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Bulletin E2797

International
IOR Rectifier

IRFK3D150,IRFK3F150

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.

$$\begin{aligned}V_{DS} &= 100V \\ R_{DS(on)} &= 20m\Omega \\ I_D &= 125A\end{aligned}$$

Absolute Maximum Rating

	Parameter	Max.	Units
I_D @ $T_C=25^\circ\text{C}$	Continuous Drain Current	125	A
I_D @ $T_C=100^\circ\text{C}$	Continuous Drain Current	55	A
I_{DM}	Pulse Drain Current	435	A ①
P_D @ $T_C=25^\circ\text{C}$	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	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-40 to 150	$^\circ\text{C}$

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 ④
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	100	-	-	V	$V_{GS}=0V, I_D=1.0mA$
$R_{DS(on)}$	Static Drain-to-Source On-State Resistance	-	16	20	m Ω	$V_{GS}=10V, I_D=45A$
$I_{D(on)}$	On-State Drain Current	125	-	-	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 ④	39	60	-	S	$V_{DS} > 50V, I_D=55A$
I_{DSS}	Zero Gate Voltage Drain Current	-	-	0.75	mA	$V_{DS}=V_{DS} \text{ max.}, V_{GS}=0V$
		-	-	3.0	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	-	-	300	nA	$V_{GS}=20V$
I_{GSS}	Gate-to-Source Leakage Reverse	-	-	-300	nA	$V_{GS}=-20V$
Q_g	Total Gate Charge	-	250	390	nC	$I_D=125A, V_{GS}=10V,$
Q_{gs}	Gate-to-Source Charge	-	50	80	nC	$V_{DS}=V_{DS} \text{ max} \times 0.8$
Q_{gd}	Gate-to-Drain ("Miller") Charge	-	132	195	nC	
$t_{d(on)}$	Turn-on Delay Time	IRFK3D150	-	65	ns	$V_{DD}=40V, I_D=55A,$ $V_{GS}=10V,$
		IRFK3F150	-	75	ns	
t_r	Rise Time	IRFK3D150	-	160	ns	$R_{SOURCE}=3.3\Omega$
		IRFK3F150	-	200	ns	
$t_{d(off)}$	Turn-off Delay Time	IRFK3D150	-	190	ns	$R_{SOURCE}=3.3\Omega$
		IRFK3F150	-	250	ns	
t_f	Fall Time	IRFK3D150	-	60	ns	$R_{SOURCE}=3.3\Omega$
		IRFK3F150	-	100	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	-	3.0	-	nF	$f=1.0MHz$
C_{rss}	Reverse Transfer Capacitance	-	0.8	-	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)	-	-	125	A	
I_{SM}	Pulsed Source Current (Body Diode)	-	-	435	A	
V_{SD}	Diode Forward Voltage	-	-	2.5	V	$V_{GS}=0V, I_S=125A, T_C=25^\circ\text{C}$
t_{rr}	Reverse Recovery Time	100	210	420	ns	$di/dt=400A/\mu s, T_J=150^\circ\text{C}$
Q_{rr}	Reverse Recovered Charge	3.6	6.9	14.0	μC	$I_S=125A$

Notes:

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

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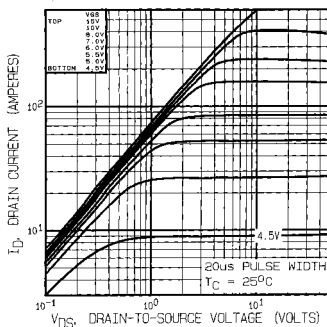


Fig 1. Typical Output Characteristics,
 $T_C=25^\circ\text{C}$

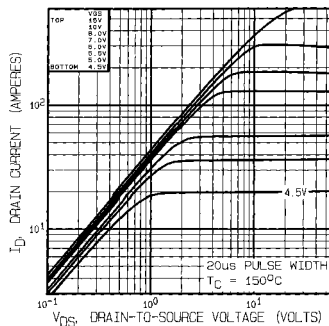


Fig 2. Typical Output Characteristics,
 $T_C=150^\circ\text{C}$

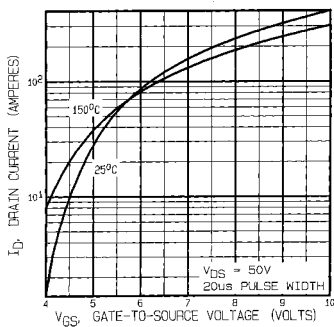


Fig 3. Typical Transfer Characteristics

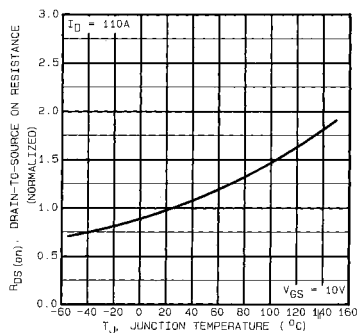
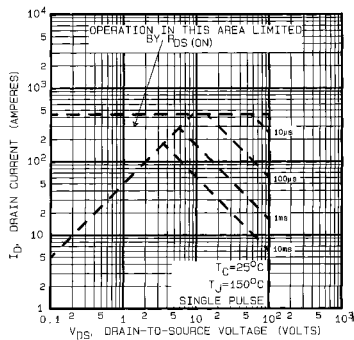
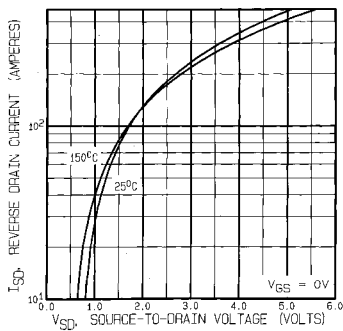
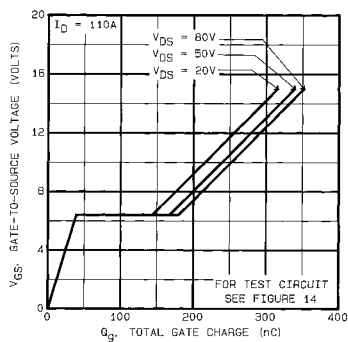
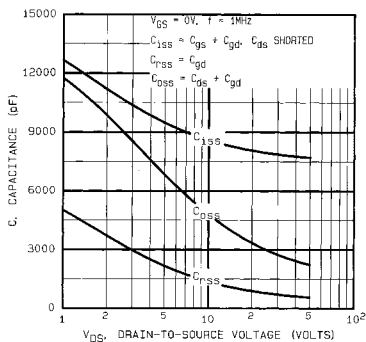


Fig 4. Normalized On-Resistance Vs.
Temperature

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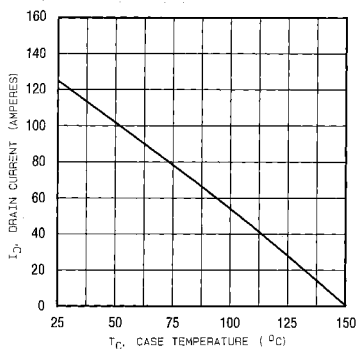


Fig 9. Maximum Drain Current Vs. Case Temperature

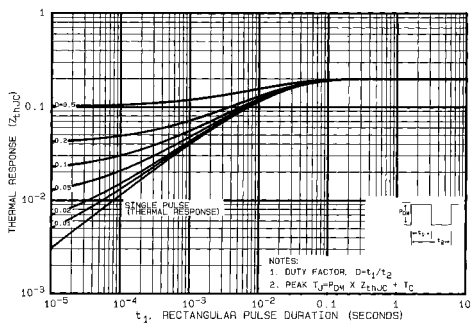


Fig 10. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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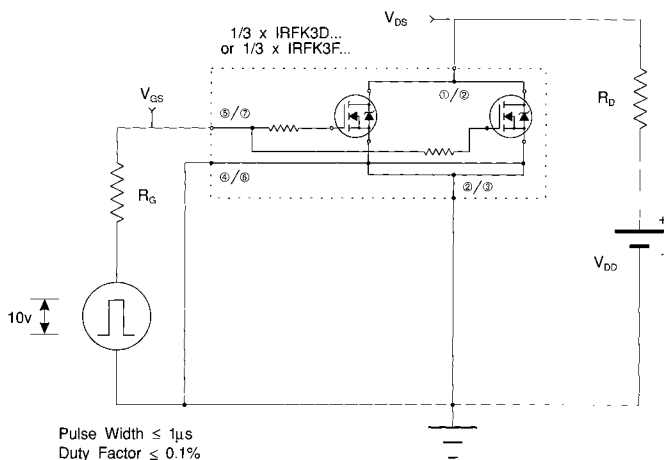


Fig 11a. Switching Time Test Circuit

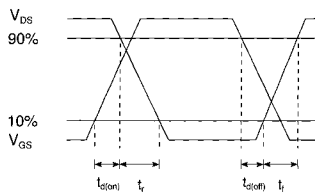
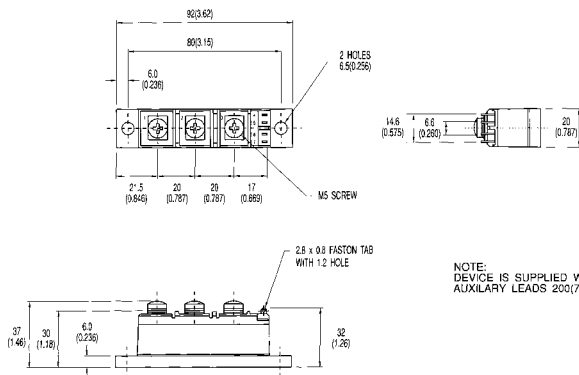
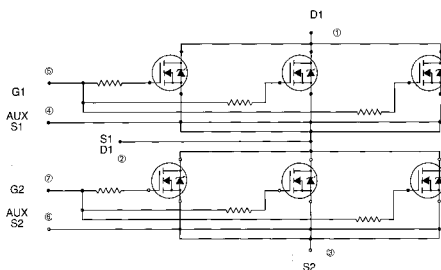


Fig 11b. Switching Time Waveforms



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Circuit Configuration and Outline

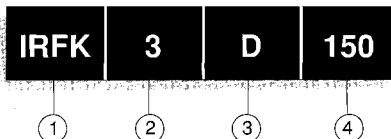


All dimensions in millimetres (inches)

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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

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