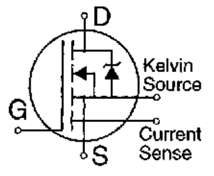
International Rectifier IRC740

HEXFET® Power MOSFET

- Dynamic dv/dt Rating
- Repetitive Avalanche Rated
- Current Sense
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements



V_{DSS} = 400V

$R_{DS(on)}$ = 0.55Ω

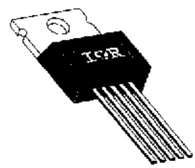
I_D = 10A

DATA SHEETS

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 HEXSense device provides an accurate fraction of the drain current through the additional two leads to be used for control or protection of the device. These devices exhibit similar electrical and thermal characteristics as their IRF-series equivalent part numbers. The provision of a kelvin source connection effectively eliminates problems of common source inductance when the HEXSense is used as a fast, high-current switch in non current-sensing applications.



TO-220 HexSense

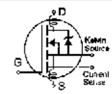
Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10 V	10	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10 V	6.3	
I_{DM}	Pulsed Drain Current ①	40	
P_D @ T_C = 25°C	Power Dissipation	125	W
	Linear Derating Factor	1.0	W/°C
V_{GS}	Gate-to-Source Voltage	±20	V
E_{AS}	Single Pulse Avalanche Energy ②	210	mJ
I_{AR}	Avalanche Current ①	10	A
E_{AR}	Repetitive Avalanche Energy ①	13	mJ
dv/dt	Peak Diode Recovery dv/dt ③	4.0	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°C
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
	Mounting Torque, 6-32 or M3 screw	10 lbf•in (1.1 N•m)	

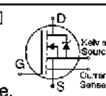
Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{θJC}$	Junction-to-Case	—	—	1.0	°C/W
$R_{θCS}$	Case-to-Sink, Flat, Greased Surface	—	0.50	—	
$R_{θJA}$	Junction-to-Ambient	—	—	62	

Electrical Characteristics @ $T_J = 25°C$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	400	—	—	V	V_{GS}=0V, I_D= 250μA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.49	—	V/°C	Reference to 25°C, I_D= 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.55	Ω	V_{GS}=10V, I_D=6.0A ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	V_{DS}=V_{GS}, I_D= 250μA
g_{fs}	Forward Transconductance	5.9	—	—	S	V_{DS}=50V, I_D=6.0A ④
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	V_{DS}=400V, V_{GS}=0V
		—	—	250		V_{DS}=320V, V_{GS}=0V, T_J=125°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	—	—	66	nC	I_D=10A
Q_{gs}	Gate-to-Source Charge	—	—	10		V_{DS}=320V
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	33		V_{GS}=10V See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	14	—	ns	V_{DD}=200V
t_r	Rise Time	—	25	—		I_D=10A
$t_{d(off)}$	Turn-Off Delay Time	—	54	—		R_G=9.1Ω
t_f	Fall Time	—	24	—		R_D=20Ω See Figure 10 ④
L_D	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6 mm (0.25in.) from package and center of die contact 
L_S	Internal Source Inductance	—	7.5	—		
C_{iss}	Input Capacitance	—	1200	—	pF	V_{GS}=0V
C_{oss}	Output Capacitance	—	230	—		V_{DS}=25V
C_{rss}	Reverse Transfer Capacitance	—	48	—		f=1.0MHz See Figure 5
r	Current Sensing Ratio	2660	—	2940	—	I_D=10A, V_{GS}=10V
C_{oss}	Output Capacitance of Sensing Cells	—	9.0	—	pF	V_{GS}=0V, V_{DS}= 25V, f=1.0MHz

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	—	—	10	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°C, I_S=10A, V_{GS}=0V ④
t_{rr}	Reverse Recovery Time	—	330	730	ns	T_J=25°C, I_F=10A
Q_{rr}	Reverse Recovery Charge	—	3.2	6.6	μC	di/dt=100A/μs ④
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is neglegible (turn-on is dominated by L_S+L_D)				

Notes:

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

② V_{DD}=50V, starting T_J=25°C, L=3.7mH R_G=25Ω, I_{AS}=10A (See Figure 12)

③ I_{SD}≤10A, di/dt≤120A/μs, V_{DD}≤$V_{(BR)DSS}$, T_J≤150°C

④ Pulse width ≤ 300 μs; duty cycle ≤2%.

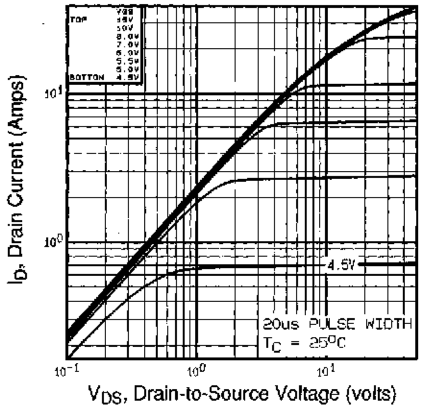


Fig 1. Typical Output Characteristics, T_C=25°C

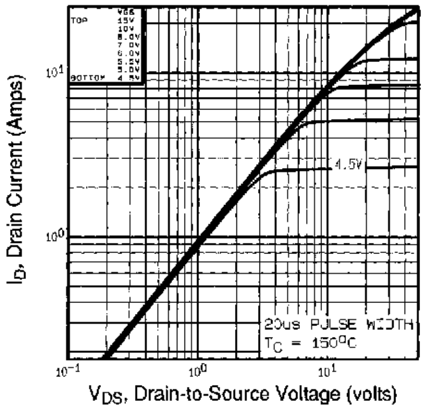


Fig 2. Typical Output Characteristics, T_C=150°C

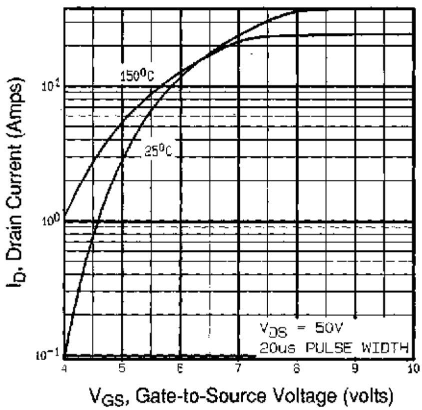


Fig 3. Typical Transfer Characteristics

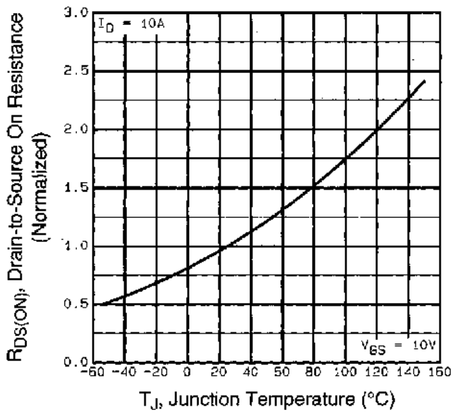


Fig 4. Normalized On-Resistance Vs. Temperature

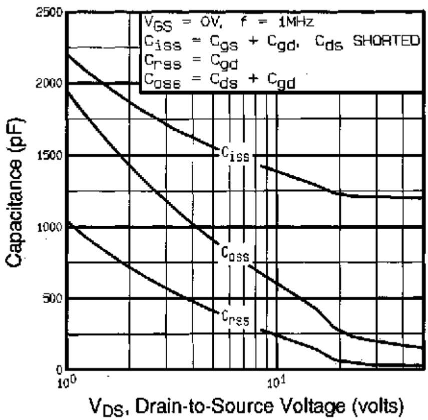


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

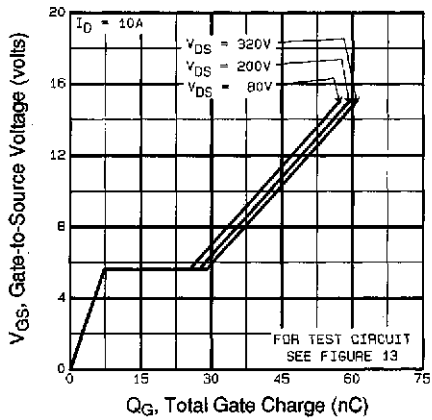


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

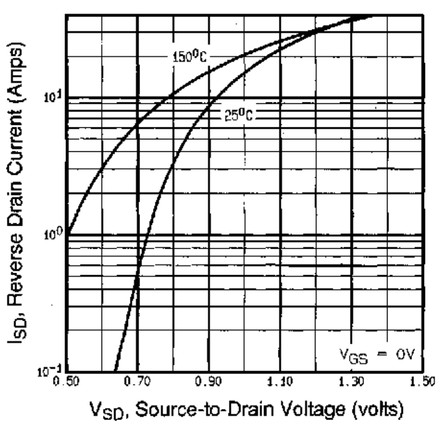


Fig 7. Typical Source-Drain Diode Forward Voltage

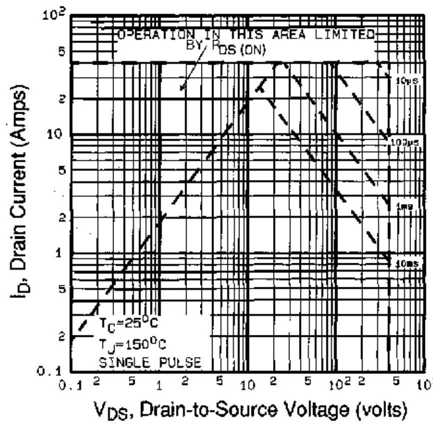


Fig 8. Maximum Safe Operating Area

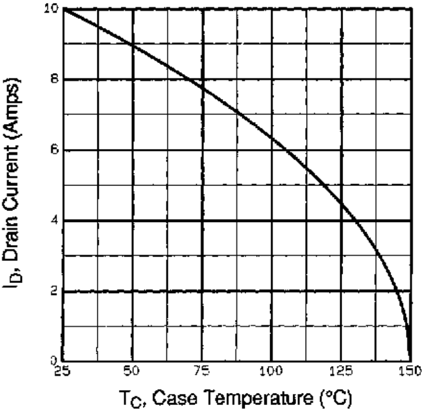


Fig 9. Maximum Drain Current Vs. Case Temperature

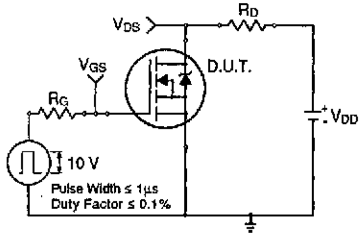


Fig 10a. Switching Time Test Circuit

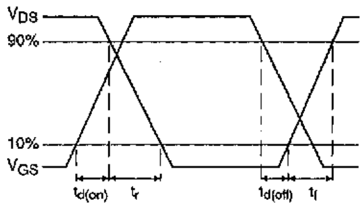


Fig 10b. Switching Time Waveforms

DATA SHEETS

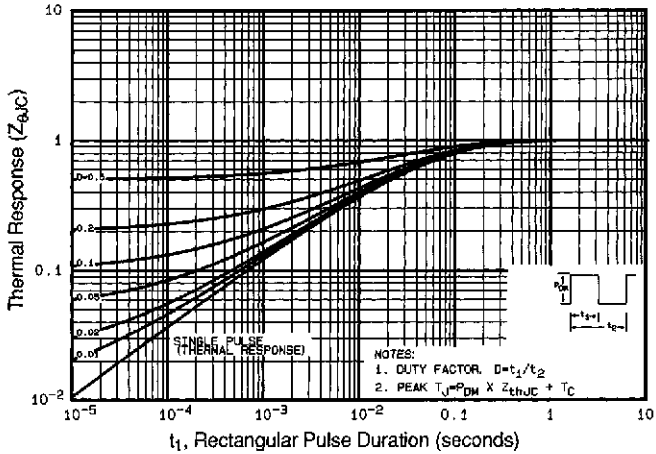


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

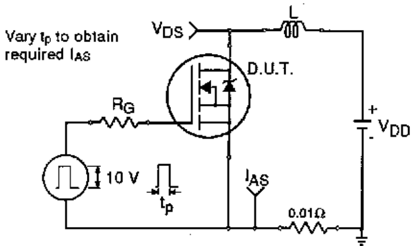


Fig 12a. Unclamped Inductive Test Circuit

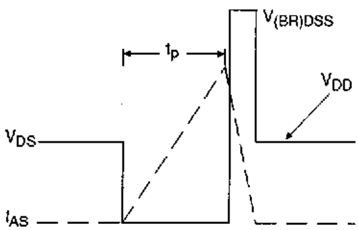


Fig 12b. Unclamped Inductive Waveforms

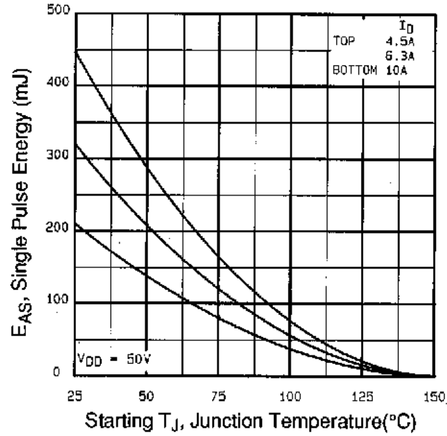


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

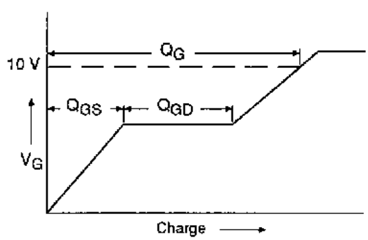


Fig 13a. Basic Gate Charge Waveform

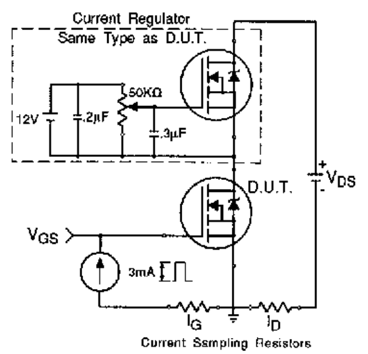


Fig 13b. Gate Charge Test Circuit

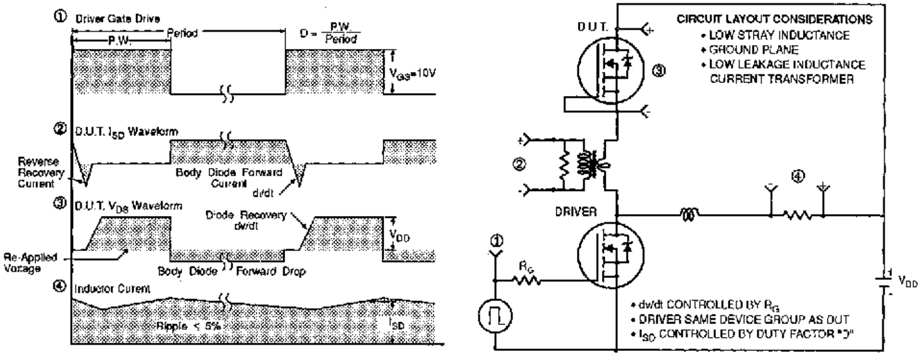


Fig 14. Peak Diode Recovery dv/dt Test Circuit

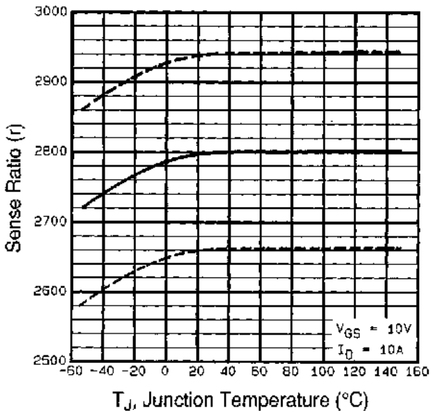


Fig 15. Typical HEXSense Ratio Vs. Junction Temperature

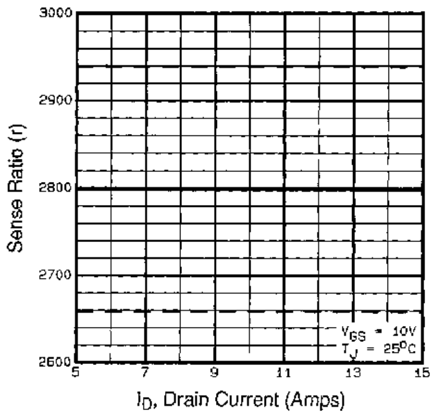


Fig 16. Typical HEXSense Ratio Vs. Drain Current

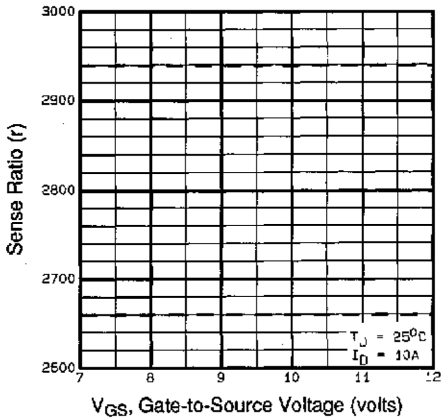


Fig 17. Typical HEXSense Ratio Vs. Gate Voltage

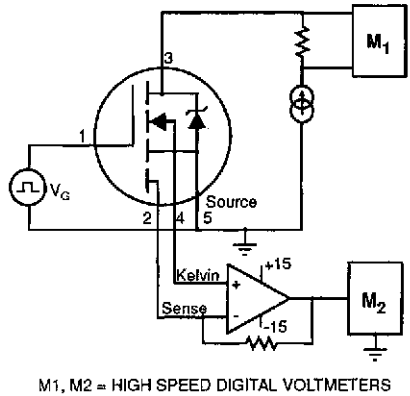


Fig 18. HEXSense Ratio Test Circuit

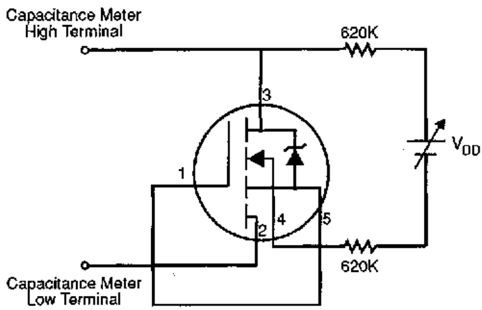


Fig 19. HEXSense Sensing Cell Output Capacitance Test Circuit

Appendix B: Package Outline Mechanical Drawing – See page 1510

Appendix C: Part Marking Information – See page 1517

International Rectifier

Notice

The products described herein were acquired by Vishay Intertechnology, Inc., as part of its acquisition of International Rectifier's Power Control Systems (PCS) business, which closed in April 2007. Specifications of the products displayed herein are pending review by Vishay and are subject to the terms and conditions shown below.

Specifications of the products displayed herein are subject to change without notice. Vishay Intertechnology, Inc., or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Vishay's terms and conditions of sale for such products, Vishay assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of Vishay products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Vishay for any damages resulting from such improper use or sale.

International Rectifier®, IR®, the IR logo, HEXFET®, HEXSense®, HEXDIP®, DOL®, INTERO®, and POWIRTRAIN® are registered trademarks of International Rectifier Corporation in the U.S. and other countries. All other product names noted herein may be trademarks of their respective owners.