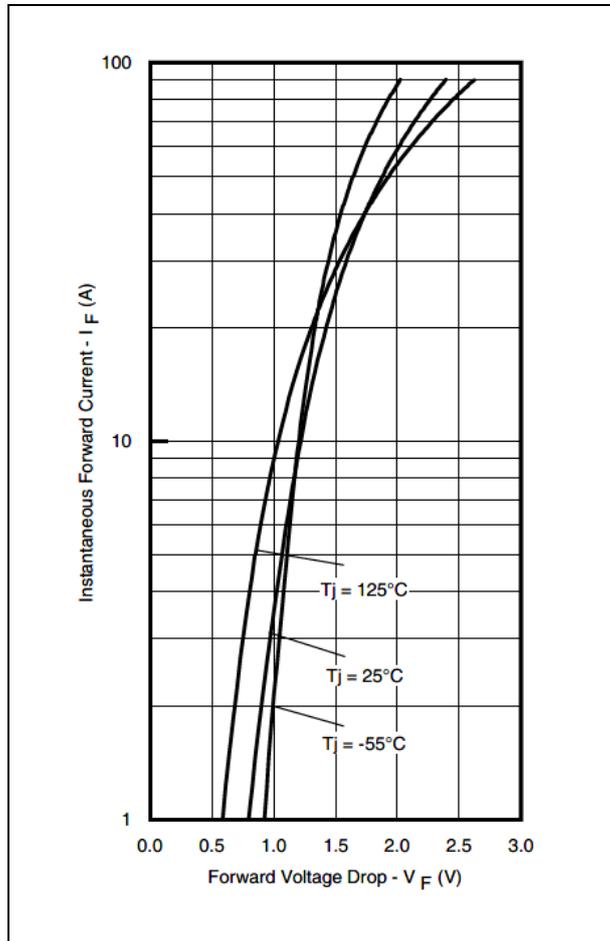
### 2.3 Thermal-Mechanical Characteristics

**Table 5 Thermal-Mechanical Characteristics**

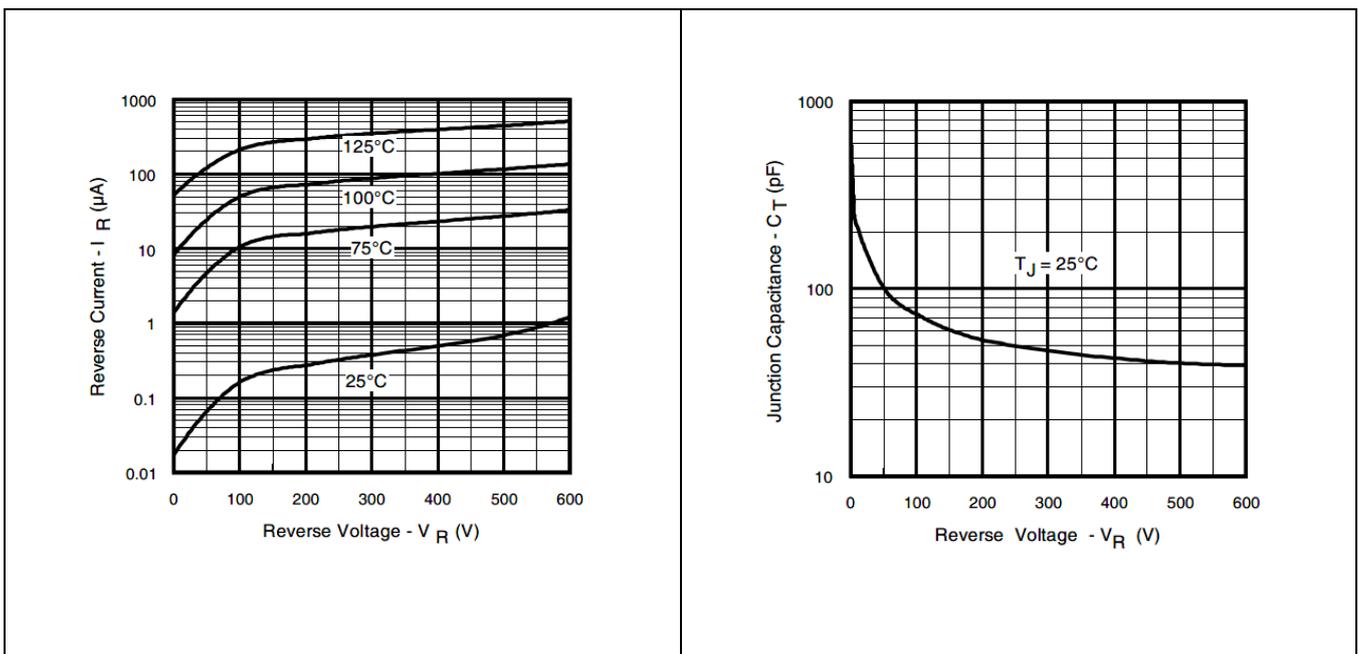
Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JC}$	Junction to Case, Single Leg Conducting	—	1.2	$^\circ\text{C}/\text{W}$

**Electrical Characteristics Curves**

**3 Electrical Characteristics Curves**



**Figure 1 Maximum Forward Voltage Drop Characteristics (Per Leg)**



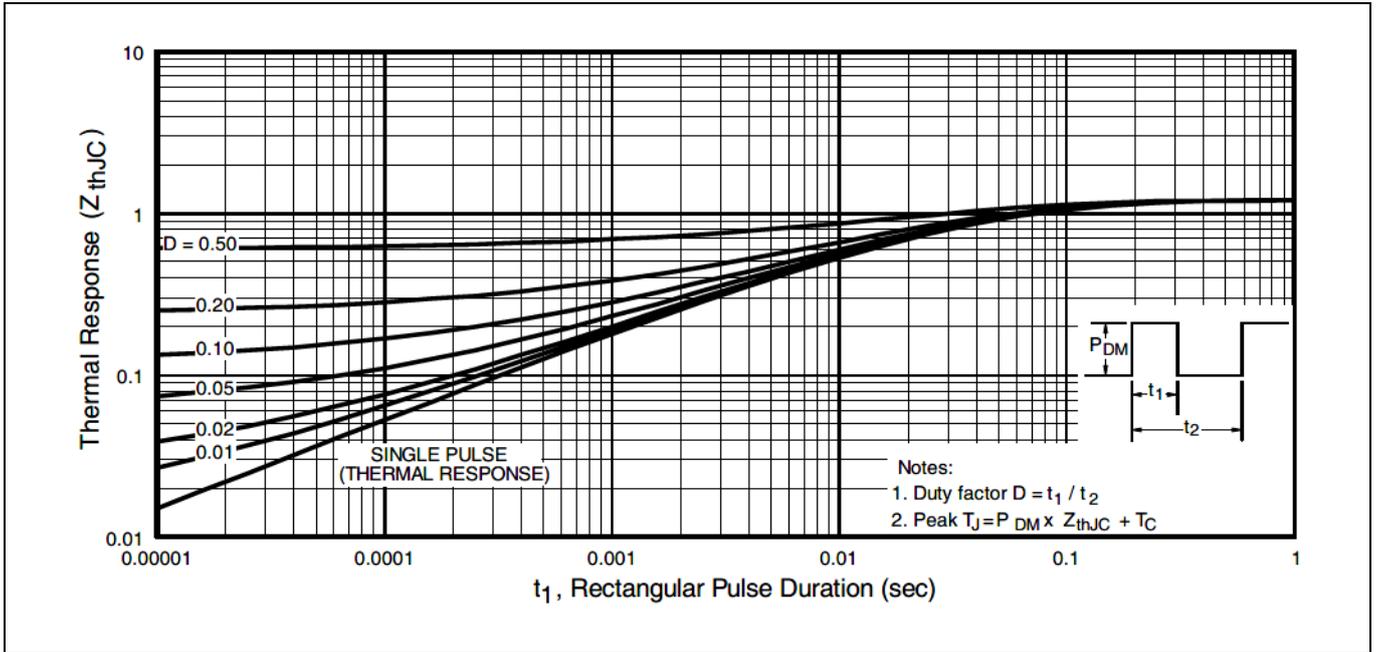
**Figure 2 Typical Values of Reverse Current Vs. Reverse Voltage (Per Leg)**

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

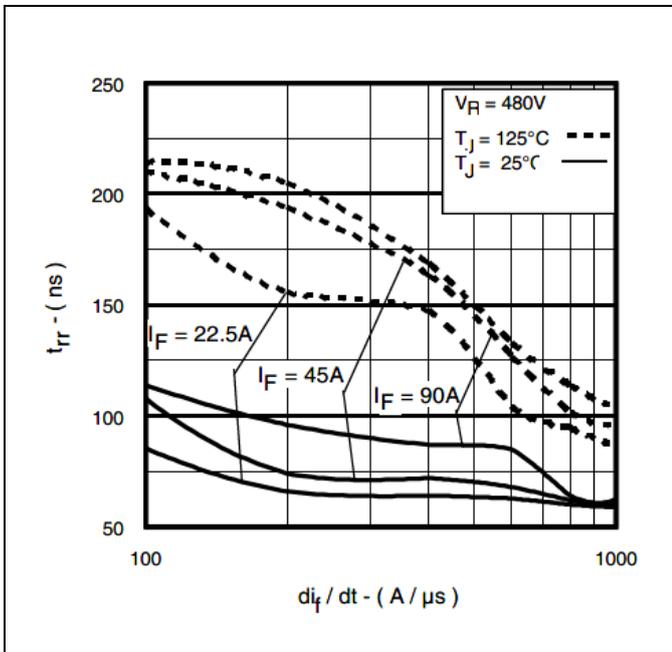
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**FRED Ultrafast, Soft Recovery Diode**

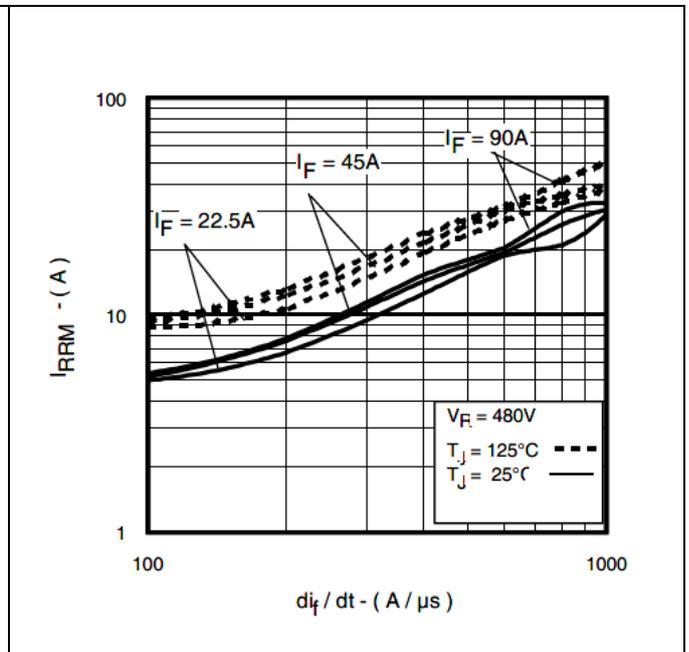
**Electrical Characteristics Curves**



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



**Figure 5 Typical Reverse Recovery Vs.  $di_f/dt$  (Per Leg)**

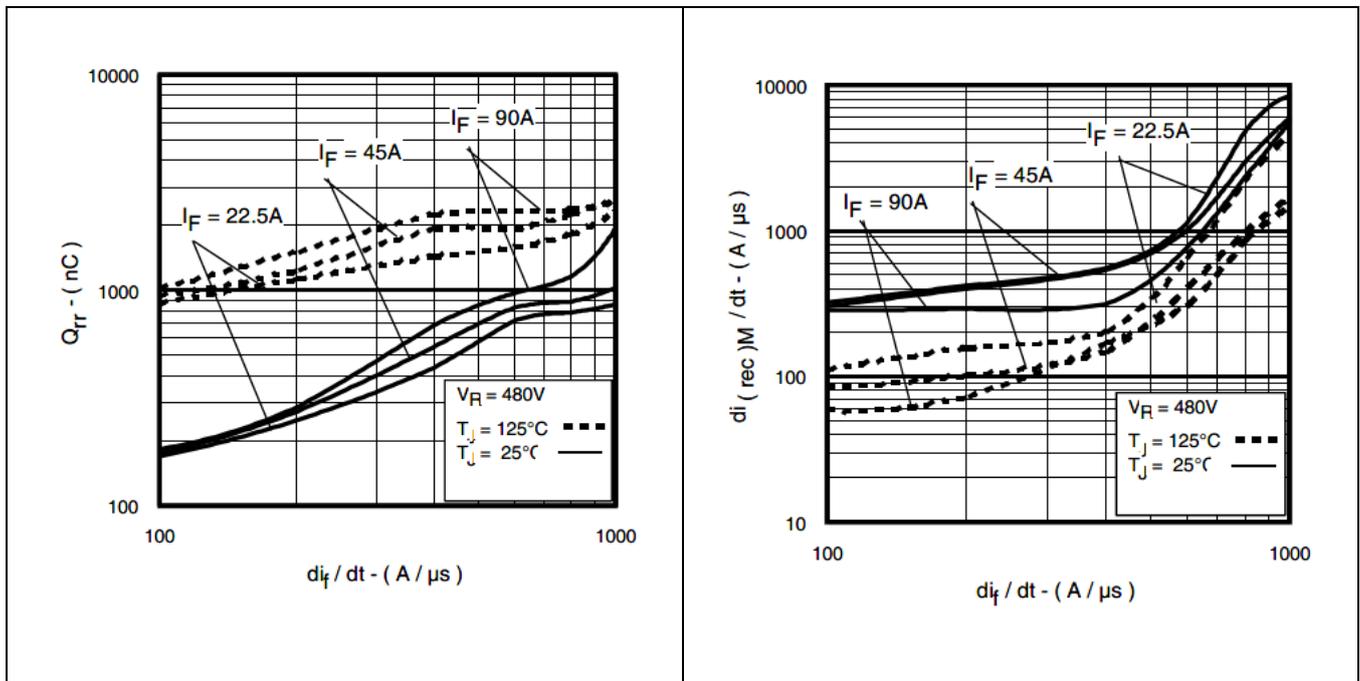


**Figure 6 Typical Recovery Current Vs.  $di_f/dt$  (Per Leg)**

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## FRED Ultrafast, Soft Recovery Diode

### Electrical Characteristics Curves

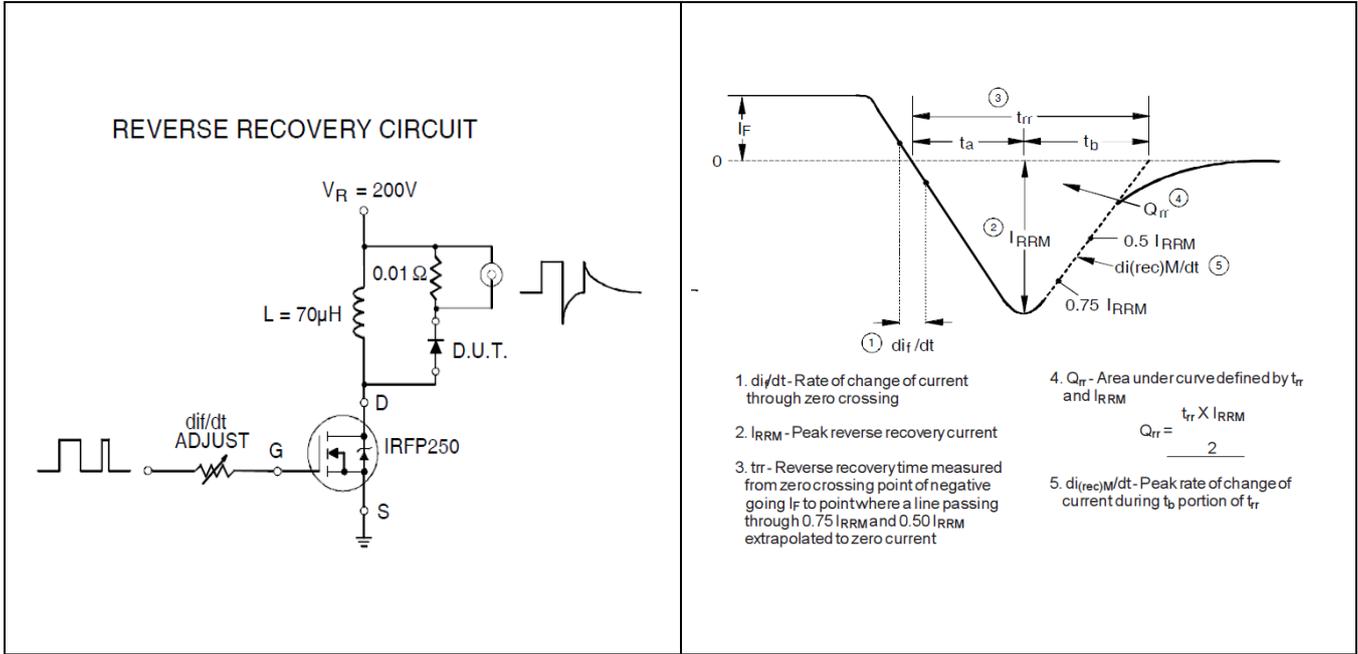


**Figure 7** Typical Stored Charge Vs.  $di_f/dt$  (Per Leg)

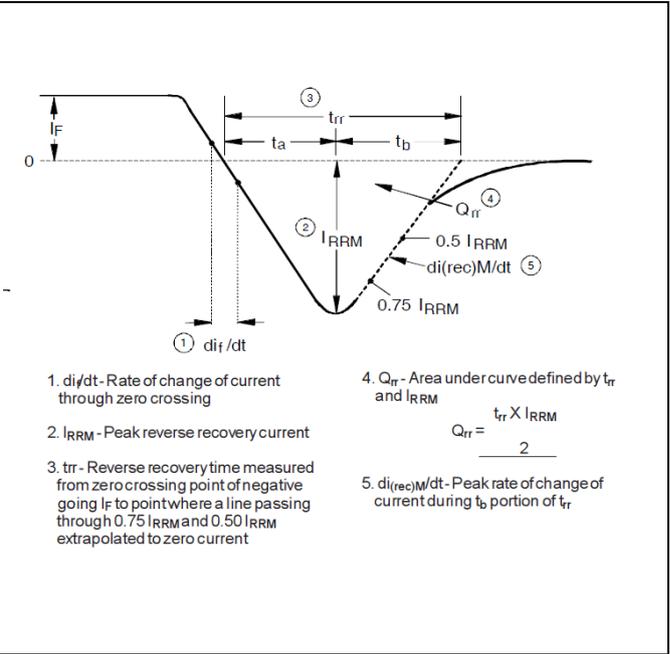
**Figure 8** Typical  $di_{(rec)M}/dt$  Vs.  $di_f/dt$  (Per Leg)

**Test Circuit**

**4 Test Circuit**



**Figure 9 Reverse Recovery Parameter Test Circuit**



**Figure 10 Reverse Recovery Waveform and Definitions**

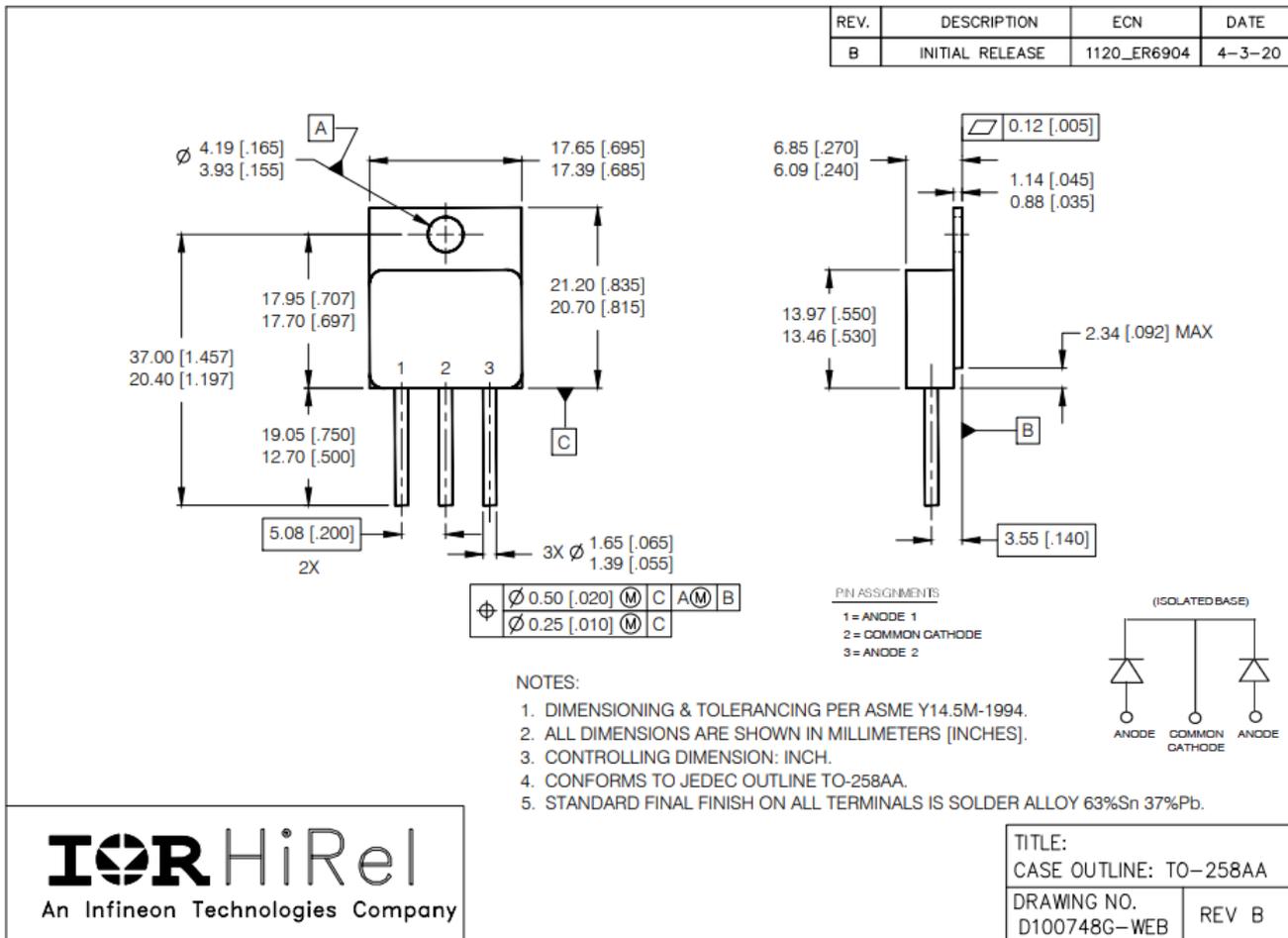
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## FRED Ultrafast, Soft Recovery Diode

### Package Outline

# 5 Package Outline

Note: For the most updated package outline, please see the website: [TO-258AA](http://www.infineon.com/toc-258aa)



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

<b>Document version</b>	<b>Date of release</b>	<b>Description of changes</b>
	04/17/2001	Final datasheet (PD-20368)
Rev A	03/07/2013	Updated per ECN-1120_00911
Rev B	06/02/2022	Updated per ECN-1120-08972
Rev C	08/02/2023	Updated per ECN-1120-09610

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