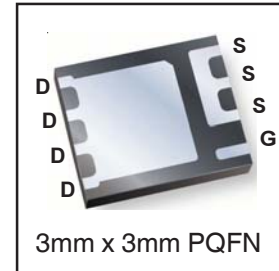
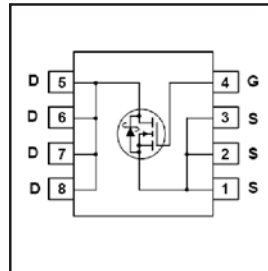


HEXFET® Power MOSFET

$V_{DS}$	<b>30</b>	<b>V</b>
$R_{DS(on) max}$ (@ $V_{GS} = 10V$ )	<b>12.4</b>	<b>mΩ</b>
$Q_g$ (typical)	<b>5.4</b>	<b>nC</b>
$I_D$ (@ $T_A = 25^\circ C$ )	<b>12</b>	<b>A</b>



**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

**Features**

Industry-standard pinout PQFN 3mm x 3mm Package
Compatible with Existing Surface Mount Techniques
RoHS Compliant, Halogen-Free
MSL1, Industrial qualification



**Benefits**

Multi-Vendor Compatibility
Easier Manufacturing
Environmentally Friendlier
Increased Reliability

Base Part Number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRFH3707PbF-1	PQFN 3mm x 3mm	Tape and Reel	4000	IRFH3707TRPbF-1

**Absolute Maximum Ratings**

	Parameter	Max.	Units
$V_{DS}$	Drain-to-Source Voltage	30	V
$V_{GS}$	Gate-to-Source Voltage	± 20	
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	12	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	9.4	
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	29	
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$ (Package Limited)	18	
$I_{DM}$	Pulsed Drain Current ①	96	
$P_D @ T_A = 25^\circ C$	Power Dissipation ⑤	2.8	W
$P_D @ T_A = 70^\circ C$	Power Dissipation ⑤	1.8	
	Linear Derating Factor ⑤	0.02	W/°C
$T_J$	Operating Junction and	-55 to + 150	°C
$T_{STG}$	Storage Temperature Range		

**Thermal Resistance**

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ④	—	7.5	°C/W
$R_{\theta JA}$	Junction-to-Ambient ⑤⑥	—	45	
$R_{\theta JA}$	Junction-to-Ambient (t<10s) ⑥	—	31	

Notes ① through ⑥ are on page 10

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

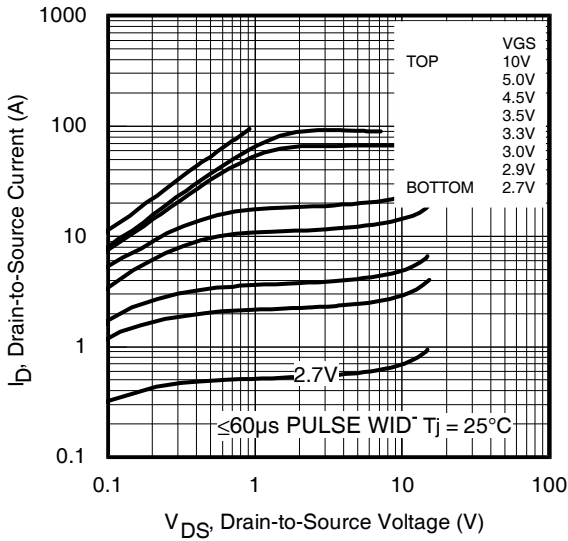
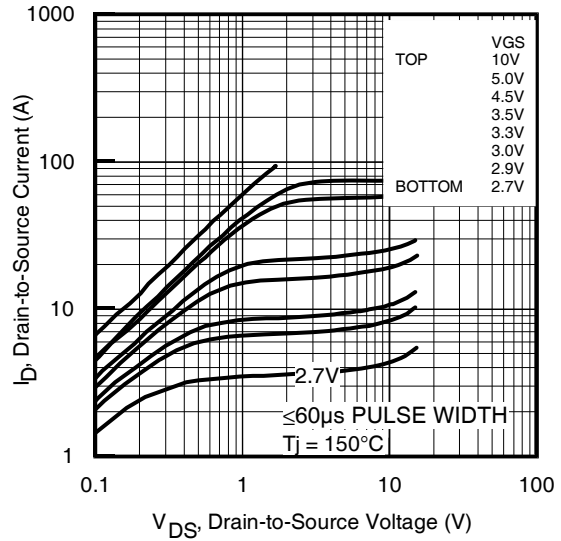
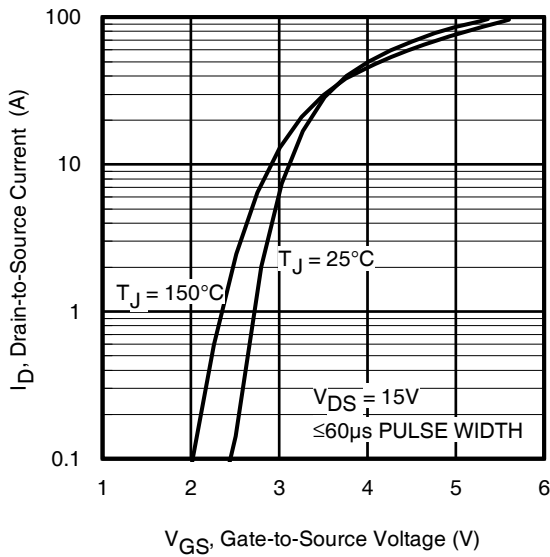
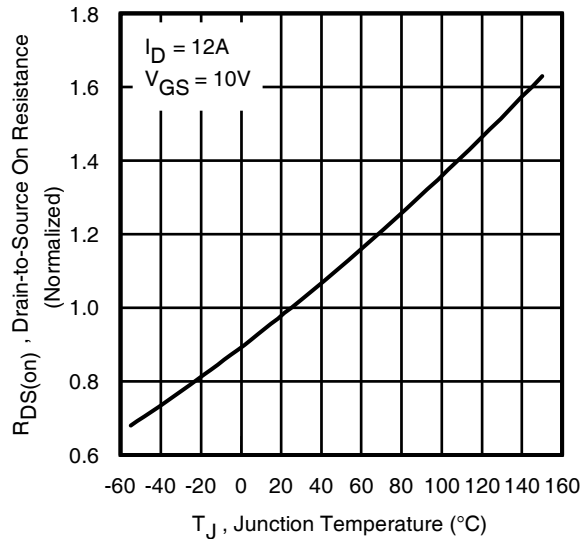
	Parameter	Min.	Typ.	Max.	Units	Conditions
BV <sub>DSS</sub>	Drain-to-Source Breakdown Voltage	30	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	0.02	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1mA
R <sub>DS(on)</sub>	Static 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
g <sub>fs</sub>	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	—		

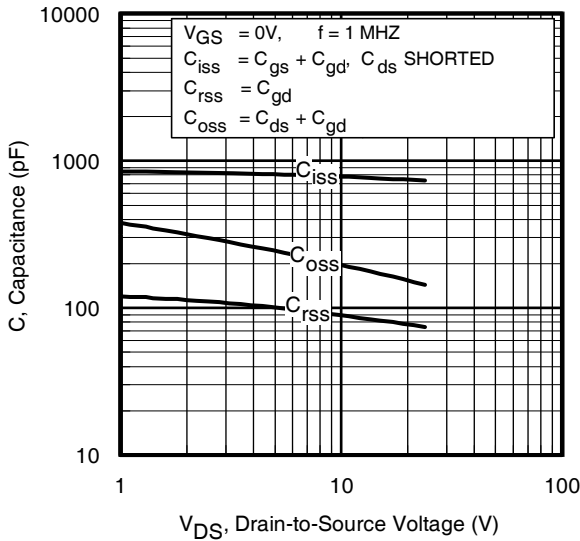
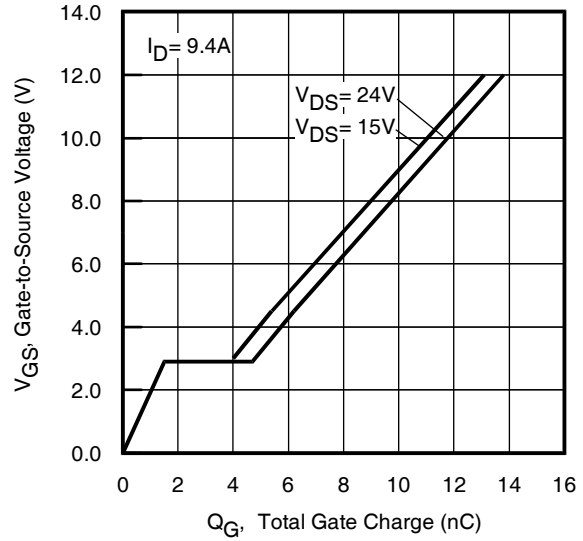
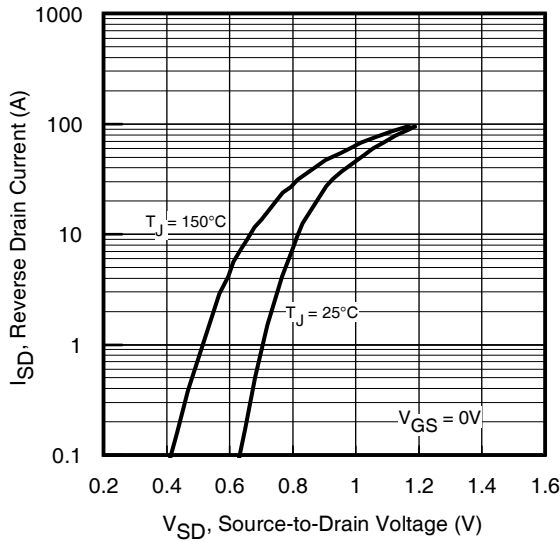
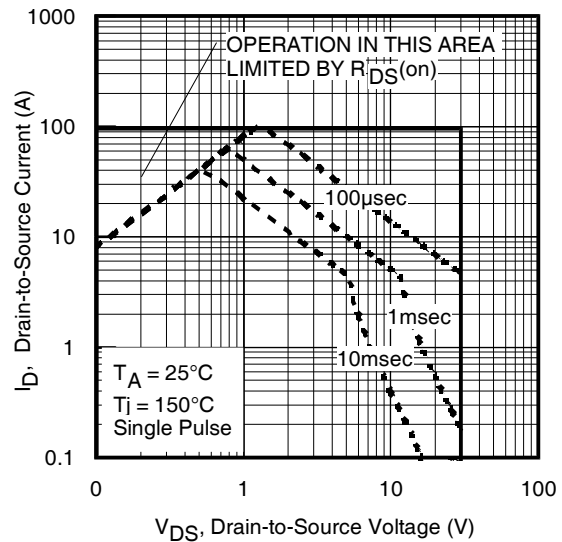
**Avalanche Characteristics**

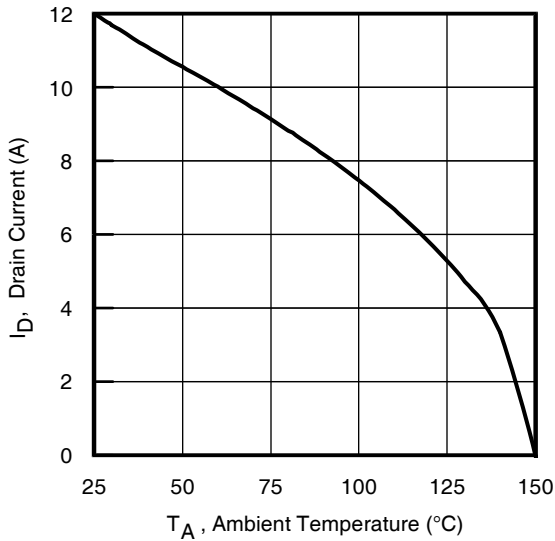
	Parameter	Typ.	Max.	Units
E <sub>AS</sub>	Single Pulse Avalanche Energy ②	—	13	mJ
I <sub>AR</sub>	Avalanche Current ①	—	9.4	A

**Diode Characteristics**

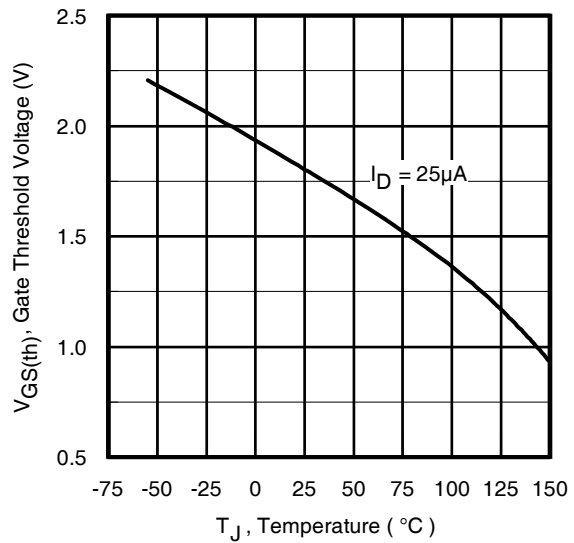
	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	3.5	A	MOSFET symbol showing the integral reverse p-n junction diode.
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	96		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.0	V	T <sub>J</sub> = 25°C, 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

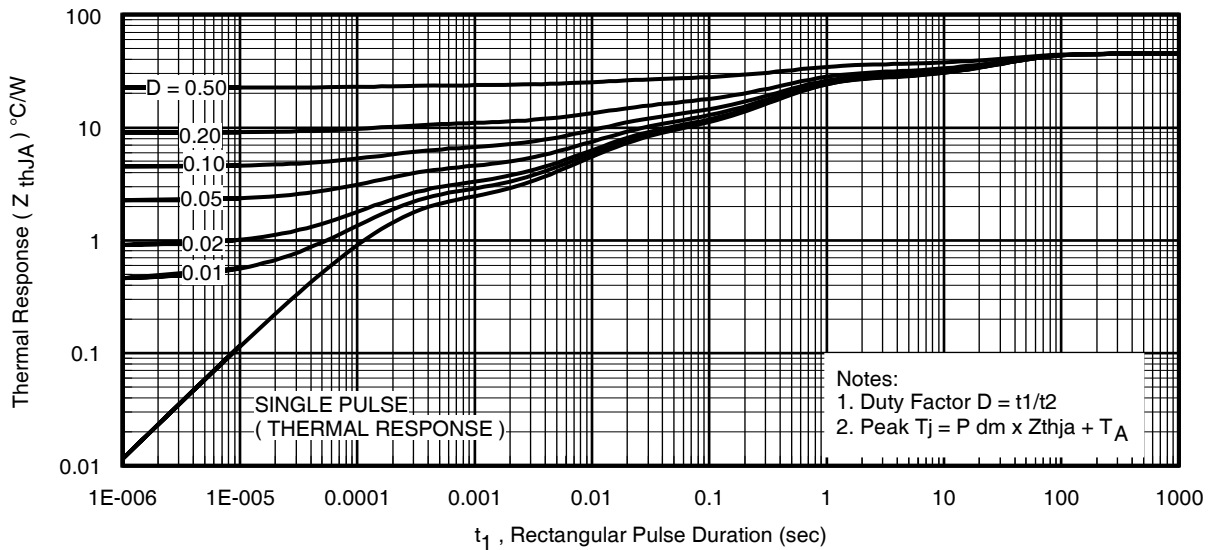

**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage

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

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

**Fig 8.** Maximum Safe Operating Area



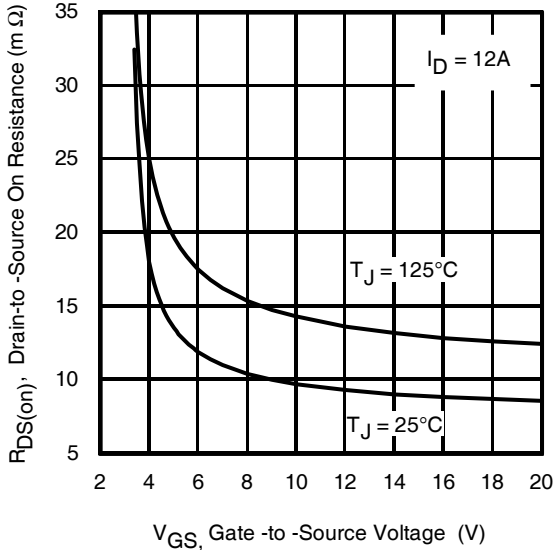
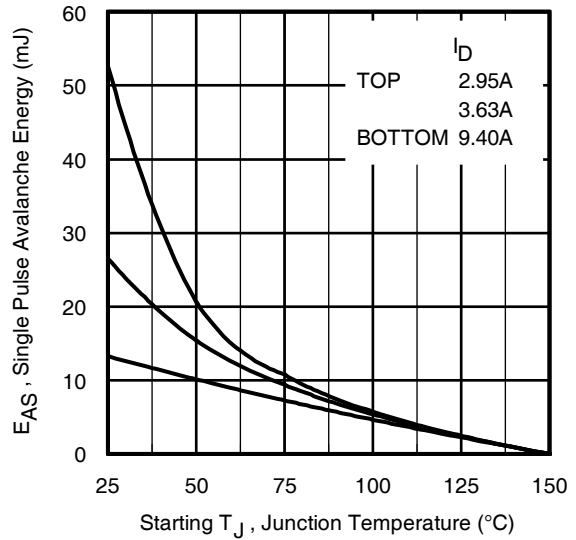
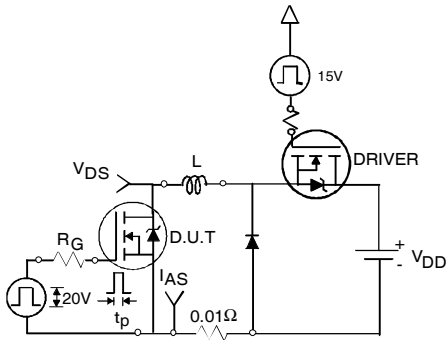
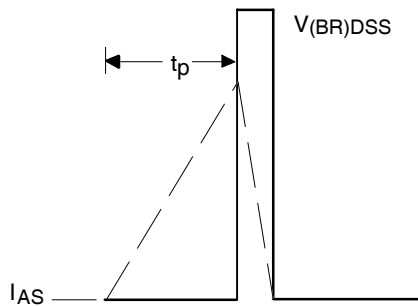
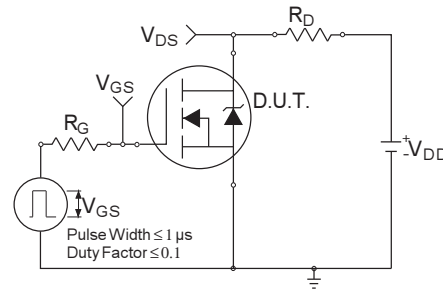
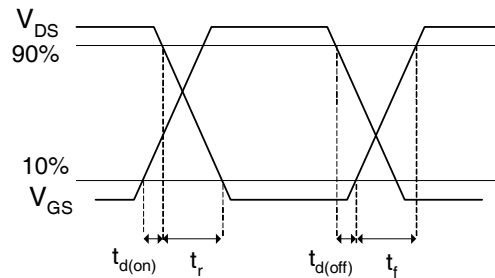
**Fig 9.** Maximum Drain Current Vs. Ambient Temperature

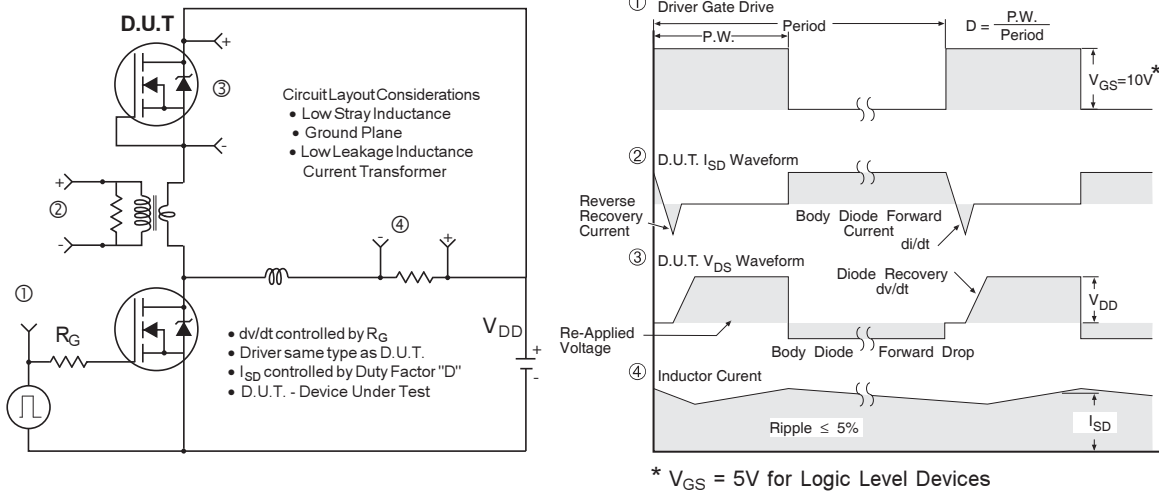


**Fig 10.** Threshold Voltage Vs. Temperature

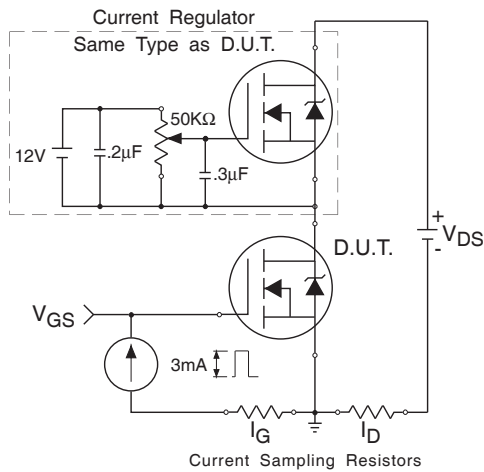


**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

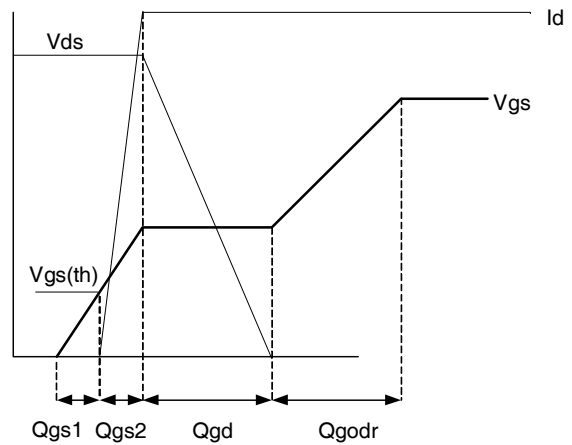

**Fig 12. On-Resistance vs. Gate Voltage**

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

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

**Fig 14b. Unclamped Inductive Waveforms**

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

**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**

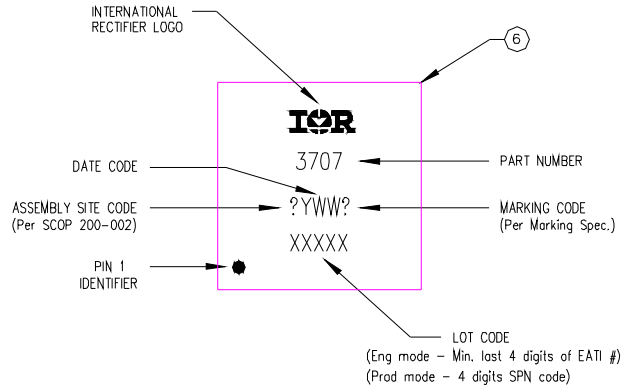


**Fig 18. Gate Charge Waveform**



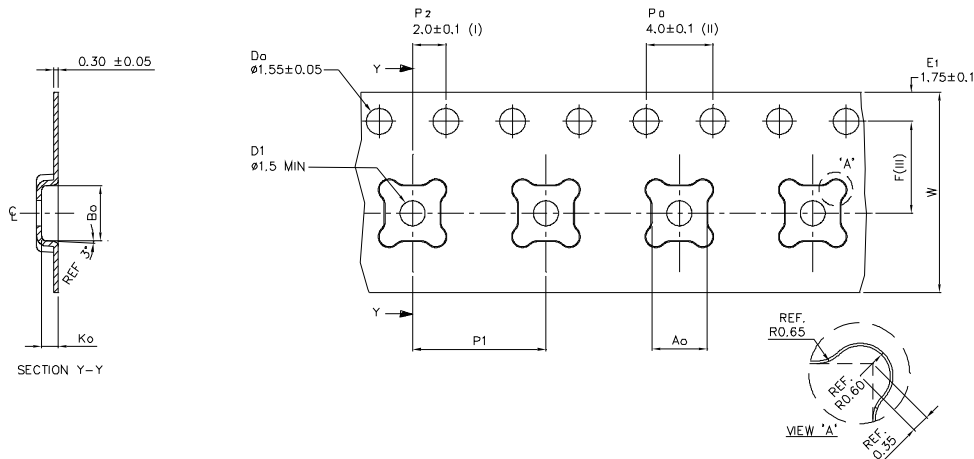


## PQFN Part Marking



TOP MARKING (LASER)

## PQFN Tape and Reel



A <sub>o</sub>	3.30 +/- 0.1
B <sub>o</sub>	3.30 +/- 0.1
K <sub>o</sub>	1.00 +/- 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  $\pm 0.20$ .
- (III) Measured from centreline of sprocket hole to centreline of pocket.
- (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/>

**Qualification information<sup>†</sup>**

Qualification level	Industrial (per JEDEC JESD47F <sup>††</sup> guidelines)	
Moisture Sensitivity Level	PQFN 3mm x 3mm	MSL1 (per JEDEC J-STD-020D <sup>††</sup> )
RoHS compliant	Yes	

<sup>†</sup> Qualification standards can be found at International Rectifier's web site: <http://www.irf.com/product-info/reliability>

<sup>††</sup> Applicable version of JEDEC standard at the time of product release

**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](#).