

HEXFET® Power MOSFET

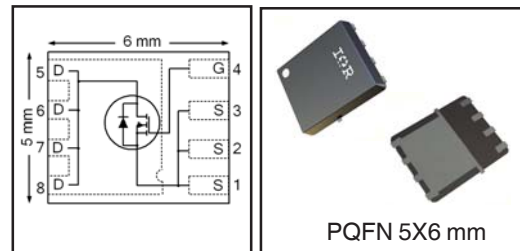
**Applications**

- Control MOSFET of Sync-Buck Converters used for Notebook Processor Power
- Control MOSFET for Isolated DC-DC Converters in Networking Systems

<b>V<sub>DSS</sub></b>	<b>R<sub>DS(on)</sub> max</b>	<b>Q<sub>g</sub></b>
<b>30V</b>	<b>3.5mΩ@V<sub>GS</sub> = 10V</b>	<b>20nC</b>

**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



Base part number	Package Type	Standard Pack		Orderable part number
		Form	Quantity	
IRFH7934PBF	PQFN 5mm x 6mm	Tape and Reel	4000	IRFH7934TRPBF

**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	24	A
I <sub>D</sub> @ T <sub>A</sub> = 70°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	19	
I <sub>D</sub> @ T <sub>C</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	76	
I <sub>DM</sub>	Pulsed Drain Current ①	190	
P <sub>D</sub> @ T <sub>A</sub> = 25°C	Power Dissipation ⑤	3.1	W
P <sub>D</sub> @ T <sub>A</sub> = 70°C	Power Dissipation ⑤	2.0	
	Linear Derating Factor ⑤	0.025	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	—	2.9	°C/W
R <sub>θJA</sub>	Junction-to-Ambient ⑤	—	40	

Notes ① through ⑤ are on page 10

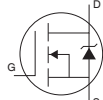
**Static @ T<sub>J</sub> = 25°C (unless otherwise specified)**

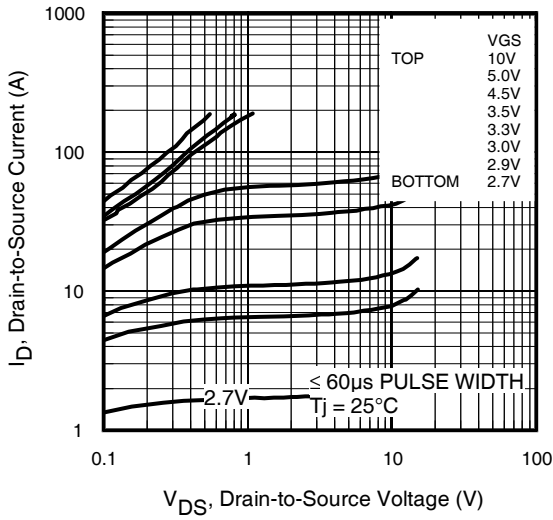
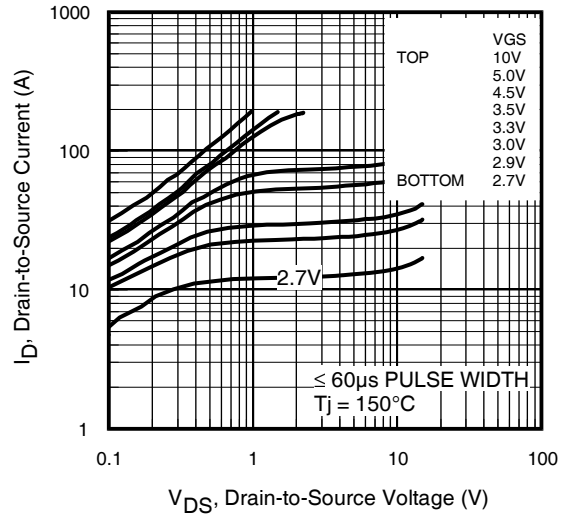
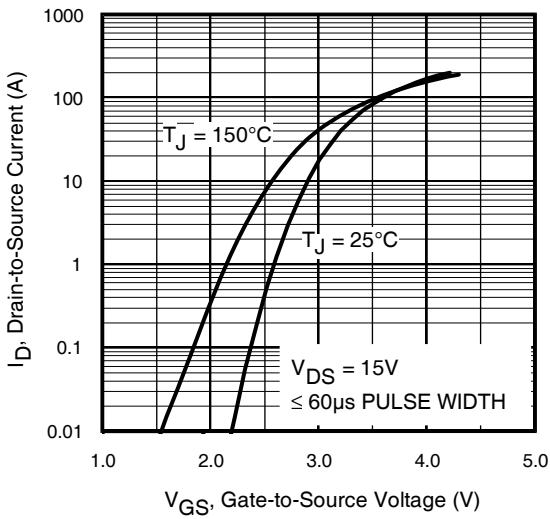
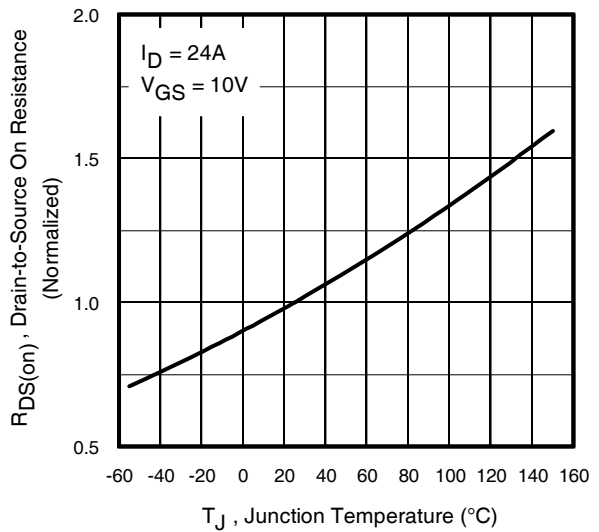
	Parameter	Min.	Typ.	Max.	Units	Conditions
BV <sub>DSS</sub>	Drain-to-Source Breakdown Voltage	30	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	0.021	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	2.9	3.5	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 24A ③
		—	4.2	5.1		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 19A 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> = 50μA
ΔV <sub>GS(th)</sub>	Gate Threshold Voltage Coefficient	—	-6.5	—	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	110	—	—	S	V <sub>DS</sub> = 15V, I <sub>D</sub> = 19A
Q <sub>g</sub>	Total Gate Charge	—	20	30	nC	V <sub>DS</sub> = 15V V <sub>GS</sub> = 4.5V I <sub>D</sub> = 19A See Fig.17 & 18
Q <sub>gs1</sub>	Pre-V <sub>th</sub> Gate-to-Source Charge	—	4.8	—		
Q <sub>gs2</sub>	Post-V <sub>th</sub> Gate-to-Source Charge	—	2.5	—		
Q <sub>gd</sub>	Gate-to-Drain Charge	—	6.3	—		
Q <sub>godr</sub>	Gate Charge Overdrive	—	6.4	—		
Q <sub>sw</sub>	Switch Charge (Q <sub>gs2</sub> + Q <sub>gd</sub> )	—	8.8	—		
Q <sub>oss</sub>	Output Charge	—	15	—	nC	V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V
R <sub>G</sub>	Gate Resistance	—	1.7	3.1	Ω	
t <sub>d(on)</sub>	Turn-On Delay Time	—	12	—	ns	V <sub>DD</sub> = 15V, V <sub>GS</sub> = 4.5V I <sub>D</sub> = 19A R <sub>G</sub> = 1.8Ω See Fig.15
t <sub>r</sub>	Rise Time	—	16	—		
t <sub>d(off)</sub>	Turn-Off Delay Time	—	14	—		
t <sub>f</sub>	Fall Time	—	7.5	—		
C <sub>iss</sub>	Input Capacitance	—	3100	—	pF	V <sub>GS</sub> = 0V V <sub>DS</sub> = 15V f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	623	—		
C <sub>rss</sub>	Reverse Transfer Capacitance	—	241	—		

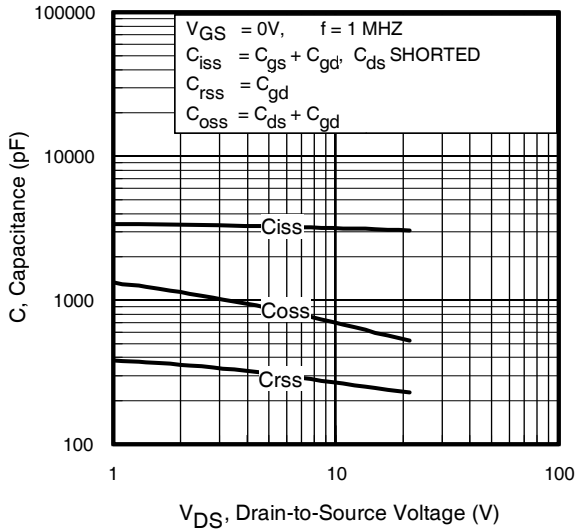
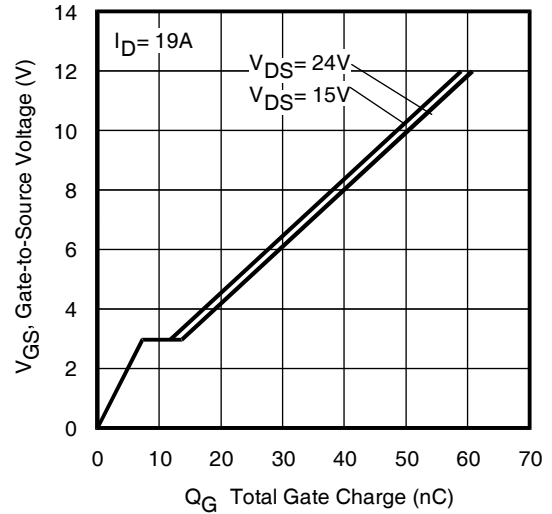
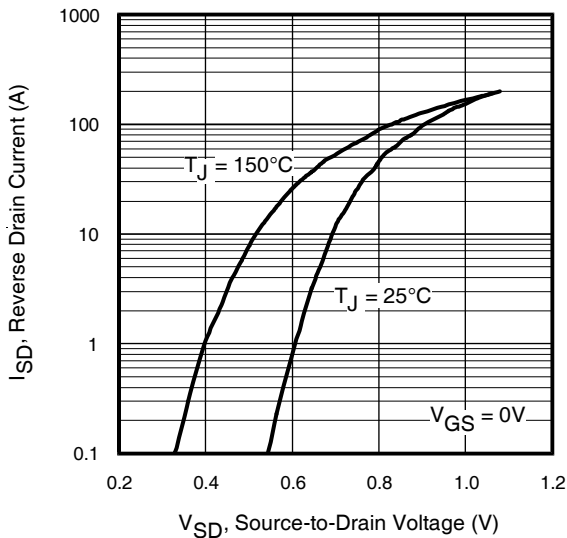
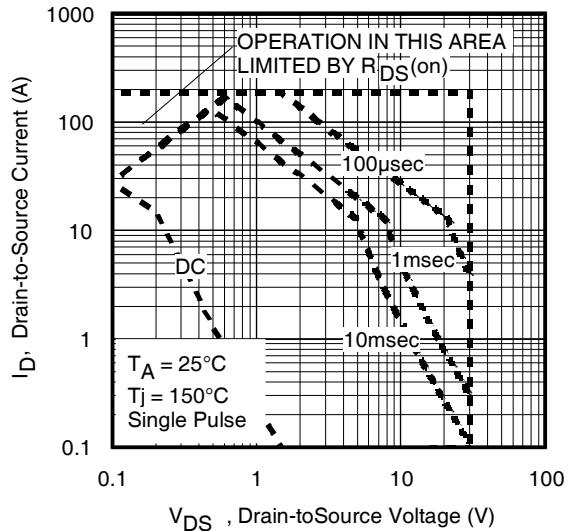
**Avalanche Characteristics**

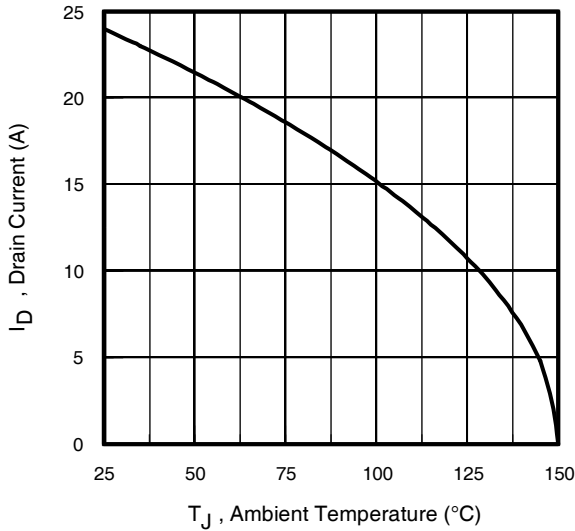
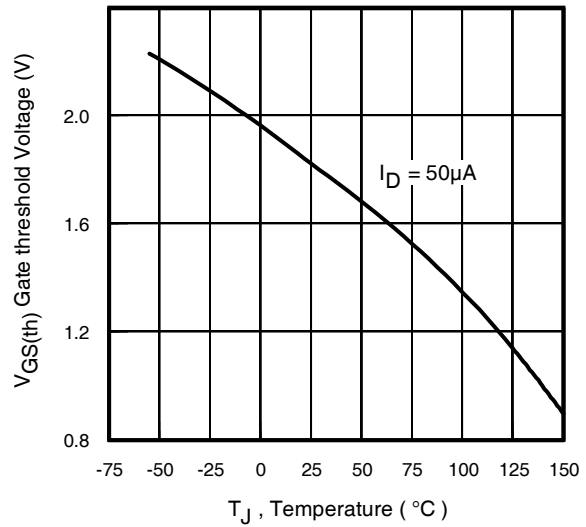
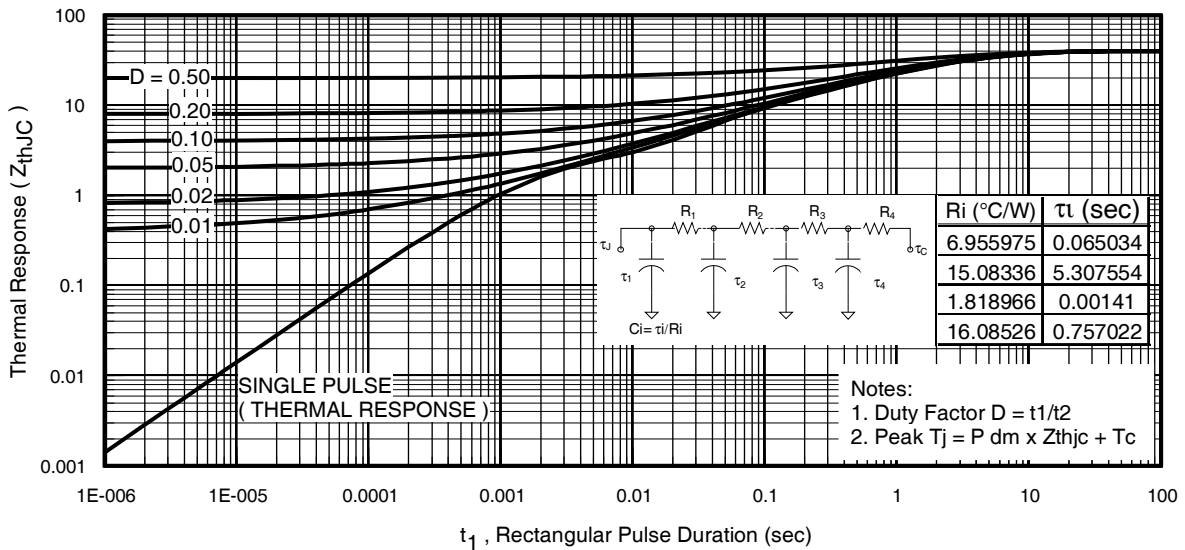
	Parameter	Typ.	Max.	Units
E <sub>AS</sub>	Single Pulse Avalanche Energy ②	—	97	mJ
I <sub>AR</sub>	Avalanche Current ①	—	19	A

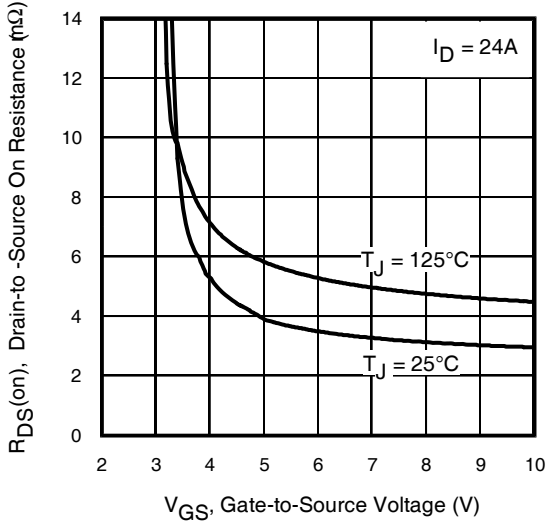
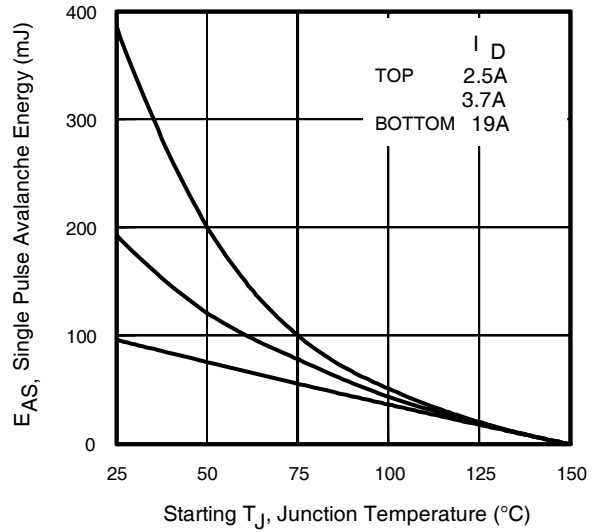
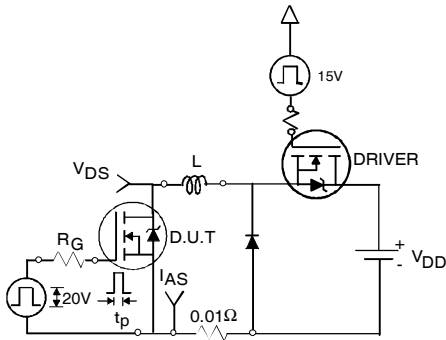
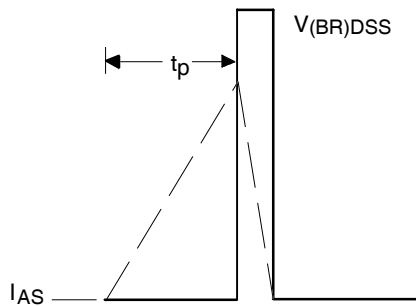
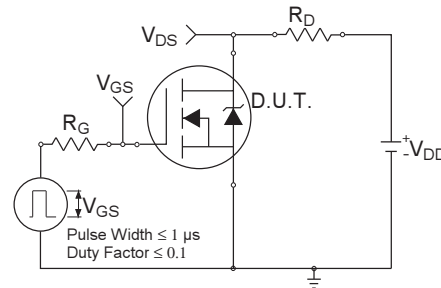
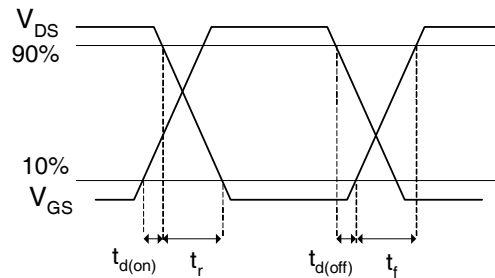
**Diode Characteristics**

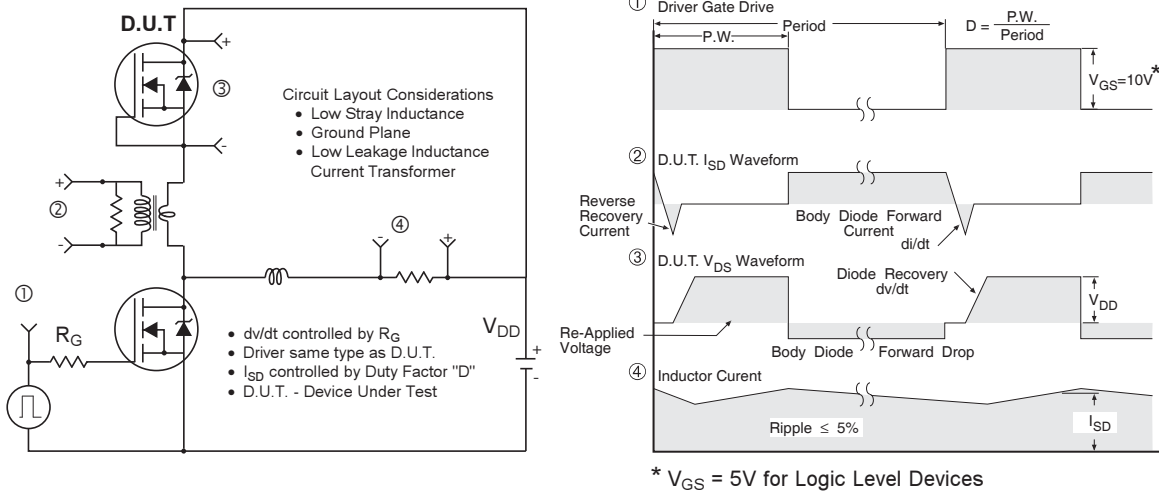
	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	3.9	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	190		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.0	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 19A, 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> = 19A, V <sub>DD</sub> = 15V
Q <sub>rr</sub>	Reverse Recovery Charge	—	28	42	nC	di/dt = 325A/μs ③ See Fig.16
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

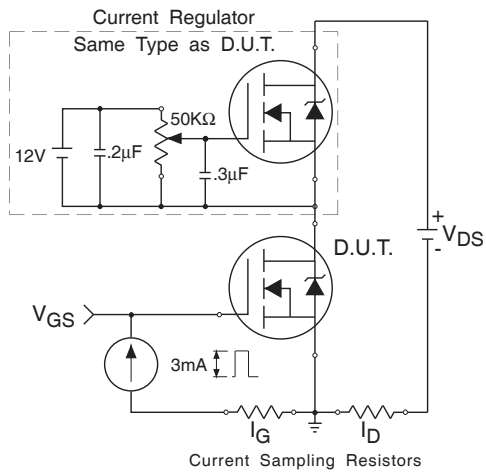

**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage

**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

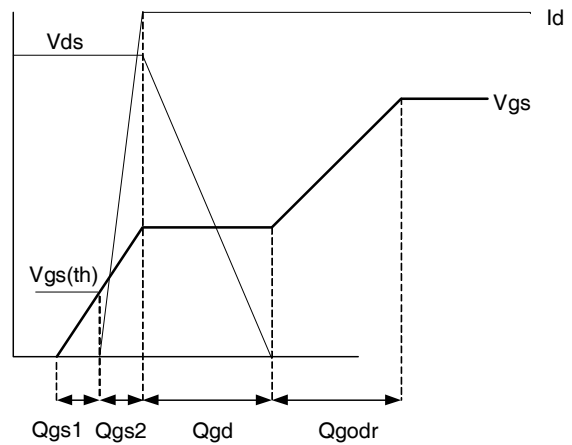

**Fig 12.** On-Resistance vs. Gate Voltage

**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<sup>®</sup> Power MOSFETS**

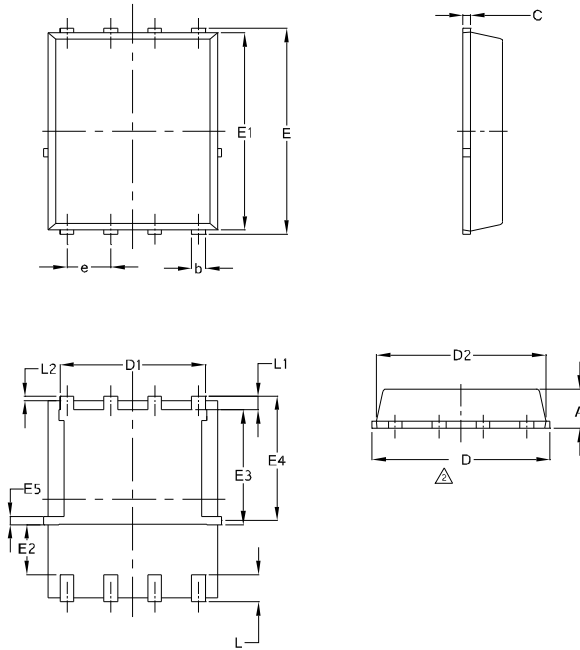


**Fig 17. Gate Charge Test Circuit**



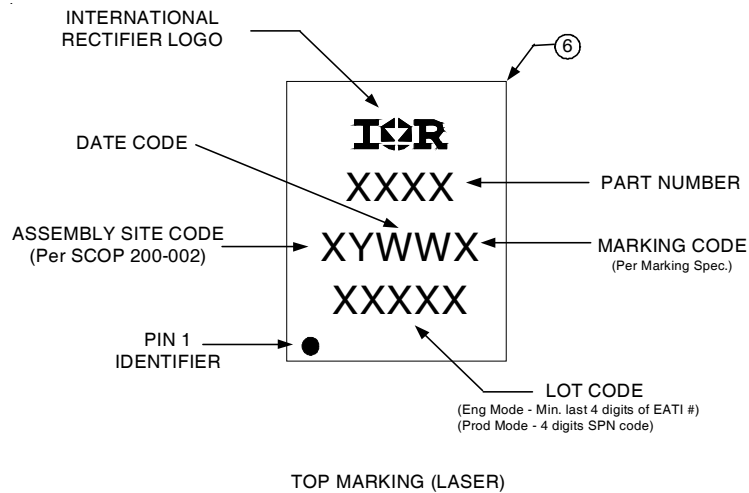
**Fig 18. Gate Charge Waveform**

## PQFN 5x6 Option "E" Package Details



SYMBOL	COMMON			
	MM		INCH	
	MIN.	MAX.	MIN.	MAX.
A	0.90	1.17	0.0354	0.0461
b	0.31	0.51	0.0130	0.0189
C	0.195	0.300	0.0077	0.0118
D	4.80	5.25	0.1890	0.2028
D1	3.91	4.31	0.1539	0.1697
D2	4.80	5.10	0.1890	0.1968
E	5.90	6.25	0.2323	0.2421
E1	5.65	6.15	0.2224	0.2362
E2	1.10	—	0.0594	—
E3	3.32	3.78	0.1307	0.1480
E4	3.52	3.72	0.1346	0.1409
E5	0.13	0.32	0.0071	0.0126
e	1.27	BSC	0.050	BSC
L	0.51	0.86	0.0020	0.0098
L1	0.38	0.71	0.0150	0.0260
L2	0.05	0.25	0.0201	0.0339
I	0	0.18	0	0.0071

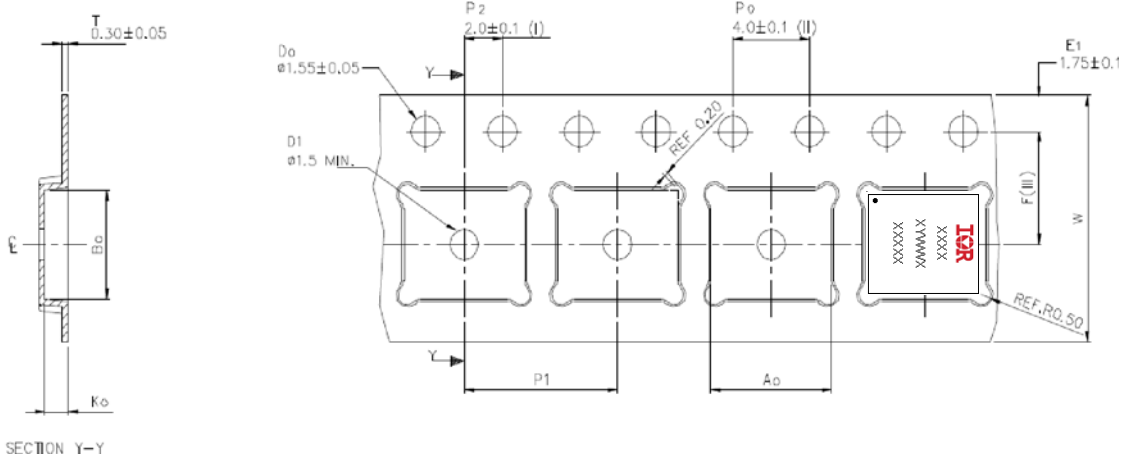
## PQFN Part Marking



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  $\pm 0.20$ .
- (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/>

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

Qualification level	Consumer <sup>††</sup> (per JEDEC JESD47F <sup>†††</sup> guidelines)	
Moisture Sensitivity Level	PQFN 5mm x 6mm	MSL2 <sup>††††</sup> (per 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.

†††† 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  $T_J = 25^\circ\text{C}$ ,  $L = 0.535\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 19\text{A}$ .
- 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.

**Revision History**

Date	Comments
08/06/2013	<ul style="list-style-type: none"> <li>• Updated the package outline drawing, on page 8.</li> <li>• This drawing change is related to PCN Hana-GTBF-GEM 5x6 PQFN Public.</li> </ul>

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