

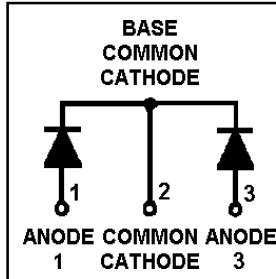
# HFA80NC40CSM

HEXFRED™

Ultrafast, Soft Recovery Diode

## Features

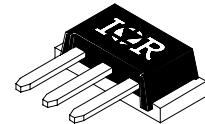
- Reduced RFI and EMI
- Reduced Snubbing
- Extensive Characterization of Recovery Parameters



$V_R = 400V$
$V_F(\text{typ.})^{\circledR} = 1V$
$I_{F(AV)} = 80A$
$Q_{rr} (\text{typ.}) = 200nC$
$I_{RRM}(\text{typ.}) = 6A$
$t_{rr}(\text{typ.}) = 30ns$
$di_{(rec)}/dt (\text{typ.})^{\circledR} = 190A/\mu s$

## 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	400	V
$I_F @ T_C = 25^\circ C$	Continuous Forward Current	85	A
$I_F @ T_C = 100^\circ C$	Continuous Forward Current	42	
$I_{FSM}$	Single Pulse Forward Current ①	300	
$E_{AS}$	Non-Repetitive Avalanche Energy ②	1.4	mJ
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	150	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	59	
$T_J$ $T_{STG}$	Operating Junction and Storage Temperature Range	-55 to +150	°C
	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	°C/W
	Junction-to-Case, Both Legs Conducting	—	—	0.42	K/W
Wt	Weight	—	4.3 (0.15)	—	g (oz)

Note: ① Limited by junction temperature

②  $L = 100\mu H$ , duty cycle limited by max  $T_J$

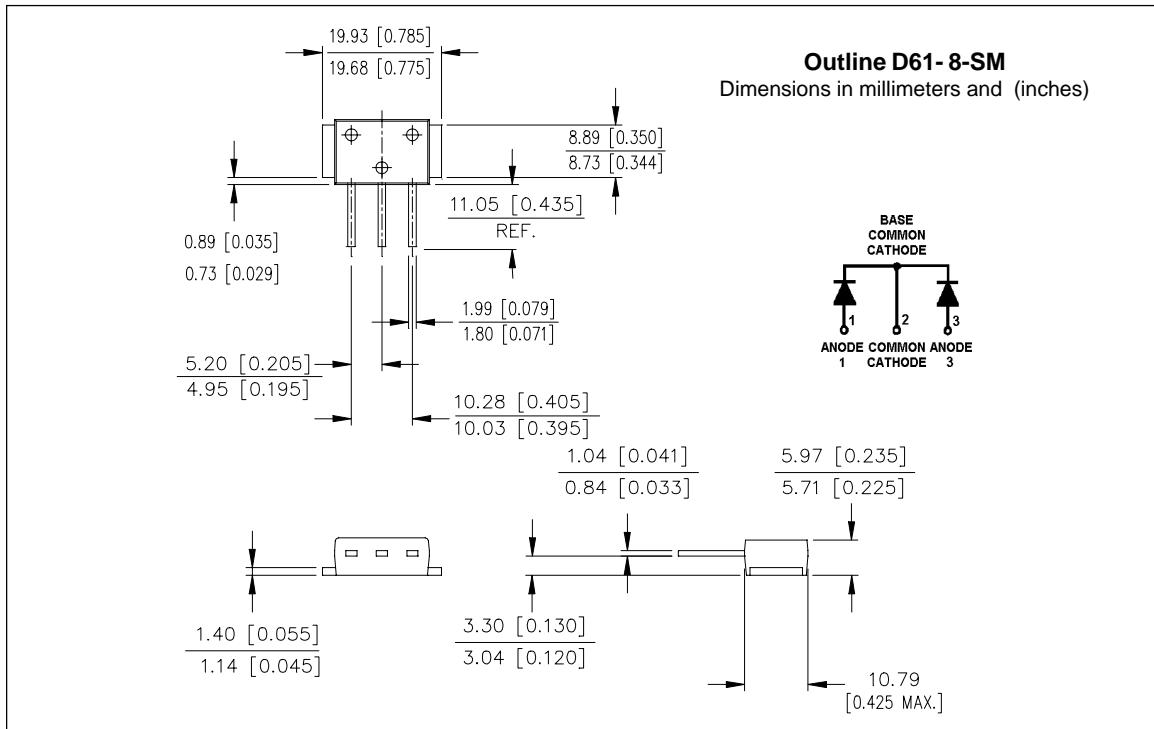
③  $125^\circ C$

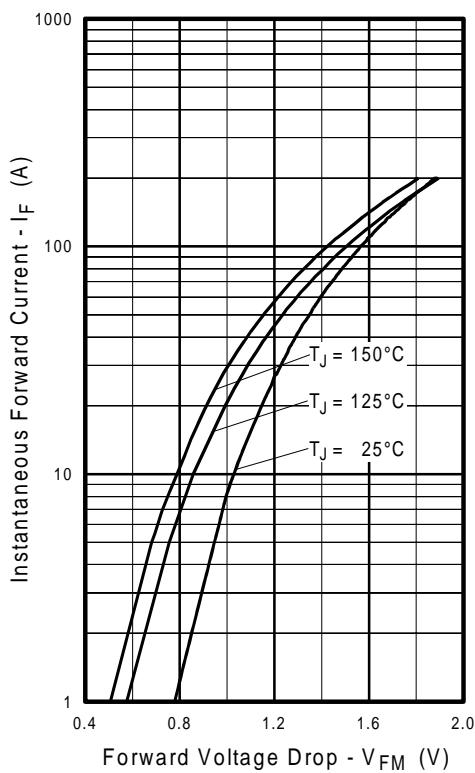
## Electrical Characteristics (per Leg) @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

Parameter		Min.	Typ.	Max.	Units	Test Conditions
$V_{BR}$	Cathode Anode Breakdown Voltage	400	—	—	V	$I_R = 100\mu\text{A}$
$V_{FM}$	Max Forward Voltage	—	1.1	1.3	V	$I_F = 40\text{A}$
		—	1.3	1.5		$I_F = 80\text{A}$
		—	1.0	1.2		$I_F = 40\text{A}, T_J = 125^\circ\text{C}$
$I_{RM}$	Max Reverse Leakage Current	—	0.50	3.0	$\mu\text{A}$	$V_R = V_R \text{ Rated}$
		—	0.75	4.0	mA	$T_J = 125^\circ\text{C}, V_R = 320\text{V}$
$C_T$	Junction Capacitance	—	90	125	pF	$V_R = 200\text{V}$
$L_S$	Series Inductance	—	5.5	—	nH	Lead to lead 5mm from package body

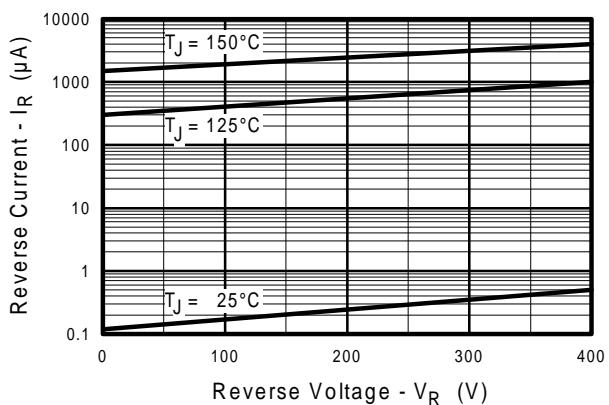
## Dynamic Recovery Characteristics (per Leg) @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

Parameter		Min.	Typ.	Max.	Units	Test Conditions
$t_{rr}$	Reverse Recovery Time	—	30	—	ns	$I_F = 1.0\text{A}, di/dt = 200\text{A}/\mu\text{s}, V_R = 30\text{V}$
$t_{rr1}$		—	67	100		$T_J = 25^\circ\text{C}$ See Fig.
$t_{rr2}$		—	110	170		$T_J = 125^\circ\text{C}$ 5
$I_{RRM1}$	Peak Recovery Current	—	6.0	11	A	$T_J = 25^\circ\text{C}$ See Fig.
$I_{RRM2}$		—	9.0	16		$T_J = 125^\circ\text{C}$ 6
$Q_{rr1}$	Reverse Recovery Charge	—	200	540	nC	$T_J = 25^\circ\text{C}$ See Fig.
$Q_{rr2}$		—	500	1300		$T_J = 125^\circ\text{C}$ 7
$di_{(rec)M}/dt_1$	Peak Rate of Fall of Recovery Current During $t_b$	—	240	—	A/ $\mu\text{s}$	$T_J = 25^\circ\text{C}$ See Fig.
$di_{(rec)M}/dt_2$		—	190	—		$T_J = 125^\circ\text{C}$ 8

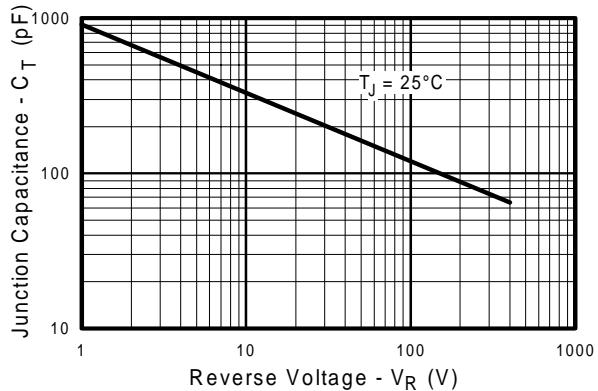




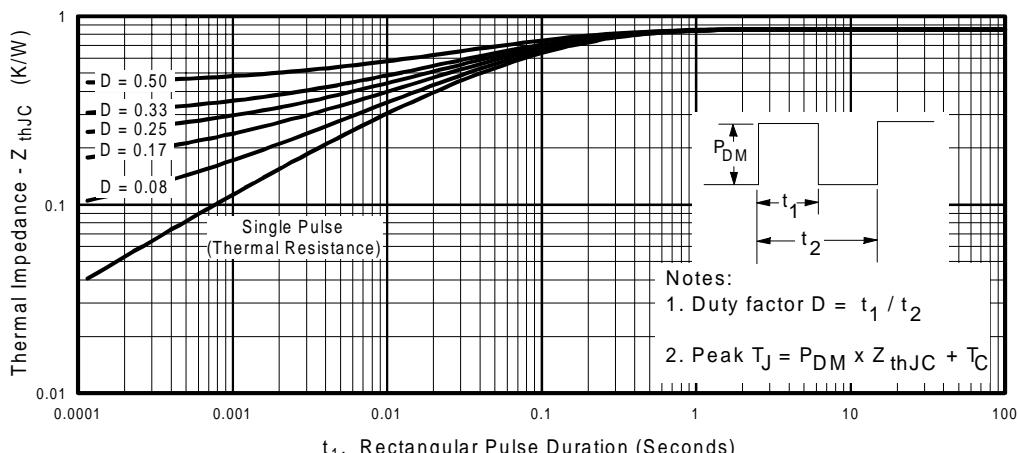
**Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current, (per Leg)**



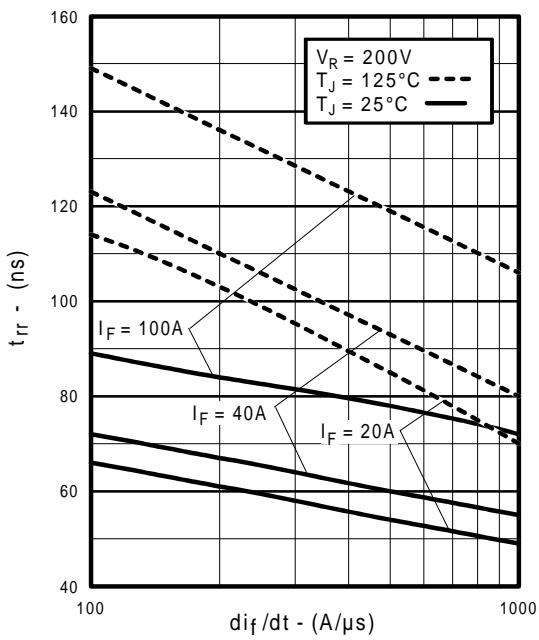
**Fig. 2 - Typical Reverse Current vs. Reverse Voltage, (per Leg)**



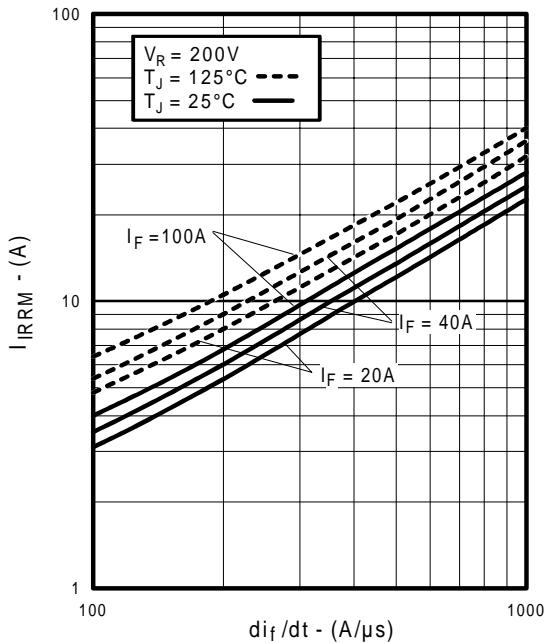
**Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage, (per Leg)**



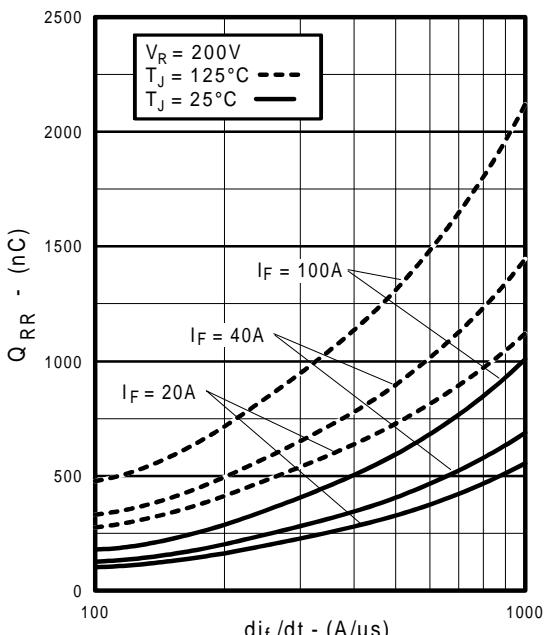
**Fig. 4 - Maximum Thermal Impedance  $Z_{thjc}$  Characteristics, (per Leg)**



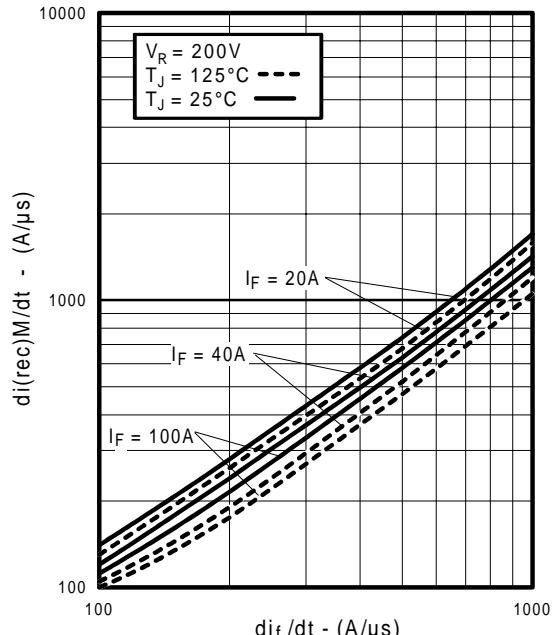
**Fig. 5 - Typical Reverse Recovery vs.  $di_f/dt$ , (per Leg)**



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

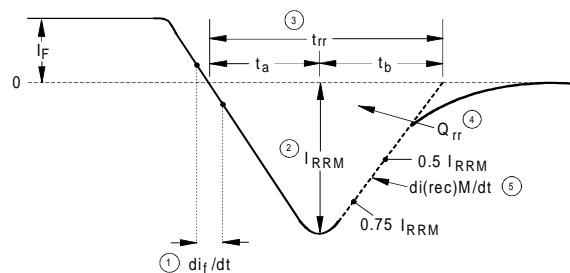
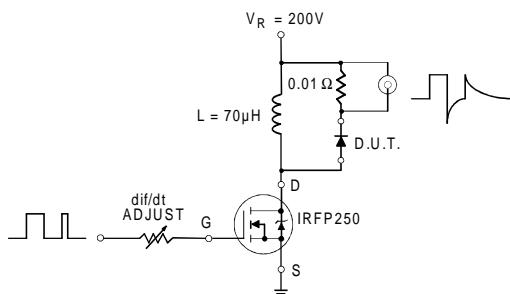


**Fig. 7 - Typical Stored Charge vs.  $di_f/dt$ , (per Leg)**



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

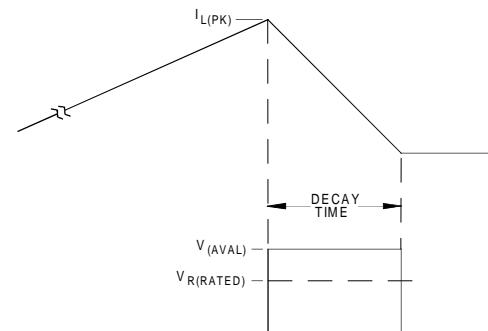
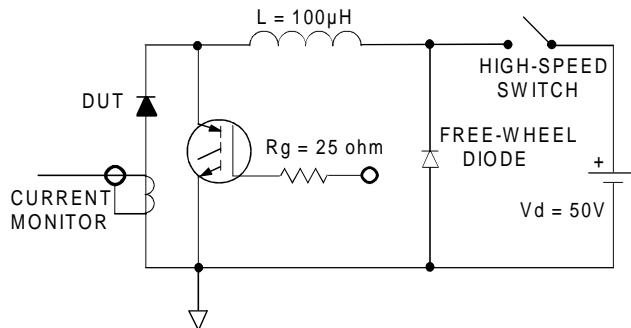
REVERSE RECOVERY CIRCUIT



1.  $di/dt$  - 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. 9 - Reverse Recovery Parameter Test Circuit**

**Fig. 10 - Reverse Recovery Waveform and Definitions**



**Fig. 11 - Avalanche Test Circuit and Waveforms**

International  
**IR** Rectifier

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[>>Vishay \(威世\)](#)