

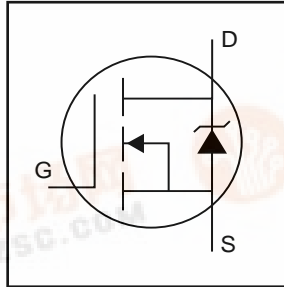
International Rectifier

PRELIMINARY

IRL2203S

HEXFET[®] Power MOSFET

- Logic-Level Gate Drive
- Surface Mount
- Advanced Process Technology
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated

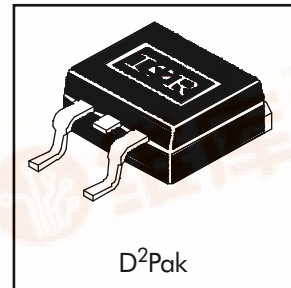


$V_{DSS} = 30V$
$R_{DS(on)} = 0.007\Omega$
$I_D = 100A^{(5)}$

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 D²Pak is a surface mount power package capable of accommodating die sizes up to HEX-4. It provides the highest power capability and the lowest possible on-resistance in any existing surface mount package. The D²Pak is suitable for high current applications because of its low internal connection resistance and can dissipate up to 2.0W in a typical surface mount application.



Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ $T_C = 25^\circ C$	Continuous Drain Current, V_{GS} @ 10V ⁽⁵⁾	100 ⁽⁵⁾	A
I_D @ $T_C = 100^\circ C$	Continuous Drain Current, V_{GS} @ 10V ⁽⁵⁾	71	
I_{DM}	Pulsed Drain Current ⁽¹⁾⁽⁶⁾	400	
P_D @ $T_A = 25^\circ C$	Power Dissipation	3.8	W
P_D @ $T_C = 25^\circ C$	Power Dissipation	130	W
	Linear Derating Factor	0.83	W/ ^o C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy ⁽²⁾⁽⁶⁾	390	mJ
I_{AR}	Avalanche Current ⁽¹⁾	60	A
E_{AR}	Repetitive Avalanche Energy ⁽¹⁾	13	mJ
dv/dt	Peak Diode Recovery dv/dt ⁽³⁾⁽⁶⁾	1.2	V/ns
T_J	Operating Junction and	-55 to + 175	^o C
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	1.2	^o C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB Mounted steady-state)**	—	40	

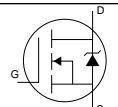


Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	30	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.035	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$ Ⓞ
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.007		$V_{GS} = 10V, I_D = 60A$ ④
		—	—	0.01		$V_{GS} = 4.5V, I_D = 50A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	2.5	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
g_{fs}	Forward Transconductance	47	—	—	S	$V_{DS} = 25V, I_D = 60A$ ⑥
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	$V_{DS} = 30V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 24V, V_{GS} = 0V, T_J = 150^\circ\text{C}$
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	—	—	110	nC	$I_D = 60A$
Q_{gs}	Gate-to-Source Charge	—	—	31		$V_{DS} = 24V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	57		$V_{GS} = 4.5V$, See Fig. 6 and 13 ④ ⑥
$t_{d(on)}$	Turn-On Delay Time	—	15	—	ns	$V_{DD} = 15V$
t_r	Rise Time	—	210	—		$I_D = 60A$
$t_{d(off)}$	Turn-Off Delay Time	—	29	—		$R_G = 1.8\Omega, V_{GS} = 4.5V$
t_f	Fall Time	—	54	—		$R_D = 0.25\Omega$, See Fig. 10 ④ ⑥
L_S	Internal Source Inductance	—	7.5	—	nH	Between lead, and center of die contact
C_{iss}	Input Capacitance	—	3500	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	1400	—		$V_{DS} = 25V$
C_{rss}	Reverse Transfer Capacitance	—	690	—		$f = 1.0\text{MHz}$, See Fig. 5 ⑥

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	100	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	400		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 60A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	94	140	ns	$T_J = 25^\circ\text{C}, I_F = 60A$
Q_{rr}	Reverse Recovery Charge	—	280	410	nC	$di/dt = 100A/\mu s$ ④ ⑥



Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)
- ② $V_{DD} = 15V$, starting $T_J = 25^\circ\text{C}$, $L = 220\mu H$
 $R_G = 25\Omega, I_{AS} = 60A$. (See Figure 12)
- ③ $I_{SD} \leq 60A, di/dt \leq 140A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 175^\circ\text{C}$
- ④ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.
- ⑤ Calculated continuous current based on maximum allowable junction temperature; for recommended current-handling of the package refer to Design Tip # 93-4
- ⑥ Uses IRL2203N data and test conditions.

** When mounted on FR-4 board using minimum recommended footprint.
For recommended footprint and soldering techniques refer to application note #AN-994.

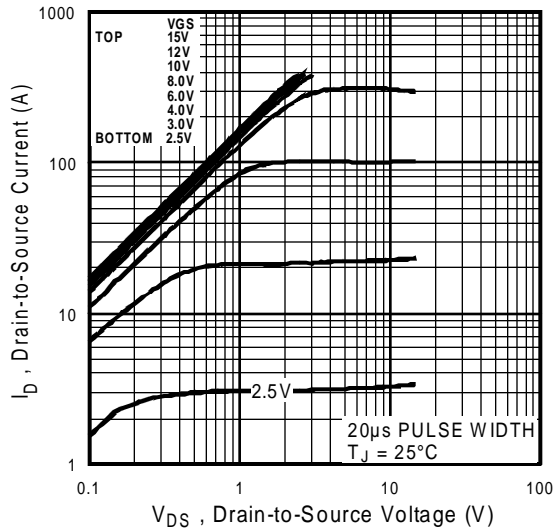


Fig 1. Typical Output Characteristics,
 $T_J = 25^\circ\text{C}$

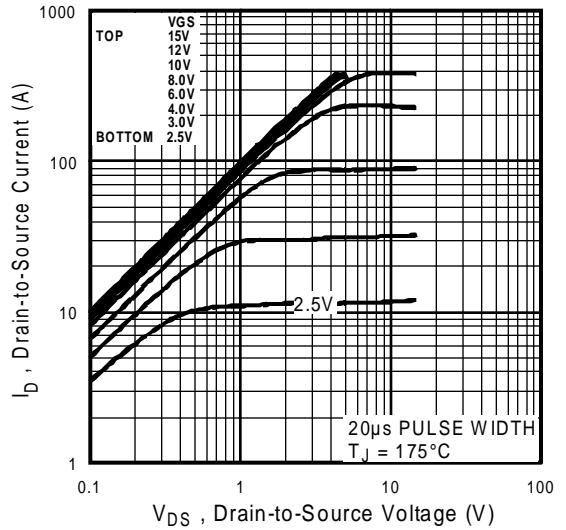


Fig 2. Typical Output Characteristics,
 $T_J = 175^\circ\text{C}$

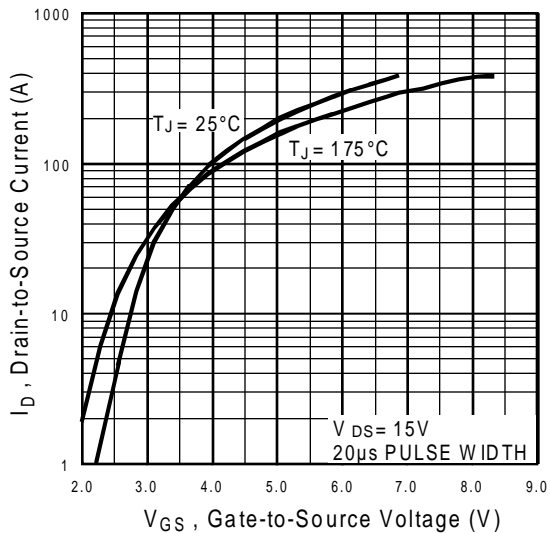


Fig 3. Typical Transfer Characteristics

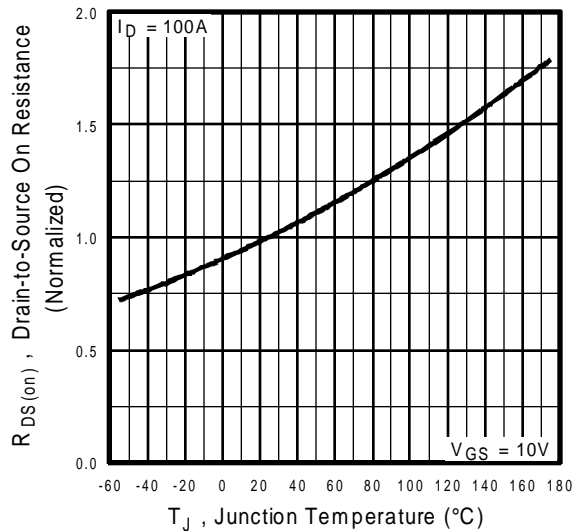


Fig 4. Normalized On-Resistance
 Vs. Temperature

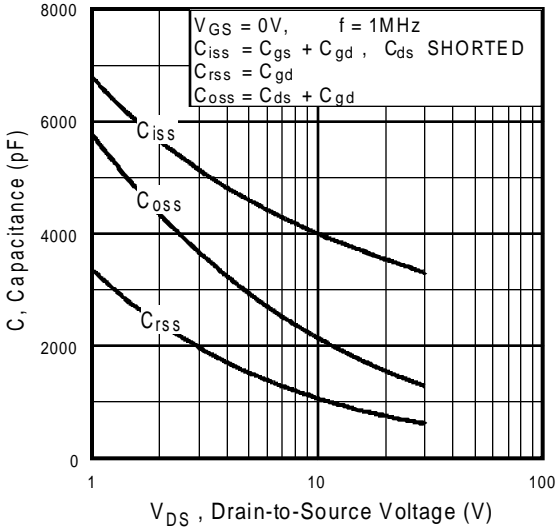


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

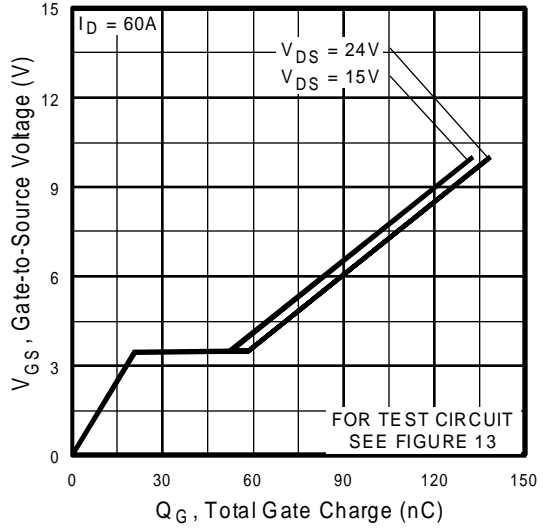


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

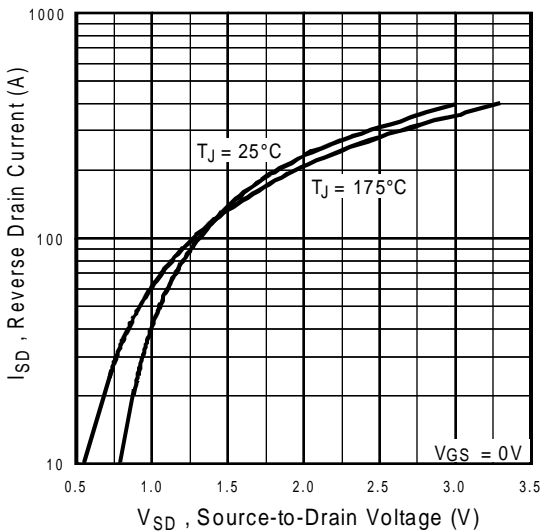


Fig 7. Typical Source-Drain Diode Forward Voltage

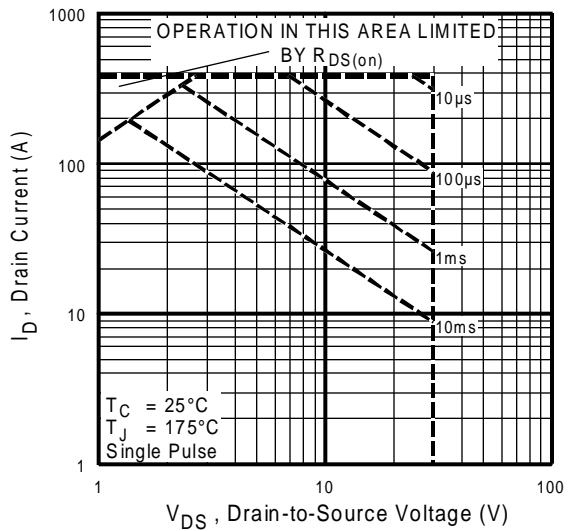


Fig 8. Maximum Safe Operating Area

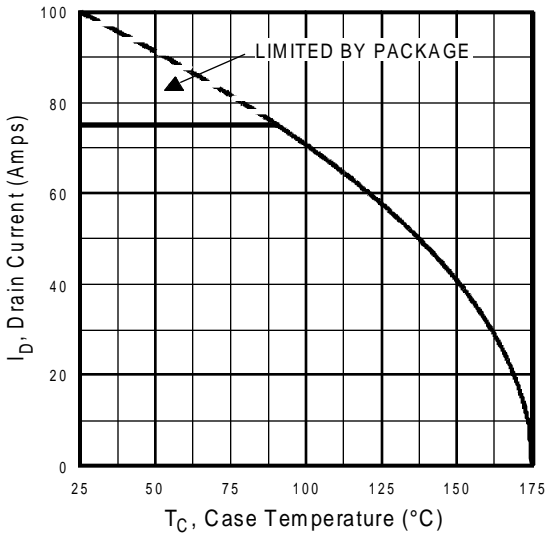


Fig 9. Maximum Drain Current Vs. Case Temperature

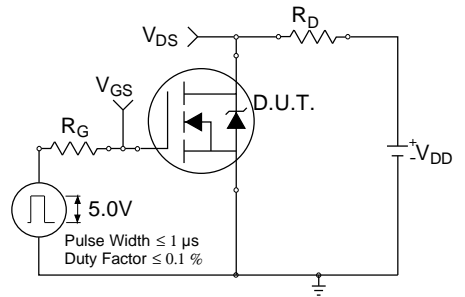


Fig 10a. Switching Time Test Circuit

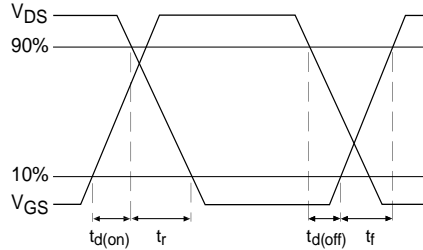


Fig 10b. Switching Time Waveforms

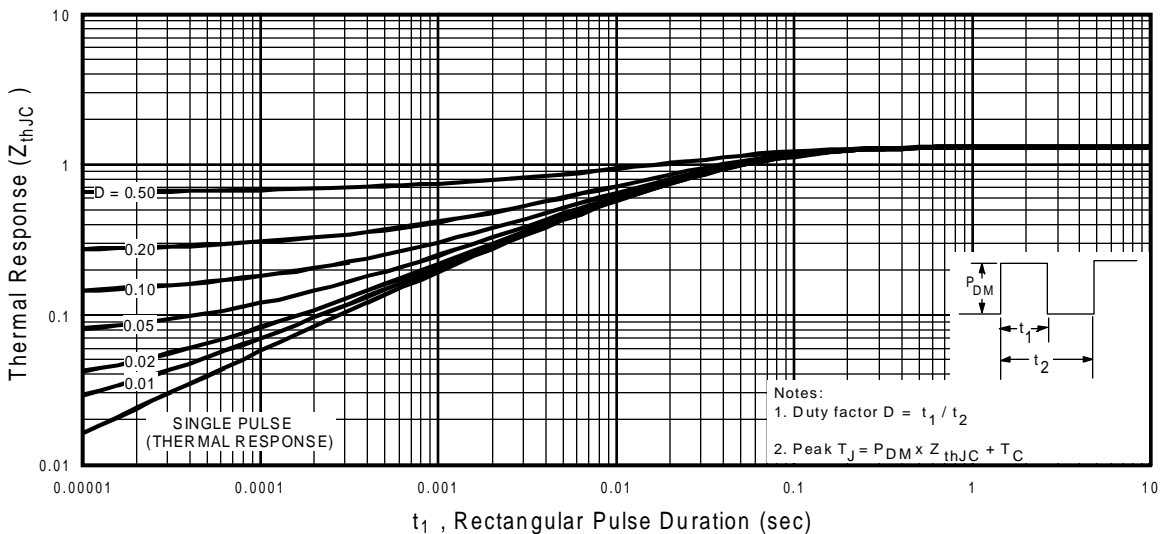


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

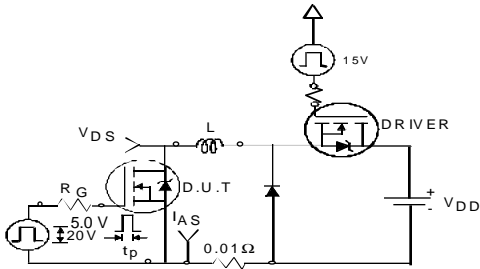


Fig 12a. Unclamped Inductive Test Circuit

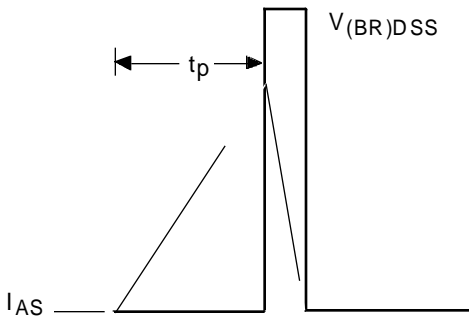


Fig 12b. Unclamped Inductive Waveforms

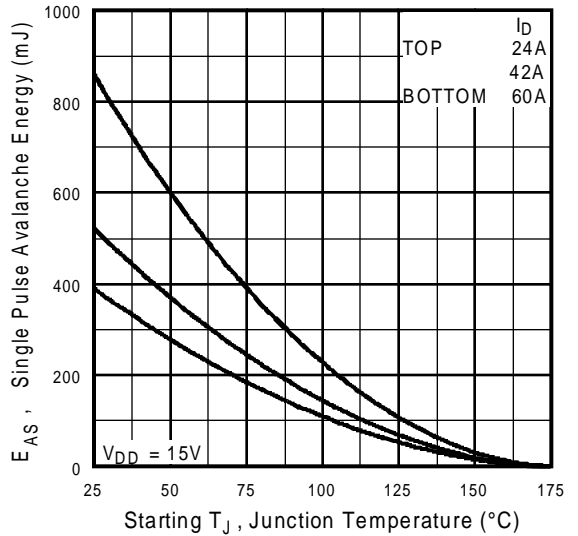


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

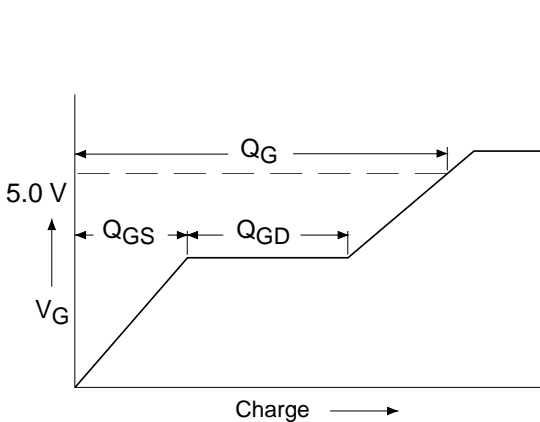


Fig 13a. Basic Gate Charge Waveform

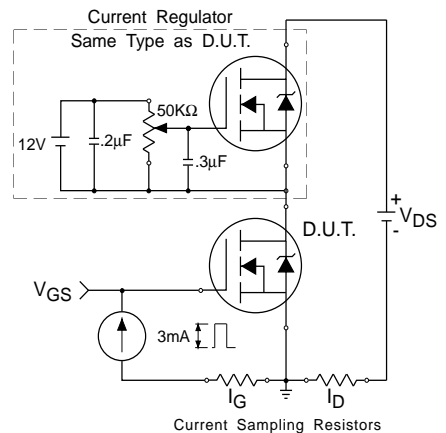
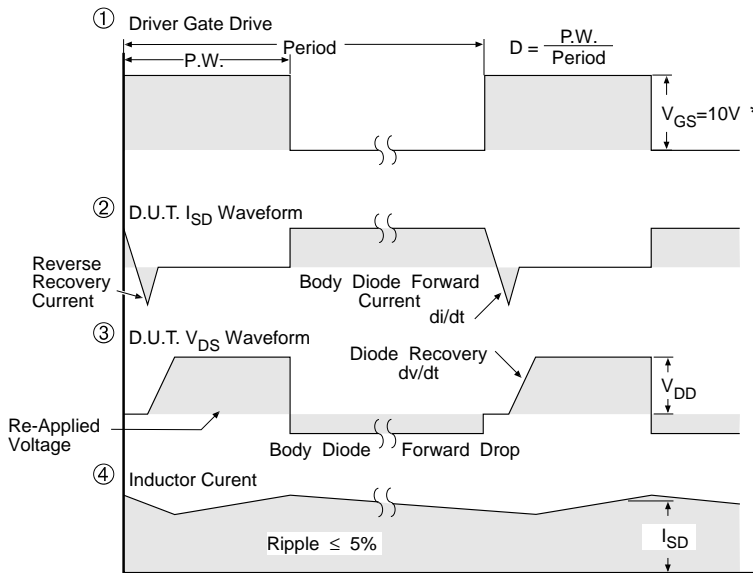
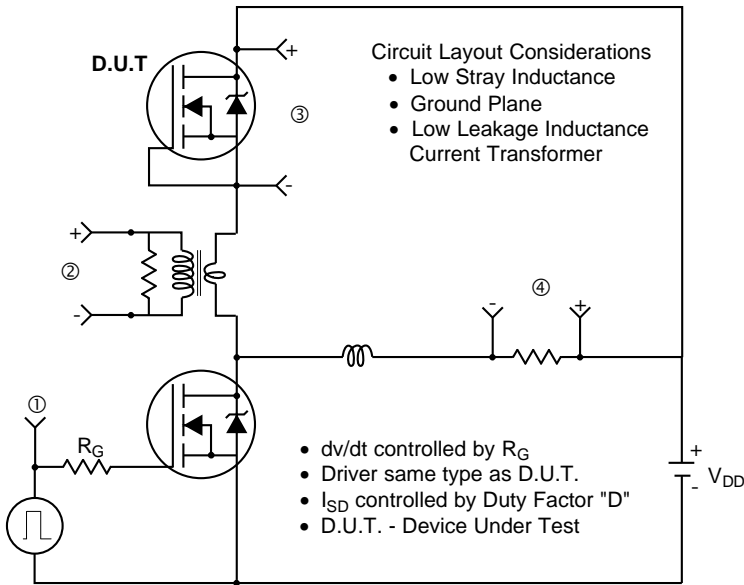


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



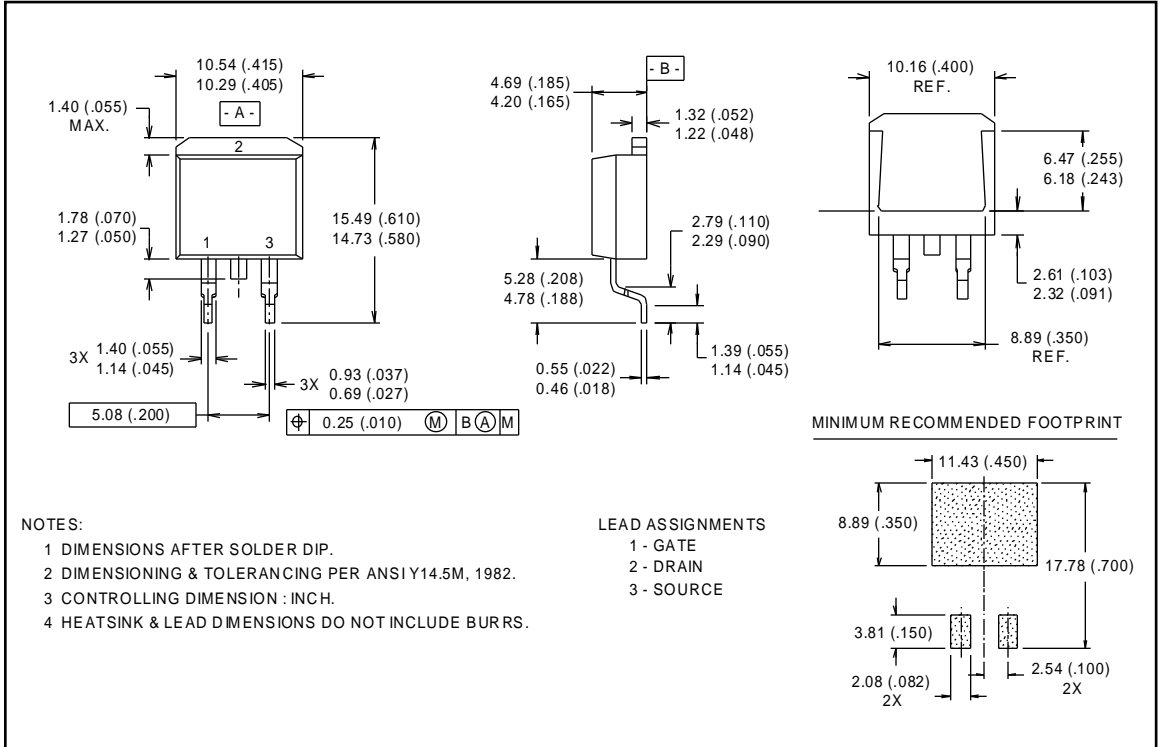
* $V_{GS} = 5V$ for Logic Level Devices

Fig 14. For N-Channel HEXFETS

IRL2203S

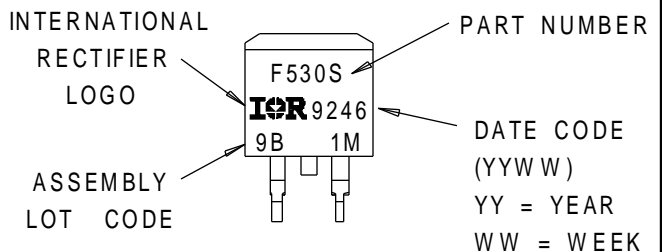
Package Outline — D²Pak

Dimensions are shown in millimeters (inches)



Part Marking

EXAMPLE : THIS IS AN IRF530S
WITH ASSEMBLY
LOT CODE 9B1M



Tape & Reel — D²Pak

Dimensions are shown in millimeters (inches)

