

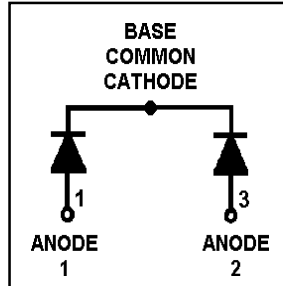
HFA70NC60CSL

HEXFRED™

Ultrafast, Soft Recovery Diode

Features

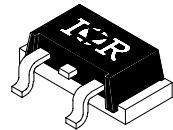
- Reduced RFI and EMI
- Reduced Snubbing
- Extensive Characterization of Recovery Parameters



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

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.



SLD-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 $\textcircled{1}$	200	
E_{AS}	Non-Repetitive Avalanche Energy $\textcircled{2}$	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
Wt	Weight	—	4.3 (0.15)	—	g (oz)

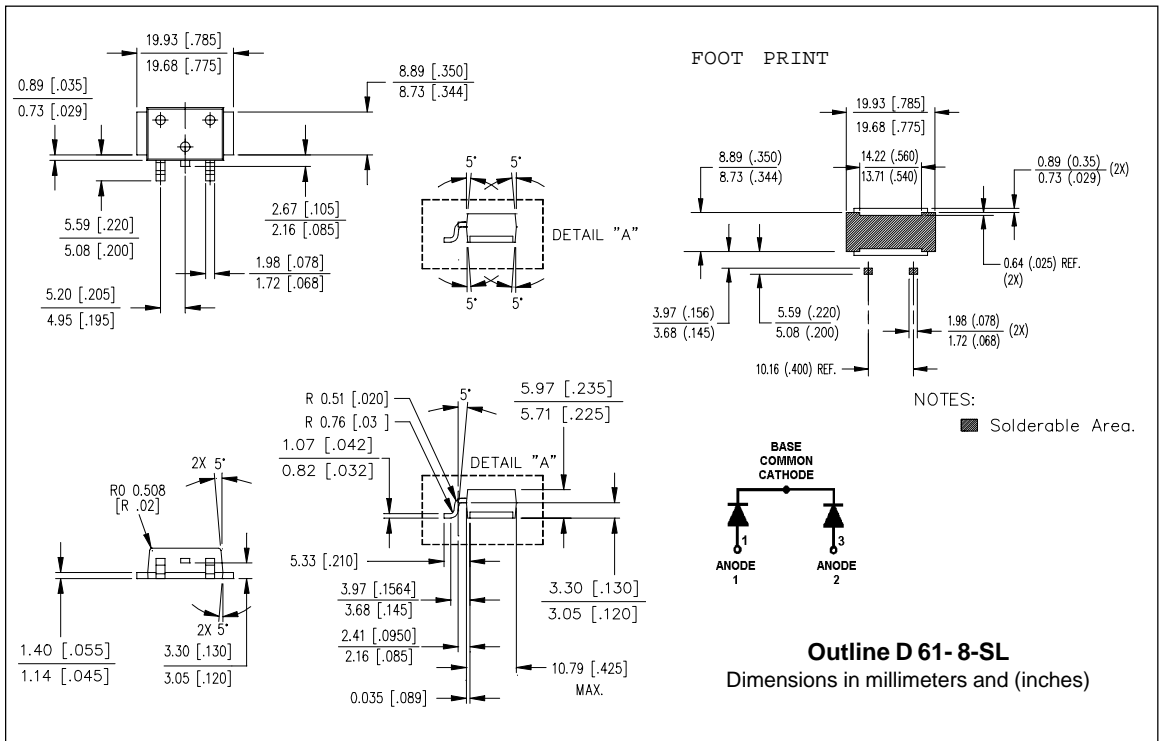
Note: $\textcircled{1}$ Limited by junction temperature
 $\textcircled{2}$ $L = 100\mu H$, duty cycle limited by max T_J
 $\textcircled{3}$ $125^\circ C$

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

Parameter	Min.	Typ.	Max.	Units	Test Conditions	
V_{BR}	Cathode Anode Breakdown Voltage	600	—	—	V	$I_R = 100\mu\text{A}$
V_{FM}	Max Forward Voltage	—	1.3	1.5	V	$I_F = 35\text{A}$ $I_F = 70\text{A}$ See Fig. 1 $I_F = 35\text{A}, T_J = 125^\circ\text{C}$
		—	1.5	1.7		
		—	1.2	1.4		
I_{RM}	Max Reverse Leakage Current	—	2.0	10	μA	$V_R = V_R$ Rated
		—	0.50	2.0	mA	$T_J = 125^\circ\text{C}, V_R = 480\text{V}$ See Fig. 2
C_T	Junction Capacitance	—	68	100	pF	$V_R = 200\text{V}$ See Fig. 3
L_S	Series Inductance	—	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}	Reverse Recovery Time	—	30	—	ns	$I_F = 1.0\text{A}, di/dt = 200\text{A}/\mu\text{s}, V_R = 30\text{V}$ $T_J = 25^\circ\text{C}$ See Fig. 5 $T_J = 125^\circ\text{C}$ See Fig. 5
t_{rr1}		—	70	110		
t_{rr2}		—	115	180		
I_{RRM1}	Peak Recovery Current	—	6.0	11	A	$T_J = 25^\circ\text{C}$ See Fig. 6 $T_J = 125^\circ\text{C}$ See Fig. 6
I_{RRM2}		—	9.0	16		
Q_{rr1}	Reverse Recovery Charge	—	210	580	nC	$T_J = 25^\circ\text{C}$ See Fig. 7 $T_J = 125^\circ\text{C}$ See Fig. 7
Q_{rr2}		—	520	1400		
$di_{(rec)M}/dt1$	Peak Rate of Fall of Recovery Current	—	280	—	$\text{A}/\mu\text{s}$	$T_J = 25^\circ\text{C}$ See Fig. 8 $T_J = 125^\circ\text{C}$ See Fig. 8
$di_{(rec)M}/dt2$	During t_b	—	180	—		



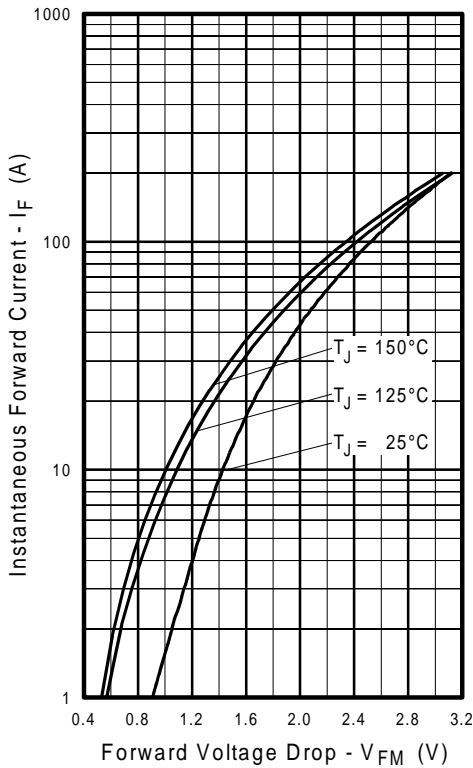


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current, (per Leg)

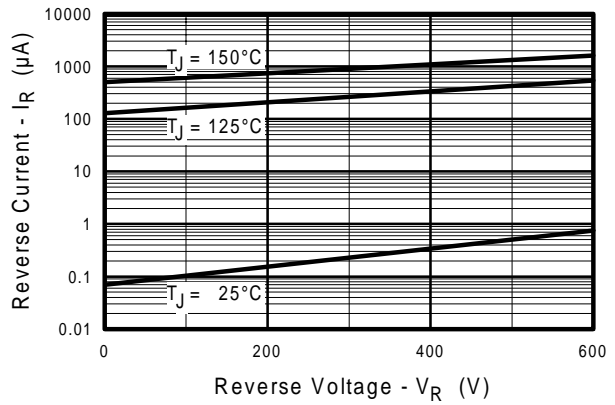


Fig. 2 - Typical Reverse Current vs. Reverse Voltage, (per Leg)

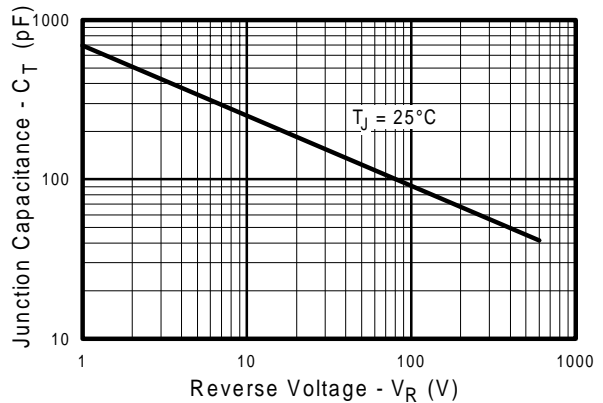


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage, (per Leg)

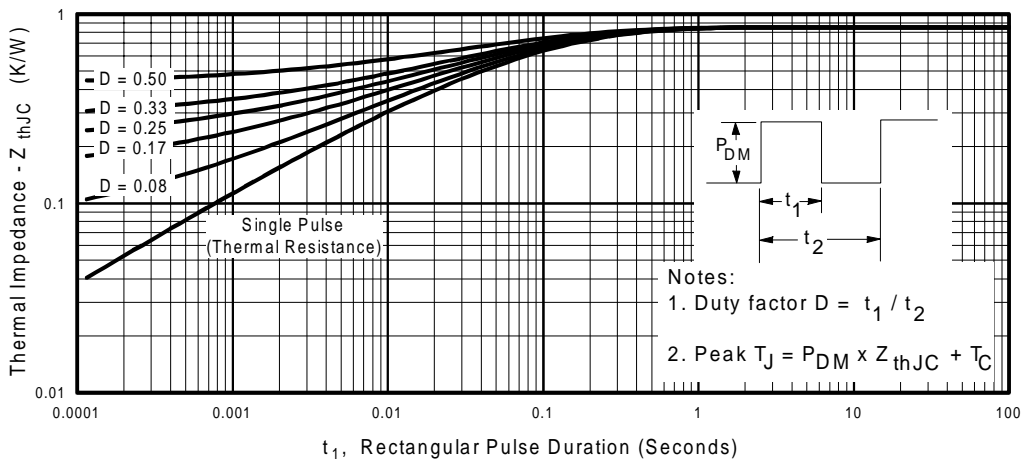


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics, (per Leg)

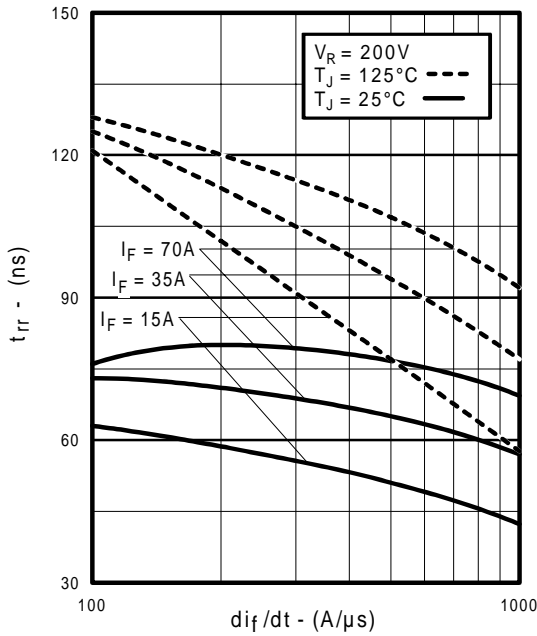


Fig. 5 - Typical Reverse Recovery vs. di_f/dt , (per Leg)

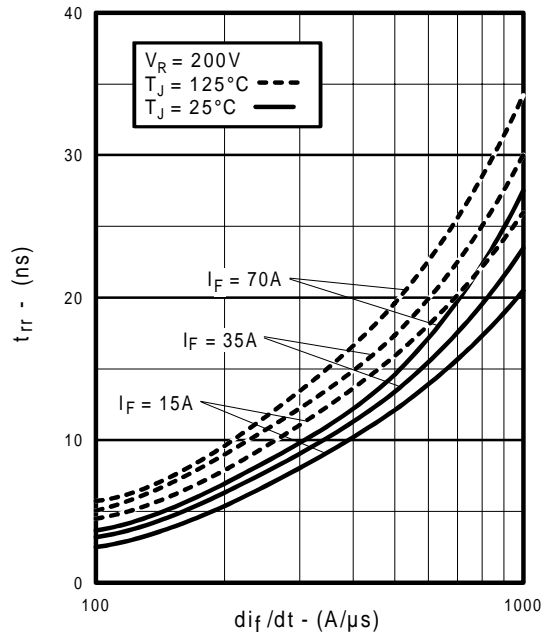


Fig. 6 - Typical Recovery Current vs. di_f/dt , (per Leg)

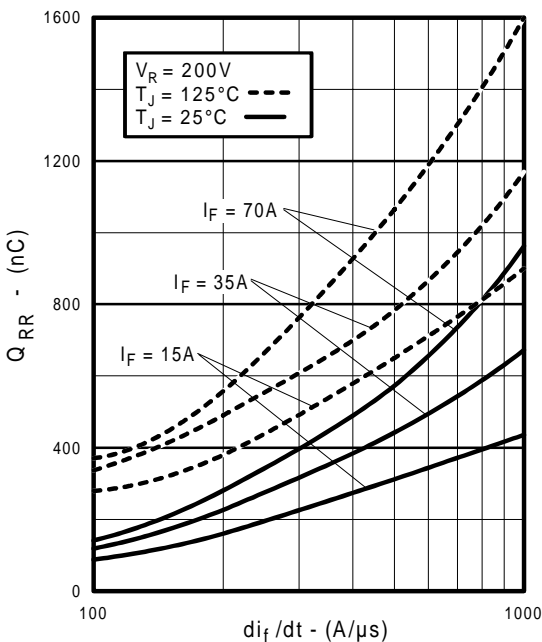


Fig. 7 - Typical Stored Charge vs. di_f/dt , (per Leg)

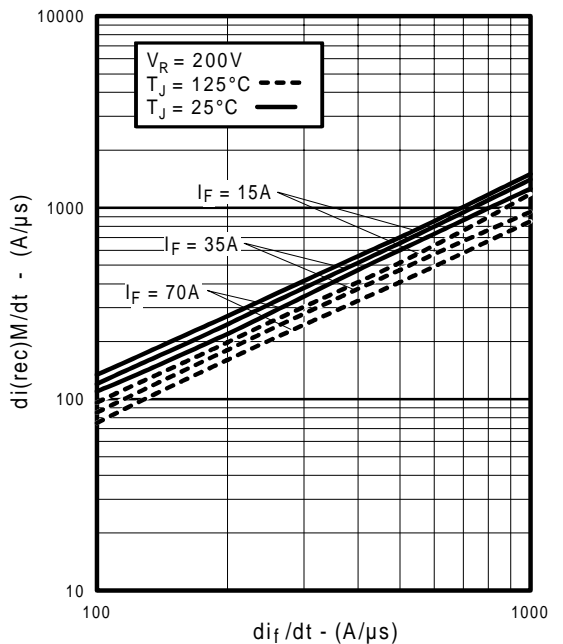


Fig. 8 - Typical $di_{(rec)}M/dt$ vs. di_f/dt , (per Leg)

REVERSE RECOVERY CIRCUIT

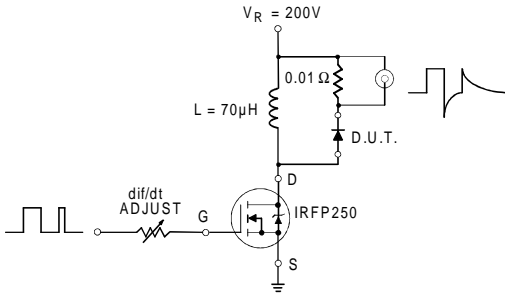
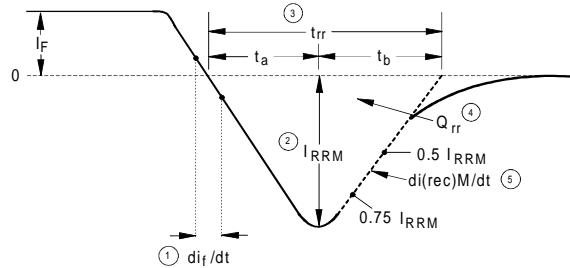


Fig. 9 - Reverse Recovery Parameter Test Circuit



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

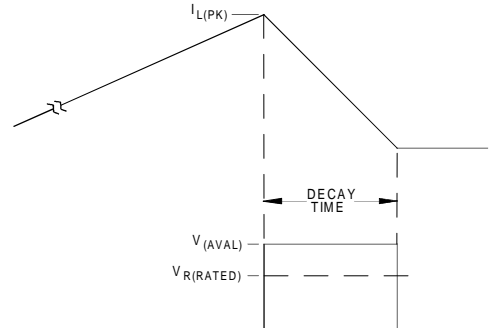
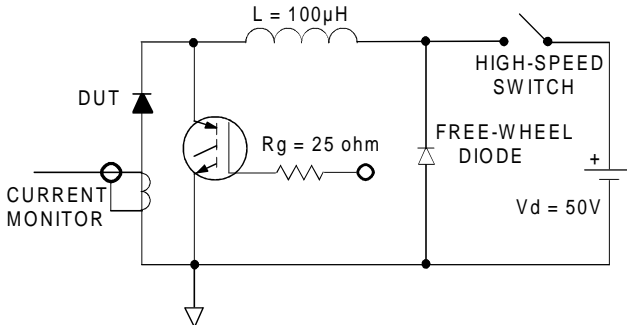


Fig. 11 - Avalanche Test Circuit and Waveforms

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