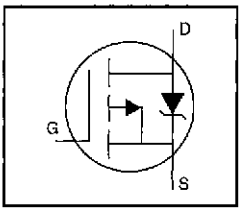
International IOR Rectifier

IRFI9520G

HEXFET® Power MOSFET

- Isolated Package
- High Voltage Isolation= 2.5KVRMS ⑤
- Sink to Lead Creepage Dist.= 4.8mm
- P-Channel
- 175°C Operating Temperature
- Dynamic dv/dt Rating
- Low Thermal Resistance



V_{DSS} = -100V

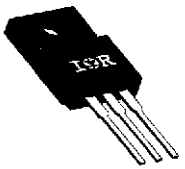
$R_{DS(on)}$ = 0.60Ω

I_D = -5.2A

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 TO-220 Fullpak eliminates the need for additional insulating hardware in commercial-industrial applications. The moulding compound used provides a high isolation capability and a low thermal resistance between the tab and external heatsink. This isolation is equivalent to using a 100 micron mica barrier with standard TO-220 product. The Fullpak is mounted to a heatsink using a single clip or by a single screw fixing.



TO-220 FULLPAK

DATA SHEETS

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ -10 V	-5.2	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ -10 V	-3.6	
I_{DM}	Pulsed Drain Current ①	-21	
P_D @ T_C = 25°C	Power Dissipation	37	W
	Linear Derating Factor	0.24	W/°C
V_{GS}	Gate-to-Source Voltage	±20	V
E_{AS}	Single Pulse Avalanche Energy ②	300	mJ
I_{AR}	Avalanche Current ①	-5.2	A
E_{AR}	Repetitive Avalanche Energy ①	3.7	mJ
dv/dt	Peak Diode Recovery dv/dt ③	-5.5	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +175	°C
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
	Mounting Torque, 6-32 or M3 screw	10 lbf•in (1.1 N•m)	

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	—	4.1	°C/W
$R_{\theta JA}$	Junction-to-Ambient	—	—	65	

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

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	-100	—	—	V	V_{GS}=0V, I_D=-250μA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	-0.10	—	V/°C	Reference to 25°C, I_D=-1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.60	Ω	V_{GS}=-10V, I_D=-3.1A ④
$V_{GS(th)}$	Gate Threshold Voltage	-2.0	—	-4.0	V	V_{DS}=V_{GS}, I_D=-250μA
g_{fs}	Forward Transconductance	1.9	—	—	S	V_{DS}=-50V, I_D=-3.1A ④
I_{DSS}	Drain-to-Source Leakage Current	—	—	-100	μA	V_{DS}=-100V, V_{GS}=0V
		—	—	-500		V_{DS}=-80V, V_{GS}=0V, T_J=150°C
I_{GSS}	Gate-to-Source Forward Leakage	—	—	-100	nA	V_{GS}=-20V
	Gate-to-Source Reverse Leakage	—	—	100		V_{GS}=20V
Q_g	Total Gate Charge	—	—	18	nC	I_D=-6.8A
Q_{gs}	Gate-to-Source Charge	—	—	3.0		V_{DS}=-80V
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	9.0		V_{GS}=-10V See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	9.6	—	ns	V_{DD}=-50V
t_r	Rise Time	—	29	—		I_D=-6.8A
$t_{d(off)}$	Turn-Off Delay Time	—	21	—		R_G=18Ω
t_f	Fall Time	—	25	—		R_D=7.1Ω See Figure 10 ④
L_D	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6 mm (0.25in.) from package and center of die contact
L_S	Internal Source Inductance	—	7.5	—		
C_{iss}	Input Capacitance	—	390	—	pF	V_{GS}=0V
C_{oss}	Output Capacitance	—	170	—		V_{DS}=-25V
C_{rss}	Reverse Transfer Capacitance	—	45	—		f=1.0MHz See Figure 5
C	Drain to Sink Capacitance	—	12	—	pF	f=1.0MHz

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	—	—	-5.2	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	-21		
V_{SD}	Diode Forward Voltage	—	—	-6.3	V	T_J=25°C, I_S=-5.2A, V_{GS}=0V ④
t_{rr}	Reverse Recovery Time	—	100	200	ns	T_J=25°C, I_F=-6.8A
Q_{rr}	Reverse Recovery Charge	—	0.33	0.66	μC	di/dt=100A/μs ④
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 V_{DD}=-25V, starting T_J=25°C, L=16mH R_G=25Ω, I_{AS}=-5.2A (See Figure 12)

③ I_{SD}≤-6.8A, di/dt≤110A/μs, V_{DD}≤$V_{(BR)DSS}$, T_J≤175°C

④ Pulse width ≤ 300 μs; duty cycle ≤2%.

⑤ t=60s, f=60Hz

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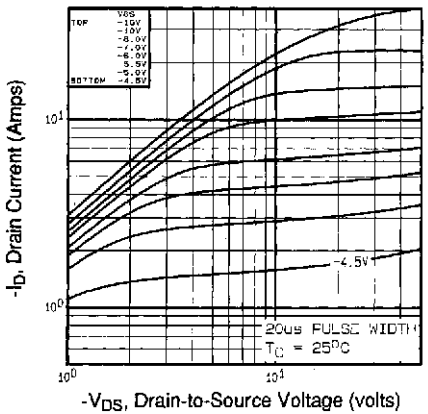

Fig 1. Typical Output Characteristics, T_C=25°C

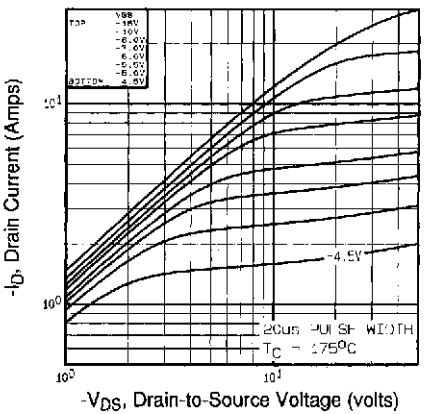

Fig 2. Typical Output Characteristics, T_C=175°C

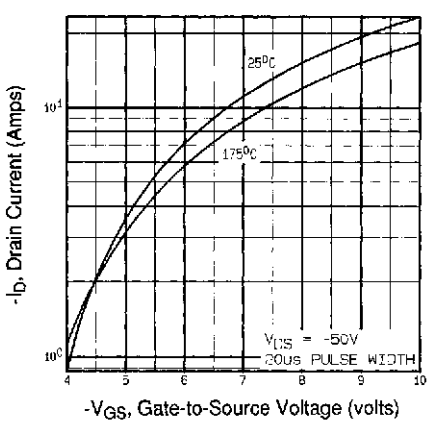

Fig 3. Typical Transfer Characteristics

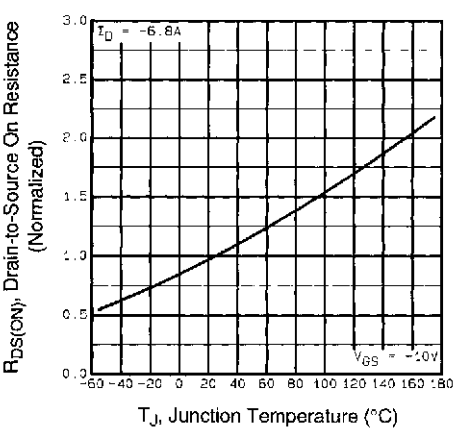

Fig 4. Normalized On-Resistance Vs. Temperature

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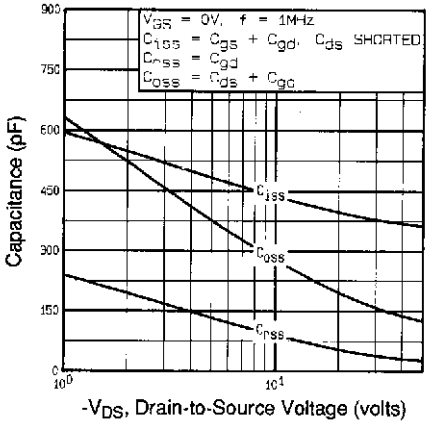

Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

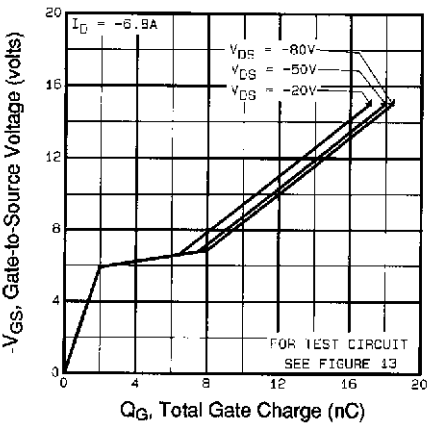

Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

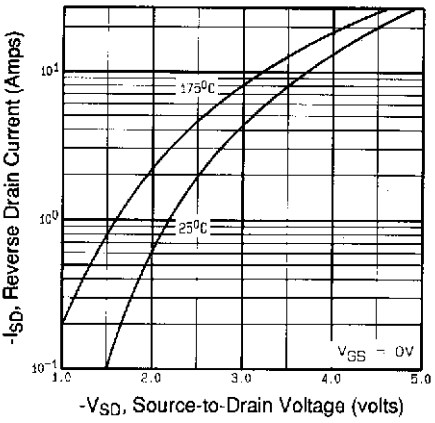

Fig 7. Typical Source-Drain Diode Forward Voltage

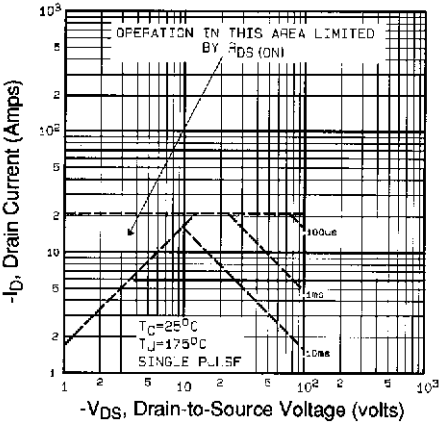

Fig 8. Maximum Safe Operating Area

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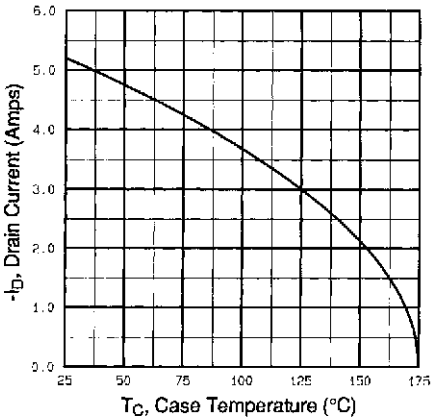

Fig 9. Maximum Drain Current Vs. Case Temperature

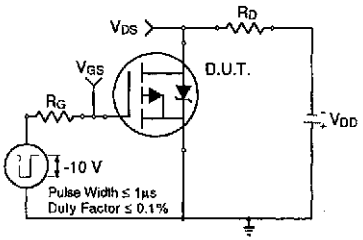

Fig 10a. Switching Time Test Circuit

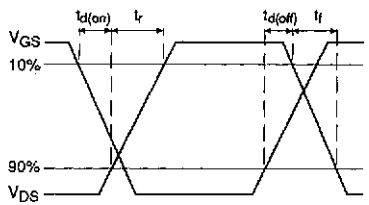

Fig 10b. Switching Time Waveforms

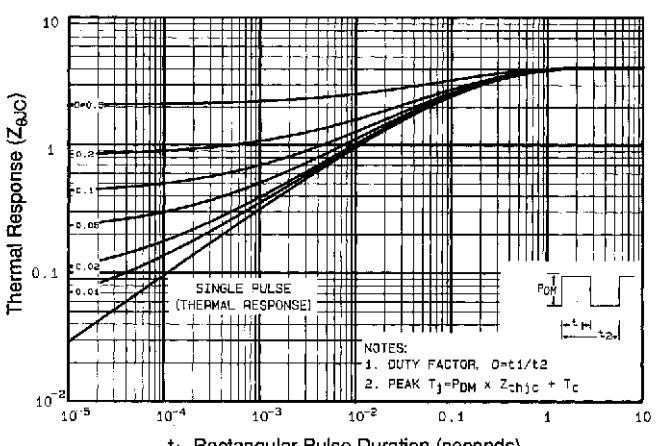

Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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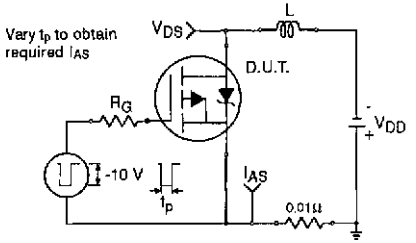

Fig 12a. Unclamped Inductive Test Circuit

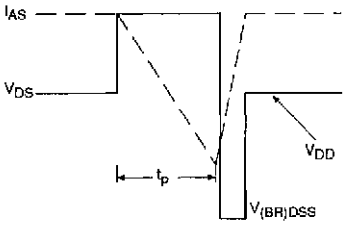

Fig 12b. Unclamped Inductive Waveforms

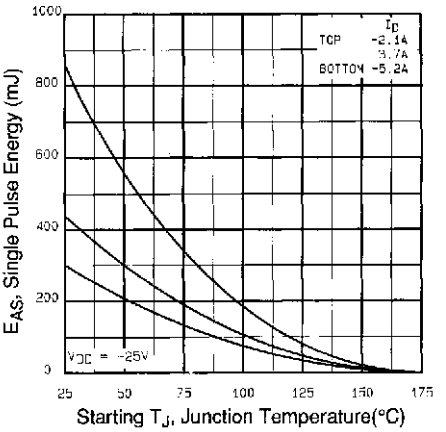

Fig 12c. Maximum Avalanche Energy Vs. Drain Current

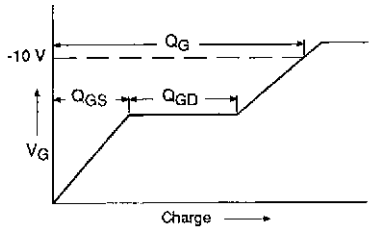

Fig 13a. Basic Gate Charge Waveform

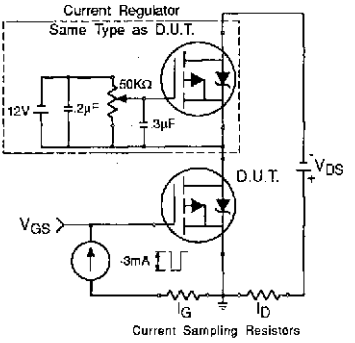

Fig 13b. Gate Charge Test Circuit

Appendix A: Figure 14, Peak Diode Recovery dv/dt Test Circuit – See page 1506

Appendix B: Package Outline Mechanical Drawing – See page 1510

Appendix C: Part Marking Information – See page 1517

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