

# 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
$I_D @ T_C=25^\circ C$	44	A
$I_D @ T_C=100^\circ C$	28	A
$I_{DM}$	176	A ①
$P_D @ T_C=25^\circ C$	500	W
$V_{GS}$	20	V
$V_{INS}$	2.5	kV
$T_J$	-40 to 150	°C
$T_{STG}$	-40 to 150	°C

### Thermal and Mechanical Specifications

Parameter	Min.	Typ.	Max.	Units
$R_{thJC}$	-	-	0.25	K/W ②
$R_{thCS}$	-	0.1	-	K/W
T	Mounting Torque +10%			
	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	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 $\Omega$	$V_{GS}=10\text{V}$ , $I_D=14\text{A}$	
$I_{D(on)}$	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	-	ns	$V_{DD}=25\text{V}$ , $I_D=150\text{A}$ , $V_{GS}=10\text{V}$ ,
		IRFK4J054	-	125	-	ns	
$t_r$	Rise Time	IRFK4H054	-	700	-	ns	$R_{SOURCE}=3.3\Omega$
		IRFK4J054	-	800	-	ns	
$t_{d(off)}$	Turn-off Delay Time	IRFK4H054	-	400	-	ns	$R_{SOURCE}=3.3\Omega$
		IRFK4J054	-	530	-	ns	
$t_f$	Fall Time	IRFK4H054	-	260	-	ns	$R_{SOURCE}=3.3\Omega$
		IRFK4J054	-	300	-	ns	
$L_{DS}$	Drain-to-Source Inductance	-	18	-	nH		
$C_{iss}$	Input Capacitance	-	10.5	-	nF	$V_{GS}=0\text{V}$ , $V_{DS}=25\text{V}$ ,	
$C_{oss}$	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

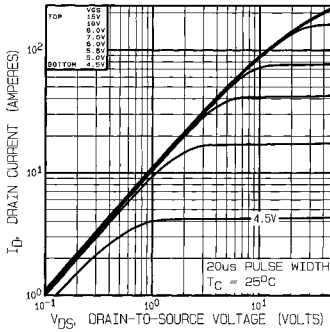
Parameter	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$I_S$	Continuous Source Current (Body Diode)	-	-	44	A	
$I_{SM}$	Pulsed Source Current (Body Diode)	-	-	165	A	
$V_{SD}$	Diode Forward Voltage	-	-	1.4	V	$V_{GS}=0\text{V}$ , $I_S=44\text{A}$ , $T_C=25^\circ\text{C}$
$t_{rr}$	Reverse Recovery Time	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	$\mu\text{C}$	$I_S=44\text{A}$

### Notes:

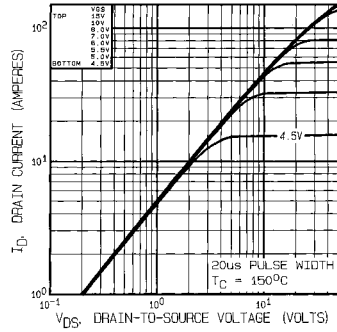
④ - Pulse Width  $\leq 300\mu\text{s}$ ; Duty cycle  $\leq 2\%$ .



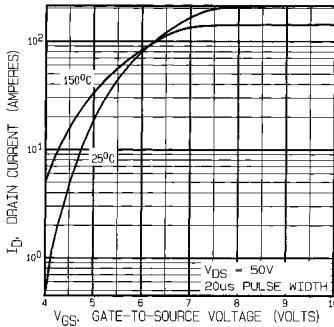
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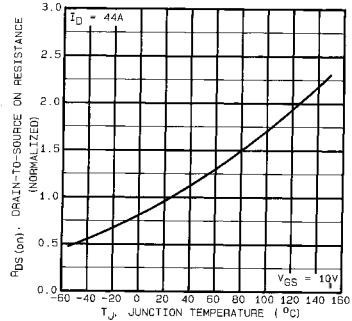
**Fig 1.** Typical Output Characteristics,  $T_C=25^\circ\text{C}$



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

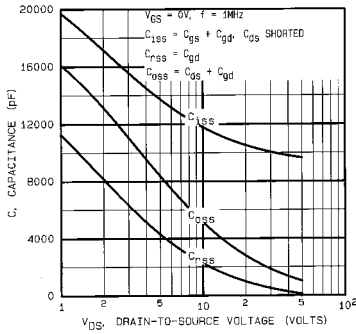


**Fig 3.** Typical Transfer Characteristics

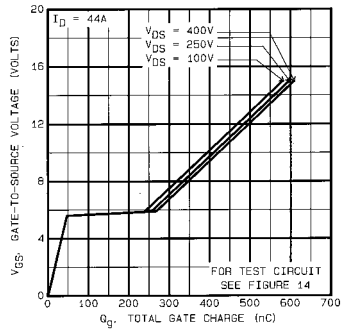


**Fig 4.** Normalized On-Resistance Vs. Temperature

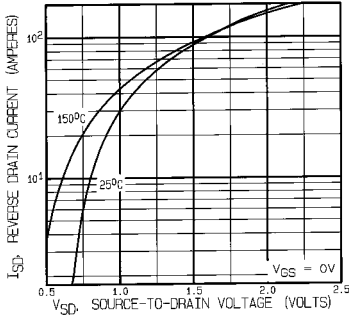
# IRFK4H450, IRFK4J450



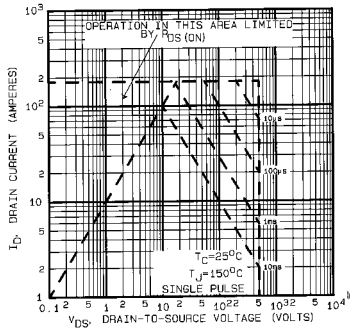
**Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage**



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



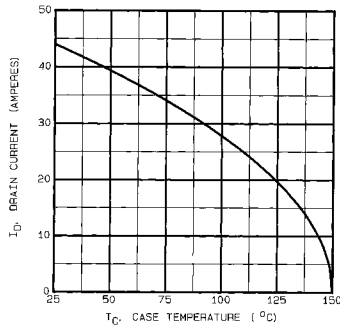
**Fig 7. Typical Source-Drain Diode Forward Voltage**



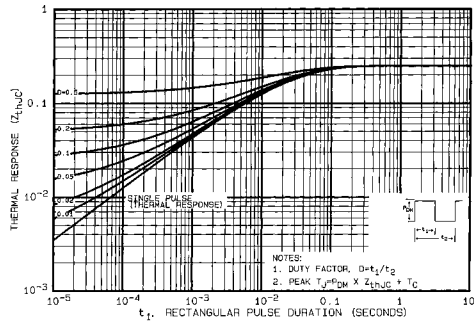
**Fig 8. Maximum Safe Operating Area**



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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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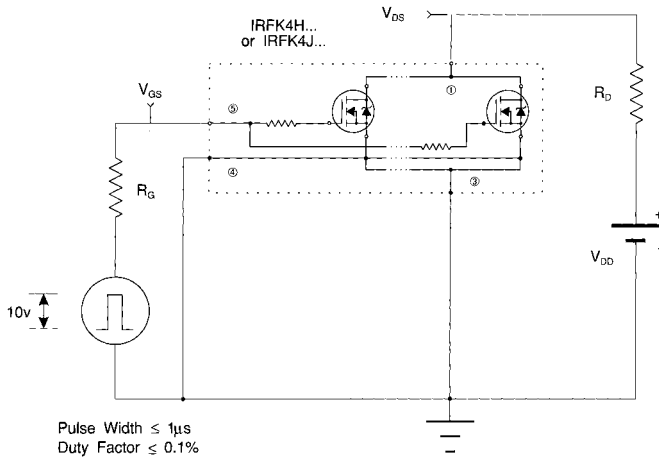


Fig 11a. Switching Time Test Circuit

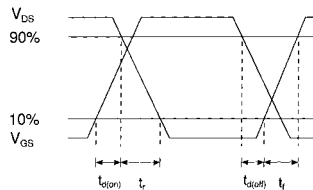
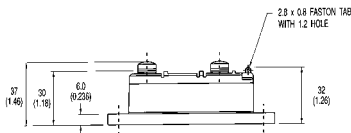
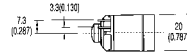
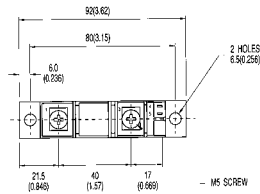
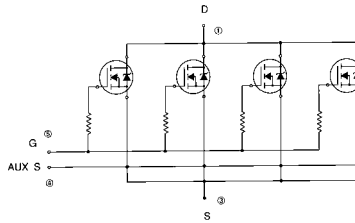


Fig 11b. Switching Time Waveforms



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## Circuit Configuration and Outline



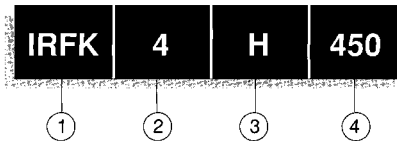
NOTE:  
DEVICE IS SUPPLIED WITH  
AUXILIARY LEADS 200(7.87) LONG

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.
  4. - 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.

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