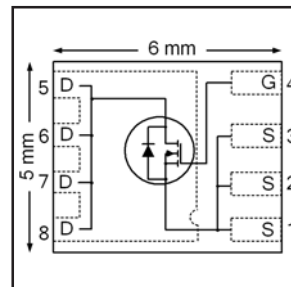


| | | |
|--|--------------|-----------|
| V_{DS} | 40 | V |
| R_{DS(on)} max (@ V _{GS} = 10V) | 2.6 | mΩ |
| Q_g (typical) | 73 | nC |
| R_G (typical) | 1.2 | Ω |
| I_D (@ T _{mb} = 25°C) | 100 Ⓢ | A |



Applications

- Secondary Side Synchronous Rectification
- Inverters for DC Motors
- DC-DC Brick Applications
- Boost Converters

Features and Benefits

Features

| |
|--|
| Low R _{DS(on)} (≤ 2.6mΩ) |
| Low Thermal Resistance to PCB (≤ 0.8°C/W) |
| 100% R _g tested |
| Low Profile (≤ 0.9 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 |
| Enables better thermal dissipation |
| Increased Reliability |
| Increased Power Density |
| Multi-Vendor Compatibility |
| Easier Manufacturing |
| Environmentally Friendlier |
| Increased Reliability |

| Base Part Number | Package Type | Standard Pack | | Orderable part number | Note |
|------------------|----------------|---------------|----------|-----------------------|-----------------|
| | | Form | Quantity | | |
| IRFH5004PBF | PQFN 5mm x 6mm | Tape and Reel | 4000 | IRFH5004TRPBF | |
| | PQFN 5mm x 6mm | Tape and Reel | 1000 | IRFH5004TR2PBF | EOL notice #259 |

Absolute Maximum Ratings

| | Parameter | Max. | Units |
|--|---|--------------|-------|
| V _{DS} | Drain-to-Source Voltage | 40 | V |
| V _{GS} | Gate-to-Source Voltage | ±20 | |
| I _D @ T _A = 25°C | Continuous Drain Current, V _{GS} @ 10V | 28 | A |
| I _D @ T _A = 70°C | Continuous Drain Current, V _{GS} @ 10V | 23 | |
| I _D @ T _{mb} = 25°C | Continuous Drain Current, V _{GS} @ 10V | 100Ⓢ | |
| I _D @ T _{mb} = 100°C | Continuous Drain Current, V _{GS} @ 10V | 100Ⓢ | |
| I _{DM} | Pulsed Drain Current ① | 400 | |
| P _D @ T _A = 25°C | Power Dissipation ⑤ | 3.6 | W |
| P _D @ T _{mb} = 25°C | Power Dissipation ⑤ | 156 | |
| | Linear Derating Factor ⑤ | 0.029 | W/°C |
| T _J | Operating Junction and | -55 to + 150 | °C |
| T _{STG} | Storage Temperature Range | | |

Notes ① through ⑤ are on page 8

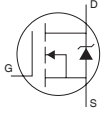
Static @ T_J = 25°C (unless otherwise specified)

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|-------------------------------------|---|------|------|------|-------|--|
| BV _{DSS} | Drain-to-Source Breakdown Voltage | 40 | — | — | V | V _{GS} = 0V, I _D = 250μA |
| ΔBV _{DSS} /ΔT _J | Breakdown Voltage Temp. Coefficient | — | 0.04 | — | V/°C | Reference to 25°C, I _D = 1mA |
| R _{DS(on)} | Static Drain-to-Source On-Resistance | — | 2.1 | 2.6 | mΩ | V _{GS} = 10V, I _D = 50A ③ |
| V _{GS(th)} | Gate Threshold Voltage | 2.0 | — | 4.0 | V | V _{DS} = V _{GS} , I _D = 150μA |
| ΔV _{GS(th)} | Gate Threshold Voltage Coefficient | — | -5.6 | — | mV/°C | |
| I _{DSS} | Drain-to-Source Leakage Current | — | — | 20 | μA | V _{DS} = 40V, V _{GS} = 0V |
| | | — | — | 250 | | V _{DS} = 40V, 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 | 91 | — | — | S | V _{DS} = 15V, I _D = 50A |
| Q _g | Total Gate Charge | — | 73 | 110 | nC | V _{DS} = 20V V _{GS} = 10V I _D = 50A See Fig. 17 & 18 |
| Q _{gs1} | Pre-V _{th} Gate-to-Source Charge | — | 15 | — | | |
| Q _{gs2} | Post-V _{th} Gate-to-Source Charge | — | 6.1 | — | | |
| Q _{gd} | Gate-to-Drain Charge | — | 27 | — | | |
| Q _{godr} | Gate Charge Overdrive | — | 25 | — | | |
| Q _{sw} | Switch Charge (Q _{gs2} + Q _{gd}) | — | 33.1 | — | | |
| Q _{oss} | Output Charge | — | 27 | — | nC | V _{DS} = 16V, V _{GS} = 0V |
| R _G | Gate Resistance | — | 1.2 | — | Ω | |
| t _{d(on)} | Turn-On Delay Time | — | 13 | — | ns | V _{DD} = 20V, V _{GS} = 10V I _D = 50A R _G = 1.8Ω See Fig. 15 |
| t _r | Rise Time | — | 39 | — | | |
| t _{d(off)} | Turn-Off Delay Time | — | 28 | — | | |
| t _f | Fall Time | — | 16 | — | | |
| C _{iss} | Input Capacitance | — | 4490 | — | pF | V _{GS} = 0V V _{DS} = 20V f = 1.0MHz |
| C _{oss} | Output Capacitance | — | 970 | — | | |
| C _{rss} | Reverse Transfer Capacitance | — | 460 | — | | |

Avalanche Characteristics

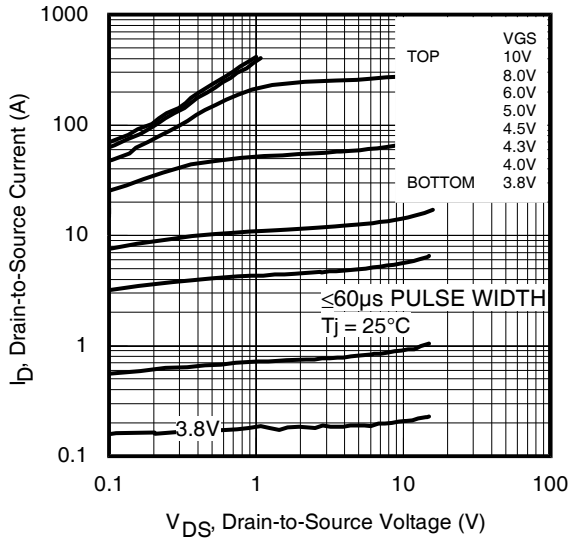
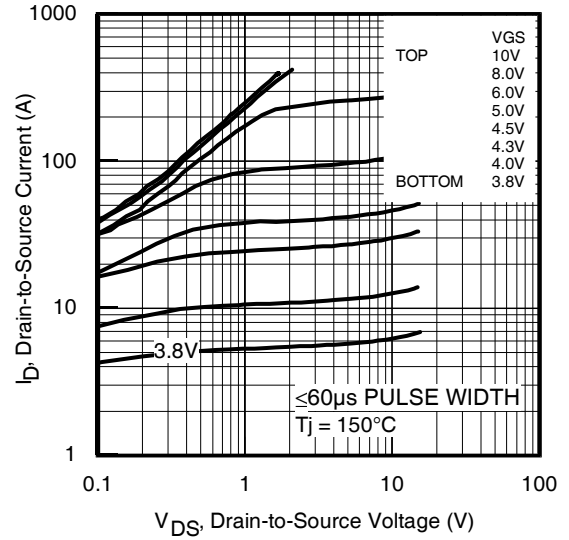
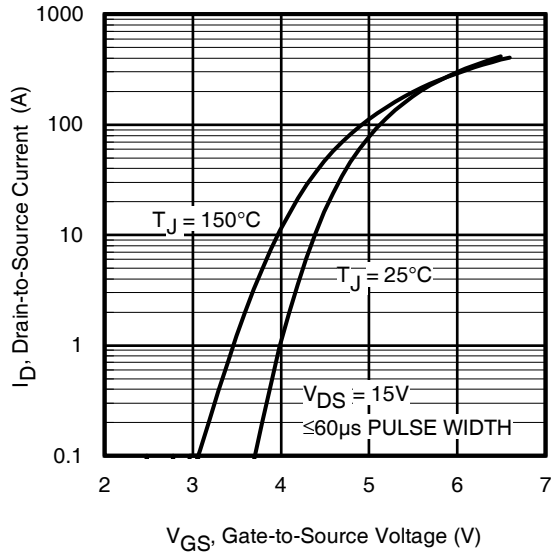
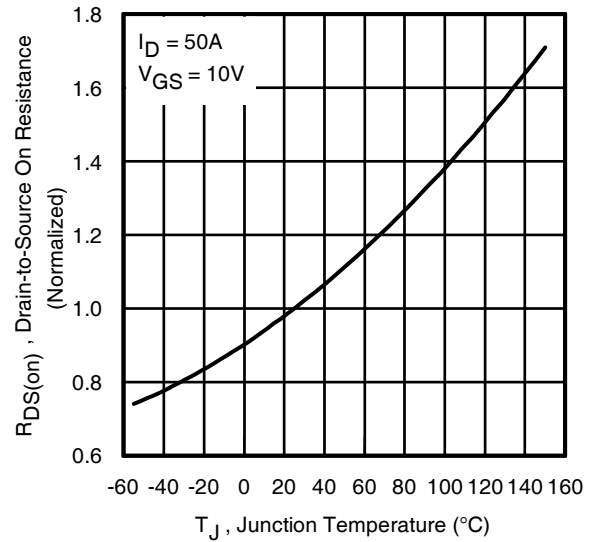
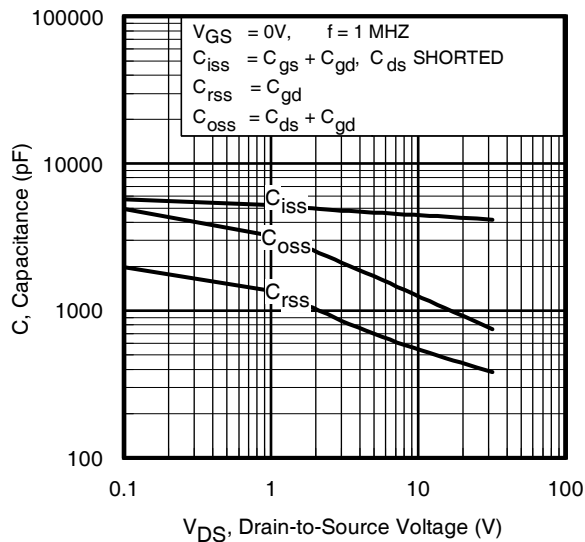
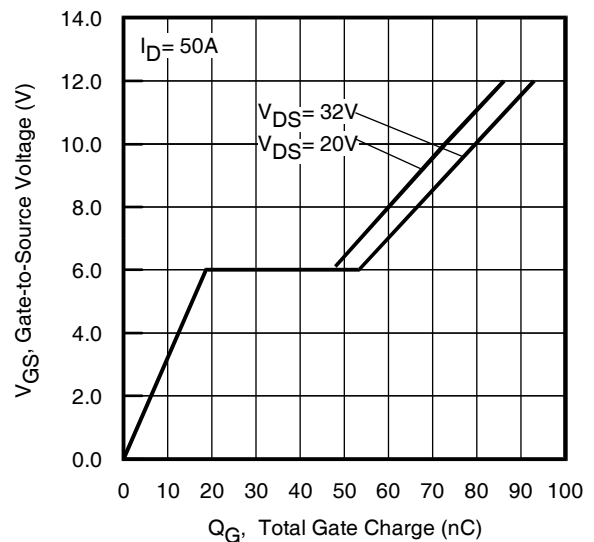
| | Parameter | Typ. | Max. | Units |
|-----------------|---------------------------------|------|------|-------|
| E _{AS} | Single Pulse Avalanche Energy ② | — | 340 | mJ |
| I _{AR} | Avalanche Current ① | — | 50 | A |

Diode Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|-----------------|--|---|------|------|-------|--|
| I _S | Continuous Source Current (Body Diode) ⑥ | — | — | 100 | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I _{SM} | Pulsed Source Current (Body Diode) ① | — | — | 400 | | |
| V _{SD} | Diode Forward Voltage | — | — | 1.0 | V | T _J = 25°C, I _S = 50A, V _{GS} = 0V ③ |
| t _{rr} | Reverse Recovery Time | — | 32 | 48 | ns | T _J = 25°C, I _F = 50A, V _{DD} = 20V |
| Q _{rr} | Reverse Recovery Charge | — | 100 | 150 | nC | di/dt = 300A/μs ③ |
| t _{on} | Forward Turn-On Time | Time is dominated by parasitic Inductance | | | | |

Thermal Resistance

| | Parameter | Typ. | Max. | Units |
|-------------------------|---------------------------|------|------|-------|
| R _{θJC-mb} | Junction-to-Mounting Base | 0.5 | 0.8 | °C/W |
| R _{θJC} (Top) | Junction-to-Case ④ | — | 15 | |
| R _{θJA} | Junction-to-Ambient ⑤ | — | 35 | |
| R _{θJA} (<10s) | Junction-to-Ambient ⑤ | — | 33 | |


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

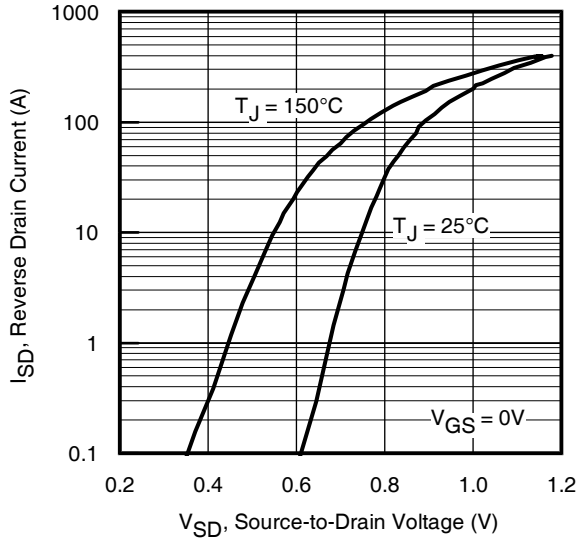


Fig 7. Typical Source-Drain Diode Forward Voltage

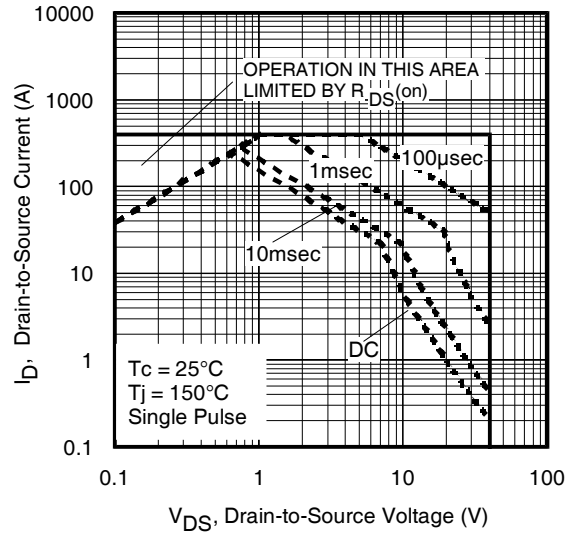


Fig 8. Maximum Safe Operating Area

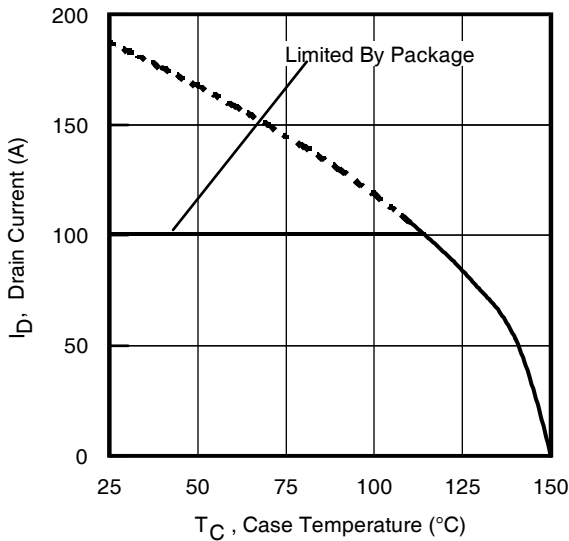


Fig 9. Maximum Drain Current vs. Case Temperature

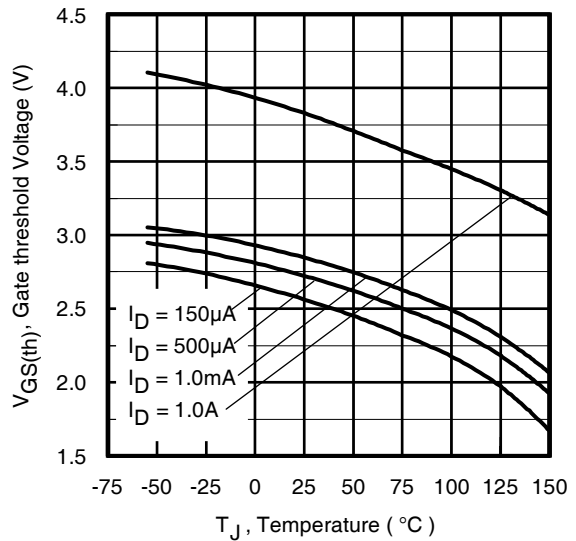


Fig 10. Threshold Voltage vs. Temperature

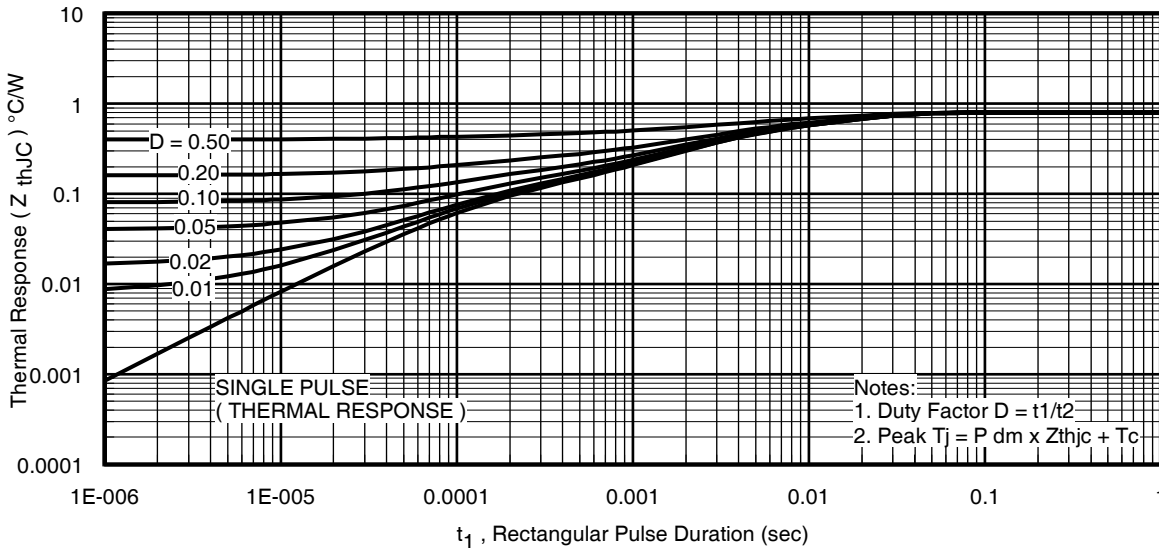


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Mounting Base

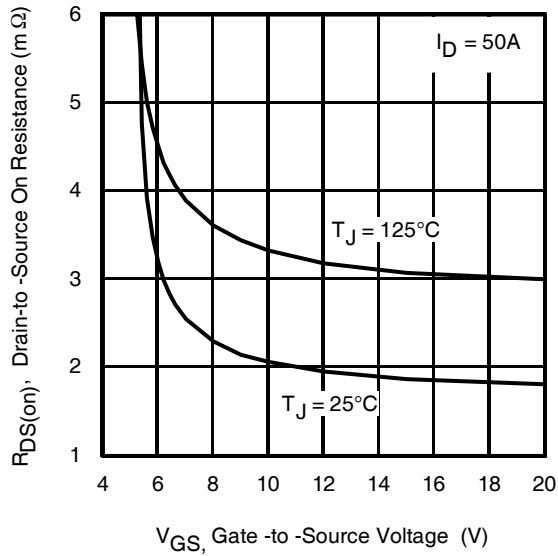


Fig 12. On-Resistance vs. Gate Voltage

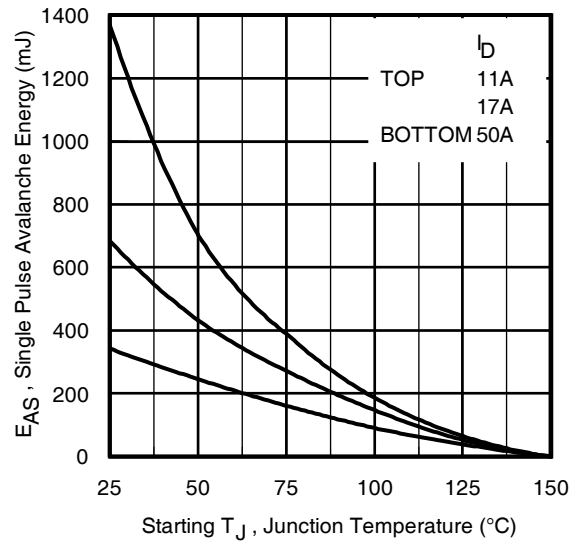


Fig 13. Maximum Avalanche Energy vs. Drain Current

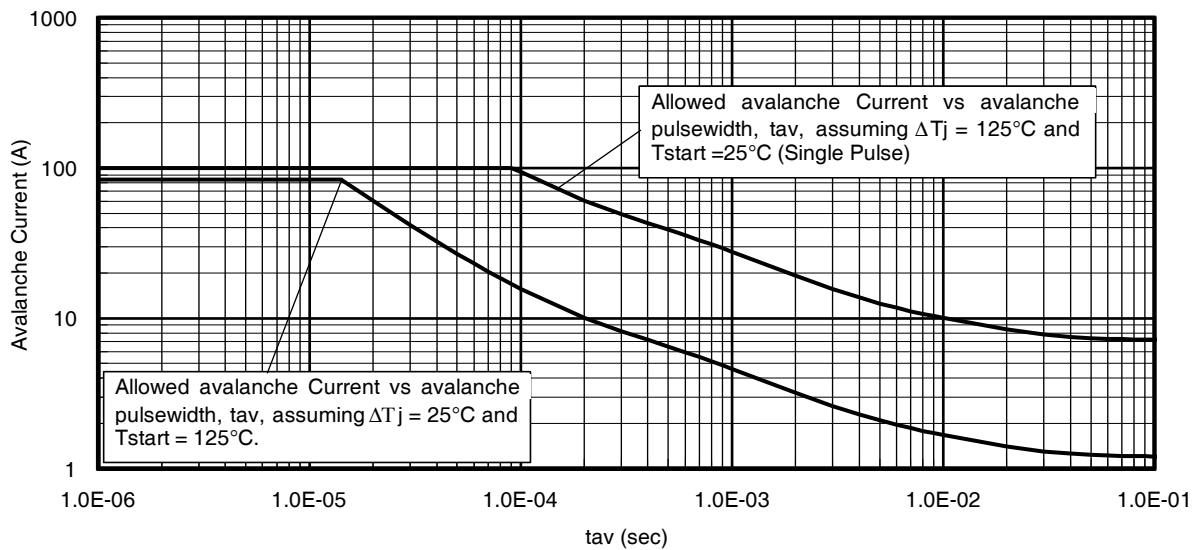


Fig 14. Typical Avalanche Current vs. Pulsewidth

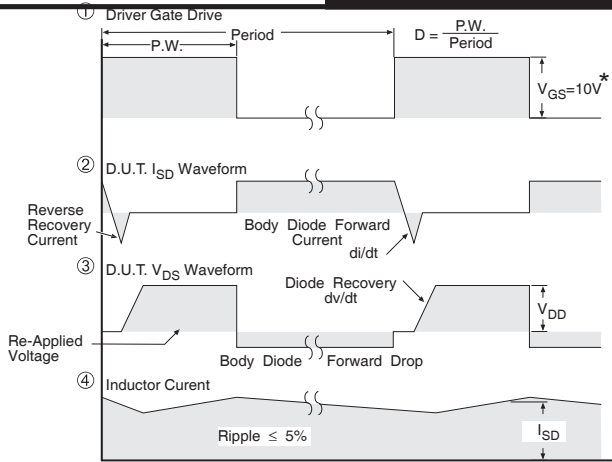
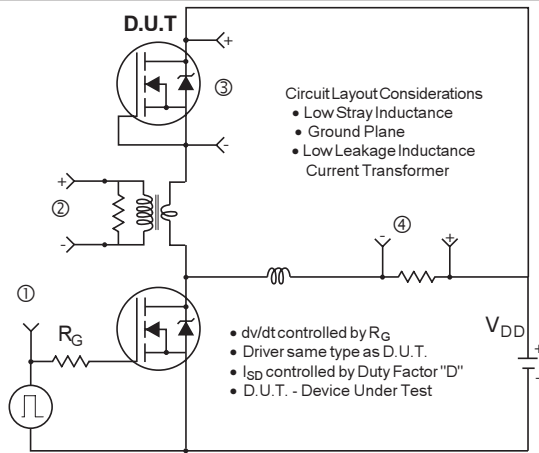


Fig 15. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET[®] Power MOSFETs

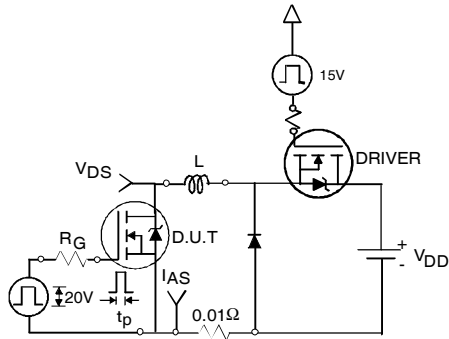


Fig 16a. Unclamped Inductive Test Circuit

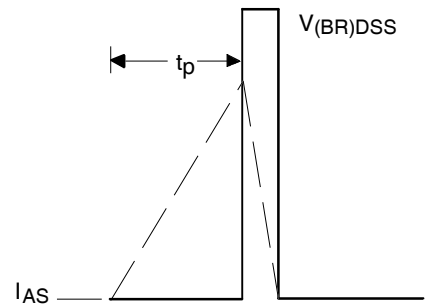


Fig 16b. Unclamped Inductive Waveforms

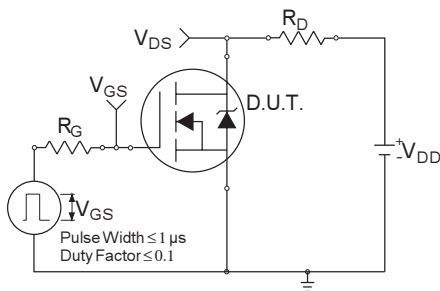


Fig 17a. Switching Time Test Circuit

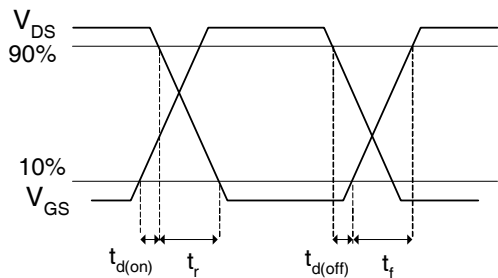


Fig 17b. Switching Time Waveforms

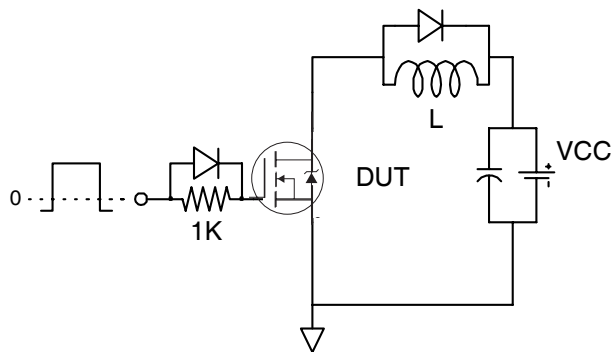


Fig 18a. Gate Charge Test Circuit

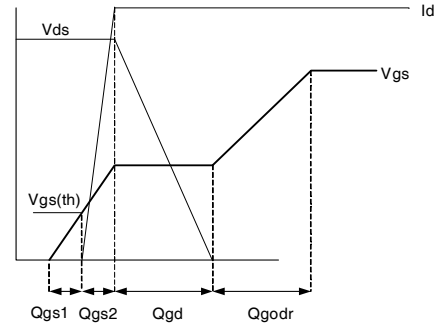
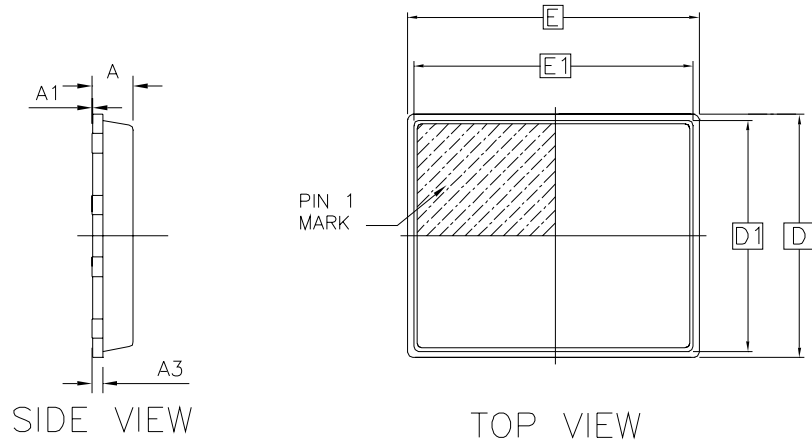


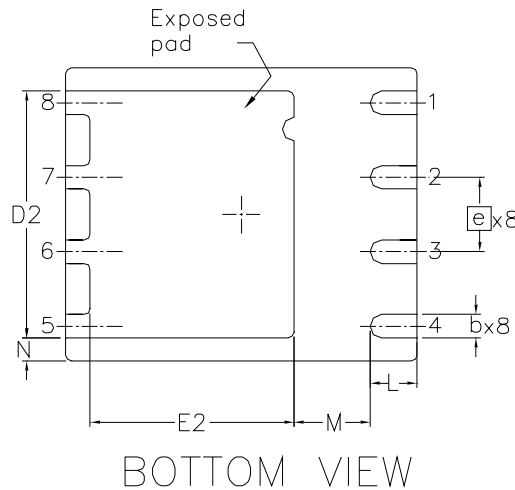
Fig 18b. Gate Charge Waveform

PQFN 5x6 Outline "B" Package Details



OUTLINE PQFN 5x6B

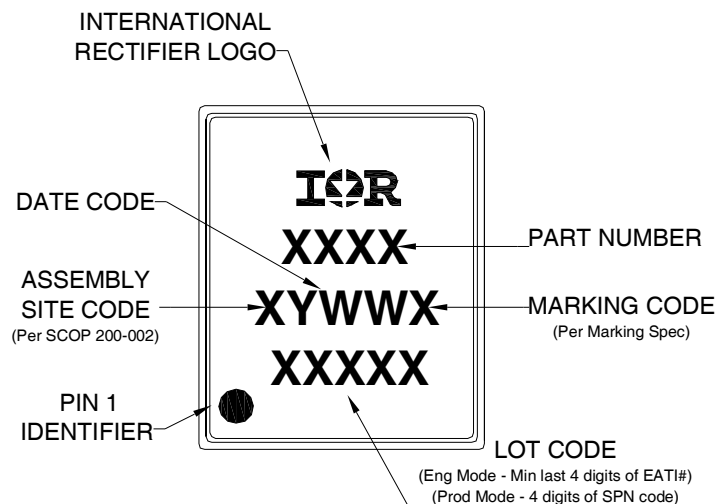
| DIM SYMBOL | MIN | NOM | MAX |
|------------|------|-------|------|
| A | 0.80 | 0.83 | 0.90 |
| A1 | 0 | 0.020 | 0.05 |
| A3 | | 0.20 | REF |
| b | 0.35 | 0.40 | 0.47 |
| D | | 5.00 | BSC |
| D1 | | 4.75 | BSC |
| D2 | 4.10 | 4.21 | 4.30 |
| e | | 1.27 | BSC |
| E | | 6.00 | BSC |
| E1 | | 5.75 | BSC |
| E2 | 3.38 | 3.48 | 3.58 |
| L | 0.70 | 0.80 | 0.90 |
| M | | 1.30 | REF |
| N | | 0.40 | REF |



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>

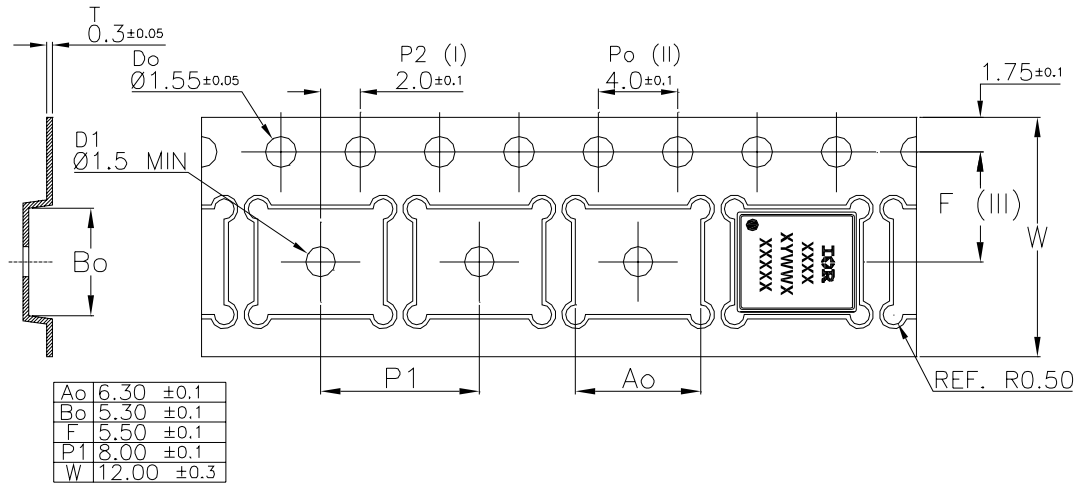
For more information on package inspection techniques, please refer to application note AN-1154: <http://www.irf.com/technical-info/appnotes/an-1154.pdf>

PQFN 5x6 Outline "B" Part Marking



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

PQFN 5x6 Outline "B" Tape and Reel



Qualification information†

| | | |
|----------------------------|--|-----------------------------------|
| Qualification level | Industrial†† (per JEDEC JESD47F ††† guidelines) | |
| Moisture Sensitivity Level | PQFN 5mm x 6mm | 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>

†† 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.

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting $T_J = 25^\circ\text{C}$, $L = 0.27\text{mH}$, $R_G = 50\Omega$, $I_{AS} = 50\text{A}$.
- 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 2 oz copper pad on 1.5x1.5 in. board of FR-4 material.
- ⑥ Calculated continuous current based on maximum allowable junction temperature. Package is limited to 100A by production test capability.

Revision History

| Date | Comment |
|-----------|--|
| 1/13/2014 | <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 the new IR corporate template. |