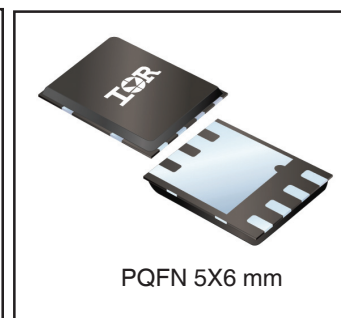
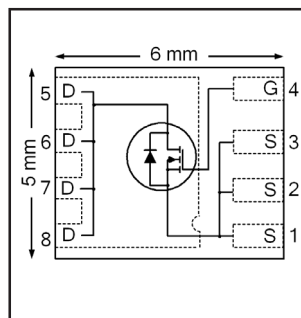


# IRFH5255PbF

HEXFET® Power MOSFET

|                                                 |            |           |
|-------------------------------------------------|------------|-----------|
| $V_{DS}$                                        | <b>25</b>  | <b>V</b>  |
| $R_{DS(on) \text{ max}}$<br>(@ $V_{GS} = 10V$ ) | <b>6.0</b> | <b>mΩ</b> |
| $Q_g$ (typical)                                 | <b>7.0</b> | <b>nC</b> |
| $R_G$ (typical)                                 | <b>0.6</b> | <b>Ω</b>  |
| $I_D$<br>(@ $T_{c(Bottom)} = 25^\circ C$ )      | <b>51</b>  | <b>A</b>  |



## Applications

- Control MOSFET for high Frequency Buck Converters

## Features and Benefits

### Features

|                                                              |
|--------------------------------------------------------------|
| Low Charge (typical 7nC)                                     |
| Low Rg (typical 0.6Ω)                                        |
| Low Thermal Resistance to PCB (<4.9°C/W)                     |
| 100% Rg tested                                               |
| Low Profile (<0.9 mm)                                        |
| Industry-Standard Pinout                                     |
| Compatible with Existing Surface Mount Techniques            |
| RoHS Compliant Containing no Lead, no Bromide and no Halogen |
| MSL1, Industrial Qualification                               |

### Benefits

|                            |
|----------------------------|
| Lower Switching Losses     |
| Lower Switching Losses     |
| Increased Power Density    |
| Increased Reliability      |
| Increased Power Density    |
| Multi-Vendor Compatibility |
| Easier Manufacturing       |
| Environmentally Friendlier |
| Increased Reliability      |

results in  
⇒

| Orderable part number | Package Type   | Standard Pack |          | Note |
|-----------------------|----------------|---------------|----------|------|
|                       |                | Form          | Quantity |      |
| IRFH5255TRPBF         | PQFN 5mm x 6mm | Tape and Reel | 4000     |      |
| IRFH5255TR2PBF        | PQFN 5mm x 6mm | Tape and Reel | 400      |      |

## Absolute Maximum Ratings

|                                     | Parameter                                | Max.         | Units |
|-------------------------------------|------------------------------------------|--------------|-------|
| $V_{DS}$                            | Drain-to-Source Voltage                  | 25           | V     |
| $V_{GS}$                            | Gate-to-Source Voltage                   | ± 20         |       |
| $I_D @ T_A = 25^\circ C$            | Continuous Drain Current, $V_{GS} @ 10V$ | 15           | A     |
| $I_D @ T_A = 70^\circ C$            | Continuous Drain Current, $V_{GS} @ 10V$ | 12           |       |
| $I_D @ T_{c(Bottom)} = 25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V$ | 51           |       |
| $I_D @ T_{c(Bottom)} = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 33           |       |
| $I_{DM}$                            | Pulsed Drain Current ①                   | 60           |       |
| $P_D @ T_A = 25^\circ C$            | Power Dissipation ⑤                      | 3.6          | W     |
| $P_D @ T_{c(Bottom)} = 25^\circ C$  | Power Dissipation ⑤                      | 26           |       |
|                                     | Linear Derating Factor ⑤                 | 0.029        | W/°C  |
| $T_J$                               | Operating Junction and                   | -55 to + 150 | °C    |
| $T_{STG}$                           | Storage Temperature Range                |              |       |

Notes ① through ⑤ are on page 8

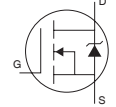
## Static @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

|                              | Parameter                                  | Min. | Typ. | Max. | Units                | Conditions                                                                      |
|------------------------------|--------------------------------------------|------|------|------|----------------------|---------------------------------------------------------------------------------|
| $BV_{DSS}$                   | Drain-to-Source Breakdown Voltage          | 25   | —    | —    | 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       | —    | 5.0  | 6.0  | $m\Omega$            | $V_{GS} = 10V, I_D = 15A$ ③                                                     |
|                              |                                            | —    | 8.8  | 10.9 |                      | $V_{GS} = 4.5V, I_D = 15A$ ③                                                    |
| $V_{GS(th)}$                 | Gate Threshold Voltage                     | 1.35 | 1.80 | 2.35 | V                    | $V_{DS} = V_{GS}, I_D = 25\mu A$                                                |
| $\Delta V_{GS(th)}$          | Gate Threshold Voltage Coefficient         | —    | -6.3 | —    | mV/ $^\circ\text{C}$ |                                                                                 |
| $I_{DSS}$                    | Drain-to-Source Leakage Current            | —    | —    | 5    | $\mu A$              | $V_{DS} = 20V, V_{GS} = 0V$                                                     |
|                              |                                            | —    | —    | 150  |                      | $V_{DS} = 20V, V_{GS} = 0V, T_J = 125^\circ\text{C}$                            |
| $I_{GSS}$                    | Gate-to-Source Forward Leakage             | —    | —    | 100  | nA                   | $V_{GS} = 20V$                                                                  |
|                              | Gate-to-Source Reverse Leakage             | —    | —    | -100 |                      | $V_{GS} = -20V$                                                                 |
| $g_{fs}$                     | Forward Transconductance                   | 48   | —    | —    | S                    | $V_{DS} = 13V, I_D = 15A$                                                       |
| $Q_g$                        | Total Gate Charge                          | —    | 14.5 | —    | nC                   | $V_{GS} = 10V, V_{DS} = 13V, I_D = 15A$                                         |
| $Q_g$                        | Total Gate Charge                          | —    | 7.0  | 11   | nC                   | $V_{DS} = 13V$<br>$V_{GS} = 4.5V$<br>$I_D = 15A$<br>See Fig.17 & 18             |
| $Q_{gs1}$                    | Pre-V <sub>th</sub> Gate-to-Source Charge  | —    | 1.6  | —    |                      |                                                                                 |
| $Q_{gs2}$                    | Post-V <sub>th</sub> Gate-to-Source Charge | —    | 1.2  | —    |                      |                                                                                 |
| $Q_{gd}$                     | Gate-to-Drain Charge                       | —    | 2.7  | —    |                      |                                                                                 |
| $Q_{godr}$                   | Gate Charge Overdrive                      | —    | 1.5  | —    |                      |                                                                                 |
| $Q_{sw}$                     | Switch Charge ( $Q_{gs2} + Q_{gd}$ )       | —    | 3.8  | —    | nC                   | $V_{DS} = 16V, V_{GS} = 0V$                                                     |
| $Q_{oss}$                    | Output Charge                              | —    | 6.0  | —    |                      |                                                                                 |
| $R_G$                        | Gate Resistance                            | —    | 0.6  | —    | $\Omega$             |                                                                                 |
| $t_{d(on)}$                  | Turn-On Delay Time                         | —    | 7.9  | —    | ns                   | $V_{DD} = 13V, V_{GS} = 4.5V$<br>$I_D = 15A$<br>$R_G = 1.0\Omega$<br>See Fig.15 |
| $t_r$                        | Rise Time                                  | —    | 10.7 | —    |                      |                                                                                 |
| $t_{d(off)}$                 | Turn-Off Delay Time                        | —    | 6.5  | —    |                      |                                                                                 |
| $t_f$                        | Fall Time                                  | —    | 3.8  | —    |                      |                                                                                 |
| $C_{iss}$                    | Input Capacitance                          | —    | 988  | —    | pF                   | $V_{GS} = 0V$                                                                   |
| $C_{oss}$                    | Output Capacitance                         | —    | 289  | —    |                      | $V_{DS} = 13V$                                                                  |
| $C_{rss}$                    | Reverse Transfer Capacitance               | —    | 127  | —    |                      | $f = 1.0MHz$                                                                    |

## Avalanche Characteristics

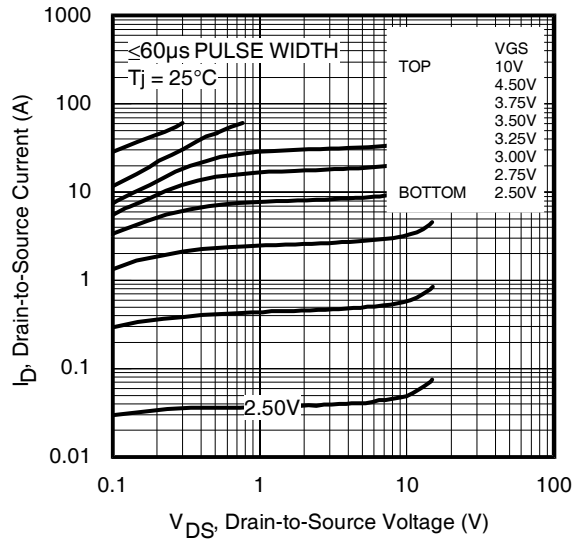
|          | Parameter                       | Typ. | Max. | Units |
|----------|---------------------------------|------|------|-------|
| $E_{AS}$ | Single Pulse Avalanche Energy ② | —    | 53   | mJ    |
| $I_{AR}$ | Avalanche Current ①             | —    | 15   | A     |

## Diode Characteristics

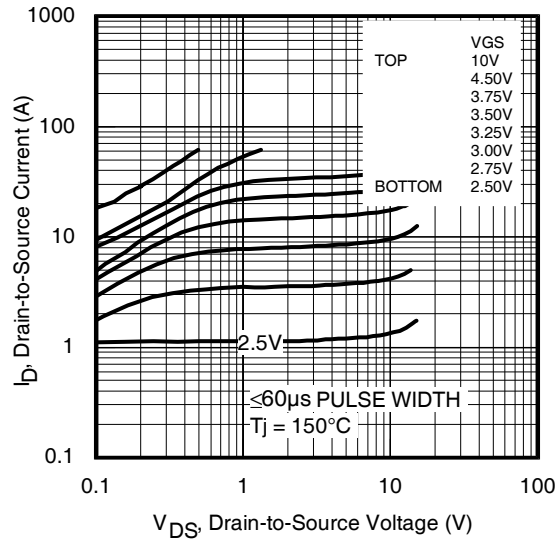
|          | Parameter                                 | Min.                                      | Typ. | Max. | Units | Conditions                                                                                                                                                       |
|----------|-------------------------------------------|-------------------------------------------|------|------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_S$    | Continuous Source Current<br>(Body Diode) | —                                         | —    | 51   | A     | MOSFET symbol<br>showing the<br>integral reverse<br>p-n junction diode.<br> |
| $I_{SM}$ | Pulsed Source Current<br>(Body Diode) ①   | —                                         | —    | 60   |       |                                                                                                                                                                  |
| $V_{SD}$ | Diode Forward Voltage                     | —                                         | —    | 1.0  | V     | $T_J = 25^\circ\text{C}, I_S = 15A, V_{GS} = 0V$ ③                                                                                                               |
| $t_{rr}$ | Reverse Recovery Time                     | —                                         | 11   | 17   | ns    | $T_J = 25^\circ\text{C}, I_F = 15A, V_{DD} = 13V$                                                                                                                |
| $Q_{rr}$ | Reverse Recovery Charge                   | —                                         | 7.8  | 12   | nC    | $di/dt = 300A/\mu s$ ③                                                                                                                                           |
| $t_{on}$ | Forward Turn-On Time                      | Time is dominated by parasitic Inductance |      |      |       |                                                                                                                                                                  |

## Thermal Resistance

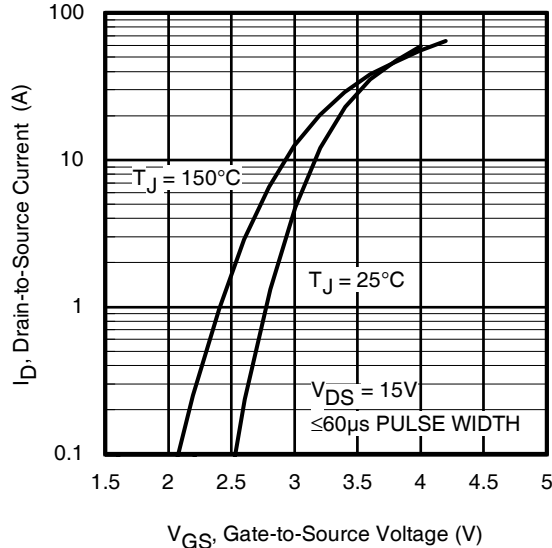
|                          | Parameter             | Typ. | Max. | Units              |
|--------------------------|-----------------------|------|------|--------------------|
| $R_{\theta JC}$ (Bottom) | Junction-to-Case ④    | —    | 4.9  | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ (Top)    | Junction-to-Case ④    | —    | 15   |                    |
| $R_{\theta JA}$          | Junction-to-Ambient ⑤ | —    | 35   |                    |
| $R_{\theta JA} (<10s)$   | Junction-to-Ambient ⑤ | —    | 22   |                    |



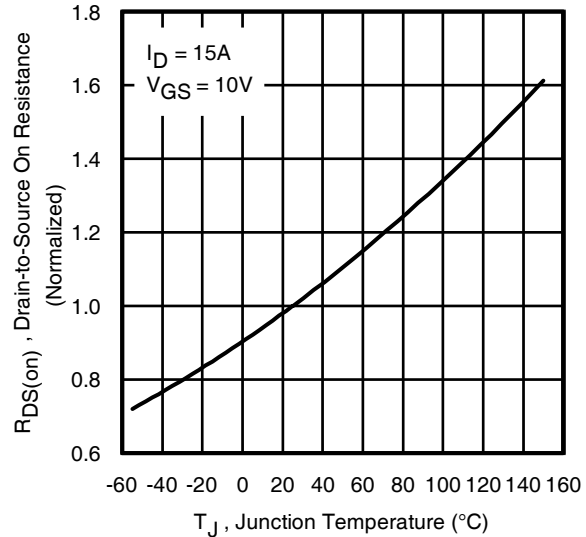
**Fig 1.** Typical Output Characteristics



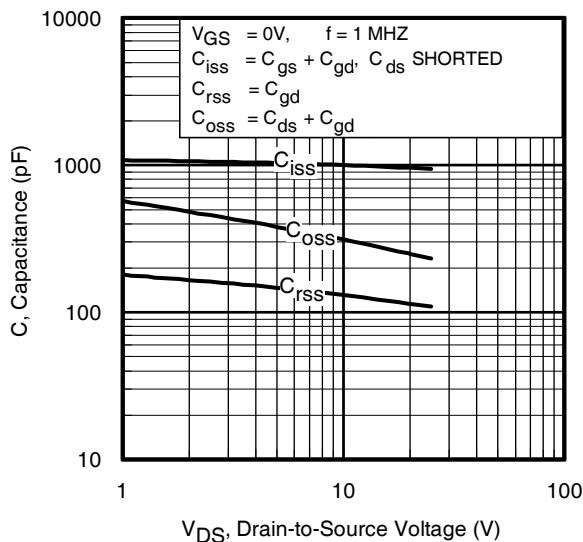
**Fig 2.** Typical Output Characteristics



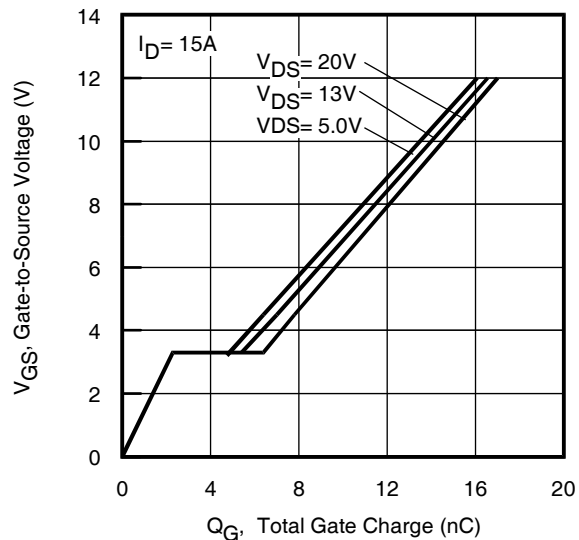
**Fig 3.** Typical Transfer Characteristics



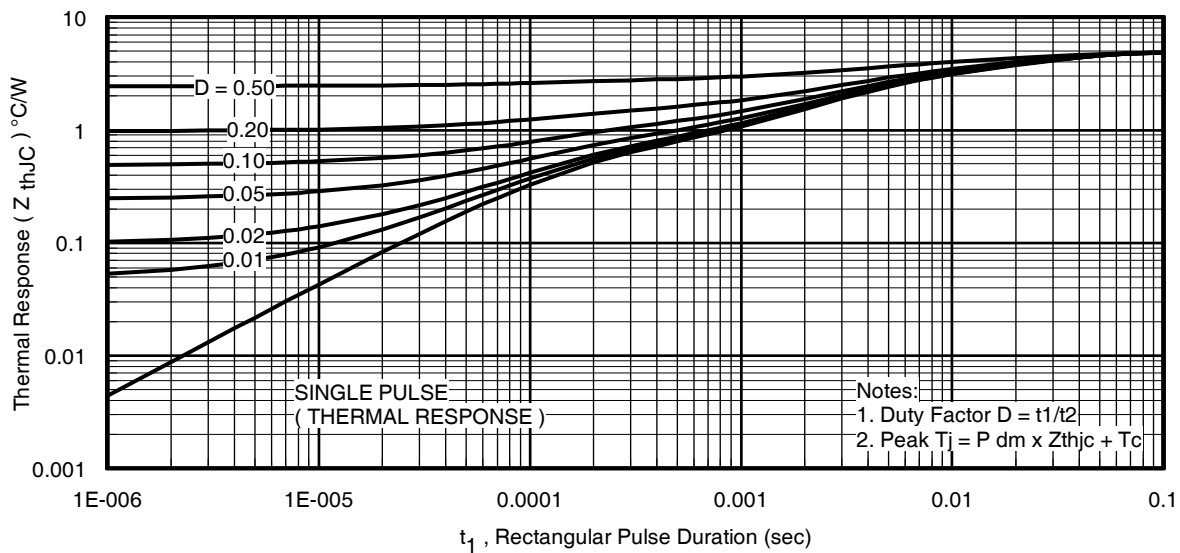
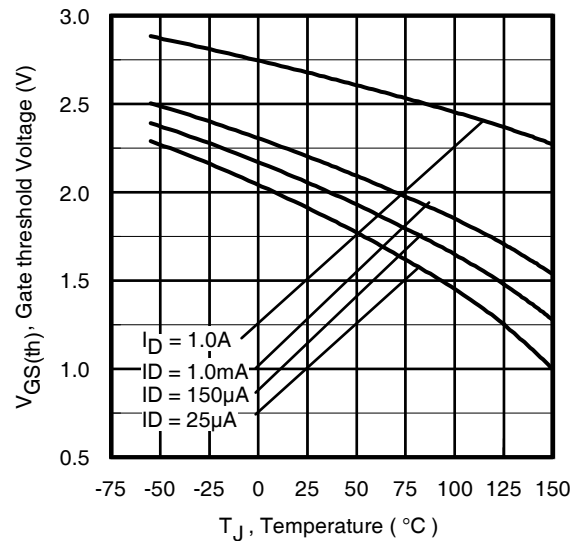
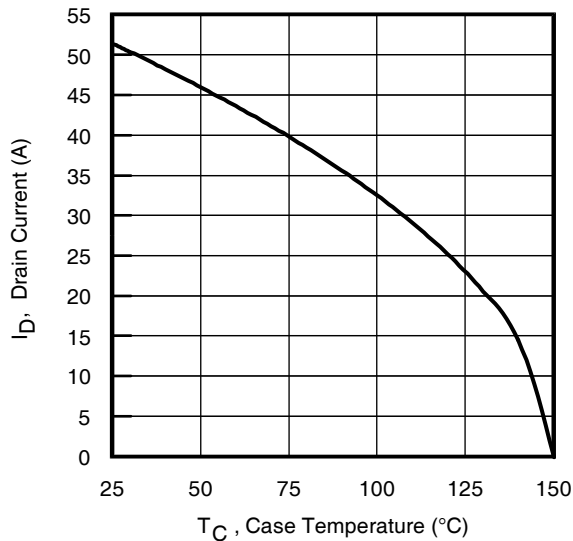
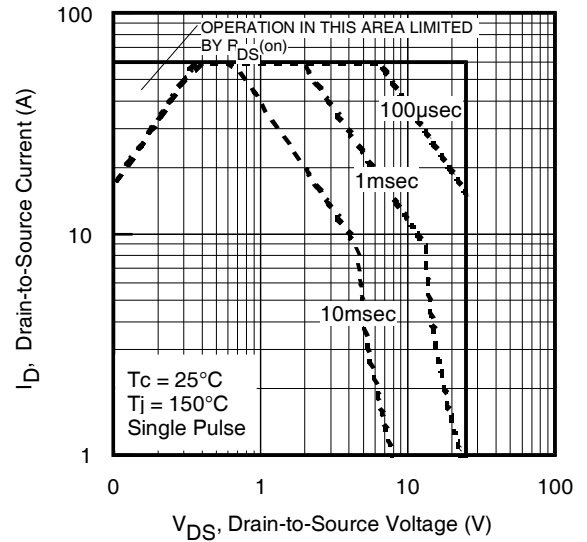
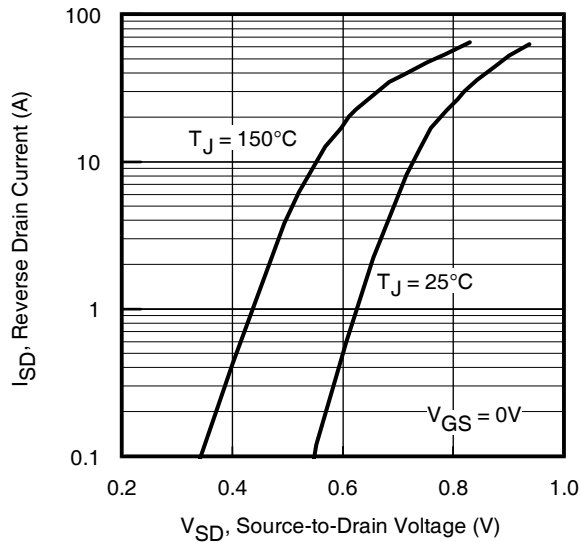
**Fig 4.** Normalized On-Resistance Vs. Temperature

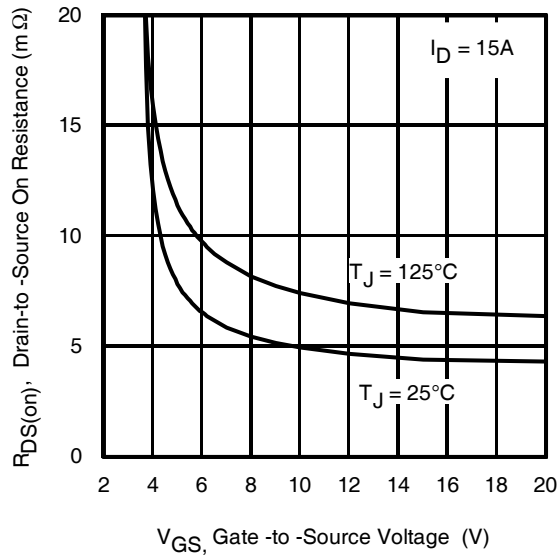


**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage  
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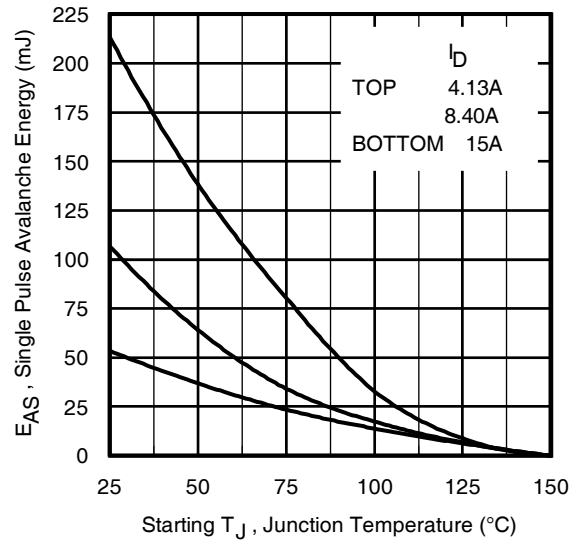


**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage

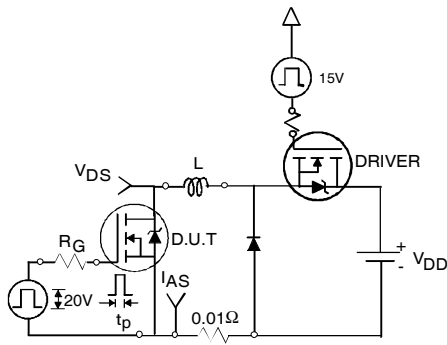




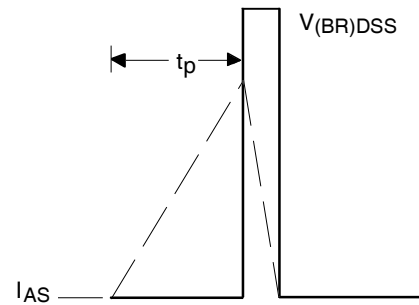
**Fig 12.** On-Resistance vs. Gate Voltage



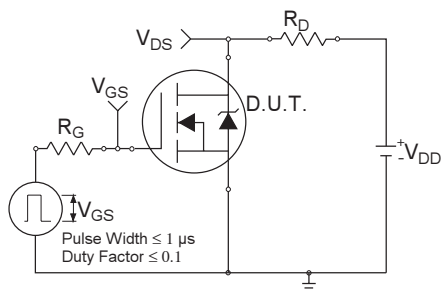
**Fig 13.** Maximum Avalanche Energy vs. Drain Current



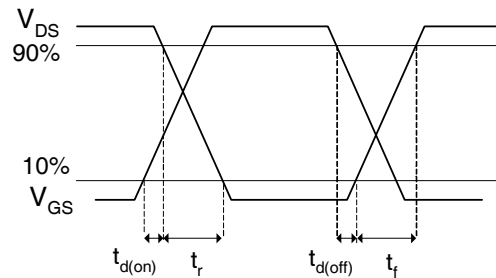
**Fig 14a.** Unclamped Inductive Test Circuit



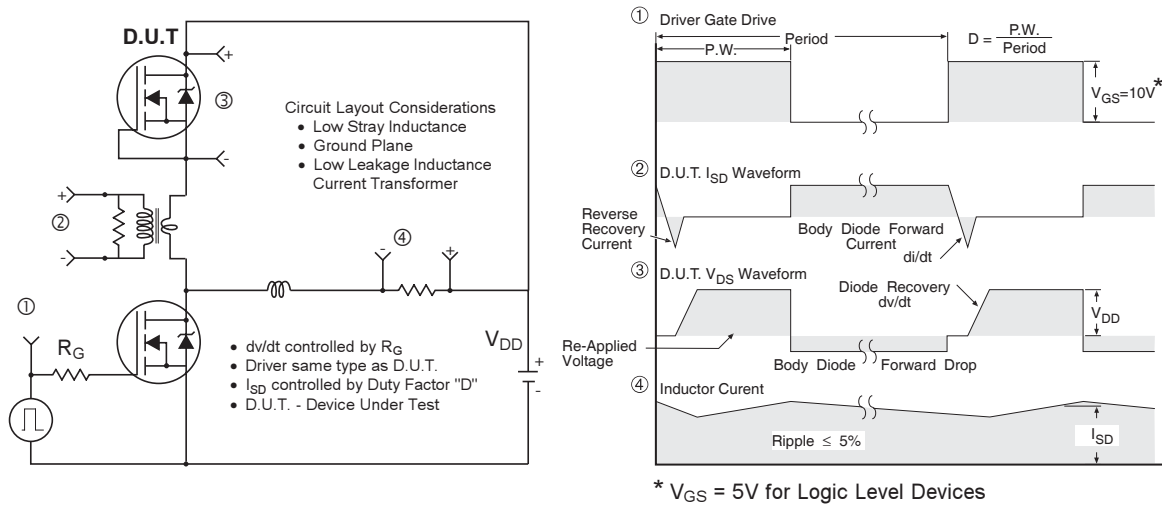
**Fig 14b.** Unclamped Inductive Waveforms



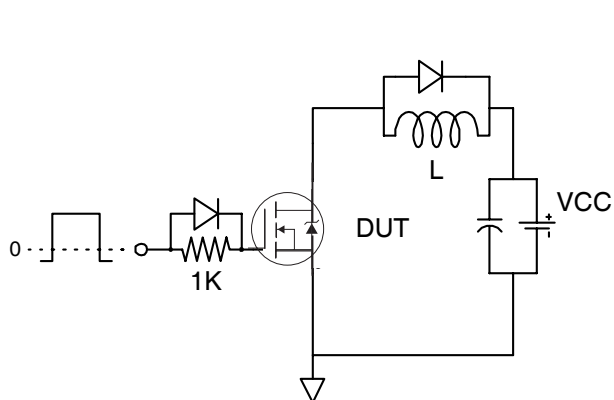
**Fig 15a.** Switching Time Test Circuit



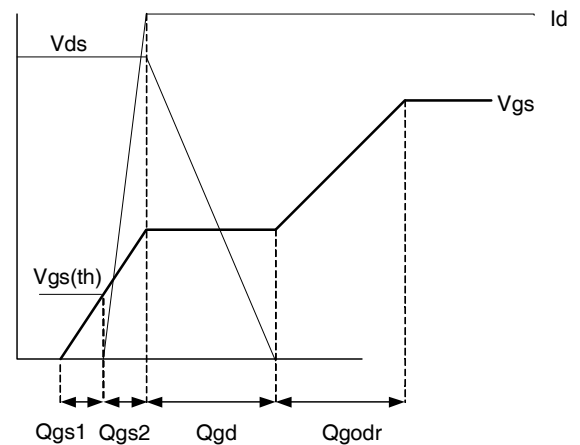
**Fig 15b.** Switching Time Waveforms



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

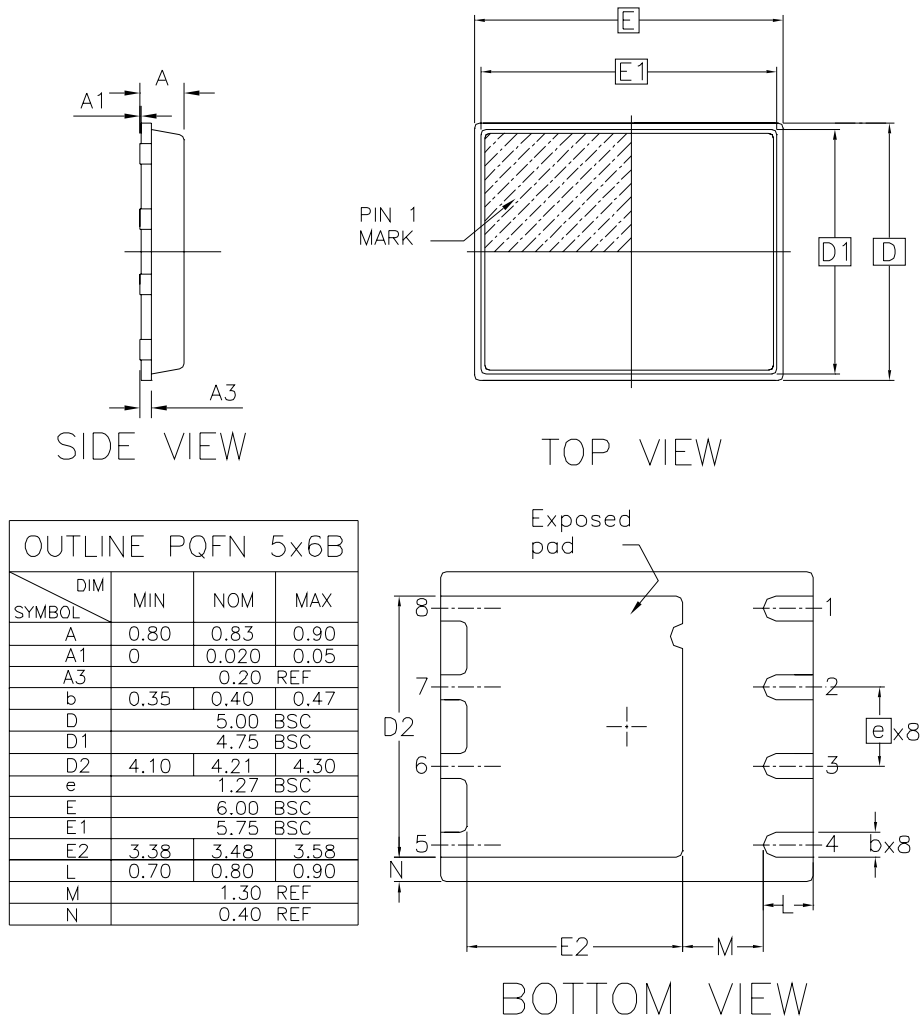


**Fig 17.** Gate Charge Test Circuit



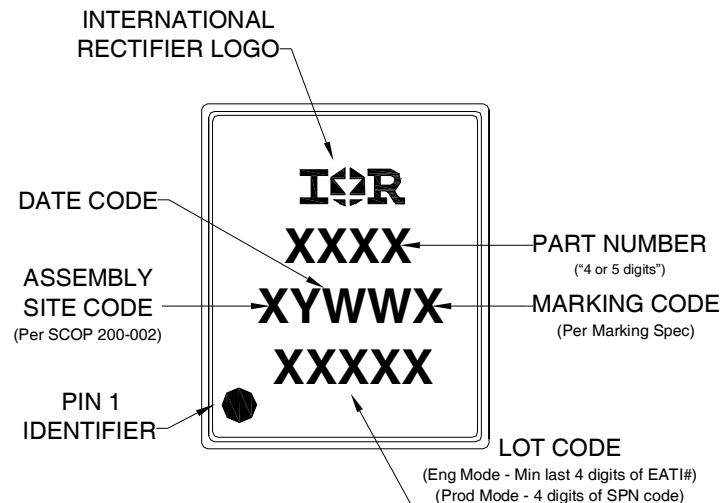
**Fig 18.** Gate Charge Waveform

## PQFN 5x6 Outline "B" Package Details



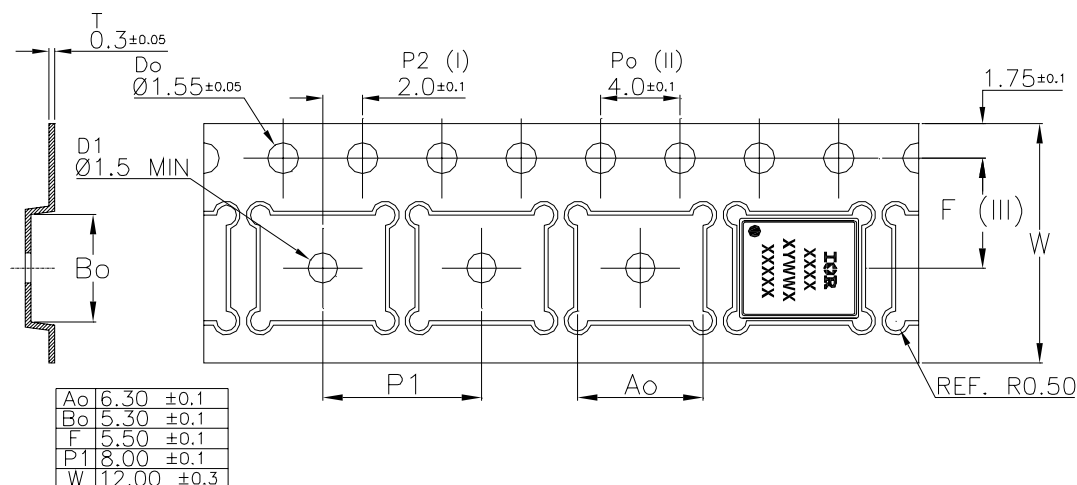
For footprint and stencil design recommendations, please refer to application note AN-1154 at <http://www.irf.com/technical-info/appnotes/an-1154.pdf>

## PQFN 5x6 Outline "B" Part Marking



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

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

Qualification information<sup>†</sup>

|                            |                                                                           |                                                |
|----------------------------|---------------------------------------------------------------------------|------------------------------------------------|
| Qualification level        | Industrial <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                                                                       |                                                |

† Qualification standards can be found at International Rectifier's web site

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

†† 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/>

††† Applicable version of JEDEC standard at the time of product release.

## Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.47\text{mH}$ ,  $R_G = 50\Omega$ ,  $I_{AS} = 15\text{A}$ .
- 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.

Data and specifications subject to change without notice.

International  
IOR Rectifier

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