

IRFH5053PbF

Applications

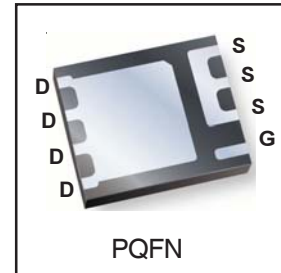
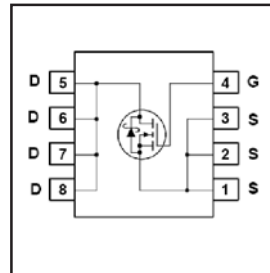
- 3 Phase Boost Converter Applications
- Secondary Side Synchronous Rectification

HEXFET® Power MOSFET

| V_{DSS} | $R_{DS(on)}$ max | Qg |
|-----------|-----------------------|------|
| 100V | 18mΩ @ $V_{GS} = 10V$ | 24nC |

Benefits

- Very low $R_{DS(ON)}$ at 10V V_{GS}
- Low Gate Charge
- Fully Characterized Avalanche Voltage and Current
- 100% Tested for R_G
- Lead-Free (Qualified up to 260°C Reflow)
- RoHS compliant (Halogen Free)
- Low Thermal Resistance
- Large Source Lead for more reliable Soldering



Absolute Maximum Ratings

| | Parameter | Max. | Units |
|--------------------------|--|--------------|-------|
| V_{DS} | Drain-to-Source Voltage | 100 | V |
| V_{GS} | Gate-to-Source Voltage | ± 20 | |
| $I_D @ T_A = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 9.3 | A |
| $I_D @ T_A = 70^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 7.4 | |
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 46 | |
| I_{DM} | Pulsed Drain Current ① | 75 | |
| $P_D @ T_A = 25^\circ C$ | Power Dissipation ⑤ | 3.1 | W |
| $P_D @ T_A = 70^\circ C$ | Power Dissipation ⑤ | 2.0 | |
| | Linear Derating Factor ⑤ | 0.025 | W/°C |
| T_J | Operating Junction and | -55 to + 150 | °C |
| T_{STG} | Storage Temperature Range | | |

Thermal Resistance

| | Parameter | Typ. | Max. | Units |
|-----------------|-----------------------|------|------|-------|
| $R_{\theta JC}$ | Junction-to-Case ④ | — | 1.6 | °C/W |
| $R_{\theta JA}$ | Junction-to-Ambient ⑤ | — | 40 | |

Notes ① through ⑤ are on page 9

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

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|------------------------------|--------------------------------------|------|------|------|-------|---|
| BV_{DSS} | Drain-to-Source Breakdown Voltage | 100 | — | — | V | $V_{GS} = 0V, I_D = 250\mu A$ |
| $\Delta BV_{DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | 0.11 | — | V/°C | Reference to $25^\circ\text{C}, I_D = 1mA$ |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | 14.4 | 18 | mΩ | $V_{GS} = 10V, I_D = 9.3A$ ③ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 3.0 | 3.7 | 4.9 | V | $V_{DS} = V_{GS}, I_D = 100\mu A$ |
| $\Delta V_{GS(th)}$ | Gate Threshold Voltage Coefficient | — | -11 | — | mV/°C | |
| I_{DSS} | Drain-to-Source Leakage Current | — | — | 20 | μA | $V_{DS} = 80V, V_{GS} = 0V$ |
| | | — | — | 250 | | $V_{DS} = 80V, V_{GS} = 0V, T_J = 125^\circ\text{C}$ |
| 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 | $V_{DS} = 50V, I_D = 7.4A$ |
| Q_g | Total Gate Charge | — | 24 | 36 | nC | $V_{DS} = 50V$ $V_{GS} = 10V$ $I_D = 7.4A$ See Fig.17 & 18 |
| Q_{gs1} | Pre-Vth Gate-to-Source Charge | — | 5.2 | — | | |
| Q_{gs2} | Post-Vth Gate-to-Source Charge | — | 1.5 | — | | |
| Q_{gd} | Gate-to-Drain Charge | — | 8.6 | — | | |
| Q_{godr} | Gate Charge Overdrive | — | 8.7 | — | | |
| Q_{sw} | Switch Charge ($Q_{gs2} + Q_{gd}$) | — | 10.1 | — | | |
| Q_{oss} | Output Charge | — | 12 | — | nC | $V_{DS} = 16V, V_{GS} = 0V$ |
| R_G | Gate Resistance | — | 0.8 | — | Ω | |
| $t_{d(on)}$ | Turn-On Delay Time | — | 12 | — | ns | $V_{DD} = 50V, V_{GS} = 10V$ $I_D = 7.4A$ $R_G = 1.8\Omega$ See Fig.15 |
| t_r | Rise Time | — | 7.5 | — | | |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 18 | — | | |
| t_f | Fall Time | — | 4.1 | — | | |
| C_{iss} | Input Capacitance | — | 1510 | — | pF | $V_{GS} = 0V$ $V_{DS} = 50V$ $f = 1.0MHz$ |
| C_{oss} | Output Capacitance | — | 230 | — | | |
| C_{riss} | Reverse Transfer Capacitance | — | 59 | — | | |

Avalanche Characteristics

| | Parameter | Typ. | Max. | Units |
|----------|---------------------------------|------|------|-------|
| E_{AS} | Single Pulse Avalanche Energy ② | — | 21 | mJ |
| I_{AR} | Avalanche Current ① | — | 7.4 | A |

Diode Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------|---|--|------|------|-------|---|
| I_S | Continuous Source Current (Body Diode) | — | — | 2.8 | A | MOSFET symbol showing the integral reverse p-n junction diode. |
| I_{SM} | Pulsed Source Current (Body Diode) ① | — | — | 75 | | |
| V_{SD} | Diode Forward Voltage | — | — | 1.3 | V | $T_J = 25^\circ\text{C}, I_S = 7.4A, V_{GS} = 0V$ ③ |
| t_{rr} | Reverse Recovery Time | — | 31 | 47 | ns | $T_J = 25^\circ\text{C}, I_F = 7.4A, V_{DD} = 50V$ |
| Q_{rr} | Reverse Recovery Charge | — | 210 | 320 | nC | $di/dt = 800A/\mu s$ ③ See Fig.16 |
| t_{on} | Forward Turn-On Time | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | |

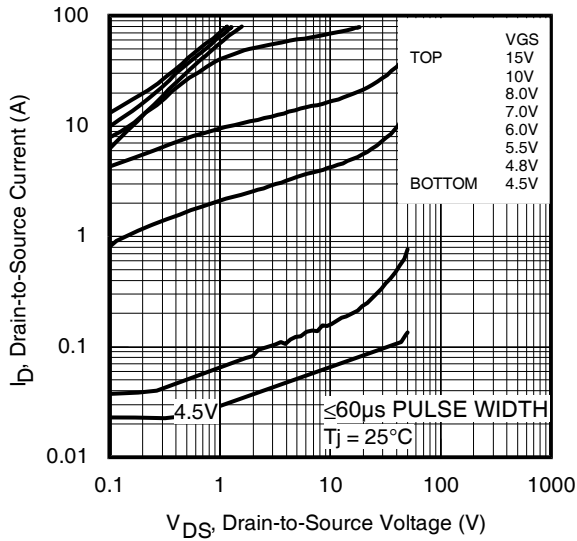


Fig 1. Typical Output Characteristics

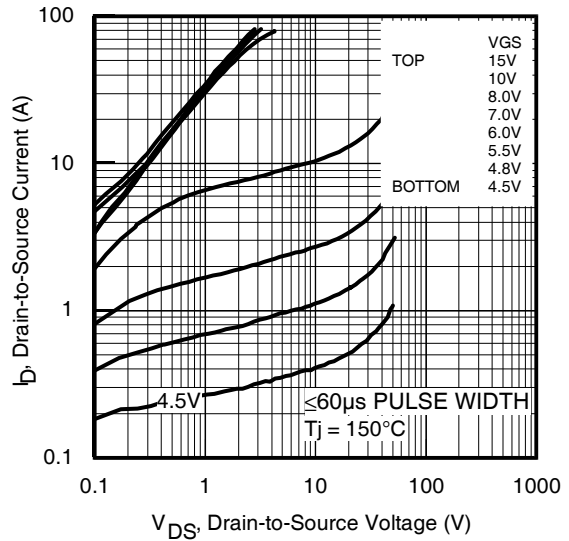


Fig 2. Typical Output Characteristics

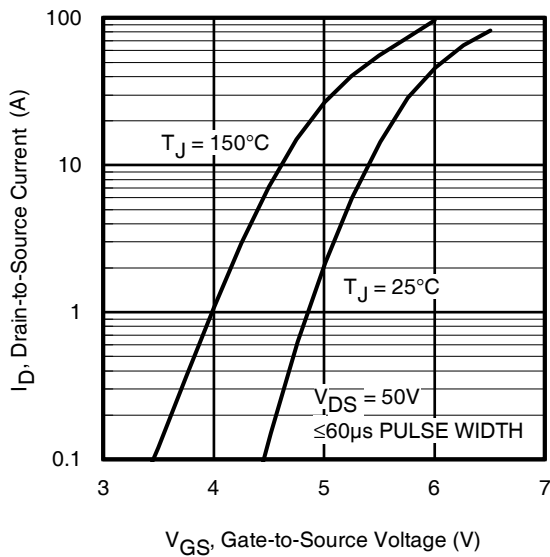


Fig 3. Typical Transfer Characteristics

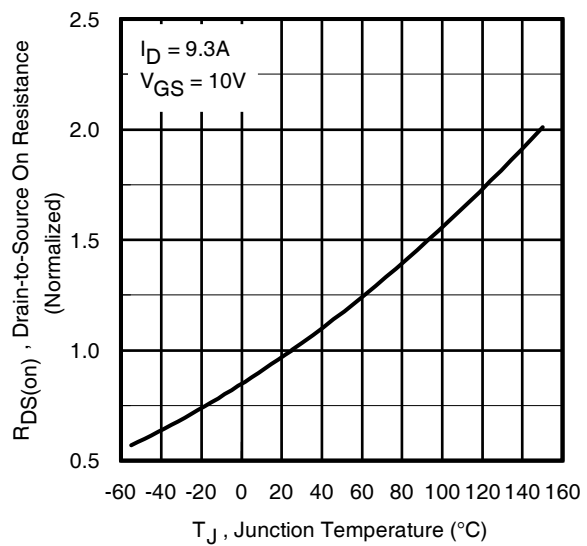


Fig 4. Normalized On-Resistance vs. Temperature

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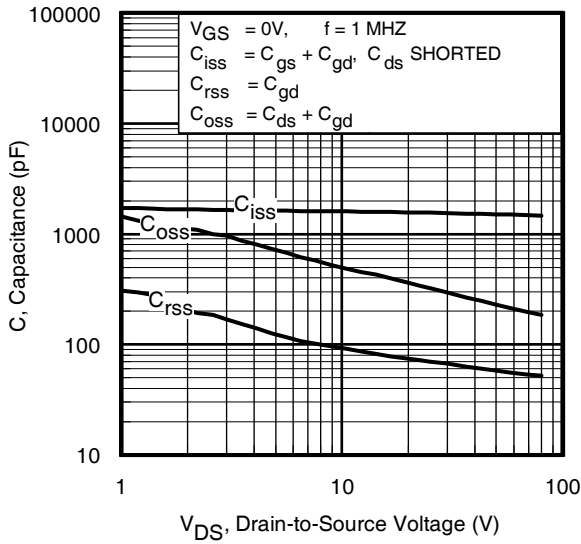


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

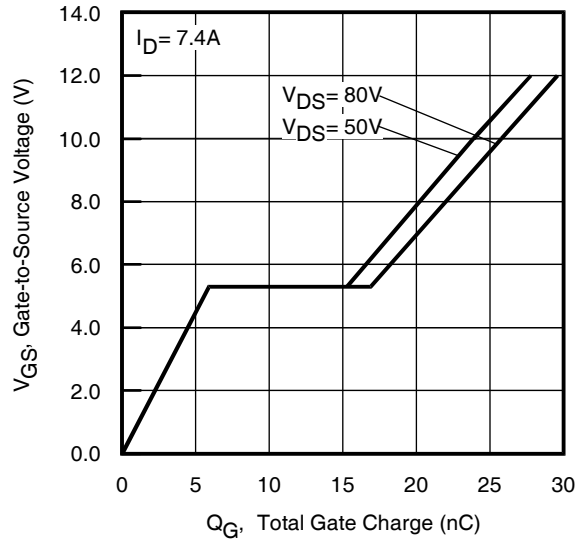


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

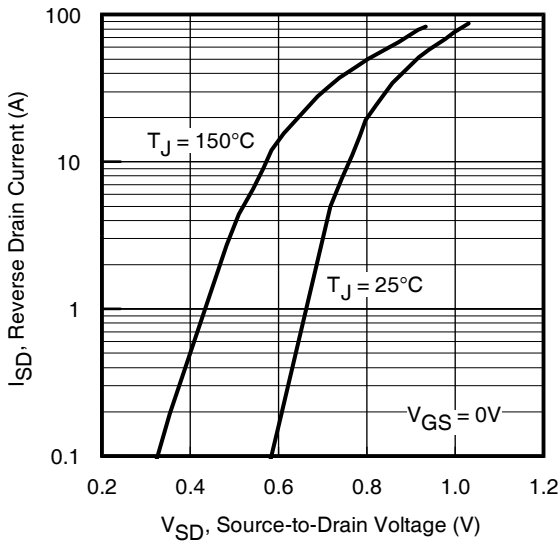


Fig 7. Typical Source-Drain Diode Forward Voltage

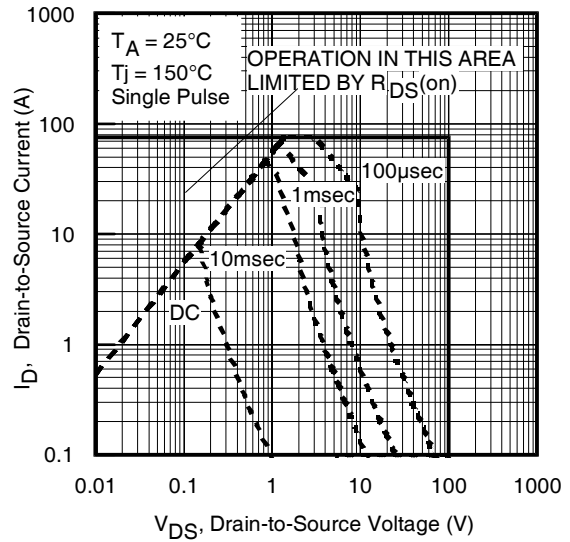


Fig 8. Maximum Safe Operating Area

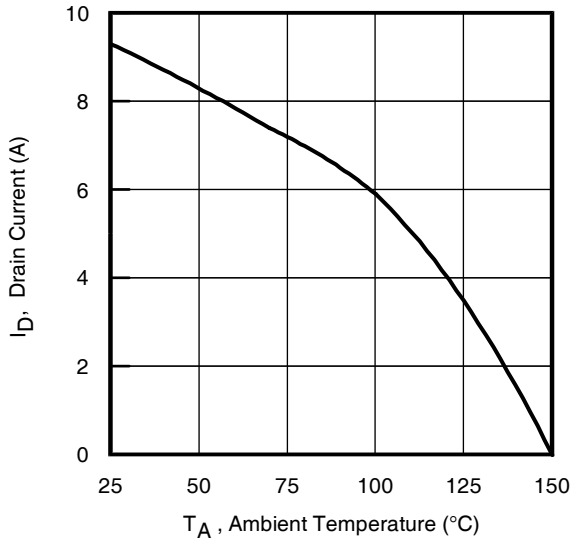


Fig 9. Maximum Drain Current vs. Ambient Temperature

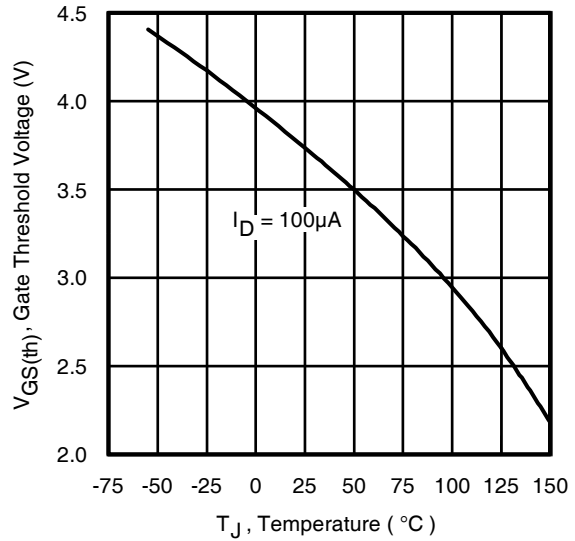


Fig 10. Threshold Voltage vs. Temperature

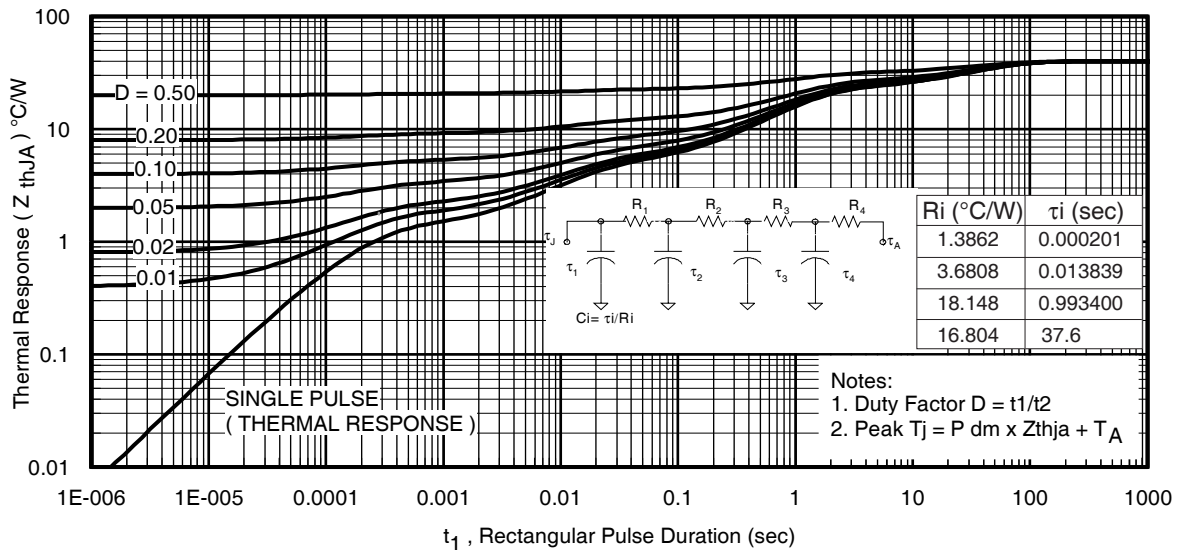


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

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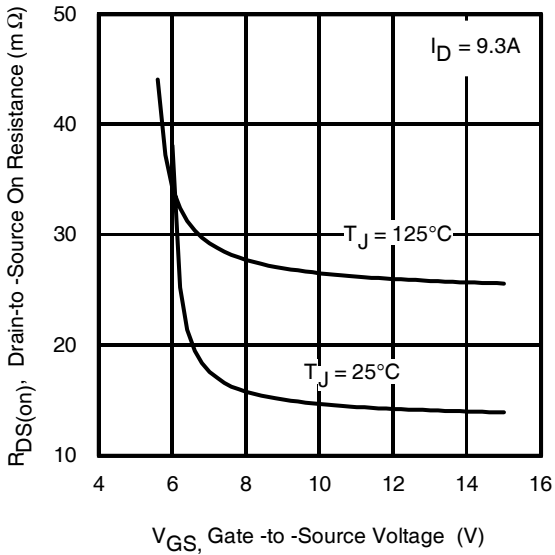


Fig 12. On-Resistance vs. Gate Voltage

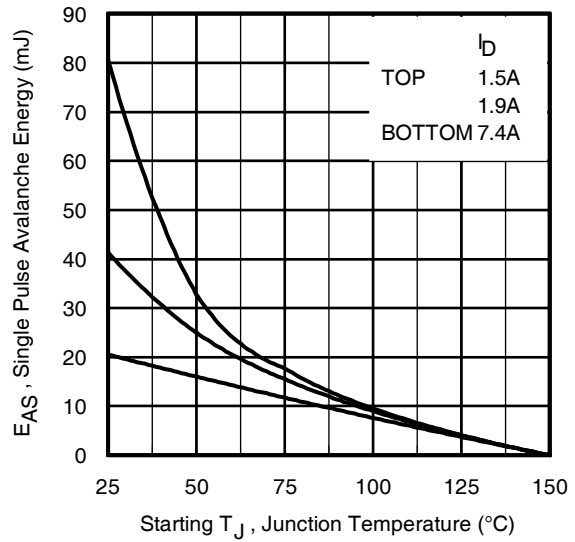


Fig 13. Maximum Avalanche Energy vs. Drain Current

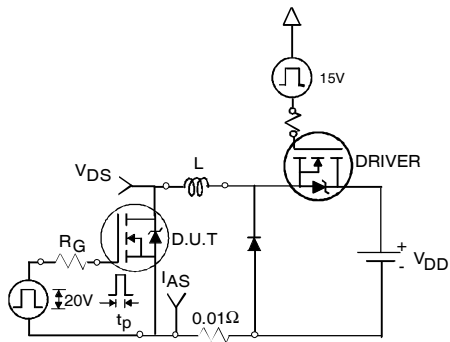


Fig 14a. Unclamped Inductive Test Circuit

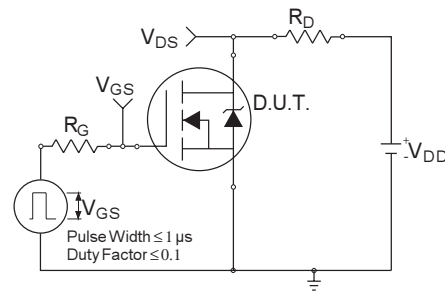


Fig 15a. Switching Time Test Circuit

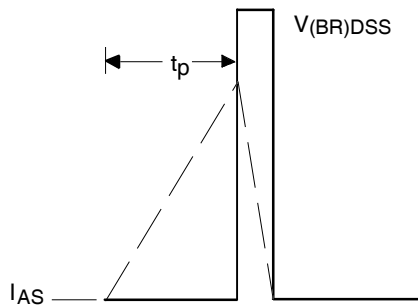


Fig 14b. Unclamped Inductive Waveforms

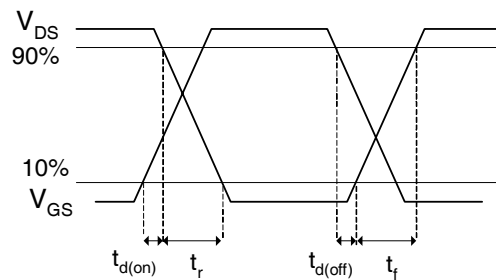


Fig 15b. Switching Time Waveforms

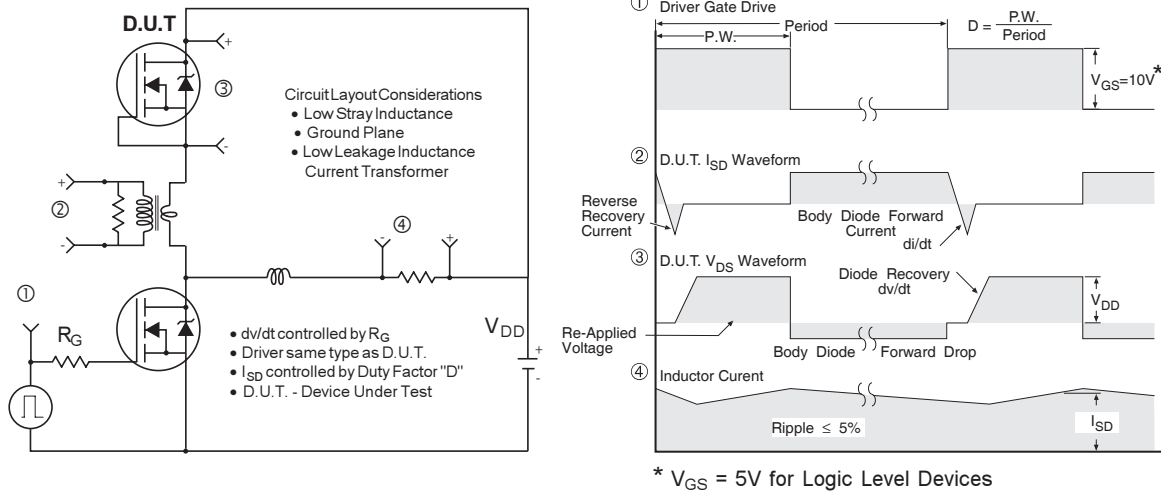


Fig 16. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

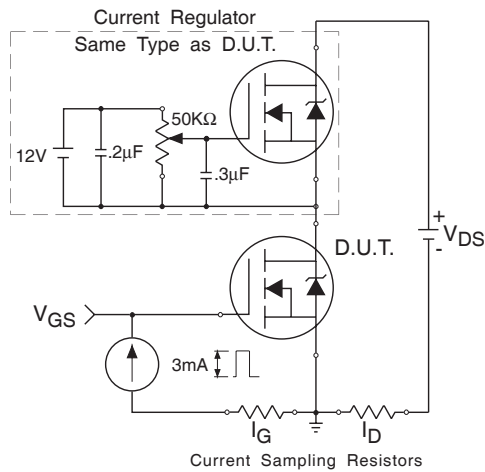


Fig 17. Gate Charge Test Circuit

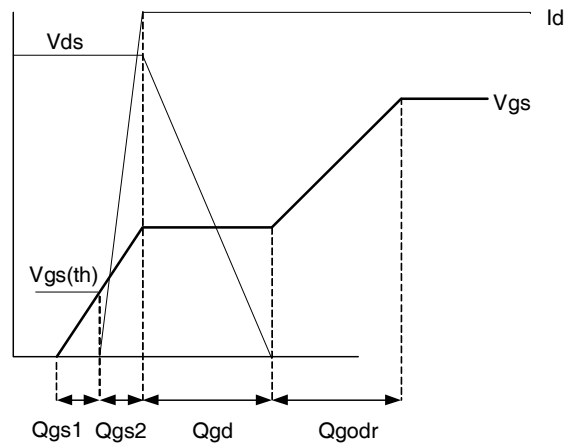
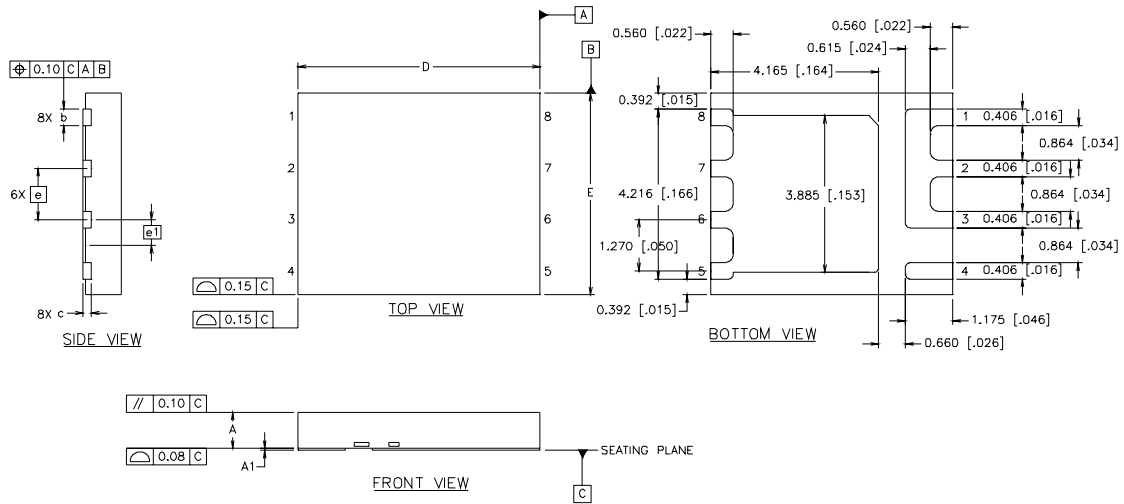


Fig 18. Gate Charge Waveform

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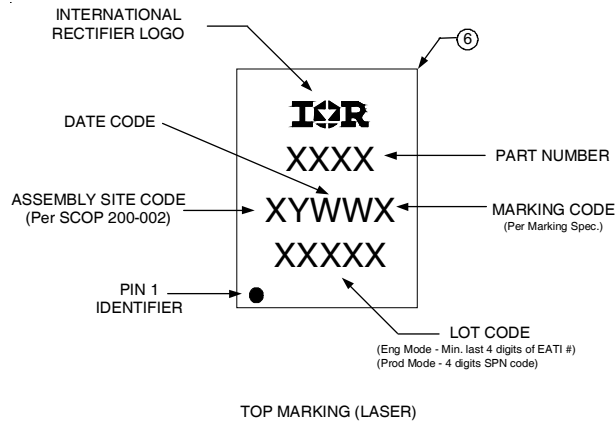
PQFN Package Details

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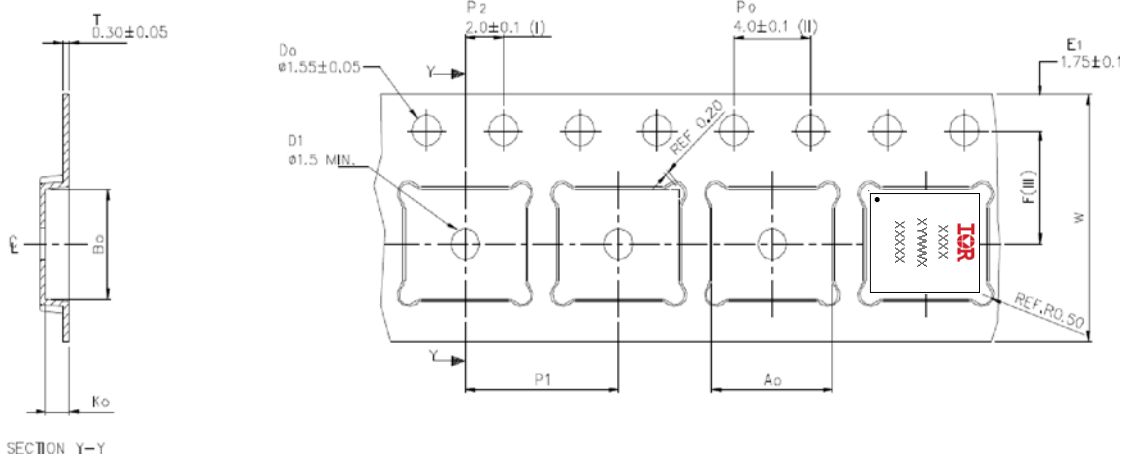
| DIM | INCHES | | MILLIMETERS | |
|-----|-------------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .0315 | .0394 | 0.800 | 1.000 |
| A1 | .0000 | .0020 | 0.000 | 0.050 |
| b | .0140 | .0180 | 0.356 | 0.456 |
| c | .0080 REF. | | 0.203 REF. | |
| D | .2362 BASIC | | 6.0 BASIC | |
| 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



| | |
|----------------|---------------|
| A ₀ | 6.30 +/− 0.1 |
| B ₀ | 5.30 +/− 0.1 |
| K ₀ | 1.20 +/− 0.1 |
| F | 5.50 +/− 0.1 |
| P ₁ | 8.00 +/− 0.1 |
| W | 12.00 +/− 0.3 |

- (I) Measured from centreline of sprocket hole to centreline of pocket.
- (II) Cumulative tolerance of 10 sprocket holes is ± 0.20 .
- (III) Measured from centreline of sprocket hole to centreline of pocket.
- (IV) Other material available.
- (V) Typical SR of form tape Max 10⁹ OHM/SQ

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED

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

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting T_J = 25°C, L = 0.75mH, R_G = 25Ω, I_{AS} = 7.4A.
- ③ Pulse width ≤ 400μs; duty cycle ≤ 2%.
- ④ R_{thjc} is guaranteed by design
- ⑤ When mounted on 1 inch square 2 oz copper pad on 1.5x1.5 in. board of FR-4 material.

Data and specifications subject to change without notice.
 This product has been designed and qualified for the Consumer market.
 Qualification Standards can be found on IR's Web site.

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