



**THE DATASHEET OF
IRFH3702TRPBF**



IRFH3702PbF

HEXFET® Power MOSFET

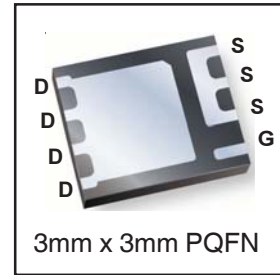
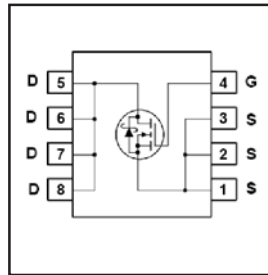
Applications

- Synchronous Buck Converter for Computer Processor Power
- Isolated DC to DC Converters for Network and Telecom
- Buck Converters for Set-Top Boxes

| V_{DSS} | $R_{DS(on)}$ max | Qg |
|-----------|--------------------------------|-------|
| 30V | 7.1m Ω @ $V_{GS} = 10V$ | 9.6nC |

Benefits

- Low $R_{DS(ON)}$
- Very Low Gate Charge
- Low Junction to PCB Thermal Resistance
- Fully Characterized Avalanche Voltage and Current
- 100% Tested for R_G
- Lead-Free (Qualified up to 260°C Reflow)
- RoHS compliant (Halogen Free)



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, $V_{GS} @ 10V$ | 16 | A |
| $I_D @ T_A = 70^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 12 | |
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ | 42 | |
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ (Package Limited) | 25 | |
| I_{DM} | Pulsed Drain Current ① | 120 | |
| $P_D @ T_A = 25^\circ C$ | Power Dissipation | 2.8 | W |
| $P_D @ T_A = 70^\circ C$ | Power Dissipation | 1.8 | |
| | Linear Derating Factor | 0.02 | 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 | — | 6.0 | °C/W |
| $R_{\theta JA}$ | Junction-to-Ambient ⑤⑥ | — | 45 | |
| $R_{\theta JA}$ | Junction-to-Ambient (t<10s) ⑥ | — | 44 | |

ORDERING INFORMATION:

See detailed ordering and shipping information on the last page of this data sheet.

Notes ① through ⑥ are on page 10

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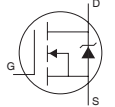
Static @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|------------------------------|--------------------------------------|------|------|------|-------|---|
| BV_{DSS} | Drain-to-Source Breakdown Voltage | 30 | — | — | V | $V_{GS} = 0V, I_D = 250\mu A$ |
| $\Delta BV_{DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | 0.02 | — | V/°C | Reference to $25^\circ\text{C}, I_D = 1mA$ |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | 5.7 | 7.1 | mΩ | $V_{GS} = 10V, I_D = 16A$ ③ |
| | | — | 8.7 | 11.8 | | $V_{GS} = 4.5V, I_D = 12A$ 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 | — | -6.5 | — | mV/°C | |
| I_{DSS} | Drain-to-Source Leakage Current | — | — | 1.0 | μA | $V_{DS} = 24V, V_{GS} = 0V$ |
| | | — | — | 150 | | $V_{DS} = 24V, V_{GS} = 0V, T_J = 125^\circ\text{C}$ |
| 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 | 37 | — | — | S | $V_{DS} = 15V, I_D = 12A$ |
| Q_g | Total Gate Charge | — | 9.6 | 14 | nC | $V_{DS} = 15V$ $V_{GS} = 4.5V$ $I_D = 12A$ See Fig.17 & 18 |
| Q_{gs1} | Pre-Vth Gate-to-Source Charge | — | 2.4 | — | | |
| Q_{gs2} | Post-Vth Gate-to-Source Charge | — | 1.2 | — | | |
| Q_{gd} | Gate-to-Drain Charge | — | 3.1 | — | | |
| Q_{godr} | Gate Charge Overdrive | — | 2.9 | — | | |
| Q_{sw} | Switch Charge ($Q_{gs2} + Q_{gd}$) | — | 4.3 | — | | |
| Q_{oss} | Output Charge | — | 7.4 | — | nC | $V_{DS} = 16V, V_{GS} = 0V$ |
| R_G | Gate Resistance | — | 2.2 | — | Ω | |
| $t_{d(on)}$ | Turn-On Delay Time | — | 9.6 | — | ns | $V_{DD} = 15V, V_{GS} = 4.5V$ $I_D = 12A$ $R_G = 1.8\Omega$ See Fig.15 |
| t_r | Rise Time | — | 15 | — | | |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 11 | — | | |
| t_f | Fall Time | — | 5.8 | — | | |
| C_{iss} | Input Capacitance | — | 1510 | — | pF | $V_{GS} = 0V$ $V_{DS} = 15V$ $f = 1.0MHz$ |
| C_{oss} | Output Capacitance | — | 306 | — | | |
| C_{riss} | Reverse Transfer Capacitance | — | 120 | — | | |

Avalanche Characteristics

| | Parameter | Typ. | Max. | Units |
|----------|---------------------------------|------|------|-------|
| E_{AS} | Single Pulse Avalanche Energy ② | — | 77 | mJ |
| I_{AR} | Avalanche Current ① | — | 12 | A |

Diode Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------|---|--|------|------|-------|--|
| I_S | Continuous Source Current (Body Diode) | — | — | 3.5 | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I_{SM} | Pulsed Source Current (Body Diode) ① | — | — | 120 | | |
| V_{SD} | Diode Forward Voltage | — | — | 1.0 | V | $T_J = 25^\circ\text{C}, I_S = 12A, V_{GS} = 0V$ ③ |
| t_{rr} | Reverse Recovery Time | — | 17 | 26 | ns | $T_J = 25^\circ\text{C}, I_F = 12A, V_{DD} = 15V$ |
| Q_{rr} | Reverse Recovery Charge | — | 15 | 23 | nC | $di/dt = 225A/\mu s$ ③ |
| t_{on} | Forward Turn-On Time | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | |

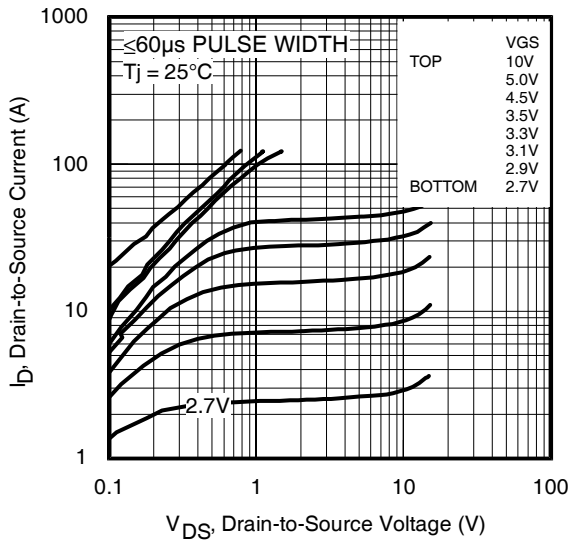


Fig 1. Typical Output Characteristics

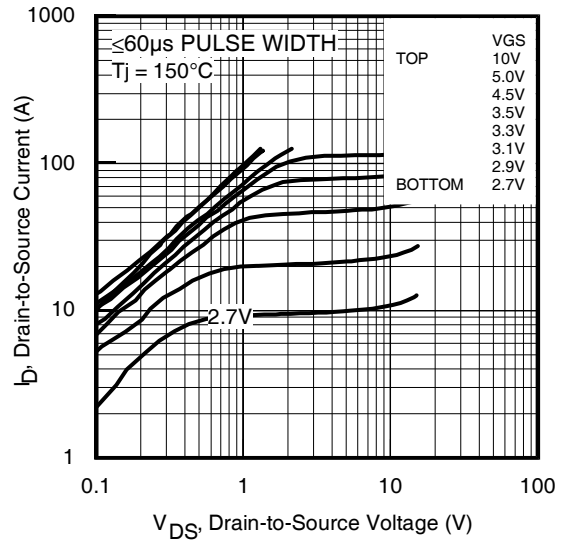


Fig 2. Typical Output Characteristics

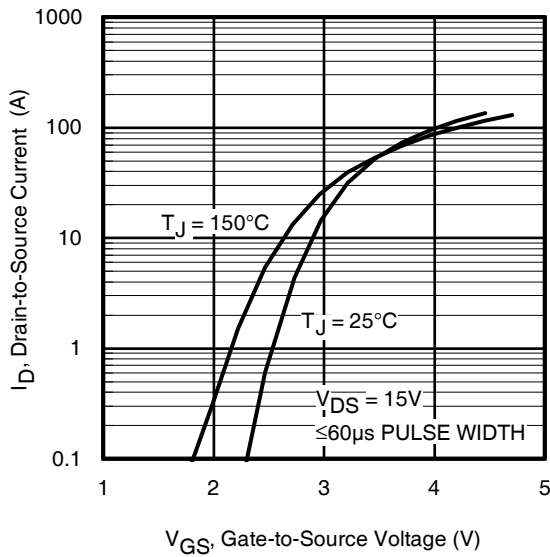


Fig 3. Typical Transfer Characteristics

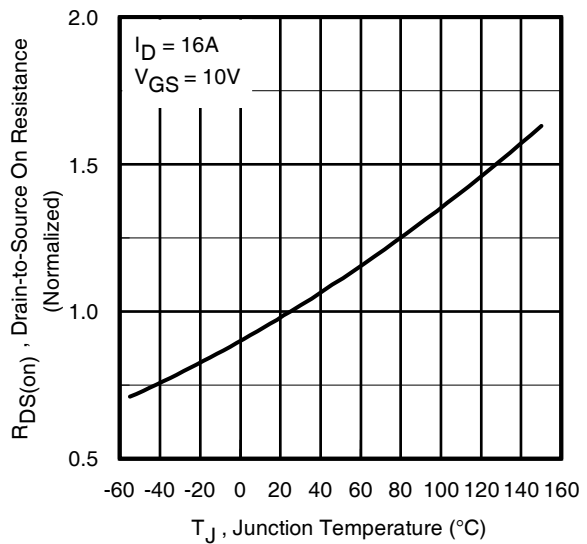


Fig 4. Normalized On-Resistance vs. Temperature

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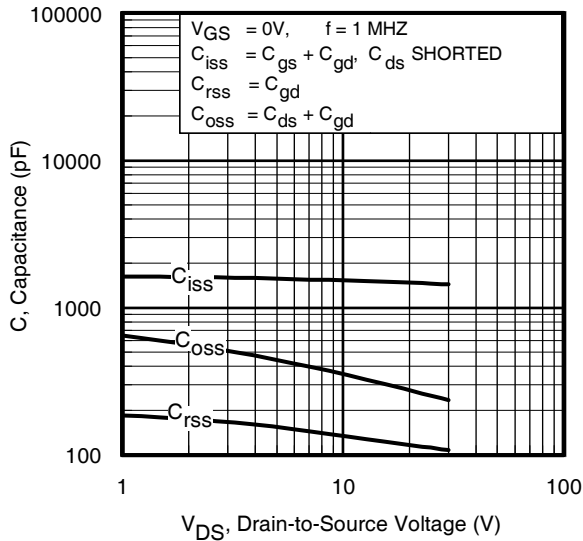


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

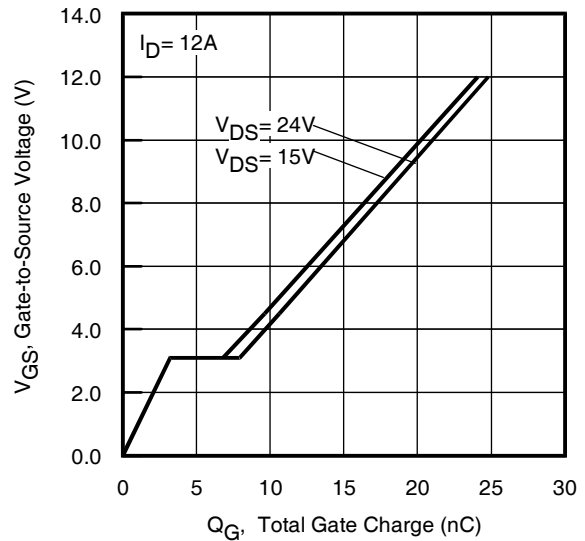


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

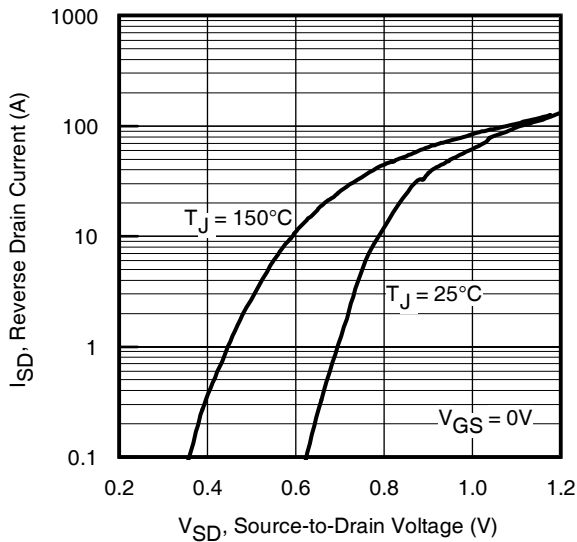


Fig 7. Typical Source-Drain Diode Forward Voltage

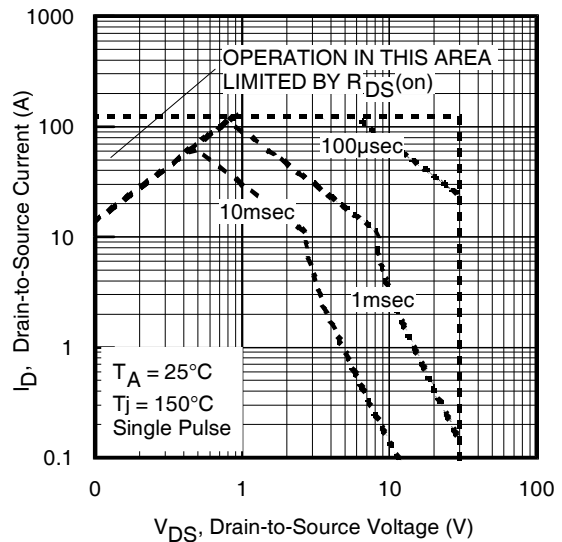


Fig 8. Maximum Safe Operating Area

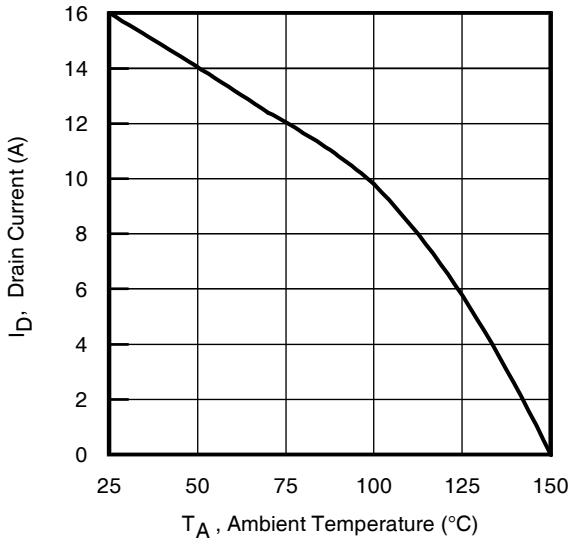


Fig 9. Maximum Drain Current vs. Ambient Temperature

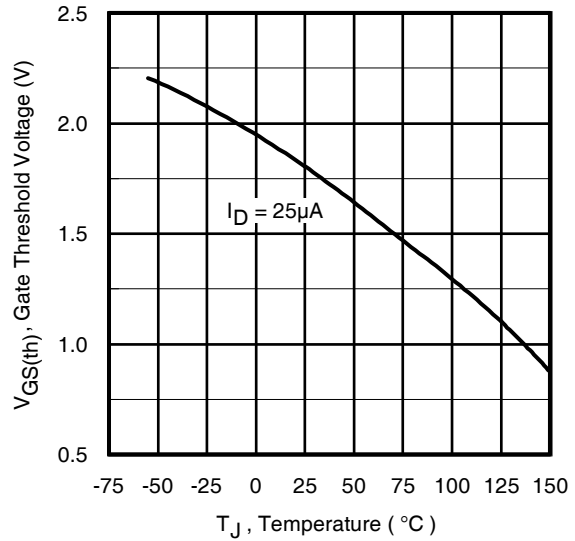


Fig 10. Threshold Voltage Vs. Temperature

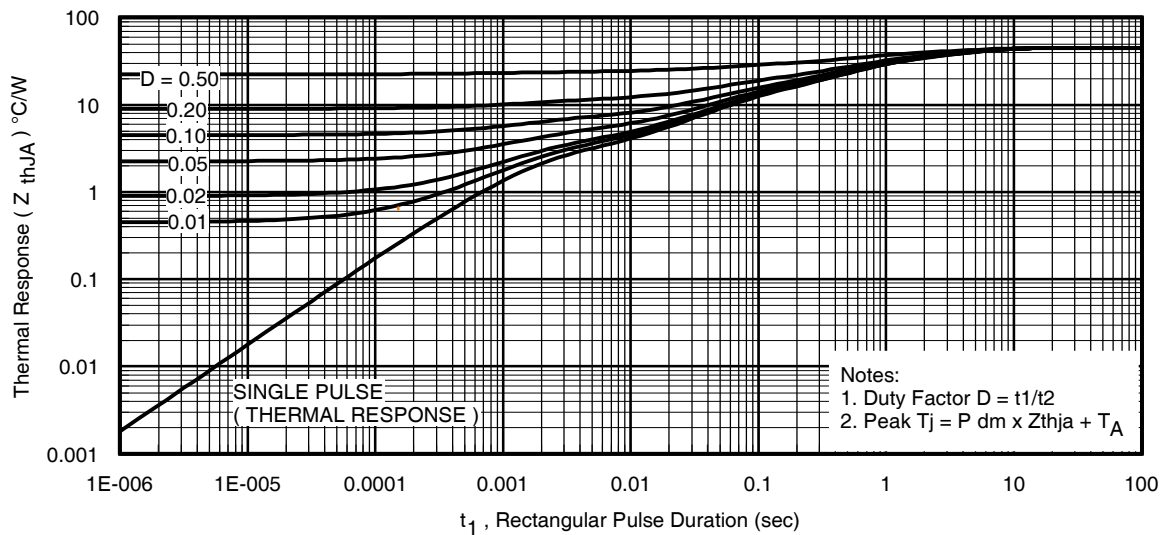


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

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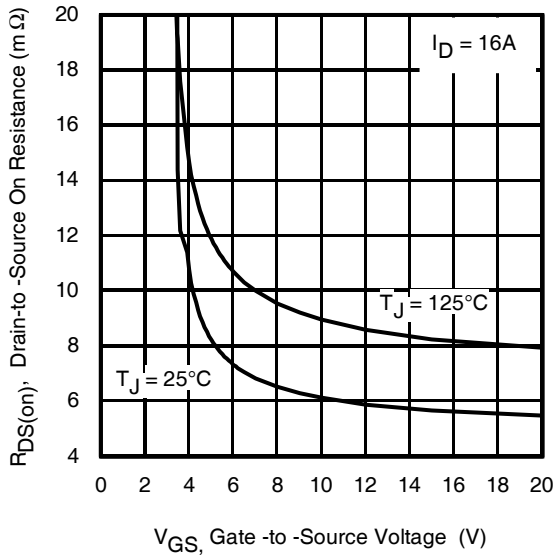


Fig 12. On-Resistance vs. Gate Voltage

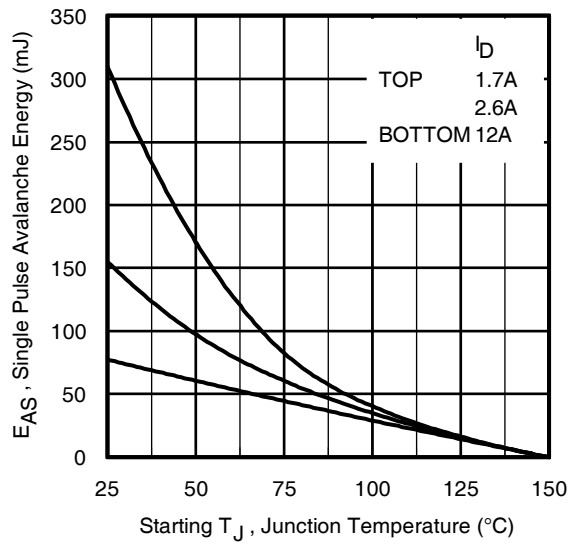


Fig 13. Maximum Avalanche Energy vs. Drain Current

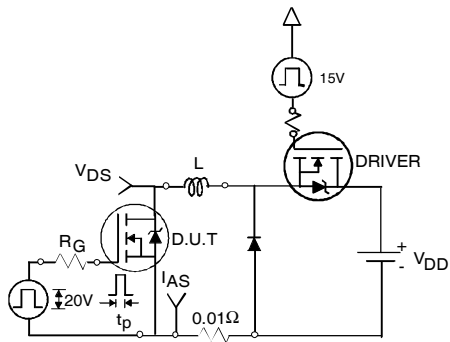


Fig 14a. Unclamped Inductive Test Circuit

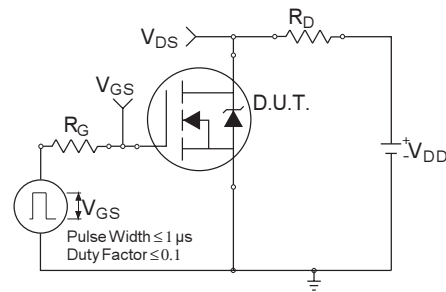


Fig 15a. Switching Time Test Circuit

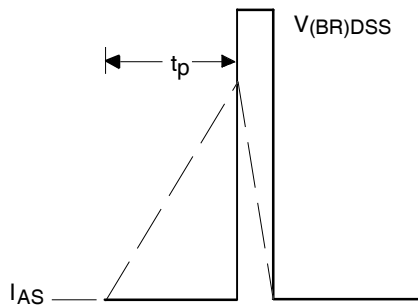


Fig 14b. Unclamped Inductive Waveforms

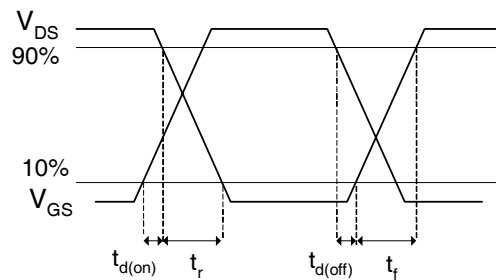


Fig 15b. Switching Time Waveforms

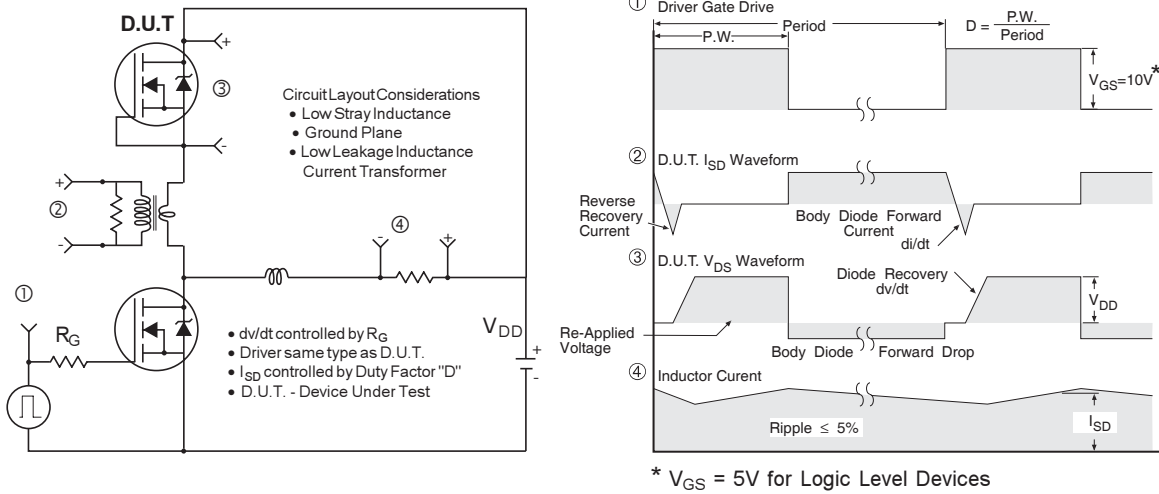


Fig 16. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

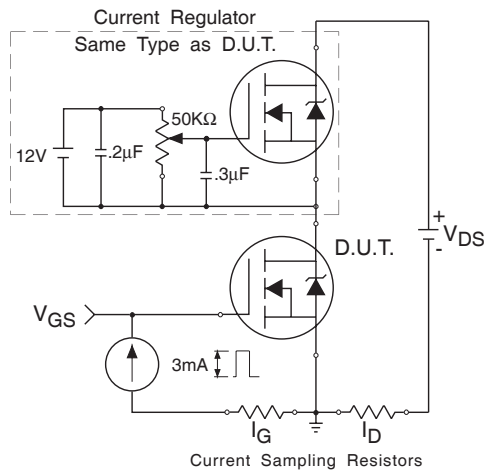


Fig 17. Gate Charge Test Circuit

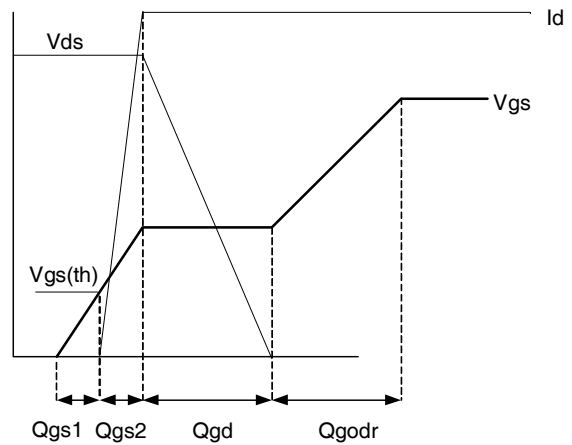
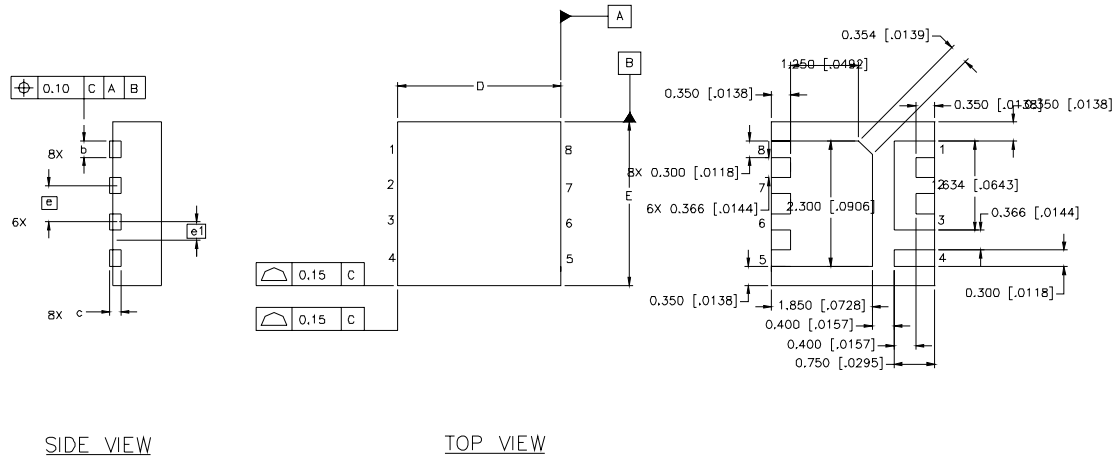


Fig 18. Gate Charge Waveform

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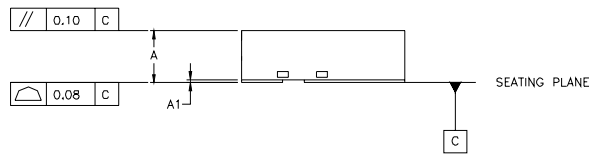
PQFN Package Details



SIDE VIEW

TOP VIEW

BOTTOM VIEW

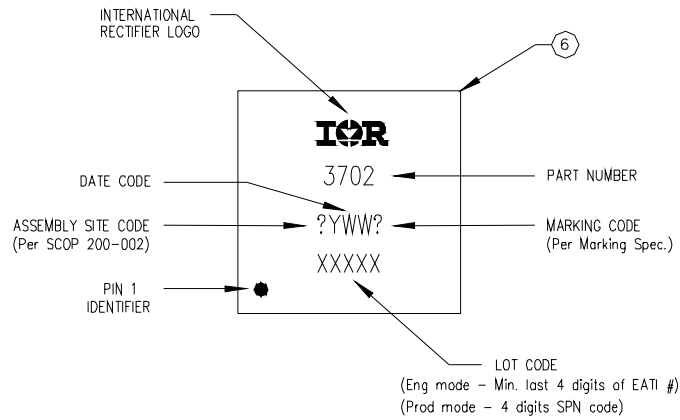


FRONT VIEW

| DIM | INCHES | | MILLIMETERS | |
|-----|-------------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .0315 | .0394 | 0.800 | 1.000 |
| A1 | .0000 | .0020 | 0.000 | 0.050 |
| b | .0098 | .0138 | 0.250 | 0.350 |
| c | .0080 REF. | | 0.203 REF. | |
| D | .1181 BASIC | | 3.000 BASIC | |
| E | .1181 BASIC | | 3.000 BASIC | |
| e | .0262 BASIC | | 0.666 BASIC | |
| e1 | .0131 BASIC | | 0.333 BASIC | |

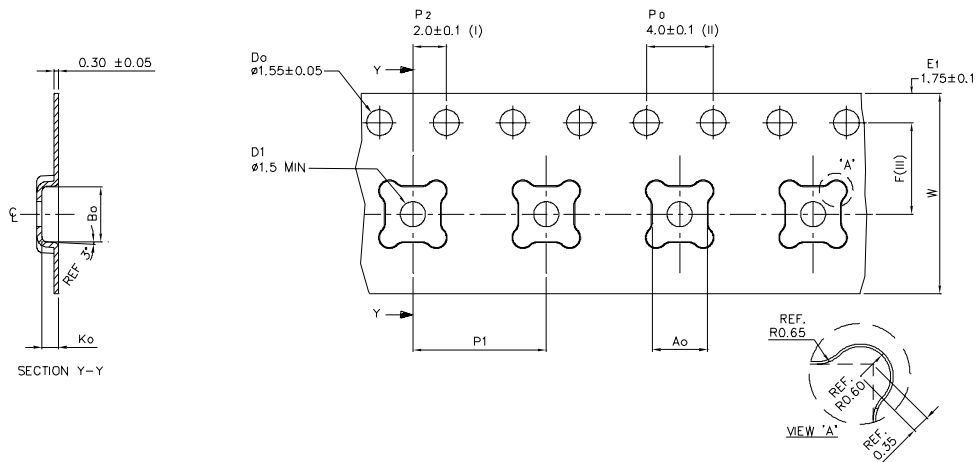
Note: For the most current drawing please refer to IR website at: <http://www.irf.com/package/>

PQFN Part Marking



TOP MARKING (LASER)

PQFN Tape and Reel



| | | |
|----|-------|---------|
| Ao | 3.30 | +/- 0.1 |
| Bo | 3.30 | +/- 0.1 |
| Ko | 1.00 | +/- 0.1 |
| F | 5.50 | +/- 0.1 |
| P1 | 8.00 | +/- 0.1 |
| W | 12.00 | +/- 0.3 |

- (I) Measured from centreline of sprocket hole to centreline of packet.
 - (II) Cumulative tolerance of 10 sprocket holes is ± 0.20 .
 - (III) Measured from centreline of sprocket hole to centreline of packet.
 - (IV) Other material available.
- ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

Note: For the most current drawing please refer to IR website at: <http://www.irf.com/package/>
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| Orderable part number | Package Type | Standard Pack | | Note |
|-----------------------|----------------|---------------|----------|------|
| | | Form | Quantity | |
| IRFH3702TRPBF | PQFN 3mm x 3mm | Tape and Reel | 4000 | |

Qualification information[†]

| | | | |
|----------------------------|---|--|--|
| Qualification level | Consumer ^{††} (per JEDEC JESD47F ^{†††} guidelines) | | |
| Moisture Sensitivity Level | PQFN 3mm x 3mm | MSL1 (per IPC/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.

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 $T_J = 25^\circ\text{C}$, $L = 1.0\text{mH}$, $R_G = 25\Omega$, $I_{AS} = 12\text{A}$.
- ③ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- 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.
- ⑥ Refer to [application note #AN-994](#).

Data and specifications subject to change without notice

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 [Infineon Technologies](#) Information

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