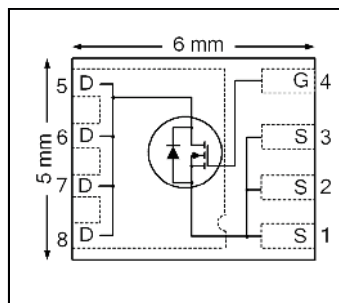


HEXFET® Power MOSFET

V_{DSS}	100	V
$R_{DS(on) \max}$ (@ $V_{GS} = 10V$)	6.0	mΩ
Q_g (typical)	33	nC
R_g (typical)	0.92	Ω
I_D (@ $T_C(Bottom) = 25^\circ C$)	105	A



Applications

- Primary Switch for High Frequency 48V/60V Telecom DC-DC Power Supplies
- Secondary Side Synchronous Rectifier
- Hot Swap and Active O-Ring

Features

Low $R_{DS(ON)}$ (< 6.0mΩ)
Low Thermal Resistance to PCB (<0.95°C/W)
100% R_g Tested
Low Profile (<1.05 mm)
Industry-Standard Pinout
Compatible with Existing Surface Mount Techniques
RoHS Compliant, Halogen-Free
MSL1

results in
⇒

Benefits

Lower Conduction Losses
Increased Power Density
Increased Reliability
Increased Power Density
Multi-Vendor Compatibility
Easier Manufacturing
Environmentally Friendlier
Increased Reliability

Base part number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRFH7188PbF	PQFN 5mm x 6 mm	Tape and Reel	4000	IRFH7188TRPbF

Absolute Maximum Ratings

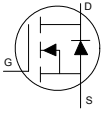
	Parameter	Max.	Units
V_{GS}	Gate-to-Source Voltage	± 20	V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	18	A
$I_D @ T_{C(Bottom)} = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	105	
$I_D @ T_{C(Bottom)} = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	66	
I_{DM}	Pulsed Drain Current ①	210	
$P_D @ T_A = 25^\circ C$	Power Dissipation	3.8	W
$P_D @ T_{C(Bottom)} = 25^\circ C$	Power Dissipation	132	
	Linear Derating Factor	0.03	W/°C
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C

Notes ① through ⑥ 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	100	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	61	—	mV/°C	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	5.0	6.0	m Ω	$V_{GS} = 10V, I_D = 50A$ ③
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	3.6	V	$V_{DS} = V_{GS}, I_D = 150\mu A$
$\Delta V_{GS(th)}$	Gate Threshold Voltage Coefficient	—	-5.6	—	mV/°C	
I_{DSS}	Drain-to-Source Leakage Current	—	—	1.0	μA	$V_{DS} = 80V, V_{GS} = 0V$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-100	nA	$V_{GS} = -20V$
g_{fs}	Forward Transconductance	109	—	—	S	$V_{DS} = 25V, I_D = 50A$
Q_g	Total Gate Charge	—	33	50	nC	$V_{DS} = 50V$ $V_{GS} = 10V$ $I_D = 50A$
Q_{gs1}	Pre-Vth Gate-to-Source Charge	—	6.5	—		
Q_{gs2}	Post-Vth Gate-to-Source Charge	—	2.1	—		
Q_{gd}	Gate-to-Drain Charge	—	11	—		
Q_{godr}	Gate Charge Overdrive	—	13.4	—		
Q_{sw}	Switch Charge ($Q_{gs2} + Q_{gd}$)	—	13.1	—		
Q_{oss}	Output Charge	—	101	—	nC	$V_{DS} = 50V, V_{GS} = 0V$
R_G	Gate Resistance	—	0.92	—	Ω	
$t_{d(on)}$	Turn-On Delay Time	—	6.7	—	ns	$V_{DD} = 50V, V_{GS} = 10V$ $I_D = 50A$ $R_G = 1.0\Omega$
t_r	Rise Time	—	14	—		
$t_{d(off)}$	Turn-Off Delay Time	—	12	—		
t_f	Fall Time	—	4.5	—		
C_{iss}	Input Capacitance	—	2116	—	pF	$V_{GS} = 0V$ $V_{DS} = 50V$ $f = 1.0\text{MHz}$
C_{oss}	Output Capacitance	—	1074	—		
C_{rss}	Reverse Transfer Capacitance	—	18	—		

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	105	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	210	A	
V_{SD}	Diode Forward Voltage	—	0.8	1.3	V	$T_J = 25^\circ\text{C}, I_S = 50A, V_{GS} = 0V$ ③
t_{rr}	Reverse Recovery Time	—	50	75	ns	$T_J = 25^\circ\text{C}, I_F = 50A, V_{DD} = 50V$
Q_{rr}	Reverse Recovery Charge	—	75	113	nC	$di/dt = 100A/\mu s$ ③

Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS} (Thermally limited)	Single Pulse Avalanche Energy ②	—	493	mJ
I_{AR}	Avalanche Current ①	—	18	A

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$ (Bottom)	Junction-to-Case ④	—	0.95	°C/W
$R_{\theta JC}$ (Top)	Junction-to-Case ④	—	21	
$R_{\theta JA}$	Junction-to-Ambient ⑤	—	33	
$R_{\theta JA} (<10s)$	Junction-to-Ambient ⑤	—	22	

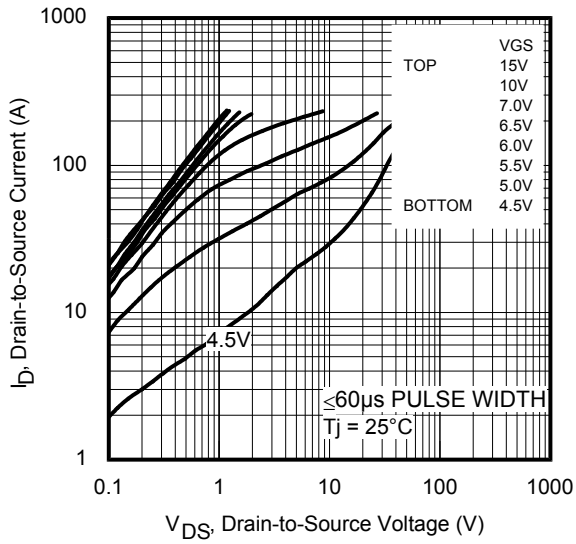


Fig 1. Typical Output Characteristics

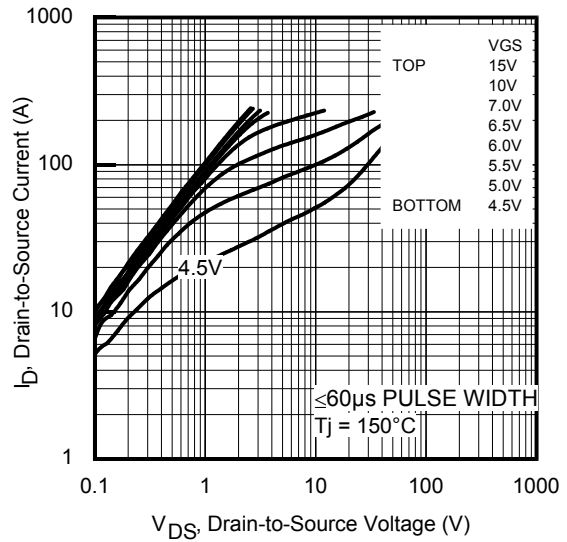


Fig 2. Typical Output Characteristics

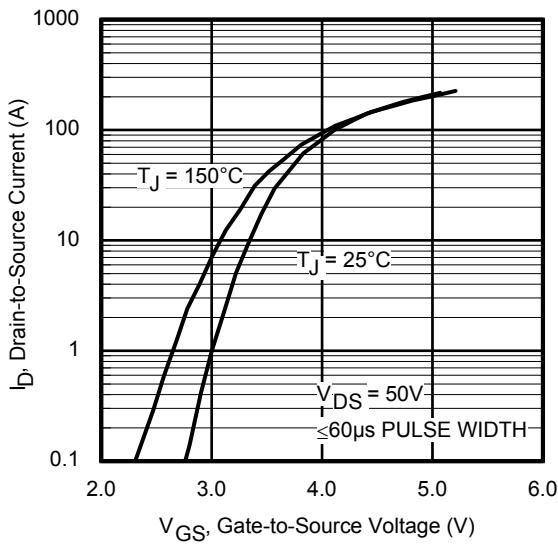


Fig 3. Typical Transfer Characteristics

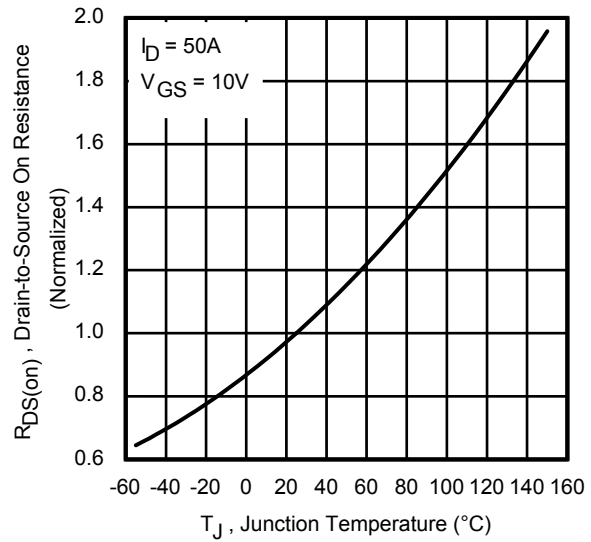


Fig 4. Normalized On-Resistance vs. Temperature

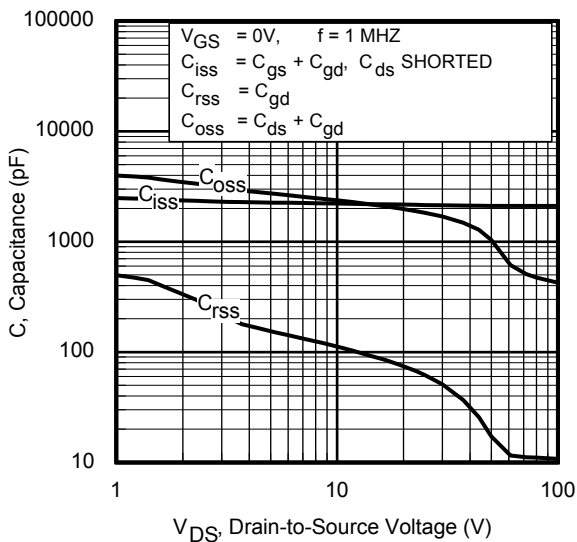


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

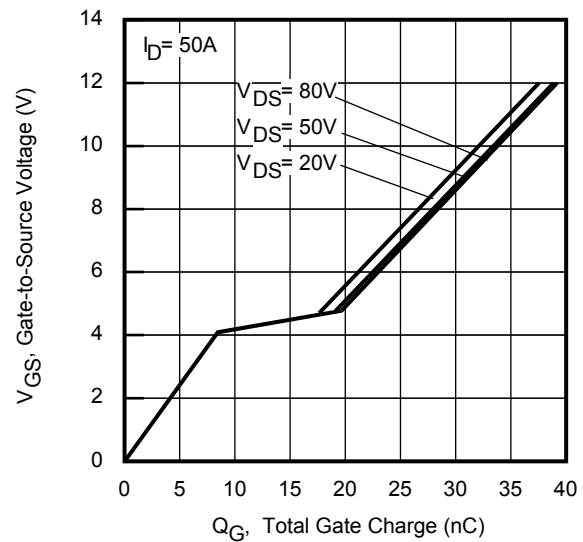


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

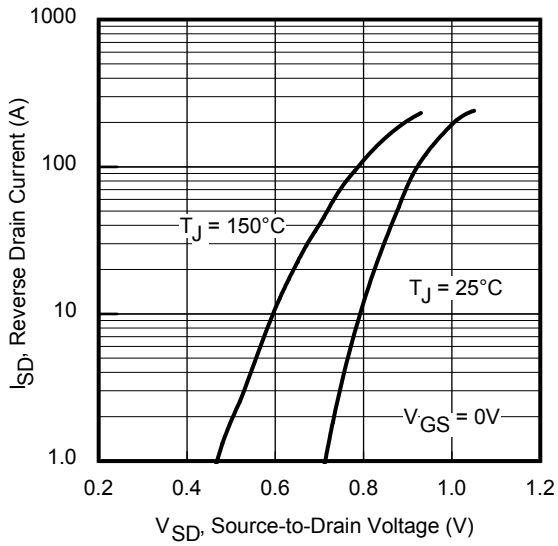


Fig 7. Typical Source-Drain Diode Forward Voltage

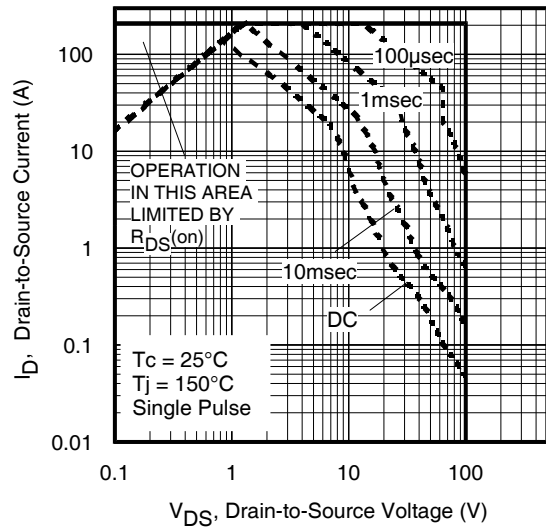


Fig 8. Maximum Safe Operating Area

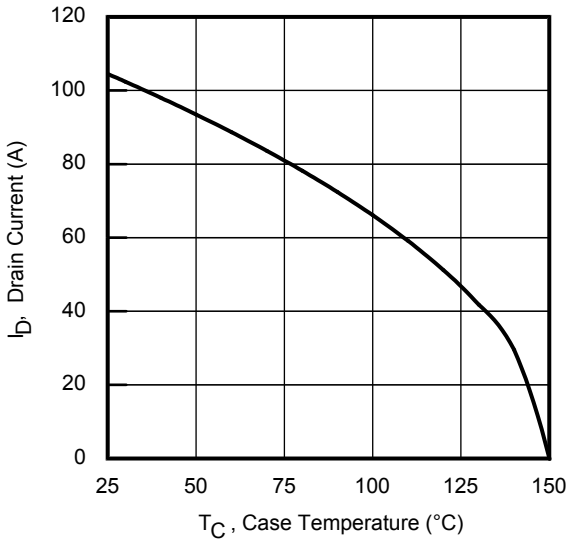


Fig 9. Maximum Drain Current vs. Case Temperature

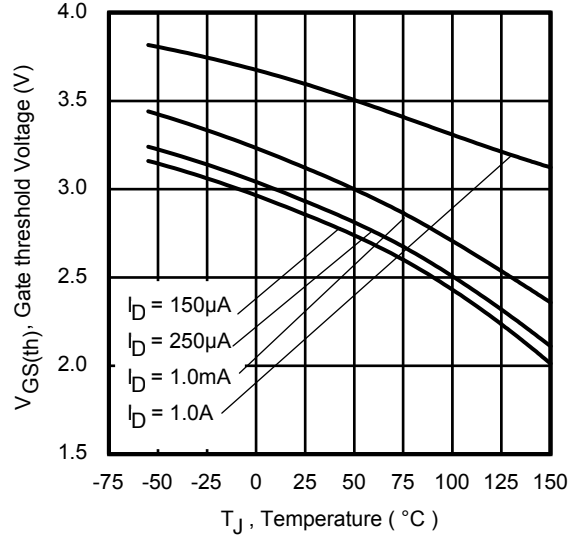


Fig 10. Threshold Voltage vs. Temperature

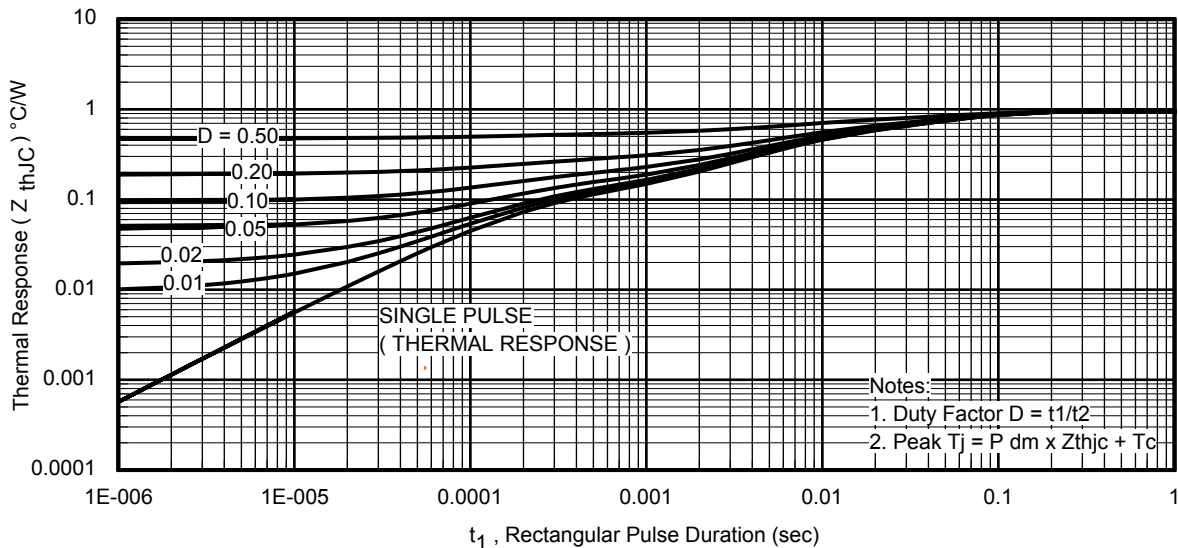


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

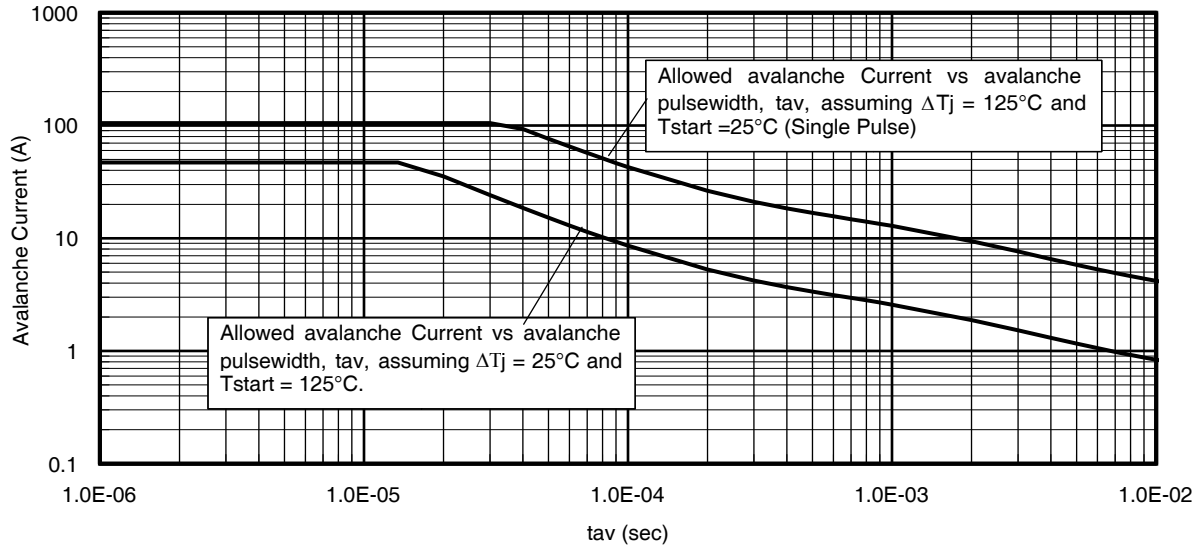


Fig 12. Typical Avalanche Current vs. Pulse Width

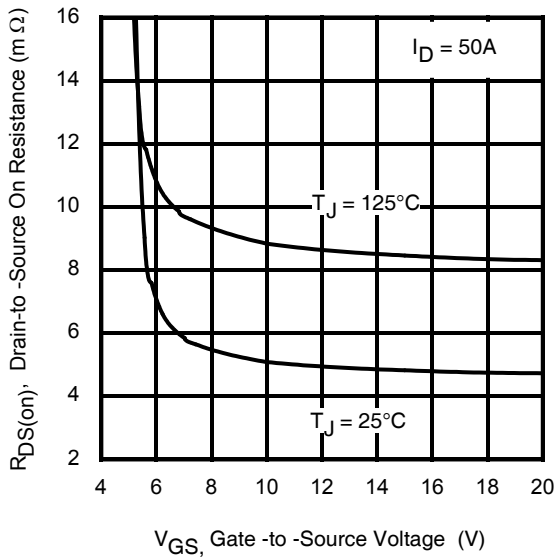


Fig 13. On-Resistance vs. Gate Voltage

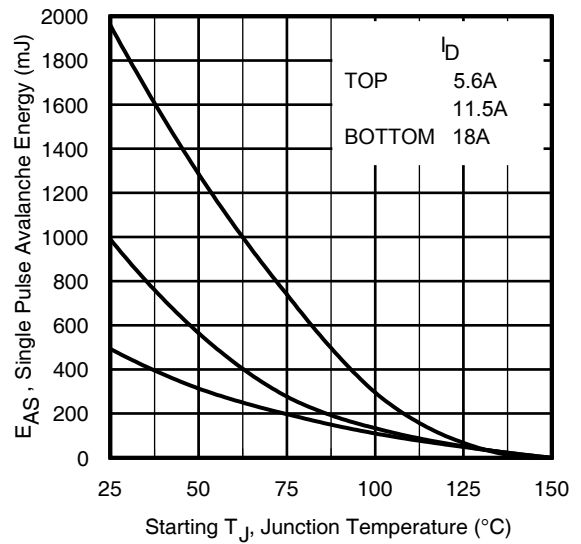
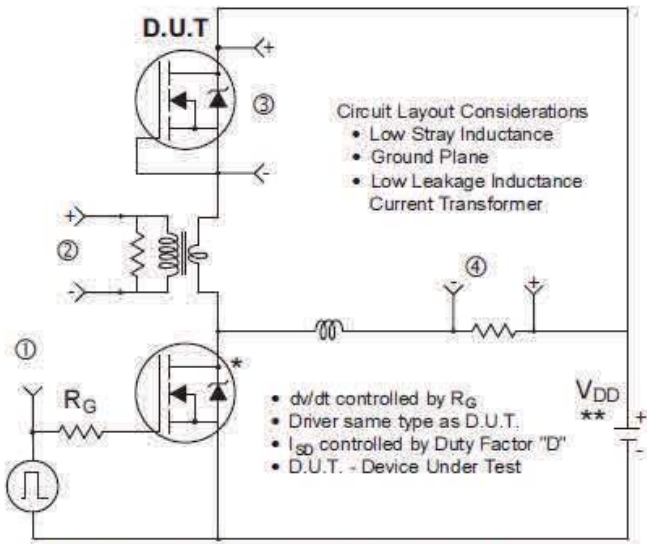
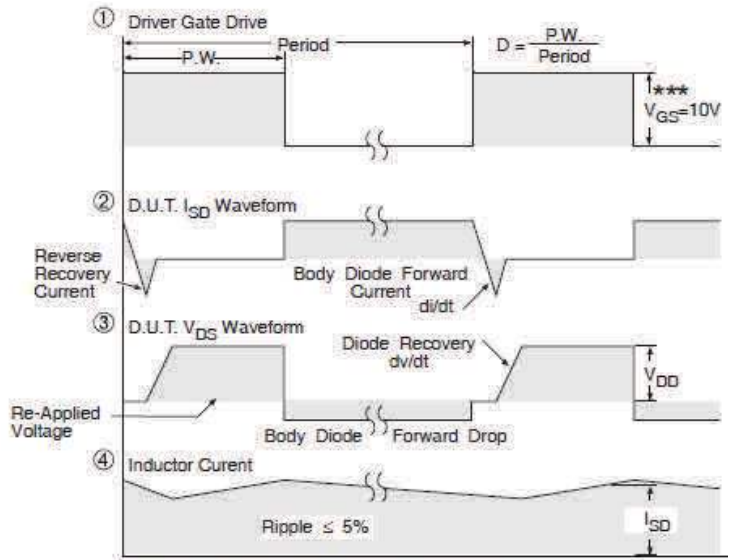


Fig 14. Maximum Avalanche Energy vs. Drain Current



* Use P-Channel Driver for P-Channel Measurements
** Reverse Polarity for P-Channel

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



*** VGS = 5V for Logic Level Devices

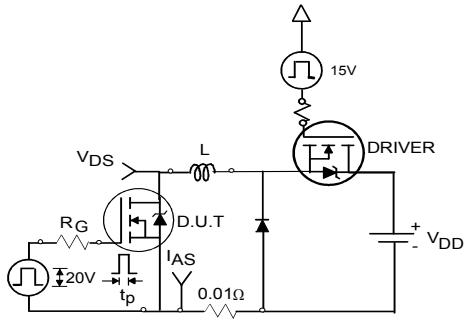


Fig 16a. Unclamped Inductive Test Circuit

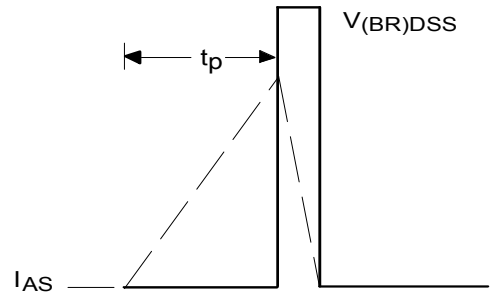


Fig 16b. Unclamped Inductive Waveforms

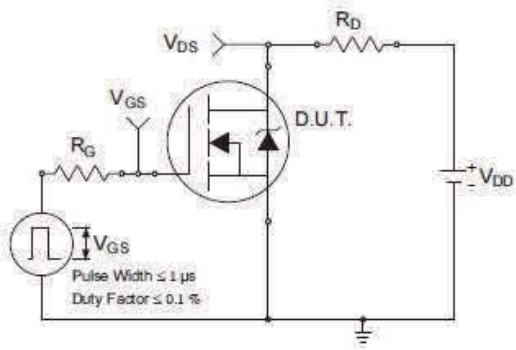


Fig 17a. Switching Time Test Circuit

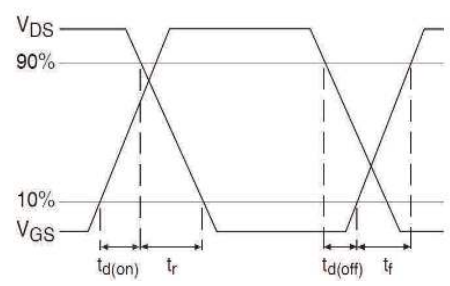


Fig 17b. Switching Time Waveforms

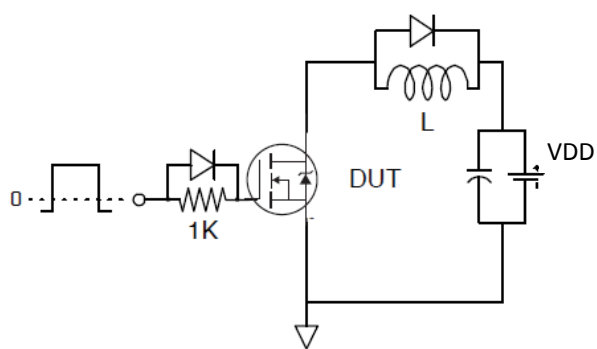


Fig 18. Gate Charge Test Circuit

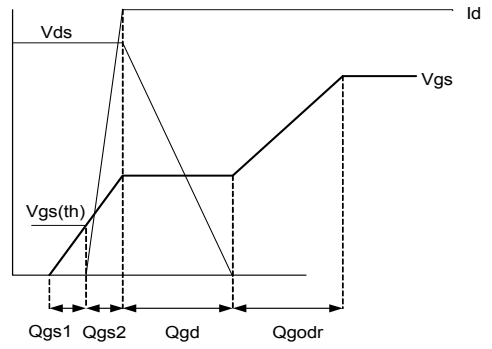
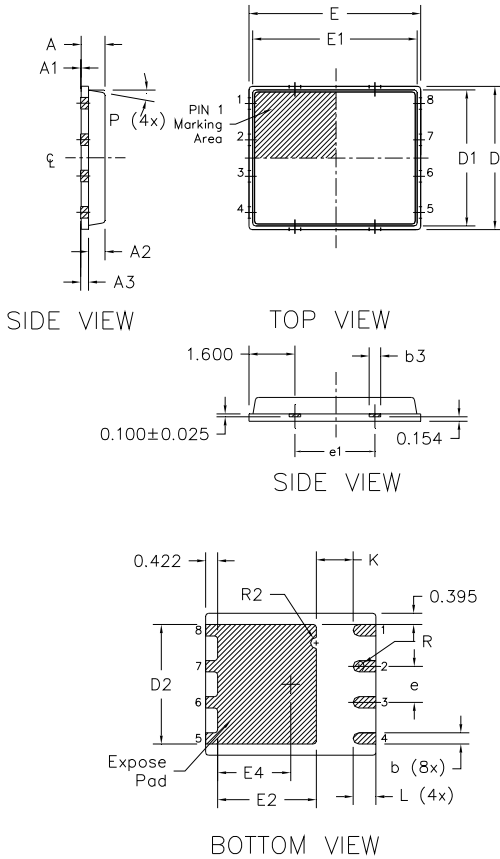


Fig 19. Gate Charge Waveform

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

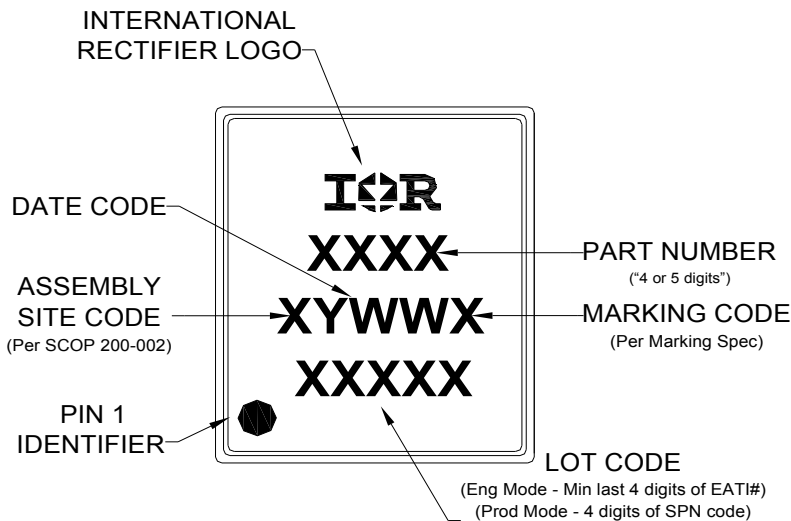
Note:

1. Dimensions and toleranceing confirm to ASME Y14.5M-1994
2. Dimension L represents terminal full back from package edge up to 0.1mm is acceptable
3. Coplanarity applies to the expose Heat Slug as well as the terminal
4. 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>

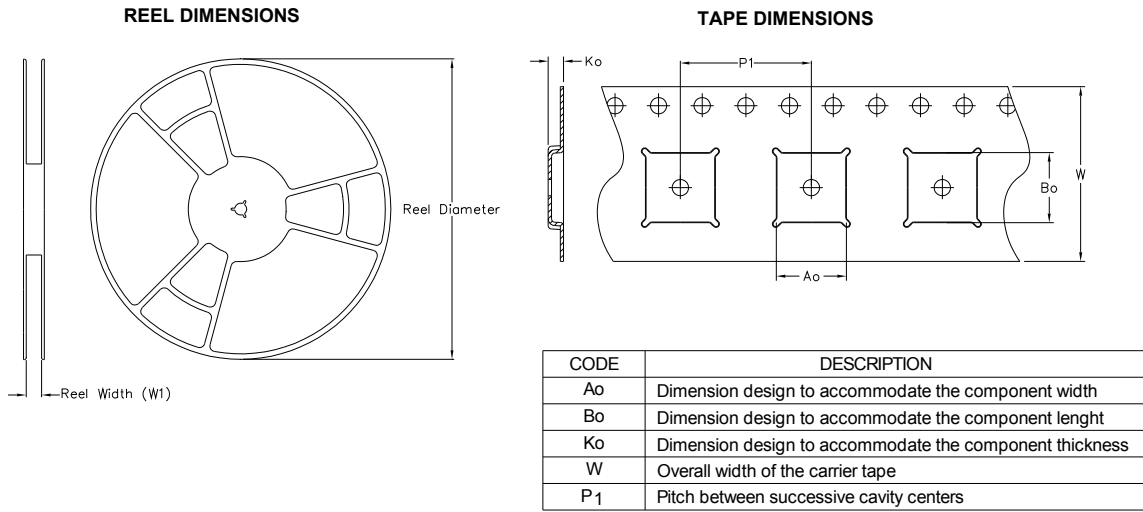
For more information on package inspection techniques, please refer to application note AN-1154:

PQFN 5x6 Part Marking

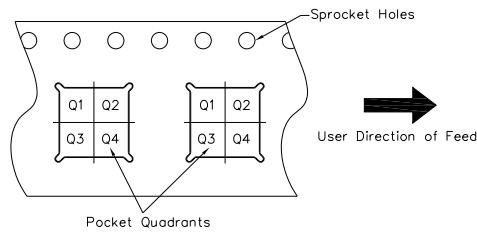


Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>

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†

Qualification Level	Industrial (per JEDEC JESD47F ^{††} guidelines)	
Moisture Sensitivity Level	PQFN 5mm x 6mm	MSL1 (per JEDEC J-STD-020D ^{††})
RoHS Compliant	Yes	

† Qualification standards can be found at International Rectifier’s web site: <http://www.irf.com/product-info/reliability/>

†† Applicable version of JEDEC standard at the time of product release.

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting $T_J = 25^{\circ}\text{C}$, $L = 3.0\text{mH}$, $R_G = 50\Omega$, $I_{AS} = 18\text{A}$.
- ③ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ④ R_{θ} is measured at T_J of approximately 90°C .
- ⑤ When mounted on 1 inch square PCB (FR-4). Please refer to AN-994 for more details:
<http://www.irf.com/technical-info/appnotes/an-994.pdf>

Revision History

Date	Comments
12/12/14	• Diode Charact. Table— Corrected Typ and Max values for T_{rr}/Q_{rr} on page 2.
12/19/14	• Updated POD for PQFN 5X6-OPTION B to match IR Web site on page 7 and Tape & Reel on page 8
04/29/15	• Static Table—Gate Charge— Q_{godr} —Corrected typo error from 24nC to 13.4nC and Switch Time—All Typical values (T_{don} , T_{rise} , T_{doff} & T_{fall}) are revised— page 2 • Fig 10— V_{gsth} vs Temp — Replaced with corrected curve—page 4 • Updated POD for PQFN 5X6-OPTION B to match IR Web site on page 7 and Tape & Reel on page 8