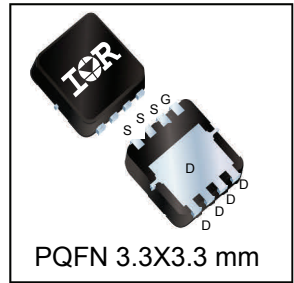
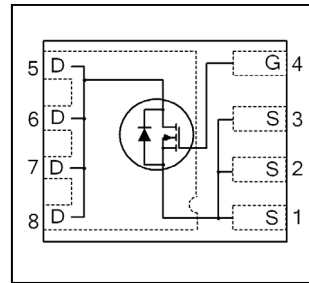


$V_{DSS}$	<b>30</b>	<b>V</b>
$V_{GS\ max}$	<b>±20</b>	<b>V</b>
$R_{DS(on)\ max}$ (@ $V_{GS} = 10V$ )	<b>9.0</b>	<b>mΩ</b>
(@ $V_{GS} = 4.5V$ )	<b>13.5</b>	
$Q_g$ (typical)	<b>7.1</b>	<b>nC</b>
$I_D$ (@ $T_C(Bottom) = 25°C$ )	<b>25</b> Ⓢ	<b>A</b>

HEXFET® Power MOSFET


**Applications**

- Control MOSFET for high frequency buck converter

**Features**

Low Thermal Resistance to PCB (<4.5°C/W)
Low Profile (<1.2mm)
Industry-Standard Pinout
Compatible with Existing Surface Mount Techniques
RoHS Compliant, Halogen-Free
MSL1, Consumer Qualification

 results in  
⇒

**Benefits**

Enable better Thermal Dissipation
Increased Power Density
Multi-Vendor Compatibility
Easier Manufacturing
Environmentally Friendlier
Increased Reliability

Base part number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRFHM8334PbF	PQFN 3.3 mm x 3.3 mm	Tape and Reel	4000	IRFHM8334TRPbF

**Absolute Maximum Ratings**

	Parameter	Max.	Units
$V_{GS}$	Gate-to-Source Voltage	± 20	V
$I_D @ T_A = 25°C$	Continuous Drain Current, $V_{GS} @ 10V$	13	A
$I_D @ T_C(Bottom) = 25°C$	Continuous Drain Current, $V_{GS} @ 10V$	43	
$I_D @ T_C(Bottom) = 100°C$	Continuous Drain Current, $V_{GS} @ 10V$	27	
$I_D @ T_C = 25°C$	Continuous Drain Current, $V_{GS} @ 10V$ (Source Bonding Technology Limited)	25	
$I_{DM}$	Pulsed Drain Current	176	W
$P_D @ T_A = 25°C$	Power Dissipation ④	2.7	
$P_D @ T_C(Bottom) = 25°C$	Power Dissipation	28	
	Linear Derating Factor	0.021	W/°C
$T_J$ $T_{STG}$	Operating Junction and Storage Temperature Range	-55 to + 150	°C

Notes ① through ⑦ are on page 10

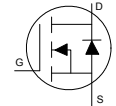
**Static @ T<sub>J</sub> = 25°C (unless otherwise specified)**

	Parameter	Min.	Typ.	Max.	Units	Conditions	
BV <sub>DSS</sub>	Drain-to-Source Breakdown Voltage	30	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	21	—	mV/°C	Reference to 25°C, I <sub>D</sub> = 1.0mA	
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	7.2	9.0	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A ②	
		—	11.2	13.5		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 16A ②	
V <sub>GS(th)</sub>	Gate Threshold Voltage	1.35	1.8	2.35	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 25μA	
ΔV <sub>GS(th)</sub>	Gate Threshold Voltage Coefficient	—	-6.6	—	mV/°C		
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	1.0	μA	V <sub>DS</sub> = 24V, V <sub>GS</sub> = 0V	
		—	—	150		V <sub>DS</sub> = 24V, 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> = 20V	
	Gate-to-Source Reverse Leakage	—	—	-100		V <sub>GS</sub> = -20V	
g <sub>fs</sub>	Forward Transconductance	44	—	—	S	V <sub>DS</sub> = 10V, I <sub>D</sub> = 20A	
Q <sub>g</sub>	Total Gate Charge	—	15	—	nC	V <sub>GS</sub> = 10V, V <sub>DS</sub> = 15V, I <sub>D</sub> = 20A	
Q <sub>g</sub>	Total Gate Charge	—	7.1	11	nC	V <sub>DS</sub> = 15V V <sub>GS</sub> = 4.5V I <sub>D</sub> = 20A	
	Q <sub>gs1</sub>	Pre-V <sub>th</sub> Gate-to-Source Charge	—	2.5			—
	Q <sub>gs2</sub>	Post-V <sub>th</sub> Gate-to-Source Charge	—	1.0			—
	Q <sub>gd</sub>	Gate-to-Drain Charge	—	2.3			—
	Q <sub>godr</sub>	Gate Charge Overdrive	—	1.3			—
Q <sub>sw</sub>	Switch Charge (Q <sub>gs2</sub> + Q <sub>gd</sub> )	—	3.3	—	nC		
Q <sub>oss</sub>	Output Charge	—	5.7	—	nC	V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V	
R <sub>G</sub>	Gate Resistance	—	1.2	—	Ω		
t <sub>d(on)</sub>	Turn-On Delay Time	—	8.3	—	ns	V <sub>DD</sub> = 15V, V <sub>GS</sub> = 4.5V I <sub>D</sub> = 20A R <sub>G</sub> = 1.8Ω	
t <sub>r</sub>	Rise Time	—	14	—			
t <sub>d(off)</sub>	Turn-Off Delay Time	—	7.0	—			
t <sub>f</sub>	Fall Time	—	4.6	—			
C <sub>iss</sub>	Input Capacitance	—	1180	—	pF	V <sub>GS</sub> = 0V V <sub>DS</sub> = 10V f = 1.0MHz	
C <sub>oss</sub>	Output Capacitance	—	260	—			
C <sub>rss</sub>	Reverse Transfer Capacitance	—	110	—			

**Avalanche Characteristics**

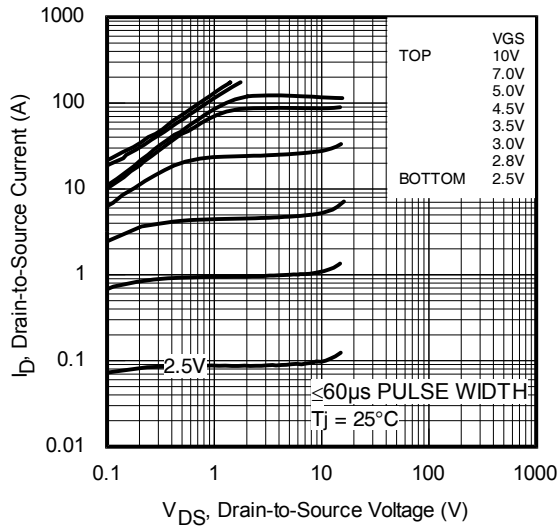
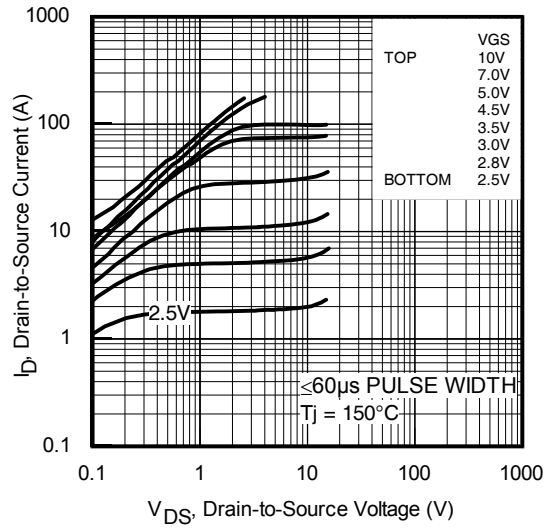
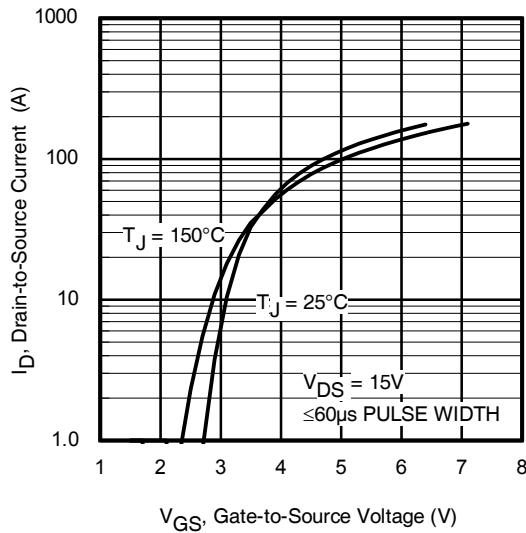
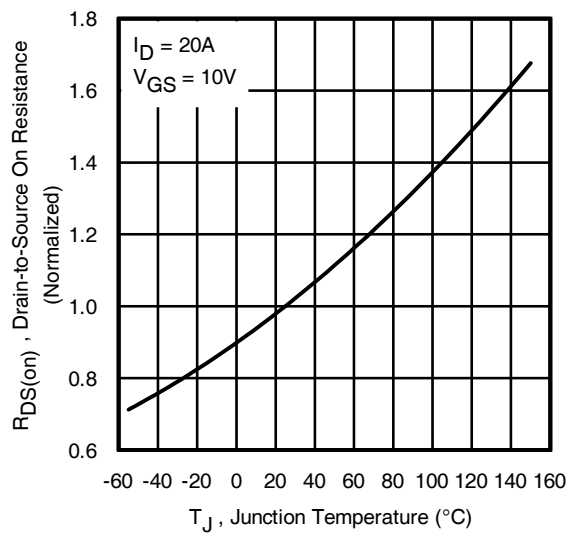
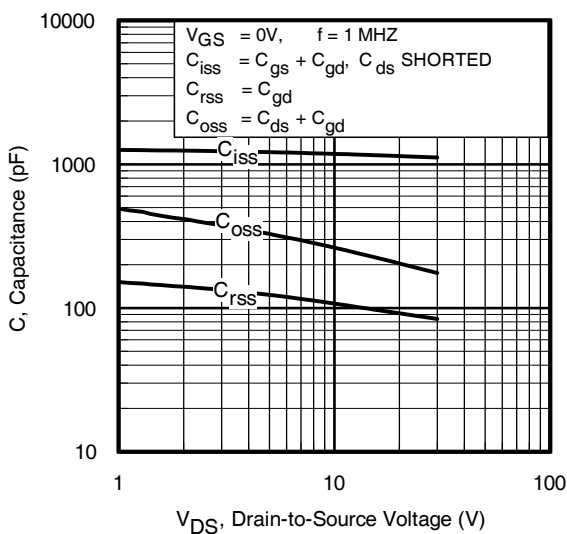
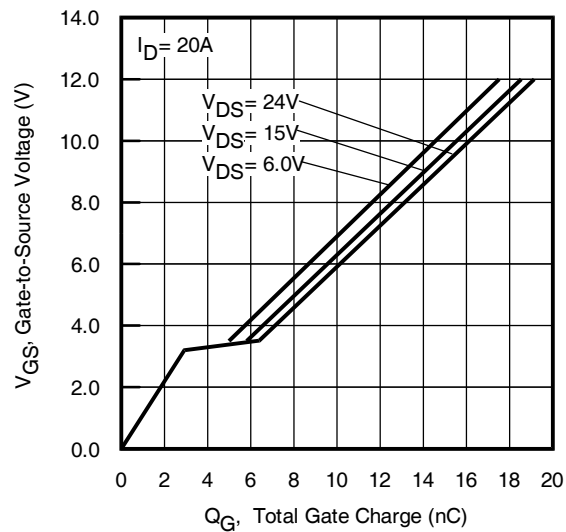
	Parameter	Typ.	Max.	Units
E <sub>AS</sub>	Single Pulse Avalanche Energy ①	—	35	mJ

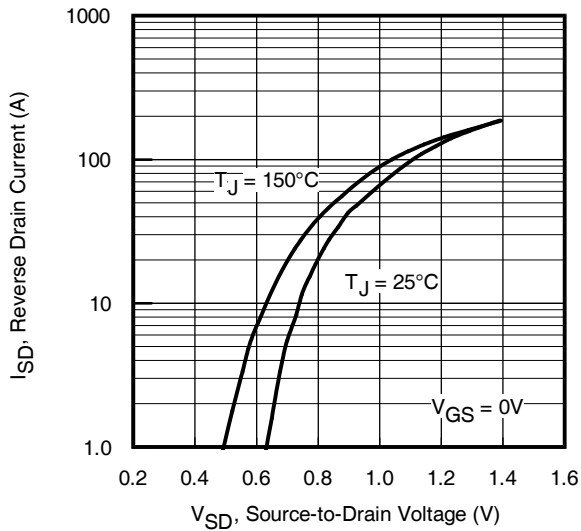
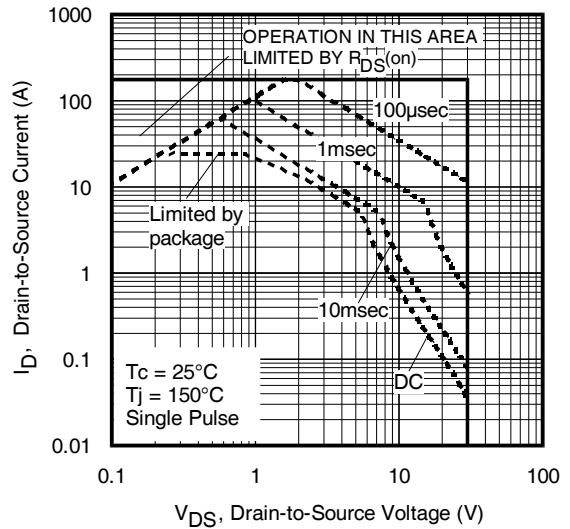
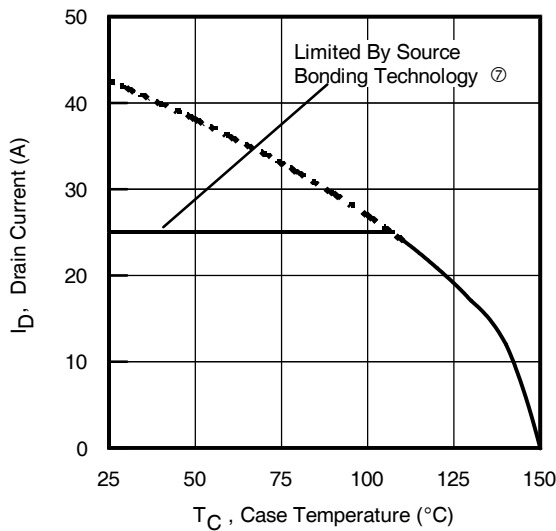
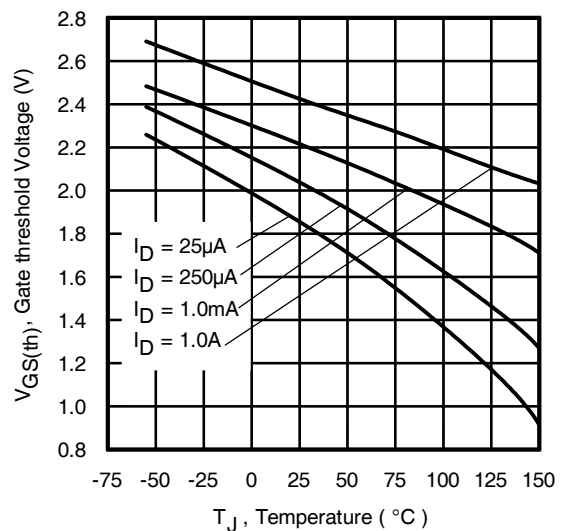
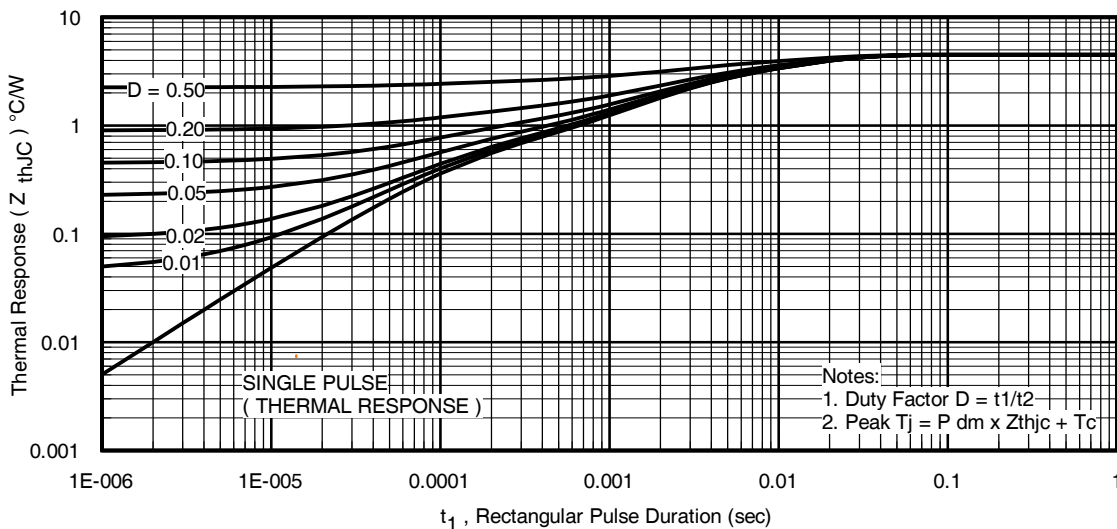
**Diode Characteristics**

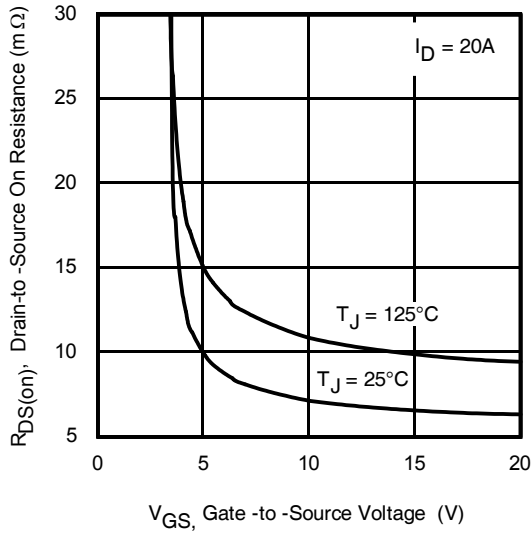
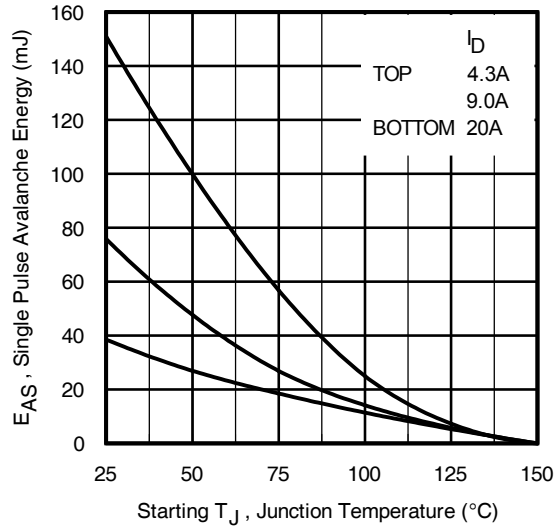
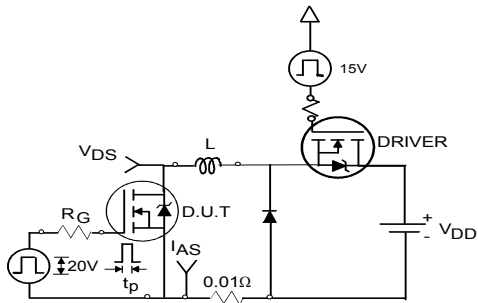
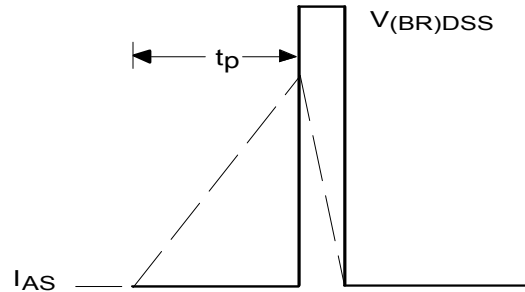
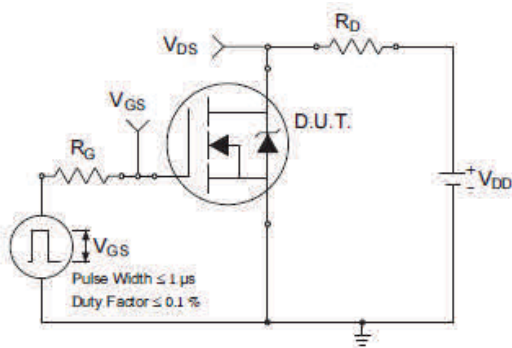
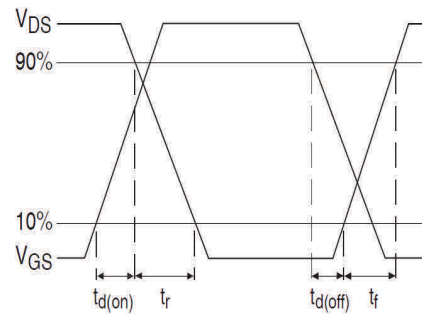
	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	25⑥	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	176⑦		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.0	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 20A, V <sub>GS</sub> = 0V ②
t <sub>rr</sub>	Reverse Recovery Time	—	13	20	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 20A, V <sub>DD</sub> = 15V
Q <sub>rr</sub>	Reverse Recovery Charge	—	19	29	nC	di/dt = 380A/μs ②

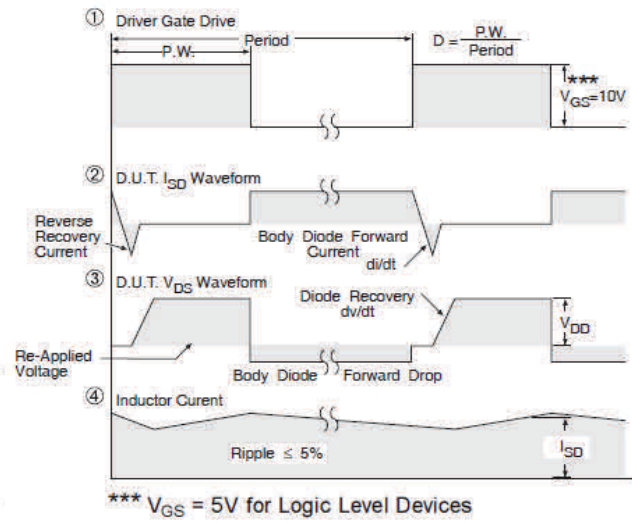
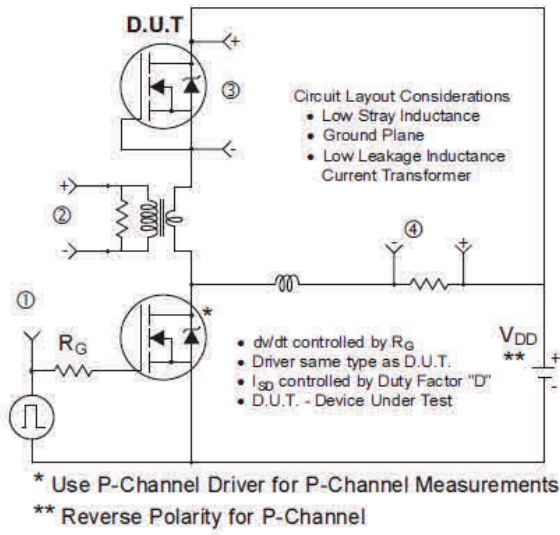
**Thermal Resistance**

	Parameter	Typ.	Max.	Units
R <sub>θJC</sub> (Bottom)	Junction-to-Case ③	—	4.5	°C/W
R <sub>θJC</sub> (Top)	Junction-to-Case ③	—	44	
R <sub>θJA</sub>	Junction-to-Ambient ④	—	47	
R <sub>θJA</sub> (<10s)	Junction-to-Ambient ④	—	30	

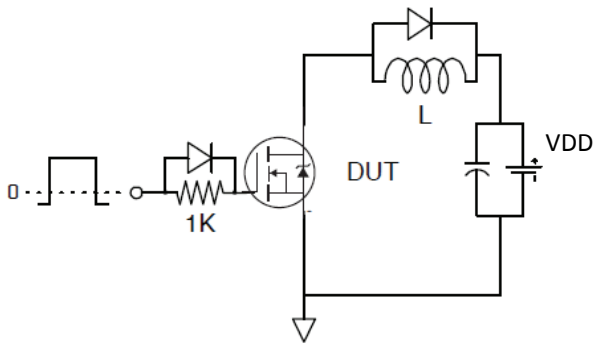

**Fig 1. Typical Output Characteristics**

**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.** Drain-to-Source Breakdown Voltage

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

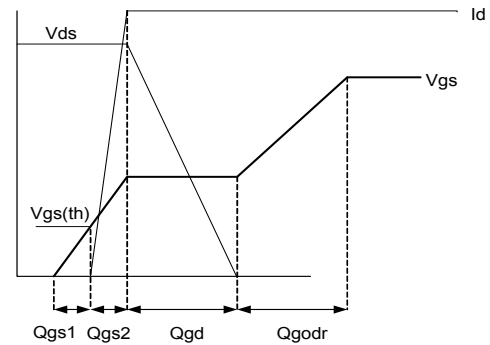

**Fig 12.** On-Resistance vs. Gate Voltage

**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<sup>®</sup> Power MOSFETs

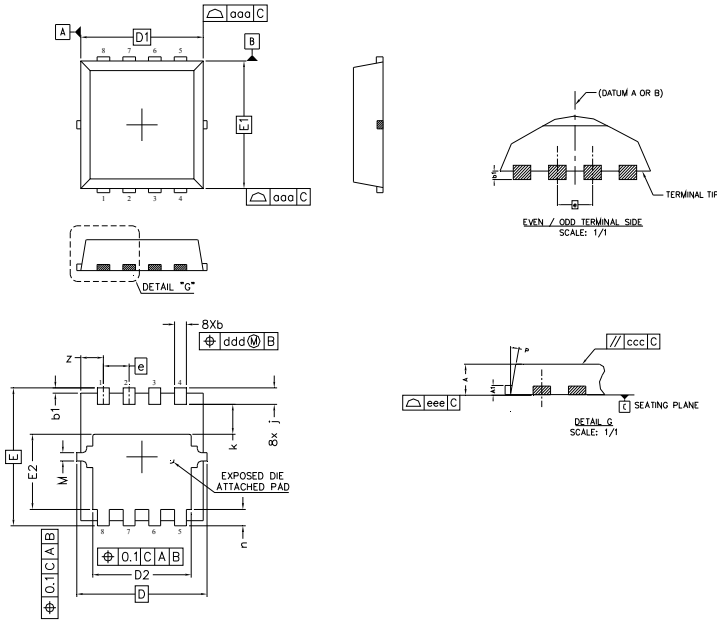


**Fig 17.** Gate Charge Test Circuit



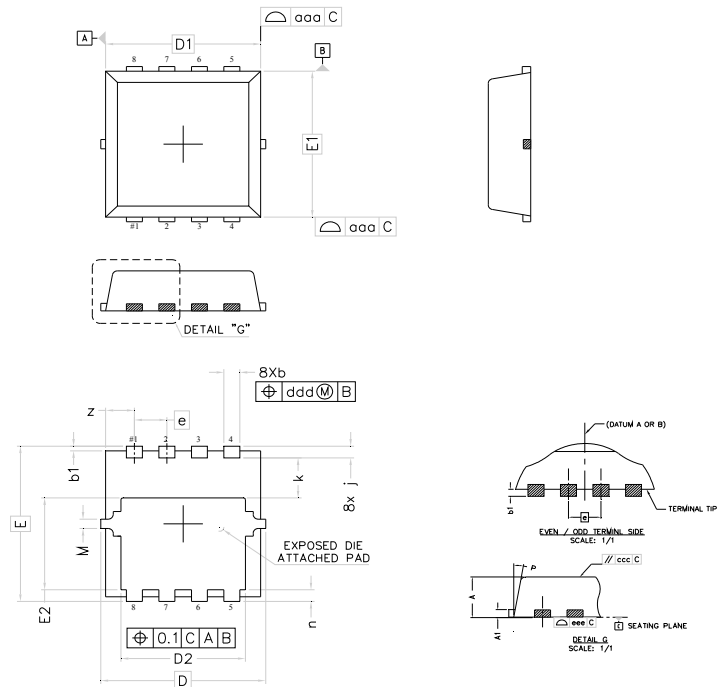
**Fig 18.** Gate Charge Waveform

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



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.70	0.80	.0276	.0315
A1	0.10	0.25	.0039	.0098
b	0.25	0.35	.0098	.0138
b1	0.05	0.15	.0020	.0059
D	3.20	3.40	.1260	.1339
D1	3.00	3.20	.1181	.1260
D2	2.39	2.59	.0941	.1020
E	3.25	3.45	.1280	.1358
E1	3.00	3.20	.1181	.1260
E2	1.78	1.98	.0701	.0780
e	0.65 BSC		.0255 BSC	
j	0.30	0.50	.0118	.0197
k	0.59	0.79	.0232	.0311
n	0.30	0.50	.0118	.0197
M	0.03	0.23	.0012	.0091
P	10°	12°	10°	12°
z	0.50	0.70	.0197	.0276

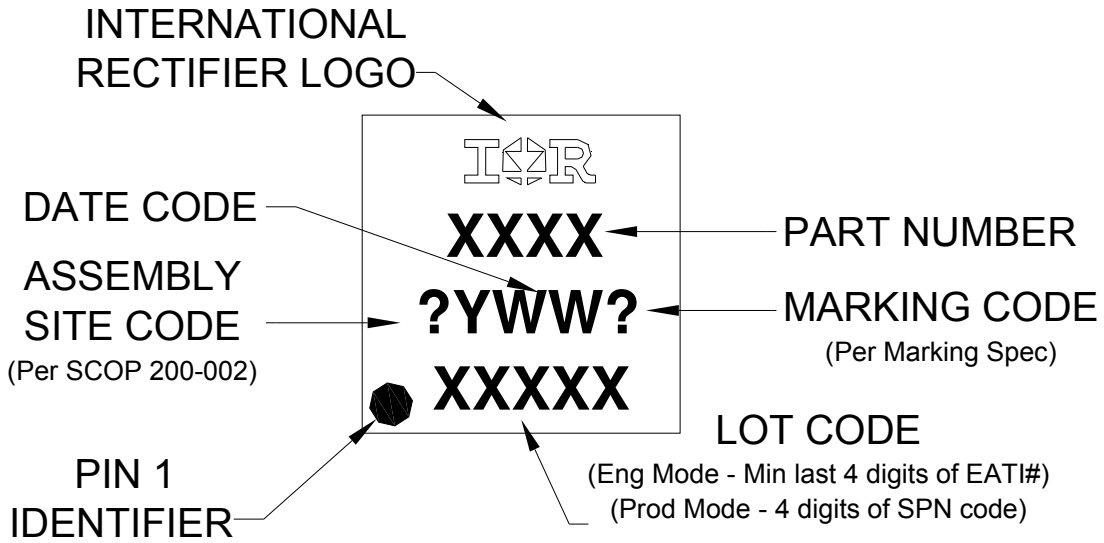
## PQFN 3.3 x 3.3 Outline "G" Package Details



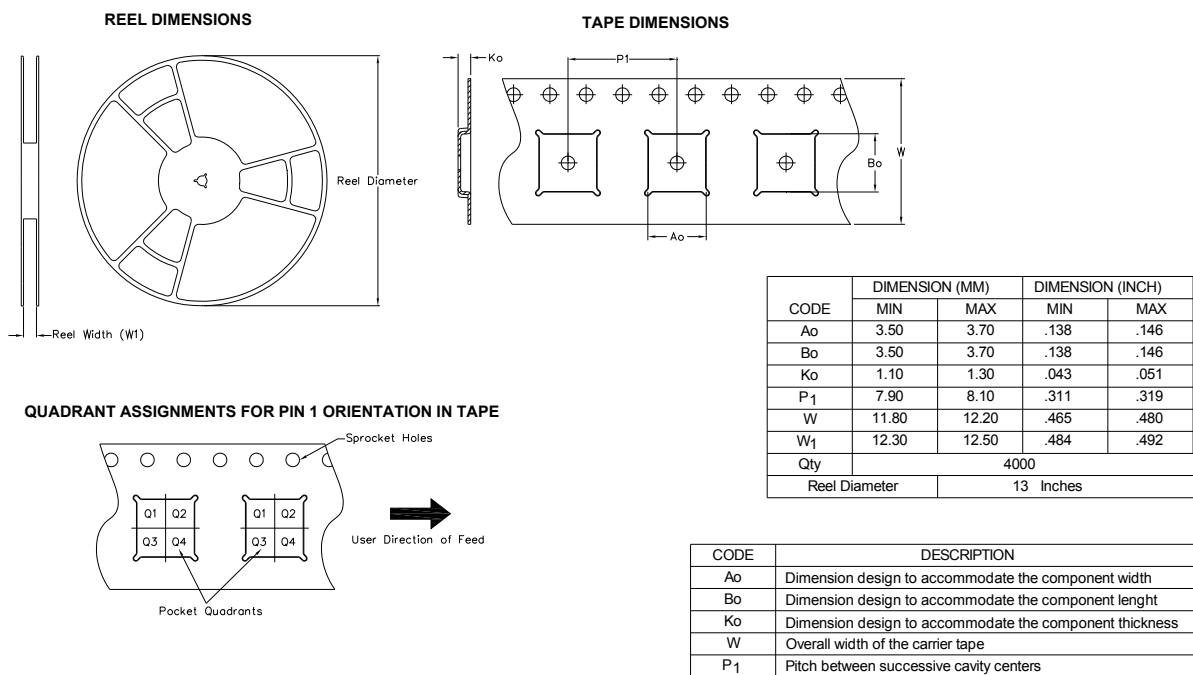
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.80	0.90	.0315	.0354
A1	0.12	0.22	.0047	.0086
b	0.22	0.42	.0087	.0165
b1	0.05	0.15	.0020	.0059
D	3.30 BSC		.1299 BSC	
D1	3.10 BSC		.1220 BSC	
D2	2.29	2.69	.0902	.1059
E	3.30 BSC		.1299 BSC	
E1	3.10 BSC		.1220 BSC	
E2	1.85	2.05	.0728	.0807
e	0.65 BSC		.0255 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 3.3mm x 3.3mm Outline Part Marking**


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

**PQFN 3.3mm x 3.3mm Outline Tape and Reel**


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



**Qualification Information<sup>†</sup>**

<b>Qualification Level</b>	Consumer (per JEDEC JESD47F <sup>††</sup> guidelines)	
<b>Moisture Sensitivity Level</b>	PQFN 3.3mm x 3.3mm	MSL1 (per JEDEC J-STD-020D <sup>††</sup> )
<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 Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.18\text{mH}$ ,  $R_G = 50\Omega$ ,  $I_{AS} = 20\text{A}$ .
- ② Pulse width  $\leq 400\mu\text{s}$ ; duty cycle  $\leq 2\%$ .
- ③  $R_{\theta}$  is measured at  $T_J$  of approximately  $90^\circ\text{C}$ .
- ④ 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>
- ⑤ Calculated continuous current based on maximum allowable junction temperature.
- ⑥ Current is limited to 25A by source bonding technology.
- ⑦ Pulse drain current is limited by source bonding technology.

**Revision History**

Date	Comments
6/5/2014	<ul style="list-style-type: none"> <li>• Updated schematic on page 1.</li> <li>• Updated tape and reel on page 8.</li> </ul>
7/1/2014	<ul style="list-style-type: none"> <li>• Remove "SAWN" package outline on page 7.</li> </ul>
2/23/2016	<ul style="list-style-type: none"> <li>• Updated datasheet with corporate template</li> <li>• Corrected typo switch time test condition from "<math>V_{DD} = 30V</math>" to "<math>V_{DD} = 15V</math>" on page 2</li> <li>• Updated package outline to reflect the PCN # (241-PCN30-Public) for "Option C" and "Option G" on page 7.</li> </ul>

**Published by**  
**Infineon Technologies AG**  
**81726 München, Germany**  
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