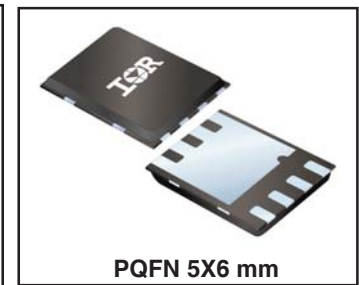
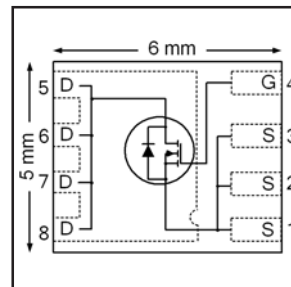


V_{DS}	40	V
$R_{DS(on) max}$ (@ $V_{GS} = 10V$)	2.6	mΩ
Q_g (typical)	73	nC
R_G (typical)	1.2	Ω
I_D (@ $T_{mb} = 25^\circ C$)	100 Ⓞ	A



Applications

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

Features and Benefits

Features

Low $R_{DS(on)}$ ($\leq 2.6m\Omega$)
Low Thermal Resistance to PCB ($\leq 0.8^\circ C/W$)
100% Rg tested
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 Reliability
Increased Power Density
Multi-Vendor Compatibility
Easier Manufacturing
Environmentally Friendlier
Increased Reliability

Base Part Number	Package Type	Standard Pack		Orderable part number	Note
		Form	Quantity		
IRFH5004PBF	PQFN 5mm x 6mm	Tape and Reel	4000	IRFH5004TRPBF	
	PQFN 5mm x 6mm	Tape and Reel	1000	IRFH5004TR2PBF	EOL notice #259

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{DS}	Drain-to-Source Voltage	40	V
V_{GS}	Gate-to-Source Voltage	±20	
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	28	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	23	
$I_D @ T_{mb} = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	100Ⓞ	
$I_D @ T_{mb} = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	100Ⓞ	
I_{DM}	Pulsed Drain Current ①	400	
$P_D @ T_A = 25^\circ C$	Power Dissipation ⑤	3.6	W
$P_D @ T_{mb} = 25^\circ C$	Power Dissipation ⑤	156	
	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 ⑤ are on page 8

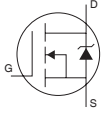
Static @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV _{DSS}	Drain-to-Source Breakdown Voltage	40	—	—	V	V _{GS} = 0V, I _D = 250μA
ΔBV _{DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	—	0.04	—	V/°C	Reference to 25°C, I _D = 1mA
R _{DS(on)}	Static Drain-to-Source On-Resistance	—	2.1	2.6	mΩ	V _{GS} = 10V, I _D = 50A ③
V _{GS(th)}	Gate Threshold Voltage	2.0	—	4.0	V	V _{DS} = V _{GS} , I _D = 150μA
ΔV _{GS(th)}	Gate Threshold Voltage Coefficient	—	-5.6	—	mV/°C	
I _{DSS}	Drain-to-Source Leakage Current	—	—	20	μA	V _{DS} = 40V, V _{GS} = 0V
		—	—	250		V _{DS} = 40V, 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
g _{fs}	Forward Transconductance	91	—	—	S	V _{DS} = 15V, I _D = 50A
Q _g	Total Gate Charge	—	73	110	nC	V _{DS} = 20V V _{GS} = 10V I _D = 50A See Fig. 17 & 18
Q _{gs1}	Pre-V _{th} Gate-to-Source Charge	—	15	—		
Q _{gs2}	Post-V _{th} Gate-to-Source Charge	—	6.1	—		
Q _{gd}	Gate-to-Drain Charge	—	27	—		
Q _{godr}	Gate Charge Overdrive	—	25	—		
Q _{sw}	Switch Charge (Q _{gs2} + Q _{gd})	—	33.1	—		
Q _{oss}	Output Charge	—	27	—	nC	V _{DS} = 16V, V _{GS} = 0V
R _G	Gate Resistance	—	1.2	—	Ω	
t _{d(on)}	Turn-On Delay Time	—	13	—	ns	V _{DD} = 20V, V _{GS} = 10V I _D = 50A R _G = 1.8Ω See Fig. 15
t _r	Rise Time	—	39	—		
t _{d(off)}	Turn-Off Delay Time	—	28	—		
t _f	Fall Time	—	16	—		
C _{iss}	Input Capacitance	—	4490	—	pF	V _{GS} = 0V V _{DS} = 20V f = 1.0MHz
C _{oss}	Output Capacitance	—	970	—		
C _{rss}	Reverse Transfer Capacitance	—	460	—		

Avalanche Characteristics

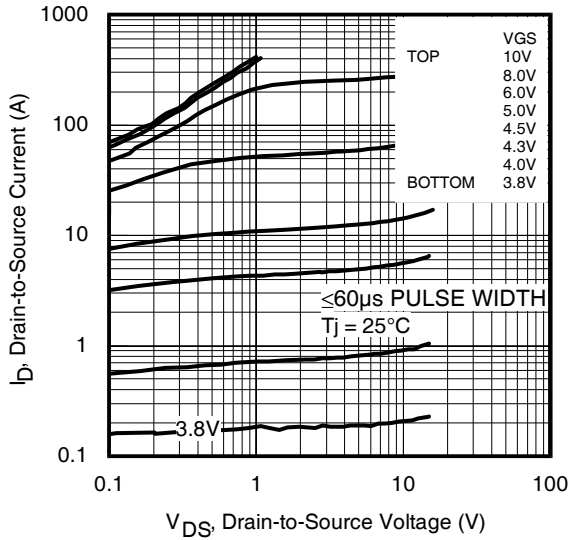
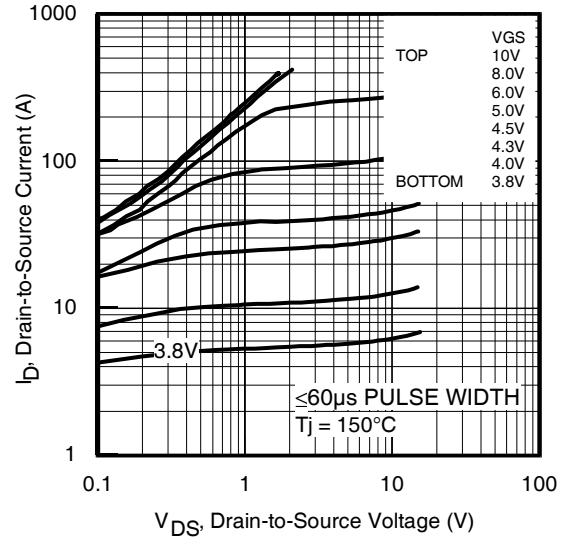
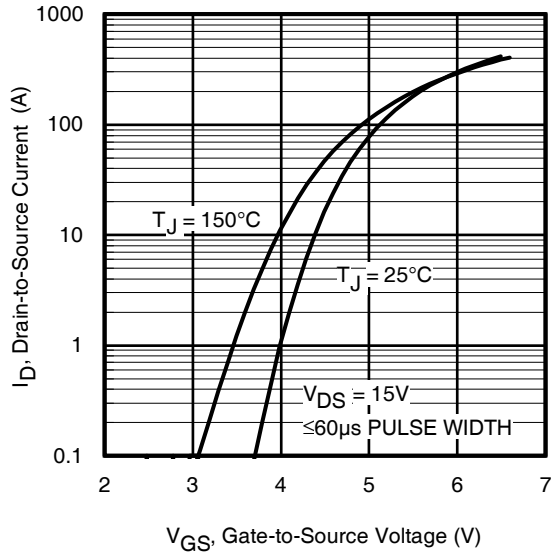
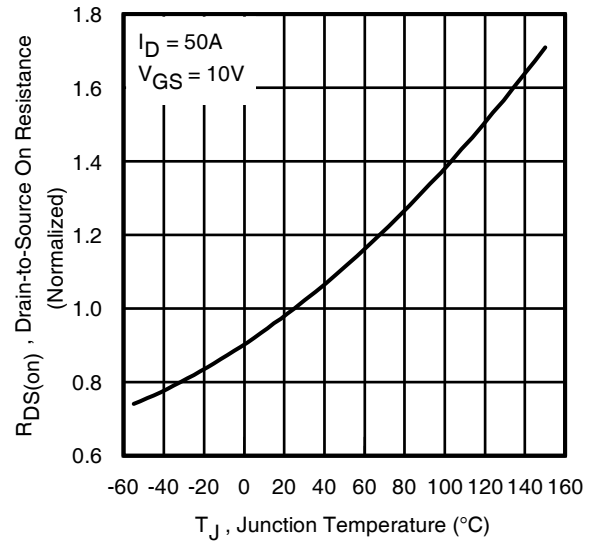
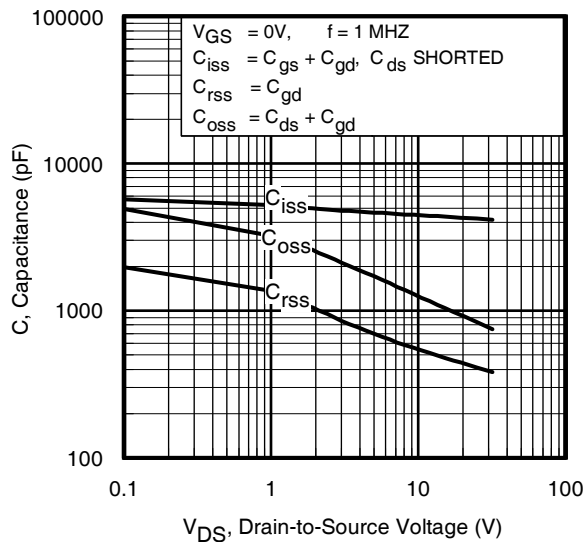
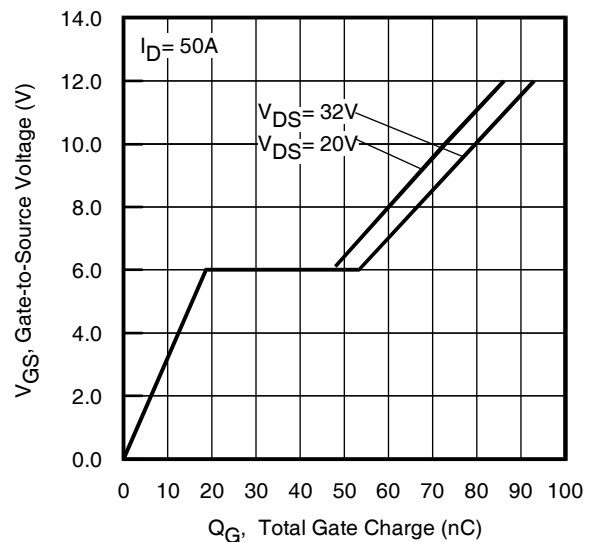
	Parameter	Typ.	Max.	Units
E _{AS}	Single Pulse Avalanche Energy ②	—	340	mJ
I _{AR}	Avalanche Current ①	—	50	A

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode) ⑥	—	—	100	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	—	32	48	ns	T _J = 25°C, I _F = 50A, V _{DD} = 20V
Q _{rr}	Reverse Recovery Charge	—	100	150	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 _{θJC-mb}	Junction-to-Mounting Base	0.5	0.8	°C/W
R _{θJC} (Top)	Junction-to-Case ④	—	15	
R _{θJA}	Junction-to-Ambient ⑤	—	35	
R _{θJA} (<10s)	Junction-to-Ambient ⑤	—	33	


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

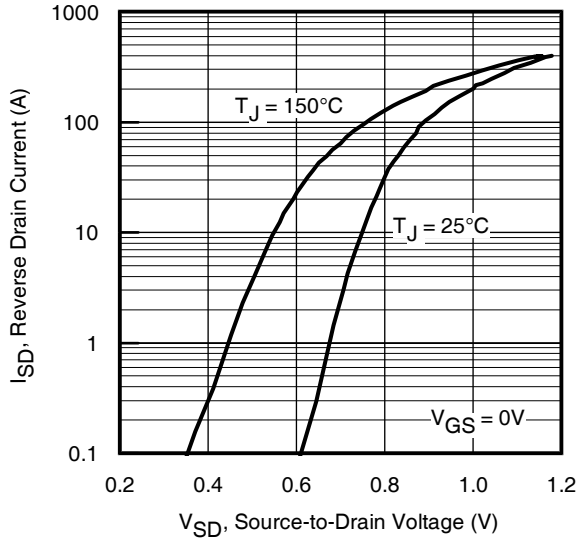


Fig 7. Typical Source-Drain Diode Forward Voltage

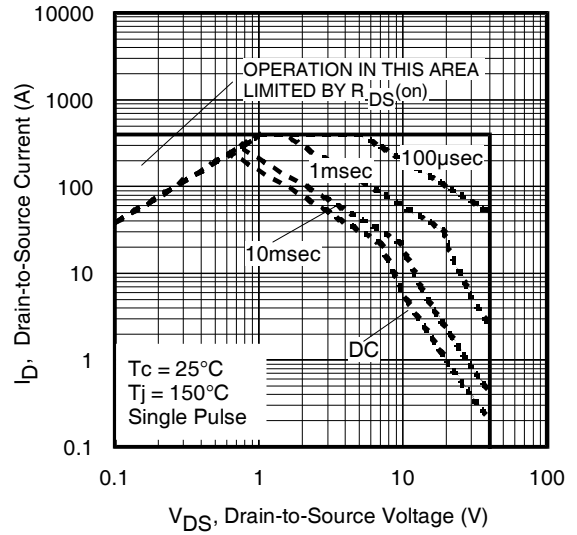


Fig 8. Maximum Safe Operating Area

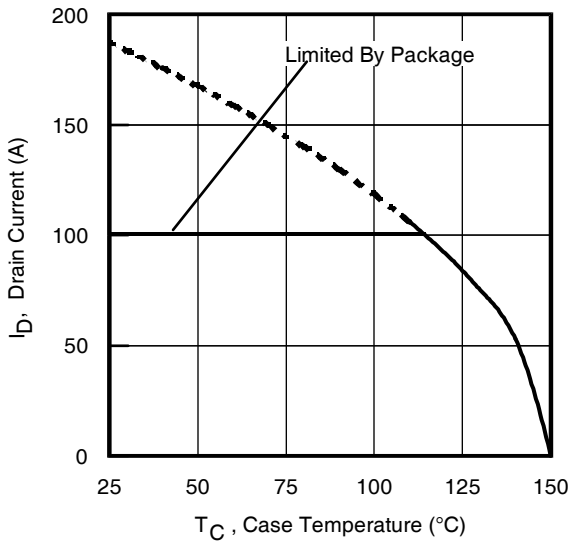


Fig 9. Maximum Drain Current vs. Case Temperature

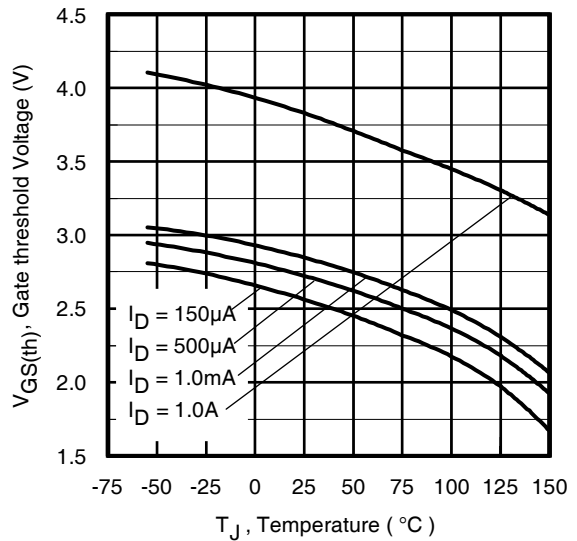


Fig 10. Threshold Voltage vs. Temperature

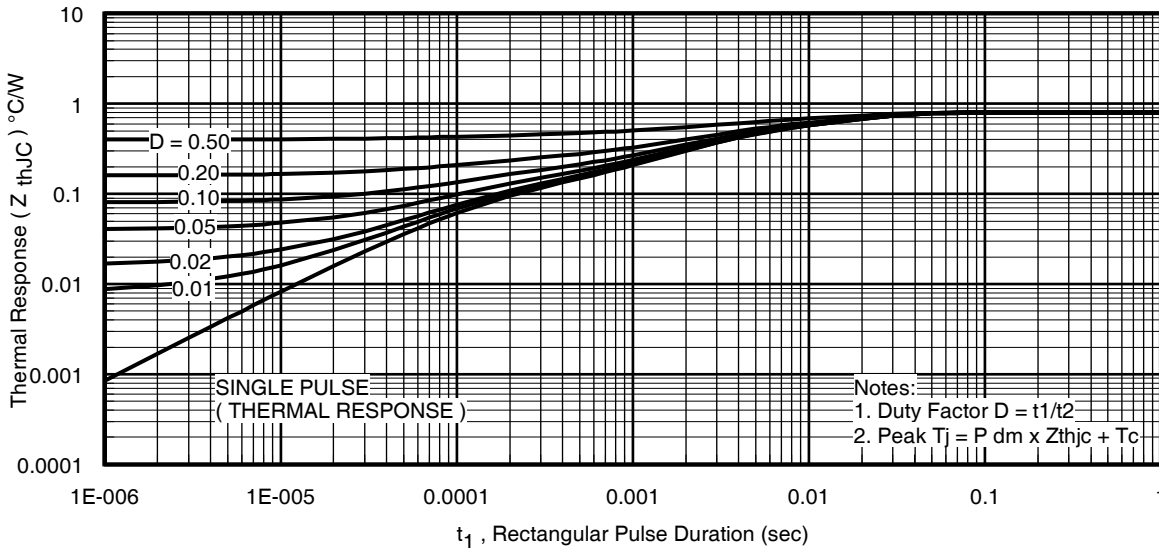


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Mounting Base

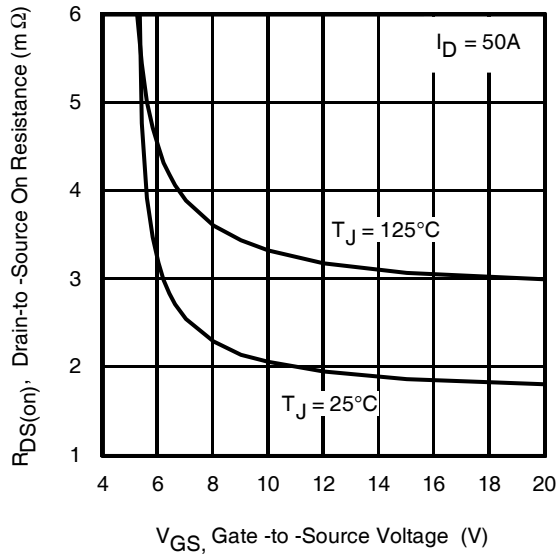


Fig 12. On-Resistance vs. Gate Voltage

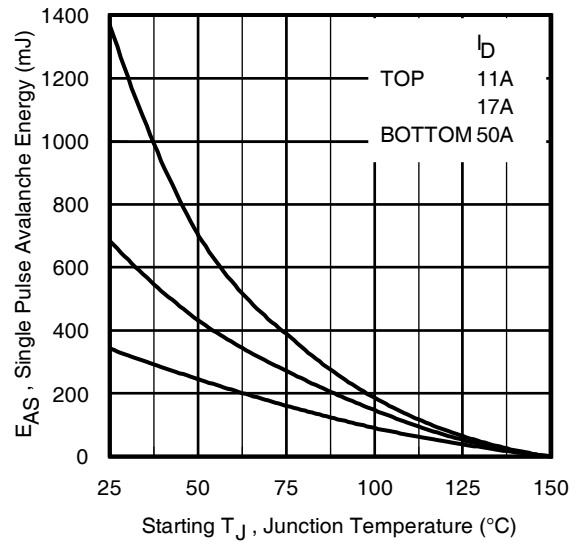


Fig 13. Maximum Avalanche Energy vs. Drain Current

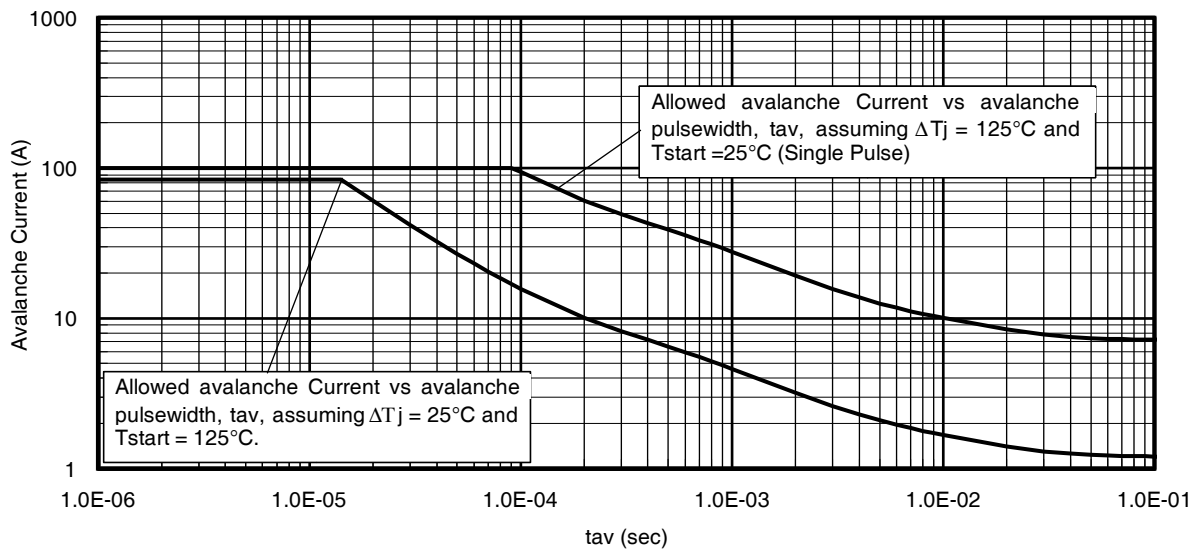
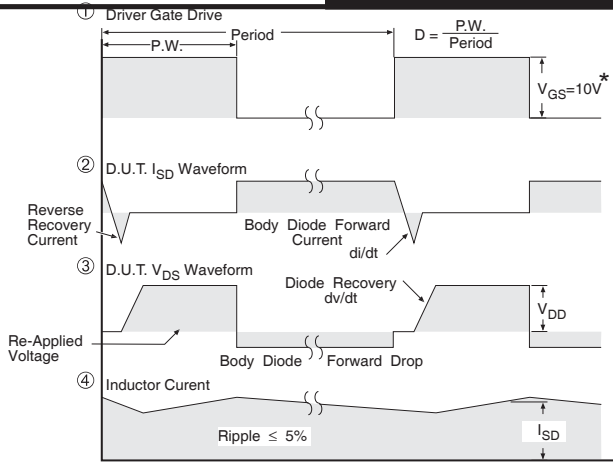
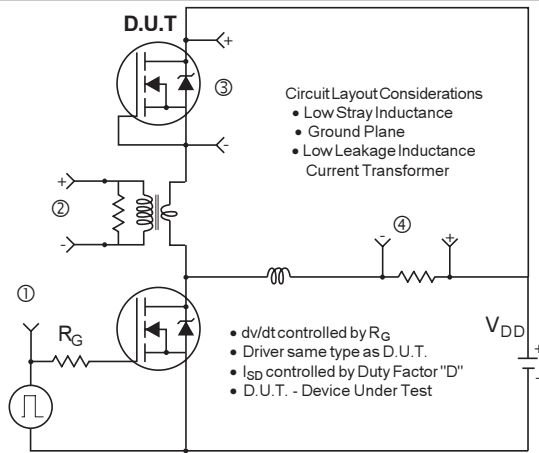


Fig 14. Typical Avalanche Current vs. Pulsewidth



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

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

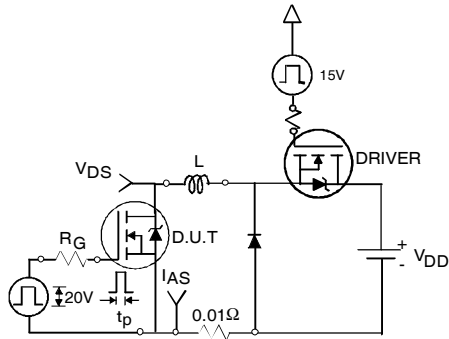


Fig 16a. Unclamped Inductive Test Circuit

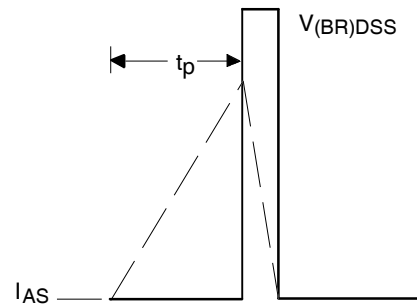


Fig 16b. Unclamped Inductive Waveforms

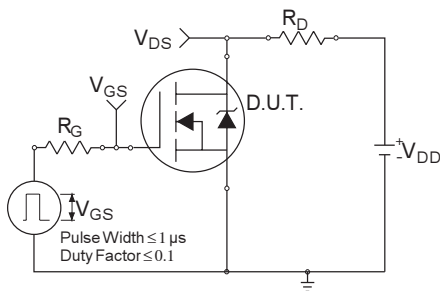


Fig 17a. Switching Time Test Circuit

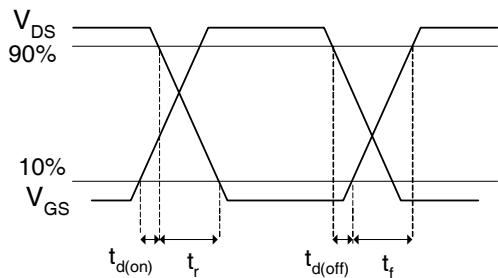


Fig 17b. Switching Time Waveforms

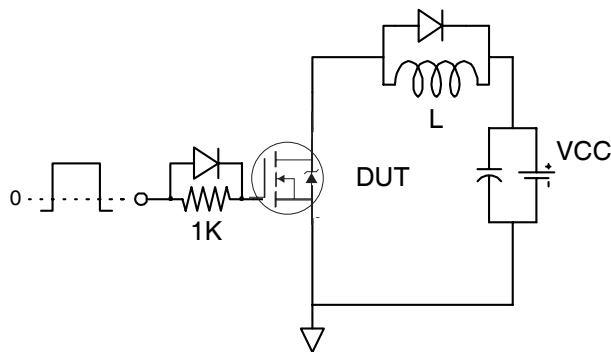


Fig 18a. Gate Charge Test Circuit

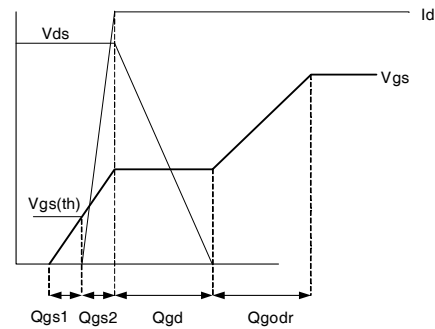
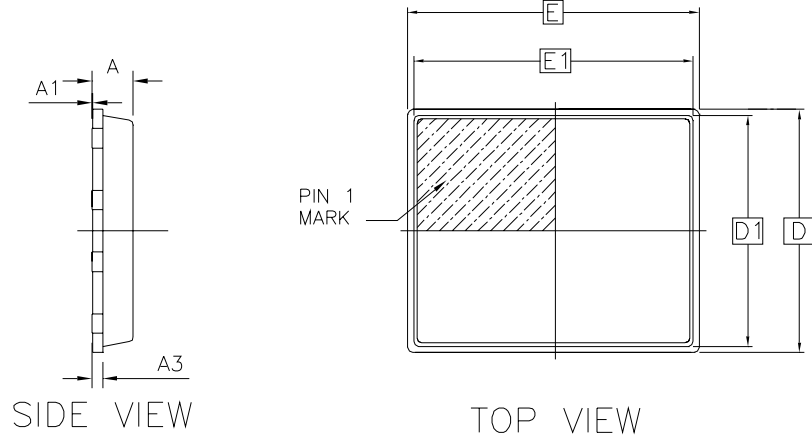
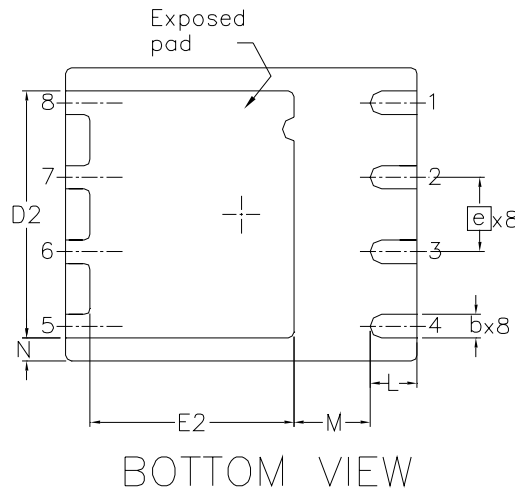


Fig 18b. Gate Charge Waveform

PQFN 5x6 Outline "B" Package Details



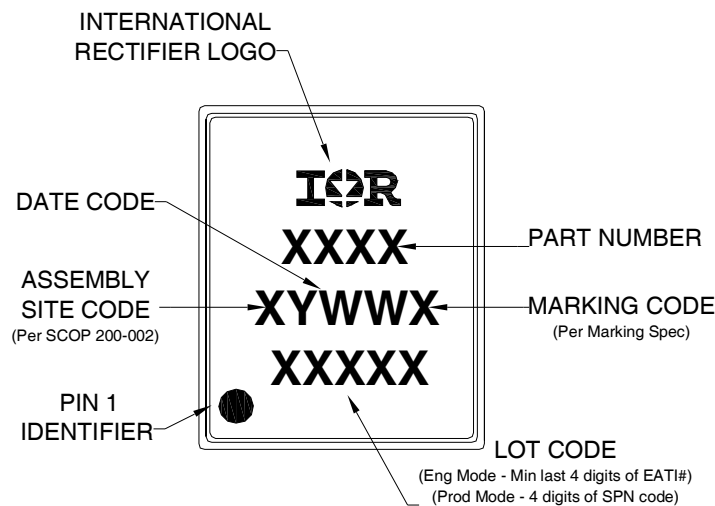
OUTLINE PQFN 5x6B			
DIM SYMBOL	MIN	NOM	MAX
A	0.80	0.83	0.90
A1	0	0.020	0.05
A3		0.20	REF
b	0.35	0.40	0.47
D		5.00	BSC
D1		4.75	BSC
D2	4.10	4.21	4.30
e		1.27	BSC
E		6.00	BSC
E1		5.75	BSC
E2	3.38	3.48	3.58
L	0.70	0.80	0.90
M		1.30	REF
N		0.40	REF



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>

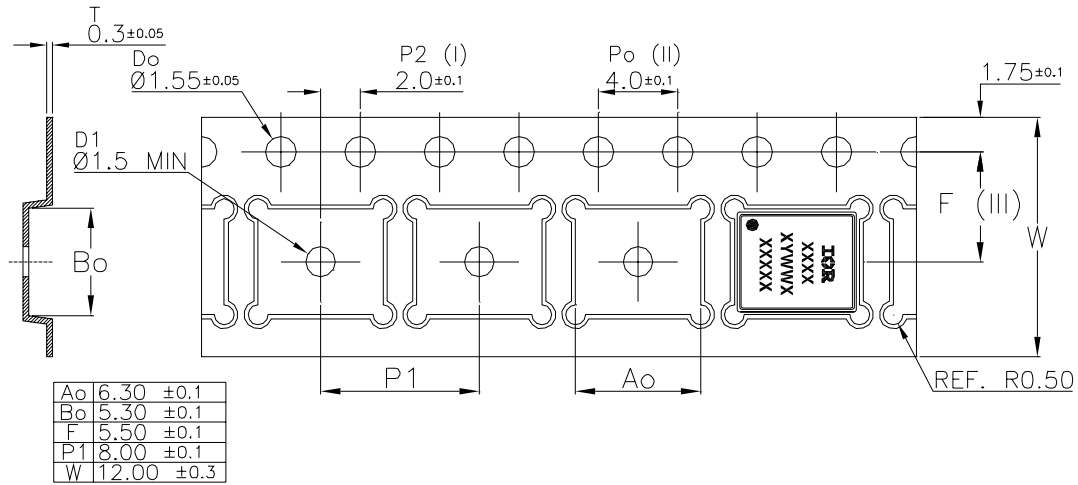
For more information on package inspection techniques, please refer to application note AN-1154: <http://www.irf.com/technical-info/appnotes/an-1154.pdf>

PQFN 5x6 Outline "B" Part Marking



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

PQFN 5x6 Outline "B" Tape and Reel



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 $T_J = 25^\circ\text{C}$, $L = 0.27\text{mH}$, $R_G = 50\Omega$, $I_{AS} = 50\text{A}$.
- 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 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
1/13/2014	<ul style="list-style-type: none"> • 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.