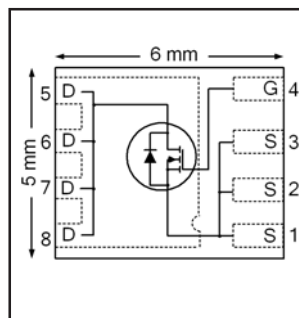


# IRFH5215PbF

HEXFET® Power MOSFET

|                                                 |            |           |
|-------------------------------------------------|------------|-----------|
| $V_{DS}$                                        | <b>150</b> | <b>V</b>  |
| $R_{DS(on) \text{ max}}$<br>(@ $V_{GS} = 10V$ ) | <b>58</b>  | <b>mΩ</b> |
| $Q_g$ (typical)                                 | <b>21</b>  | <b>nC</b> |
| $R_G$ (typical)                                 | <b>2.3</b> | <b>Ω</b>  |
| $I_D$<br>(@ $T_{c(Bottom)} = 25^\circ C$ )      | <b>27</b>  | <b>A</b>  |



## Applications

- Primary Side Synchronous Rectification
- Inverters for DC Motors
- DC-DC Brick Applications
- Boost Converters

## Features and Benefits

### Features

|                                                              |
|--------------------------------------------------------------|
| Low $R_{DS(on)}$ (< 58 mΩ)                                   |
| Low Thermal Resistance to PCB (<1.2°C/W)                     |
| 100% $R_g$ 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 Conduction 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 |      |
| IRFH5215TRPBF         | PQFN 5mm x 6mm | Tape and Reel | 4000     |      |
| IRFH5215TR2PBF        | PQFN 5mm x 6mm | Tape and Reel | 400      |      |

## Absolute Maximum Ratings

|                                       | Parameter                                           | Max.         | Units |
|---------------------------------------|-----------------------------------------------------|--------------|-------|
| $V_{DS}$                              | Drain-to-Source Voltage                             | 150          | V     |
| $V_{GS}$                              | Gate-to-Source Voltage                              | ± 20         |       |
| $I_D$ @ $T_A = 25^\circ C$            | Continuous Drain Current, $V_{GS}$ @ 10V            | 5.0          | A     |
| $I_D$ @ $T_A = 70^\circ C$            | Continuous Drain Current, $V_{GS}$ @ 10V            | 4.0          |       |
| $I_D$ @ $T_{C(Bottom)} = 25^\circ C$  | Continuous Drain Current, $V_{GS}$ @ 10V            | 27           |       |
| $I_D$ @ $T_{C(Bottom)} = 100^\circ C$ | Continuous Drain Current, $V_{GS}$ @ 10V            | 17           |       |
| $I_{DM}$                              | Pulsed Drain Current ①                              | 108          |       |
| $P_D$ @ $T_A = 25^\circ C$            | Power Dissipation ⑤                                 | 3.6          | W     |
| $P_D$ @ $T_{C(Bottom)} = 25^\circ C$  | Power Dissipation ⑤                                 | 104          |       |
|                                       | 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 ⑤ are on page 8

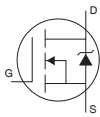
Static @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)

|                              | Parameter                            | Min. | Typ. | Max. | Units                | Conditions                                                       |
|------------------------------|--------------------------------------|------|------|------|----------------------|------------------------------------------------------------------|
| $BV_{DSS}$                   | Drain-to-Source Breakdown Voltage    | 150  | —    | —    | V                    | $V_{GS} = 0V, I_D = 250\mu A$                                    |
| $\Delta BV_{DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient  | —    | 0.19 | —    | 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 | —    | 45.5 | 58   | m $\Omega$           | $V_{GS} = 10V, I_D = 16A$ ③                                      |
| $V_{GS(th)}$                 | Gate Threshold Voltage               | 3.0  | —    | 5.0  | V                    | $V_{DS} = V_{GS}, I_D = 100\mu A$                                |
| $\Delta V_{GS(th)}$          | Gate Threshold Voltage Coefficient   | —    | -12  | —    | mV/ $^\circ\text{C}$ |                                                                  |
| $I_{DSS}$                    | Drain-to-Source Leakage Current      | —    | —    | 20   | $\mu A$              | $V_{DS} = 150V, V_{GS} = 0V$                                     |
|                              |                                      | —    | —    | 250  |                      | $V_{DS} = 150V, V_{GS} = 0V, T_J = 125^\circ\text{C}$            |
| $I_{GSS}$                    | Gate-to-Source Forward Leakage       | —    | —    | 100  | nA                   | $V_{GS} = 20V$                                                   |
|                              | Gate-to-Source Reverse Leakage       | —    | —    | -100 |                      | $V_{GS} = -20V$                                                  |
| $g_{fs}$                     | Forward Transconductance             | 21   | —    | —    | S                    | $V_{DS} = 50V, I_D = 16A$                                        |
| $Q_g$                        | Total Gate Charge                    | —    | 21   | 32   | nC                   | $V_{DS} = 75V$<br>$V_{GS} = 10V$<br>$I_D = 16A$                  |
| $Q_{gs1}$                    | Pre-Vth Gate-to-Source Charge        | —    | 7.2  | —    |                      |                                                                  |
| $Q_{gs2}$                    | Post-Vth Gate-to-Source Charge       | —    | 2.2  | —    |                      |                                                                  |
| $Q_{gd}$                     | Gate-to-Drain Charge                 | —    | 6.7  | —    |                      |                                                                  |
| $Q_{godr}$                   | Gate Charge Overdrive                | —    | 4.9  | —    |                      |                                                                  |
| $Q_{sw}$                     | Switch Charge ( $Q_{gs2} + Q_{gd}$ ) | —    | 8.9  | —    |                      |                                                                  |
| $Q_{oss}$                    | Output Charge                        | —    | 10   | —    | nC                   | $V_{DS} = 16V, V_{GS} = 0V$                                      |
| $R_G$                        | Gate Resistance                      | —    | 2.3  | —    | $\Omega$             |                                                                  |
| $t_{d(on)}$                  | Turn-On Delay Time                   | —    | 6.7  | —    | ns                   | $V_{DD} = 75V, V_{GS} = 10V$<br>$I_D = 16A$<br>$R_G = 1.3\Omega$ |
| $t_r$                        | Rise Time                            | —    | 6.3  | —    |                      |                                                                  |
| $t_{d(off)}$                 | Turn-Off Delay Time                  | —    | 11   | —    |                      |                                                                  |
| $t_f$                        | Fall Time                            | —    | 2.9  | —    |                      |                                                                  |
| $C_{iss}$                    | Input Capacitance                    | —    | 1350 | —    | pF                   | $V_{GS} = 0V$                                                    |
| $C_{oss}$                    | Output Capacitance                   | —    | 120  | —    |                      | $V_{DS} = 50V$                                                   |
| $C_{rss}$                    | Reverse Transfer Capacitance         | —    | 30   | —    |                      | $f = 1.0\text{MHz}$                                              |

## Avalanche Characteristics

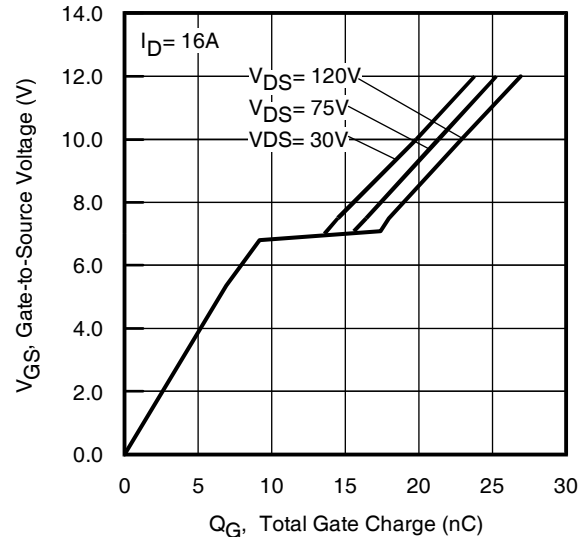
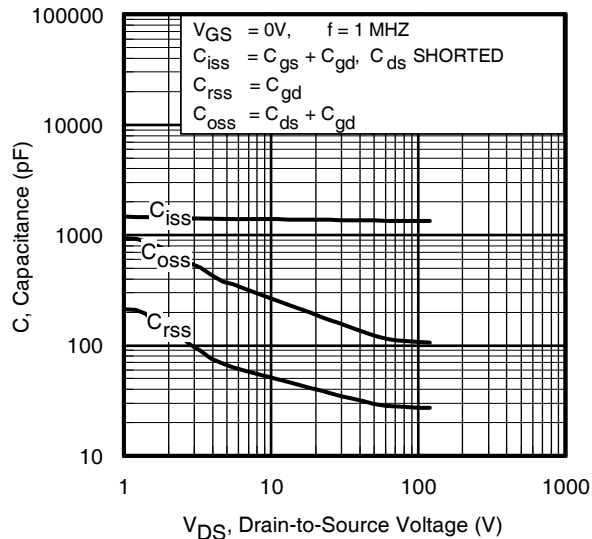
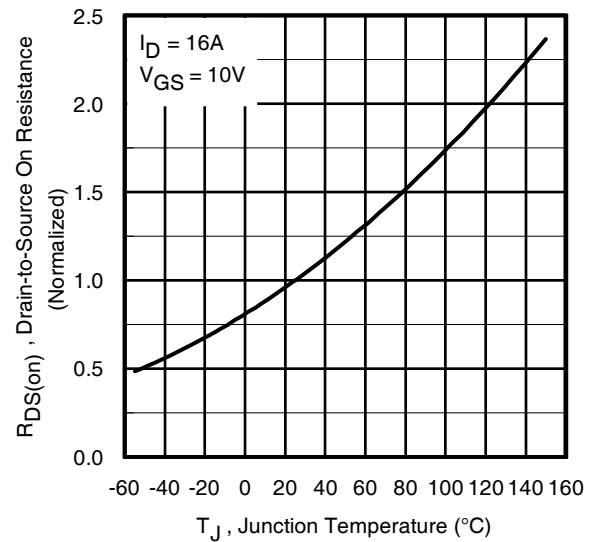
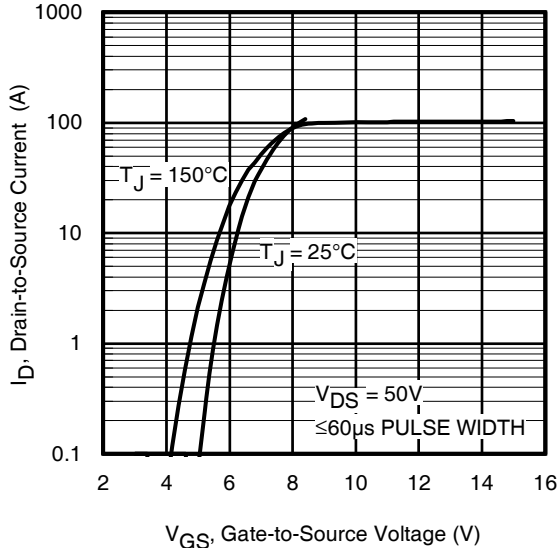
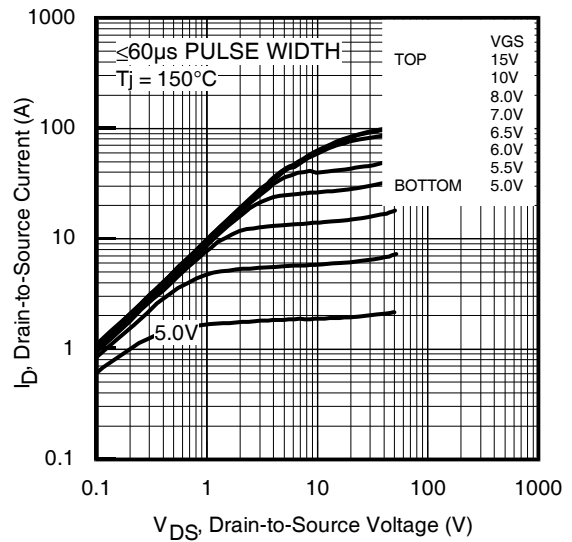
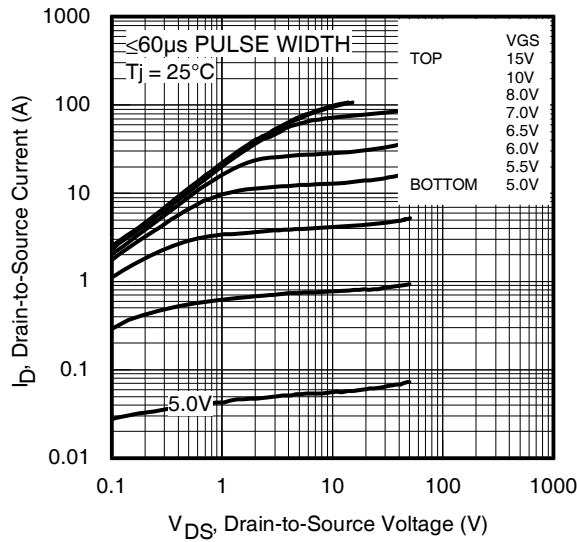
|          | Parameter                       | Typ. | Max. | Units |
|----------|---------------------------------|------|------|-------|
| $E_{AS}$ | Single Pulse Avalanche Energy ② | —    | 96   | mJ    |
| $I_{AR}$ | Avalanche Current ①             | —    | 16   | A     |

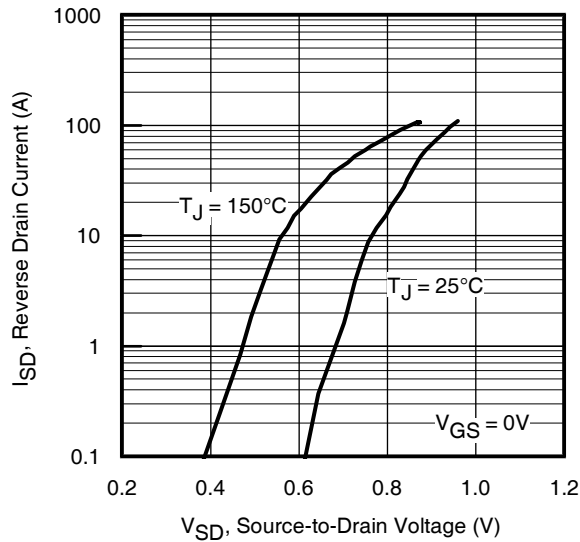
## Diode Characteristics

|          | Parameter                              | Min.                                      | Typ. | Max. | Units | Conditions                                                                                                                                           |
|----------|----------------------------------------|-------------------------------------------|------|------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_S$    | Continuous Source Current (Body Diode) | —                                         | —    | 27   | A     | MOSFET symbol showing the integral reverse p-n junction diode.  |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ①   | —                                         | —    | 108  |       |                                                                                                                                                      |
| $V_{SD}$ | Diode Forward Voltage                  | —                                         | —    | 1.3  | V     | $T_J = 25^\circ\text{C}, I_S = 16A, V_{GS} = 0V$ ③                                                                                                   |
| $t_{rr}$ | Reverse Recovery Time                  | —                                         | 40   | 60   | ns    | $T_J = 25^\circ\text{C}, I_F = 16A, V_{DD} = 75V$                                                                                                    |
| $Q_{rr}$ | Reverse Recovery Charge                | —                                         | 370  | 555  | nC    | $di/dt = 500A/\mu s$ ③                                                                                                                               |
| $t_{on}$ | Forward Turn-On Time                   | Time is dominated by parasitic Inductance |      |      |       |                                                                                                                                                      |

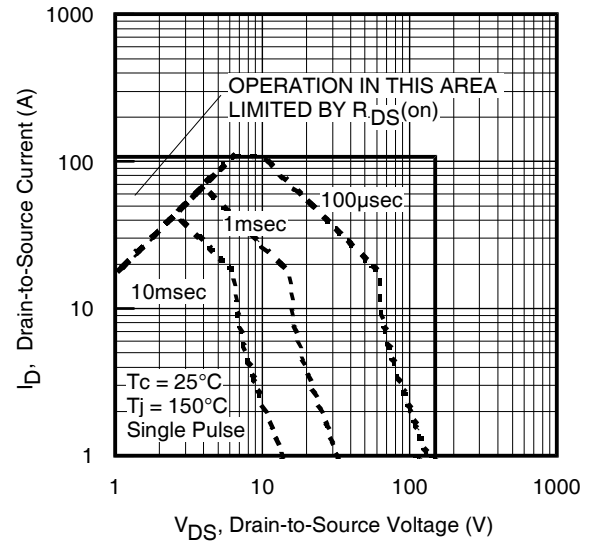
## Thermal Resistance

|                          | Parameter             | Typ. | Max. | Units              |
|--------------------------|-----------------------|------|------|--------------------|
| $R_{\theta JC}$ (Bottom) | Junction-to-Case ④    | —    | 1.2  | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ (Top)    | Junction-to-Case ④    | —    | 15   |                    |
| $R_{\theta JA}$          | Junction-to-Ambient ⑤ | —    | 35   |                    |
| $R_{\theta JA} (<10s)$   | Junction-to-Ambient ⑤ | —    | 22   |                    |

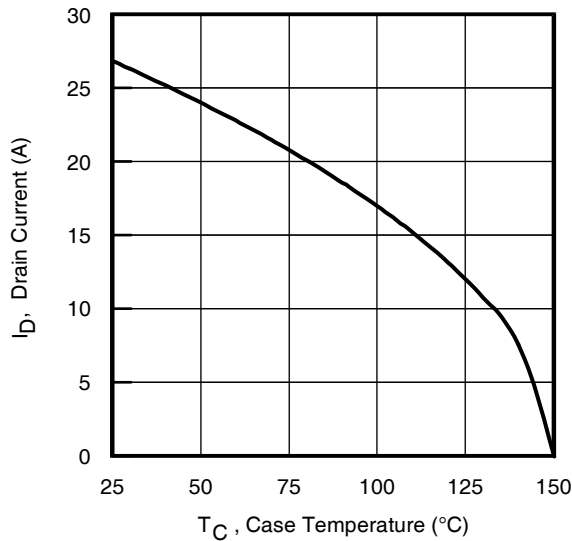




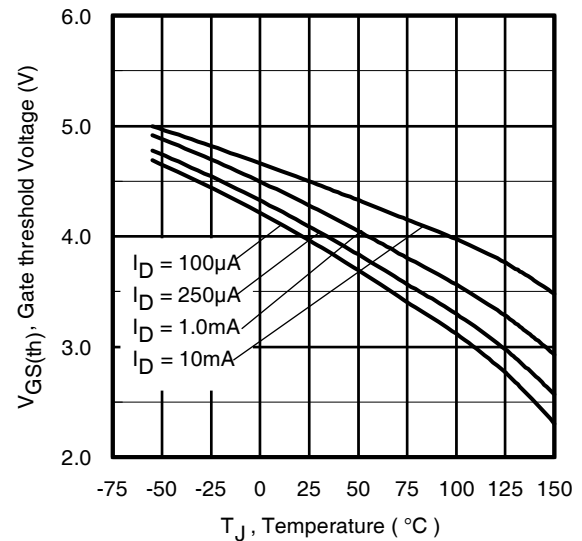
**Fig 7.** Typical Source-Drain Diode Forward Voltage



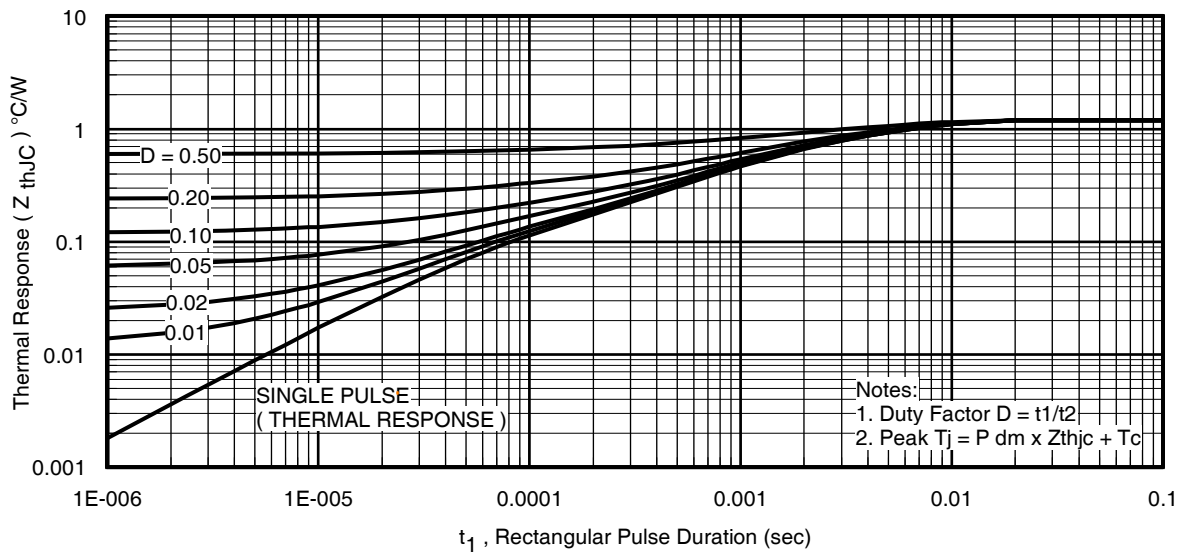
**Fig 8.** Maximum Safe Operating Area



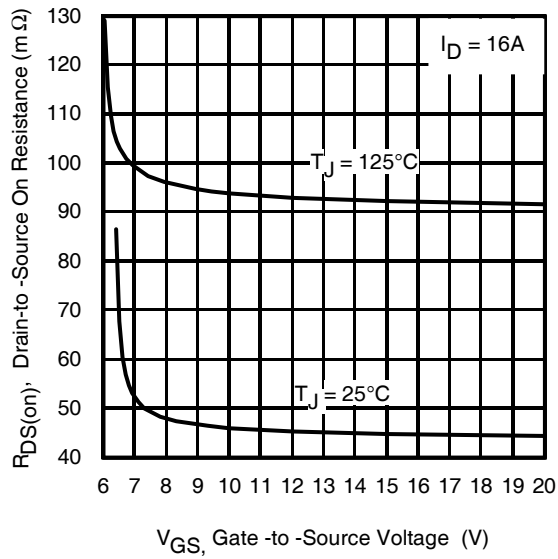
**Fig 9.** Maximum Drain Current vs. Case (Bottom) Temperature



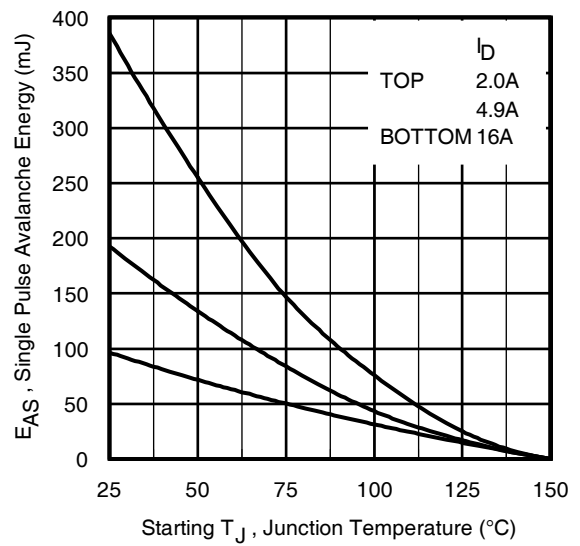
**Fig 10.** Threshold Voltage vs. Temperature



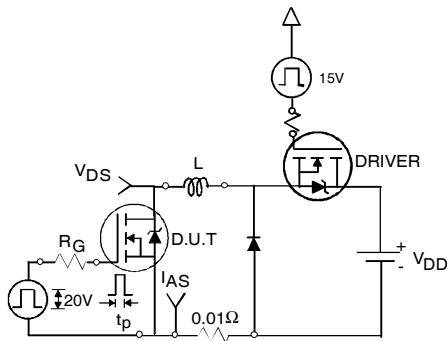
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case (Bottom)



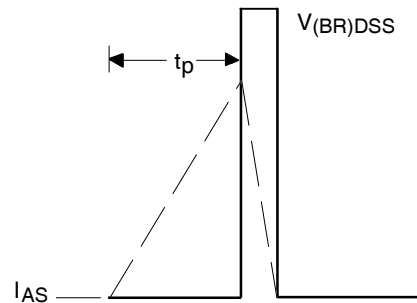
**Fig 12.** On-Resistance vs. Gate Voltage



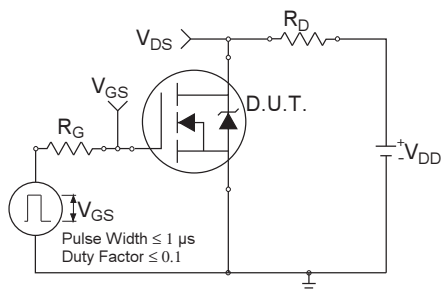
**Fig 13.** Maximum Avalanche Energy vs. Drain Current



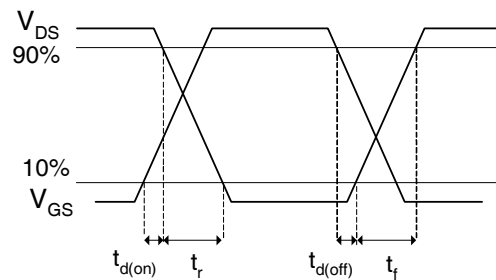
**Fig 14a.** Unclamped Inductive Test Circuit



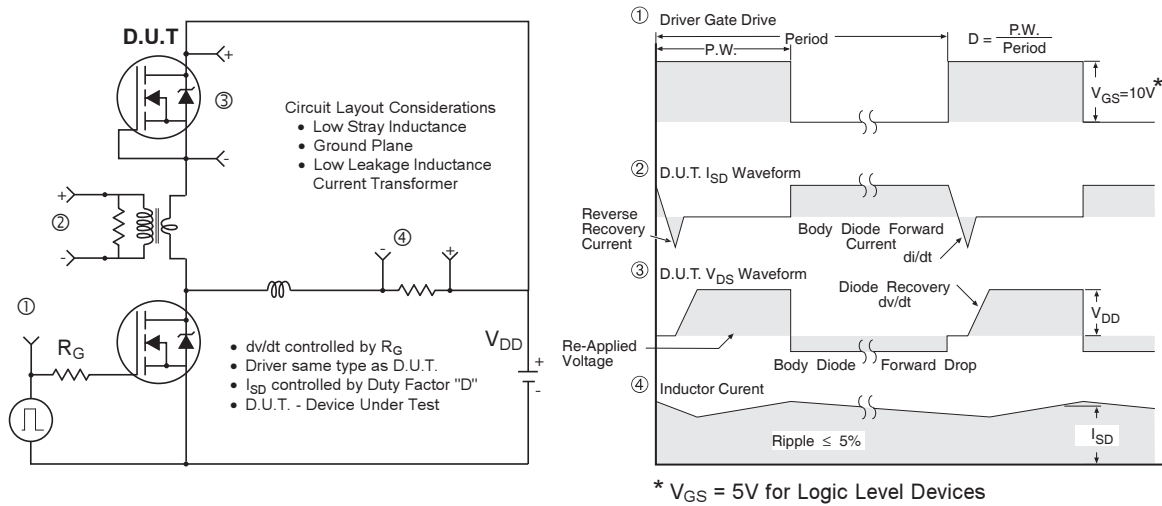
**Fig 14b.** Unclamped Inductive Waveforms



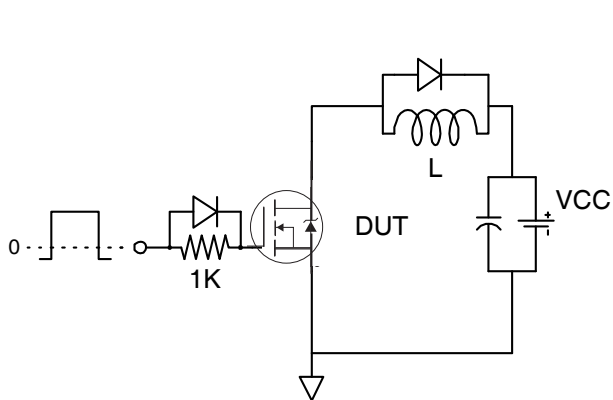
**Fig 15a.** Switching Time Test Circuit



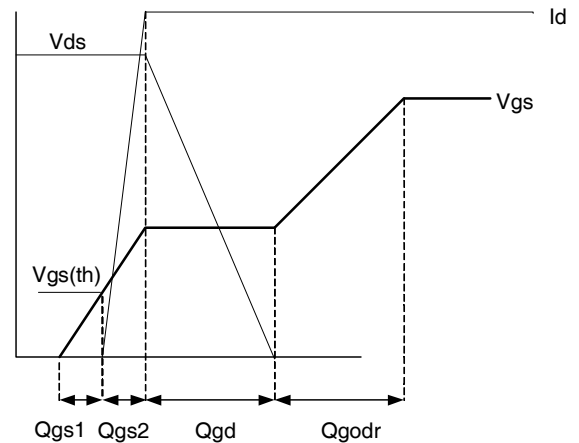
**Fig 15b.** Switching Time Waveforms



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

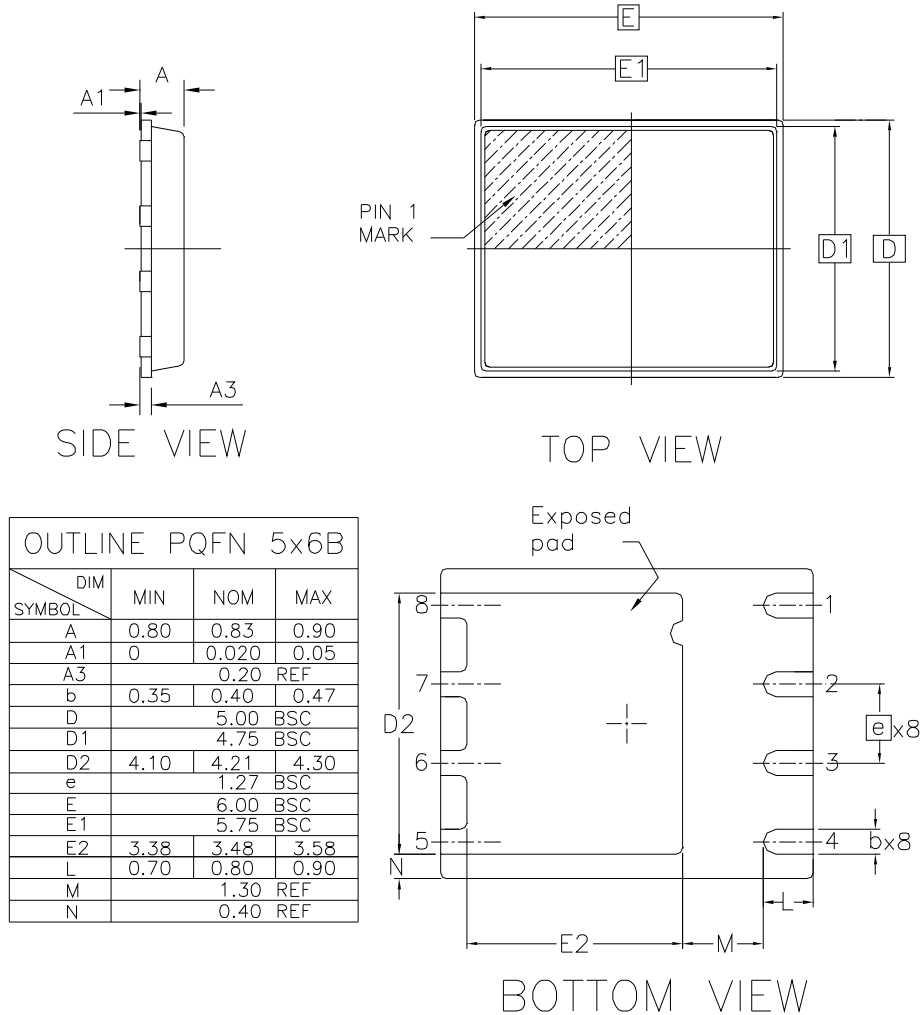


**Fig 17.** Gate Charge Test Circuit



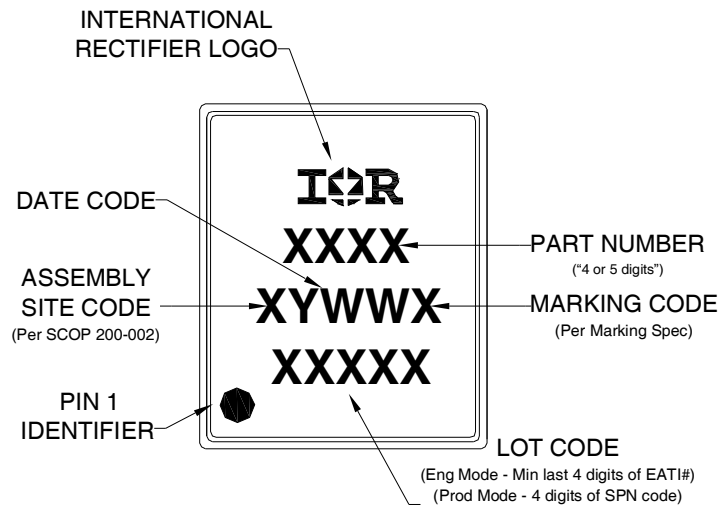
**Fig 18.** Gate Charge Waveform

## PQFN 5x6 Outline "B" Package Details



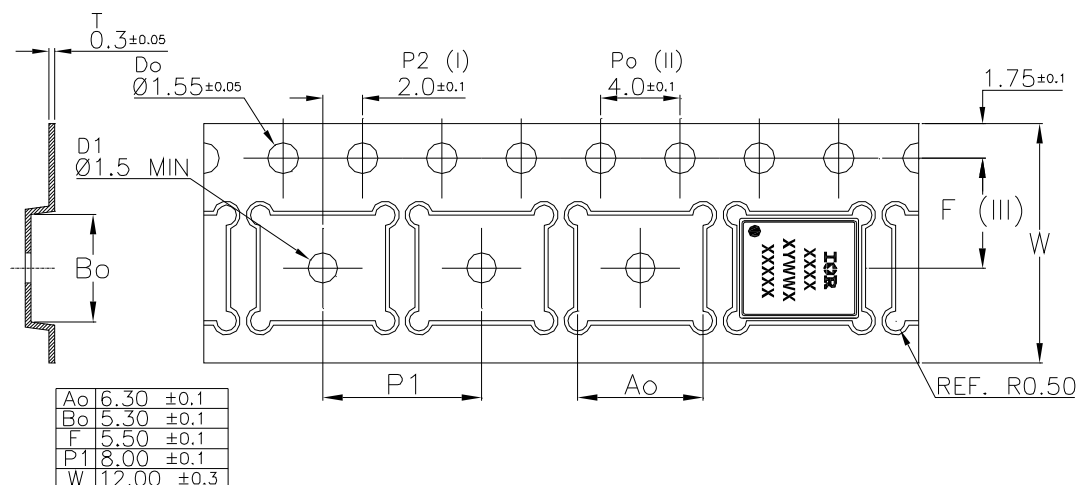
For footprint and stencil design recommendations, please refer to application note AN-1154 at <http://www.irf.com/technical-info/appnotes/an-1154.pdf>

## 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                                                                       |                                                |

<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  $T_J = 25^\circ\text{C}$ ,  $L = 0.75\text{mH}$ ,  $R_G = 50\Omega$ ,  $I_{AS} = 16\text{A}$ .
- 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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