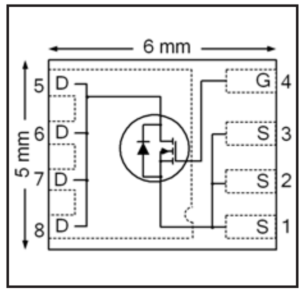
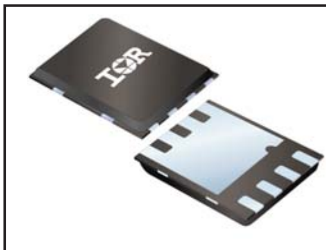
International
IOR Rectifier

IRFH5302PbF

HEXFET® Power MOSFET

V_{DS}	30	V
$R_{DS(on)}$ max (@V_{GS} = 10V)	2.1	mΩ
$Q_{g\ (typical)}$	29	nC
$R_{G\ (typical)}$	1.6	Ω
I_D (@$T_{c(Bottom)}$ = 25°C)	100⑥	A





PQFN 5X6 mm

Applications

- OR-ing MOSFET for 12V (typical) Bus in-Rush Current
- Synchronous MOSFET for buck converters
- Battery Operated DC Motor Inverter MOSFET

Features and Benefits

Features		Benefits
Low R_{DSon} (≤ 2.1mΩ)		Lower Conduction Losses
Low Thermal Resistance to PCB (≤ 1.2°C/W)		Enable better thermal dissipation
100% Rg tested		Increased Reliability
Low Profile (≤ 0.9 mm)	results in ⇒	Increased Power Density
Industry-Standard Pinout		Multi-Vendor Compatibility
Compatible with Existing Surface Mount Techniques		Easier Manufacturing
RoHS Compliant Containing no Lead, no Bromide and no Halogen		Environmentally Friendlier
MSL1, Industrial Qualification		Increased Reliability

Orderable part number	Package Type	Standard Pack		Note
		Form	Quantity	
IRFH5302TRPbF	PQFN 5mm x 6mm	Tape and Reel	4000	
~~IRFH5302TR2PbF~~	~~PQFN 5mm x 6mm~~	~~Tape and Reel~~	~~400~~	EOL Notice #259

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{DS}	Drain-to-Source Voltage	30	V
V_{GS}	Gate-to-Source Voltage	± 20	V
I_D @ T_A = 25°C	Continuous Drain Current, V_{GS} @ 10V	32	A
I_D @ T_A = 70°C	Continuous Drain Current, V_{GS} @ 10V	26	A
I_D @ $T_{C(Bottom)}$ = 25°C	Continuous Drain Current, V_{GS} @ 10V	100 ⑥	A
I_D @ $T_{C(Bottom)}$ = 100°C	Continuous Drain Current, V_{GS} @ 10V	100 ⑥	A
I_{DM}	Pulsed Drain Current ①	400	A
P_D @T_A = 25°C	Power Dissipation ⑤	3.6	W
P_D @ $T_{C(Bottom)}$ = 25°C	Power Dissipation ⑤	100	W
	Linear Derating Factor ⑤	0.029	W/°C
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C

Notes ① through ⑥ are on page 9

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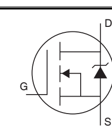
Static @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	30	–––	–––	V	V_{GS} = 0V, I_D = 250μA
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	–––	0.02	–––	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	–––	1.8	2.1	mΩ	V_{GS} = 10V, I_D = 50A ③
		–––	2.8	3.5		V_{GS} = 4.5V, I_D = 50A ③
$V_{GS(th)}$	Gate Threshold Voltage	1.35	1.8	2.35	V	V_{DS} = V_{GS}, I_D = 100μA
$\Delta V_{GS(th)}$	Gate Threshold Voltage Coefficient	–––	-6.8	–––	mV/°C	
I_{DSS}	Drain-to-Source Leakage Current	–––	–––	5.0	μA	V_{DS} = 24V, V_{GS} = 0V
		–––	–––	150		V_{DS} = 24V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage	–––	–––	100	nA	V_{GS} = 20V
	Gate-to-Source Reverse Leakage	–––	–––	-100		V_{GS} = -20V
gfs	Forward Transconductance	180	–––	–––	S	V_{DS} = 15V, I_D = 50A
Q_g	Total Gate Charge	–––	76	–––	nC	V_{GS} = 10V, V_{DS} = 15V, I_D = 50A
Q_g	Total Gate Charge	–––	29	41	nC	V_{DS} = 15V
Q_{gs1}	Pre-Vth Gate-to-Source Charge	–––	7.7	–––		V_{GS} = 4.5V
Q_{gs2}	Post-Vth Gate-to-Source Charge	–––	4.4	–––		I_D = 50A
Q_{gd}	Gate-to-Drain Charge	–––	9.7	–––		See Fig.17 & 18
Q_{godr}	Gate Charge Overdrive	–––	8.2	–––		
Q_{sw}	Switch Charge (Q_{gs2} + Q_{gd})	–––	14	–––		
Q_{oss}	Output Charge	–––	19	–––	nC	V_{DS} = 16V, V_{GS} = 0V
R_G	Gate Resistance	–––	1.6	2.5	Ω	
$t_{d(on)}$	Turn-On Delay Time	–––	18	–––	ns	V_{DD} = 15V, V_{GS} = 4.5V
t_r	Rise Time	–––	51	–––		I_D = 50A
$t_{d(off)}$	Turn-Off Delay Time	–––	22	–––		R_G=1.8Ω
t_f	Fall Time	–––	18	–––		See Fig.15
C_{iss}	Input Capacitance	–––	4400	–––	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	–––	890	–––		V_{DS} = 15V
C_{rss}	Reverse Transfer Capacitance	–––	360	–––		f = 1.0MHz

Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy ②	–––	130	mJ
I_{AR}	Avalanche Current ①	–––	50	A

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	–––	–––	100 ⑥	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	–––	–––	400		
V_{SD}	Diode Forward Voltage	–––	–––	1.0	V	T_J = 25°C, I_S = 50A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	–––	20	30	ns	T_J = 25°C, I_F = 50A, V_{DD} = 15V
Q_{rr}	Reverse Recovery Charge	–––	32	48	nC	di/dt = 300A/μs 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	–––	1.2	°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	

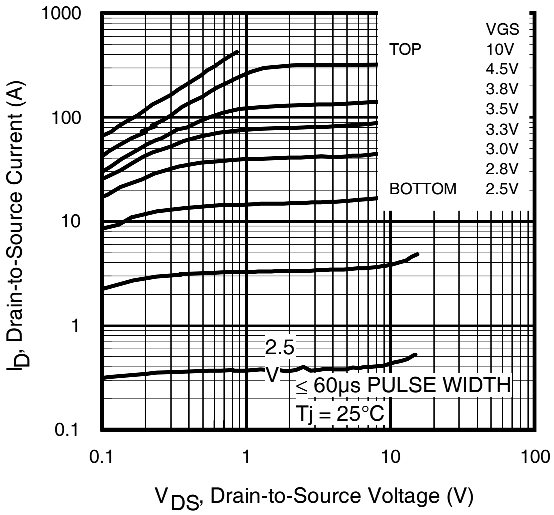


Fig 1. Typical Output Characteristics

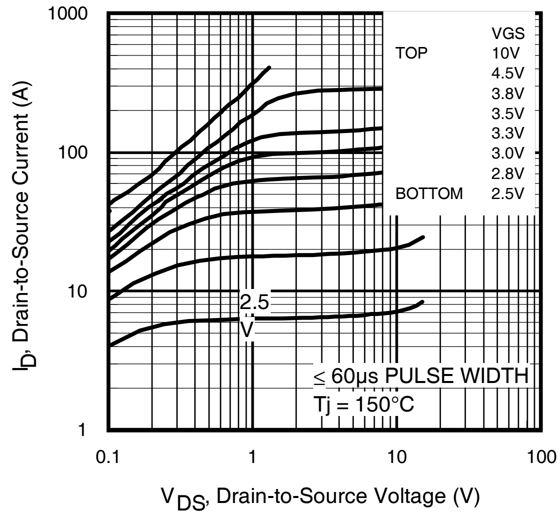


Fig 2. Typical Output Characteristics

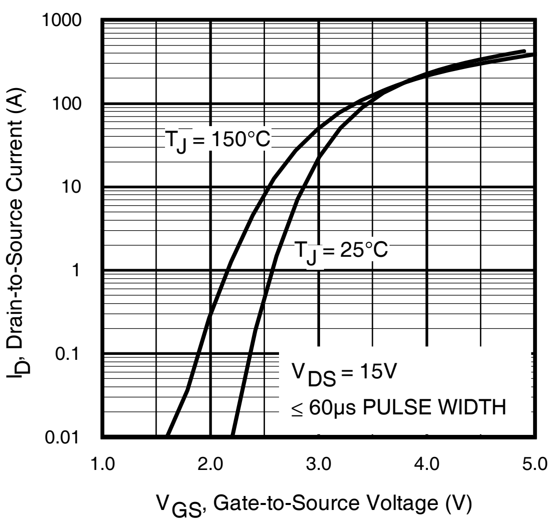


Fig 3. Typical Transfer Characteristics

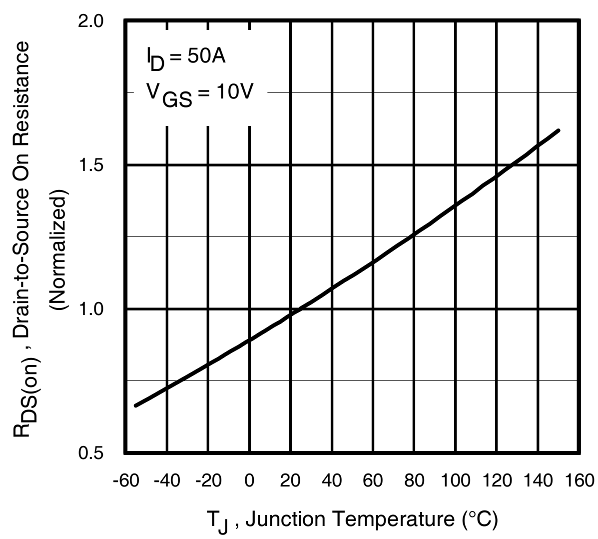


Fig 4. Normalized On-Resistance Vs. Temperature

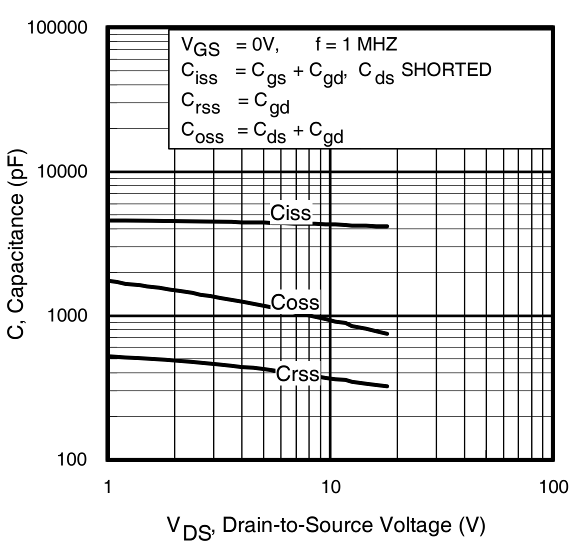


Fig 5. Typical Capacitance Vs.Drain-to-Source Voltage

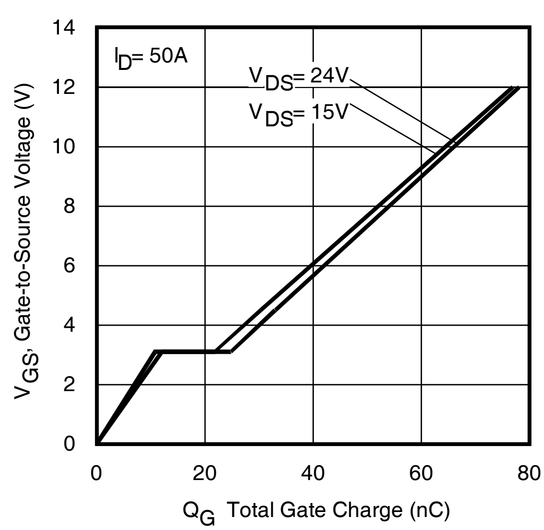


Fig 6. Typical Gate Charge Vs.Gate-to-Source Voltage

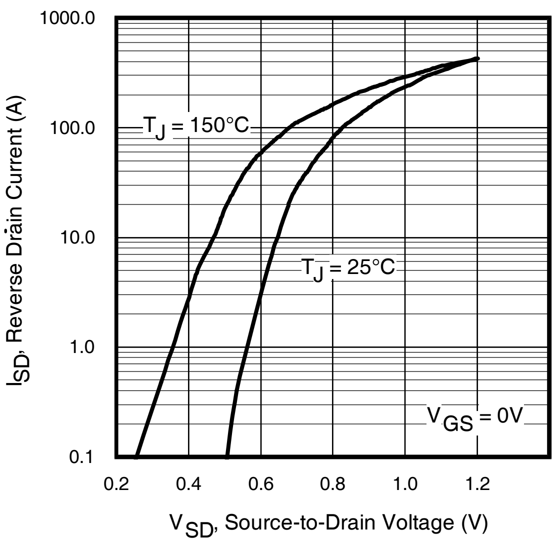


Fig 7. Typical Source-Drain Diode Forward Voltage

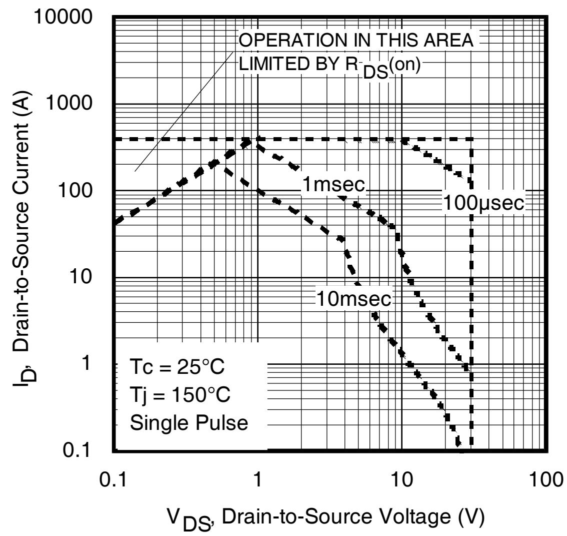


Fig 8. Maximum Safe Operating Area

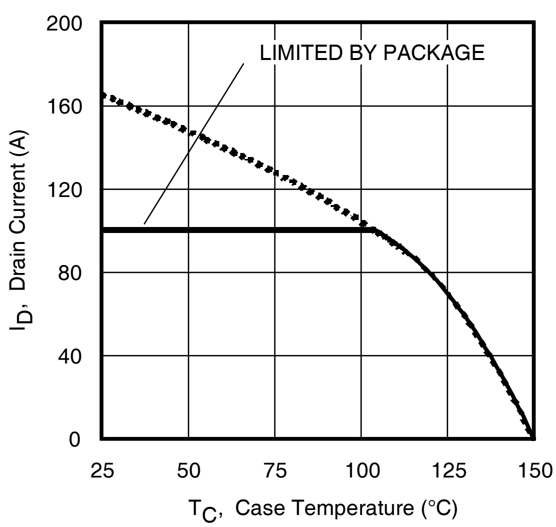


Fig 9. Maximum Drain Current Vs. Case (Bottom) Temperature

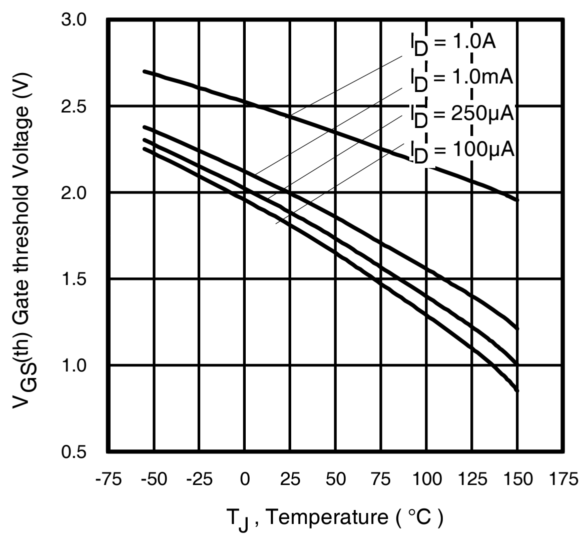


Fig 10. Threshold Voltage Vs. Temperature

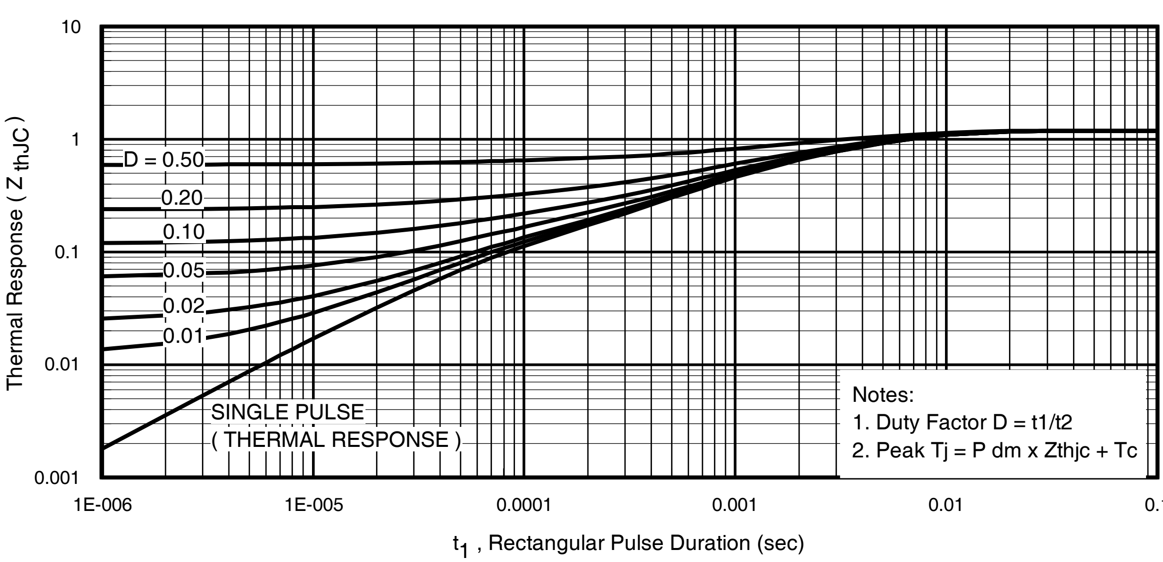


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case (Bottom)

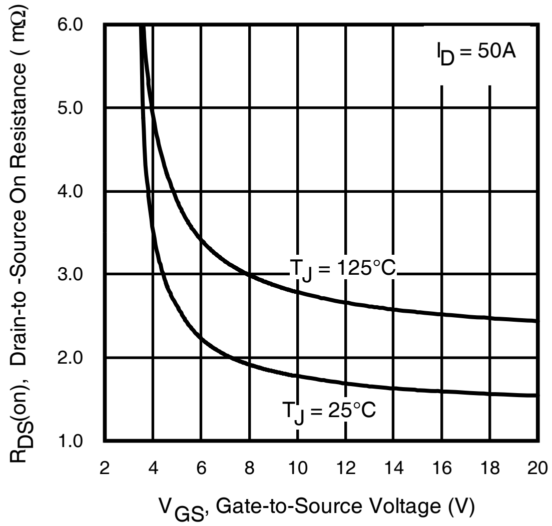


Fig 12. On-Resistance vs. Gate Voltage

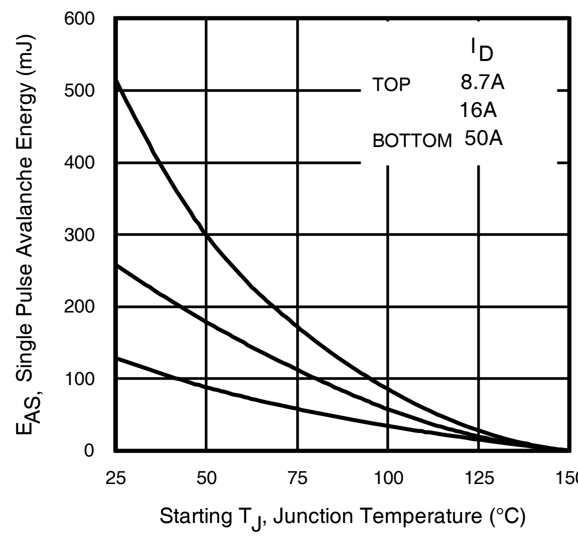


Fig 13. Maximum Avalanche Energy vs. Drain Current

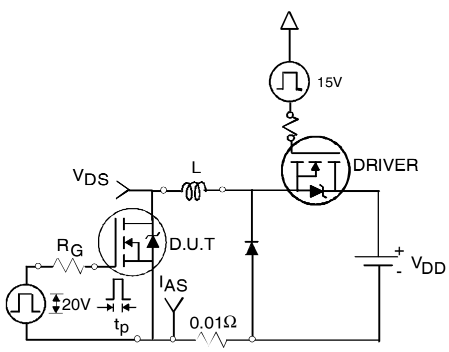


Fig 14a. Unclamped Inductive Test Circuit

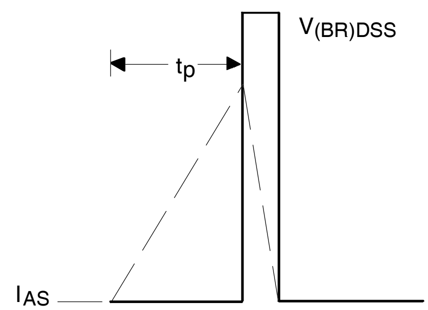


Fig 14b. Unclamped Inductive Waveforms

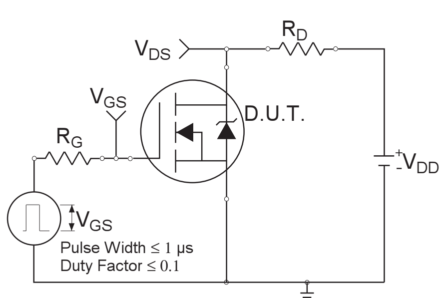


Fig 15a. Switching Time Test Circuit

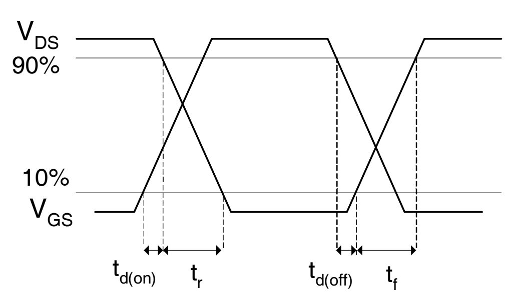


Fig 15b. Switching Time Waveforms

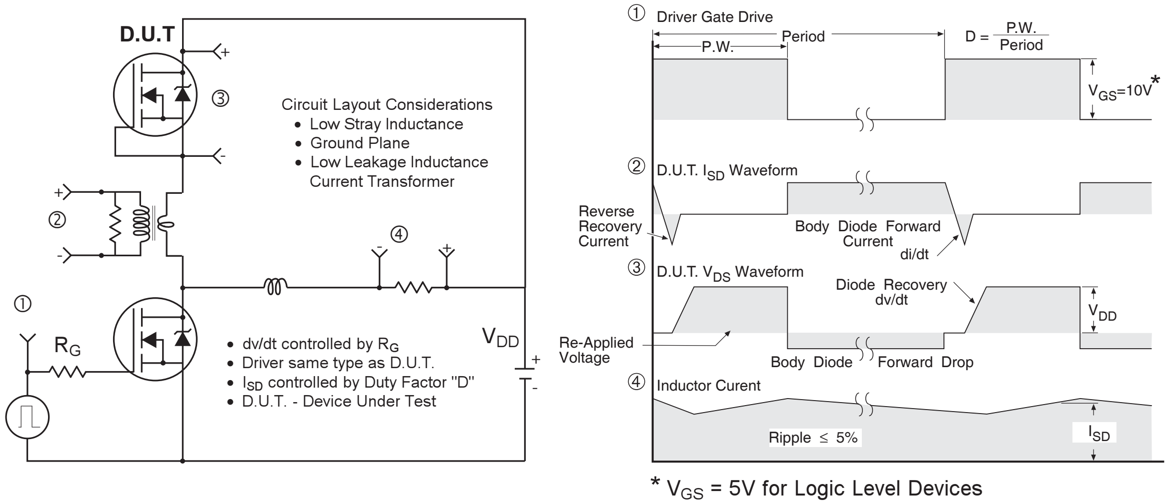


Fig 16. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

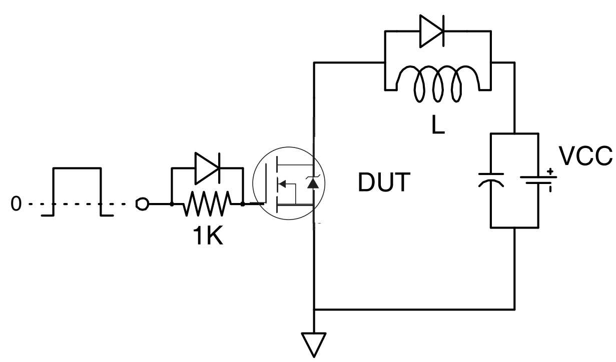


Fig 17. Gate Charge Test Circuit

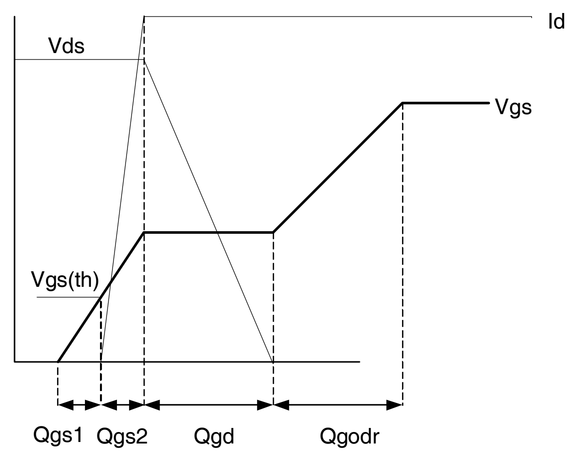
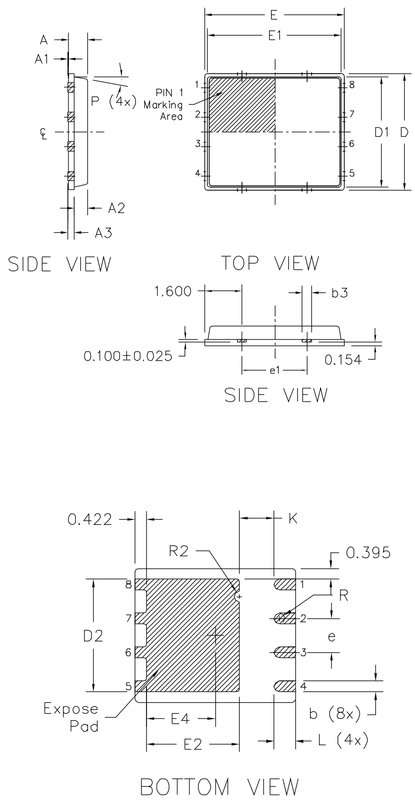


Fig 18. Gate Charge Waveform

PQFN 5x6 Outline "B" Package Details



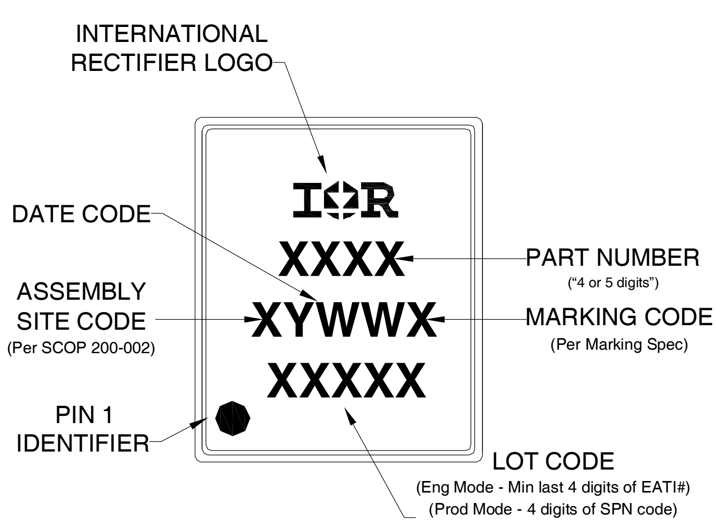
SYMBOL \ DIM	MILLIMITERS		INCH	
	MIN	MAX	MIN	MAX
A	0.800	0.900	0.0315	0.0543
A1	0.000	0.050	0.0000	0.0020
A3	0.200 REF		0.0079 REF	
b	0.350	0.470	0.0138	0.0185
b1	0.025	0.125	0.0010	0.0049
b2	0.210	0.410	0.0083	0.0161
b3	0.150	0.450	0.0059	0.0177
D	5.000 BSC		0.1969 BSC	
D1	4.750 BSC		0.1870 BSC	
D2	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:
http://www.irf.com/technical-info/appnotes/an-1154.pdf

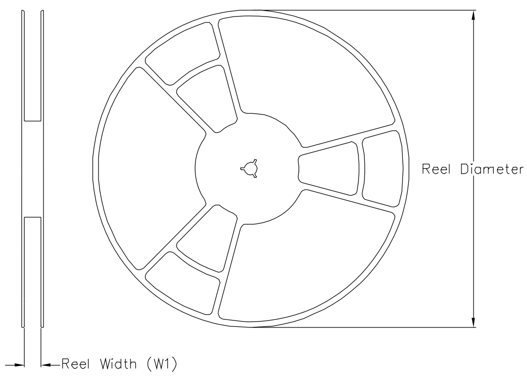
PQFN 5x6 Part Marking



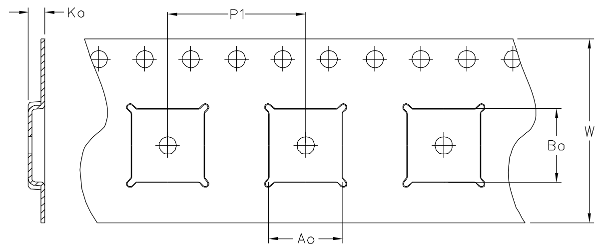
Note: For the most current drawing please refer to IR website at: http://www.irf.com/package/

PQFN Tape and Reel

REEL DIMENSIONS

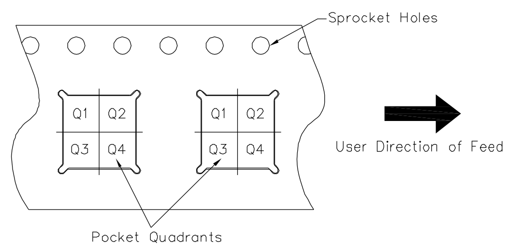


TAPE DIMENSIONS



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

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

†† 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°C, L = 0.103mH, R_G = 25Ω, I_{AS} = 50A.
③ Pulse width ≤ 400μs; duty cycle ≤ 2%.
④ R_θ is measured at T_J of approximately 90°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. Package is limited to 100A by production test capability

Revision History

Date	Comment
3/10/2014	• Updated ordering information to reflect the End-Of-Life (EOL) of the mini-reel option (EOL notice #259). • Updated data sheet with the new IR corporate template.
3/19/2015	• Updated package outline and tape and reel on pages 7 and 8.

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