International
IOR Rectifier

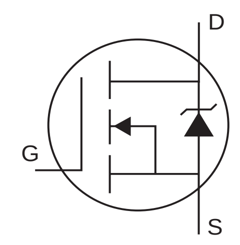
PD - 9.1497A

PRELIMINARY

IRLI540N

HEXFET® Power MOSFET

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



V_{DSS} = 100V

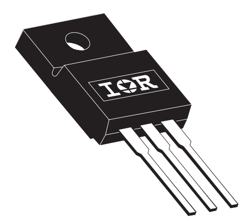
$R_{DS(on)}$ = 0.044Ω

I_D = 23A

Description

Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve extremely low 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 and reliable 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.



TO-220 FULLPAK

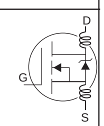
Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	23	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	16	
I_{DM}	Pulsed Drain Current ①⑥	120	
P_D @T_C = 25°C	Power Dissipation	54	W
	Linear Derating Factor	0.36	W/°C
V_{GS}	Gate-to-Source Voltage	± 16	V
E_{AS}	Single Pulse Avalanche Energy②⑥	310	mJ
I_{AR}	Avalanche Current①⑥	18	A
E_{AR}	Repetitive Avalanche Energy①	5.4	mJ
dv/dt	Peak Diode Recovery dv/dt ③⑥	5.0	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
	Mounting torque, 6-32 or M3 screw	10 lbf•in (1.1N•m)	

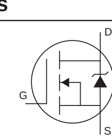
Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	——	2.8	°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	100	——	——	V	V_{GS} = 0V, I_D = 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	——	0.11	——	V/°C	Reference to 25°C, I_D = 1mA⑥
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	——	——	0.044	Ω	V_{GS} = 10V, I_D = 12A ④
		——	——	0.053		V_{GS} = 5.0V, I_D = 12A ④
		——	——	0.063		V_{GS} = 4.0V, I_D = 10A ④
$V_{GS(th)}$	Gate Threshold Voltage	1.0	——	2.0	V	V_{DS} = V_{GS}, I_D = 250µA
g_{fs}	Forward Transconductance	14	——	——	S	V_{DS} = 25V, I_D = 18A⑥
I_{DSS}	Drain-to-Source Leakage Current	——	——	25	µA	V_{DS} = 100V, V_{GS} = 0V
		——	——	250		V_{DS} = 80V, 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	——	——	74	nC	I_D = 18A
Q_{gs}	Gate-to-Source Charge	——	——	9.4		V_{DS} = 80V
Q_{gd}	Gate-to-Drain ("Miller") Charge	——	——	38		V_{GS} = 5.0V, See Fig. 6 and 13 ④⑥
$t_{d(on)}$	Turn-On Delay Time	——	11	——	ns	V_{DD} = 50V
t_r	Rise Time	——	81	——		I_D = 18A
$t_{d(off)}$	Turn-Off Delay Time	——	39	——		R_G = 5.0Ω, V_{GS} = 5.0V
t_f	Fall Time	——	62	——		R_D = 2.7Ω, 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	——	1800	——	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	——	350	——		V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	——	170	——		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)	——	——	23	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①⑥	——	——	120		
V_{SD}	Diode Forward Voltage	——	——	1.3	V	T_J = 25°C, I_S = 18A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	——	190	290	ns	T_J = 25°C, I_F = 18A
Q_{rr}	Reverse RecoveryCharge	——	1.1	1.7	µC	di/dt = 100A/µs ④⑥
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 Starting T_J = 25°C, L = 1.9mH R_G = 25Ω, I_{AS} = 18A. (See Figure 12)

③ $I_{SD} \leq$ 18A, di/dt $\leq$ 180A/µs, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq$ 175°C

④ Pulse width $\leq$ 300µs; duty cycle $\leq$ 2%.

⑤ t=60s, f=60Hz

⑥ Uses IRL540N data and test conditions

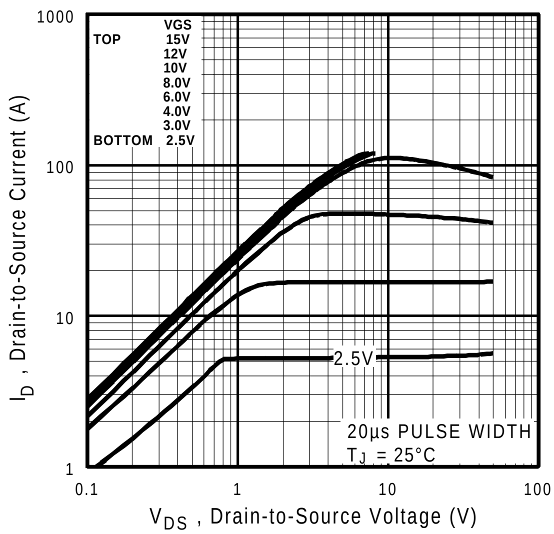


Fig 1. Typical Output Characteristics

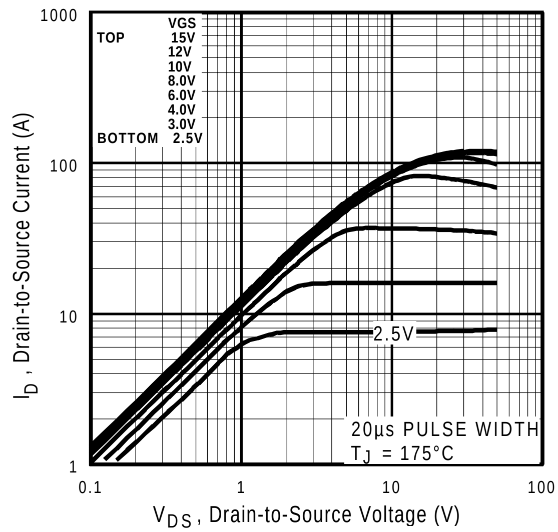


Fig 2. Typical Output Characteristics

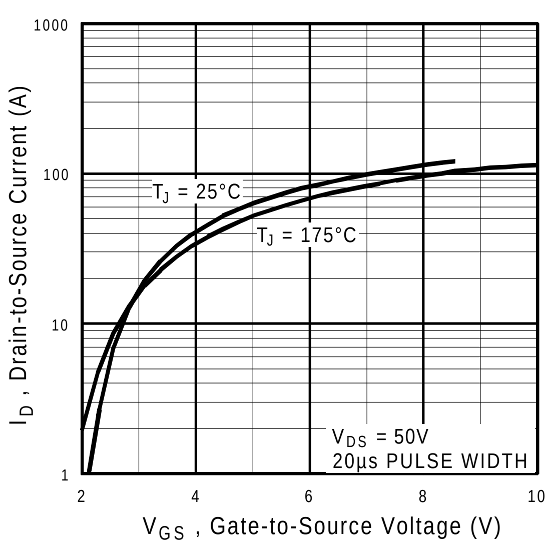


Fig 3. Typical Transfer Characteristics

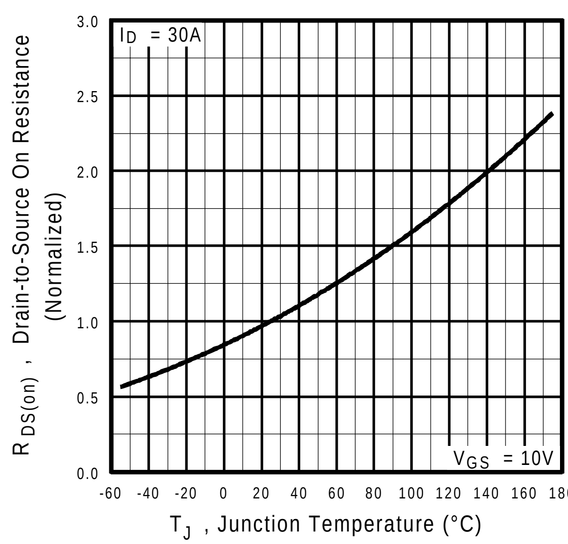


Fig 4. Normalized On-Resistance Vs. Temperature

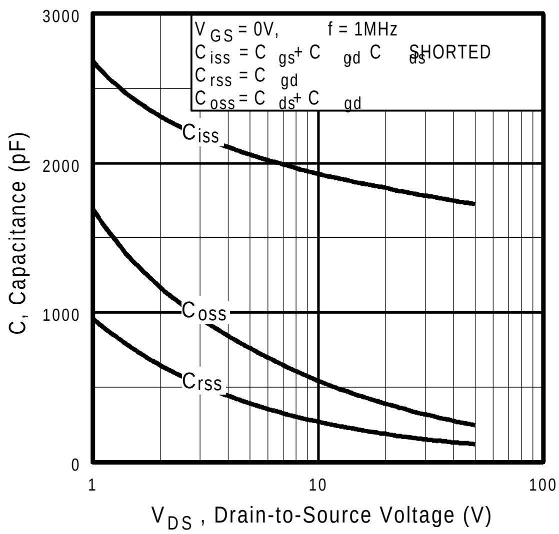


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

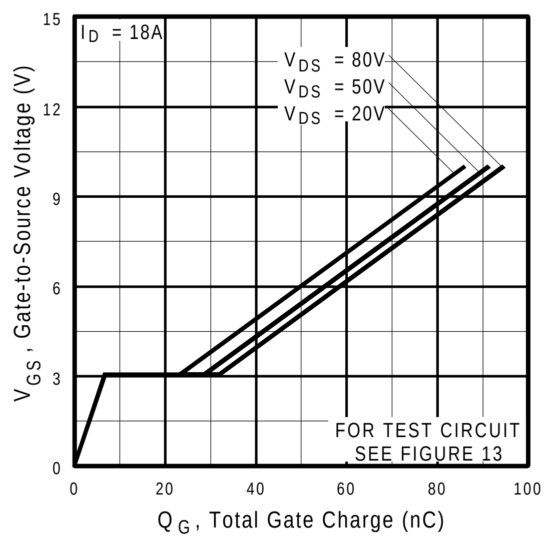


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

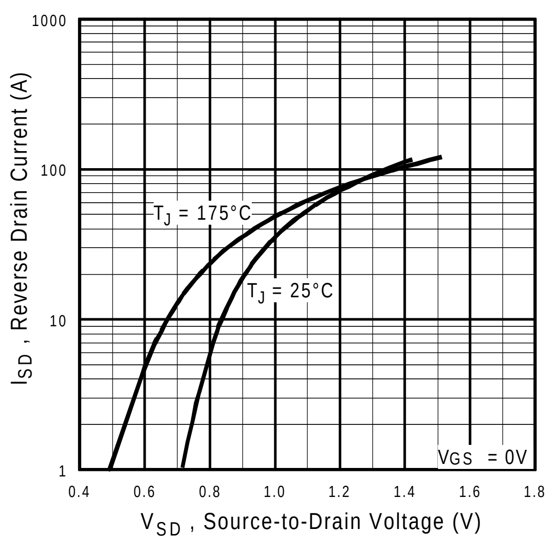


Fig 7. Typical Source-Drain Diode Forward Voltage

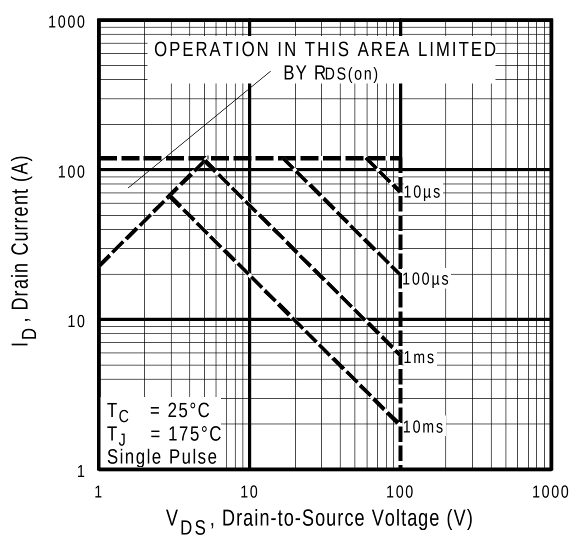


Fig 8. Maximum Safe Operating Area

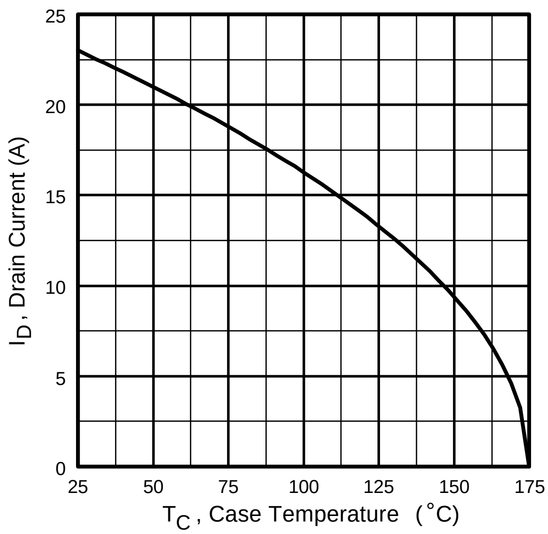


Fig 9. Maximum Drain Current Vs. Case Temperature

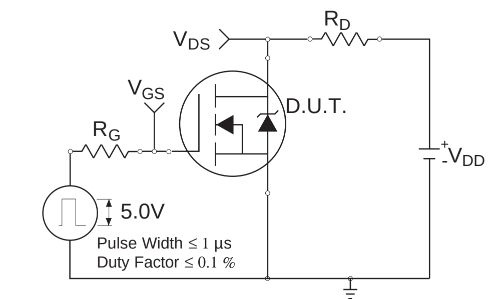


Fig 10a. Switching Time Test Circuit

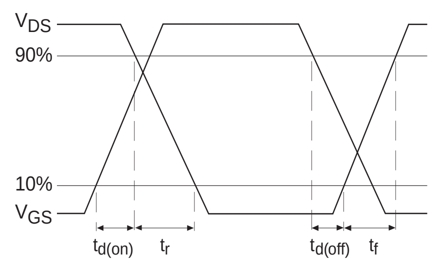


Fig 10b. Switching Time Waveforms

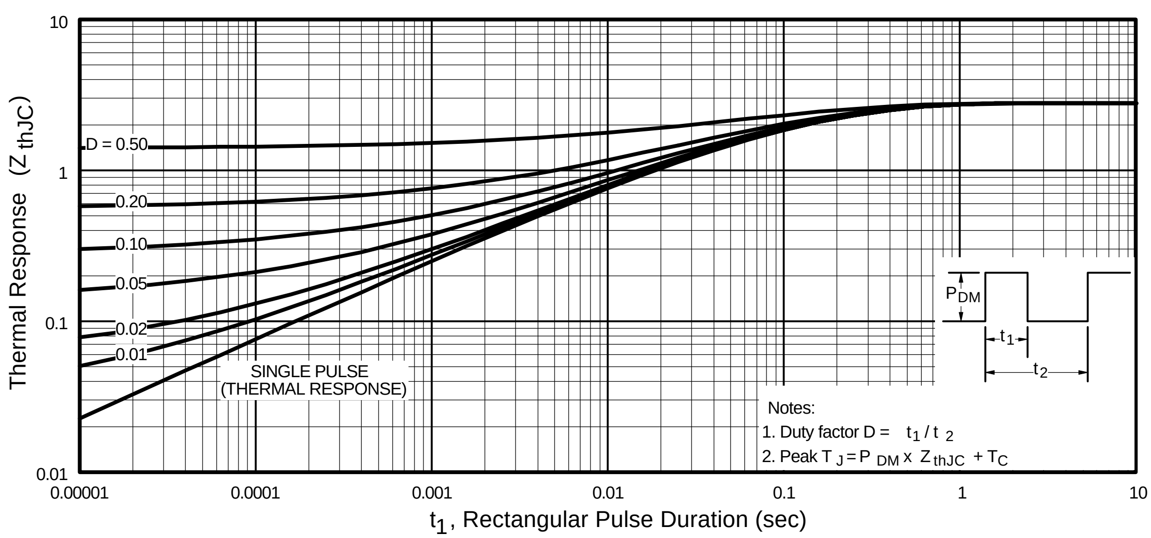


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

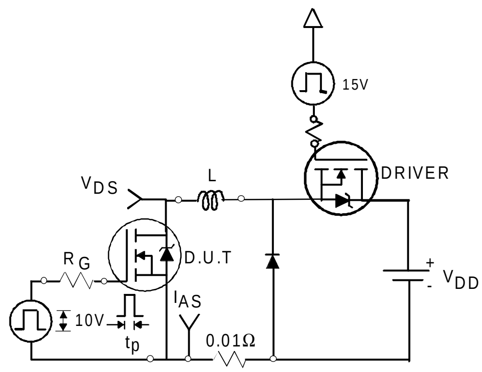


Fig 12a. Unclamped Inductive Test Circuit

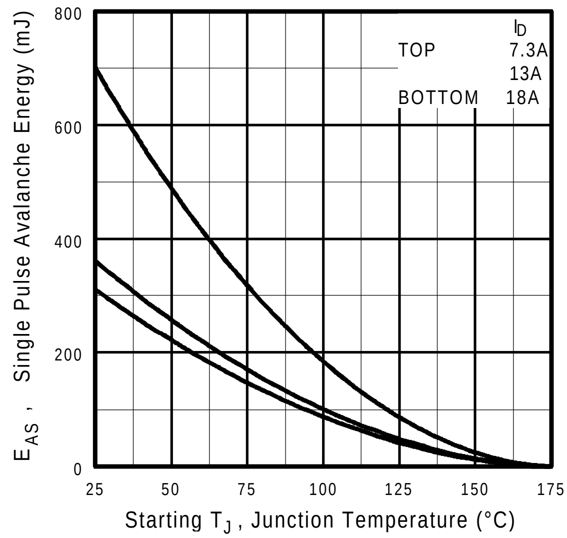


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

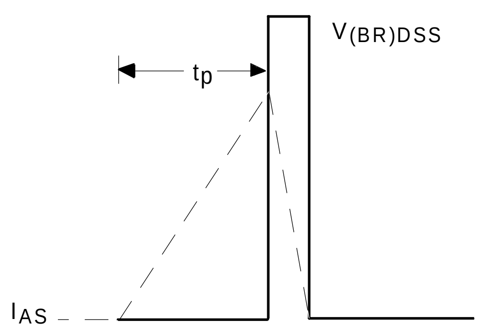


Fig 12b. Unclamped Inductive Waveforms

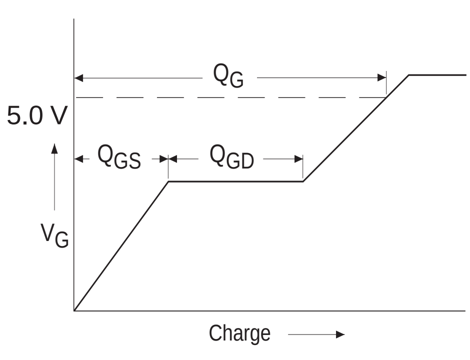


Fig 13a. Basic Gate Charge Waveform

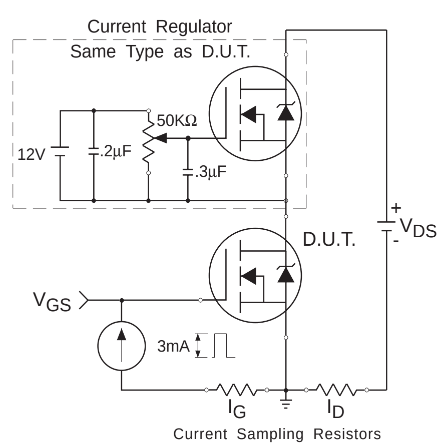
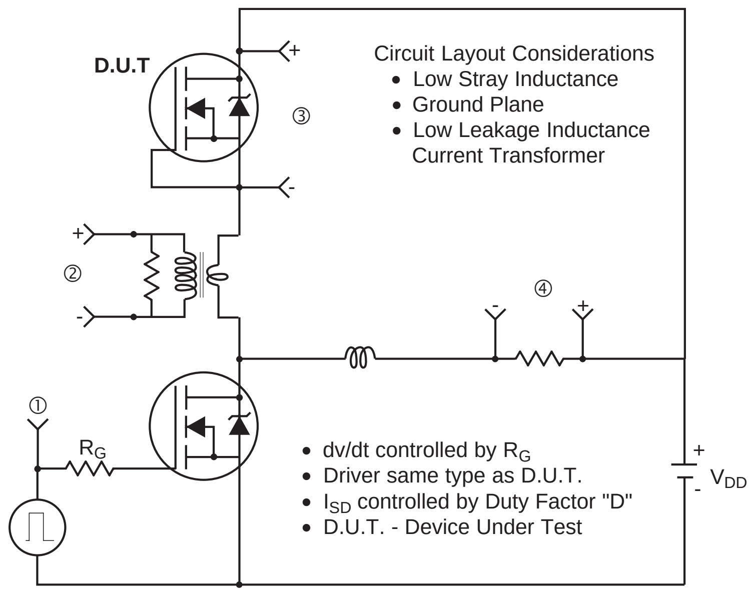
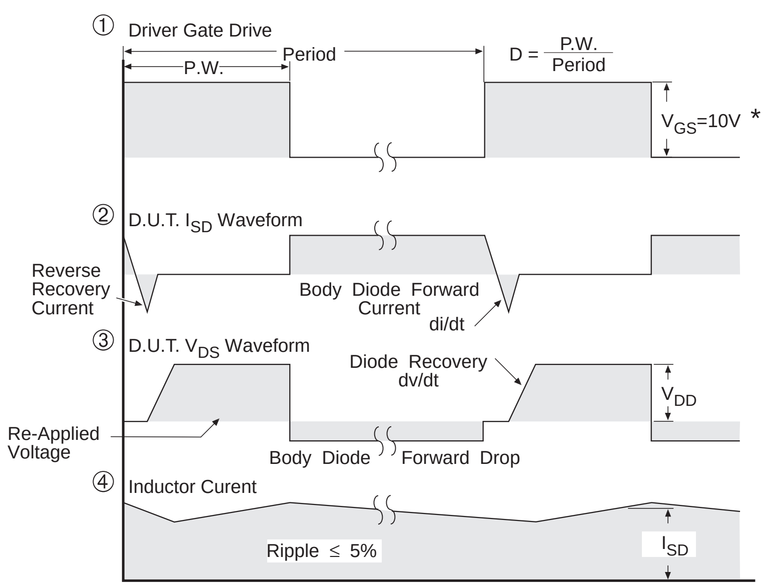


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit





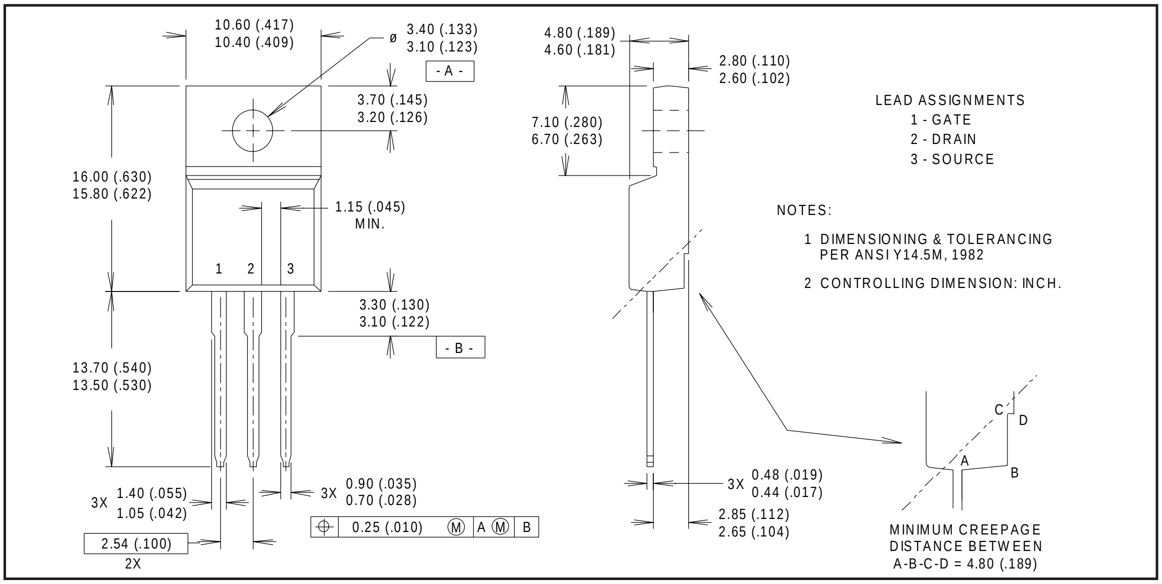
* V_{GS} = 5V for Logic Level Devices

Fig 14. For N-Channel HEXFETS

Package Outline

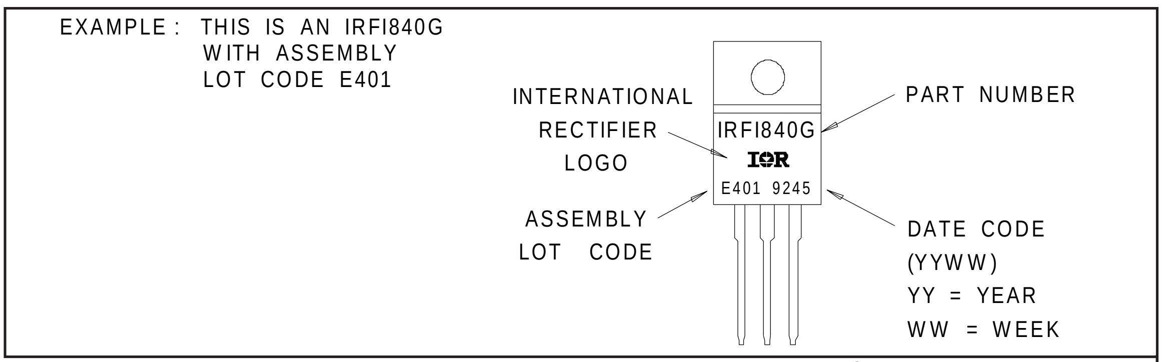
TO-220 Fullpak Outline

Dimensions are shown in millimeters (inches)



Part Marking Information

TO-220 Fullpak



International
IOR Rectifier

WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, Tel: (310) 322 3331
EUROPEAN HEADQUARTERS: Hurst Green, Oxted, Surrey RH8 9BB, UK Tel: ++ 44 1883 732020
IR CANADA: 15 Lincoln Court, Brampton, Ontario L6T 3Z2, Tel: (905) 453 2200
IR GERMANY: Saalburgstrasse 157, 61350 Bad Homburg Tel: ++ 49 6172 96590
IR ITALY: Via Liguria 49, 10071 Borgaro, Torino Tel: ++ 39 11 451 0111
IR FAR EAST: 171 (K&H Bldg.) 30-4 Nishi-ikebukuro 3-chome, Toshima-ku, Tokyo Japan Tel: 81 33 983 0086
IR SOUTHEAST ASIA: 315 Outram Road, #10-02 Tan Boon Liat Building, Singapore 16907 Tel: 65 221 8371

Note: For the most current drawings please refer to the IR website at:
http://www.irf.com/package/