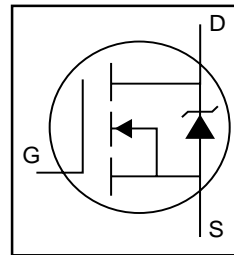


IRFPC60LC-P

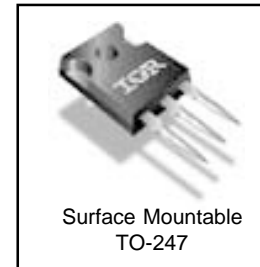
- Ultra Low Gate Charge
- Reduced Gate Drive Requirement
- Enhanced 30V V_{GS} Rating
- Reduced C_{ISS} , C_{OSS} , C_{RSS}
- Isolated Central Mounting Hole
- Dynamic dv/dt Rated
- Repetitive Avalanche Rated



$V_{DSS} = 600V$
 $R_{DS(on)} = 0.40\Omega$
 $I_D = 16A$

Description

This new series of Surface Mountable Low Charge HEXFET Power MOSFETs achieve significantly lower gate charge over conventional MOSFETs. Utilizing advanced Hexfet technology the device improvements allow for reduced gate drive requirements, faster switching speeds and increased total system savings. These device improvements combined with the proven ruggedness and reliability of HEXFETs offer the designer a new standard in power transistors for switching applications.



Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	16	
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	10	A
I_{DM}	Pulsed Drain Current ①	64	
$P_D @ T_C = 25^\circ C$	Power Dissipation	280	W
	Linear Derating Factor	2.2	W/°C
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}	Single Pulse Avalanche Energy ②	1000	mJ
I_{AR}	Avalanche Current ①	16	A
E_{AR}	Repetitive Avalanche Energy ①	28	mJ
dv/dt	Peak Diode Recovery dv/dt ③	3.0	V/ns
T_J	Operating Junction and	-55 to + 150	
T_{STG}	Storage Temperature Range		°C
	Max Reflow Temperature	225	

Thermal Resistance

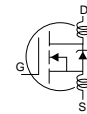
	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	—	0.45	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	—	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient	—	—	40	

IRFPC60LC-P

International
IR Rectifier

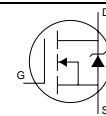
Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	600	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.63	—	V/ $^\circ\text{C}$	Reference to 25°C , $I_D = 1\text{mA}$
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	—	—	0.40	Ω	$V_{GS} = 10V, I_D = 9.6A$ 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	11	—	—	S	$V_{DS} = 50V, I_D = 9.6A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	$V_{DS} = 600V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 480V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
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	—	—	120	nC	$I_D = 16A$ $V_{DS} = 360V$ $V_{GS} = 10V$, See Fig. 6 and 13 ④
Q_{gs}	Gate-to-Source Charge	—	—	29		
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	48		
$t_{d(on)}$	Turn-On Delay Time	—	17	—		
t_r	Rise Time	—	57	—	ns	$V_{DD} = 300V$ $I_D = 16A$ $R_G = 4.3\Omega$ $R_D = 18\Omega$, See Fig. 10 ④
$t_{d(off)}$	Turn-Off Delay Time	—	43	—		
t_f	Fall Time	—	38	—		
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	—	3500	—	pF	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1.0\text{MHz}$, See Fig. 5
C_{oss}	Output Capacitance	—	400	—		
C_{rss}	Reverse Transfer Capacitance	—	39	—		



Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	16	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	64		
V_{SD}	Diode Forward Voltage	—	—	1.8	V	$T_J = 25^\circ\text{C}, I_S = 16A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	650	980	ns	$T_J = 25^\circ\text{C}, I_F = 16A$
Q_{rr}	Reverse Recovery Charge	—	6.0	9.0	μC	$di/dt = 100A/\mu s$ 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 $T_J = 25^\circ\text{C}$, $L = 7.2\text{mH}$
 $R_G = 25\Omega$, $I_{AS} = 16A$. (See Figure 12)
- ③ $I_{SD} \leq 16A$, $di/dt \leq 140A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$,
 $T_J \leq 150^\circ\text{C}$
- ④ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.

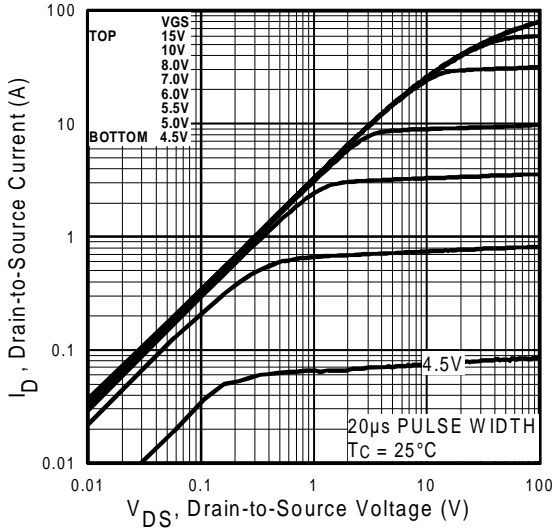


Fig 1. Typical Output Characteristics,
 $T_C = 25^\circ\text{C}$

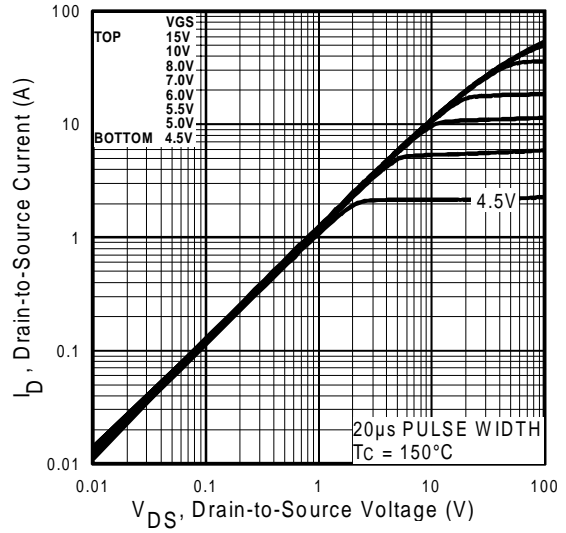


Fig 2. Typical Output Characteristics,
 $T_C = 150^\circ\text{C}$

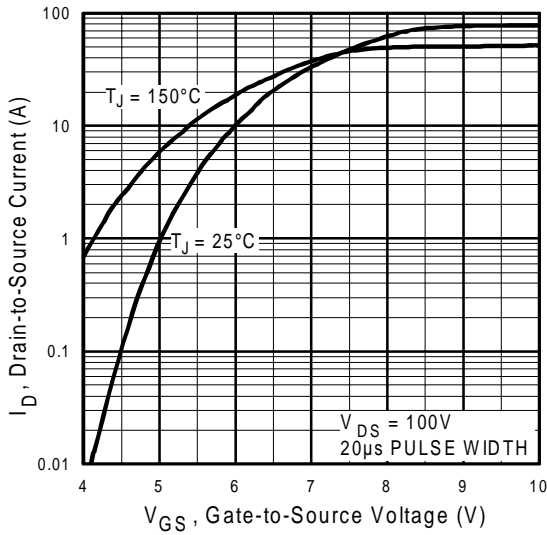


Fig 3. Typical Transfer Characteristics

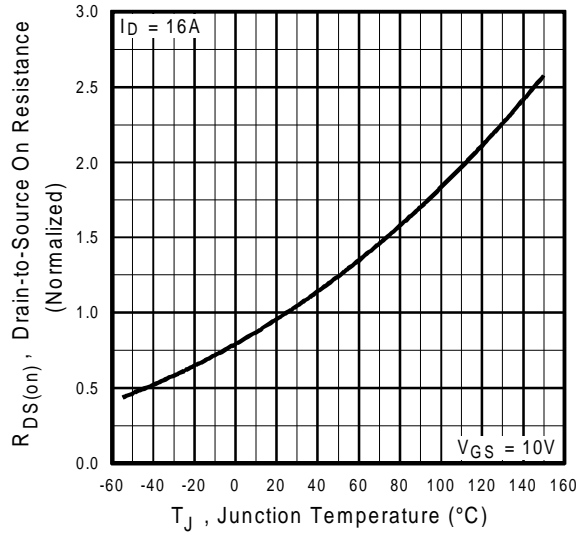


Fig 4. Normalized On-Resistance
Vs. Temperature

IRFPC60LC-P

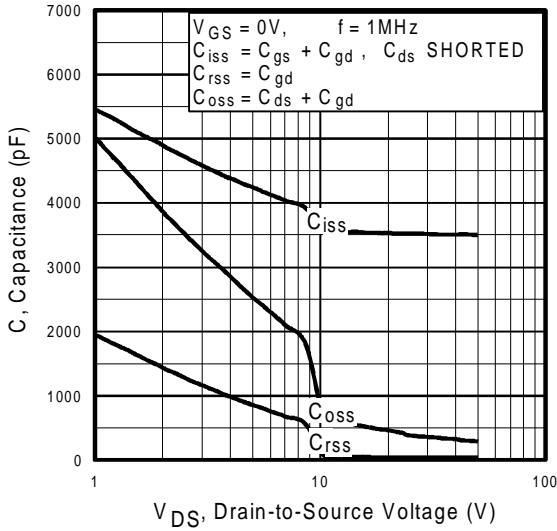


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

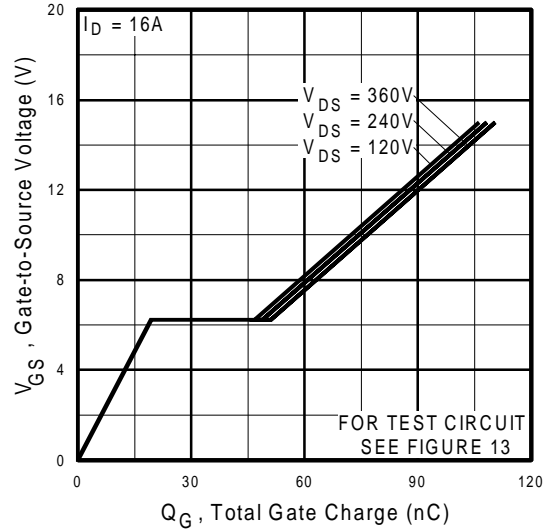


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

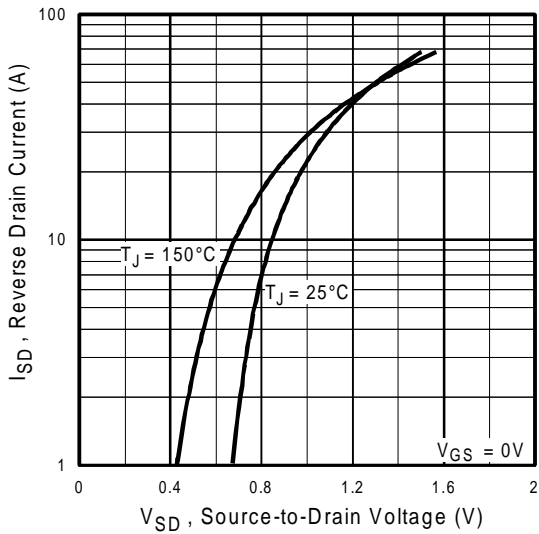


Fig 7. Typical Source-Drain Diode Forward Voltage

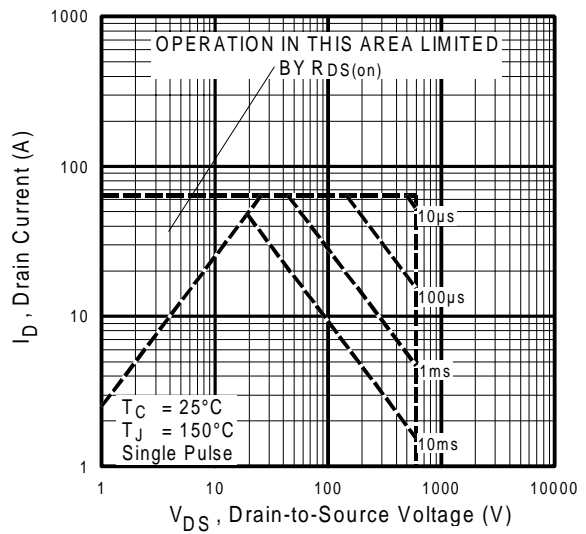


Fig 8. Maximum Safe Operating Area

IRFPC60LC-P

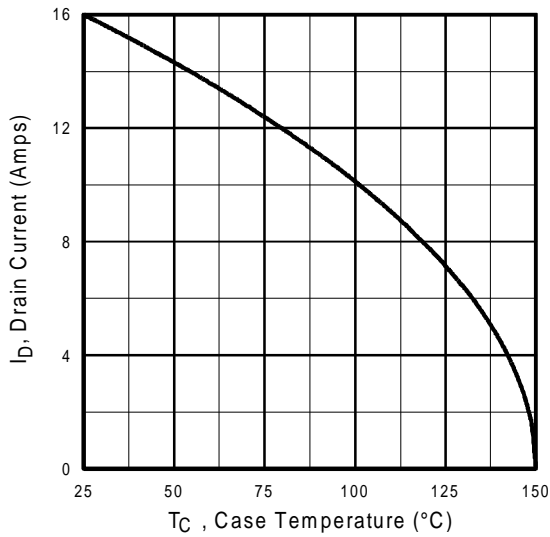


Fig 9. Maximum Drain Current Vs. Case Temperature

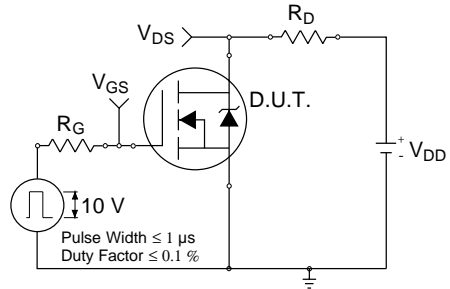


Fig 10a. Switching Time Test Circuit

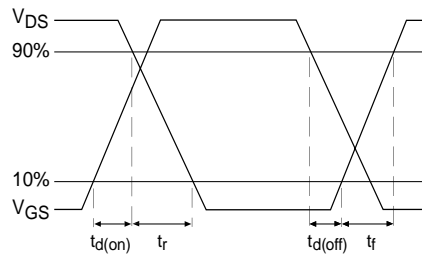


Fig 10b. Switching Time Waveforms

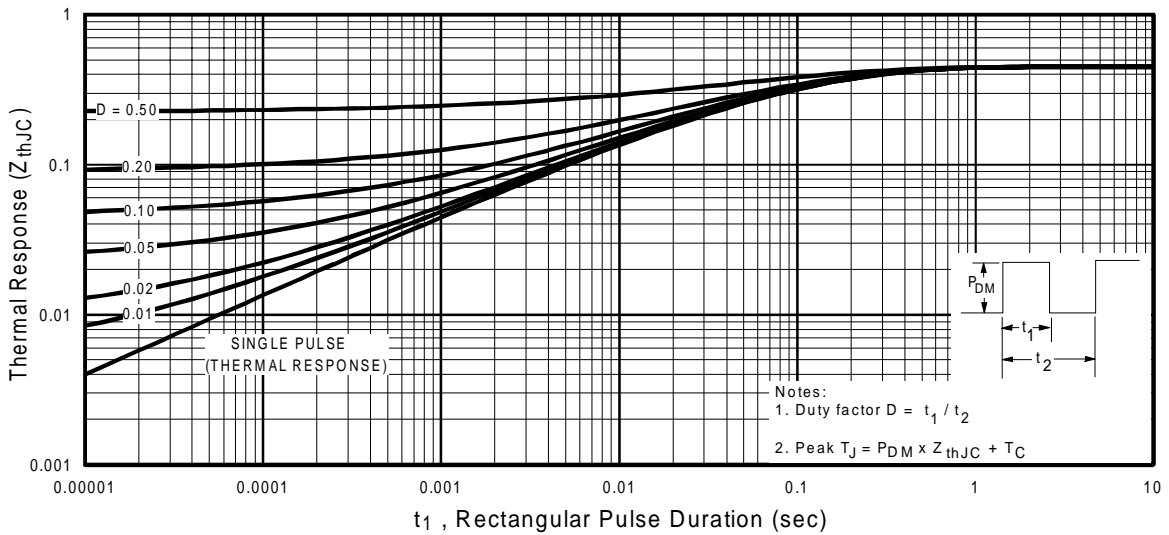


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

IRFPC60LC-P

International
IR Rectifier

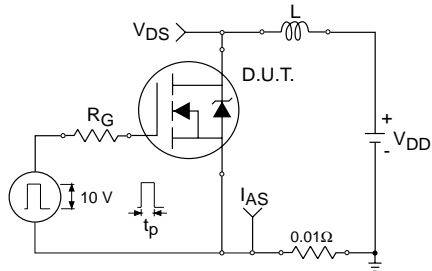


Fig 12a. Unclamped Inductive Test Circuit

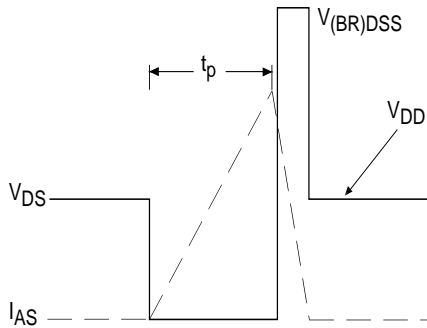


Fig 12b. Unclamped Inductive Waveforms

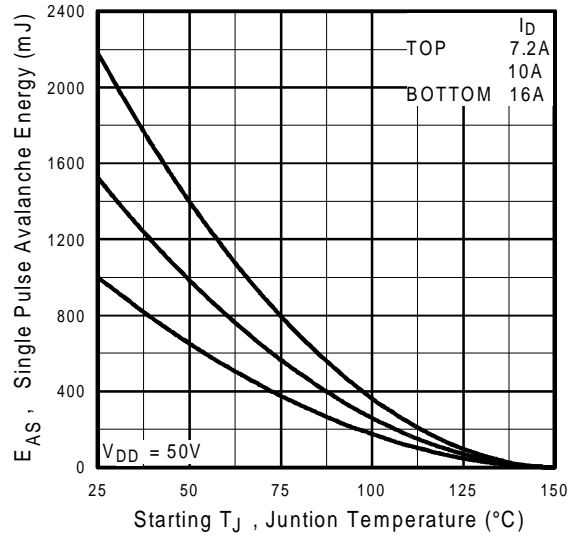


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

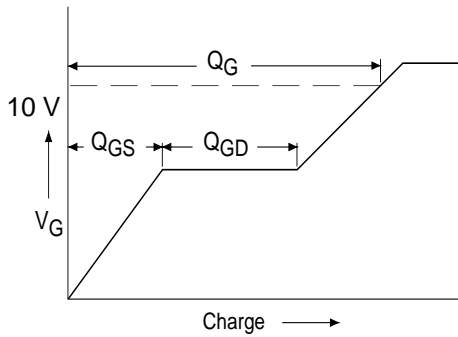


Fig 13a. Basic Gate Charge Waveform

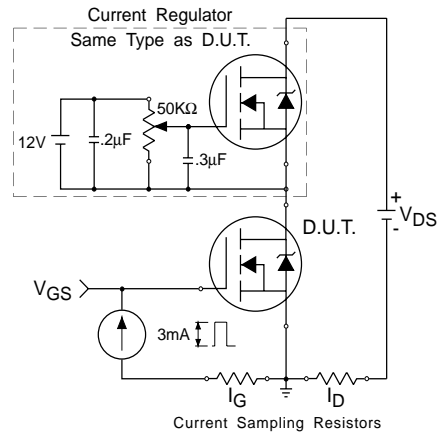
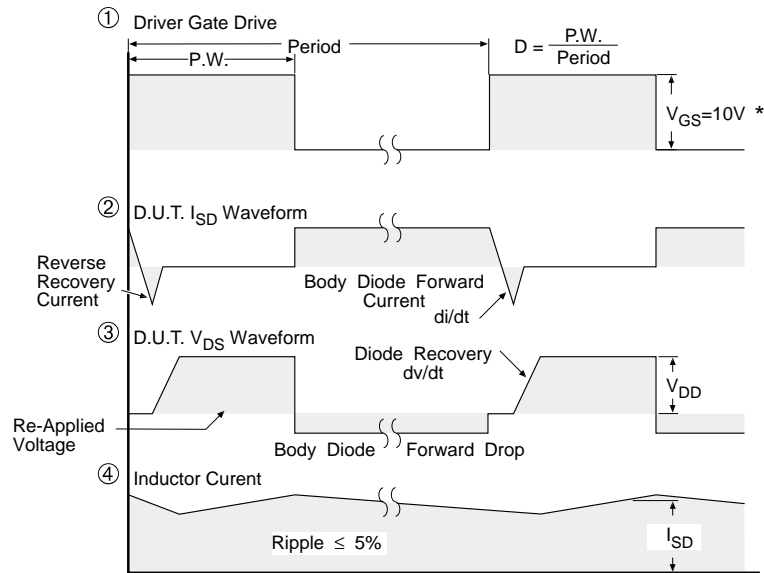
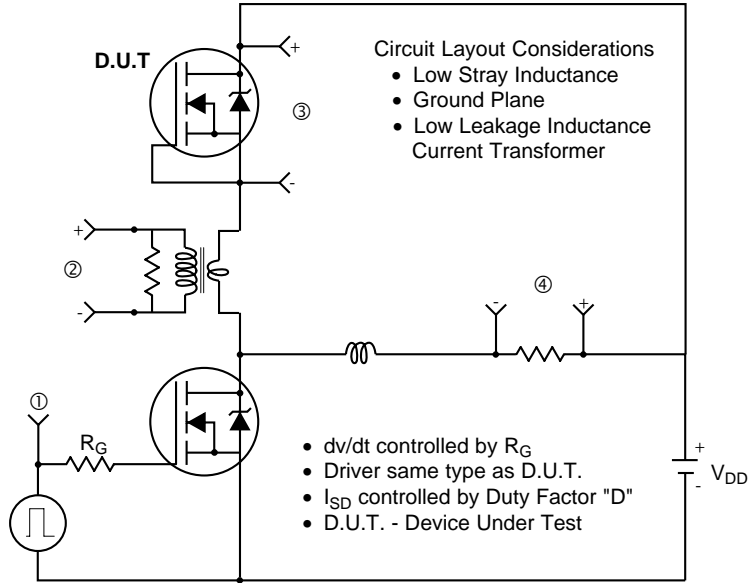


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



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

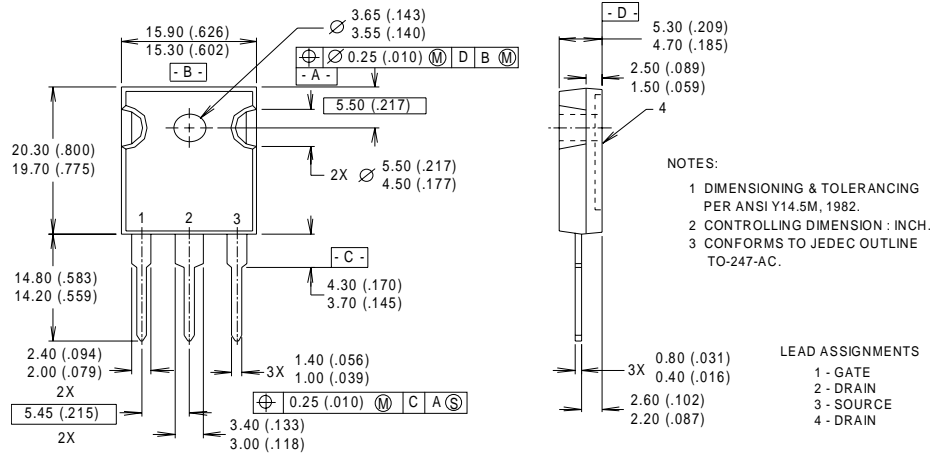
Fig 14. For N-Channel HEXFETS

IRFPC60LC-P

International
IR Rectifier

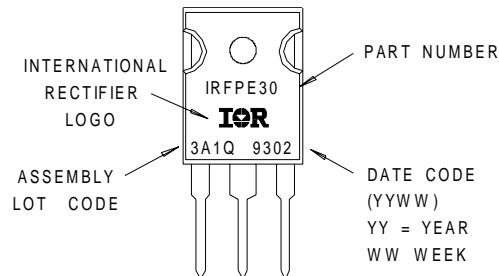
TO-247AC Package Outline

Dimensions are shown in millimeters (inches)



TO-247AC Part Marking Information

EXAMPLE : THIS IS AN IRFPE30
WITH ASSEMBLY
LOT CODE 3A1Q



Data and specifications subject to change without notice.
This product has been designed and qualified for the Industrial market.
Qualification Standards can be found on IR's Web site.

International
IR Rectifier

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7903

Visit us at www.irf.com for sales contact information.04/02

www.irf.com