

Preliminary

IRFH7928PbF

HEXFET® Power MOSFET

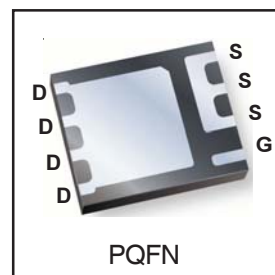
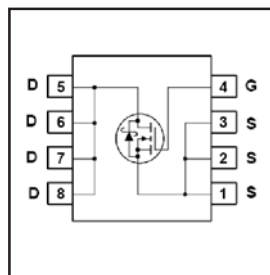
Applications

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

V_{DS}	$R_{DS(on)}$ max	Qg
30V	2.9m Ω @ $V_{GS} = 10V$	40nC

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



Absolute Maximum Ratings

	Parameter	Max.	Units
V_{DS}	Drain-to-Source Voltage	30	V
V_{GS}	Gate-to-Source Voltage	± 20	
I_D @ $T_A = 25^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	26	A
I_D @ $T_A = 70^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	21	
I_D @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	124	
I_{DM}	Pulsed Drain Current ①	208	W
P_D @ $T_A = 25^\circ\text{C}$	Power Dissipation ⑤	3.1	
P_D @ $T_A = 70^\circ\text{C}$	Power Dissipation ⑤	2.0	
	Linear Derating Factor ⑤	0.025	W/ $^\circ\text{C}$
T_J	Operating Junction and	-55 to + 150	$^\circ\text{C}$
T_{STG}	Storage Temperature Range		

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ④	—	1.8	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Junction-to-Ambient ⑤	—	40	

ORDERING INFORMATION:

See detailed ordering and shipping information on the last page of this data sheet.

Notes ① through ⑤ are on page 10

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	30	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.02	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	2.4	2.9	$m\Omega$	$V_{GS} = 10V, I_D = 26A$ ③
		—	3.0	3.8		$V_{GS} = 4.5V, I_D = 21A$ ③
$V_{GS(th)}$	Gate Threshold Voltage	1.35	1.8	2.35	V	$V_{DS} = V_{GS}, I_D = 100\mu A$
$\Delta V_{GS(th)}$	Gate Threshold Voltage Coefficient	—	-6.4	—	mV/ $^\circ\text{C}$	
I_{DSS}	Drain-to-Source Leakage Current	—	—	1.0	μA	$V_{DS} = 24V, V_{GS} = 0V$
		—	—	150		$V_{DS} = 24V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -20V$
g_{fs}	Forward Transconductance	110	—	—	S	$V_{DS} = 15V, I_D = 21A$
Q_g	Total Gate Charge	—	40	60	nC	$V_{DS} = 15V$ $V_{GS} = 4.5V$ $I_D = 21A$ See Fig.17 & 18
Q_{gs1}	Pre-Vth Gate-to-Source Charge	—	10.2	—		
Q_{gs2}	Post-Vth Gate-to-Source Charge	—	4.7	—		
Q_{gd}	Gate-to-Drain Charge	—	13.5	—		
Q_{godr}	Gate Charge Overdrive	—	11.8	—		
Q_{sw}	Switch Charge ($Q_{gs2} + Q_{gd}$)	—	18.2	—		
Q_{oss}	Output Charge	—	22.5	—	nC	$V_{DS} = 16V, V_{GS} = 0V$
R_G	Gate Resistance	—	0.57	0.7	Ω	
$t_{d(on)}$	Turn-On Delay Time	—	22.2	—	ns	$V_{DD} = 15V, V_{GS} = 4.5V$ $I_D = 21A$ $R_G = 1.8\Omega$ See Fig.15
t_r	Rise Time	—	31.5	—		
$t_{d(off)}$	Turn-Off Delay Time	—	22.3	—		
t_f	Fall Time	—	14.2	—		
C_{iss}	Input Capacitance	—	5657	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	1005	—		$V_{DS} = 15V$
C_{rss}	Reverse Transfer Capacitance	—	520	—		$f = 1.0MHz$

Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy ②	—	168	mJ
I_{AR}	Avalanche Current ①	—	21	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	—	—	208		
V_{SD}	Diode Forward Voltage	—	—	1.0	V	$T_J = 25^\circ\text{C}, I_S = 21A, V_{GS} = 0V$ ③
t_{rr}	Reverse Recovery Time	—	26	40	ns	$T_J = 25^\circ\text{C}, I_F = 21A, V_{DD} = 15V$
Q_{rr}	Reverse Recovery Charge	—	31	47	nC	$di/dt = 200A/\mu s$ ③
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

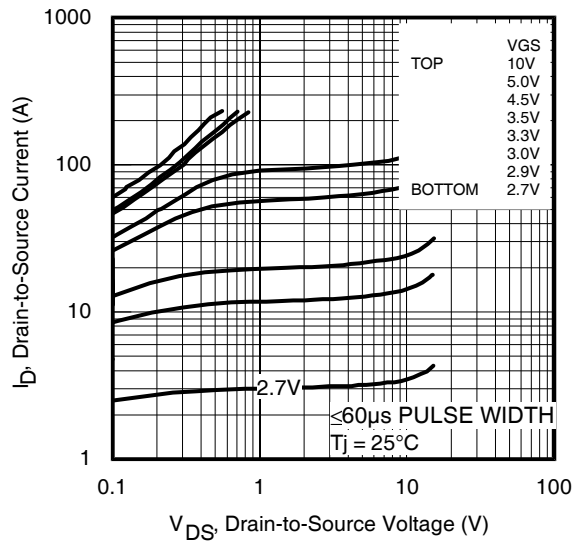


Fig 1. Typical Output Characteristics

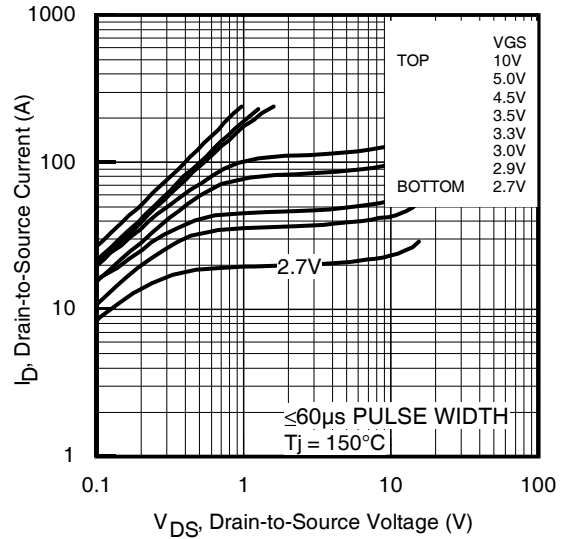


Fig 2. Typical Output Characteristics

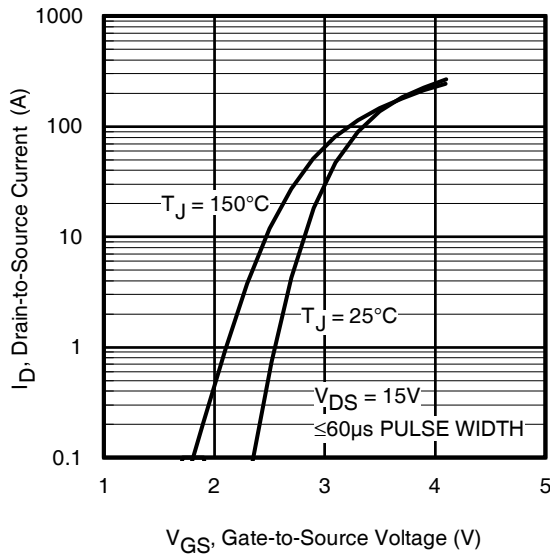


Fig 3. Typical Transfer Characteristics

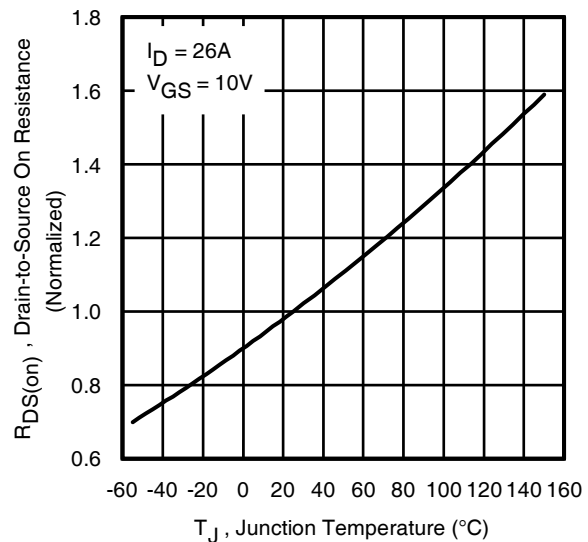


Fig 4. Normalized On-Resistance Vs. Temperature

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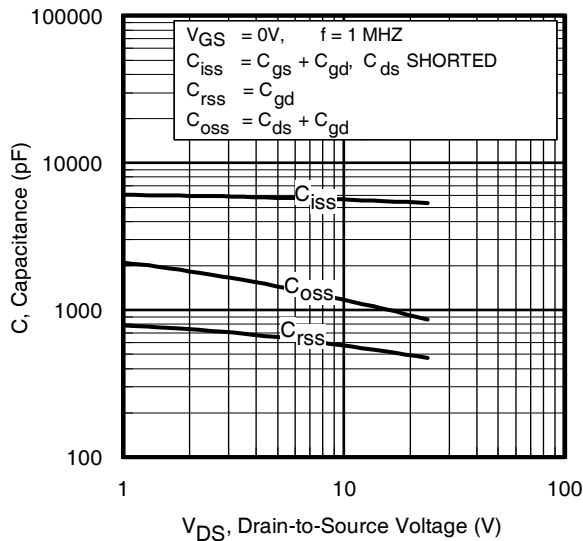


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

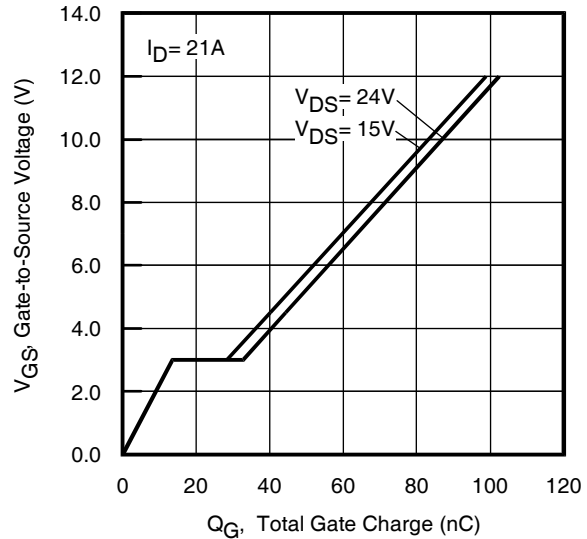


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

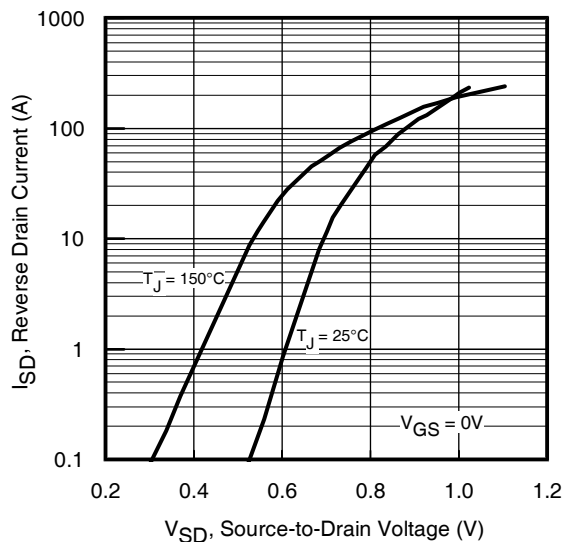


Fig 7. Typical Source-Drain Diode Forward Voltage

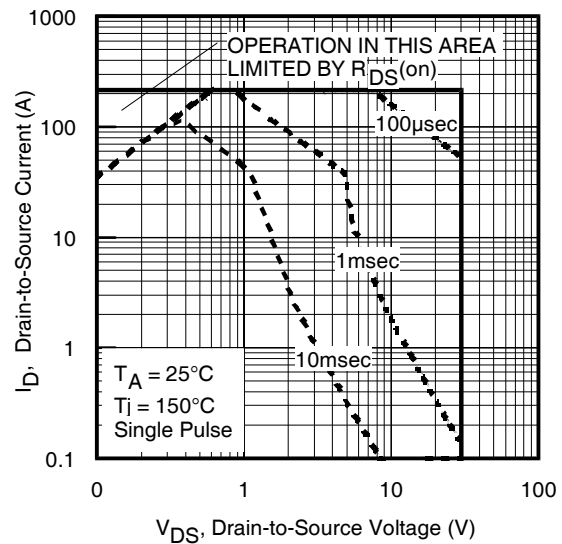


Fig 8. Maximum Safe Operating Area

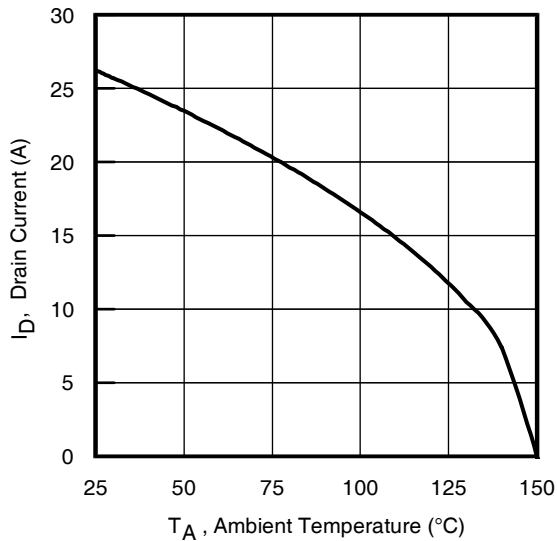


Fig 9. Maximum Drain Current Vs. Ambient Temperature

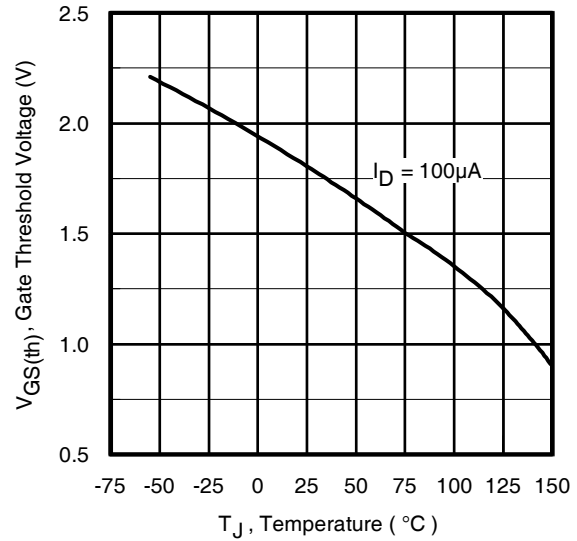


Fig 10. Threshold Voltage Vs. Temperature

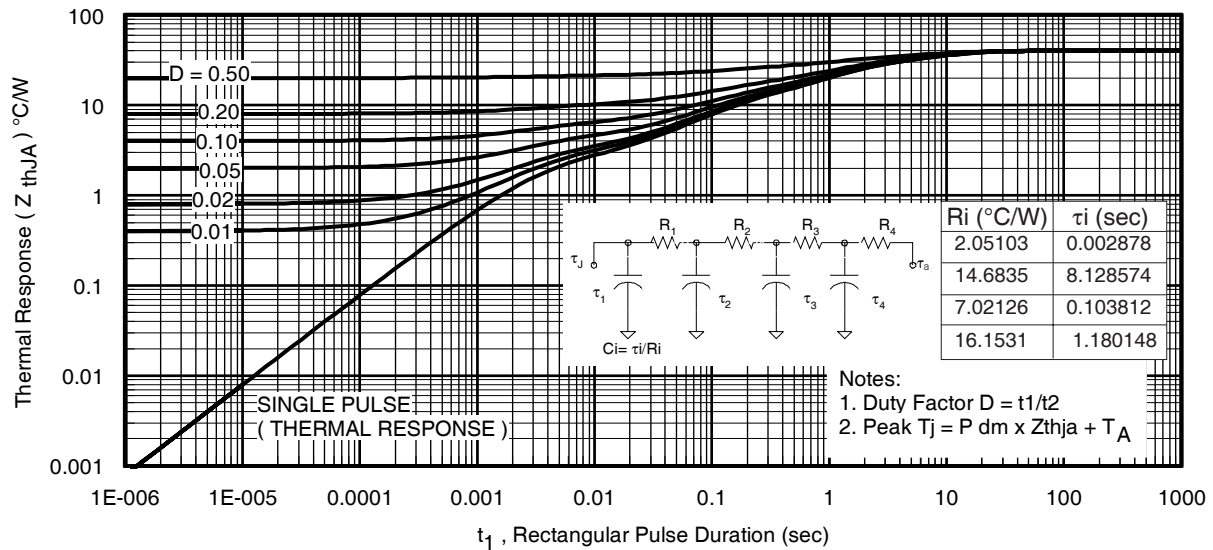


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

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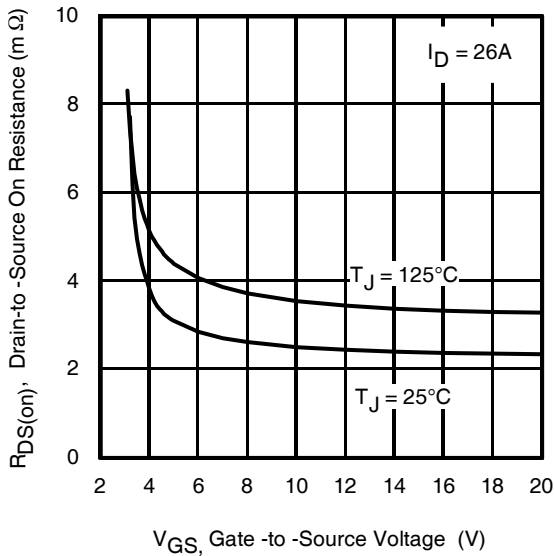


Fig 12. On-Resistance vs. Gate Voltage

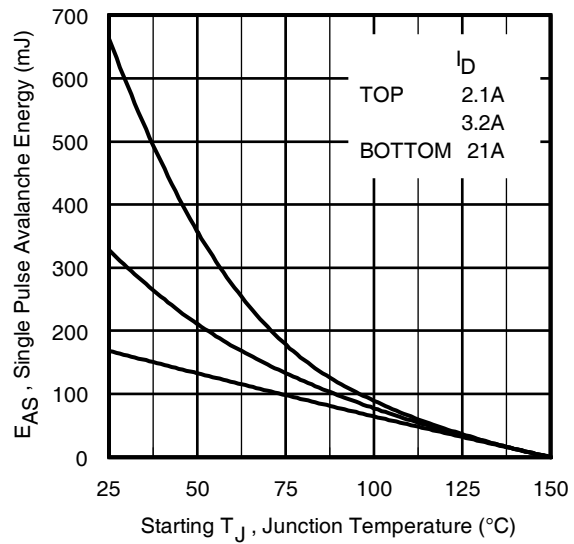


Fig 13. Maximum Avalanche Energy vs. Drain Current

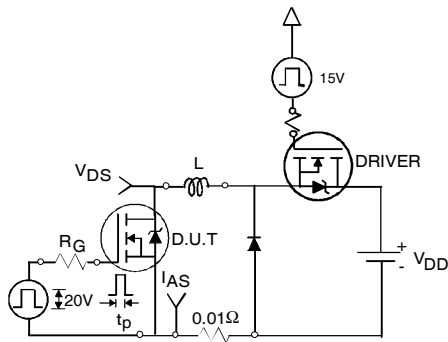


Fig 14a. Unclamped Inductive Test Circuit

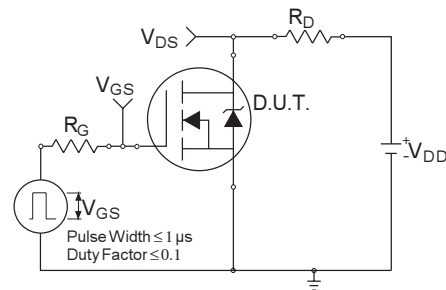


Fig 15a. Switching Time Test Circuit

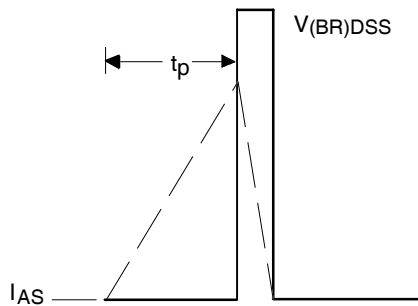


Fig 14b. Unclamped Inductive Waveforms

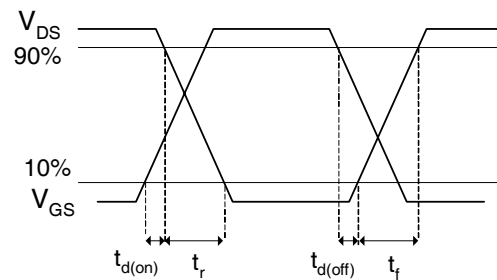


Fig 15b. Switching Time Waveforms

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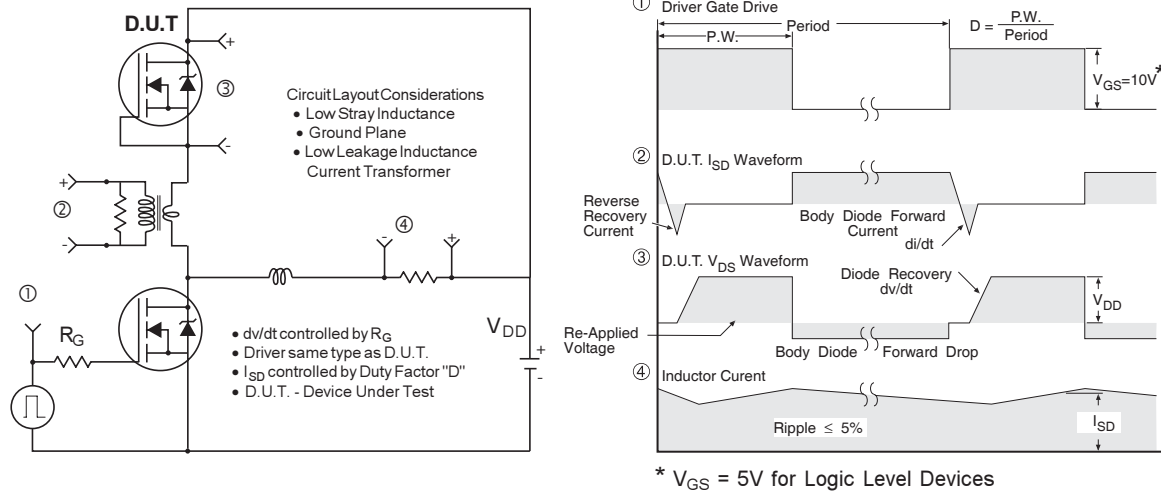


Fig 16. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

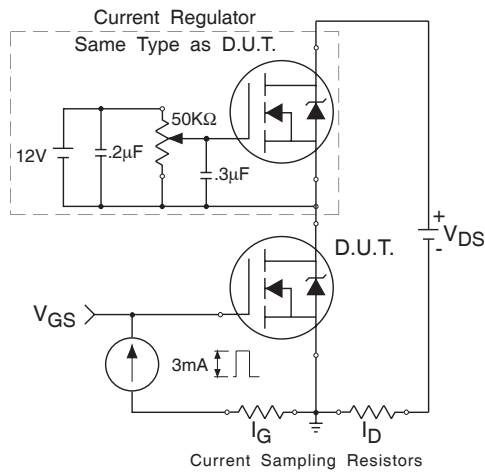


Fig 17. Gate Charge Test Circuit

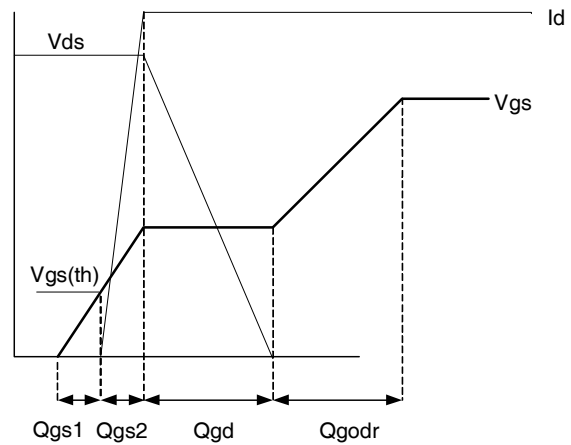
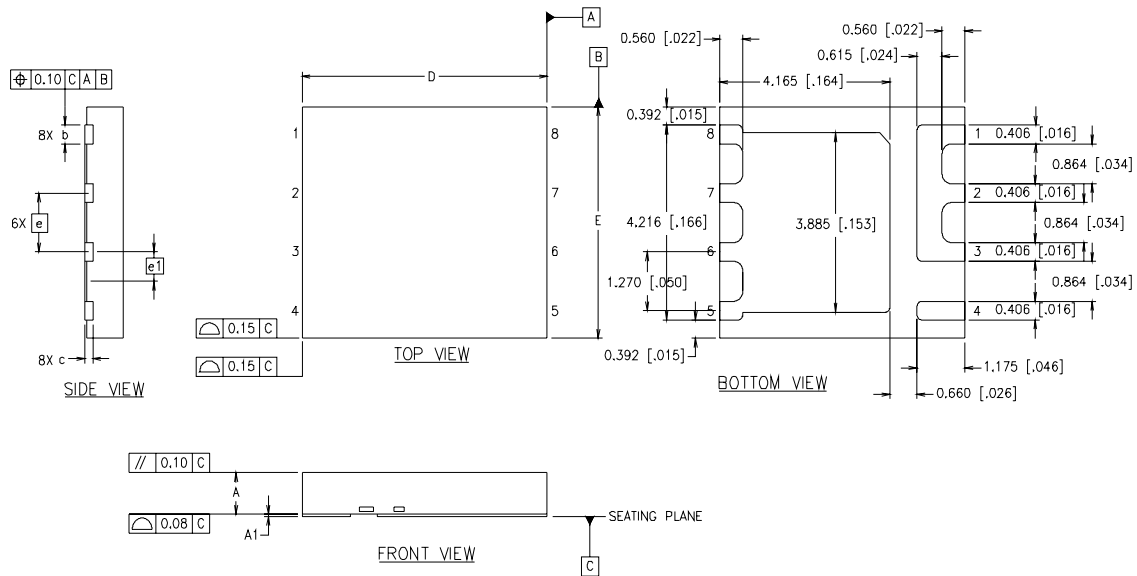


Fig 18. Gate Charge Waveform

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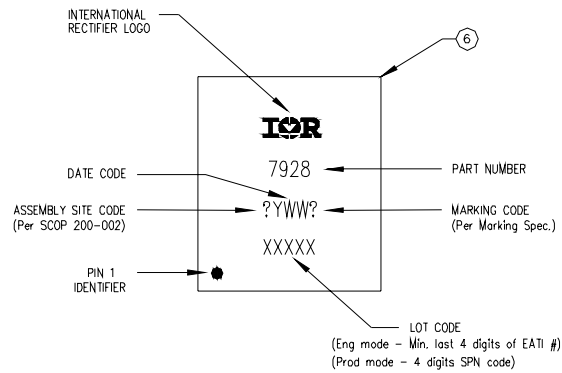
PQFN Package Details



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	

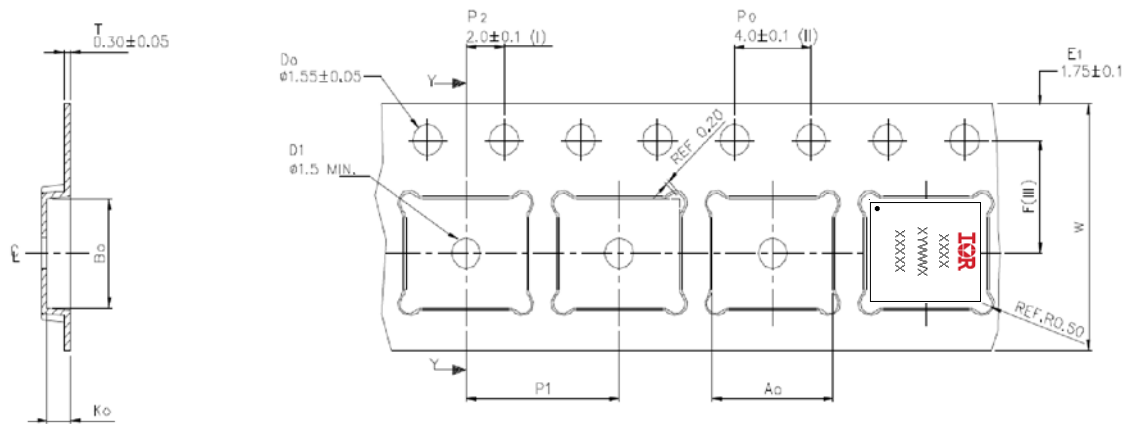
Note: For the most current drawing please refer to IR website at: <http://www.irf.com/package/>

PQFN Part Marking



TOP MARKING (LASER)

PQFN Tape and Reel



A_0	6.30 ± 0.1
B_0	5.30 ± 0.1
K_0	1.20 ± 0.1
F	5.50 ± 0.1
P_1	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/>
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Orderable part number	Package Type	Standard Pack		Note
		Form	Quantity	
IRFH7928TRPBF	PQFN 5mm x 6mm	Tape and Reel	4000	

Qualification information[†]

Qualification level	Consumer ^{††} (per JEDEC JESD47F ^{†††} guidelines)	
Moisture Sensitivity Level	PQFN 5mm x 6mm	MSL2 ^{††††} (per JEDEC J-STD-020D ^{†††})
RoHS compliant	Yes	

- † Qualification standards can be found at International Rectifier's web site
<http://www.irf.com/product-info/reliability>
- †† Higher qualification ratings may be available should the user have such requirements.
Please contact your International Rectifier sales representative for further information:
<http://www.irf.com/whoto-call/salesrep/>
- ††† Applicable version of JEDEC standard at the time of product release.
- †††† Higher MSL ratings may be available for the specific package types listed here.
Please contact your International Rectifier sales representative for further information:
<http://www.irf.com/whoto-call/salesrep/>

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting $T_J = 25^{\circ}\text{C}$, $L = 0.089\text{mH}$, $R_G = 25\Omega$, $I_{AS} = 21\text{A}$.
- ③ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ④ R_{thjc} 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.

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