INTERNATIONAL RECTIFIER IOR

HEXPAK POWER MODULE
IRFK4H450
IRFK4H451

U.L. RECOGNIZED
File no E78996

Isolated Base Power HEXFET® Parallel Assembly

500 Volt, 100 mΩ HEXPAK

The HEXFET® technology is the key to International Rectifier's advanced line of power MOSFET transistors. The efficient geometry and unique processing of the HEXFET design achieve very low on-state resistance combined with high transconductance and extreme device ruggedness.

The superior HEXFET technology has been coupled to the state of the art assembling techniques adopted for all International Rectifier isolated base modules. This multiple die package is ideally suited for high power applications where space saving and ease of assembling is important. Applications include uninterruptible power supplies, motor drive controls, switching power supplies, and high frequency welders.

Features:

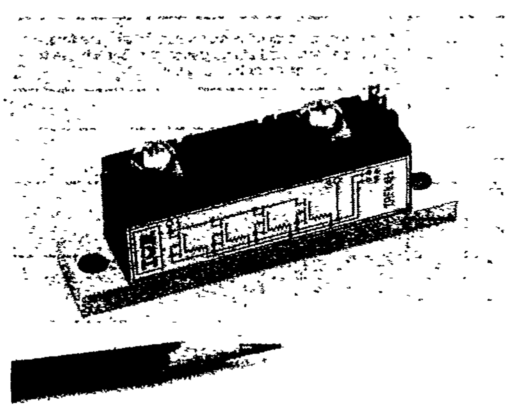
- High Current Capability
- Fast Switching
- Low Drive Current
- No Second Breakdown
- Ease of Paralleling
- Electrically Isolated Base Plate

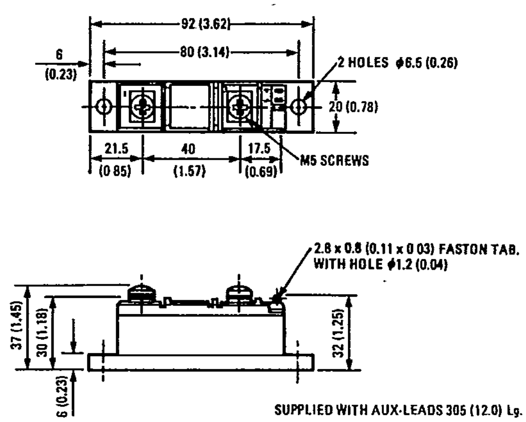
Product Summary

Part Number	V_{DS}	$R_{DS(on)}$	I_D
IRFK4H450	500V	100 mΩ	44A
IRFK4H451	450V	100 mΩ	44A

MODULE DEVICES

CASE STYLE AND DIMENSIONS





Similar to JEDEC Outline TO-240AA
Dimensions in Millimeters (Inches)

Absolute Maximum Ratings

Parameter		IRFK4H450	IRFK4H451	Units
V_{DS}	Drain-Source Voltage ①	500	450	V
V_{DGR}	Drain-Gate Voltage (R_{GS} = 10 kΩ) ①	500	450	V
I_D @ T_C = 25°C	Continuous Drain Current	44	44	A
I_D @ T_C = 100°C	Continuous Drain Current	28	28	A
I_{DM}	Pulsed Drain Current	165	165	A
V_{GS}	Gate-Source Voltage	20	20	V
P_D @ T_C = 25°C	Max. Power Dissipation	500	500	W
	Linear Derating Factor	4	4	W/K
I_{LM}	Inductive Current, Clamped	165	165	A
T_J, T_{stg}	Operating Junction and Storage Temperature Range	−55 to 150		°C
di/dt	Max. Rate of Change of Current at Turn-Off	See Fig. 15		A/μs

Electrical Characteristics @ T_C = 25°C (Unless Otherwise Specified)

Parameter		Type	Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain-Source Breakdown Voltage	IRFK4H450	500	–	–	V	V_{GS} = 0V, I_D = 1.0 mA
		IRFK4H451	450	–	–	V	
$V_{GS(th)}$	Gate Threshold Voltage	ALL	2.0	–	4.0	V	V_{DS} = V_{GS}, I_D = 1.0 mA
I_{GSS}	Gate-Source Leakage Forward	ALL	–	–	400	nA	V_{GS} = 20V
I_{GSS}	Gate-Source Leakage Reverse	ALL	–	–	−400	nA	V_{GS} = −20V
I_{DSS}	Zero Gate Voltage Drain Current	ALL	–	–	1000	μA	V_{DS} = V_{DS} Max, V_{GS} = 0V
			–	–	4.0	mA	V_{DS} = V_{DS} Max. × 0.8, V_{GS} = 0V, T_C = 125°C
$R_{DS(on)}$	Static Drain-Source On-State Resistance	ALL	–	80	100	mΩ	V_{GS} = 10V, I_D = 28A
g_{fs}	Forward Transconductance	ALL	24	44	–	S(℧)	V_{DS} > $I_{D(on)}$ × $R_{DS(on)max.}$, I_D = 28A
C_{iss}	Input Capacitance	ALL	–	8.0	12.0	nF	V_{GS} = 0V, V_{DS} = 25V, f = 1.0 MHz
C_{oss}	Output Capacitance	ALL	–	1.6	2.4	nF	
C_{rss}	Reverse Transfer Capacitance	ALL	–	400	800	pF	
$t_{d(on)}$	Turn-On Delay Time	ALL	–	–	45	ns	V_{DD} = 210V, I_D = 28A, V_{GS} = 10V, R_{Source} = 3.3Ω
t_r	Rise Time	ALL	–	–	55	ns	
$t_{d(off)}$	Turn-Off Delay Time	ALL	–	–	220	ns	
t_f	Fall Time	ALL	–	–	70	ns	
Q_g	Total Gate Charge (Gate-Source Plus Gate-Drain)	ALL	–	330	480	nC	V_{GS} = 10V, I_D = 64A, V_{DS} = V_{DS} Max. × 0.8
Q_{gs}	Gate-Source Charge	ALL	–	160	–	nC	
Q_{gd}	Gate-Drain ("Miller") Charge	ALL	–	170	–	nC	
V_{INS}	R.M.S. Isolation Voltage	ALL	2.5	–	–	kV	Circuit to Base
L_{DS}	Drain-Source Inductance	ALL	–	18	–	nH	

Thermal and Mechanical Specifications

		Type	Min.	Typ.	Max.	Units	Conditions
R_{thJC}	Junction-to-Case	ALL	–	–	0.25	K/W	Per module
R_{thCS}	Case-to-Sink	ALL	–	0.1	–	K/W	Mounting surface flat, smooth, and greased
T	Mounting torque + 10% HEXPAK to heatsink	ALL	–	5	–	Nm	A mounting compound is recommended and the torque should be rechecked after a period of about 3 hours to allow for the spread of the compound.
	Busbar to HEXPAK	ALL	–	3	–	Nm	
wt	Approximate weight	ALL	–	140 5	–	g oz	

Source-Drain Diode Ratings and Characteristics

		Type	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	ALL	–	–	44	A	
I_{SM}	Pulse Source Current (Body Diode)	ALL	–	–	165	A	
V_{SD}	Diode Forward Voltage	ALL	–	–	1.4	V	T_C = 25°C, I_S = 52A, V_{GS} = 0V
t_{rr}	Reverse Recovery Time	ALL	–	1300	–	ns	T_J = 150°C, I_F = 50A, di_F/dt = 100A/μs
Q_{RR}	Reverse Recovered Charge	ALL	–	30	–	μC	

① T_J = 25°C to 150°C

IRFK4H450, IRFK4H451 Devices

T-39-27

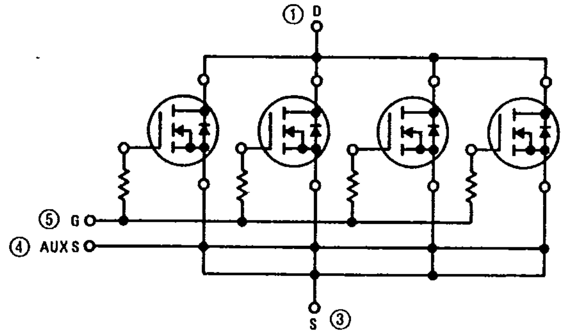


Fig. a — Circuit Configuration

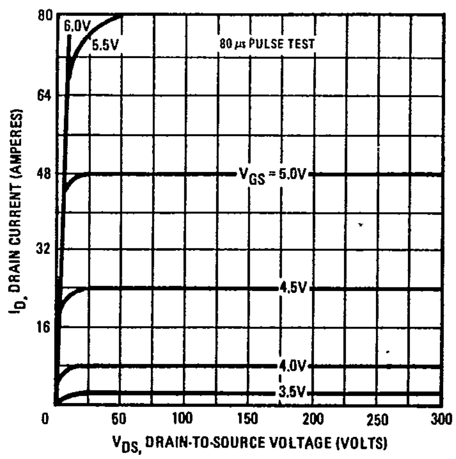


Fig. 1 — Typical Output Characteristics

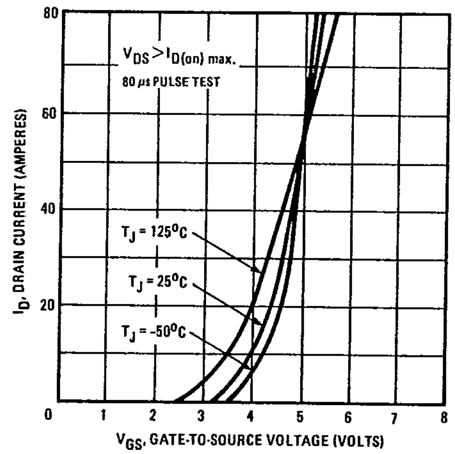


Fig. 2 — Typical Transfer Characteristics

MODULE DEVICES

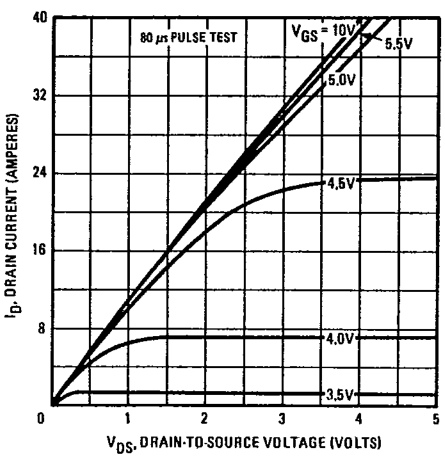


Fig. 3 — Typical Saturation Characteristics

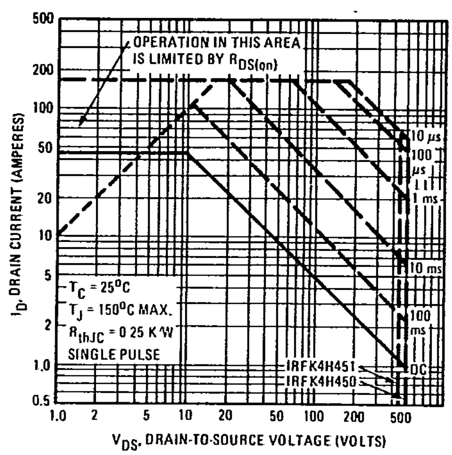


Fig. 4 — Maximum Safe Operating Area

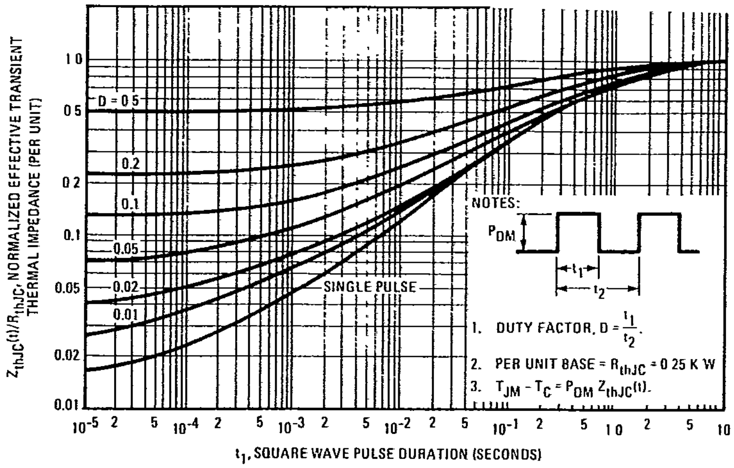


Fig. 5 — Maximum Effective Transient Thermal Impedance Junction-to-Case Vs. Pulse Duration

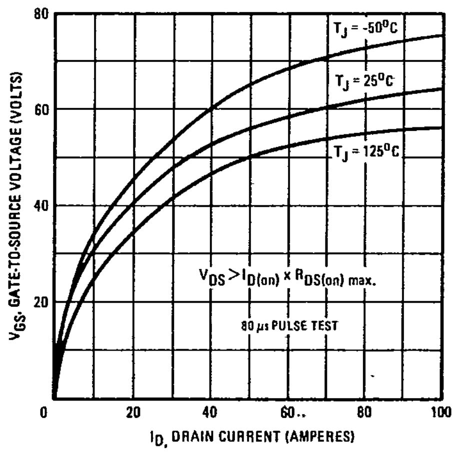


Fig. 6 — Typical Transconductance Vs. Drain Current

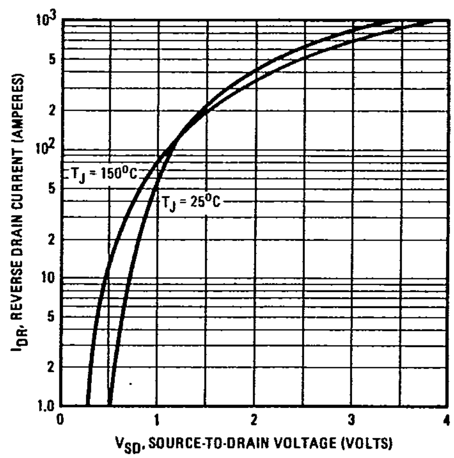


Fig. 7 — Typical Source-Drain Diode Forward Voltage

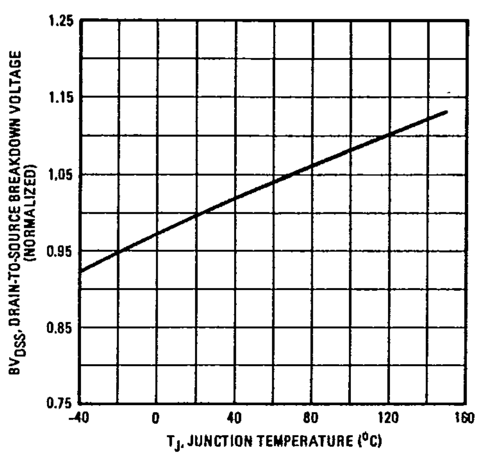


Fig. 8 — Breakdown Voltage Vs. Temperature

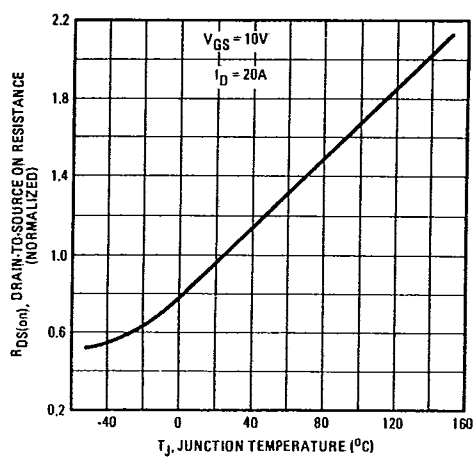


Fig. 9 — Normalized On-Resistance Vs. Temperature

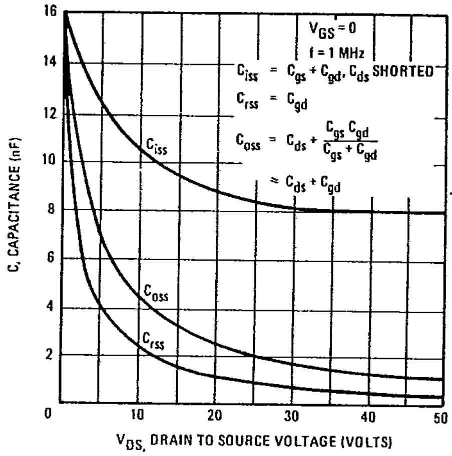


Fig. 10 — Typical Capacitance Vs. Drain-to-Source Voltage

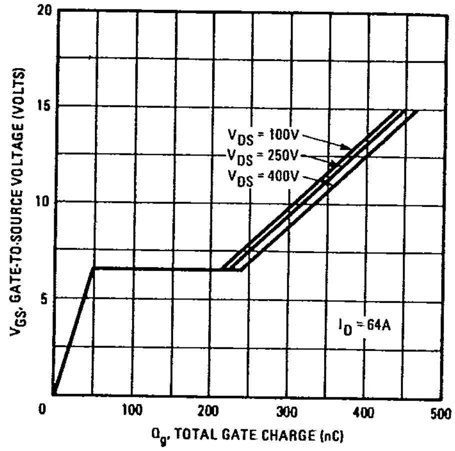


Fig. 11 — Typical Gate Charge Vs. Gate-to-Source Voltage

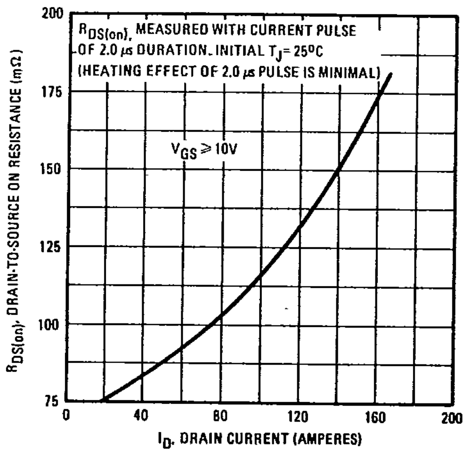


Fig. 12 — Typical On-Resistance Vs. Drain Current

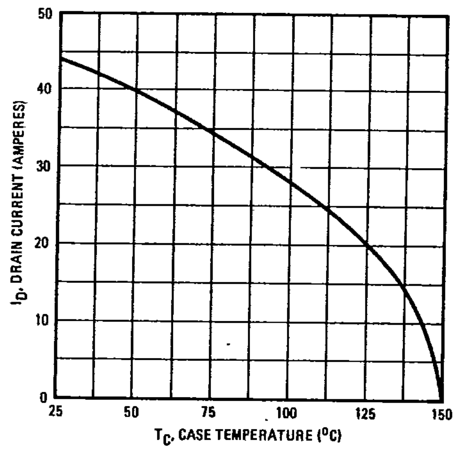


Fig. 13 — Maximum Drain Current Vs. Case Temperature

MODULE DEVICES

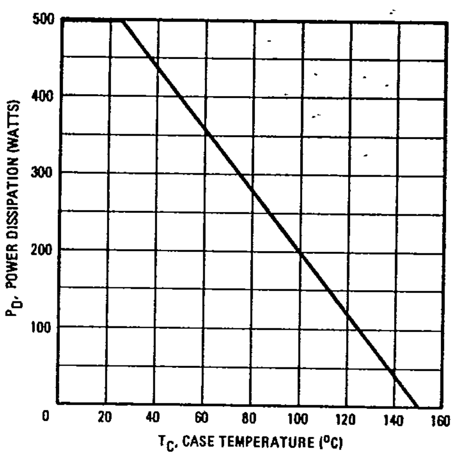


Fig. 14 — Power Vs. Temperature Derating Curve

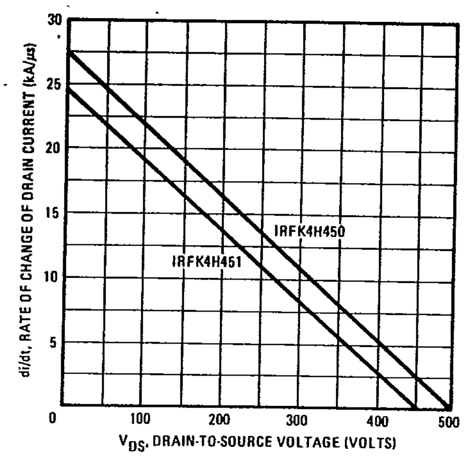


Fig. 15 — Maximum Rate of Change of Drain Current Vs. Drain-to-Source Voltage

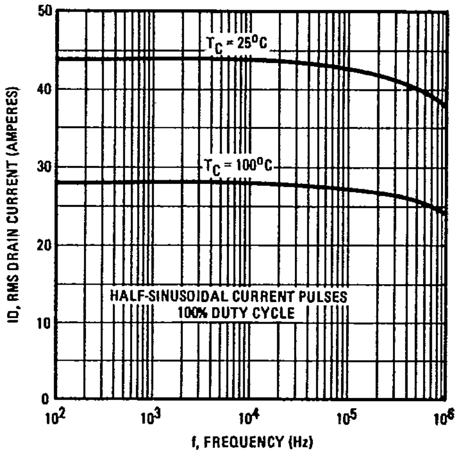


Fig. 16 — Maximum Continuous Drain Current Vs. Frequency Derating

The Do's and Don'ts of Using HEXPAK Power Modules

We can summarize some of the most common recommendations on using HEXPAK Power Modules as follows:

a) Observe mounting recommendations for optimum thermal performance and enhanced reliability during operation.

b) Keep the length of the leads to the auxiliary terminals as short as possible. **DO NOT USE THE SOURCE POWER CONNECTORS** for gate circuit return connections, **USE THE AUXILIARY SOURCE CONNECTOR.**

c) Maintain turn-off drive circuit impedances as low as possible. It is even more desirable to use gate-source reverse biasing in high dv/dt environments.

d) Use gate zener clamps.

e) Pay attention to the di/dt vs V_{DS} curve in the data.

f) Make due allowances for drain current in high frequency applications. Refer to *Figure 16.*

g) Ensure good layout practice is adhered to in the design of the power circuit to minimize undesirable perturbations and interference.

h) Always decouple the power circuit locally.

i) Ensure turn-off snubbers are in close proximity with the power terminals.

j) Do not use principles of false economy in selection of decoupling and snubber components.

Almost all of the precautions advised above are fundamental. Observation of these few precautions on the other hand will ensure long and trouble-free operation of the circuit. Of greater significance, adherence to these few precautions is rewarded by the enhanced design-in simplicity offered by these power modules.

CAUTION

SENSITIVE ELECTRONIC DEVICES

DO NOT SHIP OR STORE NEAR STRONG ELECTROSTATIC, ELECTROMAGNETIC OR RADIOACTIVE FIELDS.

INTERNATIONAL RECTIFIER

. . . because your company cares.