International IOR Rectifier

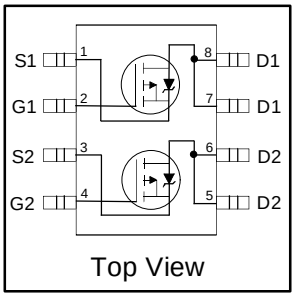
PRELIMINARY

PD - 9.1240B

IRF7304

HEXFET® Power MOSFET

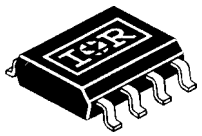
- Generation V Technology
- Ultra Low On-Resistance
- Dual P-Channel Mosfet
- Surface Mount
- Available in Tape & Reel
- Dynamic dv/dt Rating
- Fast Switching



Top View

V_{DSS} = -20V

$R_{DS(on)}$ = 0.090Ω



SO-8

Description

Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve the lowest possible on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design for which HEXFET Power MOSFETs are well known, provides the designer with an extremely efficient device for use in a wide variety of applications.

The SO-8 has been modified through a customized leadframe for enhanced thermal characteristics and multiple-die capability making it ideal in a variety of power applications. With these improvements, multiple devices can be used in an application with dramatically reduced board space. The package is designed for vapor phase, infra-red, or wave soldering techniques. Power dissipation of greater than 0.8W is possible in a typical PCB mount application.

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_A = 25°C	10 Sec. Pulsed Drain Current, V_{GS} @ -4.5V	-4.0	A
I_D @ T_A = 25°C	Continuous Drain Current, V_{GS} @ -4.5V	-3.6	A
I_D @ T_A = 70°C	Continuous Drain Current, V_{GS} @ -4.5V	-2.9	A
I_{DM}	Pulsed Drain Current ①	-14	A
P_D @T_A = 25°C	Power Dissipation (PCB Mount)**	1.4	W
	Linear Derating Factor (PCB Mount)**	0.011	W/°C
V_{GS}	Gate-to-Source Voltage	±8.0	V
dv/dt	Peak Diode Recovery dv/dt ②	-1.2	V/ns
T_J, T_{STG}	Junction and Storage Temperature Range	-55 to + 150	°C

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JA}$	Junction-to-Amb. (PCB Mount, steady state)**	——	——	90	°C/W

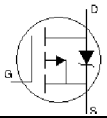
** When mounted on 1" square PCB (FR-4 or G-10 Material).
For recommended footprint and soldering techniques refer to application note #AN-994.

IRF7304

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	-20	—	—	V	V_{GS} = 0V, ID = -250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	-0.012	—	V/°C	Reference to 25°C, I_D = -1mA
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	—	—	0.090	Ω	V_{GS} = -4.5V, I_D = -2.2A ③
		—	—	0.140		V_{GS} = -2.7V, I_D = -1.8A ③
$V_{GS(th)}$	Gate Threshold Voltage	-0.70	—	—	V	V_{DS} = V_{GS}, I_D = -250µA
g_{fs}	Forward Transconductance	4.0	—	—	S	V_{DS} = -16V, I_D = -2.2A
I_{DSS}	Drain-to-Source Leakage Current	—	—	-1.0	µA	V_{DS} = -16V, V_{GS} = 0V
		—	—	-25		V_{DS} = -16V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage	—	—	-100	nA	V_{GS} = -8.0V
	Gate-to-Source Reverse Leakage	—	—	100		V_{GS} = 8.0V
Q_g	Total Gate Charge	—	—	22	nC	I_D = -2.2A
Q_{gs}	Gate-to-Source Charge	—	—	3.3		V_{DS} = -16V
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	9.0		V_{GS} = -4.5V, See Fig. 6 and 12 ③
$t_{d(on)}$	Turn-On Delay Time	—	8.4	—	ns	V_{DD} = -10V
t_r	Rise Time	—	26	—		I_D = -2.2A
$t_{d(off)}$	Turn-Off Delay Time	—	51	—		R_G = 6.0Ω
t_f	Fall Time	—	33	—		R_D = 4.5Ω, See Fig. 10 ③
L_D	Internal Drain Inductance	—	4.0	—	nH	Between lead tip and center of die contact 
L_S	Internal Source Inductance	—	6.0	—		
C_{iss}	Input Capacitance	—	610	—	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	—	310	—		V_{DS} = -15V
C_{rss}	Reverse Transfer Capacitance	—	170	—		f = 1.0MHz, See Fig. 5

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	1.8	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	-14		
V_{SD}	Diode Forward Voltage	—	—	-1.0	V	T_J = 25°C, I_S = -1.8A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	—	56	84	ns	T_J = 25°C, I_F = -2.2A
Q_{rr}	Reverse RecoveryCharge	—	71	110	µC	di/dt = 100A/µs ③
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				

① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)

② I_{SD} ≤ -2.2A, di/dt ≤– 50A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 150°C

③ Pulse width ≤ 300µs; duty cycle ≤ 2%.

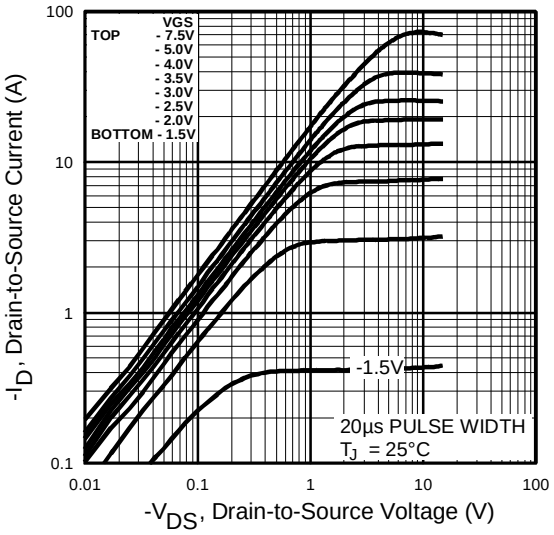


Fig 1. Typical Output Characteristics, $T_J = 25^oC$

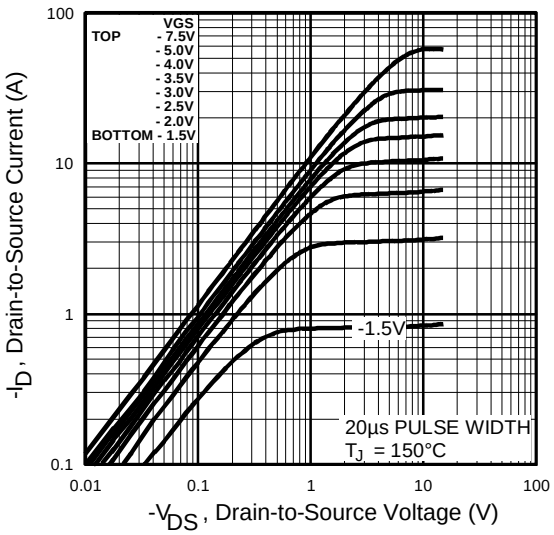


Fig 2. Typical Output Characteristics, $T_J = 150^oC$

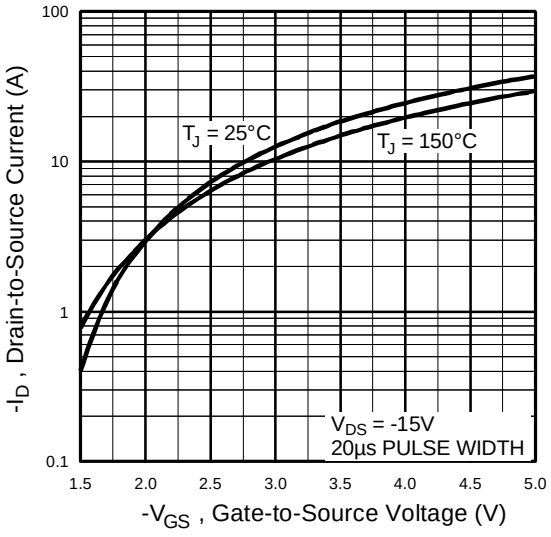


Fig 3. Typical Transfer Characteristics

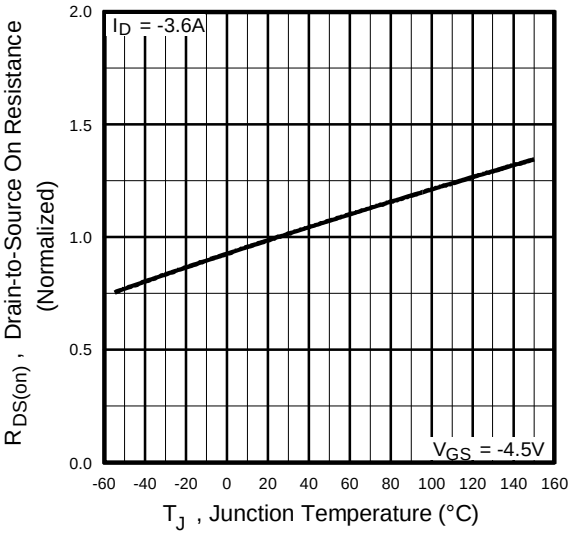


Fig 4. Normalized On-Resistance Vs. Temperature

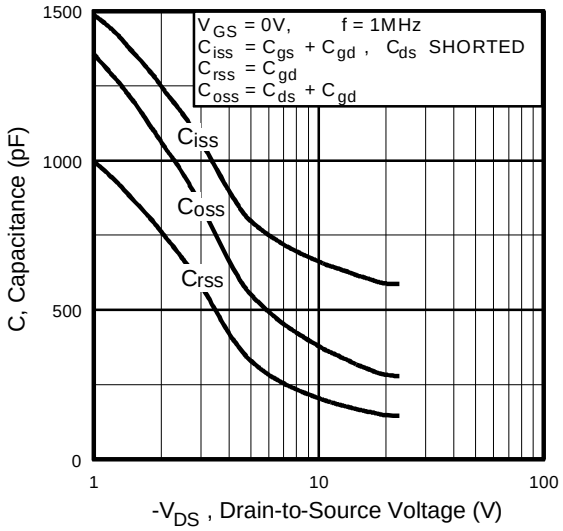


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

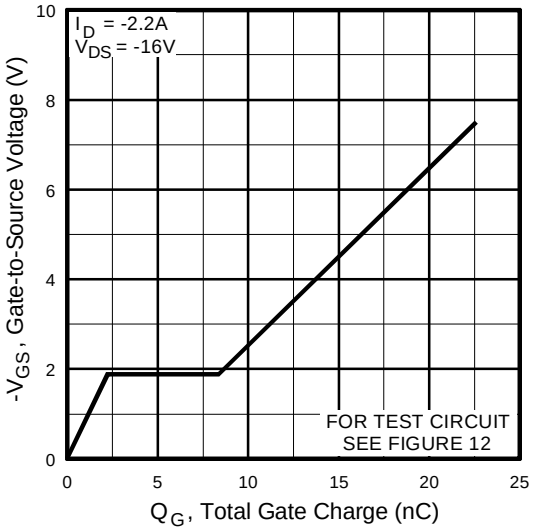


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

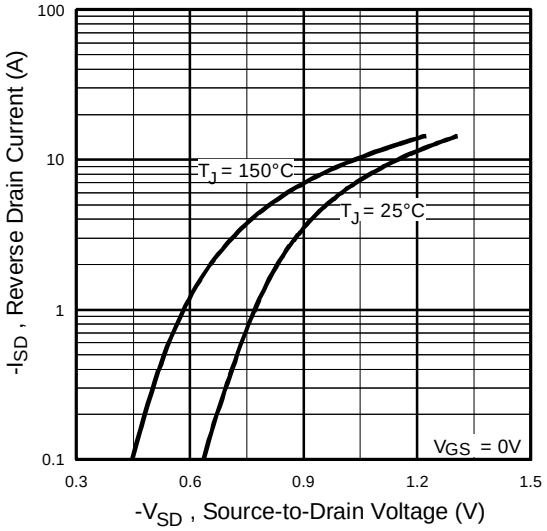


Fig 7. Typical Source-Drain Diode Forward Voltage

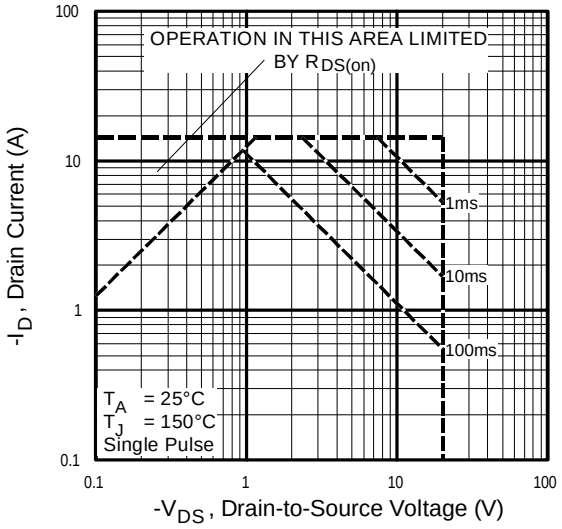


Fig 8. Maximum Safe Operating Area

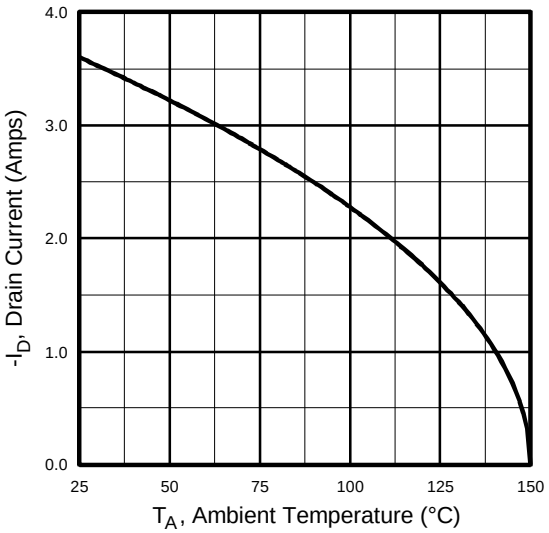


Fig 9. Maximum Drain Current Vs. Ambient Temperature

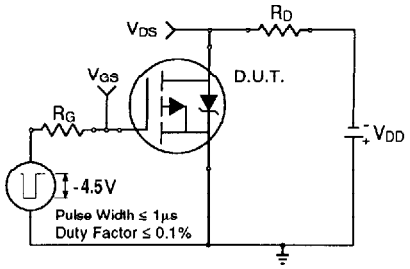


Fig 10a. Switching Time Test Circuit

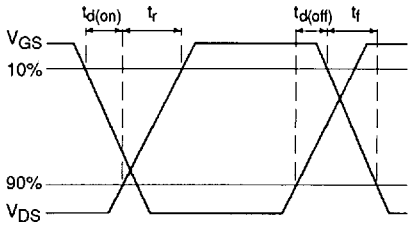


Fig 10b. Switching Time Waveforms

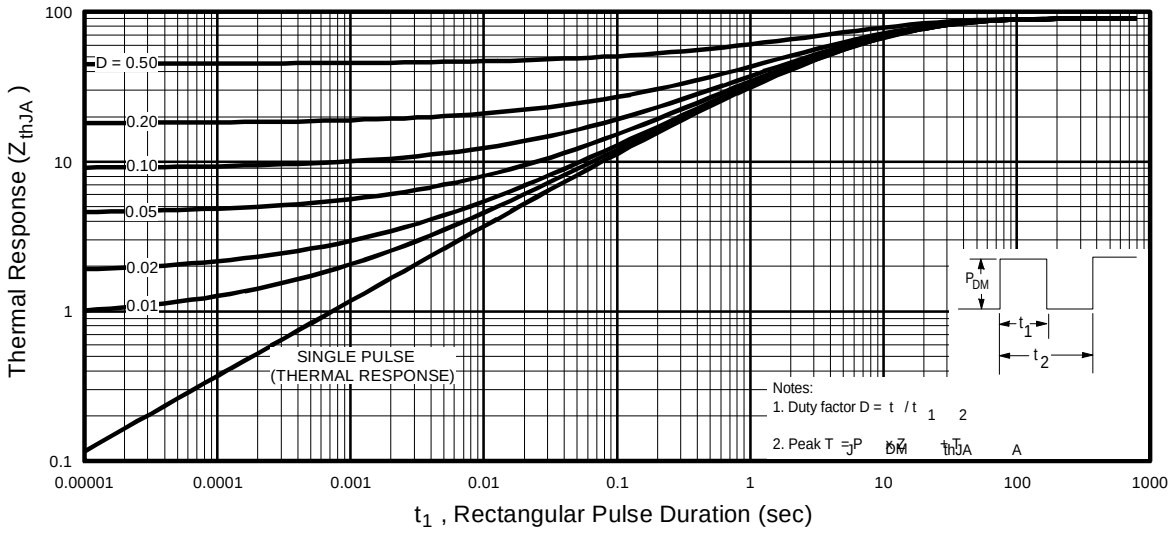


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

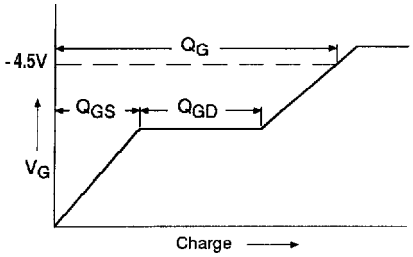


Fig 12a. Basic Gate Charge Waveform

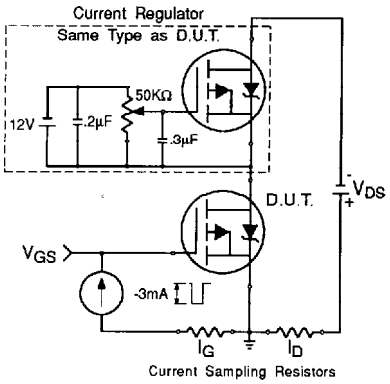


Fig 12b. Gate Charge Test Circuit

Refer to the Appendix Section for the following:

Appendix A: Figure 14, Peak Diode Recovery dv/dt Test Circuit — See page 328.

Appendix B: Package Outline Mechanical Drawing — See page 332.

Appendix C: Part Marking Information — See page 332.

Appendix D: Tape and Reel Information — See page 336.