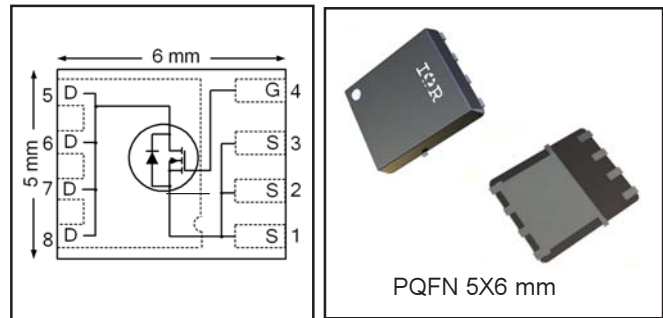


HEXFET® Power MOSFET

|  |             |           |
|--|-------------|-----------|
| $V_{DS}$                                 | <b>30</b>   | <b>V</b>  |
| $V_{GS\ max}$                            | <b>± 20</b> | <b>V</b>  |
| $R_{DS(on)\ max}$<br>(@ $V_{GS} = 10V$ ) | <b>2.95</b> | <b>mΩ</b> |
| (@ $V_{GS} = 4.5V$ )                     | <b>4.30</b> |           |
| $Q_g\ typ$                               | <b>30.0</b> | <b>nC</b> |
| $I_D$<br>(@ $T_{c(Bottom)} = 25°C$ )     | <b>50</b> ⑦ | <b>A</b>  |



**Applications**

- Synchronous MOSFET for high frequency buck converters

**Features and Benefits**

**Features**

|  |
|--|
| Low Thermal Resistance to PCB (< 1.7°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 |                  |
| IRFH8316TRPBF         | PQFN 5mm x 6mm | Tape and Reel | 4000     |                  |
| IRFH8316TR2PBF        | PQFN 5mm x 6mm | Tape and Reel | 400      | EOL notice # 259 |

**Absolute Maximum Ratings**

|                               | Parameter  | Max.         | Units |
|-------------------------------|--|--------------|-------|
| $V_{DS}$                      | Drain-to-Source Voltage                                    | 30           | V     |
| $V_{GS}$                      | Gate-to-Source Voltage                                     | ± 20         |       |
| $I_D @ T_A = 25°C$            | Continuous Drain Current, $V_{GS} @ 10V$                   | 27           | A     |
| $I_D @ T_A = 70°C$            | Continuous Drain Current, $V_{GS} @ 10V$                   | 21           |       |
| $I_D @ T_{c(Bottom)} = 25°C$  | Continuous Drain Current, $V_{GS} @ 10V$                   | 120 ⑥ ⑦      |       |
| $I_D @ T_{c(Bottom)} = 100°C$ | Continuous Drain Current, $V_{GS} @ 10V$                   | 78 ⑥ ⑦       |       |
| $I_D @ T_C = 25°C$            | Continuous Drain Current, $V_{GS} @ 10V$ (Package Limited) | 50 ⑦         |       |
| $I_{DM}$                      | Pulsed Drain Current ①                                     | 490          |       |
| $P_D @ T_A = 25°C$            | Power Dissipation ②  | 3.6          | W     |
| $P_D @ T_{c(Bottom)} = 25°C$  | Power Dissipation ②  | 59           |       |
|                               | 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 ⑦ are on page 9

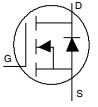
**Static @ T<sub>J</sub> = 25°C (unless otherwise specified)**

|                                     | 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                | —    | 2.40 | 2.95 | mΩ    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A ③  |
|                                     |   | —    | 3.40 | 4.30 |       | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 16A ③   |
| V <sub>GS(th)</sub>                 | Gate Threshold Voltage                              | 1.2  | 1.7  | 2.2  | V     | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 50μA                                      |
| ΔV <sub>GS(th)</sub>                | Gate Threshold Voltage Coefficient                  | —    | -6.4 | —    | mV/°C |  |
| I <sub>DSS</sub>                    | Drain-to-Source Leakage Current                     | —    | —    | 1    | 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                            | 69   | —    | —    | S     | V <sub>DS</sub> = 10V, I <sub>D</sub> = 20A  |
| Q <sub>g</sub>                      | Total Gate Charge                                   | —    | 59   | —    | nC    | V <sub>GS</sub> = 10V, V <sub>DS</sub> = 15V, I <sub>D</sub> = 20A                             |
| Q <sub>g</sub>                      | Total Gate Charge                                   | —    | 30.0 | 45.0 | 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           | —    | 7.0  | —    |       |  |
| Q <sub>gs2</sub>                    | Post-V <sub>th</sub> Gate-to-Source Charge          | —    | 2.7  | —    |       |  |
| Q <sub>gd</sub>                     | Gate-to-Drain Charge                                | —    | 9.7  | —    |       |  |
| Q <sub>godr</sub>                   | Gate Charge Overdrive                               | —    | 10.6 | —    |       |  |
| Q <sub>sw</sub>                     | Switch Charge (Q <sub>gs2</sub> + Q <sub>gd</sub> ) | —    | 12.4 | —    |       |  |
| Q <sub>oss</sub>                    | Output Charge                                       | —    | 18   | —    | nC    | V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V  |
| R <sub>G</sub>                      | Gate Resistance                                     | —    | 1.1  | 1.7  | Ω     |  |
| t <sub>d(on)</sub>                  | Turn-On Delay Time                                  | —    | 19   | —    | ns    | V <sub>DD</sub> = 15V, 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   | —    | 67   | —    |       |  |
| t <sub>d(off)</sub>                 | Turn-Off Delay Time                                 | —    | 20   | —    |       |  |
| t <sub>f</sub>                      | Fall Time   | —    | 24   | —    |       |  |
| C <sub>iss</sub>                    | Input Capacitance                                   | —    | 3610 | —    | pF    | V <sub>GS</sub> = 0V<br>V <sub>DS</sub> = 10V<br>f = 1.0MHz                                    |
| C <sub>oss</sub>                    | Output Capacitance                                  | —    | 740  | —    |       |  |
| C <sub>rss</sub>                    | Reverse Transfer Capacitance                        | —    | 390  | —    |       |  |

**Avalanche Characteristics**

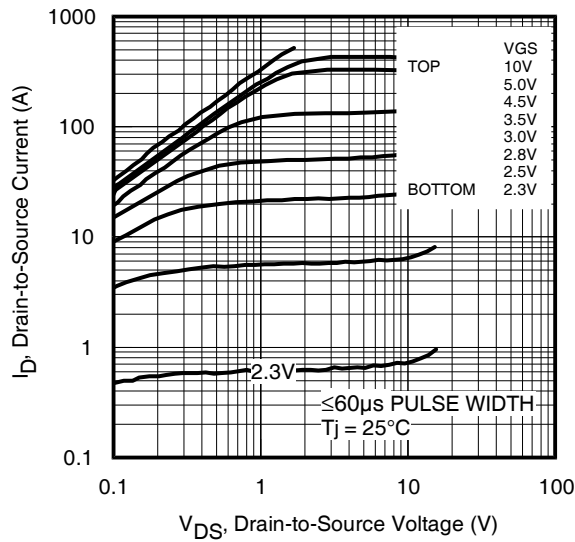
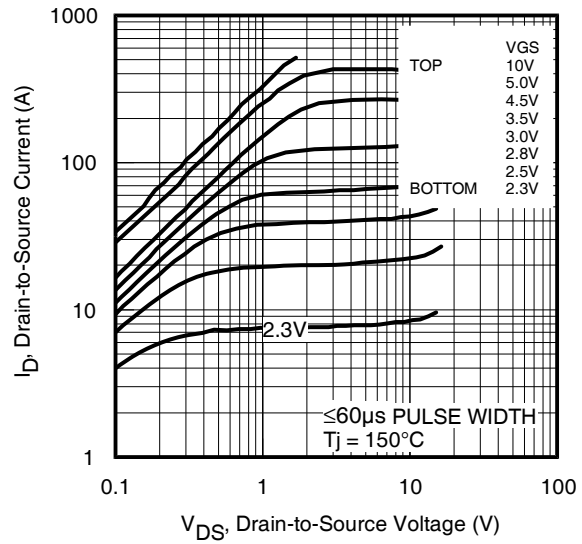
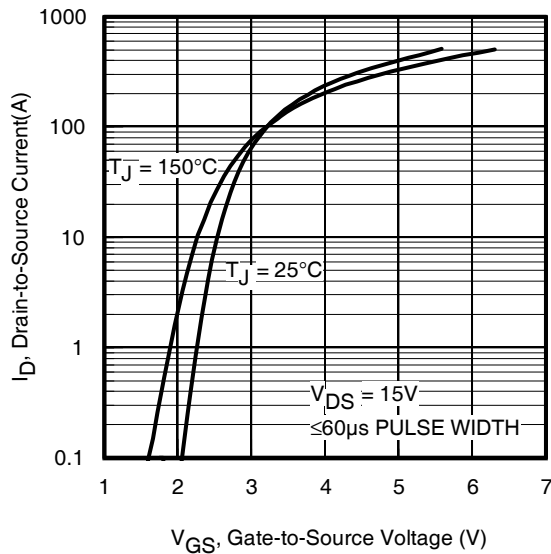
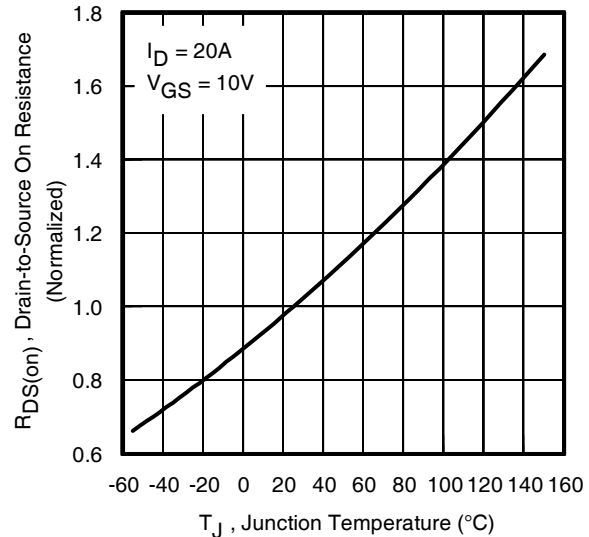
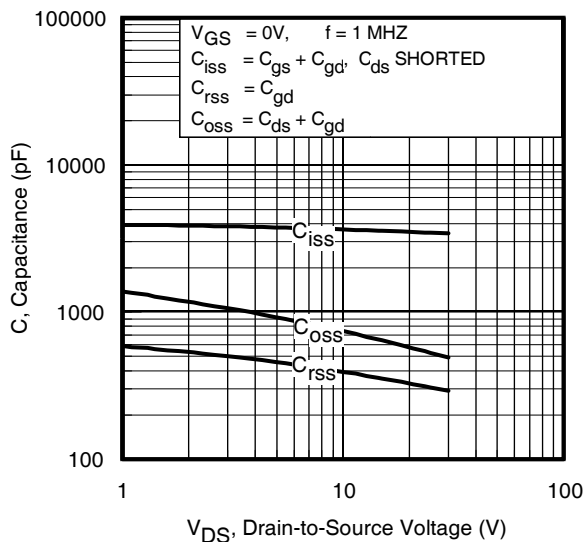
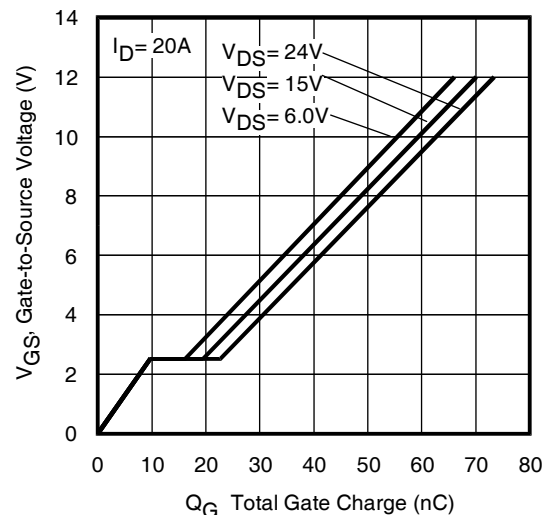
|                 | Parameter                       | Typ. | Max. | Units |
|-----------------|---------------------------------|------|------|-------|
| E <sub>AS</sub> | Single Pulse Avalanche Energy ② | —    | 160  | mJ    |
| I <sub>AR</sub> | Avalanche Current ①             | —    | 20   | A     |

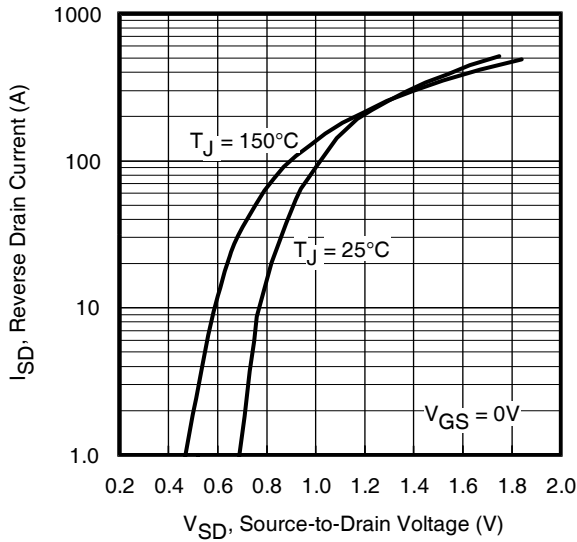
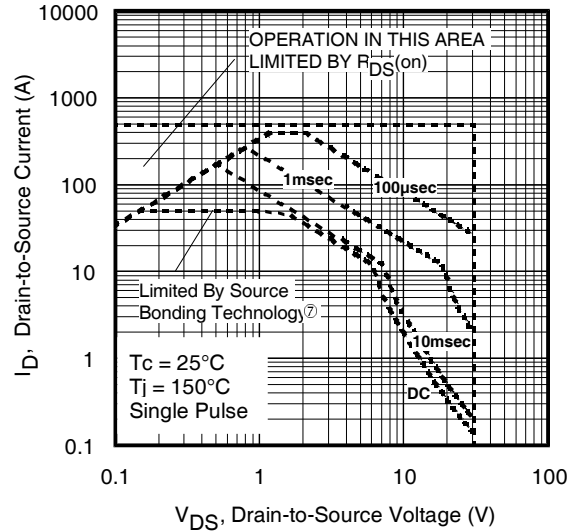
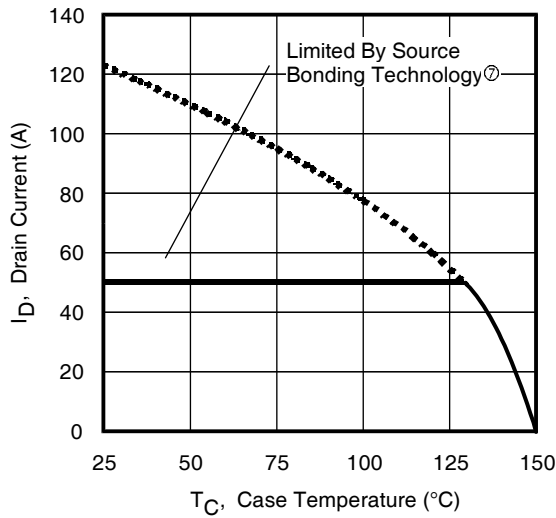
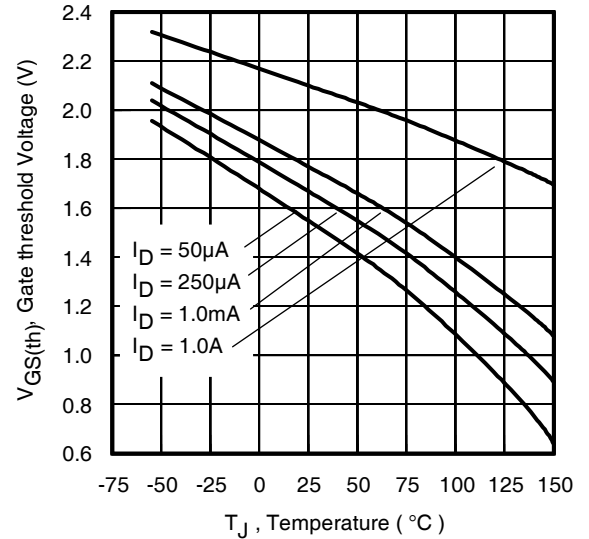
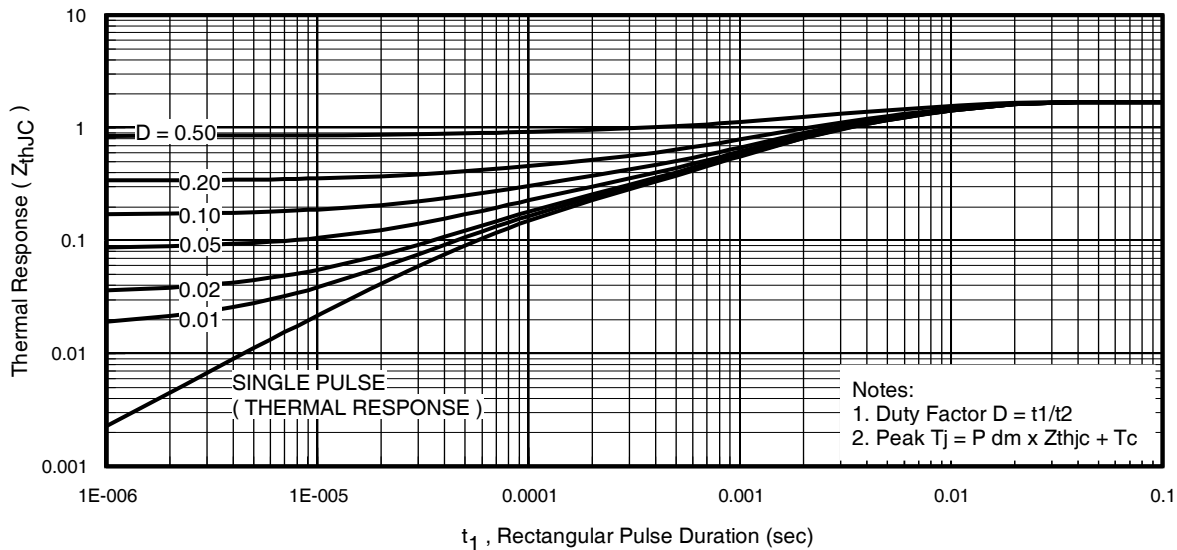
**Diode Characteristics**

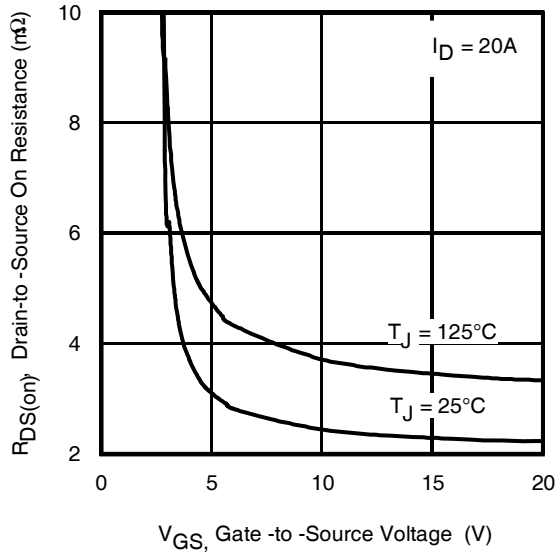
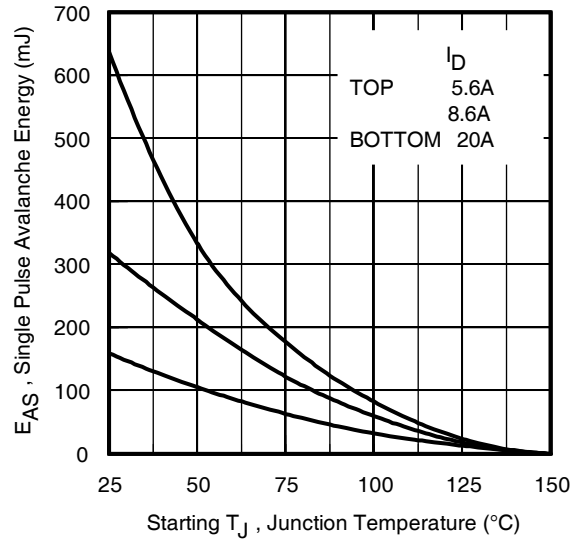
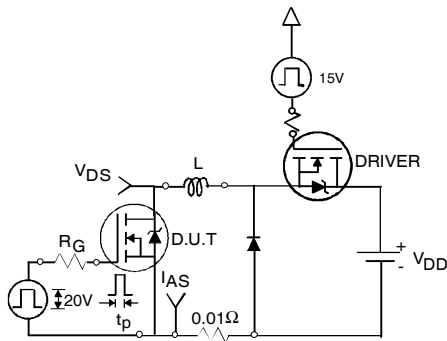
|                 | Parameter                              | Min.                                      | Typ. | Max. | Units | Conditions   |
|-----------------|--|---|------|------|-------|--|
| I <sub>S</sub>  | Continuous Source Current (Body Diode) | —   | —    | 50 ② | A     | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I <sub>SM</sub> | Pulsed Source Current (Body Diode) ①   | —   | —    | 490  |       |  |
| 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 ③  |
| t <sub>rr</sub> | Reverse Recovery Time                  | —   | 14   | 21   | ns    | T <sub>J</sub> = 25°C, I <sub>F</sub> = 20A, V <sub>DD</sub> = 15V   |
| Q <sub>rr</sub> | Reverse Recovery Charge                | —   | 18   | 27   | nC    | di/dt = 380A/μs ③  |
| t <sub>on</sub> | Forward Turn-On Time                   | Time is dominated by parasitic Inductance |      |      |       |  |

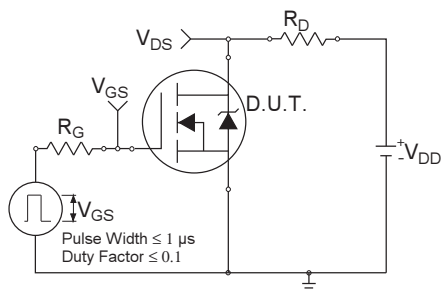
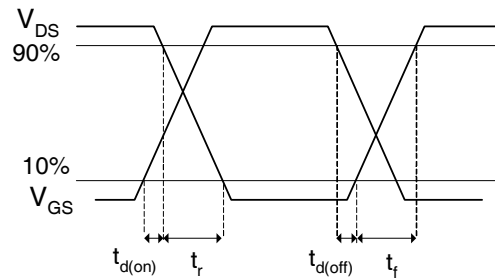
**Thermal Resistance**

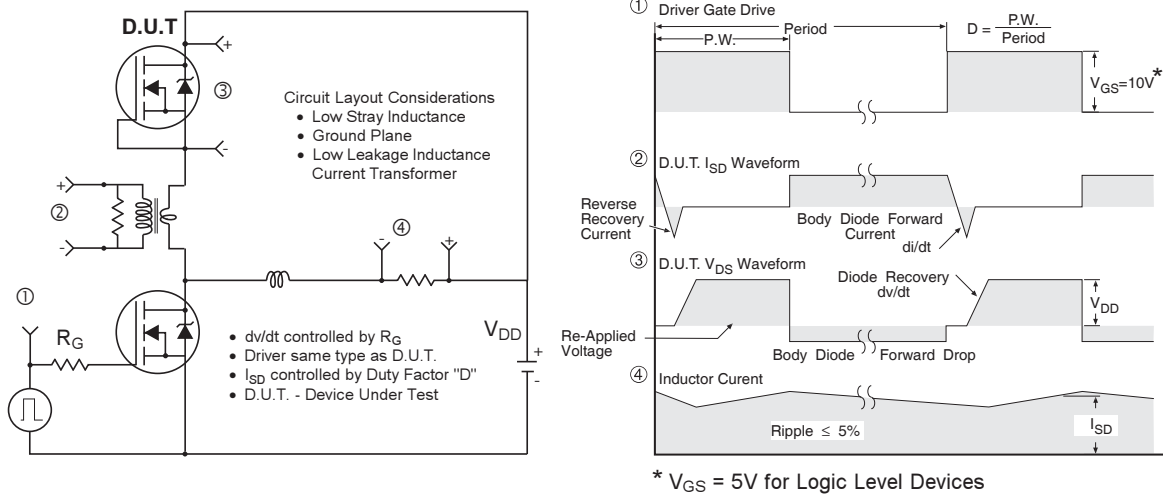
|                           | Parameter             | Typ. | Max. | Units |
|---------------------------|-----------------------|------|------|-------|
| R <sub>θJC</sub> (Bottom) | Junction-to-Case ④    | —    | 1.7  | °C/W  |
| R <sub>θJC</sub> (Top)    | Junction-to-Case ④    | —    | 32   |       |
| R <sub>θJA</sub>          | Junction-to-Ambient ⑤ | —    | 35   |       |
| R <sub>θJA</sub> (<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**

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

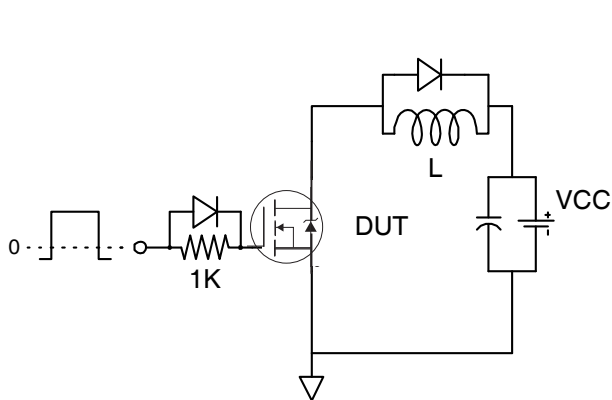

**Fig 7. Typical Source-Drain Diode Forward Voltage**

**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**

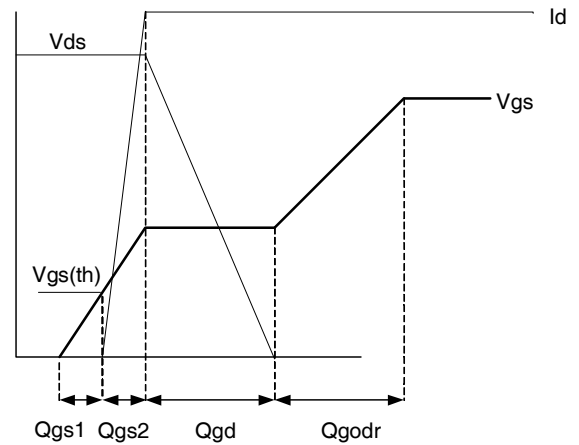
**Fig 14b. Unclamped Inductive Waveforms**

**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**

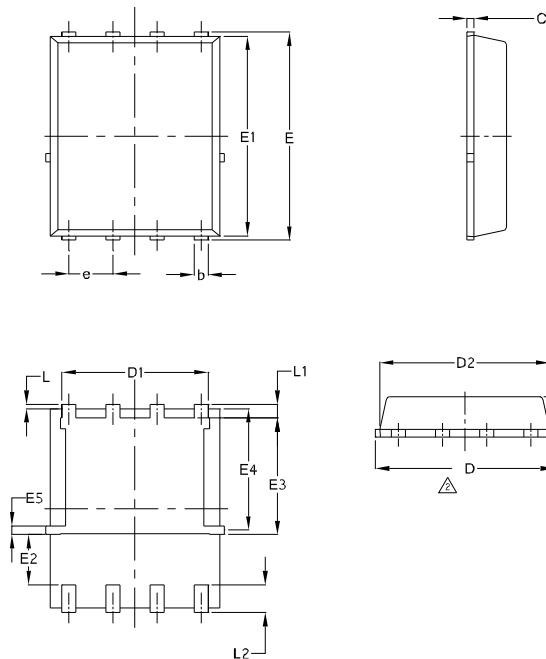


**Fig 17. Gate Charge Test Circuit**



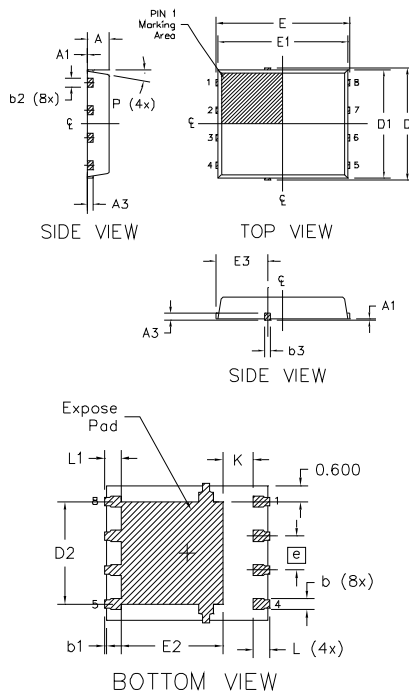
**Fig 18. Gate Charge Waveform**

## PQFN 5x6 Outline "E" Package Details



| SYMBOL | COMMON |       |        |        |
|--------|--------|-------|--------|--------|
|        | MM     |       | INCH   |        |
|        | MIN.   | MAX.  | MIN.   | MAX.   |
| A      | 0.90   | 1.17  | 0.0354 | 0.0461 |
| b      | 0.33   | 0.48  | 0.0130 | 0.0189 |
| C      | 0.195  | 0.300 | 0.0077 | 0.0118 |
| D      | 4.80   | 5.15  | 0.1890 | 0.2028 |
| D1     | 3.91   | 4.31  | 0.1539 | 0.1697 |
| D2     | 4.80   | 5.00  | 0.1890 | 0.1968 |
| E      | 5.90   | 6.15  | 0.2323 | 0.2421 |
| E1     | 5.65   | 6.00  | 0.2224 | 0.2362 |
| E2     | 1.51   | —     | 0.0594 | —      |
| E3     | 3.32   | 3.78  | 0.1307 | 0.1480 |
| E4     | 3.42   | 3.58  | 0.1346 | 0.1409 |
| E5     | 0.18   | 0.32  | 0.0071 | 0.0126 |
| e      | 1.27   | BSC   | 0.050  | BSC    |
| L      | 0.05   | 0.25  | 0.0020 | 0.0098 |
| L1     | 0.38   | 0.66  | 0.0150 | 0.0260 |
| L2     | 0.51   | 0.86  | 0.0201 | 0.0339 |
| I      | 0      | 0.18  | 0      | 0.0071 |

## PQFN 5x6 Outline "G" Package Details



| DIM SYMBOL | MILLIMETERS |        | INCH   |        |
|------------|-------------|--------|--------|--------|
|            | MIN.        | MAX.   | MIN.   | MAX.   |
| A          | 0.950       | 1.050  | 0.0374 | 0.0413 |
| A1         | 0.000       | 0.050  | 0.0000 | 0.0020 |
| A3         | 0.254       | REF    | 0.0100 | REF    |
| b          | 0.310       | 0.510  | 0.0122 | 0.0201 |
| b1         | 0.025       | 0.125  | 0.0010 | 0.0049 |
| b2         | 0.210       | 0.410  | 0.0083 | 0.0161 |
| b3         | 0.180       | 0.450  | 0.0071 | 0.0177 |
| D          | 5.150       | BSC    | 0.2028 | BSC    |
| D1         | 5.000       | BSC    | 0.1969 | BSC    |
| D2         | 3.700       | 3.900  | 0.1457 | 0.1535 |
| E          | 6.150       | BSC    | 0.2421 | BSC    |
| E1         | 6.000       | BSC    | 0.2362 | BSC    |
| E2         | 3.560       | 3.760  | 0.1402 | 0.1488 |
| E3         | 2.270       | 2.470  | 0.0894 | 0.0972 |
| e          | 1.27        | REF    | 0.050  | REF    |
| K          | 0.830       | 1.400  | 0.0327 | 0.0551 |
| L          | 0.510       | 0.710  | 0.0201 | 0.0280 |
| L1         | 0.510       | 0.710  | 0.0201 | 0.0280 |
| P          | 10 deg      | 12 deg | 0 deg  | 12 deg |

**Note:**

- Dimensions and tolerancing conform to ASME Y14.5M-1994
- Dimension L represents terminal full back from package edge up to 0.1mm is acceptable
- Coplanarity applies to the expose Heat Slug as well as the terminal
- Radius on terminal is Optional

For more information on board mounting, including footprint and stencil recommendation, please refer to application note AN-1136:

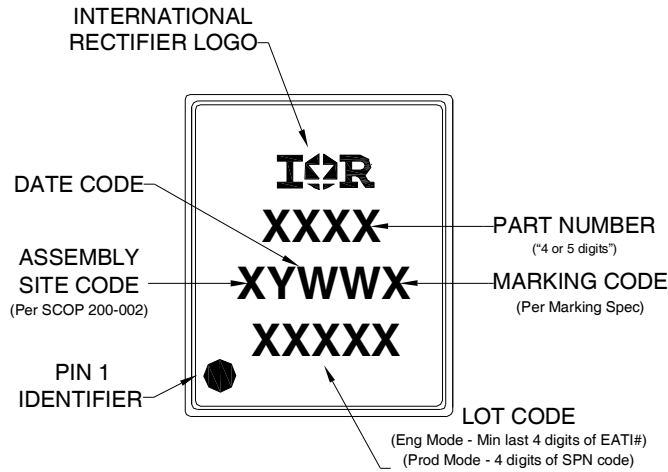
<http://www.irf.com/technical-info/appnotes/an-1136.pdf>

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

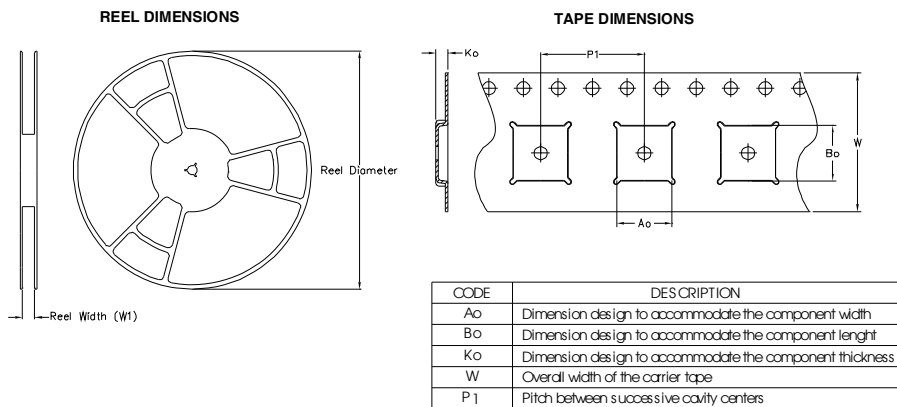
<http://www.irf.com/technical-info/appnotes/an-1154.pdf>

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

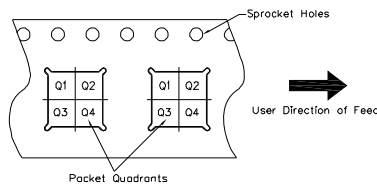
## PQFN 5x6 Part Marking



## PQFN 5x6 Tape and Reel



### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



Note: All dimension are nominal

| Package Type | Reel Diameter (Inch) | QTY  | Reel Width W1 (mm) | Ao (mm) | Bo (mm) | Ko (mm) | P1 (mm) | W (mm) | Pin 1 Quadrant |
|--------------|----------------------|------|--------------------|---------|---------|---------|---------|--------|----------------|
| 5 X 6 PQFN   | 13                   | 4000 | 12.4               | 6.300   | 5.300   | 1.20    | 8.00    | 12     | Q1             |

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 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  $T_J = 25^\circ\text{C}$ ,  $L = 0.796\text{mH}$ ,  $R_G = 50\Omega$ ,  $I_{AS} = 20\text{A}$ .
- 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.

**Revision History**

| Date      | Comment  |
|-----------|--|
| 5/13/2014 | <ul style="list-style-type: none"> <li>• Updated ordering information to reflect the End-Of-life (EOL) of the mini-reel option (EOL notice #259)</li> <li>• Updated Tape and Reel on page 8.</li> </ul>                                    |
| 6/2/2015  | <ul style="list-style-type: none"> <li>• Updated package outline for "option E" and added package outline for "option G" on page 7</li> <li>• Updated "IRF" logo on page 1 &amp; 9.</li> <li>• Updated tape and reel on page 8.</li> </ul> |



## Стандарт Электрон Связь

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

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