

Bulletin PD-20017 02/01

International IOR Rectifier

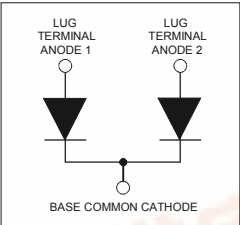
S1242

HEXFRED™

Ultrafast, Soft Recovery Diode

Features

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



$V_R = 400V$
$V_F(\text{typ.})^{\textcircled{3}} = 1V$
$I_F(AV) = 320A$
$Q_{rr}(\text{typ.}) = 420nC$
$I_{RRM}(\text{typ.}) = 8.7A$
$t_{rr}(\text{typ.}) = 45ns$
$di_{(rec)}/dt(\text{typ.})^{\textcircled{3}} = 280A/\mu s$

Description/Applications

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.

Absolute Maximum Ratings

Parameters	Max	Units
V_R Cathode-to-Anode Voltage	400	V
$I_F @ T_C = 25^{\circ}C$ Continuous Forward Current	321	A
$I_F @ T_C = 100^{\circ}C$ Continuous Forward Current	160	
I_{FSM} Single Pulse Forward Current ①	1200	
E_{AS} Non-Repetitive Avalanche Energy ②	1.4	mJ
$P_D @ T_C = 25^{\circ}C$ Maximum Power Dissipation	625	W
$P_D @ T_C = 100^{\circ}C$ Maximum Power Dissipation	250	
T_J, T_{STG} Operating Junction and Storage Temperature Range	- 55 to 150	°C

Case Styles

S1242



TO-244

- 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)

Parameters	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	-	1.10	1.35	V	$I_F = 160\text{A}$
	-	1.30	1.55	V	$I_F = 320\text{A}$ See Fig. 1
	-	1.00	1.20	V	$I_F = 160\text{A}, T_J = 125^\circ\text{C}$
I_{RM} Max. Reverse Leakage Current	-	2.0	12	μA	$V_R = V_R \text{ Rated}$ See Fig. 2
	-	3.0	16	mA	$T_J = 125^\circ\text{C}, V_R = 320\text{V}$
C_T Junction Capacitance	-	370	500	pF	$V_R = 200\text{V}$ See Fig. 3
L_S Series Inductance	-	5.0	-	nH	From top of terminal hole to mounting plane

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

Parameters	Min	Typ	Max	Units	Test Conditions
t_{rr} Reverse Recovery Time	-	45	-	ns	$I_F = 1.0\text{A}, di_F/dt = 200\text{A}/\mu\text{s}, V_R = 30\text{V}$
t_{rr1}	-	90	140		$T_J = 25^\circ\text{C}$ See Fig. 5
t_{rr2}	-	290	440		$T_J = 125^\circ\text{C}$
I_{RRM1} Peak Recovery Current	-	8.7	20	A	$T_J = 25^\circ\text{C}$ See Fig. 6
	-	18	30		$T_J = 125^\circ\text{C}$
I_{RRM2} Reverse Recovery Charge	-	420	1100	nC	$T_J = 25^\circ\text{C}$ See Fig. 7
	-	2600	7000		$T_J = 125^\circ\text{C}$
$di_{(rec)M}/dt1$	-	300	-	$\text{A}/\mu\text{s}$	$T_J = 25^\circ\text{C}$ See Fig. 8
	-	280	-		$T_J = 25^\circ\text{C}$

Thermal - Mechanical Characteristics

Parameters	Min	Typ	Max	Units
T_J Max. Junction Temperature Range	-	-	- 55 to 150	$^\circ\text{C}$
T_{Stg} Max. Storage Temperature Range	-	-	- 55 to 150	
R_{thJC} Thermal Resistance, Junction to Case	-	-	0.24	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case	-	-	0.12	K/W
R_{thCS} Thermal Resistance, Case to Heatsink	-	0.10	-	
Wt Weight	-	68 (2.4)	-	g (oz)
Mounting Torque (*)	30 (3.4)	-	40 (4.6)	lbf.in
Mounting Torque Center Hole	12 (1.4)	-	18 (2.1)	(N.m)
Terminal Torque	30 (3.4)	-	40 (4.6)	
Vertical Pull	-	-	80	lbf.in
2 inch Lever Pull	-	-	35	

(*) Mounting surface must be smooth, flat, free of burrs or other protrusions. Apply a thin even film of thermal grease to mounting surface. Gradually tighten each mounting bolt in 5-10 lbf.in steps until desired or maximum torque limits are reached

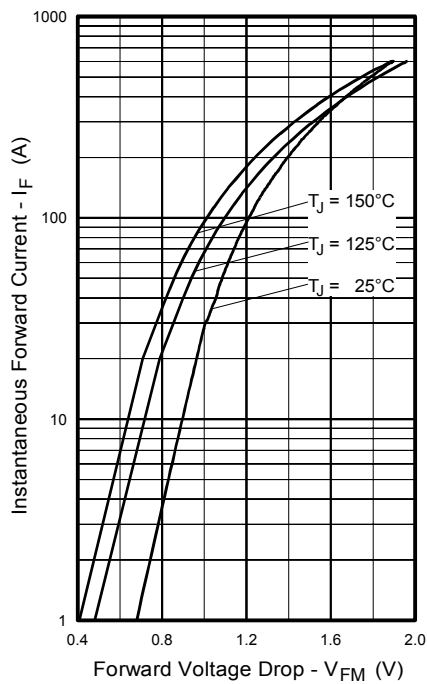


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current (per Leg)

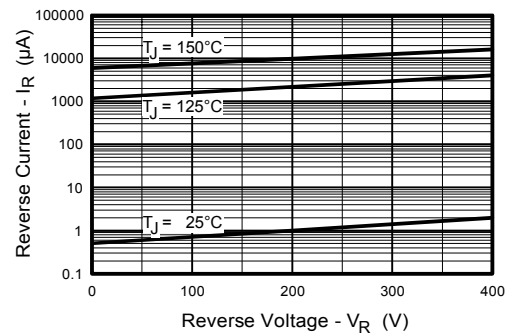


Fig. 2 - Typical Reverse Current vs. Reverse Voltage, (per Leg)

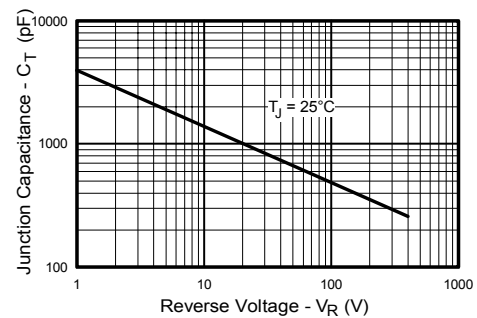


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage, (per Leg)

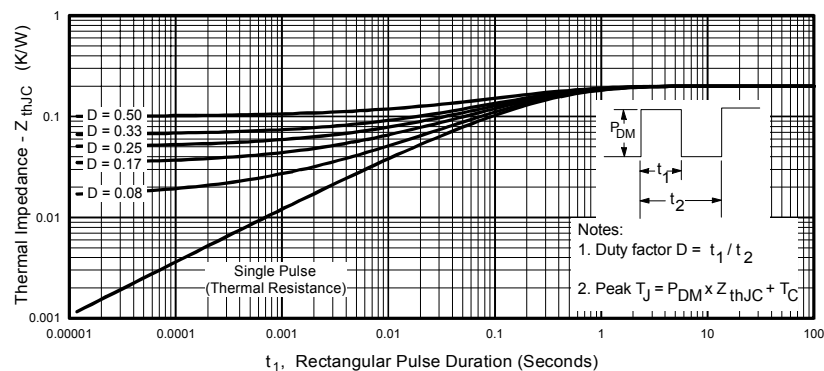
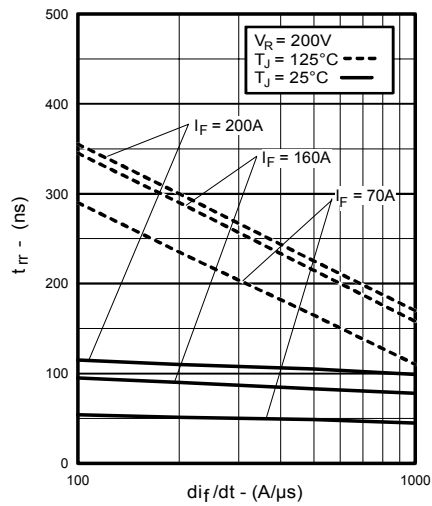
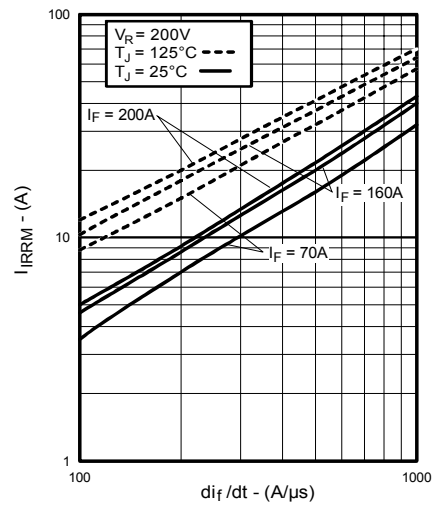
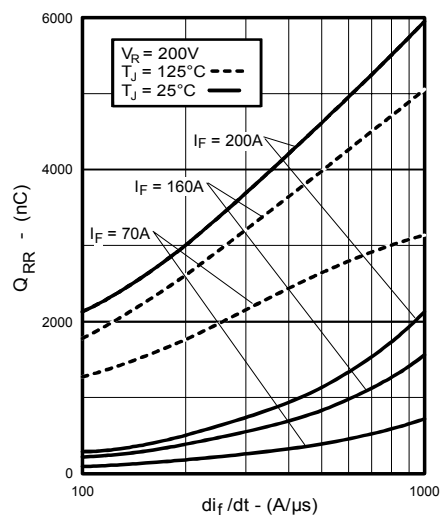
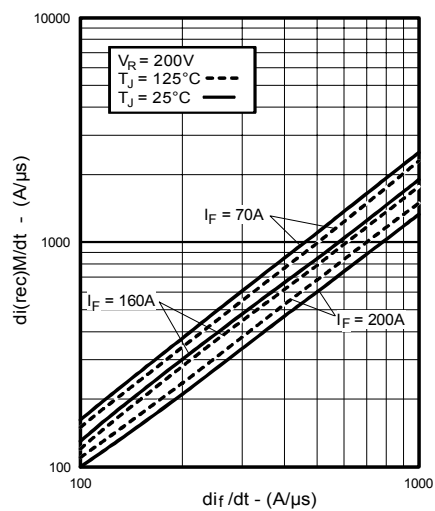


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics, (per Leg)

Fig. 5 - Typical Reverse Recovery vs. di/dt , (per Leg)Fig. 6 - Typical Recovery Current vs. di/dt , (per Leg)Fig. 7 - Typical Stored Charge vs. di/dt , (per Leg)Fig. 8 - Typical $di_{(rec)M}/dt$ vs. di/dt , (per Leg)

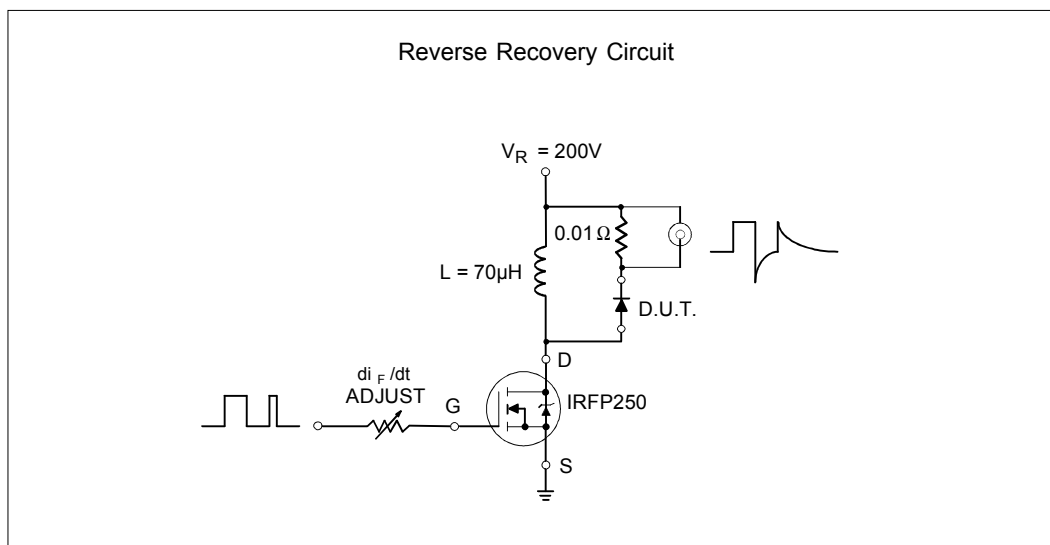


Fig. 9- Reverse Recovery Parameter Test Circuit

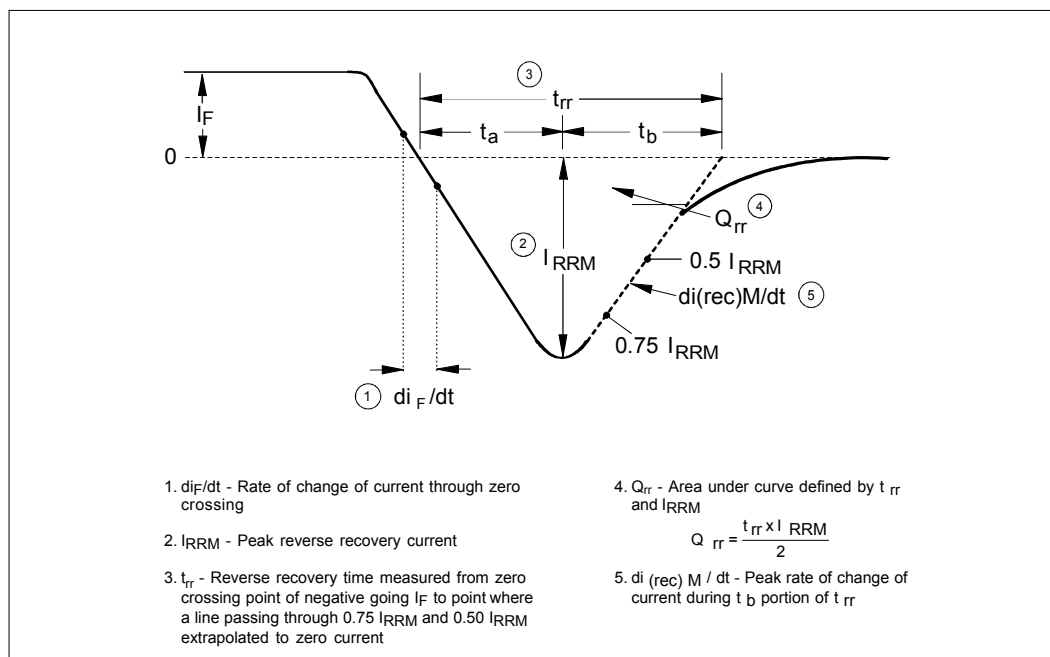


Fig. 10 - Reverse Recovery Waveform and Definitions

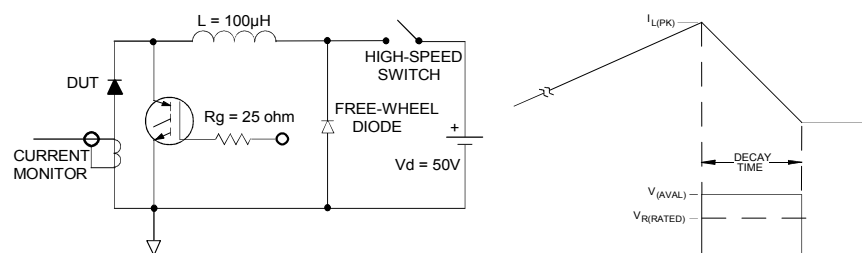
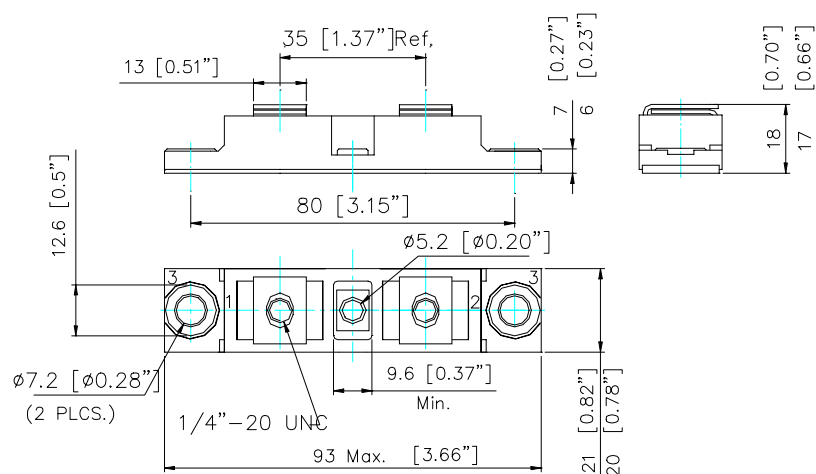


Fig. 11 - Avalanche Test Circuit and Waveforms

Outline Table



Conforms to JEDEC Outline TO-244
Dimensions in millimeters and (inches)

Data and specifications subject to change without notice.
This product has been designed and qualified for Industrial Level.
Qualification Standards can be found on IR's Web site.

International
IR Rectifier

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