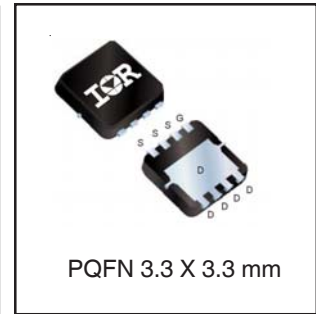
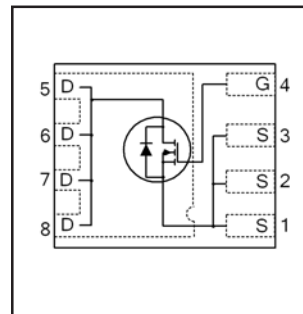


|  |             |           |
|--|-------------|-----------|
| $V_{DS}$                                   | <b>30</b>   | <b>V</b>  |
| $V_{GS\ max}$                              | <b>± 20</b> | <b>V</b>  |
| $R_{DS(on)\ max}$<br>(@ $V_{GS} = 10V$ )   | <b>9.0</b>  | <b>mΩ</b> |
| (@ $V_{GS} = 4.5V$ )                       | <b>13.5</b> |           |
| $Q_g\ typ.$                                | <b>7.1</b>  | <b>nC</b> |
| $I_D$<br>(@ $T_{c(Bottom)} = 25^\circ C$ ) | <b>25</b> Ⓢ | <b>A</b>  |

### HEXFET® Power MOSFET



### Applications

- Control MOSFET for high frequency buck converters

#### Features

|   |
|---|
| Low Thermal Resistance to PCB (< 4.5°C/W)         |
| Low Profile (<1.2mm)                              |
| Industry-Standard Pinout                          |
| Compatible with Existing Surface Mount Techniques |
| RoHS Compliant, Halogen-Free                      |
| MSL1, Consumer Qualification                      |

results in  
⇒

#### Benefits

|                                   |
|-----------------------------------|
| Enable better thermal dissipation |
| Increased Power Density           |
| Multi-Vendor Compatibility        |
| Easier Manufacturing              |
| Environmentally Friendlier        |
| Increased Reliability             |

| Base Part Number | Package Type       | Standard Pack |          | Orderable Part Number |
|------------------|--------------------|---------------|----------|-----------------------|
|                  |                    | Form          | Quantity |                       |
| IRFHM8334PBF     | PQFN 3.3mm x 3.3mm | Tape and Reel | 4000     | IRFHM8334TRPBF        |

### Absolute Maximum Ratings

|                                     | Parameter   | Max.         | Units |
|-------------------------------------|---|--------------|-------|
| $V_{GS}$                            | Gate-to-Source Voltage  | ± 20         | V     |
| $I_D @ T_A = 25^\circ C$            | Continuous Drain Current, $V_{GS} @ 10V$  | 13           | A     |
| $I_D @ T_{c(Bottom)} = 25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V$  | 43           |       |
| $I_D @ T_{c(Bottom)} = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$  | 27           |       |
| $I_D @ T_C = 25^\circ C$            | Continuous Drain Current, $V_{GS} @ 10V$<br>(Source Bonding Technology Limited) | 25           |       |
| $I_{DM}$                            | Pulsed Drain Current  | 176          |       |
| $P_D @ T_A = 25^\circ C$            | Power Dissipation   | 2.7          | W     |
| $P_D @ T_{c(Bottom)} = 25^\circ C$  | Power Dissipation   | 28           |       |
|                                     | Linear Derating Factor  | 0.021        | W/°C  |
| $T_J$                               | Operating Junction and  | -55 to + 150 | °C    |
| $T_{STG}$                           | Storage Temperature Range   |              |       |

Notes ① through ⑥ are on page 9

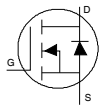
**Static @ T<sub>J</sub> = 25°C (unless otherwise specified)**

|                                     | Parameter   | Min.                                       | Typ. | Max. | Units | Conditions   |   |
|-------------------------------------|---|--|------|------|-------|--|---|
| BV <sub>DSS</sub>                   | Drain-to-Source Breakdown Voltage                   | 30   | —    | —    | V     | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA   |   |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | Breakdown Voltage Temp. Coefficient                 | —  | 21   | —    | mV/°C | Reference to 25°C, I <sub>D</sub> = 1.0mA  |   |
| R <sub>DS(on)</sub>                 | Static Drain-to-Source On-Resistance                | —  | 7.2  | 9.0  | mΩ    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A ②  |   |
|                                     |   | —  | 11.2 | 13.5 |       | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 16A ②   |   |
| V <sub>GS(th)</sub>                 | Gate Threshold Voltage                              | 1.35                                       | 1.8  | 2.35 | V     | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 25μA                                      |   |
| ΔV <sub>GS(th)</sub>                | Gate Threshold Voltage Coefficient                  | —  | -6.6 | —    | mV/°C |  |   |
| I <sub>DSS</sub>                    | Drain-to-Source Leakage Current                     | —  | —    | 1.0  | μA    | V <sub>DS</sub> = 24V, V <sub>GS</sub> = 0V  |   |
|                                     |   | —  | —    | 150  |       | V <sub>DS</sub> = 24V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C                            |   |
| I <sub>GSS</sub>                    | Gate-to-Source Forward Leakage                      | —  | —    | 100  | nA    | V <sub>GS</sub> = 20V  |   |
|                                     | Gate-to-Source Reverse Leakage                      | —  | —    | -100 |       | V <sub>GS</sub> = -20V   |   |
| g <sub>fs</sub>                     | Forward Transconductance                            | 44   | —    | —    | S     | V <sub>DS</sub> = 10V, I <sub>D</sub> = 20A  |   |
| Q <sub>g</sub>                      | Total Gate Charge                                   | —  | 15   | —    | nC    | V <sub>GS</sub> = 10V, V <sub>DS</sub> = 15V, I <sub>D</sub> = 20A                             |   |
| Q <sub>g</sub>                      | Total Gate Charge                                   | —  | 7.1  | 11   | nC    | V <sub>DS</sub> = 15V<br>V <sub>GS</sub> = 4.5V<br>I <sub>D</sub> = 20A                        |   |
|                                     | Q <sub>gs1</sub>                                    | Pre-V <sub>th</sub> Gate-to-Source Charge  | —    | 2.5  |       |  | — |
|                                     | Q <sub>gs2</sub>                                    | Post-V <sub>th</sub> Gate-to-Source Charge | —    | 1.0  |       |  | — |
|                                     | Q <sub>gd</sub>                                     | Gate-to-Drain Charge                       | —    | 2.3  |       |  | — |
|                                     | Q <sub>godr</sub>                                   | Gate Charge Overdrive                      | —    | 1.3  |       |  | — |
| Q <sub>sw</sub>                     | Switch Charge (Q <sub>gs2</sub> + Q <sub>gd</sub> ) | —  | 3.3  | —    | nC    | V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V  |   |
| Q <sub>oss</sub>                    | Output Charge                                       | —  | 5.7  | —    | nC    | V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V  |   |
| R <sub>G</sub>                      | Gate Resistance                                     | —  | 1.2  | —    | Ω     |  |   |
| t <sub>d(on)</sub>                  | Turn-On Delay Time                                  | —  | 8.3  | —    | ns    | V <sub>DD</sub> = 30V, V <sub>GS</sub> = 4.5V<br>I <sub>D</sub> = 20A<br>R <sub>G</sub> = 1.8Ω |   |
| t <sub>r</sub>                      | Rise Time   | —  | 14   | —    |       |  |   |
| t <sub>d(off)</sub>                 | Turn-Off Delay Time                                 | —  | 7.0  | —    |       |  |   |
| t <sub>f</sub>                      | Fall Time   | —  | 4.6  | —    |       |  |   |
| C <sub>iss</sub>                    | Input Capacitance                                   | —  | 1180 | —    | pF    | V <sub>GS</sub> = 0V<br>V <sub>DS</sub> = 10V<br>f = 1.0MHz                                    |   |
| C <sub>oss</sub>                    | Output Capacitance                                  | —  | 260  | —    |       |  |   |
| C <sub>rss</sub>                    | Reverse Transfer Capacitance                        | —  | 110  | —    |       |  |   |

**Avalanche Characteristics**

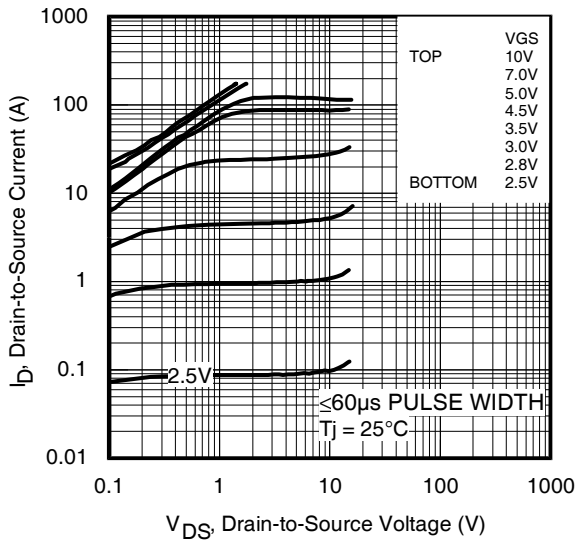
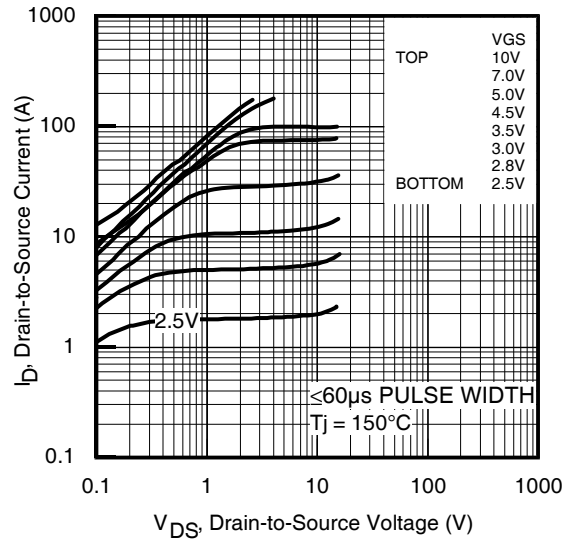
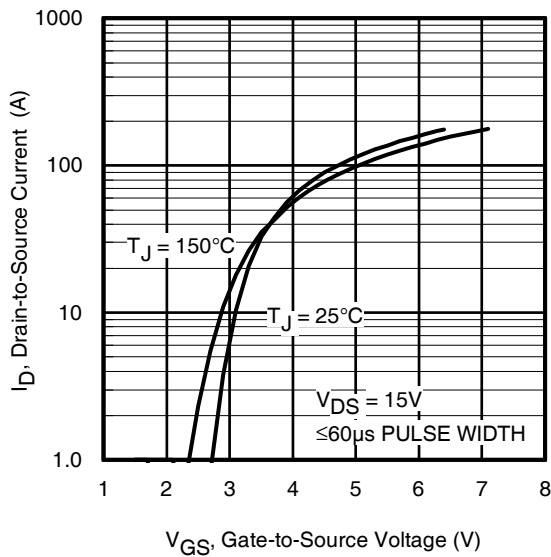
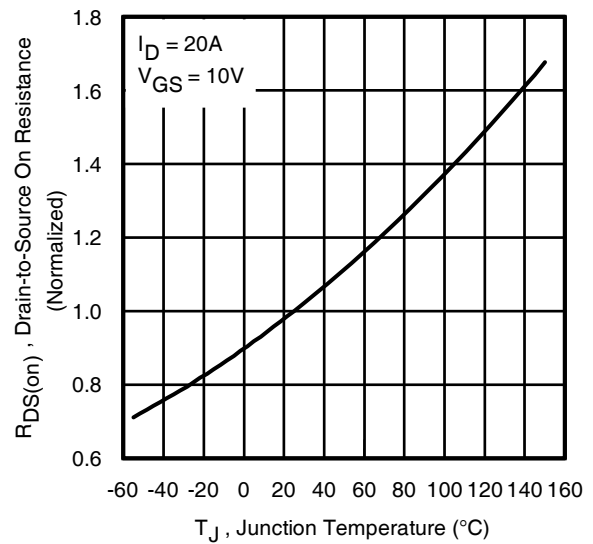
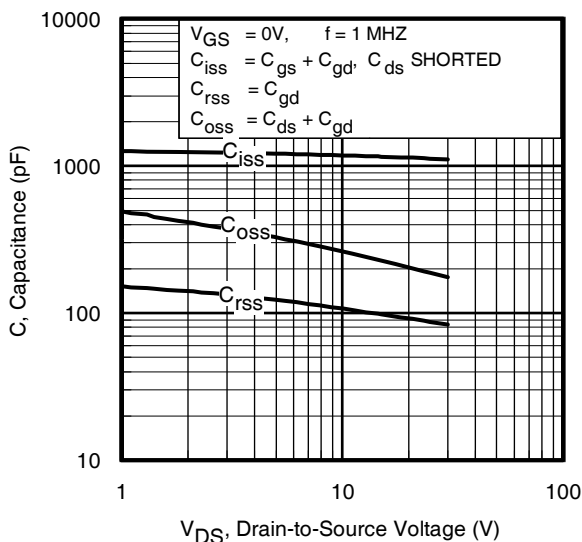
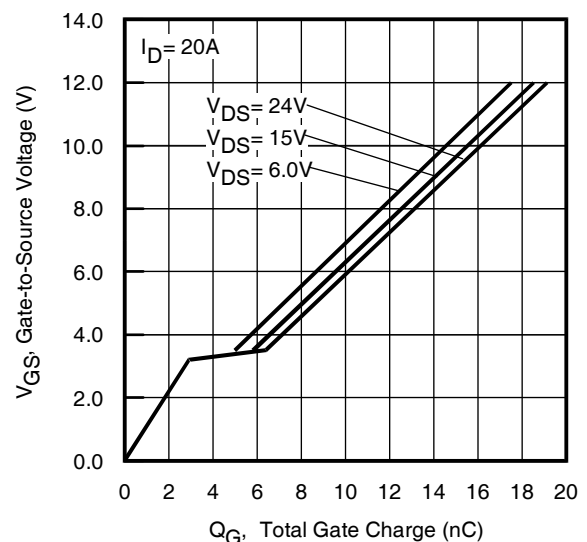
|                 | Parameter                       | Typ. | Max. | Units |
|-----------------|---------------------------------|------|------|-------|
| E <sub>AS</sub> | Single Pulse Avalanche Energy ① |      | 35   | mJ    |

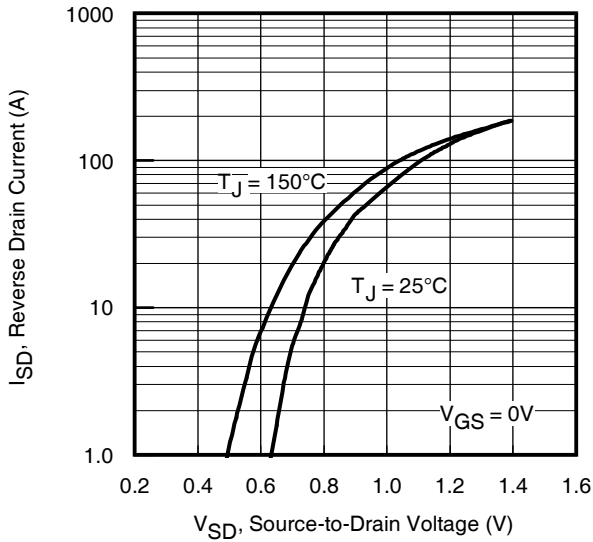
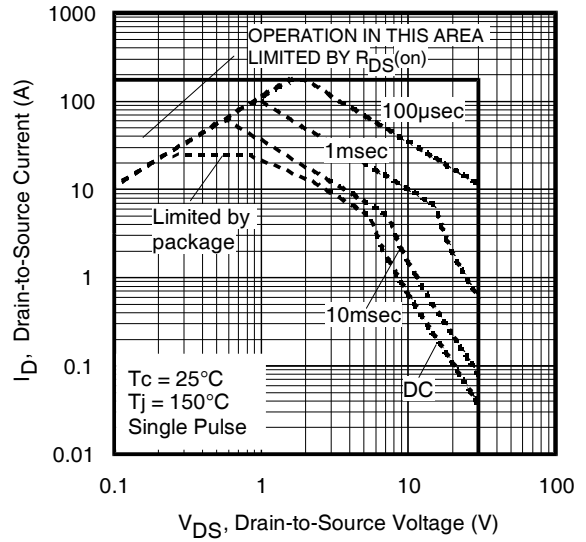
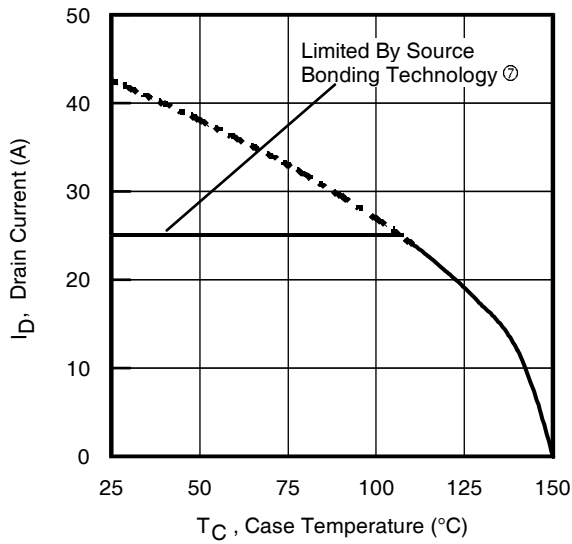
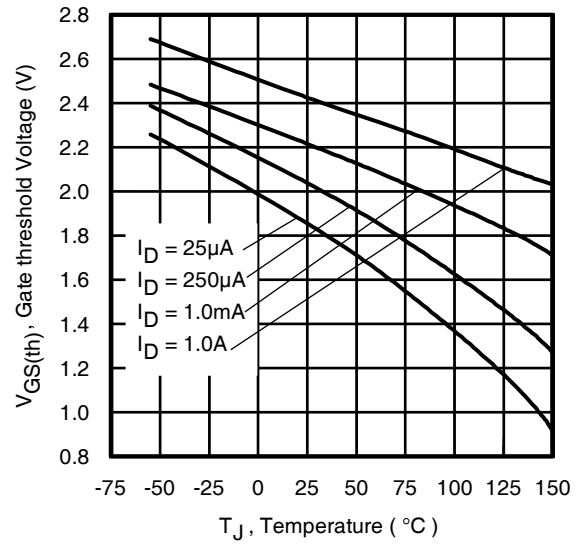
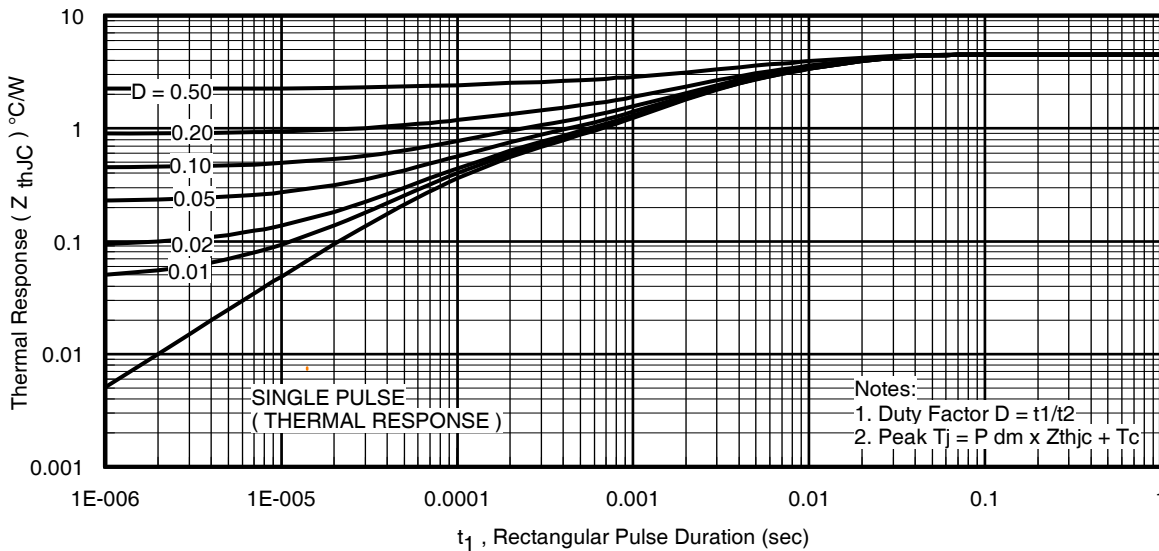
**Diode Characteristics**

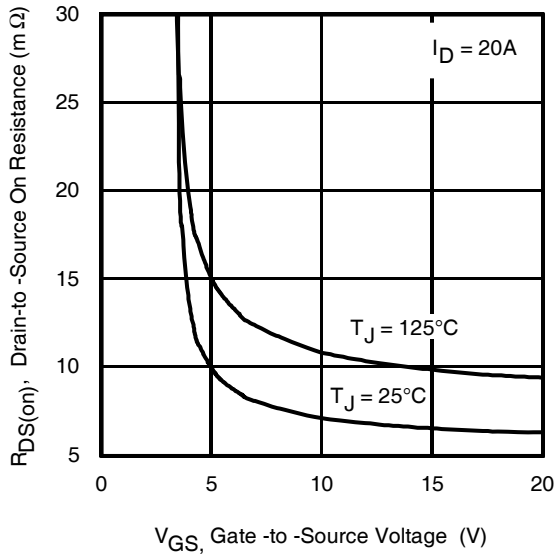
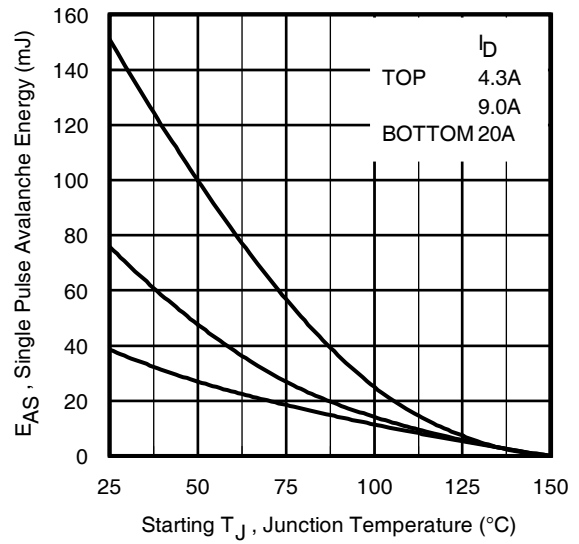
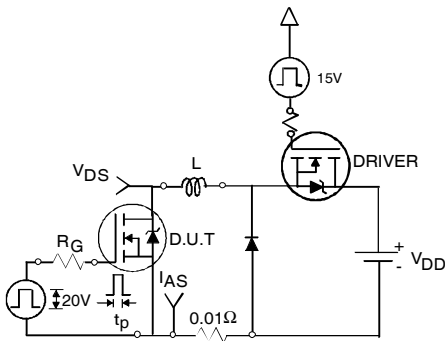
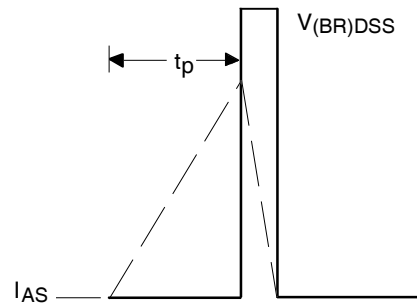
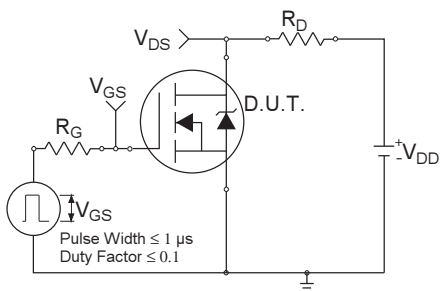
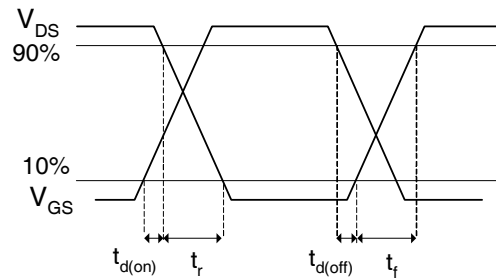
|                 | Parameter                                 | Min. | Typ. | Max. | Units | Conditions   |
|-----------------|---|------|------|------|-------|--|
| I <sub>S</sub>  | Continuous Source Current<br>(Body Diode) | —    | —    | 25⑥  | A     | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I <sub>SM</sub> | Pulsed Source Current<br>(Body Diode)     | —    | —    | 176  |       |  |
| V <sub>SD</sub> | Diode Forward Voltage                     | —    | —    | 1.0  | V     | T <sub>J</sub> = 25°C, I <sub>S</sub> = 20A, V <sub>GS</sub> = 0V ②  |
| t <sub>rr</sub> | Reverse Recovery Time                     | —    | 13   | 20   | ns    | T <sub>J</sub> = 25°C, I <sub>F</sub> = 20A, V <sub>DD</sub> = 15V   |
| Q <sub>rr</sub> | Reverse Recovery Charge                   | —    | 19   | 29   | nC    | di/dt = 380 A/μs ②   |

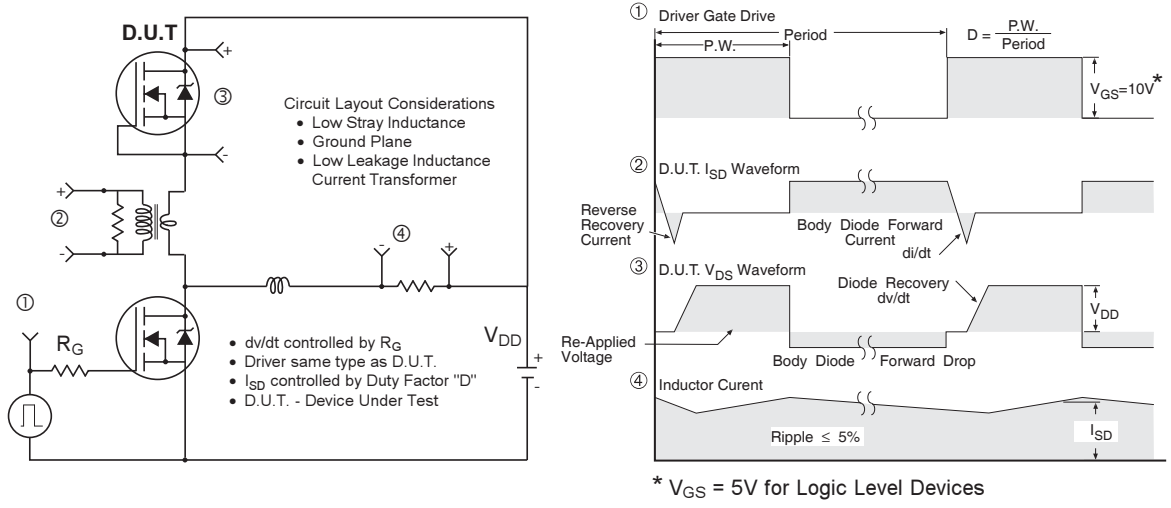
**Thermal Resistance**

|                           | Parameter             | Typ. | Max. | Units |
|---------------------------|-----------------------|------|------|-------|
| R <sub>θJC</sub> (Bottom) | Junction-to-Case ③    | —    | 4.5  | °C/W  |
| R <sub>θJC</sub> (Top)    | Junction-to-Case ③    | —    | 44   |       |
| R <sub>θJA</sub>          | Junction-to-Ambient ④ | —    | 47   |       |
| R <sub>θJA</sub> (<10s)   | Junction-to-Ambient ④ | —    | 30   |       |

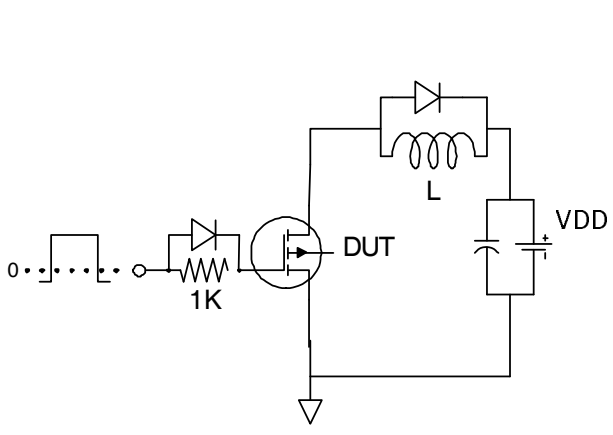

**Fig 1. Typical Output Characteristics**

**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)**

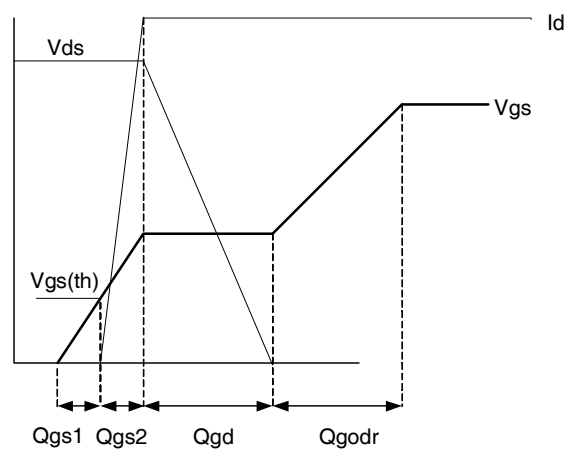

**Fig 12. On-Resistance vs. Gate Voltage**

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

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

**Fig 14b. Unclamped Inductive Waveforms**

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

**Fig 15b. Switching Time Waveforms**



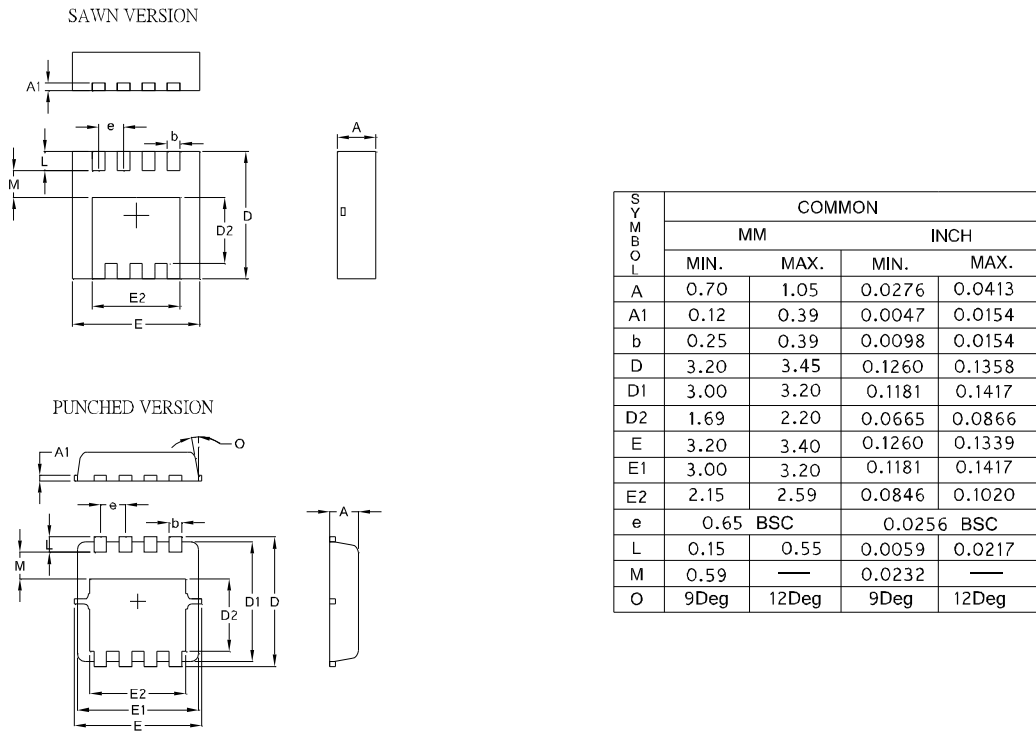
**Fig 16. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs**



**Fig 17. Gate Charge Test Circuit**



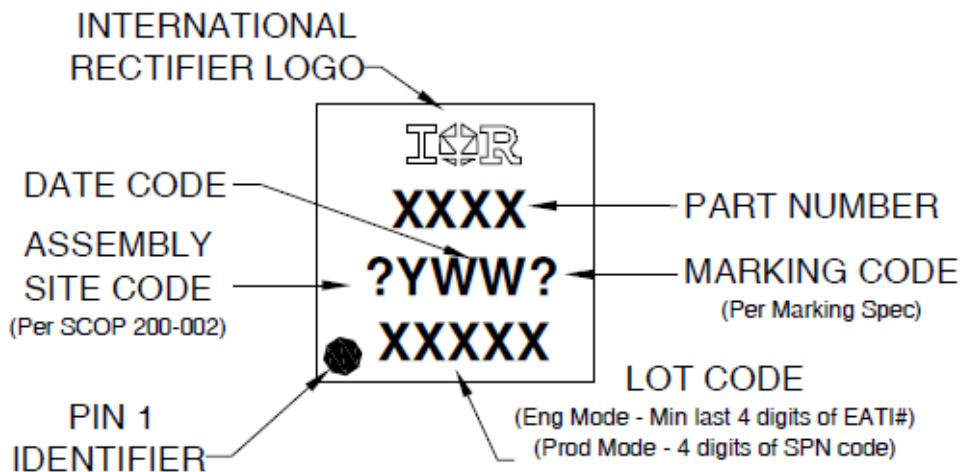
**Fig 18. Gate Charge Waveform**

**PQFN 3.3mm x 3.3mm Outline Package Details**


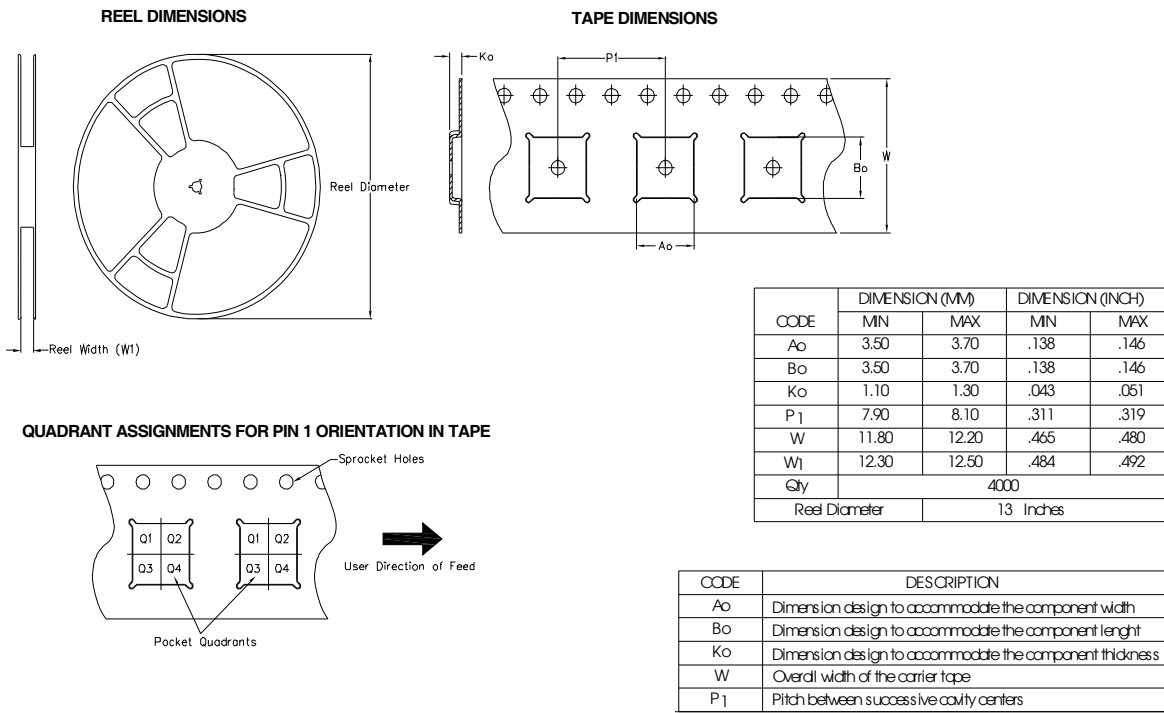
For more information on board mounting, including footprint and stencil recommendation, please refer to application note AN-1136: <http://www.irf.com/technical-info/appnotes/an-1136.pdf>

For more information on package inspection techniques, please refer to application note AN-1154:

<http://www.irf.com/technical-info/appnotes/an-1154.pdf>

**PQFN 3.3mm x 3.3mm Outline Part Marking**


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

**PQFN 3.3mm x 3.3mm Outline Tape and Reel**


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



**Qualification information<sup>†</sup>**

|                            |   |  |
|----------------------------|---|--|
| Qualification level        | Consumer <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   |  |

† 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 Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.18\text{mH}$ ,  $R_G = 50\Omega$ ,  $I_{AS} = 20\text{A}$ .
- ② Pulse width  $\leq 400\mu\text{s}$ ; duty cycle  $\leq 2\%$ .
- ③  $R_\theta$  is measured at  $T_J$  of approximately  $90^\circ\text{C}$ .
- ④ When mounted on 1 inch square PCB (FR-4). Please refer to AN-994 for more details:  
<http://www.irf.com/technical-info/appnotes/an-994.pdf>
- ⑤ Calculated continuous current based on maximum allowable junction temperature.
- ⑥ Current is limited to 25A by source bonding technology.

**Revision History**

| Date     | Comment   |
|----------|---|
| 6/5/2014 | <ul style="list-style-type: none"> <li>• Updated schematic on page 1</li> <li>• Updated Tape and Reel on page 8.</li> </ul> |