

# HFA40HF120C

PD-91797D

## Ultrafast, Soft Recovery Diode Surface Mount (SMD-1) 1200V, 15A

### Features

- Reduced RFI and EMI
- Reduced snubbing
- Extensive characterization of recovery parameters
- Hermetic package
- Surface mount

### Product Summary

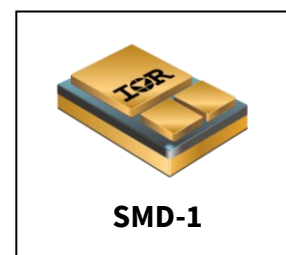
- $V_R$ : 1200V
- $V_F$ : 4.4V
- $t_{rr}$ : 100ns
- $Q_{rr}$ : 370nC
- $di_{(rec)M}/dt$ : 380A/ $\mu$ s

### Potential Applications

- DC-DC converter
- Motor drives

### Product Validation

Qualified according to MIL-PRF-19500 for space applications



### Description

HFA40HF120C is part of the IR HiRel family of products. 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, 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
HFA40HF120C	SMD-1	COTS
HFA40HF120SCV	SMD-1	JANTXV-equivalent

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## FRED Ultrafast, Soft Recovery Diode

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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	1200	V
$I_{F(AV)}$	Continuous forward current, $T_C = 100^\circ\text{C}$ <sup>1</sup>	15	A
$I_{FSM}$	Single pulse forward current, $T_C = 25^\circ\text{C}$ <sup>2</sup>	50	A
$P_D @ T_C = 25^\circ\text{C}$	Maximum power dissipation	63	W
$T_J$ $T_{STG}$	Operating Junction and Storage Temperature Range	-55 to 150	$^\circ\text{C}$
Wt	Weight	2.6 (Typical)	g

<sup>1</sup> DC = 50% rectangle wave<sup>2</sup>  $\frac{1}{2}$  sine wave, 60 Hz, Pulse width = 8.33 ms

## Device Characteristics

## 2 Device Characteristics

### 2.1 Electrical Characteristics

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

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$V_{BR}$	Cathode Anode Breakdown Voltage	1200	—	—	V	$I_R = 250\mu\text{A}$
$V_F$	Max Forward Voltage Drop See Fig. 1	—	—	3.9	V	$I_F = 7.0\text{A}$ , $T_J = -55^\circ\text{C}$
		—	—	3.3	V	$I_F = 7.0\text{A}$ , $T_J = 25^\circ\text{C}$
		—	—	4.4	V	$I_F = 15\text{A}$ , $T_J = 25^\circ\text{C}$
		—	—	2.8	V	$I_F = 7.0\text{A}$ , $T_J = 125^\circ\text{C}$
$I_R$	Max Reverse Leakage Current See Fig. 2	—	—	10	$\mu\text{A}$	$V_R = V_R$ Rated
		—	—	1.0	mA	$V_R = 960\text{V}$ , $T_J = 125^\circ\text{C}$
$C_J$	Junction Capacitance See Fig. 3	—	15	20	pF	$V_R = 200\text{V}$
$L_S$	Series Inductance	—	2.8	—	nH	Measured from center of cathode pad to center of anode pad

### 2.2 Dynamic Recovery Characteristics

Table 4 Dynamic Recovery Characteristics (Per Leg) @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)

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

### 2.3 Thermal-Mechanical Characteristics

Table 5 Thermal-Mechanical Characteristics

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

Electrical Characteristics Curves

### 3 Electrical Characteristics Curves

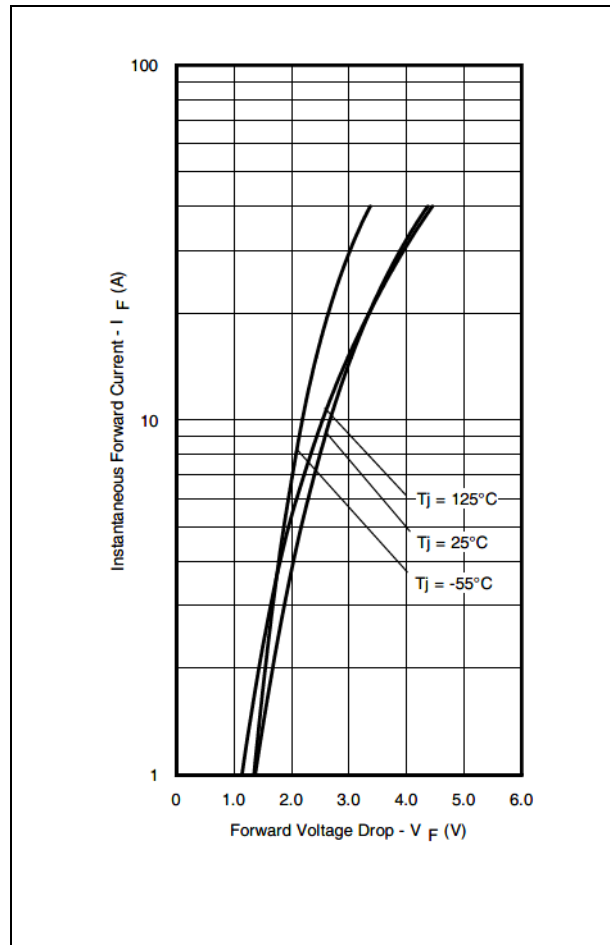


Figure 1 Typical Forward Voltage Drop Vs. Instantaneous Forward Current (Per Leg)

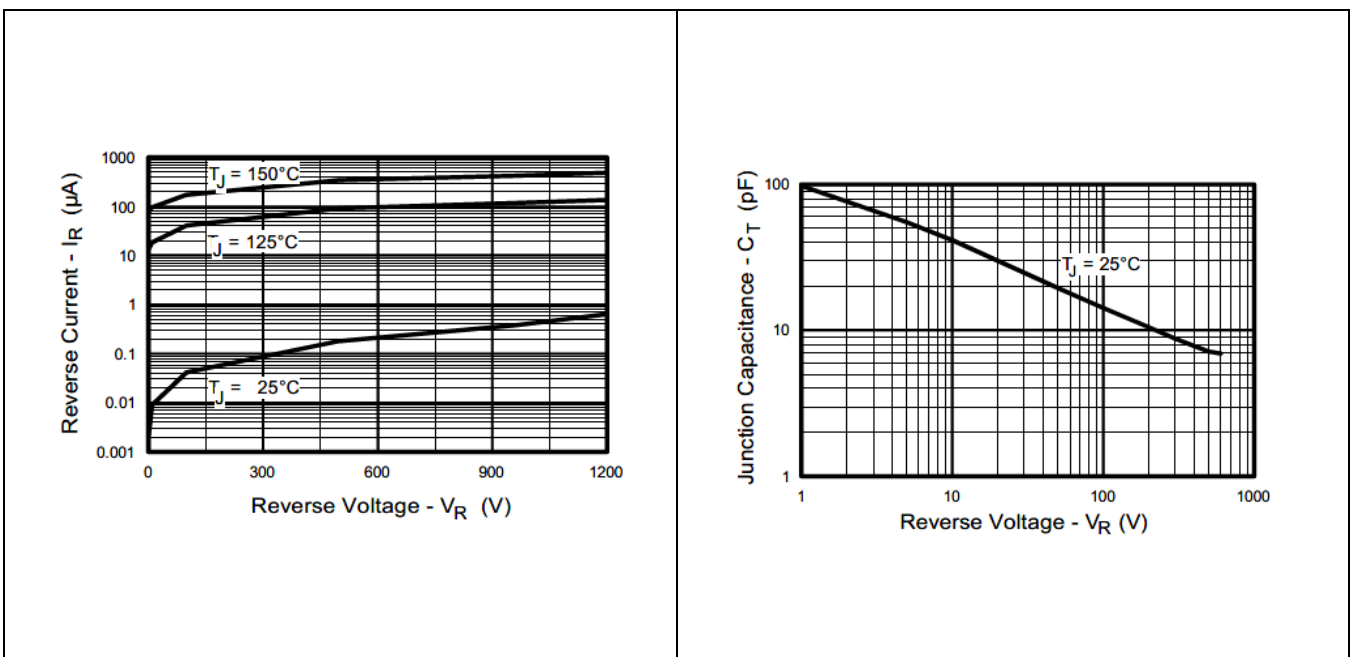


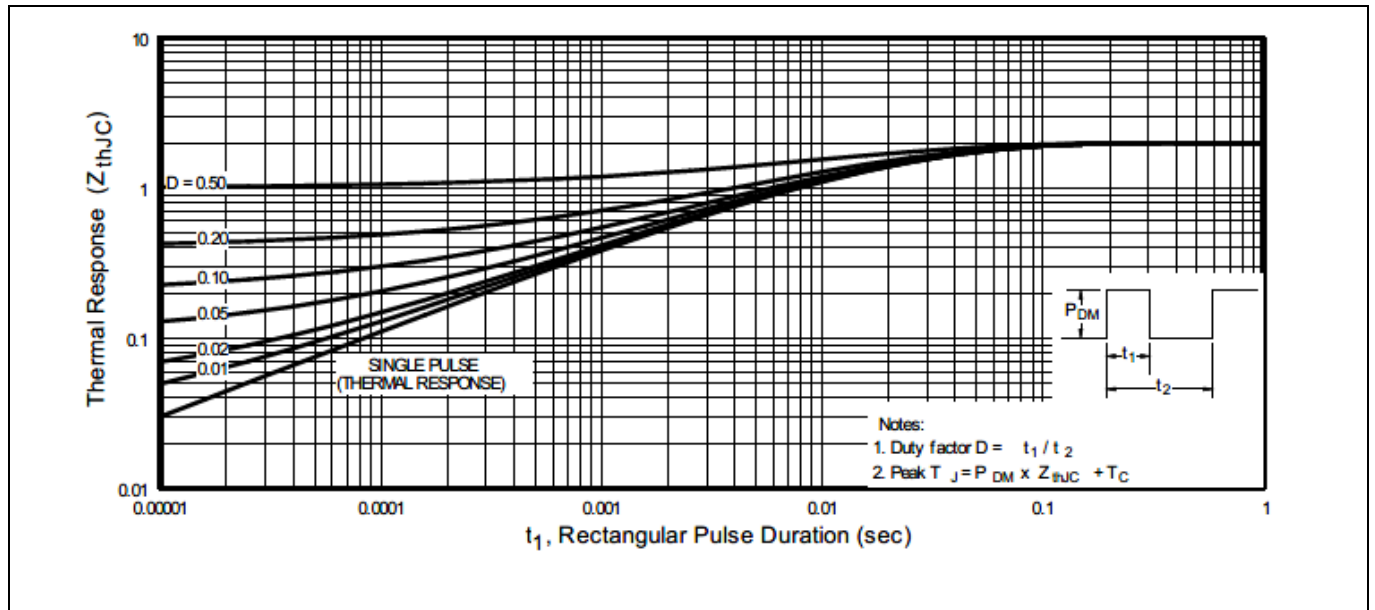
Figure 2 Typical Values of Reverse Current Vs. Reverse Voltage (Per Leg)

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

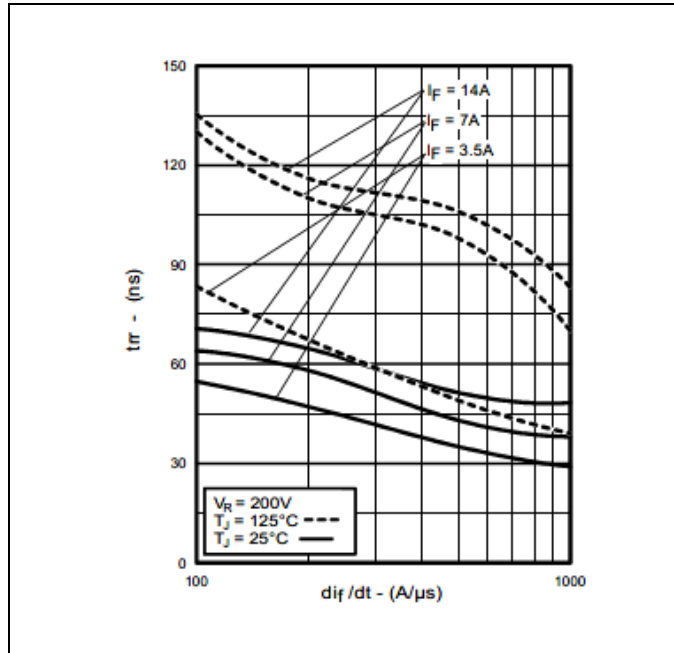
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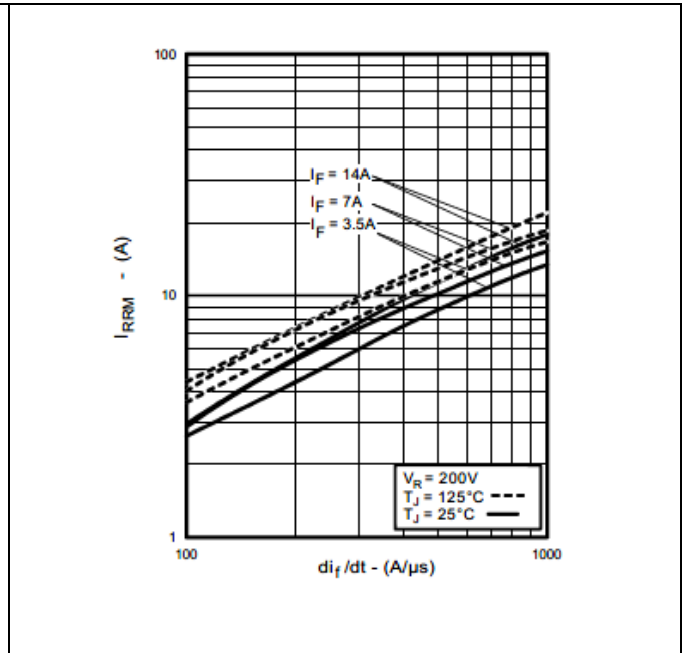
### Electrical Characteristics Curves



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



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

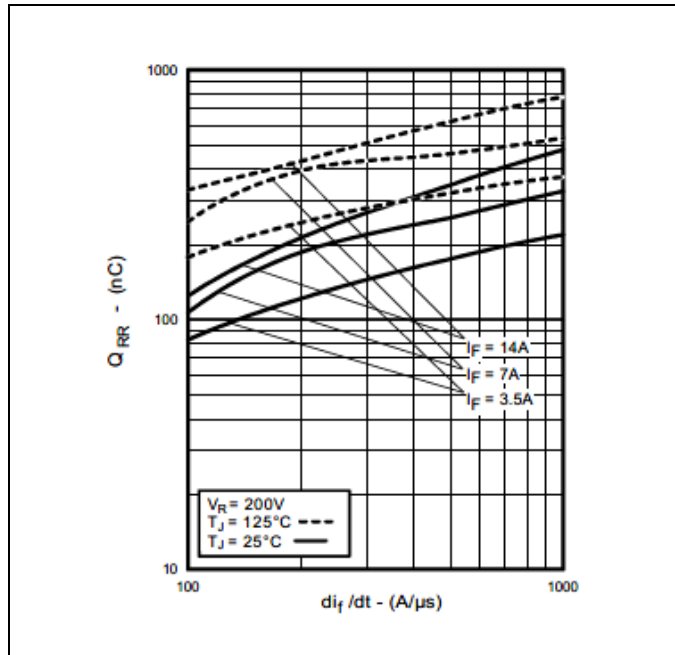


**Figure 6** Typical Recovery Current Vs.  $di_i/dt$  (Per Leg)

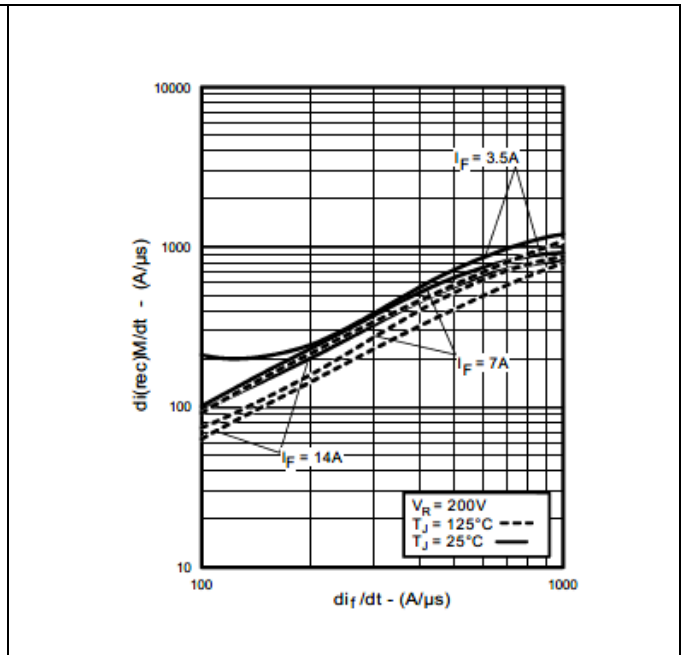
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### Electrical Characteristics Curves



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



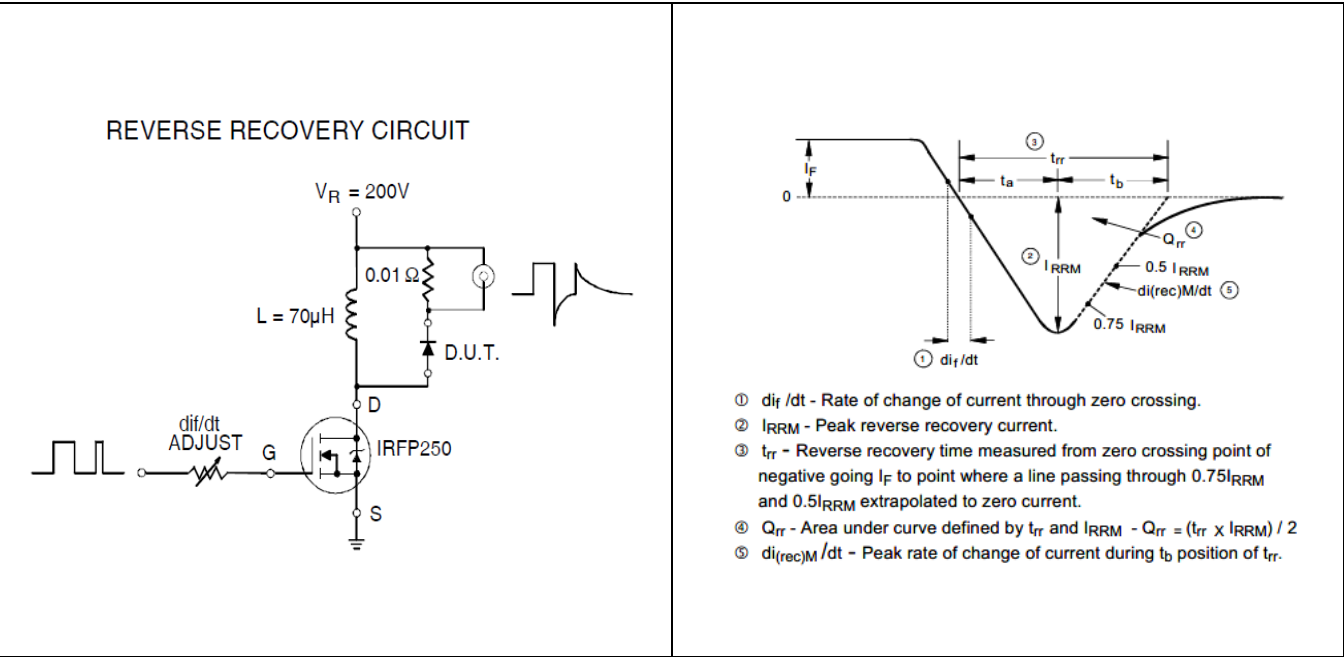
**Figure 8** Typical  $di_{(rec)M}/dt$  Vs.  $di_f/dt$  (Per Leg)

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## FRED Ultrafast, Soft Recovery Diode

### Test Circuit

## 4 Test Circuit



**Figure 9** Reverse Recovery Parameter Test Circuit

**Figure 10** Reverse Recovery Waveform and Definitions



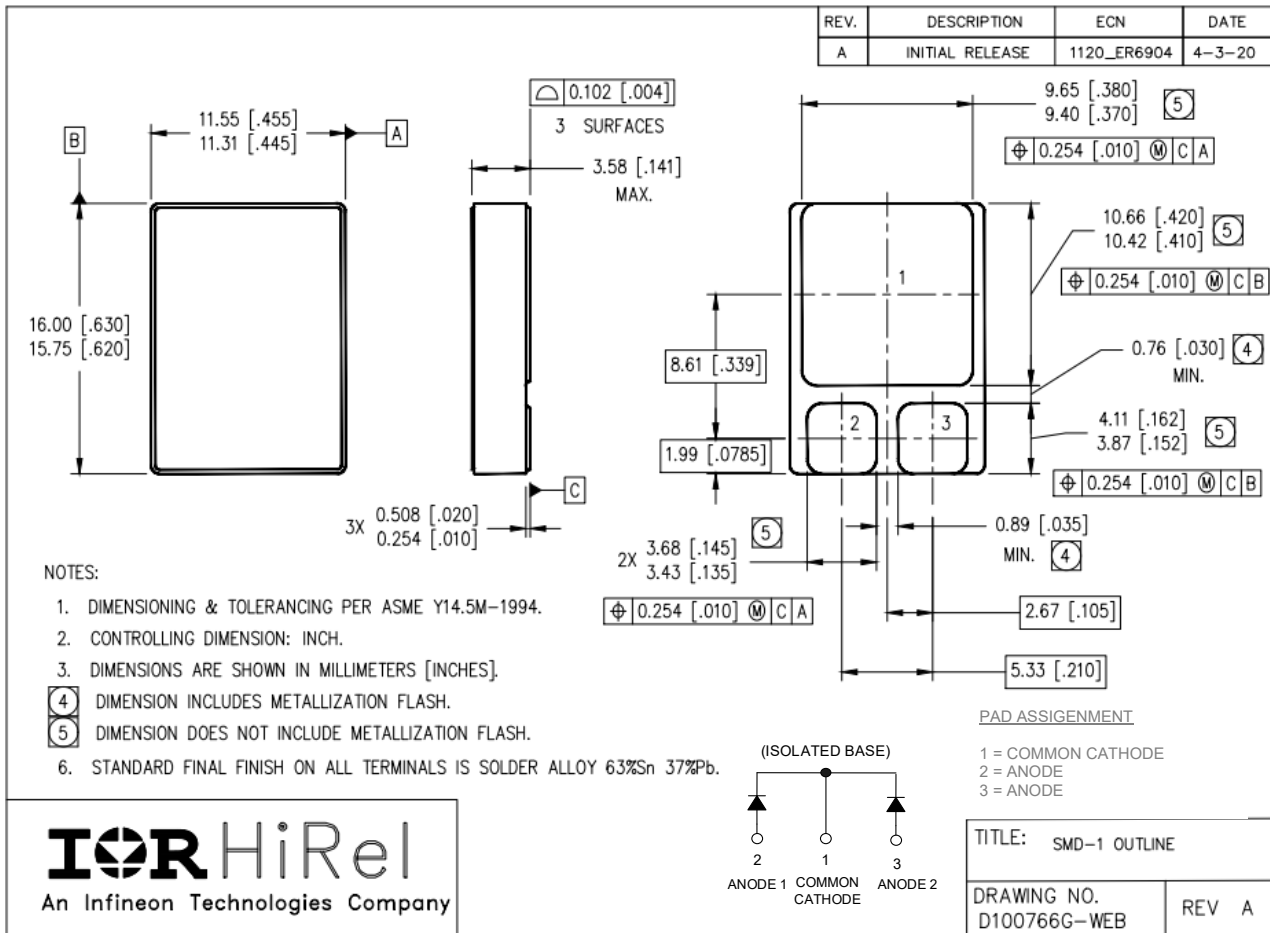
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## FRED Ultrafast, Soft Recovery Diode

### Package Outline

## 5 Package Outline

Note: For the most updated package outline, please see the website: [SMD-1](#)



**HFA40HF120C****FRED Ultrafast, Soft Recovery Diode****Revision history****Revision history**

Document version	Date of release	Description of changes
	04/30/1998	Final datasheet (PD-91797)
Rev A	12/14/2015	Updated per ECN-1120-03627
Rev B	09/21/2016	Updated per ECN-1120-04688
Rev C	10/13/2017	Updated per ECN-1120-05515
Rev D	05/31/2024	Updated per ECN-1120-09961

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