

HFA40HF60

PD-20381E

Ultrafast, Soft Recovery Diode Surface Mount (SMD-1) 600V, 22A

Features

- Single diode configuration
- Reduced RFI and EMI
- Reduced snubbing
- Extensive characterization of recovery parameters
- Hermetic package
- Surface mount
- ESD Rating: Class 3B per MIL-STD-750, Method 1020

Product Summary

- V_R : 600V
- V_F : 1.75V
- t_{rr} : 97ns
- $di_{(rec)M}/dt$: 270A/ μ s

Potential Applications

- DC-DC converter
- Motor drives

Product Validation

Qualified according to MIL-PRF-19500 for space applications

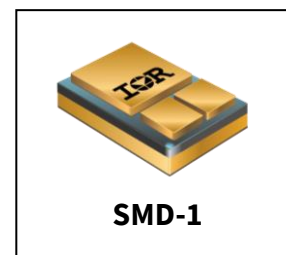
Description

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 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
HFA40HF60	SMD-1	COTS
HFA40HF60SCV	SMD-1	JANTXV-equivalent
HFA40HF60SCX	SMD-1	JANTX-equivalent
HFA40HF60SCS	SMD-1	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, $T_C = 100\text{ }^{\circ}\text{C}$ ¹	22	A
I_{FSM}	Single pulse Forward Current, $T_C = 25^{\circ}\text{C}$ ²	225	A
$P_D @ T_C = 25^{\circ}\text{C}$	Maximum Power Dissipation	83	W
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to 150	$^{\circ}\text{C}$
Wt	Weight	2.6 (Typical)	g

¹ DC = 50% rect. wave² 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 See Fig. 1	—	—	1.61	V	$I_F = 22\text{A}$, $T_J = -55^\circ\text{C}$
		—	1.63	1.75		$I_F = 22\text{A}$, $T_J = 25^\circ\text{C}$
		—	2.07	2.25		$I_F = 45\text{A}$, $T_J = 25^\circ\text{C}$
		—	1.52	1.64		$I_F = 22\text{A}$, $T_J = 125^\circ\text{C}$
I_R	Reverse Leakage Current See Fig. 2	—	—	10	μA	$V_R = V_R$ Rated
		—	—	1.0	mA	$V_R = 480\text{V}$, $T_J = 125^\circ\text{C}$
C_T	Junction Capacitance See Fig. 3	—	56	59	pF	$V_R = 200\text{V}$, $f = 1.0\text{MHz}$
L_S	Series Inductance	—	5.9	—	nH	Measured from center of cathode pad the center of anode pad

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

2.3 Thermal-Mechanical Characteristics

Table 5 Thermal-Mechanical Characteristics

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

3 Electrical Characteristics Curves

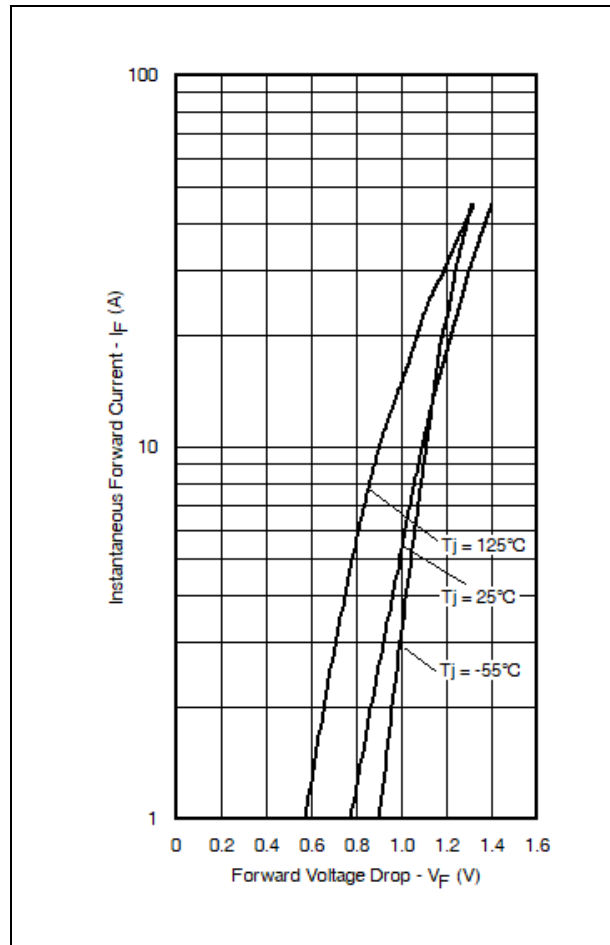


Figure 1 Maximum Forward Voltage Drop Characteristics

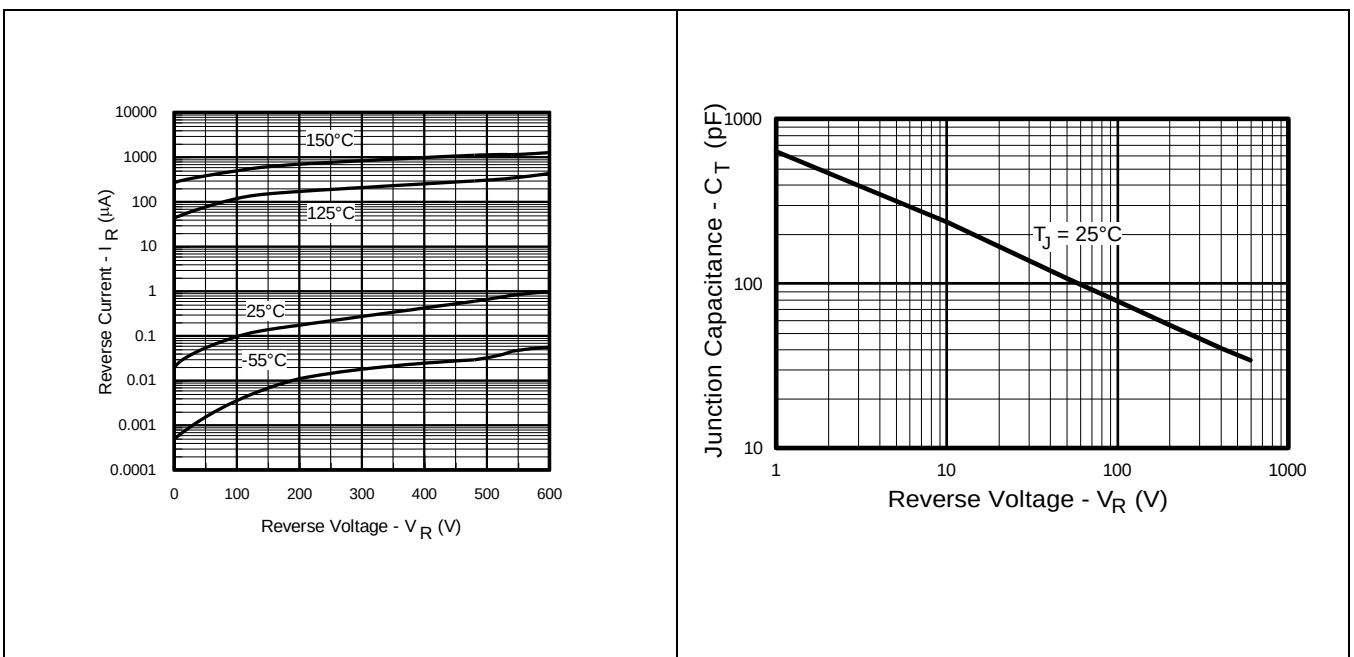


Figure 2 Typical Values of Reverse Current Vs. Reverse Voltage

Figure 3 Typical Junction Capacitance Vs. Reverse Voltage

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Electrical Characteristics Curves

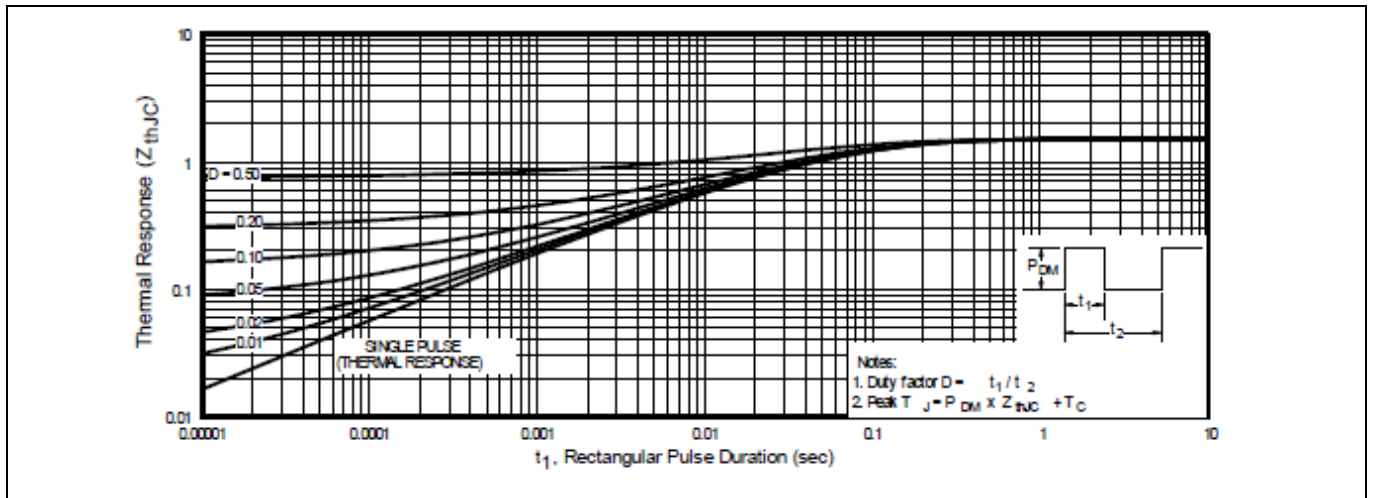


Figure 4 Maximum Thermal Impedance Z_{thJC} Characteristics

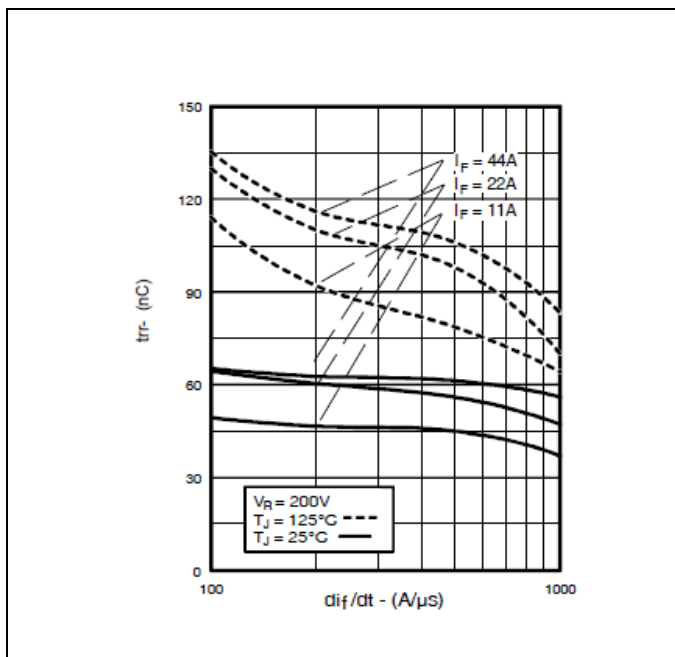


Figure 5 Typical Reverse Recovery Vs. di_i/dt

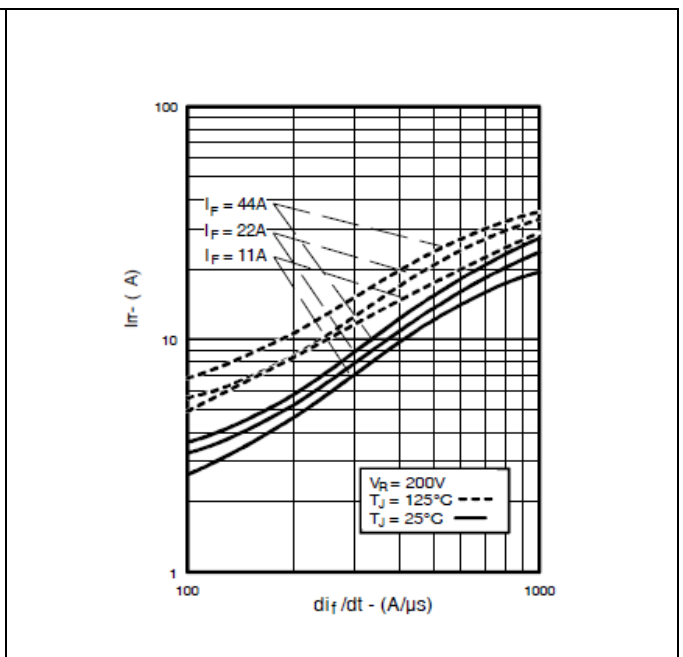


Figure 6 Typical Recovery Current Vs. di_i/dt

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Electrical Characteristics Curves

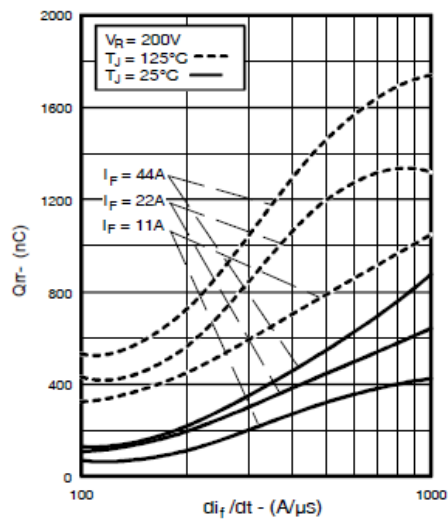


Figure 7 Typical Stored Charge Vs. di_f/dt

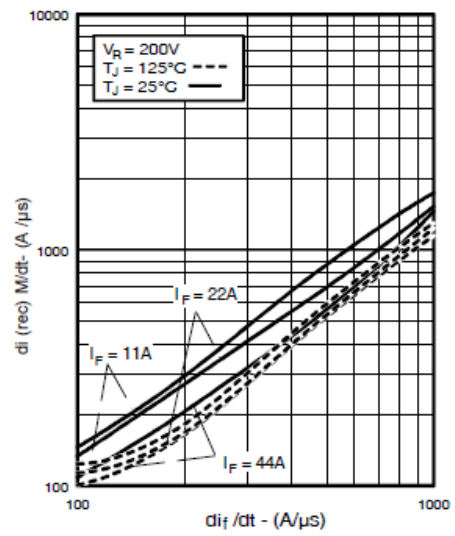


Figure 8 Typical $di_{(rec)M}/dt$ Vs. di_f/dt

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Test Circuit

4 Test Circuit

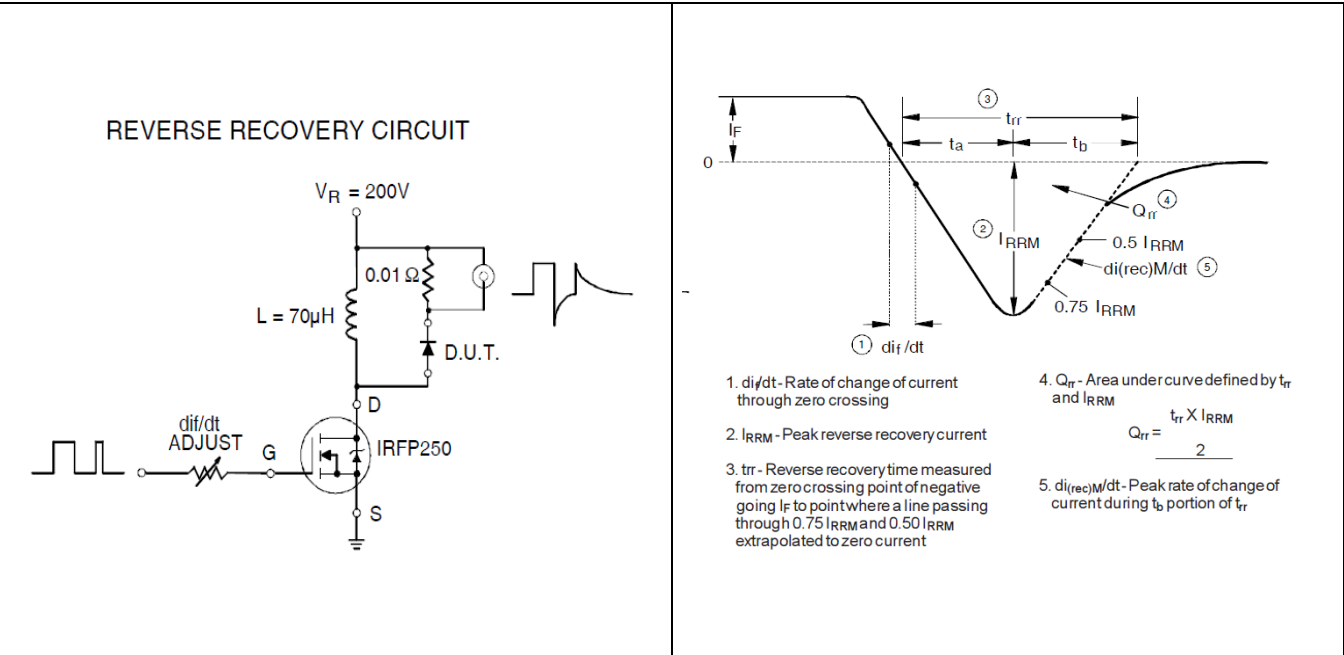


Figure 9 Reverse Recovery Parameter Test Circuit

Figure 10 Reverse Recovery Waveform and Definitions

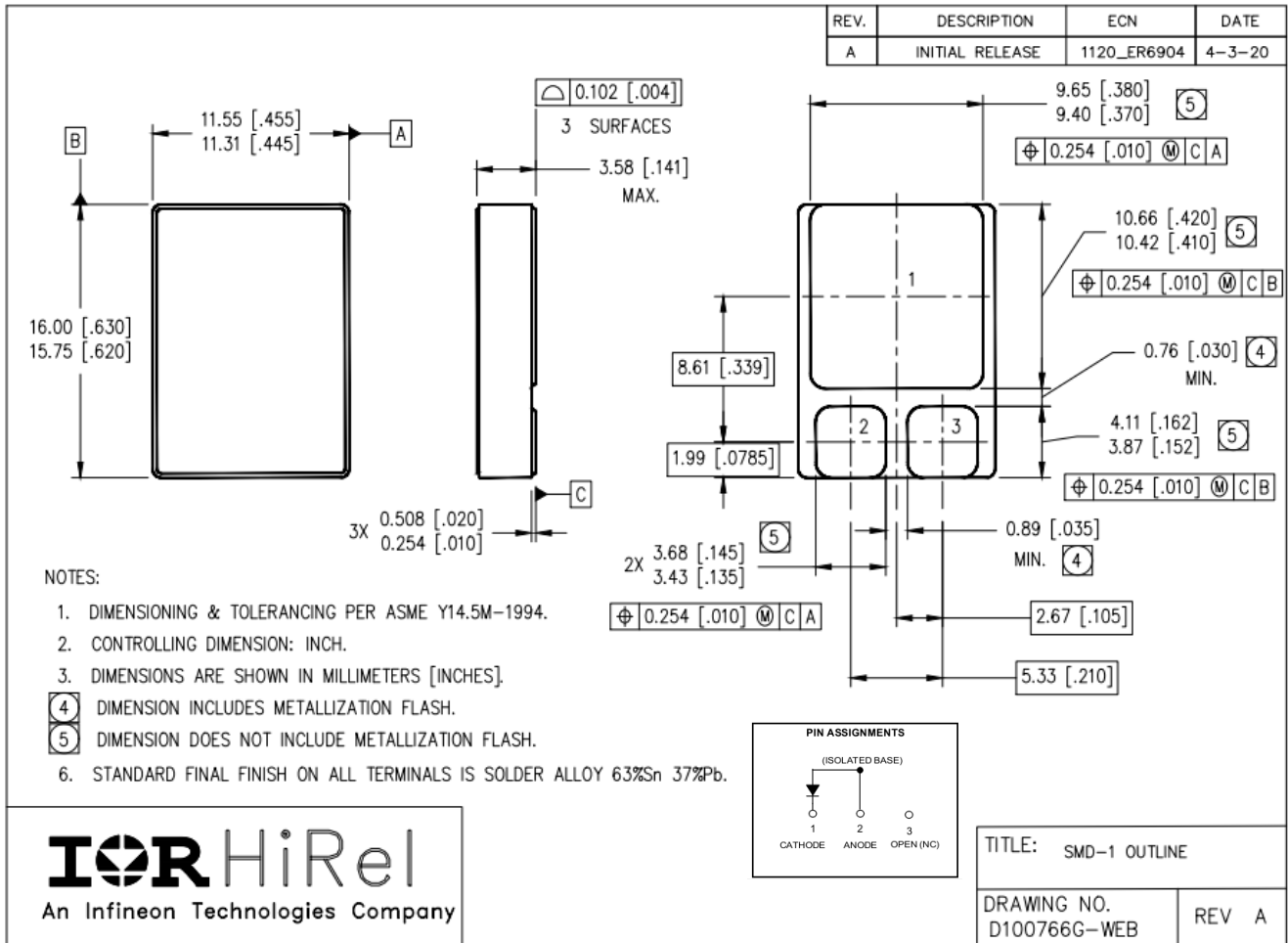
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Package Outline

5 Package Outline

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



HFA40HF60**FRED Ultrafast, Soft Recovery Diode****Revision history****Revision history**

Document version	Date of release	Description of changes
	6/30/1999	Final datasheet (PD-20381)
Rev A	04/10/2010	Updated per ECN-17456
Rev B	03/04/2013	Updated per ECN-1120-0911
Rev C	10/14/2016	Updated per ECN-1120-04754
Rev D	06/02/2022	Updated per ECN-1120-08972
Rev E	08/02/2023	Updated per ECN-1120-09610

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