

# 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	°C
$T_{STG}$	Storage Temperature Range	-40 to 150	°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<sub>J</sub> = 25°C (Unless otherwise specified)

Parameter	Min.	Typ.	Max.	Units	Test Conditions	
B <sub>V</sub> DSS	500	-	-	V	V <sub>GS</sub> =0V, I <sub>D</sub> =1.0mA	
R <sub>DS(on)</sub>	-	80	100	mΩ	V <sub>GS</sub> =10V, I <sub>D</sub> =14A	
I <sub>D(on)</sub>	44	-	-	A	V <sub>DS</sub> > I <sub>D(on)</sub> × R <sub>DS(on)</sub> max, V <sub>GS</sub> =10V	
V <sub>GS(th)</sub>	2.0	-	4.0	V	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =1.0mA	
g <sub>fs</sub>	32	52	-	S	V <sub>DS</sub> > 50V, I <sub>D</sub> =28A	
I <sub>DSS</sub>	-	-	1.0	mA	V <sub>DS</sub> =V <sub>DS</sub> max, V <sub>GS</sub> =0V	
	-	-	4.0	mA	V <sub>GS</sub> =10V, T <sub>C</sub> =125°C, V <sub>DS</sub> =V <sub>DS</sub> max × 0.8	
I <sub>GSS</sub>	-	-	400	nA	V <sub>GS</sub> =20V	
I <sub>GSS</sub>	-	-	-400	nA	V <sub>GS</sub> =-20V	
Q <sub>g</sub>	-	420	520	nC	I <sub>D</sub> =44A, V <sub>GS</sub> =10V,	
Q <sub>gs</sub>	-	45	70	nC	V <sub>DS</sub> =V <sub>DS</sub> max × 0.8	
Q <sub>gd</sub>	-	175	260	nC		
t <sub>d(on)</sub>	IRFK4H054	-	110	-	ns	V <sub>DD</sub> =25V, I <sub>D</sub> =150A, V <sub>GS</sub> =10V, R <sub>SOURCE</sub> =3.3Ω
	IRFK4J054	-	125	-	ns	
t <sub>r</sub>	IRFK4H054	-	700	-	ns	
	IRFK4J054	-	800	-	ns	
t <sub>d(off)</sub>	IRFK4H054	-	400	-	ns	
	IRFK4J054	-	530	-	ns	
t <sub>f</sub>	IRFK4H054	-	260	-	ns	
	IRFK4J054	-	300	-	ns	
L <sub>DS</sub>	-	18	-	nH		
C <sub>iss</sub>	-	10.5	-	nF	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V,	
C <sub>oss</sub>	-	2.4	-	nF	f=1.0MHz	
C <sub>rss</sub>	-	1.0	-	nF		
V <sub>INS</sub>	2.5	-	-	kV	Circuit to Base	

## Source-Drain Diode Ratings and Characteristics

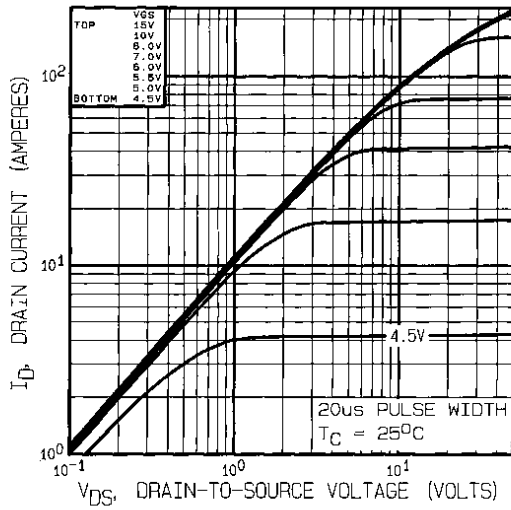
Parameter	Min.	Typ.	Max.	Units	Test Conditions
I <sub>S</sub>	-	-	44	A	
I <sub>SM</sub>	-	-	165	A	
V <sub>SD</sub>	-	-	1.4	V	V <sub>GS</sub> =0V, I <sub>S</sub> =44A, T <sub>C</sub> =25°C
t <sub>rr</sub>	280	580	1200	ns	di/dt=400A/μs, T <sub>J</sub> =150°C
Q <sub>rr</sub>	13.0	27.0	65.0	μC	I <sub>S</sub> =44A

### Notes:

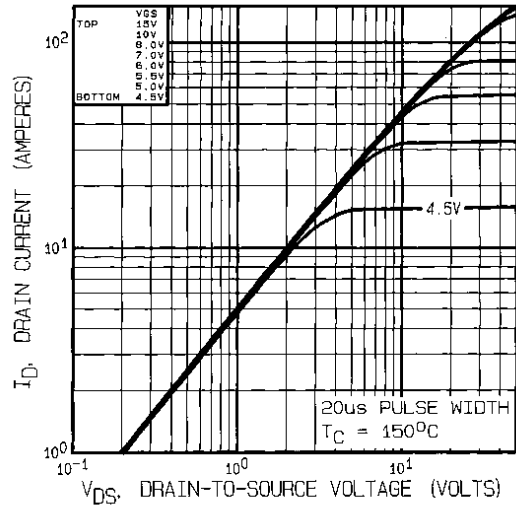
④ - Pulse Width ≤ 300μs; Duty cycle ≤ 2%.



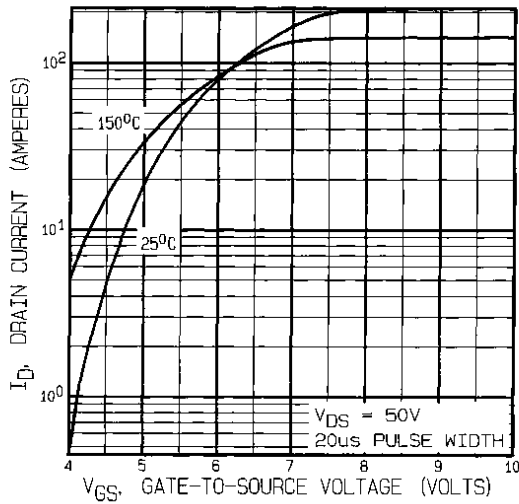
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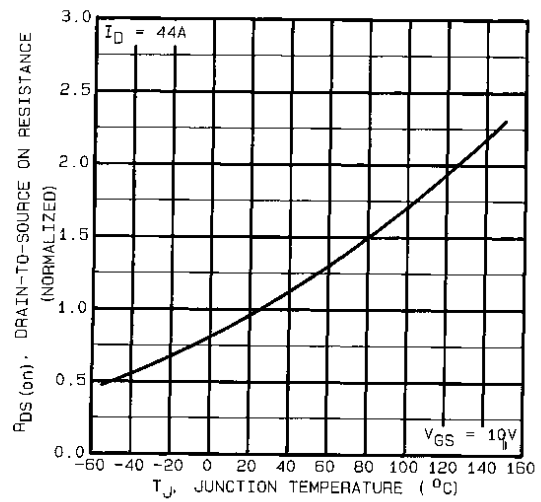
**Fig 1.** Typical Output Characteristics,  
 $T_C = 25^\circ\text{C}$



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

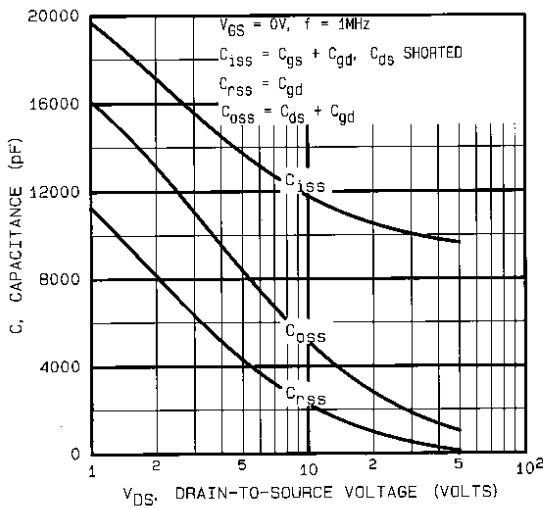


**Fig 3.** Typical Transfer Characteristics

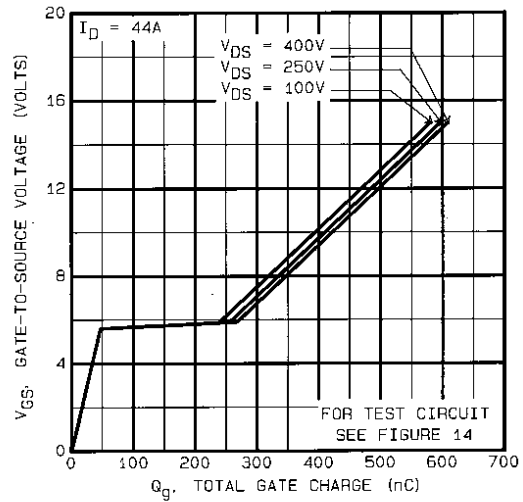


**Fig 4.** Normalized On-Resistance Vs.  
Temperature

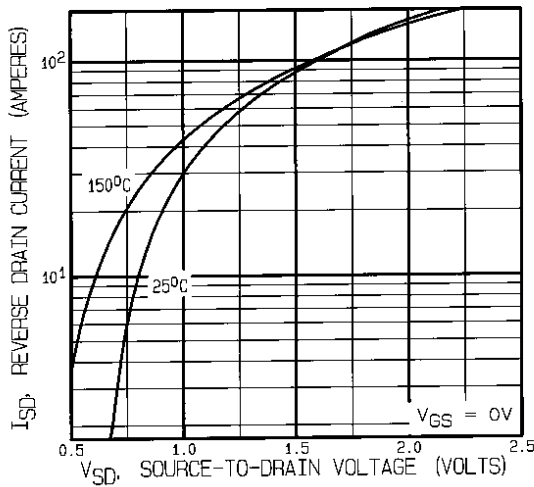
# IRFK4H450, IRFK4J450



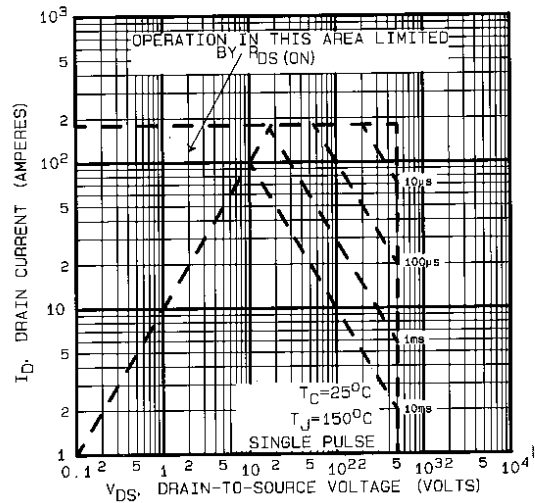
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



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



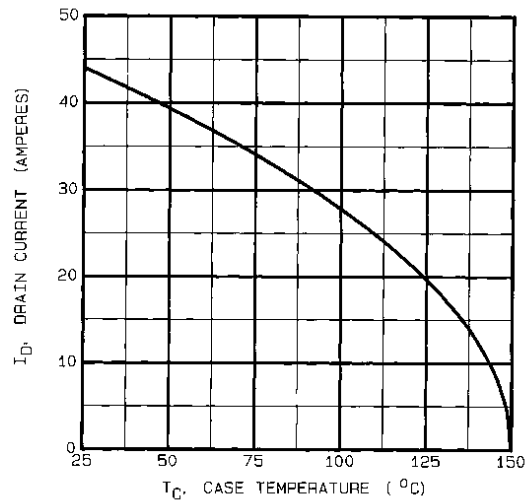
**Fig 7.** Typical Source-Drain Diode Forward Voltage



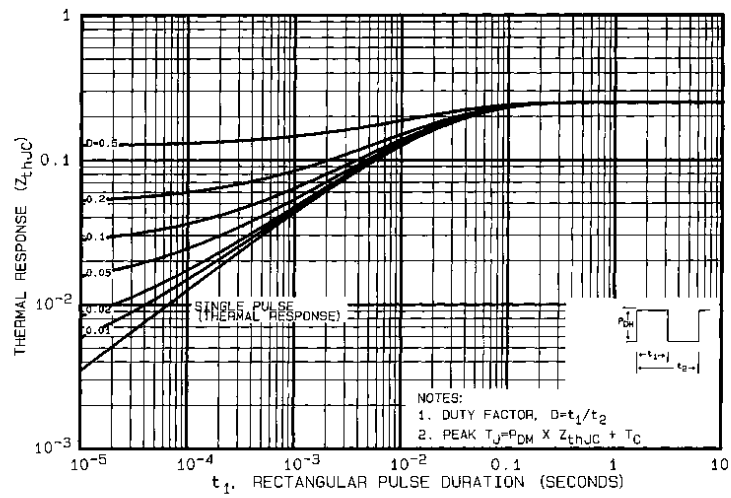
**Fig 8.** Maximum Safe Operating Area



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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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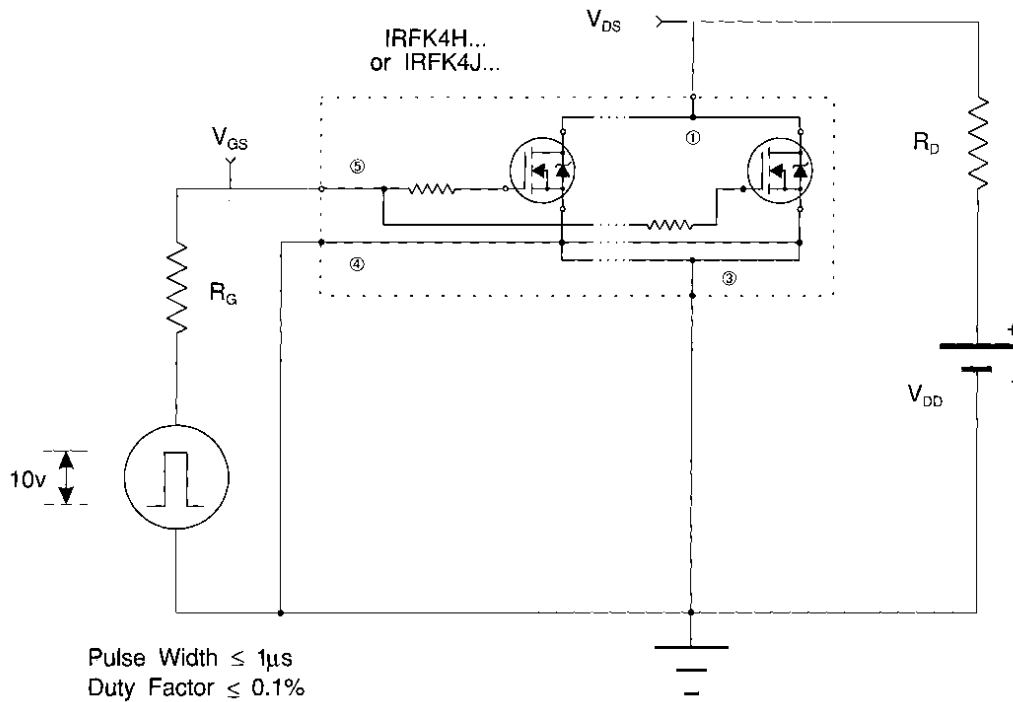


Fig 11a. Switching Time Test Circuit

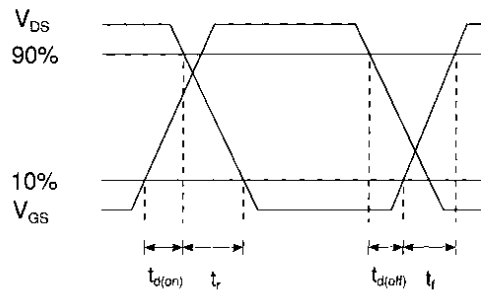
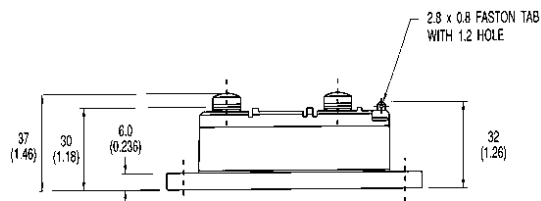
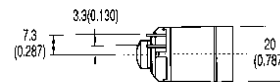
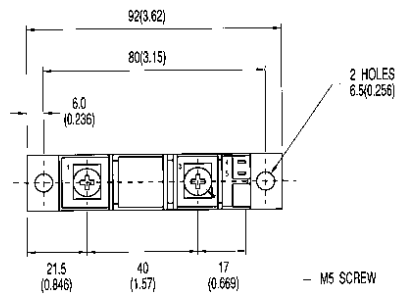
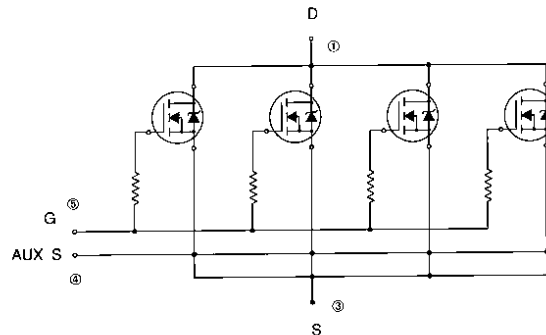


Fig 11b. Switching Time Waveforms



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## Circuit Configuration and Outline



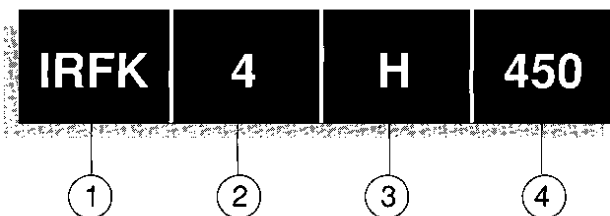
NOTE:  
DEVICE IS SUPPLIED WITH  
AUXILIARY LEADS 200(7.87) LONG

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.  
- 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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MJW/1/92