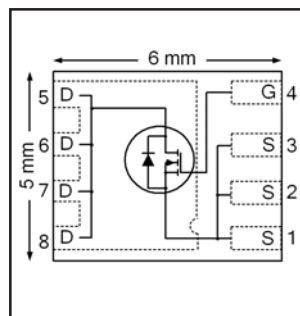


# IRFH8324PbF

HEXFET® Power MOSFET

|                                                 |             |           |
|-------------------------------------------------|-------------|-----------|
| $V_{DS}$                                        | <b>30</b>   | <b>V</b>  |
| $V_{GS \text{ max}}$                            | <b>± 20</b> | <b>V</b>  |
| $R_{DS(on) \text{ max}}$<br>(@ $V_{GS} = 10V$ ) | <b>4.1</b>  | <b>mΩ</b> |
| (@ $V_{GS} = 4.5V$ )                            | <b>6.3</b>  |           |
| $Q_g \text{ typ.}$                              | <b>14</b>   | <b>nC</b> |
| $I_D$<br>(@ $T_{c(Bottom)} = 25^\circ C$ )      | <b>50</b> ⑦ | <b>A</b>  |



## Applications

- Synchronous MOSFET for high frequency buck converters

## Features and Benefits

### Features

|                                                              |
|--------------------------------------------------------------|
| Low Thermal Resistance to PCB (< 2.3°C/W)                    |
| Low Profile (<1.2mm)                                         |
| Industry-Standard Pinout                                     |
| Compatible with Existing Surface Mount Techniques            |
| RoHS Compliant Containing no Lead, no Bromide and no Halogen |
| MSL1, Consumer Qualification                                 |

results in



### Benefits

|                                   |
|-----------------------------------|
| 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 |      |
| IRFH8324TRPBF         | PQFN 5mm x 6mm | Tape and Reel | 4000     |      |
| IRFH8324TR2PBF        | PQFN 5mm x 6mm | 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, $V_{GS} @ 10V$                   | 23           | A     |
| $I_D @ T_A = 70^\circ C$            | Continuous Drain Current, $V_{GS} @ 10V$                   | 18           |       |
| $I_D @ T_{C(Bottom)} = 25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V$                   | 90 ⑥ ⑦       |       |
| $I_D @ T_{C(Bottom)} = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$                   | 57 ⑥ ⑦       |       |
| $I_D @ T_C = 25^\circ C$            | Continuous Drain Current, $V_{GS} @ 10V$ (Package Limited) | 50 ⑦         |       |
| $I_{DM}$                            | Pulsed Drain Current ①                                     | 200          |       |
| $P_D @ T_A = 25^\circ C$            | Power Dissipation ⑤                                        | 3.6          | W     |
| $P_D @ T_{C(Bottom)} = 25^\circ C$  | Power Dissipation ⑤                                        | 54           |       |
|                                     | Linear Derating Factor ③                                   | 0.029        | W/°C  |
| $T_J$                               | Operating Junction and                                     | -55 to + 150 | °C    |
| $T_{STG}$                           | Storage Temperature Range                                  |              |       |

Notes ① through ⑥ are on page 9

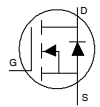
Static @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)

|                              | 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        | —    | 0.019 | —    | V/ $^\circ\text{C}$  | Reference to $25^\circ\text{C}$ , $I_D = 1.0\text{mA}$            |
| $R_{DS(on)}$                 | Static Drain-to-Source On-Resistance       | —    | 3.3   | 4.1  | $m\Omega$            | $V_{GS} = 10V, I_D = 20A$ ③                                       |
|                              |                                            | —    | 5.0   | 6.3  |                      | $V_{GS} = 4.5V, I_D = 16A$ 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         | —    | -6.2  | —    | 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                   | 72   | —     | —    | S                    | $V_{DS} = 10V, I_D = 20A$                                         |
| $Q_g$                        | Total Gate Charge                          | —    | 31    | —    | nC                   | $V_{GS} = 10V, V_{DS} = 15V, I_D = 20A$                           |
| $Q_g$                        | Total Gate Charge                          | —    | 14    | —    | nC                   | $V_{DS} = 15V$<br>$V_{GS} = 4.5V$<br>$I_D = 20A$                  |
| $Q_{gs1}$                    | Pre-V <sub>th</sub> Gate-to-Source Charge  | —    | 4.4   | —    |                      |                                                                   |
| $Q_{gs2}$                    | Post-V <sub>th</sub> Gate-to-Source Charge | —    | 2.2   | —    |                      |                                                                   |
| $Q_{gd}$                     | Gate-to-Drain Charge                       | —    | 3.5   | —    |                      |                                                                   |
| $Q_{godr}$                   | Gate Charge Overdrive                      | —    | 3.9   | —    |                      |                                                                   |
| $Q_{sw}$                     | Switch Charge ( $Q_{gs2} + Q_{gd}$ )       | —    | 5.7   | —    | nC                   | $V_{DS} = 16V, V_{GS} = 0V$                                       |
| $Q_{oss}$                    | Output Charge                              | —    | 13    | —    |                      |                                                                   |
| $R_G$                        | Gate Resistance                            | —    | 1.1   | —    | $\Omega$             |                                                                   |
| $t_{d(on)}$                  | Turn-On Delay Time                         | —    | 13    | —    | ns                   | $V_{DD} = 15V, V_{GS} = 4.5V$<br>$I_D = 20A$<br>$R_G = 1.8\Omega$ |
| $t_r$                        | Rise Time                                  | —    | 26    | —    |                      |                                                                   |
| $t_{d(off)}$                 | Turn-Off Delay Time                        | —    | 14    | —    |                      |                                                                   |
| $t_f$                        | Fall Time                                  | —    | 8.5   | —    |                      |                                                                   |
| $C_{iss}$                    | Input Capacitance                          | —    | 2380  | —    | pF                   | $V_{GS} = 0V$<br>$V_{DS} = 10V$<br>$f = 1.0\text{MHz}$            |
| $C_{oss}$                    | Output Capacitance                         | —    | 500   | —    |                      |                                                                   |
| $C_{rss}$                    | Reverse Transfer Capacitance               | —    | 205   | —    |                      |                                                                   |

## Avalanche Characteristics

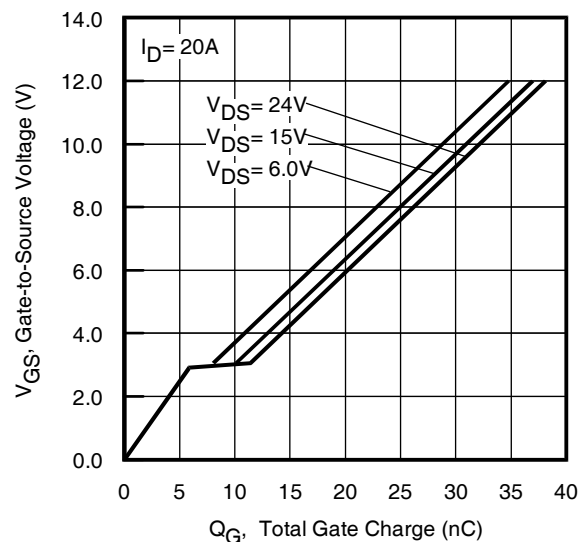
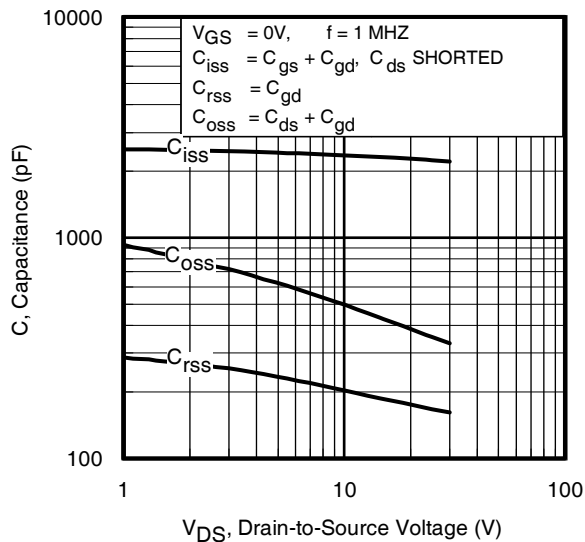
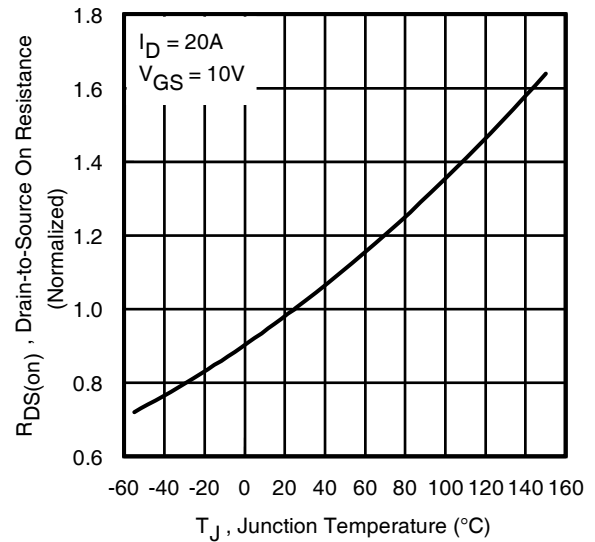
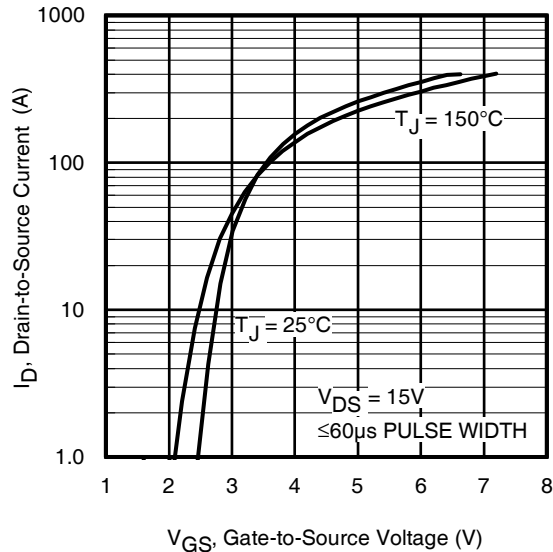
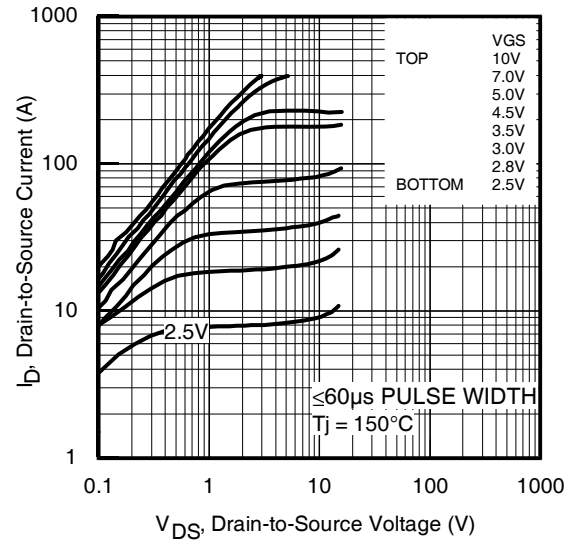
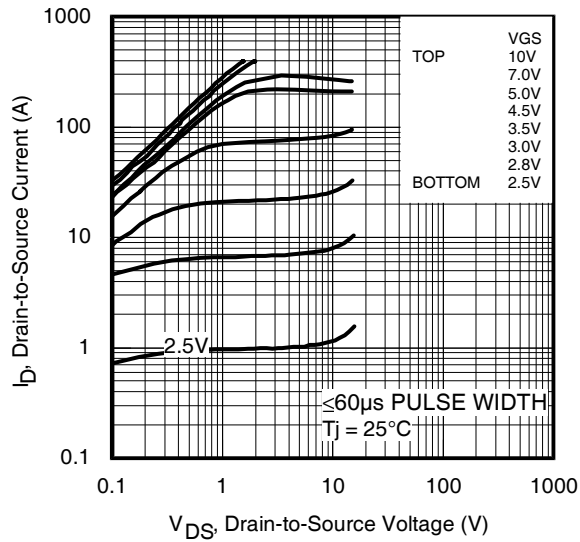
|          | Parameter                       | Typ. | Max. | Units |
|----------|---------------------------------|------|------|-------|
| $E_{AS}$ | Single Pulse Avalanche Energy ② | —    | 94   | mJ    |
| $I_{AR}$ | Avalanche Current ①             | —    | 20   | A     |

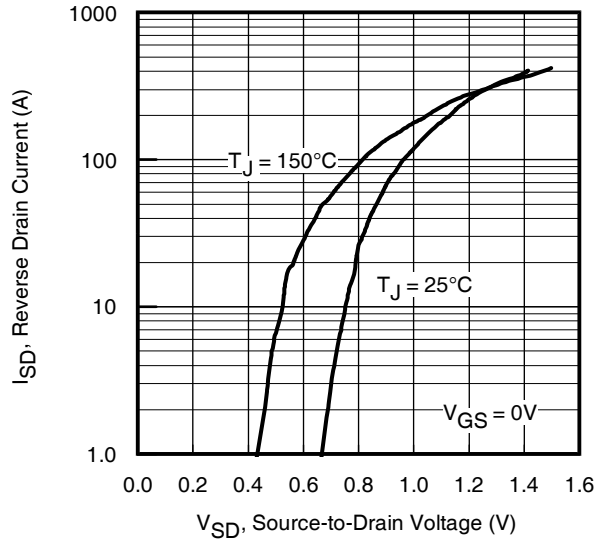
## Diode Characteristics

|          | Parameter                                 | Min.                                      | Typ. | Max. | Units | Conditions                                                                                                                                                       |
|----------|-------------------------------------------|-------------------------------------------|------|------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_S$    | Continuous Source Current<br>(Body Diode) | —                                         | —    | 50 ⑦ | A     | MOSFET symbol<br>showing the<br>integral reverse<br>p-n junction diode.<br> |
| $I_{SM}$ | Pulsed Source Current<br>(Body Diode) ①   | —                                         | —    | 200  |       |                                                                                                                                                                  |
| $V_{SD}$ | Diode Forward Voltage                     | —                                         | —    | 1.0  | V     | $T_J = 25^\circ\text{C}, I_S = 20A, V_{GS} = 0V$ ③                                                                                                               |
| $t_{rr}$ | Reverse Recovery Time                     | —                                         | 16   | 24   | ns    | $T_J = 25^\circ\text{C}, I_F = 20A, V_{DD} = 15V$                                                                                                                |
| $Q_{rr}$ | Reverse Recovery Charge                   | —                                         | 25   | 38   | nC    | $di/dt = 360 A/\mu s$ ③                                                                                                                                          |
| $t_{on}$ | Forward Turn-On Time                      | Time is dominated by parasitic Inductance |      |      |       |                                                                                                                                                                  |

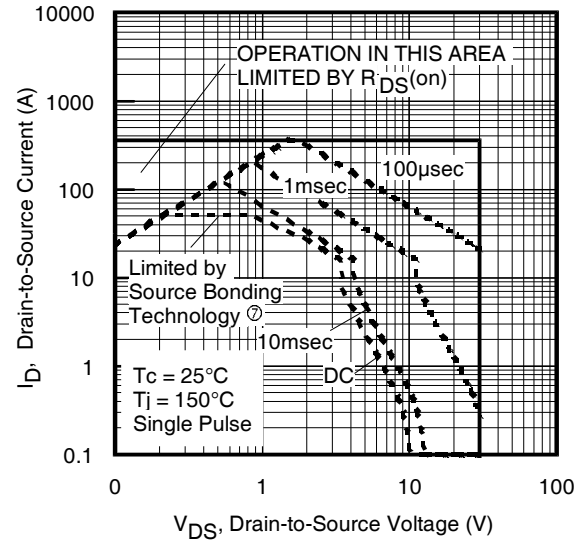
## Thermal Resistance

|                          | Parameter             | Typ. | Max. | Units              |
|--------------------------|-----------------------|------|------|--------------------|
| $R_{\theta JC}$ (Bottom) | Junction-to-Case ④    | —    | 2.3  | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ (Top)    | Junction-to-Case ④    | —    | 32   |                    |
| $R_{\theta JA}$          | Junction-to-Ambient ⑤ | —    | 35   |                    |
| $R_{\theta JA} (<10s)$   | Junction-to-Ambient ⑤ | —    | 23   |                    |

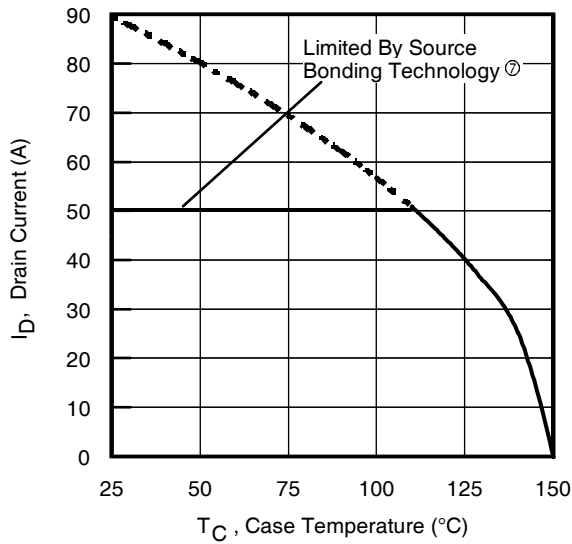




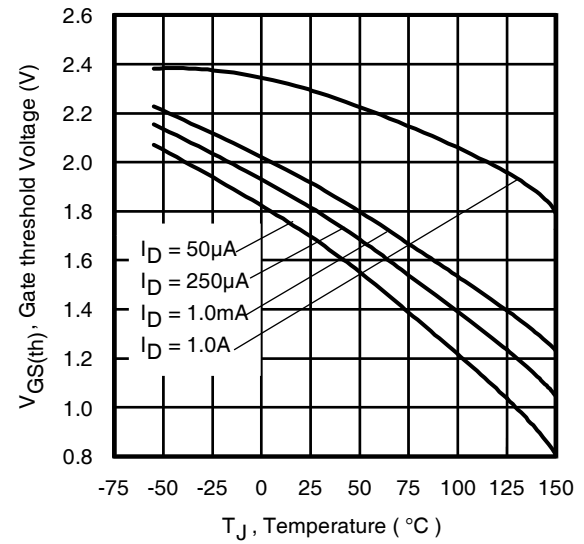
**Fig 7.** Typical Source-Drain Diode Forward Voltage



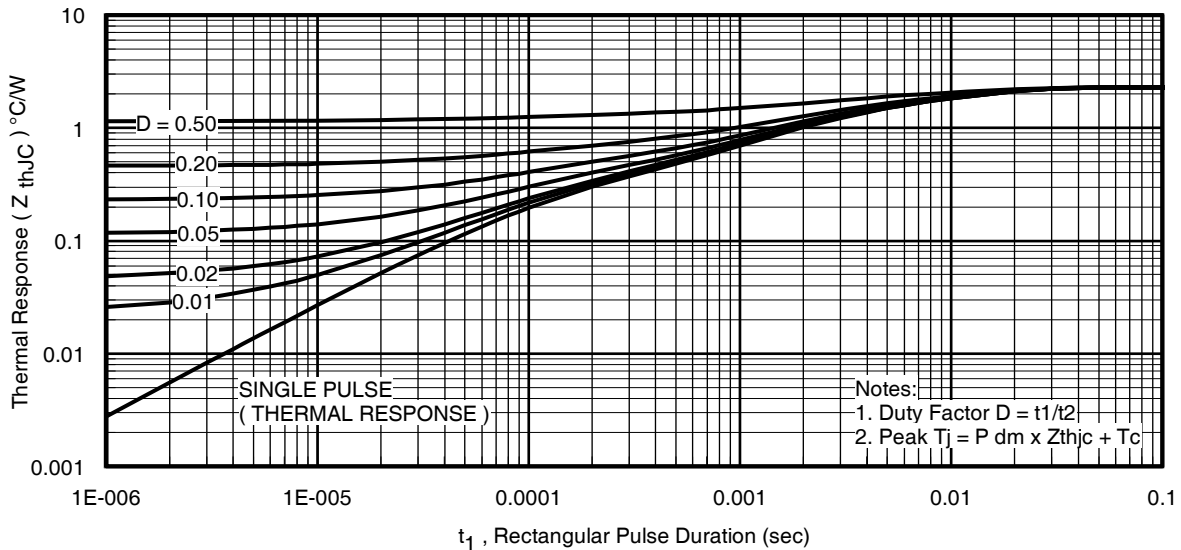
**Fig 8.** Maximum Safe Operating Area



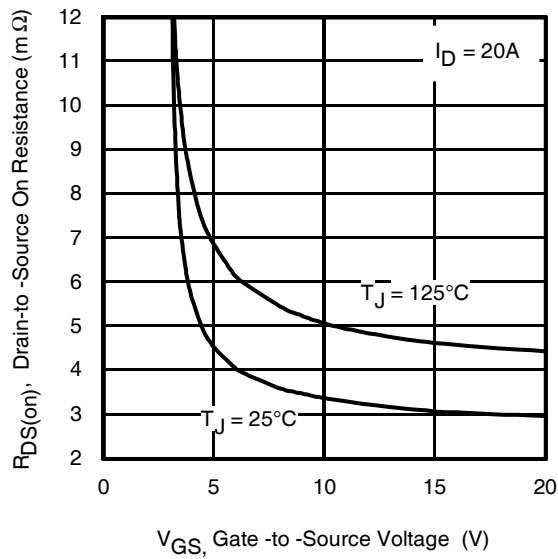
**Fig 9.** Maximum Drain Current vs. Case (Bottom) Temperature



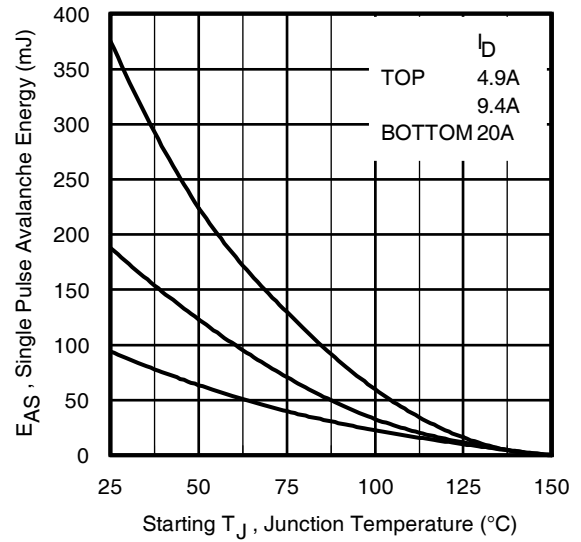
**Fig 10.** Threshold Voltage vs. Temperature



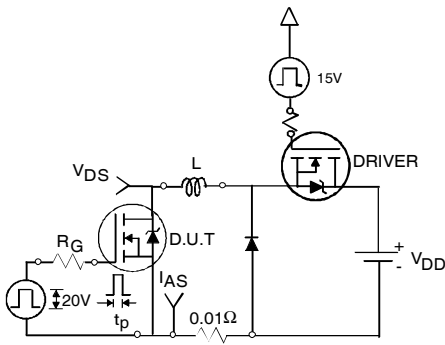
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case (Bottom)



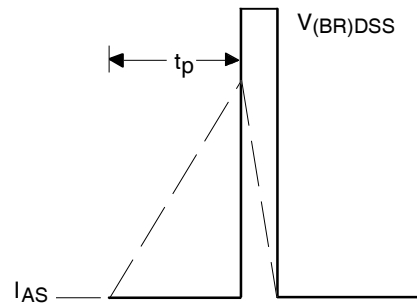
**Fig 12.** On-Resistance vs. Gate Voltage



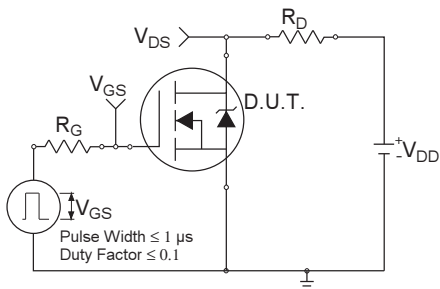
**Fig 13.** Maximum Avalanche Energy vs. Drain Current



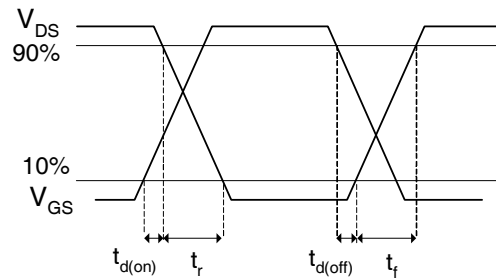
**Fig 14a.** Unclamped Inductive Test Circuit



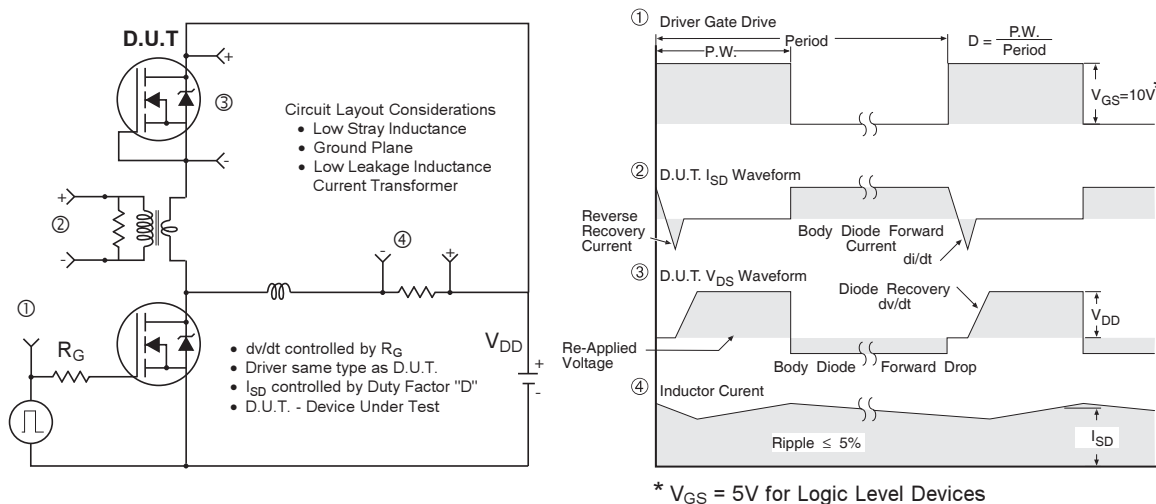
**Fig 14b.** Unclamped Inductive Waveforms



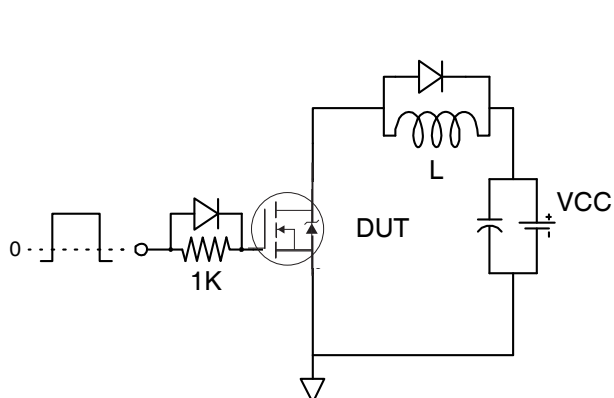
**Fig 15a.** Switching Time Test Circuit



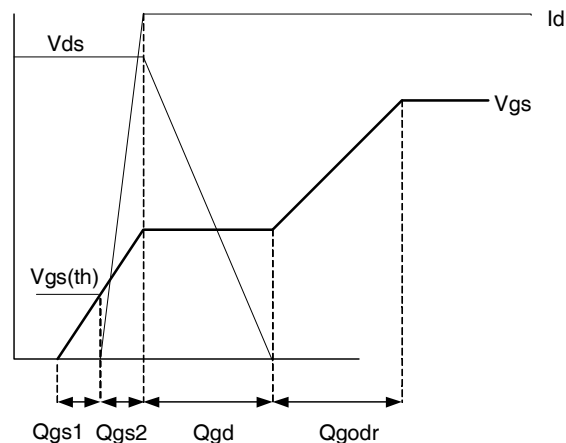
**Fig 15b.** Switching Time Waveforms



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

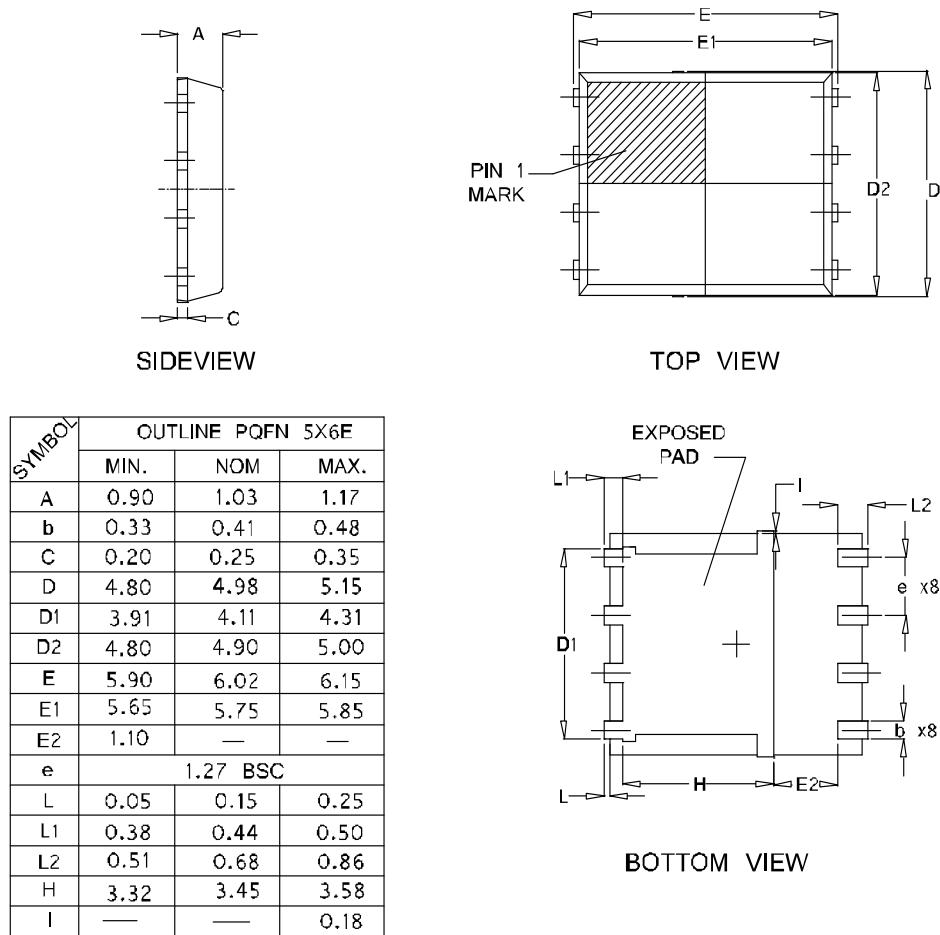


**Fig 17.** Gate Charge Test Circuit



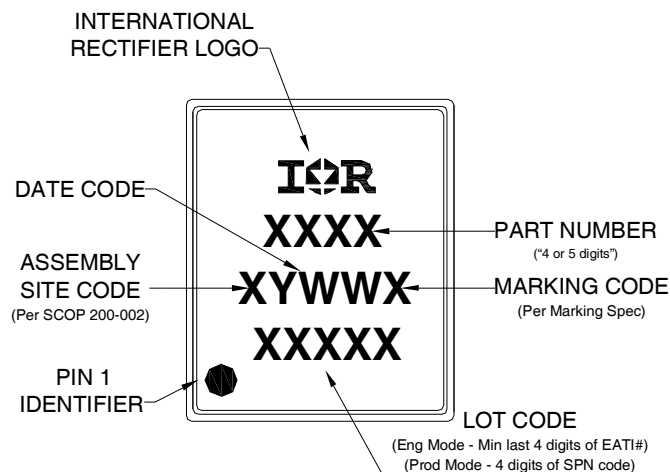
**Fig 18.** Gate Charge Waveform

## PQFN 5x6 Outline "E" Package Details



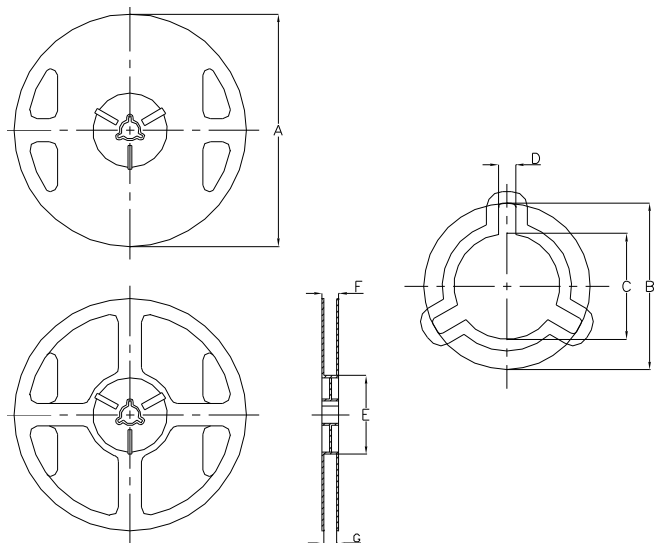
For footprint and stencil design recommendations, please refer to application note AN-1154 at <http://www.irf.com/technical-info/appnotes/an-1154.pdf>

## PQFN 5x6 Outline "E" Part Marking



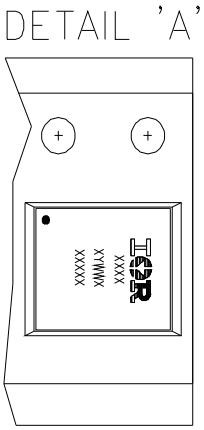
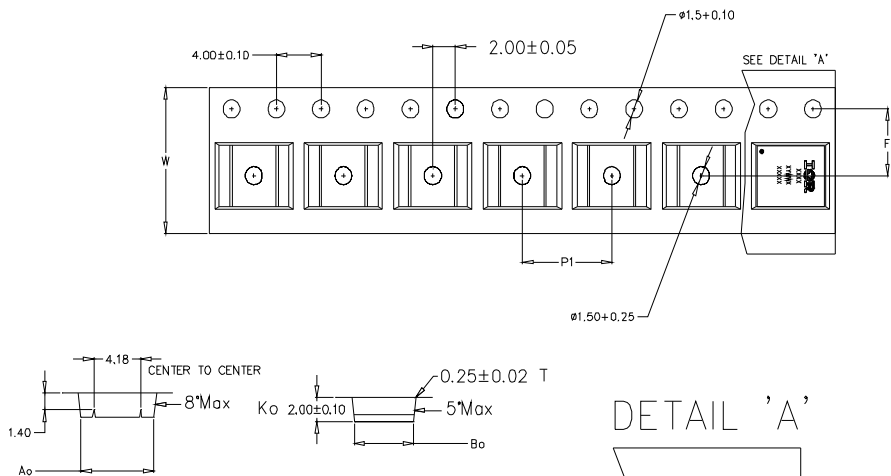
Note: For the most current drawing please refer to IR website at: <http://www.irf.com/package/>  
www.irf.com

## PQFN 5x6 Outline "E" Tape and Reel



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

| REEL DIMENSIONS            |        |       |          |        |                      |       |          |       |
|----------------------------|--------|-------|----------|--------|----------------------|-------|----------|-------|
| STANDARD OPTION (QTY 4000) |        |       |          |        | TR2 OPTION (QTY 400) |       |          |       |
| CODE                       | METRIC |       | IMPERIAL |        | METRIC               |       | IMPERIAL |       |
|                            | MIN    | MAX   | MIN      | MAX    | MIN                  | MAX   | MIN      | MAX   |
| A                          | 329.5  | 330.5 | 12.972   | 13.011 | 177.5                | 178.5 | 6.988    | 7.028 |
| B                          | 20.9   | 21.5  | 0.823    | 0.846  | 20.9                 | 21.5  | 0.823    | 0.846 |
| C                          | 12.8   | 13.5  | 0.504    | 0.532  | 13.2                 | 13.8  | 0.520    | 0.543 |
| D                          | 1.7    | 2.3   | 0.067    | 0.091  | 1.9                  | 2.3   | 0.075    | 0.091 |
| E                          | 97     | 99    | 3.819    | 3.898  | 65                   | 66    | 2.350    | 2.598 |
| F                          | Ref    | 17.4  |          |        | Ref                  | 12    |          |       |
| G                          | 13     | 14.5  | 0.512    | 0.571  | 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 ±0.10 |

## Qualification information<sup>†</sup>

|                            |                                                                         |                                                |
|----------------------------|-------------------------------------------------------------------------|------------------------------------------------|
| Qualification level        | Consumer <sup>††</sup><br>(per JEDEC JESD47F <sup>†††</sup> guidelines) |                                                |
| Moisture Sensitivity Level | PQFN 5mm x 6mm                                                          | 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  $T_J = 25^{\circ}\text{C}$ ,  $L = 0.47\text{mH}$ ,  $R_G = 50\Omega$ ,  $I_{AS} = 20\text{A}$ .
- 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.
- ⑦ Current is limited to 50A by source bonding technology.

Data and specifications subject to change without notice.

International  
**IR** Rectifier

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TAC Fax: (310) 252-7903

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