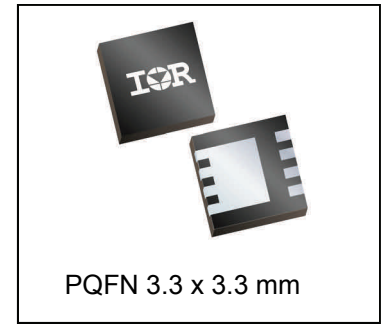
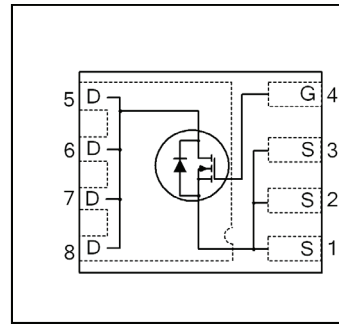




**THE DATASHEET OF  
IRLHM620TR2PBF**



$V_{DSS}$	<b>20</b>	<b>V</b>
$V_{GS}$	<b>±12</b>	<b>V</b>
$R_{DS(on) max}$ (@ $V_{GS} = 4.5V$ )	<b>2.5</b>	<b>mΩ</b>
(@ $V_{GS} = 2.5V$ )	<b>3.5</b>	
$Q_g$ (typical)	<b>52</b>	<b>nC</b>
$I_D$ (@ $T_{C(Bottom)} = 25^\circ C$ )	<b>40</b> Ⓞ	<b>A</b>



**Applications**

- Battery Operated DC Motor Inverter MOSFET
- Secondary Side Synchronous Rectification MOSFET

**Features**

Low $R_{DS(on)}$ (< 2.5mΩ)
Low Thermal Resistance to PCB (<3.4°C/W)
Low Profile (< 1.0 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
Enable better thermal dissipation
Increased Power Density
Multi-Vendor Compatibility
Easier Manufacturing
Environmentally Friendlier
Increased Reliability

Orderable part number	Package Type	Standard Pack		Note
		Form	Quantity	
IRLHM620TRPbF	PQFN 3.3mm x 3.3mm	Tape and Reel	4000	
IRLHM620TR2PbF	PQFN 3.3mm x 3.3mm	Tape and Reel	400	EOL notice # 259

**Absolute Maximum Ratings**

	Parameter	Max.	Units
$V_{DS}$	Drain-to-Source Voltage	20	V
$V_{GS}$	Gate-to-Source Voltage	± 12	
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 4.5V$	26	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ 4.5V$	21	
$I_D @ T_{C(Bottom)} = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 4.5V$	40Ⓞ	
$I_D @ T_{C(Bottom)} = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 4.5V$	40Ⓞ	
$I_{DM}$	Pulsed Drain Current ①	160	
$P_D @ T_A = 25^\circ C$	Power Dissipation ⑤	2.7	W
$P_D @ T_{C(Bottom)} = 25^\circ C$	Power Dissipation ⑤	37	
	Linear Derating Factor ⑤	0.022	W/°C
$T_J$ $T_{STG}$	Operating Junction and Storage Temperature Range	-55 to + 150	°C

Notes ① through ⑥ are on page 9

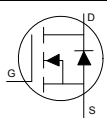
Static @ T<sub>J</sub> = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV <sub>DSS</sub>	Drain-to-Source Breakdown Voltage	20	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	5.4	—	mV/°C	Reference to 25°C, I <sub>D</sub> = 1mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	1.5	2.2	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A ③
		—	1.8	2.5		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 20A ③
		—	2.7	3.5		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 20A ③
V <sub>GS(th)</sub>	Gate Threshold Voltage	0.5	0.8	1.1	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 50μA
ΔV <sub>GS(th)</sub>	Gate Threshold Voltage Coefficient	—	-4.3	—	mV/°C	
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	1	μA	V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V
		—	—	150		V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C
I <sub>GSS</sub>	Gate-to-Source Forward Leakage	—	—	100	nA	V <sub>GS</sub> = 12V
	Gate-to-Source Reverse Leakage	—	—	-100		V <sub>GS</sub> = -12V
g <sub>fs</sub>	Forward Transconductance	58	—	—	S	V <sub>DS</sub> = 10V, I <sub>D</sub> = 20A
Q <sub>g</sub>	Total Gate Charge	—	52	78	nC	V <sub>DS</sub> = 10V
Q <sub>gs</sub>	Gate-to-Source Charge	—	6.3	—		V <sub>GS</sub> = 4.5V
Q <sub>gd</sub>	Gate-to-Drain Charge	—	25	—		I <sub>D</sub> = 20A (See Fig.17 & 18)
R <sub>G</sub>	Gate Resistance	—	2.6	—	Ω	
t <sub>d(on)</sub>	Turn-On Delay Time	—	7.5	—	ns	V <sub>DD</sub> = 10V, V <sub>GS</sub> = 4.5V I <sub>D</sub> = 20A R <sub>G</sub> = 1.0Ω See Fig.15
t <sub>r</sub>	Rise Time	—	25	—		
t <sub>d(off)</sub>	Turn-Off Delay Time	—	57	—		
t <sub>f</sub>	Fall Time	—	37	—		
C <sub>iss</sub>	Input Capacitance	—	3620	—	pF	V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance	—	900	—		V <sub>DS</sub> = 10V
C <sub>rss</sub>	Reverse Transfer Capacitance	—	620	—		f = 1.0MHz

Avalanche Characteristics

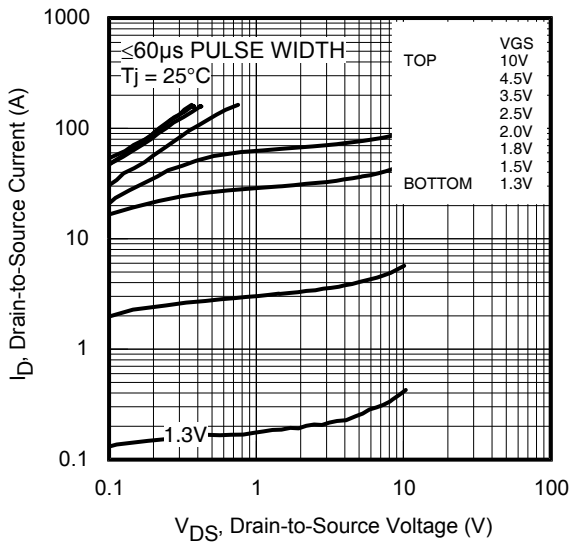
	Parameter	Typ.	Max.	Units
E <sub>AS</sub> (Thermally limited)	Single Pulse Avalanche Energy ②	—	120	mJ
I <sub>AR</sub>	Avalanche Current ①	—	20	A

Diode Characteristics

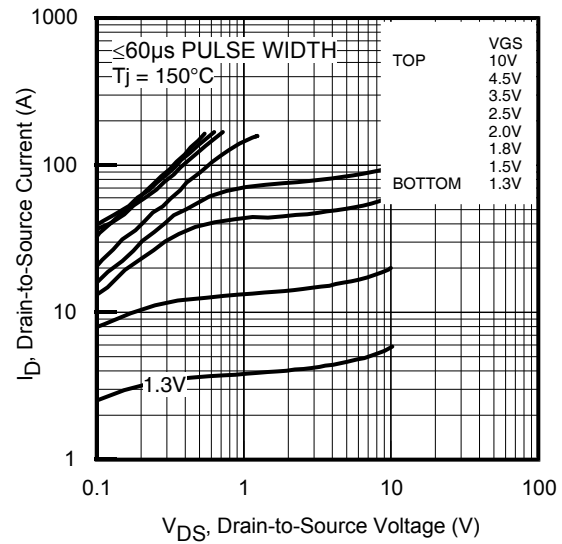
	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	40⑥	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	160		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.2	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 20A, V <sub>GS</sub> = 0V ③
t <sub>rr</sub>	Reverse Recovery Time	—	41	62	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 20A, V <sub>DD</sub> = 10V
Q <sub>rr</sub>	Reverse Recovery Charge	—	68	100	nC	di/dt = 220A/μs ③

Thermal Resistance

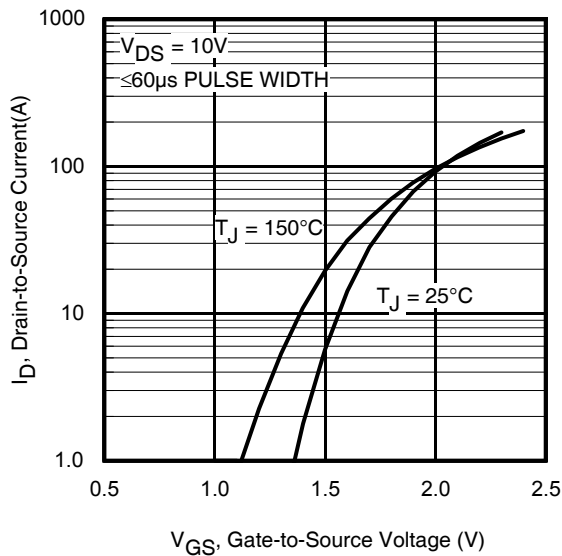
	Parameter	Typ.	Max.	Units
R <sub>θJC</sub> (Bottom)	Junction-to-Case ④	—	3.4	°C/W
R <sub>θJC</sub> (Top)	Junction-to-Case ④	—	37	
R <sub>θJA</sub>	Junction-to-Ambient ⑤	—	46	
R <sub>θJA</sub> (<10s)	Junction-to-Ambient ⑤	—	31	



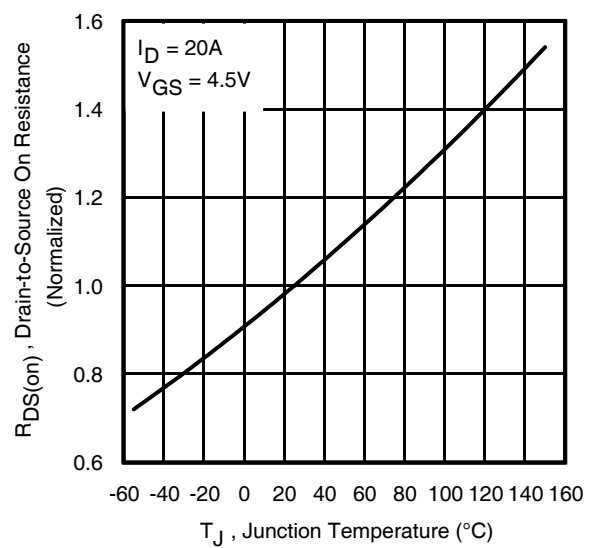
**Fig 1.** Typical Output Characteristics



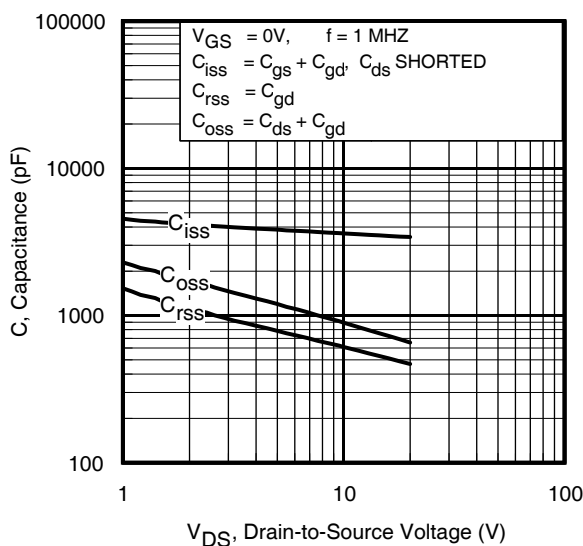
**Fig 2.** Typical Output Characteristics



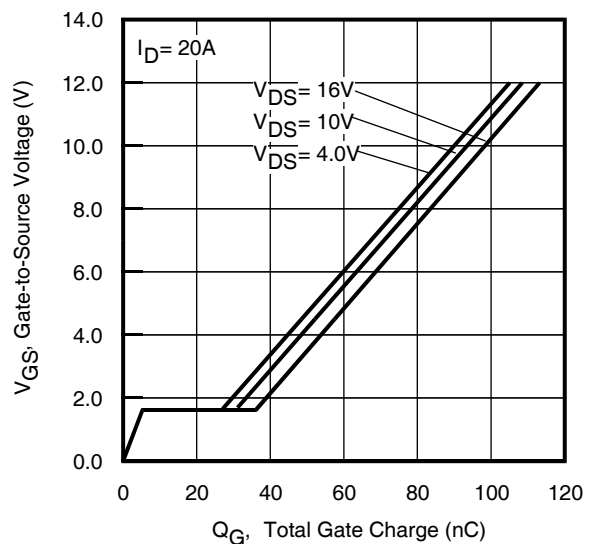
**Fig 3.** Typical Transfer Characteristics



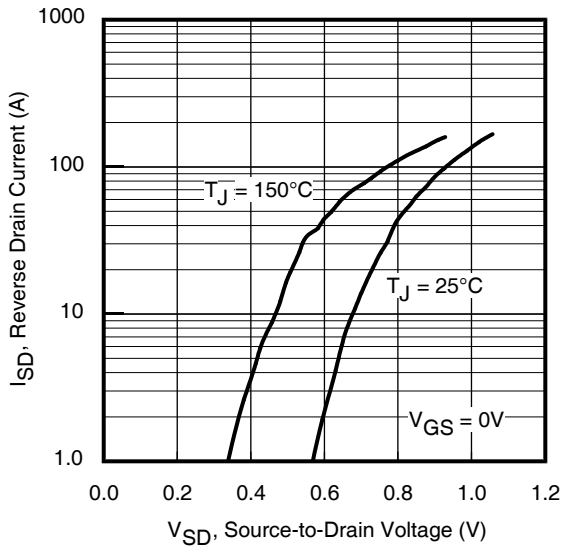
**Fig 4.** Normalized On-Resistance vs. Temperature



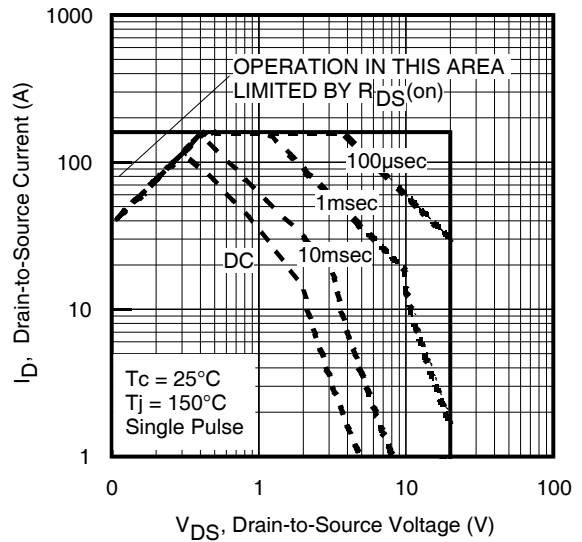
**Fig 5.** Typical Capacitance vs. Drain-to-Source Voltage



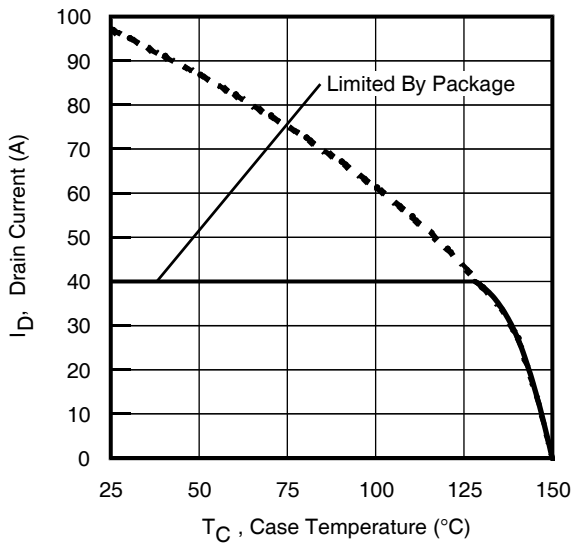
**Fig 6.** Typical Gate Charge vs. Gate-to-Source Voltage



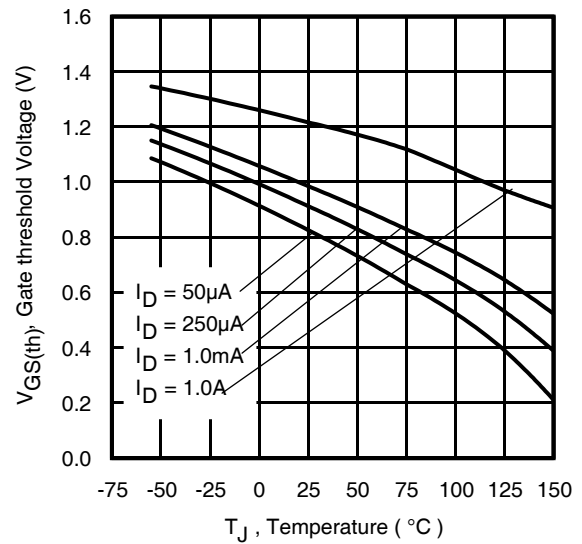
**Fig 7.** Typical Source-Drain Diode Forward Voltage



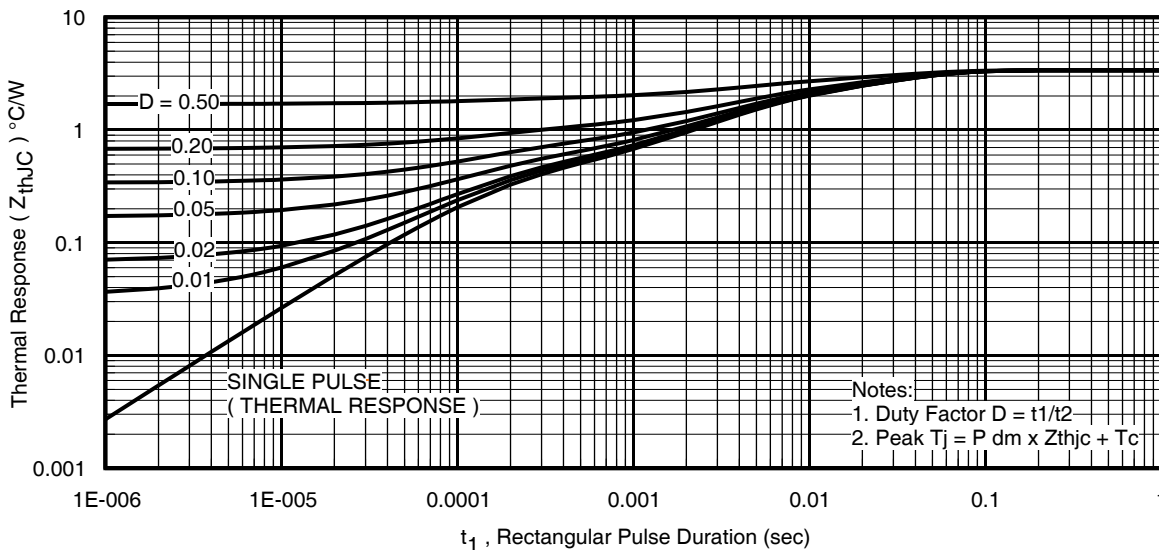
**Fig 8.** Maximum Safe Operating Area



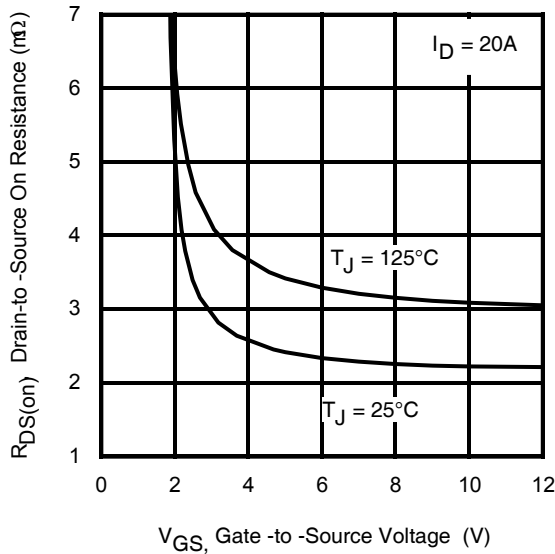
**Fig 9.** Maximum Drain Current vs. Case Temperature



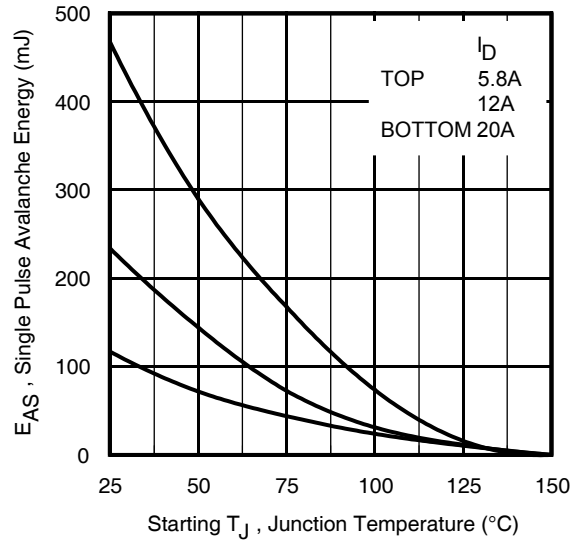
**Fig 10.** Threshold Voltage Vs. Temperature



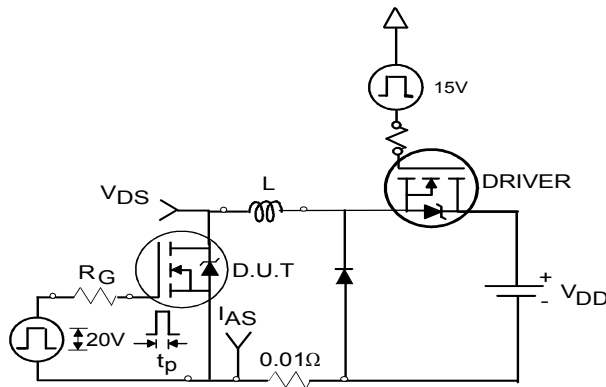
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case



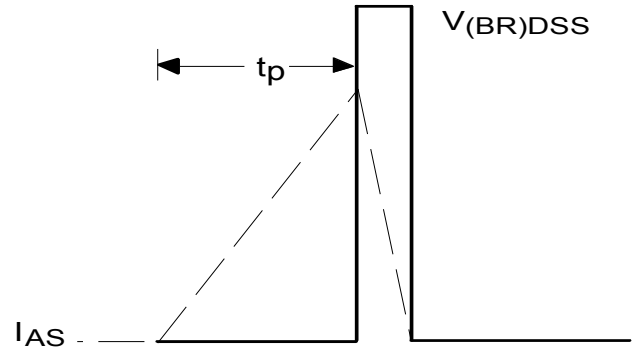
**Fig 12.** On-Resistance vs. Gate Voltage



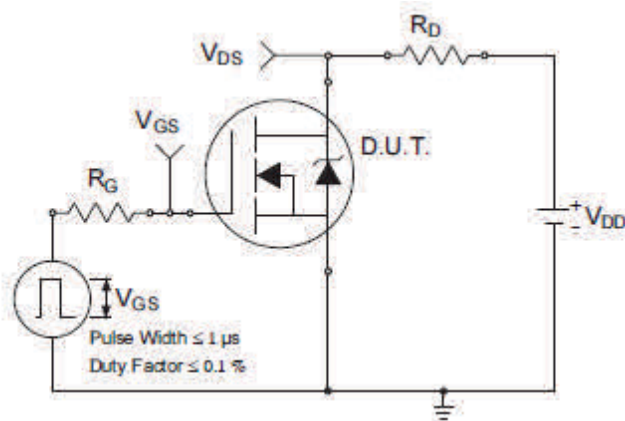
**Fig 13.** Maximum Avalanche Energy vs. Drain Current



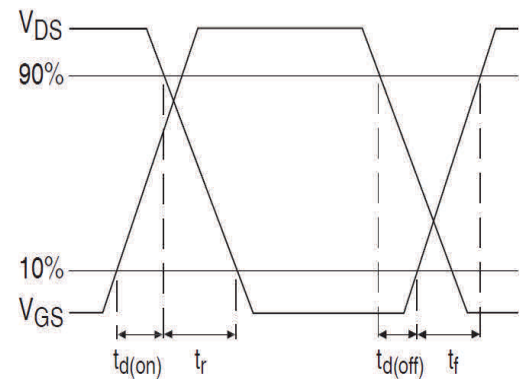
**Fig 14a.** Unclamped Inductive Test Circuit



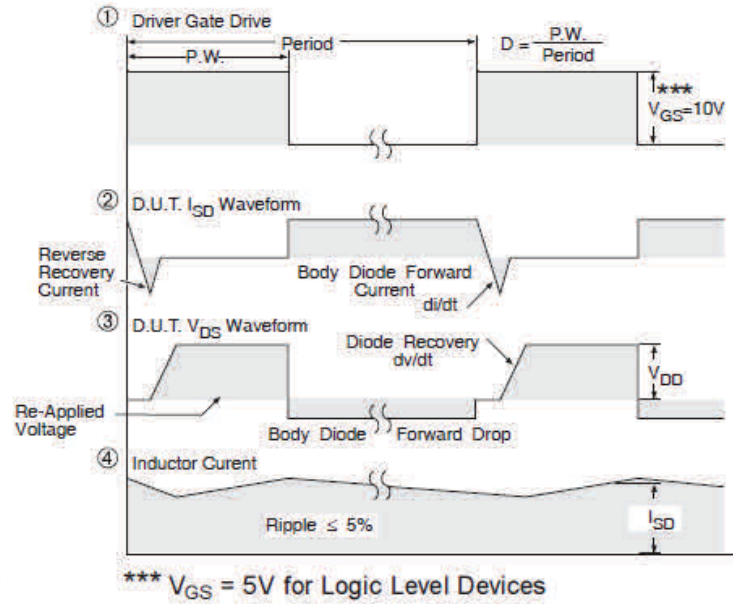
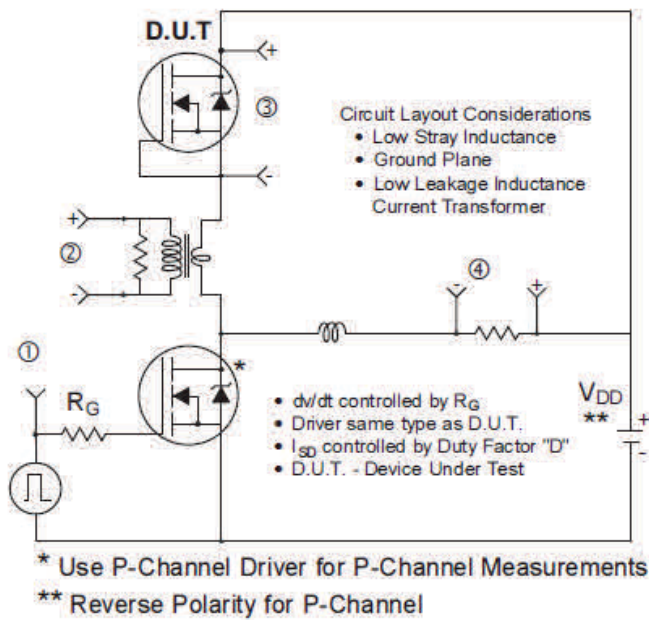
**Fig 14b.** Unclamped Inductive Waveforms



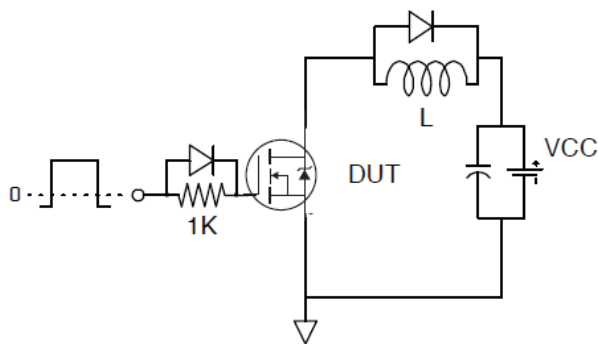
**Fig 15a.** Switching Time Test Circuit



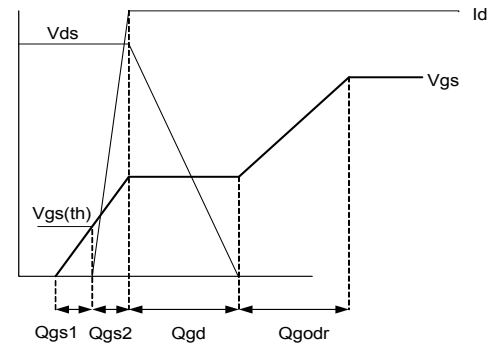
**Fig 15b.** Switching Time Waveforms



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

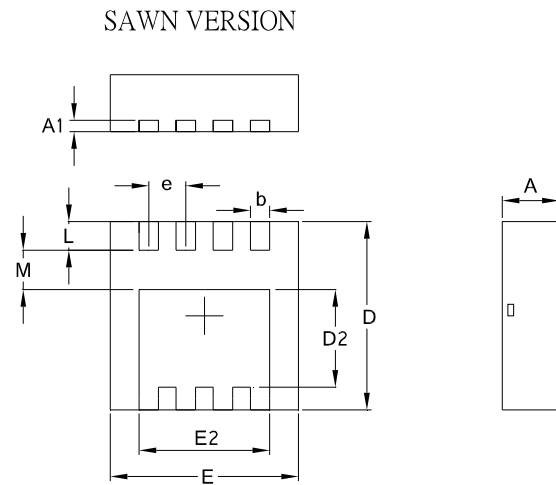


**Fig 17.** Gate Charge Test Circuit



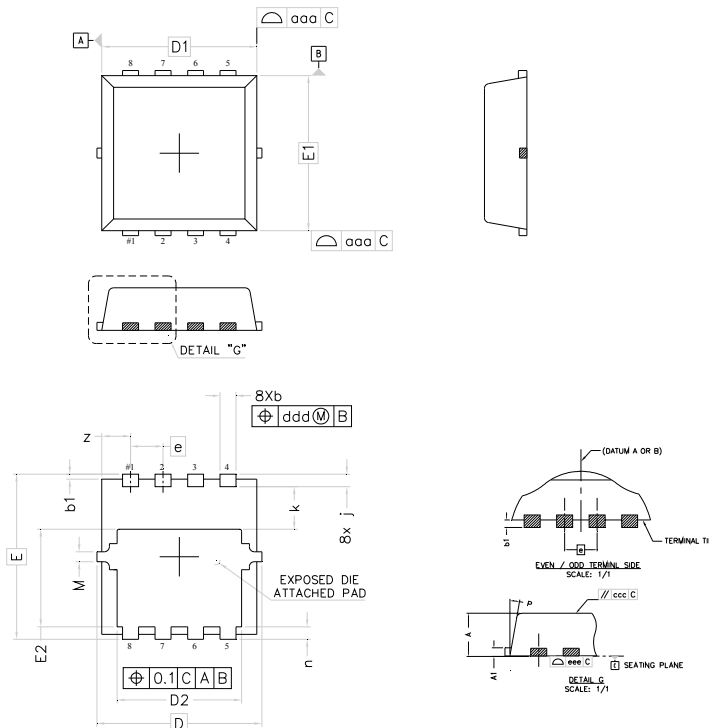
**Fig 18.** Gate Charge Waveform

## PQFN 3.3 x 3.3 Outline "B" Package Details



SYMBOL	COMMON			
	MM		INCH	
	MIN.	MAX.	MIN.	MAX.
A	0.70	1.05	0.0276	0.0413
A1	0.12	0.39	0.0047	0.0154
b	0.25	0.39	0.0098	0.0154
D	3.20	3.45	0.1260	0.1358
D1	3.00	3.20	0.1181	0.1417
D2	1.69	2.20	0.0665	0.0866
E	3.20	3.40	0.1260	0.1339
E1	3.00	3.20	0.1181	0.1417
E2	2.15	2.59	0.0846	0.1020
e	0.65 BSC		0.0256 BSC	
L	0.15	0.55	0.0059	0.0217
M	0.59	—	0.0232	—
O	9Deg	12Deg	9Deg	12Deg

## PQFN 3.3 x 3.3 Outline "G" Package Details

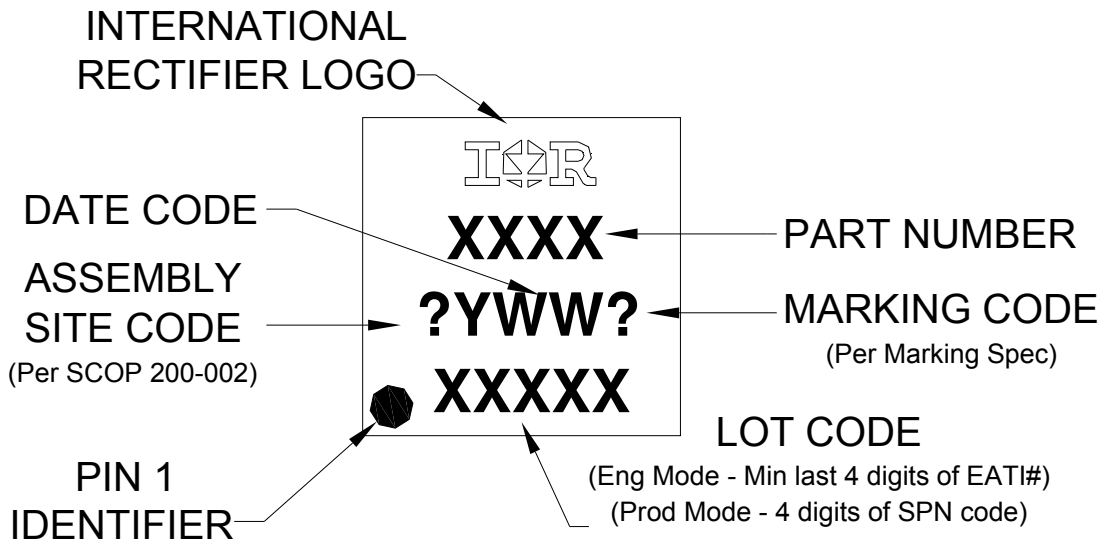


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.80	0.90	.0315	.0354
A1	0.12	0.22	.0047	.0086
b	0.22	0.42	.0087	.0165
b1	0.05	0.15	.0020	.0059
D	3.30 BSC		.1299 BSC	
D1	3.10 BSC		.1220 BSC	
D2	2.29	2.69	.0902	.1059
E	3.30 BSC		.1299 BSC	
E1	3.10 BSC		.1220 BSC	
E2	1.85	2.05	.0728	.0807
e	0.65 BSC		.0255 BSC	
j	0.15	0.35	.0059	.0137
k	0.75	0.95	.0295	.0374
n	0.15	0.35	.0059	.0137
M	NOM.	0.20	NOM.	.0078
P	9°	11°	9°	11°

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 3.3 x 3.3 Part Marking



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

# PQFN 3.3 x 3.3 Tape and Reel

**REEL DIMENSIONS**

**TAPE DIMENSIONS**

CODE	DIMENSION (MM)		DIMENSION (INCH)	
	MIN	MAX	MIN	MAX
Ao	3.50	3.70	.138	.146
Bo	3.50	3.70	.138	.146
Ko	1.10	1.30	.043	.051
P <sub>1</sub>	7.90	8.10	.311	.319
W	11.80	12.20	.465	.480
W <sub>1</sub>	12.30	12.50	.484	.492
Qty	4000			
Reel Diameter	13 Inches			

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**

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

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

**Qualification Information†**

<b>Qualification Level</b>	Industrial (per JEDEC JESD47F†† guidelines)	
<b>Moisture Sensitivity Level</b>	PQFN 3.3mm x 3.3mm	MSL1 (per JEDEC J-STD-020D††)
<b>RoHS Compliant</b>	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  $T_J = 25^{\circ}\text{C}$ ,  $L = 0.59\text{mH}$ ,  $R_G = 50\Omega$ ,  $I_{AS} = 12\text{A}$ .
- ③ Pulse width  $\leq 400\mu\text{s}$ ; duty cycle  $\leq 2\%$ .
- ④  $R_{\theta}$  is measured at  $T_J$  of approximately  $90^{\circ}\text{C}$ .
- 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>
- ⑥ Calculated continuous current based on maximum allowable junction temperature. Package is limited to 40A by production test capability.

<b>Revision History</b>	
<b>Date</b>	<b>Comments</b>
1/14/2014	<ul style="list-style-type: none"> <li>• Updated ordering information to reflect the End-Of-life (EOL) of the mini-reel option (EOL notice #259)</li> <li>• Updated data sheet with new IR corporate template</li> </ul>
5/29/2015	<ul style="list-style-type: none"> <li>• Added <math>R_{\text{dson}}</math> typical = "1.5m<math>\Omega</math>", Max = "2.2m<math>\Omega</math>" @ <math>V_{\text{GS}}=10\text{V}</math>, <math>I_{\text{D}}=20\text{A}</math> on page 2.</li> <li>• Updated <math>R_{\text{dson}}</math> typical from "2m<math>\Omega</math>" to "1.8m<math>\Omega</math>" @ <math>V_{\text{GS}}=4.5\text{V}</math>, <math>I_{\text{D}}=20\text{A}</math> on page 2.</li> <li>• Updated package outline and tape and Reel on page 7 &amp; 8.</li> </ul>
9/25/2015	<ul style="list-style-type: none"> <li>• Updated package outline to reflect the PCN # (67-PCN90-Public-R2) for "option B" and added package outline for "option G" on page 7</li> <li>• Updated "IFX" logo on all pages.</li> </ul>

## Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

 [View IRLHM620TR2PBF on WIN SOURCE](#)

 [Infineon Technologies](#) Information

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