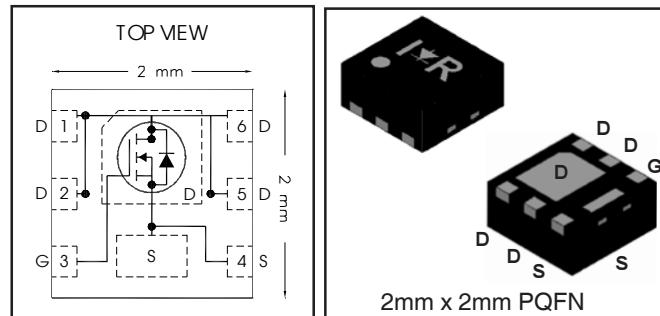


HEXFET® Power MOSFET

<b>V<sub>DS</sub></b>	<b>20</b>	<b>V</b>
<b>V<sub>GS</sub></b>	<b>±12</b>	<b>V</b>
<b>R<sub>DS(on)</sub> max</b> (@V <sub>GS</sub> = 4.5V)	<b>11.7</b>	<b>mΩ</b>
<b>R<sub>DS(on)</sub> max</b> (@V <sub>GS</sub> = 2.5V)	<b>15.5</b>	<b>mΩ</b>
<b>I<sub>D</sub></b> (@T <sub>C(Bottom)</sub> = 25°C)	<b>12①</b>	<b>A</b>



## Applications

- Charge and discharge switch for battery application
- System/Load Switch

## Features and Benefits

### Features

Low R <sub>DS(on)</sub> ( $\leq 11.7\text{m}\Omega$ )
Low Thermal Resistance to PCB ( $\leq 13^\circ\text{C/W}$ )
Low Profile ( $\leq 1.0\text{mm}$ )
Industry-Standard Pinout
Compatible with Existing Surface Mount Techniques
RoHS Compliant Containing no Lead, no Bromide and no Halogen
MSL1, Industrial Qualification

### Resulting Benefits

Lower Conduction Losses
Enable better thermal dissipation
Increased Power Density
Multi-Vendor Compatibility
Easier Manufacturing
Environmentally Friendlier
Increased Reliability

results in  
⇒

Orderable part number	Package Type	Standard Pack		Note
		Form	Quantity	
IRLHS6242TRPbF	PQFN 2mm x 2mm	Tape and Reel	4000	
IRLHS6242TR2PbF	PQFN 2mm x 2mm	Tape and Reel	400	EOL notice # 259

## Absolute Maximum Ratings

	Parameter	Max.	Units
V <sub>DS</sub>	Drain-to-Source Voltage	20	V
V <sub>GS</sub>	Gate-to-Source Voltage	±12	
I <sub>D</sub> @ T <sub>A</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 4.5V	10	A
I <sub>D</sub> @ T <sub>A</sub> = 70°C	Continuous Drain Current, V <sub>GS</sub> @ 4.5V	8.3	
I <sub>D</sub> @ T <sub>C(Bottom)</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 4.5V ②	22②	
I <sub>D</sub> @ T <sub>C(Bottom)</sub> = 70°C	Continuous Drain Current, V <sub>GS</sub> @ 4.5V ⑦	18②	
I <sub>D</sub> @ T <sub>C(Bottom)</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 4.5V (Package Limited)	12②	
I <sub>DM</sub>	Pulsed Drain Current ①	88	
P <sub>D</sub> @ T <sub>A</sub> = 25°C	Power Dissipation ③	1.98	W
P <sub>D</sub> @ T <sub>C(Bottom)</sub> = 25°C	Power Dissipation ③	9.6	
	Linear Derating Factor ⑤	0.016	W/°C
T <sub>J</sub>	Operating Junction and Storage Temperature Range	-55 to + 150	°C
T <sub>STG</sub>			

Notes ① through ⑦ are on page 2

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$BV_{DSS}$	Drain-to-Source Breakdown Voltage	20	—	—	V	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	6.8	—	mV/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	9.4	11.7	$\text{m}\Omega$	$V_{GS} = 4.5\text{V}, I_D = 8.5\text{A}$ ③②
		—	12.4	15.5		$V_{GS} = 2.5\text{V}, I_D = 8.5\text{A}$ ③②
$V_{GS(th)}$	Gate Threshold Voltage	0.5	0.8	1.1	V	$V_{DS} = V_{GS}, I_D = 10\mu\text{A}$
$\Delta V_{GS(th)}$	Gate Threshold Voltage Coefficient	—	-4.2	—	mV/ $^\circ\text{C}$	
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	1.0	$\mu\text{A}$	$V_{DS} = 16\text{V}, V_{GS} = 0\text{V}$
		—	—	150		$V_{DS} = 16\text{V}, V_{GS} = 0\text{V}, T_J = 125^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	100	$\text{nA}$	$V_{GS} = 12\text{V}$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -12\text{V}$
$g_{fs}$	Forward Transconductance	36	—	—	S	$V_{DS} = 10\text{V}, I_D = 8.5\text{A}$ ②
$Q_g$	Total Gate Charge ⑥	—	14	—	$\text{nC}$	$V_{DS} = 10\text{V}$
$Q_{gs}$	Gate-to-Source Charge ⑥	—	1.5	—		$V_{GS} = 4.5\text{V}$
$Q_{gd}$	Gate-to-Drain Charge ⑥	—	6.3	—		$I_D = 8.5\text{A}$ ② (See Fig.17 & 18)
$R_G$	Gate Resistance	—	2.1	—	$\Omega$	
$t_{d(on)}$	Turn-On Delay Time	—	5.8	—	$\text{ns}$	$V_{DD} = 10\text{V}, V_{GS} = 4.5\text{V}$ ③
$t_r$	Rise Time	—	15	—		$I_D = 8.5\text{A}$ ②
$t_{d(off)}$	Turn-Off Delay Time	—	19	—		$R_G = 1.8\Omega$
$t_f$	Fall Time	—	13	—		See Fig.15
$C_{iss}$	Input Capacitance	—	1110	—	$\text{pF}$	$V_{GS} = 0\text{V}$
$C_{oss}$	Output Capacitance	—	260	—		$V_{DS} = 10\text{V}$
$C_{rss}$	Reverse Transfer Capacitance	—	180	—		$f = 1.0\text{MHz}$

**Diode Characteristics**

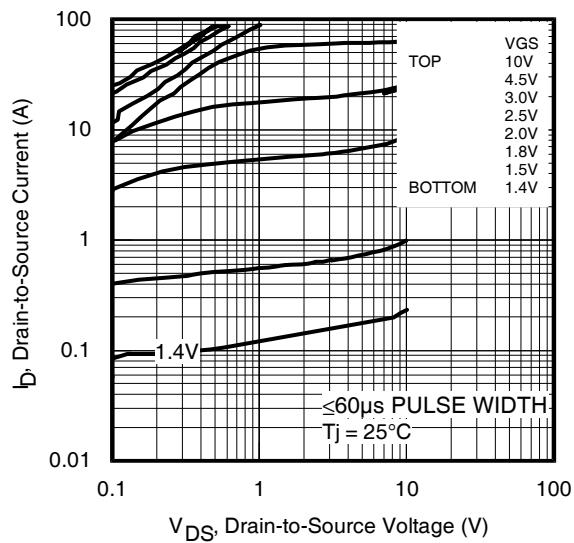
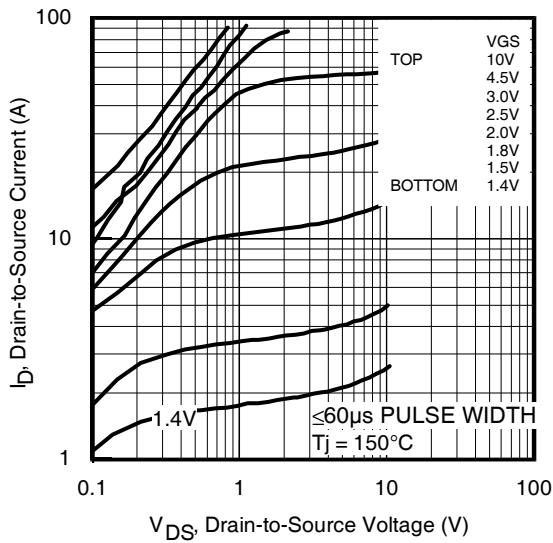
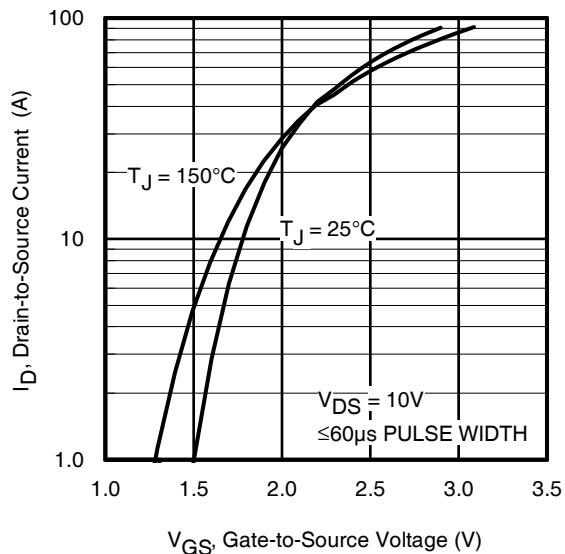
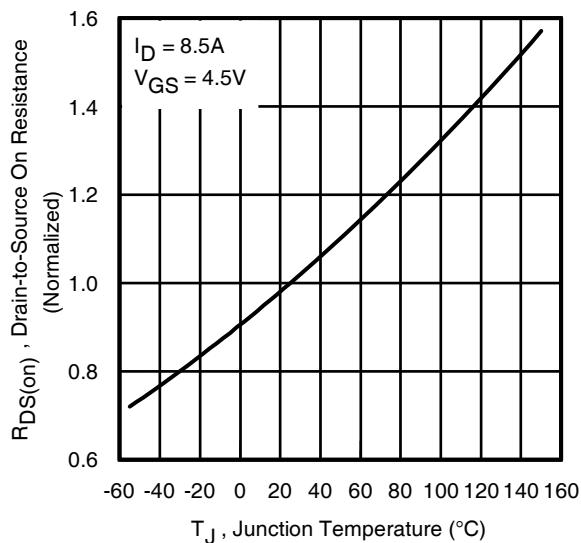
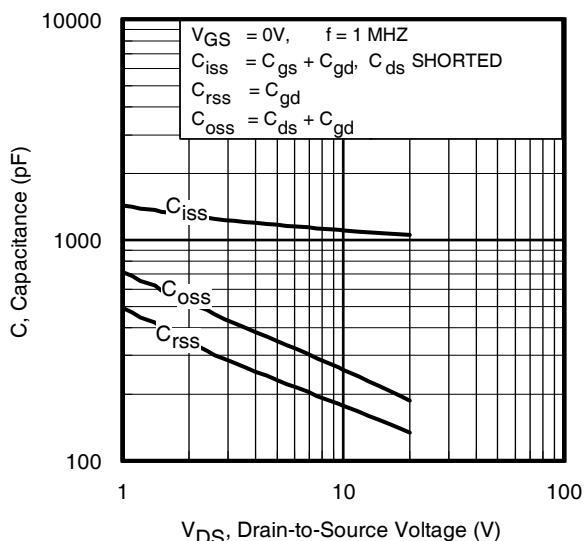
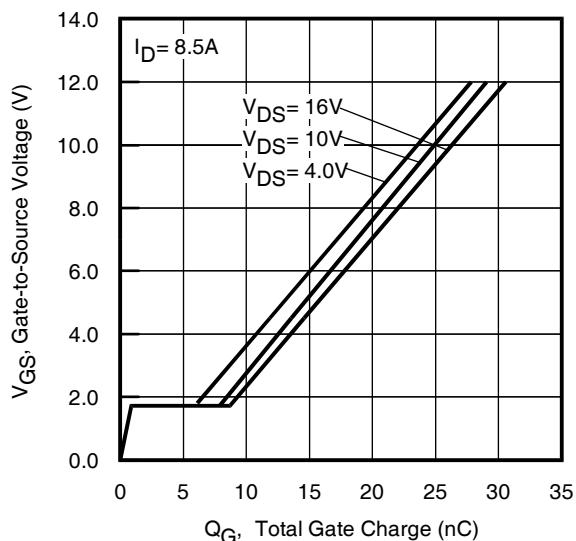
	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	22	A	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	88		
$V_{SD}$	Diode Forward Voltage	—	—	1.2	V	$T_J = 25^\circ\text{C}, I_S = 8.5\text{A}$ ②, $V_{GS} = 0\text{V}$ ③
$t_{rr}$	Reverse Recovery Time	—	15	23	ns	$T_J = 25^\circ\text{C}, I_F = 8.5\text{A}$ ②, $V_{DD} = 10\text{V}$
$Q_{rr}$	Reverse Recovery Charge	—	12	18	nC	$dI/dt = 210\text{A}/\mu\text{s}$ ③
$t_{on}$	Forward Turn-On Time	Time is dominated by parasitic Inductance				

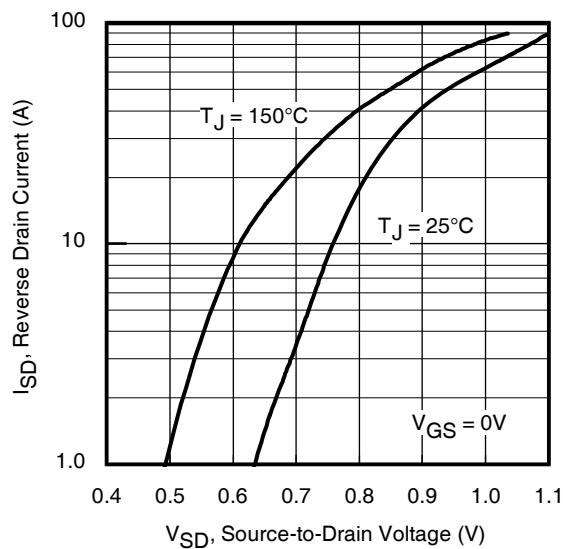
**Thermal Resistance**

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$ (Bottom)	Junction-to-Case ⑤	—	13	$^\circ\text{C/W}$
$R_{\theta JC}$ (Top)	Junction-to-Case ⑤	—	94	
$R_{\theta JA}$	Junction-to-Ambient ④	—	63	
$R_{\theta JA}$ (<10s)	Junction-to-Ambient ④	—	46	

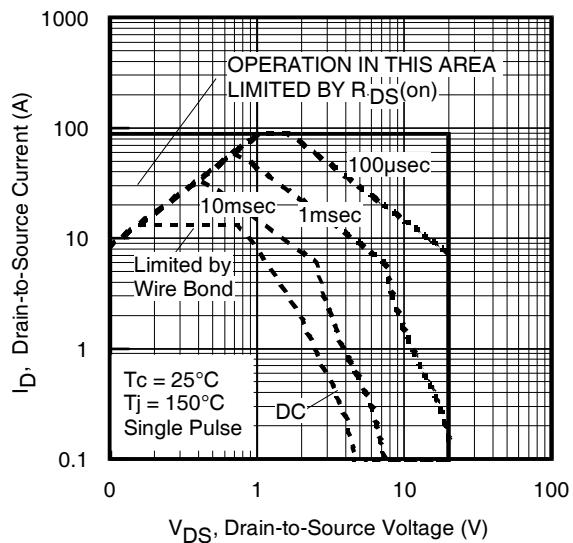
**Notes:**

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Package is limited to 12A by die-source to lead-frame bonding technology.
- ③ Pulse width  $\leq 400\mu\text{s}$ ; duty cycle  $\leq 2\%$ .
- ④ When mounted on 1 inch square copper board.
- ⑤  $R_\theta$  is measured at  $T_J$  of approximately  $90^\circ\text{C}$ .
- ⑥ For DESIGN AID ONLY, not subject to production testing.
- ⑦ Calculated continuous current based on maximum allowable junction temperature.

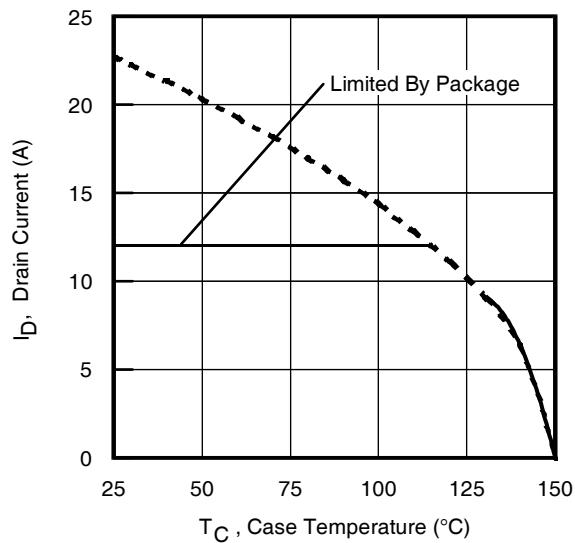
**Fig 1.** Typical Output Characteristics**Fig 2.** Typical Output Characteristics**Fig 3.** Typical Transfer Characteristics**Fig 4.** Normalized On-Resistance vs. Temperature**Fig 5.** Typical Capacitance vs. Drain-to-Source Voltage**Fig 6.** Typical Gate Charge vs. Gate-to-Source Voltage



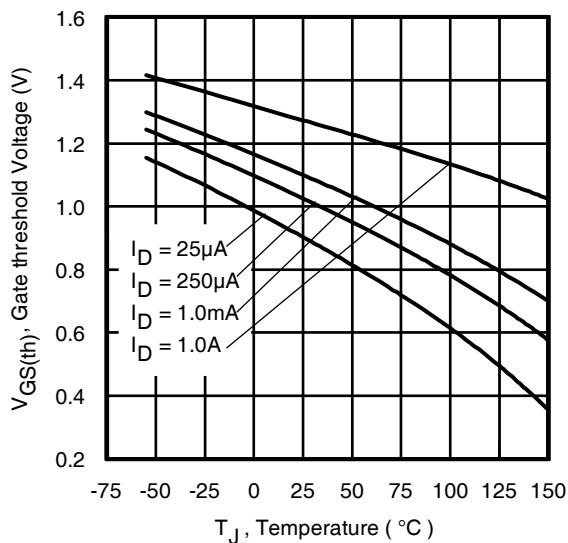
**Fig 7.** Typical Source-Drain Diode Forward Voltage



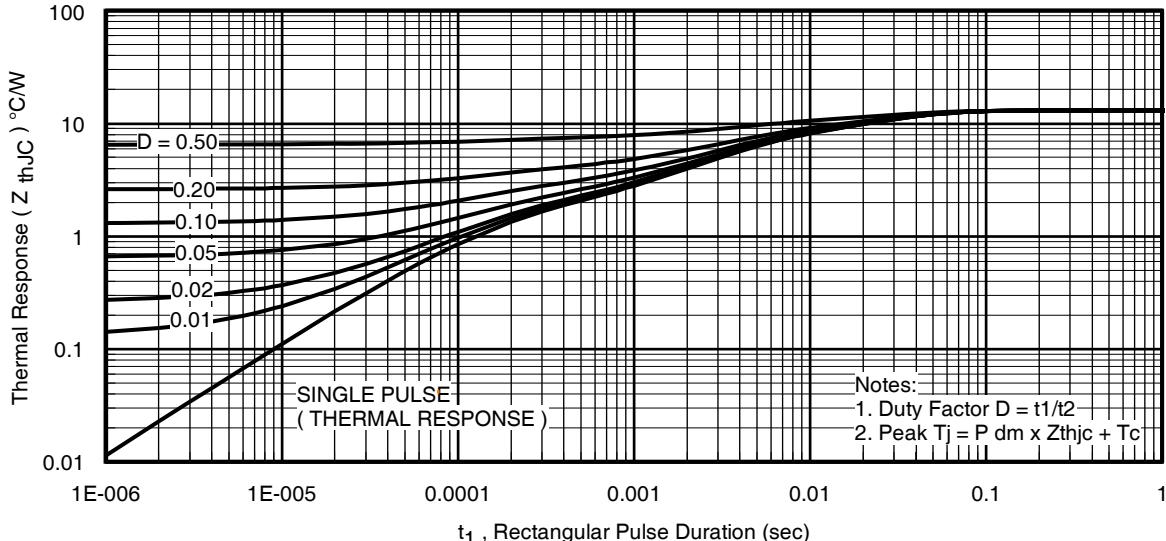
**Fig 8.** Maximum Safe Operating Area



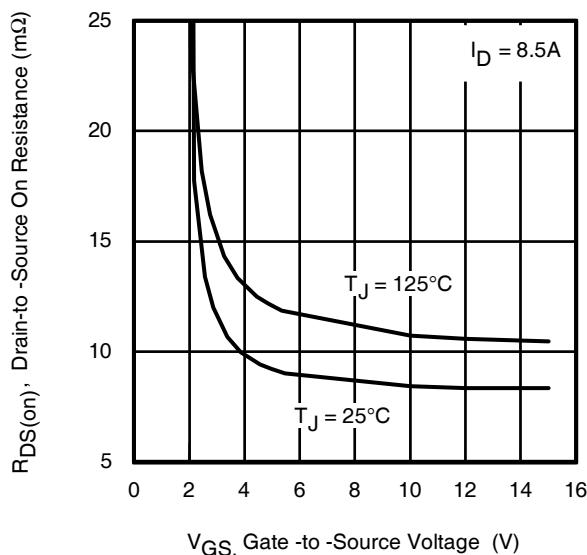
**Fig 9.** Maximum Drain Current vs. Case (Bottom) Temperature



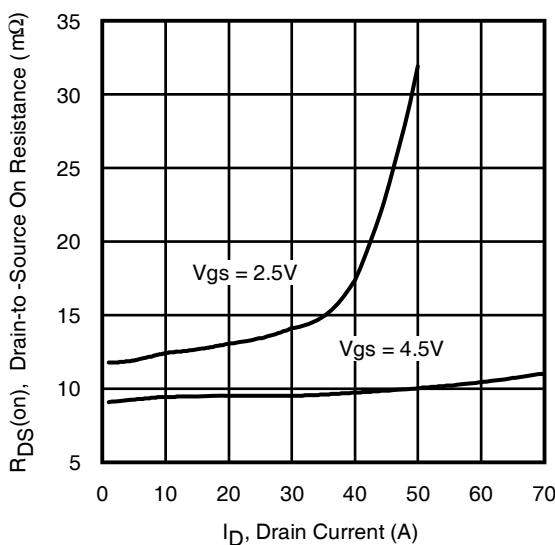
**Fig 10.** Threshold Voltage vs. Temperature



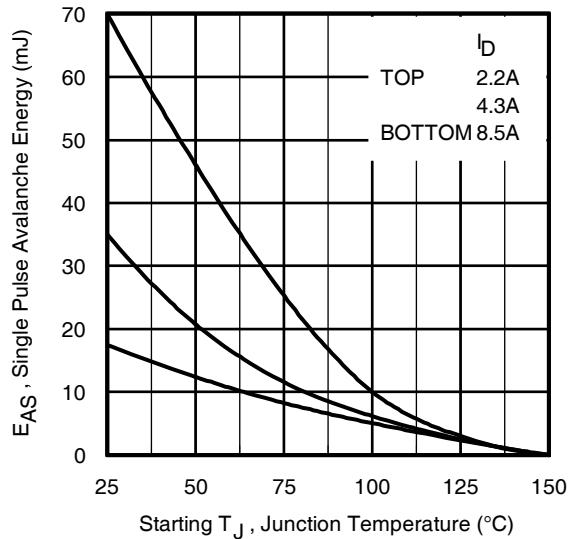
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case (Bottom)



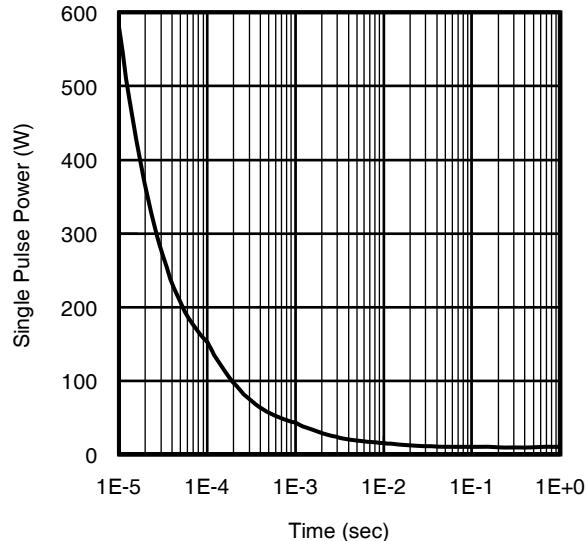
**Fig 12.** On-Resistance vs. Gate Voltage



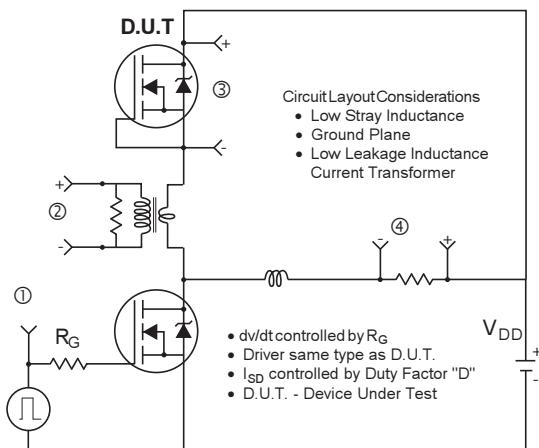
**Fig 13.** Typical On-Resistance vs. Drain Current



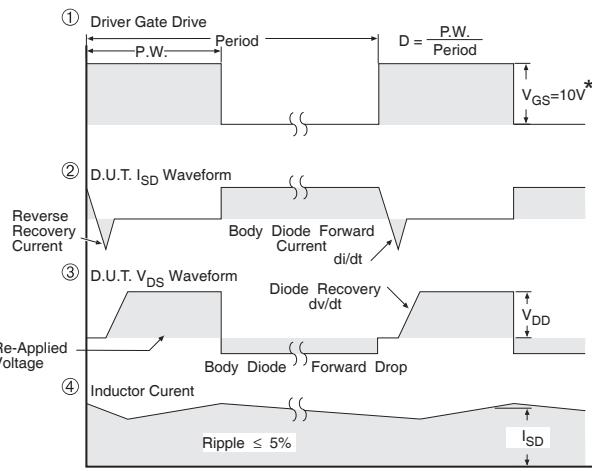
**Fig 14.** Maximum Avalanche Energy vs. Drain Current

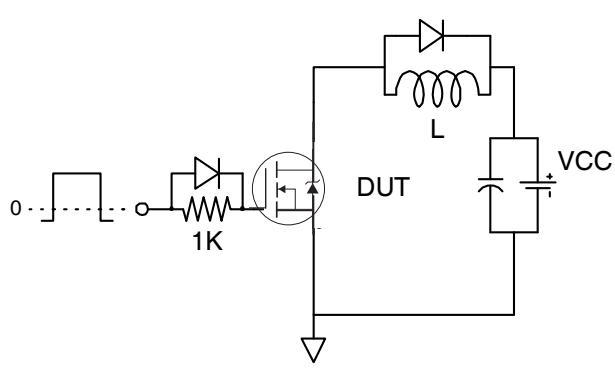
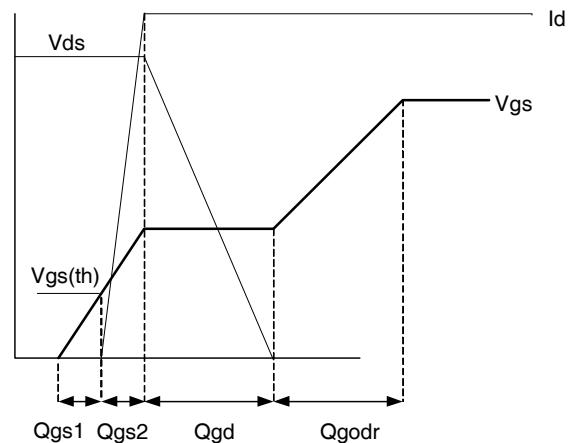
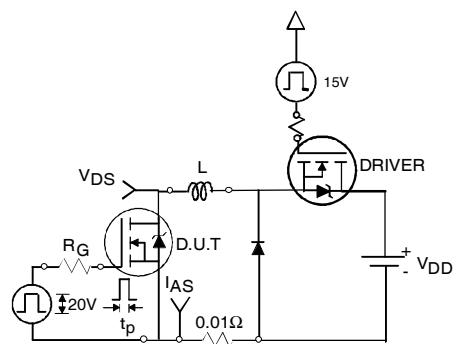
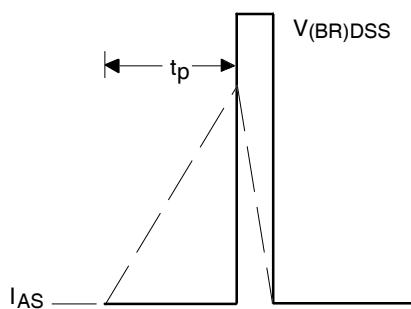
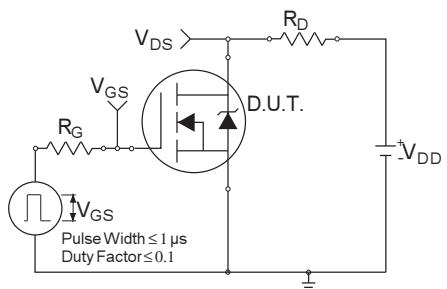
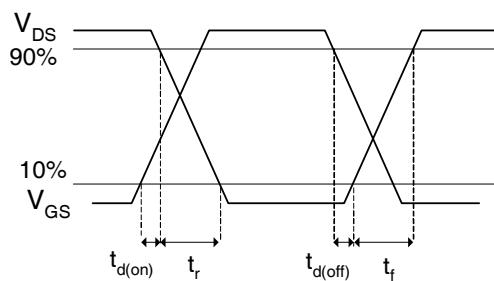


**Fig 15.** Typical Power vs. Time

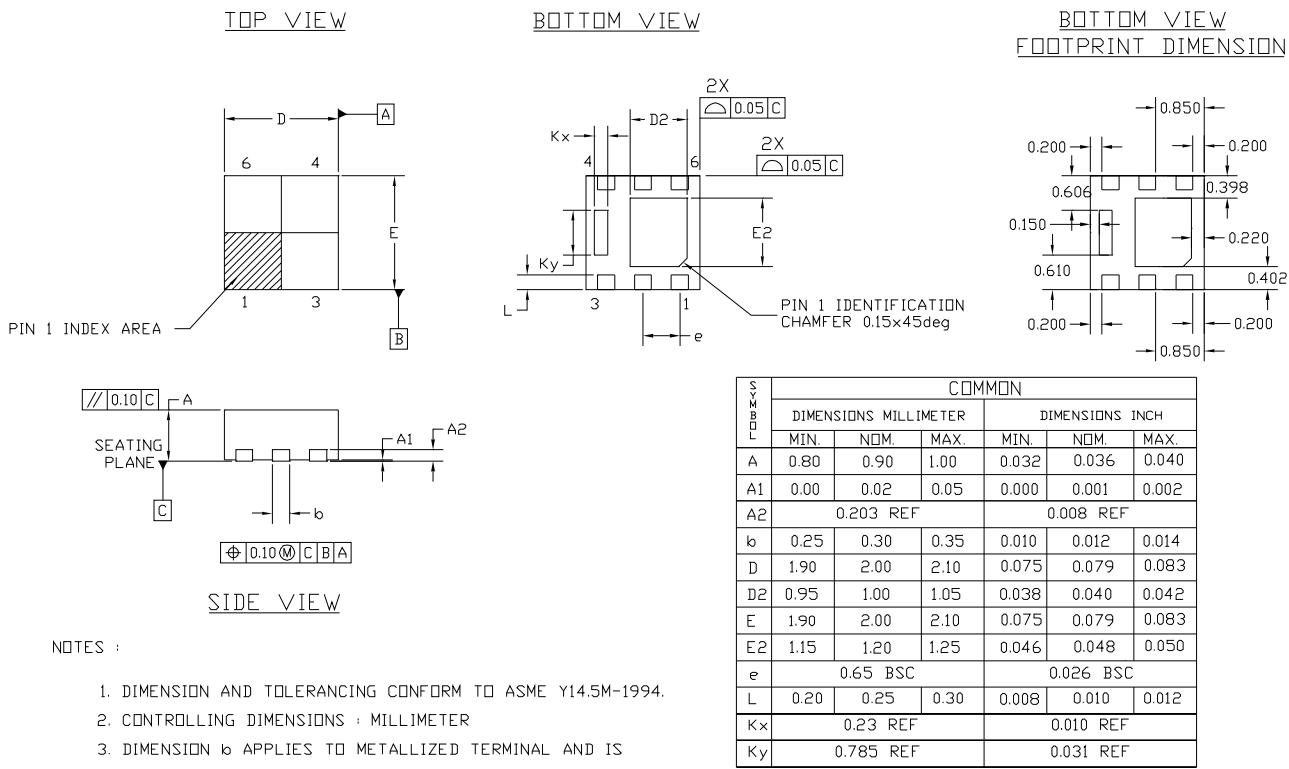


**Fig 16.** Peak Diode Recovery  $dv/dt$  Test Circuit for N-Channel HEXFET® Power MOSFETs



**Fig 17a.** Gate Charge Test Circuit**Fig 17b.** Gate Charge Waveform**Fig 18a.** Unclamped Inductive Test Circuit**Fig 18b.** Unclamped Inductive Waveforms**Fig 19a.** Switching Time Test Circuit**Fig 19b.** Switching Time Waveforms

## PQFN 2x2 Outline Package Details

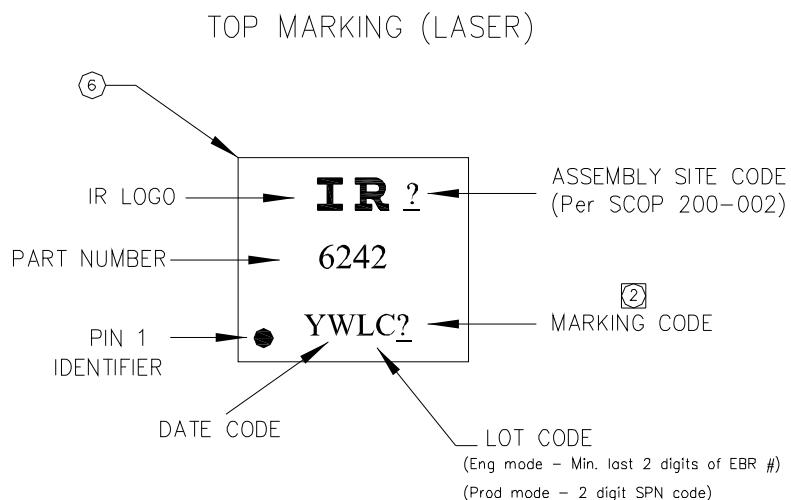


### NOTES :

1. DIMENSION AND TOLERANCING CONFORM TO ASME Y14.5M-1994.
2. CONTROLLING DIMENSIONS : MILLIMETER
3. DIMENSION b APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm. FROM TERMINAL TIP.

For footprint and stencil design recommendations, please refer to application note AN-1154 at <http://www.irf.com/technical-info/appnotes/an-1154.pdf>

## PQFN 2x2 Outline Part Marking



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

## PQFN 2x2 Outline Tape and Reel

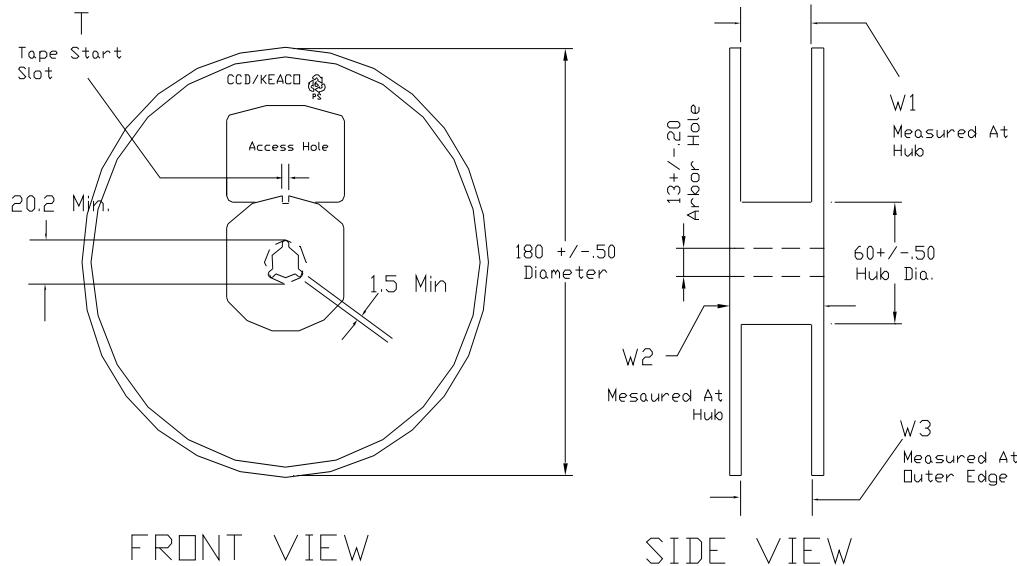
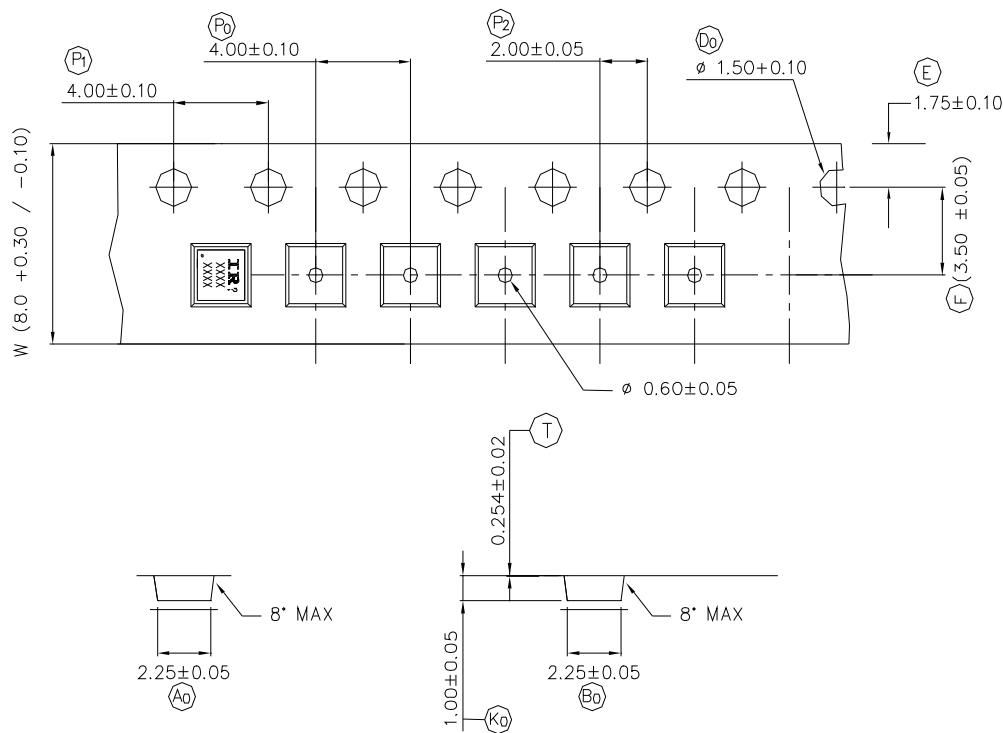


TABLE 1: REEL DETAILS

TAPE WIDTH	T	W1	W2	W3	PART NO
8 MM	3 ± 0.50	8.4 <sup>+15</sup> <sub>-0.0</sub>	14.4 Max	7.90 Min 10.9 Max	91586-1
12 MM	5 ± 0.50	12.4 <sup>+2.0</sup> <sub>-0.0</sub>	18.4 Max	11.9 Min 15.4 Max	91586-2

Note: Surface resistivity is  $\geq 1 \times 10^5$  but  $< 1 \times 10^{12}$  ohm/sq.



NOTE: The Surface Resistivity is  $10^4 - 10^8$  OHM/SQ

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

Qualification level	Industrial <sup>†</sup> (per JEDEC JESD47F <sup>††</sup> guidelines )	
Moisture Sensitivity Level	PQFN 2mm x 2mm	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.

**Revision History**

Date	Comments
12/17/2013	<ul style="list-style-type: none"><li>• Updated ordering information to reflect the End-Of-life (EOL) of the mini-reel option (EOL notice #259)</li><li>• Updated Qual level from "Consumer" to "Industrial" on page 1, 9</li><li>• Updated data sheet with new IR corporate template</li></ul>

International  
IR Rectifier

**IR WORLD HEADQUARTERS:** 101 N. Sepulveda Blvd., El Segundo, California 90245, USA  
To contact International Rectifier, please visit <http://www.irf.com/whoto-call/>

## **IMPORTANT NOTICE**

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

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.