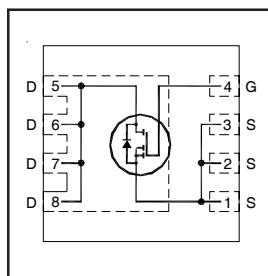
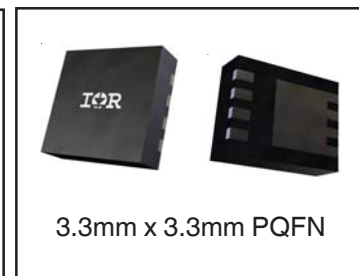


# IRFHM830PbF

HEXFET® Power MOSFET

|                                            |                       |           |
|--------------------------------------------|-----------------------|-----------|
| $V_{DS}$                                   | <b>30</b>             | <b>V</b>  |
| $R_{DS(on) \max}$<br>(@ $V_{GS} = 10V$ )   | <b>3.8</b>            | <b>mΩ</b> |
| $Q_g$ (typical)                            | <b>15</b>             | <b>nC</b> |
| $R_G$ (typical)                            | <b>2.5</b>            | <b>Ω</b>  |
| $I_D$<br>(@ $T_{C(Bottom)} = 25^\circ C$ ) | <b>40<sup>⑥</sup></b> | <b>A</b>  |



## Applications

- Battery Operated DC Motor Inverter MOSFET

## Features and Benefits

### Features

|                                                              |
|--------------------------------------------------------------|
| Low $R_{DS(on)}$ (<3.8mΩ)                                    |
| Low Thermal Resistance to PCB (<3.4°C/W)                     |
| 100% Rg tested                                               |
| Low Profile (<1.0mm)                                         |
| 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 Reliability             |
| Increased Power Density           |
| Multi-Vendor Compatibility        |
| Easier Manufacturing              |
| Environmentally Friendlier        |
| Increased Reliability             |

| Orderable part number | Package Type       | Standard Pack |          | Note |
|-----------------------|--------------------|---------------|----------|------|
|                       |                    | Form          | Quantity |      |
| IRFHM830TRPBF         | PQFN 3.3mm x 3.3mm | Tape and Reel | 4000     |      |
| IRFHM830TR2PBF        | PQFN 3.3mm x 3.3mm | Tape and Reel | 400      |      |

## Absolute Maximum Ratings

|                                       | Parameter                                           | Max.            | Units |
|---------------------------------------|-----------------------------------------------------|-----------------|-------|
| $V_{DS}$                              | Drain-to-Source Voltage                             | 30              | V     |
| $V_{GS}$                              | Gate-to-Source Voltage                              | ±20             |       |
| $I_D$ @ $T_A = 25^\circ C$            | Continuous Drain Current, $V_{GS}$ @ 10V            | 21              | A     |
| $I_D$ @ $T_A = 70^\circ C$            | Continuous Drain Current, $V_{GS}$ @ 10V            | 17              |       |
| $I_D$ @ $T_{C(Bottom)} = 25^\circ C$  | Continuous Drain Current, $V_{GS}$ @ 10V            | 40 <sup>⑥</sup> |       |
| $I_D$ @ $T_{C(Bottom)} = 100^\circ C$ | Continuous Drain Current, $V_{GS}$ @ 10V            | 40 <sup>⑥</sup> |       |
| $I_{DM}$                              | 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  |
| $T_J$<br>$T_{STG}$                    | Operating Junction and<br>Storage Temperature Range | -55 to + 150    | °C    |

Notes ① through ⑤ are on page 8

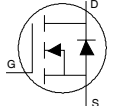
## Static @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

|                              | Parameter                            | Min. | Typ. | Max. | Units                | Conditions                                                                      |
|------------------------------|--------------------------------------|------|------|------|----------------------|---------------------------------------------------------------------------------|
| $BV_{DSS}$                   | Drain-to-Source Breakdown Voltage    | 30   | —    | —    | V                    | $V_{GS} = 0V, I_D = 250\mu A$                                                   |
| $\Delta BV_{DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient  | —    | 0.02 | —    | V/ $^\circ\text{C}$  | Reference to $25^\circ\text{C}$ , $I_D = 1mA$                                   |
| $R_{DS(on)}$                 | Static Drain-to-Source On-Resistance | —    | 3.0  | 3.8  | $m\Omega$            | $V_{GS} = 10V, I_D = 20A$ ③                                                     |
|                              |                                      | —    | 4.8  | 6.0  |                      | $V_{GS} = 4.5V, I_D = 20A$ ③                                                    |
| $V_{GS(th)}$                 | Gate Threshold Voltage               | 1.35 | 1.8  | 2.35 | V                    | $V_{DS} = V_{GS}, I_D = 50\mu A$                                                |
| $\Delta V_{GS(th)}$          | Gate Threshold Voltage Coefficient   | —    | -6.3 | —    | mV/ $^\circ\text{C}$ |                                                                                 |
| $I_{DSS}$                    | Drain-to-Source Leakage Current      | —    | —    | 1.0  | $\mu A$              | $V_{DS} = 24V, V_{GS} = 0V$                                                     |
|                              |                                      | —    | —    | 150  |                      | $V_{DS} = 24V, V_{GS} = 0V, T_J = 125^\circ\text{C}$                            |
| $I_{GSS}$                    | Gate-to-Source Forward Leakage       | —    | —    | 100  | nA                   | $V_{GS} = 20V$                                                                  |
|                              | Gate-to-Source Reverse Leakage       | —    | —    | -100 |                      | $V_{GS} = -20V$                                                                 |
| $g_{fs}$                     | Forward Transconductance             | 52   | —    | —    | S                    | $V_{DS} = 15V, I_D = 20A$                                                       |
| $Q_g$                        | Total Gate Charge                    | —    | 31   | —    | nC                   | $V_{GS} = 10V, V_{DS} = 15V, I_D = 20A$                                         |
| $Q_g$                        | Total Gate Charge                    | —    | 15   | 23   | nC                   | $V_{DS} = 15V$<br>$V_{GS} = 4.5V$<br>$I_D = 20A$<br>See Fig.17 & 18             |
| $Q_{gs1}$                    | Pre-Vth Gate-to-Source Charge        | —    | 3.8  | —    |                      |                                                                                 |
| $Q_{gs2}$                    | Post-Vth Gate-to-Source Charge       | —    | 2.0  | —    |                      |                                                                                 |
| $Q_{gd}$                     | Gate-to-Drain Charge                 | —    | 5.0  | —    |                      |                                                                                 |
| $Q_{godr}$                   | Gate Charge Overdrive                | —    | 4.2  | —    |                      |                                                                                 |
| $Q_{sw}$                     | Switch Charge ( $Q_{gs2} + Q_{gd}$ ) | —    | 7.0  | —    | nC                   | $V_{DS} = 16V, V_{GS} = 0V$                                                     |
| $Q_{oss}$                    | Output Charge                        | —    | 9.7  | —    |                      |                                                                                 |
| $R_G$                        | Gate Resistance                      | —    | 2.5  | —    | $\Omega$             |                                                                                 |
| $t_{d(on)}$                  | Turn-On Delay Time                   | —    | 12   | —    | ns                   | $V_{DD} = 15V, V_{GS} = 4.5V$<br>$I_D = 20A$<br>$R_G = 1.8\Omega$<br>See Fig.15 |
| $t_r$                        | Rise Time                            | —    | 25   | —    |                      |                                                                                 |
| $t_{d(off)}$                 | Turn-Off Delay Time                  | —    | 13   | —    |                      |                                                                                 |
| $t_f$                        | Fall Time                            | —    | 9.2  | —    |                      |                                                                                 |
| $C_{iss}$                    | Input Capacitance                    | —    | 2155 | —    | pF                   | $V_{GS} = 0V$<br>$V_{DS} = 25V$<br>$f = 1.0MHz$                                 |
| $C_{oss}$                    | Output Capacitance                   | —    | 350  | —    |                      |                                                                                 |
| $C_{rss}$                    | Reverse Transfer Capacitance         | —    | 160  | —    |                      |                                                                                 |

## Avalanche Characteristics

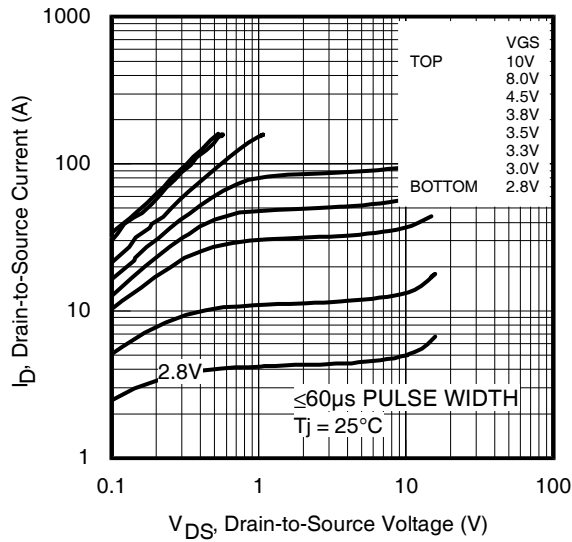
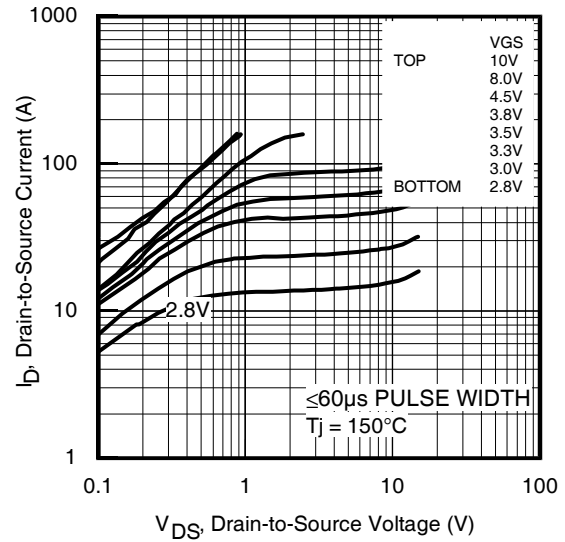
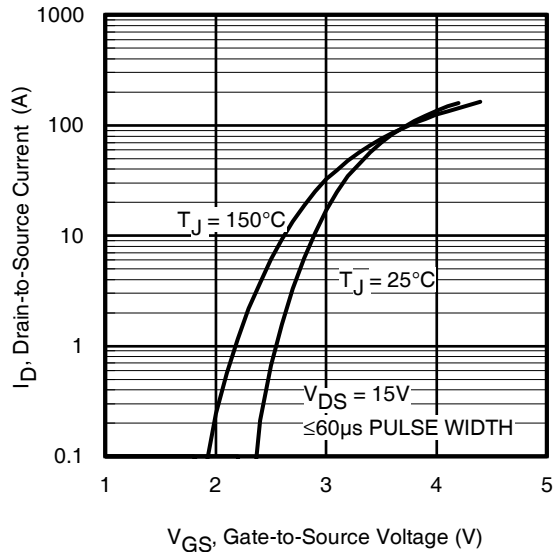
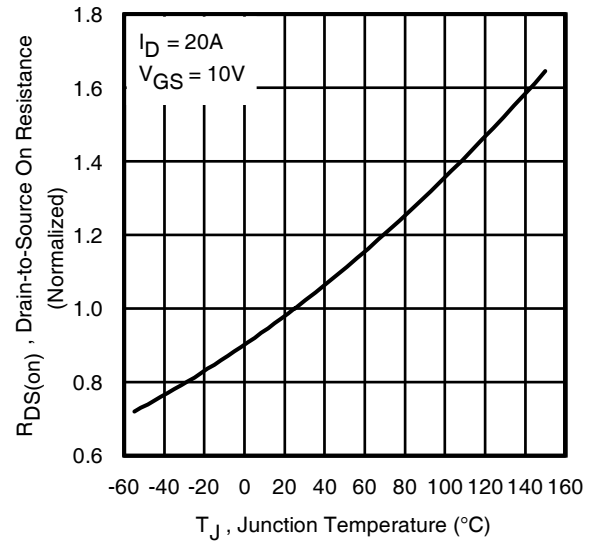
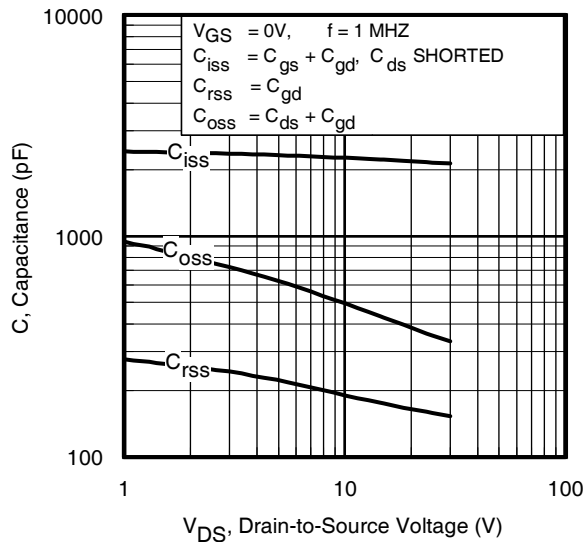
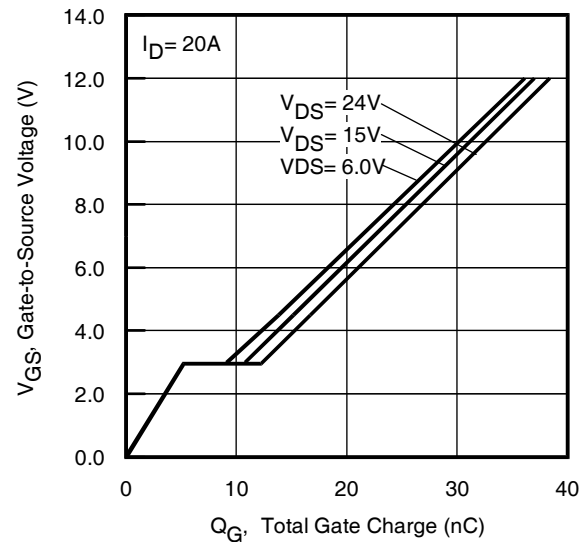
|          | Parameter                       | Typ. | Max. | Units |
|----------|---------------------------------|------|------|-------|
| $E_{AS}$ | Single Pulse Avalanche Energy ② | —    | 82   | mJ    |
| $I_{AR}$ | Avalanche Current ①             | —    | 20   | A     |

## Diode Characteristics

|          | Parameter                                | Min.                                      | Typ. | Max. | Units | Conditions                                                                                                                                           |
|----------|------------------------------------------|-------------------------------------------|------|------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_S$    | Continuous Source Current (Body Diode) ⑥ | —                                         | —    | 40   | A     | MOSFET symbol showing the integral reverse p-n junction diode.  |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ①     | —                                         | —    | 160  |       |                                                                                                                                                      |
| $V_{SD}$ | Diode Forward Voltage                    | —                                         | —    | 1.0  | V     | $T_J = 25^\circ\text{C}, I_S = 20A, V_{GS} = 0V$ ③                                                                                                   |
| $t_{rr}$ | Reverse Recovery Time                    | —                                         | 17   | 26   | ns    | $T_J = 25^\circ\text{C}, I_F = 20A, V_{DD} = 15V$                                                                                                    |
| $Q_{rr}$ | Reverse Recovery Charge                  | —                                         | 23   | 35   | nC    | $di/dt = 300A/\mu s$ ③                                                                                                                               |
| $t_{on}$ | Forward Turn-On Time                     | Time is dominated by parasitic Inductance |      |      |       |                                                                                                                                                      |

## Thermal Resistance

|                          | Parameter             | Typ. | Max. | Units              |
|--------------------------|-----------------------|------|------|--------------------|
| $R_{\theta JC}$ (Bottom) | Junction-to-Case ④    | —    | 3.4  | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ (Top)    | Junction-to-Case ④    | —    | 37   |                    |
| $R_{\theta JA}$          | Junction-to-Ambient ⑤ | —    | 46   |                    |
| $R_{\theta JA} (<10s)$   | Junction-to-Ambient ⑤ | —    | 31   |                    |



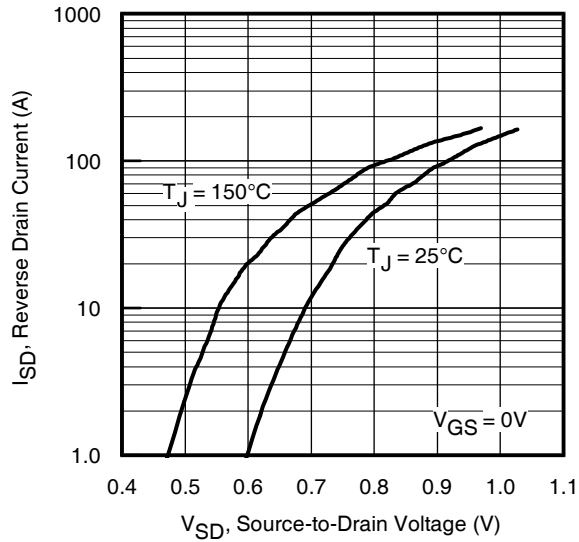


**Fig 7.** Typical Source-Drain Diode Forward Voltage

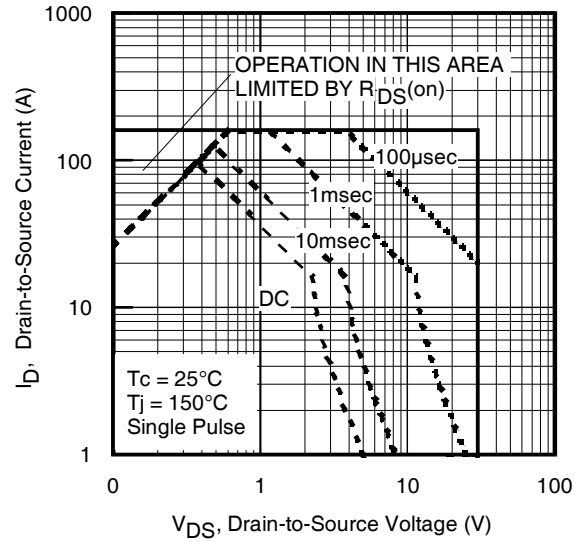


**Fig 8.** Maximum Safe Operating Area

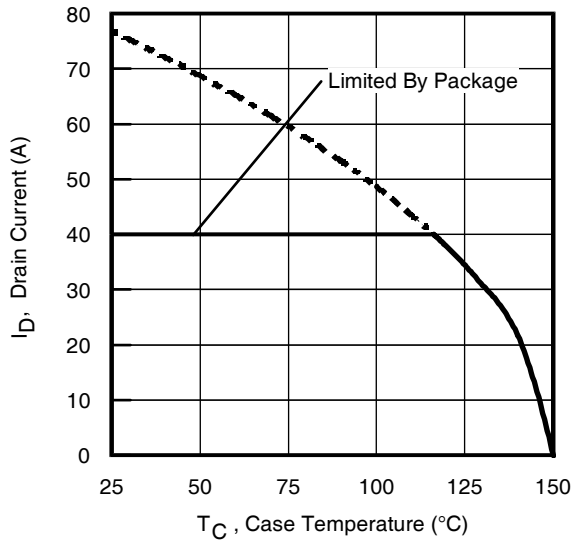


**Fig 9.** Maximum Drain Current vs. Case (Bottom) Temperature

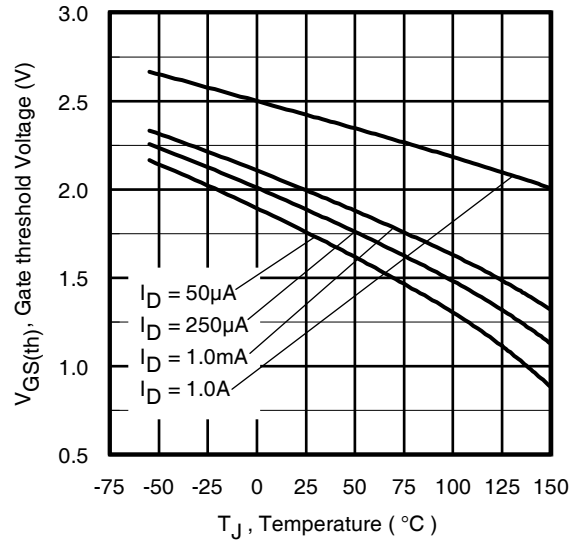


**Fig 10.** Threshold Voltage vs. Temperature

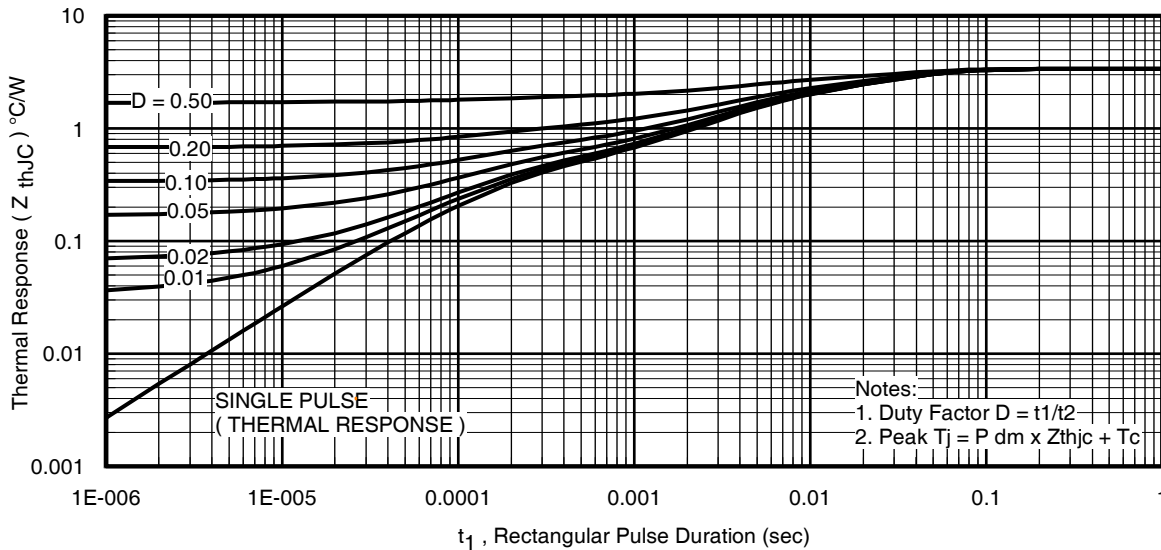


**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case (Bottom)

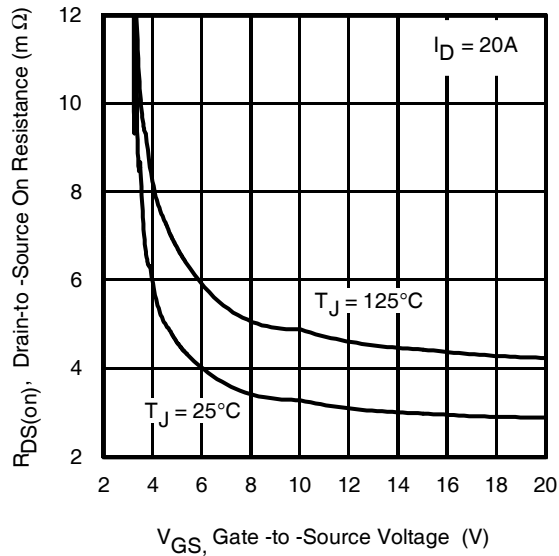


**Fig 12.** On-Resistance vs. Gate Voltage

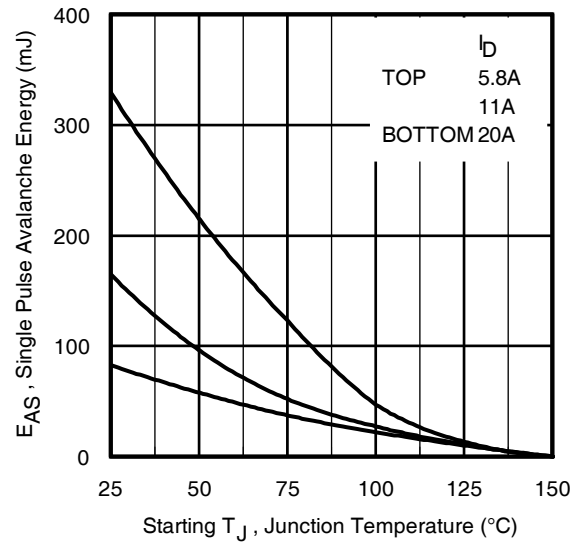


**Fig 13.** Maximum Avalanche Energy vs. Drain Current

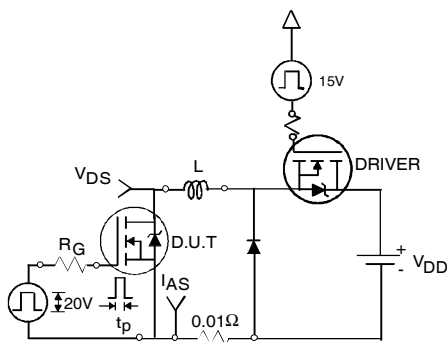


**Fig 14a.** Unclamped Inductive Test Circuit

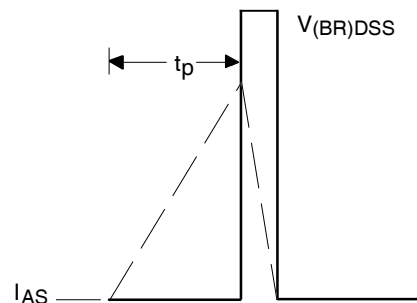


**Fig 14b.** Unclamped Inductive Waveforms

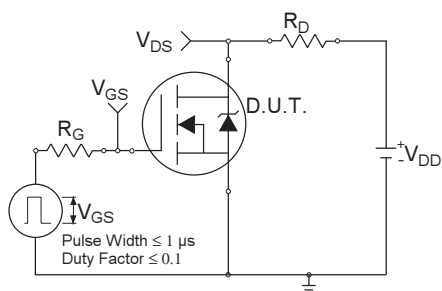


**Fig 15a.** Switching Time Test Circuit

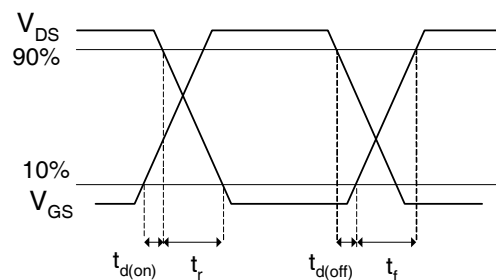


**Fig 15b.** Switching Time Waveforms

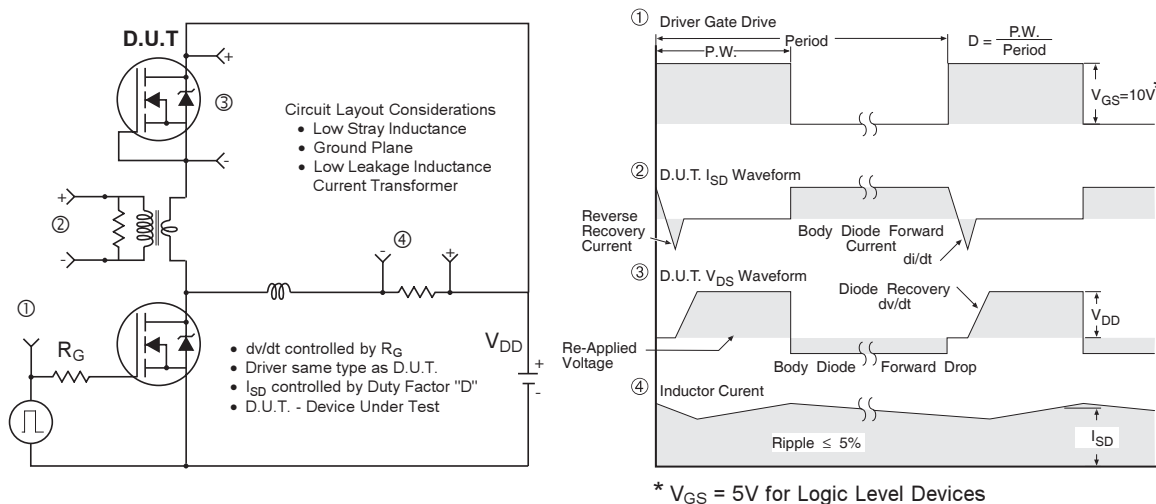


**Fig 16.** Peak Diode Recovery  $dv/dt$  Test Circuit for N-Channel HEXFET® Power MOSFETs

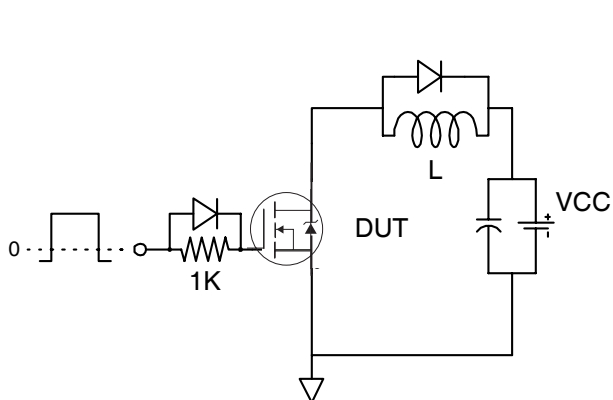


**Fig 17.** Gate Charge Test Circuit

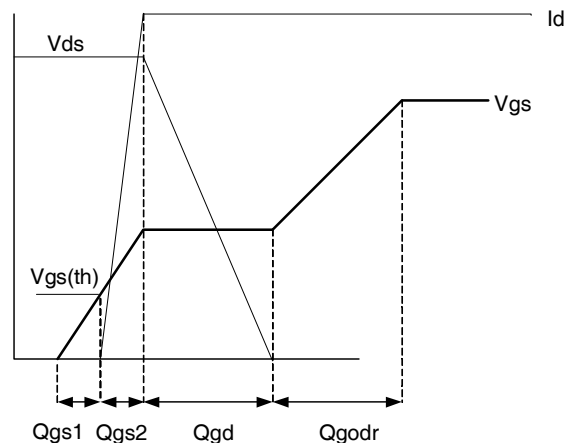
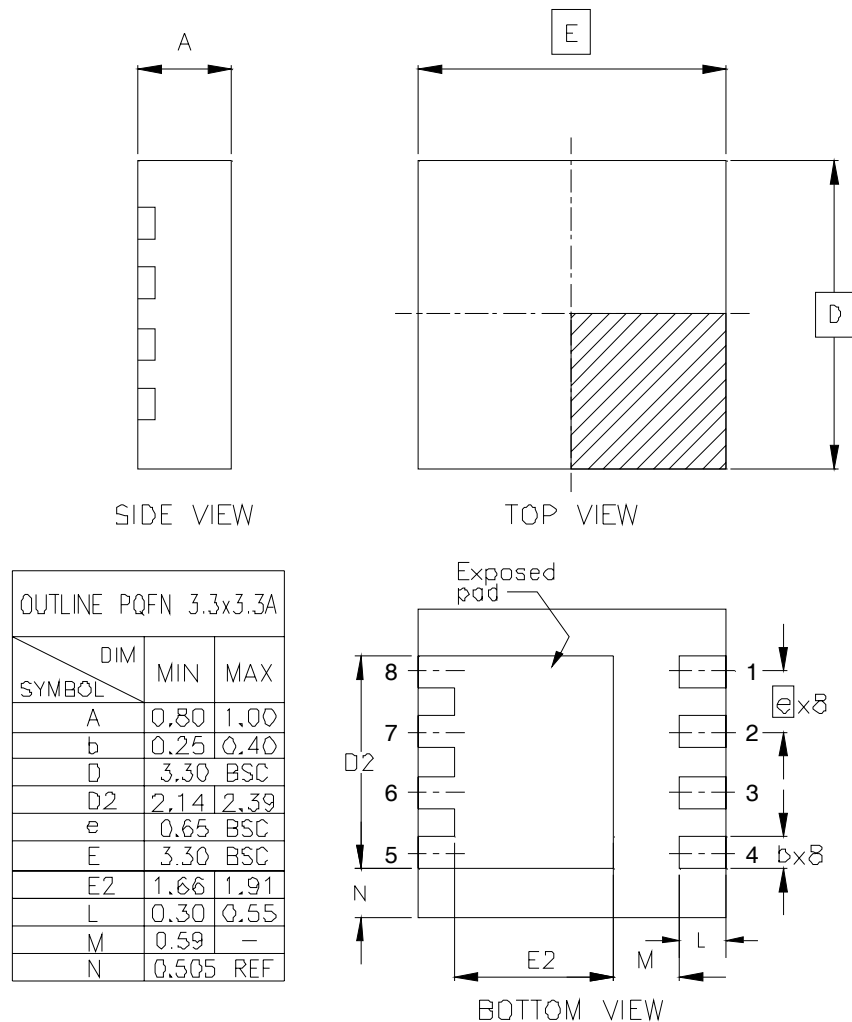


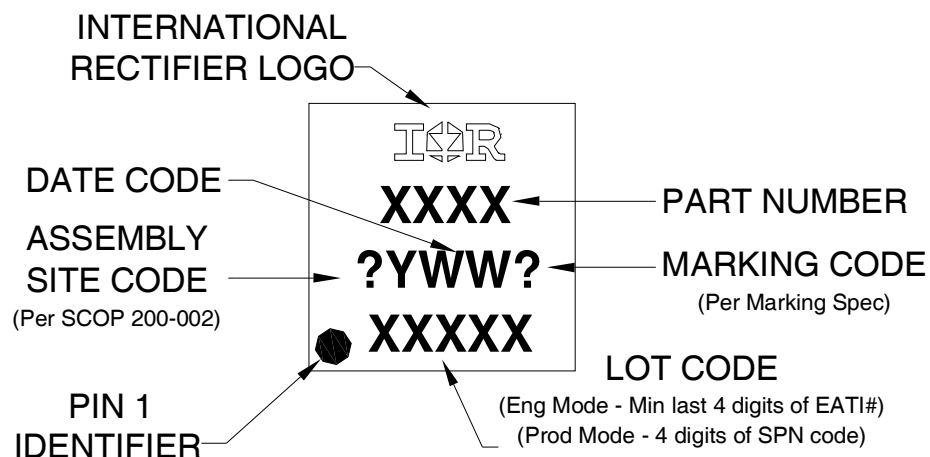
**Fig 18.** Gate Charge Waveform

## PQFN 3.3x3.3 Outline Package Details



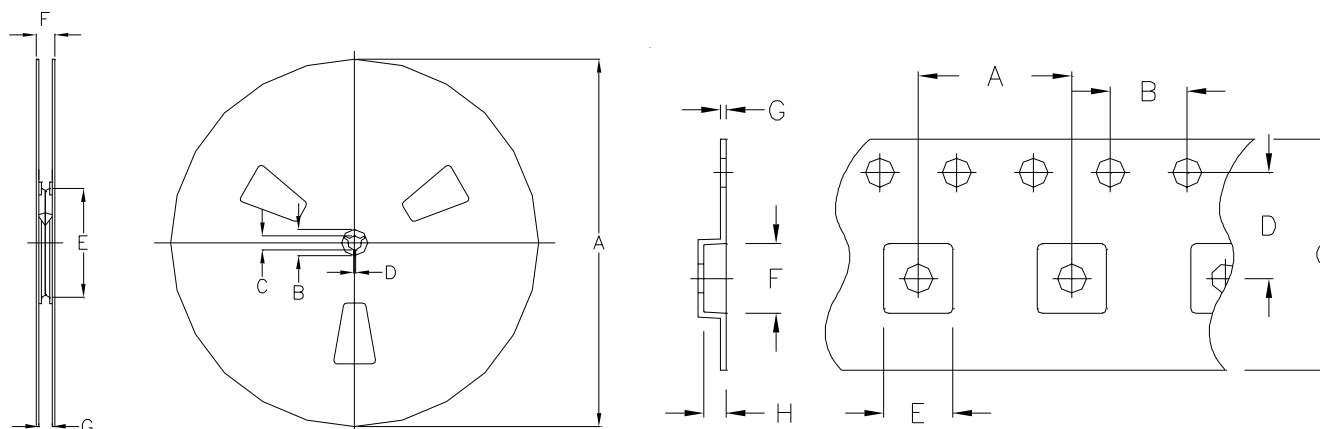
For footprint and stencil design recommendations, please refer to application note AN-1154 at <http://www.irf.com/technical-info/appnotes/an-1154.pdf>

## PQFN 3.3x3.3 Outline Part Marking



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

## PQFN 3.3x3.3 Outline Tape and Reel



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

| REEL DIMENSIONS            |           |        |           |        |
|----------------------------|-----------|--------|-----------|--------|
| STANDARD OPTION (QTY 4000) |           |        |           |        |
|                            | METRIC    |        | IMPERIAL  |        |
| CODE                       | MIN       | MAX    | MIN       | MAX    |
| A                          | 326.0     | 330.25 | 12.835    | 13.002 |
| B                          | 20.2      | 20.45  | 0.795     | 0.805  |
| C                          | 12.8      | 13.50  | 0.504     | 0.531  |
| D                          | 1.5       | 2.5    | 0.059     | 0.098  |
| E                          | 102.0 REF |        | 4.016 REF |        |
| F                          | 17.8      | 18.3   | 0.701     | 0.720  |
| G                          | 12.4      | 12.9   | 0.488     | 0.508  |

| DIMENSIONS |        |       |          |       |
|------------|--------|-------|----------|-------|
|            | METRIC |       | IMPERIAL |       |
| CODE       | MIN    | MAX   | MIN      | MAX   |
| A          | 7.90   | 8.10  | 0.311    | 0.319 |
| B          | 3.90   | 4.10  | 0.154    | 0.161 |
| C          | 11.70  | 12.30 | 0.461    | 0.484 |
| D          | 5.45   | 5.55  | 0.215    | 0.219 |
| E          | 3.50   | 3.70  | 0.138    | 0.146 |
| F          | 3.50   | 3.70  | 0.138    | 0.146 |
| G          | 0.25   | 0.35  | 0.010    | 0.014 |
| H          | 1.10   | 1.30  | 0.043    | 0.051 |

### Qualification Information<sup>†</sup>

|                            |                                                                           |                                                |
|----------------------------|---------------------------------------------------------------------------|------------------------------------------------|
| Qualification level        | Industrial <sup>††</sup><br>(per JEDEC JESD47F <sup>†††</sup> guidelines) |                                                |
| Moisture Sensitivity Level | PQFN 3.3mm x 3.3mm                                                        | MSL1<br>(per JEDEC J-STD-020D <sup>†††</sup> ) |
| RoHS Compliant             | Yes                                                                       |                                                |

<sup>†</sup> Qualification standards can be found at International Rectifier's web site

<http://www.irf.com/product-info/reliability>

<sup>††</sup> Higher qualification ratings may be available should the user have such requirements.

Please contact your International Rectifier sales representative for further information:

<http://www.irf.com/whoto-call/salesrep/>

<sup>†††</sup> Applicable version of JEDEC standard at the time of product release.

#### Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting  $T_J = 25^{\circ}\text{C}$ ,  $L = 0.41\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 20\text{A}$ .
- 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 2 oz copper pad on 1.5x1.5 in. board of FR-4 material.
- ⑥ Calculated continuous current based on maximum allowable junction temperature. Package is limited to 40A by production test capability.

Data and specifications subject to change without notice.

International  
**IR** Rectifier

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