

IRLI540NPbF

HEXFET® Power MOSFET

- Logic-Level Gate Drive
- Advanced Process Technology
- Isolated Package
- High Voltage Isolation = 2.5KVRMS ⑤
- Sink to Lead Creepage Dist. = 4.8mm
- Fully Avalanche Rated
- Lead-Free

Description

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

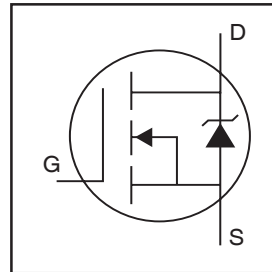
The TO-220 Fullpak eliminates the need for additional insulating hardware in commercial-industrial applications. The moulding compound used provides a high isolation capability and a low thermal resistance between the tab and external heatsink. This isolation is equivalent to using a 100 micron mica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

Absolute Maximum Ratings

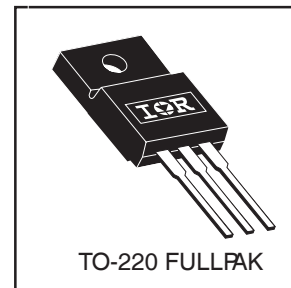
	Parameter	Max.	Units
I_D @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	23	A
I_D @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	16	
I_{DM}	Pulsed Drain Current ①⑥	120	
P_D @ $T_C = 25^\circ\text{C}$	Power Dissipation	54	W
	Linear Derating Factor	0.36	W/°C
V_{GS}	Gate-to-Source Voltage	± 16	V
E_{AS}	Single Pulse Avalanche Energy②⑥	310	mJ
I_{AR}	Avalanche Current①⑥	18	A
E_{AR}	Repetitive Avalanche Energy①	5.4	mJ
dv/dt	Peak Diode Recovery dv/dt ③⑥	5.0	V/ns
T_J	Operating Junction and	-55 to + 175	°C
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
	Mounting torque, 6-32 or M3 screw	10 lbf•in (1.1N•m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	2.8	°C/W
$R_{\theta JA}$	Junction-to-Ambient	—	65	



$V_{DSS} = 100V$
$R_{DS(on)} = 0.044\Omega$
$I_D = 23A$

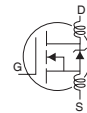


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Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
V _{(BR)DSS}	Drain-to-Source Breakdown Voltage	100	—	—	V	V _{GS} = 0V, I _D = 250μA
ΔV _{(BR)DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	—	0.11	—	V/°C	Reference to 25°C, I _D = 1mA⑥
R _{DS(on)}	Static Drain-to-Source On-Resistance	—	—	0.044	Ω	V _{GS} = 10V, I _D = 12A ④
		—	—	0.053		V _{GS} = 5.0V, I _D = 12A ④
		—	—	0.063		V _{GS} = 4.0V, I _D = 10A ④
V _{GS(th)}	Gate Threshold Voltage	1.0	—	2.0	V	V _{DS} = V _{GS} , I _D = 250μA
g _{fs}	Forward Transconductance	14	—	—	S	V _{DS} = 25V, I _D = 18A⑥
I _{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	V _{DS} = 100V, V _{GS} = 0V
		—	—	250		V _{DS} = 80V, V _{GS} = 0V, T _J = 150°C
I _{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	V _{GS} = 16V
	Gate-to-Source Reverse Leakage	—	—	-100		V _{GS} = -16V
Q _g	Total Gate Charge	—	—	74	nC	I _D = 18A
Q _{gs}	Gate-to-Source Charge	—	—	9.4		V _{DS} = 80V
Q _{gd}	Gate-to-Drain ("Miller") Charge	—	—	38		V _{GS} = 5.0V, See Fig. 6 and 13 ④⑥
t _{d(on)}	Turn-On Delay Time	—	11	—	ns	V _{DD} = 50V
t _r	Rise Time	—	81	—		I _D = 18A
t _{d(off)}	Turn-Off Delay Time	—	39	—		R _G = 5.0Ω, V _{GS} = 5.0V
t _f	Fall Time	—	62	—		R _D = 2.7Ω, See Fig. 10 ④⑥
L _D	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
L _S	Internal Source Inductance	—	7.5	—		
C _{iss}	Input Capacitance	—	1800	—	pF	V _{GS} = 0V
C _{oss}	Output Capacitance	—	350	—		V _{DS} = 25V
C _{rss}	Reverse Transfer Capacitance	—	170	—		f = 1.0MHz, See Fig. 5⑥
C	Drain to Sink Capacitance	—	12	—		f = 1.0MHz



Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	23	A	MOSFET symbol showing the integral reverse p-n junction diode.
I _{SM}	Pulsed Source Current (Body Diode) ①⑥	—	—	120		
V _{SD}	Diode Forward Voltage	—	—	1.3	V	T _J = 25°C, I _S = 18A, V _{GS} = 0V ④
t _{rr}	Reverse Recovery Time	—	190	290	ns	T _J = 25°C, I _F = 18A
Q _{rr}	Reverse Recovery Charge	—	1.1	1.7	μC	di/dt = 100A/μs ④⑥
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 fig. 11)
- ② Starting T_J = 25°C, L = 1.9mH
R_G = 25Ω, I_{AS} = 18A. (See Figure 12)
- ③ I_{SD} ≤ 18A, di/dt ≤ 180A/μs, V_{DD} ≤ V_{(BR)DSS},
T_J ≤ 175°C

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

- ⑤ t=60s, f=60Hz

- ⑥ Uses IRL540N data and test conditions

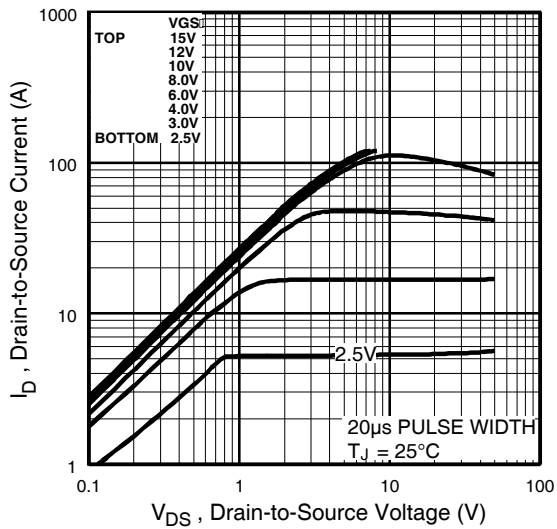


Fig 1. Typical Output Characteristics

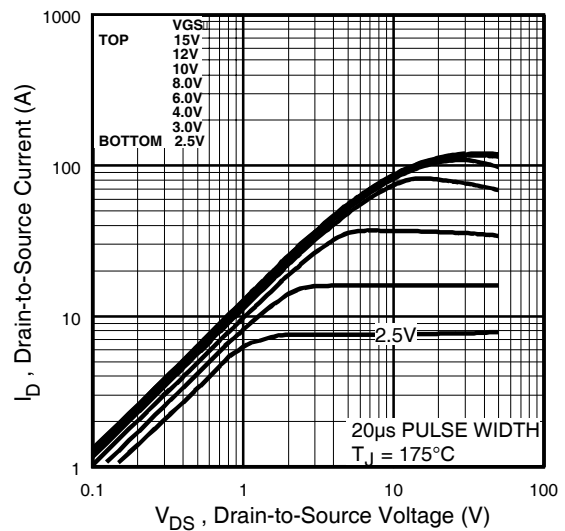


Fig 2. Typical Output Characteristics

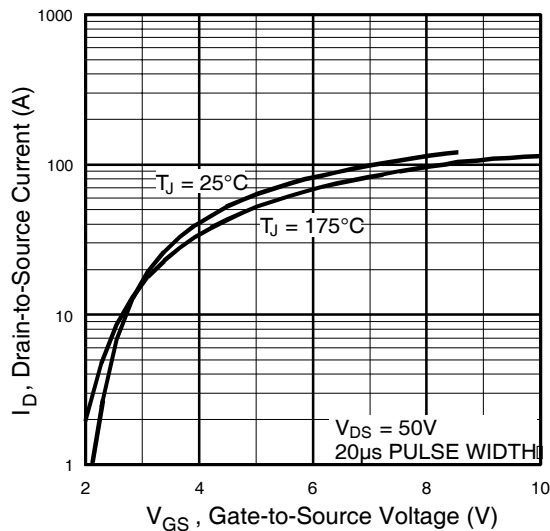


Fig 3. Typical Transfer Characteristics

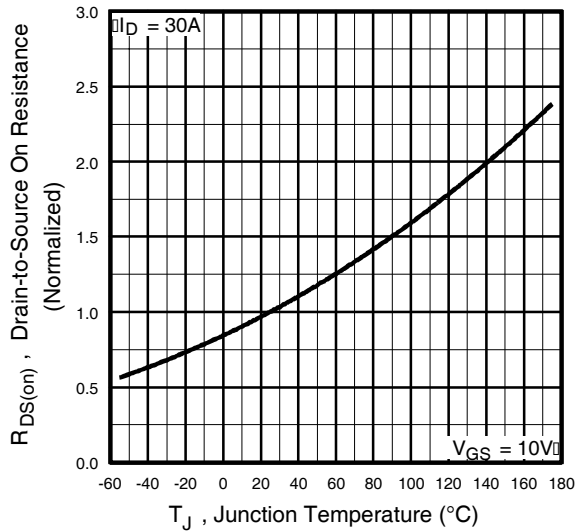


Fig 4. Normalized On-Resistance Vs. Temperature

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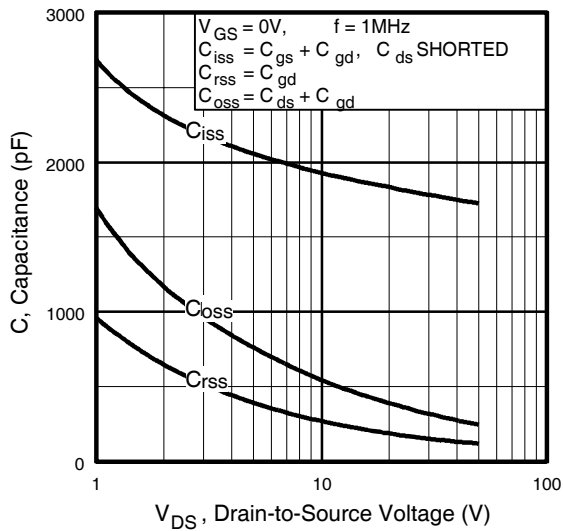


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

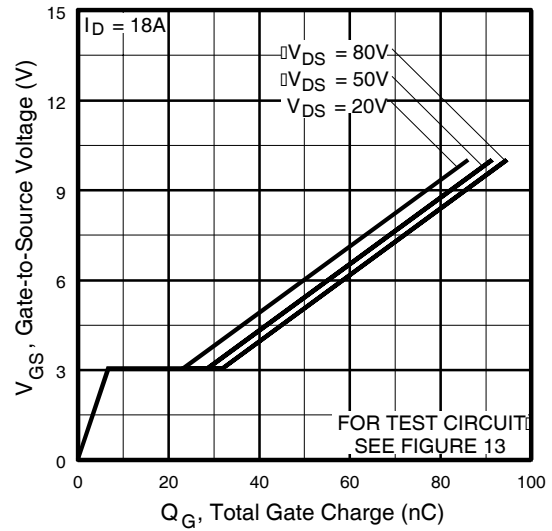


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

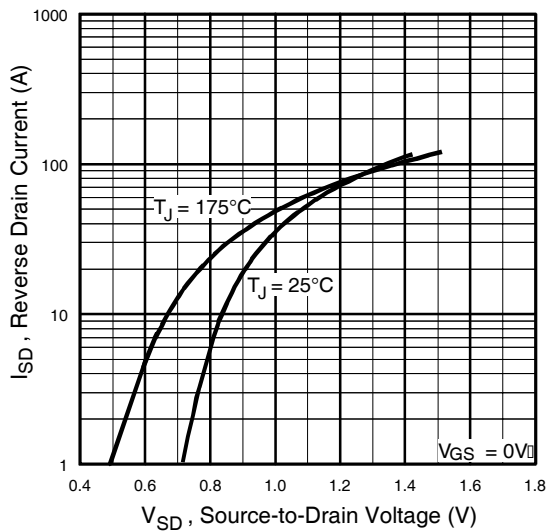


Fig 7. Typical Source-Drain Diode Forward Voltage

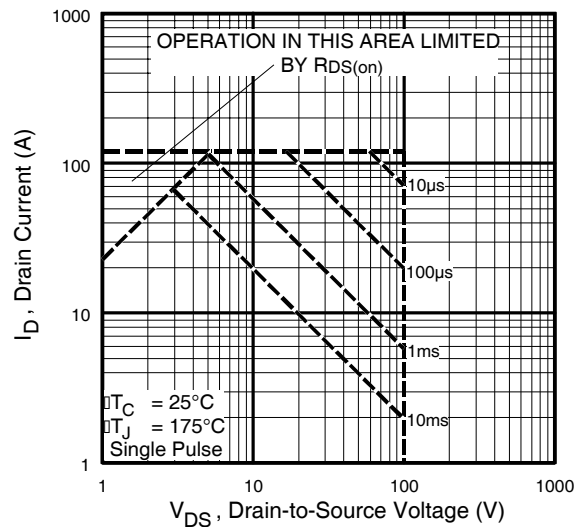


Fig 8. Maximum Safe Operating Area

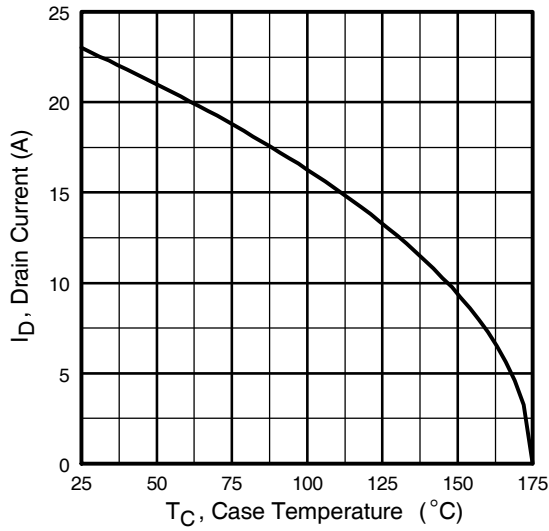


Fig 9. Maximum Drain Current Vs. Case Temperature

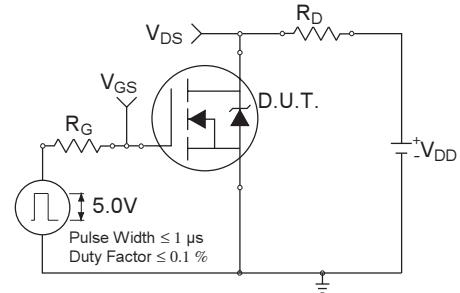


Fig 10a. Switching Time Test Circuit

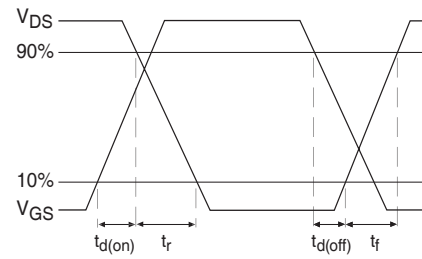


Fig 10b. Switching Time Waveforms

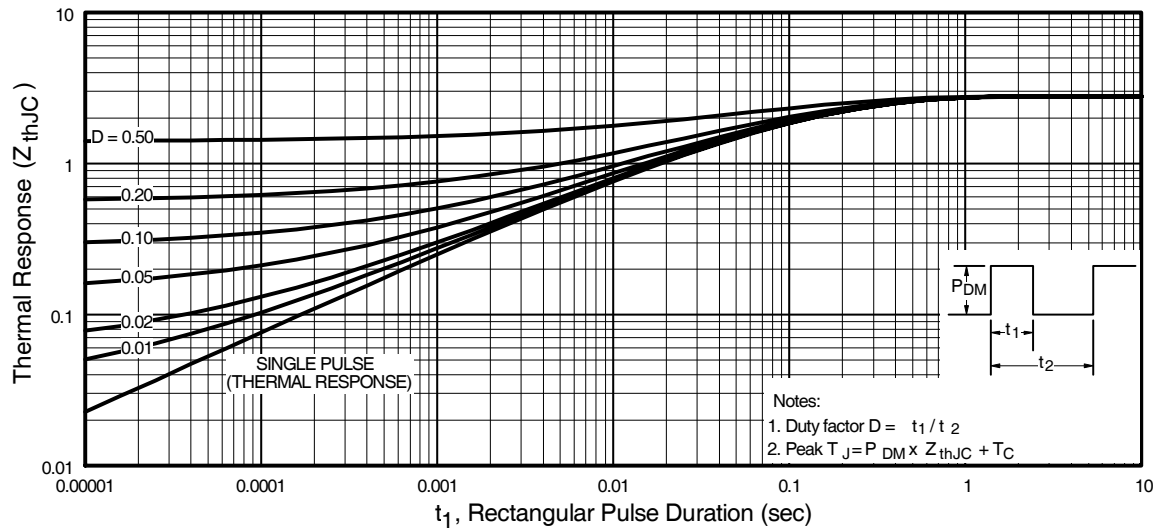


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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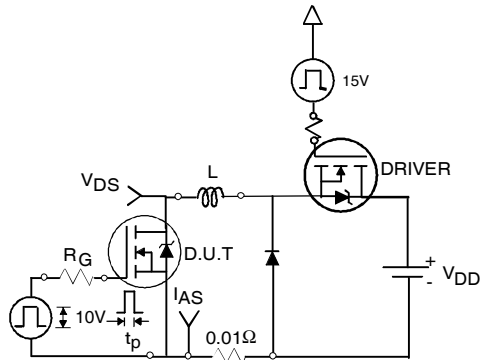


Fig 12a. Unclamped Inductive Test Circuit

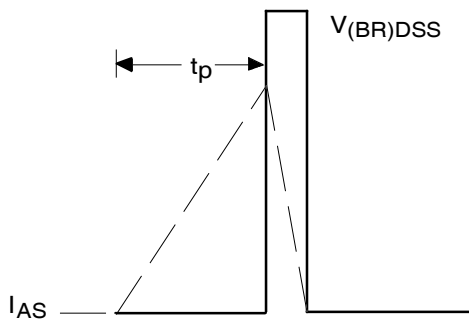


Fig 12b. Unclamped Inductive Waveforms

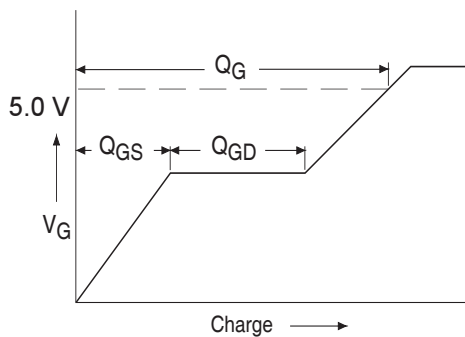


Fig 13a. Basic Gate Charge Waveform

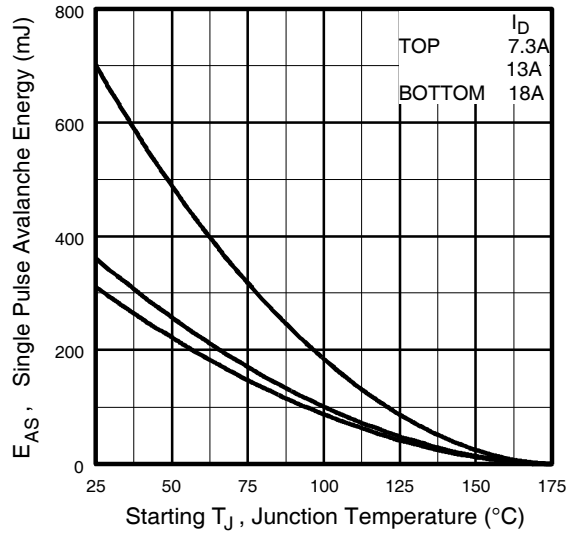


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

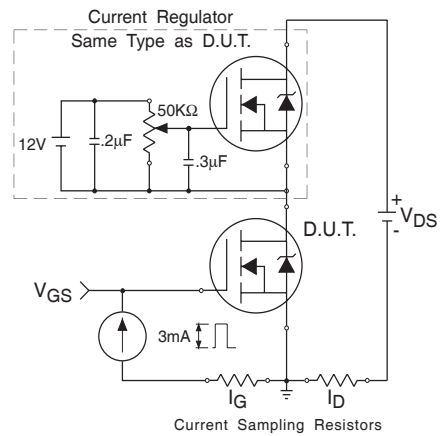


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit

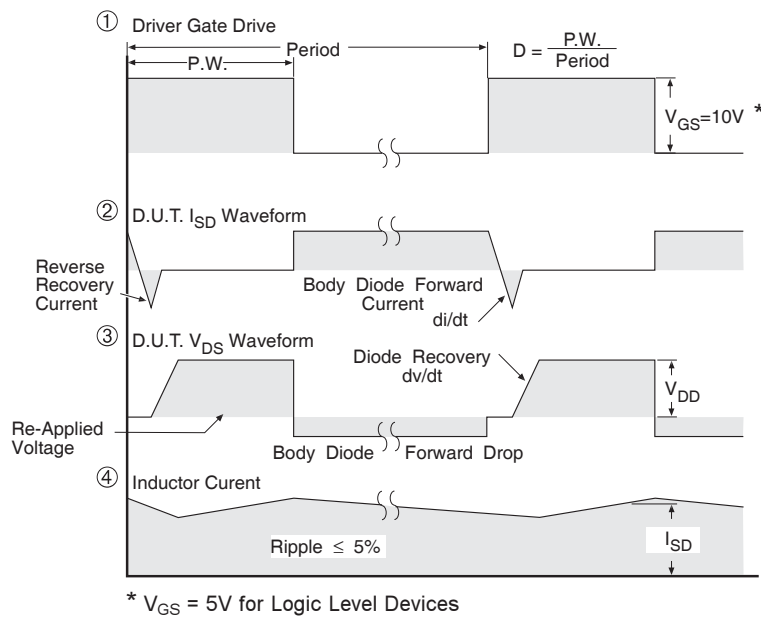
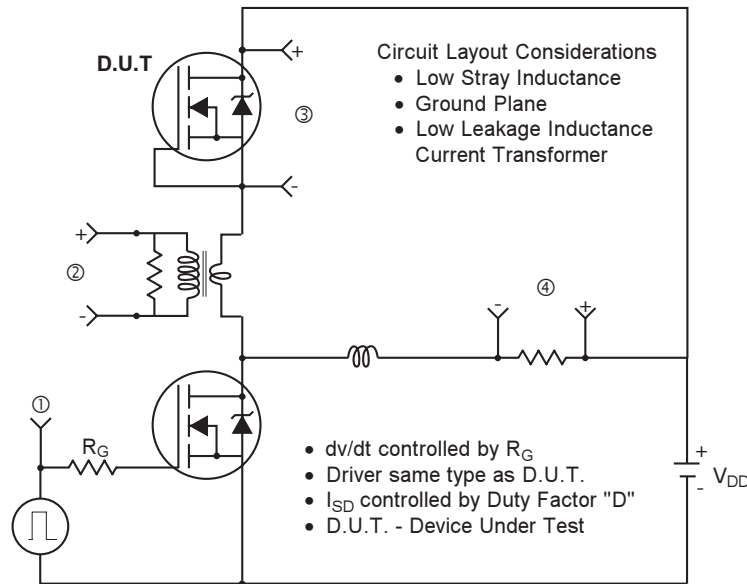


Fig 14. For N-Channel HEXFETS

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Dimensions are shown in millimeters (inches)



Diagram of a 1N4001 diode with labels for its markings:

- INTERNATIONAL RECTIFIER LOGO**: Points to the IR logo.
- ASSEMBLY LOT CODE**: Points to the "34" marking.
- PART NUMBER**: Points to the "1N4001" marking.
- DATE CODE**: Points to the "924K" marking.
- YEAR 9 = 1999**: Points to the "9" in the date code.
- WEEK 24**: Points to the "24" in the date code.
- LINE K**: Points to the "K" in the date code.

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IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
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Email amall@ameya360.com

QQ 800077892

Skype ameyasales1 ameyasales2

➤ Customer Service :

Email service@ameya360.com

➤ Partnership :

Tel +86 (21) 64016692-8333

Email mkt@ameya360.com