

# IRFH3707PbF

HEXFET® Power MOSFET

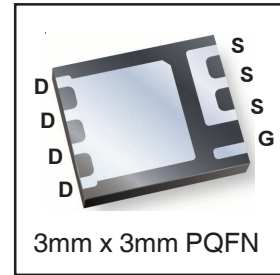
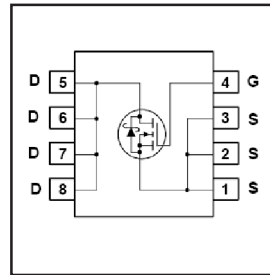
## Applications

- Synchronous Buck Converter for Computer Processor Power
- Isolated DC to DC Converters for Network and Telecom
- Buck Converters for Set-Top Boxes
- System/load switch

V <sub>DSS</sub>	R <sub>DS(on)</sub> max	Q <sub>g</sub>
30V	12.4mΩ@V <sub>GS</sub> = 10V	5.4nC

## Benefits

- Low R<sub>DS(ON)</sub>
- Very Low Gate Charge
- Low Junction to PCB Thermal Resistance
- 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)



## 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	12	A
I <sub>D</sub> @ T <sub>A</sub> = 70°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	9.4	
I <sub>D</sub> @ T <sub>C</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	29	
I <sub>D</sub> @ T <sub>C</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V (Package Limited)	18	
I <sub>DM</sub>	Pulsed Drain Current ①	96	
P <sub>D</sub> @ T <sub>A</sub> = 25°C	Power Dissipation ⑤	2.8	W
P <sub>D</sub> @ T <sub>A</sub> = 70°C	Power Dissipation ⑤	1.8	
	Linear Derating Factor ⑤	0.02	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	—	7.5	°C/W
R <sub>θJA</sub>	Junction-to-Ambient ⑤⑥	—	45	
R <sub>θJA</sub>	Junction-to-Ambient (t<10s) ⑥	—	31	

### ORDERING INFORMATION:

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

Notes ① through ⑥ are on page 10

www.irf.com

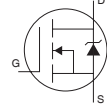
## Static @ T<sub>J</sub> = 25°C (unless otherwise specified)

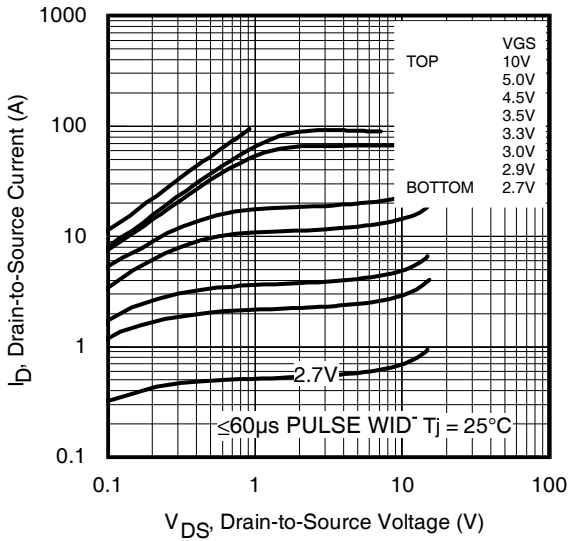
	Parameter	Min.	Typ.	Max.	Units	Conditions
BV <sub>DSS</sub>	Drain-to-Source Breakdown Voltage	30	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	0.02	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	9.4	12.4	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 12A ③
		—	14.5	17.9		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 9.4A ③
V <sub>GS(th)</sub>	Gate Threshold Voltage	1.35	1.8	2.35	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 25μA
ΔV <sub>GS(th)</sub>	Gate Threshold Voltage Coefficient	—	-6.2	—	mV/°C	
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	1.0	μA	V <sub>DS</sub> = 24V, V <sub>GS</sub> = 0V
		—	—	150		V <sub>DS</sub> = 24V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C
I <sub>GSS</sub>	Gate-to-Source Forward Leakage	—	—	100	nA	V <sub>GS</sub> = 20V
	Gate-to-Source Reverse Leakage	—	—	-100		V <sub>GS</sub> = -20V
gfs	Forward Transconductance	17	—	—	S	V <sub>DS</sub> = 15V, I <sub>D</sub> = 9.4A
Q <sub>g</sub>	Total Gate Charge	—	5.4	8.1	nC	V <sub>DS</sub> = 15V V <sub>GS</sub> = 4.5V I <sub>D</sub> = 9.4A See Fig.17 & 18
Q <sub>gs1</sub>	Pre-V <sub>th</sub> Gate-to-Source Charge	—	1.1	—		
Q <sub>gs2</sub>	Post-V <sub>th</sub> Gate-to-Source Charge	—	0.7	—		
Q <sub>gd</sub>	Gate-to-Drain Charge	—	2.2	—		
Q <sub>godr</sub>	Gate Charge Overdrive	—	1.5	—		
Q <sub>sw</sub>	Switch Charge (Q <sub>gs2</sub> + Q <sub>gd</sub> )	—	2.9	—		
Q <sub>oss</sub>	Output Charge	—	3.8	—	nC	V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V
R <sub>G</sub>	Gate Resistance	—	2.0	—	Ω	
t <sub>d(on)</sub>	Turn-On Delay Time	—	9.0	—	ns	V <sub>DD</sub> = 15V, V <sub>GS</sub> = 4.5V I <sub>D</sub> = 9.4A R <sub>G</sub> = 1.3Ω See Fig.15
t <sub>r</sub>	Rise Time	—	11	—		
t <sub>d(off)</sub>	Turn-Off Delay Time	—	9.9	—		
t <sub>f</sub>	Fall Time	—	5.6	—		
C <sub>iss</sub>	Input Capacitance	—	755	—	pF	V <sub>GS</sub> = 0V V <sub>DS</sub> = 15V f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	171	—		
C <sub>rss</sub>	Reverse Transfer Capacitance	—	83	—		

## Avalanche Characteristics

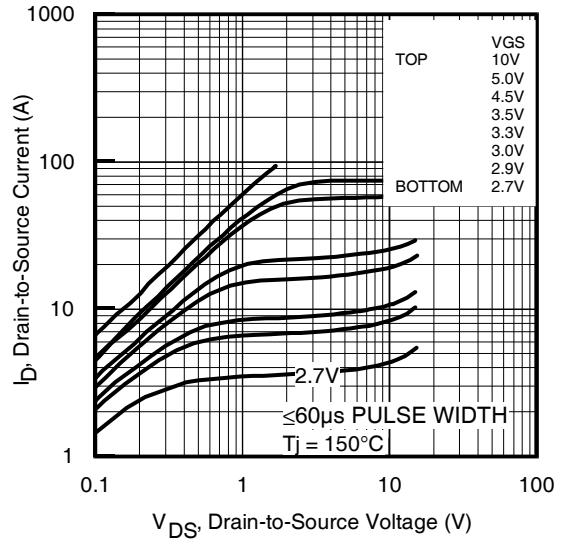
	Parameter	Typ.	Max.	Units
E <sub>AS</sub>	Single Pulse Avalanche Energy ②	—	13	mJ
I <sub>AR</sub>	Avalanche Current ①	—	9.4	A

## Diode Characteristics

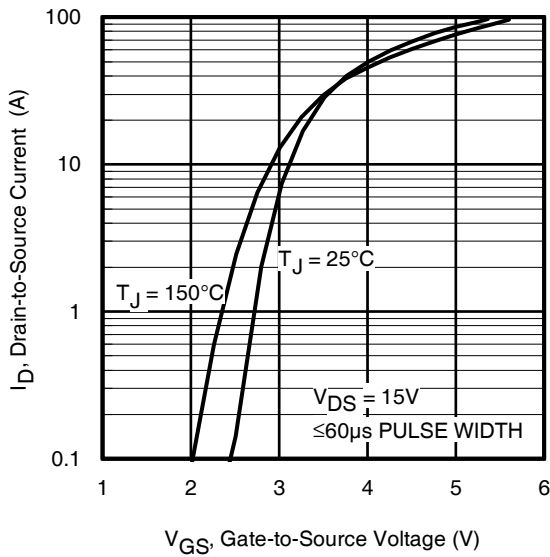
	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	3.5	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	96		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.0	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 9.4A, V <sub>GS</sub> = 0V ③
t <sub>rr</sub>	Reverse Recovery Time	—	20	30	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 9.4A, V <sub>DD</sub> = 15V
Q <sub>rr</sub>	Reverse Recovery Charge	—	27	41	nC	di/dt = 200A/μs ③
t <sub>on</sub>	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				



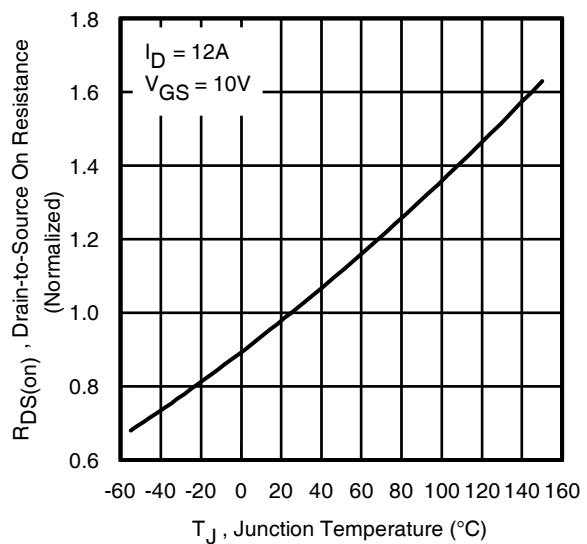
**Fig 1.** Typical Output Characteristics



**Fig 2.** Typical Output Characteristics



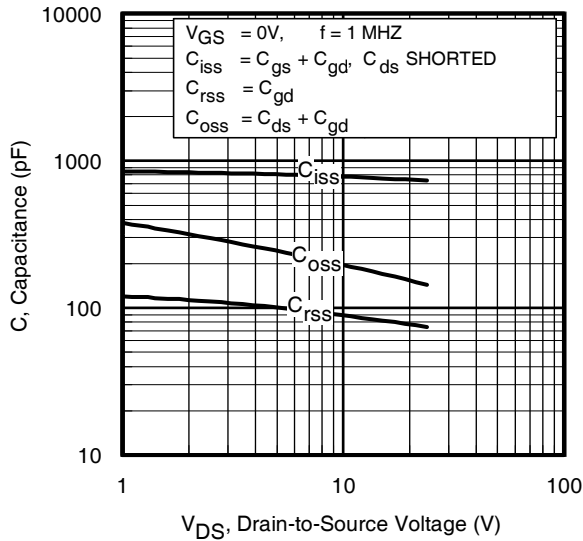
**Fig 3.** Typical Transfer Characteristics



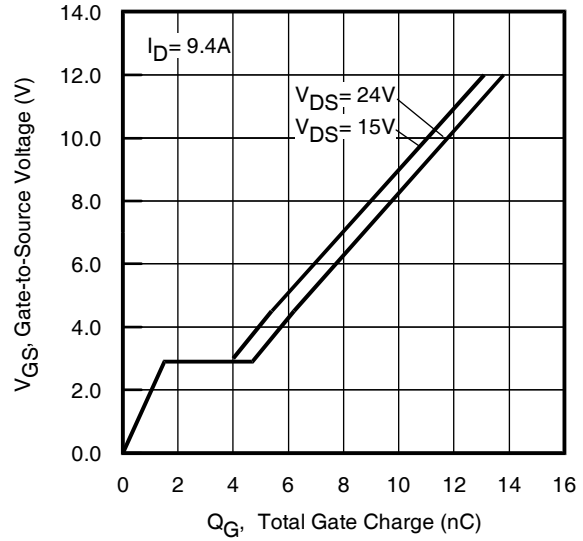
**Fig 4.** Normalized On-Resistance Vs. Temperature

# IRFH3707PbF

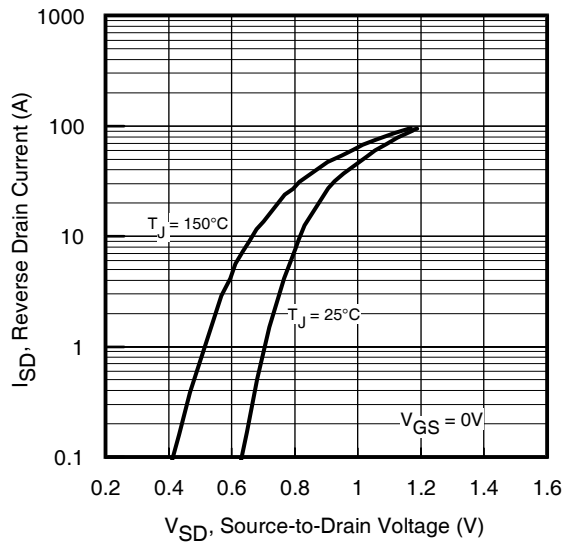
International  
**IR** Rectifier



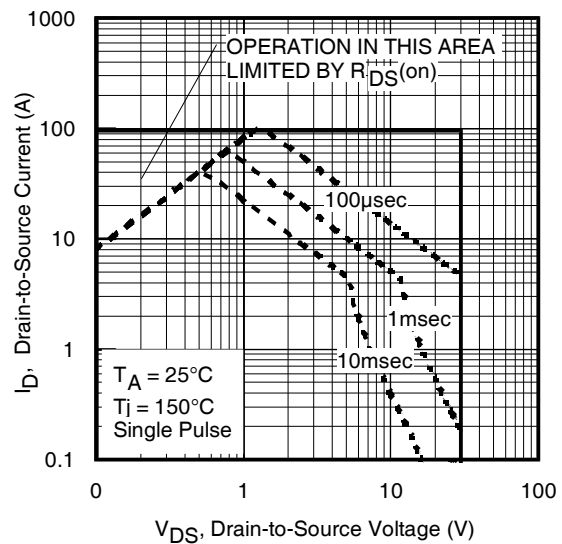
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



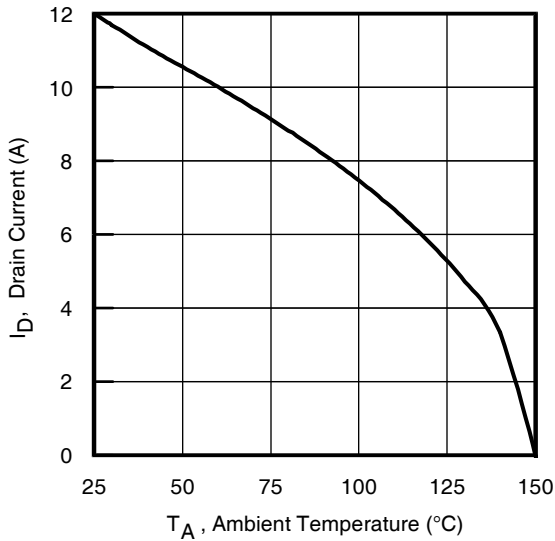
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



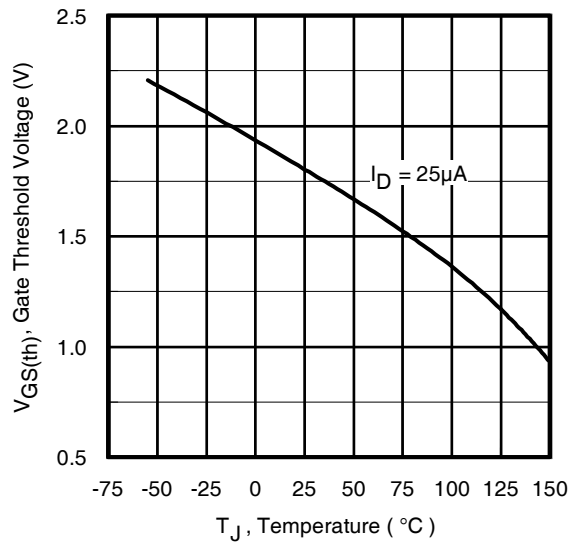
**Fig 7.** Typical Source-Drain Diode Forward Voltage



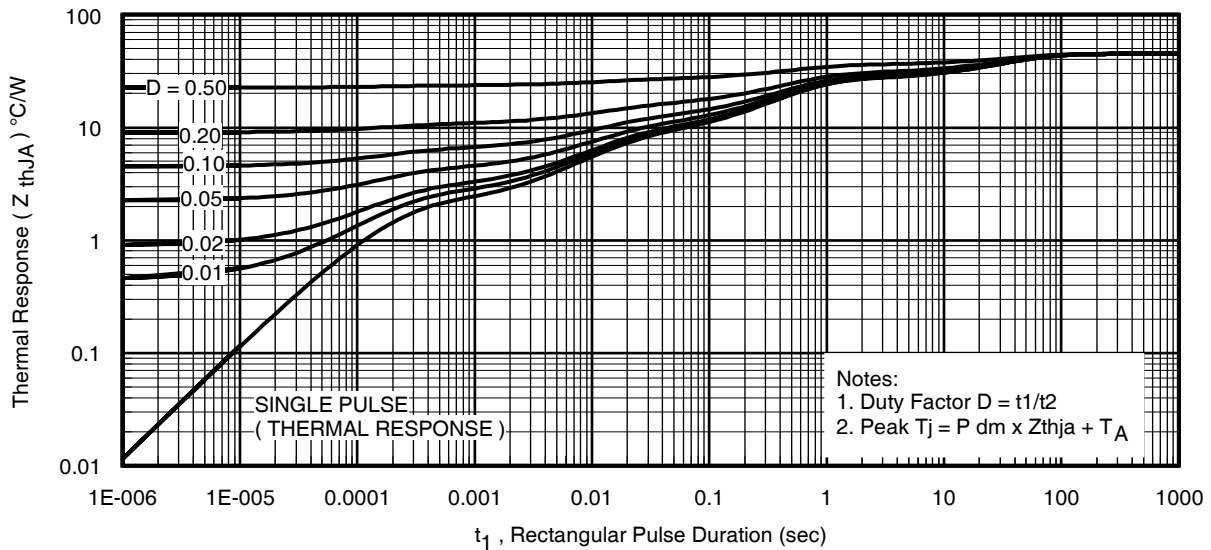
**Fig 8.** Maximum Safe Operating Area



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



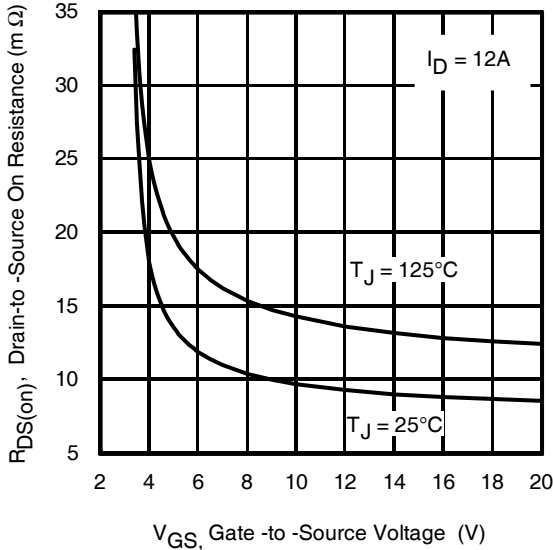
**Fig 10.** Threshold Voltage Vs. Temperature



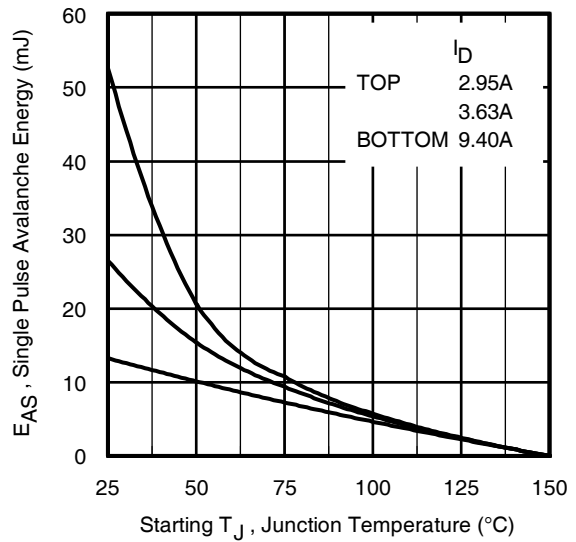
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

# IRFH3707PbF

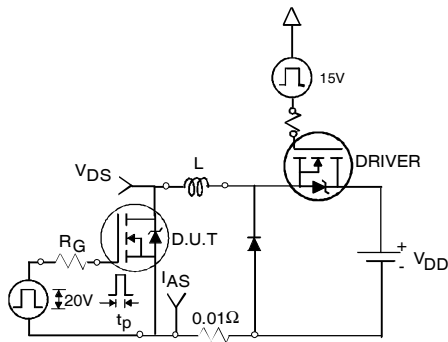
International  
**IR** Rectifier



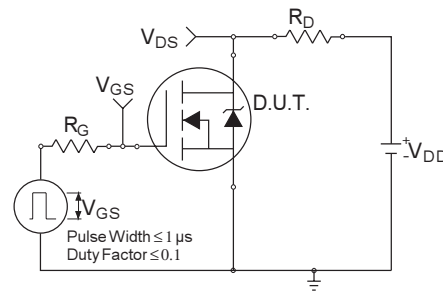
**Fig 12.** On-Resistance vs. Gate Voltage



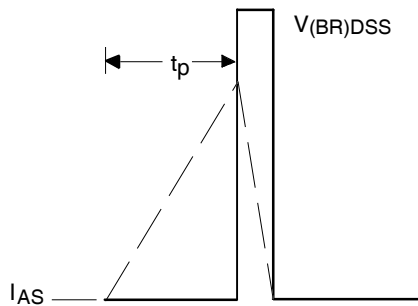
**Fig 13.** Maximum Avalanche Energy vs. Drain Current



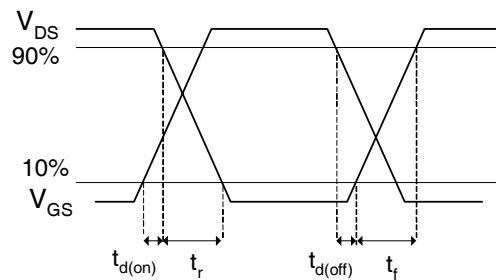
**Fig 14a.** Unclamped Inductive Test Circuit



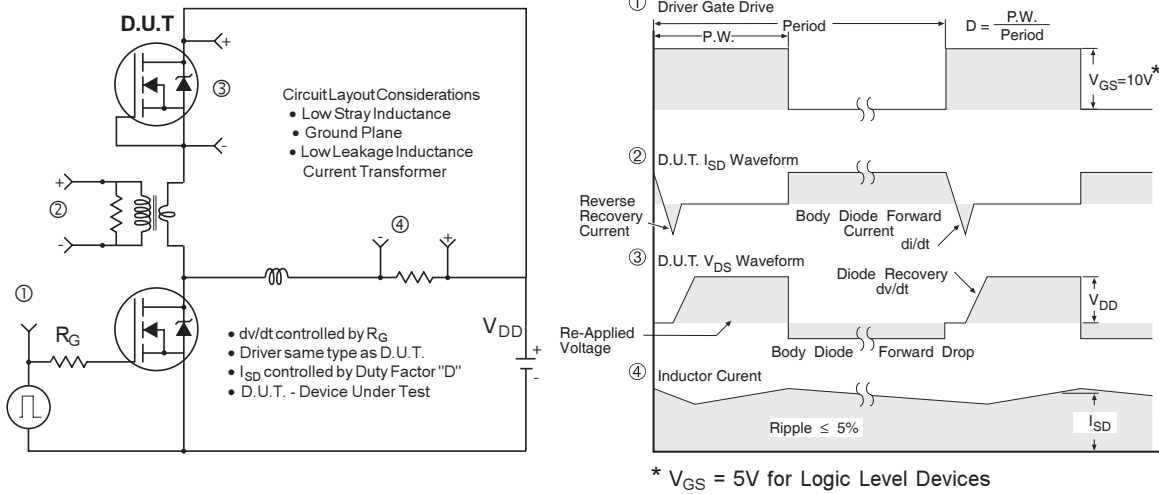
**Fig 15a.** Switching Time Test Circuit



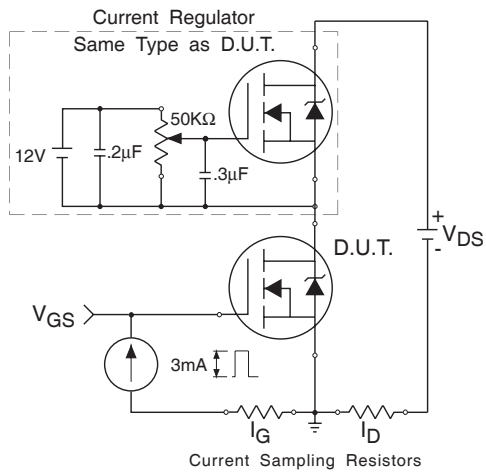
**Fig 14b.** Unclamped Inductive Waveforms



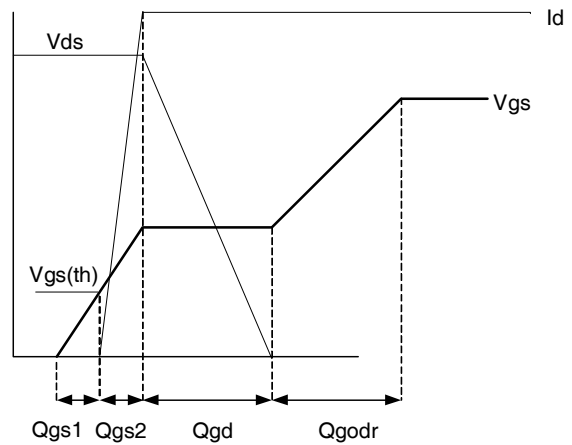
**Fig 15b.** Switching Time Waveforms



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



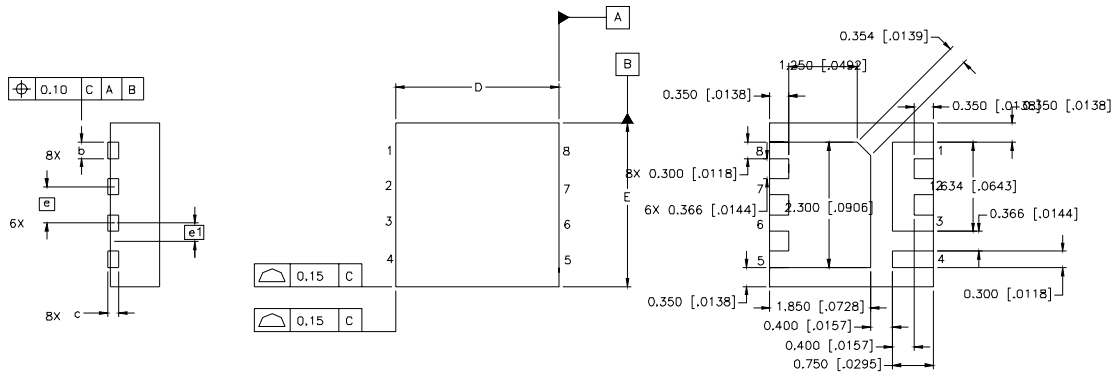
**Fig 17. Gate Charge Test Circuit**



**Fig 18. Gate Charge Waveform**

# IRFH3707PbF

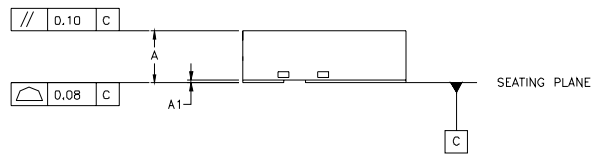
## PQFN Package Details



SIDE VIEW

TOP VIEW

BOTTOM VIEW



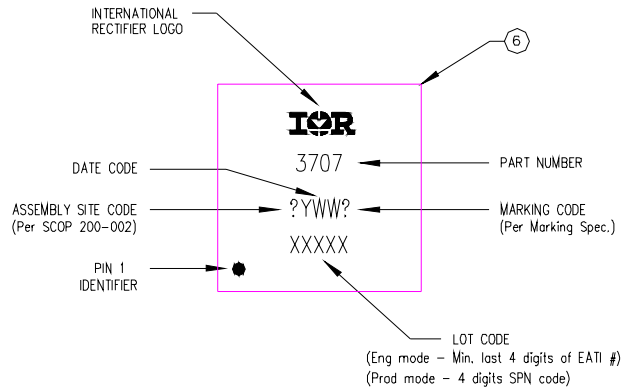
FRONT VIEW

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0315	.0394	0.800	1.000
A1	.0000	.0020	0.000	0.050
b	.0098	.0138	0.250	0.350
c	.0080 REF.		0.203 REF.	
D	.1181 BASIC		3.000 BASIC	
E	.1181 BASIC		3.000 BASIC	
e	.0262 BASIC		0.666 BASIC	
e1	.0131 BASIC		0.333 BASIC	

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

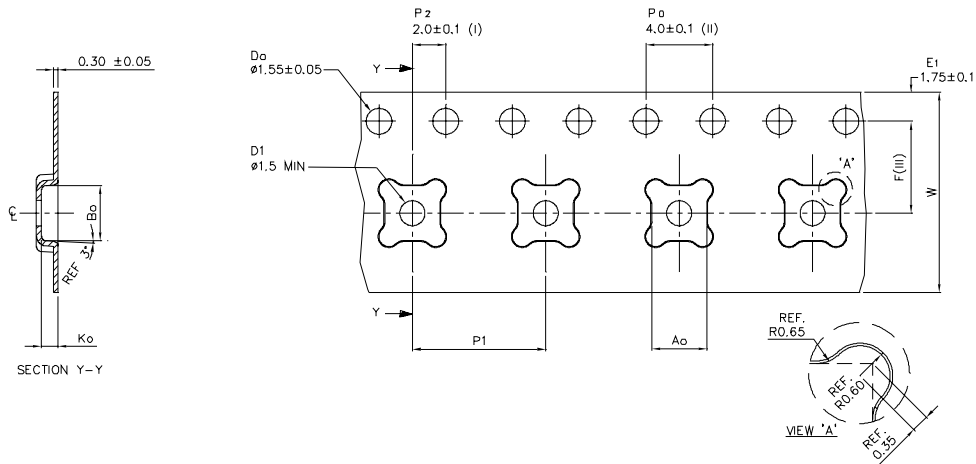


## PQFN Part Marking



TOP MARKING (LASER)

## PQFN Tape and Reel



Ao	3.30 +/- 0.1
Bo	3.30 +/- 0.1
Ko	1.00 +/- 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 packet.
- (II) Cumulative tolerance of 10 sprocket holes is  $\pm 0.20$ .
- (III) Measured from centreline of sprocket hole to centreline of packet.
- (IV) Other material available.

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

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

# IRFH3707PbF

International  
**IR** Rectifier

Orderable part number	Package Type	Standard Pack		Note
		Form	Quantity	
IRFH3707TRPBF	PQFN 3mm x 3mm	Tape and Reel	4000	

## Qualification information<sup>†</sup>

Qualification level	Consumer <sup>††</sup> (per JEDEC JESD47F <sup>†††</sup> guidelines)		
Moisture Sensitivity Level	PQFN 3mm x 3mm	MSL1 (per IPC/JEDEC J-STD-020D <sup>†††</sup> )	
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.

**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  $T_J = 25^\circ\text{C}$ ,  $L = 0.297\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 9.4\text{A}$ .
- 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.
- ⑥ Refer to [application note #AN-994](#).

Data and specifications subject to change without notice

International  
**IR** Rectifier

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

Visit us at [www.irf.com](http://www.irf.com) for sales contact information.09/2010

## **IMPORTANT NOTICE**

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffheitsgarantie").

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies office ([www.infineon.com](http://www.infineon.com)).

## **WARNINGS**

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.