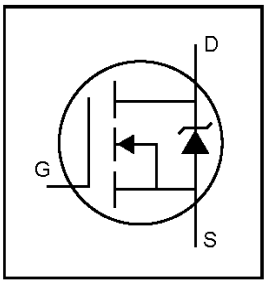
International
IOR Rectifier

PD - 95357

IRLI2505PbF

HEXFET® Power MOSFET

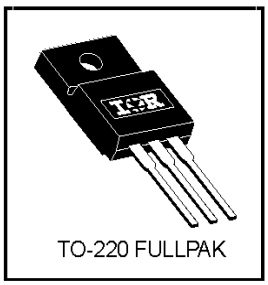
- Lead-Free
- Logic-Level Gate Drive
- Advanced Process Technology
- Ultra Low On-Resistance
- Isolated Package
- High Voltage Isolation = 2.5KVRMS ⑤
- Sink to Lead Creepage Dist. = 4.8mm
- Fully Avalanche Rated



V_{DSS} = 55V

$R_{DS(on)}$ = 0.008Ω

I_D = 58A



Description

Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve the lowest possible on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that HEXFET Power MOSFETs are well known for, provides the designer with an extremely efficient device for use in a wide variety of applications.

The TO-220 Fullpak eliminates the need for additional insulating hardware in commercial-industrial applications. The moulding compound used provides a high isolation capability and a low thermal resistance between the tab and external heatsink. This isolation is equivalent to using a 100 micron mica barrier with standard TO-220 product. The Fullpak is mounted to a heatsink using a single clip or by a single screw fixing.

Absolute Maximum Ratings

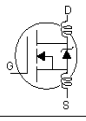
	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	58	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	41	
I_{DM}	Pulsed Drain Current ①⑥	360	
P_D @T_C = 25°C	Power Dissipation	63	W
	Linear Derating Factor	0.42	W/°C
V_{GS}	Gate-to-Source Voltage	±16	V
E_{AS}	Single Pulse Avalanche Energy ②⑥	500	mJ
I_{AR}	Avalanche Current①⑥	54	A
E_{AR}	Repetitive Avalanche Current①	6.3	mJ
dv/dt	Peak Diode Recovery dv/dt ③⑥	5.0	V/ns
T_J	Operating Junction and	-55 to + 175	°C
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
	Mounting torque, 6-32 or M3 screw.	10 lbf•in (1.1N•m)	

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	——	——	2.4	°C/W
$R_{\theta JA}$	Junction-to-Ambient	——	——	65	

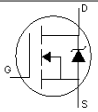
Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	55	---	---	V	V_{GS} = 0V, I_D = 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	---	0.035	---	V/°C	Reference to 25°C, I_D = 1mA⑥
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	---	---	0.008	Ω	V_{GS} = 10V, I_D = 31A ④
		---	---	0.010		V_{GS} = 5.0V, I_D = 31A ④
		---	---	0.013		V_{GS} = 4.0V, I_D = 26A ④
$V_{GS(th)}$	Gate Threshold Voltage	1.0	---	2.0	V	V_{DS} = V_{GS}, I_D = 250µA
g_{fs}	Forward Transconductance	59	---	---	S	V_{DS} = 25V, I_D = 54A⑥
I_{DSS}	Drain-to-Source Leakage Current	---	---	25	µA	V_{DS} = 55V, V_{GS} = 0V
		---	---	250		V_{DS} = 44V, V_{GS} = 0V, T_J = 150°C
I_{GSS}	Gate-to-Source Forward Leakage	---	---	100	nA	V_{GS} = 16V
	Gate-to-Source Reverse Leakage	---	---	-100		V_{GS} = -16V
Q_g	Total Gate Charge	---	---	130	nC	I_D = 54A
Q_{gs}	Gate-to-Source Charge	---	---	25		V_{DS} = 44V
Q_{gd}	Gate-to-Drain ("Miller") Charge	---	---	67		V_{GS} = 5.0V, See Fig. 6 and 13 ④⑥
$t_{d(on)}$	Turn-On Delay Time	---	12	---	ns	V_{DD} = 28V
t_r	Rise Time	---	160	---		I_D = 54A
$t_{d(off)}$	Turn-Off Delay Time	---	43	---		R_G = 1.3Ω, V_{GS} = 5.0V
t_f	Fall Time		84			R_D = 0.50Ω, See Fig. 10 ④⑥
L_D	Internal Drain Inductance	---	4.5	---	nH	Between lead, 6mm (0.25in.) from package and center of die contact
L_S	Internal Source Inductance	---	7.5	---		
C_{iss}	Input Capacitance	---	5000	---	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	---	1100	---		V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	---	390	---		f = 1.0MHz, See Fig. 5⑥
C	Drain to Sink Capacitance	---	12	---		f = 1.0MHz



Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	---	---	58	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	---	---	360		
V_{SD}	Diode Forward Voltage	---	---	1.3	V	T_J = 25°C, I_S = 31A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	---	140	210	ns	T_J = 25°C, I_F = 54A
Q_{rr}	Reverse RecoveryCharge	---	650	970	nC	di/dt = 100A/µs ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				



Notes:

① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)

② V_{DD} = 25V, starting T_J = 25°C, L = 240µH R_G = 25Ω, I_{AS} = 54A. (See Figure 12)

③ I_{SD} ≤ 54A, di/dt ≤ 230A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 175°C

④ Pulse width ≤ 300µs; duty cycle ≤ 2%.

⑤ t=60s, f=60Hz

⑥ Use IRL2505 data and test conditions

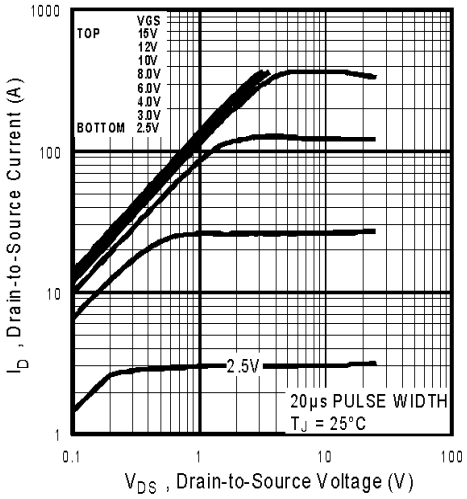


Fig 1. Typical Output Characteristics

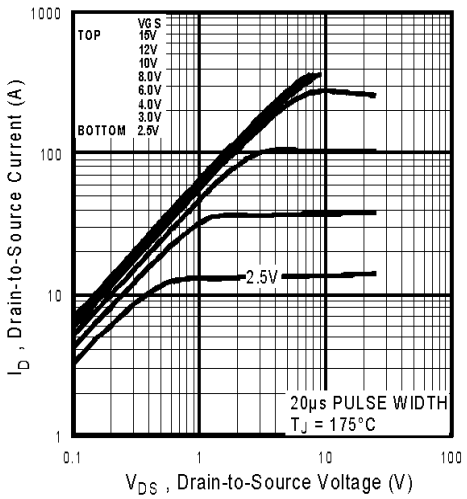


Fig 2. Typical Output Characteristics

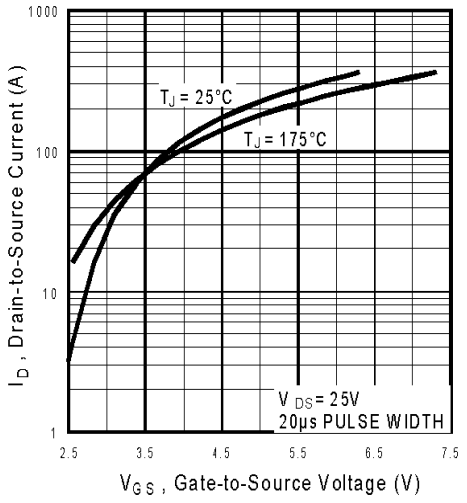


Fig 3. Typical Transfer Characteristics

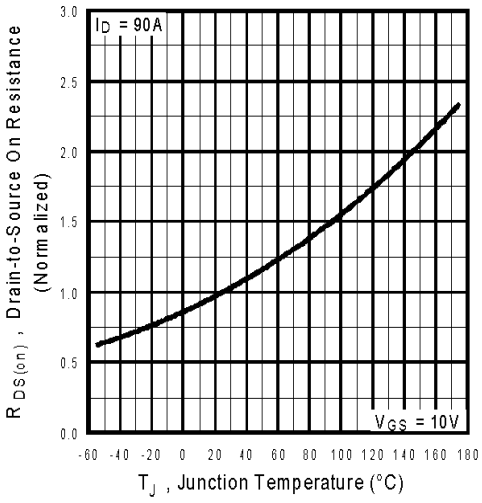


Fig 4. Normalized On-Resistance
Vs. Temperature

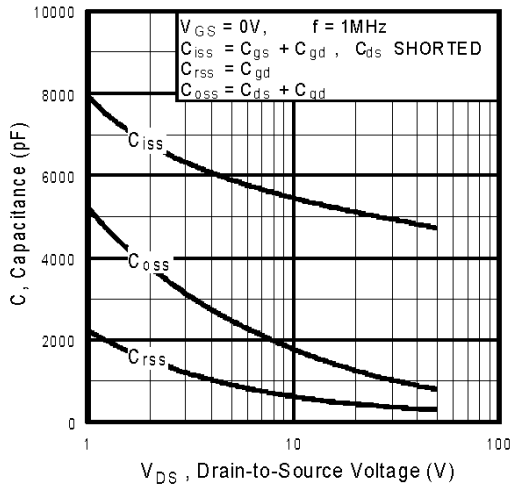


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

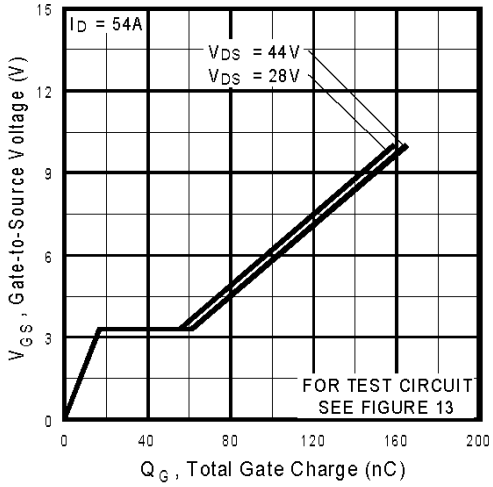


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

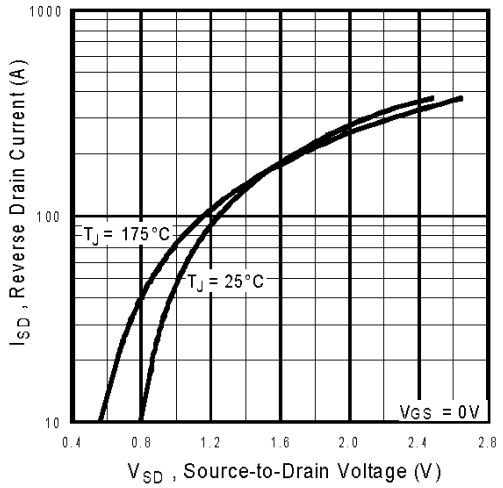


Fig 7. Typical Source-Drain Diode Forward Voltage

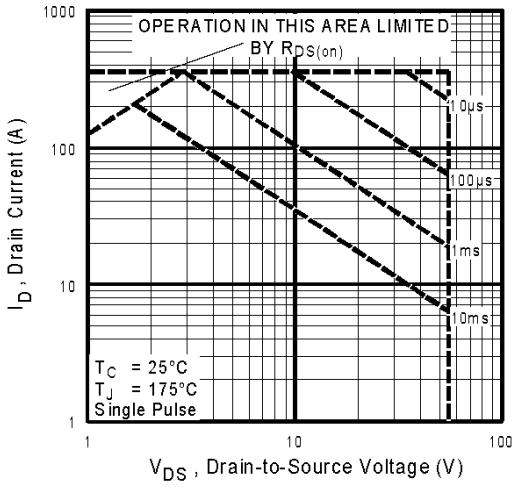


Fig 8. Maximum Safe Operating Area

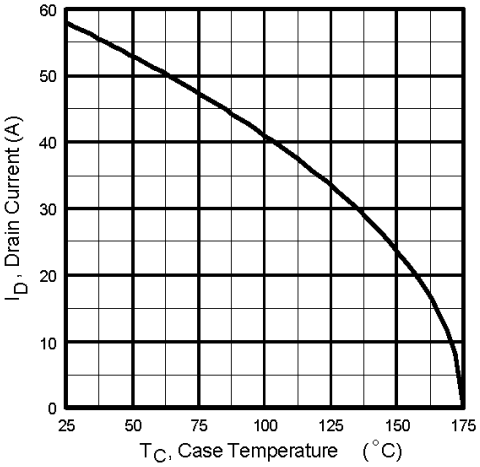


Fig 9. Maximum Drain Current Vs. Case Temperature

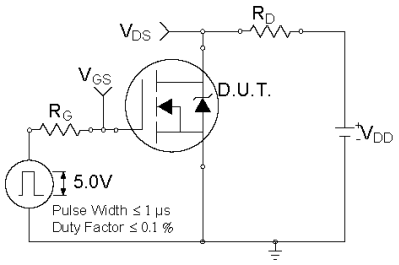


Fig 10a. Switching Time Test Circuit

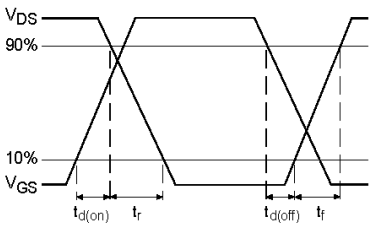


Fig 10b. Switching Time Waveforms

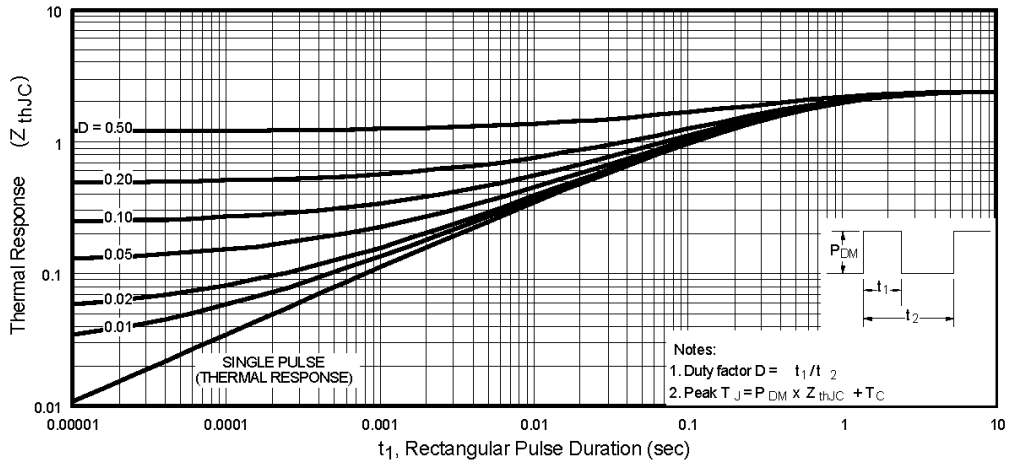


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

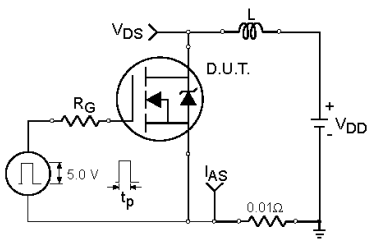


Fig 12a. Unclamped Inductive Test Circuit

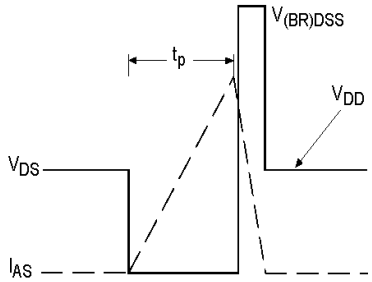


Fig 12b. Unclamped Inductive Waveforms

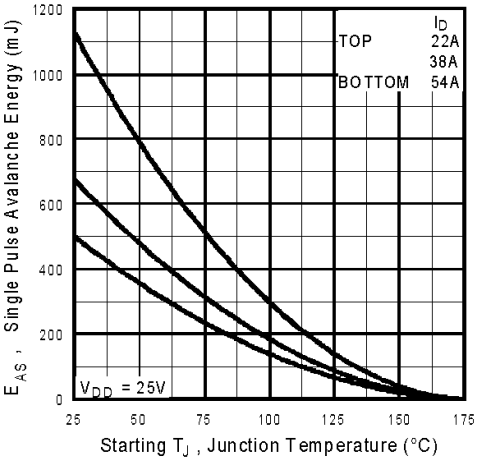


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

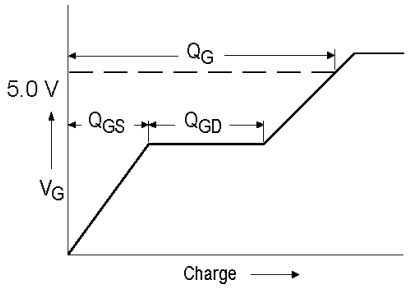


Fig 13a. Basic Gate Charge Waveform

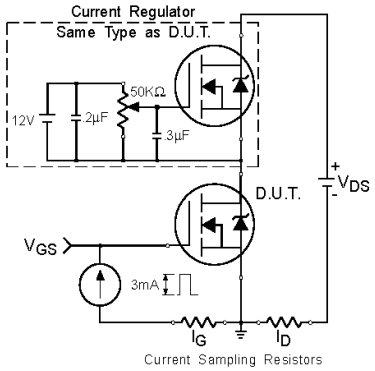
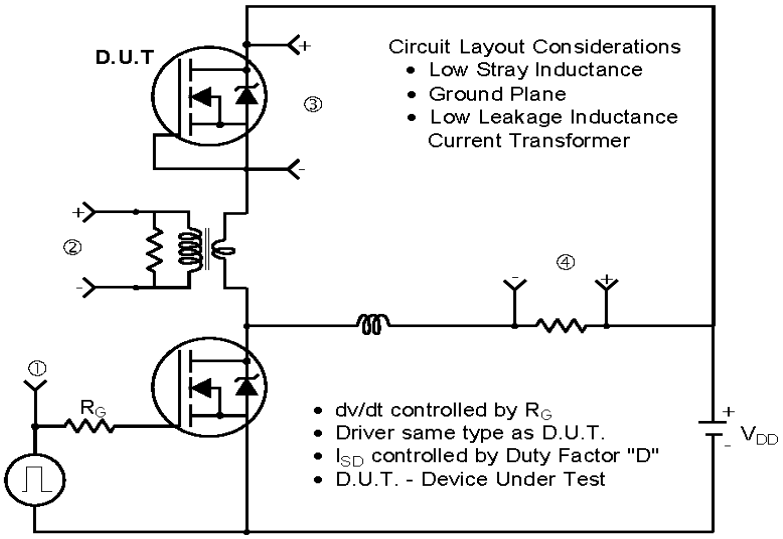


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



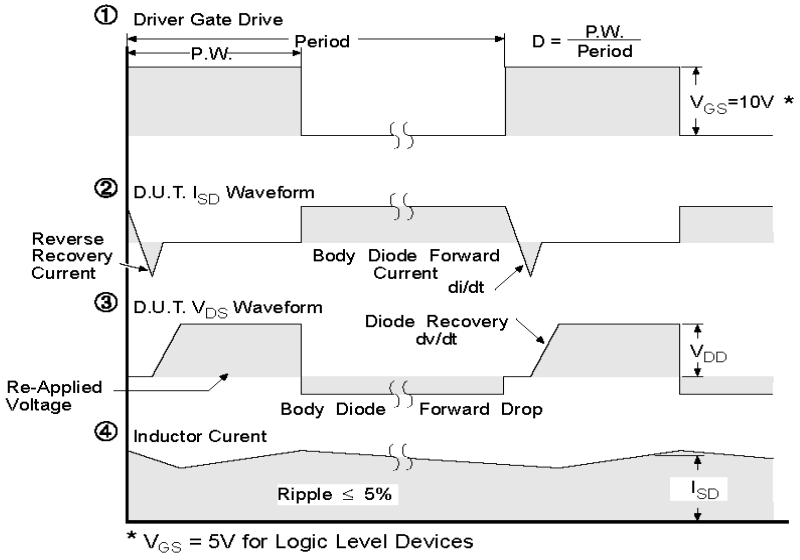
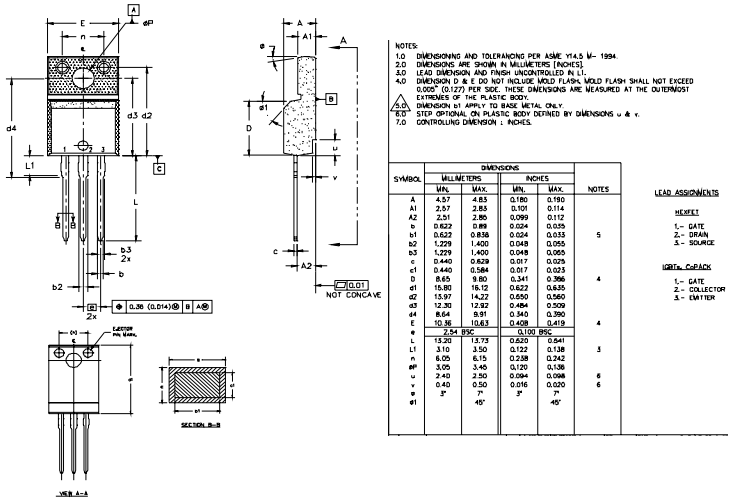


Fig 14. For N-Channel HEXFETS

TO-220 Full-Pak Package Outline

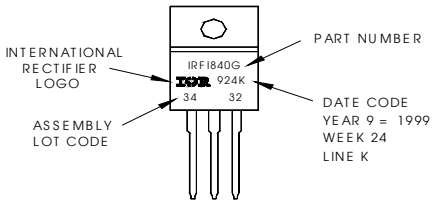
Dimensions are shown in millimeters (inches)



TO-220 Full-Pak Part Marking Information

EXAMPLE: THIS IS AN IRFI840G
WITH ASSEMBLY
LOT CODE 3432
ASSEMBLED ON WW 24 1999
IN THE ASSEMBLY LINE "K"

Note: "P" in assembly line position indicates "Lead-Free"



Data and specifications subject to change without notice.

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