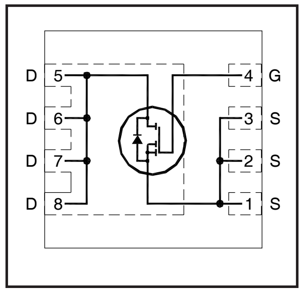
International
IOR Rectifier

PD -97539A

IRFHM831PbF

HEXFET® Power MOSFET

V_{DS}	**30**	**V**
$R_{DS(on)}$ max (@V_{GS} = 10V)	**7.8**	**mΩ**
Q_g (typical)	**7.3**	**nC**
R_G (typical)	**0.5**	**Ω**
I_D (@$T_{c(Bottom)}$ = 25°C)	**40⑥**	**A**



PQFN 3.3mm x 3.3mm

Applications

- Control MOSFET for Buck Converters

Features and Benefits

Features		Benefits
Low Charge (typical 7.3nC)		Lower Switching Losses
Low Thermal Resistance to PCB (<4.7°C/W)		Enable Better Thermal Dissipation
100% Rg tested		Increased Reliability
Low Profile (<1.0mm)	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	
IRFHM831TRPBF	PQFN 3.3mm x 3.3mm	Tape and Reel	4000	
IRFHM831TR2PBF	PQFN 3.3mm x 3.3mm	Tape and Reel	400	

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{DS}	Drain-to-Source Voltage	30	V
V_{GS}	Gate-to-Source Voltage	±20	
I_D @ T_A = 25°C	Continuous Drain Current, V_{GS} @ 10V	14	A
I_D @ T_A = 70°C	Continuous Drain Current, V_{GS} @ 10V	11	
I_D @ $T_{C(Bottom)}$ = 25°C	Continuous Drain Current, V_{GS} @ 10V	40⑥	
I_D @ $T_{C(Bottom)}$ = 100°C	Continuous Drain Current, V_{GS} @ 10V	28	
I_{DM}	Pulsed Drain Current ①	96	
P_D @T_A = 25°C	Power Dissipation ⑤	2.5	W
P_D @ $T_{C(Bottom)}$ = 25°C	Power Dissipation ⑤	27	
	Linear Derating Factor ⑤	0.02	W/°C
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C

Notes ① through ⑥ are on page 8

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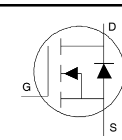
Static @ T_J = 25°C (unless otherwise specified)

	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	—	6.6	7.8	mΩ	V_{GS} = 10V, I_D = 12A ③
		—	10.7	12.6		V_{GS} = 4.5V, I_D = 12A ③
$V_{GS(th)}$	Gate Threshold Voltage	1.35	1.8	2.35	V	V_{DS} = V_{GS}, I_D = 25μA
$\Delta V_{GS(th)}$	Gate Threshold Voltage Coefficient	—	-6.8	—	mV/°C	
I_{DSS}	Drain-to-Source Leakage Current	—	—	1.0	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	82	—	—	S	V_{DS} = 15V, I_D = 12A
Q_g	Total Gate Charge	—	16	—	nC	V_{GS} = 10V, V_{DS} = 15V, I_D = 12A
Q_g	Total Gate Charge	—	7.3	11	nC	V_{DS} = 15V
Q_{gs1}	Pre-Vth Gate-to-Source Charge	—	1.7	—		V_{GS} = 4.5V
Q_{gs2}	Post-Vth Gate-to-Source Charge	—	0.9	—		I_D = 12A
Q_{gd}	Gate-to-Drain Charge	—	2.5	—		See Fig.17 & 18
Q_{godr}	Gate Charge Overdrive	—	2.2	—		
Q_{sw}	Switch Charge (Q_{gs2} + Q_{gd})	—	3.4	—		
Q_{oss}	Output Charge	—	5.1	—	nC	V_{DS} = 16V, V_{GS} = 0V
R_G	Gate Resistance	—	0.5	—	Ω	
$t_{d(on)}$	Turn-On Delay Time	—	6.9	—	ns	V_{DD} = 15V, V_{GS} = 4.5V
t_r	Rise Time	—	12	—		I_D = 12A
$t_{d(off)}$	Turn-Off Delay Time	—	6.2	—		R_G=1.8Ω
t_f	Fall Time	—	4.7	—		See Fig.15
C_{iss}	Input Capacitance	—	1050	—	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	—	190	—		V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	—	80	—		f = 1.0MHz

Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy ②	—	50	mJ
I_{AR}	Avalanche Current ①	—	12	A

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	40⑥	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	96		
V_{SD}	Diode Forward Voltage	—	—	1.0	V	T_J = 25°C, I_S = 12A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	—	15	22	ns	T_J = 25°C, I_F = 12A, V_{DD} = 15V
Q_{rr}	Reverse Recovery Charge	—	16	24	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	—	4.7	°C/W
$R_{\theta JC}$ (Top)	Junction-to-Case ④	—	44	
$R_{\theta JA}$	Junction-to-Ambient ⑤	—	50	
$R_{\theta JA}$ (<10s)	Junction-to-Ambient ⑤	—	32	

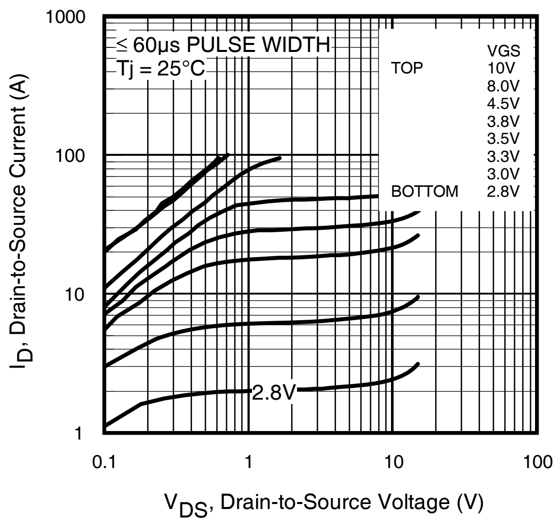


Fig 1. Typical Output Characteristics

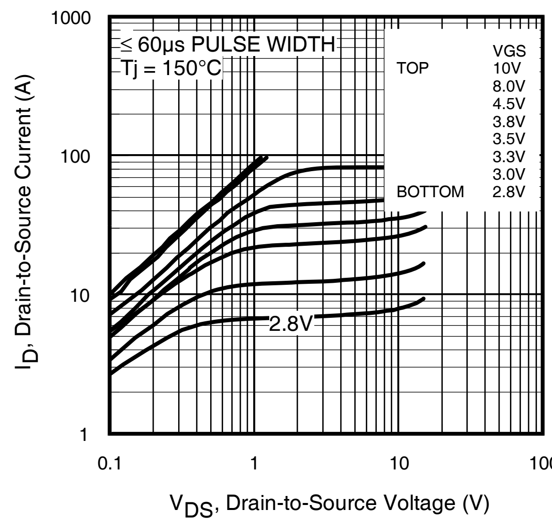


Fig 2. Typical Output Characteristics

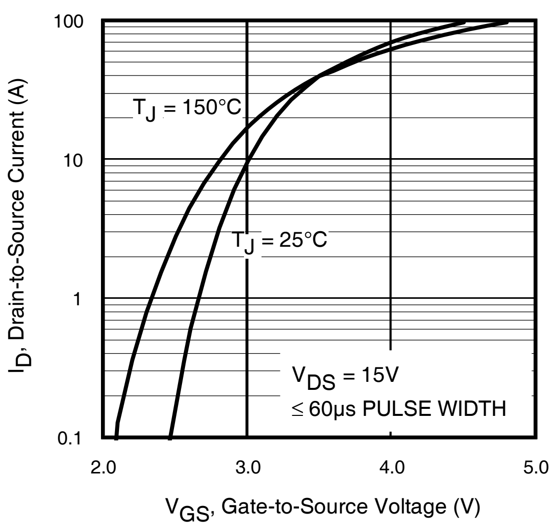


Fig 3. Typical Transfer Characteristics

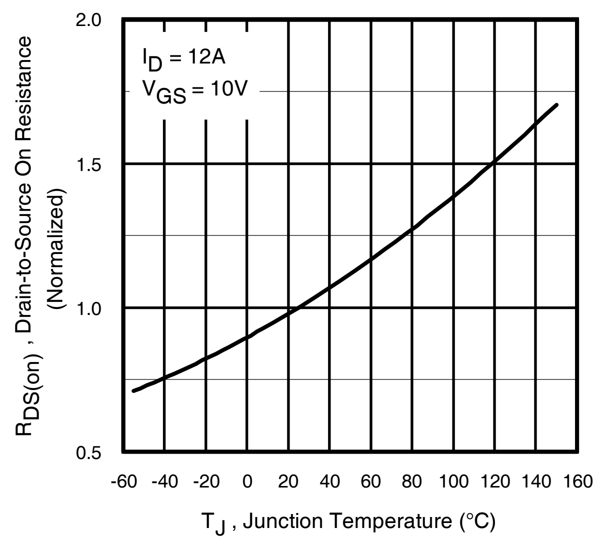


Fig 4. Normalized On-Resistance Vs. Temperature

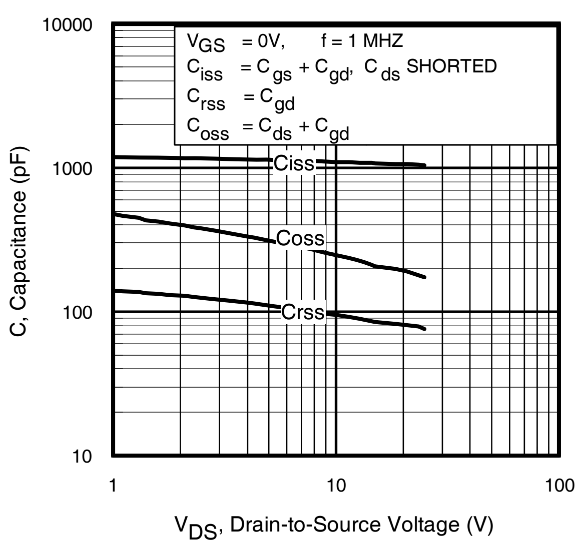


Fig 5. Typical Capacitance Vs.Drain-to-Source Voltage

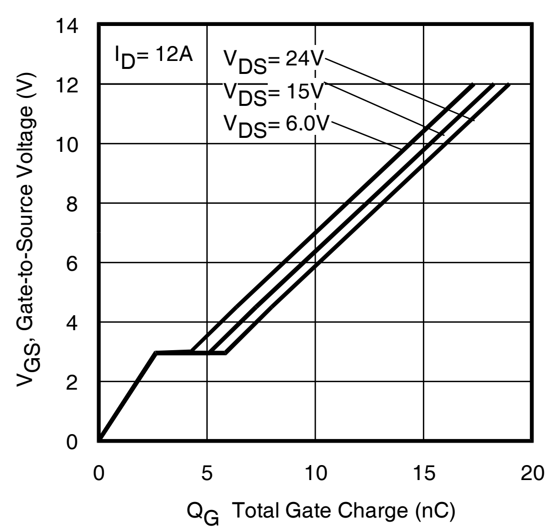


Fig 6. Typical Gate Charge Vs.Gate-to-Source Voltage

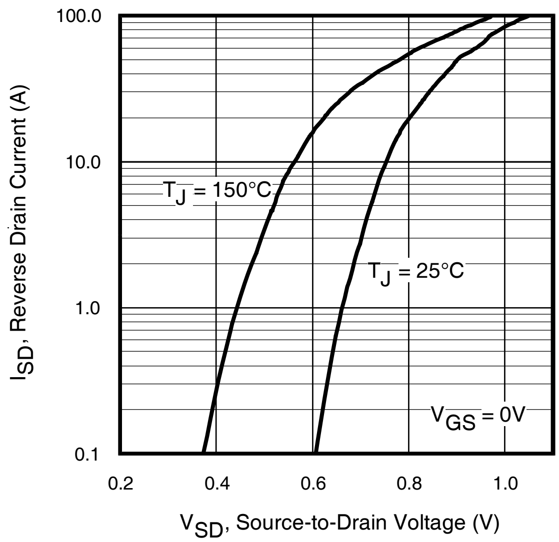


Fig 7. Typical Source-Drain Diode Forward Voltage

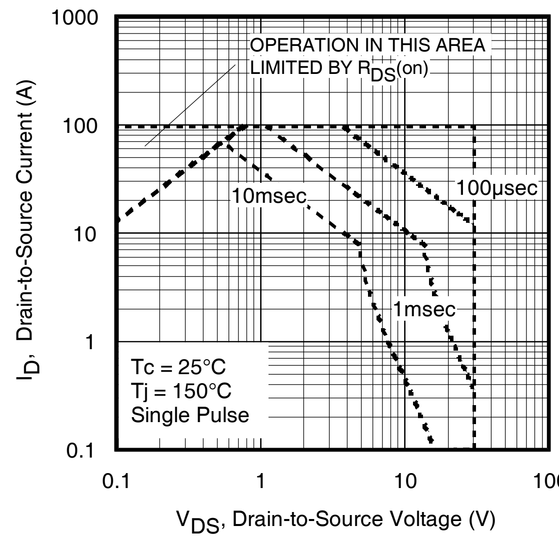


Fig 8. Maximum Safe Operating Area

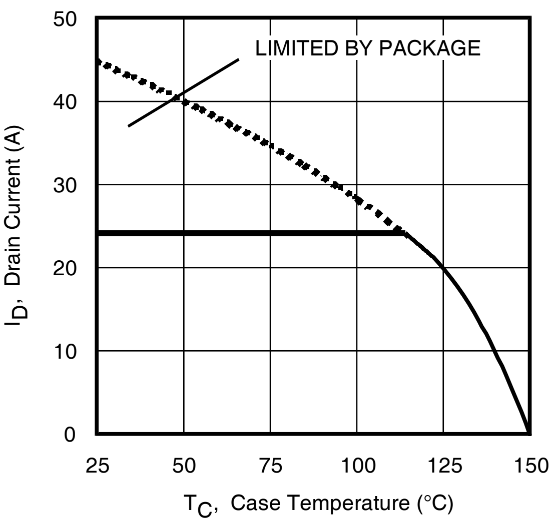


Fig 9. Maximum Drain Current Vs. Case (Bottom) Temperature

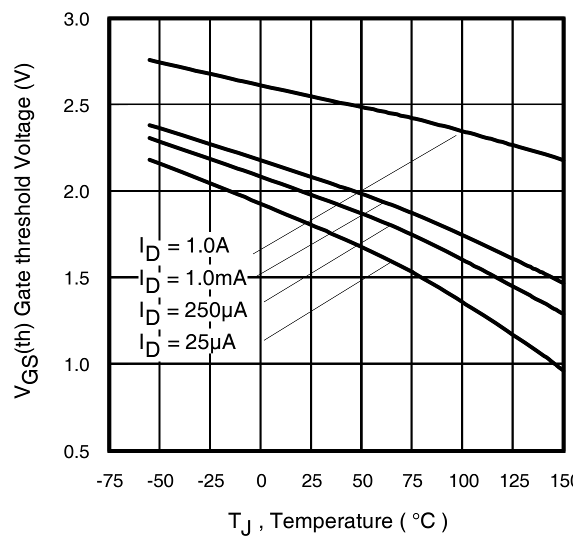


Fig 10. Threshold Voltage Vs. Temperature

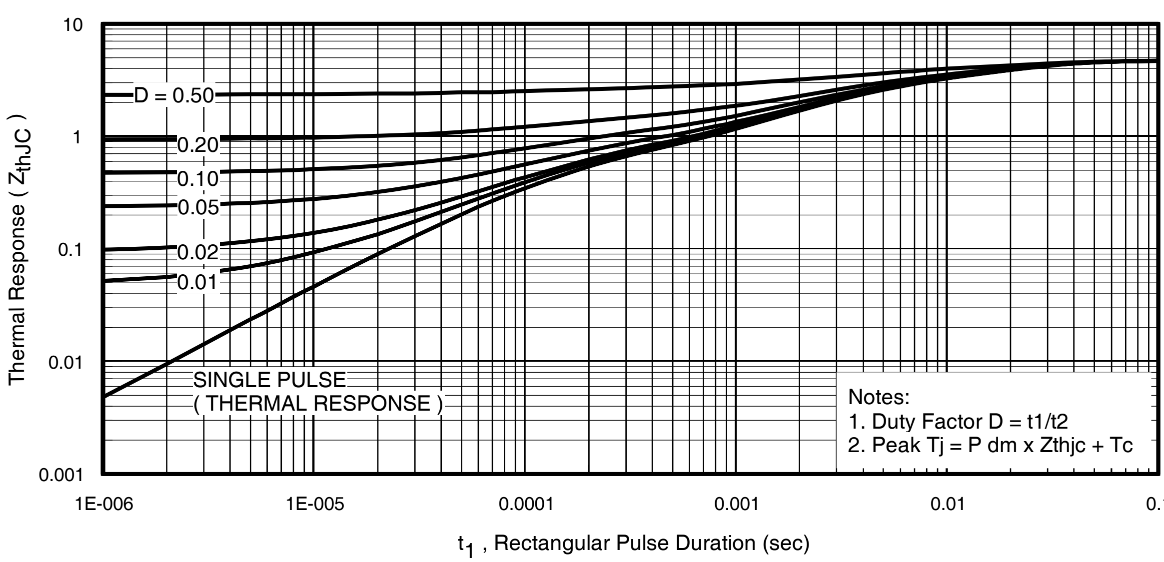


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case (Bottom)

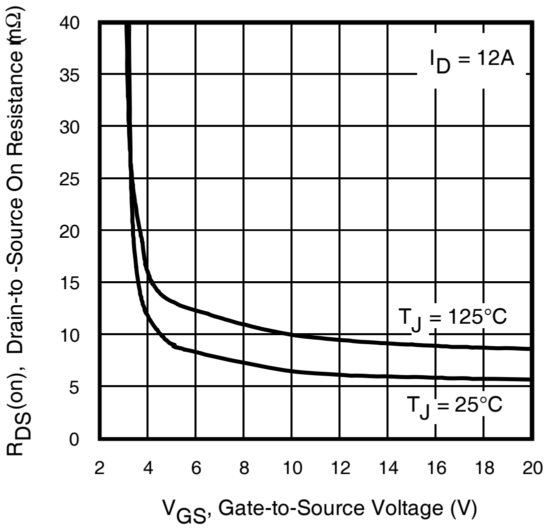


Fig 12. On-Resistance vs. Gate Voltage

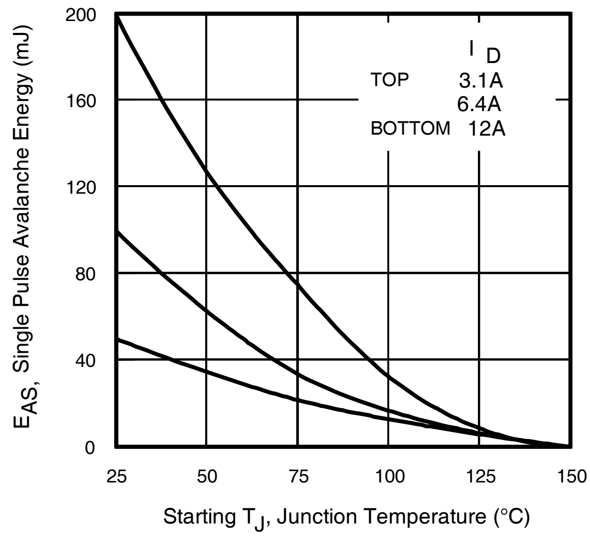


Fig 13. Maximum Avalanche Energy vs. Drain Current

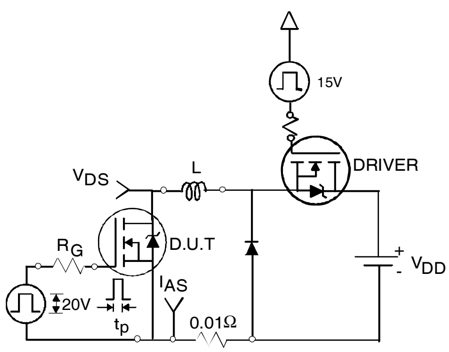


Fig 14a. Unclamped Inductive Test Circuit

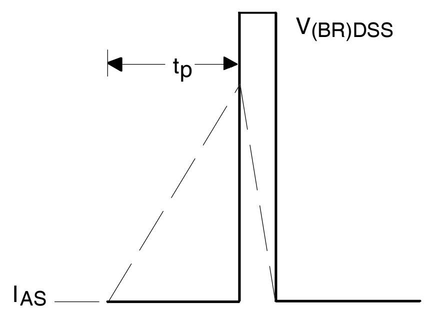


Fig 14b. Unclamped Inductive Waveforms

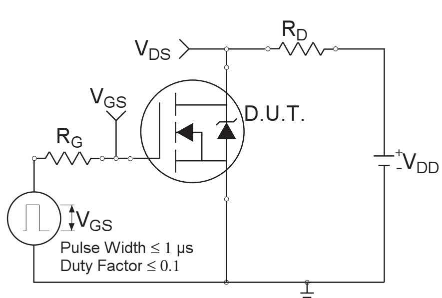


Fig 15a. Switching Time Test Circuit

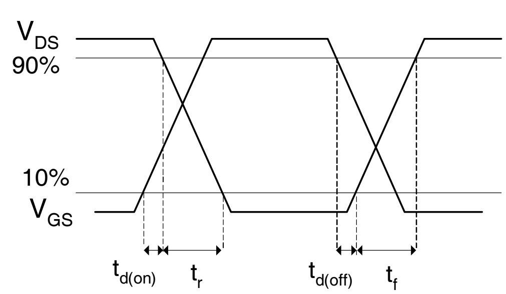
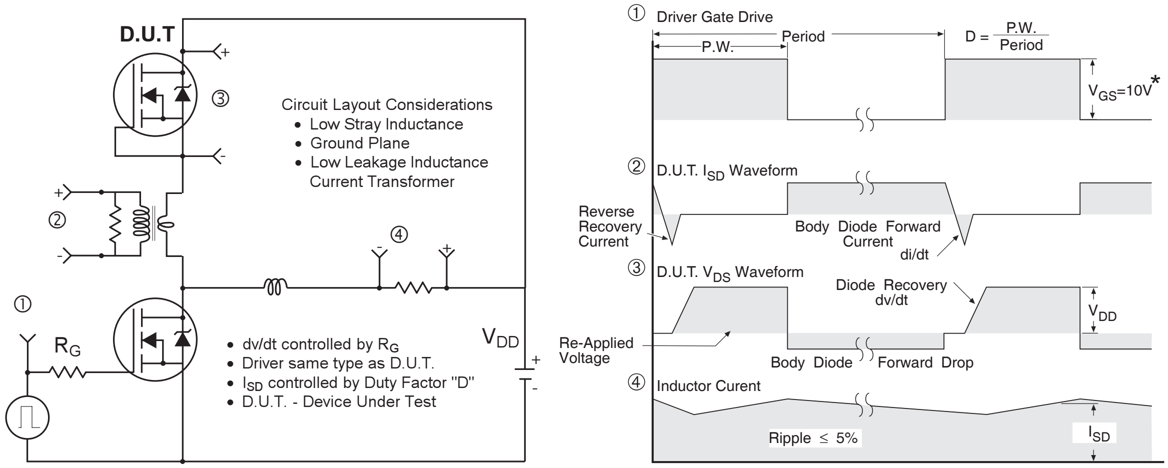


Fig 15b. Switching Time Waveforms



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

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

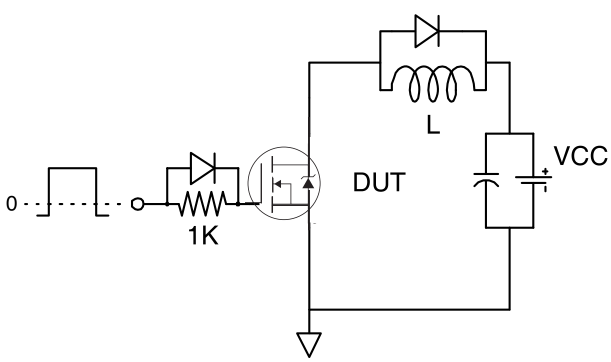


Fig 17. Gate Charge Test Circuit

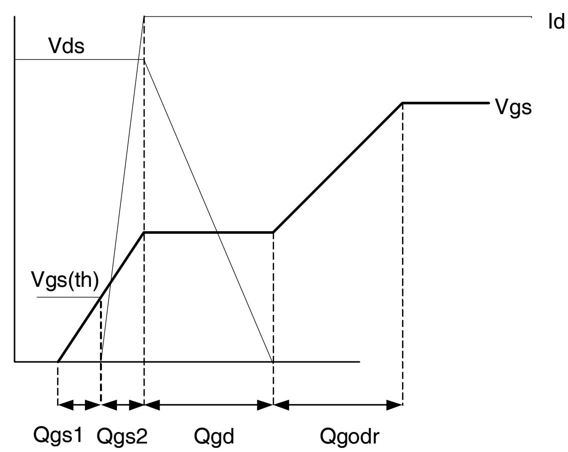
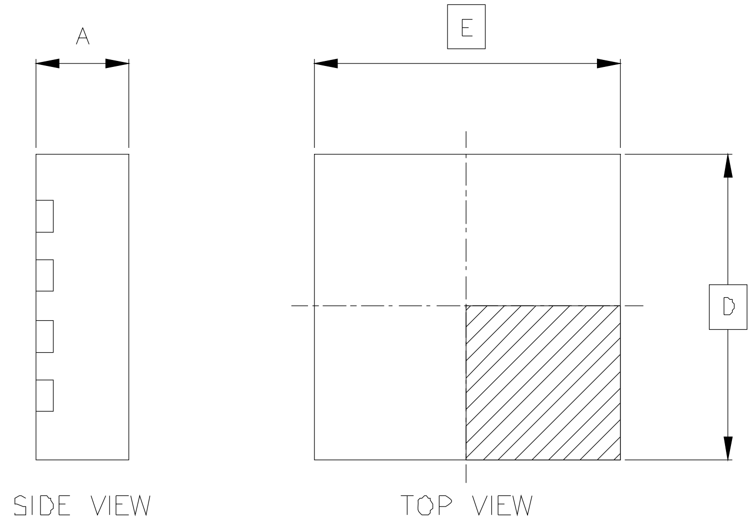
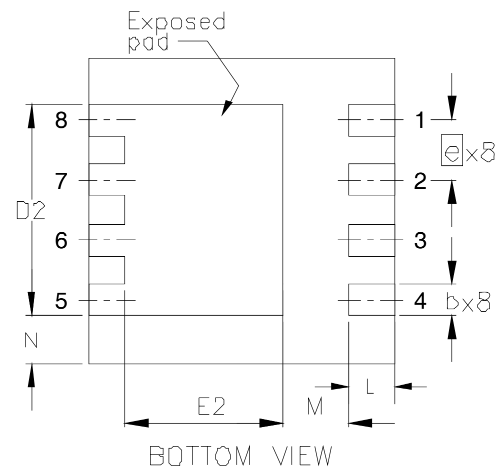


Fig 18. Gate Charge Waveform

PQFN 3.3x3.3 Outline Package Details



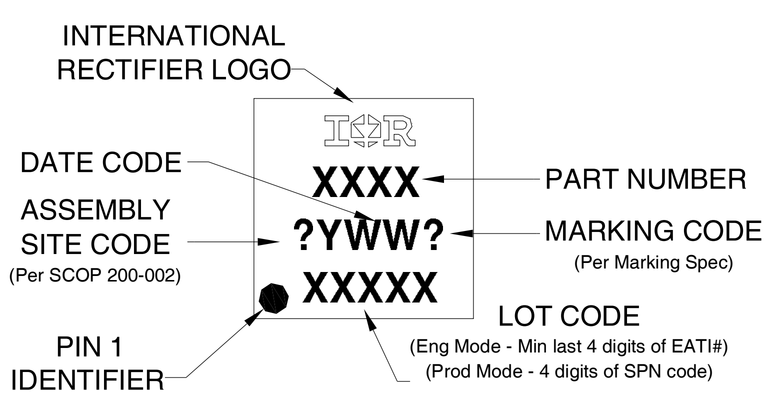
OUTLINE PQFN 3.3x3.3A		
DIM / SYMBOL	MIN	MAX
A	0.80	1.00
b	0.25	0.40
D	3.30 BSC	
D2	2.14	2.39
e	0.65 BSC	
E	3.30 BSC	
E2	1.66	1.91
L	0.30	0.55
M	0.59	—
N	0.505 REF	



For footprint and stencil design recommendations, please refer to application note AN-1154 at
http://www.irf.com/technical-info/appnotes/an-1154.pdf

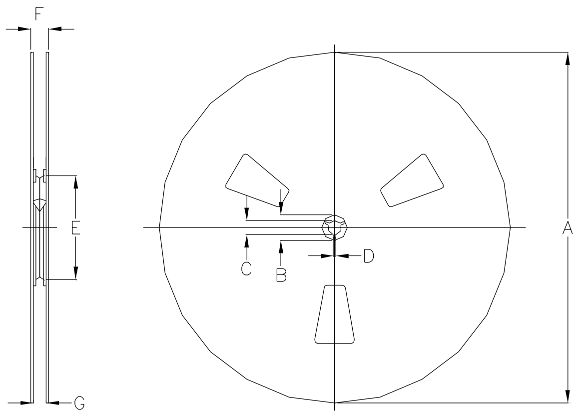
PQFN 3.3x3.3 Part Marking

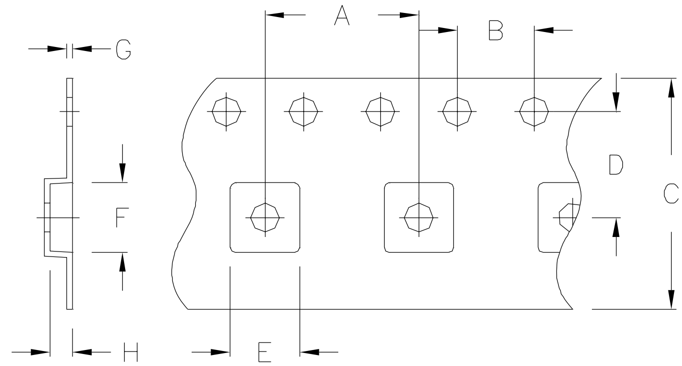
3.3x3.3 PQFN PART MARKING DETAIL



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

PQFN 3.3x3.3 Tape and Reel





NOTE: Controlling dimensions in mm
Std reel quantity is 4000 parts.

REEL DIMENSIONS				
STANDARD OPTION **(QTY 4000)**				
	METRIC		IMPERIAL	
CODE	MIN	MAX	MIN	MAX
A	326.0	330.25	12.835	13.002
B	20.2	20.45	0.795	0.805
C	12.8	13.50	0.504	0.531
D	1.5	2.5	0.059	0.098
E	102.0 REF		4.016 REF	
F	17.8	18.3	0.701	0.720
G	12.4	12.9	0.488	0.508

DIMENSIONS				
	METRIC		IMPERIAL	
CODE	MIN	MAX	MIN	MAX
A	7.90	8.10	0.311	0.319
B	3.90	4.10	0.154	0.161
C	11.70	12.30	0.461	0.484
D	5.45	5.55	0.215	0.219
E	3.50	3.70	0.138	0.146
F	3.50	3.70	0.138	0.146
G	0.25	0.35	0.010	0.014
H	1.10	1.30	0.043	0.051

Qualification Information†

Qualification level	Industrial†† (per JEDEC JESD47F††† guidelines)	
Moisture Sensitivity Level	PQFN 3.3mm x 3.3mm	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 = 0.69mH, 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 2 oz copper pad on 1.5x1.5 in. board of FR-4 material.
⑥ Calculated continouous current based on maximum allowable junction temperature. Package is limited to 40A by production test capability.

Data and specifications subject to change without notice.

International
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