

International TOR Rectifier

IRFK4H054, IRFK4J054

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.

$$V_{DS} = 60V$$

$$R_{DS(on)} = 5m\Omega$$

$$I_D = 150A^{(4)}$$

Absolute Maximum Rating

	Parameter	Max.	Units
$I_D @ T_C=25^\circ C$	Continuous Drain Current	150 ^①	A
$I_D @ T_C=100^\circ C$	Continuous Drain Current	150 ^①	A
I_{DM}	Pulse Drain Current	960	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.

④ - Limited by package.

IRFK4H054, IRFK4J054



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

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
B_{VDS}	Drain-to-Source Breakdown voltage	60	-	-	V	$V_{GS}=0V, I_D=1.0mA$
$R_{DS(on)}$	Static Drain-to-Source On-State Resistance	-	4	5	m Ω	$V_{GS}=10V, I_D=76A$
$I_{D(on)}$	On-State Drain Current	150	-	-	A	$V_{DS} > I_{D(on)} \times R_{DS(on)} \text{ max, } V_{GS}=10V$
$V_{GS(th)}$	Gate Threshold Voltage	2.0	-	4.0	V	$V_{DS}=V_{GS}, I_D=1.0mA$
g_{fs}	Forward Transconductance ⑤	124	188	-	S	$V_{DS} > 50V, I_D=150A$
I_{DSS}	Zero Gate Voltage Drain Current	-	-	1.0	mA	$V_{DS}=V_{DS} \text{ max, } V_{GS}=0V$
		-	-	4.0	mA	$V_{GS}=10V, T_C=125^\circ\text{C}, V_{DS}=V_{DS} \text{ max} \times 0.8$
I_{GSS}	Gate-to-Source Leakage Forward	-	-	400	nA	$V_{GS}=20V$
I_{GSS}	Gate-to-Source Leakage Reverse	-	-	-400	nA	$V_{GS}=-20V$
Q_g	Total Gate Charge	-	520	600	nC	$I_D=150A, V_{GS}=10V,$
Q_{gs}	Gate-to-Source Charge	-	100	148	nC	$V_{DS}=V_{DS} \text{ max} \times 0.8$
Q_{gd}	Gate-to-Drain ("Miller") Charge	-	180	272	nC	
$t_{d(on)}$	Turn-on Delay Time	IRFK4H054	-	110	-	$V_{DD}=25V, I_D=150A,$
		IRFK4J054	-	125	-	
t_r	Rise Time	IRFK4H054	-	700	-	$V_{GS}=10V,$
		IRFK4J054	-	800	-	
$t_{d(off)}$	Turn-off Delay Time	IRFK4H054	-	400	-	$R_{SOURCE}=3.3\Omega$
		IRFK4J054	-	530	-	
t_f	Fall Time	IRFK4H054	-	260	-	
		IRFK4J054	-	300	-	
L_{DS}	Drain-to-Source Inductance	-	18	-	nH	
C_{iss}	Input Capacitance	-	9.3	-	nF	$V_{GS}=0V, V_{DS}=25V,$
C_{oss}	Output Capacitance	-	1.7	-	nF	$f=1.0MHz$
C_{rss}	Reverse Transfer Capacitance	-	0.5	-	nF	
	Linear Derating Factor	-	-	4	W/K	

Source-Drain Diode Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	-	-	150	A	
I_{SM}	Pulsed Source Current (Body Diode)	-	-	800	A	
V_{SD}	Diode Forward Voltage	-	-	2.5	V	$V_{GS}=0V, I_S=150A, T_C=25^\circ\text{C}$
t_{rr}	Reverse Recovery Time	71	150	320	ns	$di/dt=400A/\mu s, T_J=150^\circ\text{C}$
Q_{rr}	Reverse Recovered Charge	4.4	10.0	23.0	μC	$I_S=150A$

Notes:

⑤ - Pulse Width $\leq 300\mu s$; Duty cycle $\leq 2\%$.

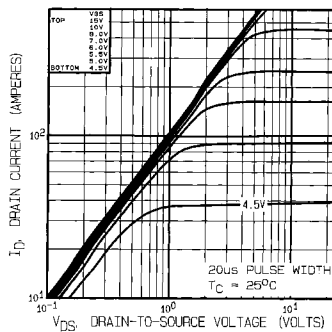


Fig 1. Typical Output Characteristics,
 $T_C=25^\circ\text{C}$

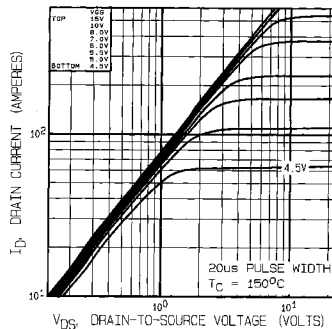


Fig 2. Typical Output Characteristics,
 $T_C=150^\circ\text{C}$

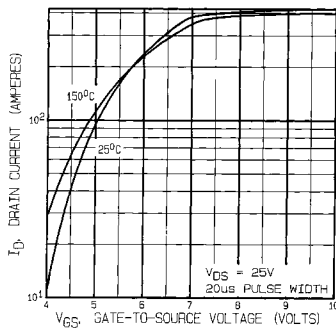


Fig 3. Typical Transfer Characteristics

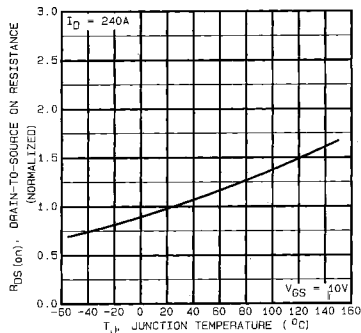


Fig 4. Normalized On-Resistance Vs.
Temperature

IRFK4H054, IRFK4J054

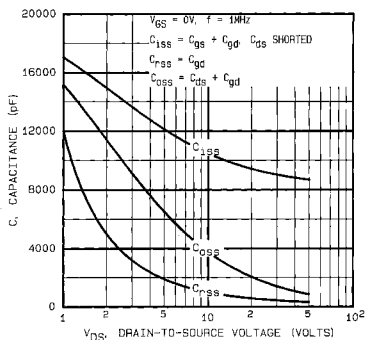


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

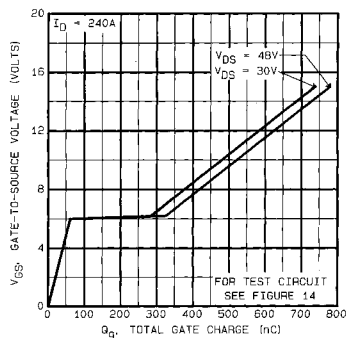


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

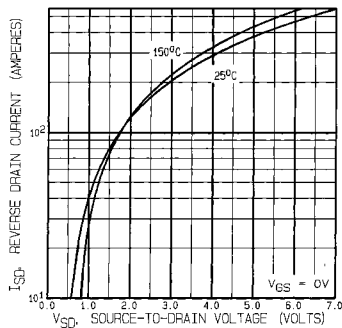


Fig 7. Typical Source-Drain Diode Forward Voltage

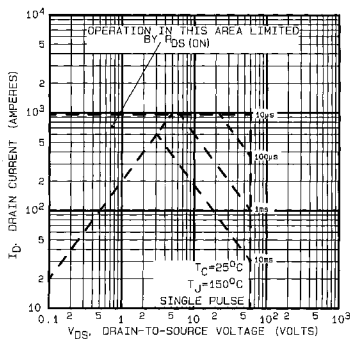


Fig 8. Maximum Safe Operating Area

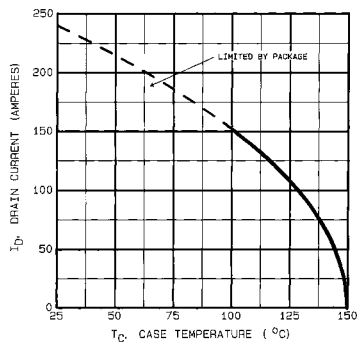


Fig 9. Maximum Drain Current Vs. Case Temperature

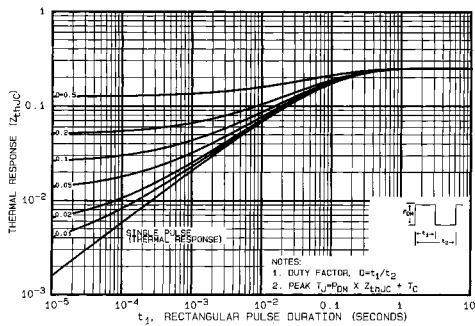


Fig 10. Maximum Effective Transient Thermal Impedance, Junction-to-Case

IRFK4H054,IRFK4J054

IR

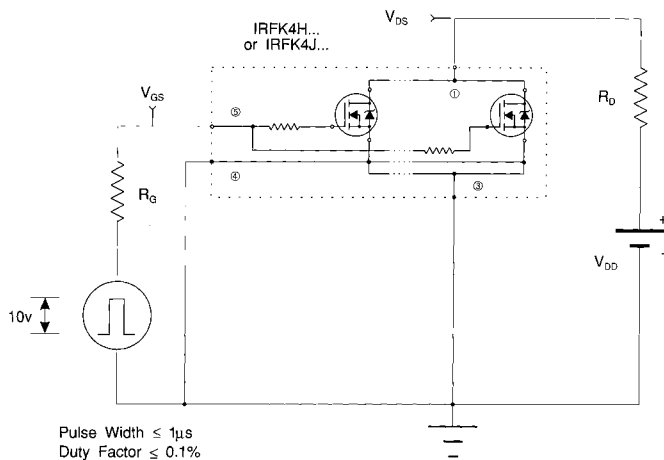


Fig 11a. Switching Time Test Circuit

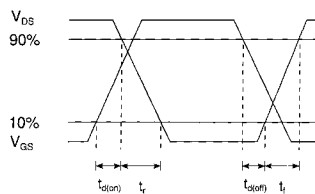
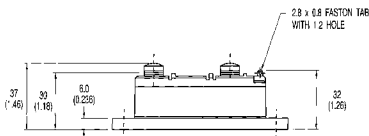
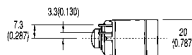
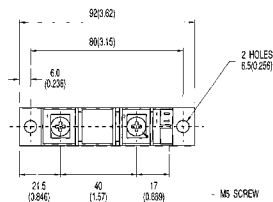
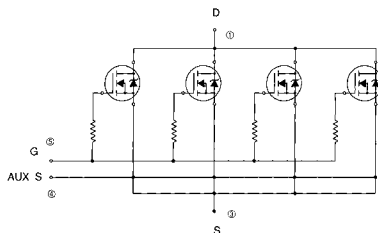


Fig 11b. Switching Time Waveforms



IRFK4H054, IRFK4J054

Circuit Configuration and Outline



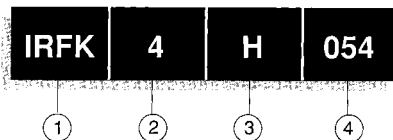
NOTE:
DEVICE IS SUPPLIED WITH
AUXILIARY LEADS 200(7.87) LONG

All dimensions in millimetres (inches)

IRFK4H054,IRFK4J054



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

WORLD HEADQUARTERS: 233 Kansas St., **EL SEGUNDO**, California 90245, USA, Tel:(213) 772-2000. Tlx:654464. Fax:(213) 772-9028
EUROPEAN HEADQUARTERS: Hurst Green, **OXTED**, Surrey RH6 9BS, UK. Tel:(0883) 713215. Tlx:95219. Fax:(0883) 714234.

CANADA: 101 Bentley St., Markham, **ONTARIO L3R 3L1**, Tel:(416)475-1897. Tlx:08-966-650. Fax:(416)475-8801
CZECHOSLOVAKIA: Macurova 19/1565, Box 30, 149 00 **PRAGUE**, Tel:(2) 792 6831. Fax:(2) 792 6831.
DENMARK: P.O. Box 70, Krogshøjvej 51, DK-2980 **BAGSVAERD**, Tel:(45) 44 37 71 50. Fax:(45) 44 37 71 52.
FRANCE: 123 Rue de Petit Vaurs, 91360 **EPINAY sur ORGE**, Tel:(1)94.54.83.29. Tlx:900943. Fax:(1)64.54.83.30.
FINLAND: Billskogsvägen 19, 02580 **Spjunda St.**, Tel:(0) 262 8144. Fax:(0) 262 8150.
GERMANY: Saselburgstr. 157, D-6380 **BAD HOMBURG**, Tel:(61)72 37066. Tlx:410404. Fax:(61)72 37065.
HUNGARY: Szent Istvan Park 15, H-1137 **BUDAPEST**, Tel:(1) 1268 822. Fax:(1) 1298 822.
HONG KONG: 232 Peter Building, 80 Queens Road Central, **HONG KONG**, Tel:(85) 252 3535. Fax:(85) 284 5298.
ITALY: Via Liguria 49, 10071 Borgaro, **TORINO**, Tel:(011)470 14 84. Tlx:221257. Fax:(011)470 42 90.
 Via Zucca 8, 20017 Rho **MILANO**, Tel:(02)93 50 36 50. Fax:(02)93 50 36 55.
 Via Arno 1, 40139 **BOLOGNA**, Tel:(051)49 33 07. Fax:(051)49 54 80.
INDIA: 31 Greenacre, 5 Union Park, Khar (W), **BOMBAY** 400 052. Tel:(022)535026/53779/540242. Tlx:011-71481.
JAPAN: K & H Bldg. 2F, 3-30-4 Nishi-koebakuro, Toshima-ku, **TOKYO**, Japan 171. Tel:(03)983 0641. Fax:(03)983 0642.
SINGAPORE: HEX 10-01 Fortune Centre, 190 Middle Road, **SINGAPORE** 0716. Tel:(65)336 3922/337 4695/336 6286. Fax:(65)337 4692.
SWEDEN: Box: 96, S-162 12 Vällingby 1, **STOCKHOLM**, Tel:(08)670035. Fax:(08)674242.
SWITZERLAND: **CH-8032 ZÜRICH**, Kirchenweg 5. Tel:(01)386 8702/8686. Fax:(01)383 5108/2379.
U.S.A.:
 Central Zone: 2401 Plum Grove Road, Suite 111, **PALATINE, IL** 60067. Tel:(312)397-0002. Fax:(312)397-0114.
 Eastern Zone: 71 Grand Avenue, **PALISADES PARK, NJ** 07650. Tel:(201)943 4554. Fax:(201)943 5754.
 Southern Zone: 800 Office Plaza Blvd., Suite 401, **KISSIMMEE, FL** 32743. Tel:(407)933-2383. Fax:(407)933-2293.
 Western Zone: 222 Kansas Street, **EL SEGUNDO, CA** 90245. Tel:(213)607-6886. Fax:(213)640-6553.

Sales Offices, Agents and Distributors in Major Cities throughout the World.

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

MJW/1/82