International
IOR Rectifier

IRFH7936PbF

Applications

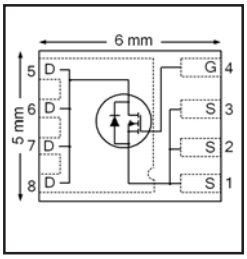
- Synchronous MOSFET for Notebook Processor Power
- Synchronous Rectifer MOSFET for Isolated DC-DC Converters in Networking Systems

HEXFET® Power MOSFET

V_{DSS}	$R_{DS(on)}$ max	Qg
30V	4.8mΩ@V_{GS} = 10V	17nC

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	20	A
I_D @ T_A = 70°C	Continuous Drain Current, V_{GS} @ 10V	16	
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	54	
I_{DM}	Pulsed Drain Current ①	160	
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	—	5.6	°C/W
$R_{\theta JA}$	Junction-to-Ambient ⑤	—	40	

Notes ① through ⑤ are on page 9

 © 2013 International Rectifier

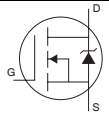
Static @ T_J = 25°C (unless otherwise specified)

	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	—	0.022	—	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	4.1	4.8	mΩ	V_{GS} = 10V, I_D = 20A ③
		—	6.0	6.8		V_{GS} = 4.5V, I_D = 16A ③
$V_{GS(th)}$	Gate Threshold Voltage	1.35	1.8	2.35	V	V_{DS} = V_{GS}, I_D = 50µA
$\Delta V_{GS(th)}$	Gate Threshold Voltage Coefficient	—	-6.3	—	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	48	—	—	S	V_{DS} = 15V, I_D = 16A
Q_g	Total Gate Charge	—	17	26	nC	V_{DS} = 15V V_{GS} = 4.5V I_D = 16A See Fig.17 & 18
Q_{gs1}	Pre-Vth Gate-to-Source Charge	—	4.5	—		
Q_{gs2}	Post-Vth Gate-to-Source Charge	—	2.0	—		
Q_{gd}	Gate-to-Drain Charge	—	5.5	—		
Q_{godr}	Gate Charge Overdrive	—	5.0	—		
Q_{sw}	Switch Charge (Q_{gs2} + Q_{gd})	—	7.5	—		
Q_{oss}	Output Charge	—	9.0	—	nC	V_{DS} = 16V, V_{GS} = 0V
R_G	Gate Resistance	—	1.5	2.3	Ω	
$t_{d(on)}$	Turn-On Delay Time	—	17	—	ns	V_{DD} = 15V, V_{GS} = 4.5V I_D = 16A R_G=1.8Ω See Fig.15
t_r	Rise Time	—	12	—		
$t_{d(off)}$	Turn-Off Delay Time	—	19	—		
t_f	Fall Time	—	7.0	—		
C_{iss}	Input Capacitance	—	2360	—	pF	V_{GS} = 0V V_{DS} = 15V f = 1.0MHz
C_{oss}	Output Capacitance	—	450	—		
C_{rss}	Reverse Transfer Capacitance	—	210	—		

Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy ②	—	28	mJ
I_{AR}	Avalanche Current ①	—	16	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	—	—	160		
V_{SD}	Diode Forward Voltage	—	—	1.0	V	T_J = 25°C, I_S = 16A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	—	14	21	ns	T_J = 25°C, I_F = 16A, V_{DD} = 15V
Q_{rr}	Reverse Recovery Charge	—	15	23	nC	di/dt = 300A/µs ③ See Fig.16
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

 © 2013 International Rectifier

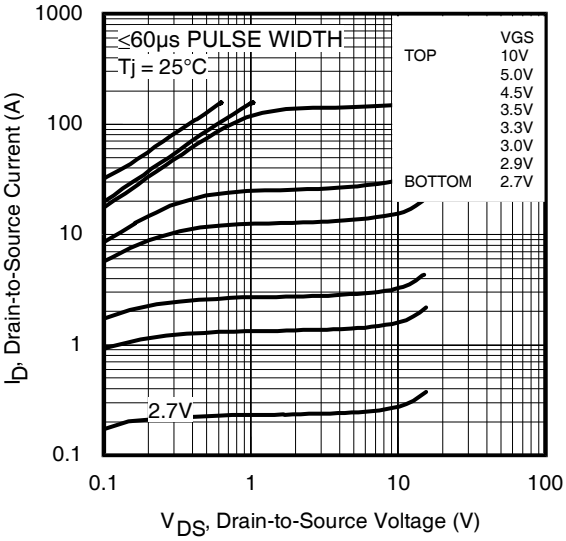


Fig 1. Typical Output Characteristics

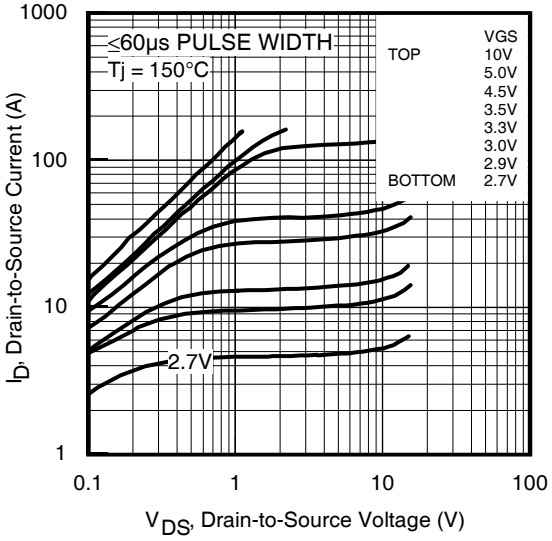


Fig 2. Typical Output Characteristics

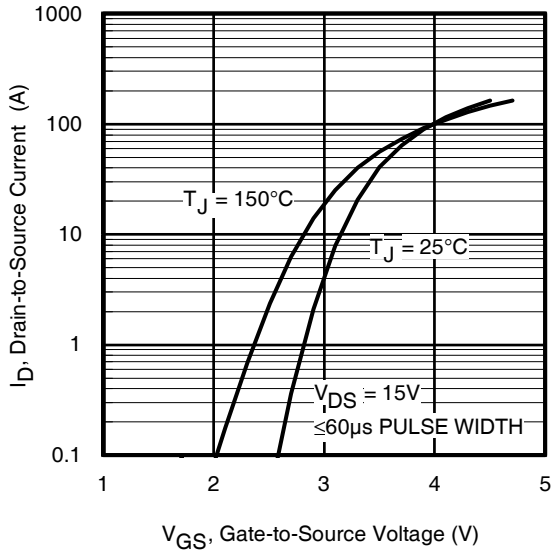


Fig 3. Typical Transfer Characteristics

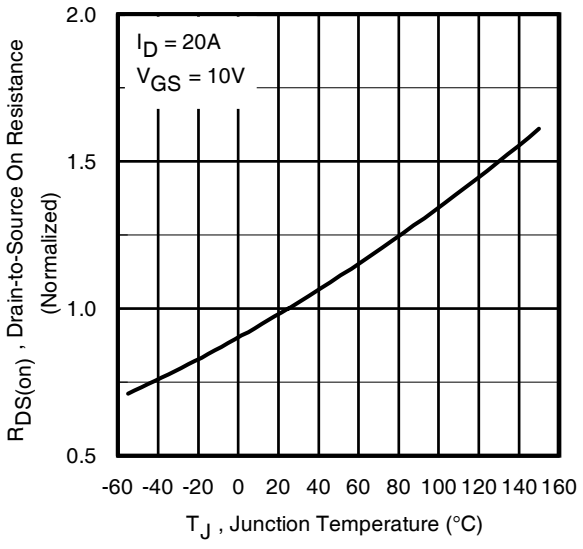


Fig 4. Normalized On-Resistance vs. Temperature

 © 2013 International Rectifier

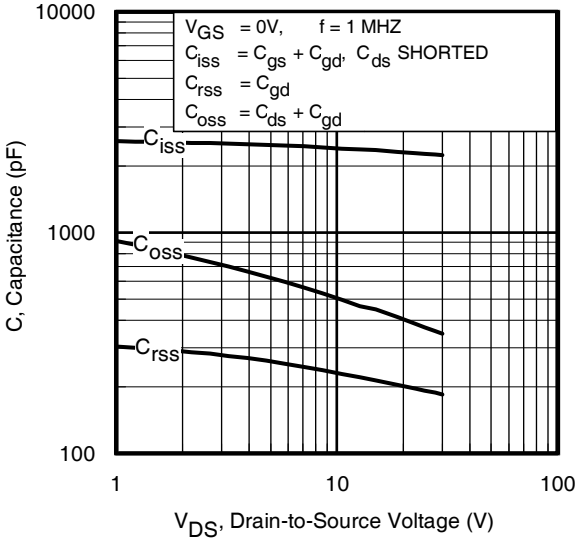


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

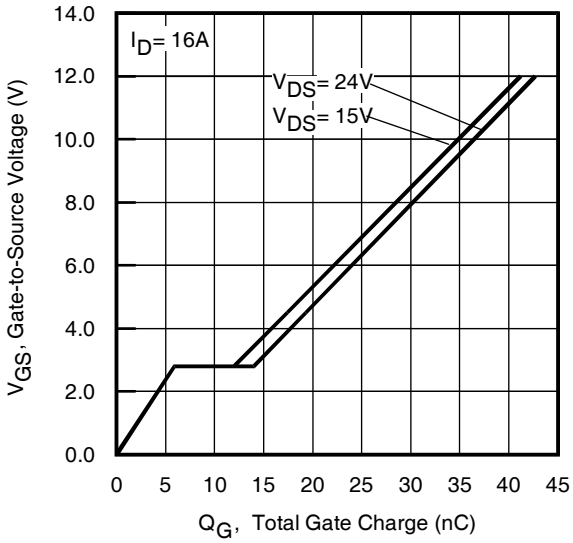


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

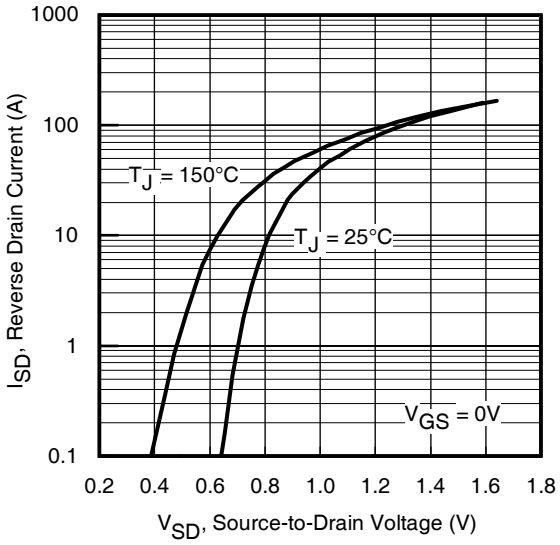


Fig 7. Typical Source-Drain Diode Forward Voltage

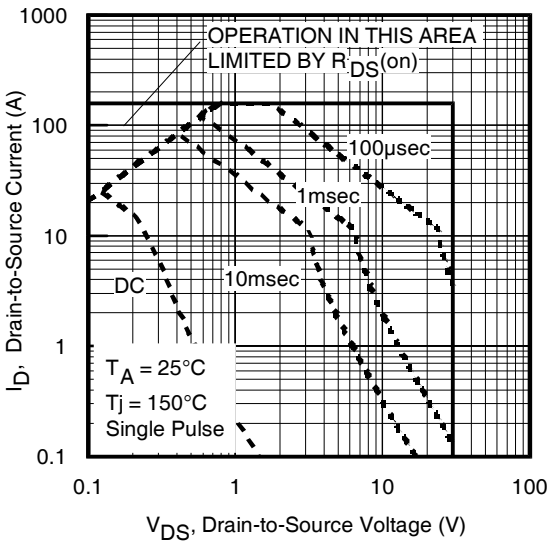


Fig 8. Maximum Safe Operating Area

 © 2013 International Rectifier

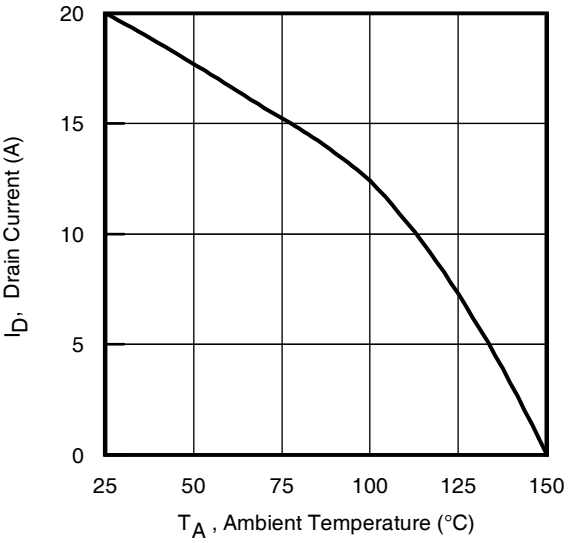


Fig 9. Maximum Drain Current vs. Ambient Temperature

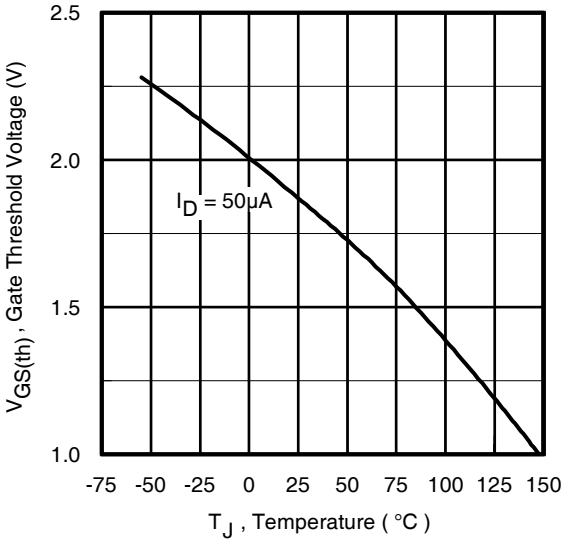


Fig 10. Threshold Voltage vs. Temperature

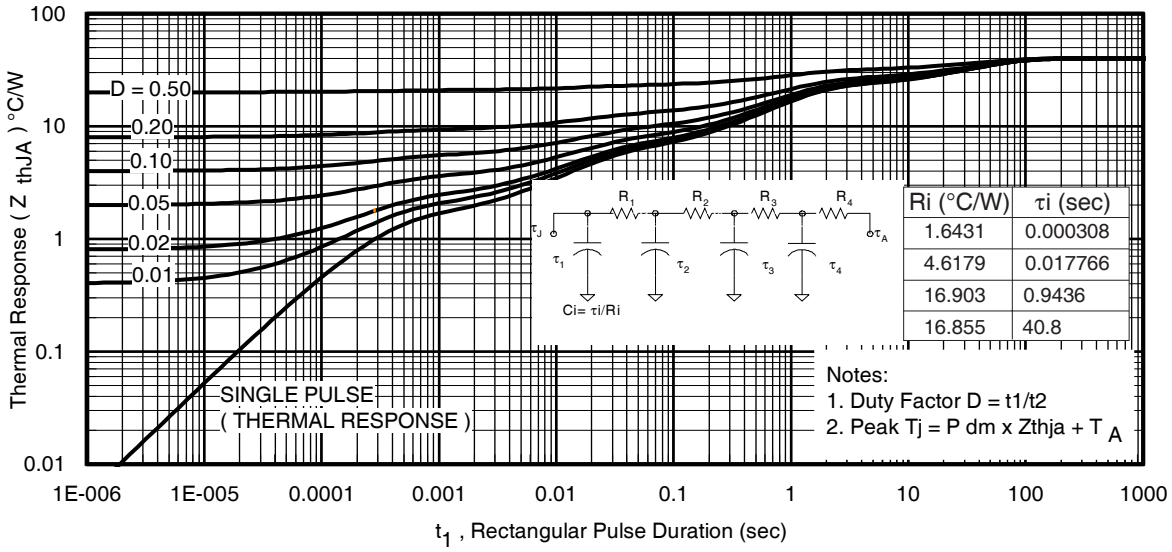


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

 © 2013 International Rectifier

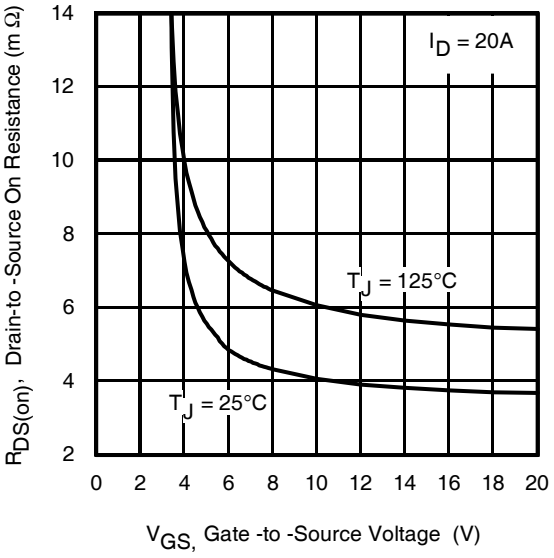


Fig 12. On-Resistance vs. Gate Voltage

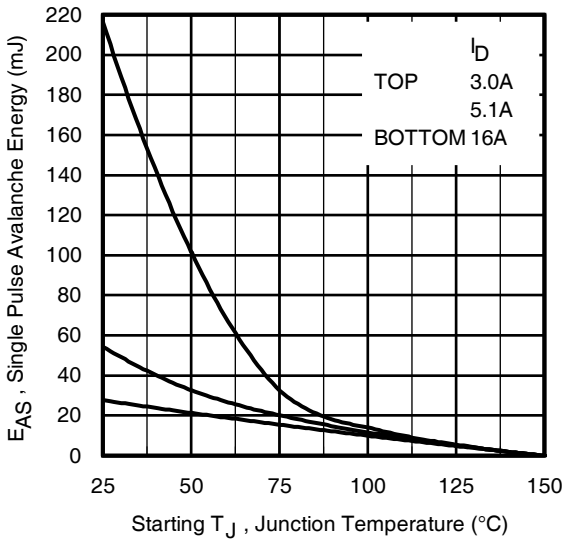


Fig 13. Maximum Avalanche Energy vs. Drain Current

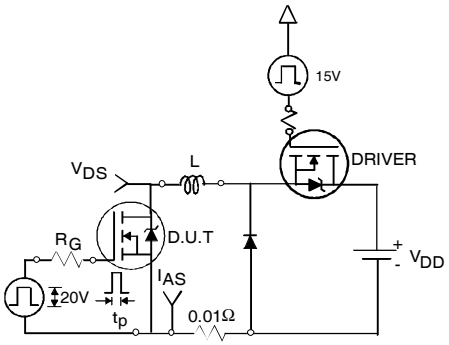


Fig 14a. Unclamped Inductive Test Circuit

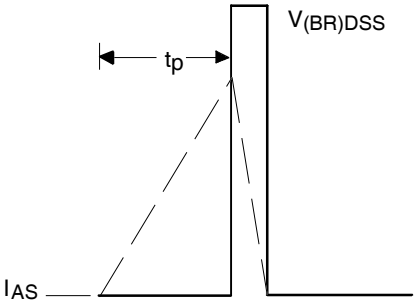


Fig 14b. Unclamped Inductive Waveforms

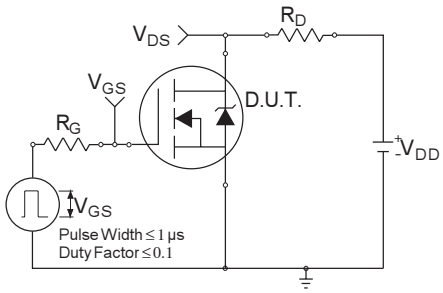


Fig 15a. Switching Time Test Circuit

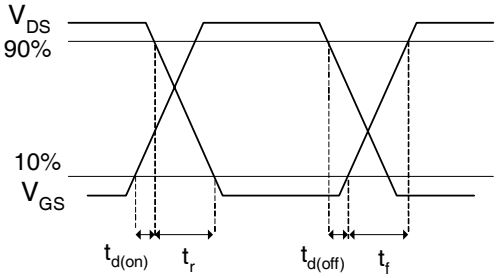


Fig 15b. Switching Time Waveforms

 © 2013 International Rectifier

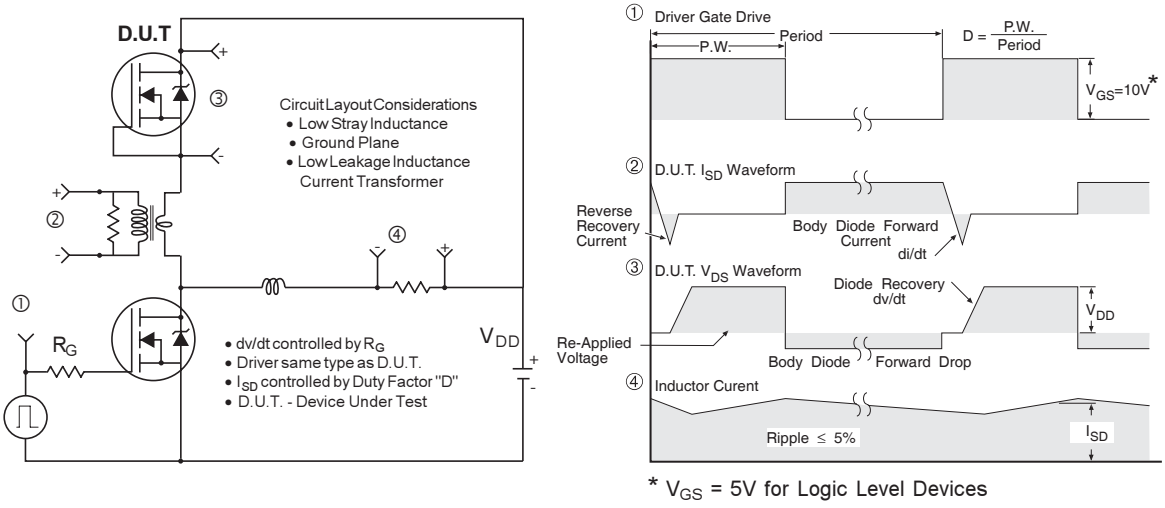


Fig 16. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

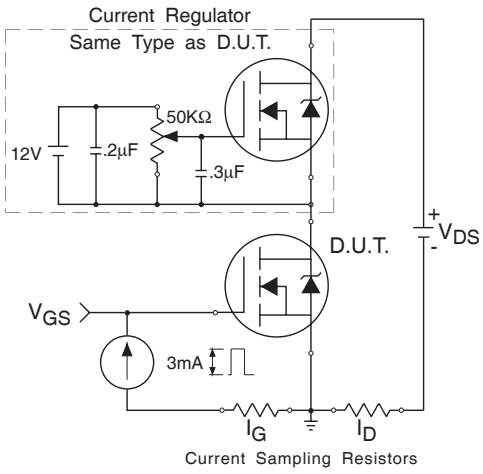


Fig 17. Gate Charge Test Circuit

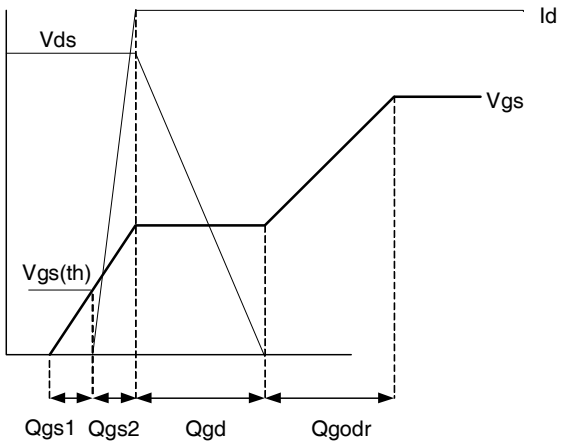
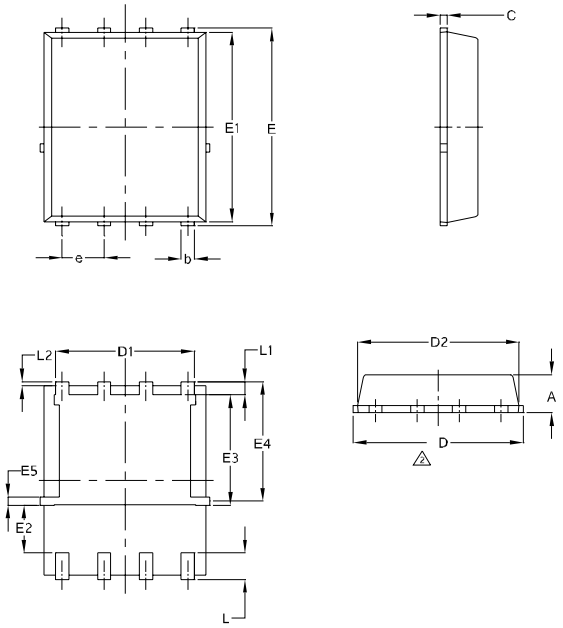


Fig 18. Gate Charge Waveform

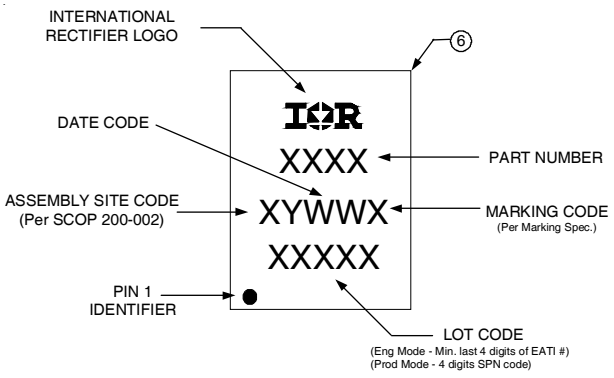
 © 2013 International Rectifier

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

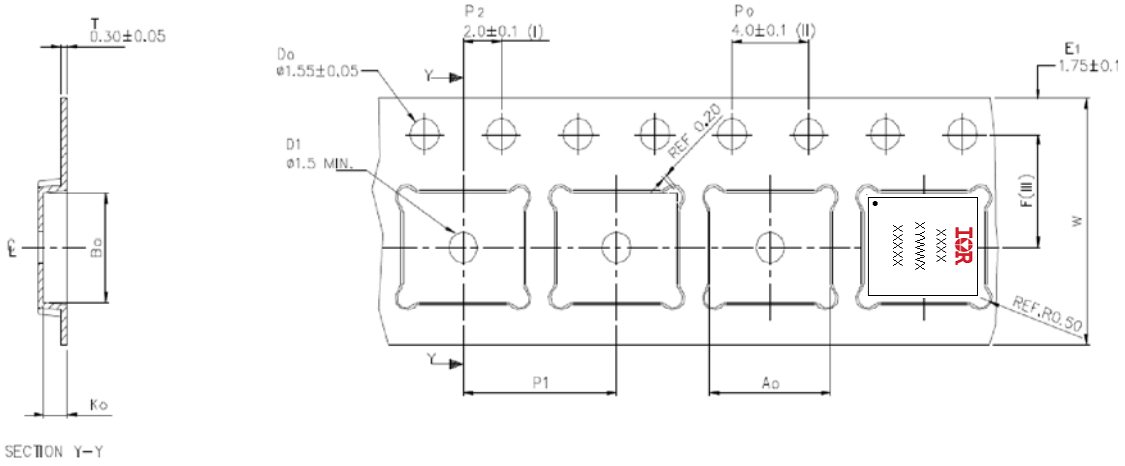


TOP MARKING (LASER)

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

 © 2013 International Rectifier

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 = 0.22mH, R_G = 25Ω, I_{AS} = 16A.
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
08/08/2013	• 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."