

# IRFH7923PbF

HEXFET® Power MOSFET

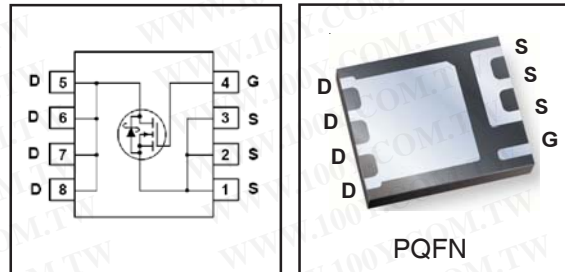
## Applications

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

V <sub>DS</sub>	R <sub>DS(on)</sub> max	Q <sub>g</sub>
30V	8.7mΩ@V <sub>GS</sub> = 10V	8.7nC

## Benefits

- Very low R<sub>DS(ON)</sub> at 4.5V V<sub>GS</sub>
- Low Gate Charge
- Fully Characterized Avalanche Voltage and Current
- 100% Tested for R<sub>G</sub>
- 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 <sub>DS</sub>	Drain-to-Source Voltage	30	V
V <sub>GS</sub>	Gate-to-Source Voltage	± 20	
I <sub>D</sub> @ T <sub>A</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	15	A
I <sub>D</sub> @ T <sub>A</sub> = 70°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	12	
I <sub>D</sub> @ T <sub>C</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	33	
I <sub>DM</sub>	Pulsed Drain Current ①	120	
P <sub>D</sub> @ T <sub>A</sub> = 25°C	Power Dissipation ②	3.1	W
P <sub>D</sub> @ T <sub>A</sub> = 70°C	Power Dissipation ②	2	
	Linear Derating Factor ③	0.03	W/°C
T <sub>J</sub>	Operating Junction and	-55 to + 150	°C
T <sub>STG</sub>	Storage Temperature Range		

## Thermal Resistance

	Parameter	Typ.	Max.	Units
R <sub>θJC</sub>	Junction-to-Case ④	—	8.3	°C/W
R <sub>θJA</sub>	Junction-to-Ambient ⑤	—	40	

Notes ① through ⑤ are on page 9

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International  
**IR** Rectifier

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

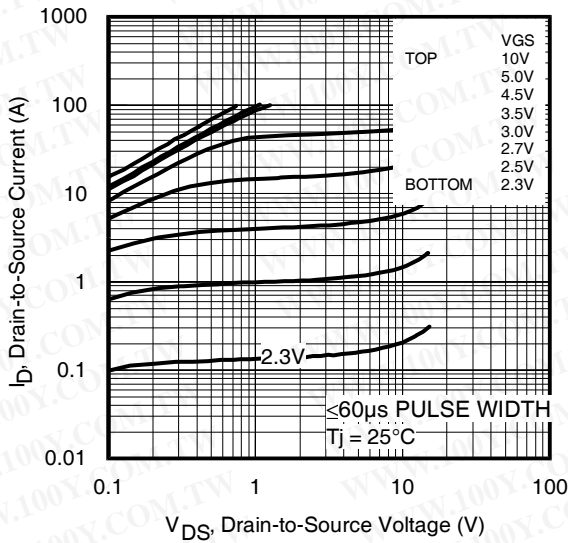
	Parameter	Min.	Typ.	Max.	Units	Conditions
$BV_{DSS}$	Drain-to-Source Breakdown Voltage	30	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.024	—	$V/^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	6.8	8.7	$m\Omega$	$V_{GS} = 10V, I_D = 15A$ ③
		—	9.3	11.9		$V_{GS} = 4.5V, I_D = 12A$ ③
$V_{GS(th)}$	Gate Threshold Voltage	1.35	1.8	2.35	V	$V_{DS} = V_{GS}, I_D = 25\mu A$
$\Delta V_{GS(th)}$	Gate Threshold Voltage Coefficient	—	-5.8	—	$mV/^\circ\text{C}$	
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	1.0	$\mu A$	$V_{DS} = 24V, V_{GS} = 0V$
		—	—	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	29	—	—	S	$V_{DS} = 15V, I_D = 12A$
$Q_g$	Total Gate Charge	—	8.7	13	$nC$	$V_{DS} = 15V$ $V_{GS} = 4.5V$ $I_D = 12A$ See Fig.17 & 18
$Q_{gs1}$	Pre-V <sub>th</sub> Gate-to-Source Charge	—	1.8	—		
$Q_{gs2}$	Post-V <sub>th</sub> Gate-to-Source Charge	—	1.1	—		
$Q_{gd}$	Gate-to-Drain Charge	—	2.7	—		
$Q_{godr}$	Gate Charge Overdrive	—	3.1	—		
$Q_{sw}$	Switch Charge ( $Q_{gs2} + Q_{gd}$ )	—	3.8	—		
$Q_{oss}$	Output Charge	—	4.9	—	$nC$	$V_{DS} = 16V, V_{GS} = 0V$
$R_G$	Gate Resistance	—	2.0	3.0	$\Omega$	
$t_{d(on)}$	Turn-On Delay Time	—	7.1	—	$ns$	$V_{DD} = 15V, V_{GS} = 4.5V$ $I_D = 12A$ $R_G = 1.8\Omega$ See Fig.15
$t_r$	Rise Time	—	8.7	—		
$t_{d(off)}$	Turn-Off Delay Time	—	8.6	—		
$t_f$	Fall Time	—	4.9	—		
$C_{iss}$	Input Capacitance	—	1095	—	$pF$	$V_{GS} = 0V$ $V_{DS} = 15V$ $f = 1.0\text{MHz}$
$C_{oss}$	Output Capacitance	—	235	—		
$C_{rss}$	Reverse Transfer Capacitance	—	110	—		

## Avalanche Characteristics

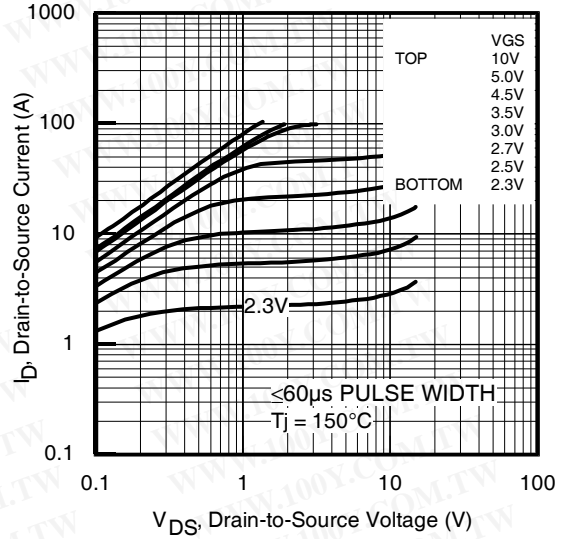
	Parameter	Typ.	Max.	Units
$E_{AS}$	Single Pulse Avalanche Energy ②	—	27	mJ
$I_{AR}$	Avalanche Current ①	—	12	A

## Diode Characteristics

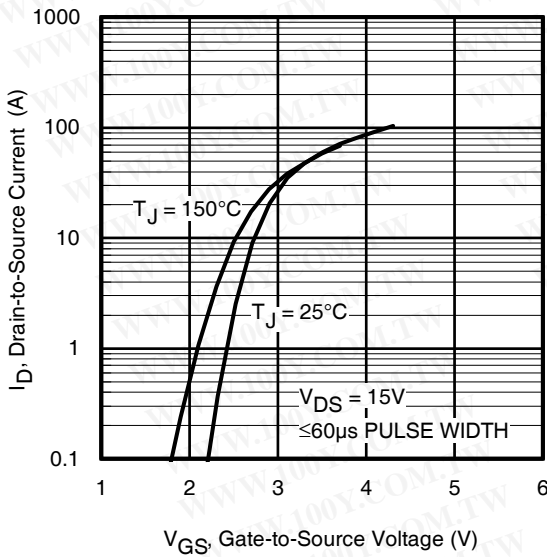
	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	3.9	A	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	120		
$V_{SD}$	Diode Forward Voltage	—	—	1.0	V	$T_J = 25^\circ\text{C}, I_S = 12A, V_{GS} =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



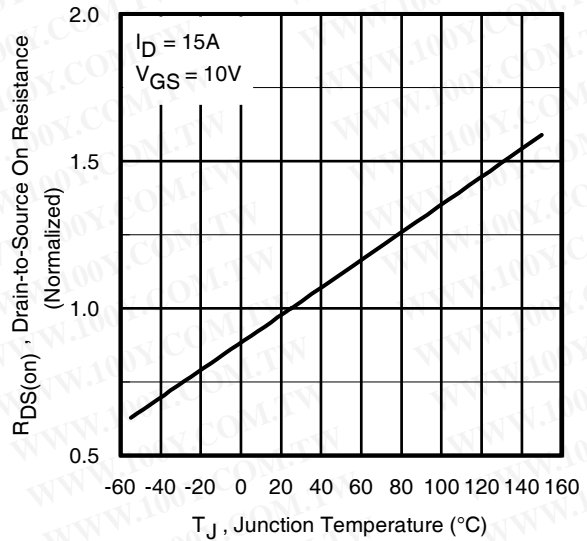
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics



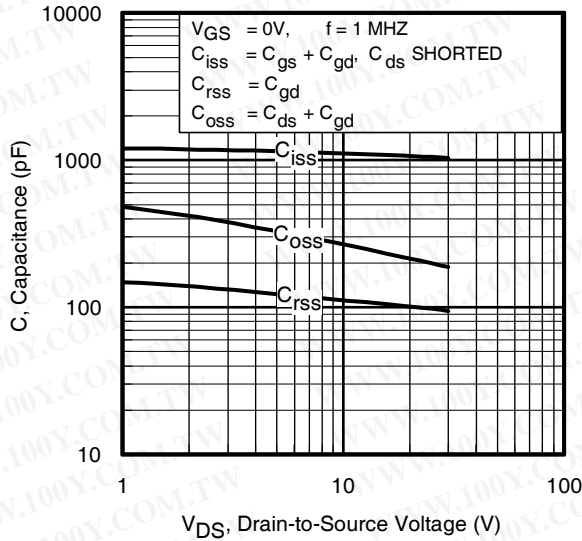
**Fig 3.** Typical Transfer Characteristics



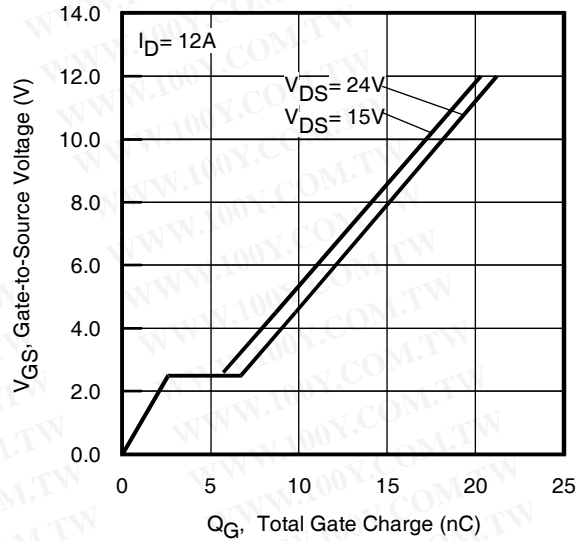
**Fig 4.** Normalized On-Resistance Vs. Temperature

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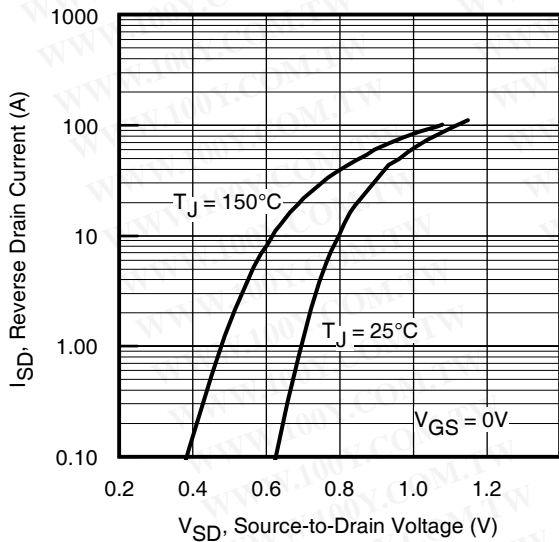
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**IR** Rectifier



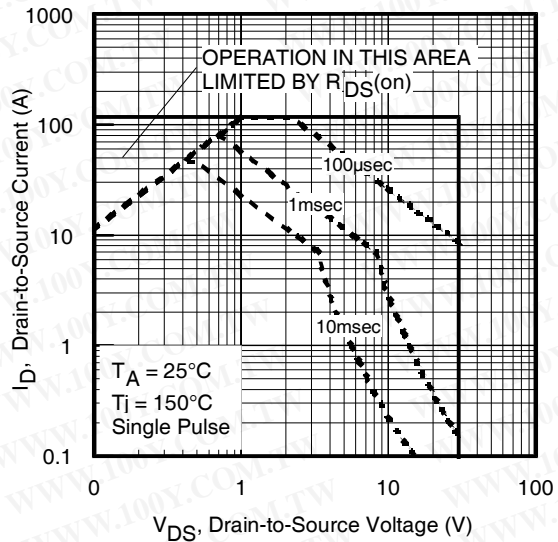
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



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

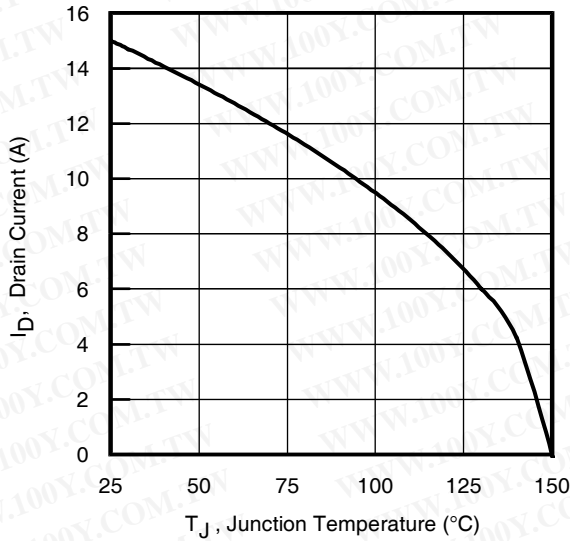


**Fig 7.** Typical Source-Drain Diode Forward Voltage

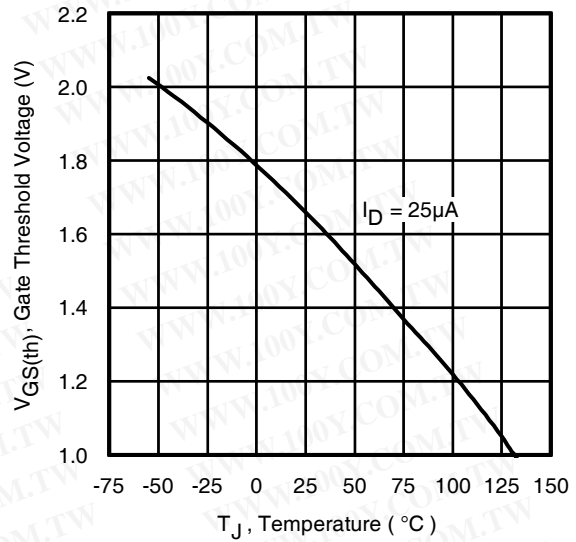


**Fig 8.** Maximum Safe Operating Area

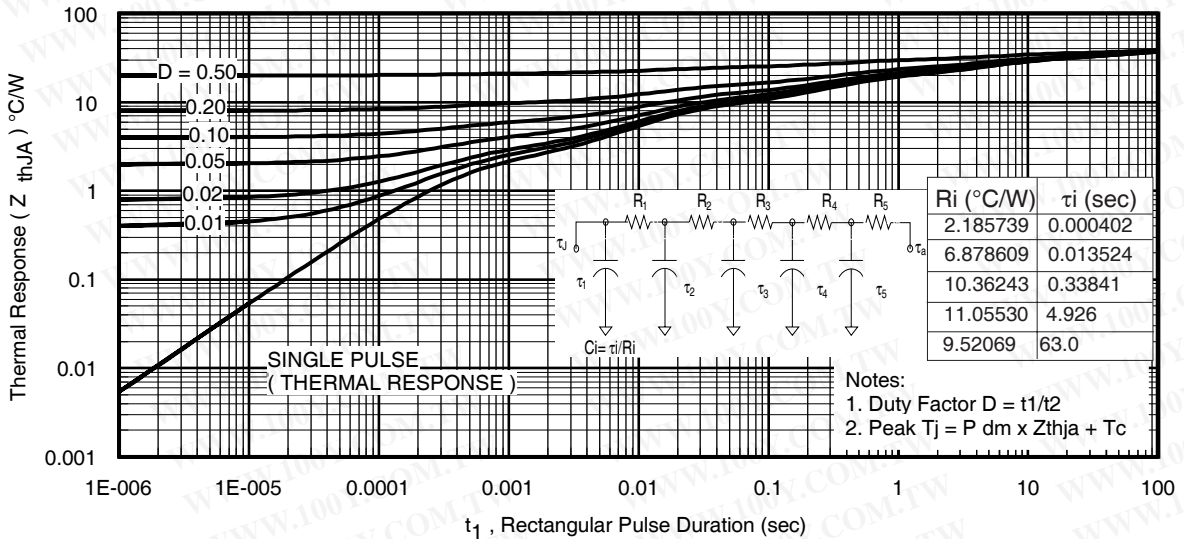




**Fig 9.** Maximum Drain Current Vs. Ambient Temperature



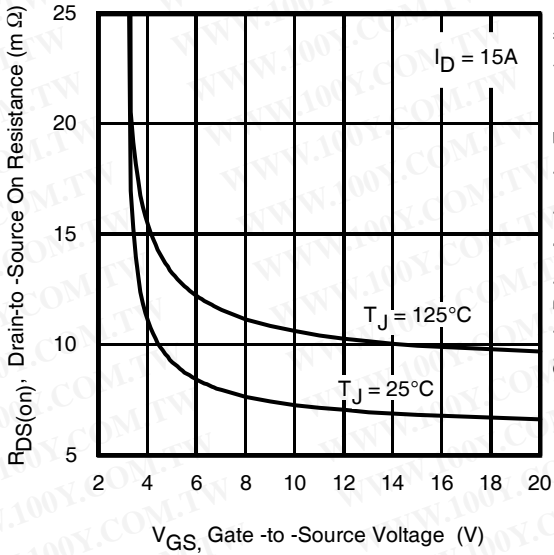
**Fig 10.** Threshold Voltage Vs. Temperature



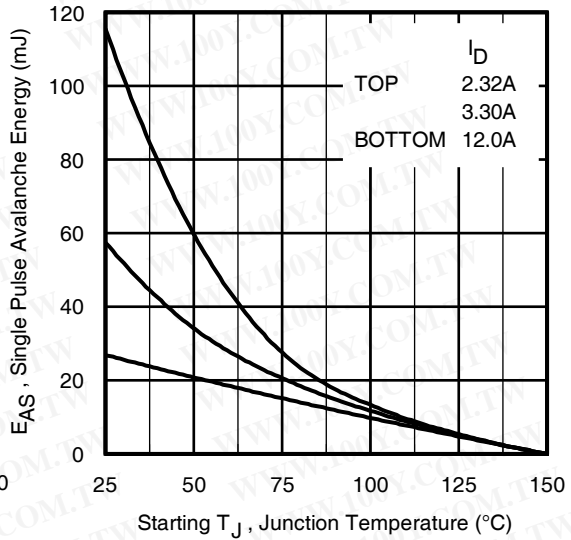
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

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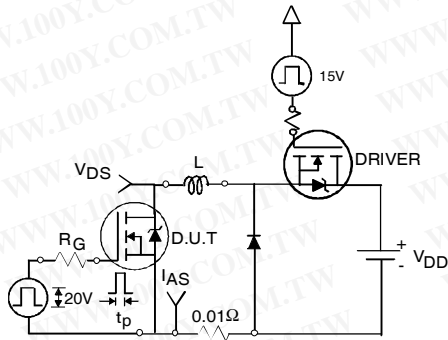
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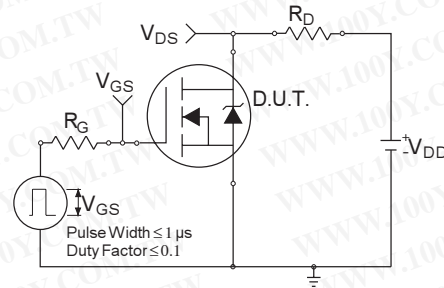
**Fig 12.** On-Resistance vs. Gate Voltage



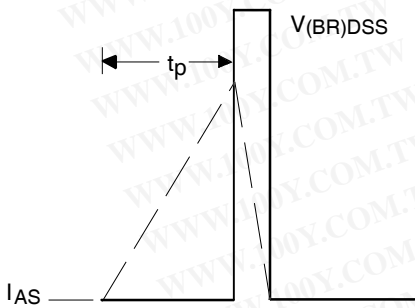
**Fig 13.** Maximum Avalanche Energy vs. Drain Current



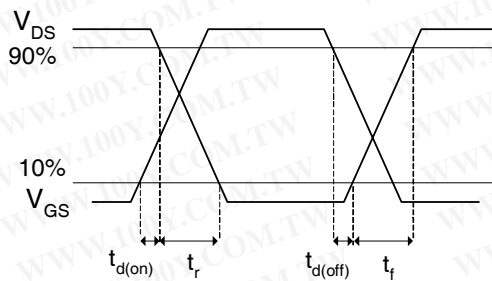
**Fig 14a.** Unclamped Inductive Test Circuit



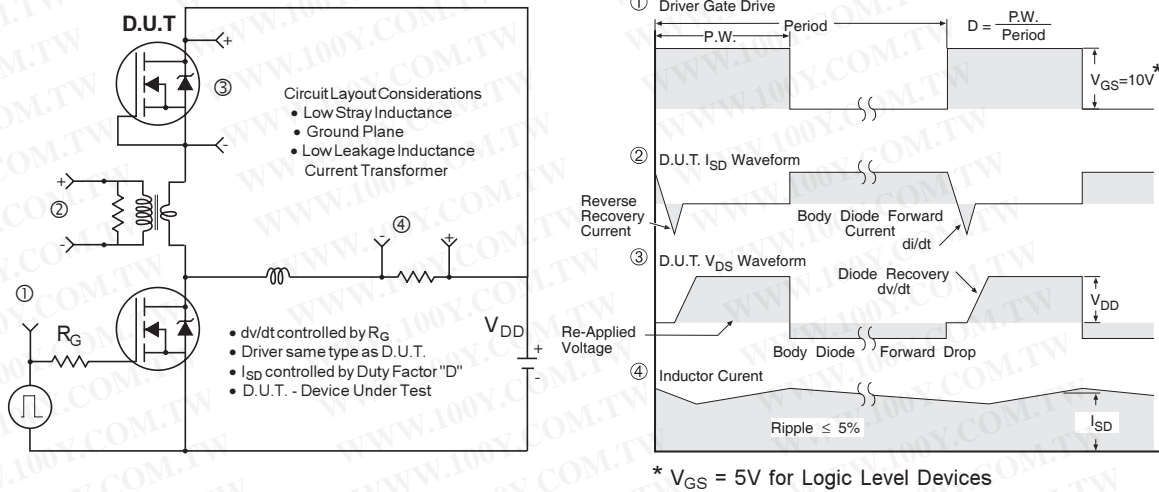
**Fig 15a.** Switching Time Test Circuit



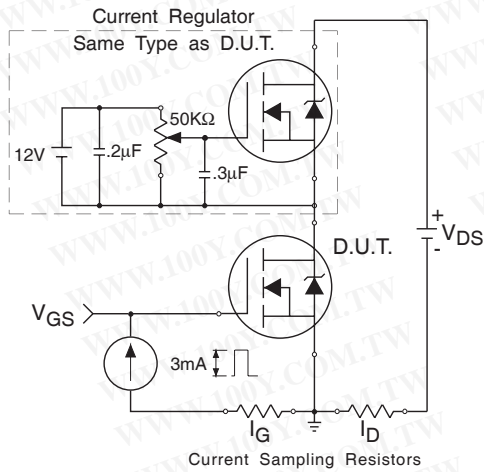
**Fig 14b.** Unclamped Inductive Waveforms



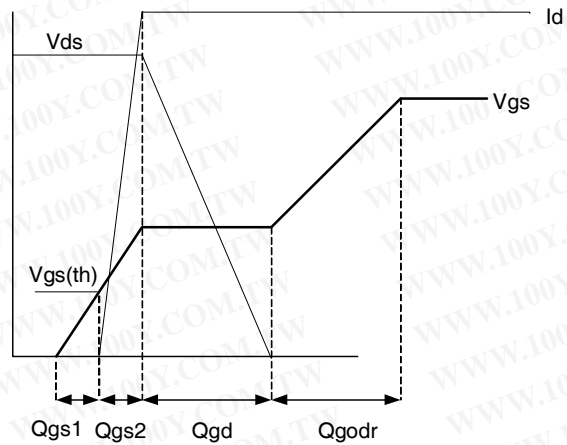
**Fig 15b.** Switching Time Waveforms



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



**Fig 17. Gate Charge Test Circuit**

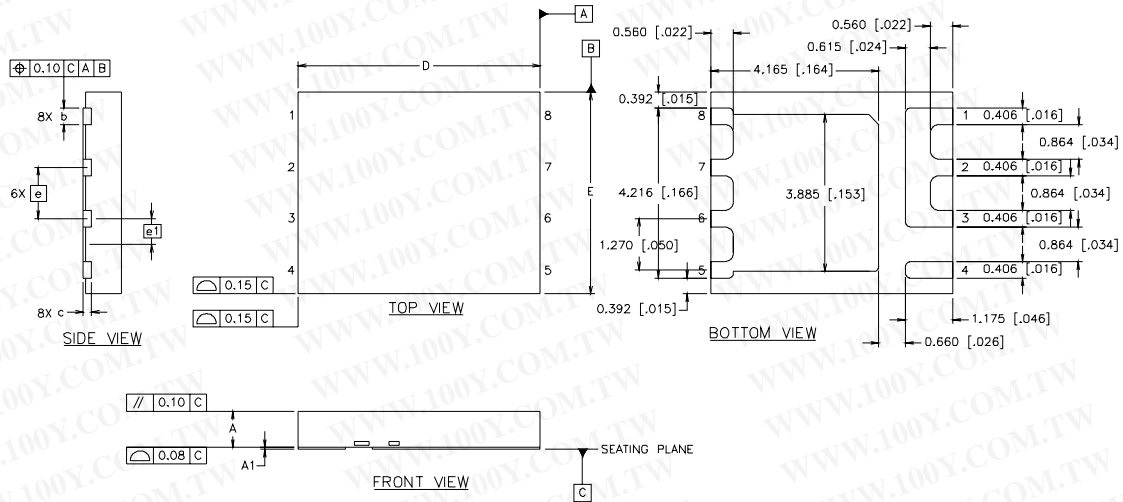


**Fig 18. Gate Charge Waveform**

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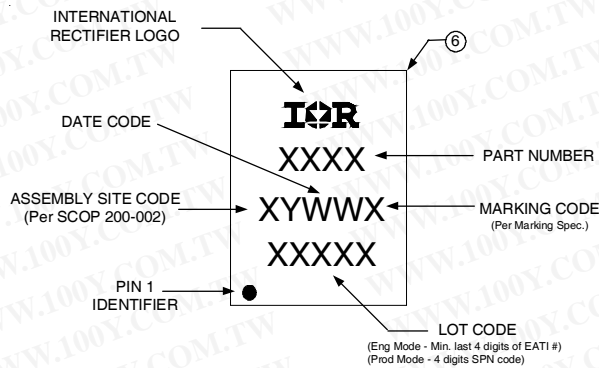
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## PQFN Package Details



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	

## PQFN Part Marking

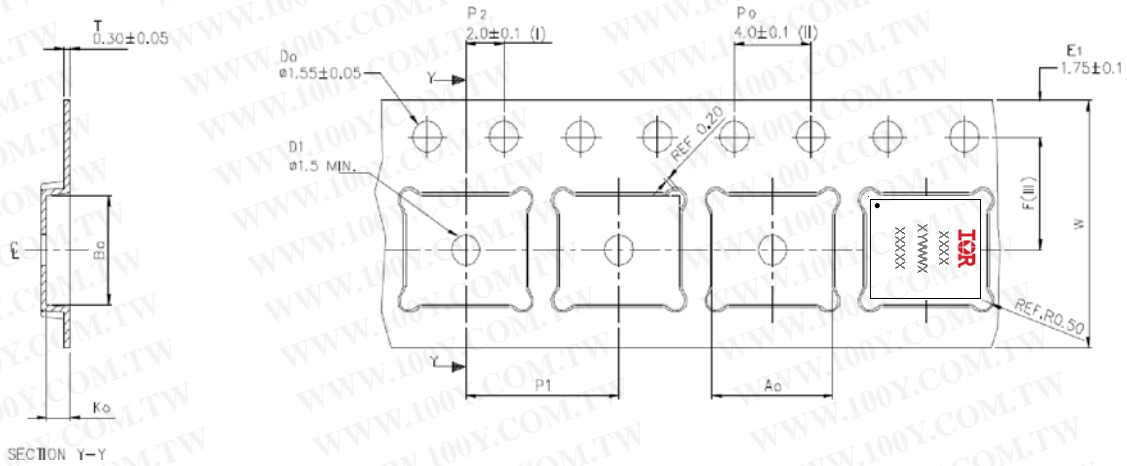


TOP MARKING (LASER)

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



**PQFN Tape and Reel**



A <sub>0</sub>	6.30 ± 0.1
B <sub>0</sub>	5.30 ± 0.1
K <sub>0</sub>	1.20 ± 0.1
F	5.50 ± 0.1
P <sub>1</sub>	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<sup>9</sup> 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<sub>J</sub> = 25°C, L = 0.39mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 12A.
- ③ Pulse width ≤ 400µs; duty cycle ≤ 2%.
- ④ R<sub>thjc</sub> 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.