International
IOR Rectifier

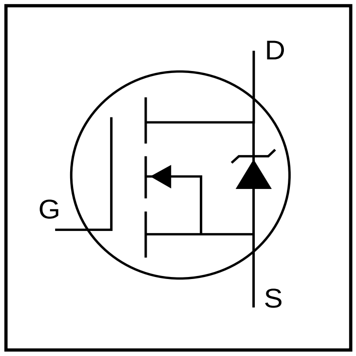
PRELIMINARY

PD 9.1091A

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

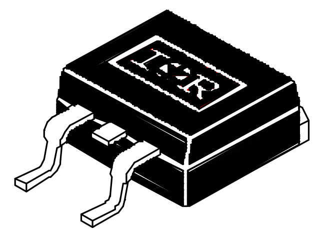
$R_{DS(on)}$ = 0.007Ω

I_D = 100A⑤

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 D^2Pak 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 D^2Pak 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.



D^2Pak

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V⑥	100⑤	
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V⑥	71	A
I_{DM}	Pulsed Drain Current ①⑥	400	
P_D @T_A = 25°C	Power Dissipation	3.8	W
P_D @T_C = 25°C	Power Dissipation	130	W
	Linear Derating Factor	0.83	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy②⑥	390	mJ
I_{AR}	Avalanche Current①	60	A
E_{AR}	Repetitive Avalanche Energy①	13	mJ
dv/dt	Peak Diode Recovery dv/dt③⑥	1.2	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)	

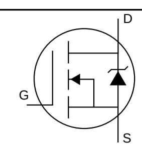
Thermal Resistance

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

Electrical Characteristics @ T_J = 25°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 = 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	–––	0.035	–––	V/°C	Reference to 25°C, I_D = 1mA⑥
$R_{DS(on)}$	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 = 250µA
g_{fs}	Forward Transconductance	47	–––	–––	S	V_{DS} = 25V, I_D = 60A⑥
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°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 ④⑥
$t_{d(on)}$	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 = 1.8Ω, V_{GS} = 4.5V
t_f	Fall Time	–––	54	–––		R_D = 0.25Ω, See Fig. 10 ④⑥
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* = 1.0MHz, See Fig. 5⑥

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	–––	–––	100⑤	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°C, I_S = 60A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	–––	94	140	ns	T_J = 25°C, I_F = 60A
Q_{rr}	Reverse RecoveryCharge	–––	280	410	nC	di/dt = 100A/µs ④⑥

Notes:

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

② V_{DD} = 15V, starting T_J = 25°C, L = 220µH R_G = 25Ω, I_{AS} = 60A. (See Figure 12)

③ $I_{SD} \leq$ 60A, di/dt $\leq$ 140A/µs, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq$ 175°C

④ Pulse width $\leq$ 300µs; 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.

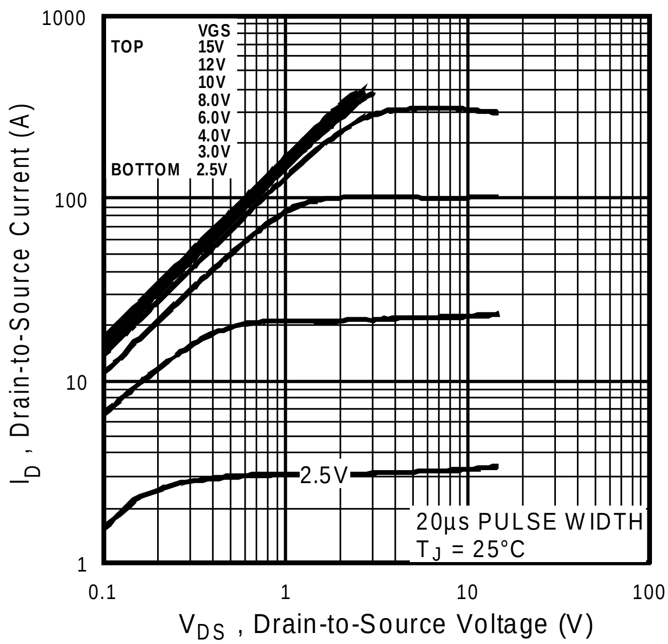


Fig 1. Typical Output Characteristics, $T_J = 25^oC$

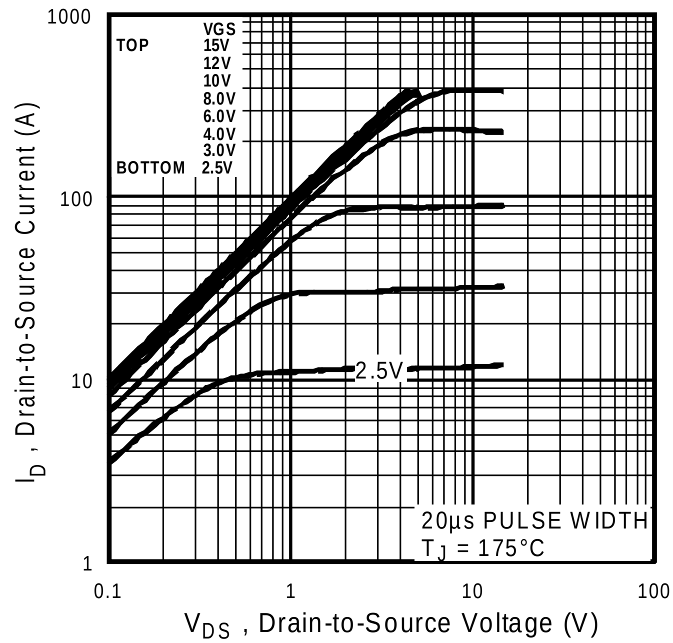


Fig 2. Typical Output Characteristics, $T_J = 175^oC$

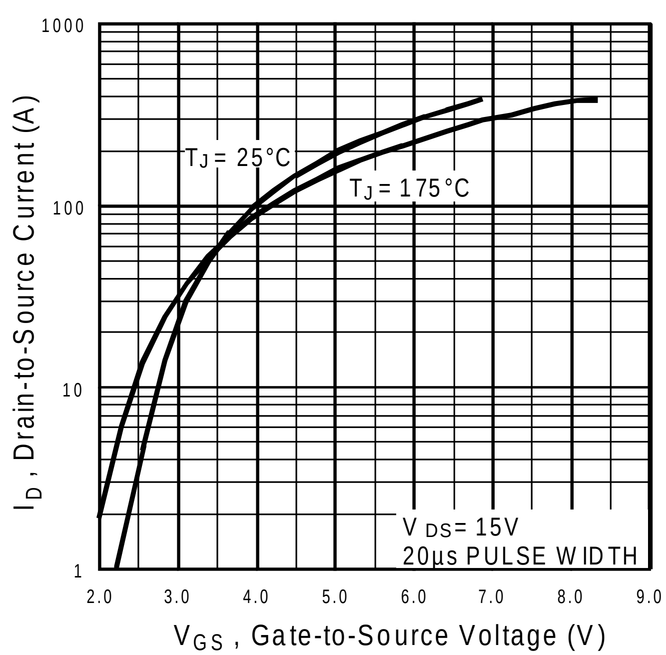


Fig 3. Typical Transfer Characteristics

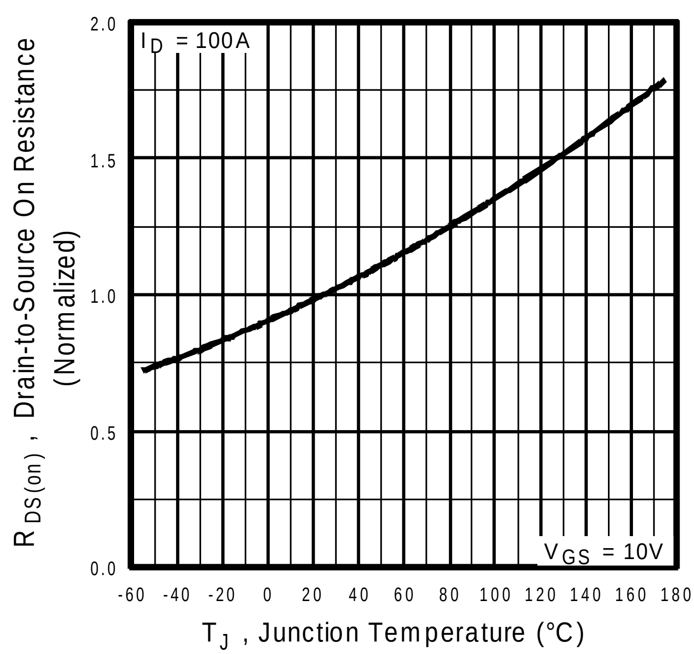


Fig 4. Normalized On-Resistance Vs. Temperature

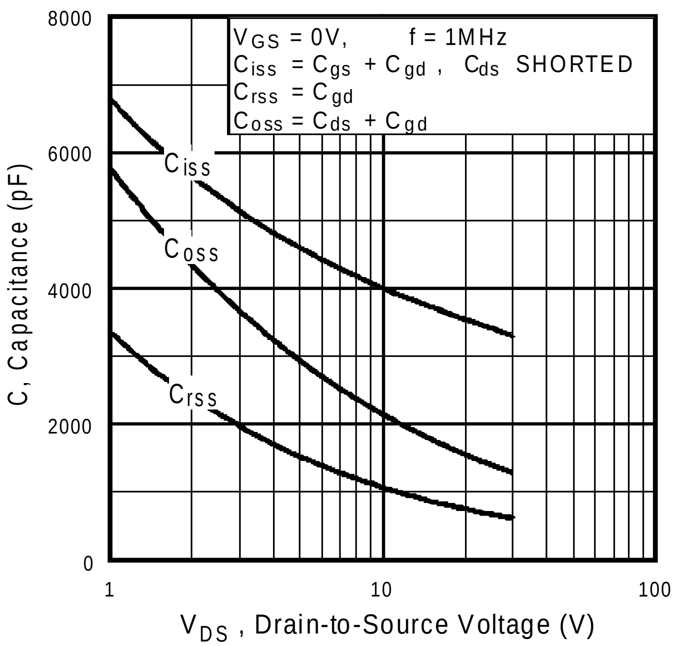


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

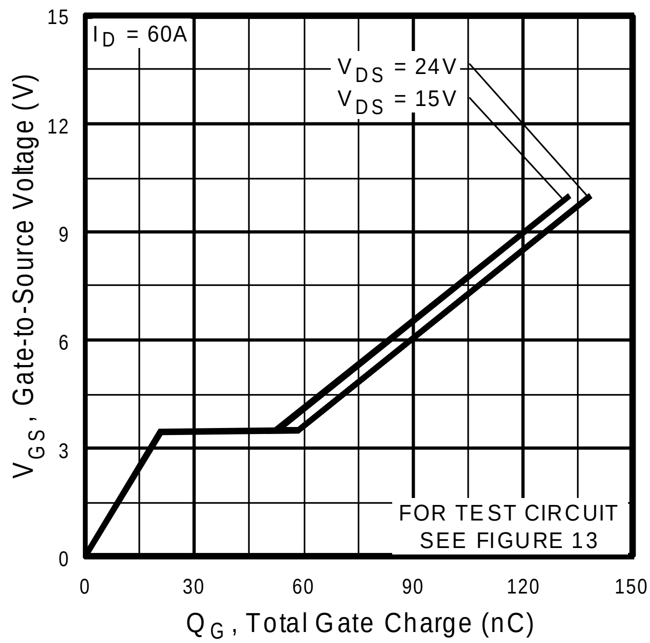


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

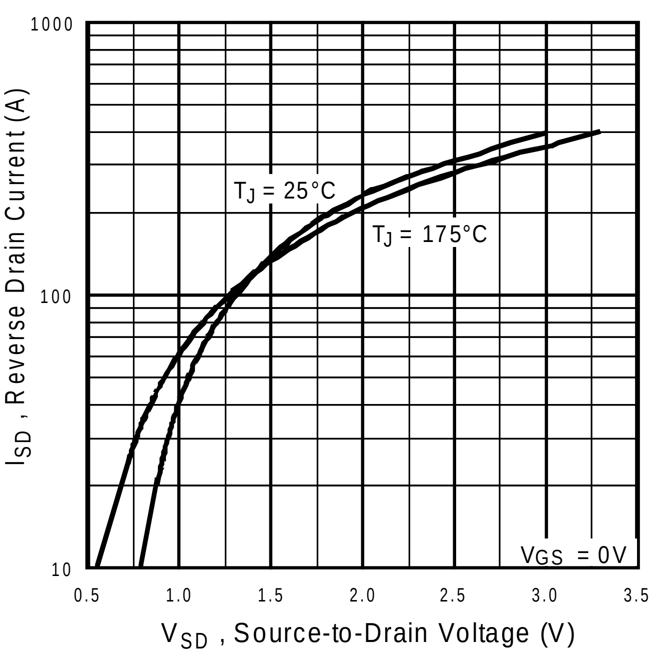


Fig 7. Typical Source-Drain Diode Forward Voltage

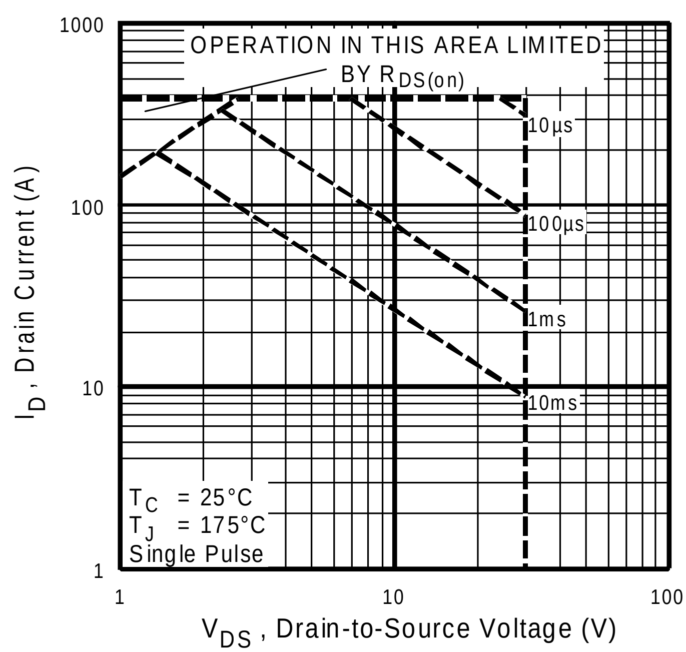
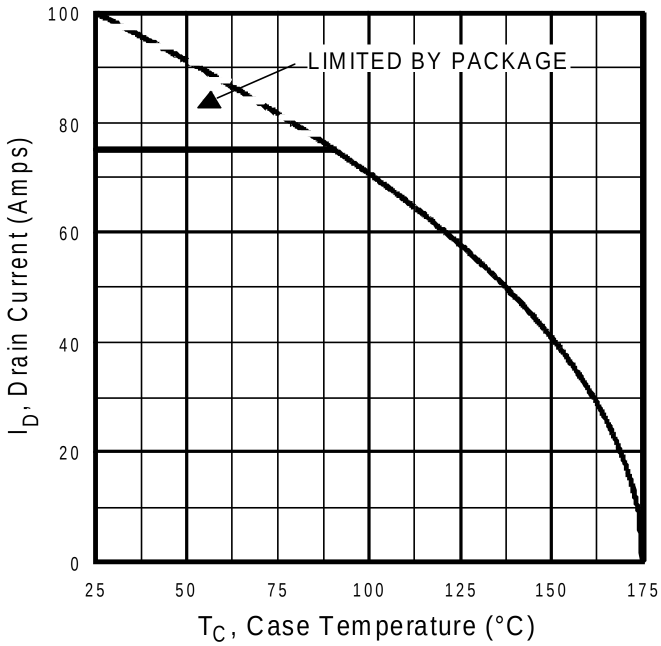


Fig 8. Maximum Safe Operating Area



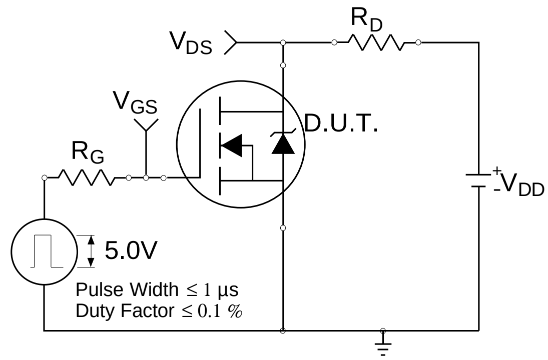


Fig 10a. Switching Time Test Circuit

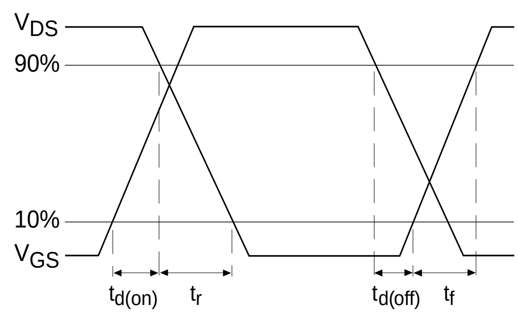


Fig 9. Maximum Drain Current Vs. Case Temperature

Fig 10b. Switching Time Waveforms

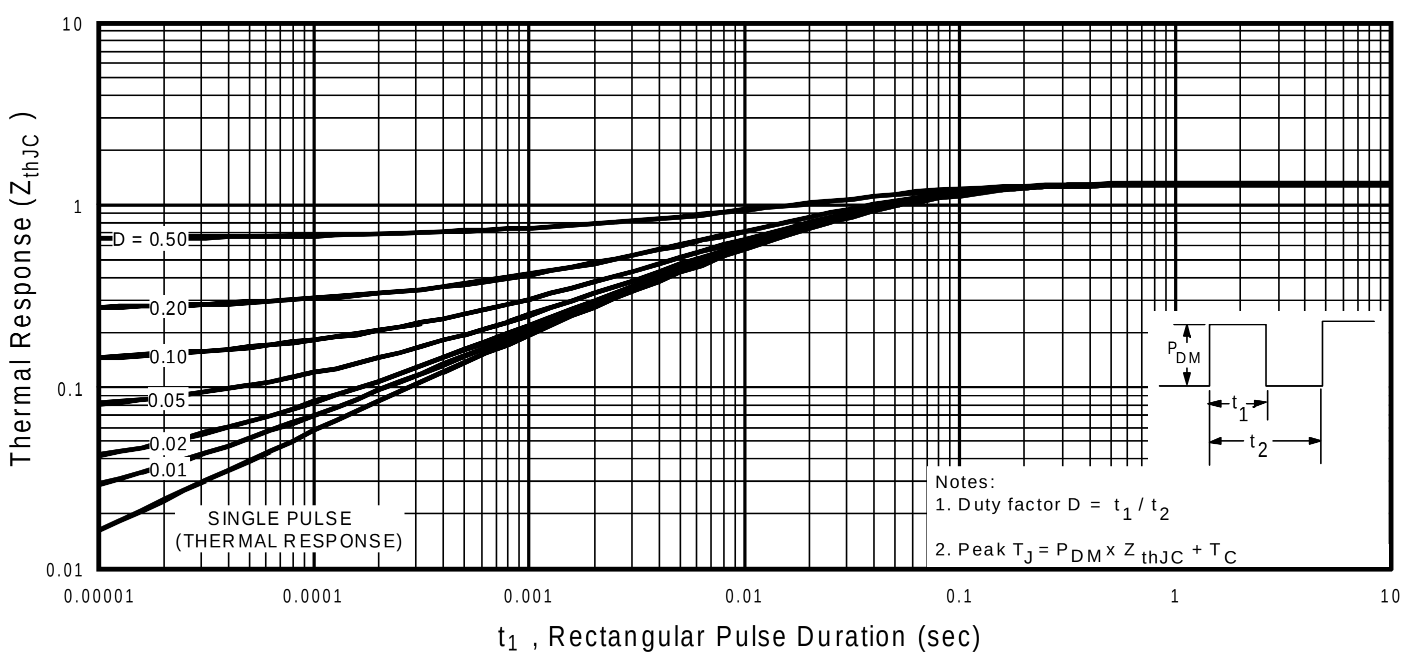


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

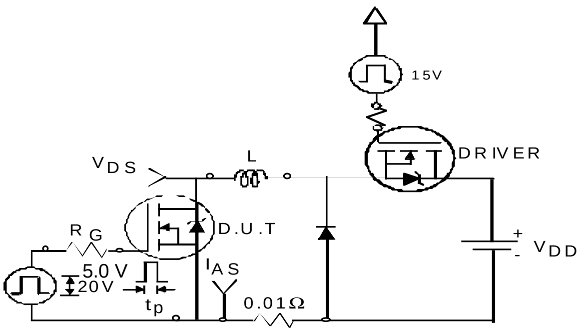


Fig 12a. Unclamped Inductive Test Circuit

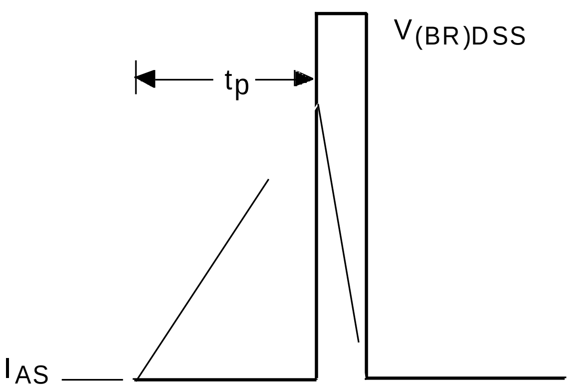


Fig 12b. Unclamped Inductive Waveforms

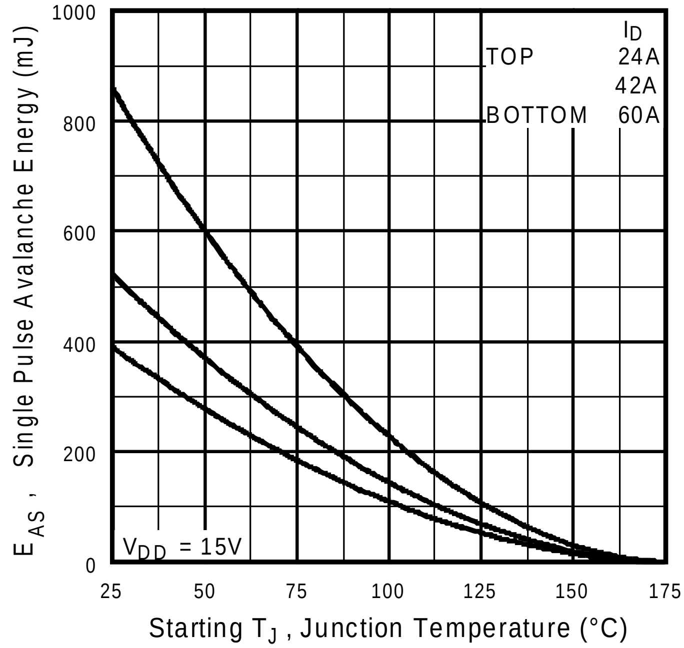


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

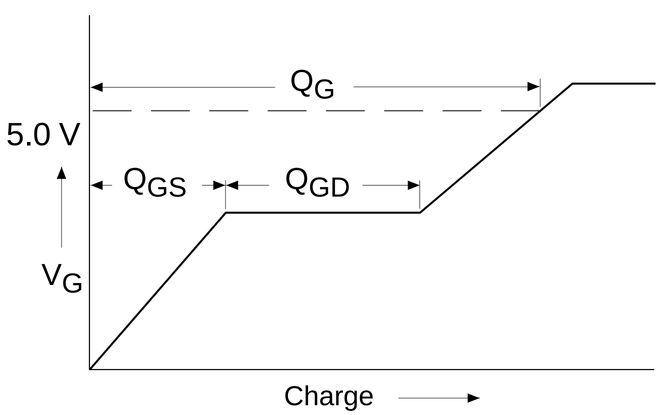


Fig 13a. Basic Gate Charge Waveform

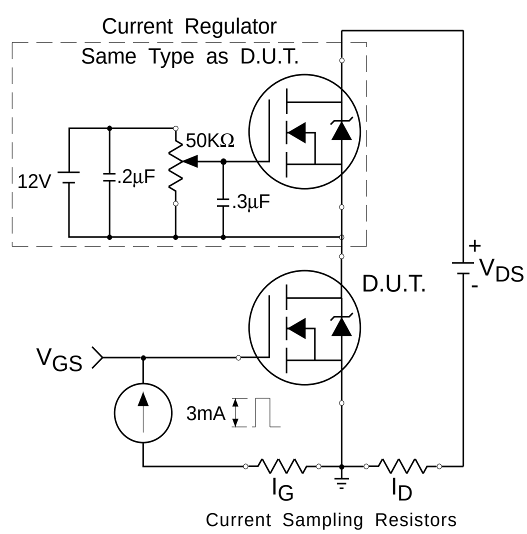
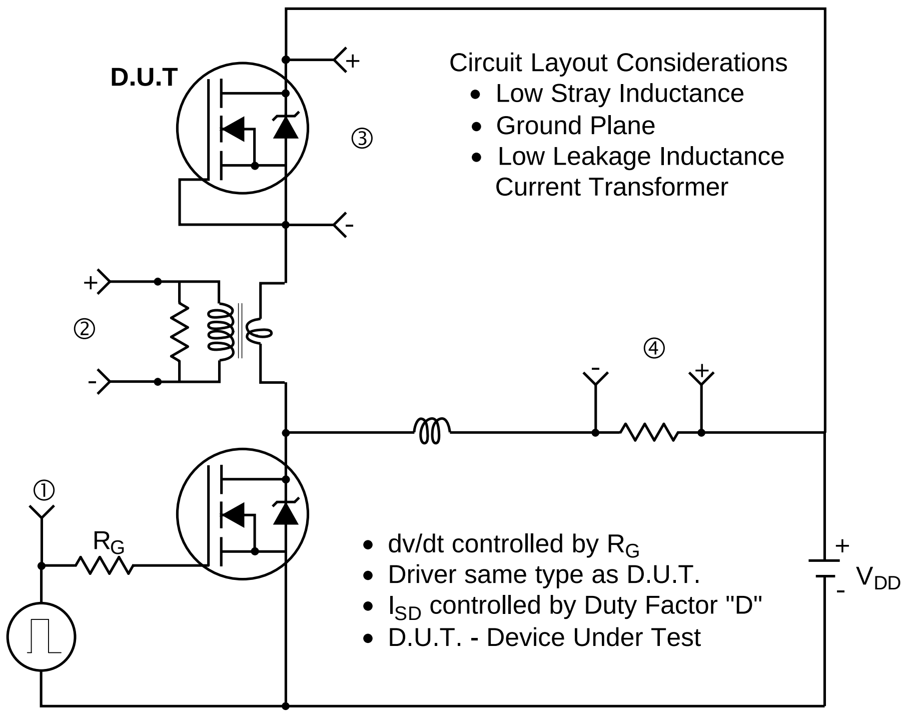
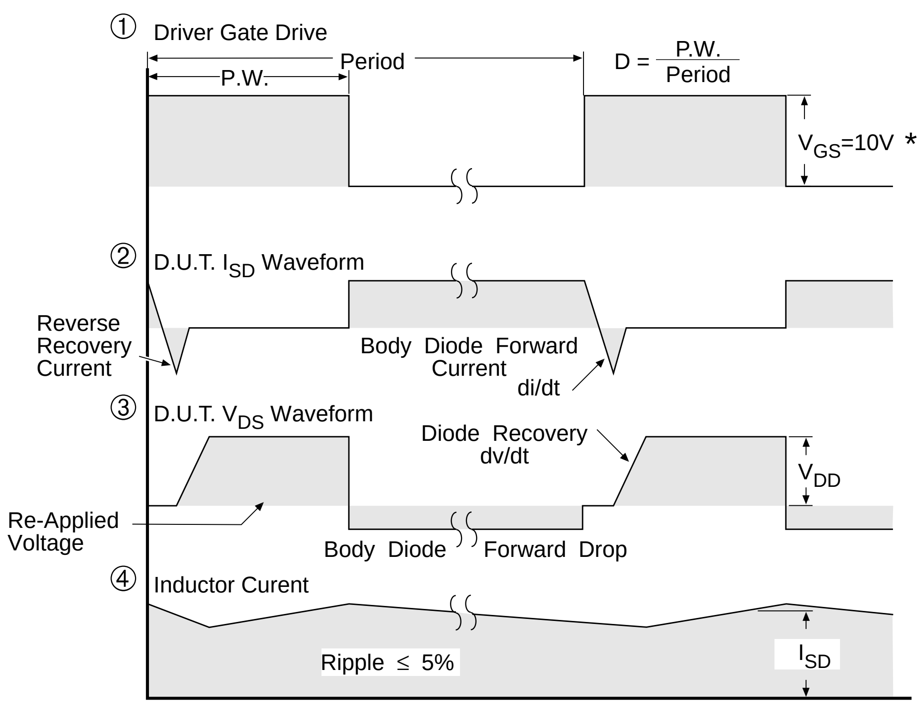


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



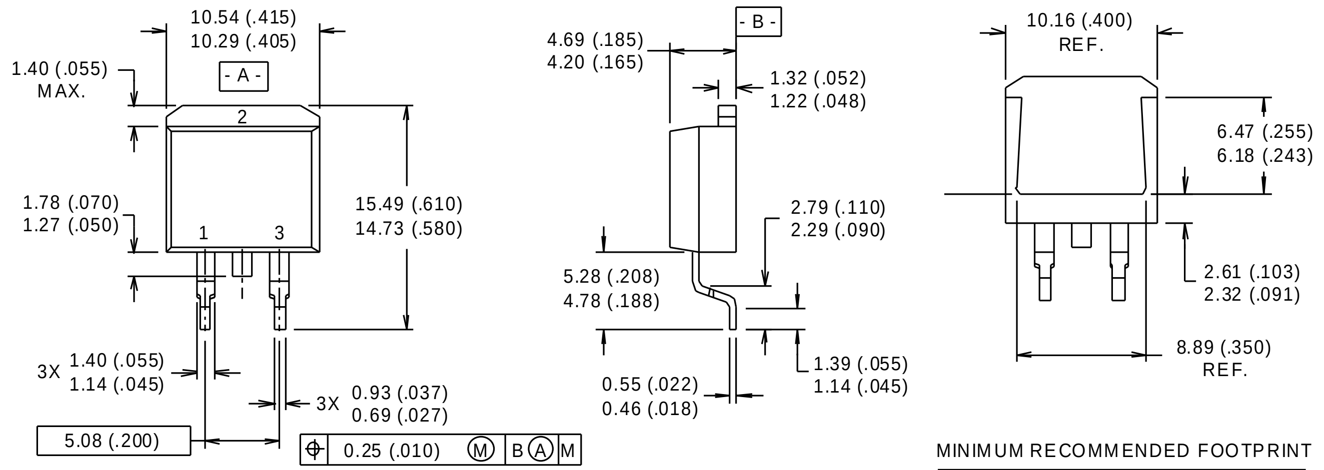


* V_{GS} = 5V for Logic Level Devices

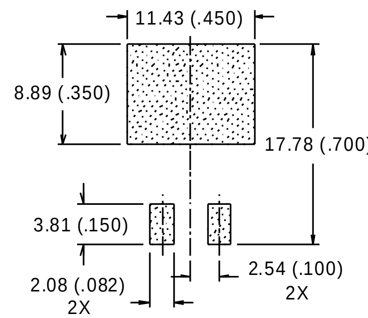
Fig 14. For N-Channel HEXFETS

Package Outline — D²Pak

Dimensions are shown in millimeters (inches)



MINIMUM RECOMMENDED FOOTPRINT



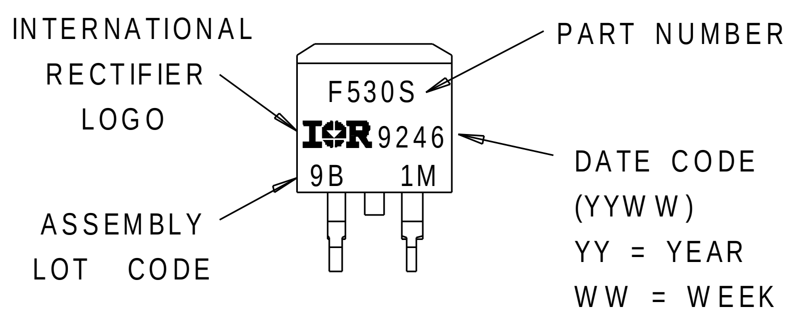
NOTES:

1 DIMENSIONS AFTER SOLDER DIP.
2 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
3 CONTROLLING DIMENSION : INCH.
4 HEATSINK & LEAD DIMENSIONS DO NOT INCLUDE BURRS.

LEAD ASSIGNMENTS
1 - GATE
2 - DRAIN
3 - SOURCE

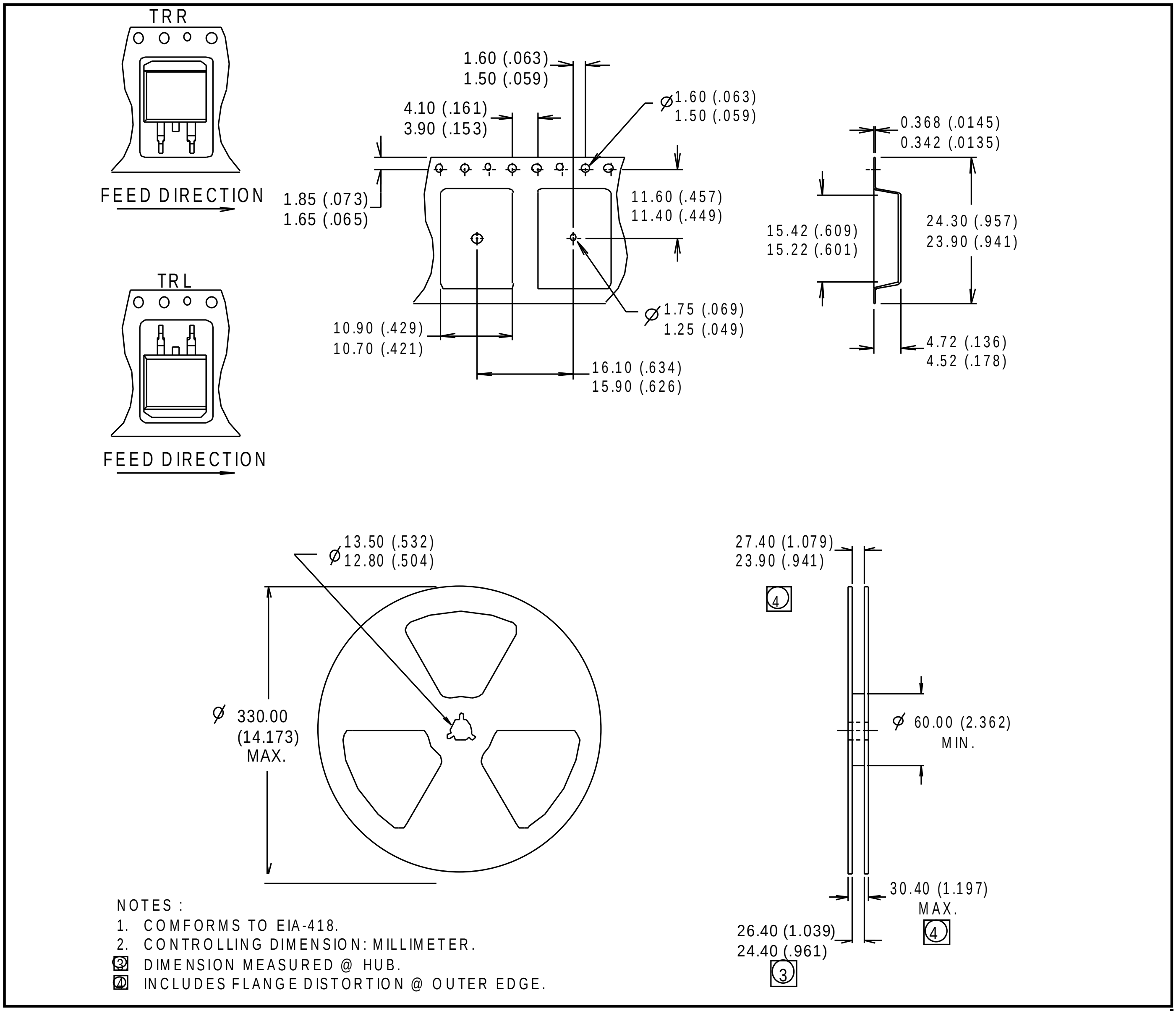
Part Marking

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



Tape & Reel — D^2Pak

Dimensions are shown in millimeters (inches)



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