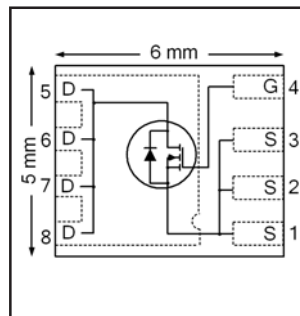


HEXFET® Power MOSFET

|                                                 |               |           |
|-------------------------------------------------|---------------|-----------|
| $V_{DS}$                                        | <b>30</b>     | <b>V</b>  |
| $V_{GS \text{ max}}$                            | <b>± 20</b>   | <b>V</b>  |
| $R_{DS(on) \text{ max}}$<br>(@ $V_{GS} = 10V$ ) | <b>12.8</b>   | <b>mΩ</b> |
| (@ $V_{GS} = 4.5V$ )                            | <b>19.9</b>   |           |
| $Q_g \text{ typ.}$                              | <b>4.7</b>    | <b>nC</b> |
| $I_D$<br>(@ $T_{c(Bottom)} = 25^\circ C$ )      | <b>16.2</b> ⑦ | <b>A</b>  |



## Applications

- Control MOSFET for high frequency buck converters

## Features and Benefits

### Features

|                                                              |
|--------------------------------------------------------------|
| Low Thermal Resistance to PCB (< 4.7°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 |                 |
| IRFH8337TRPBF         | PQFN 5mm x 6mm | Tape and Reel | 4000     |                 |
| IRFH8337TR2PBF        | 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, $V_{GS} @ 10V$                                     | 12           | A     |
| $I_D @ T_A = 70^\circ C$            | Continuous Drain Current, $V_{GS} @ 10V$                                     | 9.7          |       |
| $I_D @ T_{C(Bottom)} = 25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V$                                     | 35 ⑥ ⑦       |       |
| $I_D @ T_{C(Bottom)} = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$                                     | 22 ⑥ ⑦       |       |
| $I_D @ T_C = 25^\circ C$            | Continuous Drain Current, $V_{GS} @ 10V$ (Source Bonding Technology Limited) | 16.2 ⑦       |       |
| $I_{DM}$                            | Pulsed Drain Current ①                                                       | 65           |       |
| $P_D @ T_A = 25^\circ C$            | Power Dissipation ⑤                                                          | 3.2          | W     |
| $P_D @ T_{C(Bottom)} = 25^\circ C$  | Power Dissipation ⑤                                                          | 27           |       |
|                                     | Linear Derating Factor ③                                                     | 0.026        | W/°C  |
| $T_J$                               | Operating Junction and                                                       | -55 to + 150 | °C    |
| $T_{STG}$                           | Storage Temperature Range                                                    |              |       |

Notes ① through ⑦ are on page 9

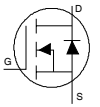
**Static @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)**

|                              | Parameter                                  | Min. | Typ.  | Max. | Units                | Conditions                                                          |
|------------------------------|--------------------------------------------|------|-------|------|----------------------|---------------------------------------------------------------------|
| $BV_{DSS}$                   | Drain-to-Source Breakdown Voltage          | 30   | —     | —    | V                    | $V_{GS} = 0V, I_D = 250\mu A$                                       |
| $\Delta BV_{DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient        | —    | 0.025 | —    | 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       | —    | 10.3  | 12.8 | m $\Omega$           | $V_{GS} = 10V, I_D = 16.2A$ ③                                       |
|                              |                                            | —    | 15.8  | 19.9 |                      | $V_{GS} = 4.5V, I_D = 13A$ ③                                        |
| $V_{GS(th)}$                 | Gate Threshold Voltage                     | 1.35 | 1.8   | 2.35 | V                    | $V_{DS} = V_{GS}, I_D = 25\mu A$                                    |
| $\Delta V_{GS(th)}$          | Gate Threshold Voltage Coefficient         | —    | -6.0  | —    | mV/ $^\circ\text{C}$ |                                                                     |
| $I_{DSS}$                    | Drain-to-Source Leakage Current            | —    | —     | 1.0  | $\mu A$              | $V_{DS} = 24V, V_{GS} = 0V$                                         |
|                              |                                            | —    | —     | 150  |                      | $V_{DS} = 24V, V_{GS} = 0V, T_J = 125^\circ\text{C}$                |
| $I_{GSS}$                    | Gate-to-Source Forward Leakage             | —    | —     | 100  | nA                   | $V_{GS} = 20V$                                                      |
|                              | Gate-to-Source Reverse Leakage             | —    | —     | -100 |                      | $V_{GS} = -20V$                                                     |
| $g_{fs}$                     | Forward Transconductance                   | 31   | —     | —    | S                    | $V_{DS} = 10V, I_D = 16.2A$                                         |
| $Q_g$                        | Total Gate Charge                          | —    | 10    | —    | nC                   | $V_{GS} = 10V, V_{DS} = 15V, I_D = 16.2A$                           |
| $Q_g$                        | Total Gate Charge                          | —    | 4.7   | —    | nC                   | $V_{DS} = 15V$<br>$V_{GS} = 4.5V$<br>$I_D = 16.2A$                  |
| $Q_{gs1}$                    | Pre-V <sub>th</sub> Gate-to-Source Charge  | —    | 1.6   | —    |                      |                                                                     |
| $Q_{gs2}$                    | Post-V <sub>th</sub> Gate-to-Source Charge | —    | 0.7   | —    |                      |                                                                     |
| $Q_{gd}$                     | Gate-to-Drain Charge                       | —    | 1.4   | —    |                      |                                                                     |
| $Q_{godr}$                   | Gate Charge Overdrive                      | —    | 1.0   | —    |                      |                                                                     |
| $Q_{sw}$                     | Switch Charge ( $Q_{gs2} + Q_{gd}$ )       | —    | 2.1   | —    | nC                   | $V_{DS} = 16V, V_{GS} = 0V$                                         |
| $Q_{oss}$                    | Output Charge                              | —    | 4.2   | —    |                      |                                                                     |
| $R_G$                        | Gate Resistance                            | —    | 1.6   | —    | $\Omega$             |                                                                     |
| $t_{d(on)}$                  | Turn-On Delay Time                         | —    | 6.4   | —    | ns                   | $V_{DD} = 15V, V_{GS} = 4.5V$<br>$I_D = 16.2A$<br>$R_G = 1.8\Omega$ |
| $t_r$                        | Rise Time                                  | —    | 12    | —    |                      |                                                                     |
| $t_{d(off)}$                 | Turn-Off Delay Time                        | —    | 5.7   | —    |                      |                                                                     |
| $t_f$                        | Fall Time                                  | —    | 4.1   | —    |                      |                                                                     |
| $C_{iss}$                    | Input Capacitance                          | —    | 790   | —    | pF                   | $V_{GS} = 0V$<br>$V_{DS} = 10V$<br>$f = 1.0\text{MHz}$              |
| $C_{oss}$                    | Output Capacitance                         | —    | 180   | —    |                      |                                                                     |
| $C_{rss}$                    | Reverse Transfer Capacitance               | —    | 69    | —    |                      |                                                                     |

**Avalanche Characteristics**

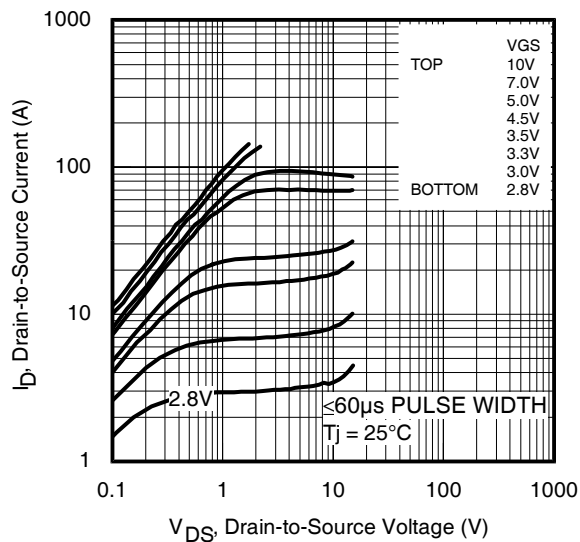
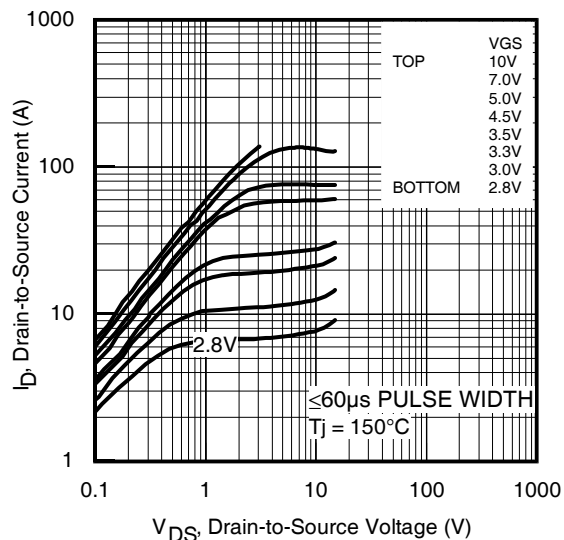
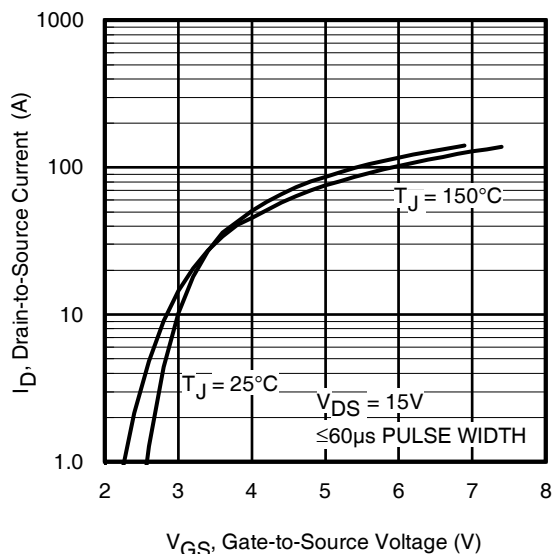
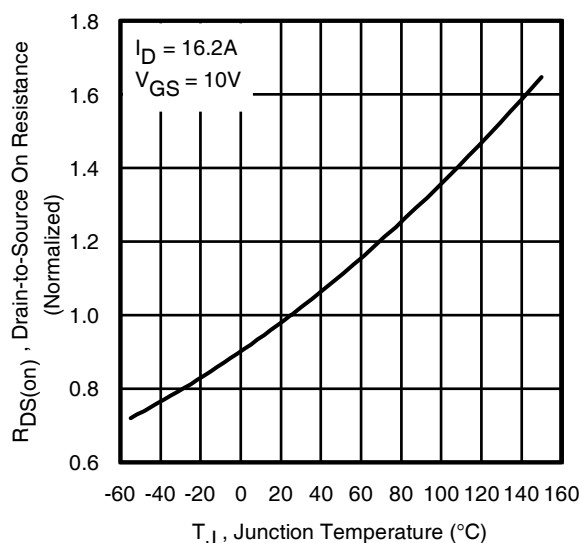
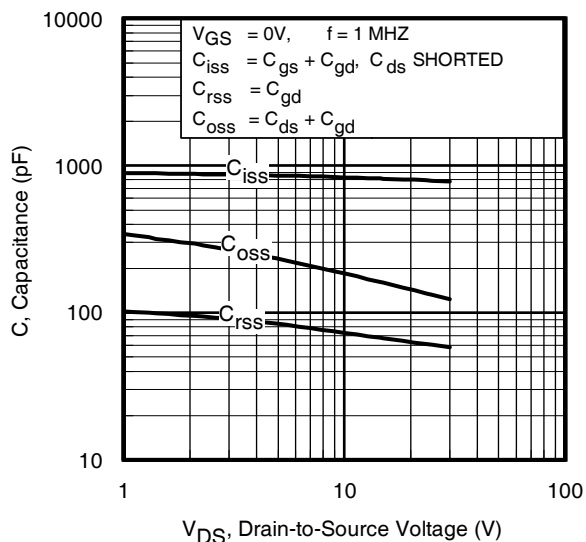
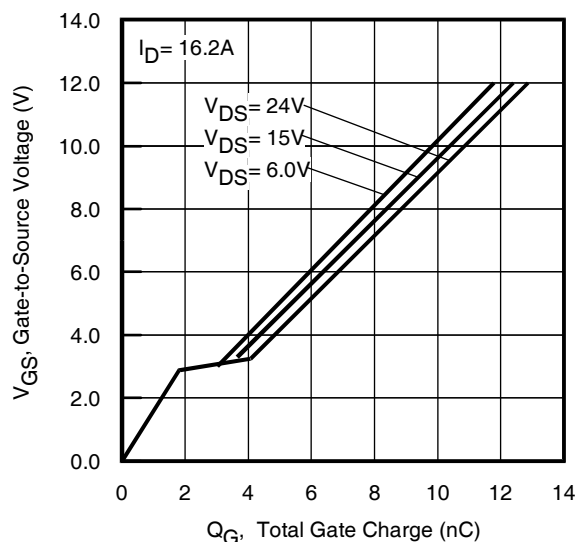
|          | Parameter                       | Typ. | Max. | Units |
|----------|---------------------------------|------|------|-------|
| $E_{AS}$ | Single Pulse Avalanche Energy ② | —    | 28   | mJ    |
| $I_{AR}$ | Avalanche Current ①             | —    | 16.2 | A     |

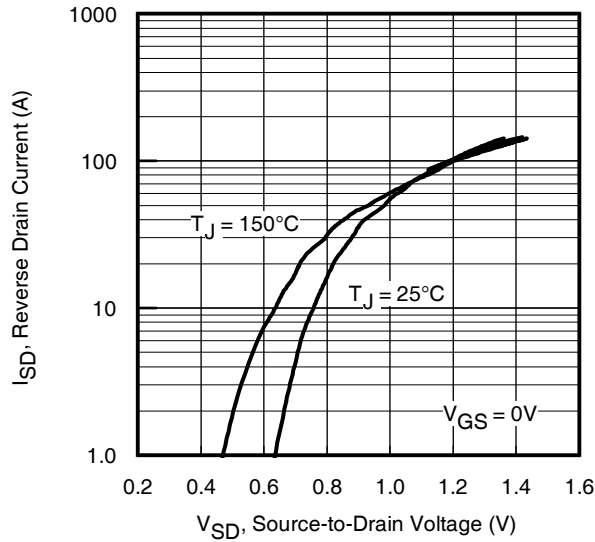
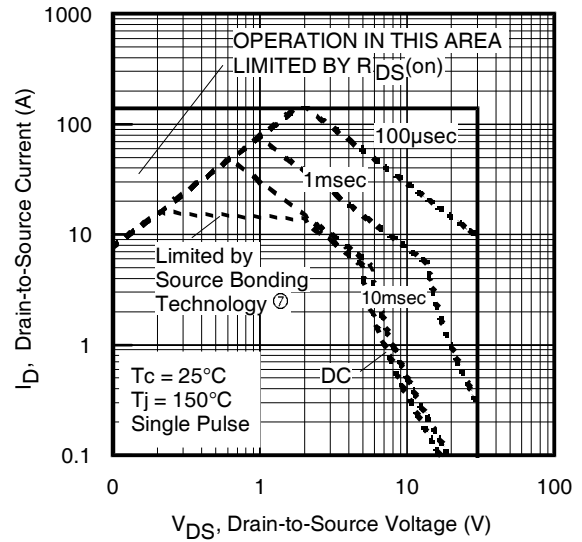
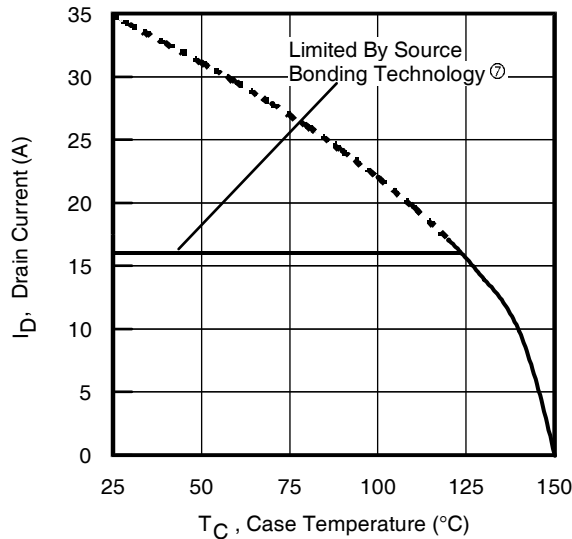
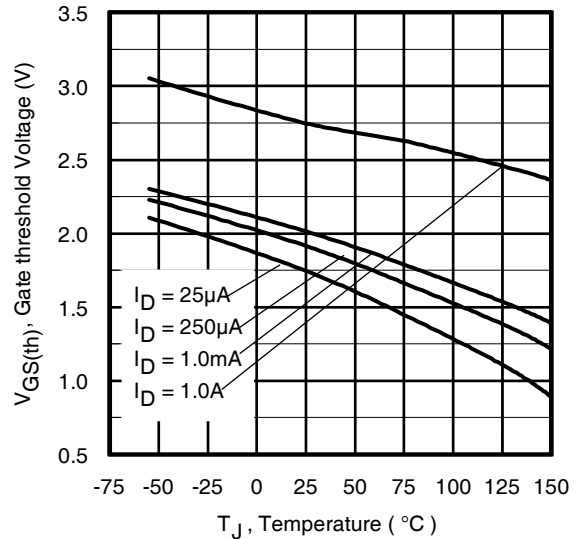
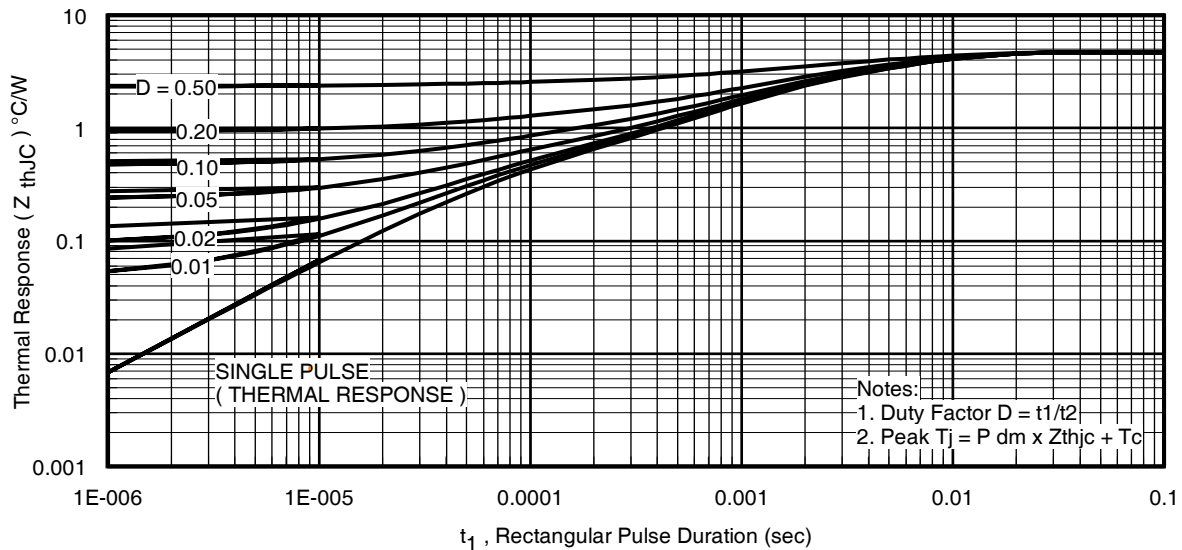
**Diode Characteristics**

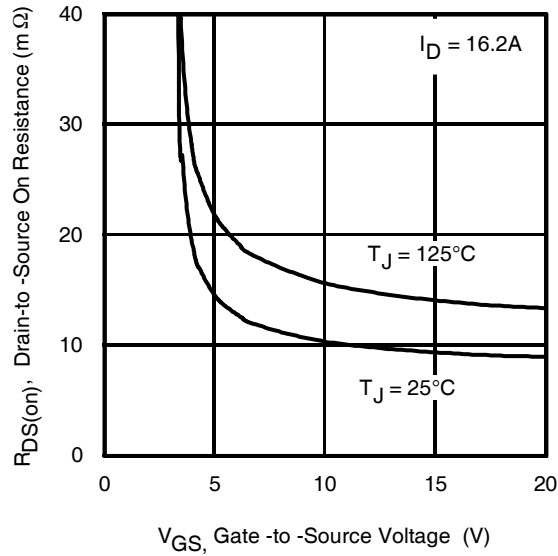
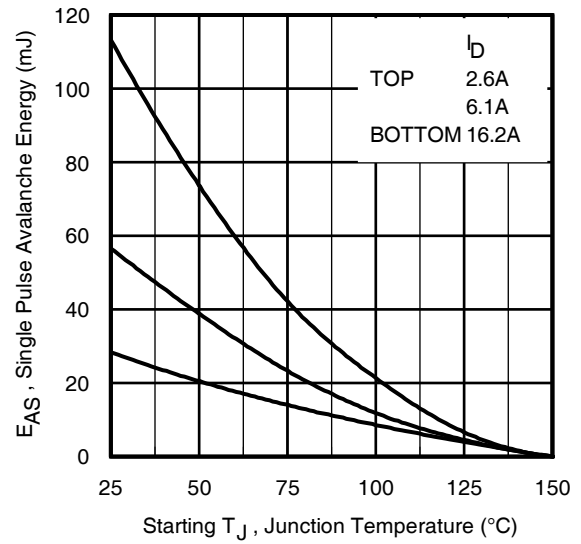
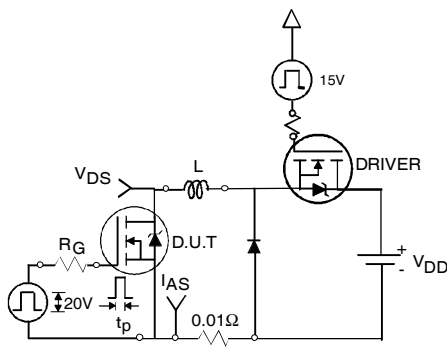
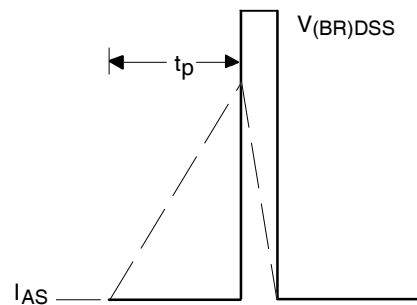
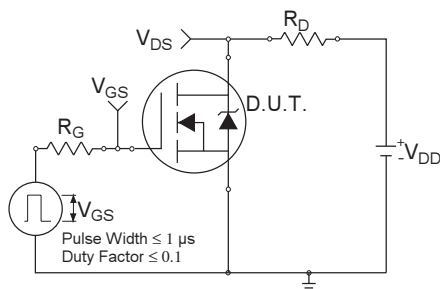
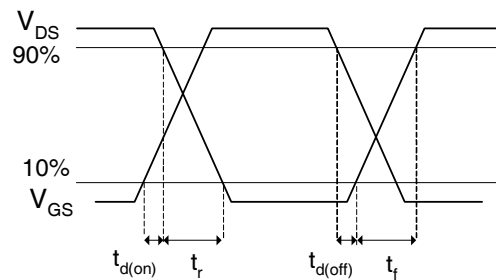
|          | Parameter                                 | Min.                                      | Typ. | Max. | Units | Conditions                                                                                                                                           |
|----------|-------------------------------------------|-------------------------------------------|------|------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_S$    | Continuous Source Current<br>(Body Diode) | —                                         | —    | 16.2 | A     | MOSFET symbol showing the integral reverse p-n junction diode.  |
| $I_{SM}$ | Pulsed Source Current<br>(Body Diode) ①   | —                                         | —    | 65   |       |                                                                                                                                                      |
| $V_{SD}$ | Diode Forward Voltage                     | —                                         | —    | 1.0  | V     | $T_J = 25^\circ\text{C}, I_S = 16.2A, V_{GS} = 0V$ ③                                                                                                 |
| $t_{rr}$ | Reverse Recovery Time                     | —                                         | 12   | 18   | ns    | $T_J = 25^\circ\text{C}, I_F = 16.2A, V_{DD} = 15V$                                                                                                  |
| $Q_{rr}$ | Reverse Recovery Charge                   | —                                         | 17   | 26   | nC    | $di/dt = 390 A/\mu s$ ③                                                                                                                              |
| $t_{on}$ | Forward Turn-On Time                      | Time is dominated by parasitic Inductance |      |      |       |                                                                                                                                                      |

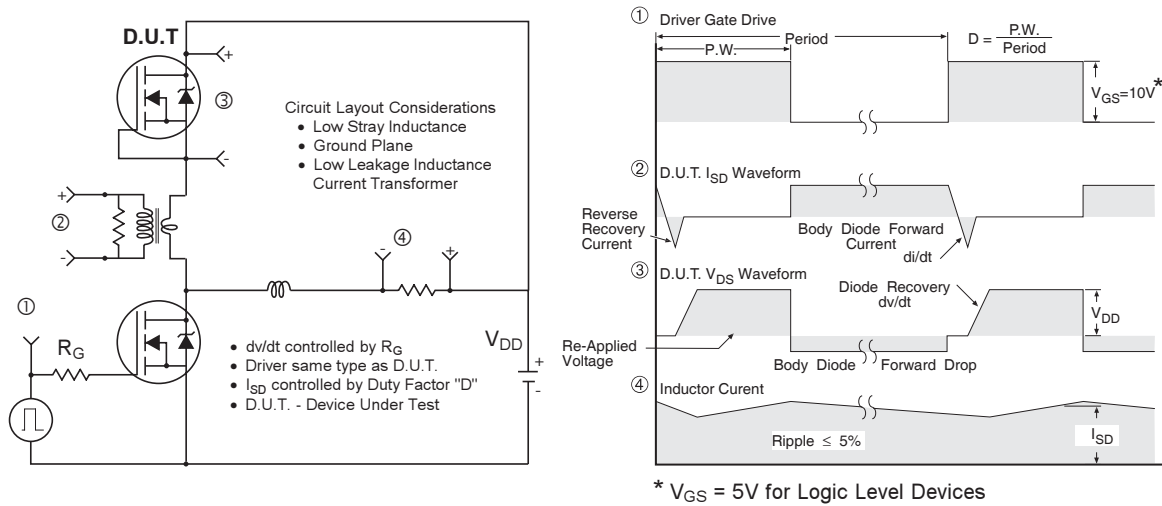
**Thermal Resistance**

|                          | Parameter             | Typ. | Max. | Units              |
|--------------------------|-----------------------|------|------|--------------------|
| $R_{\theta JC}$ (Bottom) | Junction-to-Case ④    | —    | 4.7  | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ (Top)    | Junction-to-Case ④    | —    | 40   |                    |
| $R_{\theta JA}$          | Junction-to-Ambient ⑤ | —    | 39   |                    |
| $R_{\theta JA}$ (<10s)   | Junction-to-Ambient ⑤ | —    | 26   |                    |

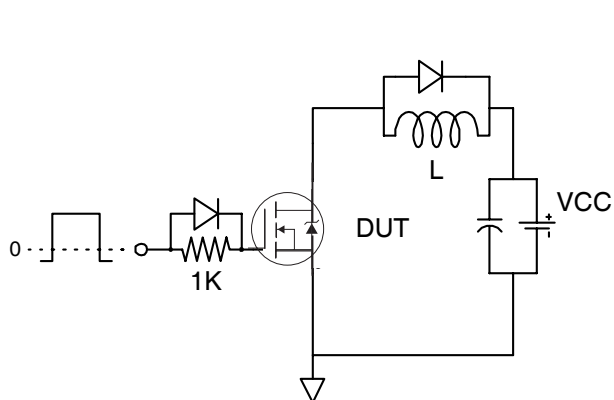

**Fig 1.** Typical Output Characteristics

**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)

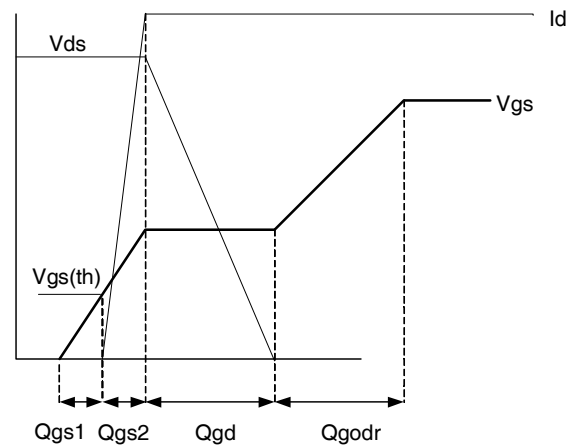

**Fig 12.** On-Resistance vs. Gate Voltage

**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

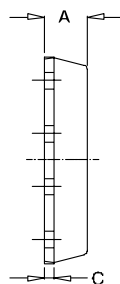


**Fig 17.** Gate Charge Test Circuit

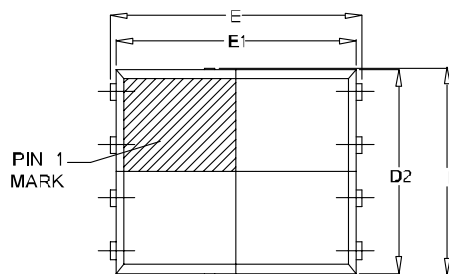


**Fig 18.** Gate Charge Waveform

## PQFN 5x6 Outline "E" Package Details

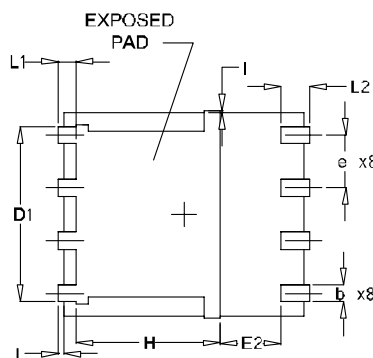


SIDEVIEW



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

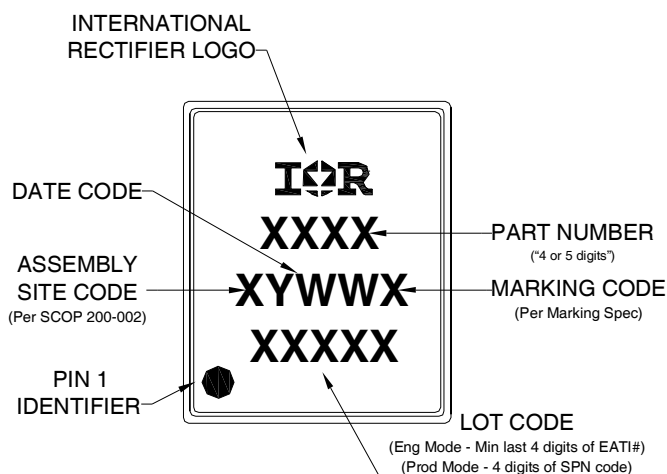
For more information on board mounting, including footprint and stencil recommendation, please refer to application note AN-1136:

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

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

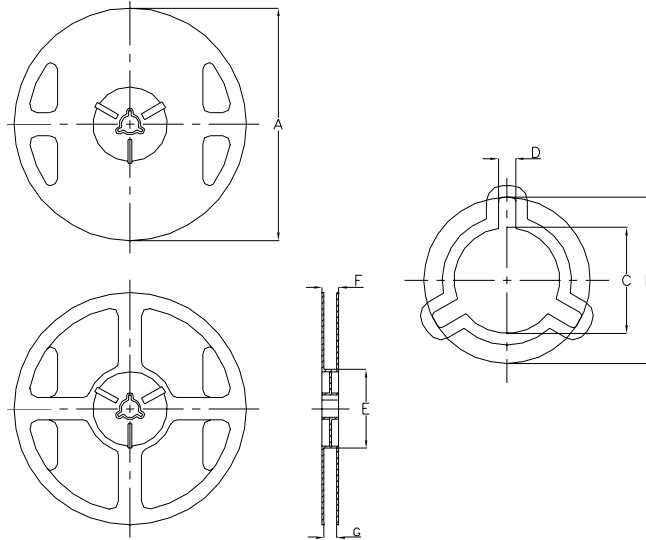
<http://www.irf.com/technical-info/appnotes/an-1154.pdf>

## PQFN 5x6 Outline "E" Part Marking



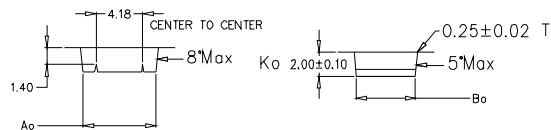
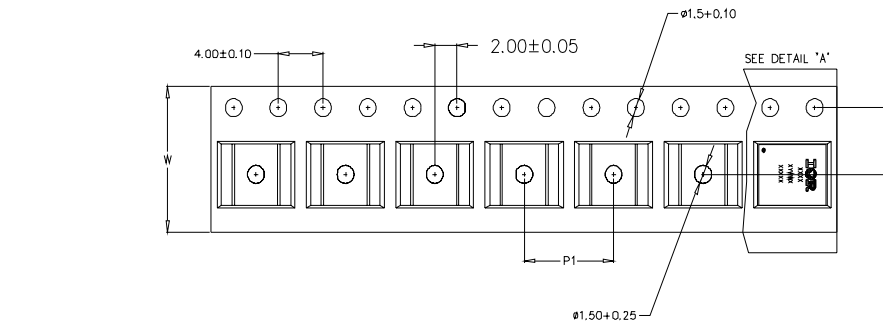
Note: For the most current drawing please refer to IR website at: <http://www.irf.com/package/>

# PQFN 5x6 Outline "E" Tape and Reel



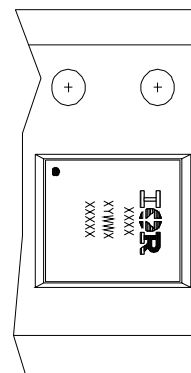
NOTE: Controlling dimensions in mm Std reel quantity is 4000 parts.

| REEL DIMENSIONS            |        |       |          |        |                      |        |       |          |
|----------------------------|--------|-------|----------|--------|----------------------|--------|-------|----------|
| STANDARD OPTION (QTY 4000) |        |       |          |        | TR2 OPTION (QTY 400) |        |       |          |
| CODE                       | METRIC |       | IMPERIAL |        | CODE                 | METRIC |       | IMPERIAL |
|                            | MIN    | MAX   | MIN      | MAX    |                      | MIN    | MAX   |          |
| A                          | 329.5  | 330.5 | 12.972   | 13.011 | A                    | 177.5  | 178.5 | 6.988    |
| B                          | 20.9   | 21.5  | 0.823    | 0.846  | B                    | 20.9   | 21.5  | 0.823    |
| C                          | 12.8   | 13.5  | 0.504    | 0.532  | C                    | 13.2   | 13.8  | 0.520    |
| D                          | 1.7    | 2.3   | 0.067    | 0.091  | D                    | 1.9    | 2.3   | 0.075    |
| E                          | 97     | 99    | 3.819    | 3.898  | E                    | 65     | 66    | 2.350    |
| F                          | Ref    | 17.4  |          |        | F                    | Ref    | 12    |          |
| G                          | 13     | 14.5  | 0.512    | 0.571  | G                    | 13     | 14.5  | 0.512    |



|    |             |
|----|-------------|
| Ao | 6.50 ±0.10  |
| Bo | 5.28 ±0.10  |
| F  | 5.50 ±0.05  |
| P1 | 8.00 ±0.10  |
| W  | 12.00 ±0.10 |

DETAIL 'A'



**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  $T_J = 25^{\circ}\text{C}$ ,  $L = 0.22\text{mH}$ ,  $R_G = 50\Omega$ ,  $I_{AS} = 16.2\text{A}$ .
- 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 16.2A by source bonding technology.

| Date      | Comment                                                                                                                                                                                                                    |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1/17/2014 | <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 data sheet with the new IR corporate template.</li> </ul> |

International  
 Rectifier

**IR WORLD HEADQUARTERS:** 101 N. Sepulveda Blvd., El Segundo, California 90245, USA

To contact International Rectifier, please visit <http://www.irf.com/whoto-call/>

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