Bulletin E2798

International Rectifier IRFK3D250,IRFK3F250

Isolated Base Power HEX-pak™ Assembly - Half Bridge Configuration

- High Current Capability.
- UL recognised E78996.
- Electrically Isolated Base Plate.
- Easy Assembly into Equipment.

V_{DS} = 200V

$R_{DS(on)}$ = 30mΩ

I_D = 70A

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.

Absolute Maximum Rating

	Parameter	Max.	Units
I_D @ T_C=25°C	Continuous Drain Current	70	A
I_D @ T_C=100°C	Continuous Drain Current	41	A
I_{DM}	Pulse Drain Current	280	A ①
P_D @ T_C=25°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	°C
T_{STG}	Storage Temperature Range	-40 to 150	°C

Thermal and Mechanical Specifications

	Parameter	Min.	Typ.	Max.	Units
R_{thJC}	Junction-to-Case	-	-	0.20	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.

IRFK3D250,IRFK3F250

Electrical Characteristics @ T_J = 25°C (Unless otherwise specified)

	Parameter		Min.	Typ.	Max.	Units	Test Conditions
B_{VDSS}	Drain-to-Source Breakdown voltage		200	-	-	V	V_{GS}=0V, I_D=1.0mA
$R_{DS(on)}$	Static Drain-to-Source On-State Resistance		-	24	30	mΩ	V_{GS}=10V, I_D=41A
$I_{D(on)}$	On-State Drain Current		70	-	-	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		36	54	-	S	V_{DS} > 50V, I_D=41A
I_{DSS}	Zero Gate Voltage Drain Current		-	-	0.75	mA	$V_{DS}=V_{DS}$max, V_{GS}=0v
			-	-	3.0	mA	V_{GS}=10V, T_C=125°C, $V_{DS}=V_{DS}$max x 0.8
I_{GSS}	Gate-to-Source Leakage Forward		-	-	300	nA	V_{GS}=20V
I_{GSS}	Gate-to-Source Leakage Reverse		-	-	-300	nA	V_{GS}=-20V
Q_g	Total Gate Charge		-	260	390	nC	I_D=70A, V_{GS}=10V,
Q_{gs}	Gate-to-Source Charge		-	48	72	nC	$V_{DS}=V_{DS}$max x 0.8
Q_{gd}	Gate-to-Drain ("Miller") Charge		-	138	210	nC	
$t_{d(on)}$	Turn-on Delay Time	IRFK3D250	-	40	-	ns	V_{DD}=95V, I_D=41A,
		IRFK3F250	-	45	-	ns	
t_r	Rise Time	IRFK3D250	-	100	-	ns	V_{GS}=10V,
		IRFK3F250	-	125	-	ns	
$t_{d(off)}$	Turn-off Delay Time	IRFK3D250	-	160	-	ns	R_{SOURCE}=3.3Ω
		IRFK3F250	-	210	-	ns	
t_f	Fall Time	IRFK3D250	-	50	-	ns	
		IRFK3F250	-	80	-	ns	
L_{DS}	Drain-to-Source Inductance		-	18	-	nH	
C_{iss}	Input Capacitance		-	9.0	-	nF	V_{GS}=0V, V_{DS}=25V,
C_{oss}	Output Capacitance		-	2.5	-	nF	f=1.0MHz
C_{rss}	Reverse Transfer Capacitance		-	0.7	-	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)	-	-	70	A	
I_{SM}	Pulsed Source Current (Body Diode)	-	-	245	A	
V_{SD}	Diode Forward Voltage	-	-	2.0	V	V_{GS}=0V, I_S= 70A, T_C=25°C
t_{rr}	Reverse Recovery Time	9160	320	640	ns	di/dt=400A/µs, T_J=150°C
Q_{rr}	Reverse Recovered Charge	6.6	13.0	26.0	µC	I_S=70A

Notes:

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

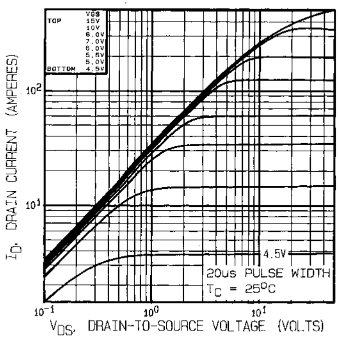


Fig 1. Typical Output Characteristics, T_C=25°C

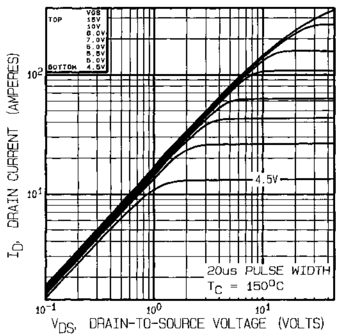


Fig 2. Typical Output Characteristics, T_C=150°C

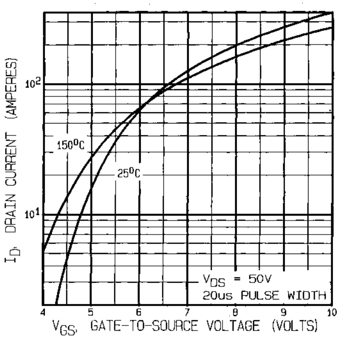


Fig 3. Typical Transfer Characteristics

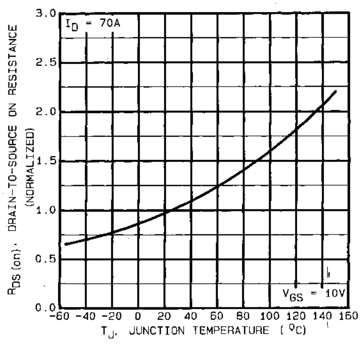


Fig 4. Normalized On-Resistance Vs. Temperature

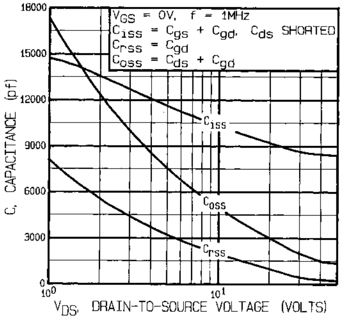


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

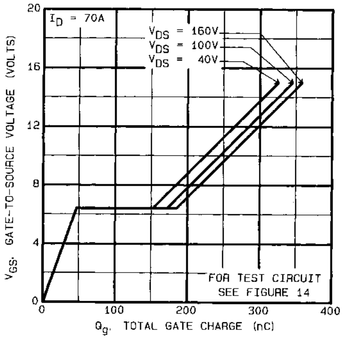


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

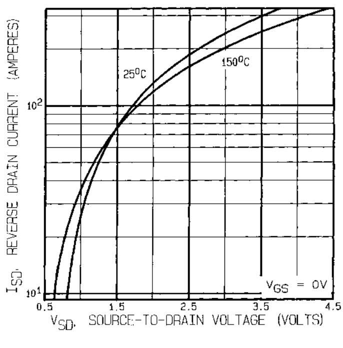


Fig 7. Typical Source-Drain Diode Forward Voltage

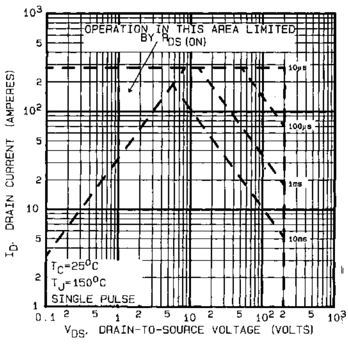


Fig 8. Maximum Safe Operating Area

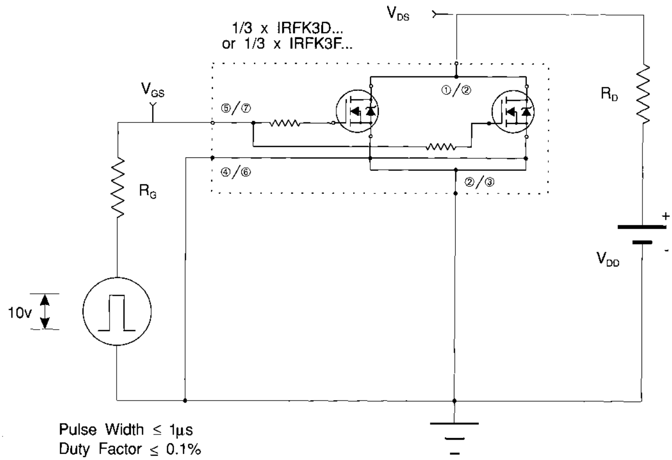


Fig 11a. Switching Time Test Circuit

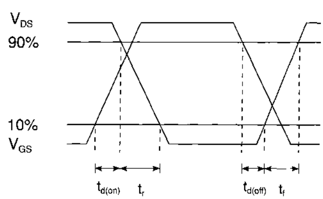


Fig 11b. Switching Time Waveforms

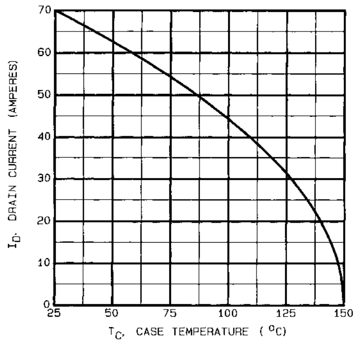


Fig 9. Maximum Drain Current Vs. Case Temperature

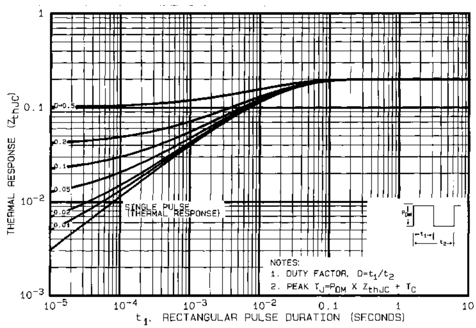
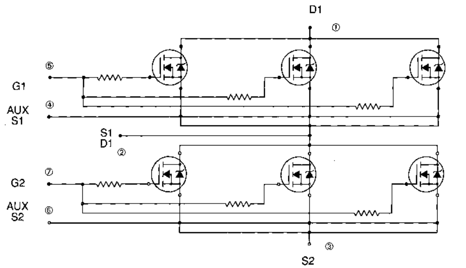
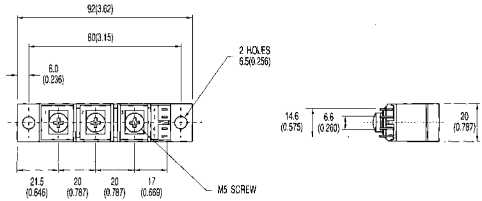
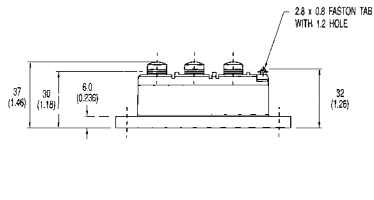


Fig 10. Maximum Effective Transient Thermal Impedance, Junction-to-Case

Circuit Configuration and Outline





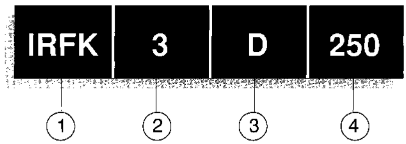


NOTE:
DEVICE IS SUPPLIED WITH
AUXILARY LEADS 200(7.87) LONG

All dimensions in millimetres (inches)

IRFK3D250,IRFK3F250

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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MJW/1/92