

# IRFP150NPbF

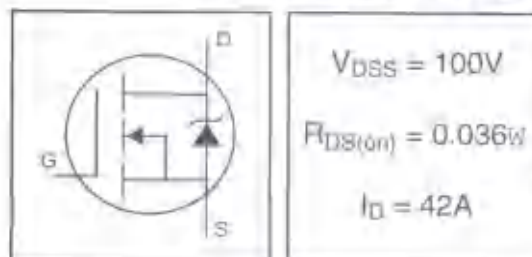
## HEXFET® Power MOSFET

- Advanced Process Technology
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Lead-Free

### 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-247 package is preferred for commercial-industrial applications where higher power levels preclude the use of TO-220 devices. The TO-247 is similar but superior to the earlier TO-218 package because of its isolated mounting hole.



$$V_{DS} = 100V$$

$$R_{DS(on)} = 0.036\Omega$$

$$I_D = 42A$$



### Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D$ @ $T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	42	A
$I_D$ @ $T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	30	
$I_{DM}$	Pulsed Drain Current (D.C.)	140	
$P_D$ @ $T_C = 25^\circ C$	Power Dissipation	163	W
	Linear Derating Factor	1.1	W/°C
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$E_{AS}$	Single Pulse Avalanche Energy(25)	420	mJ
$I_{AS}$	Avalanche Current(25)	22	A
$E_{AR}$	Repetitive Avalanche Energy(2)	16	mJ
dv/dt	Peak Diode Recovery dv/dt (25)	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, E-32 or M3 screw	10 lbf-in (1.1 N-m)	

### Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{JC}$	Junction-to-Case	—	0.95	°C/W
$R_{CS}$	Case-to-Sink, Flat, Greased Surface	0.24	—	
$R_{JA}$	Junction-to-Ambient	—	40	

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{DS(BOSS)}$	Drain-to-Source Breakdown Voltage	100	—	—	V	$V_{GS} = 0\text{V}$ , $I_D = 250\mu\text{A}$
$\Delta V_{DS(BOSS)}/T_J$	Breakdown Voltage Temp. Coefficient	—	0.11	—	V/°C	Reference to $25^\circ\text{C}$ , $I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.036	$\Omega$	$V_{DS} = 10\text{V}$ , $I_D = 22\text{A}$ ①
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	$V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$
$g_m$	Forward Transconductance	14	—	—	S	$V_{DS} = 25\text{V}$ , $I_D = 22\text{A}$ ②
$I_{SS}$	Drain-to-Source Leakage Current	—	—	25	$\mu\text{A}$	$V_{DS} = 100\text{V}$ , $V_{GS} = 0\text{V}$
		—	—	250		$V_{DS} = 80\text{V}$ , $V_{GS} = 0\text{V}$ , $T_J = 150^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 50\text{V}$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -20\text{V}$
$Q_g$	Total Gate Charge	—	—	11.0	nC	$I_D = 22\text{A}$
$Q_{gs}$	Gate-to-Source Charge	—	—	15		$V_{DS} = 20\text{V}$
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	—	58		$V_{DS} = 18\text{V}$ , See Fig. 6 and 13 ③
$t_{d(on)}$	Turn-On Delay Time	—	11	—	ns	$V_{GS} = 50\text{V}$
$t_r$	Rise Time	—	56	—		$I_D = 22\text{A}$
$t_{d(off)}$	Turn-Off Delay Time	—	45	—		$R_{\theta JA} = 3.5^\circ\text{C/W}$
$t_f$	Fall Time	—	40	—		$R_{\theta JA} = 2.9^\circ\text{C/W}$ , See Fig. 10 ④
$L_D$	Internal Drain Inductance	—	5.0	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
$L_S$	Internal Source Inductance	—	13	—		
$C_{iss}$	Input Capacitance	—	1900	—	pF	$V_{DS} = 0\text{V}$
$C_{oss}$	Output Capacitance	—	450	—		$V_{GS} = 25\text{V}$
$C_{riss}$	Reverse Transfer Capacitance	—	230	—		$f = 1\text{MHz}$ , See Fig. 5 ⑤

## Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	42	A	MOSFET symbol showing the integral, inverse p-n junction diode.
$I_{SD}$	Pulsed Source Current (Body Diode) ⑥	—	—	140		
$V_{SD}$	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}$ , $I_S = 42\text{A}$ , $V_{GS} = 0\text{V}$ ⑦
$t_r$	Reverse Recovery Time	—	190	270	ns	$T_J = 25^\circ\text{C}$ , $I_S = 22\text{A}$
$Q_{rr}$	Reverse Recovery Charge	—	1.9	1.8	$\mu\text{C}$	$dI/dt = 100\text{A}/\mu\text{s}$ ⑧
$t_{on}$	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_D$ - $L_S$ )				

### Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11.)
- ② Pulsed width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .
- ③ Starting  $T_J = 25^\circ\text{C}$ ,  $L = 1\text{mH}$ ,  $R_{\theta JA} = 25^\circ\text{C/W}$ ,  $I_D = 22\text{A}$ . (See Figure 12.)
- ④ Using 140/180  $\mu\text{s}$  and 50% duty cycle.
- ⑤  $I_{SD} \leq 22\text{A}$ ,  $dI/dt \leq 100\text{A}/\mu\text{s}$ ,  $V_{GS} \leq V_{GS(th)}$ ,  $T_J = 175^\circ\text{C}$ .

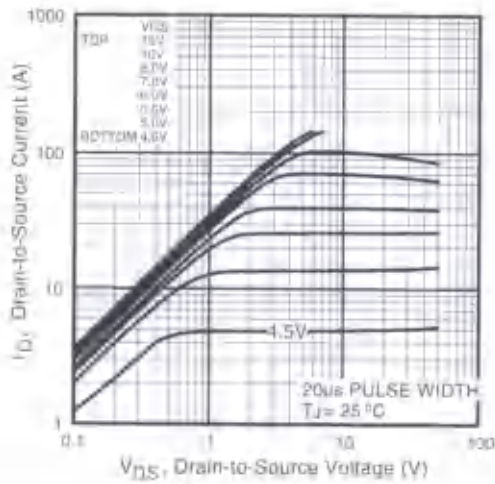


Fig 1. Typical Output Characteristics

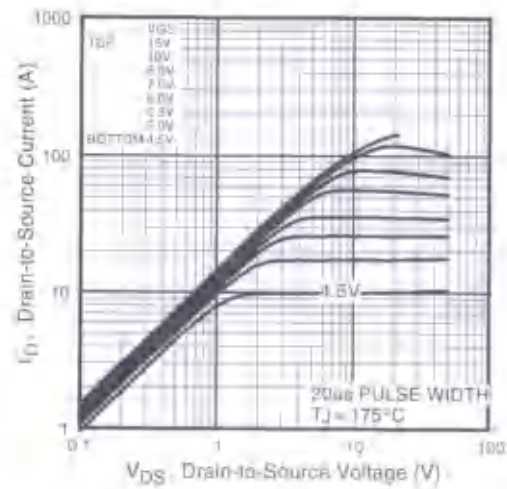


Fig 2. Typical Output Characteristics

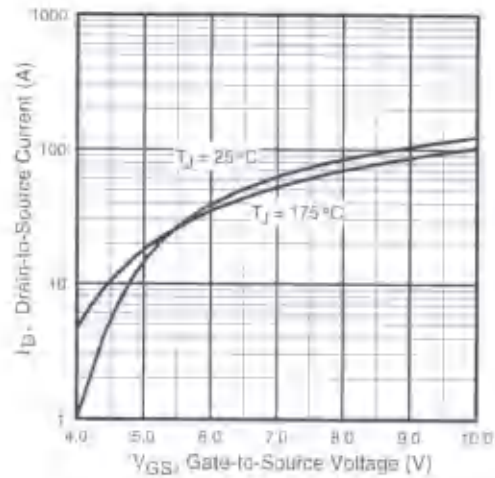


Fig 3. Typical Transfer Characteristics

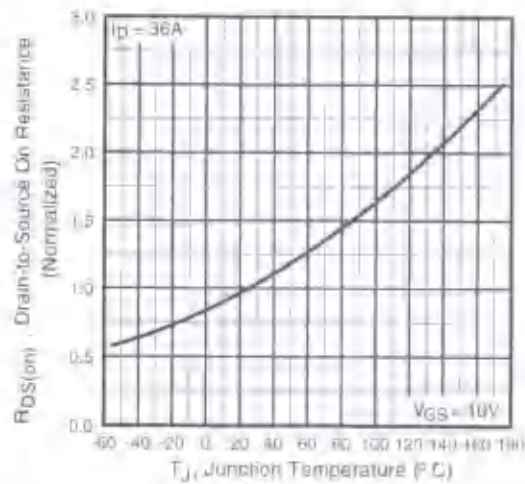
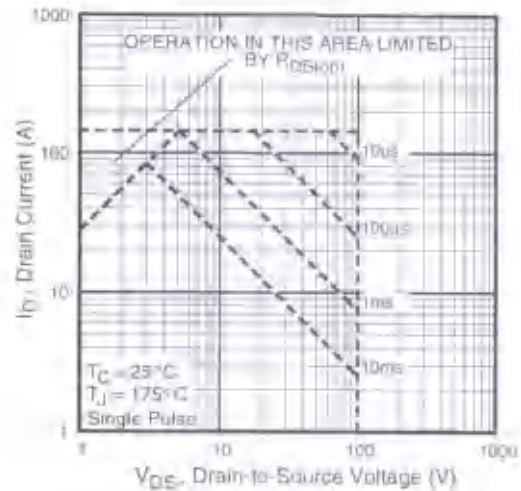
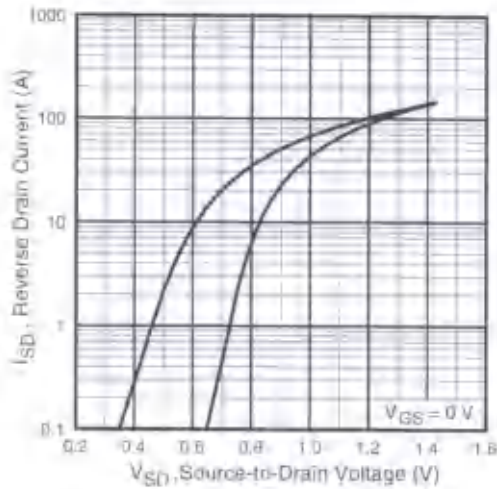
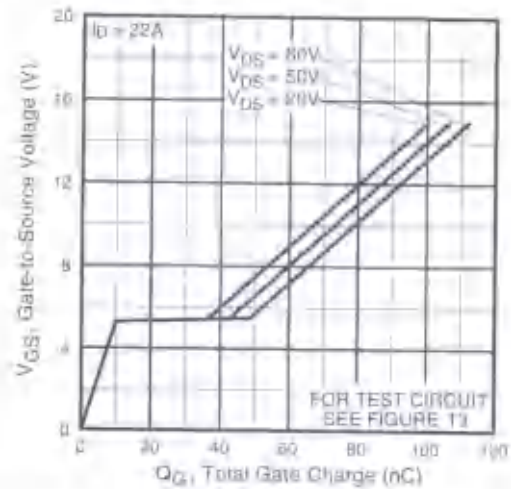
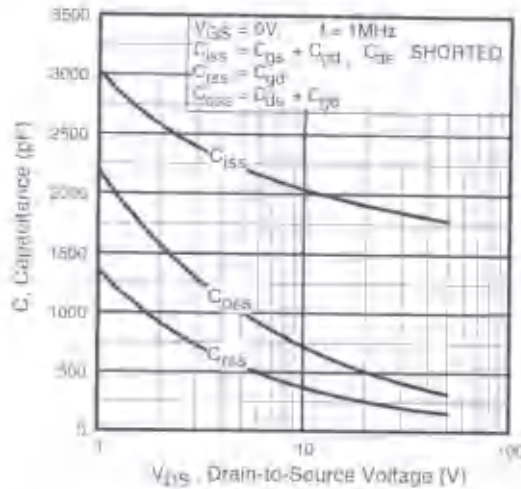


Fig 4. Normalized On-Resistance  
Vs. Temperature

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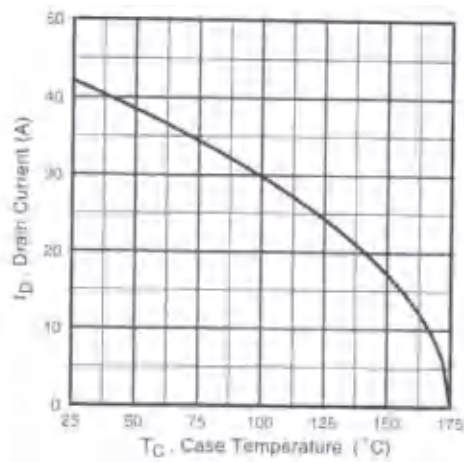


Fig 9. Maximum Drain Current Vs. Case Temperature

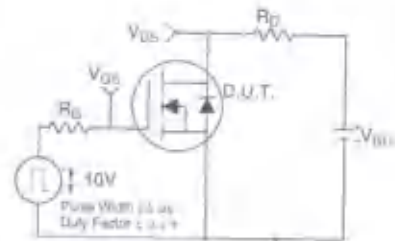


Fig 10a. Switching Time Test Circuit

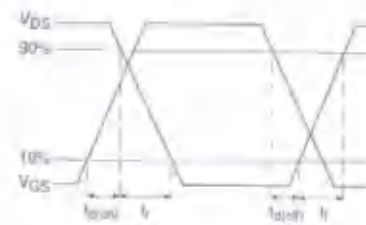


Fig 10b. Switching Time Waveforms

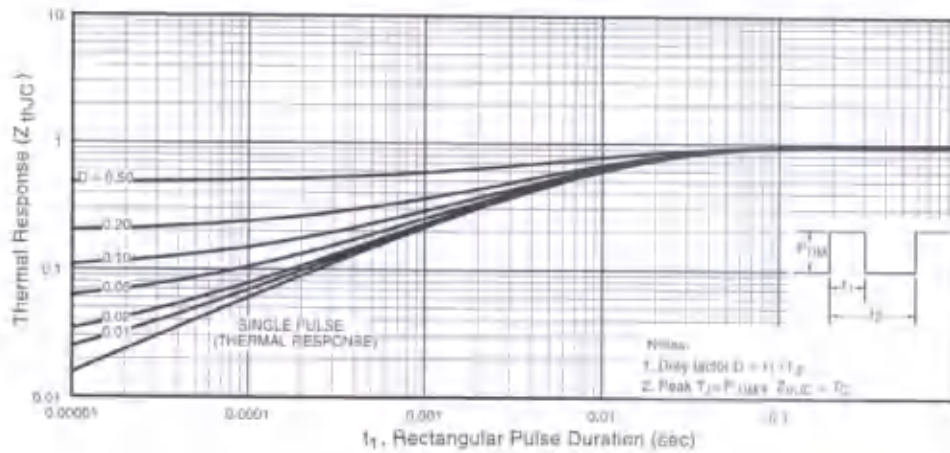


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case



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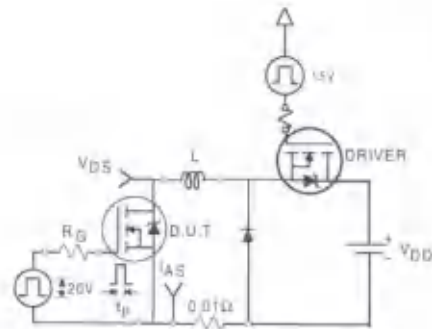


Fig 12a. Unclamped Inductive Test Circuit

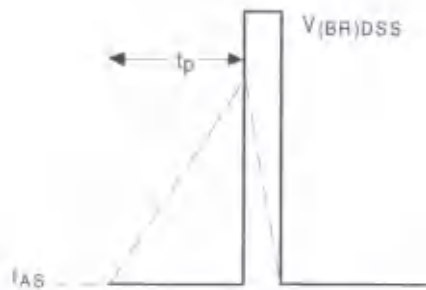


Fig 12b. Unclamped Inductive Waveforms

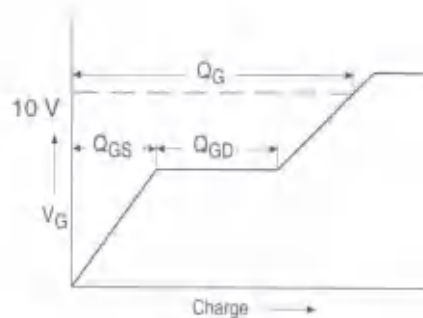


Fig 13a. Basic Gate Charge Waveform

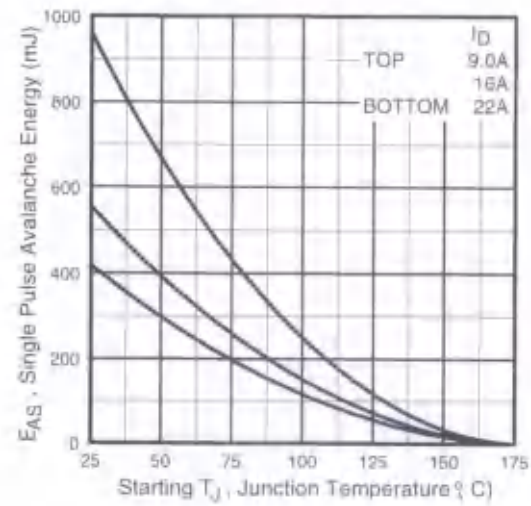


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

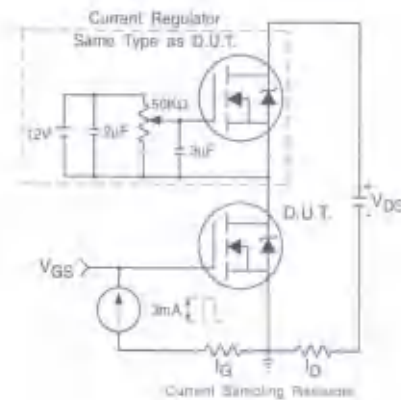
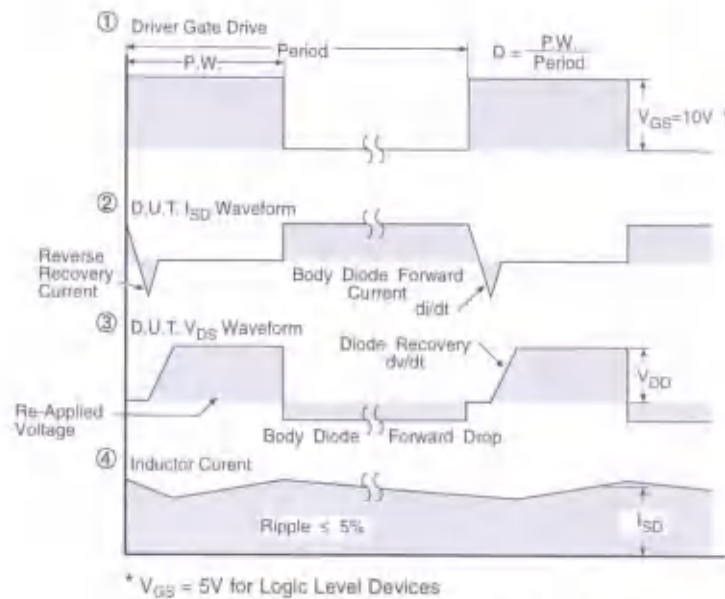
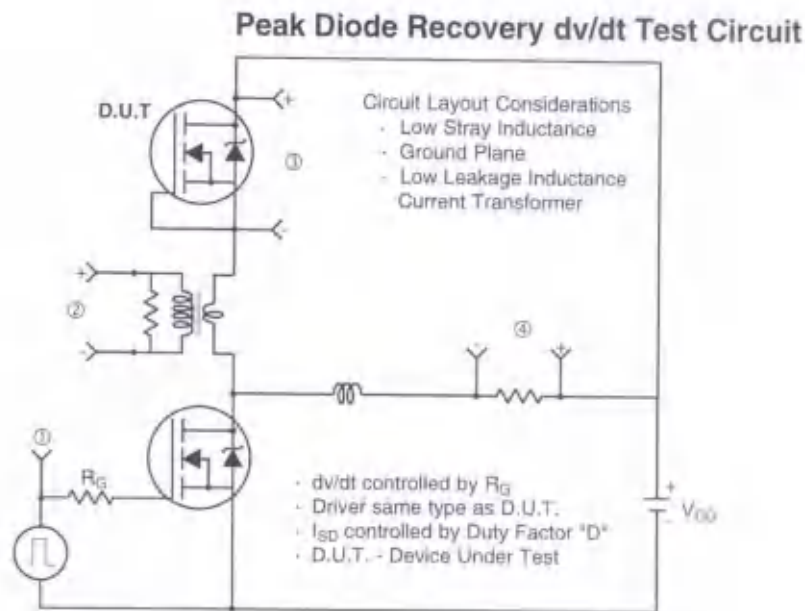


Fig 13b. Gate Charge Test Circuit



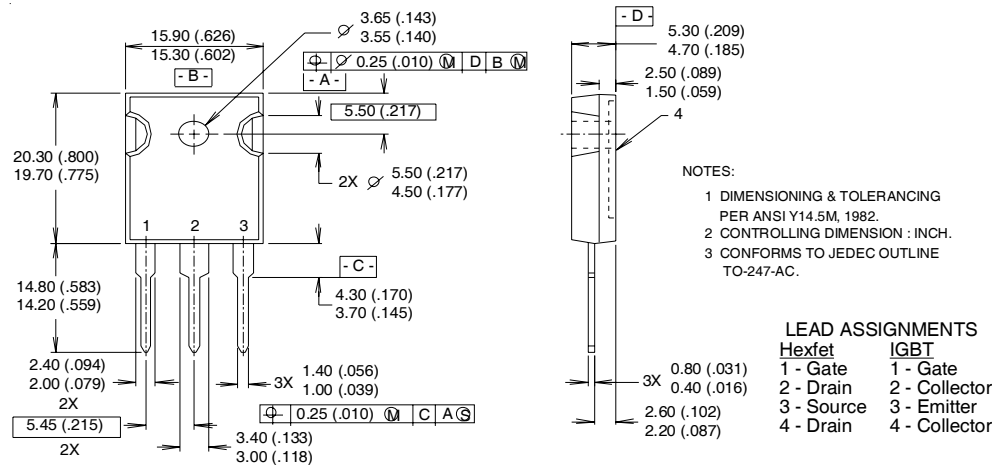
**Fig 14. For N-Channel HEXFETS**

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## TO-247AC Package Outline

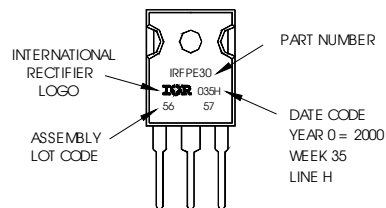
Dimensions are shown in millimeters (inches)



## TO-247AC Part Marking Information

EXAMPLE: THIS IS AN IRFPE30  
WITH ASSEMBLY  
LOT CODE 5657  
ASSEMBLED ON WW 35, 2000  
IN THE ASSEMBLY LINE "H"

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



Data and specifications subject to change without notice.

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TAC Fax: (310) 252-7903

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

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