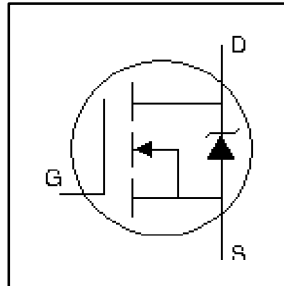


## HEXFET® Power MOSFET

- Advanced Process Technology
- Ultra Low On-Resistance
- Dynamic dv/dt Rating
- Repetitive Avalanche Rated
- 175°C Operating Temperature
- Fast Switching
- Ease of Paralleling

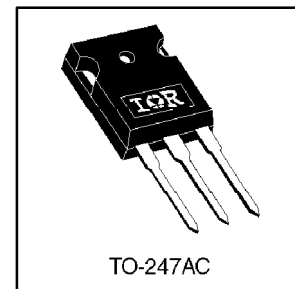


$V_{DSS} = 100V$
$R_{DS(on)} = 0.025\Omega$
$I_D = 61A$

### 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-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. It also provides greater creepage distance between pins to meet the requirements of most safety specifications.



### Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	61	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	43	
$I_{DM}$	Pulsed Drain Current ①	240	
$P_D @ T_C = 25^\circ C$	Power Dissipation	230	W
	Linear Derating Factor	1.5	W/°C
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$E_{AS}$	Single Pulse Avalanche Energy ②	830	mJ
$I_{AR}$	Avalanche Current ③	37	A
$E_{AR}$	Repetitive Avalanche Energy ④	23	mJ
dv/dt	Peak Diode Recovery dv/dt ⑤	5.5	V/ns
$T_J$	Operating Junction and	-55 to + 175	°C
$T_{STG}$	Storage Temperature Range		
	Soldering Temperature, for 10 seconds		
	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	—	—	0.65	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	—	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient	—	—	40	

# IRFP2410



## 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	100	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	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	—	—	0.025	$\Omega$	$V_{GS} = 10V, I_D = 37A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
$g_{fs}$	Forward Transconductance	16	—	—	S	$V_{DS} = 25V, I_D = 37A$
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	25	$\mu A$	$V_{DS} = 100V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 80V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -20V$
$Q_g$	Total Gate Charge	—	—	180	nC	$I_D = 37A$
$Q_{gs}$	Gate-to-Source Charge	—	—	30		$V_{DS} = 80V$
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	—	69		$V_{GS} = 10V$ , See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	16	—		ns
$t_r$	Rise Time	—	100	—	$I_D = 37A$	
$t_{d(off)}$	Turn-Off Delay Time	—	120	—	$R_G = 6.2\Omega$	
$t_f$	Fall Time	—	97	—	$R_D = 1.3\Omega$ , 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	—	4600	—	pF	$V_{GS} = 0V$
$C_{oss}$	Output Capacitance	—	1100	—		$V_{DS} = 25V$
$C_{rss}$	Reverse Transfer Capacitance	—	200	—		$f = 1.0\text{MHz}$ , See Fig. 5

## Source-Drain Ratings and Characteristics

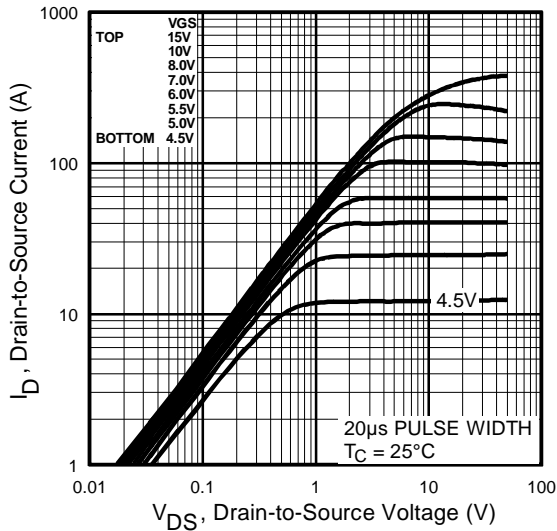
	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	61	A	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	240		
$V_{SD}$	Diode Forward Voltage	—	—	2.5	V	$T_J = 25^\circ\text{C}, I_S = 37A, V_{GS} = 0V$ ④
$t_{rr}$	Reverse Recovery Time	—	180	270	ns	$T_J = 25^\circ\text{C}, I_F = 37A$
$Q_{rr}$	Reverse Recovery Charge	—	990	1500	nC	$di/dt = 100A/\mu s$ ④
$t_{on}$	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$ )				

### Notes:

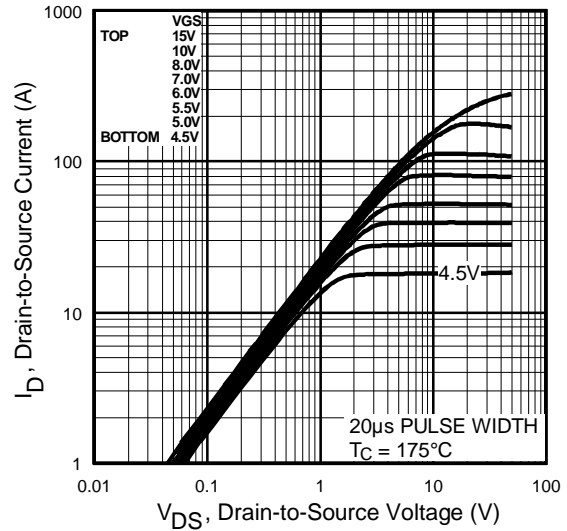
- ① Repetitive rating; pulse width limited by max. junction temperature. ( See fig. 11 )
- ②  $V_{DD} = 25V$ , starting  $T_J = 25^\circ\text{C}$ ,  $L = 270\mu H$   
 $R_G = 25\Omega, I_{AS} = 37A$ . (See Figure 12)
- ③  $I_{SD} \leq 37A, di/dt \leq 200A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 175^\circ\text{C}$
- ④ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .



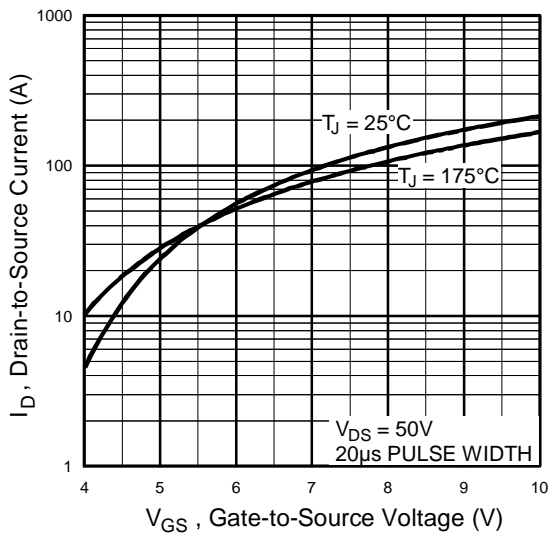
# IRFP2410



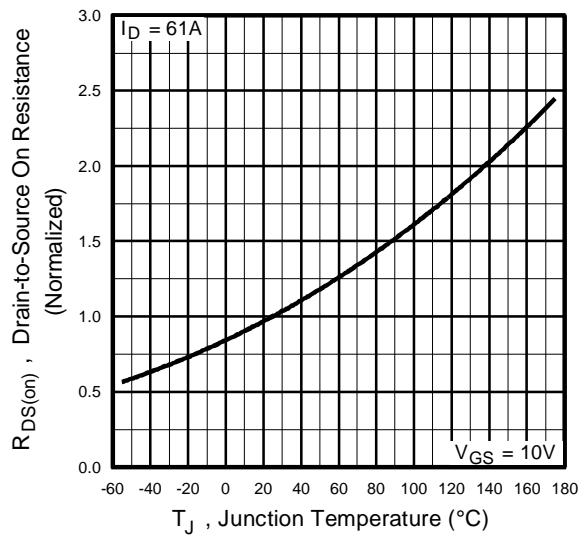
**Fig 1.** Typical Output Characteristics,  
 $T_C = 25^\circ\text{C}$



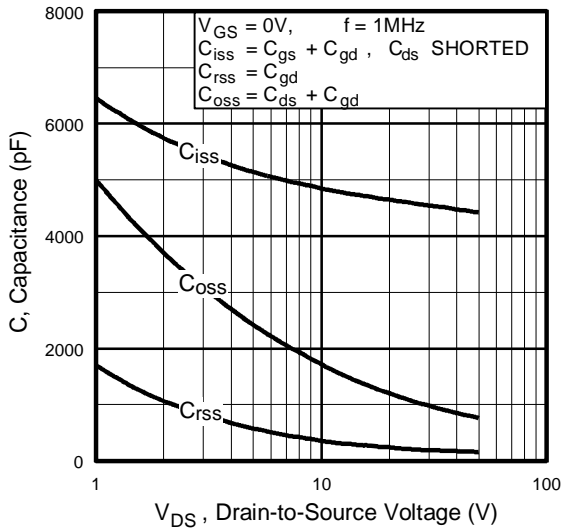
**Fig 2.** Typical Output Characteristics,  
 $T_C = 175^\circ\text{C}$



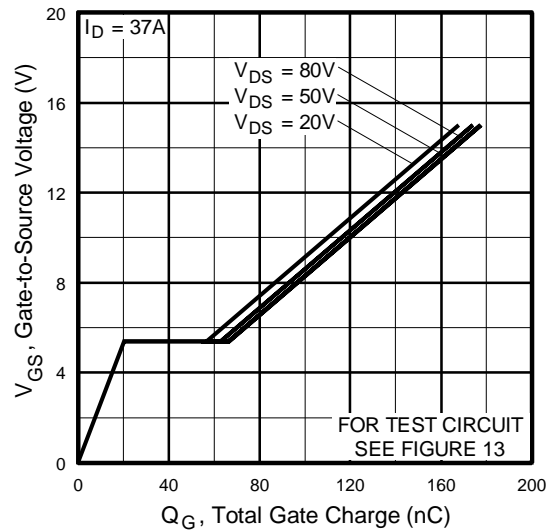
**Fig 3.** Typical Transfer Characteristics



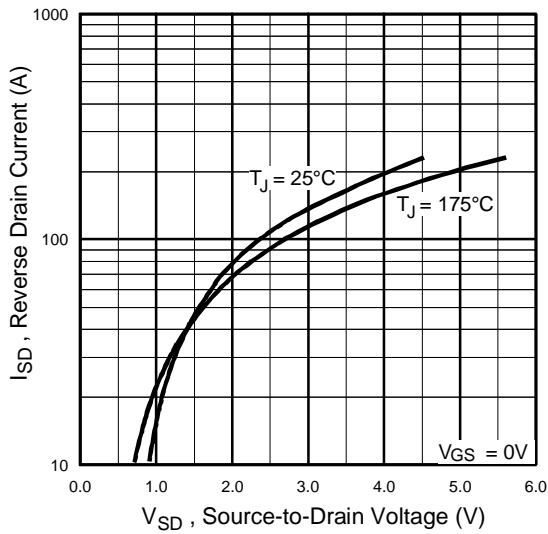
**Fig 4.** Normalized On-Resistance  
Vs. Temperature



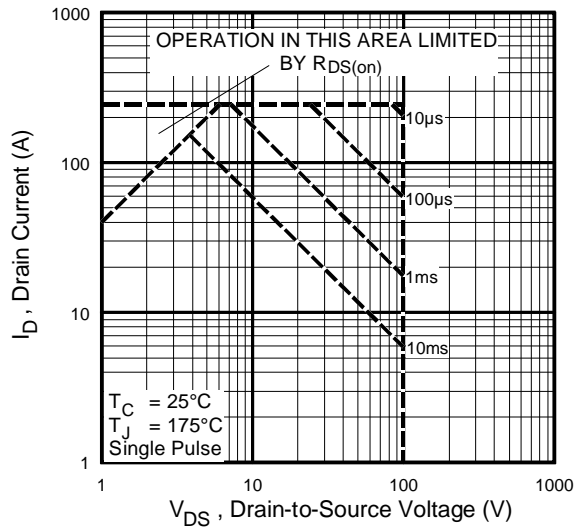
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



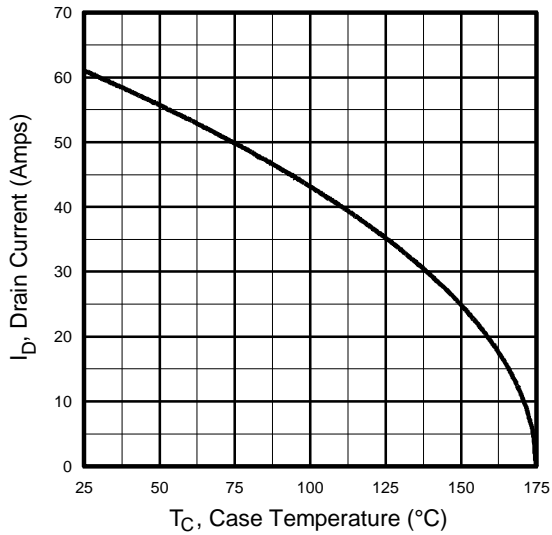
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



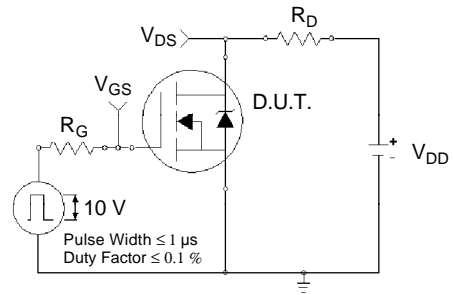
**Fig 7.** Typical Source-Drain Diode Forward Voltage



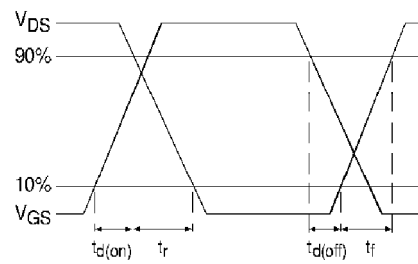
**Fig 8.** Maximum Safe Operating Area



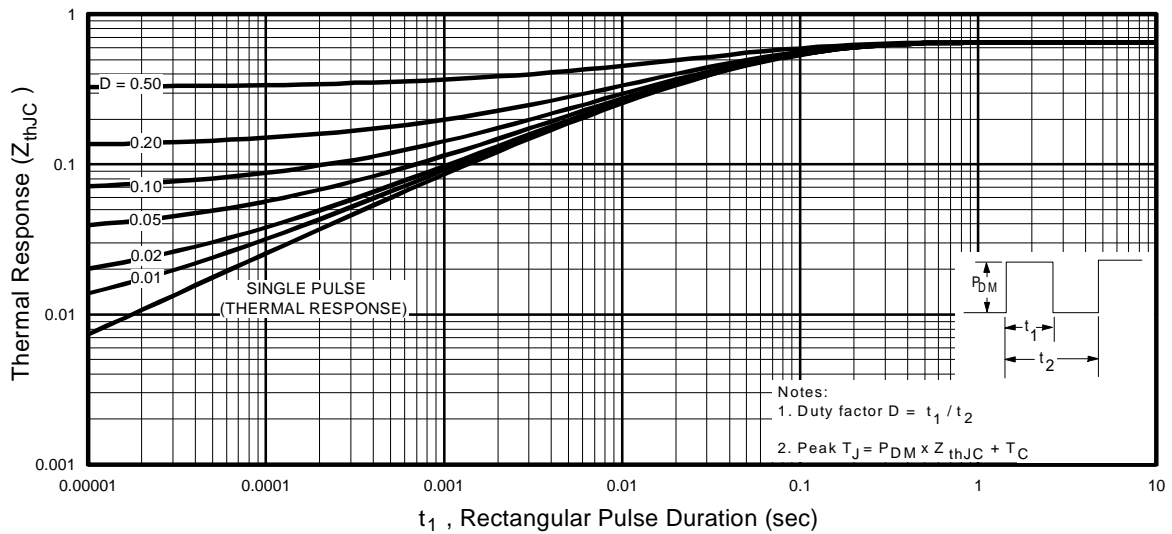
**Fig 9.** Maximum Drain Current Vs. Case Temperature



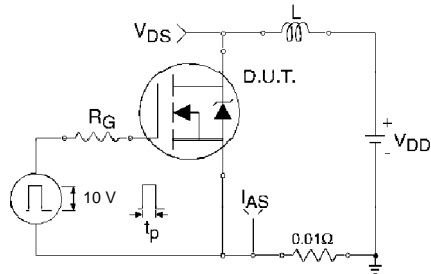
**Fig 10a.** Switching Time Test Circuit



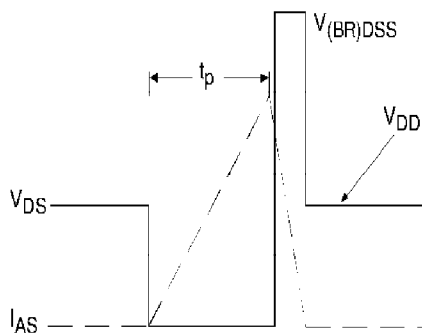
**Fig 10b.** Switching Time Waveforms



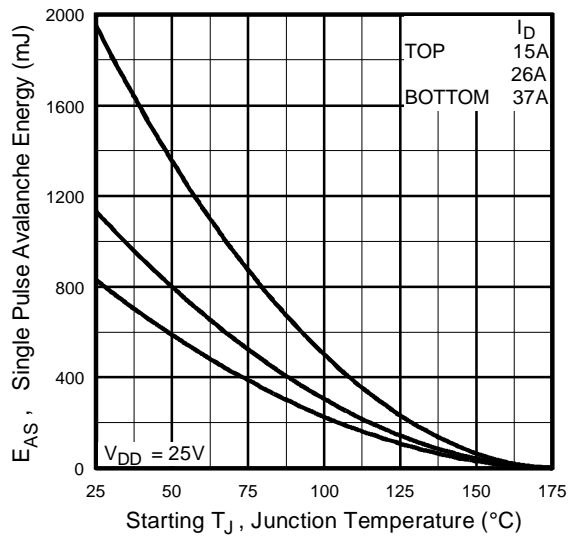
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case



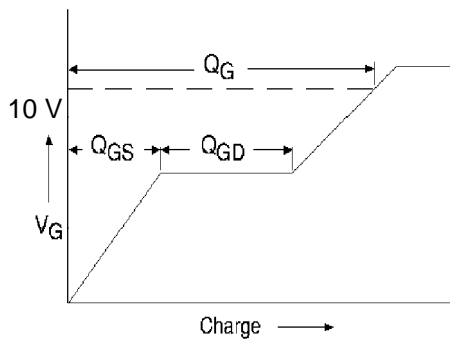
**Fig 12a.** Unclamped Inductive Test Circuit



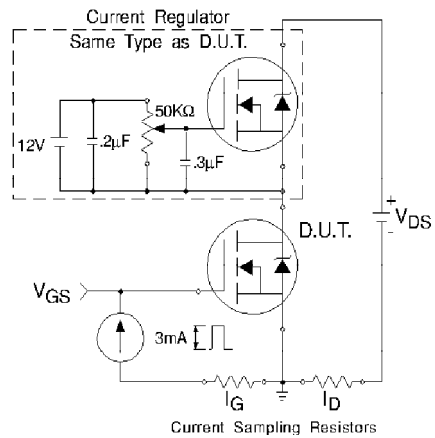
**Fig 12b.** Unclamped Inductive Waveforms



**Fig 12c.** Maximum Avalanche Energy Vs. Drain Current

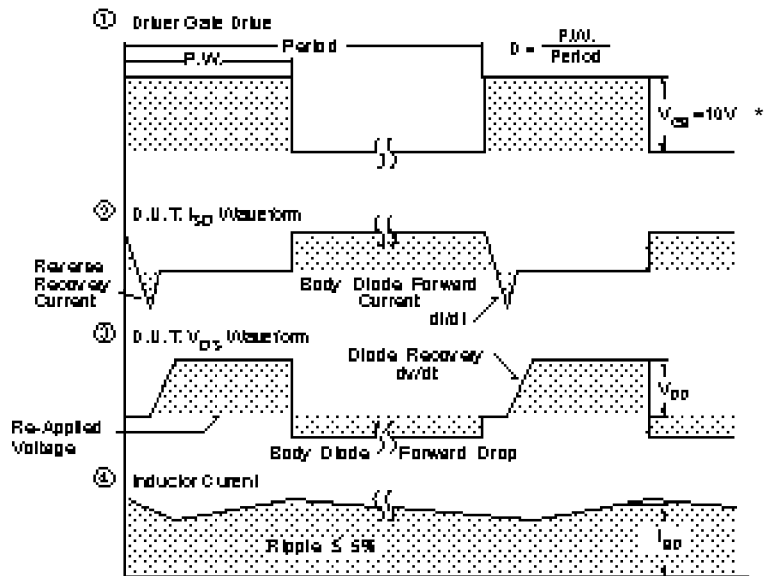
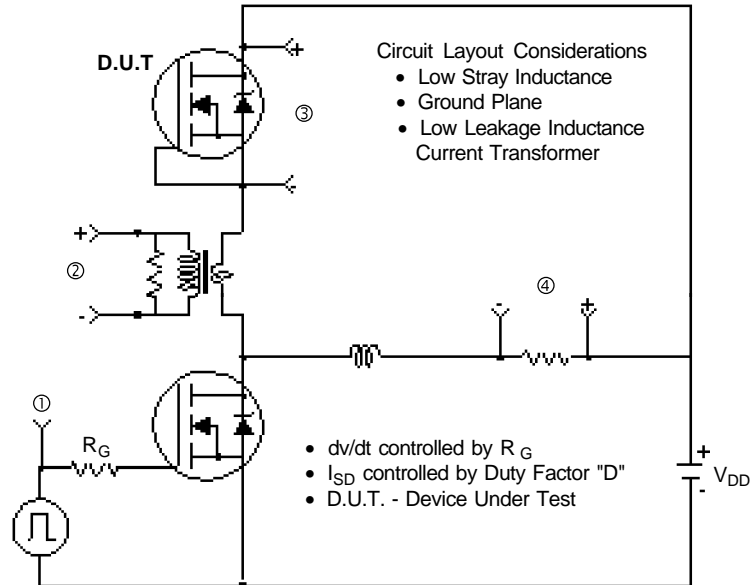


**Fig 13a.** Basic Gate Charge Waveform



**Fig 13b.** Gate Charge Test Circuit

## Peak Diode Recovery dv/dt Test Circuit



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

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

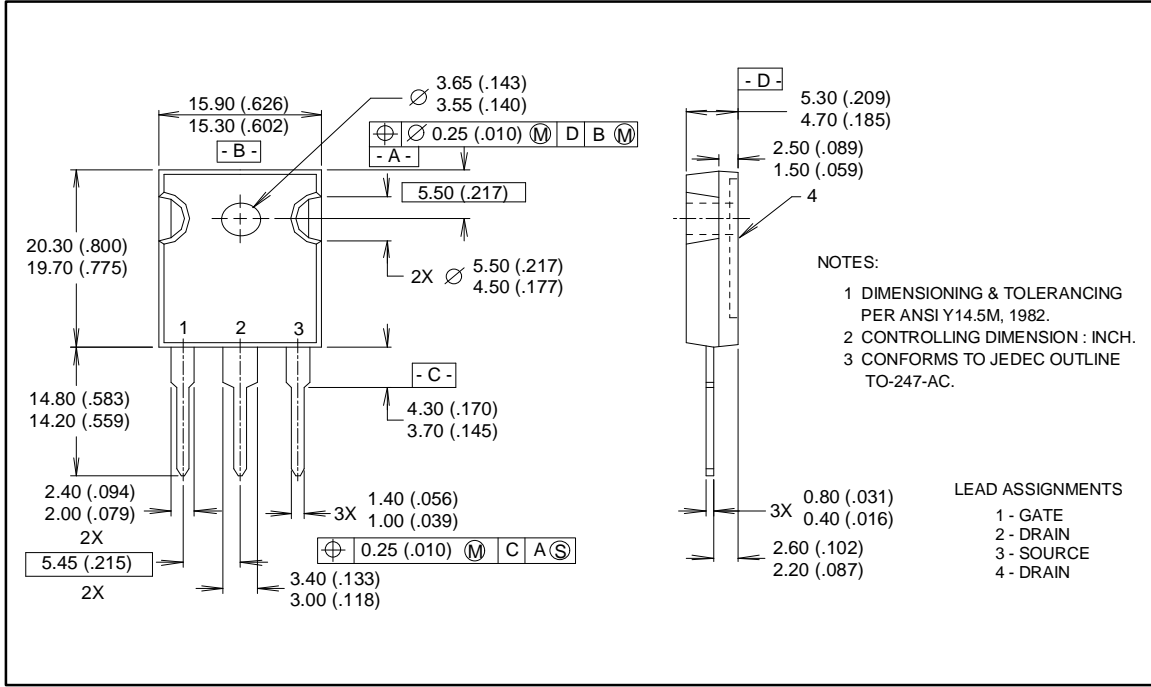
# IRFP2410



## Package Outline

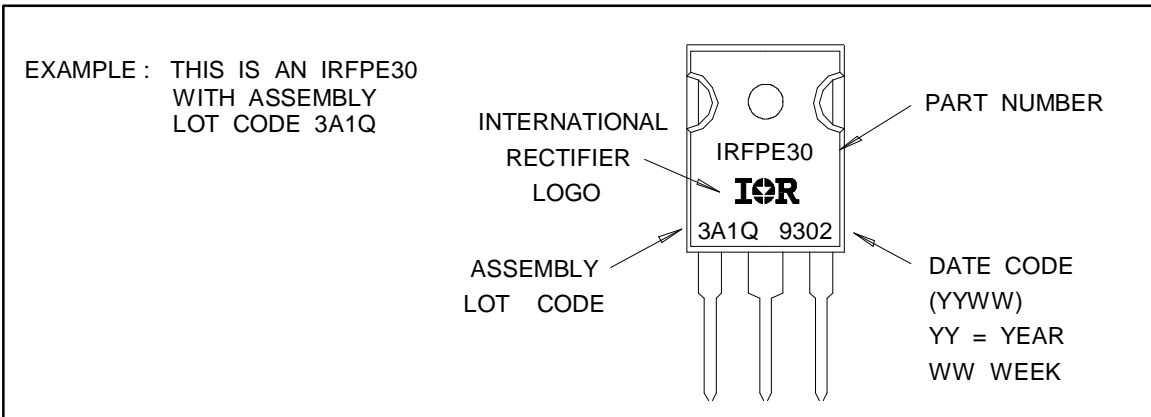
### TO-247AC Outline

Dimensions are shown in millimeters (inches)



## Part Marking Information

### TO-247AC



**WORLD HEADQUARTERS:** 233 Kansas St., El Segundo, California 90245, Tel: (310) 322 3331

**EUROPEAN HEADQUARTERS:** Hurst Green, Oxted, Surrey RH8 9BB, UK Tel: (44) 0883 713215

**IR CANADA:** 7321 Victoria Park Ave., Suite 201, Markham, Ontario L3R 3L1, Tel: (905) 475 1897 **IR GERMANY:**

Saalburgstrasse 157, 61350 Bad Homburg Tel: 6172 37066 **IR ITALY:** Via Liguria 49, 10071 Borgaro, Torino Tel: (39) 1145

10111 **IR FAR EAST:** K&H Bldg., 2F, 3-30-4 Nishi-Ikeburo 3-Chome, Toshima-Ki, Tokyo 171 Tel: (03)3983 0641 **IR**

**SOUTHEAST ASIA:** 315 Outram Road, #10-02 Tan Boon Liat Building, 0316 Tel: 65 221 8371

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