

International
IR Rectifier
HEXFET[®] Power MOSFET

PD- 95654

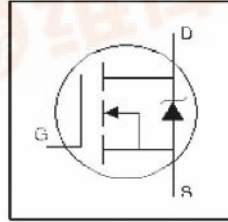
IRLI640GPbF

- Isolated Package
- High Voltage Isolation = 2.5KV RMS
- Sink to Lead Creepage Dist. 4.8mm
- Logic-Level Gate Drive
- R_{DS(on)} Specified at V_{GS} = 4V & 5V
- Fast Switching
- Ease of paralleling
- Lead-Free

Description

Third Generation HEXFETs from International Rectifier provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

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.



V _{DSS} = 200V
R _{DS(on)} = 0.18Ω
I _D = 9.9A



Absolute Maximum Ratings


	Parameter	Max.	Units
I _D @ T _C = 25°C	Continuous Drain Current, V _{GS} @ 5.0V	9.9	A
I _D @ T _C = 100°C	Continuous Drain Current, V _{GS} @ 5.0V	6.3	
I _{DM}	Pulsed Drain Current ①	40	
P _D @ T _C = 25°C	Power Dissipation	40	W
	Linear Derating Factor	0.32	W/°C
V _{GS}	Gate-to-Source Voltage	±10	V
E _{AS}	Single Pulse Avalanche Energy ②	290	mJ
I _{AR}	Avalanche Current ③	9.9	A
E _{AR}	Repetitive Avalanche Energy ④	4.0	mJ
dv/dt	Peak Diode Recovery dv/dt ⑤	5.0	V/ns
T _J	Operating Junction and	-55 to + 150	°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

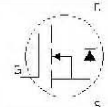
	Parameter	Min.	Typ.	Max.	Units
R _{θJC}	Junction-to-Case	—	—	3.1	°C/W
R _{θJA}	Junction-to-Ambient	—	—	65	



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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	200	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.27	—	V/°C	Reference to $25^\circ\text{C}, I_D = 1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.18	Ω	$V_{GS} = 5.0V, I_D = 5.9A$ ①
		—	—	0.27		$V_{GS} = 4.0V, I_D = 5.0A$ ②
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	2.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
g_{fs}	Forward Transconductance	16	—	—	S	$V_{DS} = 50V, I_D = 10A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	$V_{DS} = 200V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 160V, V_{GS} = 0V, T_J = 160^\circ\text{C}$
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	—	—	66	nC	$I_D = 17A$
Q_{gs}	Gate-to-Source Charge	—	—	9.0		$V_{DS} = 160V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	38		$V_{GS} = 10V$, See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	8.0	—		ns
t_r	Rise Time	—	83	—	$I_D = 17A$	
$t_{d(off)}$	Turn-Off Delay Time	—	44	—	$R_G = 4.6\Omega$	
t_f	Fall Time	—	52	—	$R_D = 5.7\Omega$, See Fig. 10 ④	
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	—	400	—		$V_{DS} = 25V$
C_{rss}	Reverse Transfer Capacitance	—	120	—		$f = 1.0MHz$, See Fig. 5

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	9.9	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	40		
V_{SD}	Diode Forward Voltage	—	—	2.0	V	$T_J = 25^\circ\text{C}, I_S = 9.9A, V_{GS} = 0V$ ②
t_{rr}	Reverse Recovery Time	—	310	470	ns	$T_J = 25^\circ\text{C}, I_F = 17A$
Q_{rr}	Reverse Recovery Charge	—	3.2	4.8	μC	$di/dt = 100A/\mu s$ ③
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 $I_{SD} \leq 17A, di/dt \leq 150A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 150^\circ\text{C}$
- ③ $t = 60s, f = 60Hz$
- ④ $V_{DD} = 25V$, starting $T_J = 25^\circ\text{C}, L = 4.4mH, R_G = 25\Omega, I_{AS} = 9.9A$. (See Figure 12)
- ⑤ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.

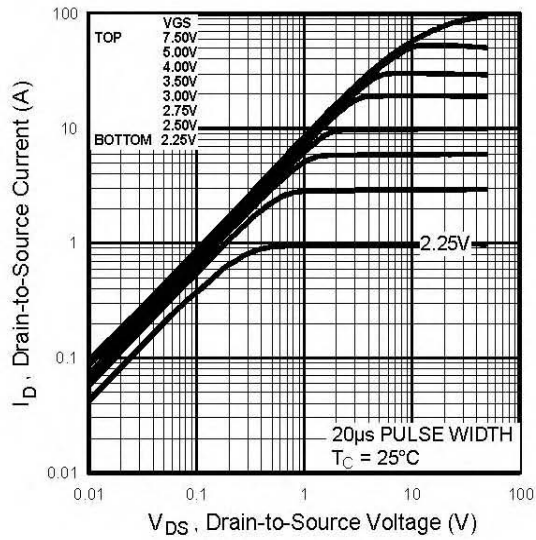


Fig 1. Typical Output Characteristics,
 $T_C = 25^\circ\text{C}$

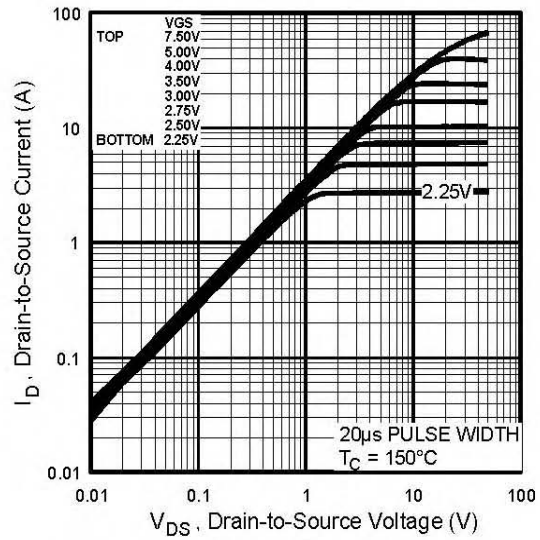


Fig 2. Typical Output Characteristics,
 $T_C = 150^\circ\text{C}$

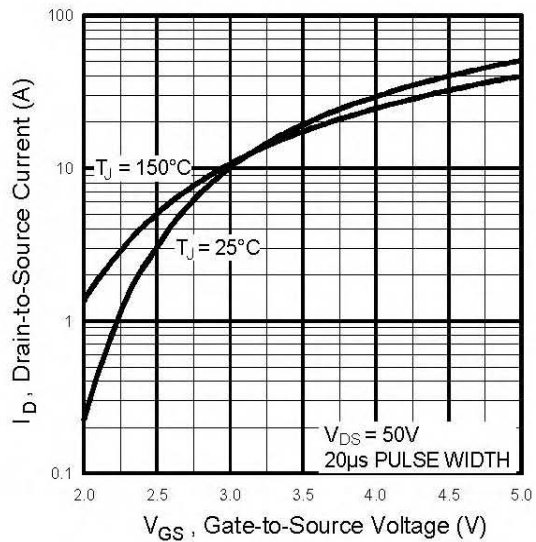


Fig 3. Typical Transfer Characteristics

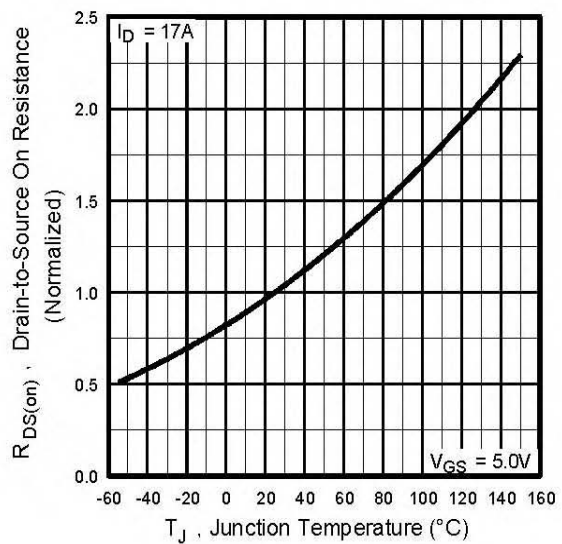


Fig 4. Normalized On-Resistance
Vs. Temperature

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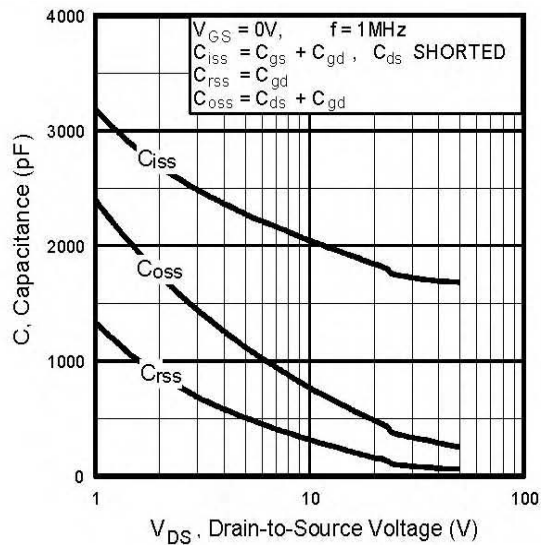


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

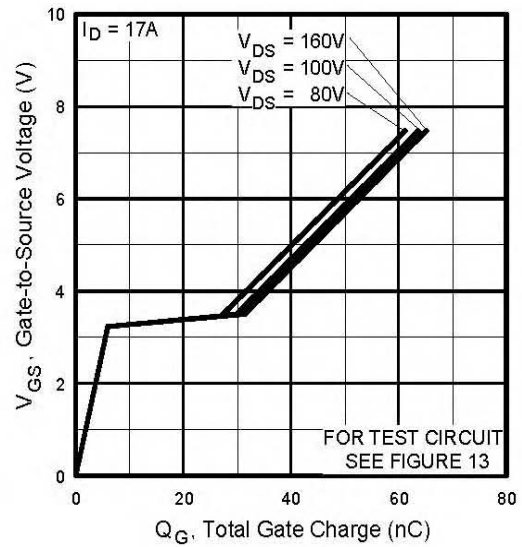


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

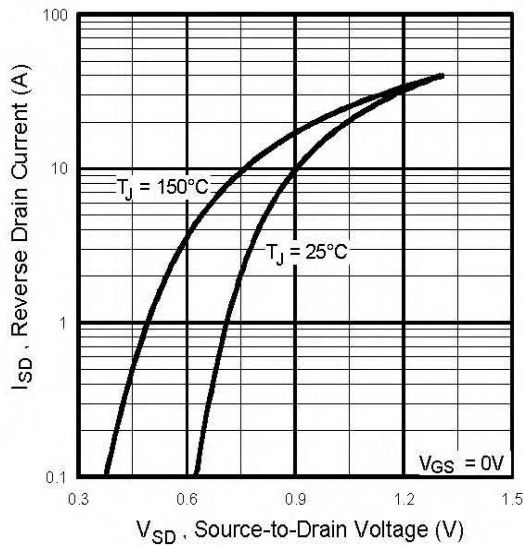


Fig 7. Typical Source-Drain Diode Forward Voltage

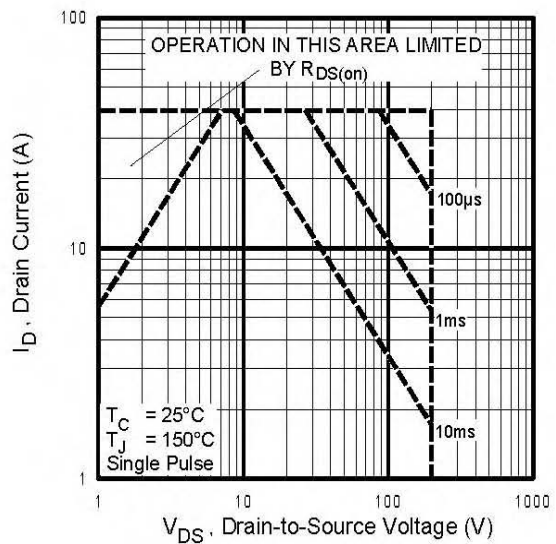


Fig 8. Maximum Safe Operating Area

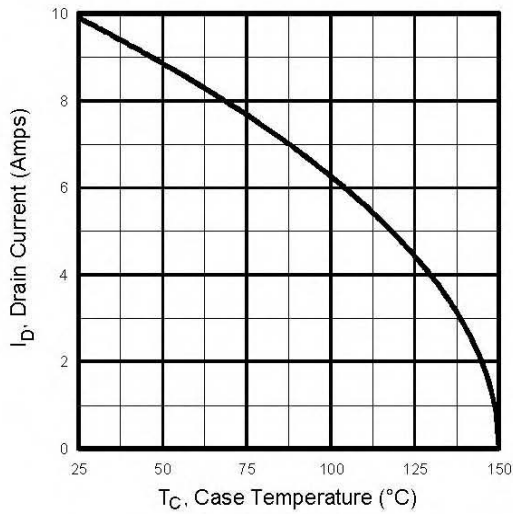


Fig 9. Maximum Drain Current Vs. Case Temperature

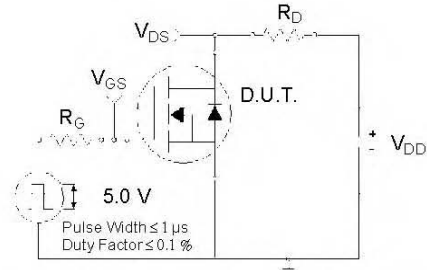


Fig 10a. Switching Time Test Circuit

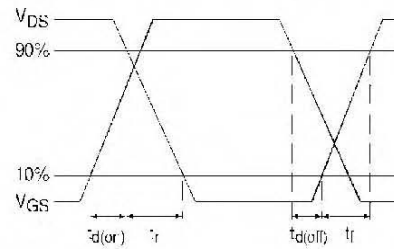


Fig 10b. Switching Time Waveforms

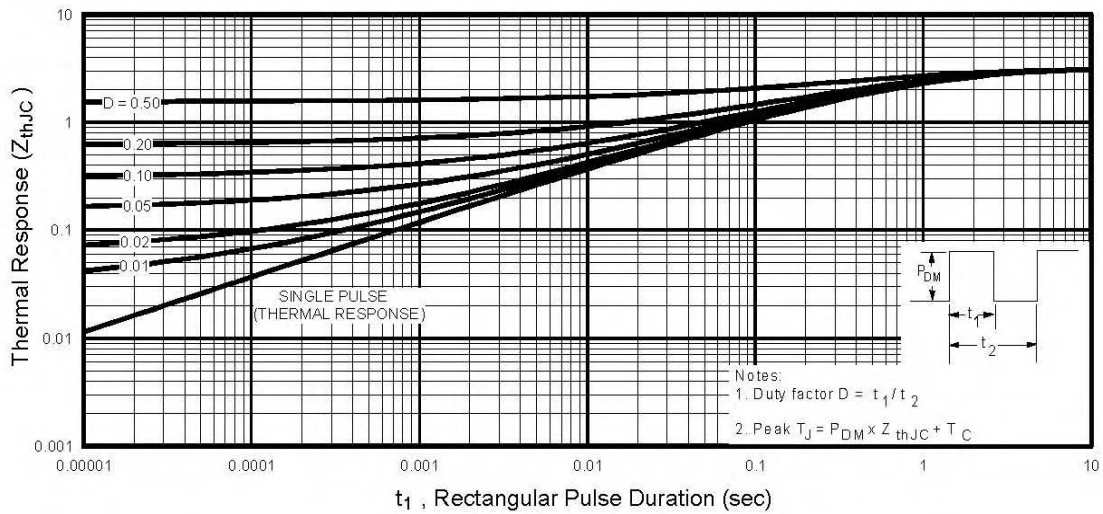


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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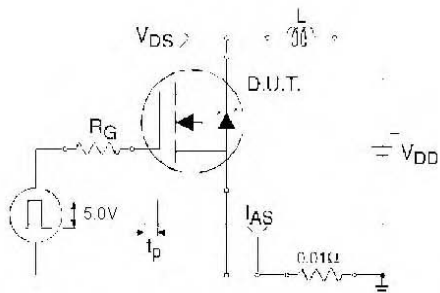


Fig 12a. Unclamped Inductive Test Circuit

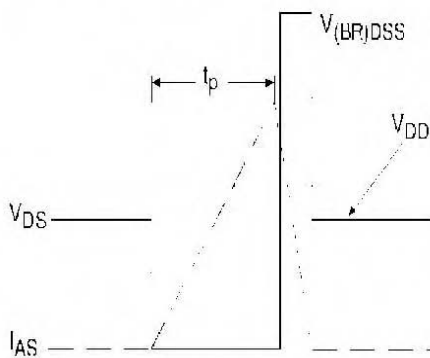


Fig 12b. Unclamped Inductive Waveforms

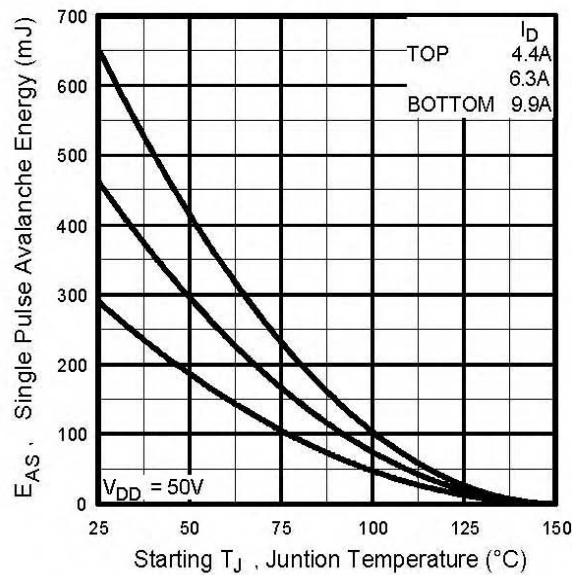


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

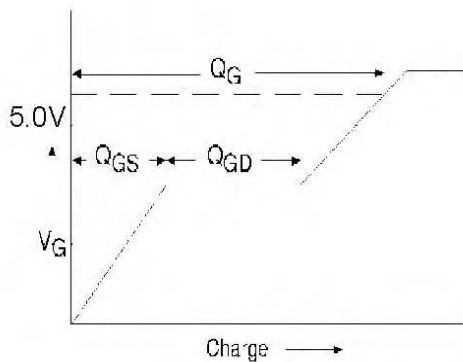


Fig 13a. Basic Gate Charge Waveform

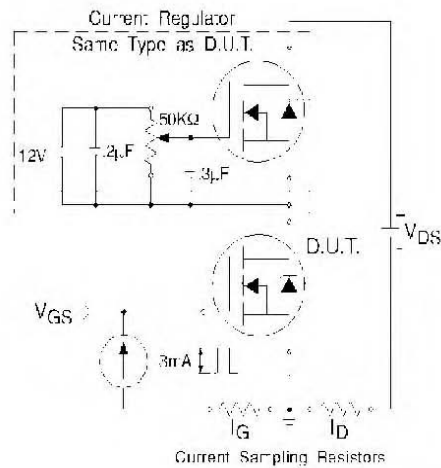
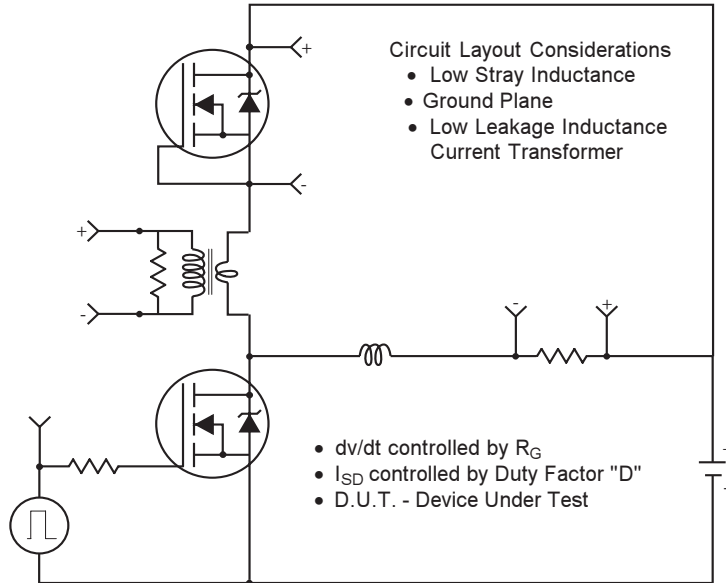
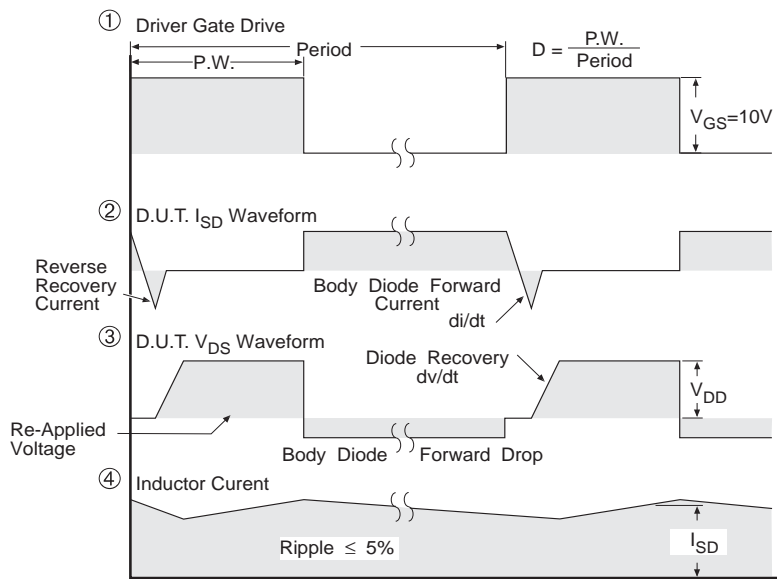


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



* Reverse Polarity for P-Channel
** Use P-Channel Driver for P-Channel Measurements



*** $V_{GS} = 5.0V$ for Logic Level and 3V Drive Devices

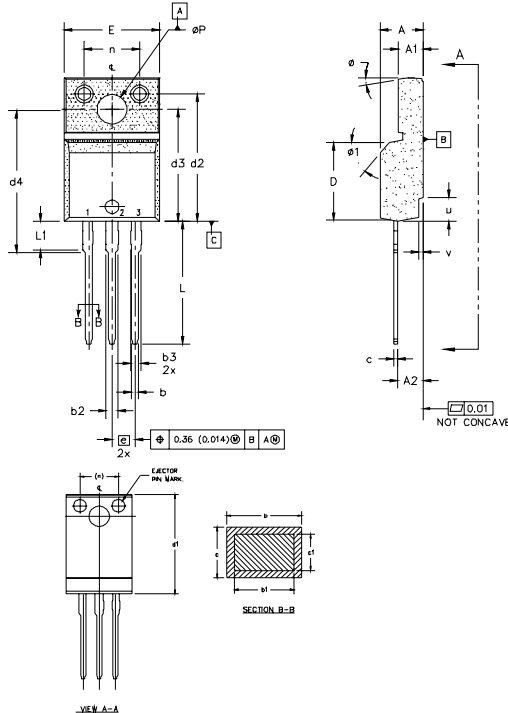
Fig -14 For N Channel HEXFETS

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TO-220 Full-Pak Package Outline

Dimensions are shown in millimeters (inches)



- NOTES:
- 1.0 DIMENSIONING AND TOLERANCING PER ASME Y14.5 M- 1994.
 - 2.0 DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES)
 - 3.0 LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
 - 4.0 DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
 - 5.0 DIMENSION b1 APPLY TO BASE METAL ONLY.
 - 6.0 STEP OPTIONAL ON PLASTIC BODY DEFINED BY DIMENSIONS u & v.
 - 7.0 CONTROLLING DIMENSION : INCHES.

SYMBOL	DIMENSIONS				NOTES	LEAD ASSIGNMENTS
	MILLIMETERS		INCHES			
A	4.57	4.83	0.180	0.190		
A1	2.57	2.83	0.101	0.114		
A2	2.51	2.85	0.099	0.112		
b	0.622	0.89	0.024	0.035		
b1	0.622	0.838	0.024	0.033	5	
b2	1.229	1.400	0.048	0.055		
b3	1.229	1.400	0.048	0.055		
c	0.440	0.629	0.017	0.025		
c1	0.440	0.584	0.017	0.023		
D	8.65	9.80	0.341	0.386	4	
d1	15.80	16.12	0.622	0.635		
d2	13.97	14.22	0.550	0.560		
d3	12.30	12.92	0.484	0.509		
d4	8.64	9.91	0.340	0.390		
E	10.36	10.63	0.408	0.419	4	
e	2.54 BSC		0.100 BSC			
L	13.20	13.73	0.520	0.541		
L1	3.10	3.50	0.122	0.138	3	
n	6.05	6.15	0.238	0.242		
phi P	3.05	3.45	0.120	0.136		
u	2.40	2.50	0.094	0.098	6	
v	0.40	0.50	0.016	0.020	6	
phi	3°	7°	3°	7°		
phi 1		45°		45°		

LEAD ASSIGNMENTS

HEXFET

1.- GATE
2.- DRAIN
3.- SOURCE

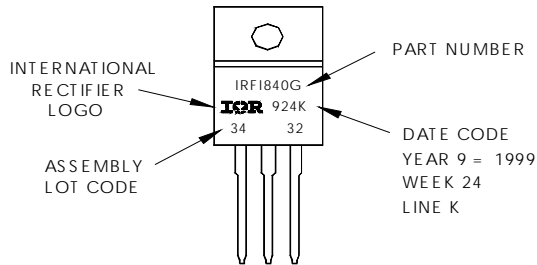
IGBTs, CoPACK

1.- GATE
2.- COLLECTOR
3.- EMITTER

TO-220 Full-Pak Part Marking Information

EXAMPLE: THIS IS AN IRF1840G
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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