

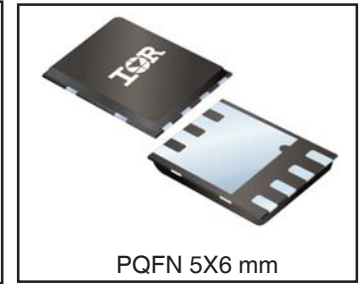
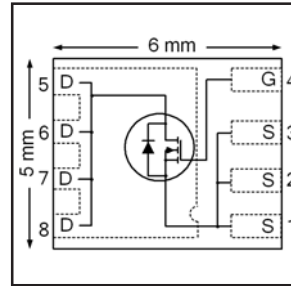


**THE DATASHEET OF  
IRFH5025TR2PBF**



HEXFET® Power MOSFET

$V_{DS}$	<b>250</b>	<b>V</b>
$R_{DS(on) \max}$ (@ $V_{GS} = 10V$ )	<b>100</b>	<b>m<math>\Omega</math></b>
$Q_g$ (typical)	<b>37</b>	<b>nC</b>
$R_G$ (typical)	<b>1.6</b>	<b><math>\Omega</math></b>
$I_D$ (@ $T_{c(Bottom)} = 25^\circ C$ )	<b>25</b>	<b>A</b>



**Applications**

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

**Features and Benefits**

**Features**

Low $R_{DS(on)}$
Low Thermal Resistance to PCB ( $\leq 0.8^\circ C/W$ )
100% Rg tested
Low Profile ( $\leq 0.9$ 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
Enable better thermal dissipation
Increased Reliability
Increased Power Density
Multi-Vendor Compatibility
Easier Manufacturing
Environmentally Friendlier
Increased Reliability

Orderable part number	Package Type	Standard Pack		Note
		Form	Quantity	
IRFH5025TRPBF	PQFN 5mm x 6mm	Tape and Reel	4000	
IRFH5025TR2PBF	PQFN 5mm x 6mm	Tape and Reel	400	EOL notice # 259

**Absolute Maximum Ratings**

	Parameter	Max.	Units
$V_{DS}$	Drain-to-Source Voltage	250	V
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	
$I_D$ @ $T_A = 25^\circ C$	Continuous Drain Current, $V_{GS}$ @ 10V	3.8	A
$I_D$ @ $T_A = 70^\circ C$	Continuous Drain Current, $V_{GS}$ @ 10V	3.1	
$I_D$ @ $T_{c(Bottom)} = 25^\circ C$	Continuous Drain Current, $V_{GS}$ @ 10V	25	
$I_D$ @ $T_{c(Bottom)} = 100^\circ C$	Continuous Drain Current, $V_{GS}$ @ 10V	16	
$I_D$ @ $T_{c(Top)} = 25^\circ C$	Continuous Drain Current, $V_{GS}$ @ 10V	5.7	
$I_D$ @ $T_{c(Top)} = 100^\circ C$	Continuous Drain Current, $V_{GS}$ @ 10V	3.7	
$I_{DM}$	Pulsed Drain Current ①	46	
$P_D$ @ $T_A = 25^\circ C$	Power Dissipation ⑤	3.6	W
$P_D$ @ $T_{c(Top)} = 25^\circ C$	Power Dissipation ④	8.3	
	Linear Derating Factor ④	0.07	W/°C
$T_J$ $T_{STG}$	Operating Junction and Storage Temperature Range	-55 to + 150	°C

Notes ① through ⑤ are on page 8

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

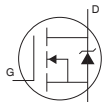
	Parameter	Min.	Typ.	Max.	Units	Conditions
$BV_{DSS}$	Drain-to-Source Breakdown Voltage	250	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.31	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = 1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	84	100	m $\Omega$	$V_{GS} = 10V, I_D = 5.7A$ ③
$V_{GS(th)}$	Gate Threshold Voltage	3.0	—	5.0	V	$V_{DS} = V_{GS}, I_D = 150\mu A$
$\Delta V_{GS(th)}$	Gate Threshold Voltage Coefficient	—	-13	—	mV/ $^\circ\text{C}$	
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	20	$\mu A$	$V_{DS} = 250V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 250V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -20V$
$g_{fs}$	Forward Transconductance	13	—	—	S	$V_{DS} = 50V, I_D = 5.7A$
$Q_g$	Total Gate Charge	—	37	56	nC	$V_{DS} = 125V$ $V_{GS} = 10V$ $I_D = 5.7A$ See Fig.17 & 18
$Q_{gs1}$	Pre-Vth Gate-to-Source Charge	—	8.3	—		
$Q_{gs2}$	Post-Vth Gate-to-Source Charge	—	1.9	—		
$Q_{gd}$	Gate-to-Drain Charge	—	13	—		
$Q_{godr}$	Gate Charge Overdrive	—	14	—		
$Q_{sw}$	Switch Charge ( $Q_{gs2} + Q_{gd}$ )	—	15	—		
$Q_{oss}$	Output Charge	—	11	—	nC	$V_{DS} = 16V, V_{GS} = 0V$
$R_G$	Gate Resistance	—	1.6	—	$\Omega$	
$t_{d(on)}$	Turn-On Delay Time	—	9.0	—	ns	$V_{DD} = 125V, V_{GS} = 10V$ $I_D = 5.7A$ $R_G = 1.8\Omega$ See Fig.15
$t_r$	Rise Time	—	6.3	—		
$t_{d(off)}$	Turn-Off Delay Time	—	17	—		
$t_f$	Fall Time	—	6.1	—		
$C_{iss}$	Input Capacitance	—	2150	—	pF	$V_{GS} = 0V$ $V_{DS} = 50V$ $f = 1.0MHz$
$C_{oss}$	Output Capacitance	—	150	—		
$C_{rss}$	Reverse Transfer Capacitance	—	40	—		

**Avalanche Characteristics**

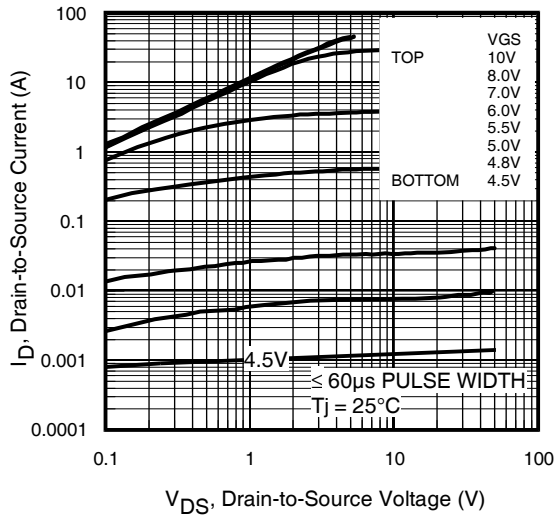
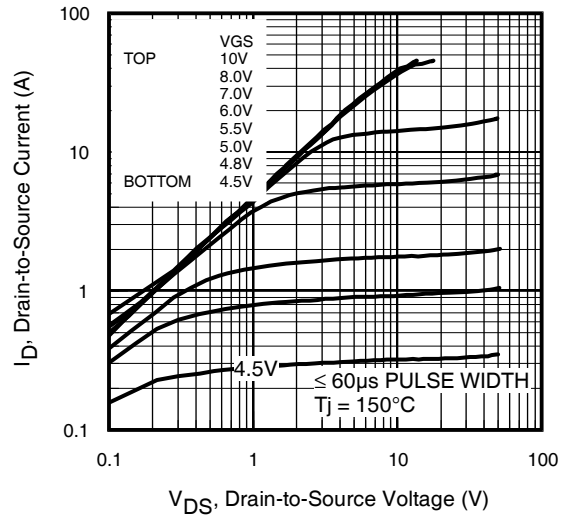
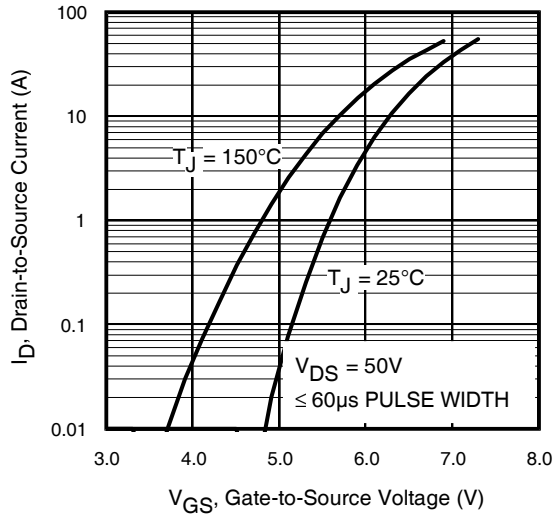
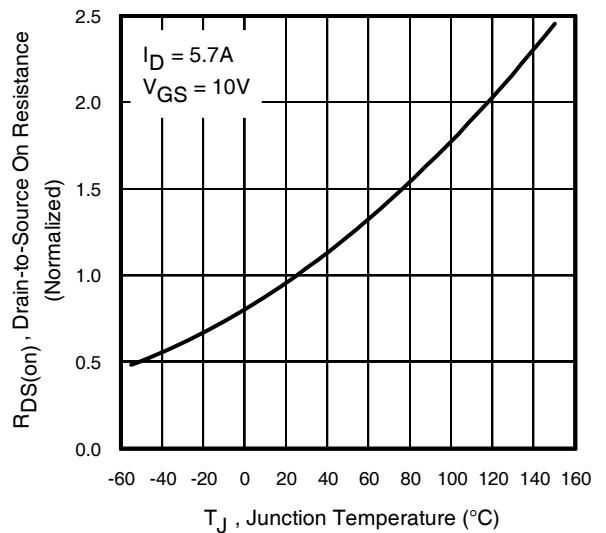
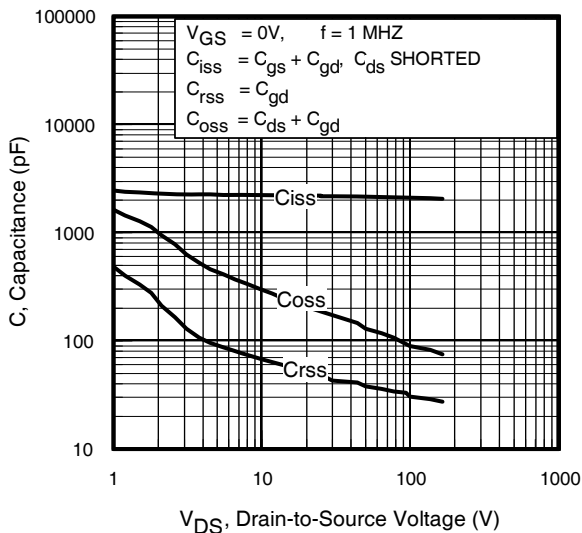
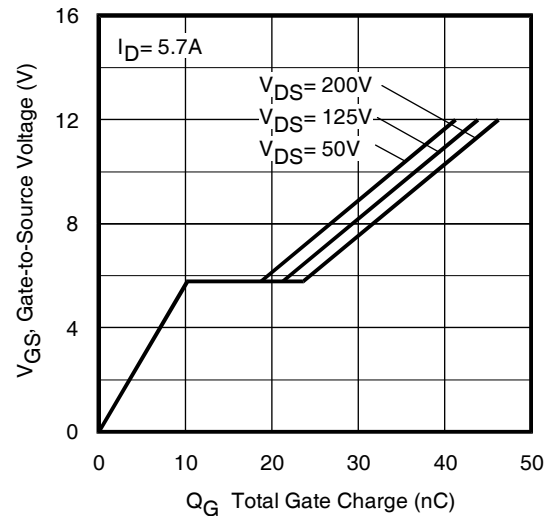
	Parameter	Typ.	Max.	Units
$E_{AS}$	Single Pulse Avalanche Energy ②	—	320	mJ
$I_{AR}$	Avalanche Current ①	—	5.7	A

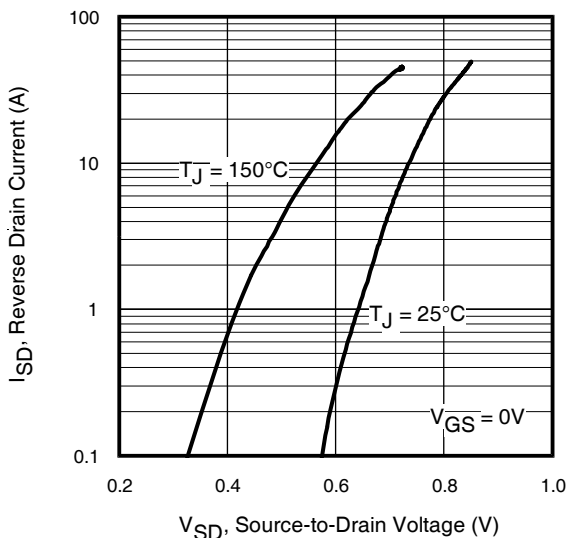
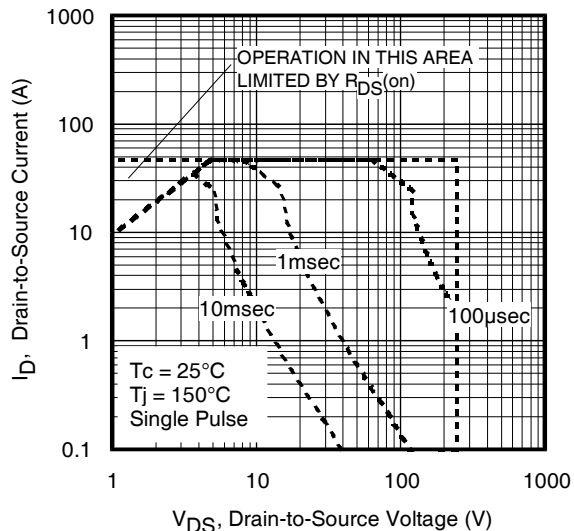
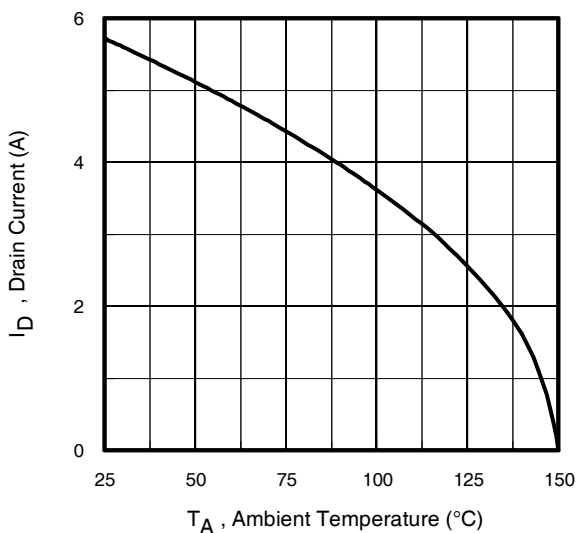
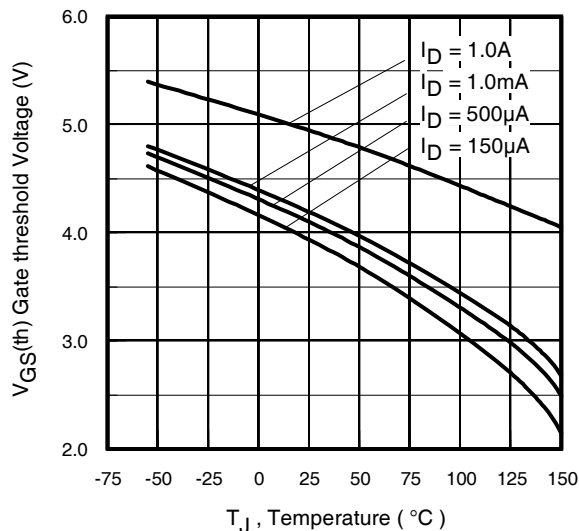
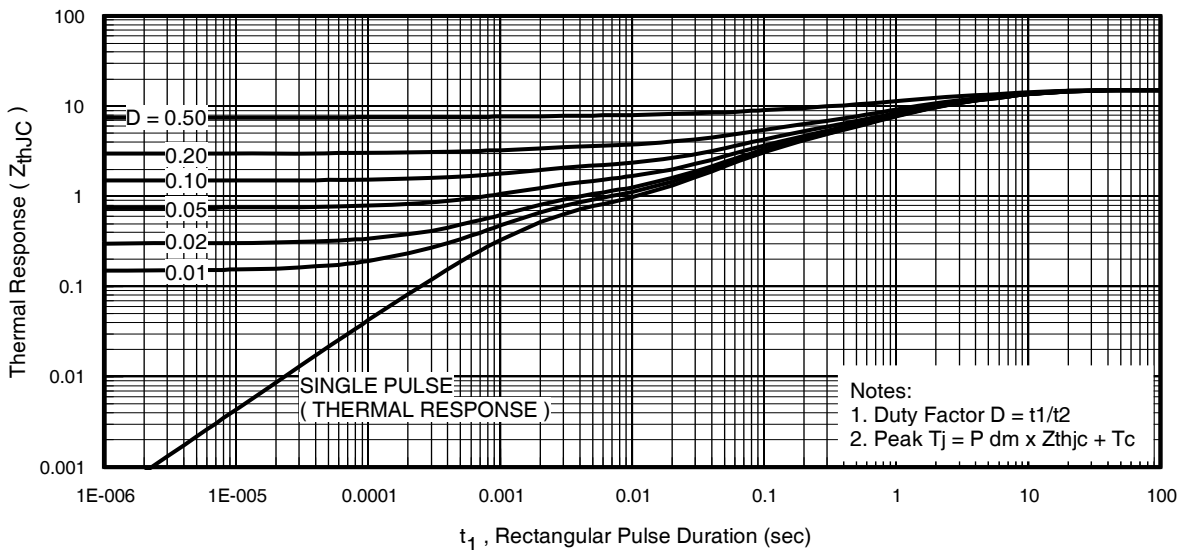
**Diode Characteristics**

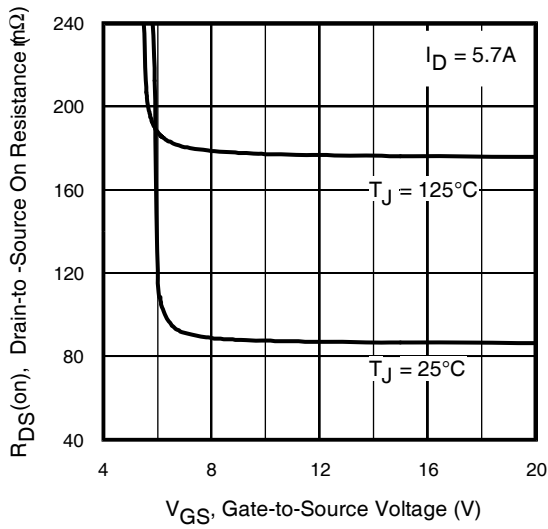
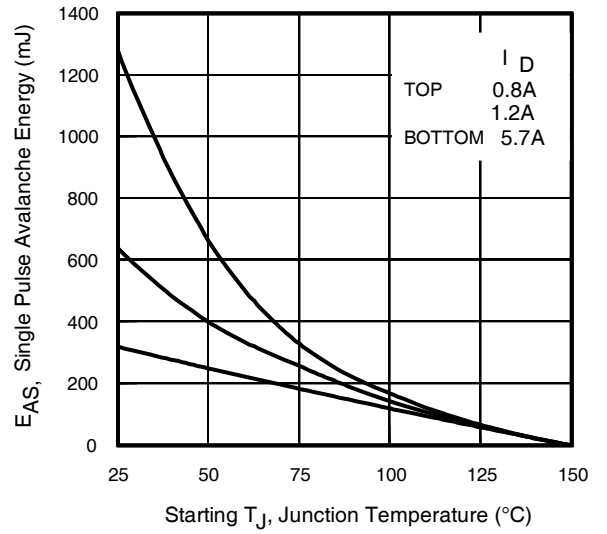
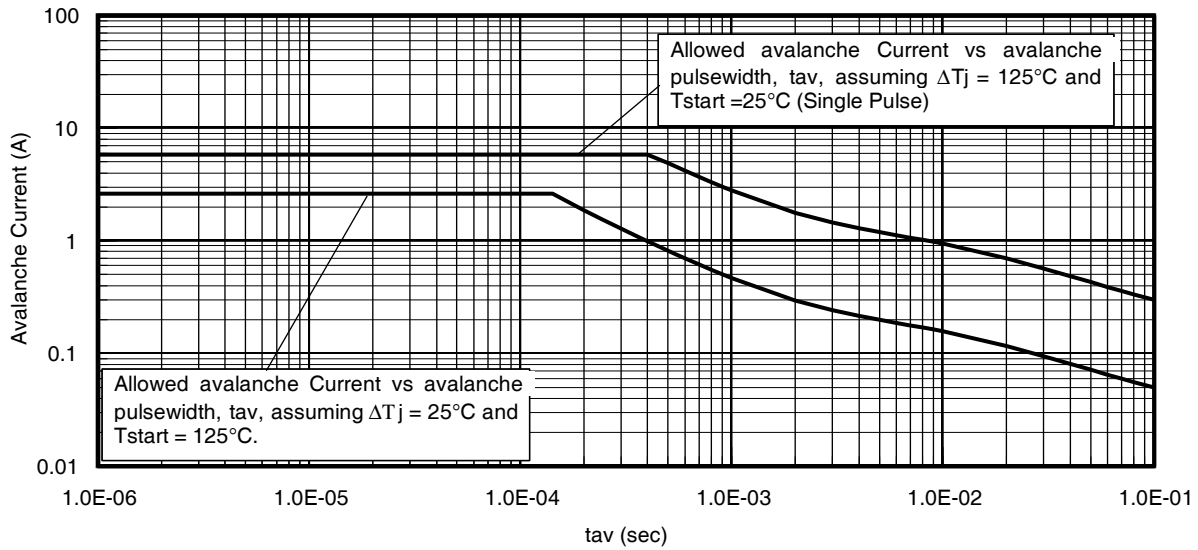
	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	5.7	A	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	46		
$V_{SD}$	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 5.7A, V_{GS} = 0V$ ③
$t_{rr}$	Reverse Recovery Time	—	55	83	ns	$T_J = 25^\circ\text{C}, I_F = 5.7A, V_{DD} = 125V$
$Q_{rr}$	Reverse Recovery Charge	—	510	770	nC	$di/dt = 500A/\mu s$ ③
$t_{on}$	Forward Turn-On Time	Time is dominated by parasitic Inductance				

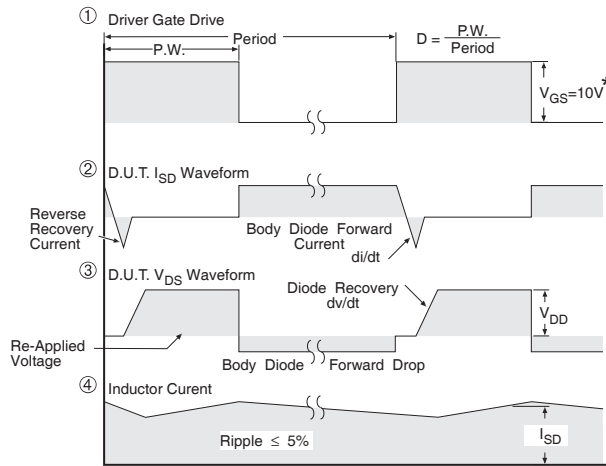
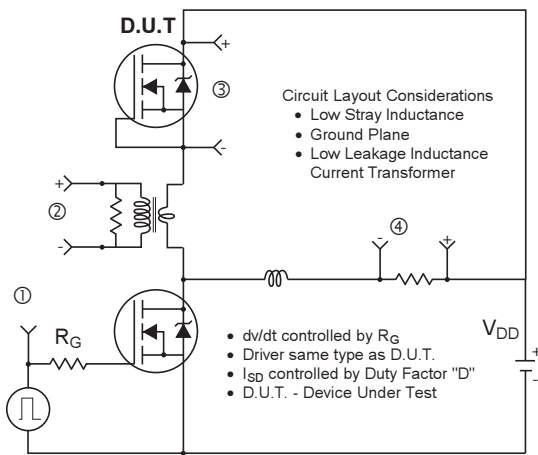

**Thermal Resistance**

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$ (Bottom)	Junction-to-Case	0.5	0.8	$^\circ\text{C/W}$
$R_{\theta JC}$ (Top)	Junction-to-Case ④	—	15	
$R_{\theta JA}$	Junction-to-Ambient ⑤	—	35	
$R_{\theta JA}$ (<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**

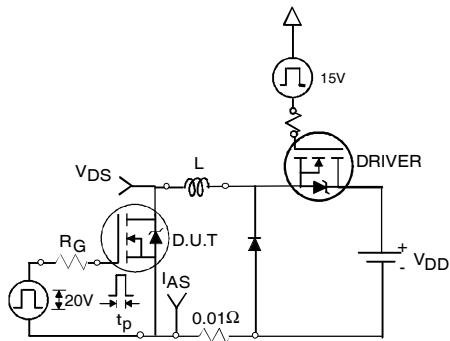

**Fig 7.** Typical Source-Drain Diode Forward Voltage

**Fig 8.** Maximum Safe Operating Area

**Fig 9.** Maximum Drain Current Vs. Case (Top) Temperature

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

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


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

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

**Fig 14.** Typical Avalanche Current vs. Pulsewidth

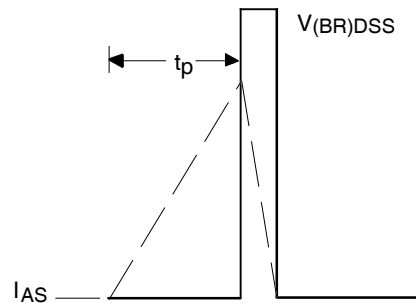


\*  $V_{GS} = 5V$  for Logic Level Devices

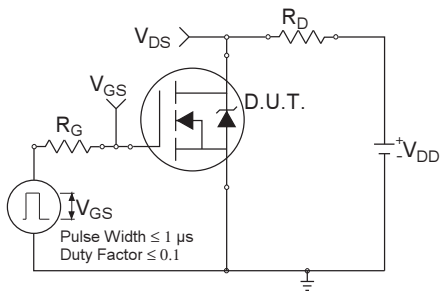
**Fig 15. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs**



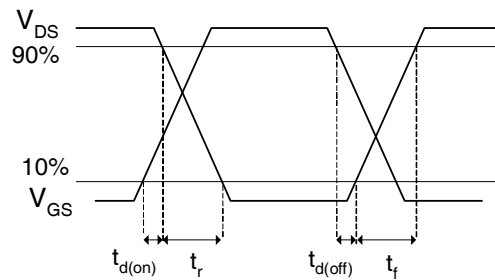
**Fig 16a. Unclamped Inductive Test Circuit**



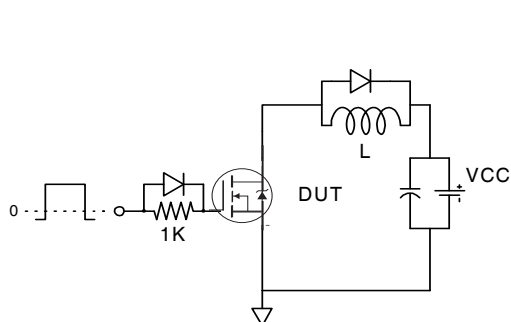
**Fig 16b. Unclamped Inductive Waveforms**



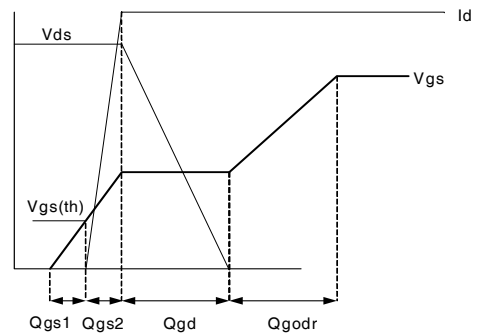
**Fig 17a. Switching Time Test Circuit**



**Fig 17b. Switching Time Waveforms**

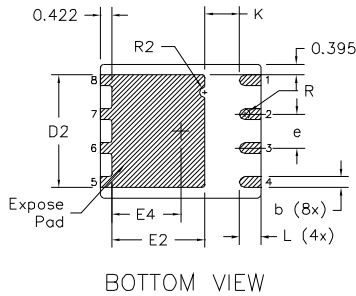
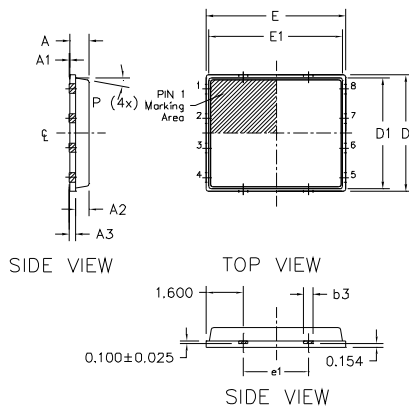


**Fig 18a. Gate Charge Test Circuit**



**Fig 18b. Gate Charge Waveform**

## PQFN 5x6 Outline "B" Package Details

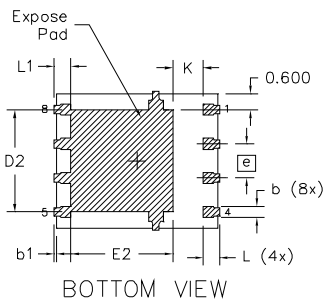
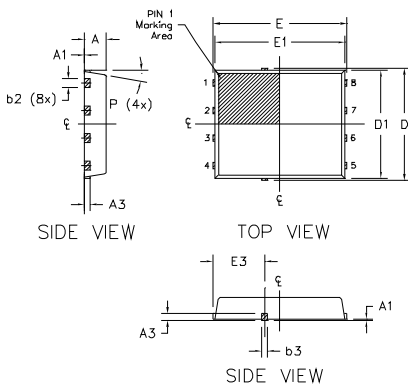


DIM SYMBOL	MILLIMETERS		INCH	
	MIN	MAX	MIN	MAX
A	0.800	0.900	0.0315	0.0543
A1	0.000	0.050	0.0000	0.0020
A3	0.200 REF		0.0079 REF	
b	0.350	0.470	0.0138	0.0185
b1	0.025	0.125	0.0010	0.0049
b2	0.210	0.410	0.0083	0.0161
b3	0.150	0.450	0.0059	0.0177
D	5.000 BSC		0.1969 BSC	
D1	4.750 BSC		0.1870 BSC	
D2	4.100	4.300	0.1614	0.1693
E	6.000 BSC		0.2362 BSC	
E1	5.750 BSC		0.2264 BSC	
E2	3.380	3.780	0.1331	0.1488
e	1.270 REF		0.0500 REF	
e1	2.800 REF		0.1102 REF	
K	1.200	1.420	0.0472	0.0559
L	0.710	0.900	0.0280	0.0354
P	0°	12°	0°	12°
R	0.200 REF		0.0079 REF	
R2	0.150	0.200	0.0059	0.0079

**Note:**

- Dimensions and tolerancing confirm to ASME Y14.5M-1994
- Dimension L represents terminal full back from package edge up to 0.1mm is acceptable
- Coplanarity applies to the expose Heat Slug as well as the terminal
- Radius on terminal is Optional

## PQFN 5x6 Outline "G" Package Details



DIM SYMBOL	MILLIMETERS		INCH	
	MIN.	MAX.	MIN.	MAX.
A	0.950	1.050	0.0374	0.0413
A1	0.000	0.050	0.0000	0.0020
A3	0.254 REF		0.0100 REF	
b	0.310	0.510	0.0122	0.0201
b1	0.025	0.125	0.0010	0.0049
b2	0.210	0.410	0.0083	0.0161
b3	0.180	0.450	0.0071	0.0177
D	5.150 BSC		0.2028 BSC	
D1	5.000 BSC		0.1969 BSC	
D2	3.700	3.900	0.1457	0.1535
E	6.150 BSC		0.2421 BSC	
E1	6.000 BSC		0.2362 BSC	
E2	3.560	3.760	0.1402	0.1488
E3	2.270	2.470	0.0894	0.0972
e	1.27 REF		0.050 REF	
K	0.830	1.400	0.0327	0.0551
L	0.510	0.710	0.0201	0.0280
L1	0.510	0.710	0.0201	0.0280
P	10 deg	12 deg	0 deg	12 deg

**Note:**

- Dimensions and tolerancing confirm to ASME Y14.5M-1994
- Dimension L represents terminal full back from package edge up to 0.1mm is acceptable
- Coplanarity applies to the expose Heat Slug as well as the terminal
- Radius on terminal is Optional

For more information on board mounting, including footprint and stencil recommendation, please refer to application note AN-1136:

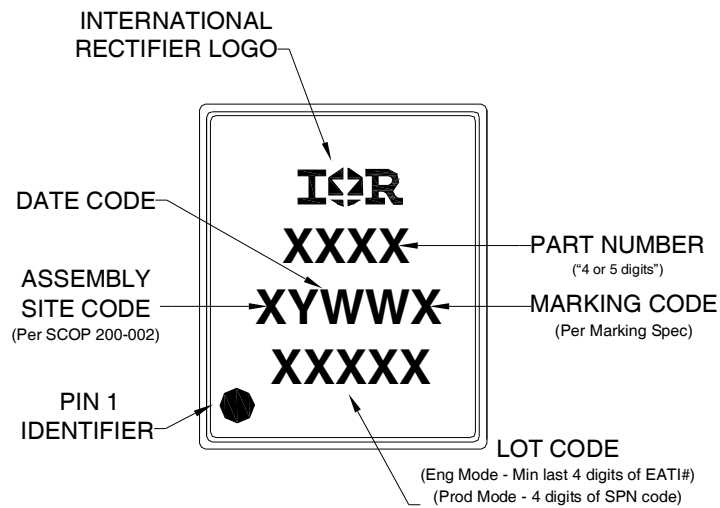
<http://www.irf.com/technical-info/appnotes/an-1136.pdf>

For more information on package inspection techniques, please refer to application note AN-1154:

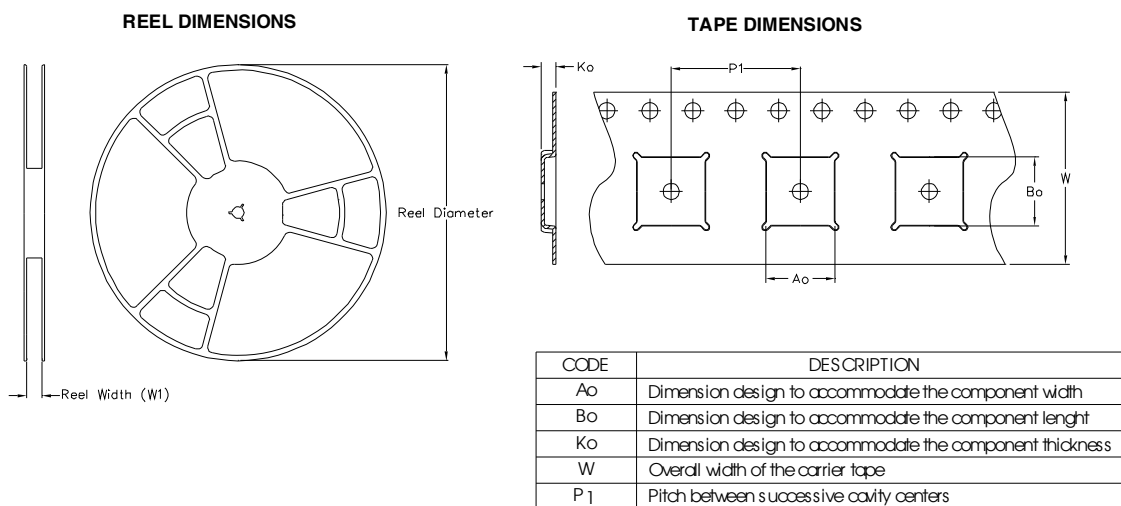
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**Note:** For the most current drawing please refer to IR website at: <http://www.irf.com/package/>

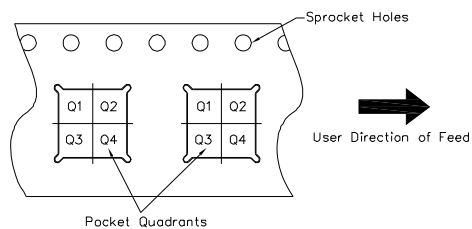
## PQFN 5x6 Part Marking



## PQFN 5x6 Tape and Reel



### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



Note: All dimension are nominal

Package Type	Reel Diameter (Inch)	QTY	Reel Width W1 (mm)	Ao (mm)	Bo (mm)	Ko (mm)	P1 (mm)	W (mm)	Pin 1 Quadrant
5 X 6 PQFN	13	4000	12.4	6.300	5.300	1.20	8.00	12	Q1

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  $T_J = 25^\circ\text{C}$ ,  $L = 19.6\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 5.7\text{A}$ .
- 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.

**Revision History**

Date	Comment
5/12/2014	<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 data sheet based on corporate template.</li> </ul>
4/28/2015	<ul style="list-style-type: none"> <li>• Updated package outline for "option B" and added package outline for "option G" on page 7</li> <li>• Updated tape and reel on page 8.</li> </ul>
5/19/2015	<ul style="list-style-type: none"> <li>• Updated package outline for "option G" on page 7.</li> <li>• Updated "IFX logo" on page 1 and page 9.</li> </ul>

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