

International Rectifier

IRFK4H450, IRFK4J450

Isolated Base Power HEX-pak™ Assembly - Parallel Chip Configuration

- High Current Capability.
- UL recognised E78996.
- Electrically Isolated Base Plate.
- Easy Assembly into Equipment.



Description

The HEX-pak™ utilises the well-proven HEXFET™ die, combining low on-state resistance with high transconductance. These superior technology die are assembled by state of the art techniques into the TO-240 package, featuring 2.5kV rms isolation and solid M5 screw connections. The small footprint means the package is highly suited to power applications where space is a premium. Available in two versions, IRFK.H... for fast switching and IRFK.J... for oscillation sensitive applications.

$$V_{DS} = 500V$$

$$R_{DS(on)} = 100m\Omega$$

$$I_D = 44A$$

Absolute Maximum Rating

	Parameter	Max.	Units
I_D @ $T_C=25^\circ C$	Continuous Drain Current	44	A
I_D @ $T_C=100^\circ C$	Continuous Drain Current	28	A
I_{DM}	Pulse Drain Current	176	A ①
P_D @ $T_C=25^\circ C$	Maximum Power Dissipation	500	W
V_{GS}	Gate-to-Source Voltage	20	V
V_{INS}	R.M.S. Isolation Voltage, circuit to base	2.5	kV
T_J	Operating Junction Temperature Range	-40 to 150	$^\circ C$
T_{STG}	Storage Temperature Range	-40 to 150	$^\circ C$

Thermal and Mechanical Specifications

	Parameter	Min.	Typ.	Max.	Units
R_{thJC}	Junction-to-Case	-	-	0.25	K/W ②
R_{thCS}	Case-to-Sink, smooth & greased surface	-	0.1	-	K/W
T	Mounting Torque +10%				③
	HEXpak to Heatsink	-	5	-	Nm
	Busbar to HEXpak	-	3	-	Nm
wt	Approximate Weight	-	140	-	g
		-	5	-	oz

Notes:

- ① - Repetitive Rating: Pulse width limited by maximum junction temperature see figure 8.
- ② - Per Module.
- ③ - A mounting compound is recommended and the torque should be rechecked after a period of three hours to allow for the spread of the compound.

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

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$B_{V_{DS}}$	Drain-to-Source Breakdown voltage	500	-	-	V	$V_{GS}=0\text{V}$, $I_D=1.0\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-State Resistance	-	80	100	m Ω	$V_{GS}=10\text{V}$, $I_D=14\text{A}$
$I_{D(on)}$	On-State Drain Current	44	-	-	A	$V_{DS} > I_{D(on)} \times R_{DS(on)}$ max, $V_{GS}=10\text{V}$
$V_{GS(th)}$	Gate Threshold Voltage	2.0	-	4.0	V	$V_{DS}=V_{GS}$, $I_D=1.0\text{mA}$
g_{fs}	Forward Transconductance ④	32	52	-	S	$V_{DS} > 50\text{V}$, $I_D=28\text{A}$
I_{DSS}	Zero Gate Voltage Drain Current	-	-	1.0	mA	$V_{DS}=V_{DSmax}$, $V_{GS}=0\text{V}$
		-	-	4.0	mA	$V_{GS}=10\text{V}$, $T_C=125^\circ\text{C}$, $V_{DS}=V_{DSmax} \times 0.8$
I_{GSS}	Gate-to-Source Leakage Forward	-	-	400	nA	$V_{GS}=20\text{V}$
I_{GSS}	Gate-to-Source Leakage Reverse	-	-	-400	nA	$V_{GS}=-20\text{V}$
Q_g	Total Gate Charge	-	420	520	nC	$I_D=44\text{A}$, $V_{GS}=10\text{V}$
Q_{gs}	Gate-to-Source Charge	-	45	70	nC	$V_{DS}=V_{DSmax} \times 0.8$
Q_{gd}	Gate-to-Drain ("Miller") Charge	-	175	260	nC	
$t_{d(on)}$	Turn-on Delay Time	IRFK4H054 - 110 IRFK4J054 - 125	-	-	ns	$V_{DD}=25\text{V}$, $I_D=150\text{A}$, $V_{GS}=10\text{V}$, $R_{SOURCE}=3.3\Omega$
t_r	Rise Time	IRFK4H054 - 700 IRFK4J054 - 800	-	-	ns	
$t_{d(off)}$	Turn-off Delay Time	IRFK4H054 - 400 IRFK4J054 - 530	-	-	ns	
t_f	Fall Time	IRFK4H054 - 260 IRFK4J054 - 300	-	-	ns	
L_{DS}	Drain-to-Source Inductance	-	18	-	nH	
C_{iss}	Input Capacitance	-	10.5	-	nF	
C_{oss}	Output Capacitance	-	2.4	-	nF	$f=1.0\text{MHz}$
C_{rss}	Reverse Transfer Capacitance	-	1.0	-	nF	
V_{INS}	R.M.S. Isolation Voltage	2.5	-	-	kV	Circuit to Base

Source-Drain Diode Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	-	-	44	A	
I_{SM}	Pulsed Source Current (Body Diode)	-	-	165	A	
V_{SD}	Diode Forward Voltage	-	-	1.4	V	$V_{GS}=0\text{V}$, $I_S=44\text{A}$, $T_C=25^\circ\text{C}$
t_{rr}	Reverse Recovery Time	280	580	1200	ns	$di/dt=400\text{A}/\mu\text{s}$, $T_J=150^\circ\text{C}$
Q_{rr}	Reverse Recovered Charge	13.0	27.0	65.0	μC	$I_S=44\text{A}$

Notes:

④ - Pulse Width $\leq 300\mu\text{s}$; Duty cycle $\leq 2\%$.



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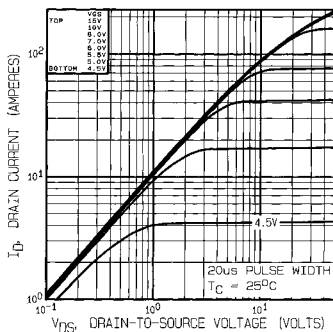


Fig 1. Typical Output Characteristics,
 $T_C = 25^\circ\text{C}$

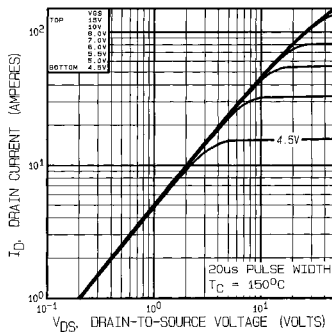


Fig 2. Typical Output Characteristics,
 $T_C = 150^\circ\text{C}$

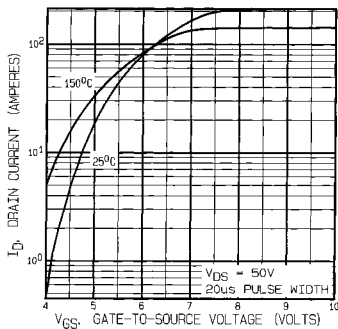


Fig 3. Typical Transfer Characteristics

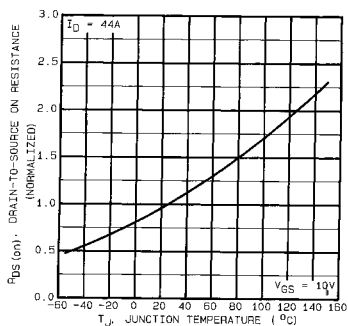


Fig 4. Normalized On-Resistance Vs.
Temperature

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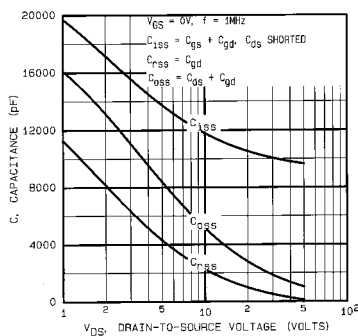


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

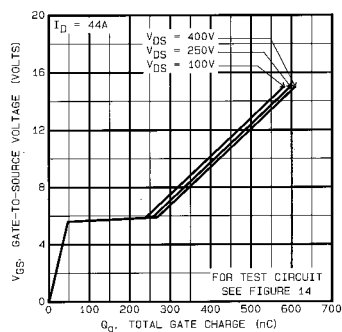


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

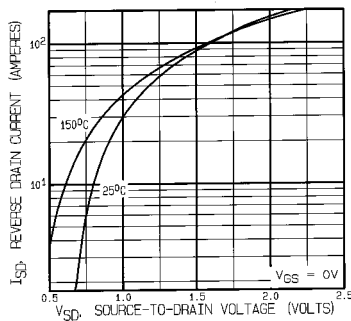


Fig 7. Typical Source-Drain Diode Forward Voltage

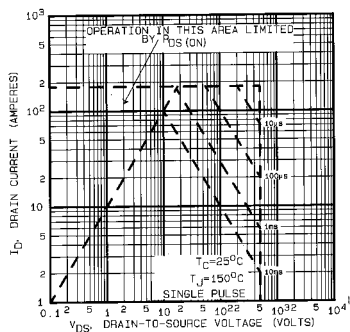


Fig 8. Maximum Safe Operating Area



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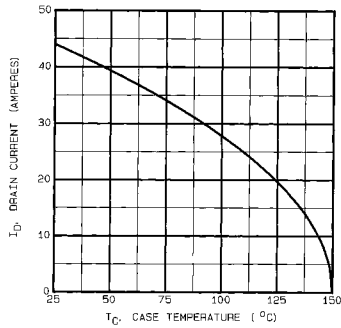


Fig 9. Maximum Drain Current Vs. Case Temperature

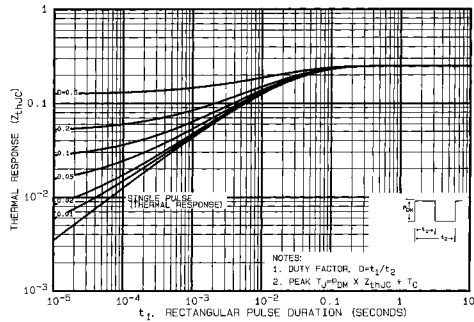


Fig 10. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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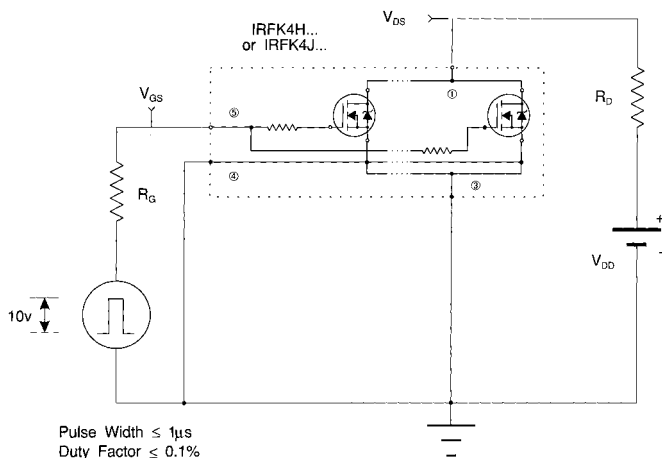


Fig 11a. Switching Time Test Circuit

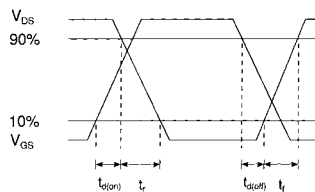
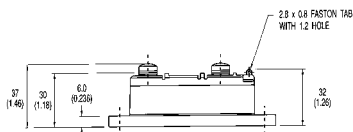
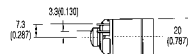


Fig 11b. Switching Time Waveforms



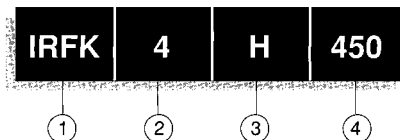
NOTE:
DEVICE IS SUPPLIED WITH
AUXILIARY LEADS 200(7.87) LONG

All dimensions in millimetres (inches)

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Part Numbering



1. - HEX-pak Module.
2. - Number of HEXFETs in parallel.
3. - H - Fast switching.
- J - Oscillation resistant for sensitive applications.
4. - Voltage code:-

054	- 60V
150	- 100V
250	- 200V
350	- 400V
450	- 500V
C50	- 600V

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In the interest of product improvement **INTERNATIONAL RECTIFIER** reserves the right to change specifications at any time without notice.

MJW/192