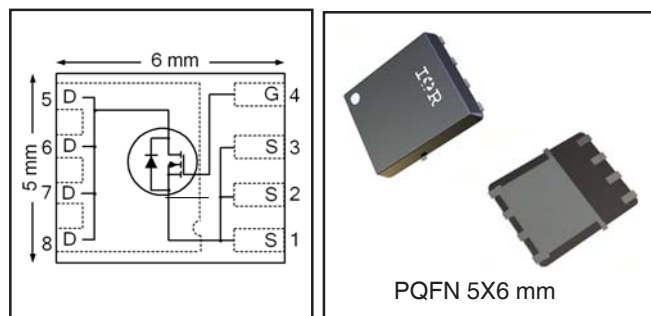


HEXFET® Power MOSFET

|                                            |             |           |
|--------------------------------------------|-------------|-----------|
| $V_{DS}$                                   | <b>30</b>   | <b>V</b>  |
| $V_{GS\ max}$                              | <b>± 20</b> | <b>V</b>  |
| $R_{DS(on)\ max}$<br>(@ $V_{GS} = 10V$ )   | <b>3.1</b>  | <b>mΩ</b> |
| (@ $V_{GS} = 4.5V$ )                       | <b>4.6</b>  |           |
| $Q_g\ typ$                                 | <b>19</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 (< 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 |                  |
| IRFH8318TRPBF         | PQFN 5mm x 6mm | Tape and Reel | 4000     |                  |
| IRFH8318TR2PBF        | 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         |       |
| $I_D @ T_A = 25^\circ C$            | Continuous Drain Current, $V_{GS} @ 10V$                   | 27           | A     |
| $I_D @ T_A = 70^\circ C$            | Continuous Drain Current, $V_{GS} @ 10V$                   | 21           |       |
| $I_D @ T_{C(Bottom)} = 25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V$                   | 120 ⑥ ⑦      |       |
| $I_D @ T_{C(Bottom)} = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$                   | 76 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                                     | 400          |       |
| $P_D @ T_A = 25^\circ C$            | Power Dissipation ②                                        | 3.6          | W     |
| $P_D @ T_{C(Bottom)} = 25^\circ C$  | Power Dissipation ②                                        | 59           |       |
|                                     | Linear Derating Factor ③                                   | 0.029        | W/°C  |
| $T_J$<br>$T_{STG}$                  | Operating Junction and<br>Storage Temperature Range        | -55 to + 150 | °C    |

Notes ① through ⑦ are on page 9

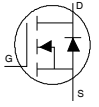
**Static @ T<sub>J</sub> = 25°C (unless otherwise specified)**

|                                     | 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                 | —    | 0.019 | —    | V/°C  | Reference to 25°C, I <sub>D</sub> = 1.0mA                                                      |
| R <sub>DS(on)</sub>                 | Static Drain-to-Source On-Resistance                | —    | 2.5   | 3.1  | mΩ    | V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A ③                                                  |
|                                     |                                                     | —    | 3.6   | 4.6  | mΩ    | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 16A ③                                                 |
| 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> = 50μA                                      |
| ΔV <sub>GS(th)</sub>                | Gate Threshold Voltage Coefficient                  | —    | -6.0  | —    | mV/°C |                                                                                                |
| I <sub>DSS</sub>                    | Drain-to-Source Leakage Current                     | —    | —     | 1    | μA    | V <sub>DS</sub> = 24V, V <sub>GS</sub> = 0V                                                    |
|                                     |                                                     | —    | —     | 150  | μA    | 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 | nA    | V <sub>GS</sub> = -20V                                                                         |
| g <sub>fs</sub>                     | Forward Transconductance                            | 81   | —     | —    | S     | V <sub>DS</sub> = 10V, I <sub>D</sub> = 20A                                                    |
| Q <sub>g</sub>                      | Total Gate Charge                                   | —    | 41    | —    | nC    | V <sub>GS</sub> = 10V, V <sub>DS</sub> = 15V, I <sub>D</sub> = 20A                             |
| Q <sub>g</sub>                      | Total Gate Charge                                   | —    | 19    | —    | 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           | —    | 5.8   | —    | nC    |                                                                                                |
| Q <sub>gs2</sub>                    | Post-V <sub>th</sub> Gate-to-Source Charge          | —    | 2.3   | —    | nC    |                                                                                                |
| Q <sub>gd</sub>                     | Gate-to-Drain Charge                                | —    | 4.4   | —    | nC    |                                                                                                |
| Q <sub>godr</sub>                   | Gate Charge Overdrive                               | —    | 6.5   | —    | nC    |                                                                                                |
| Q <sub>sw</sub>                     | Switch Charge (Q <sub>gs2</sub> + Q <sub>gd</sub> ) | —    | 6.7   | —    | nC    |                                                                                                |
| Q <sub>oss</sub>                    | Output Charge                                       | —    | 18    | —    | nC    | V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V                                                    |
| R <sub>G</sub>                      | Gate Resistance                                     | —    | 1.7   | —    | Ω     |                                                                                                |
| t <sub>d(on)</sub>                  | Turn-On Delay Time                                  | —    | 15    | —    | 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                                           | —    | 33    | —    | ns    |                                                                                                |
| t <sub>d(off)</sub>                 | Turn-Off Delay Time                                 | —    | 18    | —    | ns    |                                                                                                |
| t <sub>f</sub>                      | Fall Time                                           | —    | 12    | —    | ns    |                                                                                                |
| C <sub>iss</sub>                    | Input Capacitance                                   | —    | 3180  | —    | pF    | V <sub>GS</sub> = 0V                                                                           |
| C <sub>oss</sub>                    | Output Capacitance                                  | —    | 700   | —    | pF    | V <sub>DS</sub> = 10V                                                                          |
| C <sub>rss</sub>                    | Reverse Transfer Capacitance                        | —    | 270   | —    | pF    | f = 1.0MHz                                                                                     |

**Avalanche Characteristics**

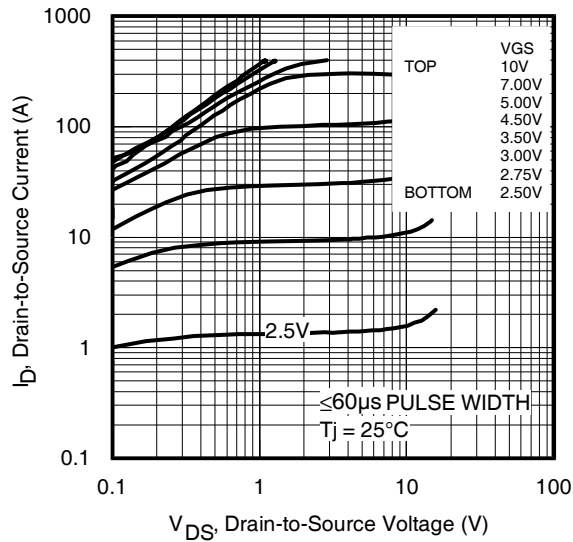
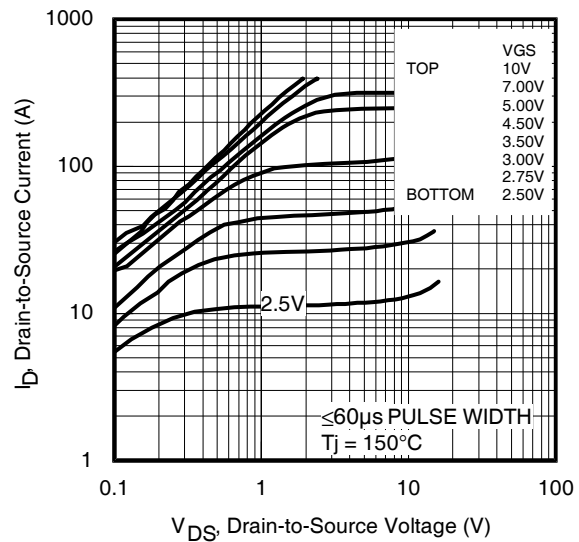
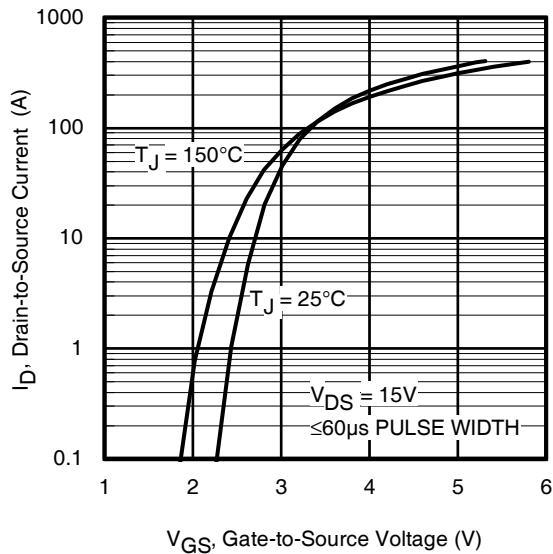
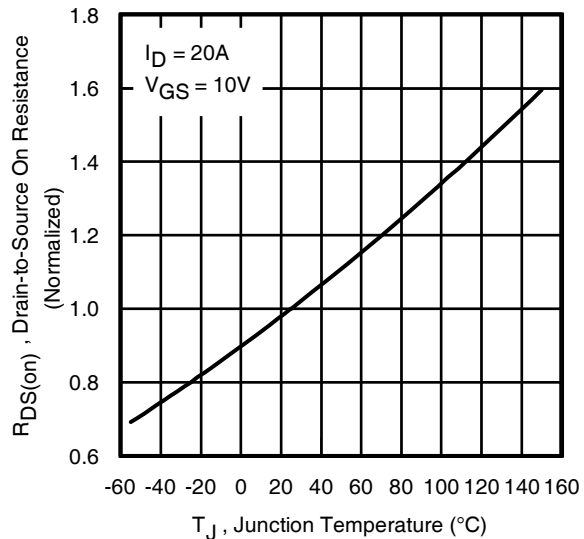
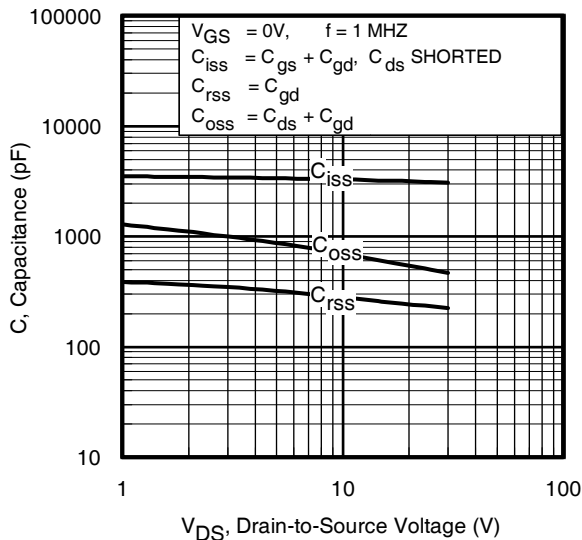
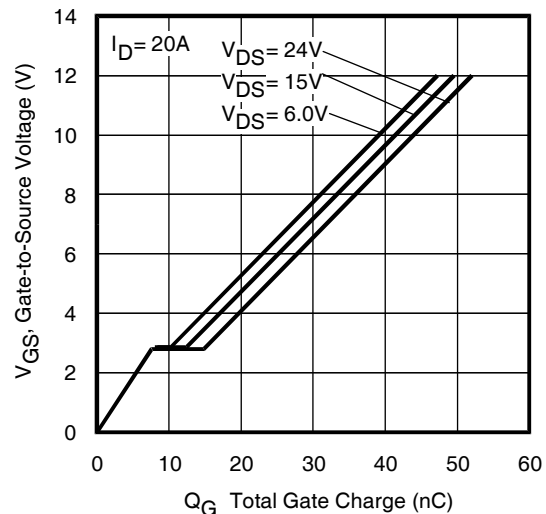
|                 | Parameter                       | Typ. | Max. | Units |
|-----------------|---------------------------------|------|------|-------|
| E <sub>AS</sub> | Single Pulse Avalanche Energy ② | —    | 160  | mJ    |
| I <sub>AR</sub> | Avalanche Current ①             | —    | 20   | A   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

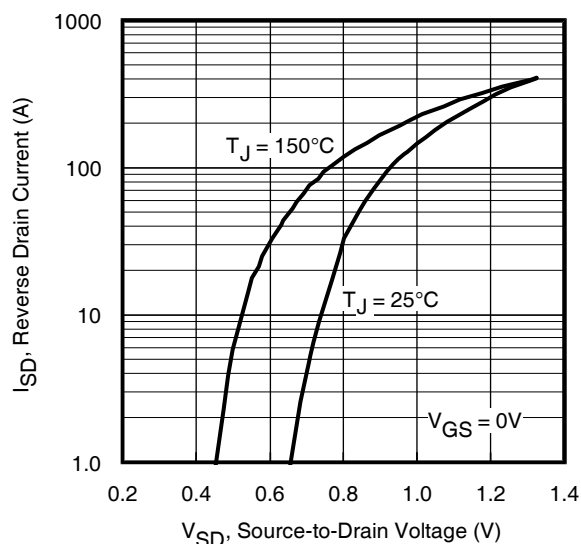
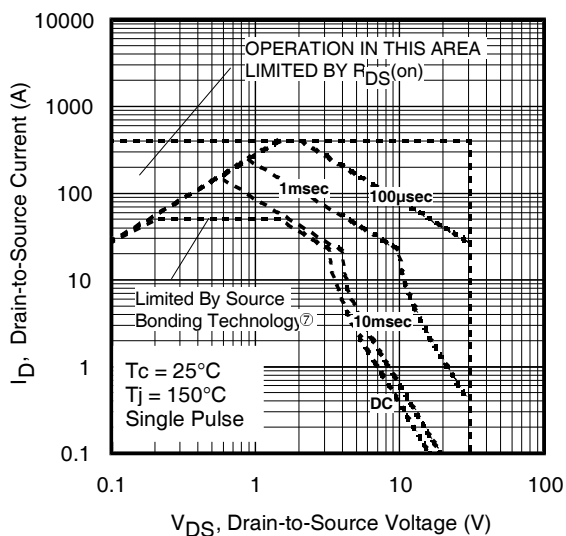
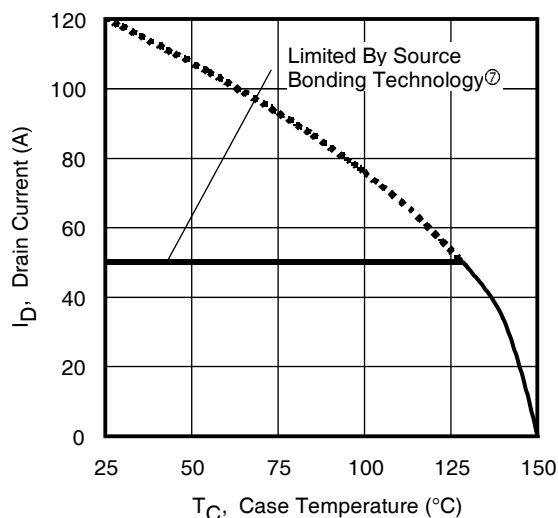
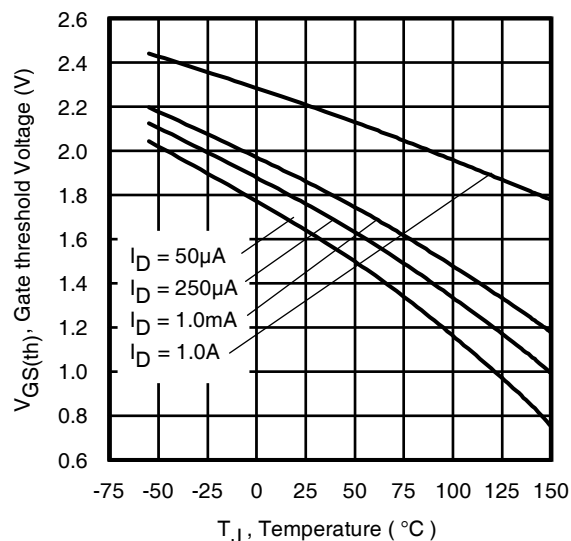
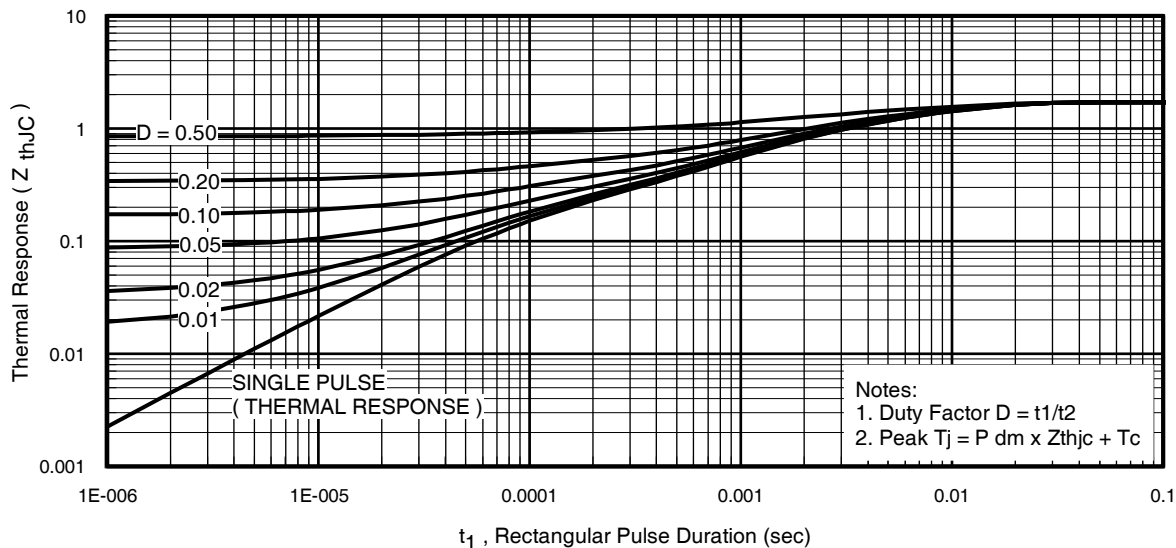
**Diode Characteristics**

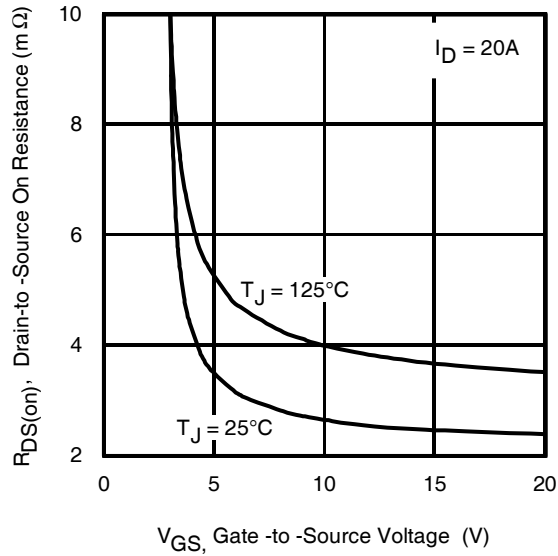
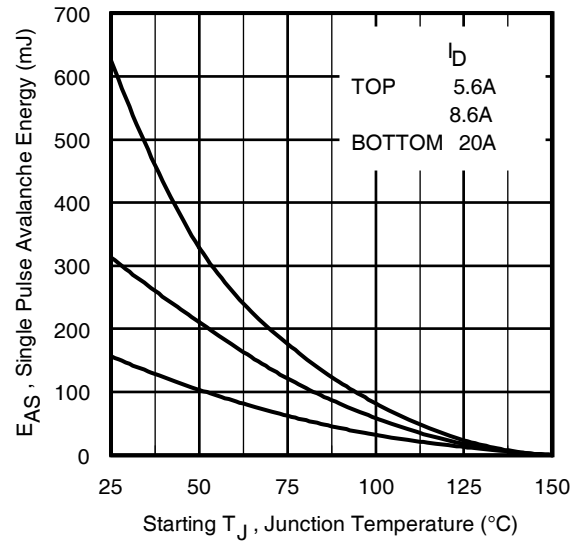
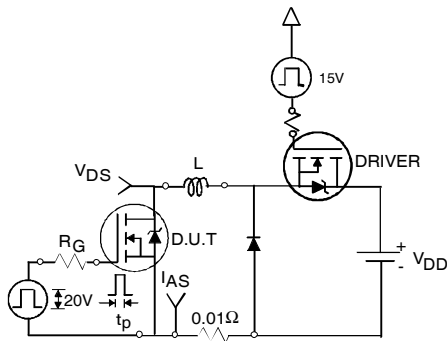
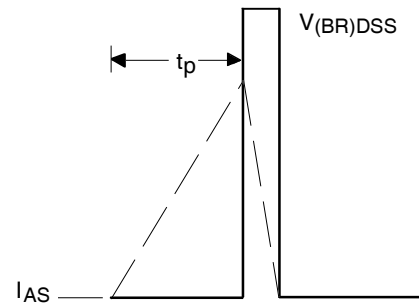
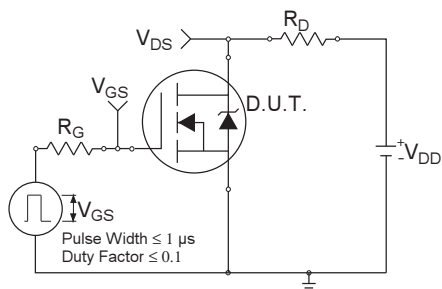
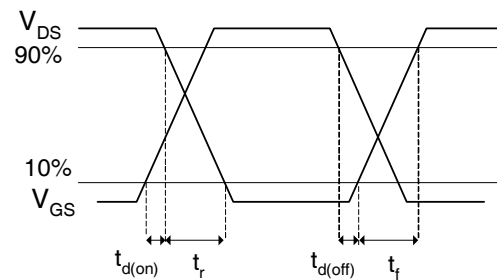
|                 | Parameter                              | Min.                                      | Typ. | Max. | Units | Conditions                                                                                                                                           |
|-----------------|----------------------------------------|-------------------------------------------|------|------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| I <sub>S</sub>  | Continuous Source Current (Body Diode) | —                                         | —    | 50 ⑦ | A     | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I <sub>SM</sub> | Pulsed Source Current (Body Diode) ①   | —                                         | —    | 400  | A     |                                                                                                                                                      |
| 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                  | —                                         | 16   | 24   | ns    | T <sub>J</sub> = 25°C, I <sub>F</sub> = 20A, V <sub>DD</sub> = 15V                                                                                   |
| Q <sub>rr</sub> | Reverse Recovery Charge                | —                                         | 35   | 53   | nC    | di/dt = 380A/μs ③                                                                                                                                    |
| t <sub>on</sub> | Forward Turn-On Time                   | Time is dominated by parasitic Inductance |      |      |       |                                                                                                                                                      |

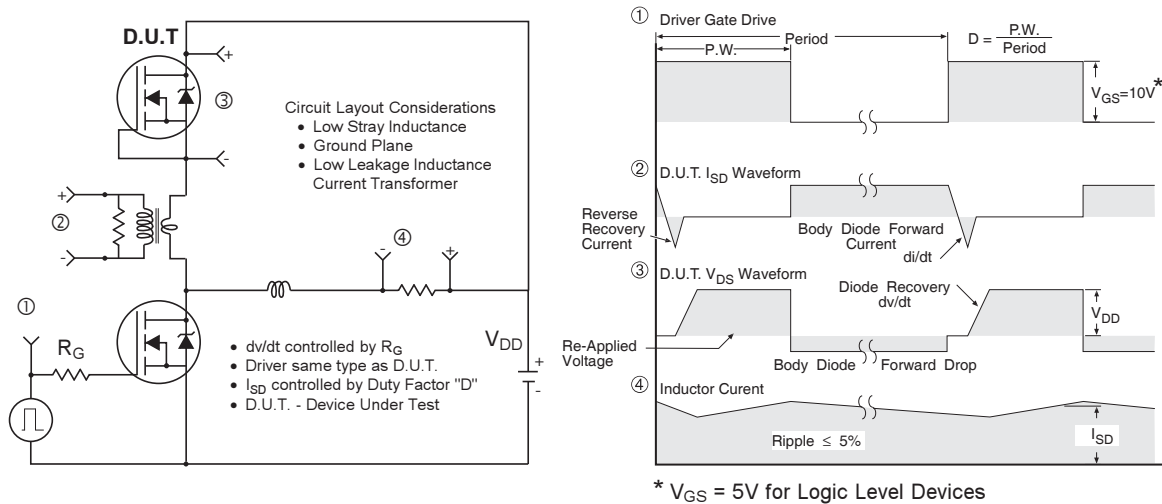
**Thermal Resistance**

|                           | 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   |       |

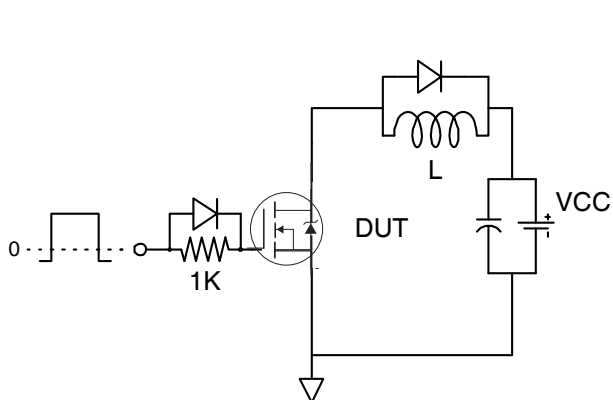

**Fig 1. Typical Output Characteristics**

**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)

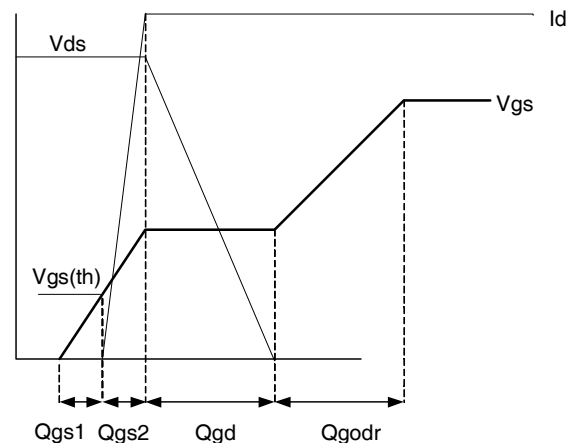

**Fig 12.** On-Resistance vs. Gate Voltage

**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

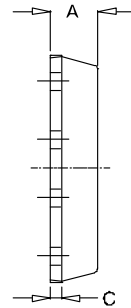


**Fig 17.** Gate Charge Test Circuit

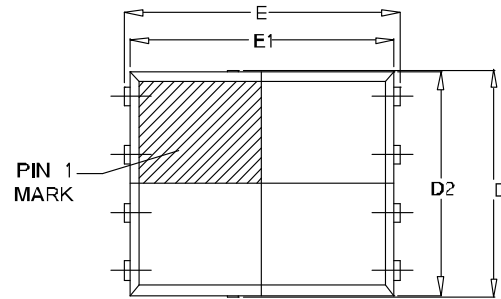


**Fig 18.** Gate Charge Waveform

## PQFN 5x6 Outline "E" Package Details

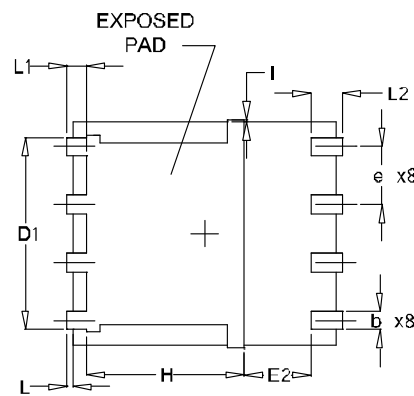


SIDEVIEW



TOP VIEW

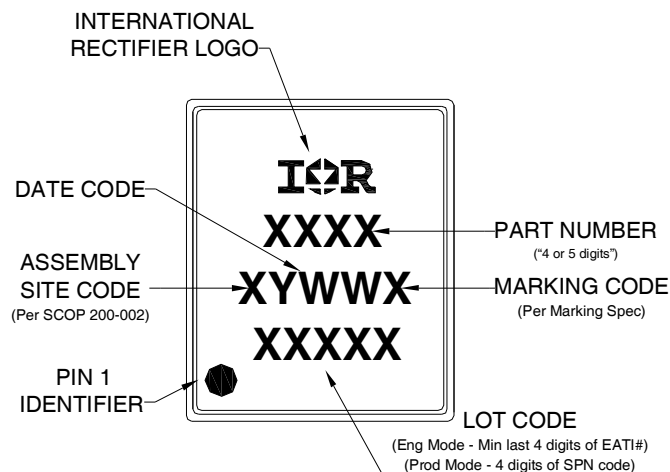
| SYMBOL | OUTLINE PQFN 5X6E |      |      |
|--------|-------------------|------|------|
|        | MIN.              | NOM. | MAX. |
| A      | 0.90              | 1.03 | 1.17 |
| b      | 0.33              | 0.41 | 0.48 |
| C      | 0.20              | 0.25 | 0.35 |
| D      | 4.80              | 4.98 | 5.15 |
| D1     | 3.91              | 4.11 | 4.31 |
| D2     | 4.80              | 4.90 | 5.00 |
| E      | 5.90              | 6.02 | 6.15 |
| E1     | 5.65              | 5.75 | 5.85 |
| E2     | 1.10              | —    | —    |
| e      | 1.27 BSC          |      |      |
| L      | 0.05              | 0.15 | 0.25 |
| L1     | 0.38              | 0.44 | 0.50 |
| L2     | 0.51              | 0.68 | 0.86 |
| H      | 3.32              | 3.45 | 3.58 |
| I      | —                 | —    | 0.18 |



BOTTOM VIEW

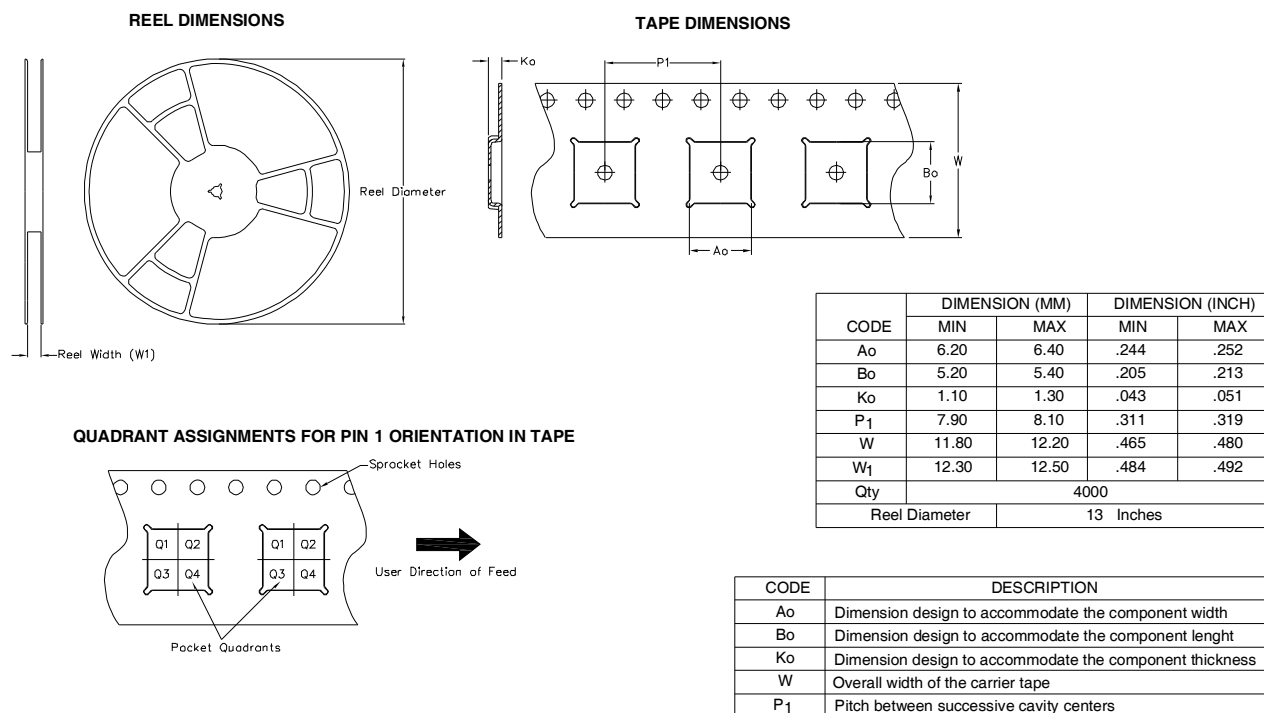
For footprint and stencil design recommendations, please refer to application note AN-1154 at <http://www.irf.com/technical-info/appnotes/an-1154.pdf>

## PQFN 5x6 Outline "E" Part Marking



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

# PQFN 5x6 Outline "E" 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 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  $T_J = 25^{\circ}\text{C}$ ,  $L = 0.78\text{mH}$ ,  $R_G = 50\Omega$ ,  $I_{AS} = 20\text{A}$ .
- 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> <li>Updated data sheet based on corporate template.</li> </ul> |

International  
 Rectifier

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