International
IOR Rectifier

PD - 97359

IRFH5053PbF

HEXFET® Power MOSFET

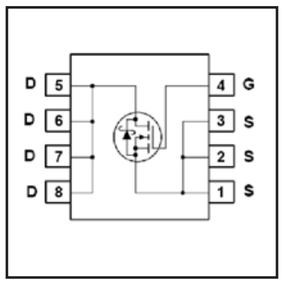
Applications

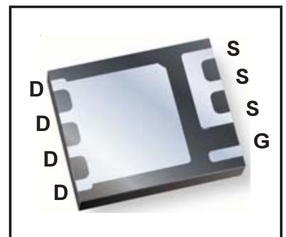
- 3 Phase Boost Converter Applications
- Secondary Side Synchronous Rectification

V_{DSS}	$R_{DS(on)}$ max	Qg
100V	18mΩ@V_{GS} = 10V	24nC

Benefits

- Very low $R_{DS(ON)}$ at 10V 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

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{DS}	Drain-to-Source Voltage	100	V
V_{GS}	Gate-to-Source Voltage	± 20	
I_D @ T_A = 25°C	Continuous Drain Current, V_{GS} @ 10V	9.3	A
I_D @ T_A = 70°C	Continuous Drain Current, V_{GS} @ 10V	7.4	
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	46	
I_{DM}	Pulsed Drain Current ①	75	
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	——	1.6	°C/W
$R_{\theta JA}$	Junction-to-Ambient ⑤	——	40	

Notes ① through ⑤ are on page 9

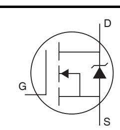
Static @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	100	—	—	V	V_{GS} = 0V, I_D = 250μA
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.11	—	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	14.4	18	mΩ	V_{GS} = 10V, I_D = 9.3A ③
$V_{GS(th)}$	Gate Threshold Voltage	3.0	3.7	4.9	V	$V_{DS} = V_{GS}$, I_D = 100μA
$\Delta V_{GS(th)}$	Gate Threshold Voltage Coefficient	—	-11	—	mV/°C	
I_{DSS}	Drain-to-Source Leakage Current	—	—	20	μA	V_{DS} = 80V, V_{GS} = 0V
		—	—	250		V_{DS} = 80V, 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	19	—	—	S	V_{DS} = 50V, I_D = 7.4A
Q_g	Total Gate Charge	—	24	36	nC	
Q_{gs1}	Pre-Vth Gate-to-Source Charge	—	5.2	—		V_{DS} = 50V
Q_{gs2}	Post-Vth Gate-to-Source Charge	—	1.5	—		V_{GS} = 10V
Q_{gd}	Gate-to-Drain Charge	—	8.6	—		I_D = 7.4A
Q_{godr}	Gate Charge Overdrive	—	8.7	—		See Fig.17 & 18
Q_{sw}	Switch Charge (Q_{gs2} + Q_{gd})	—	10.1	—		
Q_{oss}	Output Charge	—	12	—	nC	V_{DS} = 16V, V_{GS} = 0V
R_G	Gate Resistance	—	0.8	—	Ω	
$t_{d(on)}$	Turn-On Delay Time	—	12	—	ns	V_{DD} = 50V, V_{GS} = 10V
t_r	Rise Time	—	7.5	—		I_D = 7.4A
$t_{d(off)}$	Turn-Off Delay Time	—	18	—		R_G=1.8Ω
t_f	Fall Time	—	4.1	—		See Fig.15
C_{iss}	Input Capacitance	—	1510	—	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	—	230	—		V_{DS} = 50V
C_{rss}	Reverse Transfer Capacitance	—	59	—		f = 1.0MHz

Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy ②	—	21	mJ
I_{AR}	Avalanche Current ①	—	7.4	A

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	2.8	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	75		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	T_J = 25°C, I_S = 7.4A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	—	31	47	ns	T_J = 25°C, I_F = 7.4A, V_{DD} = 50V
Q_{rr}	Reverse Recovery Charge	—	210	320	nC	di/dt = 800A/μs ③ See Fig.16
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

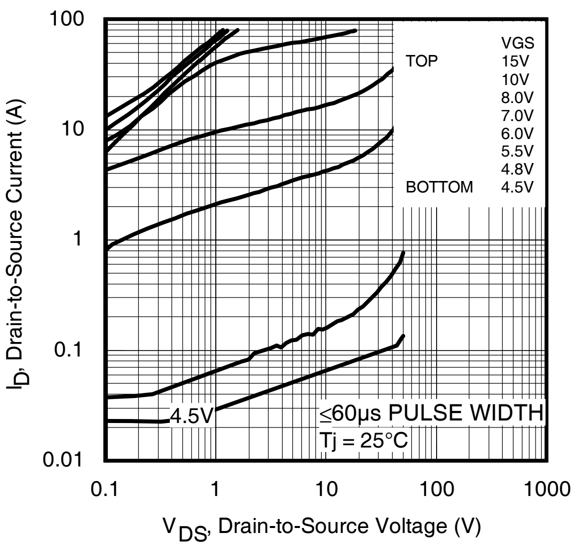


Fig 1. Typical Output Characteristics

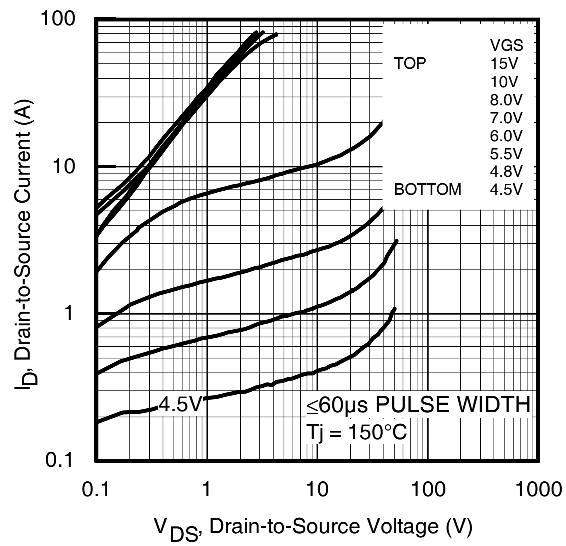


Fig 2. Typical Output Characteristics

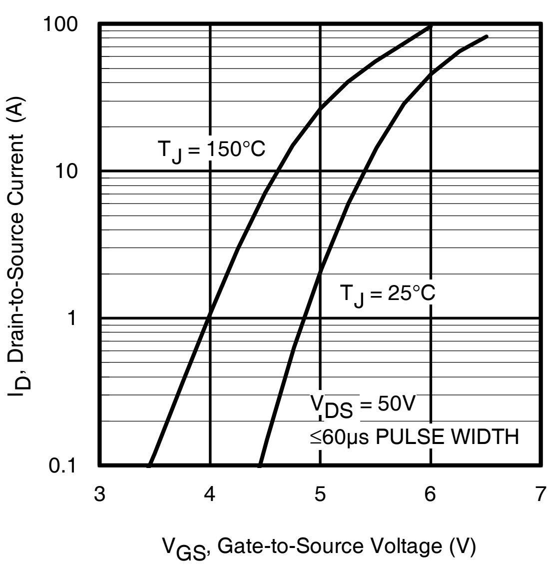


Fig 3. Typical Transfer Characteristics

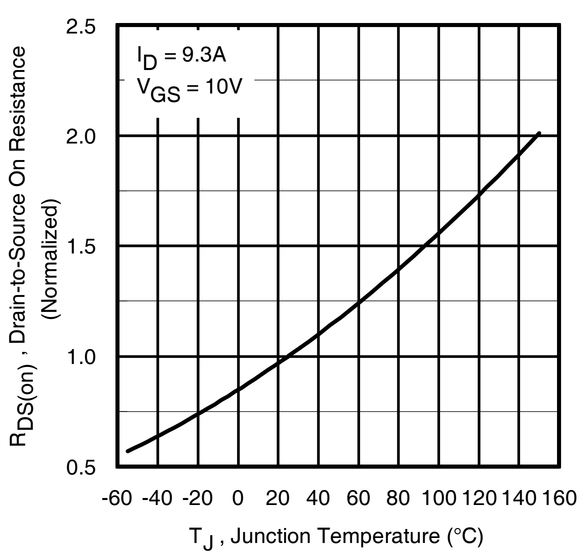


Fig 4. Normalized On-Resistance vs. Temperature

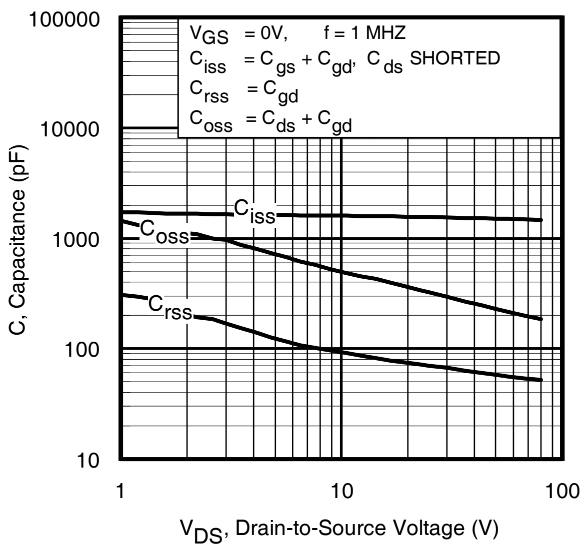


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

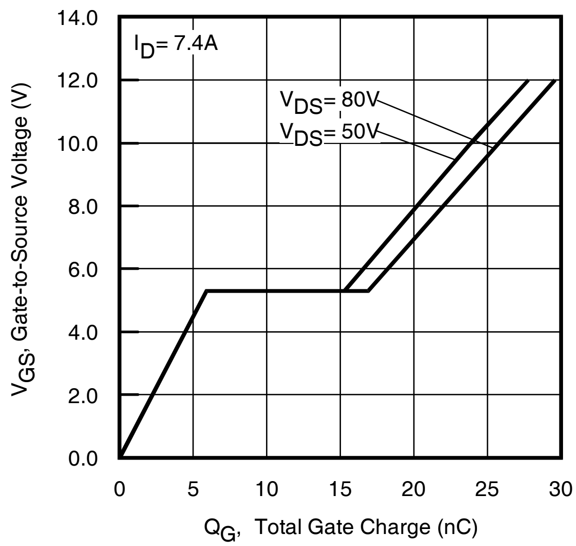


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

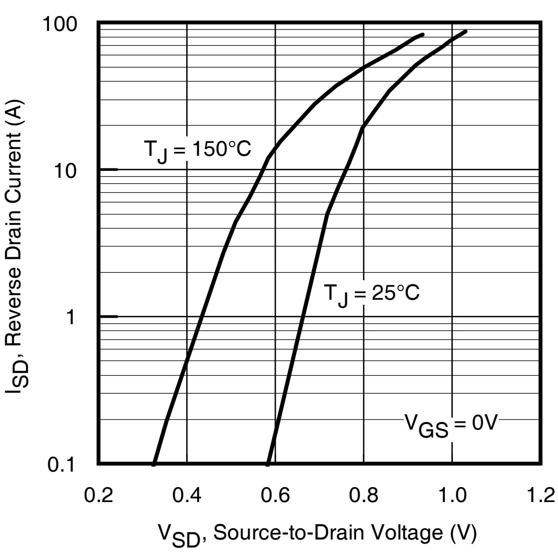


Fig 7. Typical Source-Drain Diode Forward Voltage

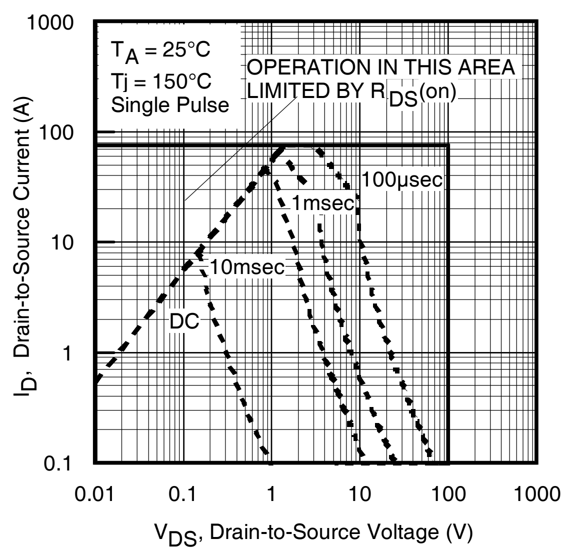


Fig 8. Maximum Safe Operating Area

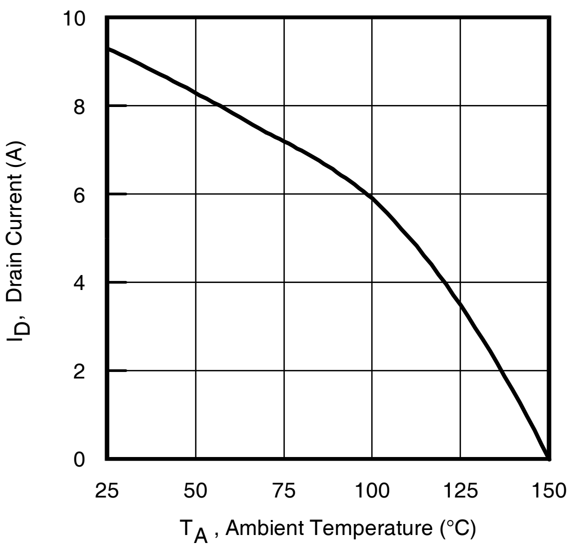


Fig 9. Maximum Drain Current vs. Ambient Temperature

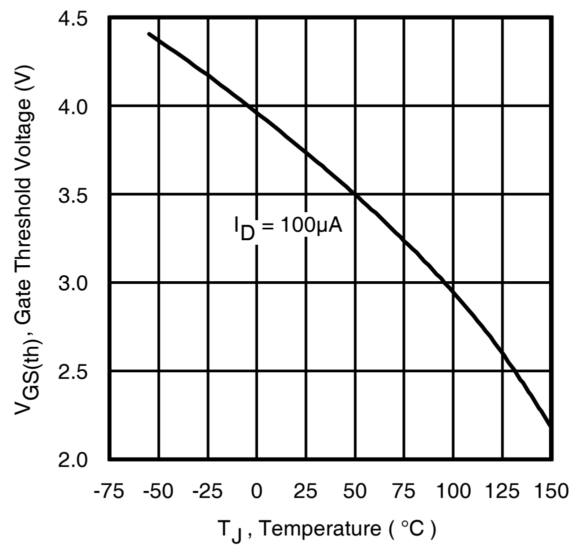


Fig 10. Threshold Voltage vs. Temperature

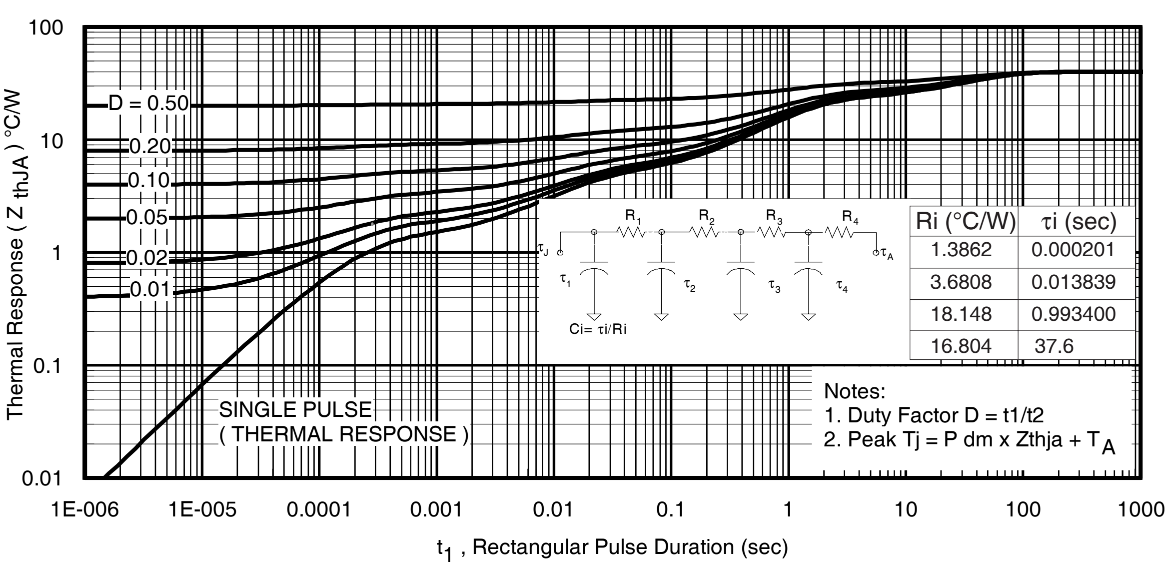


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

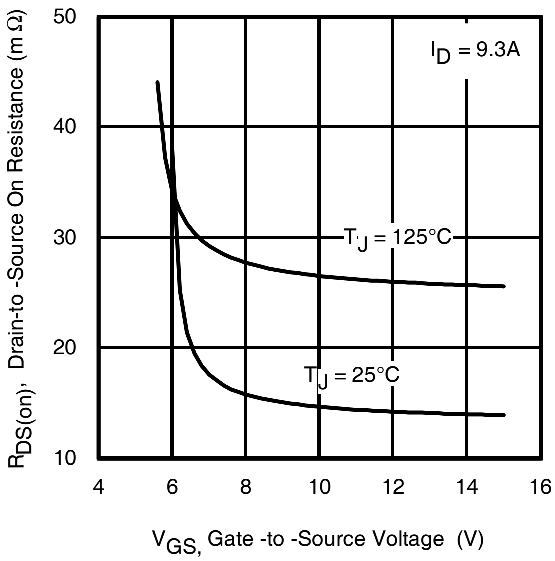


Fig 12. On-Resistance vs. Gate Voltage

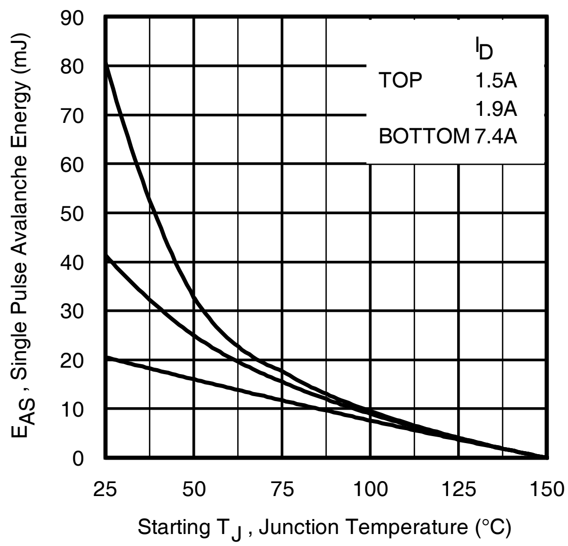


Fig 13. Maximum Avalanche Energy vs. Drain Current

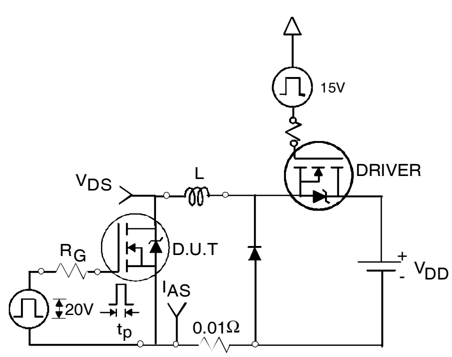


Fig 14a. Unclamped Inductive Test Circuit

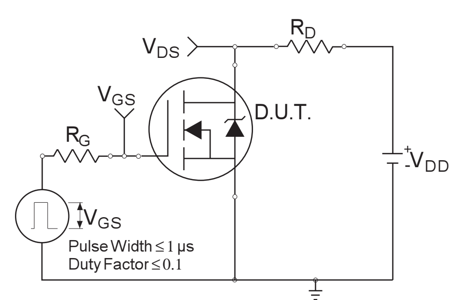


Fig 15a. Switching Time Test Circuit

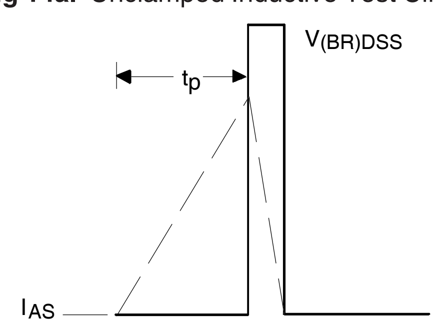


Fig 14b. Unclamped Inductive Waveforms

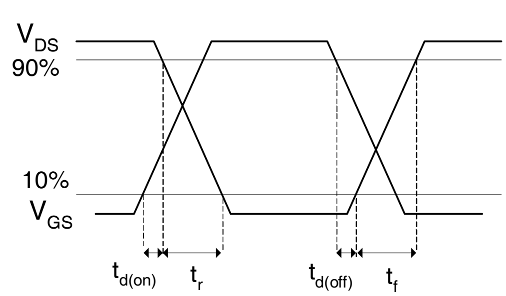


Fig 15b. Switching Time Waveforms

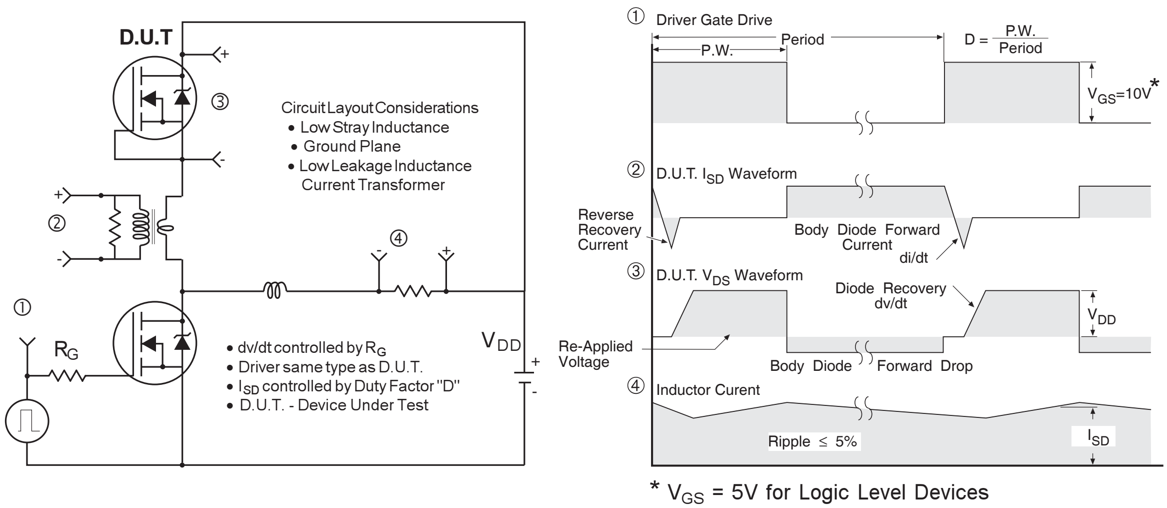


Fig 16. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

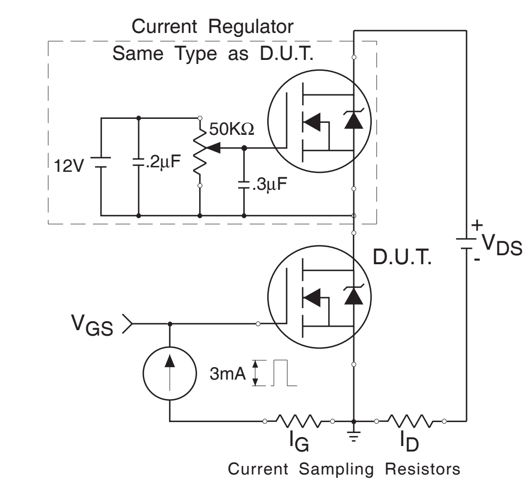


Fig 17. Gate Charge Test Circuit

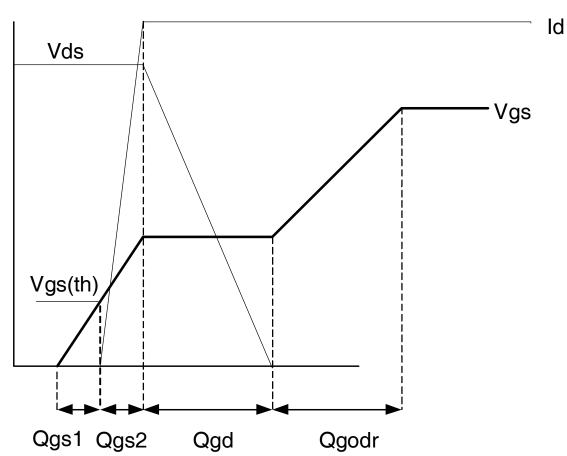
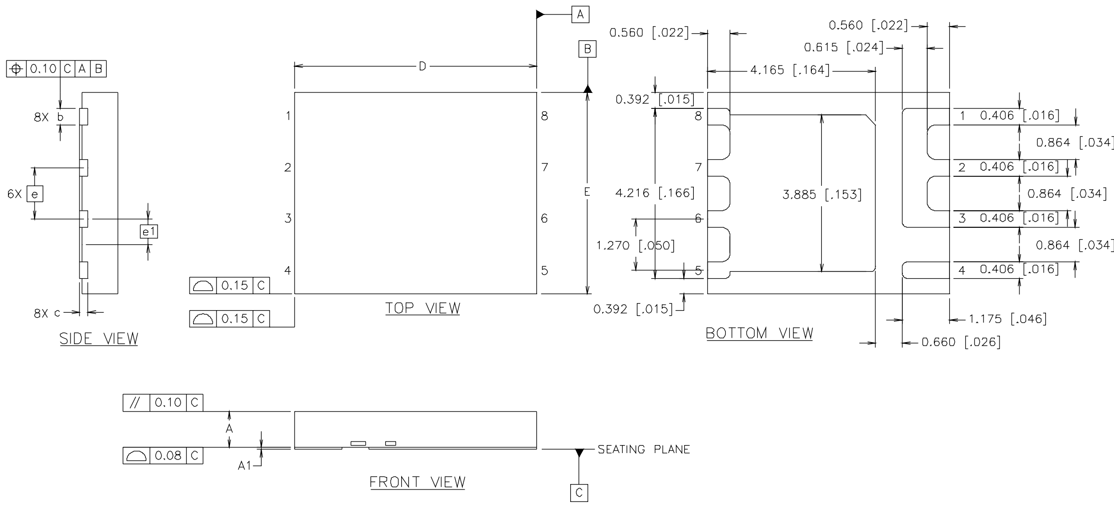


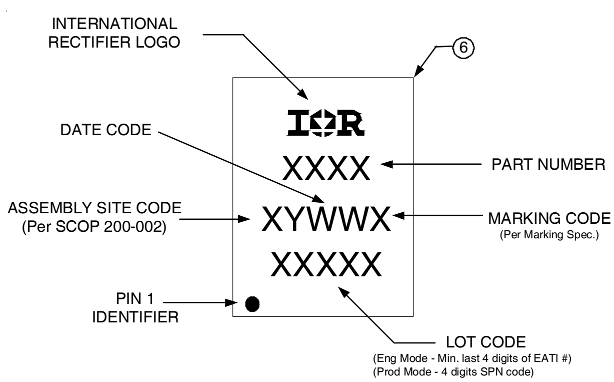
Fig 18. Gate Charge Waveform

PQFN Package Details



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0315	.0394	0.800	1.000
A1	.0000	.0020	0.000	0.050
b	.0140	.0180	0.356	0.456
c	.0080 REF.		0.203 REF.	
D	.2362 BASIC		6.0 BASIC	
E	.1969 BASIC		5.0 BASIC	
e	.0500 BASIC		1.270 BASIC	
e1	.0250 BASIC		0.635 BASIC	

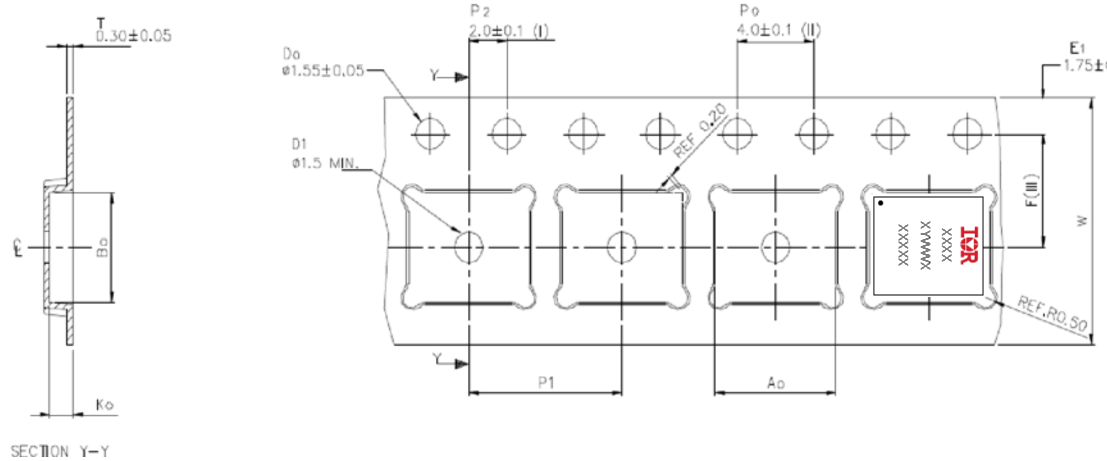
PQFN Part Marking



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 = 0.75mH, R_G = 25Ω, I_{AS} = 7.4A.
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.

Data and specifications subject to change without notice.
This product has been designed and qualified for the Consumer market.
Qualification Standards can be found on IR's Web site.

International
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IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7903
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