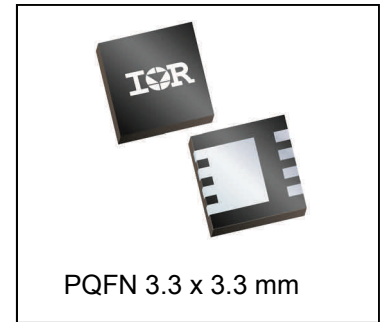
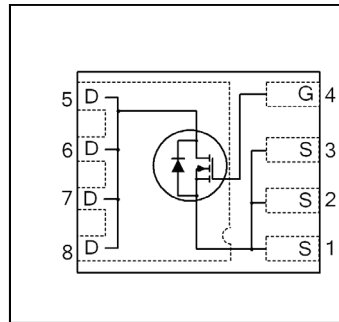


| | | |
|--|-------------|-----------|
| V_{DSS} | 20 | V |
| V_{GS} | ±12 | V |
| $R_{DS(on) max}$ (@ $V_{GS} = 4.5V$) | 2.5 | mΩ |
| (@ $V_{GS} = 2.5V$) | 3.5 | |
| Q_g (typical) | 52 | nC |
| I_D (@ $T_{C(Bottom)} = 25°C$) | 40 Ⓞ | A |



Applications

- Battery Operated DC Motor Inverter MOSFET
- Secondary Side Synchronous Rectification MOSFET

Features

| |
|--|
| Low $R_{DS(on)}$ (< 2.5mΩ) |
| Low Thermal Resistance to PCB (<3.4°C/W) |
| Low Profile (< 1.0 mm) |
| Industry-Standard Pinout |
| Compatible with Existing Surface Mount Techniques |
| RoHS Compliant Containing no Lead, no Bromide and no Halogen |
| MSL1, Industrial Qualification |

results in
⇒

Benefits

| |
|-----------------------------------|
| Lower Conduction Losses |
| 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 | |
| IRLHM620TRPbF | PQFN 3.3mm x 3.3mm | Tape and Reel | 4000 | |
| IRLHM620TR2PbF | PQFN 3.3mm x 3.3mm | Tape and Reel | 400 | EOL notice # 259 |

Absolute Maximum Ratings

| | Parameter | Max. | Units |
|-------------------------------|---|--------------|-------|
| V_{DS} | Drain-to-Source Voltage | 20 | V |
| V_{GS} | Gate-to-Source Voltage | ± 12 | |
| $I_D @ T_A = 25°C$ | Continuous Drain Current, $V_{GS} @ 4.5V$ | 26 | A |
| $I_D @ T_A = 70°C$ | Continuous Drain Current, $V_{GS} @ 4.5V$ | 21 | |
| $I_D @ T_{C(Bottom)} = 25°C$ | Continuous Drain Current, $V_{GS} @ 4.5V$ | 40Ⓞ | |
| $I_D @ T_{C(Bottom)} = 100°C$ | Continuous Drain Current, $V_{GS} @ 4.5V$ | 40Ⓞ | |
| I_{DM} | Pulsed Drain Current ① | 160 | |
| $P_D @ T_A = 25°C$ | Power Dissipation ⑤ | 2.7 | W |
| $P_D @ T_{C(Bottom)} = 25°C$ | Power Dissipation ⑤ | 37 | |
| | Linear Derating Factor ⑤ | 0.022 | W/°C |
| T_J T_{STG} | Operating Junction and Storage Temperature Range | -55 to + 150 | °C |

Notes ① through ⑥ are on page 9

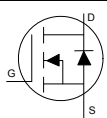
Static @ T_J = 25°C (unless otherwise specified)

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|-------------------------------------|--------------------------------------|------|------|------|-------|---|
| BV _{DSS} | Drain-to-Source Breakdown Voltage | 20 | — | — | V | V _{GS} = 0V, I _D = 250μA |
| ΔBV _{DSS} /ΔT _J | Breakdown Voltage Temp. Coefficient | — | 5.4 | — | mV/°C | Reference to 25°C, I _D = 1mA |
| R _{DS(on)} | Static Drain-to-Source On-Resistance | — | 1.5 | 2.2 | mΩ | V _{GS} = 10V, I _D = 20A ③ |
| | | — | 1.8 | 2.5 | | V _{GS} = 4.5V, I _D = 20A ③ |
| | | — | 2.7 | 3.5 | | V _{GS} = 2.5V, I _D = 20A ③ |
| V _{GS(th)} | Gate Threshold Voltage | 0.5 | 0.8 | 1.1 | V | V _{DS} = V _{GS} , I _D = 50μA |
| ΔV _{GS(th)} | Gate Threshold Voltage Coefficient | — | -4.3 | — | mV/°C | |
| I _{DSS} | Drain-to-Source Leakage Current | — | — | 1 | μA | V _{DS} = 16V, V _{GS} = 0V |
| | | — | — | 150 | | V _{DS} = 16V, V _{GS} = 0V, T _J = 125°C |
| I _{GSS} | Gate-to-Source Forward Leakage | — | — | 100 | nA | V _{GS} = 12V |
| | Gate-to-Source Reverse Leakage | — | — | -100 | | V _{GS} = -12V |
| g _{fs} | Forward Transconductance | 58 | — | — | S | V _{DS} = 10V, I _D = 20A |
| Q _g | Total Gate Charge | — | 52 | 78 | nC | V _{DS} = 10V |
| Q _{gs} | Gate-to-Source Charge | — | 6.3 | — | | V _{GS} = 4.5V |
| Q _{gd} | Gate-to-Drain Charge | — | 25 | — | | I _D = 20A (See Fig.17 & 18) |
| R _G | Gate Resistance | — | 2.6 | — | Ω | |
| t _{d(on)} | Turn-On Delay Time | — | 7.5 | — | ns | V _{DD} = 10V, V _{GS} = 4.5V |
| t _r | Rise Time | — | 25 | — | | I _D = 20A |
| t _{d(off)} | Turn-Off Delay Time | — | 57 | — | | R _G = 1.0Ω |
| t _f | Fall Time | — | 37 | — | | See Fig.15 |
| C _{iss} | Input Capacitance | — | 3620 | — | pF | V _{GS} = 0V |
| C _{oss} | Output Capacitance | — | 900 | — | | V _{DS} = 10V |
| C _{rss} | Reverse Transfer Capacitance | — | 620 | — | | f = 1.0MHz |

Avalanche Characteristics

| | Parameter | Typ. | Max. | Units |
|-------------------------------------|---------------------------------|------|------|-------|
| E _{AS} (Thermally limited) | Single Pulse Avalanche Energy ② | — | 120 | mJ |
| I _{AR} | Avalanche Current ① | — | 20 | A |

Diode Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|-----------------|--|------|------|------|-------|--|
| I _S | Continuous Source Current (Body Diode) | — | — | 40⑥ | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I _{SM} | Pulsed Source Current (Body Diode) ① | — | — | 160 | | |
| V _{SD} | Diode Forward Voltage | — | — | 1.2 | V | T _J = 25°C, I _S = 20A, V _{GS} = 0V ③ |
| t _{rr} | Reverse Recovery Time | — | 41 | 62 | ns | T _J = 25°C, I _F = 20A, V _{DD} = 10V |
| Q _{rr} | Reverse Recovery Charge | — | 68 | 100 | nC | di/dt = 220A/μs ③ |

Thermal Resistance

| | Parameter | Typ. | Max. | Units |
|---------------------------|-----------------------|------|------|-------|
| R _{θJC} (Bottom) | Junction-to-Case ④ | — | 3.4 | °C/W |
| R _{θJC} (Top) | Junction-to-Case ④ | — | 37 | |
| R _{θJA} | Junction-to-Ambient ⑤ | — | 46 | |
| R _{θJA} (<10s) | Junction-to-Ambient ⑤ | — | 31 | |

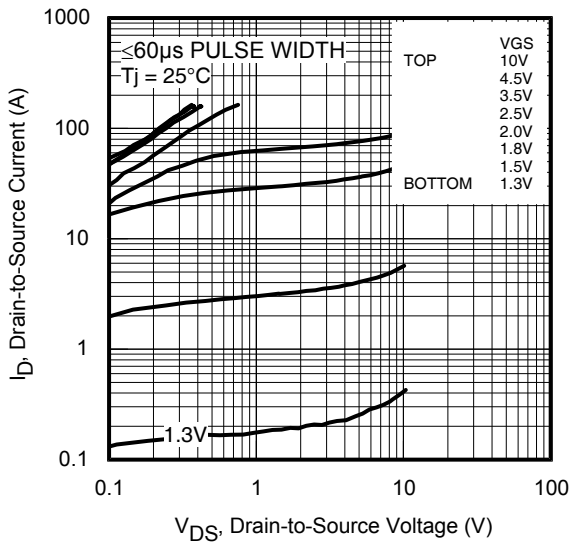


Fig 1. Typical Output Characteristics

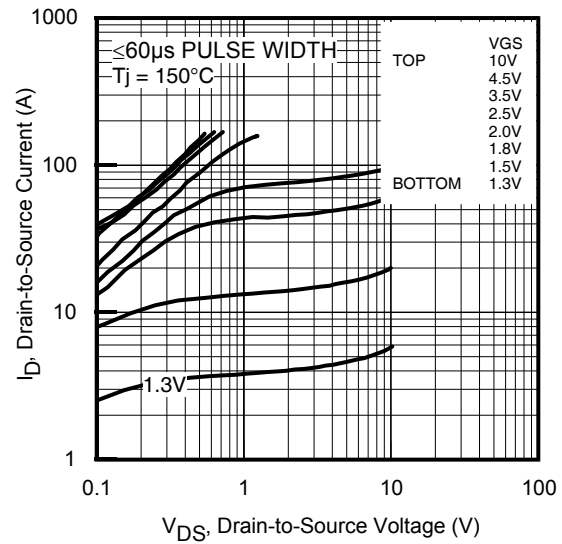


Fig 2. Typical Output Characteristics

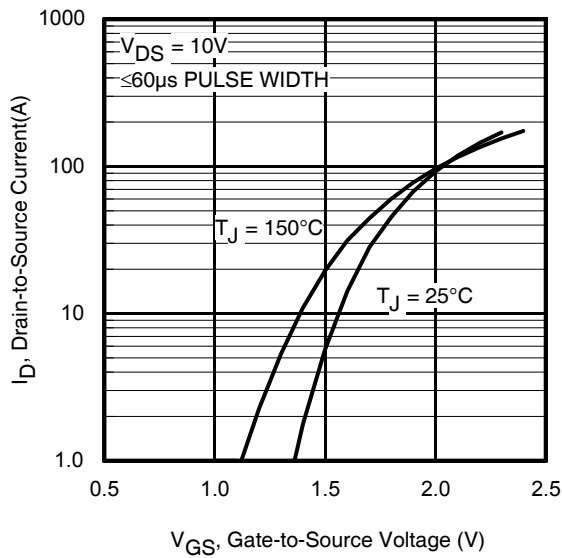


Fig 3. Typical Transfer Characteristics

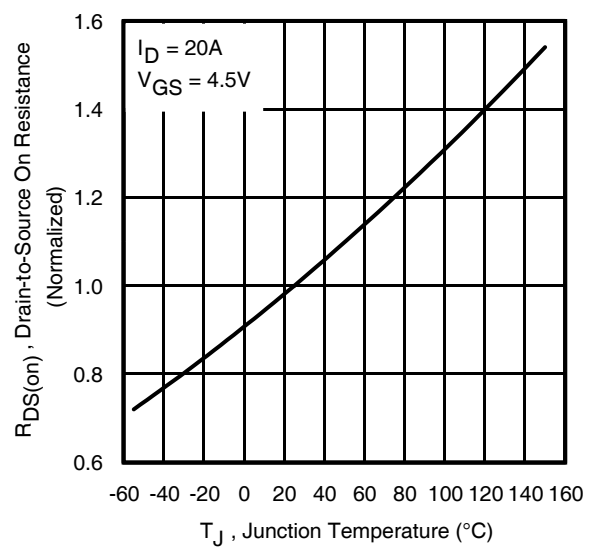


Fig 4. Normalized On-Resistance vs. Temperature

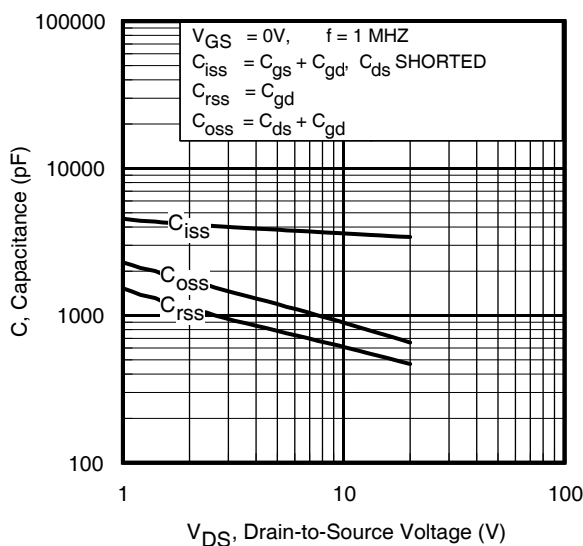


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

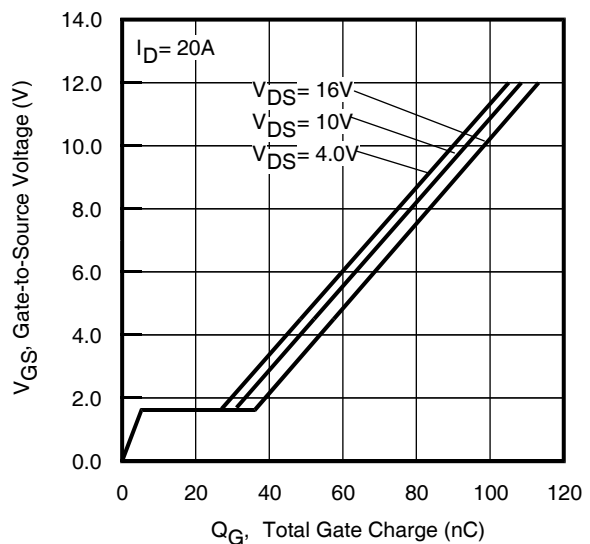


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

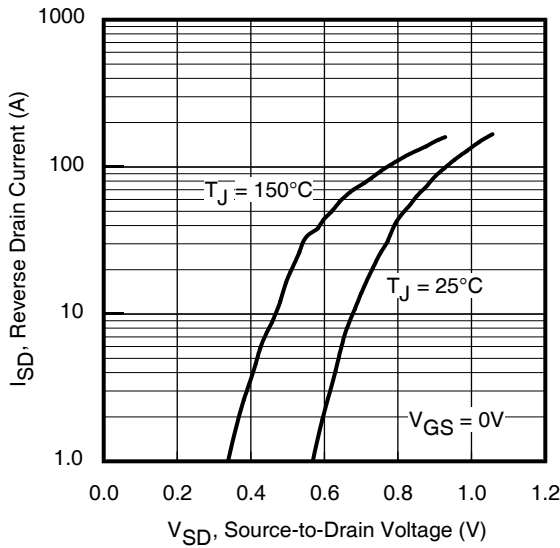


Fig 7. Typical Source-Drain Diode Forward Voltage

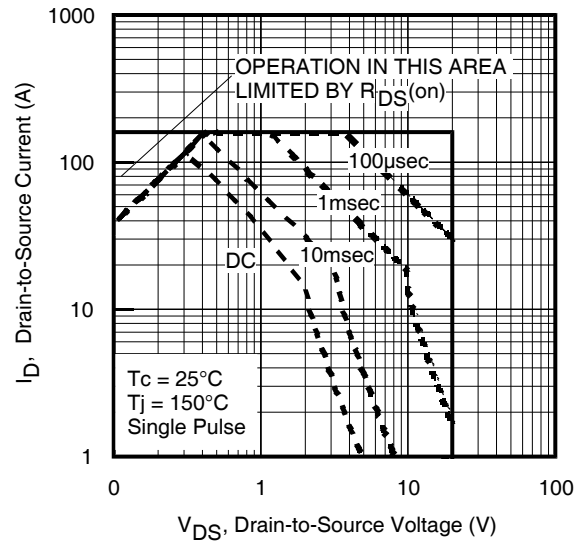


Fig 8. Maximum Safe Operating Area

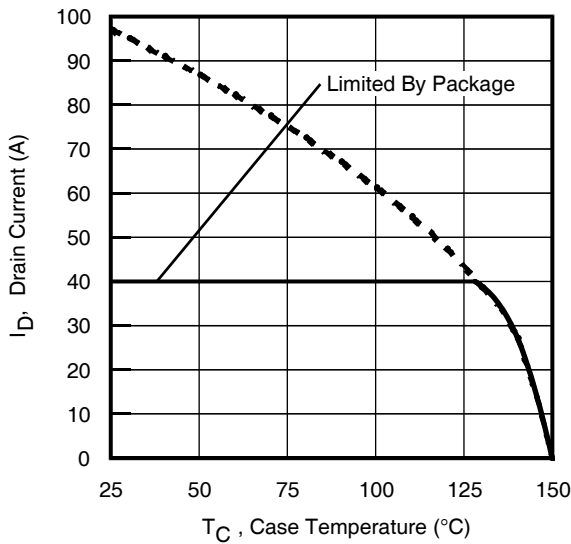


Fig 9. Maximum Drain Current vs. Case Temperature

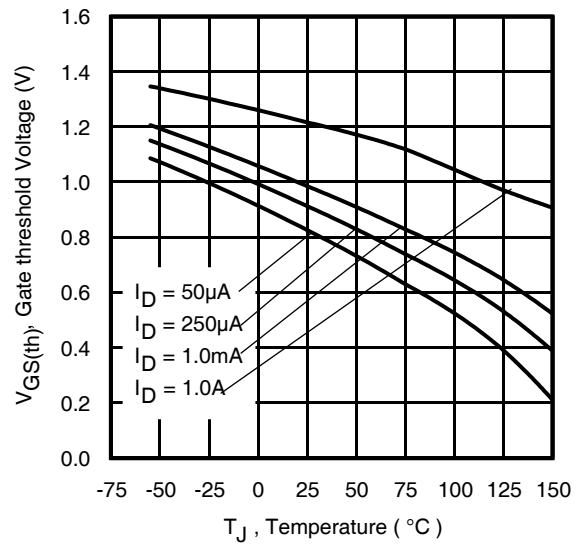


Fig 10. Threshold Voltage Vs. Temperature

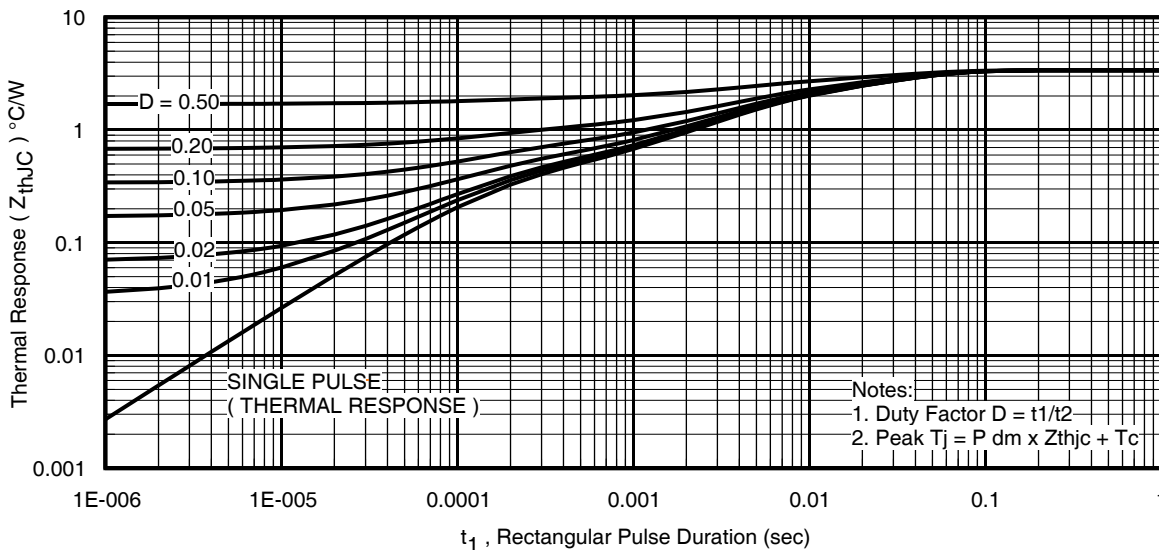


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

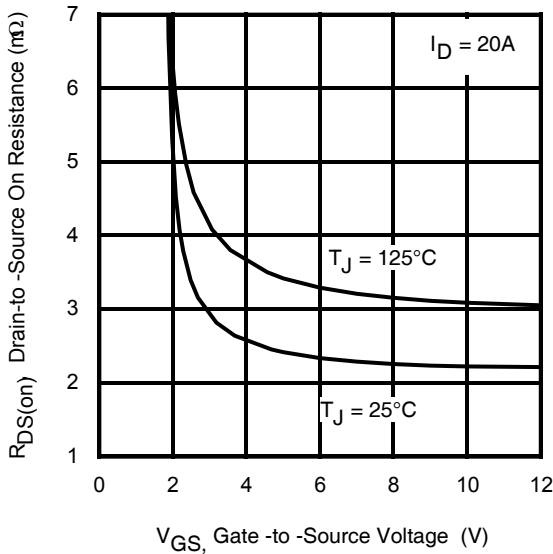


Fig 12. On-Resistance vs. Gate Voltage

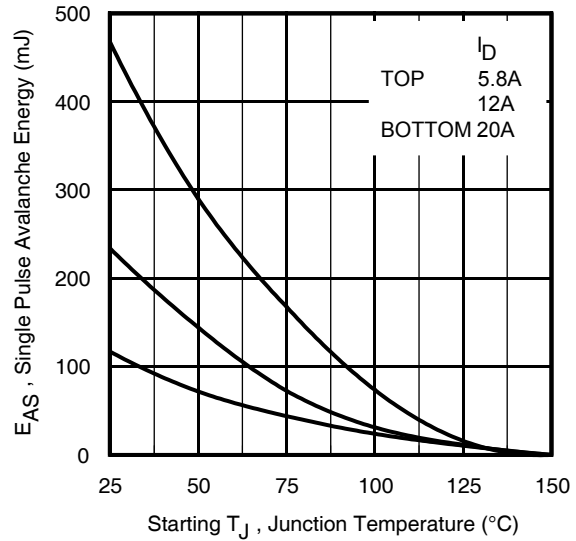


Fig 13. Maximum Avalanche Energy vs. Drain Current

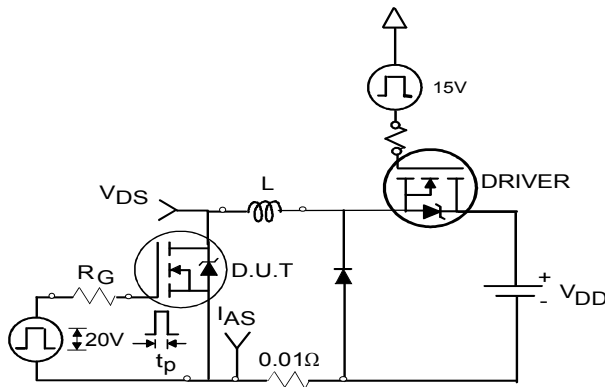


Fig 14a. Unclamped Inductive Test Circuit

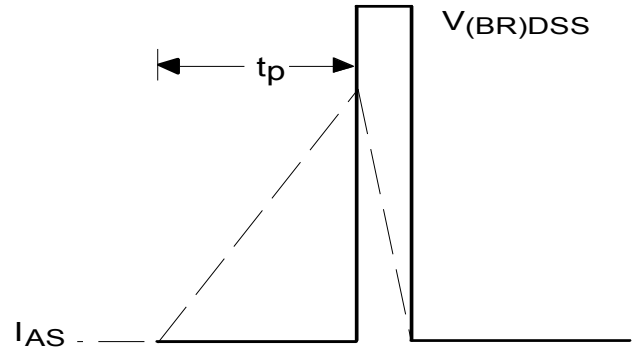


Fig 14b. Unclamped Inductive Waveforms

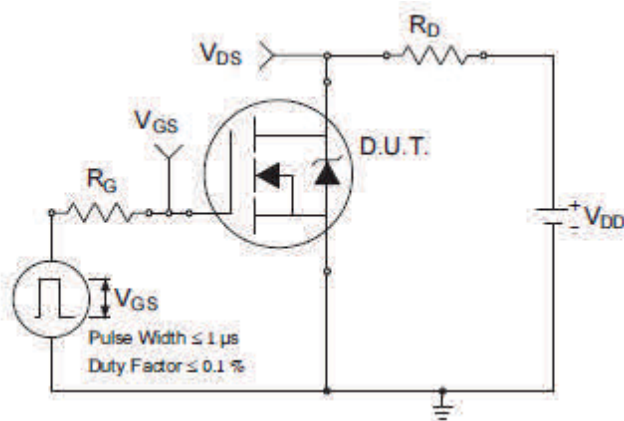


Fig 15a. Switching Time Test Circuit

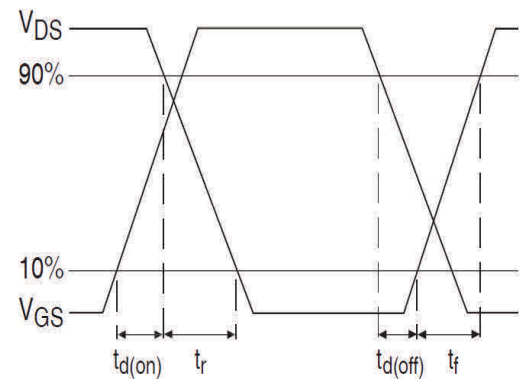


Fig 15b. Switching Time Waveforms

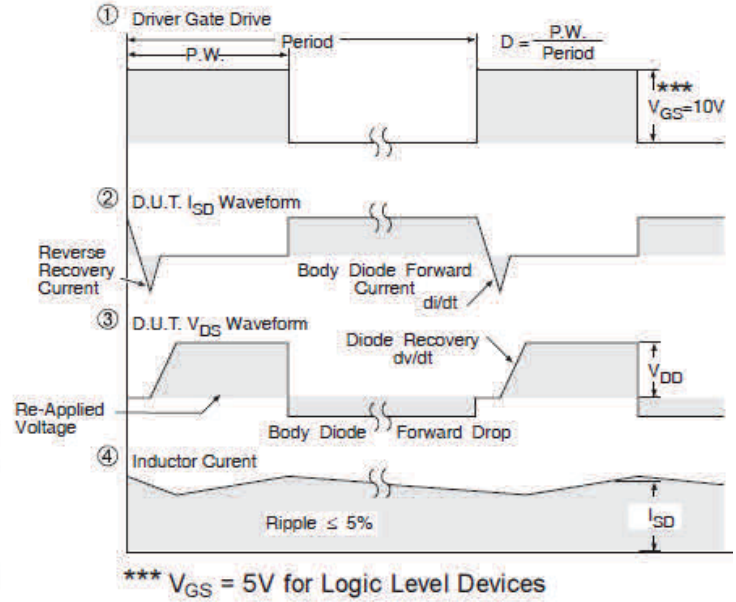
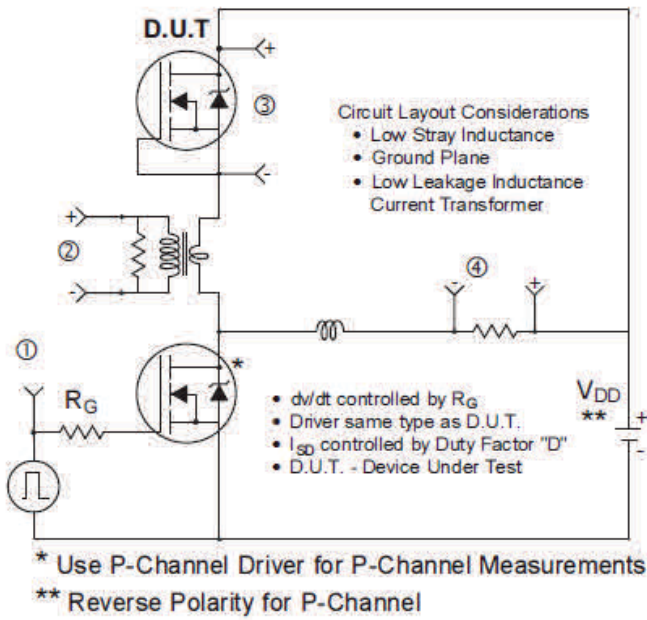


Fig 16. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

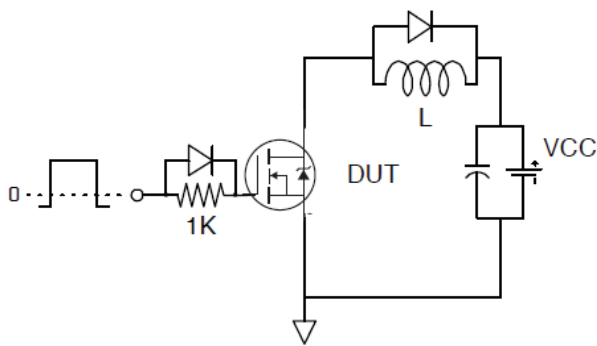


Fig 17. Gate Charge Test Circuit

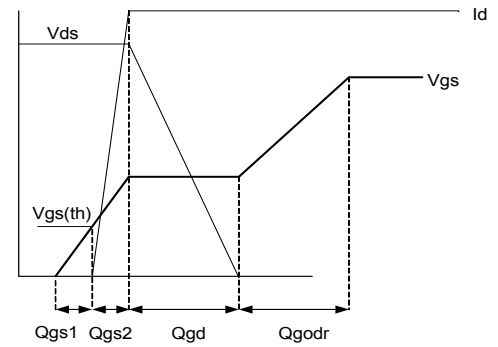
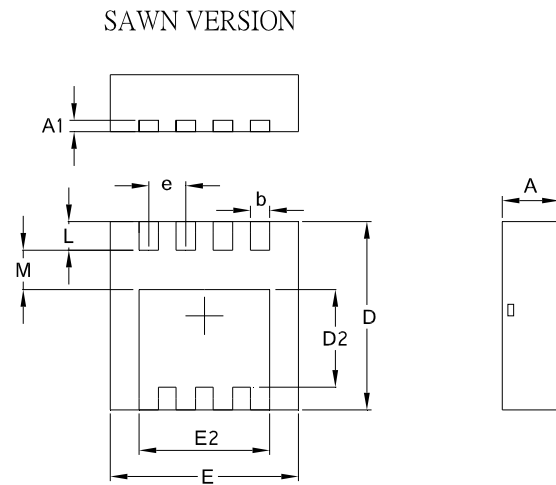


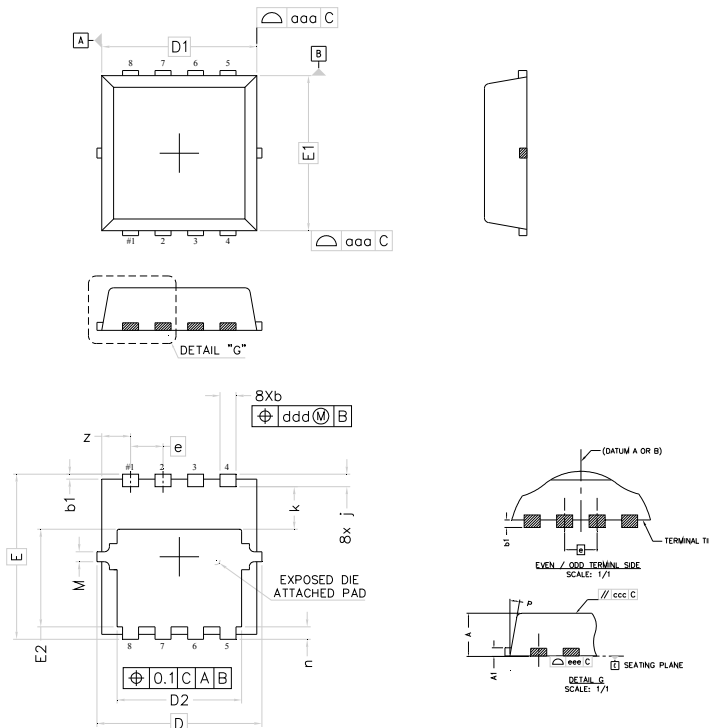
Fig 18. Gate Charge Waveform

PQFN 3.3 x 3.3 Outline "B" Package Details



| SYMBOL | COMMON | | | |
|--------|----------|-------|------------|--------|
| | MM | | INCH | |
| | MIN. | MAX. | MIN. | MAX. |
| A | 0.70 | 1.05 | 0.0276 | 0.0413 |
| A1 | 0.12 | 0.39 | 0.0047 | 0.0154 |
| b | 0.25 | 0.39 | 0.0098 | 0.0154 |
| D | 3.20 | 3.45 | 0.1260 | 0.1358 |
| D1 | 3.00 | 3.20 | 0.1181 | 0.1417 |
| D2 | 1.69 | 2.20 | 0.0665 | 0.0866 |
| E | 3.20 | 3.40 | 0.1260 | 0.1339 |
| E1 | 3.00 | 3.20 | 0.1181 | 0.1417 |
| E2 | 2.15 | 2.59 | 0.0846 | 0.1020 |
| e | 0.65 BSC | | 0.0256 BSC | |
| L | 0.15 | 0.55 | 0.0059 | 0.0217 |
| M | 0.59 | — | 0.0232 | — |
| O | 9Deg | 12Deg | 9Deg | 12Deg |

PQFN 3.3 x 3.3 Outline "G" Package Details



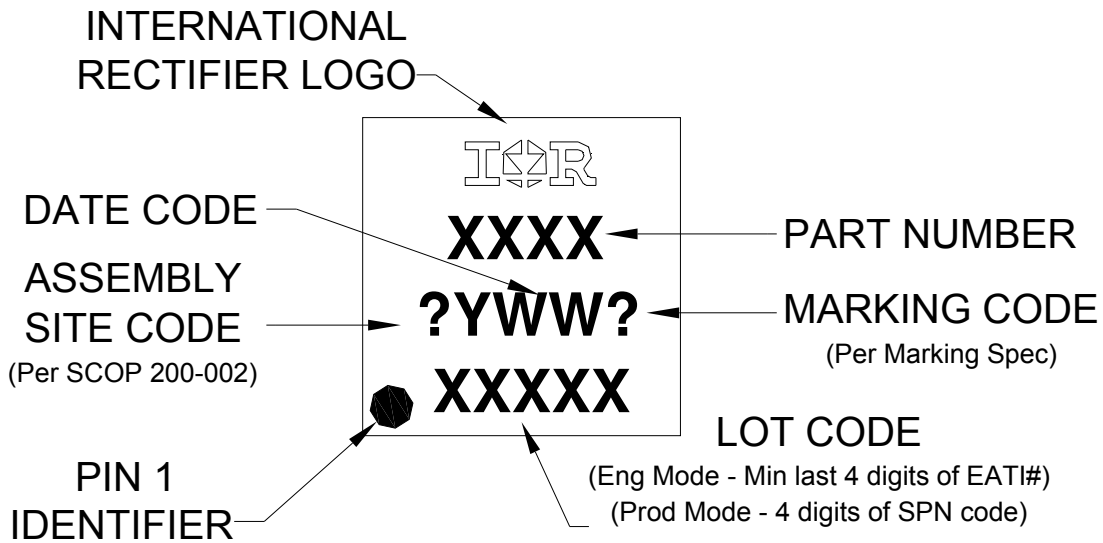
| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.80 | 0.90 | .0315 | .0354 |
| A1 | 0.12 | 0.22 | .0047 | .0086 |
| b | 0.22 | 0.42 | .0087 | .0165 |
| b1 | 0.05 | 0.15 | .0020 | .0059 |
| D | 3.30 BSC | | .1299 BSC | |
| D1 | 3.10 BSC | | .1220 BSC | |
| D2 | 2.29 | 2.69 | .0902 | .1059 |
| E | 3.30 BSC | | .1299 BSC | |
| E1 | 3.10 BSC | | .1220 BSC | |
| E2 | 1.85 | 2.05 | .0728 | .0807 |
| e | 0.65 BSC | | .0255 BSC | |
| j | 0.15 | 0.35 | .0059 | .0137 |
| k | 0.75 | 0.95 | .0295 | .0374 |
| n | 0.15 | 0.35 | .0059 | .0137 |
| M | NOM. | 0.20 | NOM. | .0078 |
| P | 9° | 11° | 9° | 11° |

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 3.3 x 3.3 Part Marking



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

PQFN 3.3 x 3.3 Tape and Reel

REEL DIMENSIONS

TAPE DIMENSIONS

| CODE | DIMENSION (MM) | | DIMENSION (INCH) | |
|----------------|----------------|-------|------------------|------|
| | MIN | MAX | MIN | MAX |
| Ao | 3.50 | 3.70 | .138 | .146 |
| Bo | 3.50 | 3.70 | .138 | .146 |
| Ko | 1.10 | 1.30 | .043 | .051 |
| P ₁ | 7.90 | 8.10 | .311 | .319 |
| W | 11.80 | 12.20 | .465 | .480 |
| W ₁ | 12.30 | 12.50 | .484 | .492 |
| Qty | 4000 | | | |
| Reel Diameter | 13 Inches | | | |

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

| CODE | DESCRIPTION |
|----------------|---|
| Ao | Dimension design to accommodate the component width |
| Bo | Dimension design to accommodate the component length |
| Ko | Dimension design to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P ₁ | Pitch between successive cavity centers |

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

Qualification Information†

| | | |
|-----------------------------------|--|----------------------------------|
| Qualification Level | Industrial (per JEDEC JESD47F†† guidelines) | |
| Moisture Sensitivity Level | PQFN 3.3mm x 3.3mm | MSL1 (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>

†† Applicable version of JEDEC standard at the time of product release.

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting $T_J = 25^\circ\text{C}$, $L = 0.59\text{mH}$, $R_G = 50\Omega$, $I_{AS} = 12\text{A}$.
- ③ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ④ R_θ is measured at T_J of approximately 90°C .
- ⑤ When mounted on 1 inch square PCB (FR-4). Please refer to AN-994 for more details:
<http://www.irf.com/technical-info/appnotes/an-994.pdf>
- ⑥ Calculated continuous current based on maximum allowable junction temperature. Package is limited to 40A by production test capability.

| Revision History | |
|-------------------------|--|
| Date | Comments |
| 1/14/2014 | <ul style="list-style-type: none"> • Updated ordering information to reflect the End-Of-life (EOL) of the mini-reel option (EOL notice #259) • Updated data sheet with new IR corporate template |
| 5/29/2015 | <ul style="list-style-type: none"> • Added R_{dson} typical = "1.5mΩ", Max = "2.2mΩ" @ $V_{\text{GS}}=10\text{V}$, $I_{\text{D}}=20\text{A}$ on page 2. • Updated R_{dson} typical from "2mΩ" to "1.8mΩ" @ $V_{\text{GS}}=4.5\text{V}$, $I_{\text{D}}=20\text{A}$ on page 2. • Updated package outline and tape and Reel on page 7 & 8. |
| 9/25/2015 | <ul style="list-style-type: none"> • Updated package outline to reflect the PCN # (67-PCN90-Public-R2) for "option B" and added package outline for "option G" on page 7 • Updated "IFX" logo on all pages. |

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