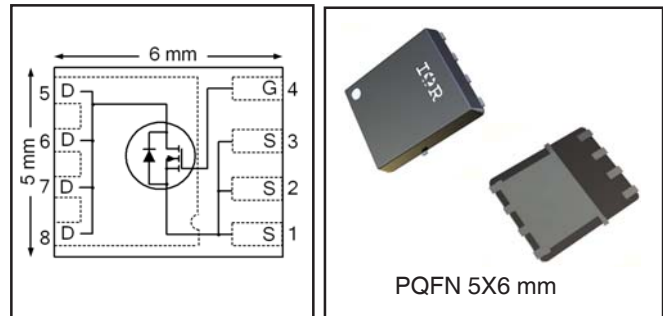


# IRFH8324PbF

HEXFET® Power MOSFET

$V_{DS}$	<b>30</b>	<b>V</b>
$V_{GS\ max}$	<b>± 20</b>	<b>V</b>
$R_{DS(on)\ max}$ (@ $V_{GS} = 10V$ )	<b>4.1</b>	<b>mΩ</b>
(@ $V_{GS} = 4.5V$ )	<b>6.3</b>	
$Q_g\ typ.$	<b>14</b>	<b>nC</b>
$I_D$ (@ $T_{c(Bottom)} = 25^\circ C$ )	<b>50</b> <sup>⑦</sup>	<b>A</b>



## Applications

- Synchronous MOSFET for high frequency buck converters

## Features and Benefits

### Features

Low Thermal Resistance to PCB (< 2.3°C/W)
Low Profile (<1.2mm)
Industry-Standard Pinout
Compatible with Existing Surface Mount Techniques
RoHS Compliant Containing no Lead, no Bromide and no Halogen
MSL1, Consumer Qualification

results in

⇒

### Benefits

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

Orderable part number	Package Type	Standard Pack		Note
		Form	Quantity	
IRFH8324TRPBF	PQFN 5mm x 6mm	Tape and Reel	4000	
IRFH8324TR2PBF	PQFN 5mm x 6mm	Tape and Reel	400	

## 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, $V_{GS} @ 10V$	23	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	18	
$I_D @ T_{C(Bottom)} = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	90 <sup>⑥⑦</sup>	
$I_D @ T_{C(Bottom)} = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	57 <sup>⑥⑦</sup>	
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$ (Package Limited)	50 <sup>⑦</sup>	
$I_{DM}$	Pulsed Drain Current <sup>①</sup>	200	
$P_D @ T_A = 25^\circ C$	Power Dissipation <sup>⑤</sup>	3.6	W
$P_D @ T_{C(Bottom)} = 25^\circ C$	Power Dissipation <sup>⑤</sup>	54	
	Linear Derating Factor <sup>③</sup>	0.029	W/°C
$T_J$ $T_{STG}$	Operating Junction and Storage Temperature Range	-55 to + 150	°C

Notes <sup>①</sup> through <sup>⑥</sup> are on page 9

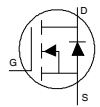
## Static @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	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	—	0.019	—	V/°C	Reference to $25^\circ\text{C}, I_D = 1.0\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	3.3	4.1	mΩ	$V_{GS} = 10V, I_D = 20A$ ③
		—	5.0	6.3		$V_{GS} = 4.5V, I_D = 16A$ ③
$V_{GS(th)}$	Gate Threshold Voltage	1.35	1.8	2.35	V	$V_{DS} = V_{GS}, I_D = 50\mu A$
$\Delta V_{GS(th)}$	Gate Threshold Voltage Coefficient	—	-6.2	—	mV/°C	
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	1.0	μA	$V_{DS} = 24V, V_{GS} = 0V$
		—	—	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	72	—	—	S	$V_{DS} = 10V, I_D = 20A$
$Q_g$	Total Gate Charge	—	31	—	nC	$V_{GS} = 10V, V_{DS} = 15V, I_D = 20A$
$Q_g$	Total Gate Charge	—	14	—	nC	$V_{DS} = 15V$ $V_{GS} = 4.5V$ $I_D = 20A$
$Q_{gs1}$	Pre-V <sub>th</sub> Gate-to-Source Charge	—	4.4	—		
$Q_{gs2}$	Post-V <sub>th</sub> Gate-to-Source Charge	—	2.2	—		
$Q_{gd}$	Gate-to-Drain Charge	—	3.5	—		
$Q_{godr}$	Gate Charge Overdrive	—	3.9	—		
$Q_{sw}$	Switch Charge ( $Q_{gs2} + Q_{gd}$ )	—	5.7	—		
$Q_{oss}$	Output Charge	—	13	—	nC	$V_{DS} = 16V, V_{GS} = 0V$
$R_G$	Gate Resistance	—	1.1	—	Ω	
$t_{d(on)}$	Turn-On Delay Time	—	13	—	ns	$V_{DD} = 15V, V_{GS} = 4.5V$ $I_D = 20A$ $R_G = 1.8\Omega$
$t_r$	Rise Time	—	26	—		
$t_{d(off)}$	Turn-Off Delay Time	—	14	—		
$t_f$	Fall Time	—	8.5	—		
$C_{iss}$	Input Capacitance	—	2380	—	pF	$V_{GS} = 0V$ $V_{DS} = 10V$ $f = 1.0\text{MHz}$
$C_{oss}$	Output Capacitance	—	500	—		
$C_{rss}$	Reverse Transfer Capacitance	—	205	—		

## Avalanche Characteristics

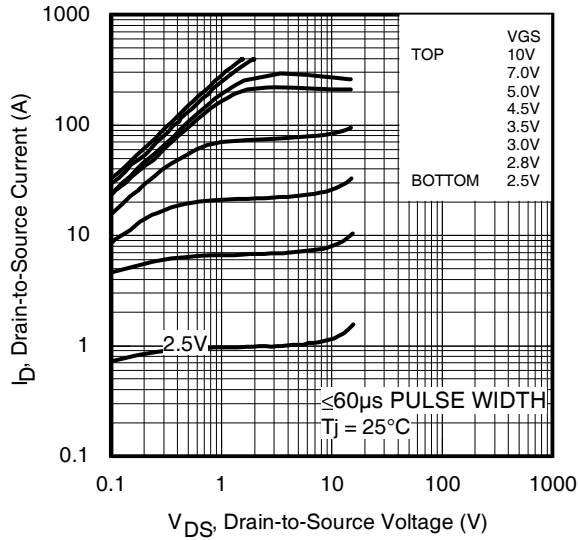
	Parameter	Typ.	Max.	Units
$E_{AS}$	Single Pulse Avalanche Energy ②	—	94	mJ
$I_{AR}$	Avalanche Current ①	—	20	A

## Diode Characteristics

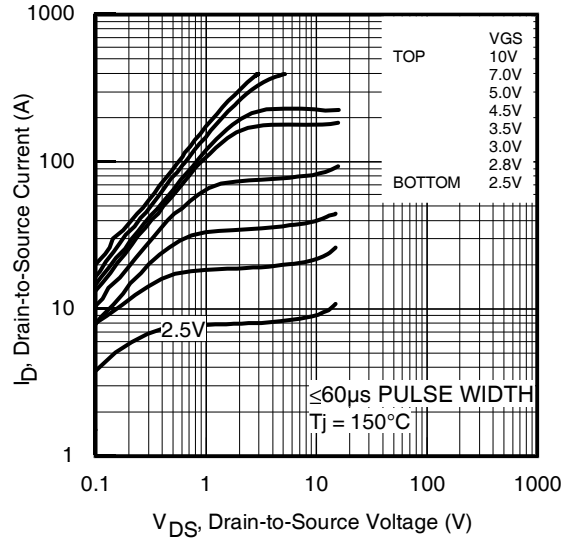
	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	50 ⑦	A	MOSFET symbol showing the integral reverse p-n junction diode. 
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	200		
$V_{SD}$	Diode Forward Voltage	—	—	1.0	V	$T_J = 25^\circ\text{C}, I_S = 20A, V_{GS} = 0V$ ③
$t_{rr}$	Reverse Recovery Time	—	16	24	ns	$T_J = 25^\circ\text{C}, I_F = 20A, V_{DD} = 15V$
$Q_{rr}$	Reverse Recovery Charge	—	25	38	nC	$di/dt = 360\text{ A}/\mu\text{s}$ ③
$t_{on}$	Forward Turn-On Time	Time is dominated by parasitic inductance				

## Thermal Resistance

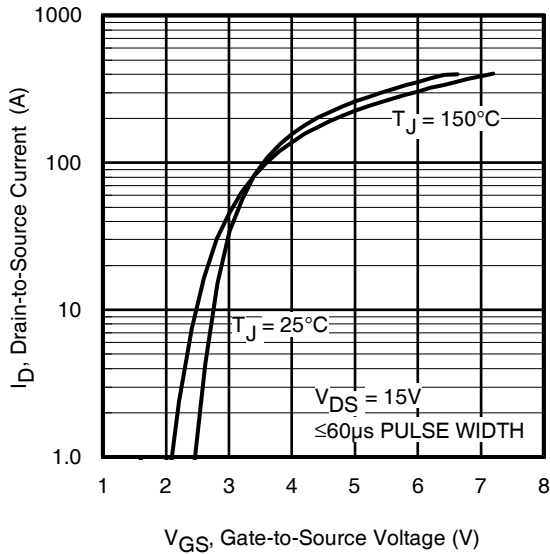
	Parameter	Typ.	Max.	Units
$R_{\theta JC}$ (Bottom)	Junction-to-Case ④	—	2.3	°C/W
$R_{\theta JC}$ (Top)	Junction-to-Case ④	—	32	
$R_{\theta JA}$	Junction-to-Ambient ⑤	—	35	
$R_{\theta JA} (<10s)$	Junction-to-Ambient ⑤	—	23	



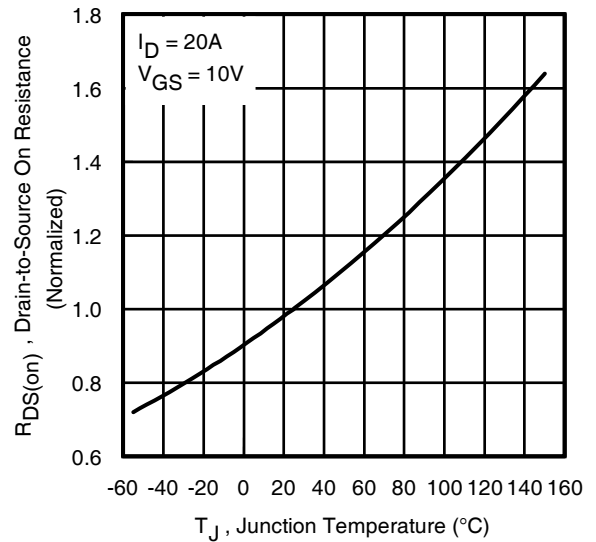
**Fig 1.** Typical Output Characteristics



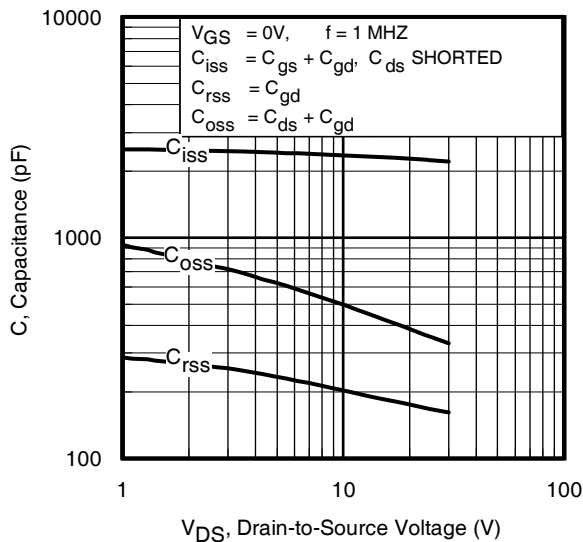
**Fig 2.** Typical Output Characteristics



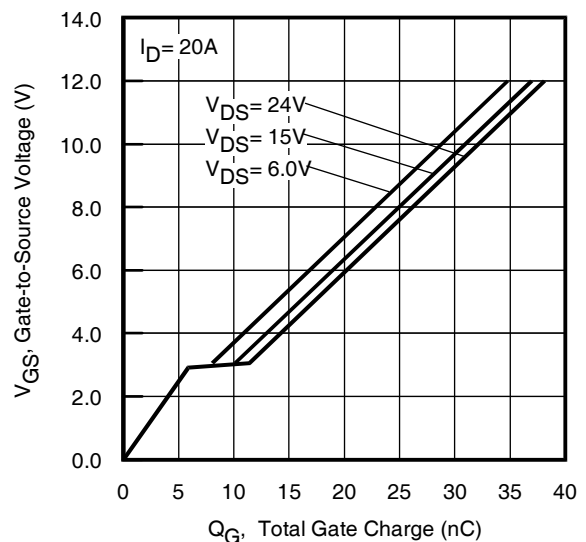
**Fig 3.** Typical Transfer Characteristics



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



**Fig 5.** Typical Capacitance vs. Drain-to-Source Voltage  
[www.irf.com](http://www.irf.com)



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

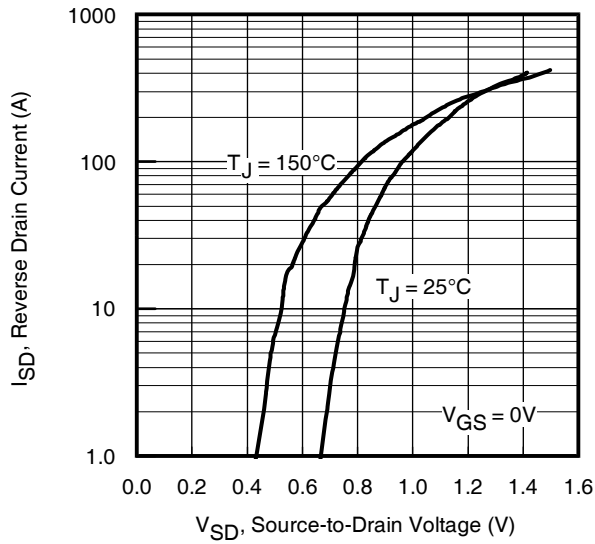


Fig 7. Typical Source-Drain Diode Forward Voltage

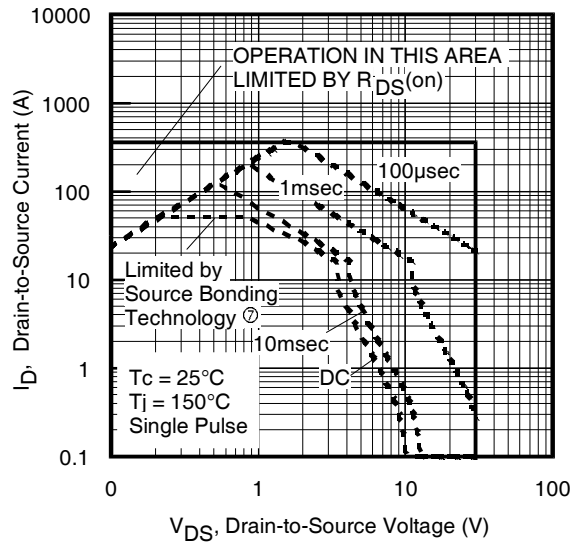


Fig 8. Maximum Safe Operating Area

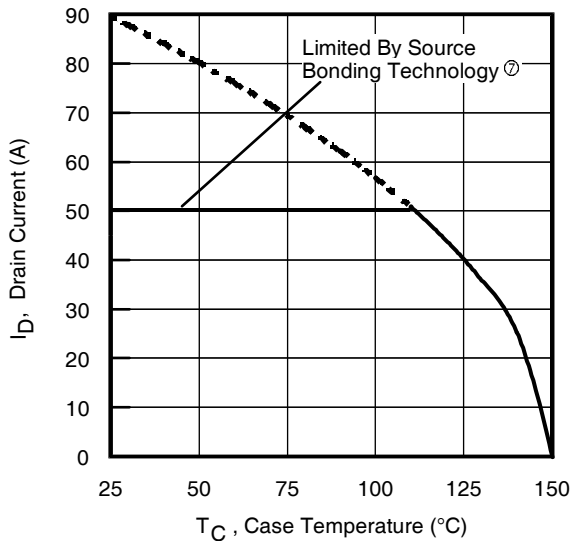


Fig 9. Maximum Drain Current vs. Case (Bottom) Temperature

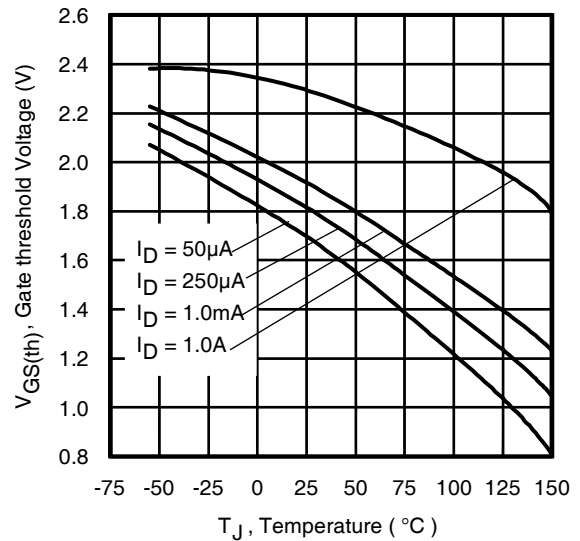


Fig 10. Threshold Voltage vs. Temperature

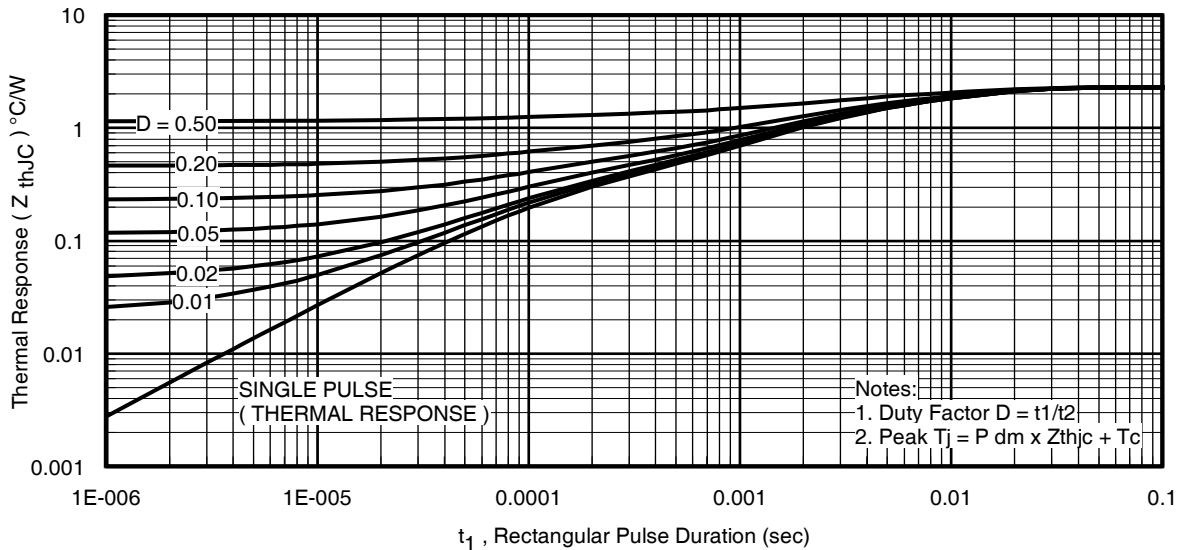


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case (Bottom)

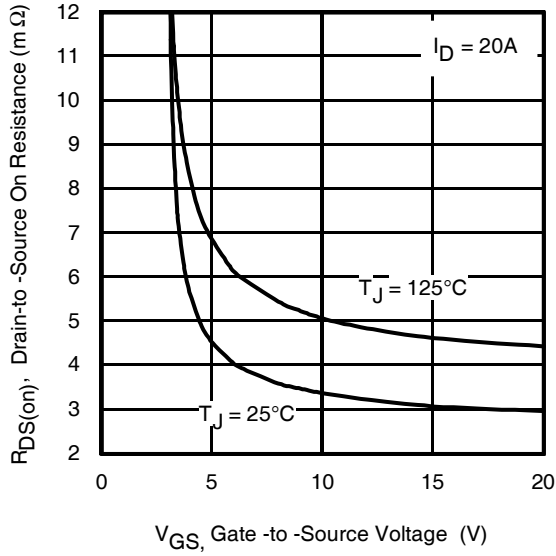


Fig 12. On-Resistance vs. Gate Voltage

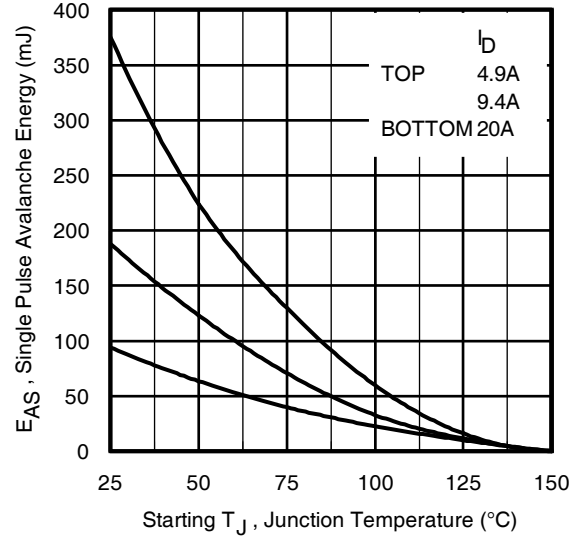


Fig 13. Maximum Avalanche Energy vs. Drain Current

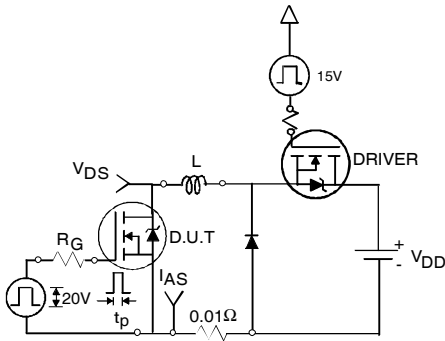


Fig 14a. Unclamped Inductive Test Circuit



Fig 14b. Unclamped Inductive Waveforms

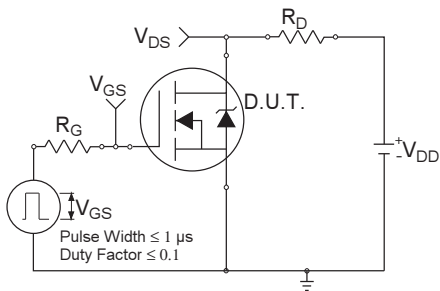


Fig 15a. Switching Time Test Circuit

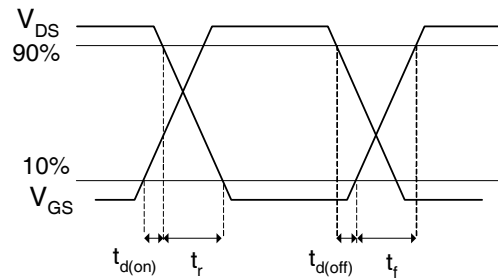
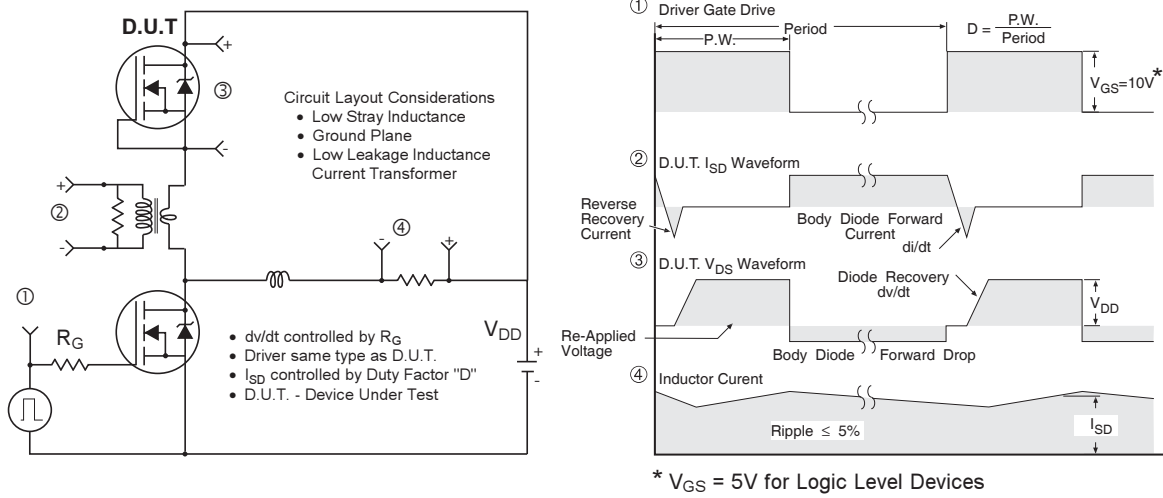


Fig 15b. Switching Time Waveforms



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

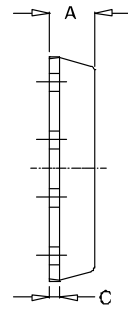


**Fig 17. Gate Charge Test Circuit**

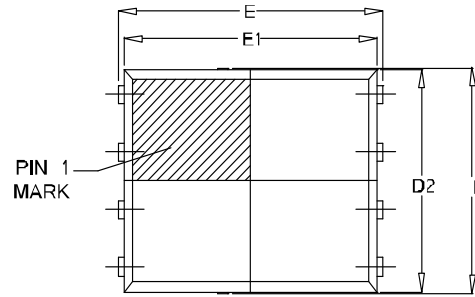


**Fig 18. Gate Charge Waveform**

## PQFN 5x6 Outline "E" Package Details

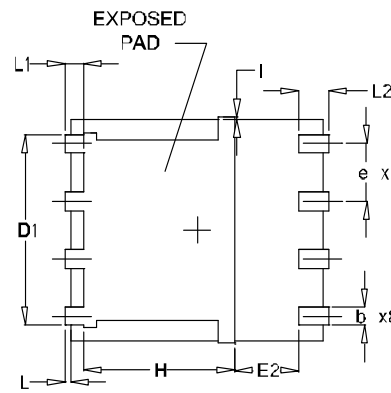


SIDEVIEW



TOP VIEW

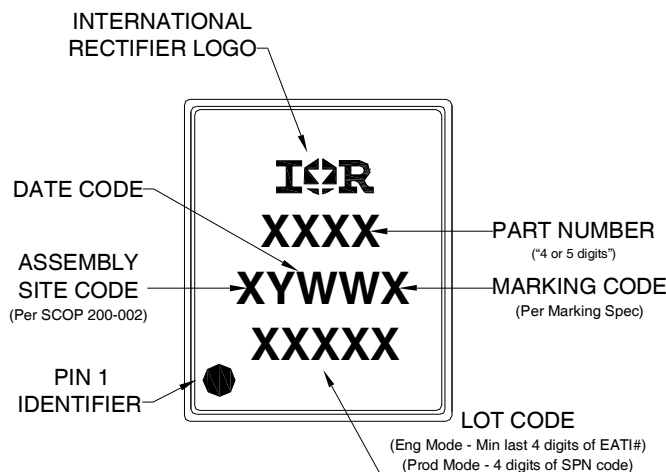
SYMBOL	OUTLINE PQFN 5X6E		
	MIN.	NOM.	MAX.
A	0.90	1.03	1.17
b	0.33	0.41	0.48
C	0.20	0.25	0.35
D	4.80	4.98	5.15
D1	3.91	4.11	4.31
D2	4.80	4.90	5.00
E	5.90	6.02	6.15
E1	5.65	5.75	5.85
E2	1.10	—	—
e	1.27 BSC		
L	0.05	0.15	0.25
L1	0.38	0.44	0.50
L2	0.51	0.68	0.86
H	3.32	3.45	3.58
I	—	—	0.18



BOTTOM VIEW

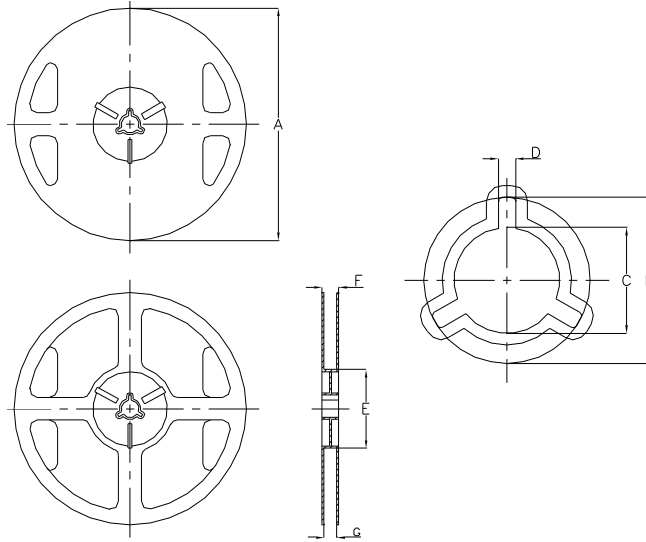
For footprint and stencil design recommendations, please refer to application note AN-1154 at <http://www.irf.com/technical-info/appnotes/an-1154.pdf>

## PQFN 5x6 Outline "E" Part Marking



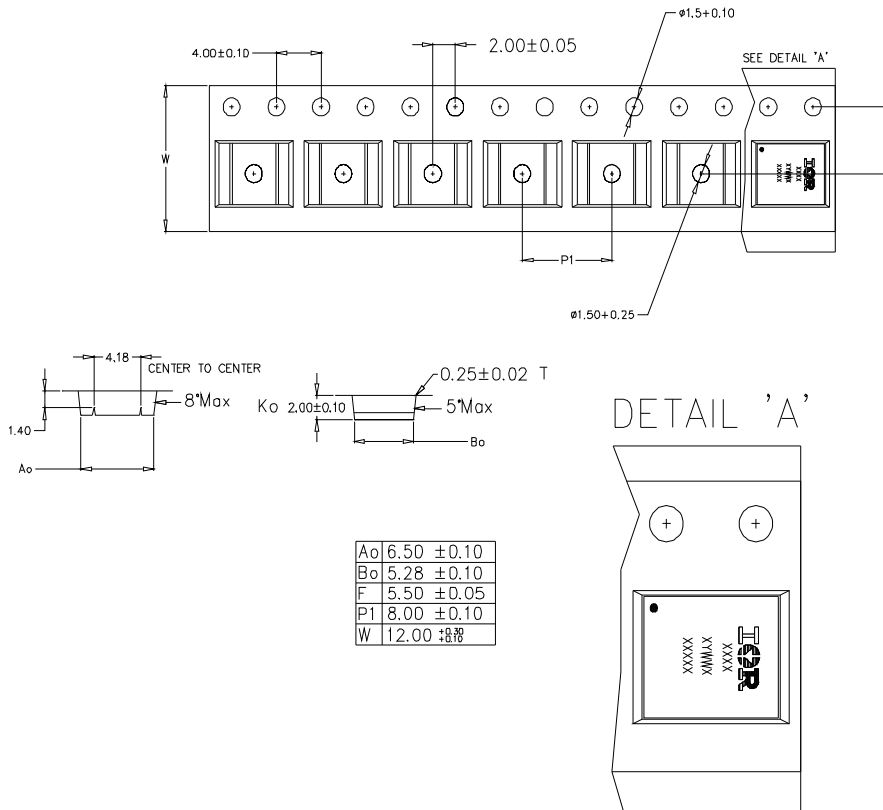
Note: For the most current drawing please refer to IR website at: <http://www.irf.com/package/>

## PQFN 5x6 Outline "E" Tape and Reel



NOTE: Controlling dimensions in mm Std reel quantity is 4000 parts.

REEL DIMENSIONS								
CODE	STANDARD OPTION (QTY 4000)				TR2 OPTION (QTY 400)			
	METRIC		IMPERIAL		METRIC		IMPERIAL	
A	329.5	330.5	12.972	13.011	177.5	178.5	6.988	7.028
B	20.9	21.5	0.823	0.846	20.9	21.5	0.823	0.846
C	12.8	13.5	0.504	0.532	13.2	13.8	0.520	0.543
D	1.7	2.3	0.067	0.091	1.9	2.3	0.075	0.091
E	97	99	3.819	3.898	65	66	2.350	2.598
F	Ref	17.4			Ref	12		
G	13	14.5	0.512	0.571	13	14.5	0.512	0.571





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

Qualification level	Consumer <sup>††</sup> (per JEDEC JESD47F <sup>†††</sup> guidelines)	
Moisture Sensitivity Level	PQFN 5mm x 6mm	MSL1 (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.

**Notes:**

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting  $T_J = 25^{\circ}\text{C}$ ,  $L = 0.47\text{mH}$ ,  $R_G = 50\Omega$ ,  $I_{AS} = 20\text{A}$ .
- ③ Pulse width  $\leq 400\mu\text{s}$ ; duty cycle  $\leq 2\%$ .
- ④  $R_{\theta}$  is measured at  $T_J$  of approximately  $90^{\circ}\text{C}$ .
- ⑤ When mounted on 1 inch square 2 oz copper pad on 1.5x1.5 in. board of FR-4 material.
- ⑥ Calculated continuous current based on maximum allowable junction temperature.
- ⑦ Current is limited to 50A by source bonding technology.

Data and specifications subject to change without notice.