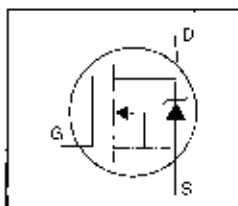


HEXFET® Power MOSFET

IRFR320

IRFU320

- Dynamic dI/dt Rating
- Repetitive Avalanche Rated
- Surface Mount (IRFR320)
- Straight Lead (IRFU320)
- Available in Tape & Reel
- Fast Switching
- Ease of Paralleling



$$V_{DS} = 400V$$

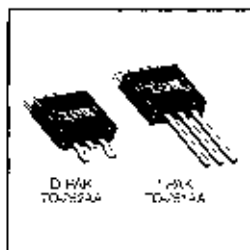
$$R_{DS(on)} = 1.8\Omega$$

$$I_D = 3.1A$$

Description

Third Generation HEXFETs from International Rectifier provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The D-Pak is designed for surface mounting using vapor phase, infrared, or wave soldering techniques. The straight lead version (IRFU series) is for through-hole mounting applications. Power dissipation levels up to 1.5 watts are possible in typical surface mount applications.



DATA
SHEETS

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ $T_J = 25^\circ C$	Continuous Drain Current, $V_{GS} \geq 10V$	3.1	A
I_D @ $T_J = 100^\circ C$	Continuous Drain Current, $V_{GS} \geq 10V$	2.0	A
I_{DM}	Pulsed Drain Current, Δt	12	A
P_n @ $T_J = 25^\circ C$	Power Dissipation	42	W
P_D @ $T_J = 25^\circ C$	Power Dissipation (PCB Mount)**	2.5	W
	Linear Derating Factor	0.33	W/°C
	Linear Derating Factor (PCU Mount)**	0.020	W/°C
V_{GS}	Gate-to-Source Voltage	+20	V
E_{AS}	Single Pulse Avalanche Energy Δt	160	mJ
I_{AS}	Avalanche Current, Δt	3.1	A
E_{RS}	Repetitive Avalanche Energy Δt	4.2	mJ
dI/dt	Peak Diode Recovery dI/dt at	4.0	W/A
T_J, T_{stg}	Junction and Storage Temperature Range	-55 to +150	°C
	Soldering Temperature, for 10 seconds	260 (1.8mm from base)	°C

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
R_{JC}	Junction-to-Case	—	—	9.3	°C/W
R_{JA}	Junction-to-Ambient (PCB mount)**	—	—	50	°C/W
R_{JA}	Junction-to-Ambient	—	—	110	°C/W

** When mounted on 1" square PCB (FR-4 or G-10 Material).

For recommended footprint and soldering techniques refer to application note #AN-994.

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

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$V_{DS(BR)}$	Drain-to-Source Breakdown Voltage	400			V	$V_{GS}=0V$, $I_S=25\mu A$
$\Delta V_{DS(BR)}/\Delta T_J$	Breakdown Voltage Temp. Coefficient		0.51		mV/°C	Reference to 25°C , $I_D=1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	1.8	Ω	$V_{GS}=10V$, $I_D=1.9A$ ①
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	$V_{DS}=V_{GS}$, $I_D=250\mu A$
g_m	Forward Transconductance	—	—	1.7	S	$V_{DS}=50V$, $I_D=1.9A$ ②
I_{SS}	Drain-to-Source Leakage Current	—	—	25	μA	$V_{DS}=600V$, $V_{GS}=0V$
		—	—	250		$V_{DS}=320V$, $V_{GS}=0V$, $T_J=125^\circ\text{C}$
I_{SS}	Gate-to-Source Forward Leakage	—	—	100	μA	$V_{GS}=50V$
	Gate-to-Source Reverse Leakage	—	—	<100		$V_{GS}=-20V$
Q_g	Total Gate Charge	—	—	20	nC	$I_D=3.3A$
Q_{gs}	Gate-to-Source Charge	—	—	3.3		$V_{DS}=320V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	11		$V_{GS}=10V$ See Fig. 6 and 13 ③
$t_{d(on)}$	Turn-On Delay Time	—	10	—	ns	$V_{DS}=200V$
t_r	Rise Time	—	14	—		$I_D=3.3A$
$t_{d(off)}$	Turn-Off Delay Time	—	30	—		$R_{\theta JA}=18\Omega$
t_f	Fall Time	—	13	—		$R_{\theta JA}=56\Omega$ See Figure 10 ④
L_i	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6 mm (0.25 in.) from package and center of die contact
L_s	Internal Source Inductance	—	7.5	—		
C_{iss}	Input Capacitance	—	350	—	pF	$V_{GS}=0V$
C_{oss}	Output Capacitance	—	120	—		$V_{DS}=25V$
C_{rsw}	Reverse Transfer Capacitance	—	47	—		$f=1.0MHz$ See Figure 5

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	—	—	3.1	A	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{S(av)}$	Pulsed Source Current (Body Diode) ①	—	—	12		
V_{SD}	Diode Forward Voltage	—	—	1.6	V	$T_J=25^\circ\text{C}$, $I_S=3.1A$, $V_{GS}=0V$ ②
t_{rr}	Reverse Recovery Time	—	270	600	ns	$T_J=25^\circ\text{C}$, $I_F=3.3A$
Q_{rr}	Reverse Recovery Charge	—	1.4	3.0	μC	$dI/dt=100A/\mu s$ ③
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L_S & L_D)				

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature (See Figure 11)
- ② $I_{S(av)}=3.1A$, $dI/dt=85A/\mu s$, $V_{GS}=0V$, $R_{DS(on)}$, $T_J=150^\circ\text{C}$
- ③ $V_{DS}=50V$, starting $T_J=25^\circ\text{C}$, $L=29mH$, $R_{\theta JA}=26\Omega$, $I_{AS}=3.1A$ (See Figure 12)
- ④ Pulse width $\leq 500\mu s$; duty cycle $\leq 2\%$.

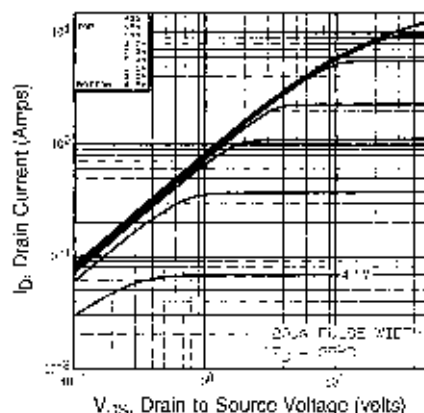


Fig 1. Typical Output Characteristics,
 $T_C=25^\circ\text{C}$

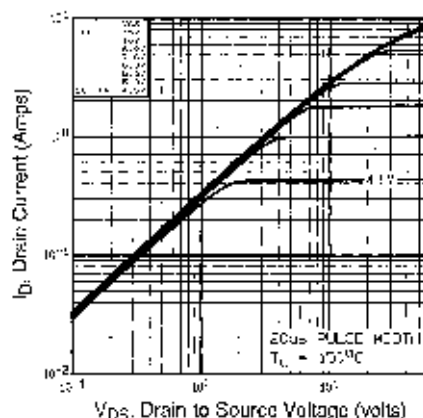


Fig 2. Typical Output Characteristics,
 $T_C=150^\circ\text{C}$

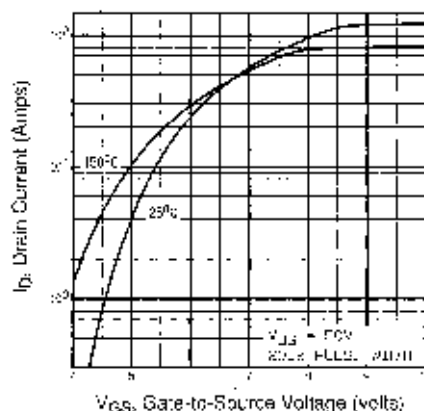


Fig 3. Typical Transfer Characteristics

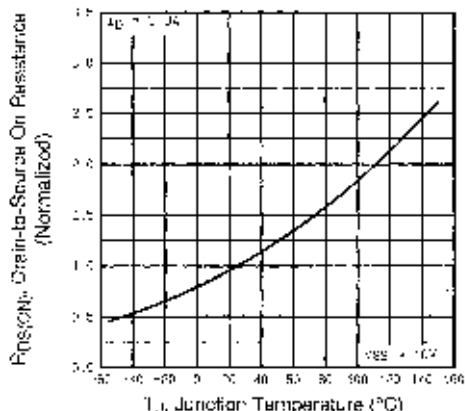


Fig 4. Normalized On-Resistance
Vs. Temperature

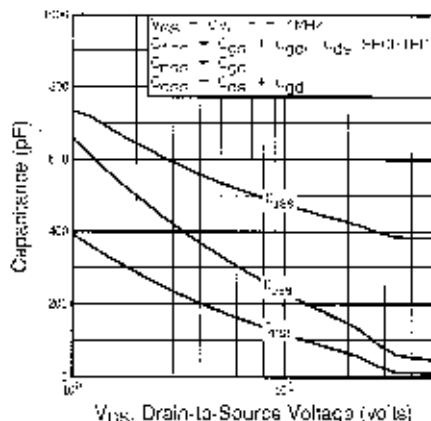


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

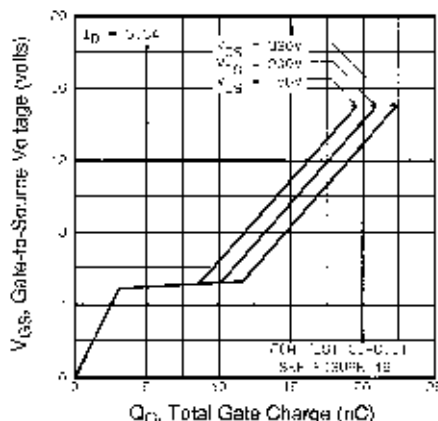


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

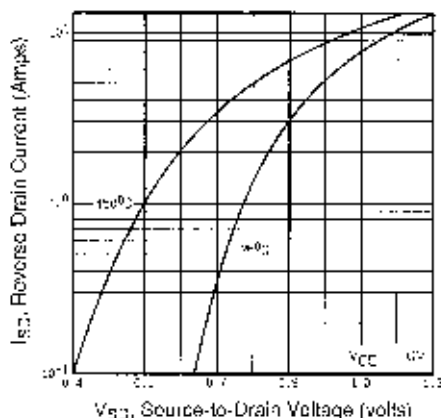


Fig 7. Typical Source-Drain Diode Forward Voltage

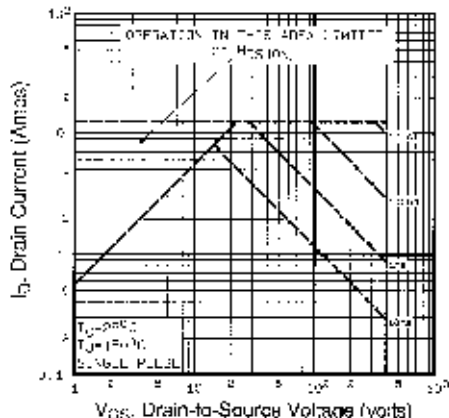


Fig 8. Maximum Safe Operating Area

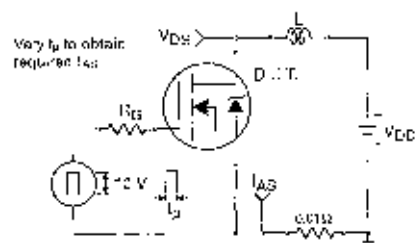


Fig 12a. Unclamped Inductive Test Circuit

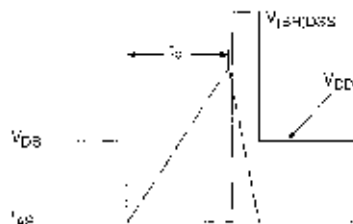


Fig 12b. Unclamped Inductive Waveforms

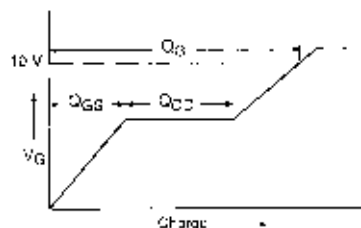


Fig 13a. Basic Gate Charge Waveform

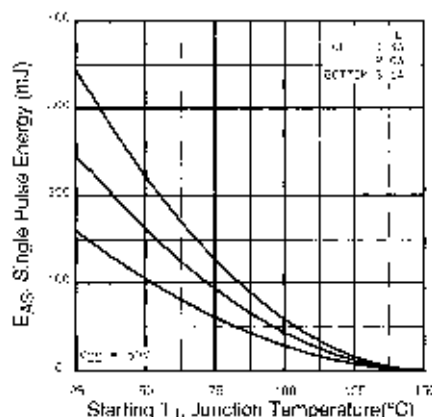


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

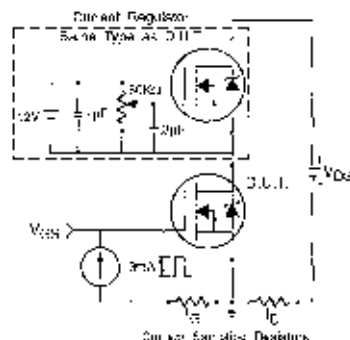


Fig 13b. Gate Charge Test Circuit

Appendix A: Figure 14, Peak Diode Recovery dv/dt Test Circuit – See page 1505

Appendix B: Package Outline Mechanical Drawing – See pages 1512, 1513

Appendix C: Part Marking Information – See page 1518

Appendix D: Tape & Reel Information – See page 1523

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