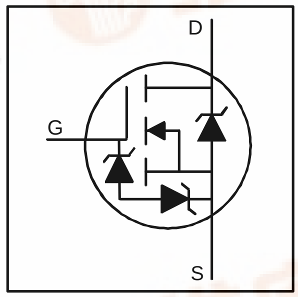
PD - 9.1253

International
IOR Rectifier

IRFR2605
IRFU2605

HEXFET® Power MOSFET

- Ultra Low On-Resistance
- ESD Protected
- Surface Mount (IRFR2605)
- Straight Lead (IRFU2605)
- 150°C Operating Temperature
- Repetitive Avalanche Rated
- Fast Switching



V_{DSS} = 55V

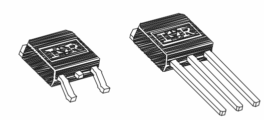
$R_{DS(on)}$ = 0.075Ω

I_D = 19A

Description

Fourth Generation HEXFETs from International Rectifier utilize advanced processing techniques that achieve extremely low on-resistance per silicon area and allow electrostatic discharge protection to be integrated in the gate structure. These benefits, combined with the ruggedized device design that HEXFETs are known for, provide the designer with extremely efficient and reliable device for use in a wide variety of applications.

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.



D-PAK
TO-252AA

I-PAK
TO-251AA

Absolute Maximum Ratings

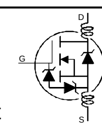
	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	19	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	12	
I_{DM}	Pulsed Drain Current ①	76	
P_D @T_C = 25°C	Power Dissipation	50	W
P_D @T_C = 25°C	Power Dissipation (PCB Mount)**	3.1	
	Linear Derating Factor	0.40	W/°C
	Linear Derating Factor (PCB Mount)**	0.025	
V_{GS}	Gate-to-Source Voltage	±20	V
E_{AS}	Single Pulse Avalanche Energy ②	100	mJ
I_{AR}	Avalanche Current ①	12	A
E_{AR}	Repetitive Avalanche Energy ①	5.0	mJ
dv/dt	Peak Diode Recovery dv/dt ③	4.5	V/ns
T_J, T_{STG}	Junction and Storage Temperature Range	-55 to + 150	°C
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
V_{ESD}	Human Body Model, 100pF, 1.5KΩ	2000	V

Thermal Resistance

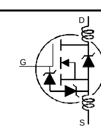
	Parameter	Min.	Typ.	Max.	Units
$R_{θJC}$	Junction-to-Case	—	—	2.5	°C/W
$R_{θJA}$	Junction-to-Ambient (PCB Mount)**	—	—	40	
$R_{θJA}$	Junction-to-Ambient	—	—	62	

** 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°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	55	——	——	V	V_{GS} = 0V, I_D = 250μA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	——	0.051	——	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	——	——	0.085	Ω	V_{GS} = 10V, I_D = 11A ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	——	4.0	V	$V_{DS} = V_{GS}$, I_D = 250μA
g_{fs}	Forward Transconductance	3.6	——	——	S	V_{DS} = 25V, I_D = 11A
I_{DSS}	Drain-to-Source Leakage Current	——	——	25	μA	V_{DS} = 55V, V_{GS} = 0V
		——	——	250		V_{DS} = 44V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage	——	——	10	μA	V_{GS} = 20V
	Gate-to-Source Reverse Leakage	——	——	-10		V_{GS} = -20V
Q_g	Total Gate Charge	——	——	23	nC	I_D = 11A
Q_{gs}	Gate-to-Source Charge	——	——	5.4		V_{DS} = 44V
Q_{gd}	Gate-to-Drain ("Miller") Charge	——	——	10		V_{GS} = 10V, See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	——	7.1	——	ns	V_{DD} = 25V
t_r	Rise Time	——	56	——		I_D = 11A
$t_{d(off)}$	Turn-Off Delay Time	——	31	——		R_G = 20Ω
t_f	Fall Time	——	39	——		R_D = 2.2Ω, See Fig. 10 ④
L_D	Internal Drain Inductance	——	4.5	——	nH	Between lead, 6mm (0.25in.) 
L_S	Internal Source Inductance	——	7.5	——		from package and center of die contact
C_{iss}	Input Capacitance	——	420	——	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	——	250	——		V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	——	67	——		f = 1.0MHz, See Fig. 5

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	——	——	18	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	——	——	72		
V_{SD}	Diode Forward Voltage	——	——	1.5	V	T_J = 25°C, I_S = 11A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	——	67	100	ns	T_J = 25°C, I_F = 11A
Q_{rr}	Reverse Recovery Charge	——	0.18	0.26	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 fig. 11)

② V_{DD} = 25V, starting T_J = 25°C, L = 830μH R_G = 25Ω, I_{AS} = 11A. (See Figure 12)

③ $I_{SD} \leq$ 11A, di/dt ≤ 110A/μs, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq$ 150°C

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

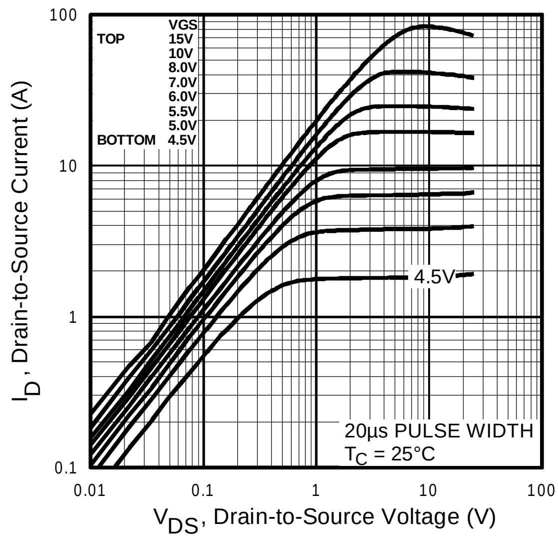


Fig 1. Typical Output Characteristics, $T_C = 25^oC$

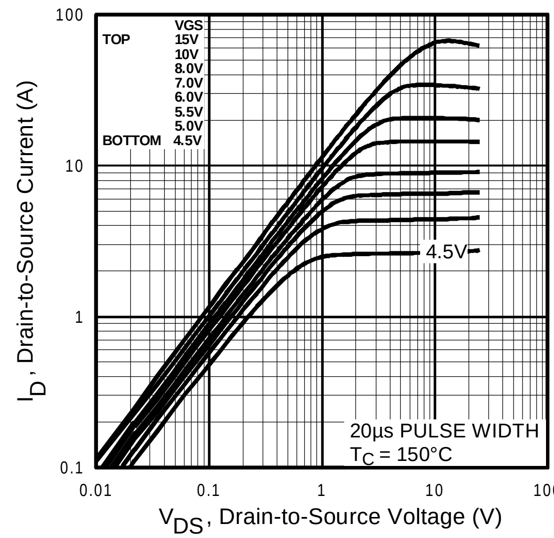


Fig 2. Typical Output Characteristics, $T_C = 150^oC$

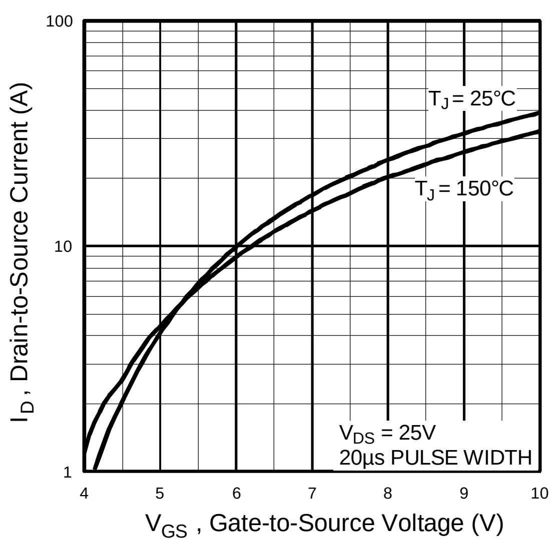


Fig 3. Typical Transfer Characteristics

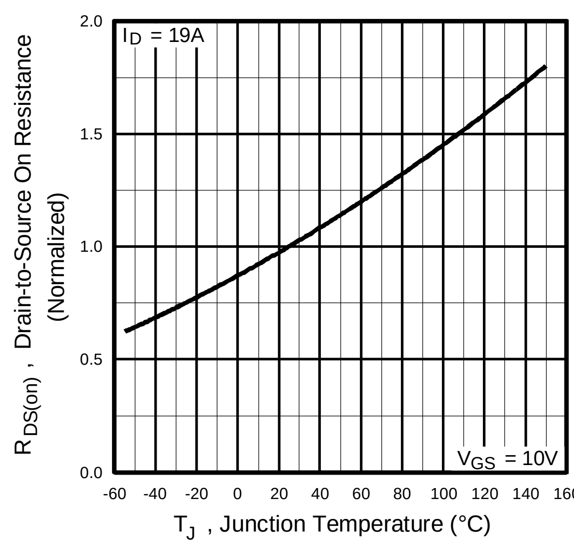


Fig 4. Normalized On-Resistance Vs. Temperature

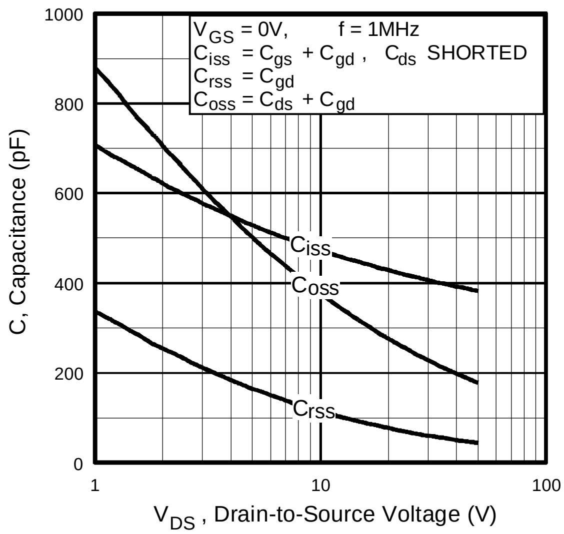


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

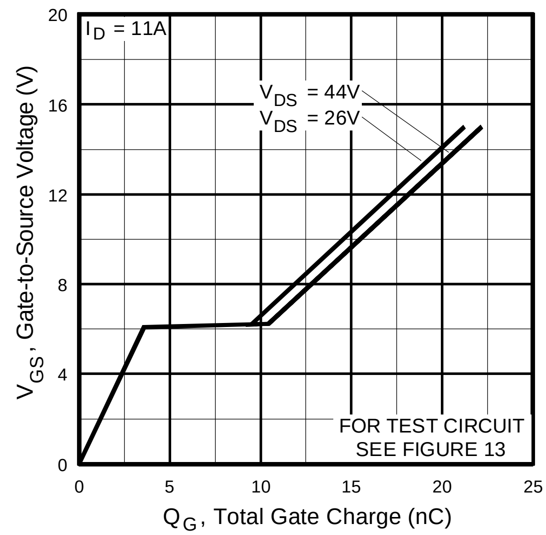


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

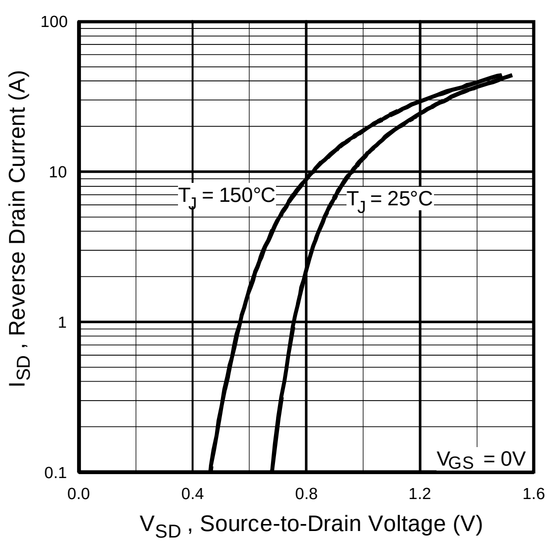


Fig 7. Typical Source-Drain Diode Forward Voltage

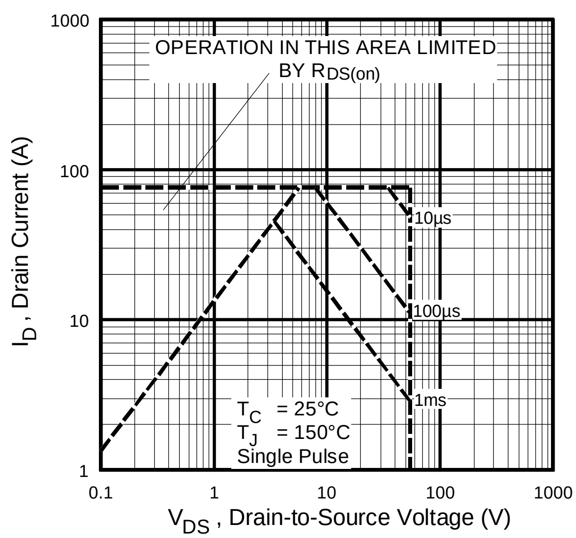


Fig 8. Maximum Safe Operating Area

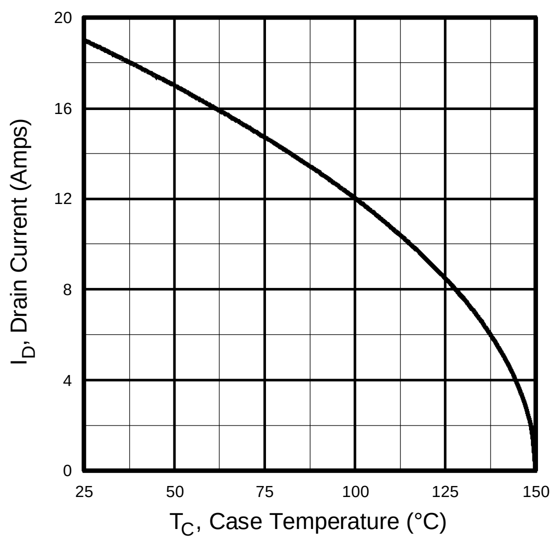


Fig 9. Maximum Drain Current Vs. Case Temperature

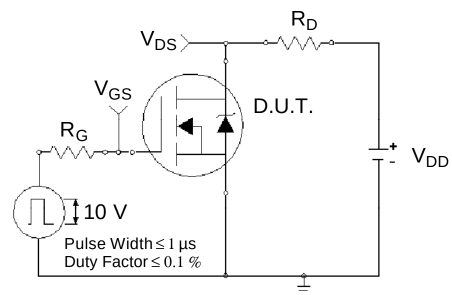


Fig 10a. Switching Time Test Circuit

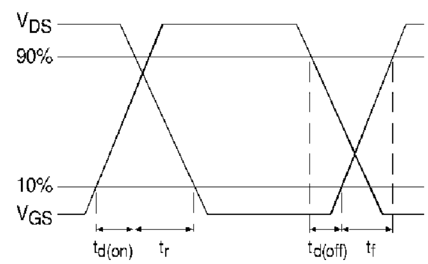


Fig 10b. Switching Time Waveforms

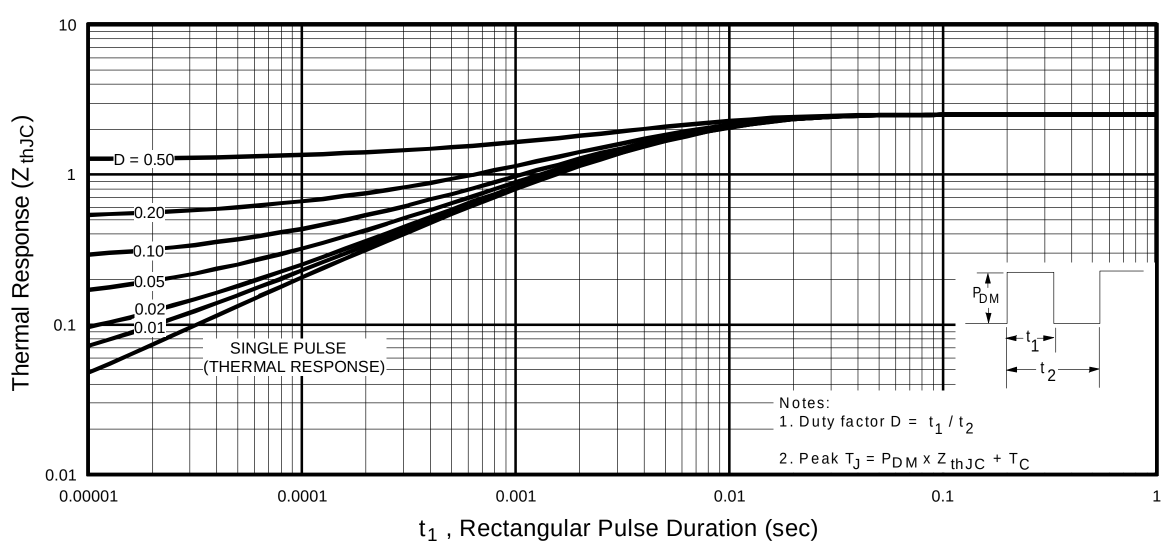


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

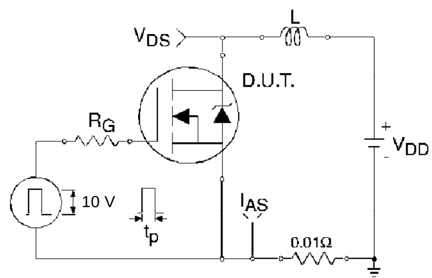


Fig 12a. Unclamped Inductive Test Circuit

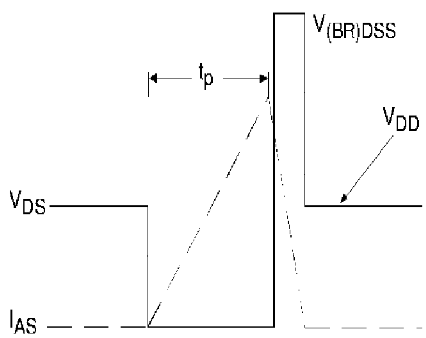


Fig 12b. Unclamped Inductive Waveforms

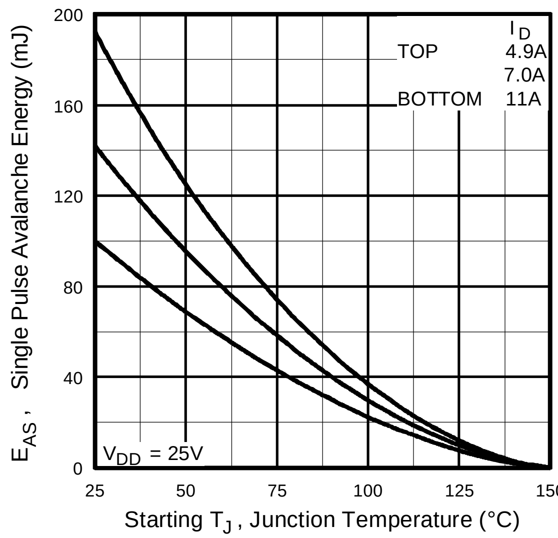


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

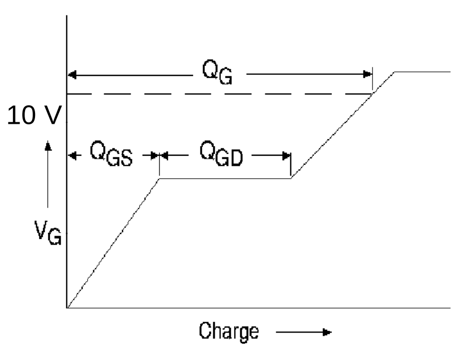


Fig 13a. Basic Gate Charge Waveform

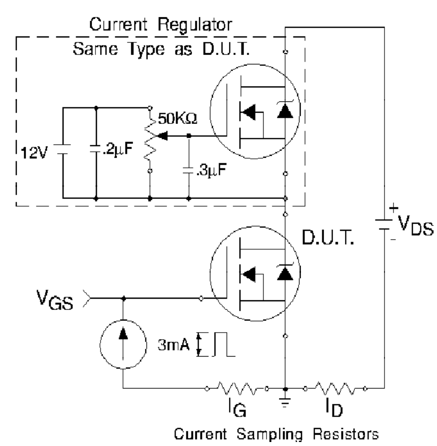
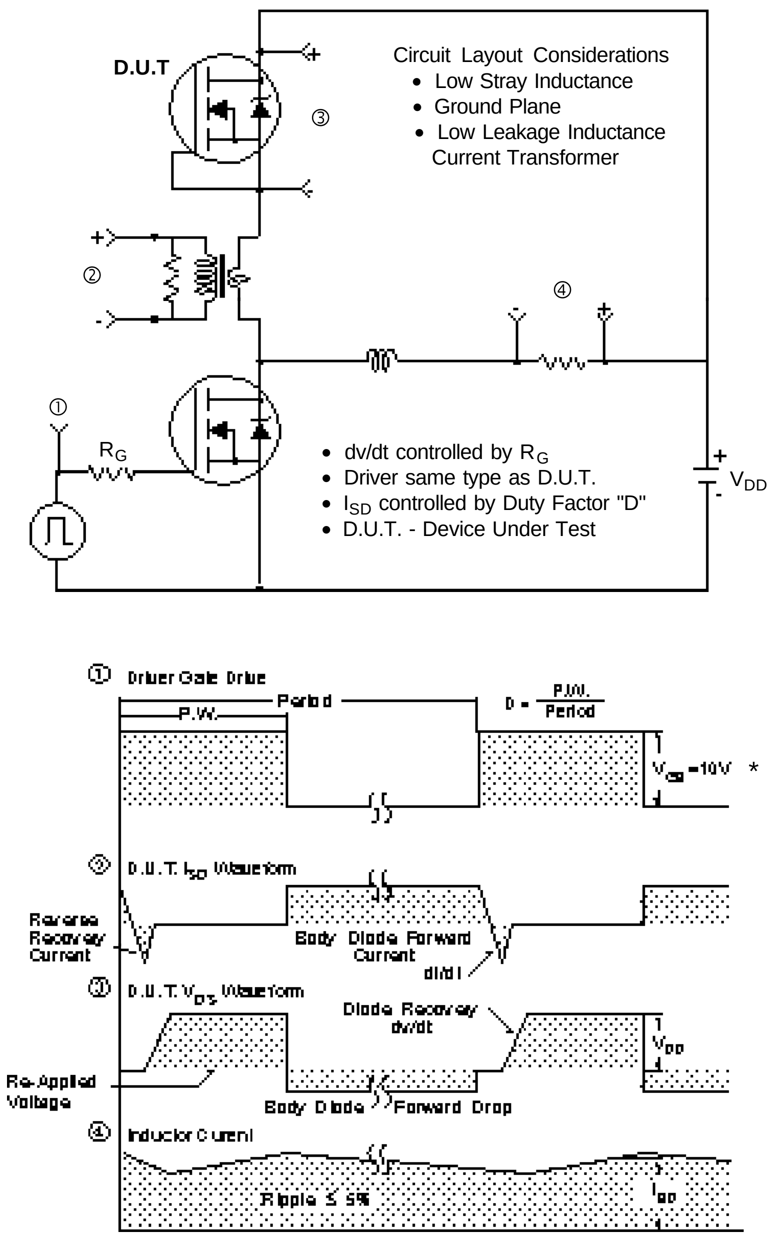


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



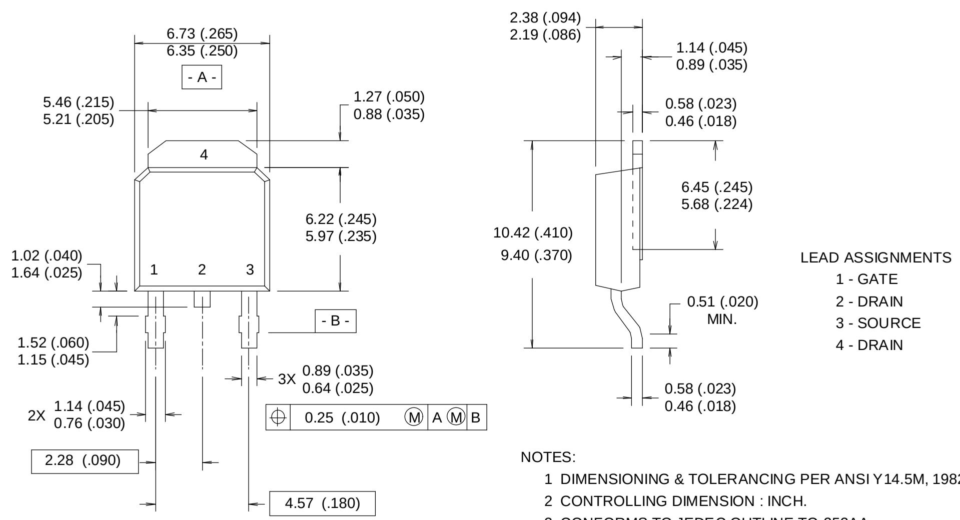
* VGS = 5V for Logic Level Devices

Fig 14. For N-Channel HEXFETS

Package Outline

D-PAK Outline

Dimensions are shown in millimeters (inches)

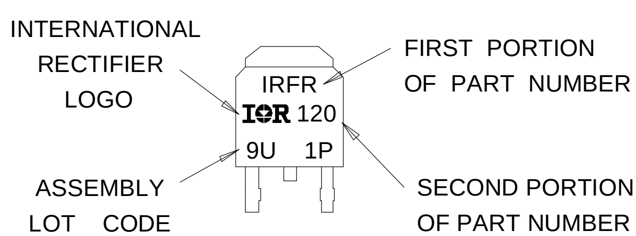


NOTES:
1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
2 CONTROLLING DIMENSION : INCH.
3 CONFORMS TO JEDEC OUTLINE TO-252AA.
4 DIMENSIONS SHOWN ARE BEFORE SOLDER DIP, SOLDER DIP MAX. +0.16 (.006).

Part Marking Information

D-PAK

EXAMPLE : THIS IS AN IRFR120 WITH ASSEMBLY LOT CODE 9U1P



International IOR Rectifier

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IR CANADA: 7321 Victoria Park Ave., Suite 201, Markham, Ontario L3R 3L1, Tel: (905) 475 1897 **IR GERMANY:** Saalburgstrasse 157, 61350 Bad Homburg Tel: 6172 37066 **IR ITALY:** Via Liguria 49, 10071 Borgaro, Torino Tel: (39) 1145 10111 **IR FAR EAST:** K&H Bldg., 2F, 3-30-4 Nishi-Ikeburo 3-Chome, Toshima-Ki, Tokyo 171 Tel: (03)3983 0641 **IR SOUTHEAST ASIA:** 315 Outram Road, #10-02 Tan Boon Liat Building, 0316 Tel: 65 221 8371