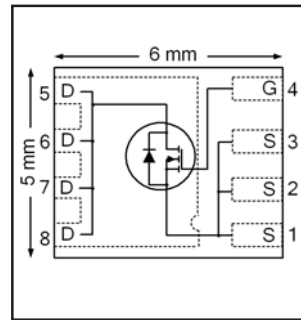


HEXFET® Power MOSFET

$V_{DS}$	<b>100</b>	<b>V</b>
$V_{GS\ max}$	<b>± 20</b>	<b>V</b>
$R_{DS(on)\ max}$ (@ $V_{GS} = 10V$ )	<b>13.5</b>	<b>mΩ</b>
$Q_G$ (typical)	<b>58</b>	<b>nC</b>
$R_G$ (typical)	<b>0.6</b>	<b>Ω</b>
$I_D$ (@ $T_{c(Bottom)} = 25^\circ C$ )	<b>50</b> Ⓣ	<b>A</b>



**Applications**

- Secondary Side Synchronous Rectification
- Inverters for DC Motors
- DC-DC Brick Applications
- Boost Converters

**Features and Benefits**

**Features**

Low $R_{DSon}$ (< 13.5mW)
Low Thermal Resistance to PCB (< 1.2°C/W)
Low Profile (<0.9 mm)
Industry-Standard Pinout
Compatible with Existing Surface Mount Techniques
RoHS Compliant Containing no Lead, no Bromide and no Halogen
MSL1, Industrial Qualification

results in  
⇒

**Benefits**

Lower Conduction Losses
Enables 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	
IRFH7110TRPBF	PQFN 5mm x 6mm	Tape and Reel	4000	
IRFH7110TR2PBF	PQFN 5mm x 6mm	Tape and Reel	400	EOL notice # 259

**Absolute Maximum Ratings**

	Parameter	Max.	Units
$V_{DS}$	Drain-to-Source Voltage	100	V
$V_{GS}$	Gate-to-Source Voltage	± 20	
$I_D$ @ $T_A = 25^\circ C$	Continuous Drain Current, $V_{GS}$ @ 10V	11	A
$I_D$ @ $T_A = 70^\circ C$	Continuous Drain Current, $V_{GS}$ @ 10V	8.6	
$I_D$ @ $T_{c(Bottom)} = 25^\circ C$	Continuous Drain Current, $V_{GS}$ @ 10V	58 Ⓣ	
$I_D$ @ $T_{c(Bottom)} = 100^\circ C$	Continuous Drain Current, $V_{GS}$ @ 10V	37 Ⓣ	
$I_D$ @ $T_C = 25^\circ C$	Continuous Drain Current, $V_{GS}$ @ 10V (Package Limited)	50 Ⓣ	
$I_{DM}$	Pulsed Drain Current ①	240	
$P_D$ @ $T_A = 25^\circ C$	Power Dissipation ②	3.6	W
$P_D$ @ $T_{c(Bottom)} = 25^\circ C$	Power Dissipation ②	104	
	Linear Derating Factor ③	0.029	W/°C
$T_J$	Operating Junction and	-55 to + 150	°C
$T_{STG}$	Storage Temperature Range		

Notes ① through ③ are on page 9

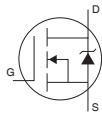
**Static @ T<sub>J</sub> = 25°C (unless otherwise specified)**

	Parameter	Min.	Typ.	Max.	Units	Conditions
B <sub>V</sub> DSS	Drain-to-Source Breakdown Voltage	100	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔB <sub>V</sub> DSS/ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	0.09	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1.0mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	10.6	13.5	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 35A ③
V <sub>GS(th)</sub>	Gate Threshold Voltage	2.0	3.0	4.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 100μA
ΔV <sub>GS(th)</sub>	Gate Threshold Voltage Coefficient	—	-9.0	—	mV/°C	
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	20	μA	V <sub>DS</sub> = 100V, V <sub>GS</sub> = 0V
		—	—	250		V <sub>DS</sub> = 100V, 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	74	—	—	S	V <sub>DS</sub> = 25V, I <sub>D</sub> = 35A
Q <sub>g</sub>	Total Gate Charge	—	58	87	nC	V <sub>DS</sub> = 50V V <sub>GS</sub> = 10V I <sub>D</sub> = 35A
Q <sub>gs1</sub>	Pre-V <sub>th</sub> Gate-to-Source Charge	—	11	—		
Q <sub>gs2</sub>	Post-V <sub>th</sub> Gate-to-Source Charge	—	3.6	—		
Q <sub>gd</sub>	Gate-to-Drain Charge	—	16	—		
Q <sub>godr</sub>	Gate Charge Overdrive	—	27.4	—		
Q <sub>sw</sub>	Switch Charge (Q <sub>gs2</sub> + Q <sub>gd</sub> )	—	19.6	—		
Q <sub>oss</sub>	Output Charge	—	17	—	nC	V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V
R <sub>G</sub>	Gate Resistance	—	0.6	—	Ω	
t <sub>d(on)</sub>	Turn-On Delay Time	—	11	—	ns	V <sub>DD</sub> = 50V, V <sub>GS</sub> = 10V I <sub>D</sub> = 35A R <sub>G</sub> = 1.8Ω
t <sub>r</sub>	Rise Time	—	23	—		
t <sub>d(off)</sub>	Turn-Off Delay Time	—	22	—		
t <sub>f</sub>	Fall Time	—	18	—		
C <sub>iss</sub>	Input Capacitance	—	3240	—	pF	V <sub>GS</sub> = 0V V <sub>DS</sub> = 25V f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	300	—		
C <sub>rss</sub>	Reverse Transfer Capacitance	—	140	—		

**Avalanche Characteristics**

	Parameter	Typ.	Max.	Units
E <sub>AS</sub>	Single Pulse Avalanche Energy ②	—	110	mJ
I <sub>AR</sub>	Avalanche Current ①	—	35	A

**Diode Characteristics**

	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	50 ②	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	240		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.3	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 35A, V <sub>GS</sub> = 0V ③
t <sub>rr</sub>	Reverse Recovery Time	—	27	41	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 35A, V <sub>DD</sub> = 50V
Q <sub>rr</sub>	Reverse Recovery Charge	—	140	210	nC	di/dt = 500A/μs ③
t <sub>on</sub>	Forward Turn-On Time	Time is dominated by parasitic Inductance				

**Thermal Resistance**

	Parameter	Typ.	Max.	Units
R <sub>θJC</sub> (Bottom)	Junction-to-Case ④	—	1.2	°C/W
R <sub>θJC</sub> (Top)	Junction-to-Case ④	—	32	
R <sub>θJA</sub>	Junction-to-Ambient ④⑤	—	35	
R <sub>θJA</sub> (<10s)	Junction-to-Ambient ⑤	—	22	

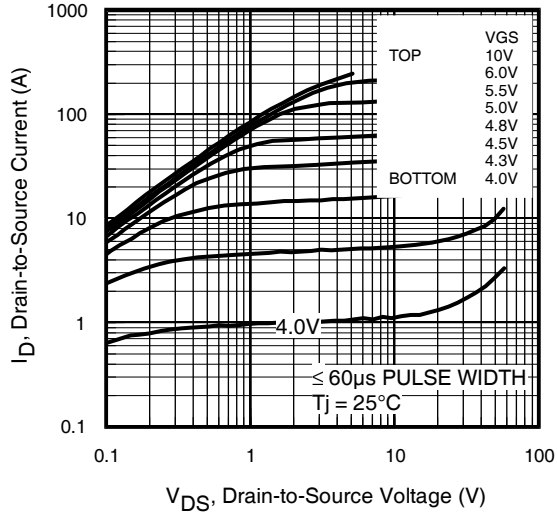


Fig 1. Typical Output Characteristics

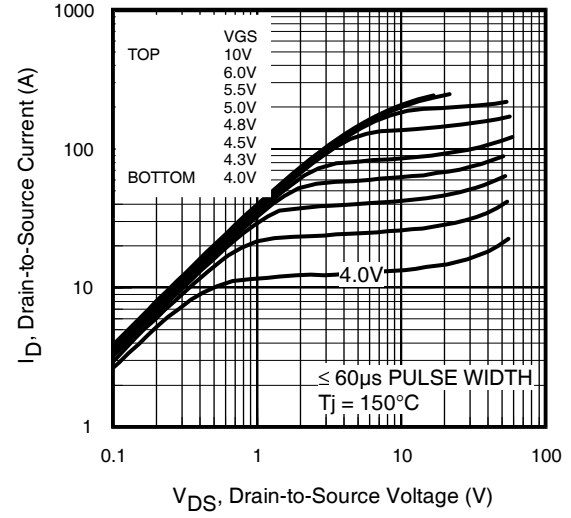


Fig 2. Typical Output Characteristics

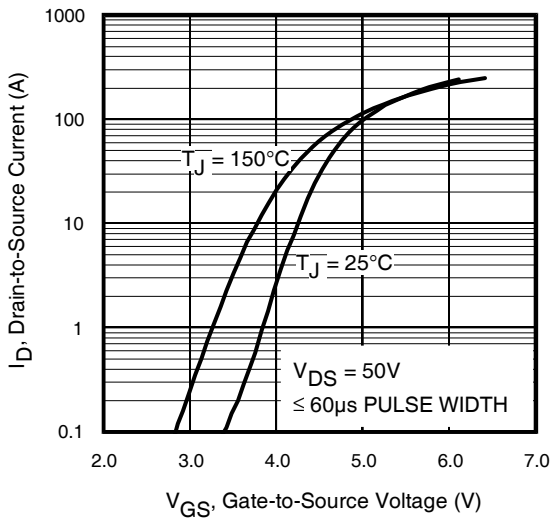


Fig 3. Typical Transfer Characteristics

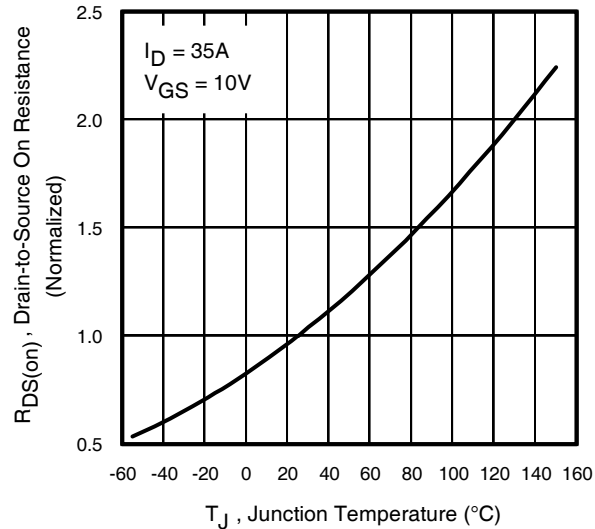


Fig 4. Normalized On-Resistance vs. Temperature

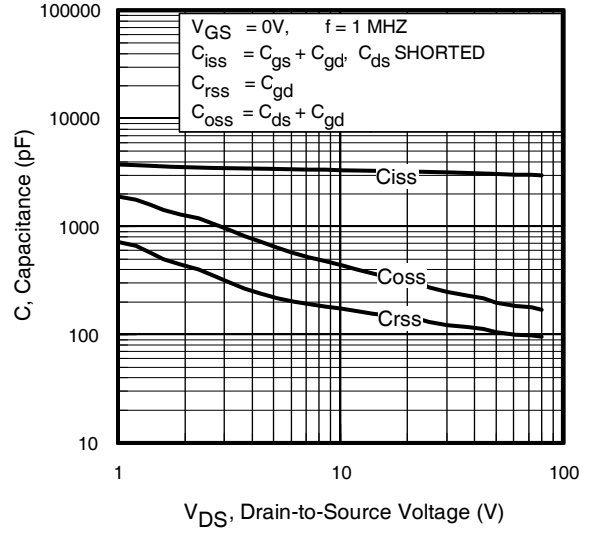


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

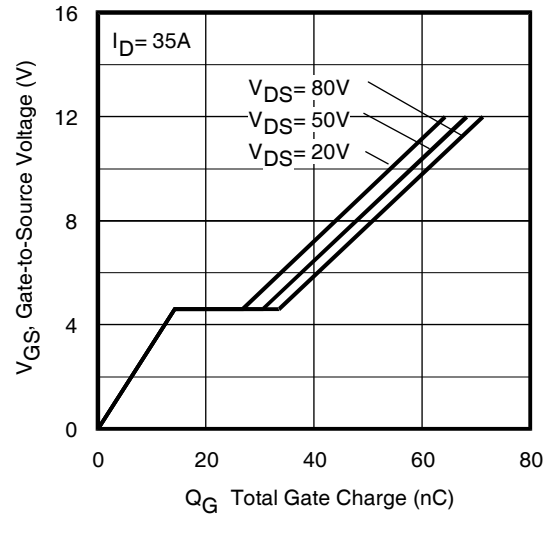


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

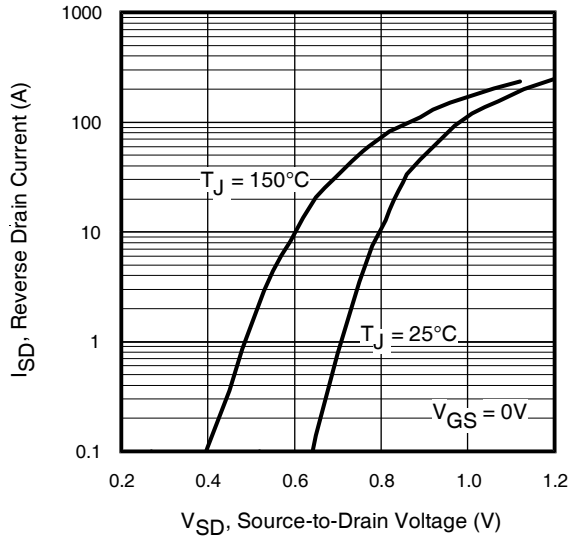


Fig 7. Typical Source-Drain Diode Forward Voltage

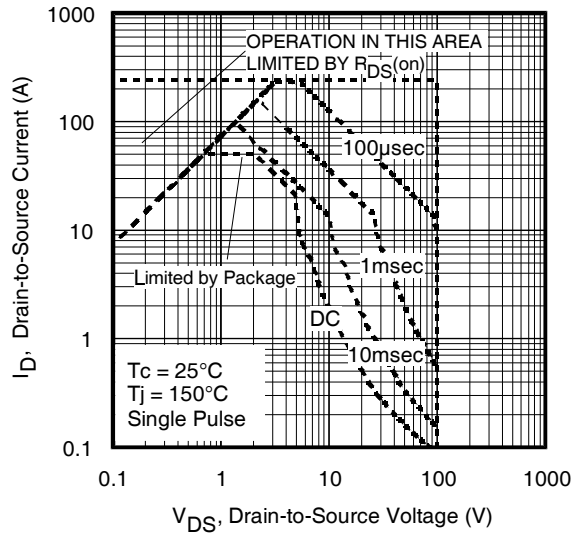


Fig 8. Maximum Safe Operating Area

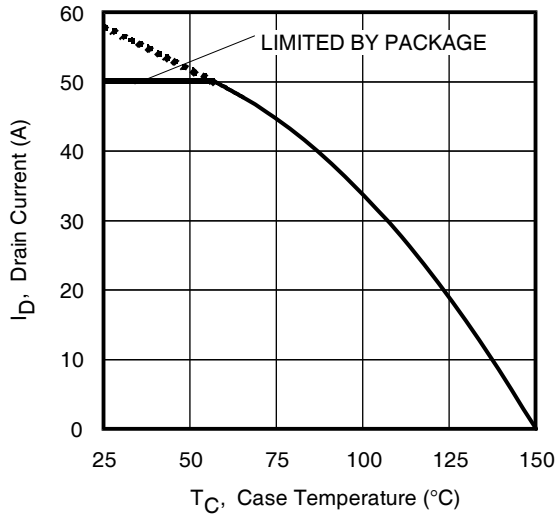


Fig 9. Maximum Drain Current vs. Case (Bottom) Temperature

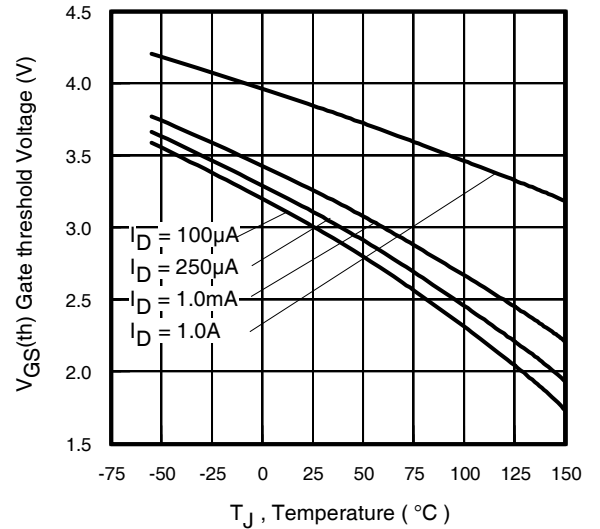


Fig 10. Threshold Voltage vs. Temperature

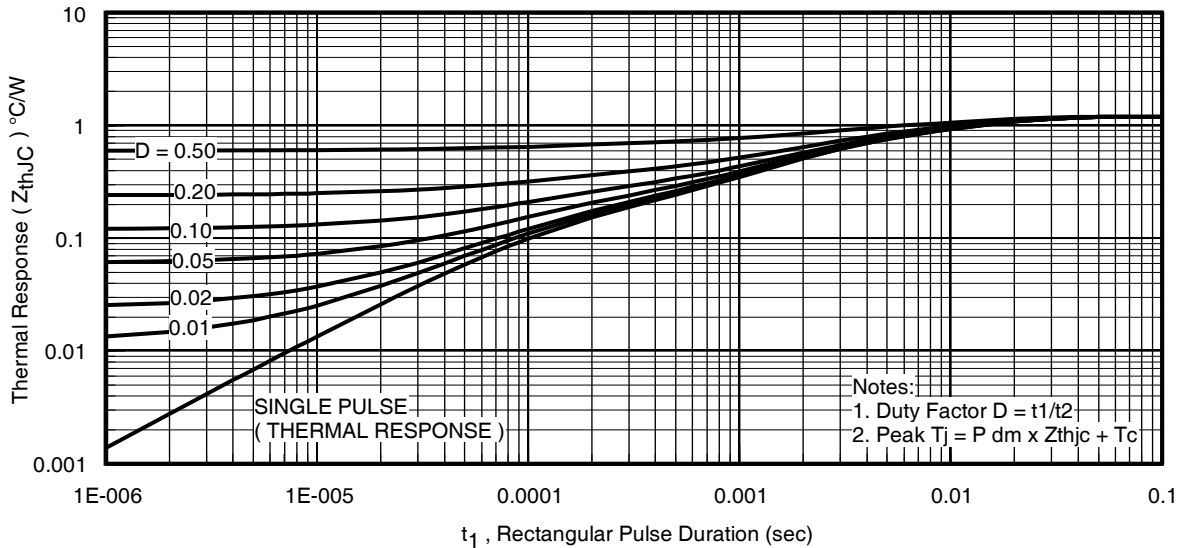


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case (Bottom)

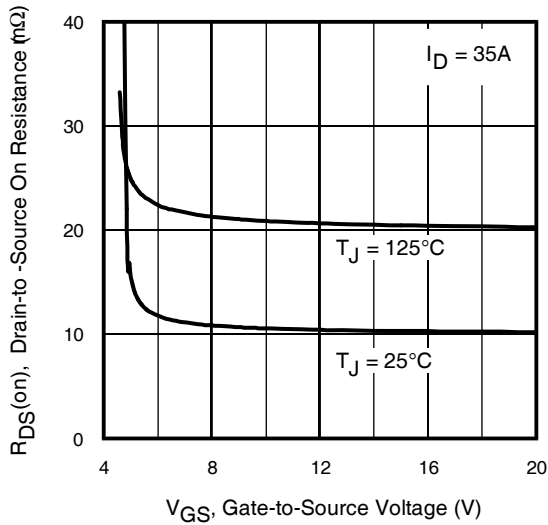


Fig 12. On-Resistance vs. Gate Voltage

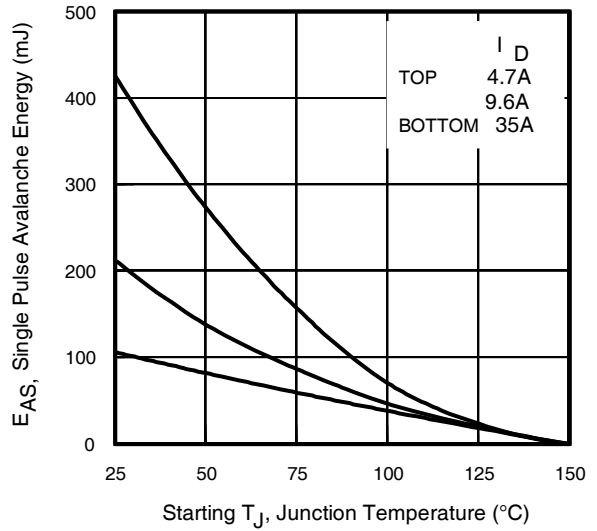


Fig 13. Maximum Avalanche Energy vs. Drain Current

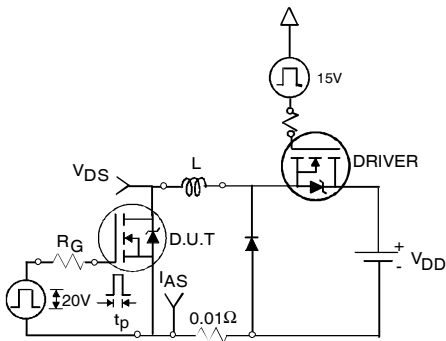


Fig 14a. Unclamped Inductive Test Circuit



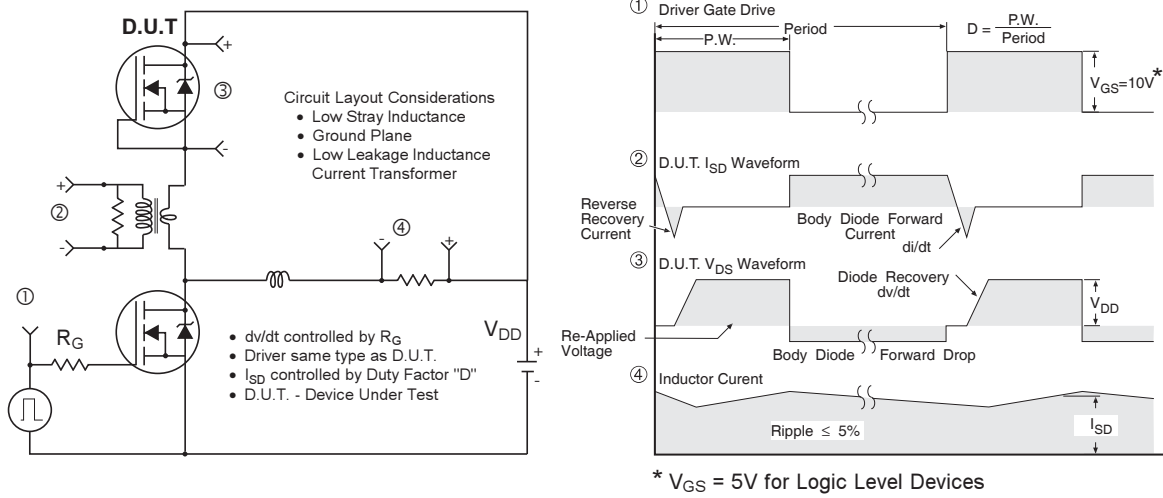
Fig 14b. Unclamped Inductive Waveforms



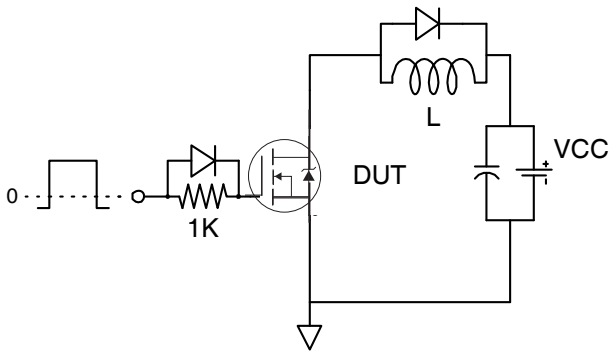
Fig 15a. Switching Time Test Circuit



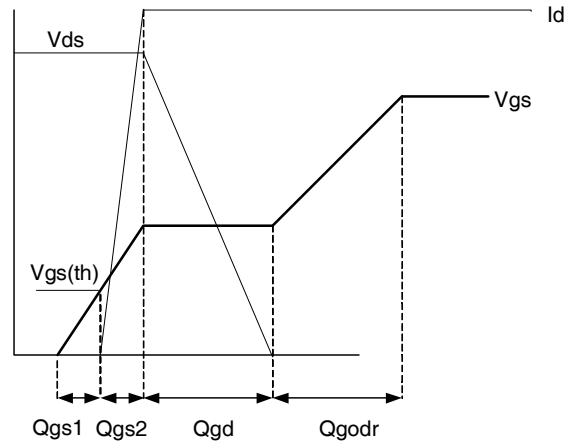
Fig 15b. Switching Time Waveforms



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

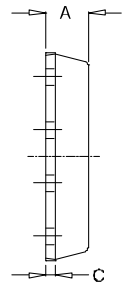


**Fig 17. Gate Charge Test Circuit**

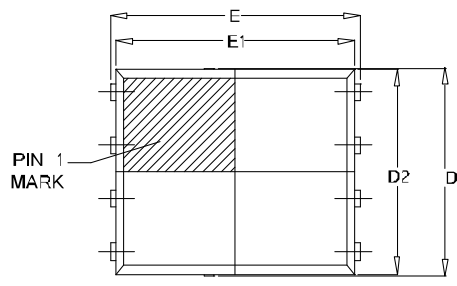


**Fig 18. Gate Charge Waveform**

# PQFN 5x6 Outline "E" Package Details

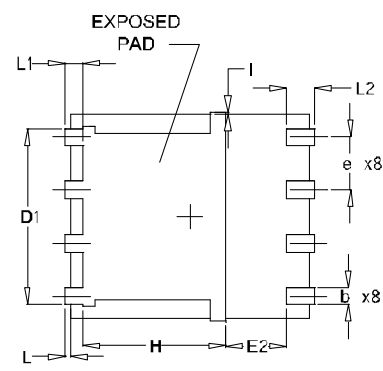


SIDEVIEW



TOP VIEW

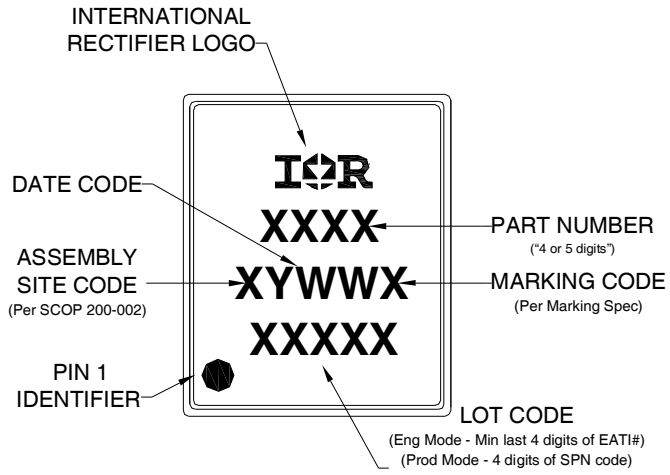
SYMBOL	OUTLINE PQFN 5X6E		
	MIN.	NOM.	MAX.
A	0.90	1.03	1.17
b	0.33	0.41	0.48
C	0.20	0.25	0.35
D	4.80	4.98	5.15
D1	3.91	4.11	4.31
D2	4.80	4.90	5.00
E	5.90	6.02	6.15
E1	5.65	5.75	5.85
E2	1.10	—	—
e	1.27 BSC		
L	0.05	0.15	0.25
L1	0.38	0.44	0.50
L2	0.51	0.68	0.86
H	3.32	3.45	3.58
I	—	—	0.18



BOTTOM VIEW

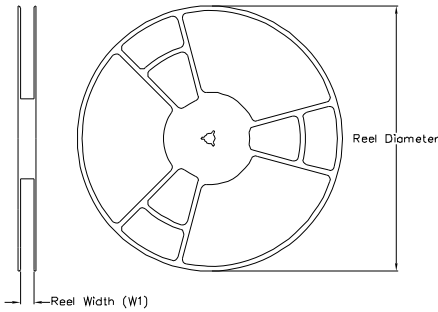
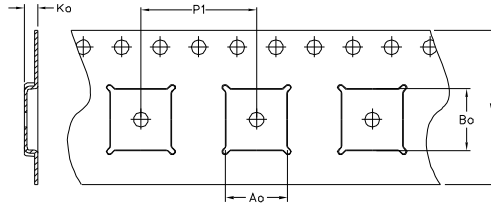
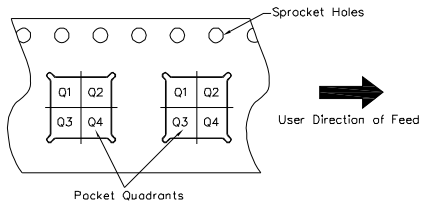
For footprint and stencil design recommendations, please refer to application note AN-1154 at <http://www.irf.com/technical-info/appnotes/an-1154.pdf>

# 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

**REEL DIMENSIONS**

**TAPE DIMENSIONS**

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**


CODE	DIMENSION (MM)		DIMENSION (INCH)	
	MIN	MAX	MIN	MAX
Ao	6.20	6.40	.244	.252
Bo	5.20	5.40	.205	.213
Ko	1.10	1.30	.043	.051
P <sub>1</sub>	7.90	8.10	.311	.319
W	11.80	12.20	.465	.480
W <sub>1</sub>	12.30	12.50	.484	.492
Qty	4000			
Reel Diameter	13 Inches			

CODE	DESCRIPTION
Ao	Dimension design to accommodate the component width
Bo	Dimension design to accommodate the component length
Ko	Dimension design to accommodate the component thickness
W	Overall width of the carrier tape
P <sub>1</sub>	Pitch between successive cavity centers

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



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

Qualification level	Industrial <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  $T_J = 25^\circ\text{C}$ ,  $L = 0.174\text{mH}$ ,  $R_G = 50\Omega$ ,  $I_{AS} = 35\text{A}$ .
- 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 Package is limited to 50A by die-source to lead-frame bonding technology

**Revision History**

Date	Comment
5/13/2014	<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 Package outline on page 7.</li> <li>• Updated Tape and Reel on page 8.</li> <li>• Updated data sheet based on corporate template.</li> </ul>