HEXFET® POWER MOSFET

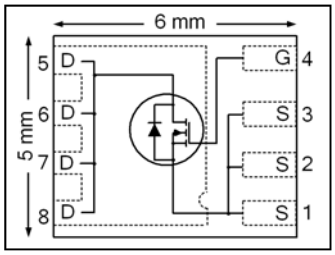
### Features

- 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 |
| $T_J$<br>$T_{STG}$ | Operating Junction and<br>Storage Temperature Range | -55 to + 175 | °C |

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*Qualification standards can be found at www.infineon.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 | |

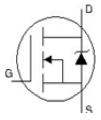
**Static Electrical Characteristics @ $T_J$ = 25°C (unless otherwise specified)**

| 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 |

**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 $R_\theta$ 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.

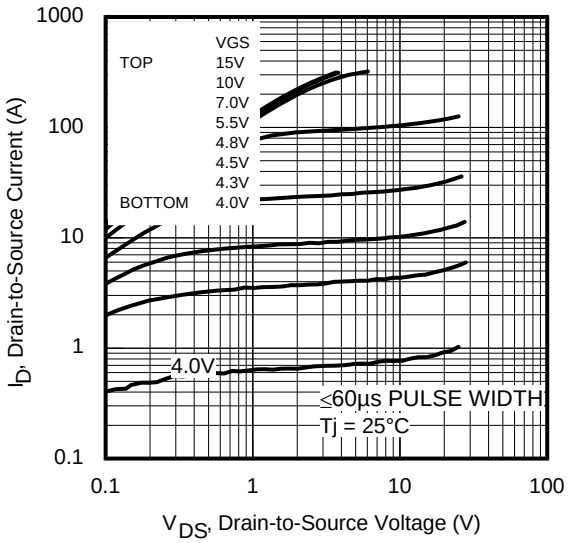



**Fig. 1** Typical Output Characteristics

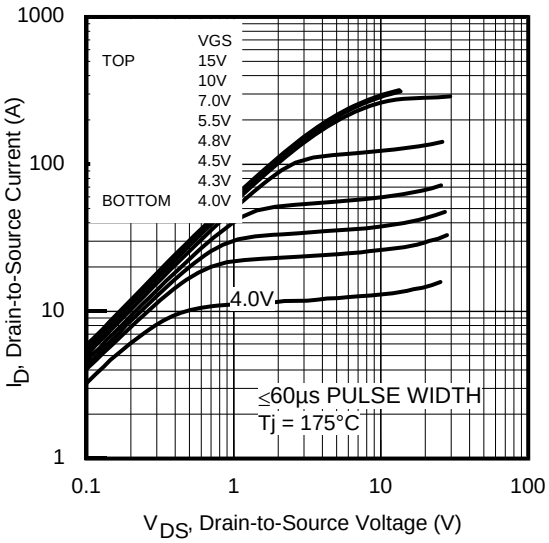



**Fig. 2** Typical Output Characteristics

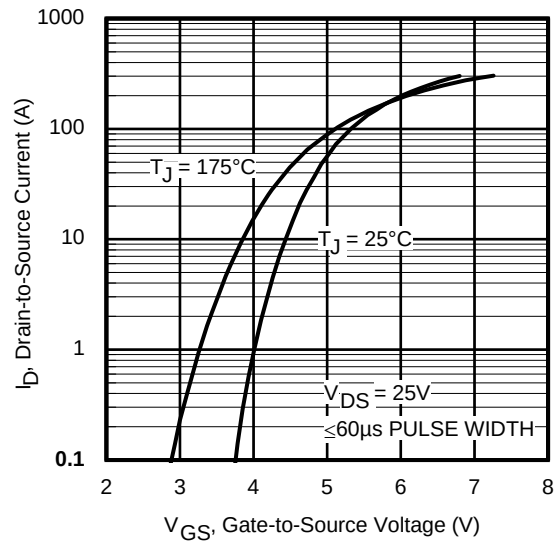



**Fig. 3** Typical Transfer Characteristics

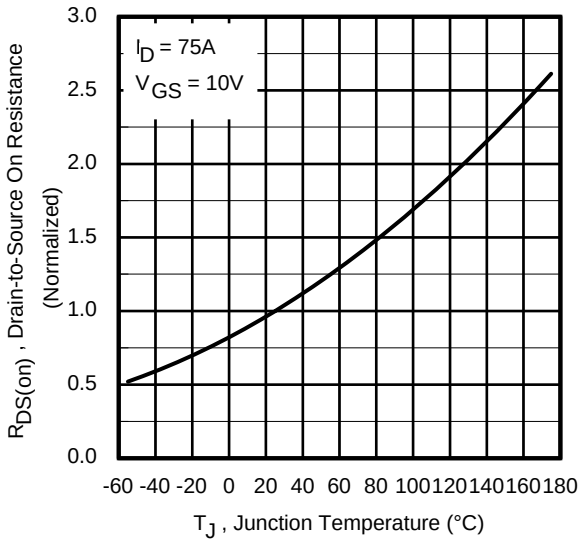



**Fig. 4** Normalized On-Resistance vs. Temperature

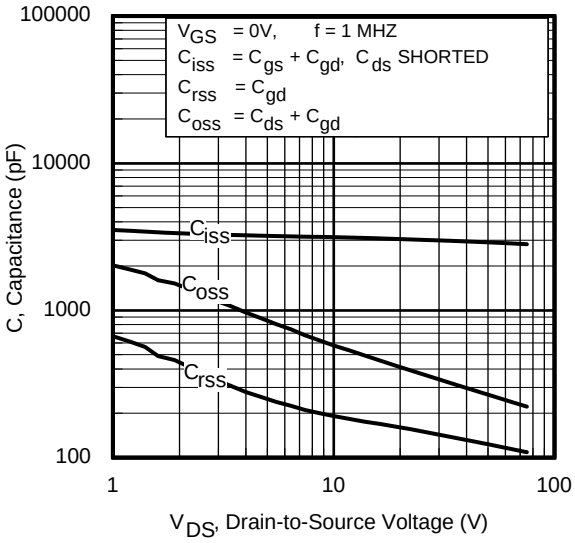



**Fig 5.** Typical Capacitance vs. Drain-to-Source Voltage

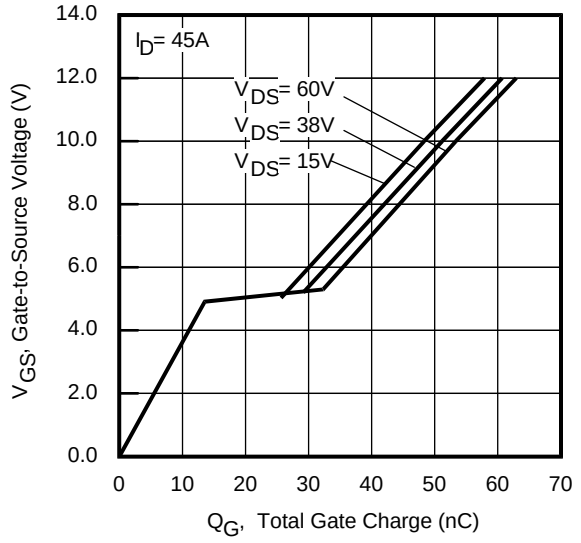



**Fig 6.** Typical Gate Charge vs. Gate-to-Source Voltage

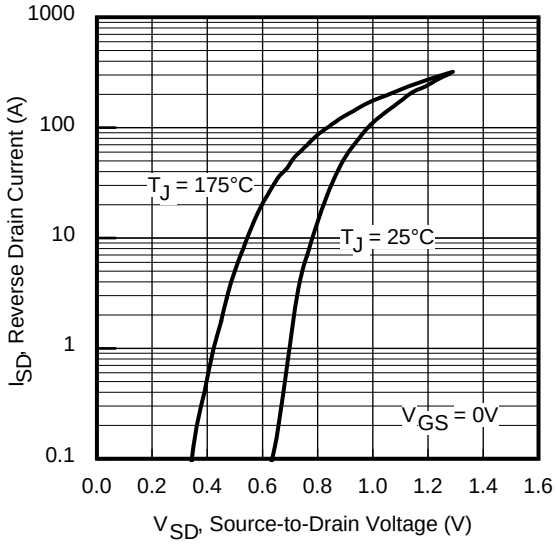



**Fig. 7** Typical Source-to-Drain Diode Forward Voltage

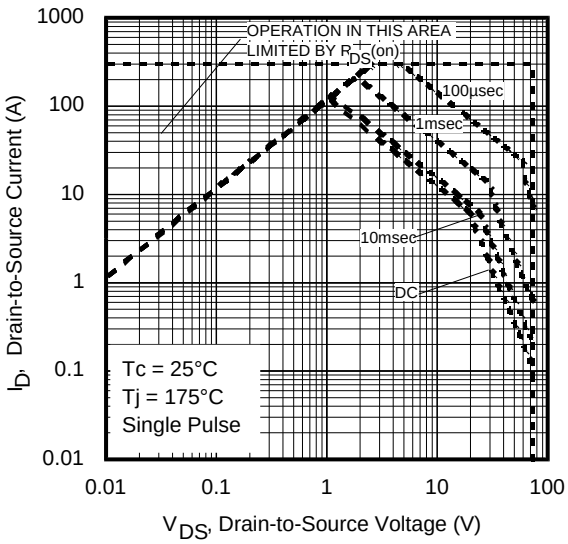



**Fig 8.** Maximum Safe Operating Area

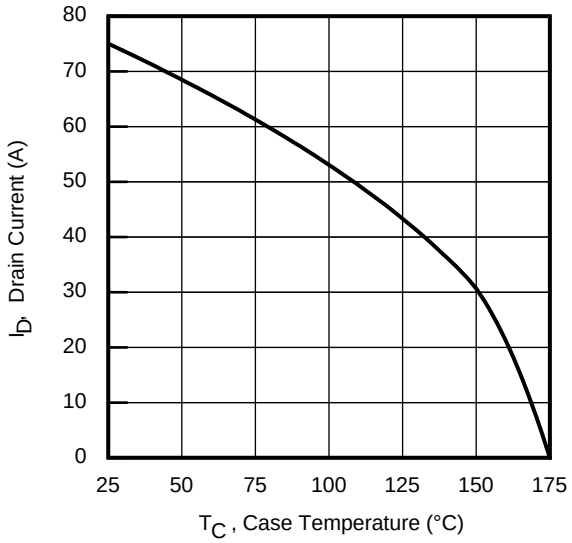



**Fig 9.** Maximum Drain Current vs. Case Temperature

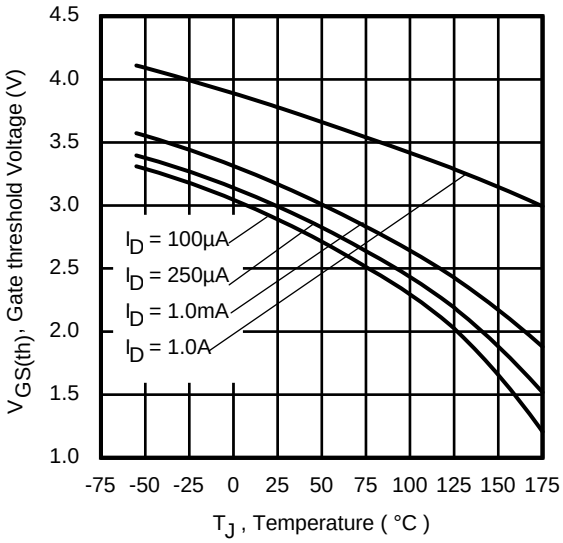



**Fig 10.** Threshold Voltage vs. Temperature

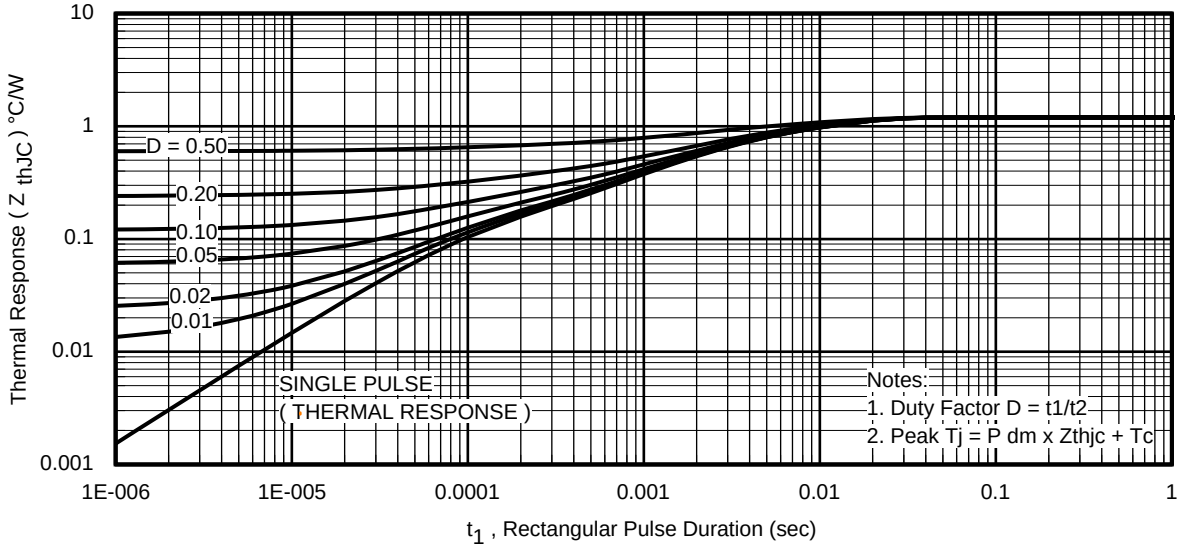



**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

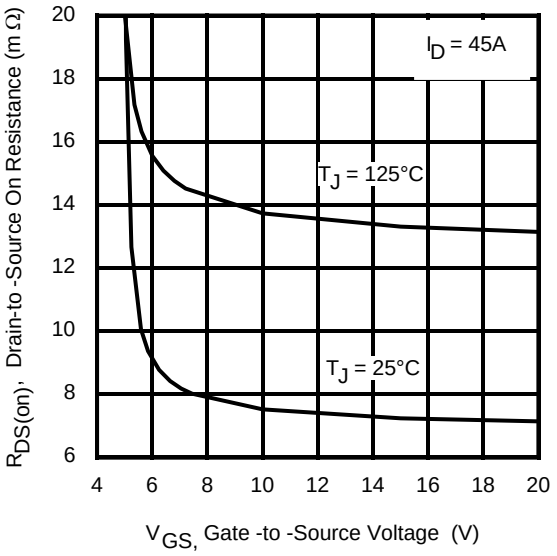



**Fig 12.** Typical On-Resistance vs. Gate Voltage

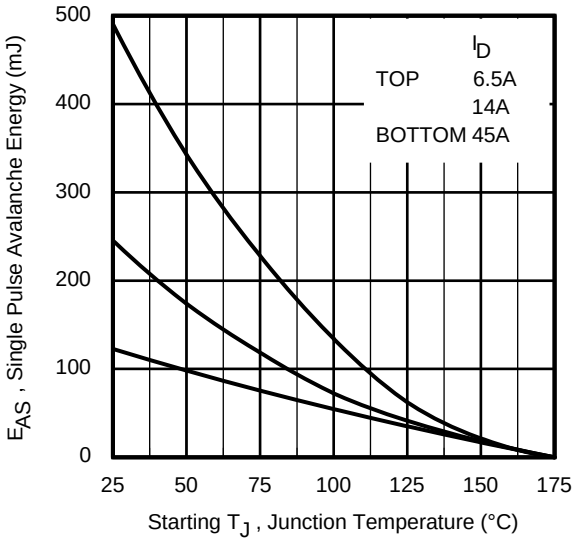



**Fig 13.** Maximum Avalanche Energy vs. Drain Current

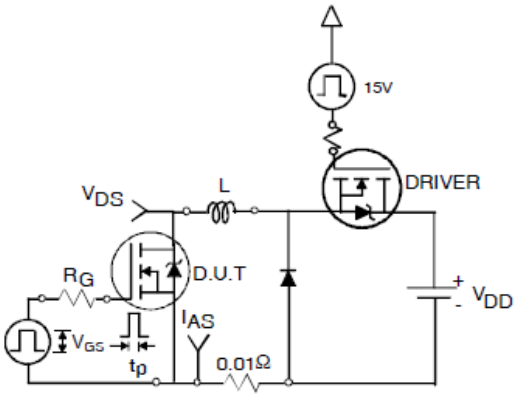



**Fig 14a.** Unclamped Inductive Test Circuit

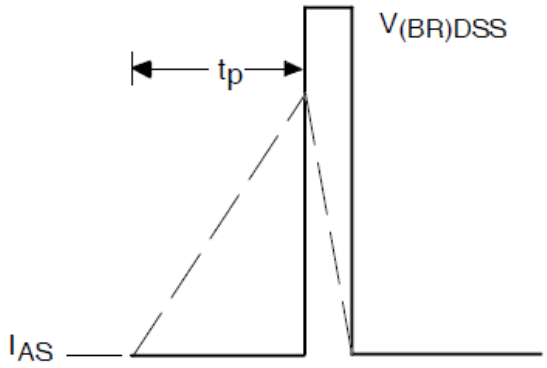



**Fig 14b.** Unclamped Inductive Waveforms

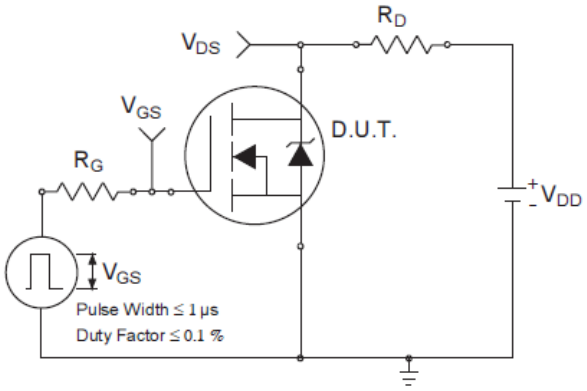



**Fig 15a.** Switching Time Test Circuit

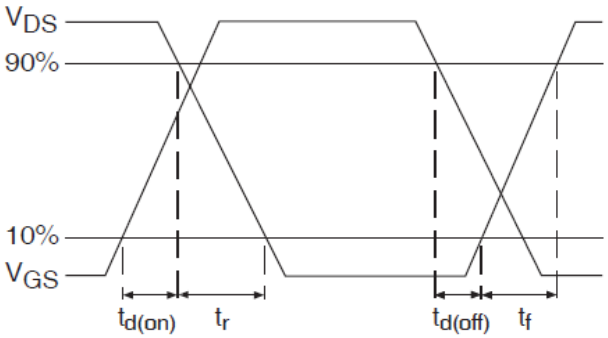



**Fig 15b.** Switching Time Waveforms

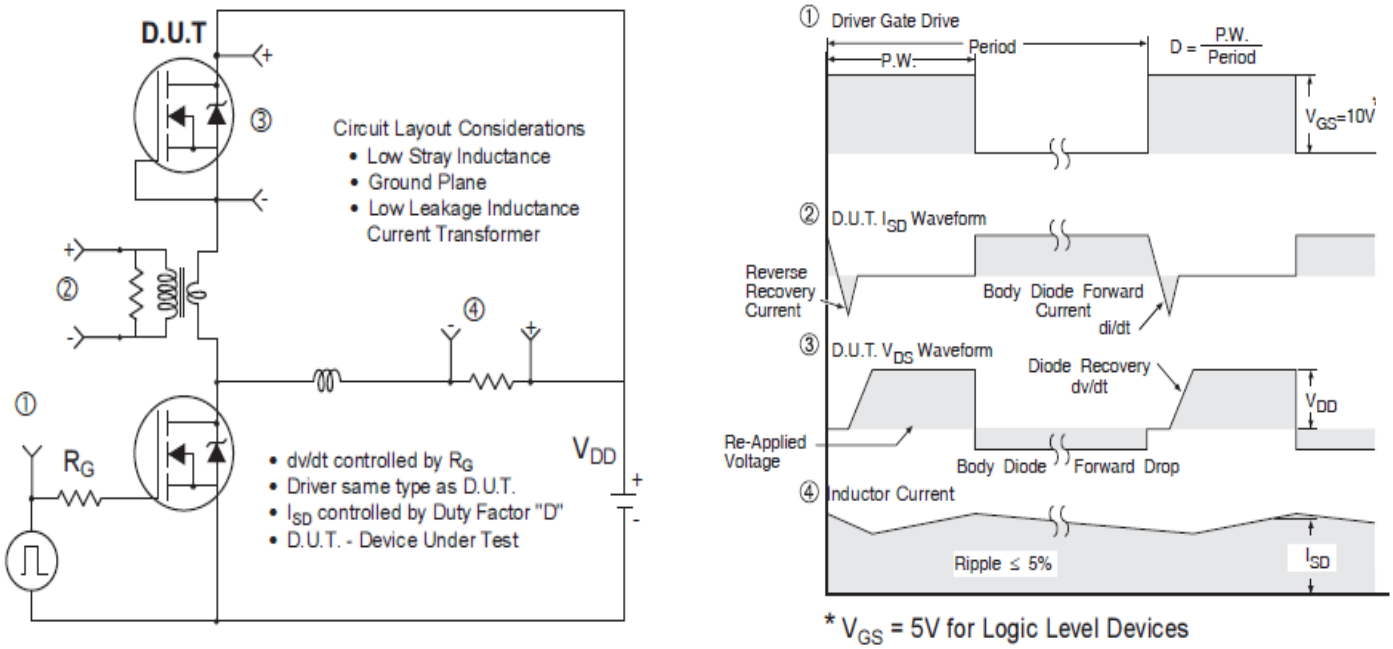



**Fig 16.** Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

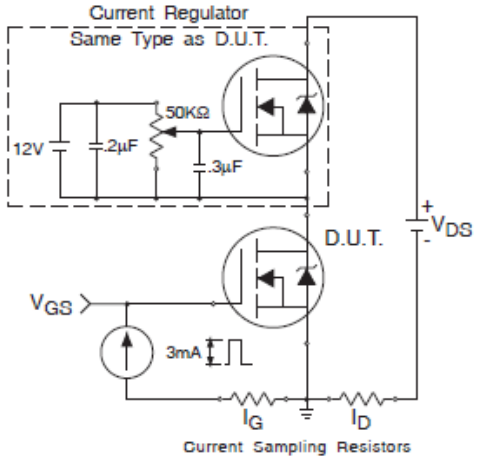



**Fig 17a.** Gate Charge Test Circuit

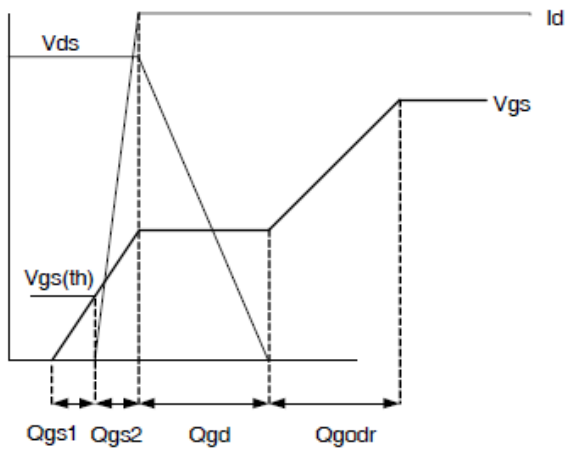
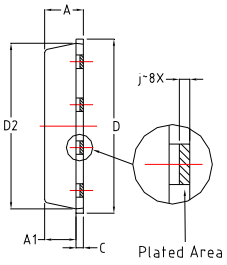
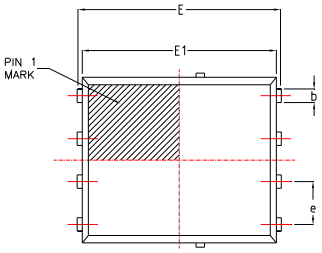



**Fig 17b.** Gate Charge Waveform

## PQFN 5x6 Outline "E" Package Details

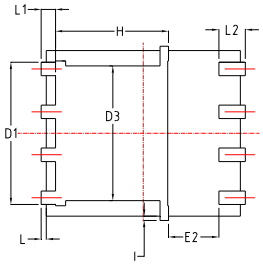



SIDE VIEW




TOP VIEW

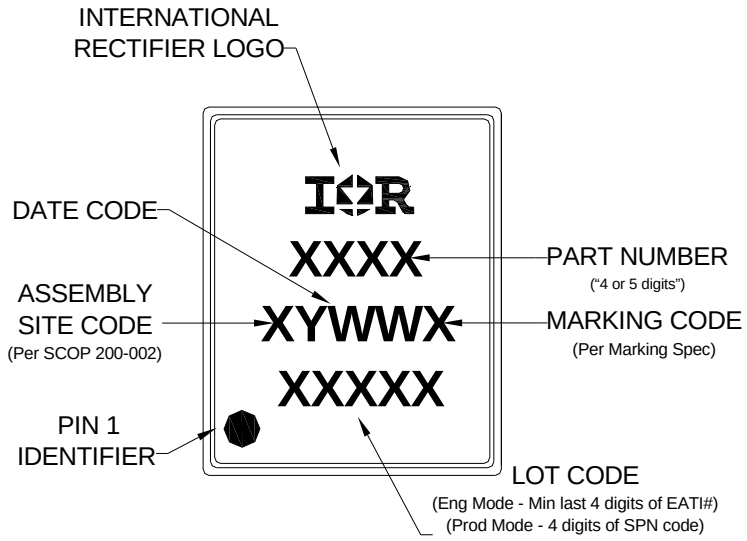
| DIM | MM | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 0.90 | 1.10 | 1.17 |
| A1 | 0.824 | 0.897 | 0.97 |
| b | 0.33 | 0.41 | 0.50 |
| c | 0.150 | 0.20 | 0.250 |
| D | 4.80 | 4.98 | 5.15 |
| D1 | 3.91 | 4.22 | 4.36 |
| D2 | 4.80 | 4.90 | 5.00 |
| D3 | 3.85 | 4.00 | 4.15 |
| E | 5.90 | 6.05 | 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

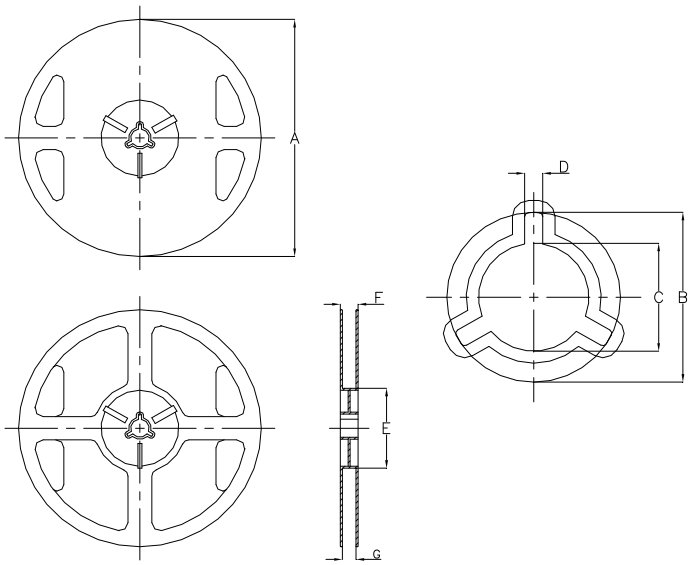
For more information on board mounting, including footprint and stencil recommendation, please refer to application note AN-1136: http://www.irf.com/technical-info/appnotes/an-1136.pdf
For more information on package inspection techniques, please refer to application note AN-1154: http://www.irf.com/technical-info/appnotes/an-1154.pdf

## PQFN 5x6 Outline "E" Part Marking



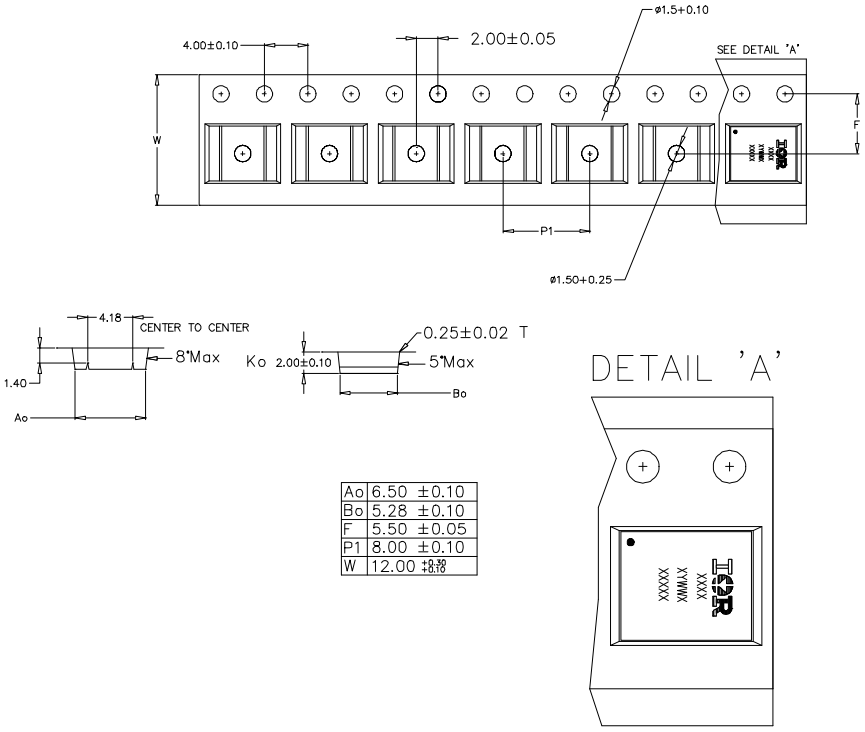

Note: For the most current drawing please refer to IR website at http://www.irf.com/package/

## 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. Infineon'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 | |

† Highest passing voltage.

**Revision History**

| Date | Comments |
|---|---|
| 10/12/2015 | • Updated datasheet with corporate template |

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