

International IOR Rectifier

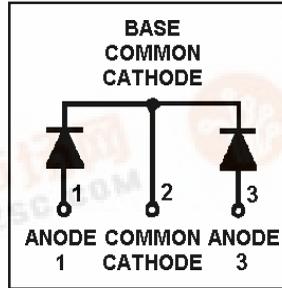
HFA70NC60CSM

HEXFRED™

Ultrafast, Soft Recovery Diode

Features

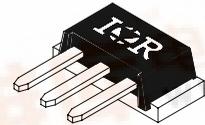
- Reduced RFI and EMI
- Reduced Snubbing
- Extensive Characterization of Recovery Parameters



$V_R = 600V$
$V_F(\text{typ.})^{\text{①}} = 1.2V$
$I_{F(AV)} = 70A$
$Q_{rr}(\text{typ.}) = 210nC$
$I_{RRM}(\text{typ.}) = 6A$
$t_{rr}(\text{typ.}) = 30ns$
$di_{(rec)}/dt(\text{typ.})^{\text{③}} = 180A/\mu s$

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



SMD-61-8

Absolute Maximum Ratings (per Leg)

	Parameter	Max.	Units
V_R	Cathode-to-Anode Voltage	600	V
$I_F @ T_C = 25^\circ C$	Continuous Forward Current	56	A
$I_F @ T_C = 100^\circ C$	Continuous Forward Current	27	
I_{FSM}	Single Pulse Forward Current ①	200	
E_{AS}	Non-Repetitive Avalanche Energy ②	220	μJ
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	150	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	59	
T_J	Operating Junction and	-55 to +150	$^\circ C$
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 sec.	300 (0.063 in. (1.6mm) from case)	

Thermal - Mechanical Characteristics

	Parameter	Min.	Typ.	Max.	Units
R_{thJC}	Junction-to-Case, Single Leg Conducting	—	—	0.85	$^\circ C/W$
	Junction-to-Case, Both Legs Conducting	—	—	0.42	K/W
W_t	Weight	—	4.3 (0.15)	—	g (oz)

Note: ① Limited by junction temperature
② $L_s = 100\mu H$, duty cycle limited by max T_J

③ 125 $^\circ C$



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PD-2.459 rev. B 01/99

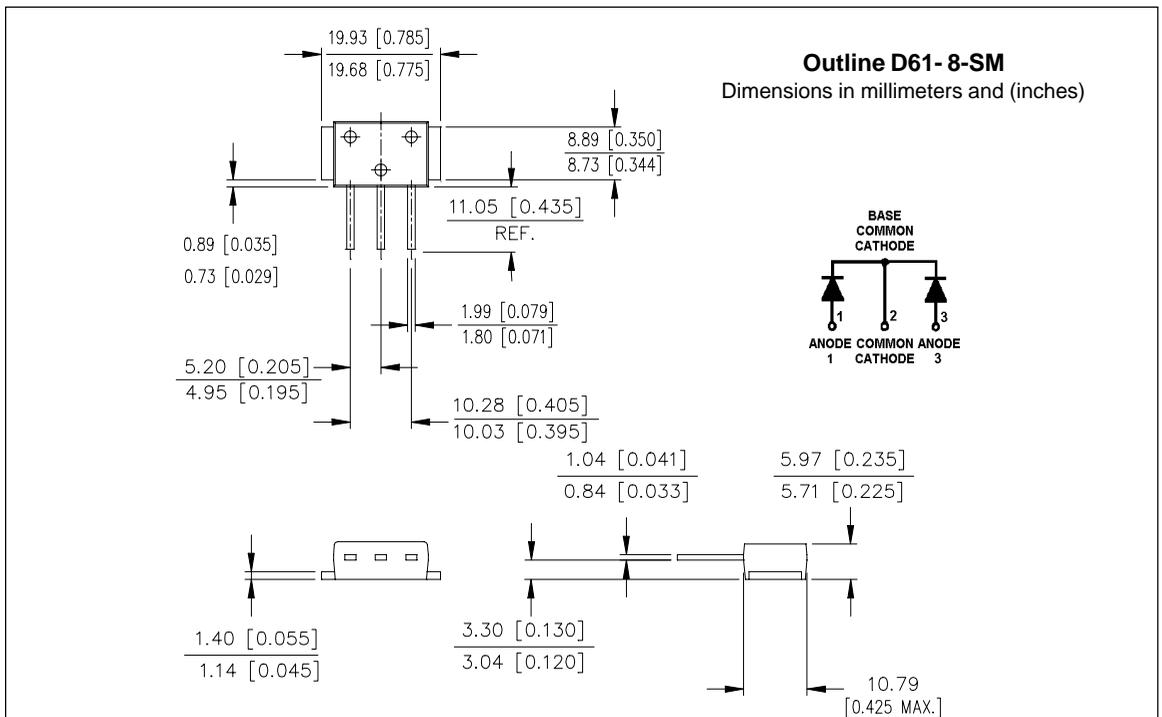
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Electrical Characteristics (per Leg) @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

Parameter	Min.	Typ.	Max.	Units	Test Conditions
V_{BR}	600	—	—	V	$I_R = 100\mu\text{A}$
V_{FM}	—	1.3	1.5	V	$I_F = 35\text{A}$ $I_F = 70\text{A}$ $I_F = 35\text{A}, T_J = 125^\circ\text{C}$
		1.5	1.7		
		1.2	1.4		
I_{RM}	—	2.0	10	μA	$V_R = V_R \text{ Rated}$
		0.50	2.0	mA	$T_J = 125^\circ\text{C}, V_R = 480\text{V}$
C_T	—	68	100	pF	$V_R = 200\text{V}$
L_S	—	5.5	—	nH	Lead to lead 5mm from package body

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

Parameter	Min.	Typ.	Max.	Units	Test Conditions
t_{rr}	—	30	—	ns	$I_F = 1.0\text{A}, di/dt = 200\text{A}/\mu\text{s}, V_R = 30\text{V}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$
t_{rr1}	—	70	110		
t_{rr2}	—	115	180		
I_{RRM1}	—	6.0	11	A	$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$
		9.0	16		
I_{RRM2}	—	210	580	nC	$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$
		520	1400		
Q_{rr1}	—	210	580	A/ μs	$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$
Q_{rr2}	—	520	1400		
$di_{(rec)M}/dt1$	—	280	—	A/ μs	$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$
$di_{(rec)M}/dt2$	—	180	—		



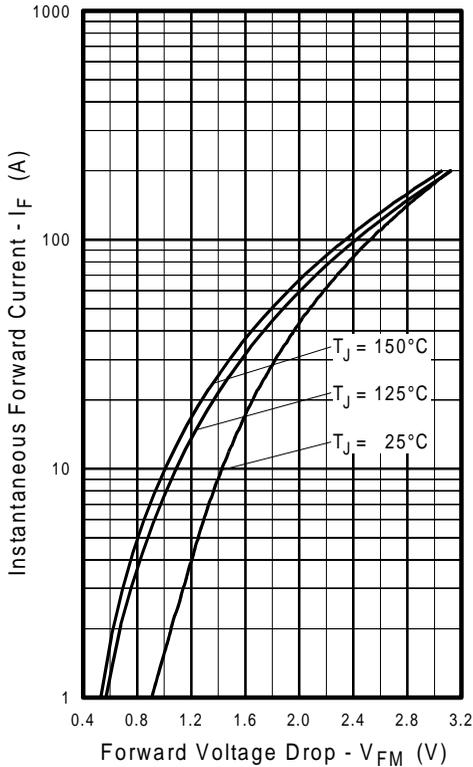


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current, (per Leg)

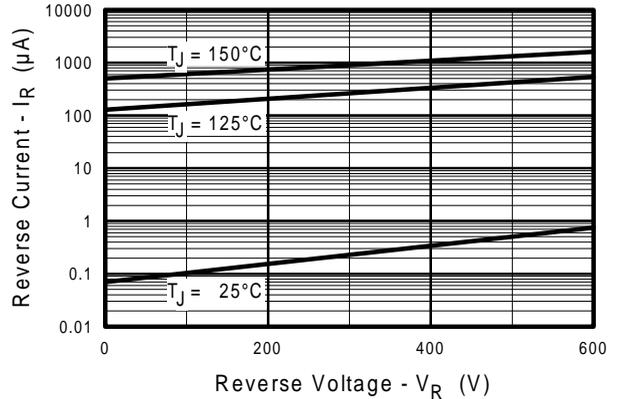


Fig. 2 - Typical Reverse Current vs. Reverse Voltage, (per Leg)

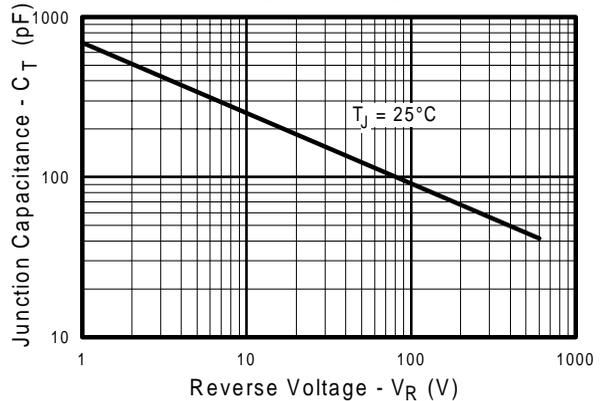


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage, (per Leg)

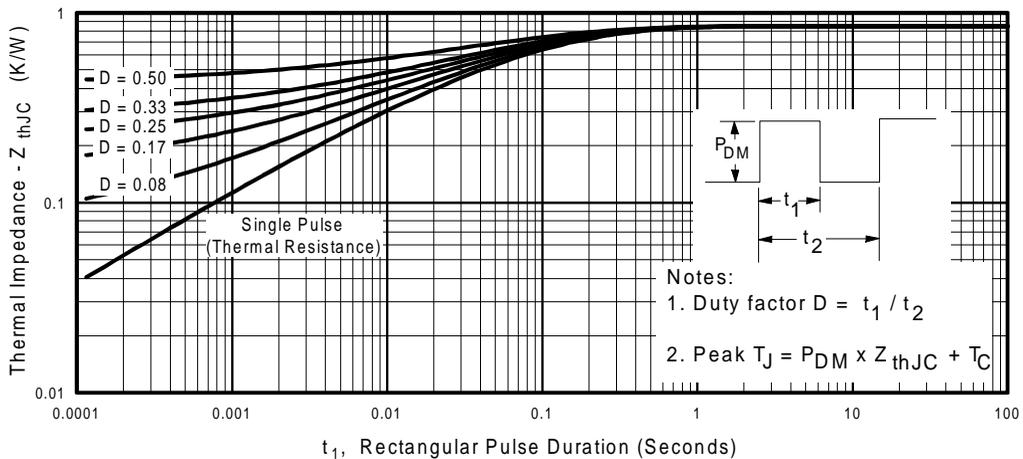


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics. (per Leg)

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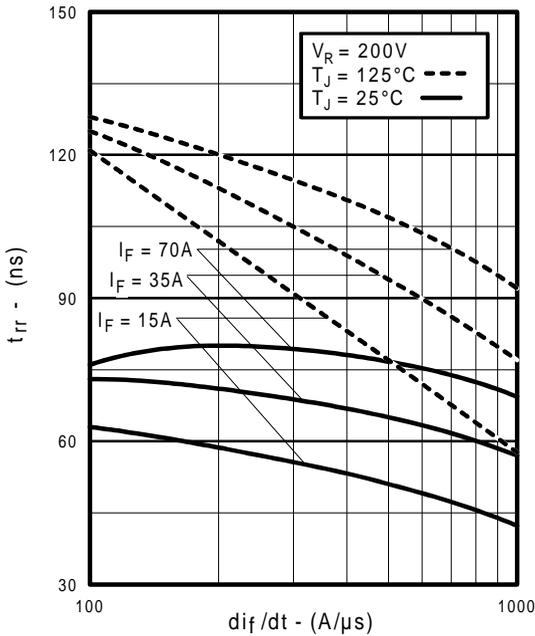


Fig. 5 - Typical Reverse Recovery vs. di_f/dt , (per Leg)

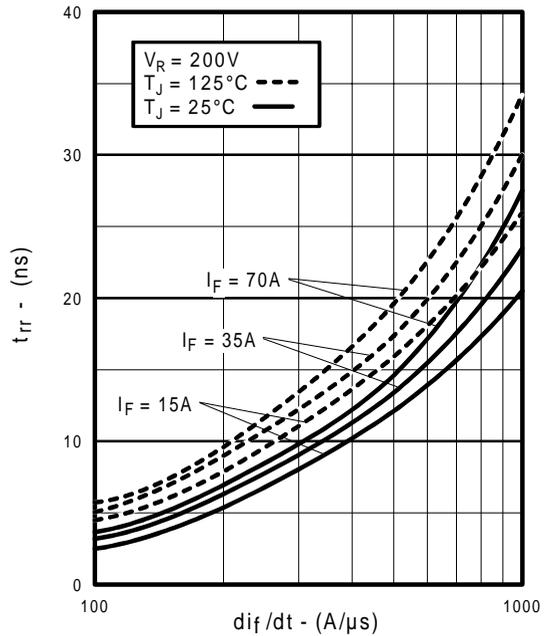


Fig. 6 - Typical Recovery Current vs. di_f/dt , (per Leg)

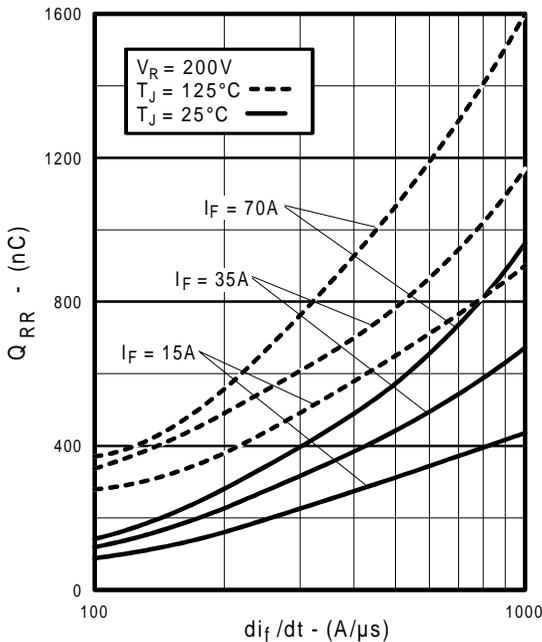


Fig. 7 - Typical Stored Charge vs. di_f/dt , (per Leg)

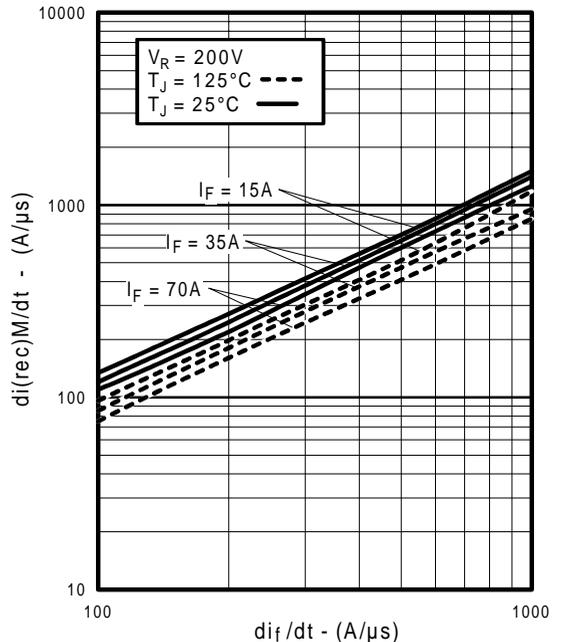


Fig. 8 - Typical $di_{(rec)}M/dt$ vs. di_f/dt , (per Leg)

REVERSE RECOVERY CIRCUIT

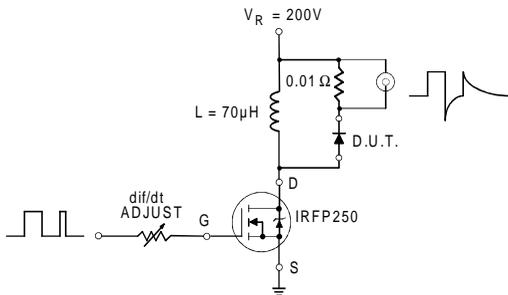
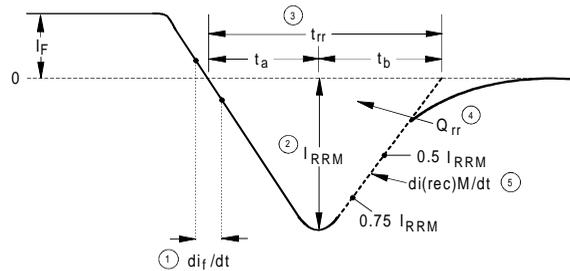


Fig. 9 - Reverse Recovery Parameter Test Circuit



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 $0.75 I_{RRM}$ and $0.50 I_{RRM}$ extrapolated to zero current
4. Q_{rr} - Area under curve defined by t_{rr} and I_{RRM}
5. $di_{(rec)M}/dt$ - Peak rate of change of current during t_b portion of t_{rr}

$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

Fig. 10 - Reverse Recovery Waveform and Definitions

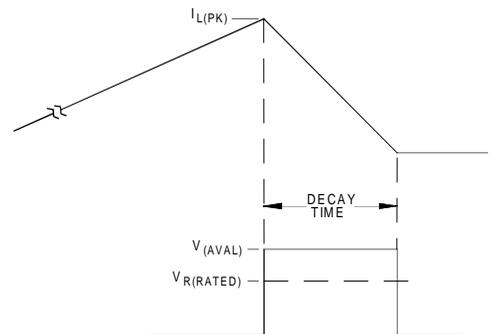
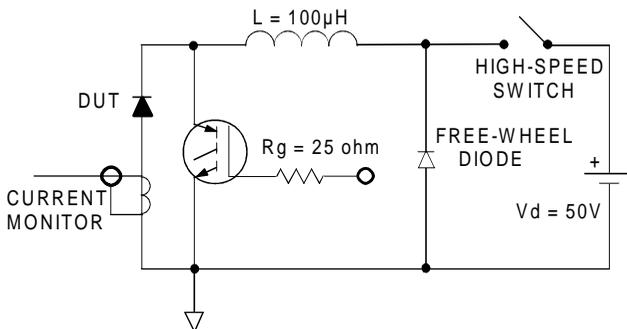


Fig. 11 - Avalanche Test Circuit and Waveforms