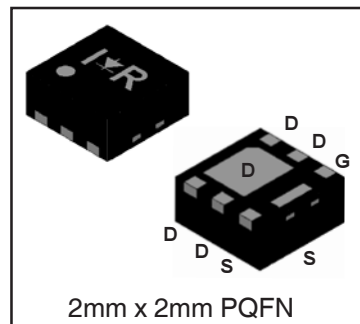
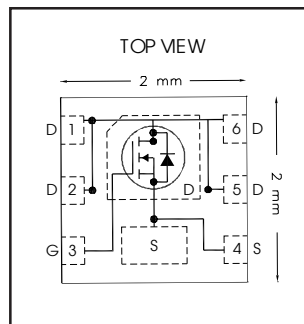


## HEXFET® Power MOSFET

|                                            |          |            |
|--------------------------------------------|----------|------------|
| $V_{DS}$                                   | 25       | V          |
| $V_{GS\ max}$                              | $\pm 20$ | V          |
| $R_{DS(on)\ max}$<br>(@ $V_{GS} = 10V$ )   | 13.0     | m $\Omega$ |
| $Q_g$ (typical)<br>(@ $V_{GS} = 4.5V$ )    | 4.3      | nC         |
| $I_D$<br>(@ $T_{C(Bottom)} = 25^\circ C$ ) | 8.5②     | A          |



## Applications

- System/Load Switch

## Features and Benefits

### Features

|                                                              |
|--------------------------------------------------------------|
| Low $R_{DS(on)}$ ( $\leq 13.0m\Omega$ )                      |
| Low Thermal Resistance to PCB ( $\leq 13^\circ C/W$ )        |
| Low Profile ( $\leq 1.0\ mm$ )                               |
| Compatible with Existing Surface Mount Techniques            |
| RoHS Compliant Containing no Lead, no Bromide and no Halogen |
| MSL1, Industrial Qualification                               |

results in

### Resulting Benefits

|                                   |
|-----------------------------------|
| Lower Conduction Losses           |
| Enable better thermal dissipation |
| Increased Power Density           |
| Easier Manufacturing              |
| Environmentally Friendlier        |
| Increased Reliability             |

| Orderable part number | Package Type   | Standard Pack |          | Note             |
|-----------------------|----------------|---------------|----------|------------------|
|                       |                | Form          | Quantity |                  |
| IRFHS8242TRPbF        | PQFN 2mm x 2mm | Tape and Reel | 4000     |                  |
| IRFHS8242TR2PbF       | PQFN 2mm x 2mm | Tape and Reel | 400      | EOL notice # 259 |

## Absolute Maximum Ratings

|                                      | Parameter                                                  | Max.         | Units |
|--------------------------------------|------------------------------------------------------------|--------------|-------|
| $V_{DS}$                             | Drain-to-Source Voltage                                    | 25           | V     |
| $V_{GS}$                             | Gate-to-Source Voltage                                     | $\pm 20$     |       |
| $I_D$ @ $T_A = 25^\circ C$           | Continuous Drain Current, $V_{GS}$ @ 10V                   | 9.9②         | A     |
| $I_D$ @ $T_A = 70^\circ C$           | Continuous Drain Current, $V_{GS}$ @ 10V                   | 8.0          |       |
| $I_D$ @ $T_{C(Bottom)} = 25^\circ C$ | Continuous Drain Current, $V_{GS}$ @ 10V                   | 21②          |       |
| $I_D$ @ $T_{C(Bottom)} = 70^\circ C$ | Continuous Drain Current, $V_{GS}$ @ 10V                   | 17②          |       |
| $I_D$ @ $T_{C(Bottom)} = 25^\circ C$ | Continuous Drain Current, $V_{GS}$ @ 10V (Package Limited) | 8.5②         |       |
| $I_{DM}$                             | Pulsed Drain Current ①                                     | 84           | W     |
| $P_D$ @ $T_A = 25^\circ C$           | Power Dissipation ④                                        | 2.1          |       |
| $P_D$ @ $T_A = 70^\circ C$           | Power Dissipation ④                                        | 1.3          |       |
|                                      | Linear Derating Factor ④                                   | 0.02         | W/°C  |
| $T_J$                                | Operating Junction and                                     | -55 to + 150 | °C    |
| $T_{STG}$                            | Storage Temperature Range                                  |              |       |

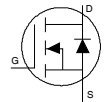
Notes ① through ⑥ are on page 2

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

|                              | Parameter                            | Min. | Typ. | Max. | Units                | Conditions                                           |
|------------------------------|--------------------------------------|------|------|------|----------------------|------------------------------------------------------|
| $BV_{DSS}$                   | Drain-to-Source Breakdown Voltage    | 25   | —    | —    | V                    | $V_{GS} = 0V, I_D = 250\mu A$                        |
| $\Delta BV_{DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient  | —    | 18   | —    | mV/ $^\circ\text{C}$ | Reference to $25^\circ\text{C}, I_D = 1mA$           |
| $R_{DS(on)}$                 | Static Drain-to-Source On-Resistance | —    | 10.0 | 13.0 | m $\Omega$           | $V_{GS} = 10V, I_D = 8.5A$ ②                         |
|                              |                                      | —    | 17.0 | 21.0 |                      | $V_{GS} = 4.5V, I_D = 6.8A$ 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   | —    | -6.8 | —    | mV/ $^\circ\text{C}$ |                                                      |
| $I_{DSS}$                    | Drain-to-Source Leakage Current      | —    | —    | 1.0  | $\mu A$              | $V_{DS} = 20V, V_{GS} = 0V$                          |
|                              |                                      | —    | —    | 150  |                      | $V_{DS} = 20V, V_{GS} = 0V, T_J = 125^\circ\text{C}$ |
| $I_{GSS}$                    | Gate-to-Source Forward Leakage       | —    | —    | 100  | nA                   | $V_{GS} = 20V$                                       |
|                              | Gate-to-Source Reverse Leakage       | —    | —    | -100 |                      | $V_{GS} = -20V$                                      |
| $g_{fs}$                     | Forward Transconductance             | 19   | —    | —    | S                    | $V_{DS} = 10V, I_D = 8.5A$ ②                         |
| $Q_g$                        | Total Gate Charge ⑥                  | —    | 4.3  | —    | nC                   | $V_{GS} = 4.5V, V_{DS} = 13V, I_D = 8.5A$ ②          |
| $Q_g$                        | Total Gate Charge ⑥                  | —    | 10.4 | —    | nC                   | $V_{DS} = 13V$                                       |
| $Q_{gs}$                     | Gate-to-Source Charge ⑥              | —    | 1.8  | —    |                      | $V_{GS} = 10V$                                       |
| $Q_{gd}$                     | Gate-to-Drain Charge ⑥               | —    | 1.6  | —    |                      | $I_D = 8.5A$ ② (See Fig. 6 & 16)                     |
| $R_G$                        | Gate Resistance                      | —    | 1.9  | —    | $\Omega$             |                                                      |
| $t_{d(on)}$                  | Turn-On Delay Time                   | —    | 6.5  | —    | ns                   | $V_{DD} = 13V, V_{GS} = 4.5V$ ③                      |
| $t_r$                        | Rise Time                            | —    | 19   | —    |                      | $I_D = 8.5A$ ②                                       |
| $t_{d(off)}$                 | Turn-Off Delay Time                  | —    | 5.4  | —    |                      | $R_G = 1.8\Omega$                                    |
| $t_f$                        | Fall Time                            | —    | 5.3  | —    |                      | See Fig. 17                                          |
| $C_{iss}$                    | Input Capacitance                    | —    | 653  | —    | pF                   | $V_{GS} = 0V$                                        |
| $C_{oss}$                    | Output Capacitance                   | —    | 171  | —    |                      | $V_{DS} = 10V$                                       |
| $C_{rss}$                    | Reverse Transfer Capacitance         | —    | 78   | —    |                      | $f = 1.0MHz$                                         |

**Diode Characteristics**

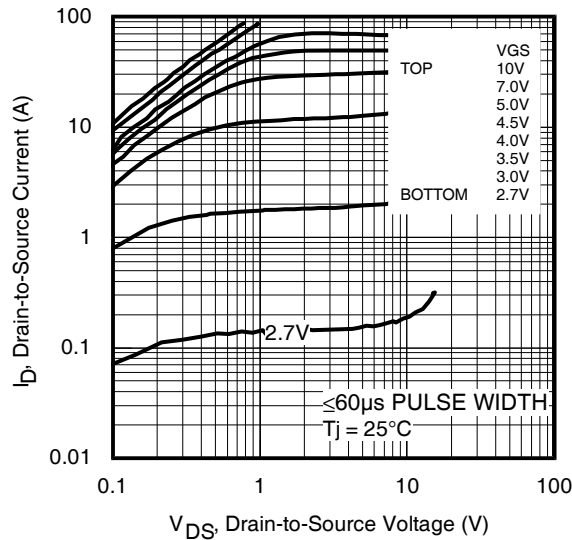
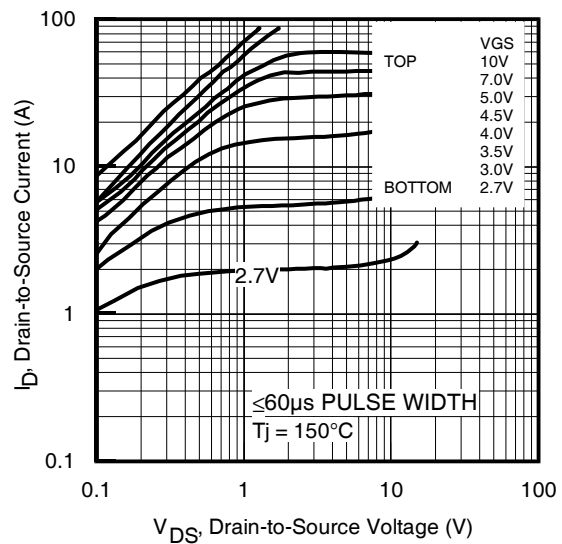
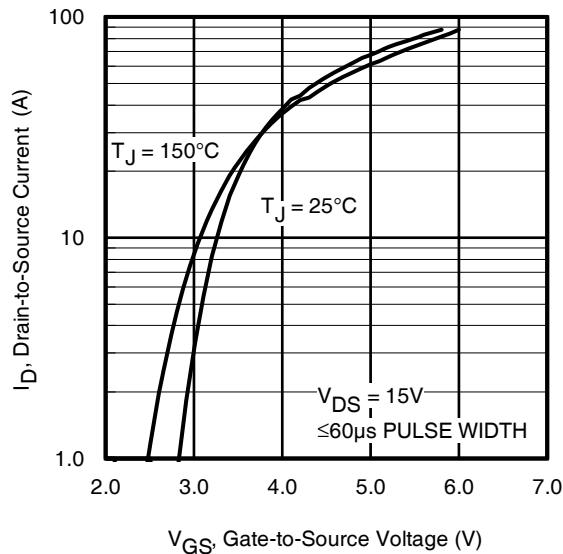
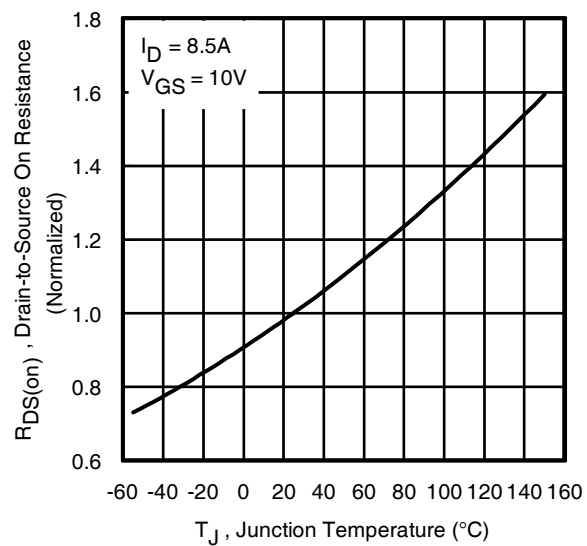
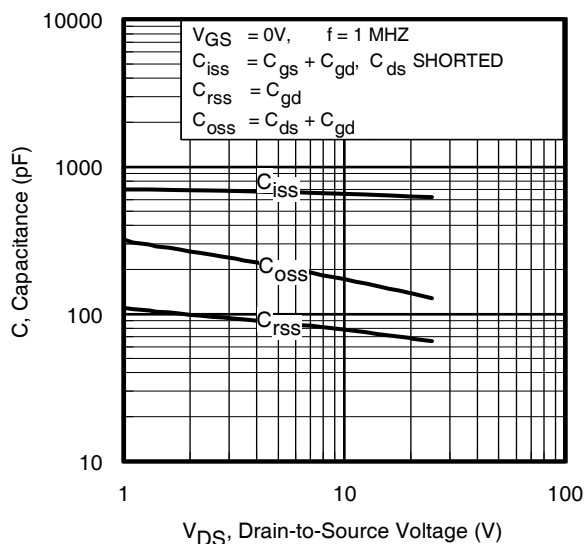
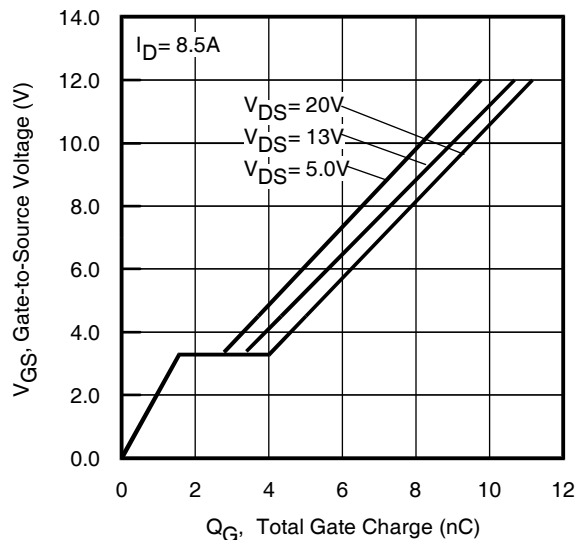
|          | Parameter                                 | Min.                                      | Typ. | Max.  | Units | Conditions                                                              |
|----------|-------------------------------------------|-------------------------------------------|------|-------|-------|-------------------------------------------------------------------------|
| $I_S$    | Continuous Source Current<br>(Body Diode) | —                                         | —    | 8.5 ② | A     | MOSFET symbol<br>showing the<br>integral reverse<br>p-n junction diode. |
| $I_{SM}$ | Pulsed Source Current<br>(Body Diode) ①   | —                                         | —    | 84    |       |                                                                         |
| $V_{SD}$ | Diode Forward Voltage                     | —                                         | —    | 1.0   | V     | $T_J = 25^\circ\text{C}, I_S = 8.5A$ ②, $V_{GS} = 0V$ ③                 |
| $t_{rr}$ | Reverse Recovery Time                     | —                                         | 11   | 17    | ns    | $T_J = 25^\circ\text{C}, I_F = 8.5A$ ②, $V_{DD} = 13V$                  |
| $Q_{rr}$ | Reverse Recovery Charge                   | —                                         | 11   | 17    | nC    | $di/dt = 280 A/\mu s$ ③                                                 |
| $t_{on}$ | Forward Turn-On Time                      | Time is dominated by parasitic Inductance |      |       |       |                                                                         |

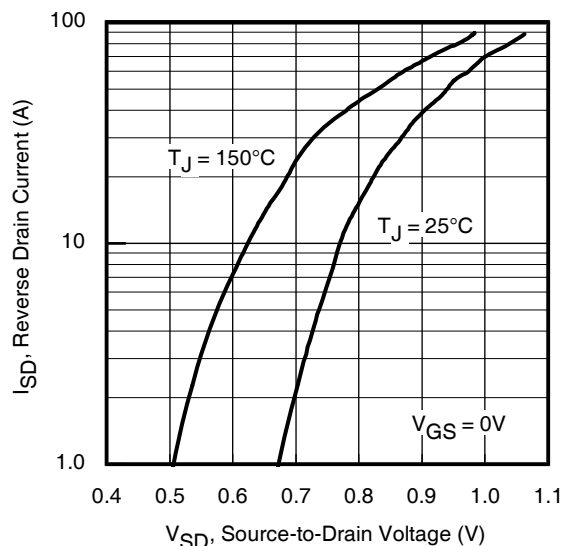
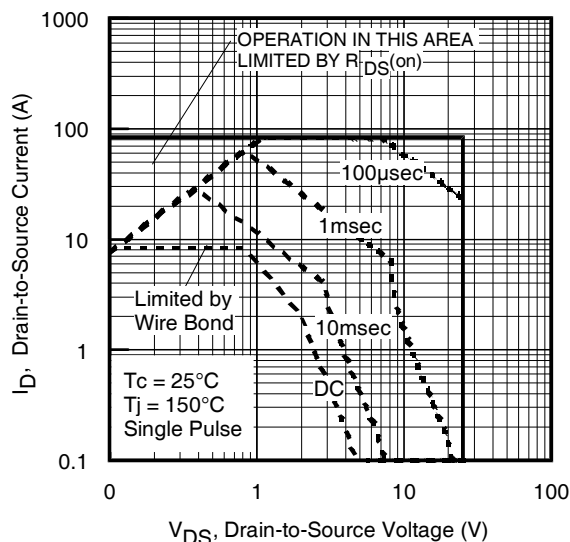
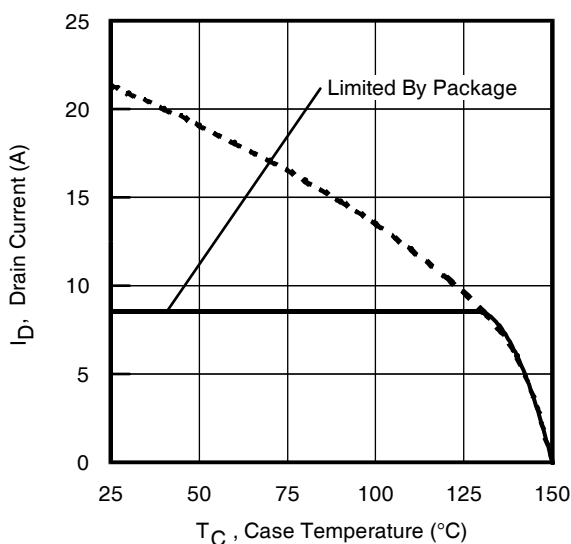
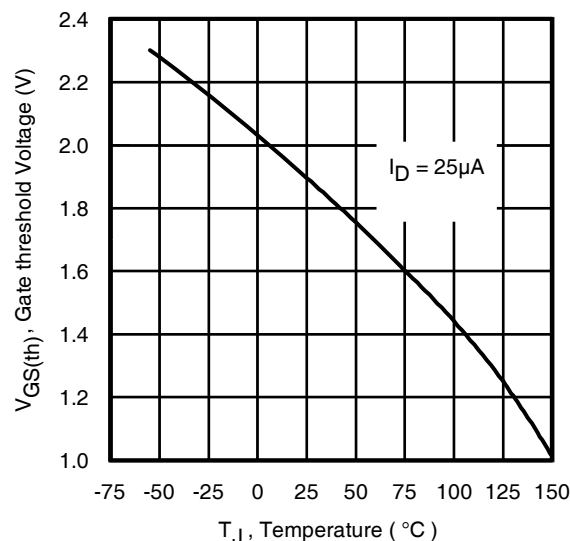
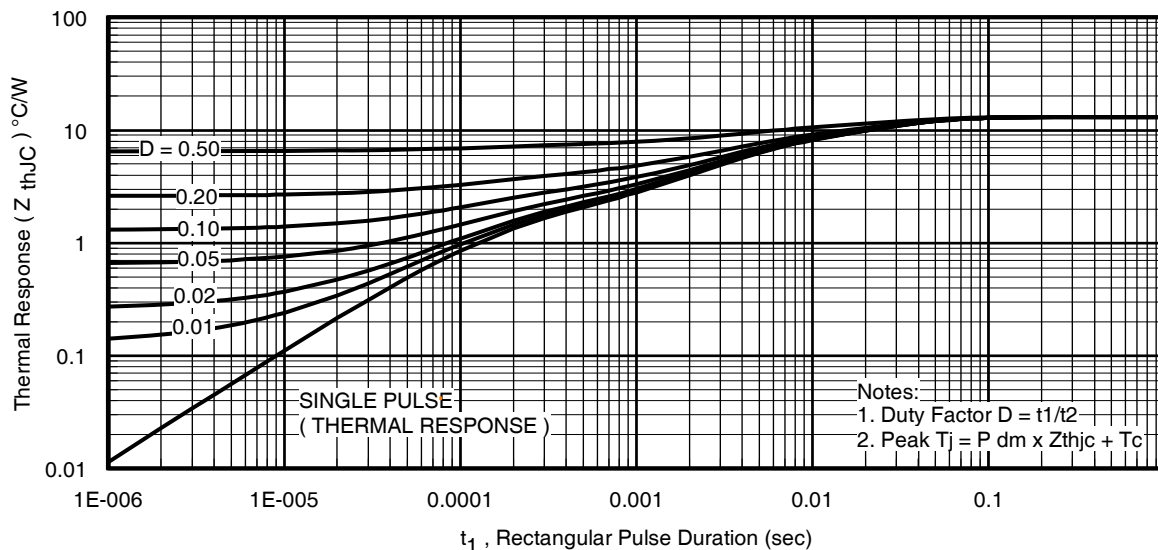

**Thermal Resistance**

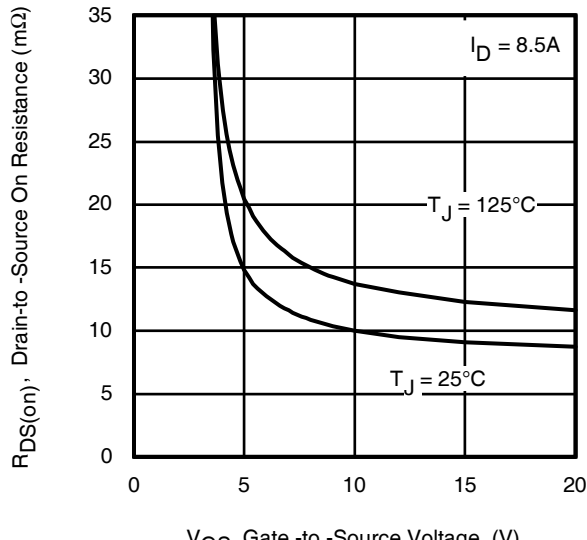
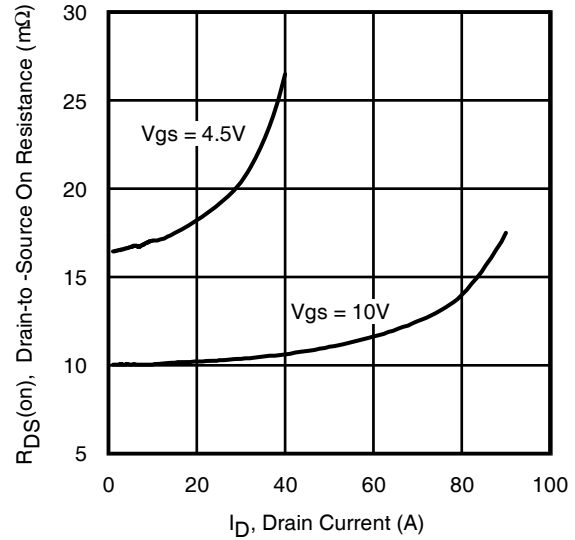
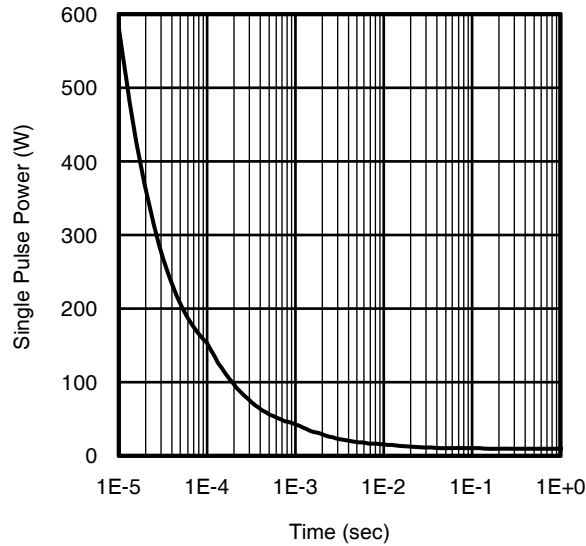
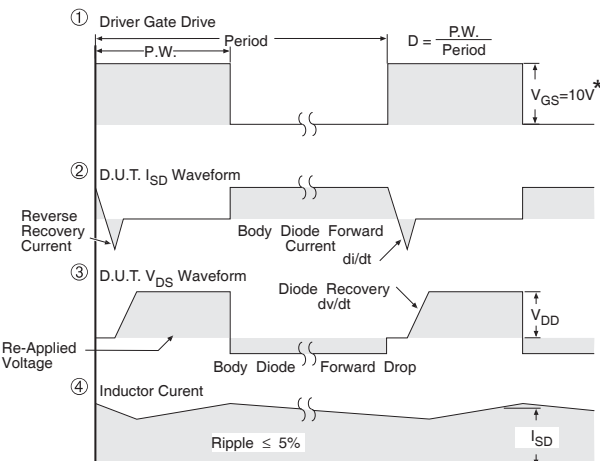
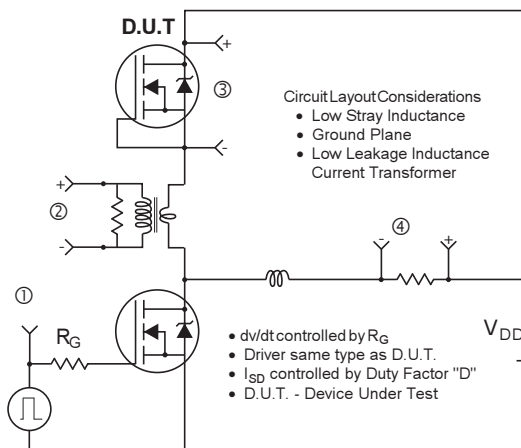
|                          | Parameter                    | Typ. | Max. | Units              |
|--------------------------|------------------------------|------|------|--------------------|
| $R_{\theta JC}$ (Bottom) | Junction-to-Case ⑤           | —    | 13   | $^\circ\text{C}/W$ |
| $R_{\theta JC}$ (Top)    | Junction-to-Case ⑤           | —    | 90   |                    |
| $R_{\theta JA}$          | Junction-to-Ambient ④        | —    | 60   |                    |
| $R_{\theta JA}$          | Junction-to-Ambient (<10s) ④ | —    | 42   |                    |

**Notes:**

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Current limited by package.
- ③ Pulse width  $\leq 400\mu s$ ; duty cycle  $\leq 2\%$ .
- ④ When mounted on 1 inch square copper board
- ⑤  $R_{\theta}$  is measured at  $T_J$  of approximately  $90^\circ\text{C}$ .
- ⑥ For DESIGN AID ONLY, not subject to production testing.

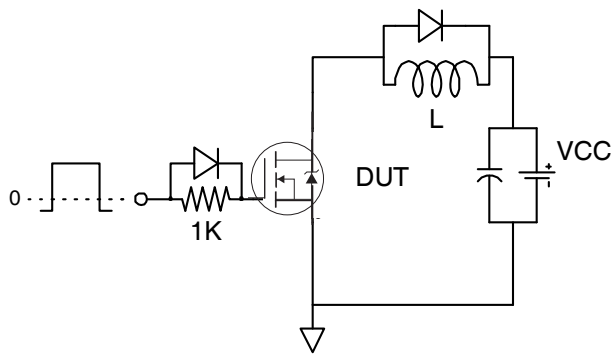
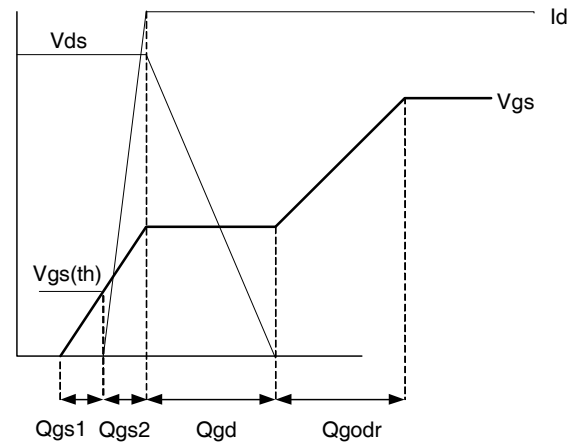
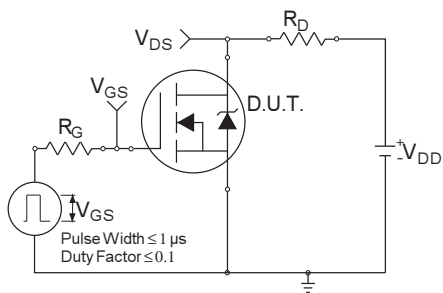
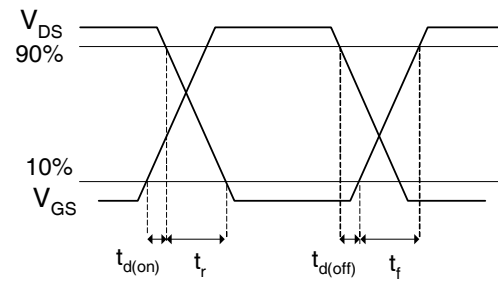

**Fig 1.** Typical Output Characteristics

**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)

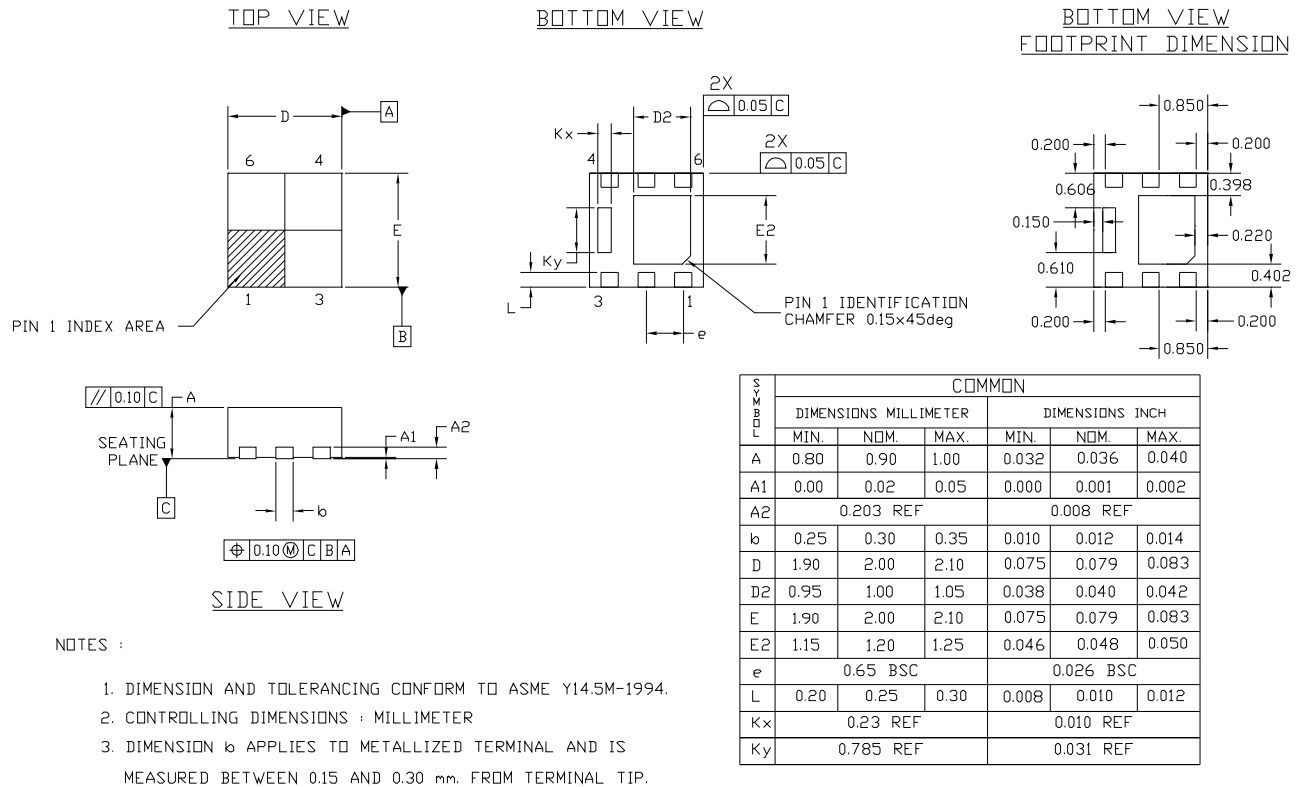

**Fig 12. On-Resistance vs. Gate Voltage**

**Fig 13. Typical On-Resistance vs. Drain Current**

**Fig 14. Typical Power vs. Time**


\*  $V_{GS} = 5V$  for Logic Level Devices

**Fig 15. Peak Diode Recovery  $dv/dt$  Test Circuit for N-Channel HEXFET<sup>®</sup> Power MOSFETs**

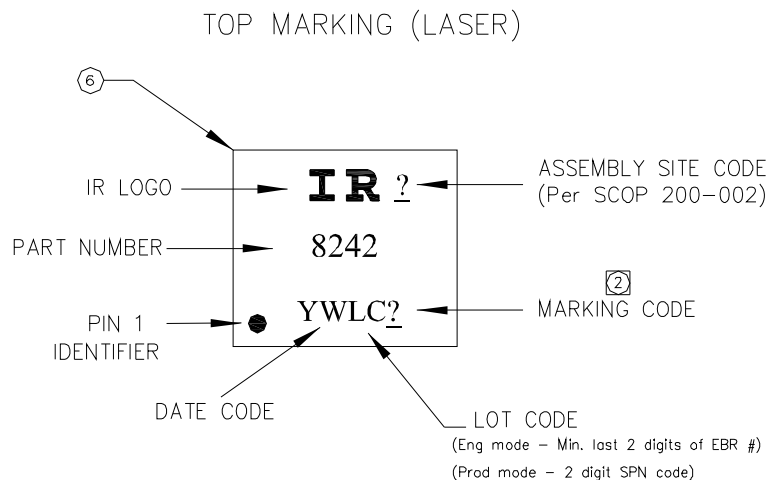

**Fig 16a.** Gate Charge Test Circuit

**Fig 16b.** Gate Charge Waveform

**Fig 17a.** Switching Time Test Circuit

**Fig 17b.** Switching Time Waveforms

## PQFN 2x2 Outline 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 2x2 Outline Part Marking



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

# PQFN 2x2 Outline Tape and Reel

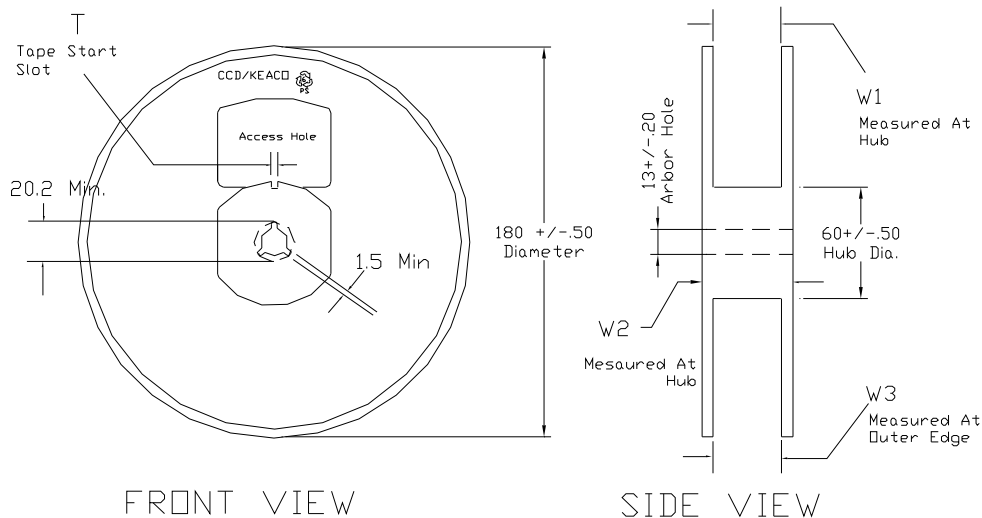
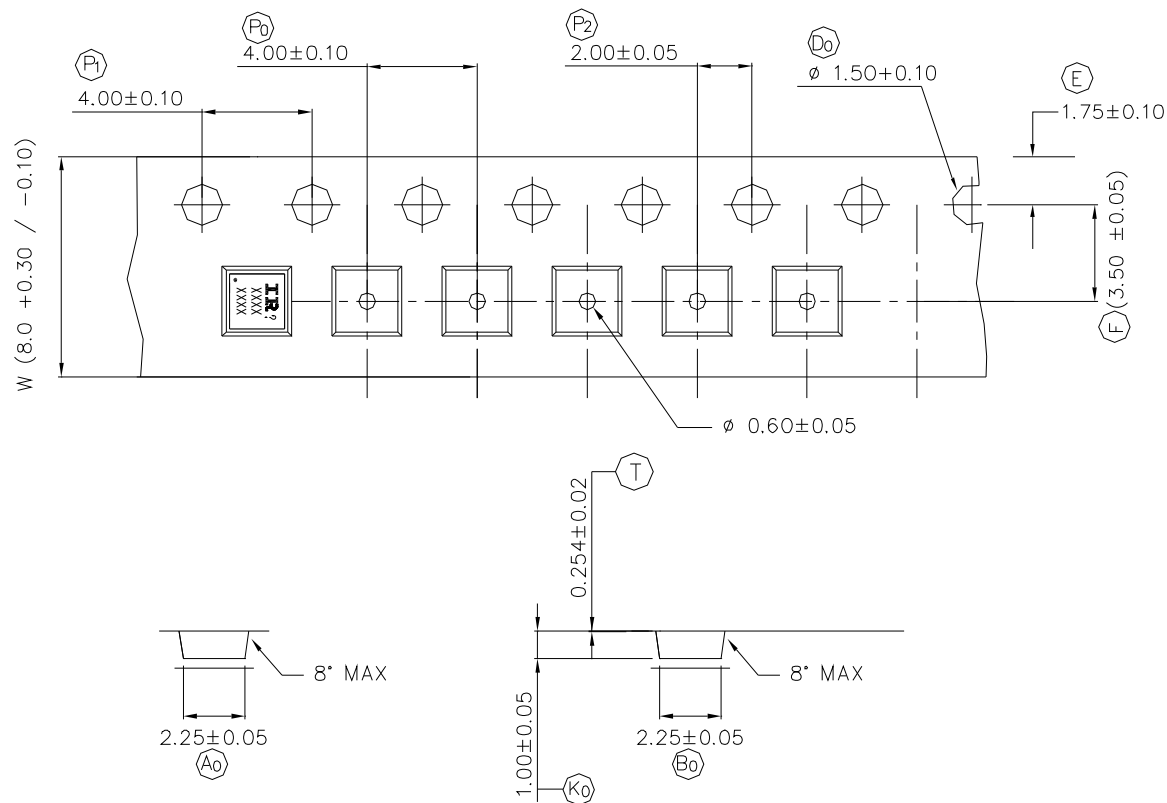


TABLE 1: REEL DETAILS

| TAPE WIDTH | T        | W1                                   | W2       | W3                   | PART NO |
|------------|----------|--------------------------------------|----------|----------------------|---------|
| 8 MM       | 3 ± 0.50 | 8.4 <sup>+1.5</sup> <sub>-0.0</sub>  | 14.4 Max | 7.90 Min<br>10.9 Max | 91586-1 |
| 12 MM      | 5 ± 0.50 | 12.4 <sup>+2.0</sup> <sub>-0.0</sub> | 18.4 Max | 11.9 Min<br>15.4 Max | 91586-2 |

Note: Surface resistivity is  $\geq 1 \times 10^5$  but  $< 1 \times 10^{12}$  ohm/sq.



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

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

|                            |                                                                         |                                               |
|----------------------------|-------------------------------------------------------------------------|-----------------------------------------------|
| Qualification level        | Industrial <sup>†</sup><br>(per JEDEC JESD47F <sup>††</sup> guidelines) |                                               |
| Moisture Sensitivity Level | PQFN 2mm x 2mm                                                          | 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> Applicable version of JEDEC standard at the time of product release.

**Revision History**

| Date       | Comments                                                                                                                                                                                                                                                                                      |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12/17/2013 | <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 Qual level from "Consumer" to "Industrial" on page 1, 9</li> <li>Updated data sheet with 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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