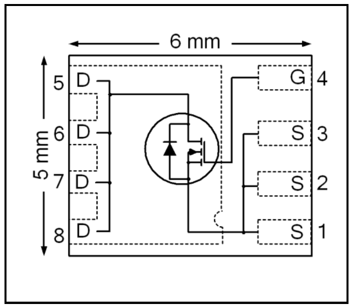
International Rectifier

Fast*IR*FET™
IRFH7194PbF

HEXFET® Power MOSFET

V_{DSS}	100	V
$R_{DS(on)}$ max (@ V_{GS} = 10V)	16.4	mΩ
$Q_{g\ (typical)}$	13	nC
$R_{g\ (typical)}$	2.1	Ω
I_D (@$T_{C\ (Bottom)}$ = 25°C)	35	A



PQFN 5X6 mm

Applications

- Primary Switch for High Frequency 48V/60V Telecom DC-DC Power Supplies
- Secondary Side Synchronous Rectifier

Features		Benefits
Low $R_{DS(ON)}$ (< 16.4mΩ)		Lower Conduction Losses
Low Thermal Resistance to PCB (<3.2°C/W)		Increased Power Density
100% Rg Tested		Increased Reliability
Low Profile (<1.05 mm)	results in ⇒	Increased Power Density
Industry-Standard Pinout		Multi-Vendor Compatibility
Compatible with Existing Surface Mount Techniques		Easier Manufacturing
RoHS Compliant, Halogen-Free		Environmentally Friendlier
MSL1		Increased Reliability

Base part number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRFH7194PbF	PQFN 5mm x 6 mm	Tape and Reel	4000	IRFH7194TRPbF

Absolute Maximum Ratings

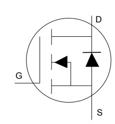
	Parameter	Max.	Units
V_{GS}	Gate-to-Source Voltage	± 20	V
I_D @ T_A = 25°C	Continuous Drain Current, V_{GS} @ 10V	11	A
I_D @ $T_{C(Bottom)}$ = 25°C	Continuous Drain Current, V_{GS} @ 10V	35	
I_D @ $T_{C(Bottom)}$ = 100°C	Continuous Drain Current, V_{GS} @ 10V	22	
I_{DM}	Pulsed Drain Current ①	140	
P_D @T_A = 25°C	Power Dissipation	3.6	W
P_D @$T_{C(Bottom)}$ = 25°C	Power Dissipation	39	
	Linear Derating Factor	0.03	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	100	——	——	V	V_{GS} = 0V, I_D = 250μA
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	——	78	——	mV/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	——	13.7	16.4	mΩ	V_{GS} = 10V, I_D = 21A ③
$V_{GS(th)}$	Gate Threshold Voltage	2.0	——	3.6	V	V_{DS} = V_{GS}, I_D = 50μA
$\Delta V_{GS(th)}$	Gate Threshold Voltage Coefficient	——	-5.2	——	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		V_{GS} = -20V
gfs	Forward Transconductance	45	——	——	S	V_{DS} = 25V, I_D = 21A
Q_g	Total Gate Charge	——	13	19	nC	V_{DS} = 50V V_{GS} = 10V I_D = 21A
Q_{gs1}	Pre-Vth Gate-to-Source Charge	——	1.8	——		
Q_{gs2}	Post-Vth Gate-to-Source Charge	——	0.9	——		
Q_{gd}	Gate-to-Drain Charge	——	4.3	——		
Q_{godr}	Gate Charge Overdrive	——	6.0	——		
Q_{sw}	Switch Charge (Q_{gs2} + Q_{gd})	——	5.2	——		
Q_{oss}	Output Charge	——	40	——	nC	V_{DS} = 50V, V_{GS} = 0V
R_G	Gate Resistance	——	2.1	——	Ω	
$t_{d(on)}$	Turn-On Delay Time	——	2.7	——	ns	V_{DD} = 50V, V_{GS} = 10V I_D = 21A R_G = 1.0Ω
t_r	Rise Time	——	3.3	——		
$t_{d(off)}$	Turn-Off Delay Time	——	8.0	——		
t_f	Fall Time	——	2.5	——		
C_{iss}	Input Capacitance	——	733	——	pF	V_{GS} = 0V V_{DS} = 50V *ƒ* = 1.0MHz
C_{oss}	Output Capacitance	——	374	——		
C_{rss}	Reverse Transfer Capacitance	——	11	——		

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	——	——	35	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	——	——	140		
V_{SD}	Diode Forward Voltage	——	0.8	1.3	V	T_J = 25°C, I_S= 21A, V_{GS}=0V ③
t_{rr}	Reverse Recovery Time	——	30	45	ns	T_J = 25°C, I_F = 21A, V_{DD} = 50V
Q_{rr}	Reverse Recovery Charge	——	26	39	nC	di/dt = 100A/μs ③

Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS} (Thermally limited)	Single Pulse Avalanche Energy ②	——	220	mJ
I_{AR}	Avalanche Current ①	——	12	A

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$ (Bottom)	Junction-to-Case ④	——	3.2	°C/W
$R_{\theta JC}$ (Top)	Junction-to-Case ④	——	22	
$R_{\theta JA}$	Junction-to-Ambient ⑤	——	35	
$R_{\theta JA}$ (<10s)	Junction-to-Ambient ⑤	——	20	

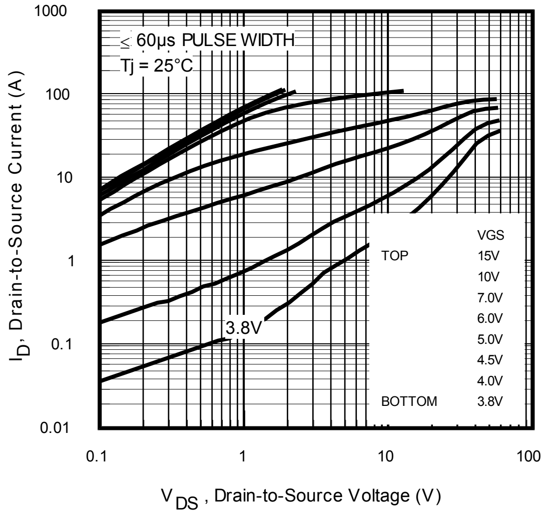


Fig 1. Typical Output Characteristics

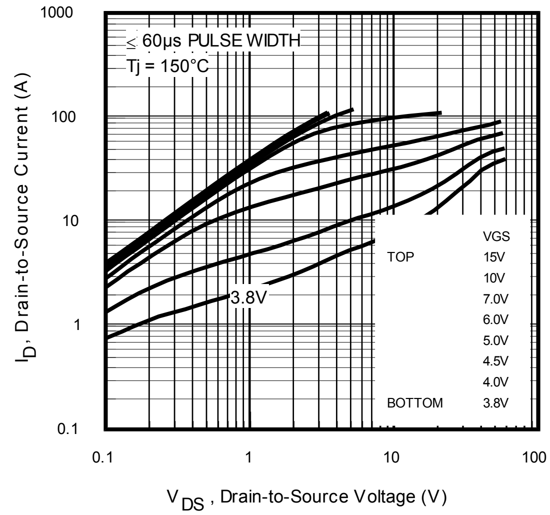


Fig 2. Typical Output Characteristics

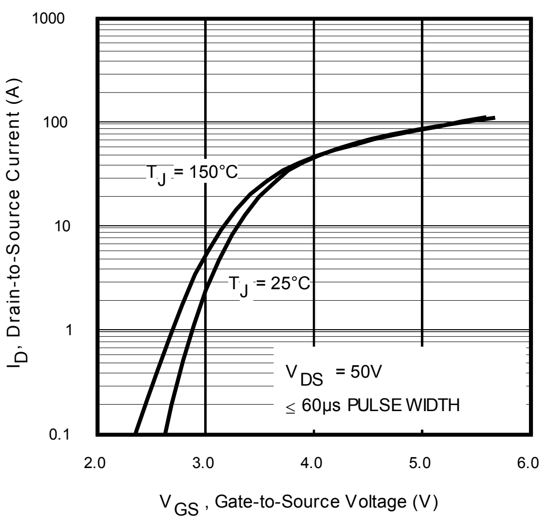


Fig 3. Typical Transfer Characteristics

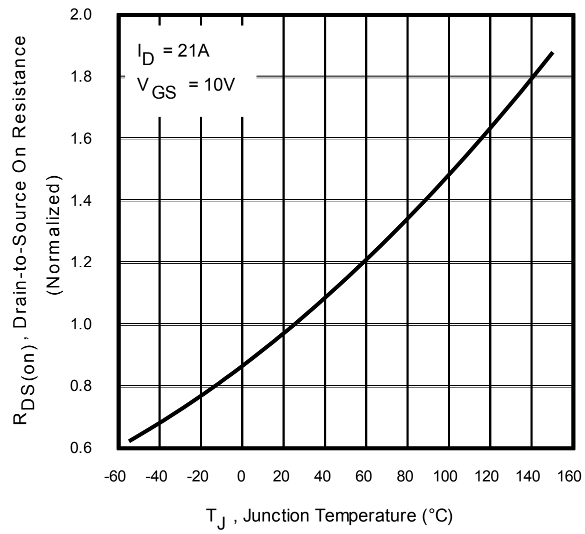
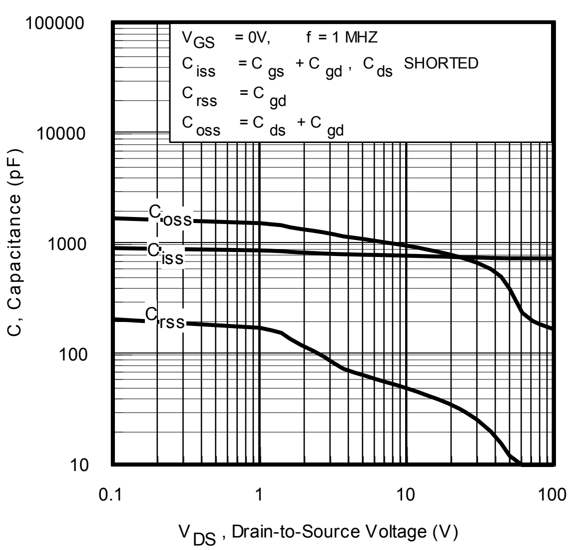


Fig 4. Normalized On-Resistance vs. Temperature



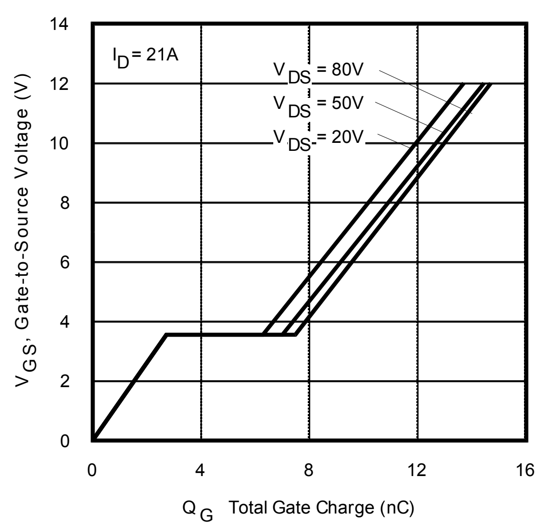


Fig 5.

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

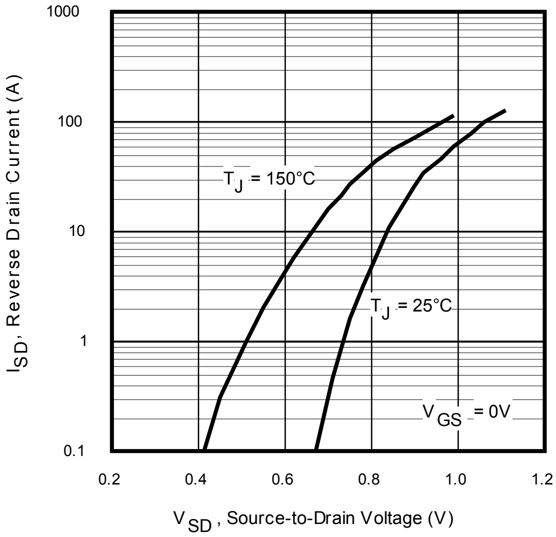


Fig 7. Typical Source-Drain Diode Forward Voltage

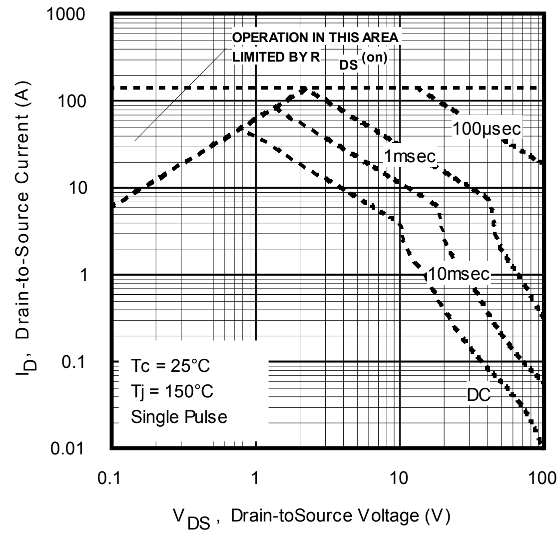


Fig 8. Maximum Safe Operating Area

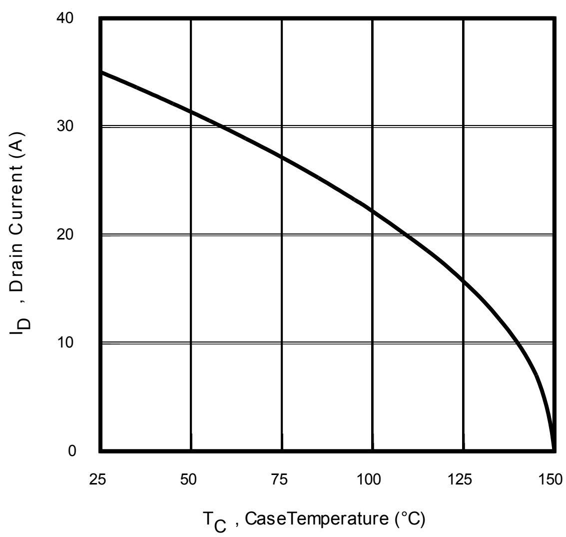


Fig 9. Maximum Drain Current vs. Case Temperature

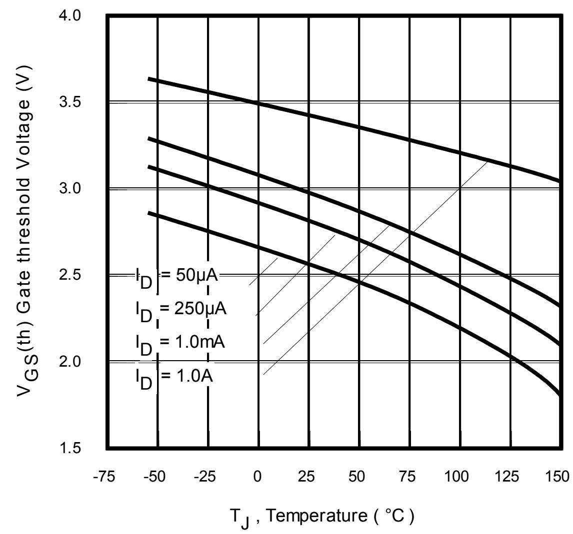


Fig 10. Threshold Voltage vs. Temperature

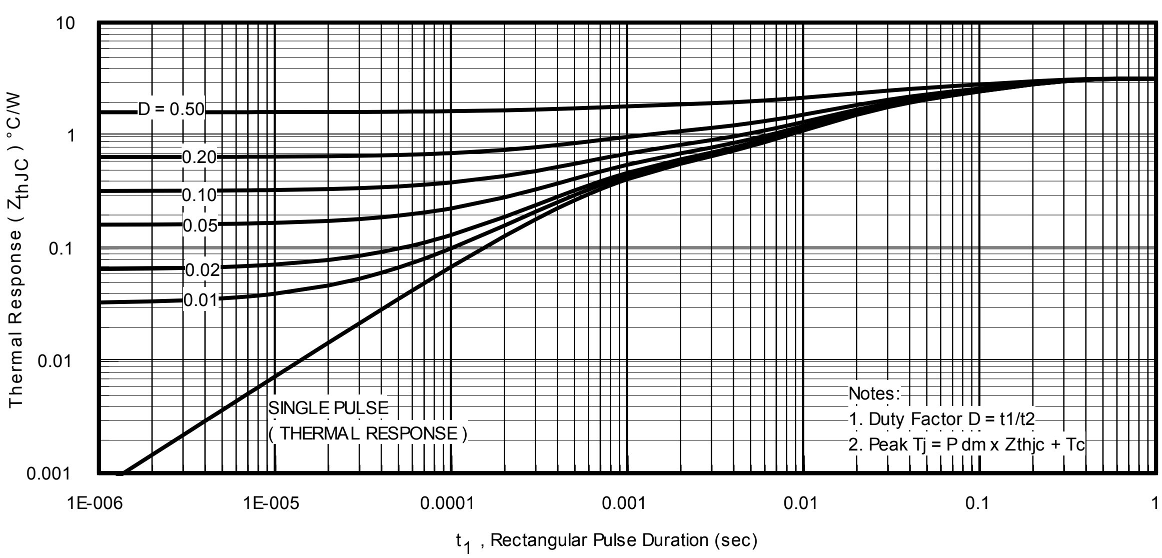


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

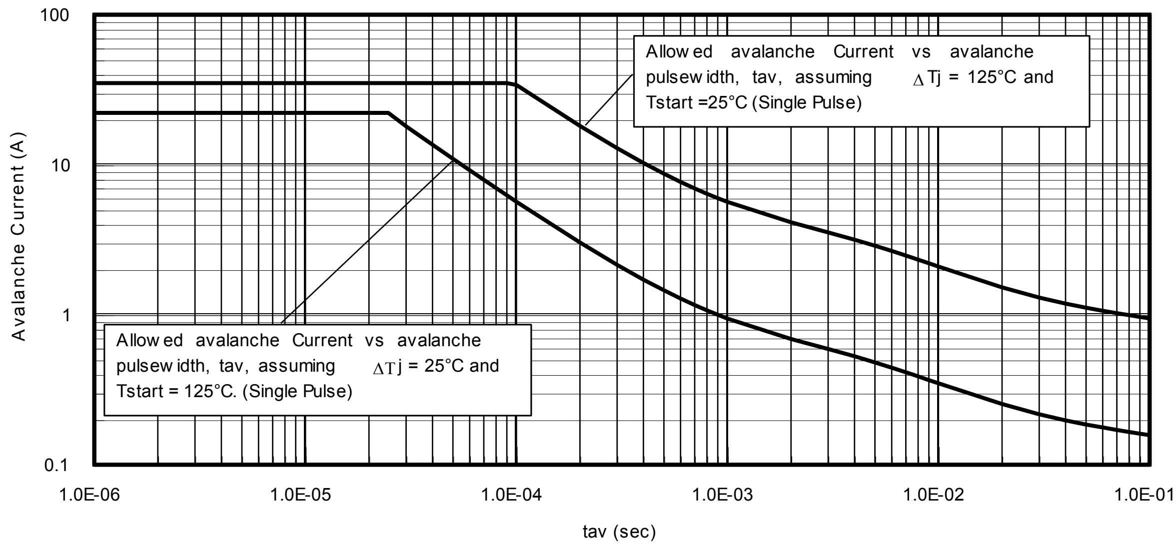


Fig 12. Typical Avalanche Current vs. Pulse Width

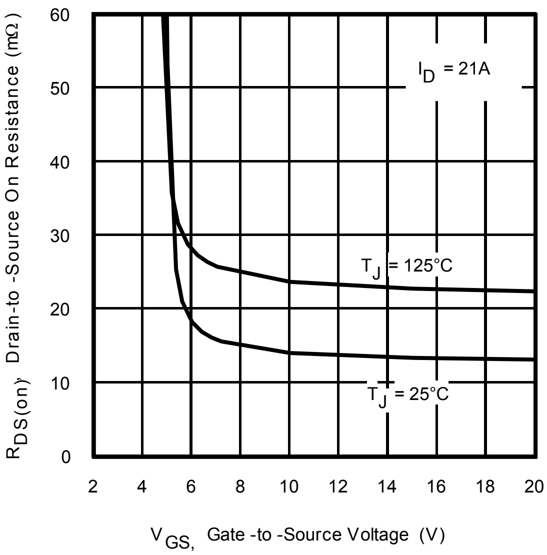


Fig 13. On–Resistance vs. Gate Voltage

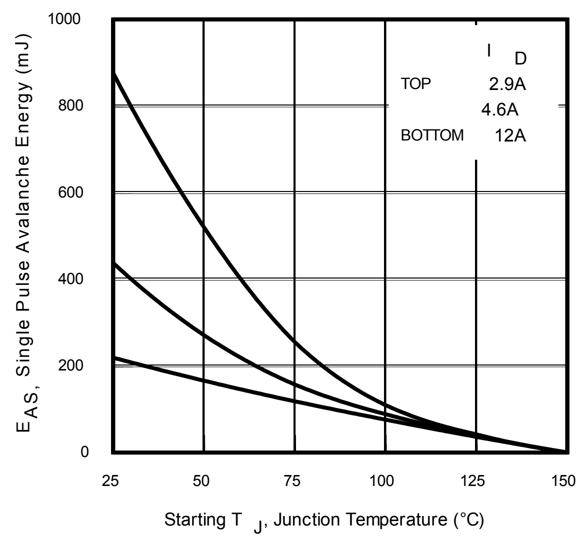
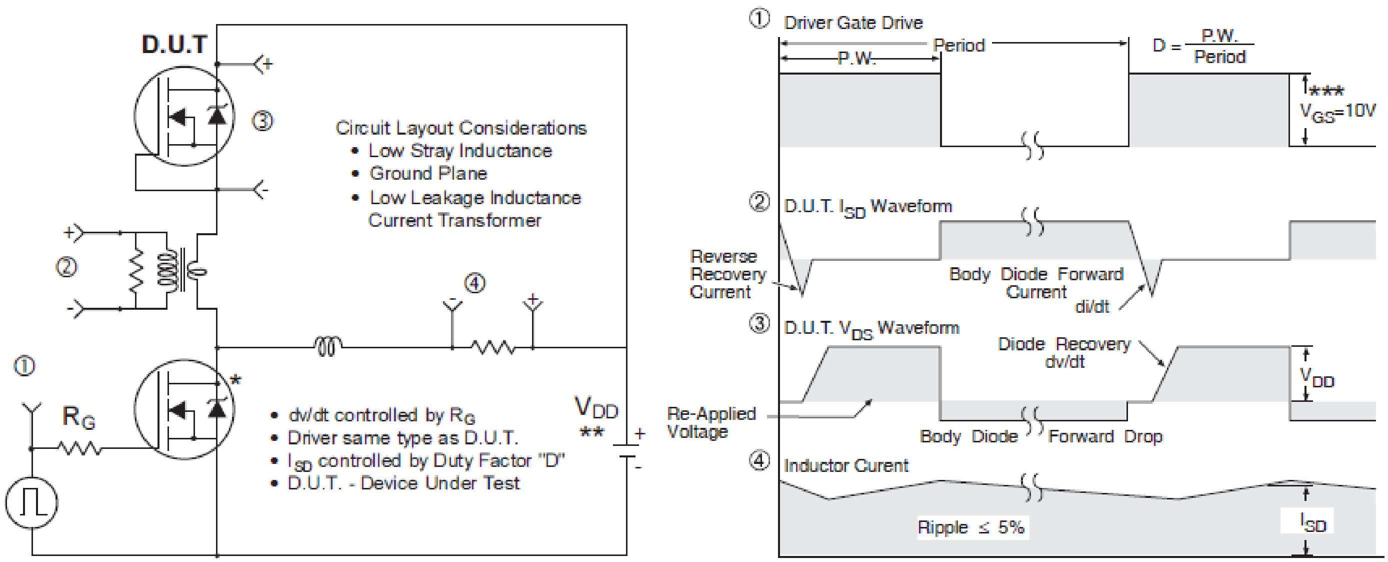


Fig 14. Maximum Avalanche Energy vs. Drain Current



* Use P-Channel Driver for P-Channel Measurements

** Reverse Polarity for P-Channel

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

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

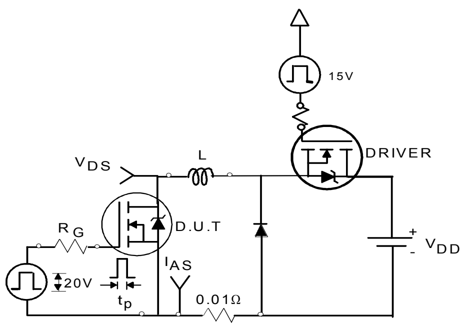


Fig 16a. Unclamped Inductive Test Circuit

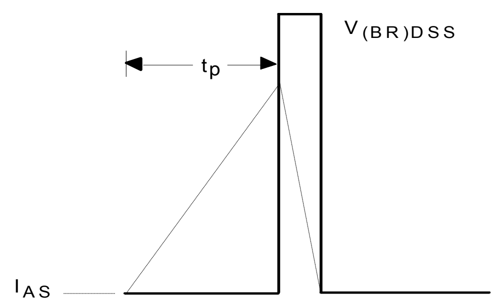


Fig 16b. Unclamped Inductive Waveforms

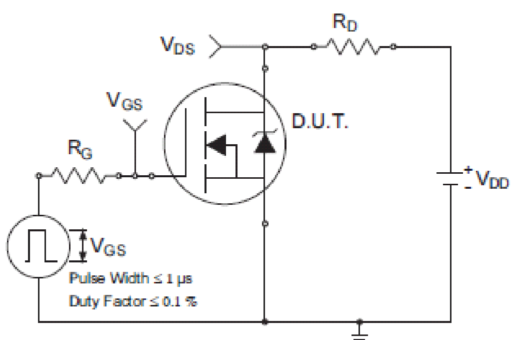


Fig 17a. Switching Time Test Circuit

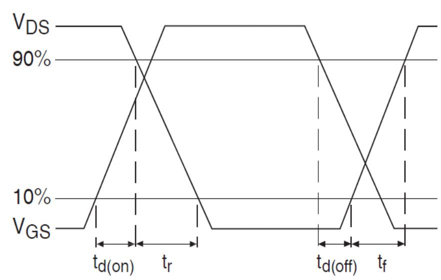


Fig 17b. Switching Time Waveforms

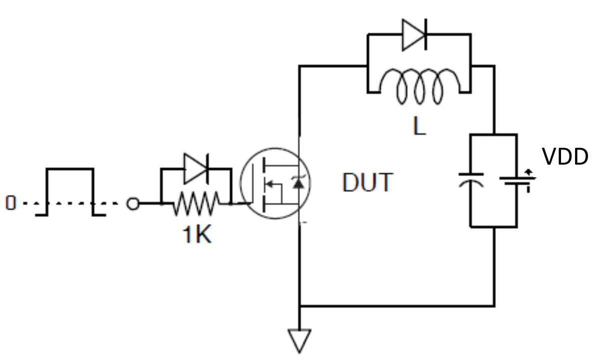


Fig 18. Gate Charge Test Circuit

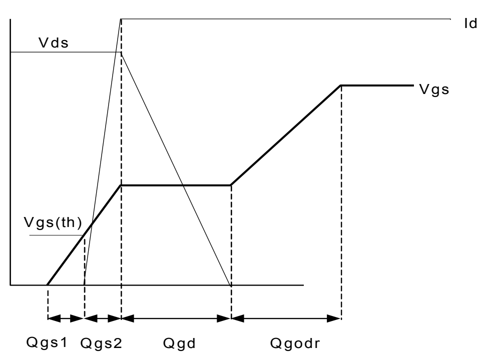
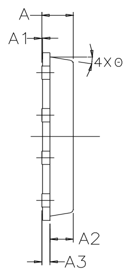
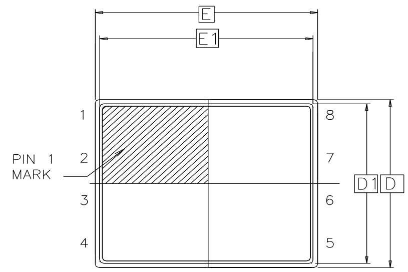


Fig 19. Gate Charge Waveform

PQFN 5x6 Outline "B" Package Details

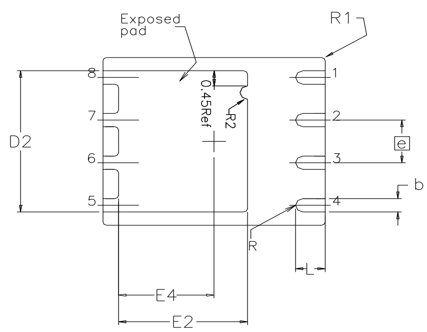


SIDE VIEW



TOP VIEW

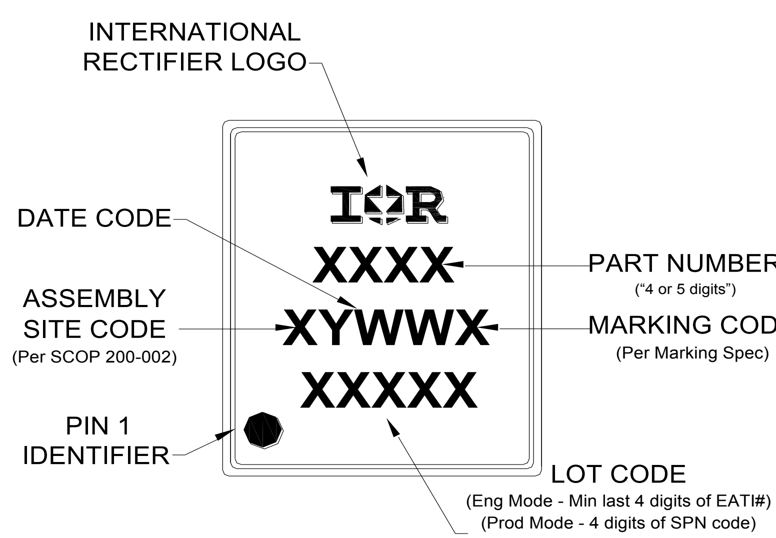
SYMBOL \ DIM	MIN	NOM	MAX
A	0.800	0.830	1.05
A1	0.000	0.020	0.050
A2	0.580	0.630	0.680
A3		0.254 REF	
Θ	0°	10°	12°
b	0.350	0.400	0.470
D	4.850	5.000	5.150
D1	4.675	4.750	5.000
D2	3.700	4.210	4.300
e		1.270 BSC	
E	5.850	6.000	6.150
E1	5.675	5.750	6.000
E2	3.380	3.480	3.760
E4	2.480	2.580	2.680
L	0.550	0.800	0.900
R		0.200 REF	
R1		0.100 REF	
R2	0.150	0.200	0.250



BOTTOM VIEW

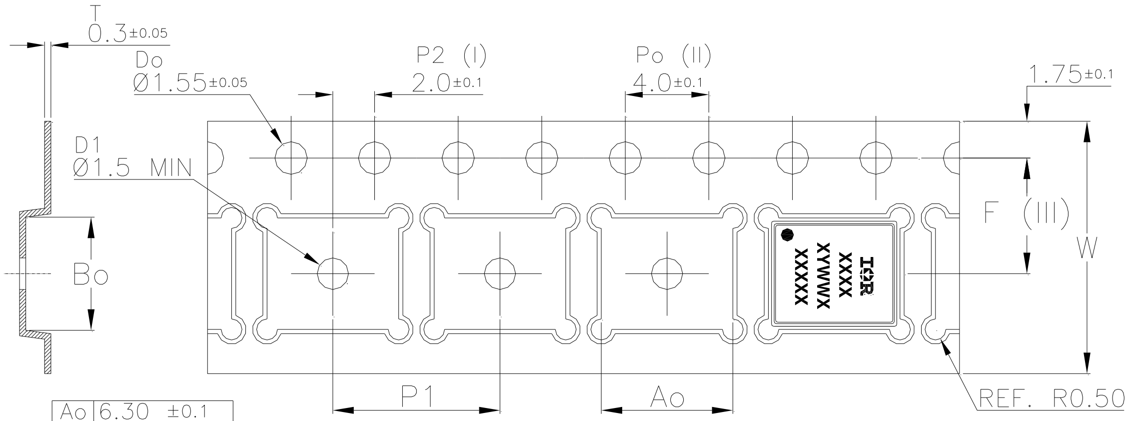
For more information on board mounting, including footprint and stencil recommendation, please refer to application note AN-1136: http://www.irf.com/technical-info/appnotes/an-1136.pdf
For more information on package inspection techniques, please refer to application note AN-1154: http://www.irf.com/technical-info/appnotes/an-1154.pdf

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



Ao	6.30	±0.1
Bo	5.30	±0.1
F	5.50	±0.1
P1	8.00	±0.1
W	12.00	±0.3

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

Qualifiction 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°C, L = 3.0mH, R_G = 50Ω, I_{AS} = 12A.
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 PCB (FR-4). Please refer to AN-994 for more details:
http://www.irf.com/technical-info/appnotes/an-994.pdf

International Rectifier
IR WORLD HEADQUARTERS: 101 N. Sepulveda Blvd., El Segundo, California 90245, USA
To contact International Rectifier, please visit http://www.irf.com/whoto-call/

IMPORTANT NOTICE

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics (“Beschaffenheitsgarantie”) .

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer’s compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer’s products and any use of the product of Infineon Technologies in customer’s applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer’s technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies office (**www.infineon.com**).

WARNINGS

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies’ products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.