

**FRED**

**HFA40HF60C**  
 Ultrafast, Soft Recovery Diode

**Features**

- Reduced RFI and EMI
- Reduced Snubbing
- Extensive Characterization of Recovery Parameters
- Hermetic
- Surface Mount

$V_R = 600V$
$V_F = 1.56V$
$Q_{rr} = 270nC$
$di_{(rec)}/dt = 345A/\mu s$

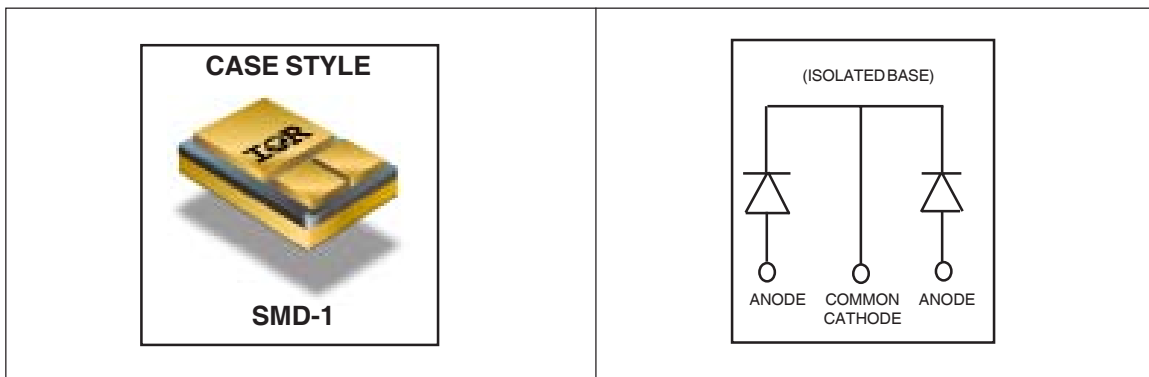
**Description**

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, motors drives and other applications where switching losses are significant portion of the total losses.

**Absolute Maximum Ratings (per Leg)**

	Parameter	Max.	Units
$V_R$	Cathode to Anode Voltage	600	V
$I_{F(AV)}$	Continuous Forward Current, ① $T_C = 55^\circ C$	30	A
$I_{FSM}$	Single Pulse Forward Current, ② $T_C = 25^\circ C$	150	
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	63	W
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 to +150	$^\circ C$

**Note:** ① D.C.= 50% rect. wave  
 ② 1/2 sine wave, 60Hz, P.W.= 8.33ms



**Electrical Characteristics (per Leg) @ T<sub>J</sub> = 25°C (unless otherwise specified)**

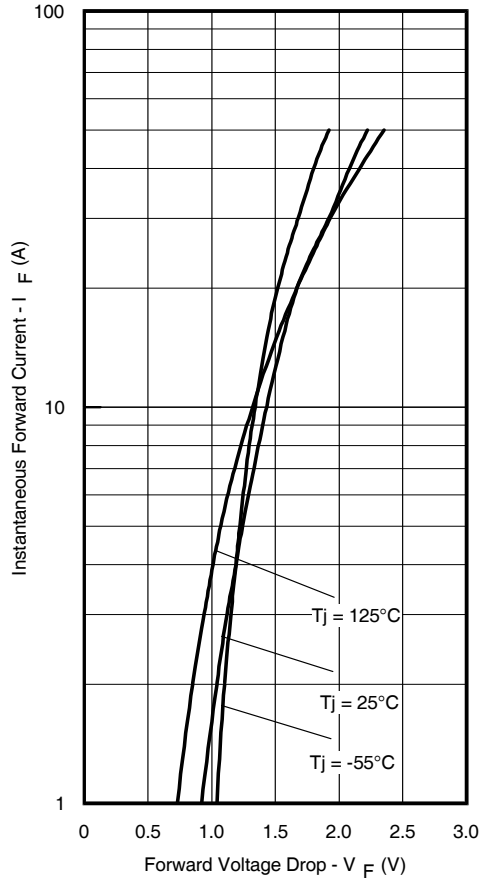
	Parameter	Min.	Typ.	Max.	Units	Test Conditions
V <sub>BR</sub>	Cathode Anode Breakdown Voltage	600	—	—	V	I <sub>R</sub> = 250μA
V <sub>F</sub>	Max Forward Voltage	—	—	1.43	V	I <sub>F</sub> = 15A, T <sub>J</sub> = -55°C
	See Fig. 1	—	—	1.56		I <sub>F</sub> = 15A, T <sub>J</sub> = 25°C
		—	—	1.92		I <sub>F</sub> = 30A, T <sub>J</sub> = 25°C
		—	—	1.51		I <sub>F</sub> = 15A, T <sub>J</sub> = 125°C
I <sub>R</sub>	Max Reverse Leakage Current	—	—	10	μA	V <sub>R</sub> = V <sub>R</sub> Rated
	See Fig. 2	—	—	1.0	mA	V <sub>R</sub> = 480V, T <sub>J</sub> = 125°C
C <sub>T</sub>	Junction Capacitance, See Fig. 3	—	24	36	pF	V <sub>R</sub> = 200V
L <sub>S</sub>	Series Inductance	—	2.8	—	nH	Measured from center of cathode pad to center of anode pad

**Dynamic Recovery Characteristics (per Leg) @ T<sub>J</sub> = 25°C (unless otherwise specified)**

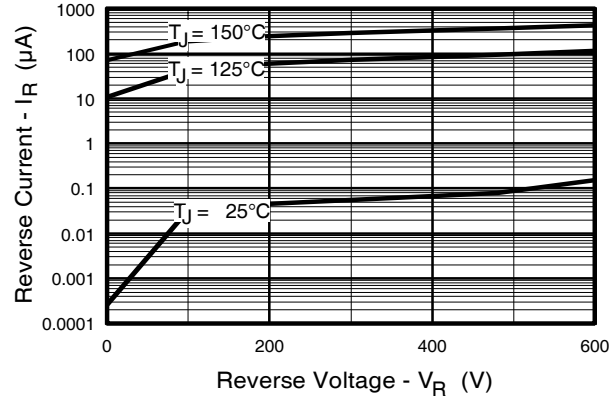
	Parameter	Min.	Typ.	Max.	Units	Test Conditions
t <sub>rr1</sub>	Reverse Recovery Time	—	54	88	ns	T <sub>J</sub> = 25°C See Fig.
t <sub>rr2</sub>		—	94	140		T <sub>J</sub> = 125°C 5
I <sub>RRM1</sub>	Peak Recovery Current	—	5.6	7.8	A	T <sub>J</sub> = 25°C See Fig.
I <sub>RRM2</sub>		—	7.8	11.7		T <sub>J</sub> = 125°C 6
Q <sub>rr1</sub>	Reverse Recovery Charge	—	180	270	nC	T <sub>J</sub> = 25°C See Fig.
Q <sub>rr2</sub>		—	435	650		T <sub>J</sub> = 125°C 7
di <sub>(rec)M</sub> /dt1	Peak Rate of Fall of Recovery Current	—	300	345	A/μs	T <sub>J</sub> = 25°C See Fig.
di <sub>(rec)M</sub> /dt2	During t <sub>b</sub>	—	190	285		T <sub>J</sub> = 125°C 8

**Thermal-Mechanical Characteristics**

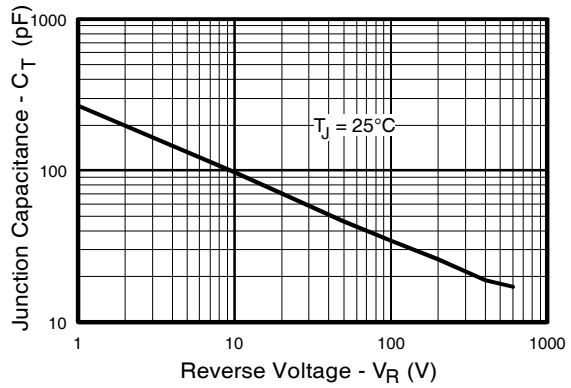
	Parameter	Typ.	Max.	Units
R <sub>thJC</sub>	Junction-to-Case, Single Leg conducting	—	2.0	°C/W
Wt	Weight	2.6	—	g



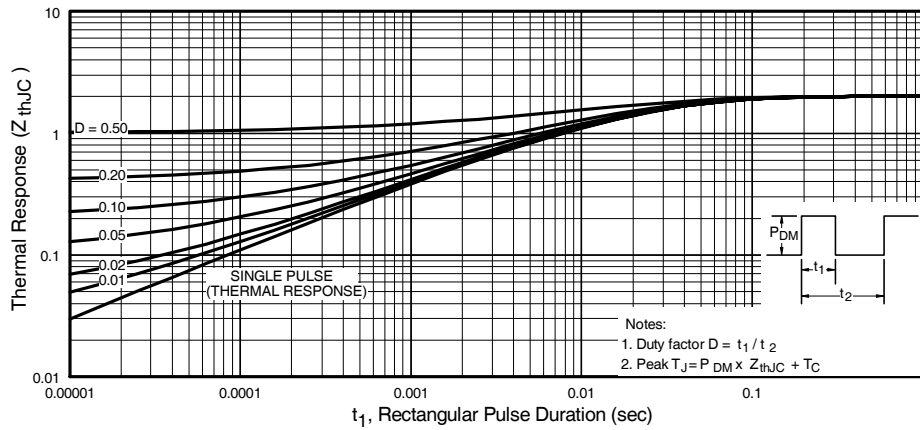
**Fig. 1** - Maximum Forward Voltage Drop Vs. Instantaneous Forward Current (per Leg)



**Fig. 2** - Typical Reverse Current Vs. Reverse Voltage (per Leg)



**Fig. 3** - Typical Junction Capacitance Vs. Reverse Voltage (per Leg)



**Fig. 4** - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (per Leg)

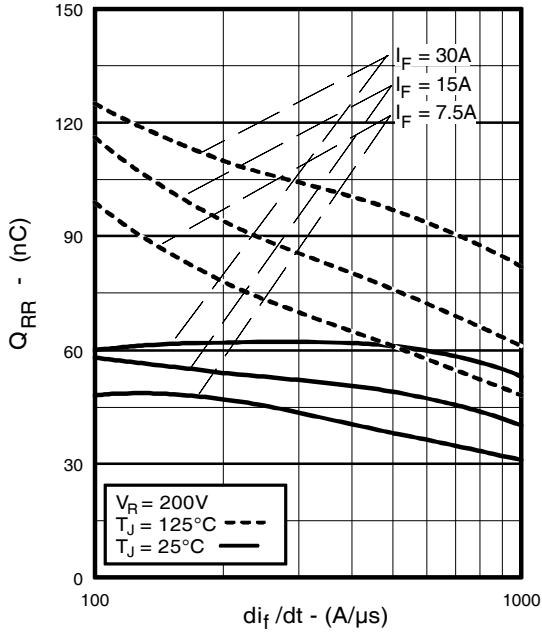


Fig. 5 - Typical Reverse Recovery Vs.  $di_f/dt$  (per Leg)

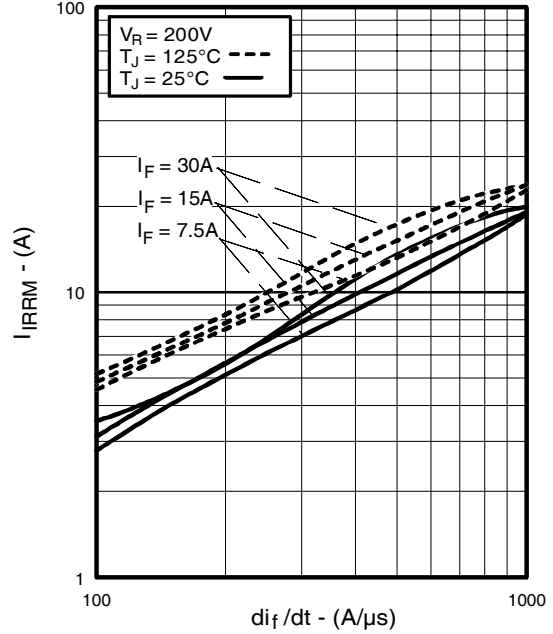


Fig. 6 - Typical Recovery Current Vs.  $di_f/dt$  (per Leg)

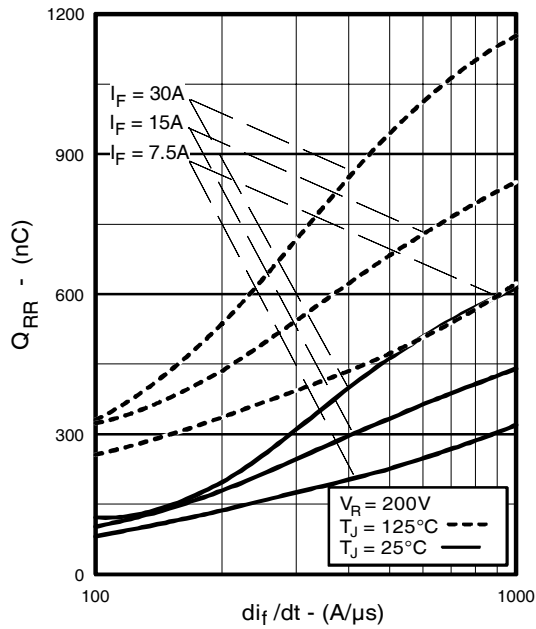


Fig. 7 - Typical Stored Charge Vs.  $di_f/dt$  (per Leg)

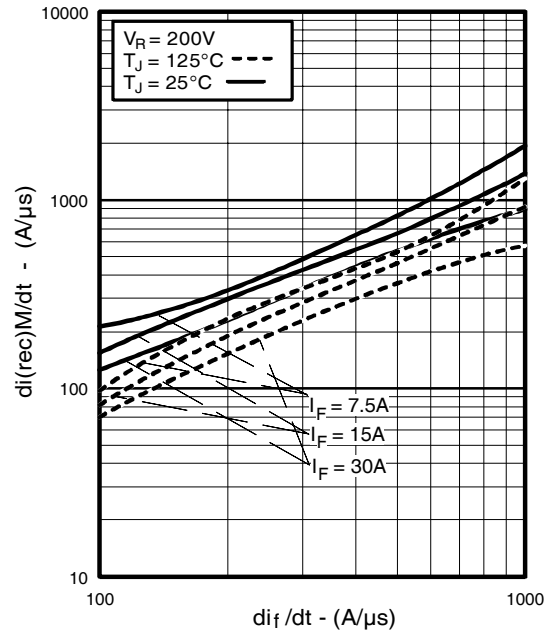


Fig. 8 - Typical  $di_{(rec)M}/dt$  Vs.  $di_f/dt$  (per Leg)

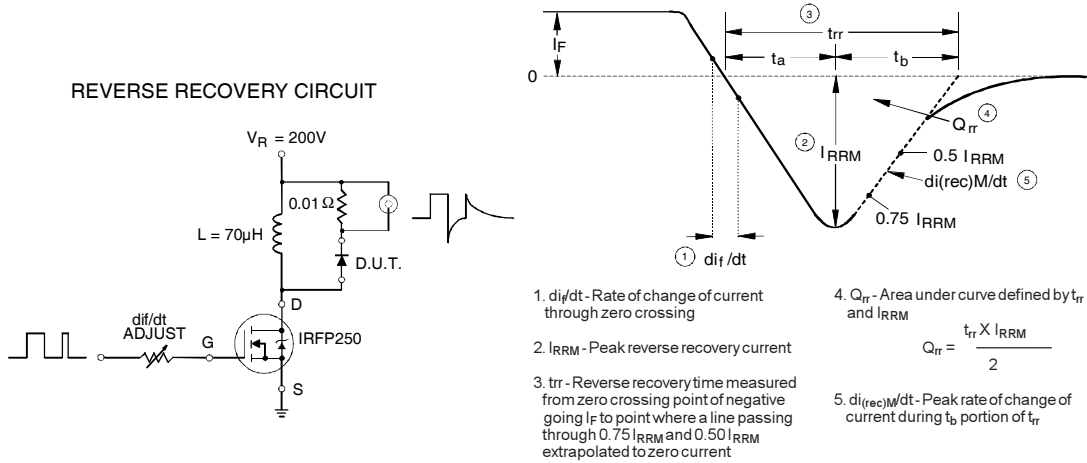
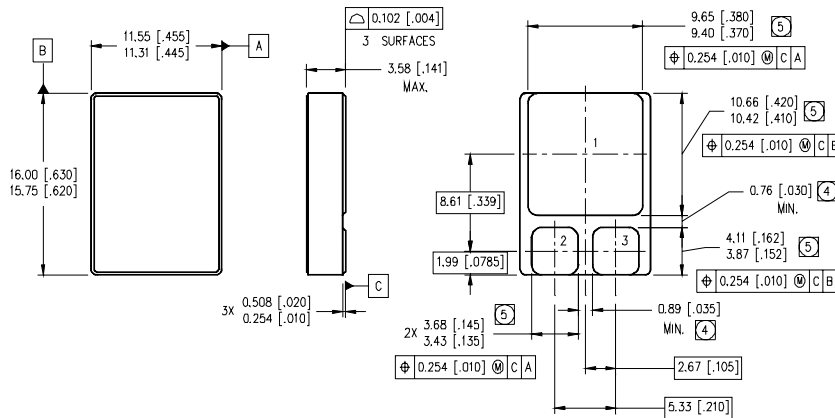


Fig. 9 - Reverse Recovery Parameter Test Circuit

Fig. 10 - Reverse Recovery Waveform and Definitions

### Case Outline and Dimensions — SMD-1



NOTES:

1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
- ④ DIMENSION INCLUDES METALLIZATION FLASH.
- ⑤ DIMENSION DOES NOT INCLUDE METALLIZATION FLASH.

PAD ASSIGNMENTS

- 1 = CATHODE
- 2 = COMMON ANODE
- 3 = COMMON ANODE