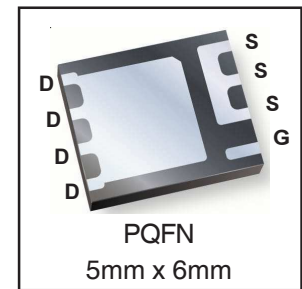
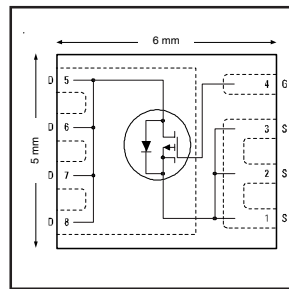


HEXFET® Power MOSFET

| | | |
|--|------------|-----------------------------|
| V_{DS} | -30 | V |
| $R_{DS(on) \max}$ (@ $V_{GS} = 10V$) | 4.6 | mΩ |
| Q_g (typical) | 110 | nC |
| R_G (typical) | 2.8 | Ω |
| I_D (@ $T_A = 25^\circ C$) | -21 | A |



Applications

- Charge and Discharge Switch for Notebook PC Battery Application

Features and Benefits

Features

| |
|--|
| Low $R_{DS(on)} (\leq 4.6m\Omega)$ |
| Industry-Standard PQFN Package |
| RoHS Compliant Containing no Lead, no Bromide and no Halogen |

results in
⇒

Resulting Benefits

| |
|----------------------------|
| Lower Conduction Losses |
| Multi-Vendor Compatibility |
| Environmentally Friendlier |

| Orderable part number | Package Type | Standard Pack | | Note |
|-----------------------|----------------|---------------|----------|------|
| | | Form | Quantity | |
| IRFH9310TRPBF | PQFN 5mm x 6mm | Tape and Reel | 4000 | |

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, $V_{GS} @ -10V$ | -21 | A |
| $I_D @ T_A = 70^\circ C$ | Continuous Drain Current, $V_{GS} @ -10V$ | -17 | |
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ -10V$ (Silicon Limited) | -107 | |
| $I_D @ T_C = 70^\circ C$ | Continuous Drain Current, $V_{GS} @ -10V$ (Silicon Limited) | -86 | |
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ -10V$ (Package Limited) | -40 | |
| I_{DM} | Pulsed Drain Current ① | -170 | |
| $P_D @ T_A = 25^\circ C$ | Power Dissipation ④ | 3.1 | W |
| $P_D @ T_A = 70^\circ C$ | Power Dissipation ④ | 2.0 | |
| | Linear Derating Factor | 0.025 | W/ $^\circ C$ |
| T_J | Operating Junction and | -55 to + 150 | $^\circ C$ |
| T_{STG} | Storage Temperature Range | | |

Notes ① through ④ are on page 2

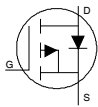
Static @ T_J = 25°C (unless otherwise specified)

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|-------------------------------------|--------------------------------------|------|-------|------|-------|--|
| BV _{DSS} | Drain-to-Source Breakdown Voltage | -30 | — | — | V | V _{GS} = 0V, I _D = -250μA |
| ΔBV _{DSS} /ΔT _J | Breakdown Voltage Temp. Coefficient | — | 0.020 | — | V/°C | Reference to 25°C, I _D = -1mA |
| R _{DS(on)} | Static Drain-to-Source On-Resistance | — | 3.7 | 4.6 | mΩ | V _{GS} = -10V, I _D = -21A ③ |
| | | — | 5.7 | 7.1 | | V _{GS} = -4.5V, I _D = -17A ③ |
| V _{GS(th)} | Gate Threshold Voltage | -1.3 | -1.9 | -2.4 | V | V _{DS} = V _{GS} , I _D = -100μA |
| ΔV _{GS(th)} | Gate Threshold Voltage Coefficient | — | -5.8 | — | mV/°C | |
| I _{DSS} | Drain-to-Source Leakage Current | — | — | -1.0 | μA | V _{DS} = -24V, V _{GS} = 0V |
| | | — | — | -150 | | V _{DS} = -24V, V _{GS} = 0V, T _J = 125°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 | 39 | — | — | S | V _{DS} = -10V, I _D = -17A |
| Q _g | Total Gate Charge ⑥ | — | 58 | — | nC | V _{DS} = -15V, V _{GS} = -4.5V, I _D = -17A |
| Q _g | Total Gate Charge ⑥ | — | 110 | 165 | nC | V _{GS} = -10V |
| Q _{gs} | Gate-to-Source Charge ⑥ | — | 17 | — | | V _{DS} = -15V |
| Q _{gd} | Gate-to-Drain Charge ⑥ | — | 28 | — | | I _D = -17A |
| R _G | Gate Resistance ⑥ | — | 2.8 | — | Ω | |
| t _{d(on)} | Turn-On Delay Time | — | 25 | — | ns | V _{DD} = -15V, V _{GS} = -4.5V ③ |
| t _r | Rise Time | — | 47 | — | | I _D = -1.0A |
| t _{d(off)} | Turn-Off Delay Time | — | 65 | — | | R _G = 1.8Ω |
| t _f | Fall Time | — | 70 | — | | See Figs. 19a & 19b |
| C _{iss} | Input Capacitance | — | 5250 | — | pF | V _{GS} = 0V |
| C _{oss} | Output Capacitance | — | 1300 | — | | V _{DS} = -15V |
| C _{rss} | Reverse Transfer Capacitance | — | 880 | — | | f = 1.0MHz |

Avalanche Characteristics

| | Parameter | Typ. | Max. | Units |
|-----------------|---------------------------------|------|------|-------|
| E _{AS} | Single Pulse Avalanche Energy ② | — | 170 | mJ |
| I _{AR} | Avalanche Current ① | — | -17 | A |

Diode Characteristics

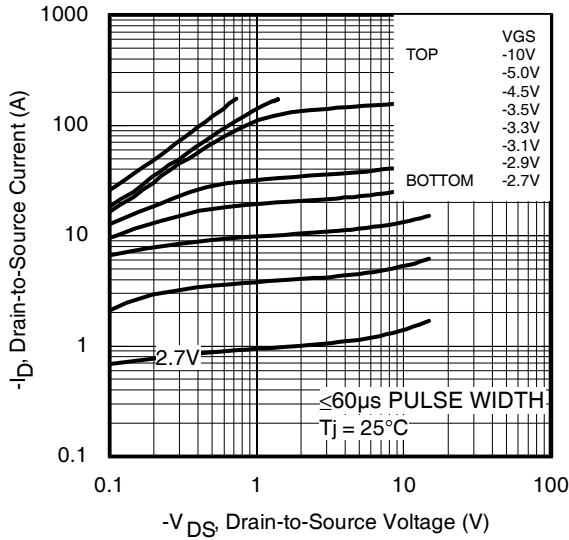
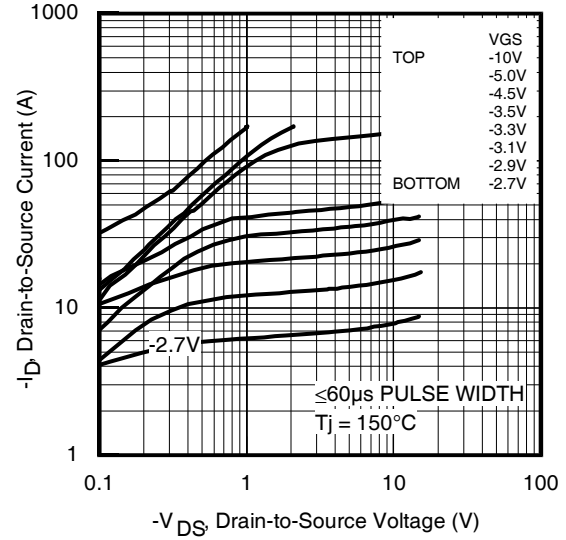
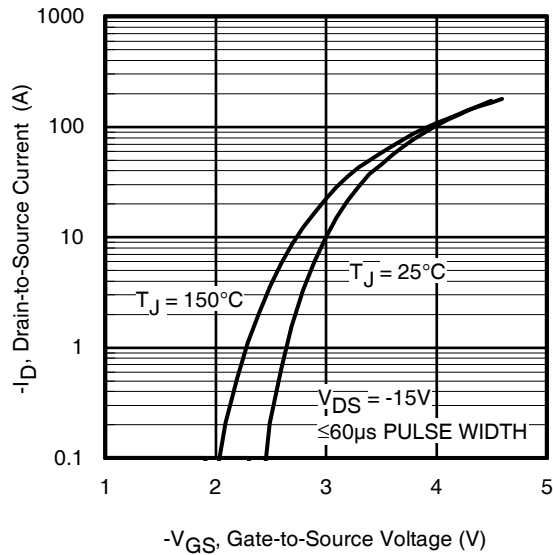
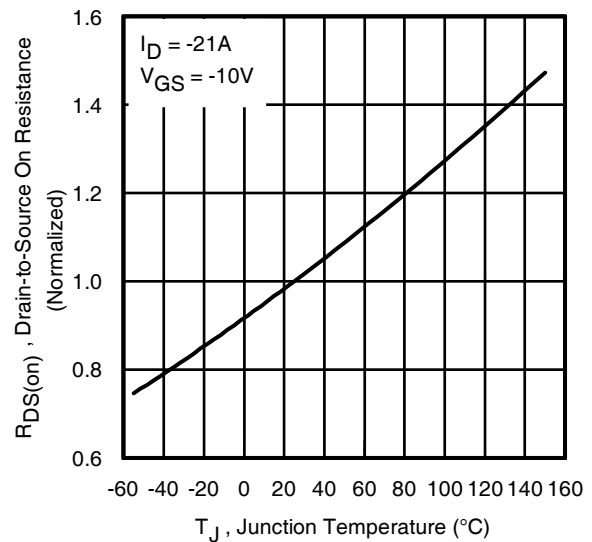
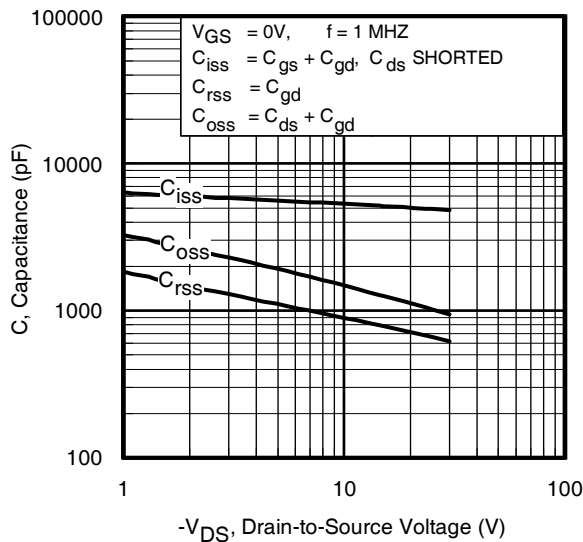
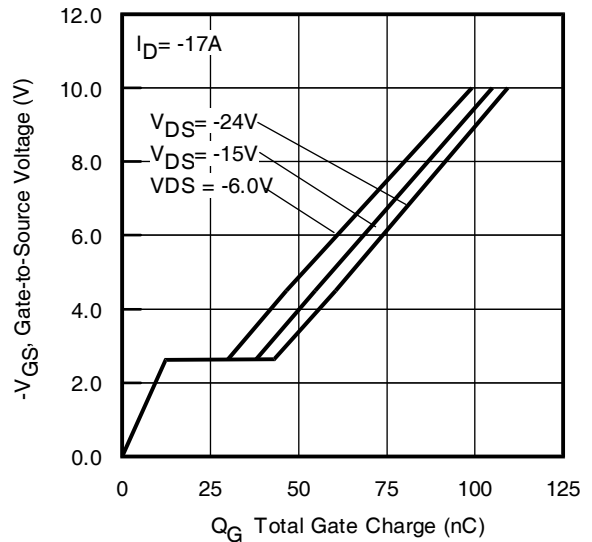
| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|-----------------|--|------|------|------|-------|--|
| I _S | Continuous Source Current (Body Diode) | — | — | -3.1 | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I _{SM} | Pulsed Source Current (Body Diode) ① | — | — | -170 | | |
| V _{SD} | Diode Forward Voltage | — | — | -1.2 | V | T _J = 25°C, I _S = -3.1A, V _{GS} = 0V ③ |
| t _{rr} | Reverse Recovery Time | — | 42 | 63 | ns | T _J = 25°C, I _F = -3.1A, V _{DD} = -24V |
| Q _{rr} | Reverse Recovery Charge | — | 42 | 63 | nC | di/dt = 100/μs ③ |

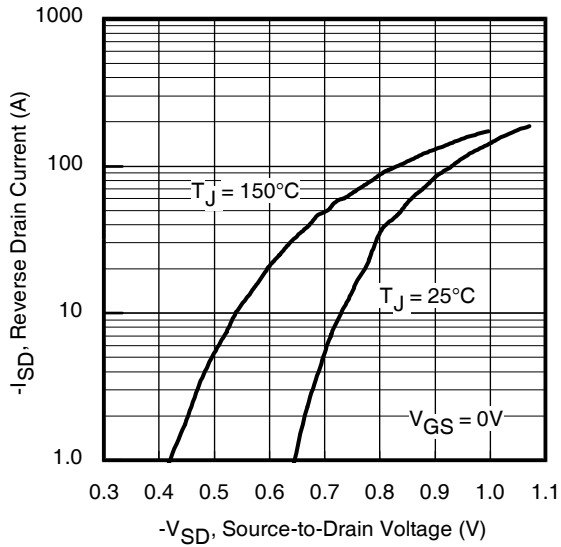
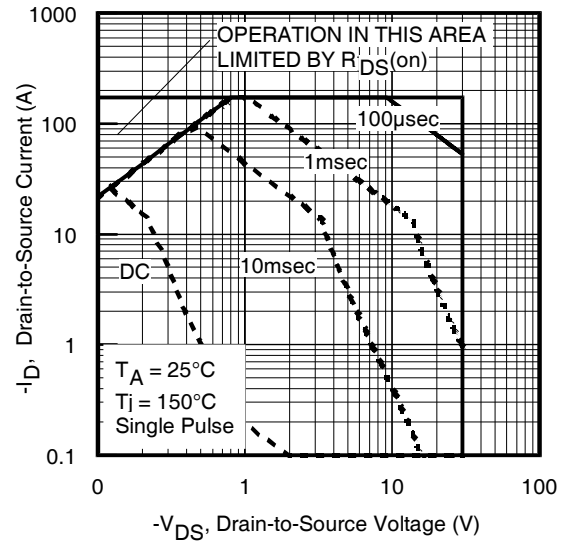
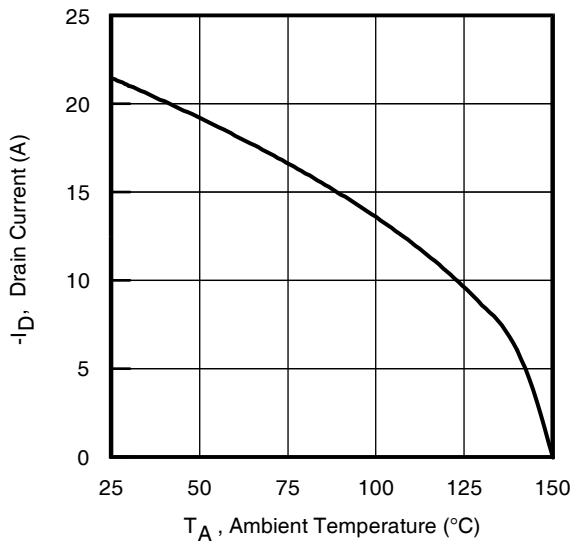
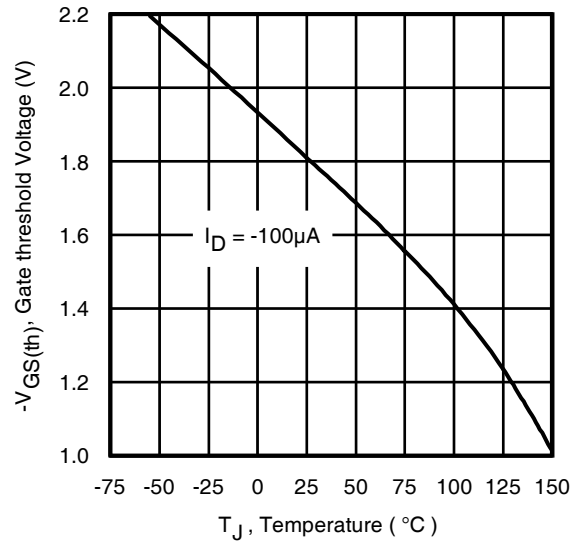
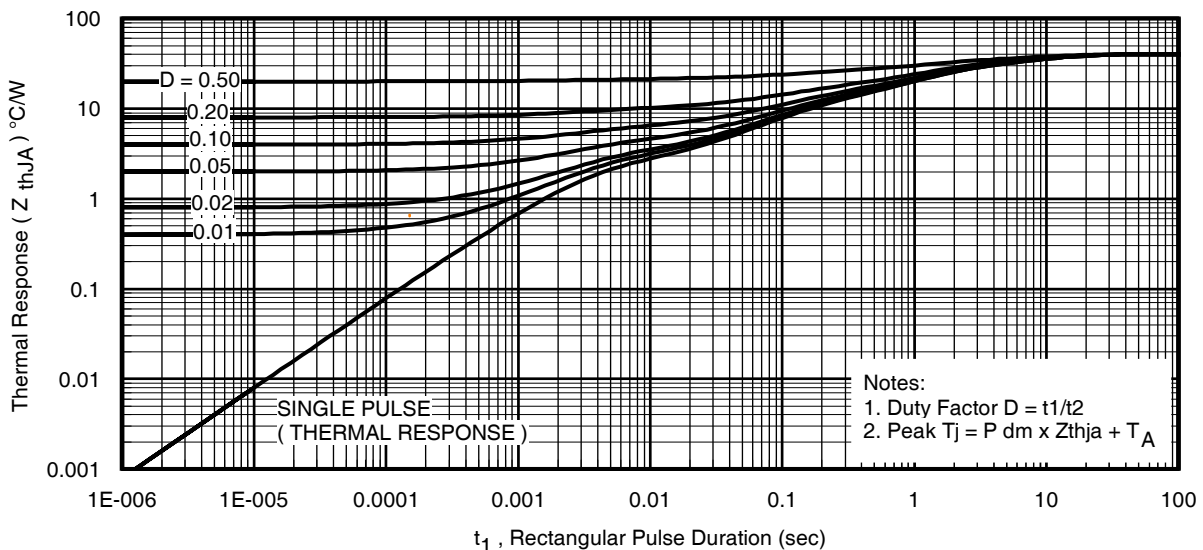
Thermal Resistance

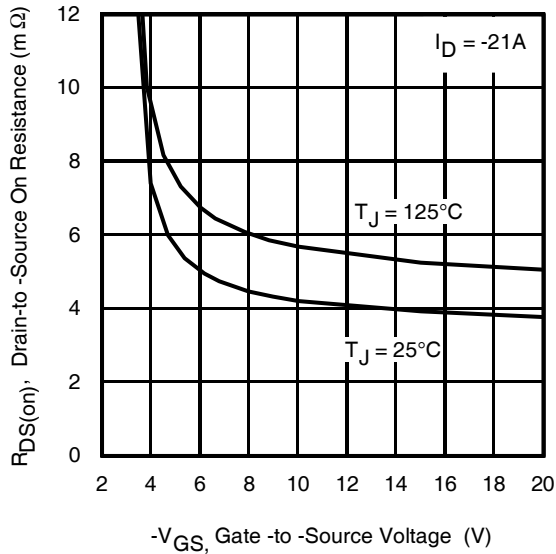
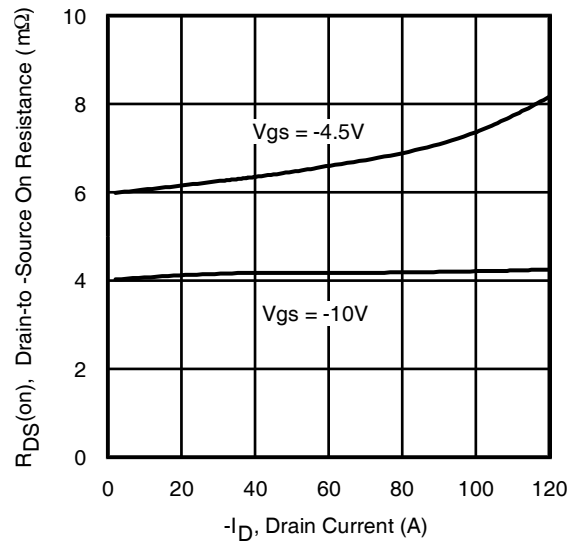
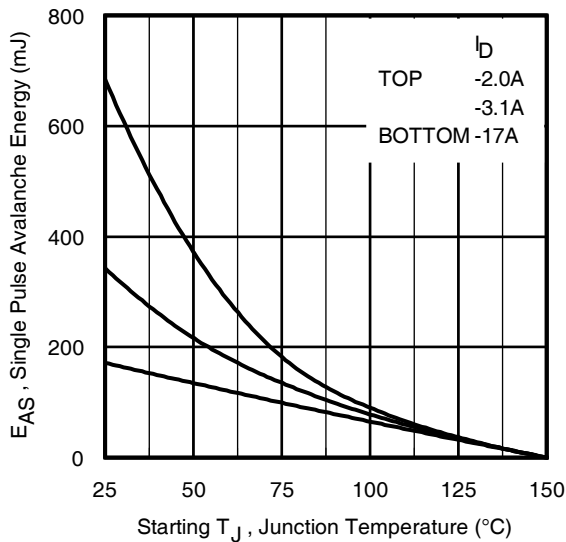
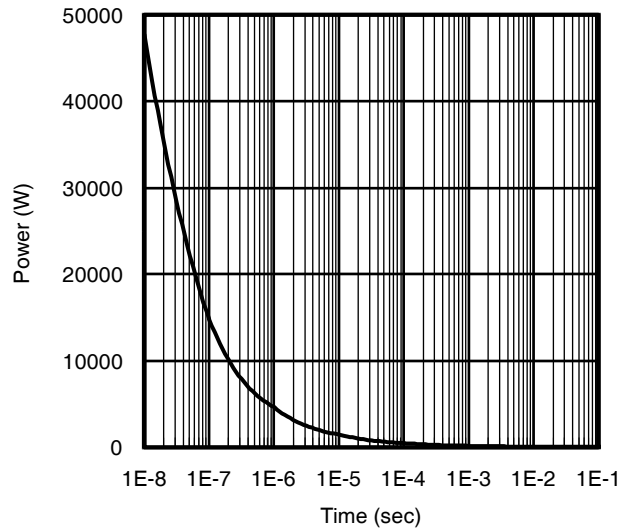
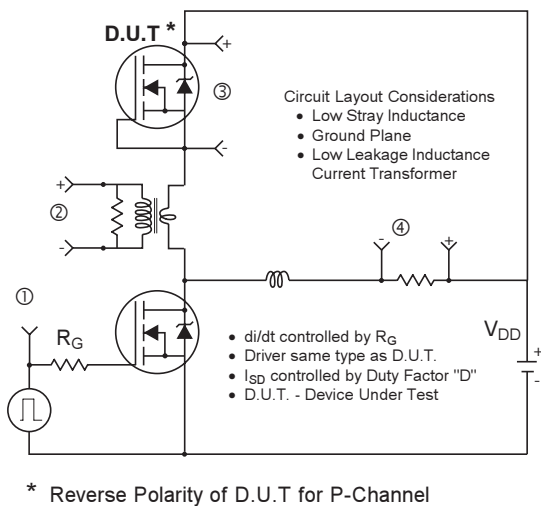
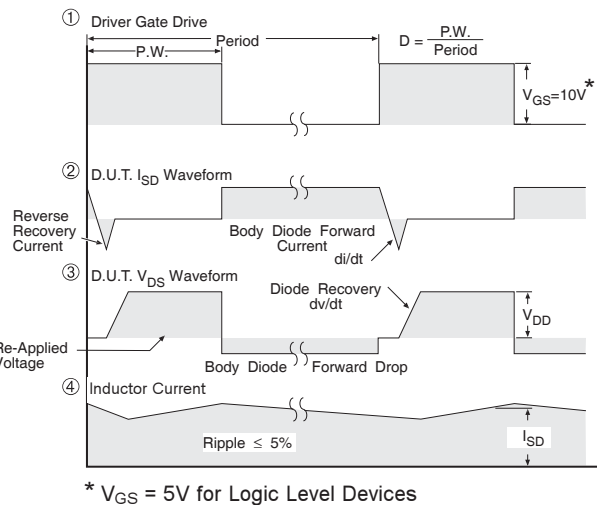
| | Parameter | Typ. | Max. | Units |
|------------------|---------------------------------|------|------|-------|
| R _{θJC} | Junction-to-Case ⑤ | — | 1.6 | °C/W |
| R _{θJA} | Junction-to-Ambient ④ | — | 40 | |
| R _{θJA} | Junction-to-Ambient (t < 10s) ④ | — | 35 | |

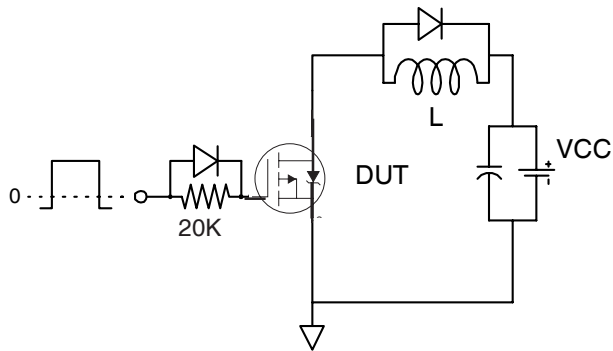
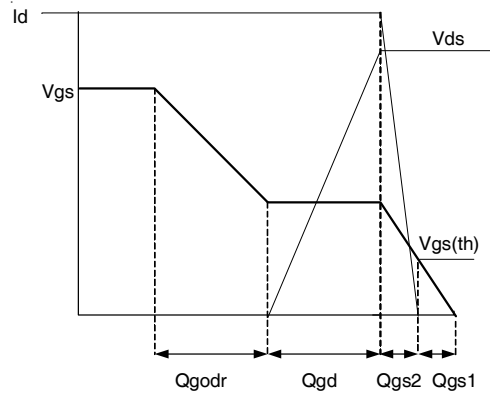
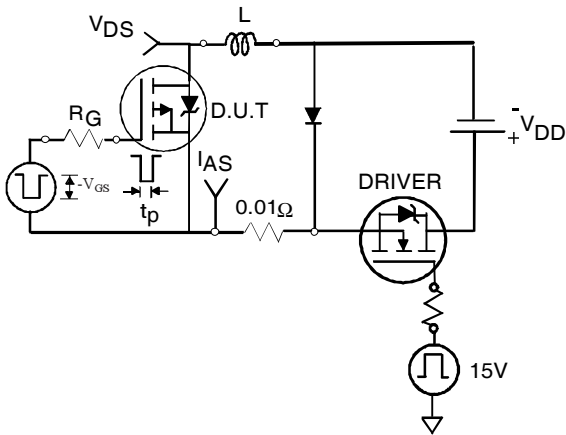
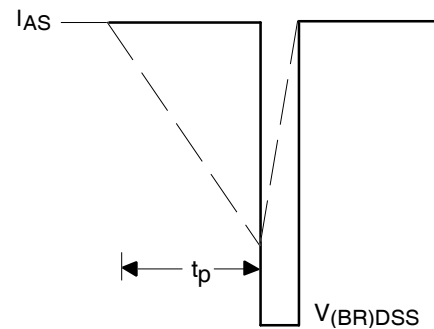
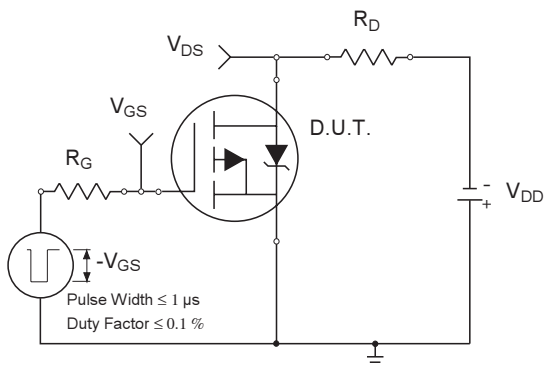
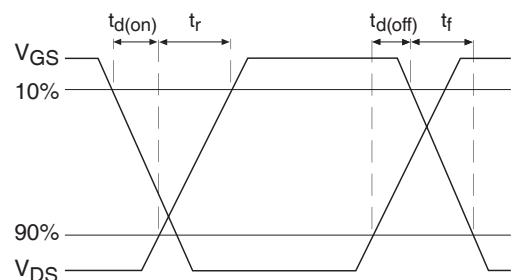
Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting T_J = 25°C, L = 1.1mH, R_G = 50Ω, I_{AS} = -17A.
- ③ Pulse width ≤ 400μs; duty cycle ≤ 2%.
- ④ When mounted on 1 inch square copper board.
- ⑤ R_θ is measured at T_J of approximately 90°C.
- ⑥ For DESIGN AID ONLY, not subject to production testing.

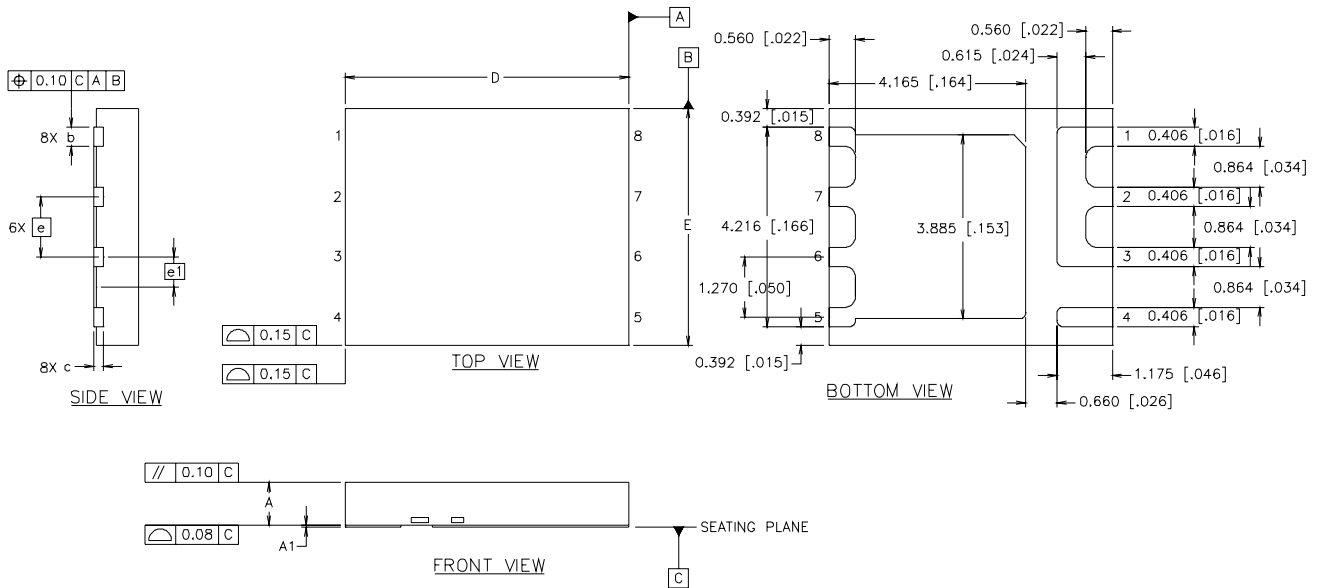

Fig 1. Typical Output Characteristics

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. Ambient Temperature

Fig 10. Threshold Voltage vs. Temperature

Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient


Fig 12. On-Resistance vs. Gate Voltage

Fig 13. Typical On-Resistance vs. Drain Current

Fig 14. Maximum Avalanche Energy vs. Drain Current

Fig 15. Typical Power vs. Time

Fig 16. Diode Reverse Recovery Test Circuit for P-Channel HEXFET[®] Power MOSFETs


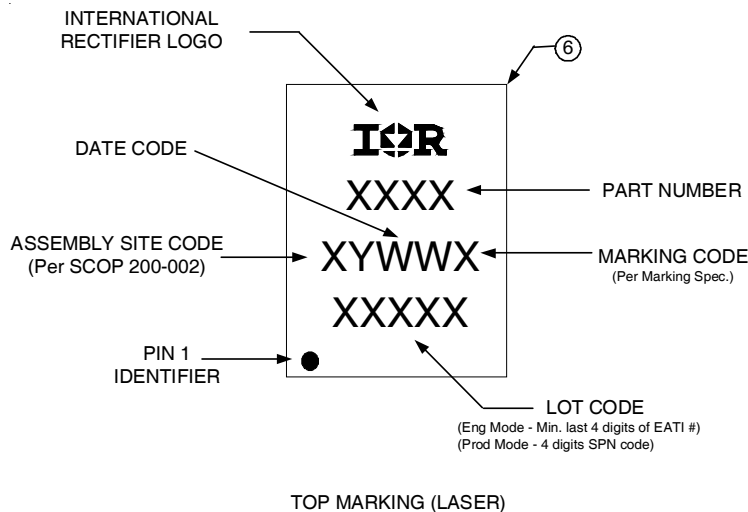

Fig 17a. Gate Charge Test Circuit

Fig 17b. Gate Charge Waveform

Fig 18a. Unclamped Inductive Test Circuit

Fig 18b. Unclamped Inductive Waveforms

Fig 19a. Switching Time Test Circuit

Fig 19b. Switching Time Waveforms

PQFN Package Details



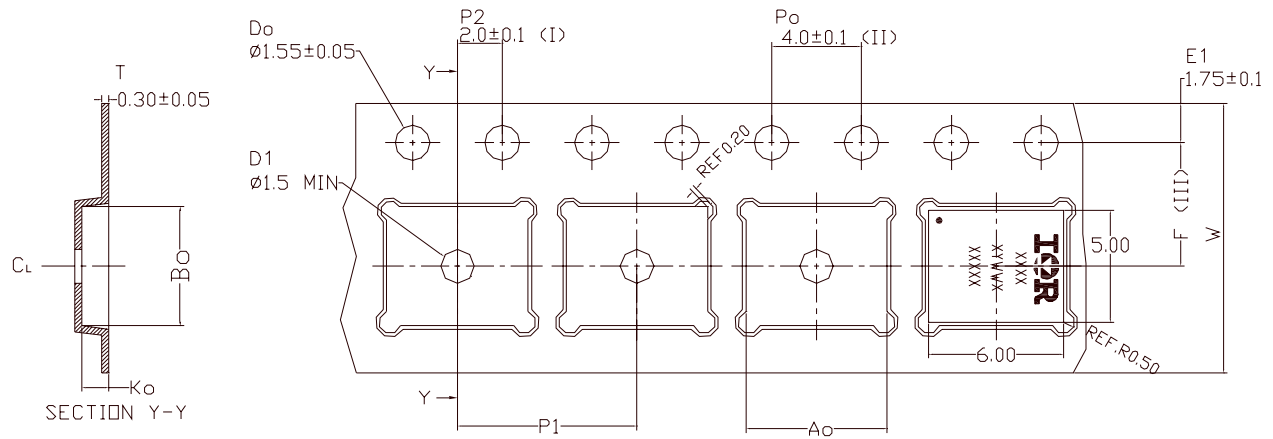
| DIM | INCHES | | MILLIMETERS | |
|-----|-------------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .0315 | .0394 | 0.800 | 1.000 |
| A1 | .0000 | .0020 | 0.000 | 0.050 |
| b | .0140 | .0180 | 0.356 | 0.456 |
| c | .0080 REF. | | 0.203 REF. | |
| D | .2362 BASIC | | 6.0 BASIC | |
| E | .1969 BASIC | | 5.0 BASIC | |
| e | .0500 BASIC | | 1.270 BASIC | |
| e1 | .0250 BASIC | | 0.635 BASIC | |

PQFN Part Marking



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

PQFN Tape and Reel



| | |
|----|---------------|
| Ao | 6.30 +/- 0.1 |
| Bo | 5.30 +/- 0.1 |
| Ko | 1.20 +/- 0.1 |
| F | 5.50 +/- 0.1 |
| P1 | 8.00 +/- 0.1 |
| W | 12.00 +/- 0.3 |

(I) Measured from centerline of sprocket hole to centerline of pocket.

(II) Cumulative tolerance of 10 sprocket hole is ±0.20.

(III) Measured from centerline of sprocket hole to centerline of pocket.

(IV) Other material available.

(V) Typical SR of form tape Max 10⁹ DHM/SQ.

ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE STATED.

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

Qualification Information[†]

| | | |
|----------------------------|---|--|
| Qualification level | Consumer ^{††} | |
| | (per JEDEC JESD47F ^{†††} guidelines) | |
| Moisture Sensitivity Level | PQFN 5mm x 6mm | MSL2 (per JEDEC J-STD-020D ^{†††}) |
| 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.

†††† Higher MSL ratings may be available for the specific package types listed here. Please contact your

International Rectifier sales representative for further information: <http://www.irf.com/whoto-call/salesrep/>

Revision History

| Date | Comments |
|-----------|--|
| 8/19/2014 | <ul style="list-style-type: none"> • Updated datasheet as per new IR Corporate Template • Updated data sheet with latest PQFN Tape and Reel Diagram. |