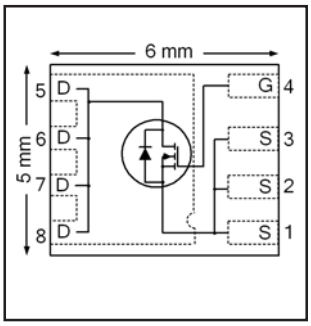
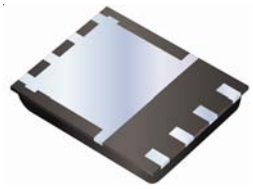
International
IOR Rectifier
AN INFINEON TECHNOLOGIES COMPANY

# StrongIRFET™
# IRFH8202TRPbF

HEXFET® Power MOSFET

| | | |
|---|---|---|
| $V_{DS}$ | 25 | V |
| $R_{DS(on)\ max}$ ($@V_{GS}$ = 10V) | 1.05 | mΩ |
| $Q_{g\ (typical)}$ | 52 | nC |
| $R_{G\ (typical)}$ | 1.3 | Ω |
| $I_D$ ($@T_{C(Bottom)}$ = 25°C) | 100 ⑥ | A |



PQFN 5X6 mm

## Applications

- OR-ing MOSFET for 12V (typical) Bus in-Rush Current
- Battery Operated DC Motor Inverter MOSFET

## Features and Benefits

| Features | | Benefits |
|---|---|---|
| Low RDSon (<1.05 mΩ) | | Lower Conduction Losses |
| Low Thermal Resistance to PCB (<0.8°C/W) | | Enable better thermal dissipation |
| Low Profile (<0.9 mm) | 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 |

| Base part number | Package Type | Standard Pack | | Orderable part number |
|---|---|---|---|---|
| | | Form | Quantity | |
| IRFH8202PbF | PQFN 5mm x 6mm | Tape and Reel | 4000 | IRFH8202TRPbF |

### 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 | 47 | A |
| $I_D$ @ $T_A$ = 70°C | Continuous Drain Current, $V_{GS}$ @ 10V | 30 | |
| $I_D$ @ $T_{C(Bottom)}$ = 25°C | Continuous Drain Current, $V_{GS}$ @ 10V | 100 ⑥ | |
| $I_D$ @ $T_{C(Bottom)}$ = 100°C | Continuous Drain Current, $V_{GS}$ @ 10V | 100⑥ | |
| $I_{DM}$ | Pulsed Drain Current ① | 400 | |
| $P_D$ @$T_A$ = 25°C | Power Dissipation ⑤ | 3.6 | W |
| $P_D$ @$T_{C(Bottom)}$ = 25°C | Power Dissipation ⑤ | 160 | |
| | Linear Derating Factor ⑤ | 0.029 | W/°C |
| $T_J$<br>$T_{STG}$ | Operating Junction and<br>Storage Temperature Range | -55 to + 150 | °C |

Notes ① through ⑥ are on page 9

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

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-to-Source Breakdown Voltage | 25 | — | — | 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 | — | 0.90 | 1.05 | mΩ | $V_{GS}$ = 10V, $I_D$ = 50A ③ |
| | | — | 1.40 | 1.85 | | $V_{GS}$ = 4.5V, $I_D$ = 50A ③ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 1.35 | 1.80 | 2.35 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 150µA |
| $\Delta V_{GS(th)}$ | Gate Threshold Voltage Coefficient | — | -6.3 | — | mV/°C | |
| $I_{DSS}$ | Drain-to-Source Leakage Current | — | — | 5.0 | µA | $V_{DS}$ = 20V, $V_{GS}$ = 0V |
| | | — | — | 150 | | $V_{DS}$ = 20V, $V_{GS}$ = 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 | 181 | — | — | S | $V_{DS}$ = 13V, $I_D$ = 50A |
| $Q_g$ | Total Gate Charge | — | 110 | — | nC | $V_{GS}$ = 10V, $V_{DS}$ = 13V, $I_D$ = 50A |
| $Q_g$ | Total Gate Charge | — | 52 | 78 | nC | $V_{DS}$ = 13V<br>$V_{GS}$ = 4.5V<br>$I_D$ = 50A |
| $Q_{gs1}$ | Pre-Vth Gate-to-Source Charge | — | 13 | — | | |
| $Q_{gs2}$ | Post-Vth Gate-to-Source Charge | — | 7.8 | — | | |
| $Q_{gd}$ | Gate-to-Drain Charge | — | 17 | — | | |
| $Q_{godr}$ | Gate Charge Overdrive | — | 15 | — | | |
| $Q_{sw}$ | Switch Charge ($Q_{gs2}$ + $Q_{gd}$) | — | 25 | — | | |
| $Q_{oss}$ | Output Charge | — | 36 | — | nC | $V_{DS}$ = 16V, $V_{GS}$ = 0V |
| $R_G$ | Gate Resistance | — | 1.3 | 2.6 | Ω | |
| $t_{d(on)}$ | Turn-On Delay Time | — | 28 | — | ns | $V_{DD}$ = 13V, $V_{GS}$ = 4.5V<br>$I_D$ = 50A<br>$R_G$=1.8Ω |
| $t_r$ | Rise Time | — | 46 | — | | |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 30 | — | | |
| $t_f$ | Fall Time | — | 19 | — | | |
| $C_{iss}$ | Input Capacitance | — | 7174 | — | pF | $V_{GS}$ = 0V<br>$V_{DS}$ = 13V<br>$f$ = 1.0MHz |
| $C_{oss}$ | Output Capacitance | — | 1758 | — | | |
| $C_{rss}$ | Reverse Transfer Capacitance | — | 828 | — | | |

**Avalanche Characteristics**

| | Parameter | Typ. | Max. | Units |
|---|---|---|---|---|
| $E_{AS}$ | Single Pulse Avalanche Energy ② | — | 468 | mJ |
| $I_{AR}$ | Avalanche Current ① | — | 50 | A |

**Diode Characteristics**

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current (Body Diode) | — | — | 100 ⑥ | A | MOSFET symbol showing the integral reverse p-n junction diode. |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ① | — | — | 400 | | |
| $V_{SD}$ | Diode Forward Voltage | — | — | 1.0 | V | $T_J$ = 25°C, $I_S$ = 50A, $V_{GS}$ = 0V ③ |
| $t_{rr}$ | Reverse Recovery Time | — | 37 | 56 | ns | $T_J$ = 25°C, $I_F$ = 50A, $V_{DD}$ = 13V |
| $Q_{rr}$ | Reverse Recovery Charge | — | 68 | 102 | nC | di/dt = 200A/µs ③ |

## Thermal Resistance

| | Parameter | Typ. | Max. | Units |
|---|---|---|---|---|
| $R_{\theta JC}$(Bottom) | Junction-to-Case ④ | 0.5 | 0.8 | °C/W |
| $R_{\theta JC}$ (Top) | Junction-to-Case ④ | — | 15 | |
| $R_{\theta JA}$ | Junction-to-Ambient ⑤ | — | 35 | |
| $R_{\theta JA}$ (<10s) | Junction-to-Ambient ⑤ | — | 21 | |

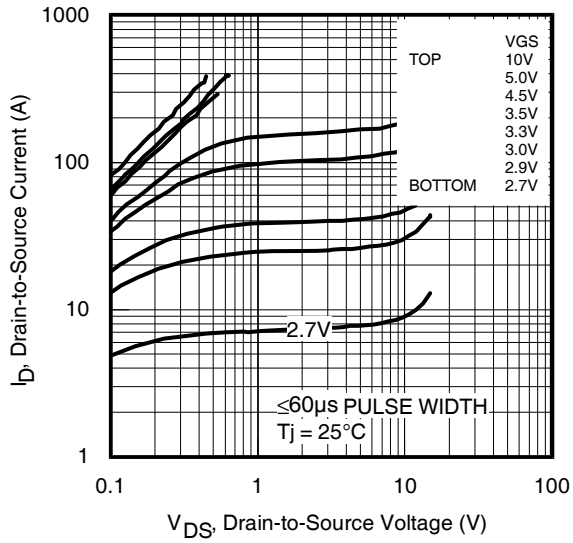



**Fig 1.** Typical Output Characteristics

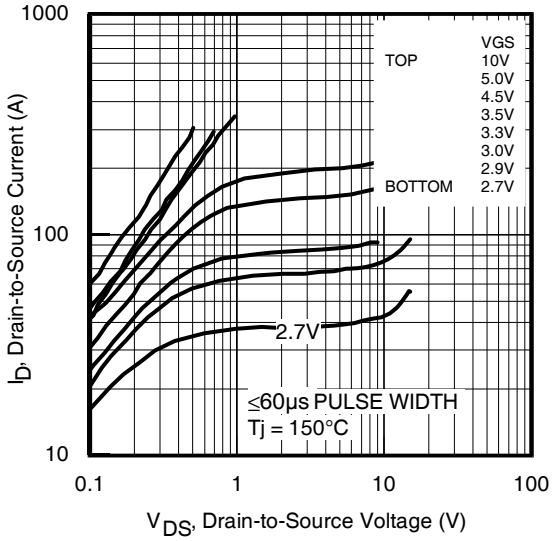



**Fig 2.** Typical Output Characteristics

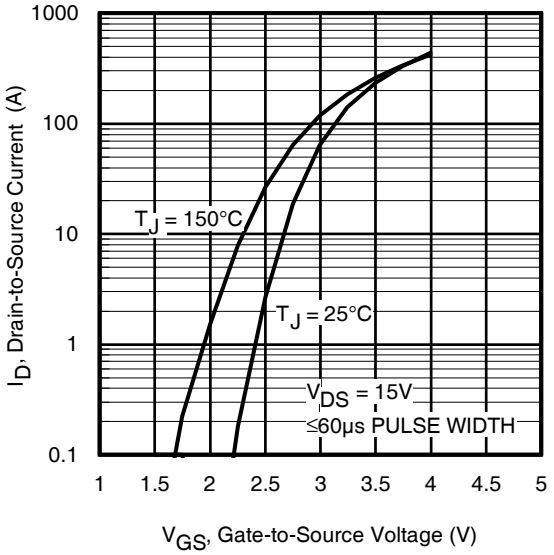



**Fig 3.** Typical Transfer Characteristics

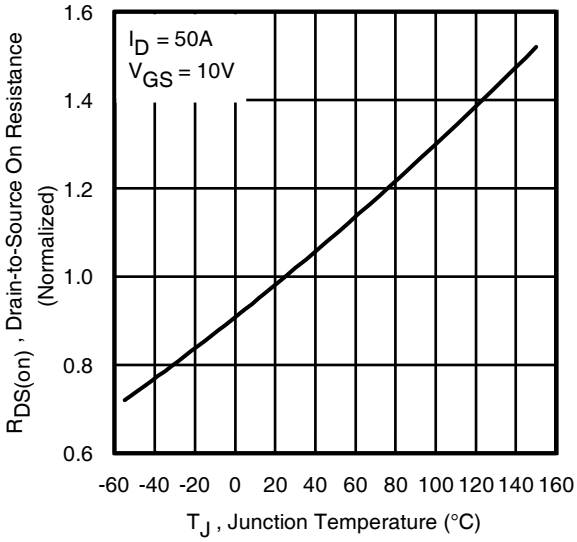



**Fig 4.** Normalized On-Resistance Vs. Temperature

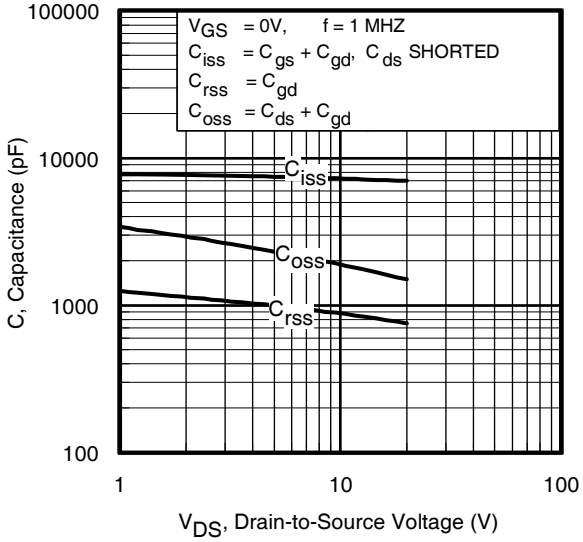



**Fig 5.** Typical Capacitance Vs.Drain-to-Source Voltage

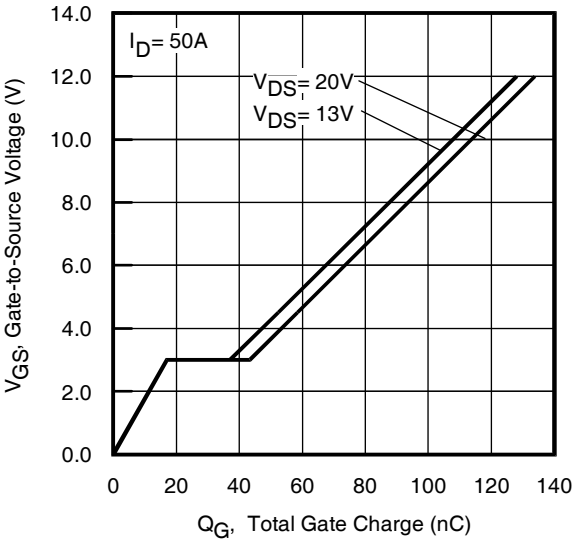



**Fig 6.** Typical Gate Charge Vs.Gate-to-Source Voltage

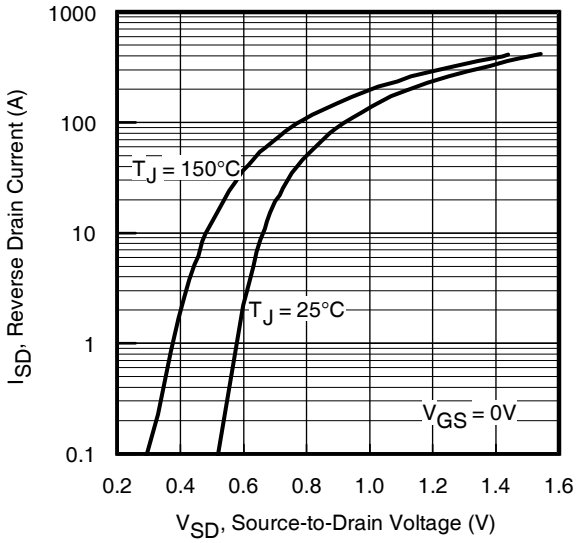



**Fig 7.** Typical Source-Drain Diode Forward Voltage

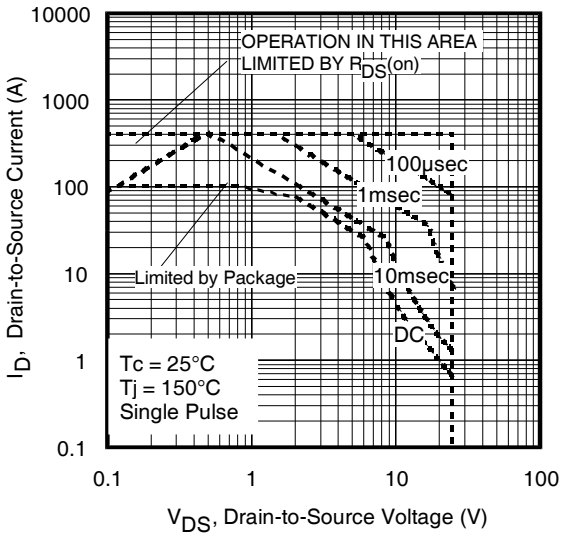



**Fig 8.** Maximum Safe Operating Area

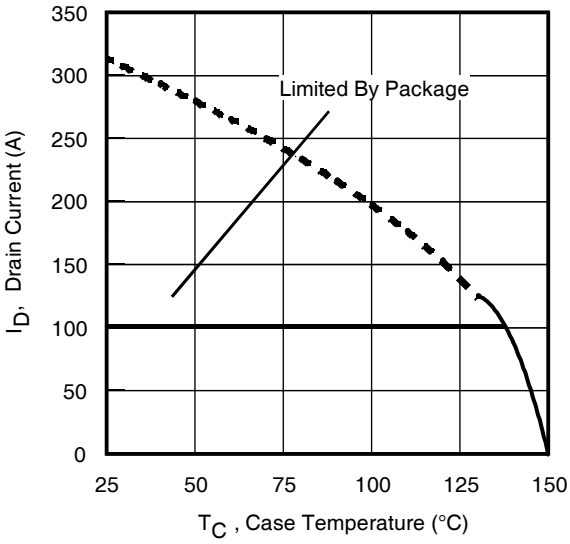



**Fig 9.** Maximum Drain Current Vs. Case (Bottom) Temperature

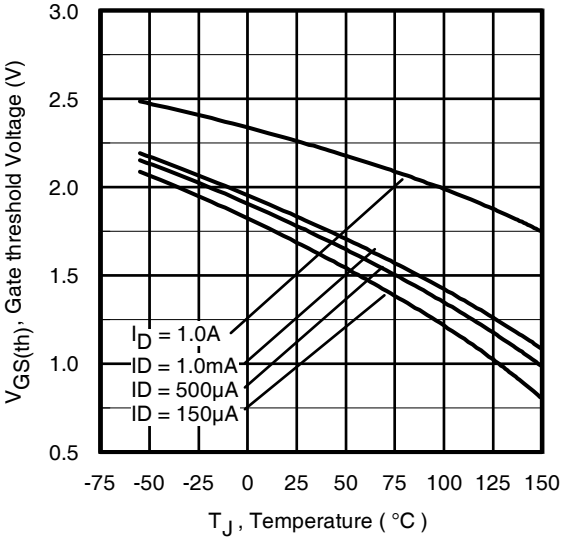



**Fig 10.** Threshold Voltage Vs. Temperature

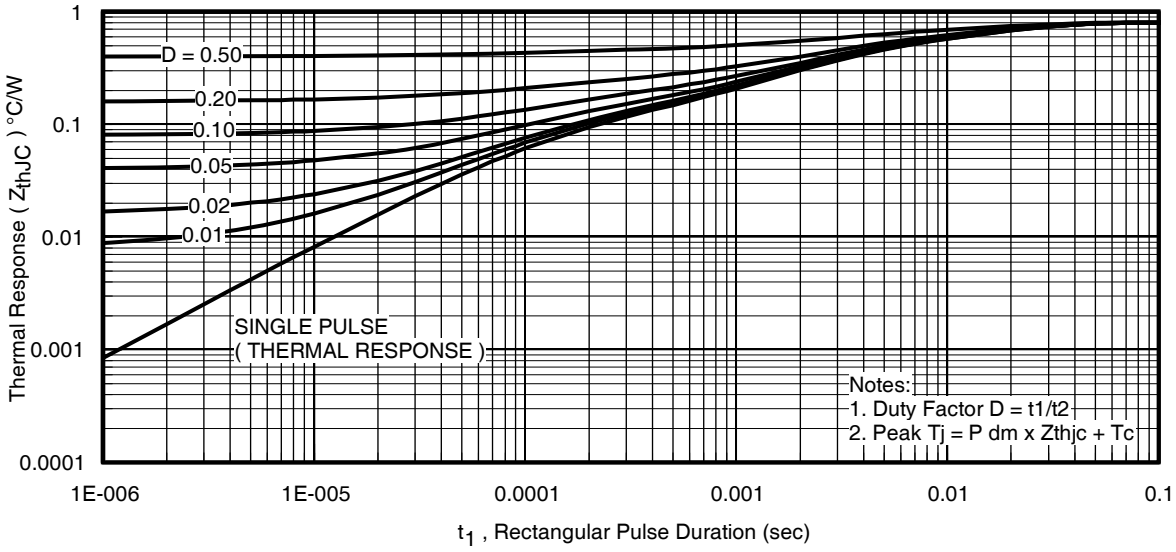



**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case (Bottom)

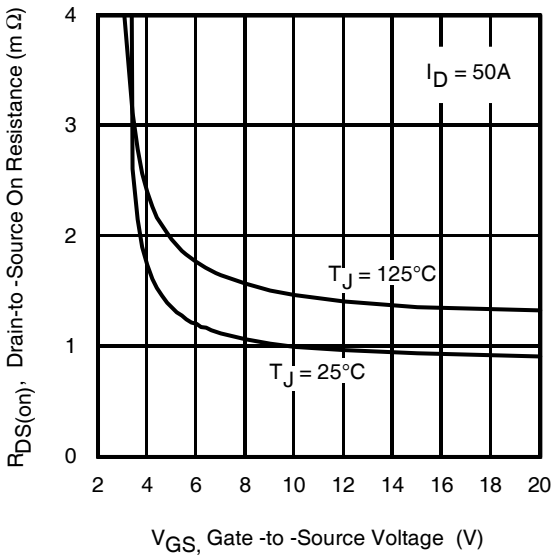



**Fig 12.** On-Resistance vs. Gate Voltage

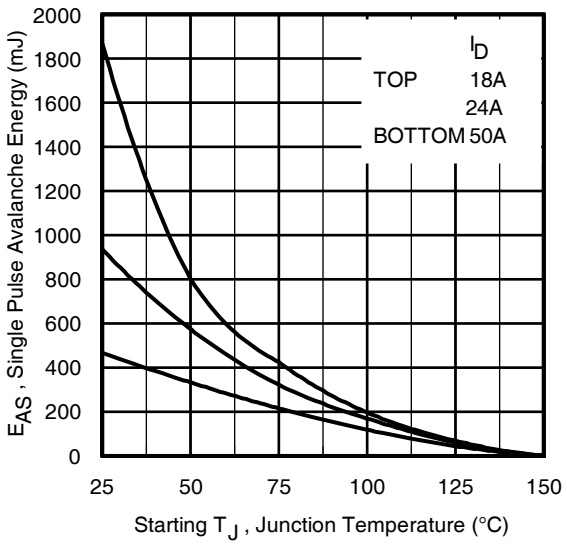



**Fig 13.** Maximum Avalanche Energy vs. Drain Current

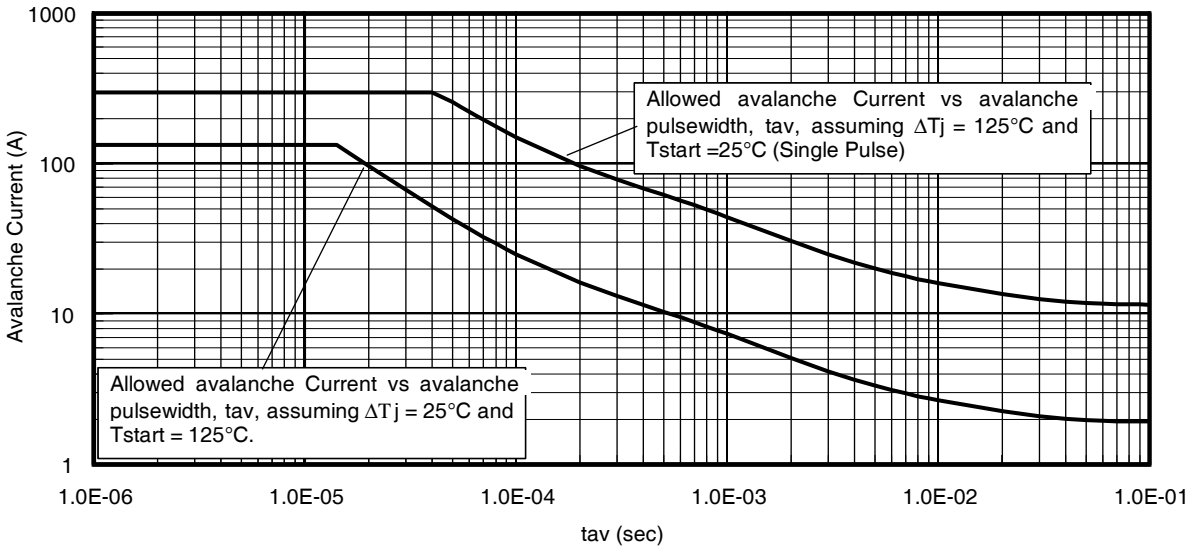



**Fig 14.** Typical Avalanch Current vs. Pulsewidth

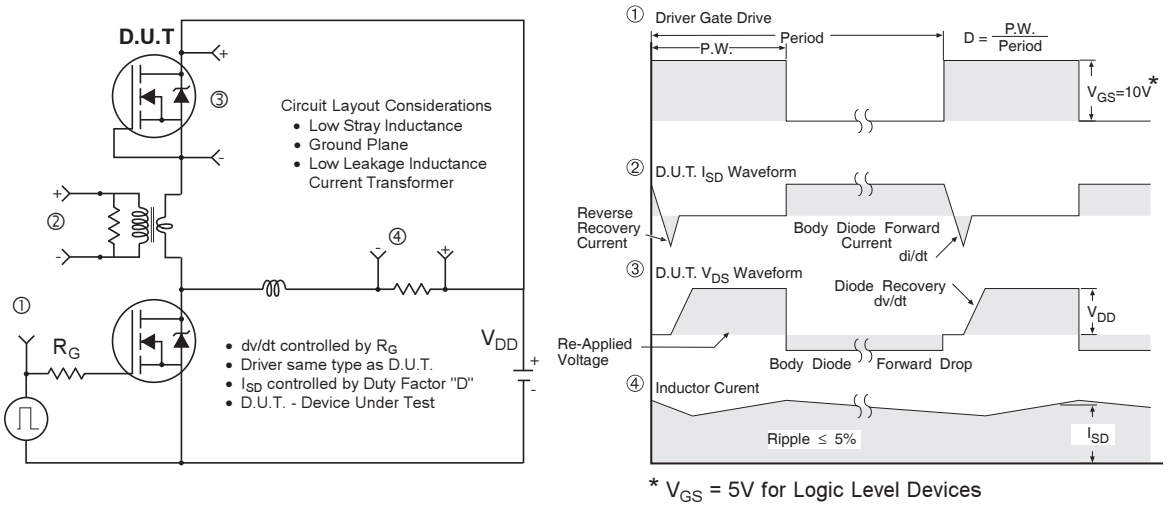



**Fig 15.** Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

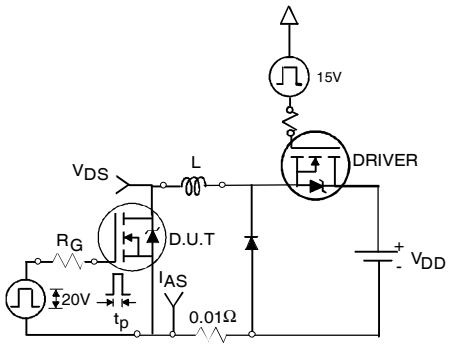



**Fig 16a.** Unclamped Inductive Test Circuit

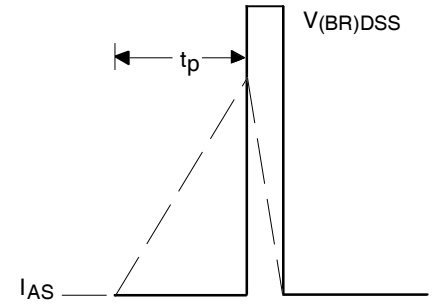



**Fig 16b.** Unclamped Inductive Waveforms

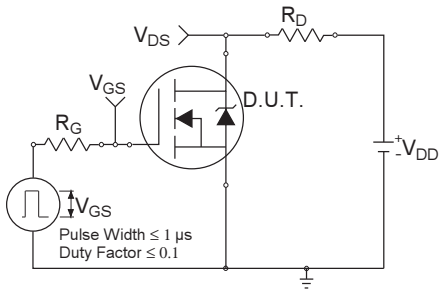



**Fig 17a.** Switching Time Test Circuit

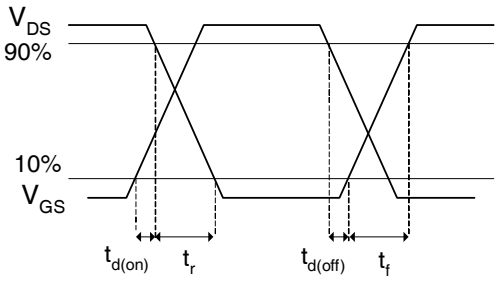



**Fig 17b.** Switching Time Waveforms

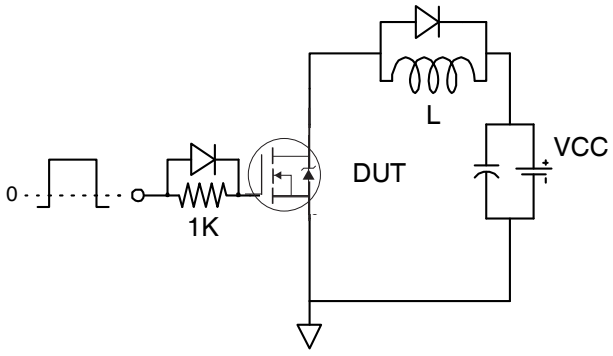



**Fig 18a.** Gate Charge Test Circuit

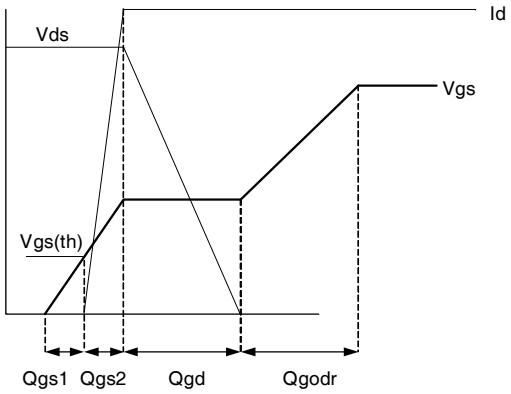
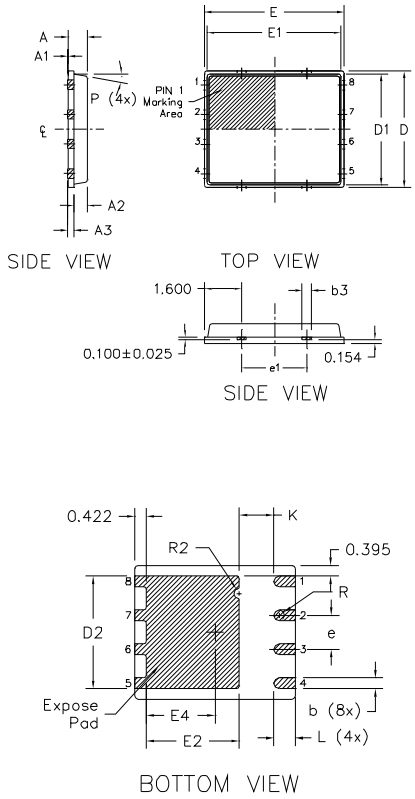



**Fig 18b.** Gate Charge Waveform

# PQFN 5x6 Outline "B" Package Details

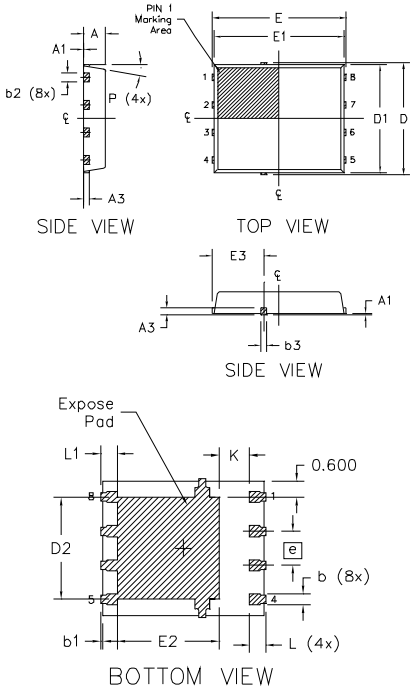



| DIM / SYMBOL | MILLIMITERS MIN | MILLIMITERS MAX | INCH MIN | INCH MAX |
|---|---|---|---|---|
| A | 0.800 | 0.900 | 0.0315 | 0.0543 |
| A1 | 0.000 | 0.050 | 0.0000 | 0.0020 |
| A3 | 0.200 REF | | 0.0079 REF | |
| b | 0.350 | 0.470 | 0.0138 | 0.0185 |
| b1 | 0.025 | 0.125 | 0.0010 | 0.0049 |
| b2 | 0.210 | 0.410 | 0.0083 | 0.0161 |
| b3 | 0.150 | 0.450 | 0.0059 | 0.0177 |
| D | 5.000 BSC | | 0.1969 BSC | |
| D1 | 4.750 BSC | | 0.1870 BSC | |
| D2 | 4.100 | 4.300 | 0.1614 | 0.1693 |
| E | 6.000 BSC | | 0.2362 BSC | |
| E1 | 5.750 BSC | | 0.2264 BSC | |
| E2 | 3.380 | 3.780 | 0.1331 | 0.1488 |
| e | 1.270 REF | | 0.0500 REF | |
| e1 | 2.800 REF | | 0.1102 REF | |
| K | 1.200 | 1.420 | 0.0472 | 0.0559 |
| L | 0.710 | 0.900 | 0.0280 | 0.0354 |
| P | 0° | 12° | 0° | 12° |
| R | 0.200 REF | | 0.0079 REF | |
| R2 | 0.150 | 0.200 | 0.0059 | 0.0079 |

*Note:*

1. Dimensions and toleranceing confirm to ASME Y14.5M-1994
2. Dimension L represents terminal full back from package edge up to 0.1mm is acceptable
3. Coplanarity applies to the expose Heat Slug as well as the terminal
4. Radius on terminal is Optional

# PQFN 5x6 Outline "G" Package Details




| DIM / SYMBOL | MILLIMETERS MIN. | MILLIMETERS MAX. | INCH MIN. | INCH MAX. |
|---|---|---|---|---|
| A | 0.950 | 1.050 | 0.0374 | 0.0413 |
| A1 | 0.000 | 0.050 | 0.0000 | 0.0020 |
| A3 | 0.254 REF | | 0.0100 REF | |
| b | 0.310 | 0.510 | 0.0122 | 0.0201 |
| b1 | 0.025 | 0.125 | 0.0010 | 0.0049 |
| b2 | 0.210 | 0.410 | 0.0083 | 0.0161 |
| b3 | 0.180 | 0.450 | 0.0071 | 0.0177 |
| D | 5.150 BSC | | 0.2028 BSC | |
| D1 | 5.000 BSC | | 0.1969 BSC | |
| D2 | 3.700 | 3.900 | 0.1457 | 0.1535 |
| E | 6.150 BSC | | 0.2421 BSC | |
| E1 | 6.000 BSC | | 0.2362 BSC | |
| E2 | 3.560 | 3.760 | 0.1402 | 0.1488 |
| E3 | 2.270 | 2.470 | 0.0894 | 0.0972 |
| e | 1.27 REF | | 0.050 REF | |
| K | 0.830 | 1.400 | 0.0327 | 0.0551 |
| L | 0.510 | 0.710 | 0.0201 | 0.0280 |
| L1 | 0.510 | 0.710 | 0.0201 | 0.0280 |
| P | 10 deg | 12 deg | 0 deg | 12 deg |

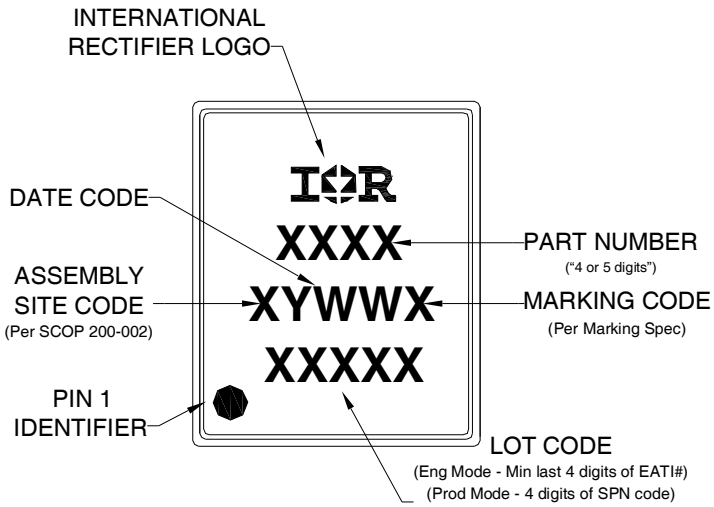
Note:

1. Dimensions and toleranceing confirm to ASME Y14.5M-1994
2. Dimension L represents terminal full back from package edge up to 0.1mm is acceptable
3. Coplanarity applies to the expose Heat Slug as well as the terminal
4. Radius on terminal is Optional

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

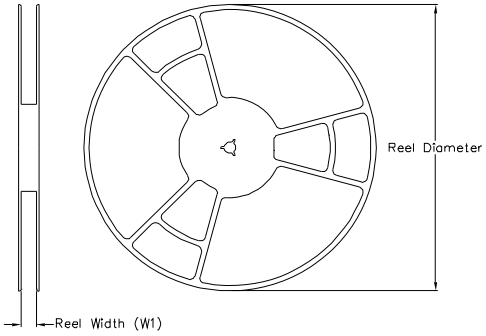
**Note: For the most current drawing please refer to IR website at:** http://www.irf.com/package/

# PQFN 5x6 Part Marking

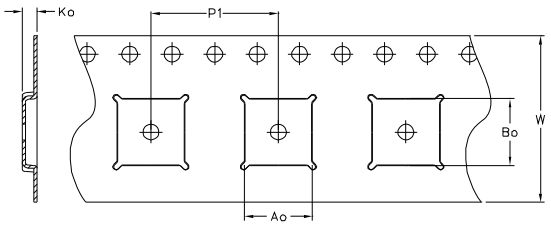



# PQFN 5x6 Tape and Reel

**REEL DIMENSIONS**

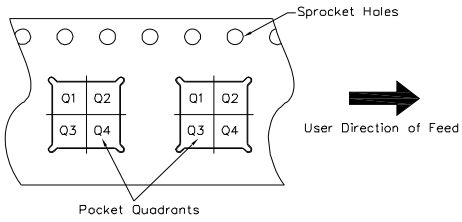



**TAPE DIMENSIONS**




| CODE | DESCRIPTION |
|---|---|
| Ao | Dimension design to accommodate the component width |
| Bo | Dimension design to accommodate the component lenght |
| Ko | Dimension design to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P1 | Pitch between successive cavity centers |

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




Note: All dimension are nominal

| Package Type | Reel Diameter (Inch) | QTY | Reel Width W1 (mm) | Ao (mm) | Bo (mm) | Ko (mm) | P1 (mm) | W (mm) | Pin 1 Quadrant |
|---|---|---|---|---|---|---|---|---|---|
| 5 X 6 PQFN | 13 | 4000 | 12.4 | 6.300 | 5.300 | 1.20 | 8.00 | 12 | Q1 |

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

**Qualification information**†

| | | |
|---|---|---|
| Qualification level | Industrial<br>(per JEDEC JESD47F guidelines ) | |
| Moisture Sensitivity Level | PQFN 5mm x 6mm | MSL1<br>(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

†† 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 = 0.37mH, $R_G$ = 25Ω, $I_{AS}$ = 50A.

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

④ $R_\theta$ 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.
http://www.irf.com/technical-info/appnotes/an-994.pdf

⑥ Calculated continuous current based on maximum allowable junction temperature. Package is limited to 100A by production test capability

**Revision History**

| Date | Comments |
|---|---|
| 8/1/2013 | • Added "Strong*IR*FET™" above part number on page 1 |
| 4/28/2015 | • Updated package outline for "option B" and added package outline for "option G" on page 7<br>• Updated tape and reel on page 8. |
| 5/19/2015 | • Updated package outline for "option G" on page 7.<br>• Updated "IFX logo" on page 1 and page 9. |

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