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/µs

Potential Applications

- DC-DC converter
- Motor drives

SMD-1

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 optimizedto 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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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°C [1]	15	A
I_{FSM}	Single pulse forward current, T_C = 25°C [2]	50	A
P_D @ T_C = 25°C	Maximum power dissipation	63	W
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to 150	°C
Wt	Weight	2.6 (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 (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	Max Forward Voltage Drop See Fig. 1	—	—	3.9	V	I_F = 7.0A, T_J = -55°C
		—	—	3.3	V	I_F = 7.0A, T_J = 25°C
		—	—	4.4	V	I_F = 15A, T_J = 25°C
		—	—	2.8	V	I_F = 7.0A, 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 = 960V, T_J = 125°C
C_J	Junction Capacitance See Fig. 3	—	15	20	pF	V_R = 200V
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°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 = 7.0A
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	d_{if}/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

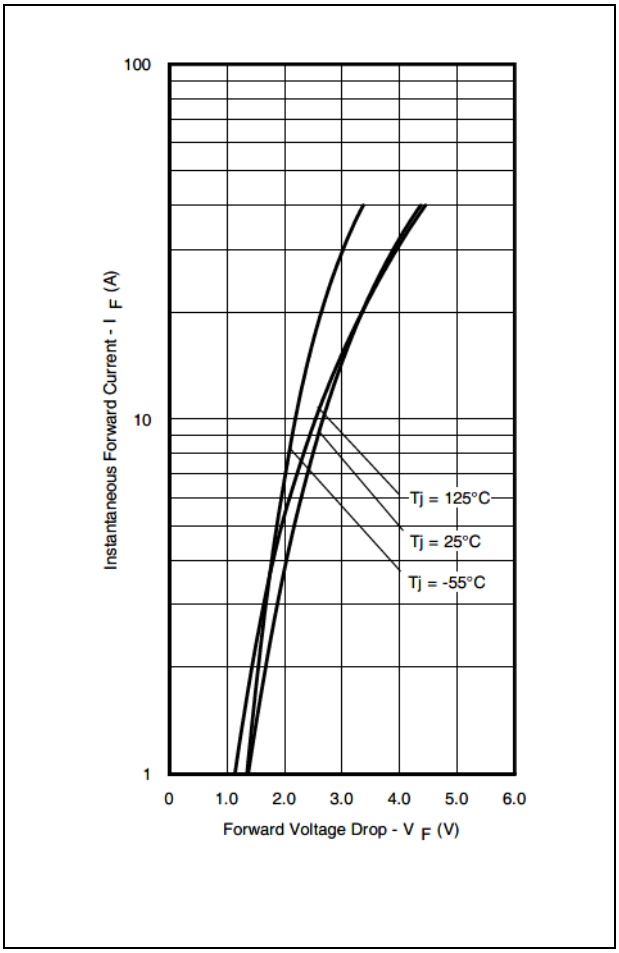


Figure 1 Typical Forward Voltage Drop Vs. Instantaneous Forward Current (Per Leg)

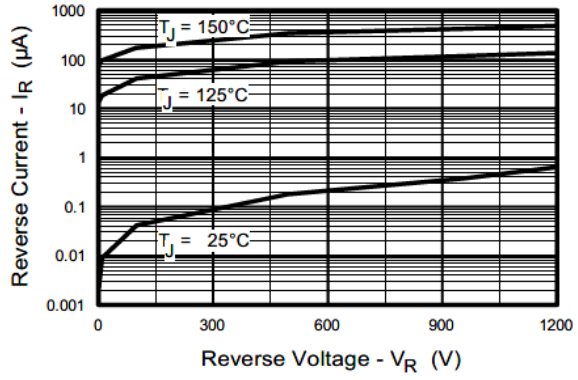


Figure 2 Typical Values of Reverse Current Vs. Reverse Voltage (Per Leg)

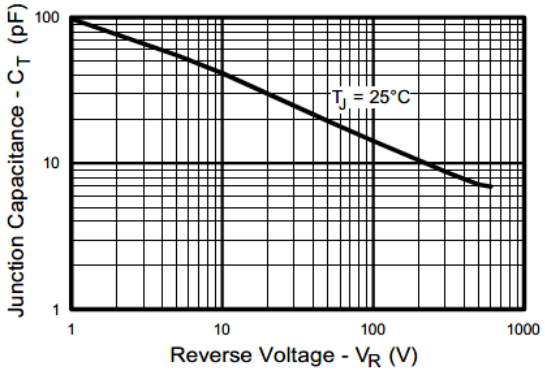


Figure 3 Typical Junction Capacitance Vs. Reverse Voltage (Per Leg)

Electrical Characteristics Curves

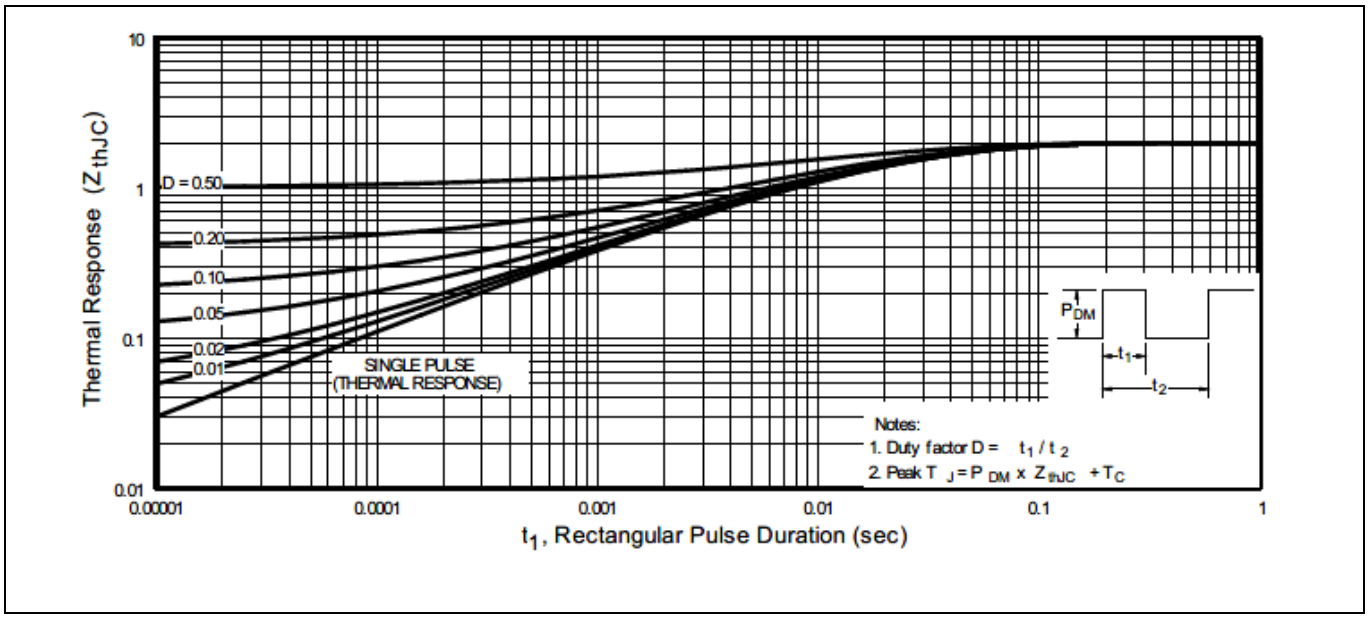


Figure 4 Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)

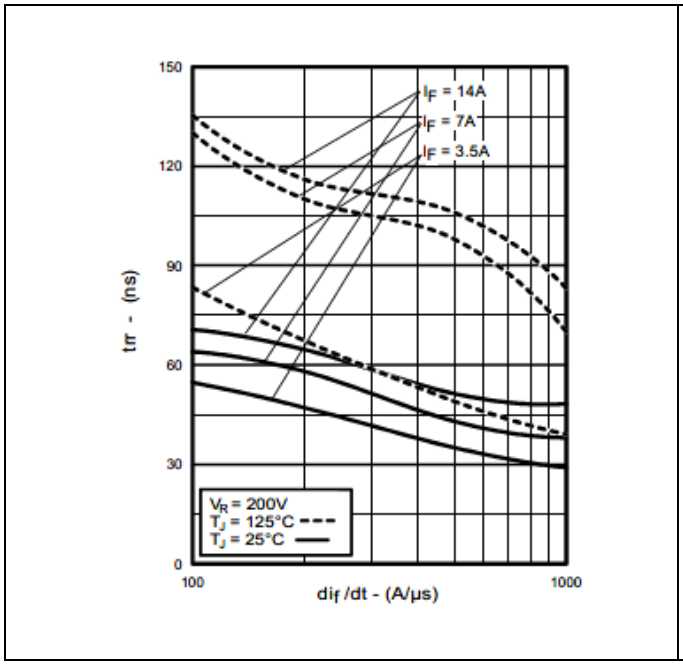


Figure 5 Typical Reverse Recovery Vs. di_f/dt (Per Leg)

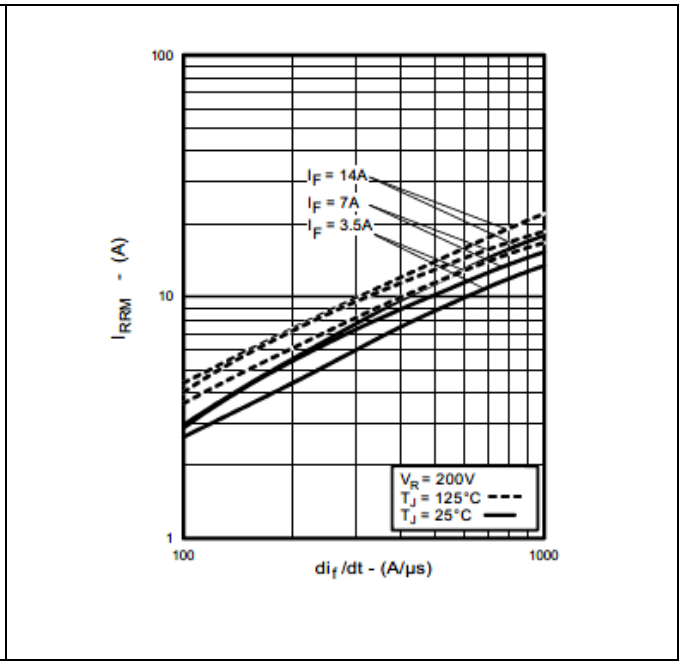


Figure 6 Typical Recovery Current Vs. di_f/dt (Per Leg)

Electrical Characteristics Curves

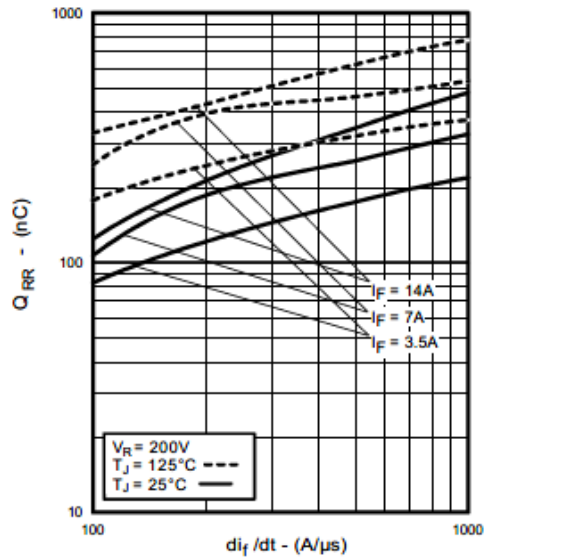


Figure 7 Typical Stored Charge Vs. di_f/dt (Per Leg)

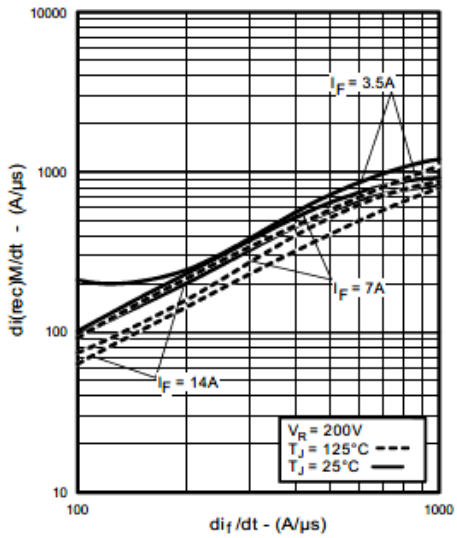


Figure 8 Typical $di_{(rec)M}/dt$ Vs. di_f/dt (Per Leg)

4 Test Circuit

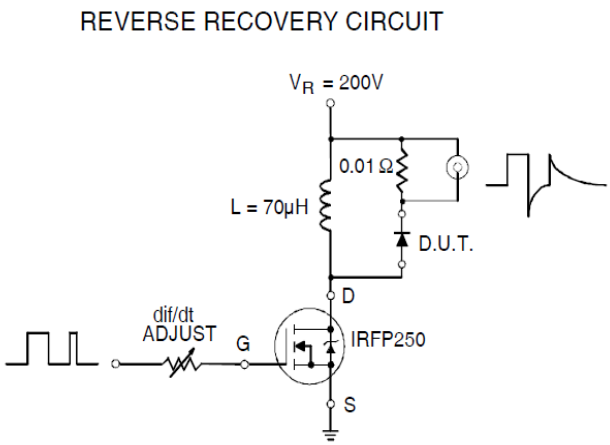
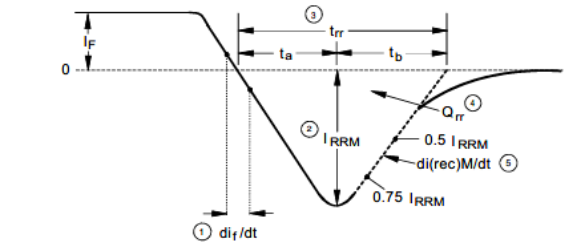


Figure 9 Reverse Recovery Parameter Test Circuit

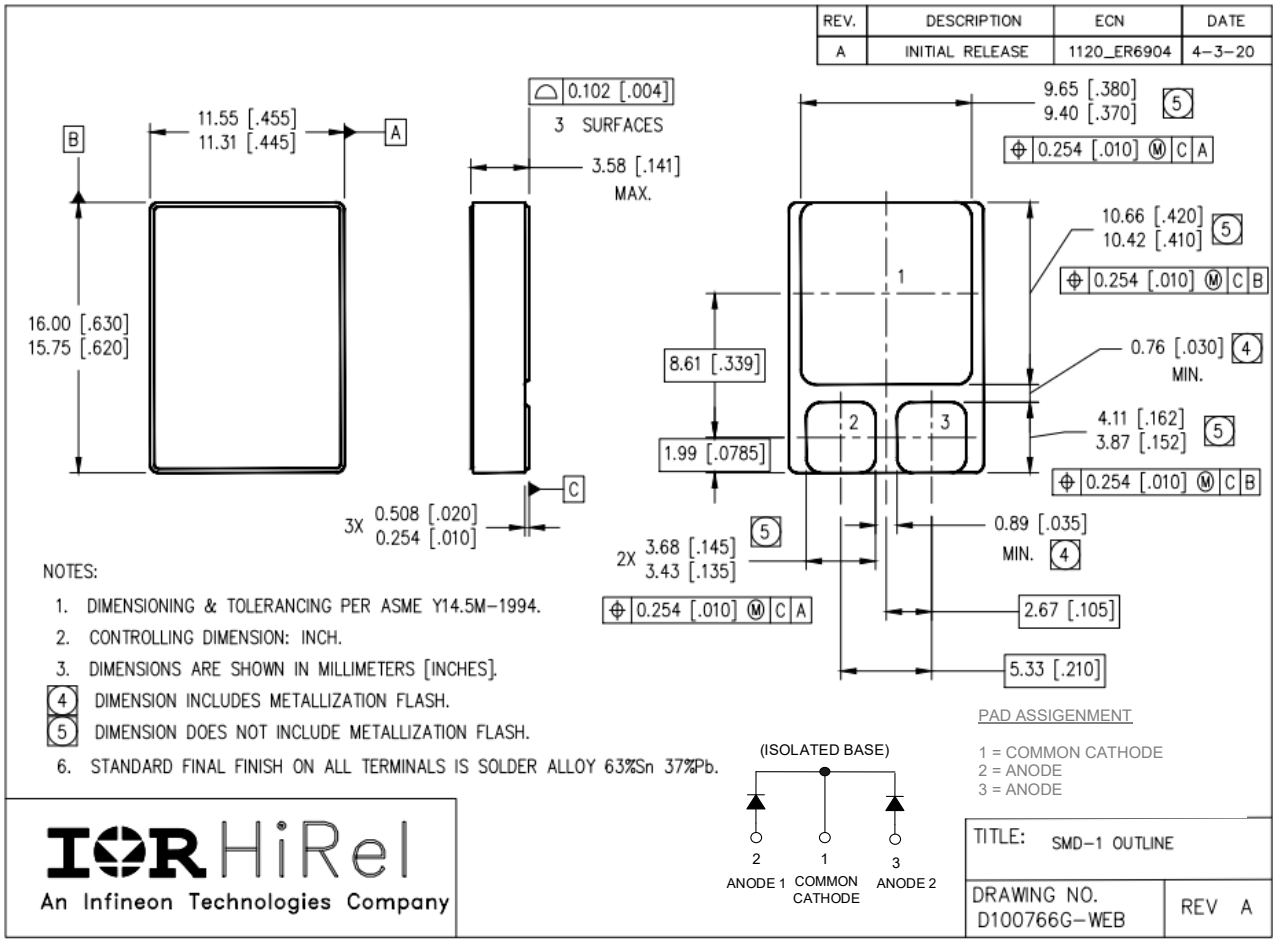


① di_f/dt - Rate of change of current through zero crossing.
② I_{RRM} - Peak reverse recovery current.
③ t_{rr} - Reverse recovery time measured from zero crossing point of negative going I_F to point where a line passing through $0.75I_{RRM}$ and $0.5I_{RRM}$ extrapolated to zero current.
④ Q_{rr}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



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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