International
IOR Rectifier

IRFH7921PbF

Applications

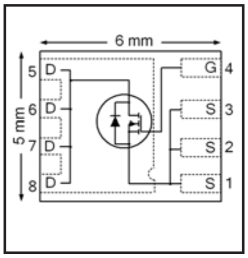
- High Frequency Point-of-Load Synchronous Buck Converter for Applications in Neworking & Computing Systems
- Optimized for Control FET Applications

HEXFET® Power MOSFET

V_{DSS}	$R_{DS(on)}$ max	Qg
30V	8.5mΩ@V_{GS} = 10V	9.3nC

Benefits

- Very low $R_{DS(ON)}$ at 4.5V V_{GS}
- Low Gate Charge
- Fully Characterized Avalanche Voltage and Current
- 100% Tested for R_G
- Lead-Free (Qualified up to 260°C Reflow)
- RoHS compliant (Halogen Free)
- Low Thermal Resistance
- Large Source Lead for more reliable Soldering




PQFN 5X6 mm

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{DS}	Drain-to-Source Voltage	30	V
V_{GS}	Gate-to-Source Voltage	± 20	
I_D @ T_A = 25°C	Continuous Drain Current, V_{GS} @ 10V	15	A
I_D @ T_A = 70°C	Continuous Drain Current, V_{GS} @ 10V	12	
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	34	
I_{DM}	Pulsed Drain Current ①	120	
P_D @T_A = 25°C	Power Dissipation ⑤	3.1	W
P_D @T_A = 70°C	Power Dissipation ⑤	2.0	
	Linear Derating Factor ⑤	0.025	W/°C
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ④	—	7.9	°C/W
$R_{\theta JA}$	Junction-to-Ambient ⑤	—	40	

Notes ① through ⑤ are on page 9

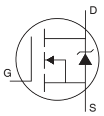
Static @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	30	——	——	V	V_{GS} = 0V, I_D = 250μA
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	——	0.02	——	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	——	7.1	8.5	mΩ	V_{GS} = 10V, I_D = 15A ③
		——	10.4	12.5		V_{GS} = 4.5V, I_D = 12A ③
$V_{GS(th)}$	Gate Threshold Voltage	1.35	1.8	2.35	V	V_{DS} = V_{GS}, I_D = 25μA
$\Delta V_{GS(th)}$	Gate Threshold Voltage Coefficient	——	-6.2	——	mV/°C	
I_{DSS}	Drain-to-Source Leakage Current	——	——	1.0	μA	V_{DS} = 24V, V_{GS} = 0V
		——	——	150		V_{DS} = 24V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage	——	——	100	nA	V_{GS} = 20V
	Gate-to-Source Reverse Leakage	——	——	-100		V_{GS} = -20V
gfs	Forward Transconductance	27	——	——	S	V_{DS} = 15V, I_D = 12A
Q_g	Total Gate Charge	——	9.3	14	nC	V_{DS} = 15V V_{GS} = 4.5V I_D = 12A See Fig.17 & 18
Q_{gs1}	Pre-Vth Gate-to-Source Charge	——	2.2	——		
Q_{gs2}	Post-Vth Gate-to-Source Charge	——	1.2	——		
Q_{gd}	Gate-to-Drain Charge	——	3.2	——		
Q_{godr}	Gate Charge Overdrive	——	2.7	——		
Q_{sw}	Switch Charge (Q_{gs2} + Q_{gd})	——	4.4	——		
Q_{oss}	Output Charge	——	5.0	——	nC	V_{DS} = 16V, V_{GS} = 0V
R_G	Gate Resistance	——	1.4	2.4	Ω	
$t_{d(on)}$	Turn-On Delay Time	——	12	——	ns	V_{DD} = 15V, V_{GS} = 4.5V I_D = 12A R_G=1.8Ω See Fig.15
t_r	Rise Time	——	7.6	——		
$t_{d(off)}$	Turn-Off Delay Time	——	14	——		
t_f	Fall Time	——	4.7	——		
C_{iss}	Input Capacitance	——	1210	——	pF	V_{GS} = 0V V_{DS} = 15V f = 1.0MHz
C_{oss}	Output Capacitance	——	240	——		
C_{rss}	Reverse Transfer Capacitance	——	120	——		

Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy ②	——	29	mJ
I_{AR}	Avalanche Current ①	——	12	A

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	——	——	3.9	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	——	——	120		
V_{SD}	Diode Forward Voltage	——	——	1.0	V	T_J = 25°C, I_S = 12A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	——	12	18	ns	T_J = 25°C, I_F = 12A, V_{DD} = 15V di/dt = 300A/μs ③
Q_{rr}	Reverse Recovery Charge	——	11	17	nC	
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

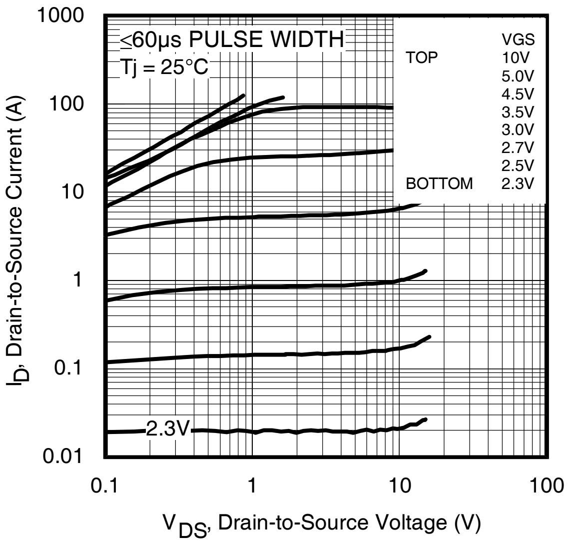


Fig 1. Typical Output Characteristics

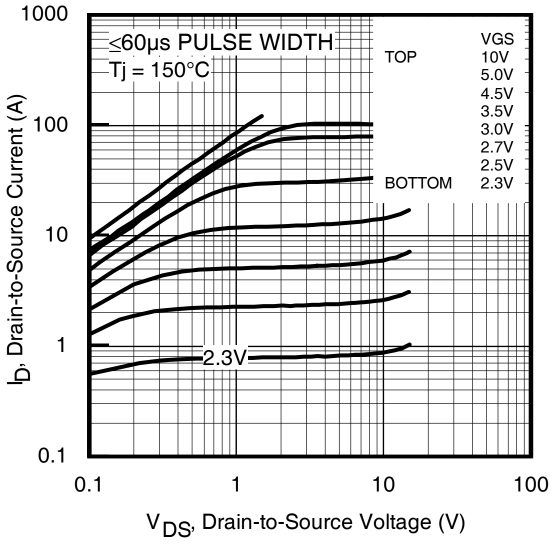


Fig 2. Typical Output Characteristics

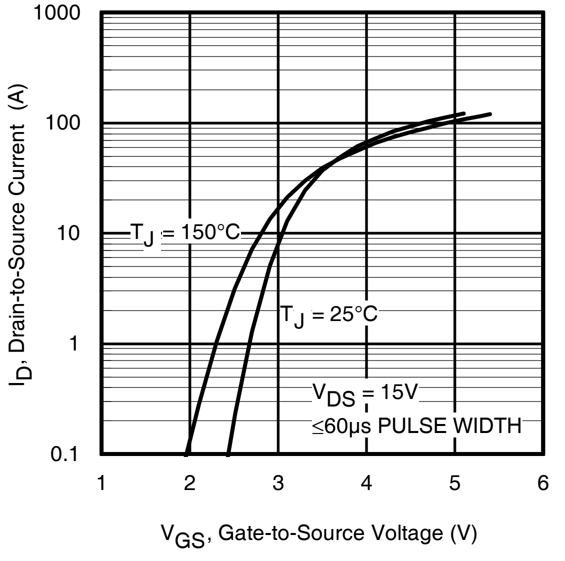


Fig 3. Typical Transfer Characteristics

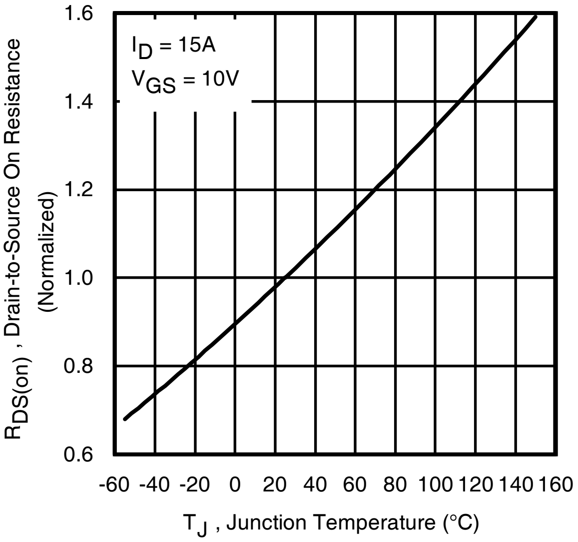


Fig 4. Normalized On-Resistance vs. Temperature

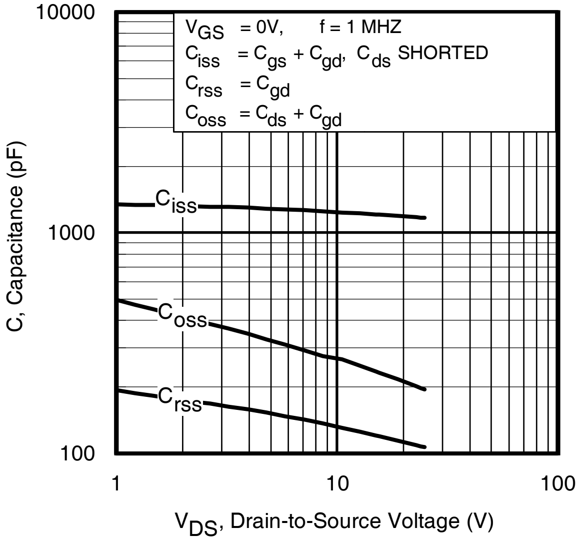


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

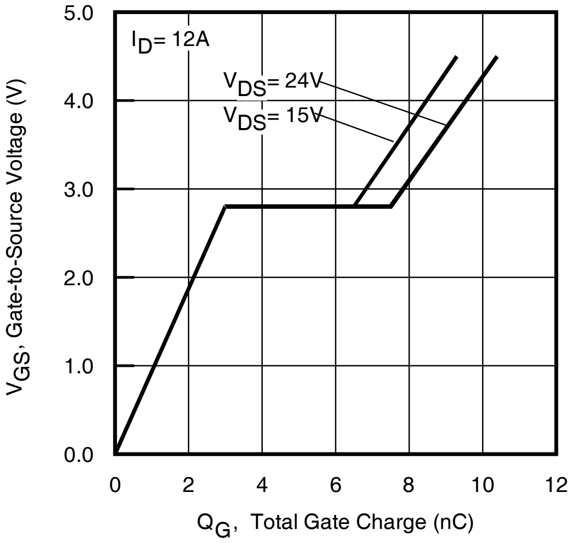


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

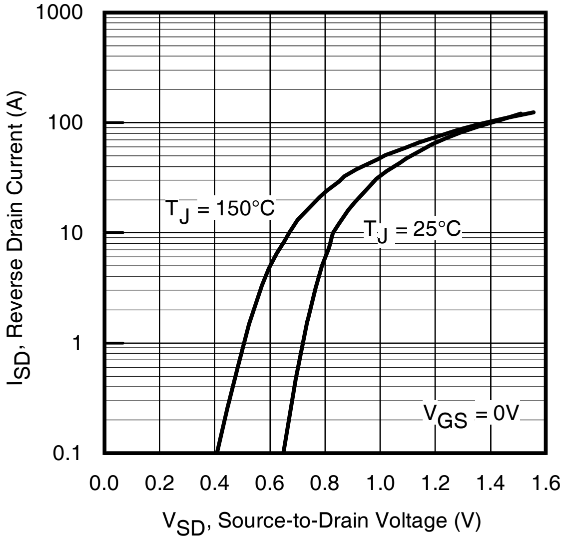


Fig 7. Typical Source-Drain Diode Forward Voltage

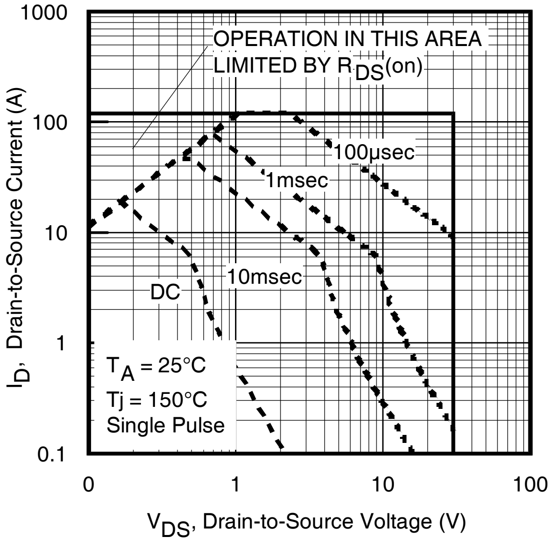


Fig 8. Maximum Safe Operating Area

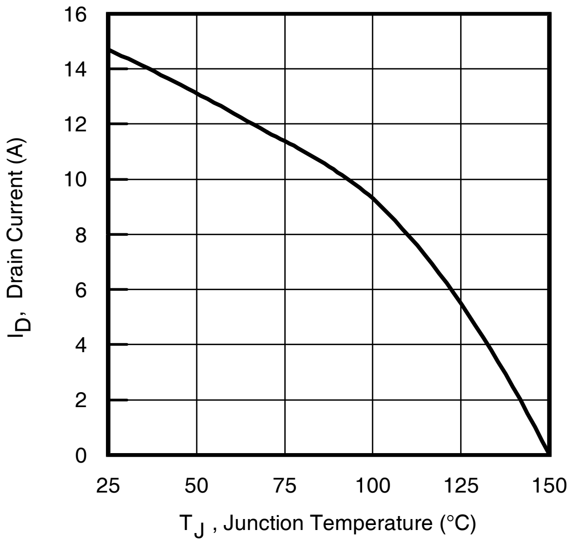


Fig 9. Maximum Drain Current vs. Ambient Temperature

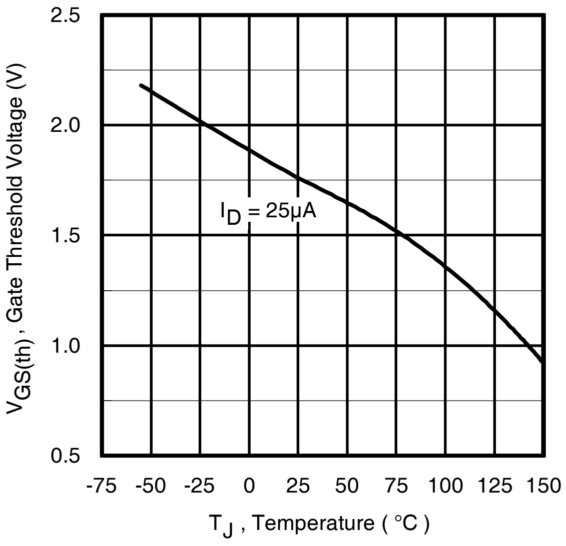
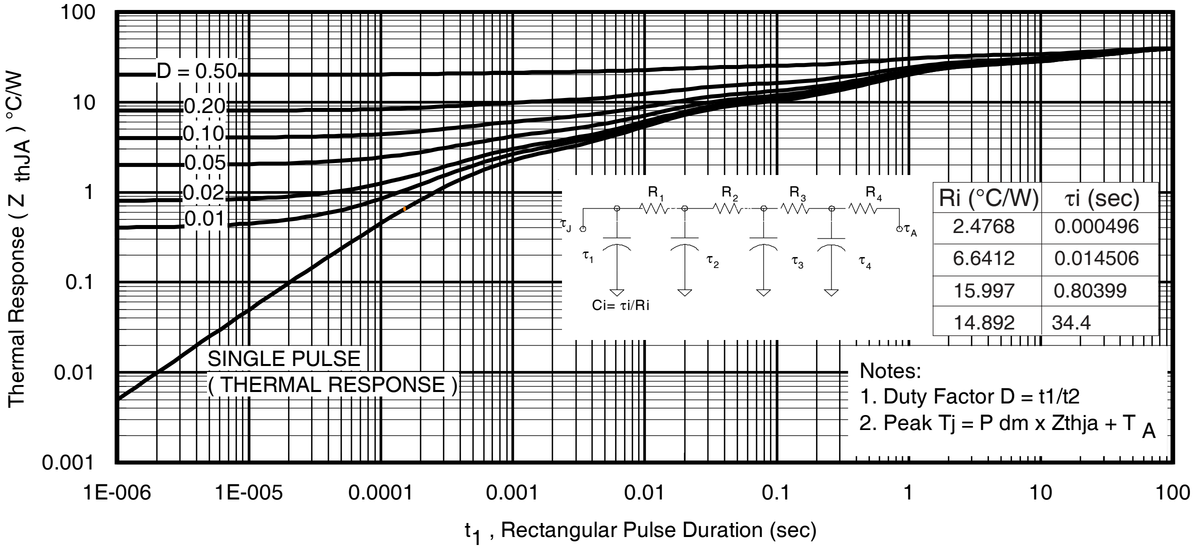


Fig 10. Threshold Voltage vs. Temperature



Ri (°C/W)	τi (sec)
2.4768	0.000496
6.6412	0.014506
15.997	0.80399
14.892	34.4

Notes:
1. Duty Factor D = t1/t2
2. Peak Tj = P dm x Zthja + T_A

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

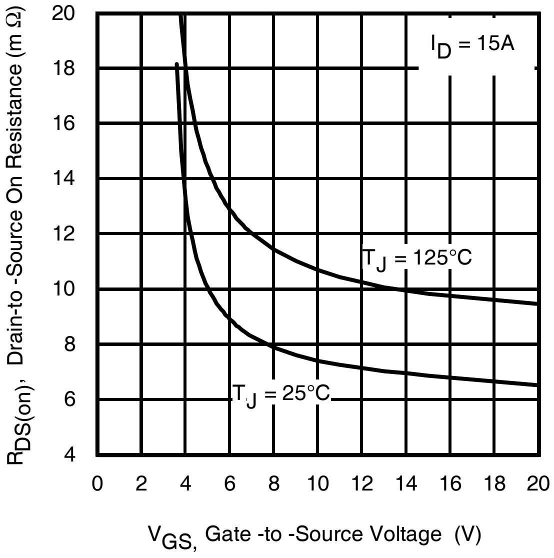


Fig 12. On-Resistance vs. Gate Voltage

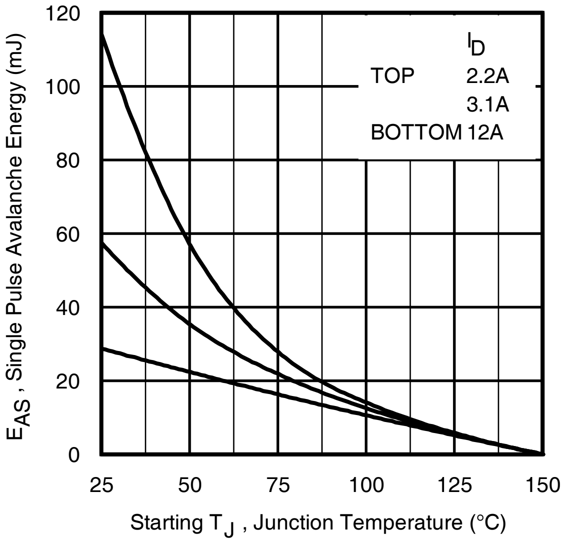


Fig 13. Maximum Avalanche Energy vs. Drain Current

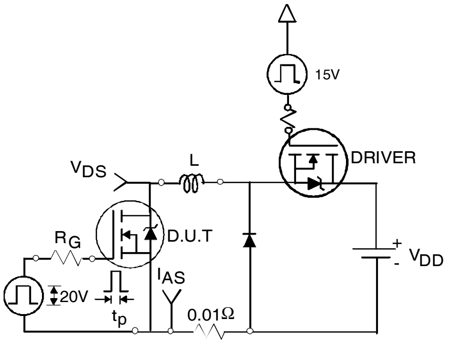


Fig 14a. Unclamped Inductive Test Circuit

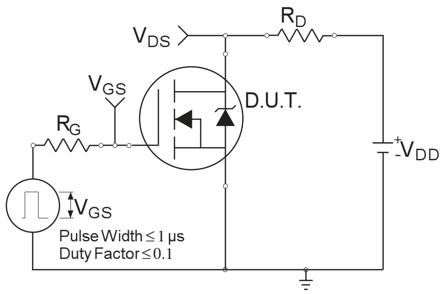


Fig 15a. Switching Time Test Circuit

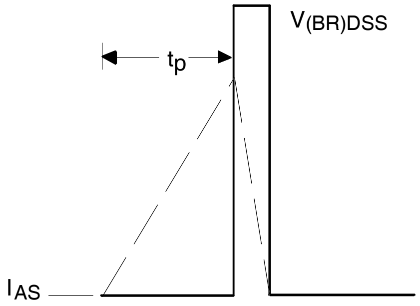


Fig 14b. Unclamped Inductive Waveforms

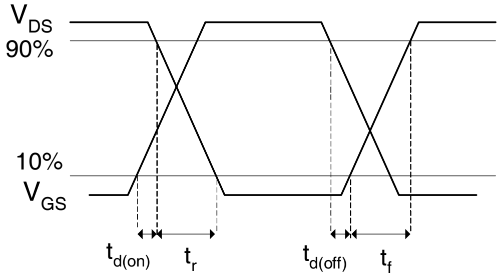
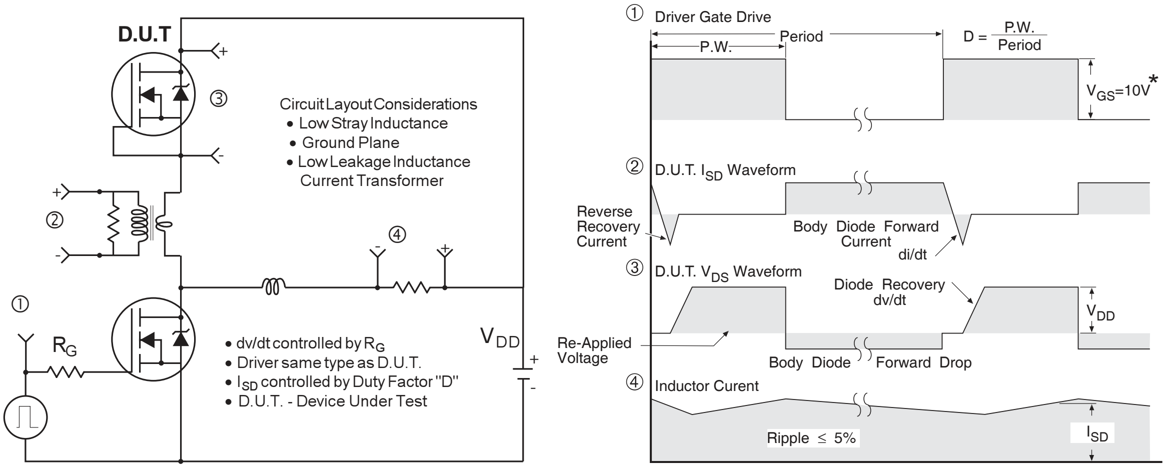


Fig 15b. Switching Time Waveforms



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

Fig 16. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

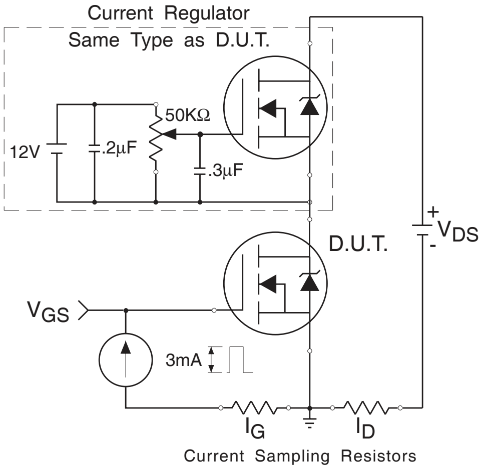


Fig 17. Gate Charge Test Circuit

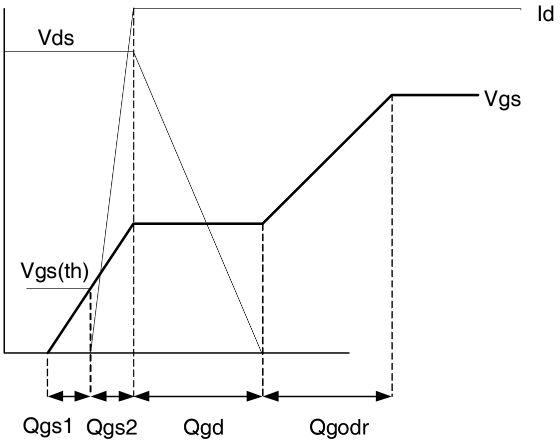
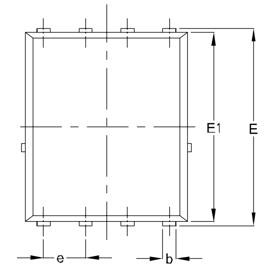
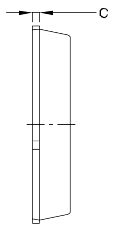
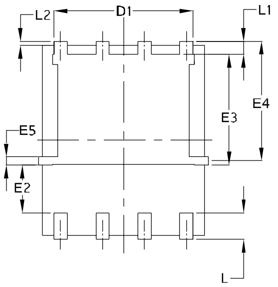


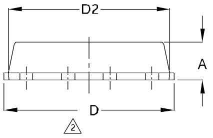
Fig 18. Gate Charge Waveform

PQFN 5x6 Option "E" Package Details



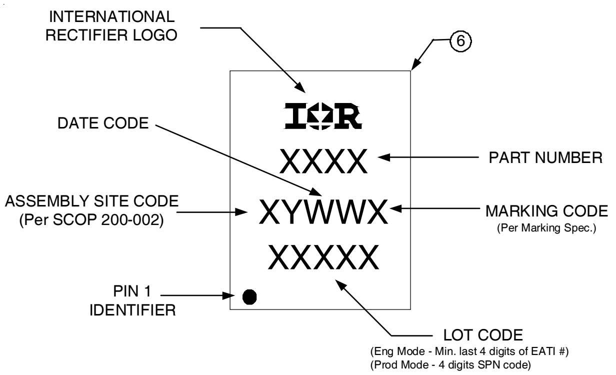






SYMBOL	COMMON			
	MM		INCH	
	MIN.	MAX.	MIN.	MAX.
A	0.90	1.17	0.0354	0.0461
b	0.31	0.51	0.0130	0.0189
C	0.195	0.300	0.0077	0.0118
D	4.80	5.25	0.1890	0.2028
D1	3.91	4.31	0.1539	0.1697
D2	4.80	5.10	0.1890	0.1968
E	5.90	6.25	0.2323	0.2421
E1	5.65	6.15	0.2224	0.2362
E2	1.10	—	0.0594	—
E3	3.32	3.78	0.1307	0.1480
E4	3.52	3.72	0.1346	0.1409
E5	0.13	0.32	0.0071	0.0126
e	1.27 BSC		0.050 BSC	
L	0.51	0.86	0.0020	0.0098
L1	0.38	0.71	0.0150	0.0260
L2	0.05	0.25	0.0201	0.0339
I	0	0.18	0	0.0071

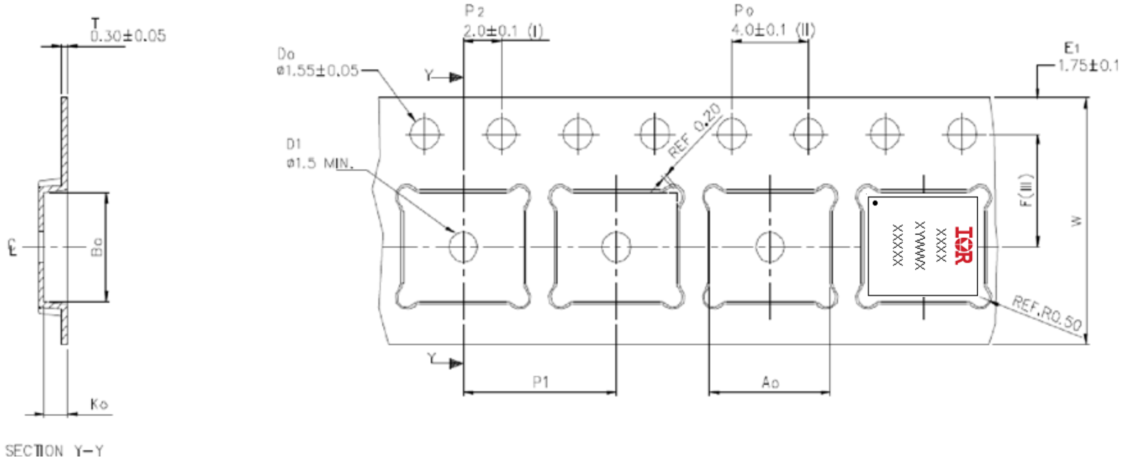
PQFN Part Marking



TOP MARKING (LASER)

Note: For the most current drawing please refer to IR website at http://www.irf.com/package/

PQFN Tape and Reel



Ao	6.30 +/− 0.1
Bo	5.30 +/− 0.1
Ko	1.20 +/− 0.1
F	5.50 +/− 0.1
P1	8.00 +/− 0.1
W	12.00 +/− 0.3

(I) Measured from centreline of sprocket hole to centreline of pocket.
(II) Cumulative tolerance of 10 sprocket holes is ± 0.20 .
(III) Measured from centreline of sprocket hole to centreline of pocket.
(IV) Other material available.
(V) Typical SR of form tape Max 10^9 OHM/SQ

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

Note: For the most current drawing please refer to IR website at http://www.irf.com/package/

Notes:

① Repetitive rating; pulse width limited by max. junction temperature.
② Starting $T_J = 25°C$, L = 0.39mH, $R_G = 25\Omega$, $I_{AS} = 12A$.
③ Pulse width ≤ 400µs; duty cycle ≤ 2%.
④ Rthjc is guaranteed by design
⑤ When mounted on 1 inch square 2 oz copper pad on 1.5x1.5 in. board of FR-4 material.

Revision History

Date	Comments
08/05/2013	• Updated the package drawing, on page 1. • Updated the package outline drawing, on page 8. • This drawing change is related to PCN "Hana-GTBF-GEM 5x6 PQFN Public."

International
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