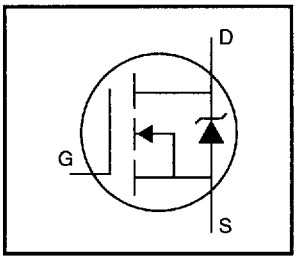
International IOR Rectifier

IRLI3705G

HEXFET® Power MOSFET

- Advanced Process Technology
- Ultra Low On-Resistance
- Isolated Package
- High Voltage Isolation= 2.5KVRMS ⑤
- Sink to Lead Creepage Dist.= 4.8mm
- Logic-Level Gate Drive
- $R_{DS(on)}$ Specified at V_{GS}=5.0V & 10V



V_{DSS} = 50V

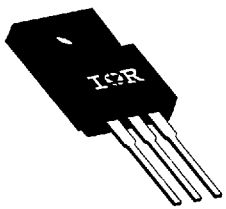
$R_{DS(on)}$ = 0.012Ω

I_D = 45A

Description

Fourth 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.



TO-220 FULLPAK

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10 V	45	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10 V	32	
I_{DM}	Pulsed Drain Current ①	180	
P_D @ T_C = 25°C	Power Dissipation	48	W
	Linear Derating Factor	0.32	W/°C
V_{GS}	Gate-to-Source Voltage	±20	V
E_{AS}	Single Pulse Avalanche Energy ②	350	mJ
I_{AR}	Avalanche Current ①	27	A
E_{AR}	Repetitive Avalanche Energy ①	4.8	mJ
dv/dt	Peak Diode Recovery dv/dt ③	4.5	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 (1.1 N•m)	

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	—	3.1	°C/W
$R_{\theta JA}$	Junction-to-Ambient	—	—	65	

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

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	50	—	—	V	V_{GS}=0V, I_D= 250μA, T_J>-40°C
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.056	—	V/°C	Reference to 25°C, I_D= 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.012	Ω	V_{GS}=10V, I_D=27A ④
		—	—	0.018		V_{GS}=5.0V, I_D=23A ④
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	2.0	V	V_{DS}=V_{GS}, I_D= 250μA
g_{fs}	Forward Transconductance	21	—	—	S	V_{DS}=25V, I_D=48A ④
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	V_{DS}=50V, V_{GS}=0V
		—	—	250		V_{DS}=40V, V_{GS}=0V, T_J=150°C
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	V_{GS}=10V
	Gate-to-Source Reverse Leakage	—	—	-100		V_{GS}=-10V
Q_g	Total Gate Charge	—	—	110	nC	ID=40A, V_{DS}=44V, V_{GS}=5.0V
		—	—	190		I_D=48A
Q_{gs}	Gate-to-Source Charge	—	—	23		V_{DS}=44V
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	51		V_{GS}=10V See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	9.4	—	ns	V_{DD}=28V
t_r	Rise Time	—	90	—		I_D=48A
$t_{d(off)}$	Turn-Off Delay Time	—	140	—		R_G=5.0Ω
t_f	Fall Time	—	140	—		R_D=0.56Ω See Figure 10 ④
L_D	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6 mm (0.25in.) from package and center of die contact
L_S	Internal Source Inductance	—	7.5	—		
C_{iss}	Input Capacitance	—	3300	—	pF	V_{GS}=0V
C_{oss}	Output Capacitance	—	1300	—		V_{DS}= 25V
C_{rss}	Reverse Transfer Capacitance	—	410	—		f=1.0MHz See Figure 5
C	Drain to Sink Capacitance	—	12	—	pF	f=1.0MHz

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	—	—	45	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	180		
V_{SD}	Diode Forward Voltage	—	—	1.7	V	T_J=25°C, I_S=27A, V_{GS}=0V ④
t_{rr}	Reverse Recovery Time	—	97	150	ns	T_J=25°C, I_F=48A
Q_{rr}	Reverse Recovery Charge	—	0.31	0.47	μC	di/dt=100A/μs ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is neglegible (turn-on is dominated by L_S+L_D)				

Notes:

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

② V_{DD}=25V, starting T_J=25°C, L=480μH R_G=25Ω, I_{AS}=27A (See Figure 12)

③ I_{SD}≤48A, di/dt≤180A/μs, V_{DD}≤$V_{(BR)DSS}$, T_J≤175°C

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

⑤ t=60s, f=60Hz

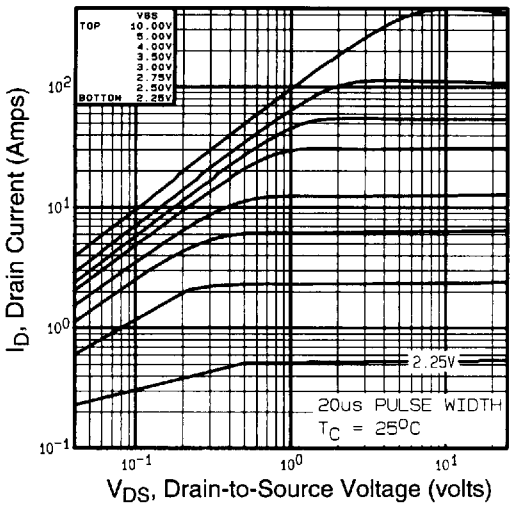


Fig 1. Typical Output Characteristics, T_C=25°C

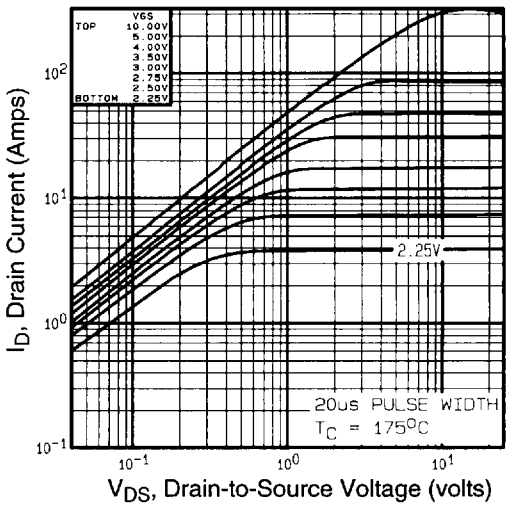


Fig 2. Typical Output Characteristics, T_C=175°C

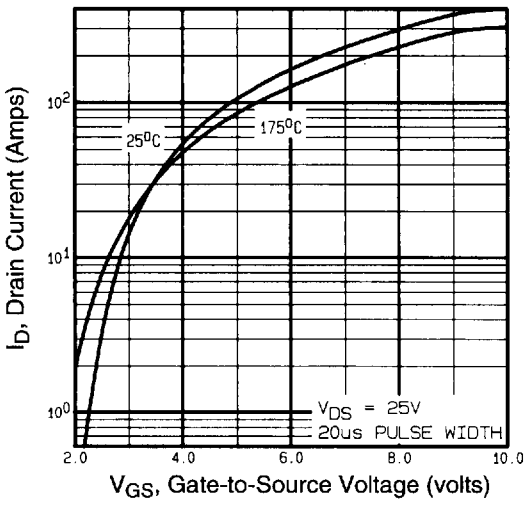


Fig 3. Typical Transfer Characteristics

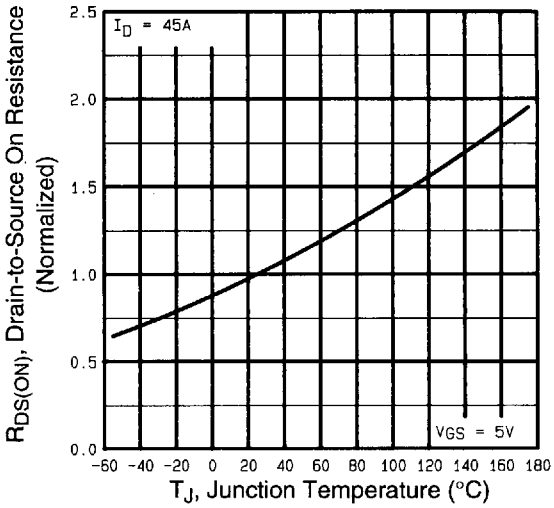


Fig 4. Normalized On-Resistance Vs. Temperature

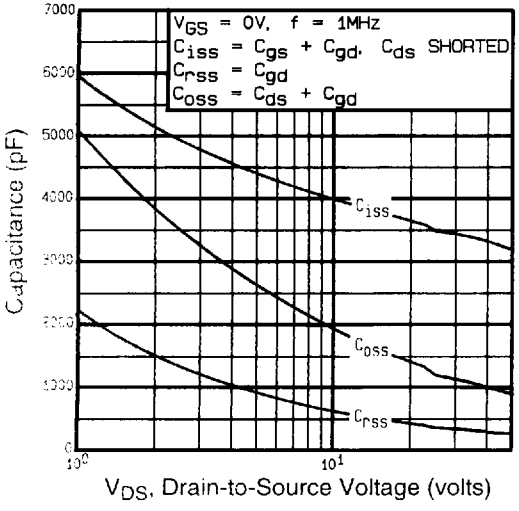


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

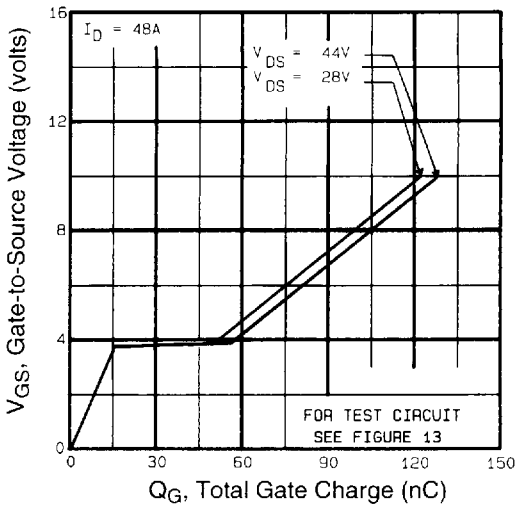


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

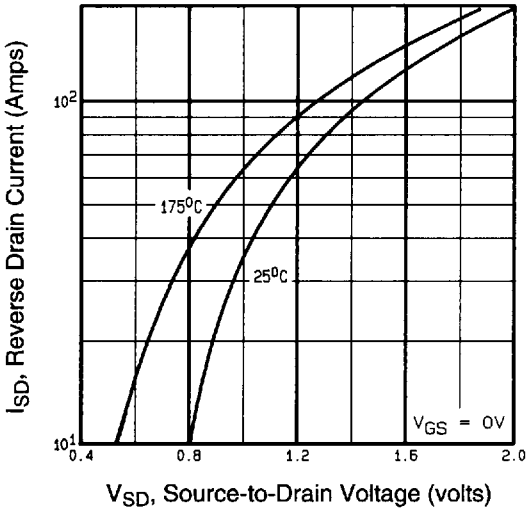


Fig 7. Typical Source-Drain Diode Forward Voltage

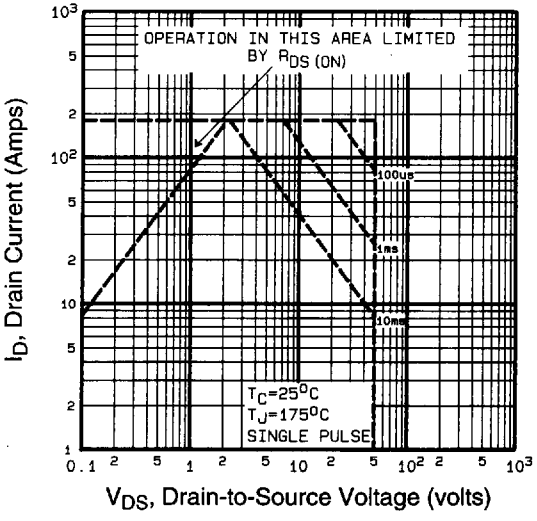


Fig 8. Maximum Safe Operating Area

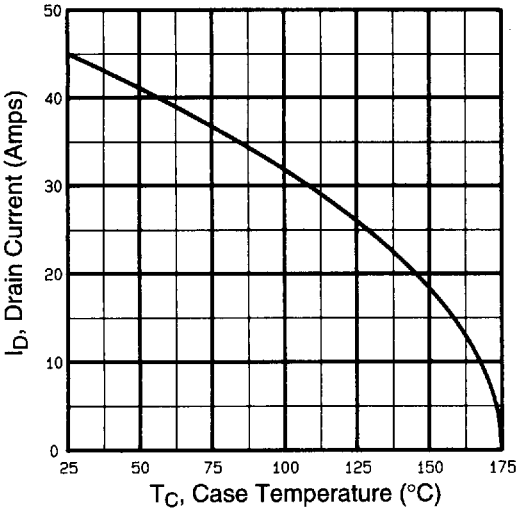


Fig 9. Maximum Drain Current Vs. Case Temperature

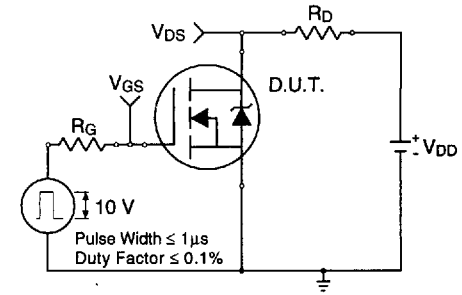


Fig 10a. Switching Time Test Circuit

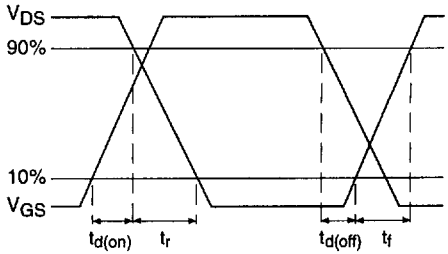


Fig 10b. Switching Time Waveforms

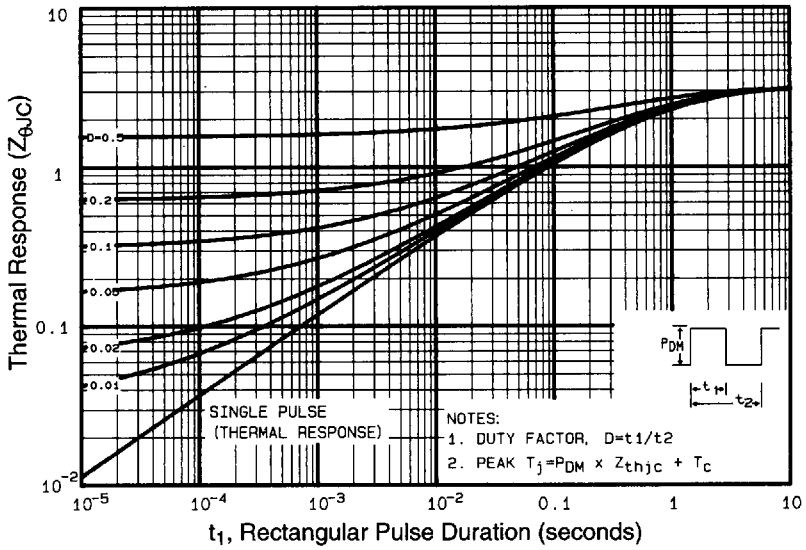


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

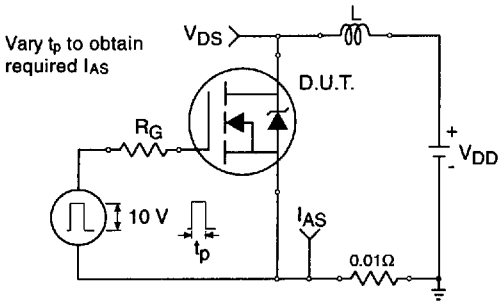


Fig 12a. Unclamped Inductive Test Circuit

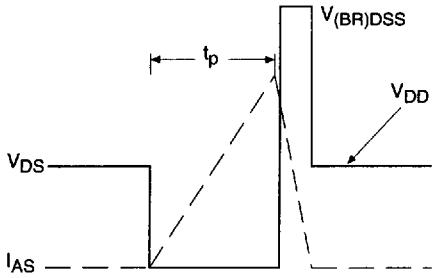


Fig 12b. Unclamped Inductive Waveforms

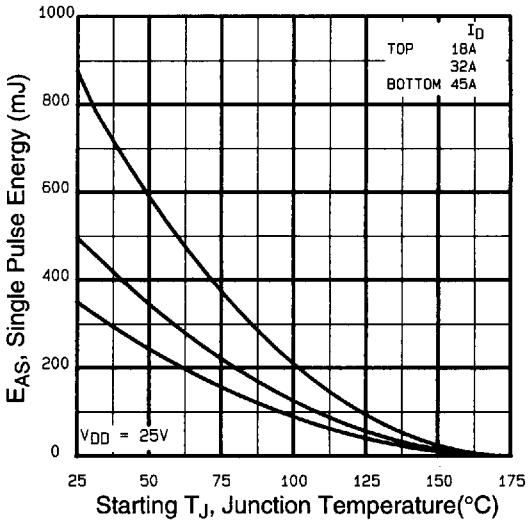


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

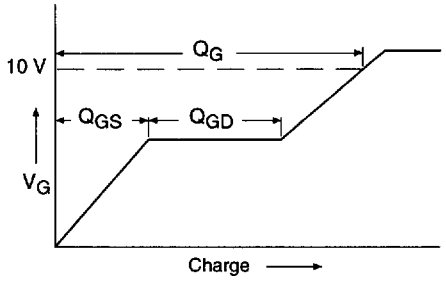


Fig 13a. Basic Gate Charge Waveform

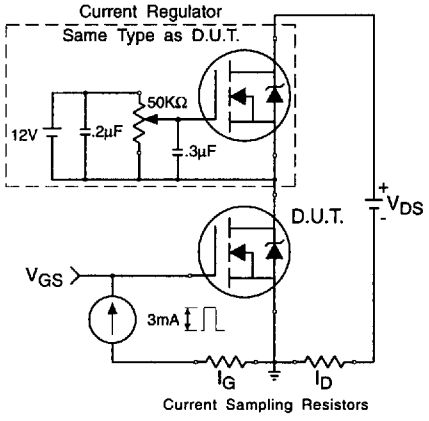
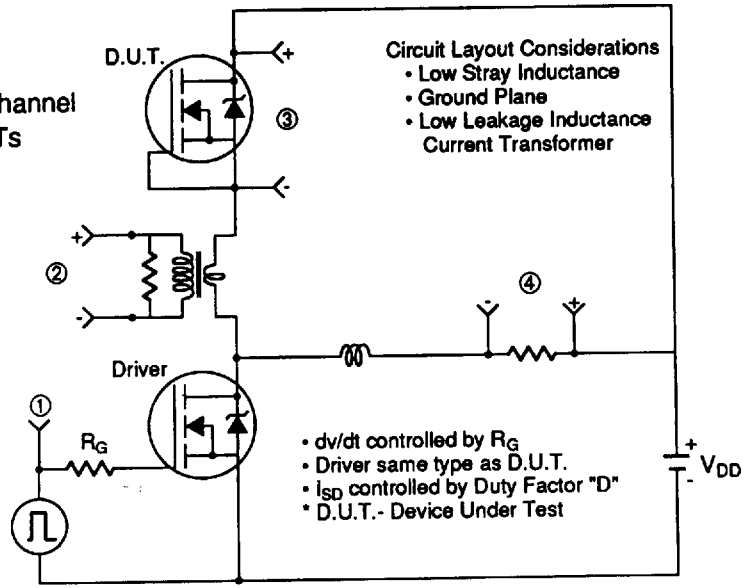


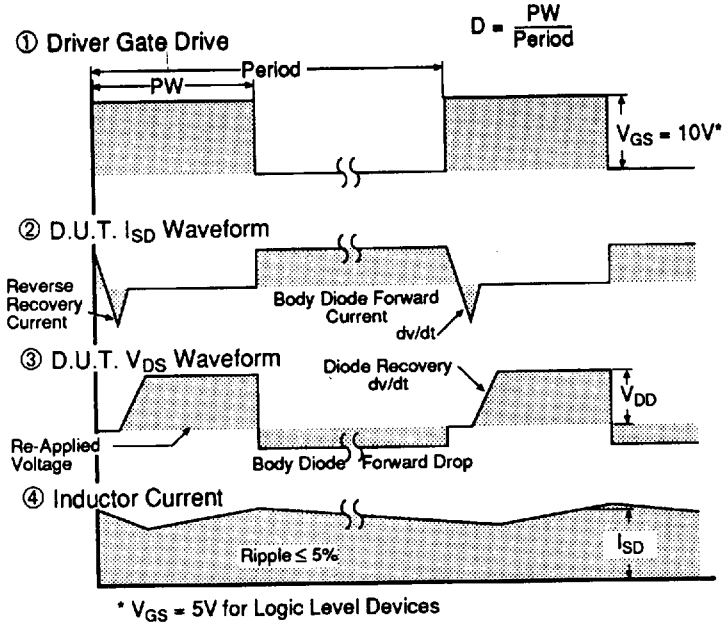
Fig 13b. Gate Charge Test Circuit

Appendix A

Peak Diode Recovery dv/dt Test Circuit

Fig 14. For N-Channel HEXFETs





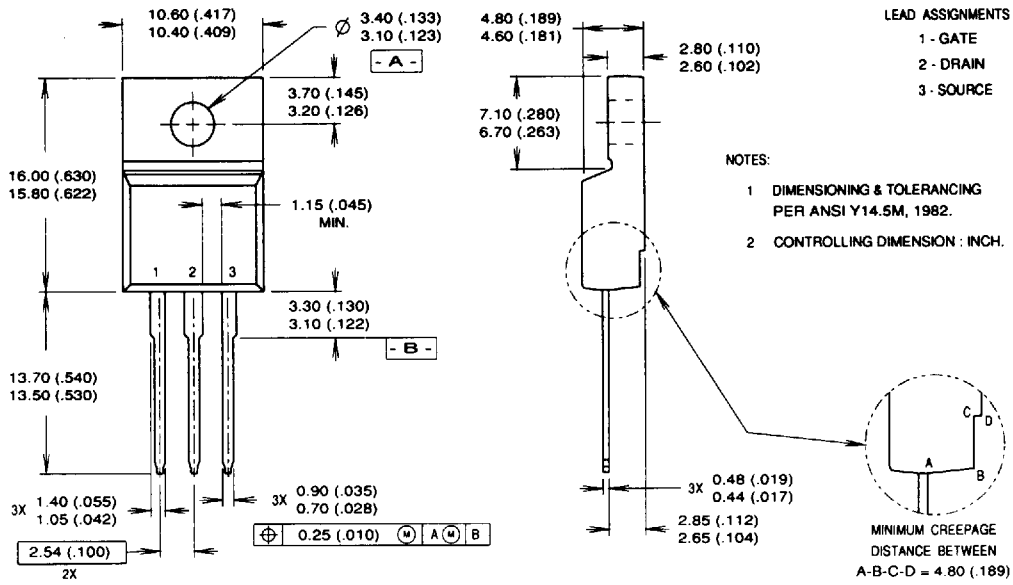
* V_{GS} = 5V for Logic Level Devices

Package Outline

Appendix B

TO-220 FullPak Outline

Dimensions are shown in millimeters (inches)



LEAD ASSIGNMENTS
1 - GATE
2 - DRAIN
3 - SOURCE

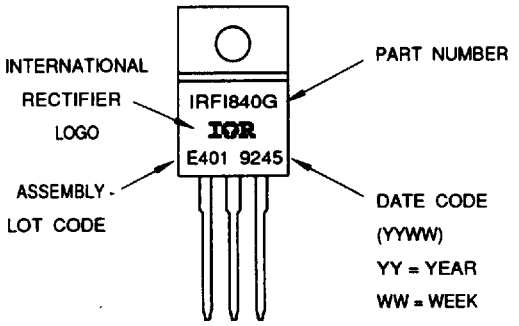
NOTES:
1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
2 CONTROLLING DIMENSION : INCH.

Part Marking Information

Appendix C

TO-220 FULL-PAK

EXAMPLE: THIS IS AN IRFI840G WITH ASSEMBLY LOT CODE E401



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