

International IOR Rectifier IRFK3DC50, IRFK3FC50

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.

$$V_{DS} = 600V$$

$$R_{DS(on)} = 230m\Omega$$

$$I_D = 24A$$

Absolute Maximum Rating

	Parameter	Max.	Units
I_D @ $T_C=25^\circ C$	Continuous Drain Current	24	A
I_D @ $T_C=100^\circ C$	Continuous Drain Current	15	A
I_{DM}	Pulse Drain Current	96	A ①
P_D @ $T_C=25^\circ C$	Maximum Power Dissipation	625	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	-	-	0.20	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	600	-	-	V	$V_{GS}=0\text{V}$, $I_D=1.0\text{mA}$	
$R_{DS(on)}$	Static Drain-to-Source On-State Resistance	-	185	230	m Ω	$V_{GS}=10\text{V}$, $I_D=15\text{A}$	
$I_{D(on)}$	On-State Drain Current	24	-	-	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	24	37	-	S	$V_{DS} > 50\text{V}$, $I_D=15\text{A}$	
I_{DSS}	Zero Gate Voltage Drain Current	-	-	0.75	mA	$V_{DS}=V_{DS}$ max, $V_{GS}=0\text{V}$	
		-	-	3.0	mA	$V_{GS}=10\text{V}$, $T_C=125^\circ\text{C}$, $V_{DS}=V_{DS}$ max x 0.8	
I_{GSS}	Gate-to-Source Leakage Forward	-	-	300	nA	$V_{GS}=20\text{V}$	
I_{GSS}	Gate-to-Source Leakage Reverse	-	-	-300	nA	$V_{GS}=-20\text{V}$	
Q_g	Total Gate Charge	-	320	390	nC	$I_D=24\text{A}$, $V_{GS}=10\text{V}$,	
Q_{gs}	Gate-to-Source Charge	-	40	60	nC	$V_{DS}=V_{DS}$ max x 0.8	
Q_{gd}	Gate-to-Drain ("Miller") Charge	-	125	180	nC		
$t_{d(on)}$	Turn-on Delay Time	IRFK3DC50	-	40	-	ns	$V_{DD}=300\text{V}$, $I_D=15\text{A}$,
		IRFK3FC50	-	45	-	ns	
t_r	Rise Time	IRFK3DC50	-	50	-	ns	$V_{GS}=10\text{V}$,
		IRFK3FC50	-	65	-	ns	
$t_{d(off)}$	Turn-off Delay Time	IRFK3DC50	-	240	-	ns	$R_{SOURCE}=3.3\Omega$
		IRFK3FC50	-	320	-	ns	
t_f	Fall Time	IRFK3DC50	-	50	-	ns	
		IRFK3FC50	-	80	-	ns	
L_{DS}	Drain-to-Source Inductance	-	18	-	nH		
C_{iss}	Input Capacitance	-	7.5	-	nF	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$,	
C_{oss}	Output Capacitance	-	1.2	-	nF	$f=1.0\text{MHz}$	
C_{riss}	Reverse Transfer Capacitance	-	0.5	-	nF		
	Linear Derating Factor	-	-	5	W/K		

Source-Drain Diode Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	-	-	24	A	
I_{SM}	Pulsed Source Current (Body Diode)	-	-	90	A	
V_{SD}	Diode Forward Voltage	-	-	1.4	V	$V_{GS}=0\text{V}$, $I_S=24\text{A}$, $T_C=25^\circ\text{C}$
t_{rr}	Reverse Recovery Time	270	530	1100	ns	$di/dt=400\text{A}/\mu\text{s}$, $T_J=150^\circ\text{C}$
Q_{rr}	Reverse Recovered Charge	6.0	12.0	25.0	μC	$I_S=24\text{A}$

Notes:

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



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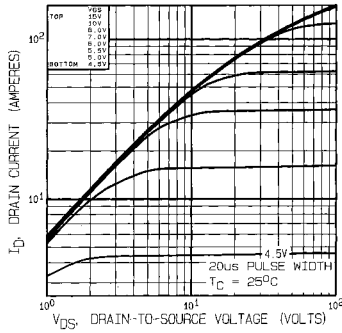


Fig 1. Typical Output Characteristics, $T_C = 25^\circ\text{C}$

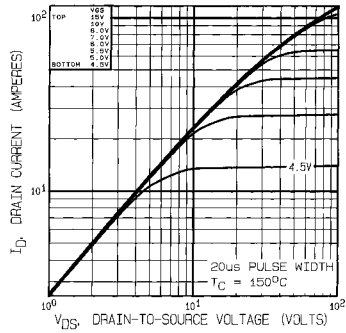


Fig 2. Typical Output Characteristics, $T_C = 150^\circ\text{C}$

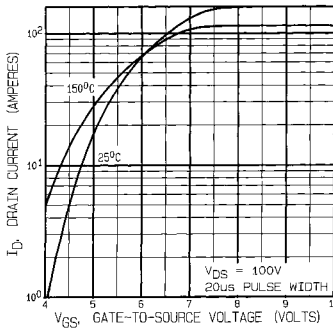


Fig 3. Typical Transfer Characteristics

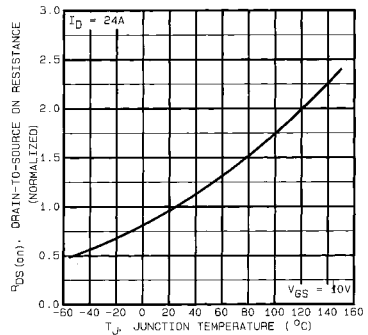


Fig 4. Normalized On-Resistance Vs. Temperature

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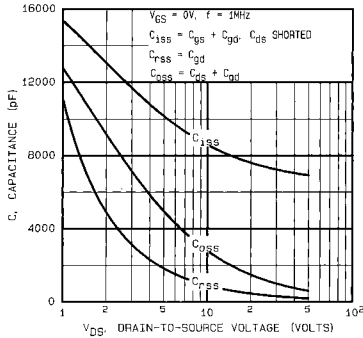


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

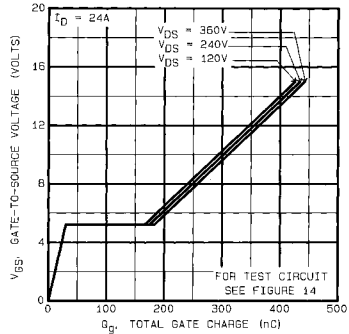


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

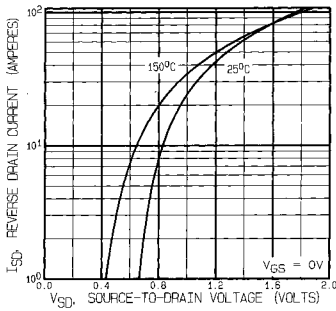


Fig 7. Typical Source-Drain Diode Forward Voltage

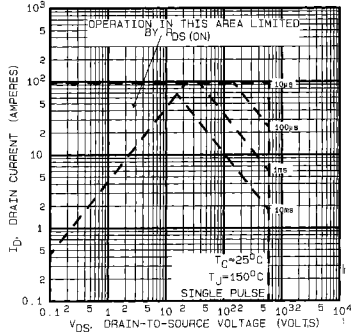


Fig 8. Maximum Safe Operating Area



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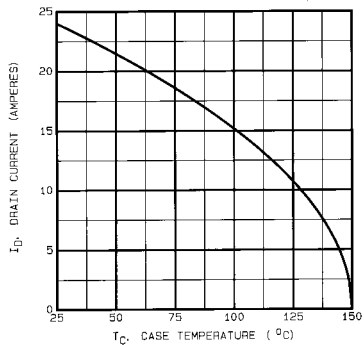


Fig 9. Maximum Drain Current Vs. Case Temperature

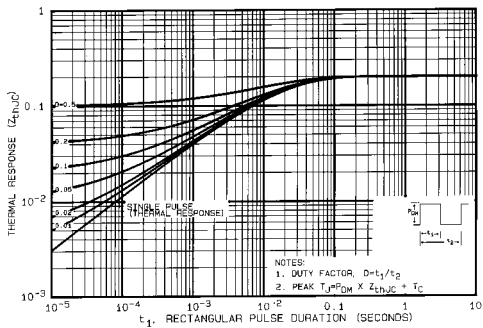


Fig 10. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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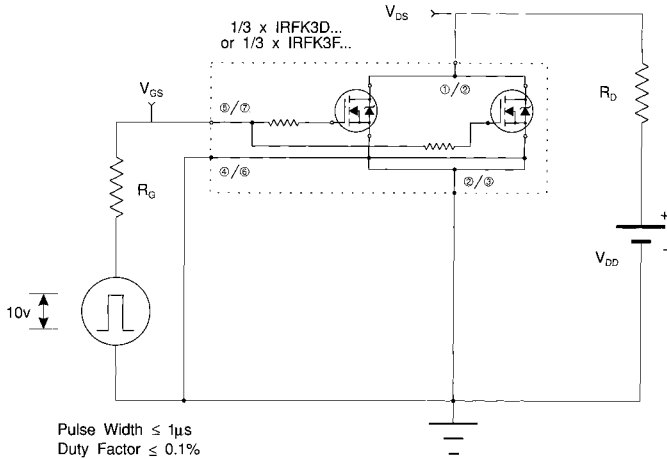


Fig 11a. Switching Time Test Circuit

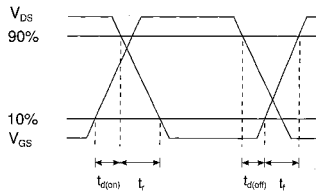
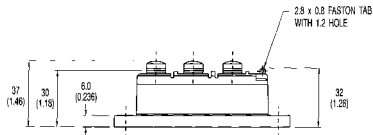
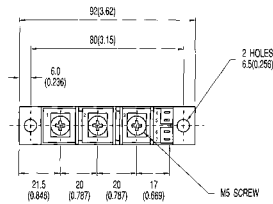
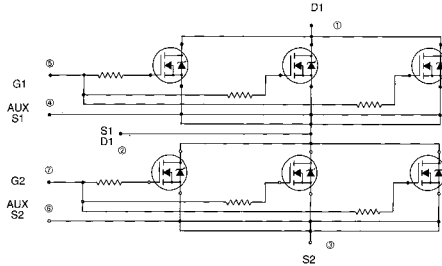


Fig 11b. Switching Time Waveforms



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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 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

WORLD HEADQUARTERS: 233 Kansas St., EL SEGUNDO, California 90245, USA. Tel:(213) 772-2000. Tlx.664464. Fax:(213) 772-9028
EUROPEAN HEADQUARTERS: Hurst Green, OXTED, Surrey RH8 9BB, UK. Tel:(0883) 713215. Tlx.95219. Fax:(0883)714234.

CANADA: 101 Bentley St., Markham, ONTARIO L3R 3J1. Tel:(416)475-1897. Tlx.06-966-650. Fax:(416)475-9801
CZECHOSLOVAKIA: Macurova 19/1565, Box 30, 149 00 PRAGUE. Tel:(2) 792 6831. Fax:(2) 792 6831.

DENMARK: P.O. Box 70, Krogshoejvej 51, DK-2880 BAGSVAERD. Tel: (45) 44 37 71 50. Fax (45) 44 37 71 52.

FRANCE: 123 Rue de Petit Vaux, 91360 EPINAY sur ORGE. Tel:(1)64.54.83.29. Tlx.600943. Fax:(1)64.54.83.30.

FINLAND: Biliskogsvägen 19, 02580 Sundela St. Tel:(0) 262 8144. Fax:(0) 262 8150.

GERMANY: Saalburgerstr. 137, D-6390 BAD HOMBURG. Tel:(6)172 37056. Tlx.410404. Fax:(6)172 37065.

HUNGARY: Szent Istvan Park 15, H-1137 BUDAPEST. Tel:(1) 1298 822. Fax:(1) 1298 822.

HONG KONG: 202 Peter Building, 60 Queens Road Central, HONG KONG. Tel:(85) 252 36355. Fax: (85) 284 52908.

ITALY: Via Liguria 49, 10071 Borgaro, TORINO. Tel:(0)11470 14 84. Tlx.221257. Fax:(0)11470 42 90.

Via Zucca 3, 20017 Rho MILANO. Tel:(02)93 50 36 50. Fax:(02)93 50 36 55.

Via Arno 1, 40139 BOLOGNA. Tel:(05)149 33 07. Fax:(05)149 54 80.

INDIA: 31 Greenacre, 5 Union Park, Khar (W), BOMBAY 400 052. Tel:(022)335026/533779/540242. Tlx:011-71481.

JAPAN: K & H Bldg. 2F, 3-30-4 Nishi-kebukuro, Toshima-ku, TOKYO, Japan 171. Tel:(03)983 0641. Fax:(03)983 0642.

SINGAPORE: HEX 10-01 Fortune Centre, 190 Middle Road, SINGAPORE 0718. Tel:(65)336 3822/337 4695/336 6286. Fax: (65)337 4692.

SWEDEN: Box 86, S-162 12 Vallingby 1, STOCKHOLM. Tel:(08)870355. Fax:(08)874242.

SWITZERLAND: CH-8032 ZURICH, Kirchenweg 5. Tel:(0)1286 8702/8668. Fax:(0)1383 5108/2379.

U.S.A.:

Central Zone: 2401 Plum Grove Road, Suite 111, PALATINE, IL60067. Tel:(312)397-2002. Fax:(312)397-0114.

Eastern Zone: 71 Grand Avenue, PALMBADES PARK, NJ07850. Tel:(953)943-4554. Fax:(201)943-5754.

Southern Zone: 800 Office Plaza Blvd., Suite 401, KISSIMMEE, FL32743. Tel:(407)833-2383. Fax:(407)933-2293.

Western Zone: 222 Kansas Street, EL SEGUNDO, CA90245. Tel:(213)607-8886. Fax:(213)640-6533.

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