HEXFET® POWER MOSFET

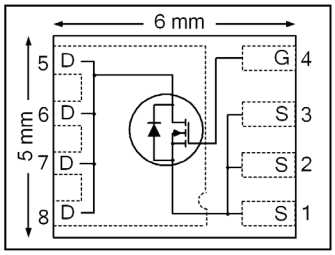
Features

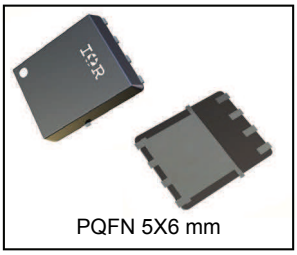
- Advanced Process Technology
- Ultra Low On-Resistance
- 175°C Operating Temperature
- Fast Switching
- Repetitive Avalanche Allowed up to Tjmax
- Lead-Free, RoHS Compliant
- Automotive Qualified *

V_{DSS}	75V
$R_{DS(on)}$ max (@V_{GS} = 10V)	8.5mΩ
$Q_{G\ (typical)}$	51nC
I_D (@$T_{C\ (Bottom)}$ = 25°C)	75A

Description

Specifically designed for Automotive applications, this HEXFET® Power MOSFET utilizes the latest processing techniques to achieve extremely low on-resistance per silicon are. Additional features of this design are a 175°C junction operating temperature, fast switching speed and improved repetitive avalanche rating. These features combine to make this product an extremely efficient and reliable device for use in Automotive and wide variety of other applications.





G	D	S
Gate	Drain	Source

Applications

- Injection
- Heavy Loads
- DC-DC Converter

Base Part Number	Package Type	Standard Pack		Complete Part Number
		Form	Quantity	
AUIRFN7107	PQFN 5mm x 6mm	Tape and Reel	4000	AUIRFN7107TR

Absolute Maximum Ratings

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only; and functional operation of the device at these or any other condition beyond those indicated in the specifications is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions. Ambient temperature (TA) is 25°C, unless otherwise specified.

	Parameter	Max.	Units
V_{DS}	Drain-to-Source Voltage	75	V
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	12	
I_D @ $T_{C(Bottom)}$ = 25°C	Continuous Drain Current, V_{GS} @ 10V	75⑥	
I_D @ $T_{C(Bottom)}$ = 100°C	Continuous Drain Current, V_{GS} @ 10V	53⑥	
I_{DM}	Pulsed Drain Current ①	300	
P_D @T_A = 25°C	Power Dissipation	4.4	W
P_D @$T_{C(Bottom)}$ = 25°C	Power Dissipation	125	
	Linear Derating Factor	0.029	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy ②	123	mJ
I_{AR}	Avalanche Current ①	45	A
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C

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*Qualification standards can be found at http://www.irf.com/

Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$ (Bottom)	Junction-to-Case ④	–––	1.2	°C/W
$R_{\theta JC}$ (Top)	Junction-to-Case ④	–––	27	
$R_{\theta JA}$	Junction-to-Ambient ⑤	–––	34	
$R_{\theta JA}$ (<10s)	Junction-to-Ambient ⑤	–––	22	

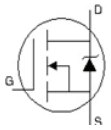
Static Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	75	–––	–––	V	V_{GS} = 0V, I_D = 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	–––	0.074	–––	V/°C	Reference to 25°C, I_D = 1.0mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	–––	6.9	8.5	mΩ	V_{GS} = 10V, I_D = 45A ③
$V_{GS(th)}$	Gate Threshold Voltage	2.0	–––	4.0	V	V_{DS} = V_{GS}, I_D = 100µA
R_G	Internal Gate Resistance	–––	0.82	–––	Ω	
gfs	Forward Transconductance	73	–––	–––	S	V_{DS} = 25V, I_D = 45A
I_{DSS}	Drain-to-Source Leakage Current	–––	–––	20	µA	V_{DS} = 75V, V_{GS} = 0V
		–––	–––	250		V_{DS} = 75V, 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

Dynamic Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge	–––	51	77	nC	I_D = 45A
Q_{gs}	Gate-to-Source Charge	–––	15	–––		V_{DS} = 38V
Q_{gd}	Gate-to-Drain ("Miller") Charge	–––	14	–––		V_{GS} = 10V
Q_{sync}	Total Gate Charge Sync. (Q_g - Q_{gd})	–––	37	–––		I_D = 45A, V_{DS} =0V, V_{GS} = 10V
$t_{d(on)}$	Turn-On Delay Time	–––	8.0	–––	ns	V_{DD} = 75V
t_r	Rise Time	–––	12	–––		I_D = 45A
$t_{d(off)}$	Turn-Off Delay Time	–––	19	–––		R_G = 1.8Ω
t_f	Fall Time	–––	7.0	–––		V_{GS} = 10V ③
C_{iss}	Input Capacitance	–––	3001	–––	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	–––	371	–––		V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	–––	151	–––		*f* = 1.0 MHz

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	–––	–––	75	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	–––	–––	300	A	
V_{SD}	Diode Forward Voltage	–––	0.85	1.3	V	T_J = 25°C, I_S = 45A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	–––	28	–––	ns	T_J = 25°C, I_F = 45A, V_{DD} = 38V
Q_{rr}	Reverse Recovery Charge	–––	145	–––	nC	di/dt = 500A/µs ③

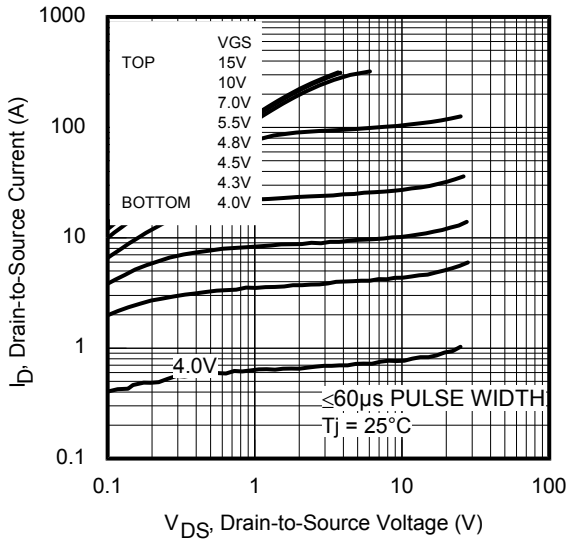


Fig. 1 Typical Output Characteristics

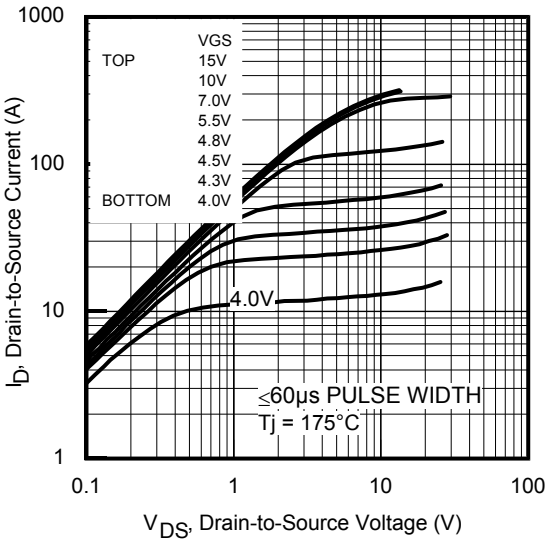


Fig. 2 Typical Output Characteristics

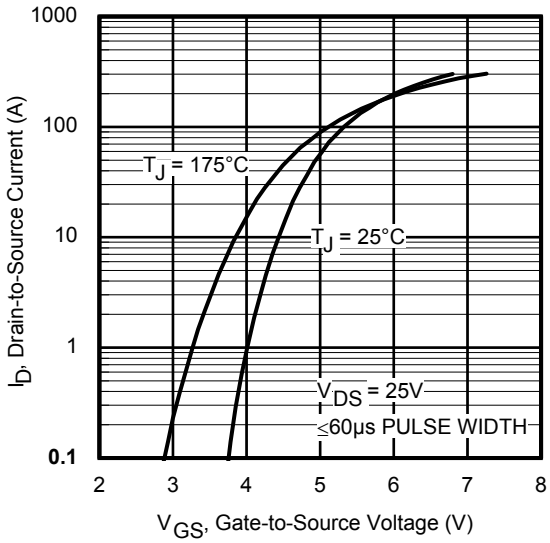


Fig. 3 Typical Transfer Characteristics

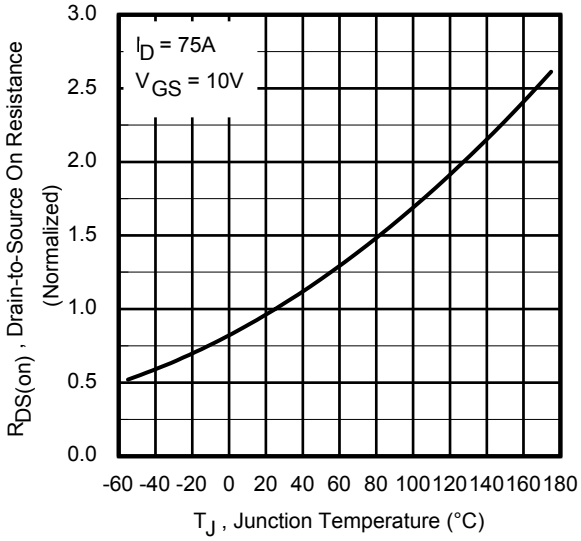


Fig. 4 Normalized On-Resistance vs. Temperature

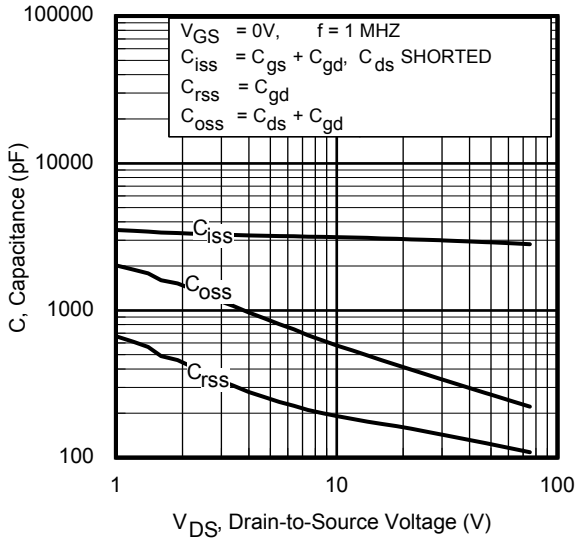


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

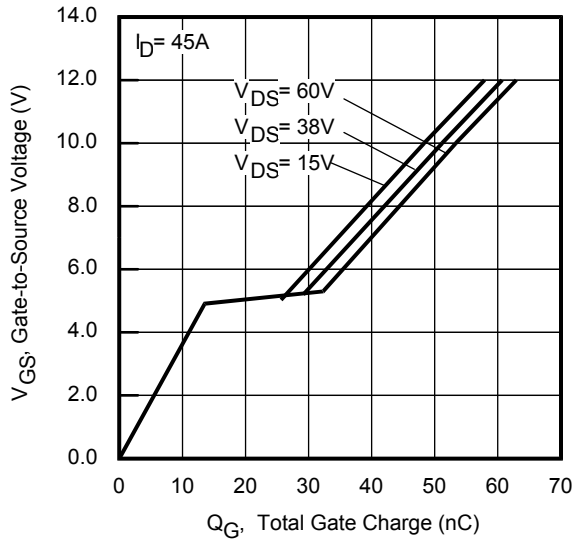


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

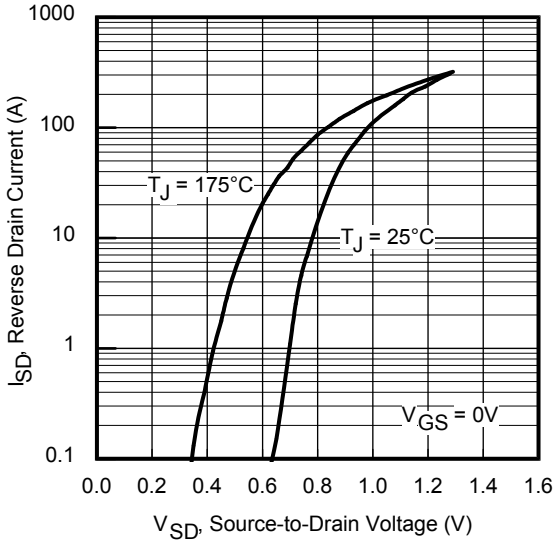


Fig. 7 Typical Source-to-Drain Diode Forward Voltage

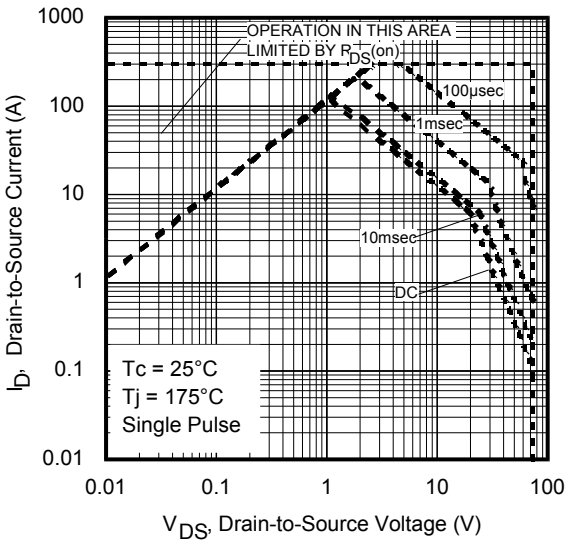


Fig 8. Maximum Safe Operating Area

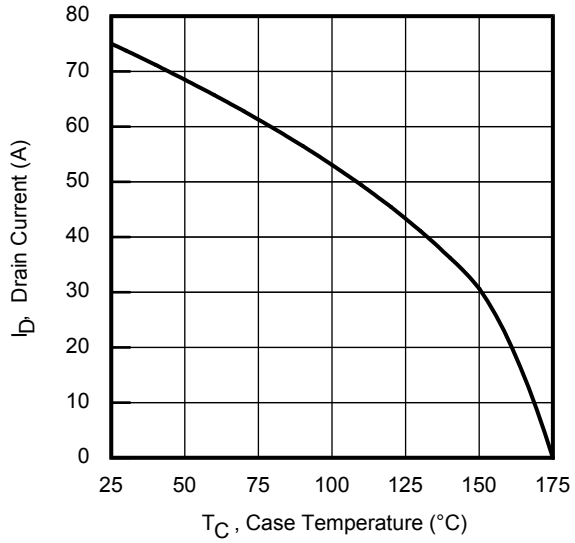


Fig 9. Maximum Drain Current vs. Case Temperature

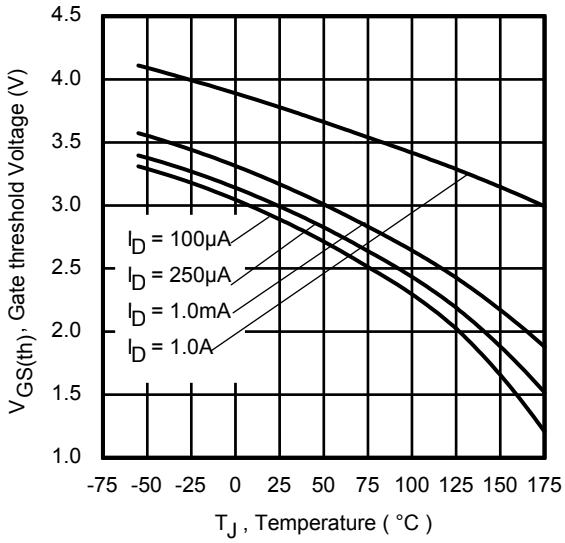


Fig 10. Threshold Voltage vs. Temperature

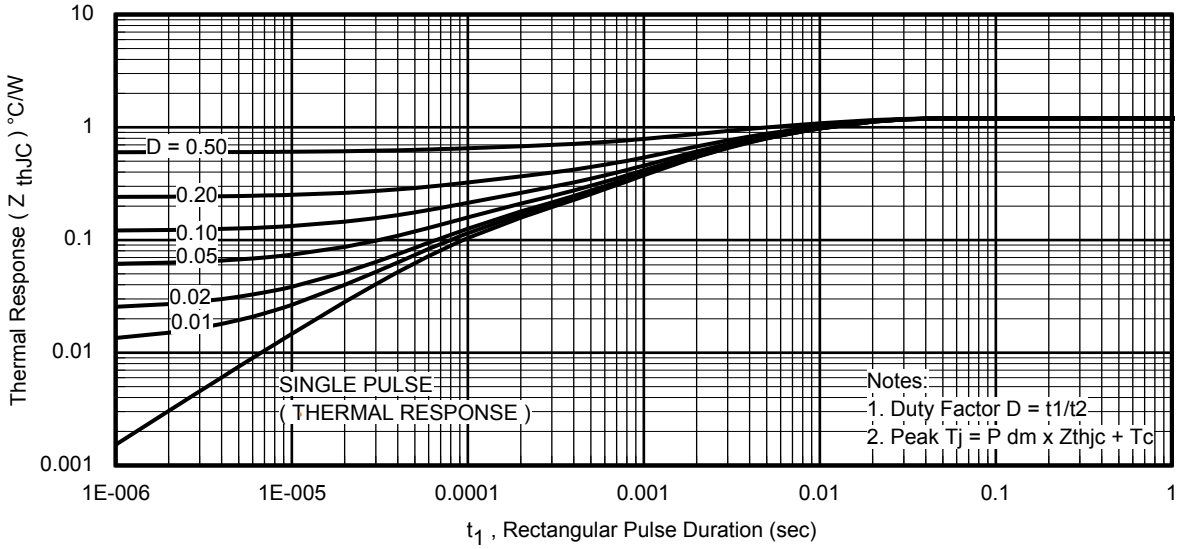


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

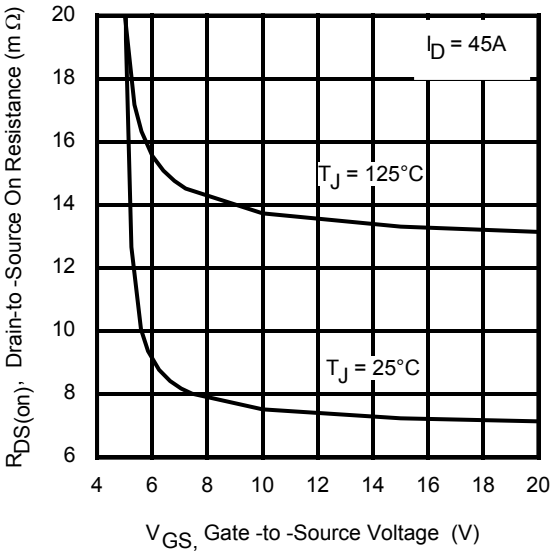


Fig 12. Typical On-Resistance vs. Gate Voltage

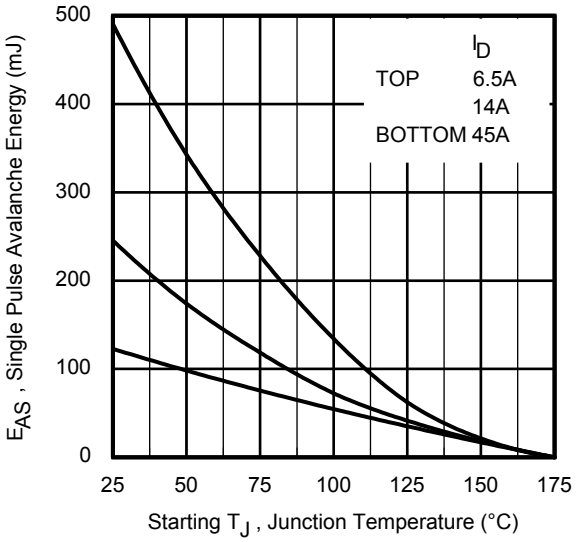


Fig 13. Maximum Avalanche Energy vs. Drain Current

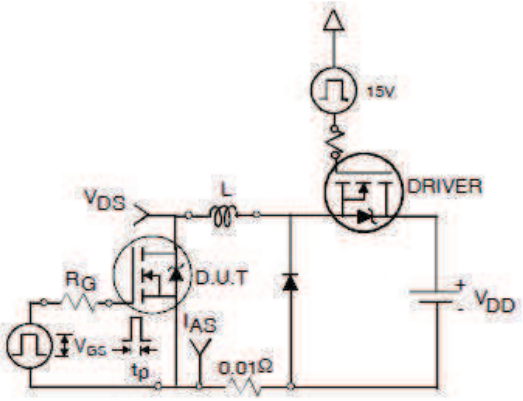


Fig 14a. Unclamped Inductive Test Circuit

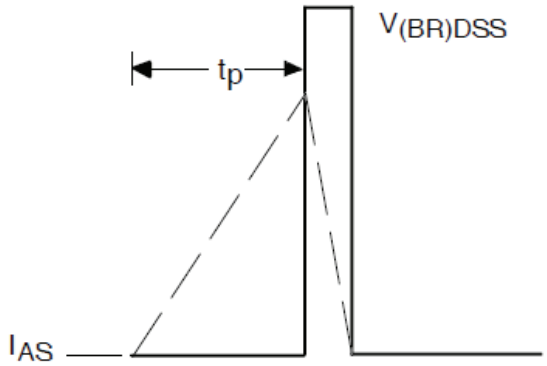


Fig 14b. Unclamped Inductive Waveforms

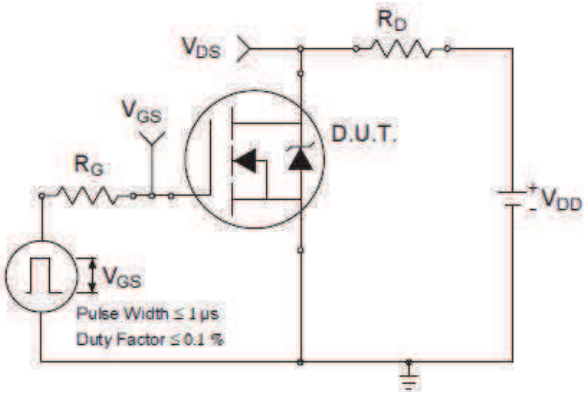


Fig 15a. Switching Time Test Circuit

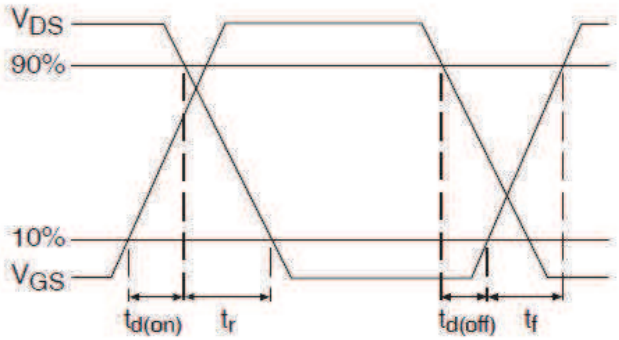


Fig 15b. Switching Time Waveforms

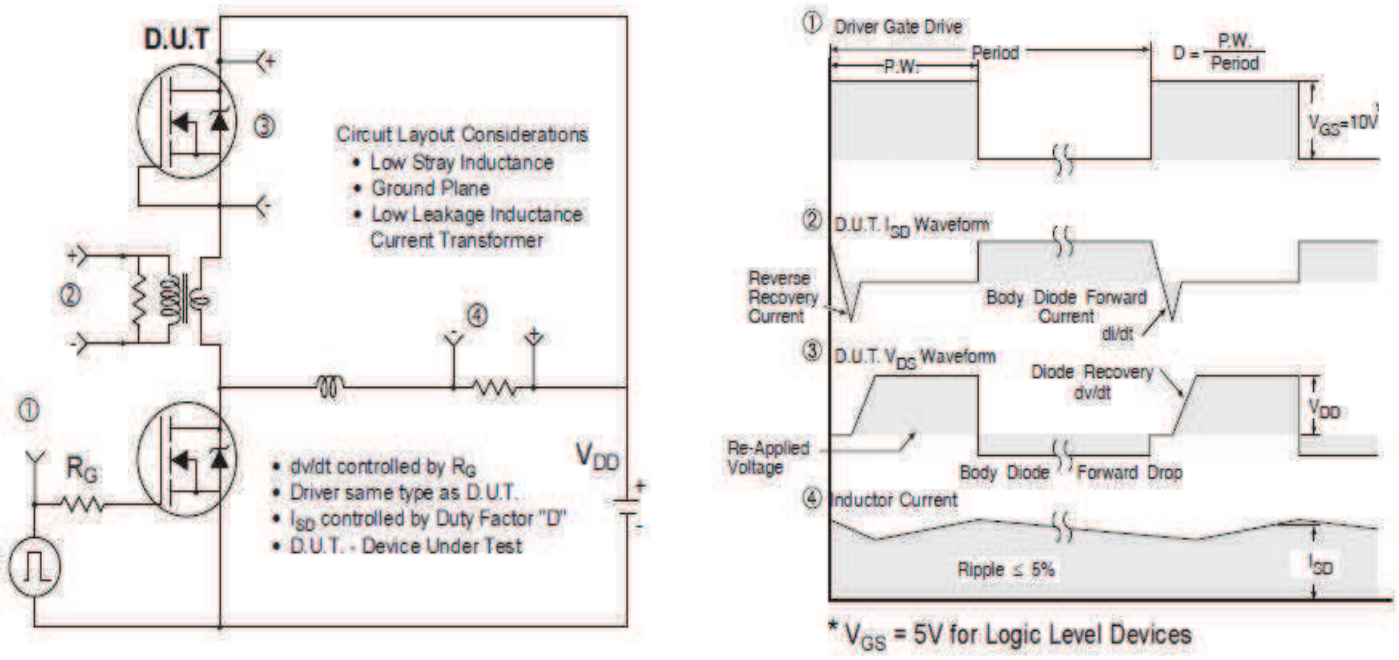


Fig 16. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

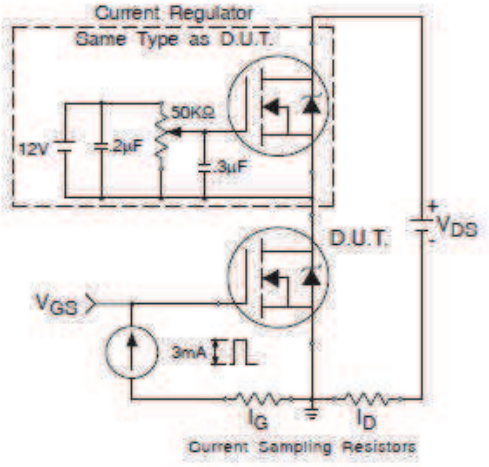


Fig 17a. Gate Charge Test Circuit

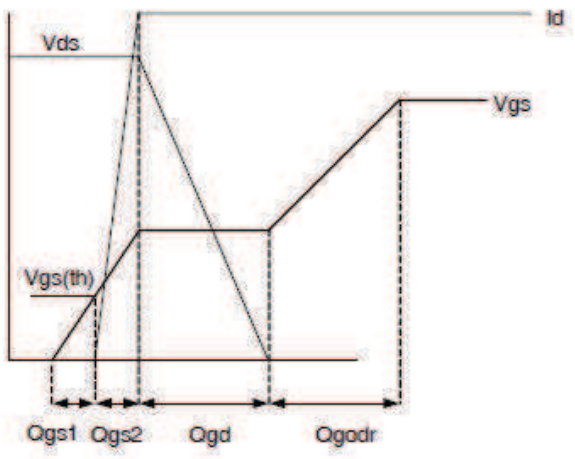
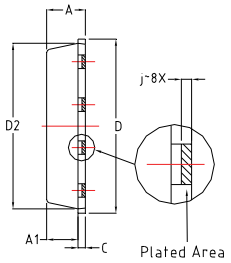
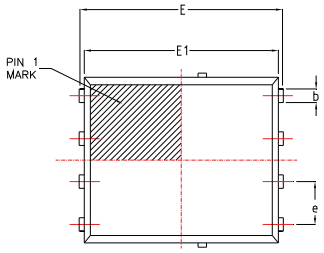


Fig 17b. Gate Charge Waveform

PQFN 5x6 Outline "E" Package Details

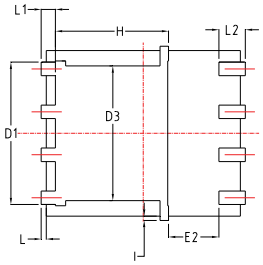


SIDE VIEW



TOP VIEW

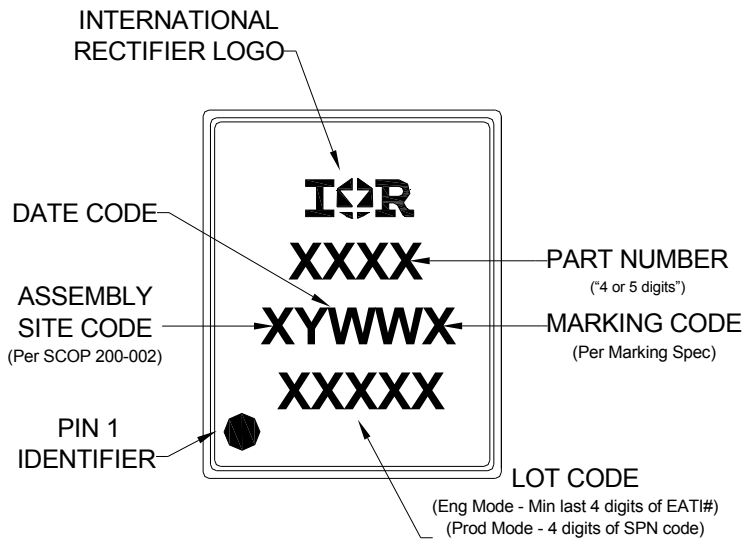
DIM	MM		
	MIN	NOM	MAX
A	0.90	1.10	1.17
A1	0.824	0.897	0.97
b	0.33	0.41	0.50
c	0.150	0.20	0.250
D	4.80	4.98	5.15
D1	3.91	4.22	4.36
D2	4.80	4.90	5.00
D3	3.85	4.00	4.15
E	5.90	6.05	6.15
E1	5.65	5.76	5.85
E2	1.10	/	/
e	1.27 BSC		
L	0.05	0.15	0.25
L1	0.38	0.425	0.50
L2	0.51	0.785	0.86
H	3.25	3.35	3.58
I	0	/	0.18
j	0.1015 BSC		



BOTTOM VIEW

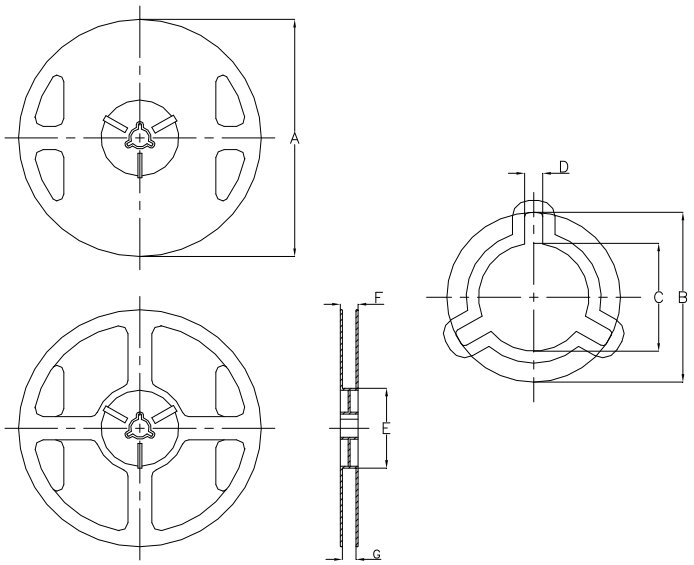
For more information on board mounting, including footprint and stencil recommendation, please refer to application note AN-1136: http://www.irf.com/technical-info/appnotes/an-1136.pdf
For more information on package inspection techniques, please refer to application note AN-1154: http://www.irf.com/technical-info/appnotes/an-1154.pdf

PQFN 5x6 Outline "E" Part Marking



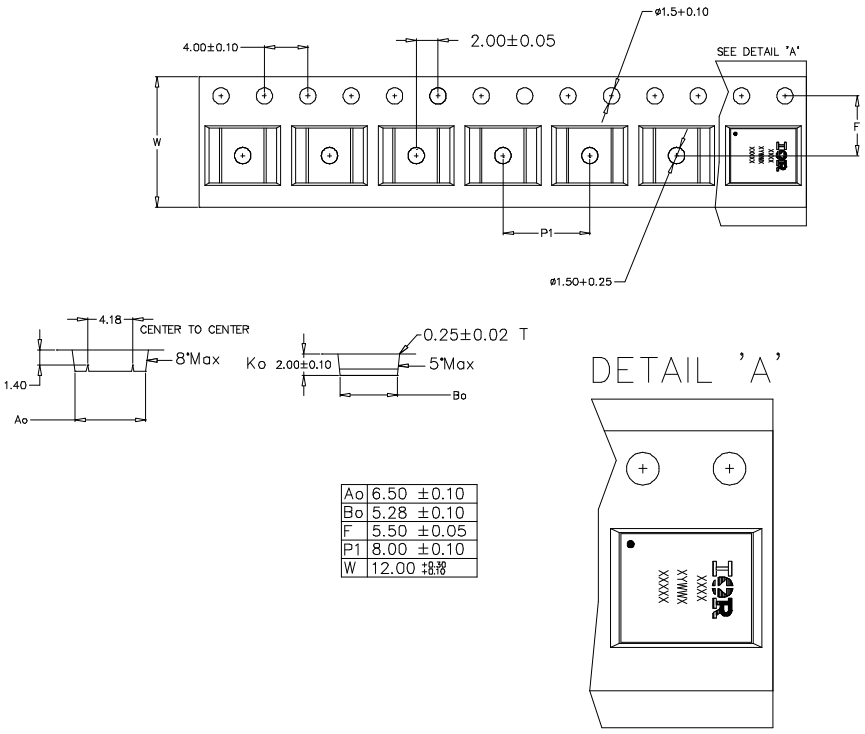
Note: For the most current drawing please refer to IR website at http://www.irf.com/package/

PQFN 5x6 Outline "E" Tape and Reel



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

REEL DIMENSIONS				
STANDARD OPTION **(QTY 4000)** TR				
	METRIC		IMPERIAL	
CODE	MIN	MAX	MIN	MAX
A	329.5	330.5	12.972	13.011
B	20.9	21.5	0.823	0.846
C	12.8	13.5	0.504	0.532
D	1.7	2.3	0.067	0.091
E	97	99	3.819	3.898
F	Ref	17.4		
G	13	14.5	0.512	0.571



Ao	6.50 ±0.10
Bo	5.28 ±0.10
F	5.50 ±0.05
P1	8.00 ±0.10
W	12.00 +0.30 −0.10

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

Qualification Information†

Qualification Level		Automotive (per AEC-Q101)	
		Comments: This part number(s) passed Automotive qualification. IR's Industrial and Consumer qualification level is granted by extension of the higher Automotive level.	
Moisture Sensitivity Level		PQFN 5x6	MSL1
ESD	Human Body Model	Class H1C (+/- 2000V)†† AEC-Q101-001	
	Charged Device Model	Class C5 (+/- 2000V)†† AEC-Q101-005	
RoHS Compliant		Yes	

† Qualification standards can be found at International Rectifier's web site: http//www.irf.com/

†† Highest passing voltage.

Notes:

① Repetitive rating; pulse width limited by max. junction temperature.

② Starting T_J = 25°C, L =0.12mH, R_G = 50Ω, I_{AS} = 45A.

③ Pulse width ≤ 400μs; duty cycle ≤ 2%.

④ R_θ is measured at TJ of approximately 90°C.

⑤ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994: http://www.irf.com/technical-info/appnotes/an-994.pdf

⑥ Calculated continuous current based on maximum allowable junction temperature.

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http://www.irf.com/technical-info/

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