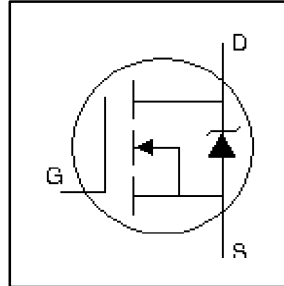


HEXFET® Power MOSFET

- 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



$$V_{DSS} = 500V$$

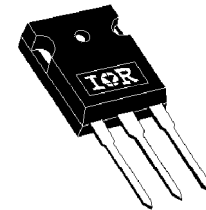
$$R_{DS(on)} = 0.27\Omega$$

$$I_D = 20A$$

Description

This new series of 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.

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.



TO-247AC

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ $T_C = 25^\circ C$	Continuous Drain Current, V_{GS} @ 10V	20	A
I_D @ $T_C = 100^\circ C$	Continuous Drain Current, V_{GS} @ 10V	12	
I_{DM}	Pulsed Drain Current ①	80	
P_D @ $T_C = 25^\circ C$	Power Dissipation	280	W
	Linear Derating Factor	2.2	W/ $^\circ C$
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}	Single Pulse Avalanche Energy ②	960	mJ
I_{AR}	Avalanche Current ③	20	A
E_{AR}	Repetitive Avalanche Energy ①	28	mJ
dv/dt	Peak Diode Recovery dv/dt ③	3.5	V/ns
T_J	Operating Junction and	-55 to + 150	$^\circ C$
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
$R_{\theta JC}$	Junction-to-Case	—	—	0.45	$^\circ C/W$
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	—	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient	—	—	—	

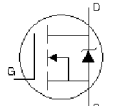
IRFP460LC



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	500	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.59	—	V/ $^\circ\text{C}$	Reference to 25°C , $I_D = 1mA$
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	—	—	0.27	Ω	$V_{GS} = 10V, I_D = 12A$ 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	12	—	—	S	$V_{DS} = 50V, I_D = 12A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	$V_{DS} = 500V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 400V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
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	$I_D = 20A$
Q_{gs}	Gate-to-Source Charge	—	—	32		$V_{DS} = 400V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	49		$V_{GS} = 10V$, See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	18	—		$V_{DD} = 250V$
t_r	Rise Time	—	77	—	ns	$I_D = 20A$
$t_{d(off)}$	Turn-Off Delay Time	—	40	—		$R_G = 4.3\Omega$
t_f	Fall Time	—	43	—		$R_D = 12\Omega$, 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	—	3600	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	440	—		$V_{DS} = 25V$
C_{rss}	Reverse Transfer Capacitance	—	39	—		$f = 1.0MHz$, See Fig. 5

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	20	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	80		
V_{SD}	Diode Forward Voltage	—	—	1.8	V	$T_J = 25^\circ\text{C}, I_S = 20A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	570	860	ns	$T_J = 25^\circ\text{C}, I_F = 20A$
Q_{rr}	Reverse Recovery Charge	—	6.6	9.9	μC	$di/dt = 100A/\mu s$ ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$)				

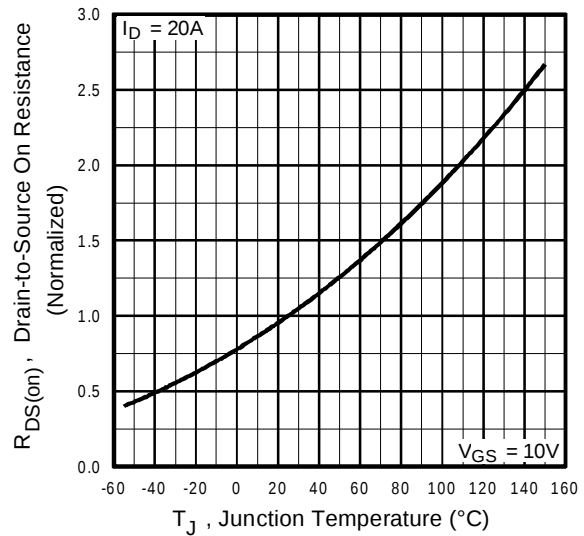
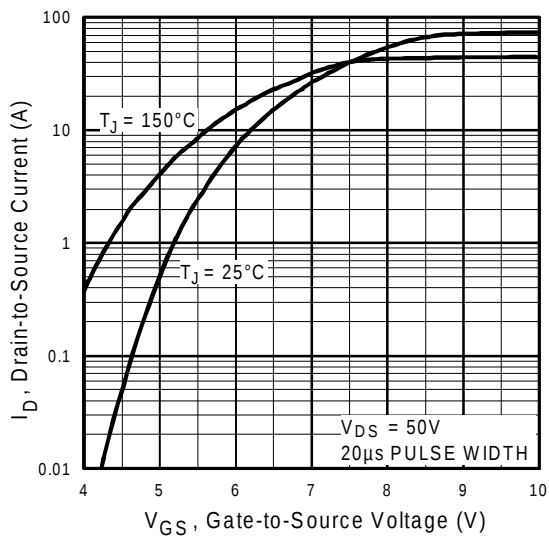
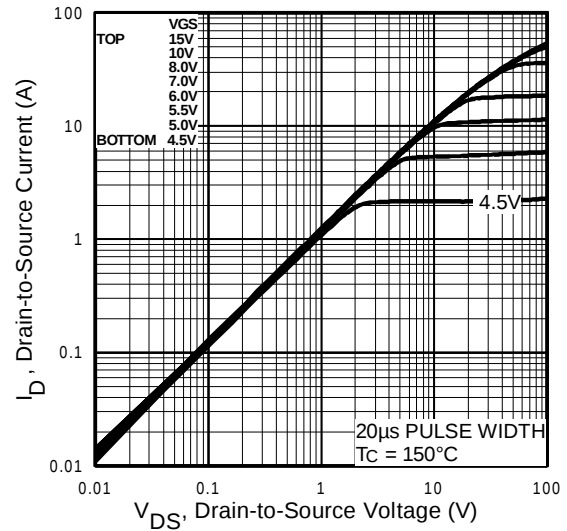
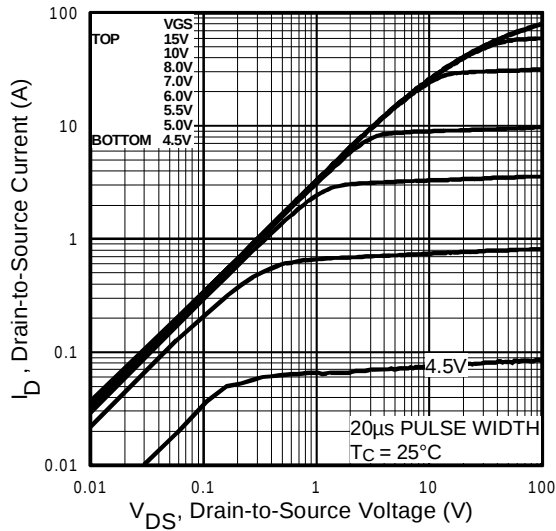
Notes:

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

③ $I_{SD} \leq 20A, di/dt \leq 160A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 150^\circ\text{C}$

② $V_{DD} = 25V$, starting $T_J = 25^\circ\text{C}$, $L = 4.3mH$
 $R_G = 25\Omega, I_{AS} = 20A$. (See Figure 12)

④ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.



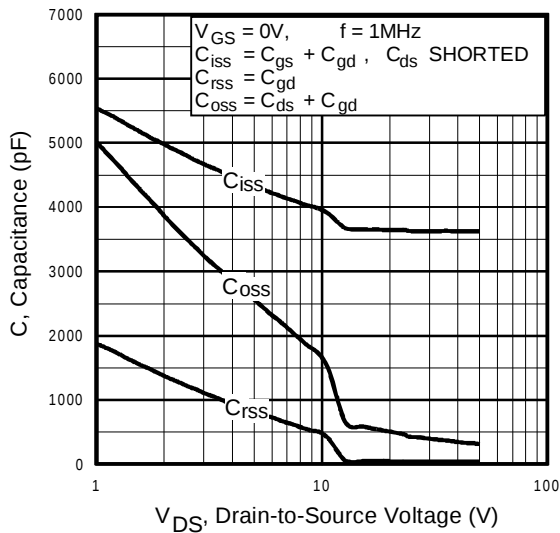


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

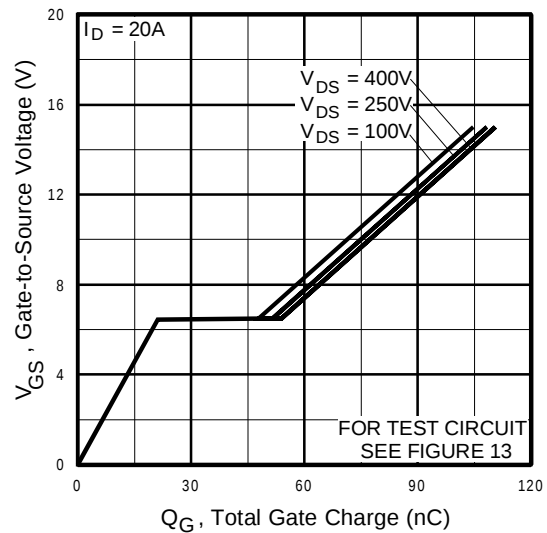


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

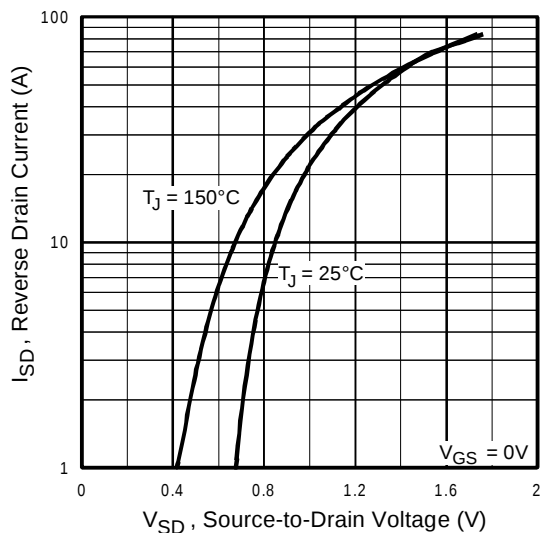


Fig 7. Typical Source-Drain Diode Forward Voltage

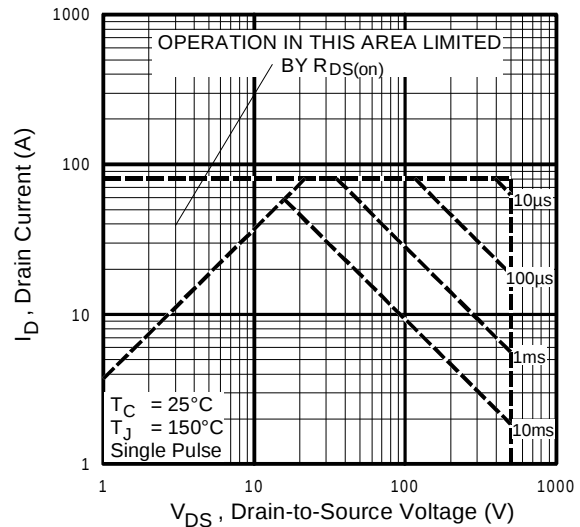


Fig 8. Maximum Safe Operating Area

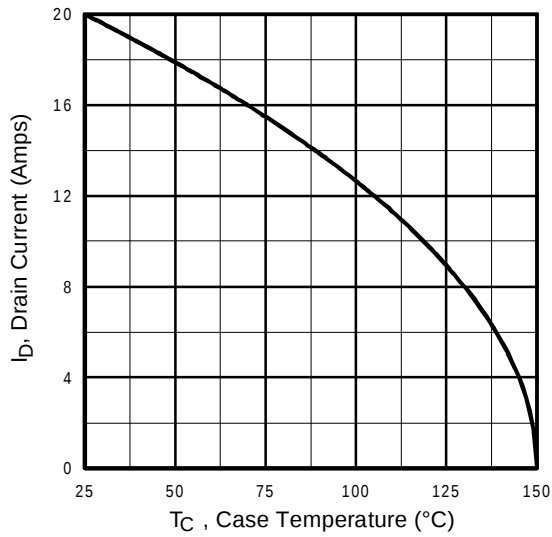


Fig 9. Maximum Drain Current Vs. Case Temperature

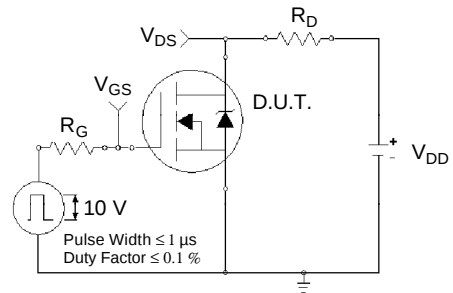


Fig 10a. Switching Time Test Circuit

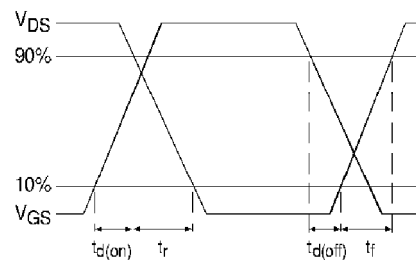


Fig 10b. Switching Time Waveforms

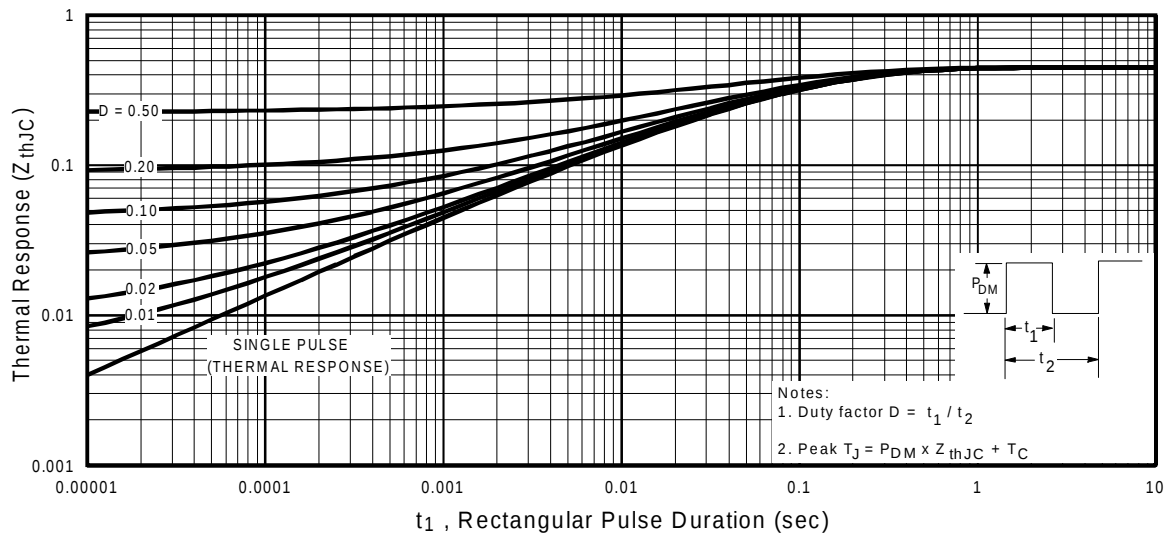


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

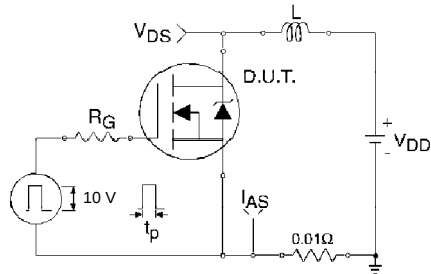


Fig 12a. Unclamped Inductive Test Circuit

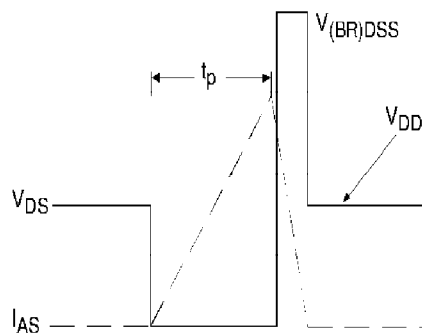


Fig 12b. Unclamped Inductive Waveforms

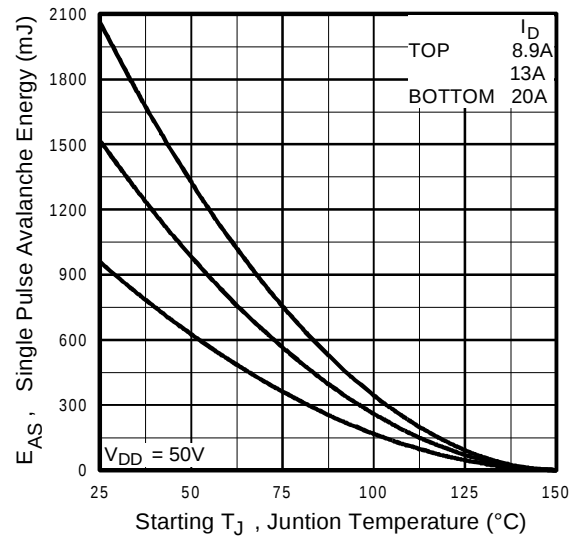


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

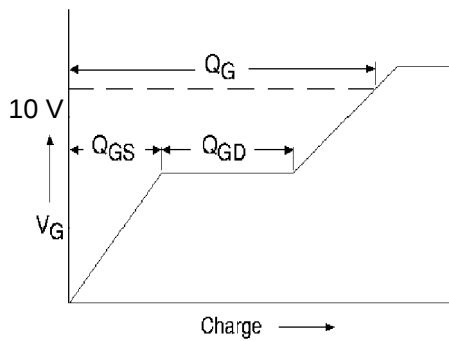


Fig 13a. Basic Gate Charge Waveform

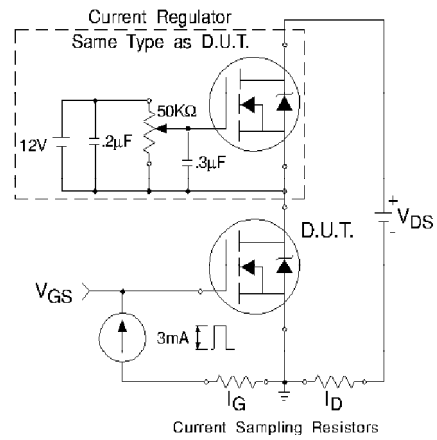
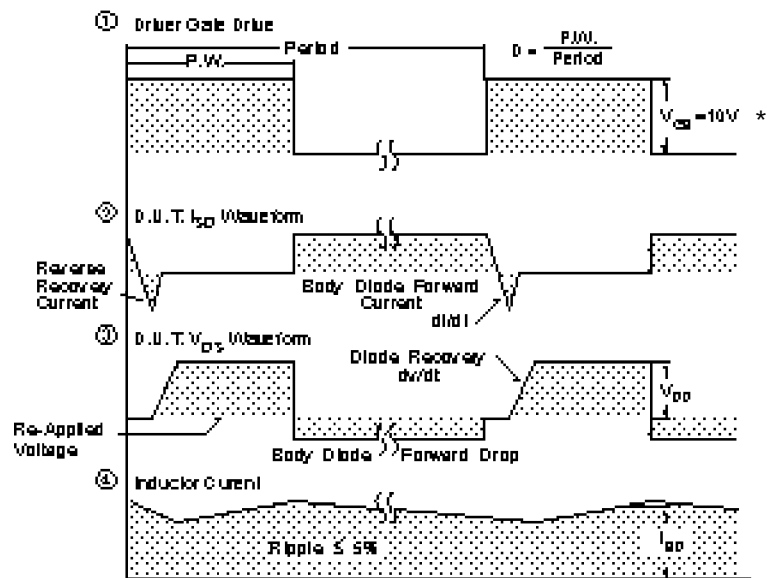
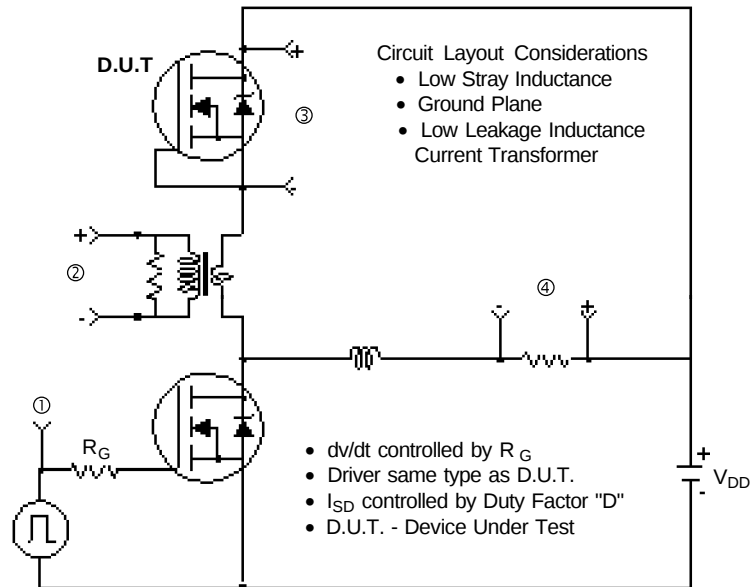


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



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

Fig 14. For N-Channel HEXFETS

Technical drawing of a 3-pin connector. The drawing includes a top view and a side view. Dimensions are provided in inches and millimeters.

Top View Dimensions:

- Overall width: 15.90 (.626)
- Width between pins: 15.30 (.602)
- Pin diameter: $\varnothing 0.25$ (.010)
- Pin spacing: 2X 5.50 (.217)
- Pin diameter: 2X $\varnothing 4.50$ (.177)
- Pin length: 14.80 (.583)
- Pin diameter: 2X 2.40 (.094)
- Pin diameter: 2X 2.00 (.079)
- Pin diameter: 2X 5.45 (.215)
- Pin length: 3.40 (.133)
- Pin diameter: 3X 1.40 (.056)
- Pin diameter: 3X 1.00 (.039)
- Pin diameter: 3X 0.80 (.031)
- Pin diameter: 3X 0.40 (.016)
- Pin length: 2.60 (.102)
- Pin length: 2.20 (.087)

Side View Dimensions:

- Overall height: 5.30 (.209)
- Height between pins: 4.70 (.185)
- Pin diameter: 2.50 (.098)
- Pin diameter: 1.50 (.059)

Feature Callouts:

- B-
- A-
- C-
- D-

Feature Callouts:

- 1
- 2
- 3
- 4

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

The diagram shows a MOSFET package with the following labels and arrows:

- INTERNATIONAL RECTIFIER LOGO**: Points to the IOR logo.
- PART NUMBER**: Points to the text IRFPE30.
- ASSEMBLY LOT CODE**: Points to the text 3A1Q.
- DATE CODE (YYWW)**: Points to the text 9302. Below this, it specifies YY = YEAR and WW WEEK.

International Rectifier

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

Data and specifications subject to change without notice.