

# International Rectifier IRFK2D054, IRFK2F054

## Isolated Base Power HEX-pak™ Assembly - Half Bridge 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.D... for fast switching and IRFK.F... for oscillation sensitive applications.

$$V_{DS} = 60V$$

$$R_{DS(on)} = 10m\Omega$$

$$I_D = 120A$$

### Absolute Maximum Rating

	Parameter	Max.	Units
$I_D @ T_C=25^\circ C$	Continuous Drain Current	120	A
$I_D @ T_C=100^\circ C$	Continuous Drain Current	76	A
$I_{DM}$	Pulse Drain Current	480	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 @ $T_J = 25^\circ\text{C}$ (Unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Test Conditions	
$B_{V_{DS}}$	Drain-to-Source Breakdown voltage	60	-	-	V	$V_{GS}=0V, I_D=1.0mA$	
$R_{DS(on)}$	Static Drain-to-Source On-State Resistance	-	8	10	m $\Omega$	$V_{GS}=10V, I_D=76A$	
$I_{D(on)}$	On-State Drain Current	120	-	-	A	$V_{DS} > I_{D(on)} \times R_{DS(on)}$ 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 ④	62	94	-	S	$V_{DS} > 50V, I_D=76A$	
$I_{DSS}$	Zero Gate Voltage Drain Current	-	-	0.5	mA	$V_{DS}=V_{DS}max, V_{GS}=0V$	
		-	-	2.0	mA	$V_{GS}=10V, T_C=125^\circ\text{C},$ $V_{DS}=V_{DS}max \times 0.8$	
$I_{GSS}$	Gate-to-Source Leakage Forward	-	-	200	nA	$V_{GS}=20V$	
$I_{GSS}$	Gate-to-Source Leakage Reverse	-	-	-200	nA	$V_{GS}=-20V$	
$Q_g$	Total Gate Charge	-	260	300	nC	$I_D=120A, V_{GS}=10V,$	
$Q_{GS}$	Gate-to-Source Charge	-	50	74	nC	$V_{DS}=V_{DS}max \times 0.8$	
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	-	90	136	nC		
$t_{d(on)}$	Turn-on Delay Time	IRFK2D054	-	100	-	ns	$V_{DD}=25V, I_D=76A,$ $V_{GS}=10V,$ $R_{SOURCE}=3.3\Omega$
		IRFK2F054	-	115	-	ns	
$t_r$	Rise Time	IRFK2D054	-	300	-	ns	
		IRFK2F054	-	380	-	ns	
$t_{d(off)}$	Turn-off Delay Time	IRFK2D054	-	320	-	ns	
		IRFK2F054	-	420	-	ns	
$t_f$	Fall Time	IRFK2D054	-	120	-	ns	
		IRFK2F054	-	200	-	ns	
$L_{DS}$	Drain-to-Source Inductance	-	18	-	nH		
$C_{iss}$	Input Capacitance	-	8.0	-	nF	$V_{GS}=0V, V_{DS}=25V,$	
$C_{oss}$	Output Capacitance	-	2.0	-	nF	$f=1.0MHz$	
$C_{rss}$	Reverse Transfer Capacitance	-	1.0	-	nF		
	Linear Derating Factor	-	-	4	KW		

## Source-Drain Diode Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$I_S$	Continuous Source Current (Body Diode)	-	-	120	A	
$I_{SM}$	Pulsed Source Current (Body Diode)	-	-	310	A	
$V_{SD}$	Diode Forward Voltage	-	-	2.5	V	$V_{GS}=0V, I_S=120A, T_C=25^\circ\text{C}$
$t_{rr}$	Reverse Recovery Time	71	150	320	ns	$di/dt=200A/\mu s, T_J=150^\circ\text{C}$
$Q_{rr}$	Reverse Recovered Charge	2.2	5.0	11.4	$\mu\text{C}$	$I_S=120A$

### Notes:

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



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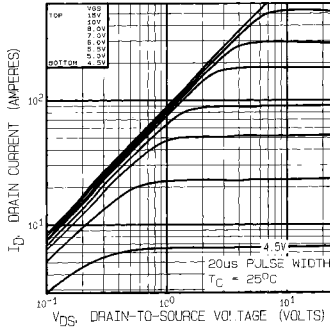


Fig 1. Typical Output Characteristics,  
 $T_C = 25^\circ\text{C}$

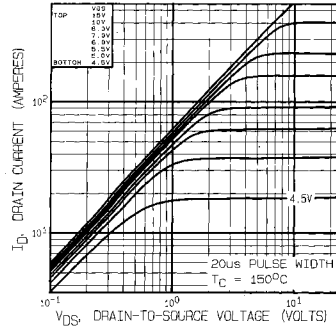


Fig 2. Typical Output Characteristics,  
 $T_C = 150^\circ\text{C}$

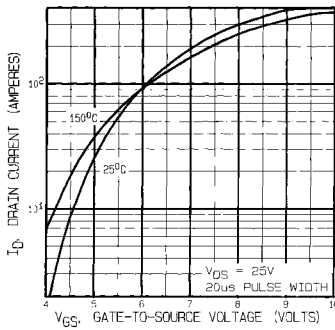


Fig 3. Typical Transfer Characteristics

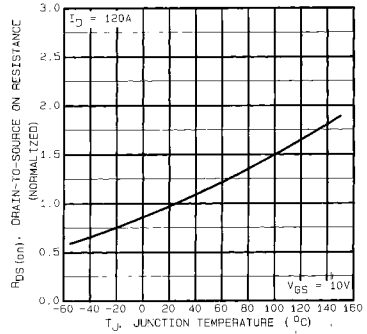
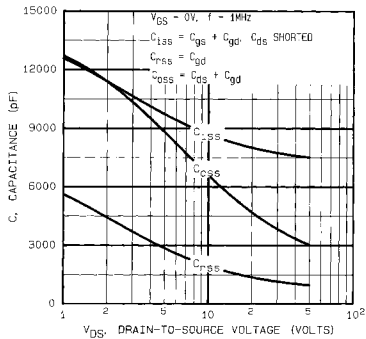
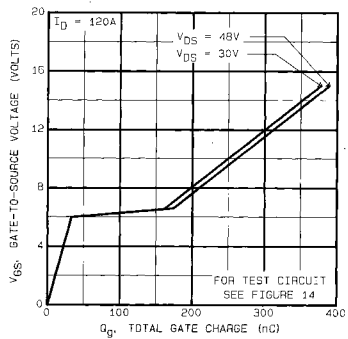


Fig 4. Normalized On-Resistance Vs.  
Temperature

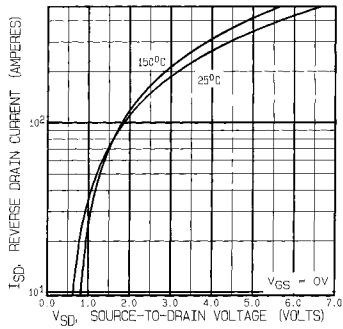
# IRFK2D054, IRFK2F054



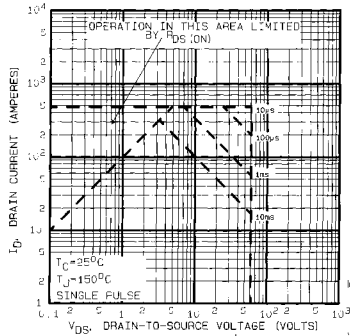
**Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage**



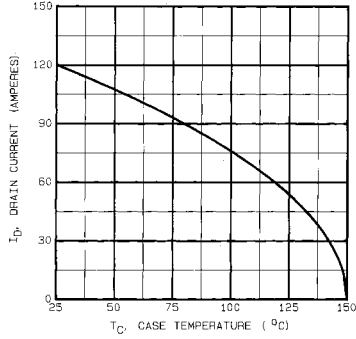
**Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage**



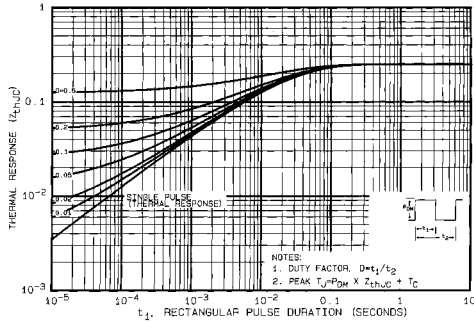
**Fig 7. Typical Source-Drain Diode Forward Voltage**



**Fig 8. Maximum Safe Operating Area**



**Fig 9.** Maximum Drain Current Vs. Case Temperature

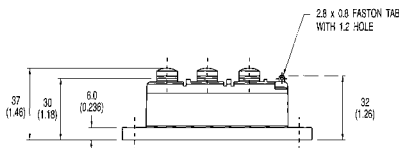
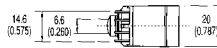
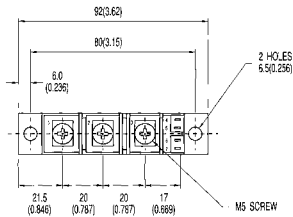
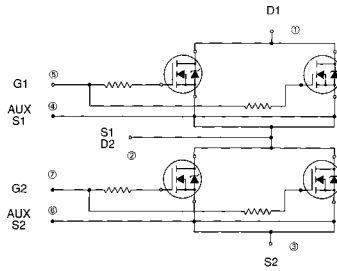


**Fig 10.** Maximum Effective Transient Thermal Impedance, Junction-to-Case



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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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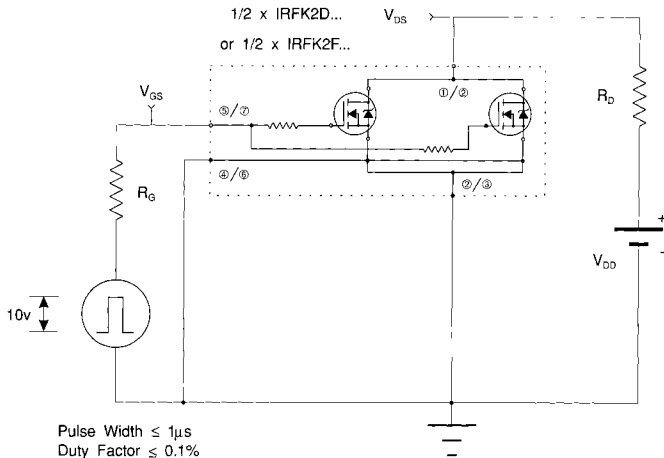


Fig 11a. Switching Time Test Circuit

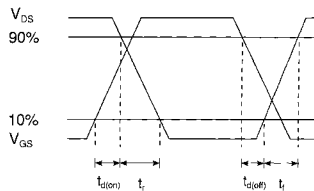
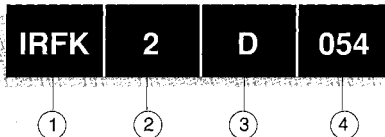


Fig 11b. Switching Time Waveforms

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## Part Numbering



1. - HEX-pak Module.
2. - Number of arms of bridge.
3. - D - Fast switching.
  - F - 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.

M.JW/1/92