

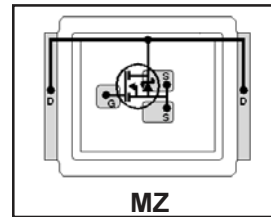
IRF6674TRPbF

DirectFET™ Power MOSFET ②

Typical values (unless otherwise specified)

- RoHS Compliant ①
- Lead-Free (Qualified up to 260°C Reflow)
- Application Specific MOSFETs
- Ideal for High Performance Isolated Converter Primary Switch Socket
- Optimized for Synchronous Rectification
- Low Conduction Losses
- High Cdv/dt Immunity
- Dual Sided Cooling Compatible ①
- Compatible with existing Surface Mount Techniques ①

| | | |
|--------------------------|-----------------------|---------------------------|
| V_{DSS} | V_{GS} | R_{DS(on)} |
| 60V max | ±20V max | 9.0mΩ @ 10V |
| Q_{g tot} | Q_{gd} | V_{gs(th)} |
| 24nC | 8.3nC | 4.0V |



Applicable DirectFET Outline and Substrate Outline (see p.7,8 for details)①

| | | | | | | | | | |
|----|----|----|-----------|----|--|--|--|--|--|
| SH | SJ | SP | MZ | MN | | | | | |
|----|----|----|-----------|----|--|--|--|--|--|

Description

The IRF6674PbF combines the latest HEXFET® Power MOSFET Silicon technology with the advanced DirectFET™ packaging to achieve the lowest on-state resistance in a package that has the footprint of an Micro8 and only 0.7 mm profile. The DirectFET package is compatible with existing layout geometries used in power applications, PCB assembly equipment and vapor phase, infra-red or convection soldering techniques, when application note AN-1035 is followed regarding the manufacturing methods and processes. The DirectFET package allows dual sided cooling to maximize thermal transfer in power systems, improving previous best thermal resistance by 80%.

The IRF6674PbF is optimized for primary side sockets in forward and push-pull isolated DC-DC topologies, for 48V and 36V-60V input voltage range systems. The reduced total losses in the device coupled with the high level of thermal performance enables high efficiency and low temperatures, which are key for system reliability improvements, and makes this device ideal for high performance isolated DC-DC converters.

Absolute Maximum Ratings

| | Parameter | Max. | Units |
|--|---|------|-------|
| V _{DS} | Drain-to-Source Voltage | 60 | V |
| V _{GS} | Gate-to-Source Voltage | ±20 | |
| I _D @ T _A = 25°C | Continuous Drain Current, V _{GS} @ 10V ③ | 13.4 | A |
| I _D @ T _A = 70°C | Continuous Drain Current, V _{GS} @ 10V ③ | 10.7 | |
| I _D @ T _C = 25°C | Continuous Drain Current, V _{GS} @ 10V ④ | 67 | |
| I _{DM} | Pulsed Drain Current ⑤ | 134 | |
| E _{AS} | Single Pulse Avalanche Energy ⑥ | 98 | mJ |
| I _{AS} | Avalanche Current ⑥ | 13.4 | A |

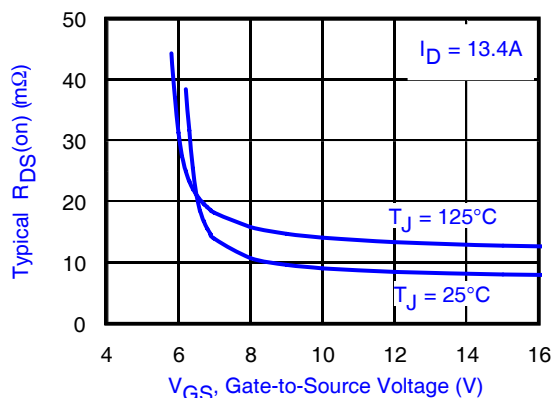


Fig 1. Typical On-Resistance vs. Gate Voltage

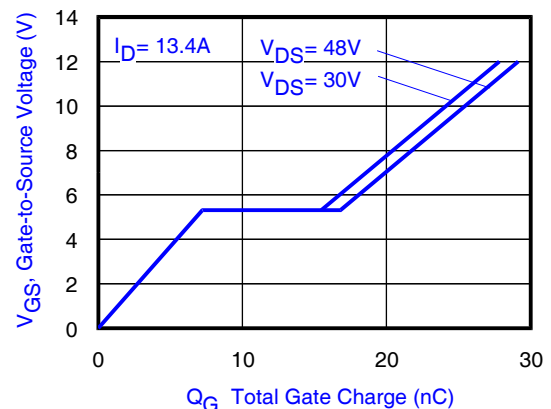


Fig 2. Typical Total Gate Charge vs. Gate-to-Source Voltage

Notes:

- ① Click on this section to link to the appropriate technical paper.
- ② Click on this section to link to the DirectFET Website.
- ③ Surface mounted on 1 in. square Cu board, steady state.

- ④ T_C measured with thermocouple mounted to top (Drain) of part.
- ⑤ Repetitive rating; pulse width limited by max. junction temperature.
- ⑥ Starting T_J = 25°C, L = 0.272mH, R_G = 25Ω, I_{AS} = 13.4A.

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

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|--------------------------------|--------------------------------------|------|------|------|----------------------|--|
| BV_{DSS} | Drain-to-Source Breakdown Voltage | 60 | — | — | V | $V_{GS} = 0V, I_D = 250\mu A$ |
| $\Delta BV_{DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | 0.07 | — | V/ $^\circ\text{C}$ | Reference to $25^\circ\text{C}, I_D = 1\text{mA}$ |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | 9.0 | 11 | m Ω | $V_{GS} = 10V, I_D = 13.4A$ ② |
| $V_{GS(th)}$ | Gate Threshold Voltage | 3.0 | 4.0 | 4.9 | V | $V_{DS} = V_{GS}, I_D = 100\mu A$ |
| $\Delta V_{GS(th)}/\Delta T_J$ | Gate Threshold Voltage Coefficient | — | -11 | — | mV/ $^\circ\text{C}$ | |
| I_{DSS} | Drain-to-Source Leakage Current | — | — | 20 | μA | $V_{DS} = 60V, V_{GS} = 0V$ |
| | | — | — | 250 | | $V_{DS} = 48V, V_{GS} = 0V, T_J = 125^\circ\text{C}$ |
| I_{GSS} | Gate-to-Source Forward Leakage | — | — | 100 | nA | $V_{GS} = 20V$ |
| | Gate-to-Source Reverse Leakage | — | — | -100 | | $V_{GS} = -20V$ |
| gfs | Forward Transconductance | 16 | — | — | S | $V_{DS} = 25V, I_D = 13.4A$ |
| Q_g | Total Gate Charge | — | 24 | 36 | nC | $V_{DS} = 30V$ $V_{GS} = 10V$ $I_D = 13.4A$ See Fig. 15 |
| Q_{gs1} | Pre-Vth Gate-to-Source Charge | — | 5.4 | — | | |
| Q_{gs2} | Post-Vth Gate-to-Source Charge | — | 1.9 | — | | |
| Q_{gd} | Gate-to-Drain Charge | — | 8.3 | 12 | | |
| Q_{godr} | Gate Charge Overdrive | — | 8.4 | — | | |
| Q_{sw} | Switch Charge ($Q_{gs2} + Q_{gd}$) | — | 10.2 | — | | |
| Q_{oss} | Output Charge | — | 14 | — | nC | $V_{DS} = 16V, V_{GS} = 0V$ |
| R_G | Gate Resistance | — | 1.0 | — | Ω | |
| $t_{d(on)}$ | Turn-On Delay Time | — | 7.0 | — | ns | $V_{DD} = 30V, V_{GS} = 10V$ ② $I_D = 13.4A$ $R_G = 6.2\ \Omega$ |
| t_r | Rise Time | — | 12 | — | | |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 12 | — | | |
| t_f | Fall Time | — | 8.7 | — | | |
| C_{iss} | Input Capacitance | — | 1350 | — | pF | $V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1.0\text{MHz}$ |
| C_{oss} | Output Capacitance | — | 390 | — | | |
| C_{rss} | Reverse Transfer Capacitance | — | 105 | — | | |
| C_{oss} | Output Capacitance | — | 1580 | — | | |
| C_{oss} | Output Capacitance | — | 290 | — | | |
| | | | | | | $V_{GS} = 0V, V_{DS} = 48V, f = 1.0\text{MHz}$ |

Diode Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------|--|------|------|------|-------|---|
| I_S | Continuous Source Current (Body Diode) $T_J = 25^\circ\text{C}$ | — | — | 67 | A | MOSFET symbol showing the integral reverse p-n junction diode. |
| I_{SM} | Pulsed Source Current (Body Diode) ⑤ | — | — | 134 | | |
| V_{SD} | Diode Forward Voltage | — | — | 1.3 | V | $T_J = 25^\circ\text{C}, I_S = 13.4A, V_{GS} = 0V$ ② |
| t_{rr} | Reverse Recovery Time | — | 32 | 48 | ns | $T_J = 25^\circ\text{C}, I_F = 13.4A, V_{DD} = 50V$ |
| Q_{rr} | Reverse Recovery Charge | — | 36 | 54 | nC | $di/dt = 100A/\mu s$ ① |

Notes:

⑤ Repetitive rating; pulse width limited by max. junction temperature.

② Pulse width $\leq 400\mu s$; duty cycle $\leq 2\%$.

Absolute Maximum Ratings

| | Parameter | Max. | Units |
|--------------------------------|----------------------------|--------------|------------------|
| $P_D @ T_A = 25^\circ\text{C}$ | Power Dissipation ③ | 3.6 | W |
| $P_D @ T_A = 70^\circ\text{C}$ | Power Dissipation ③ | 2.3 | |
| $P_D @ T_C = 25^\circ\text{C}$ | Power Dissipation ④ | 89 | |
| T_P | Peak Soldering Temperature | 270 | $^\circ\text{C}$ |
| T_J | Operating Junction and | -40 to + 150 | |
| T_{STG} | Storage Temperature Range | | |

Thermal Resistance

| | Parameter | Typ. | Max. | Units |
|--------------------|-------------------------|------|------|--------------------|
| $R_{\theta JA}$ | Junction-to-Ambient ③⑩ | — | 35 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Junction-to-Ambient ⑧⑩ | 12.5 | — | |
| $R_{\theta JA}$ | Junction-to-Ambient ⑨⑩ | 20 | — | |
| $R_{\theta JC}$ | Junction-to-Case ④⑩ | — | 1.4 | |
| $R_{\theta J-PCB}$ | Junction-to-PCB Mounted | 1.0 | — | |

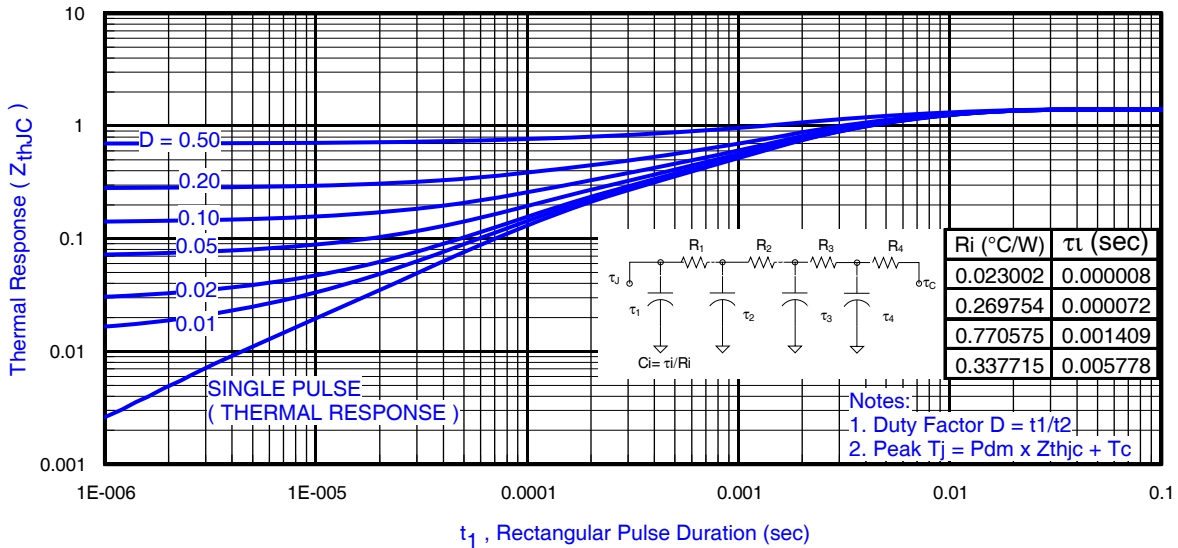


Fig 3. Maximum Effective Transient Thermal Impedance, Junction-to-Case ①

Notes:

- ③ Surface mounted on 1 in. square Cu board, steady state.
- ④ T_C measured with thermocouple incontact with top (Drain) of part.
- ⑧ Used double sided cooling, mounting pad with large heatsink.
- ⑨ Mounted on minimum footprint full size board with metalized back and with small clip heatsink.
- ⑩ R_{θ} is measured at T_J of approximately 90°C .



③ Surface mounted on 1 in. square Cu board (still air).



⑨ Mounted on minimum footprint full size board with metalized back and with small clip heatsink. (still air)

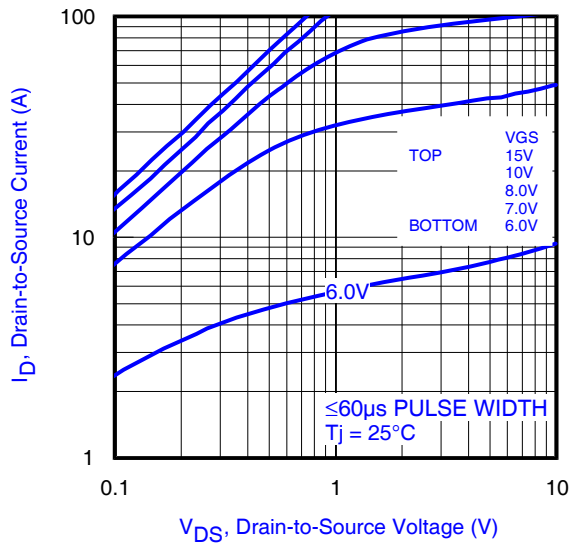


Fig 4. Typical Output Characteristics

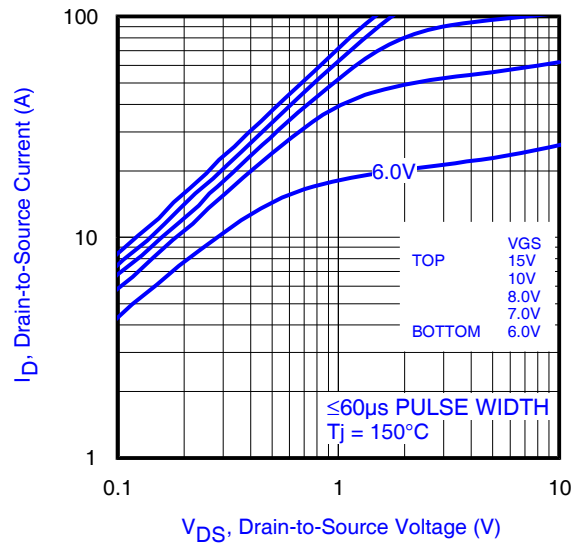


Fig 5. Typical Output Characteristics

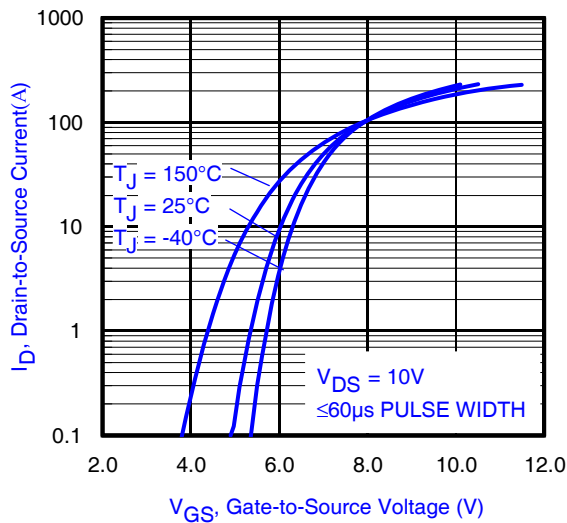


Fig 6. Typical Transfer Characteristics

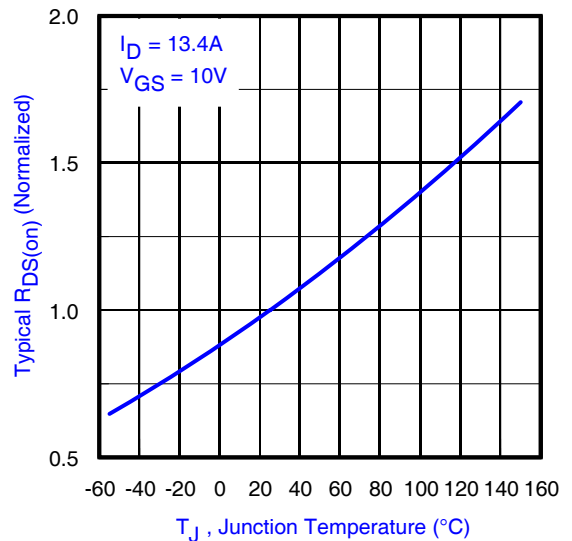


Fig 7. Normalized On-Resistance vs. Temperature

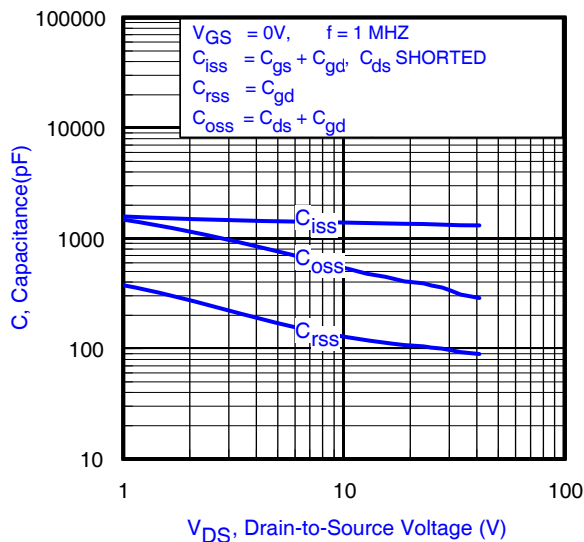


Fig 8. Typical Capacitance vs. Drain-to-Source Voltage

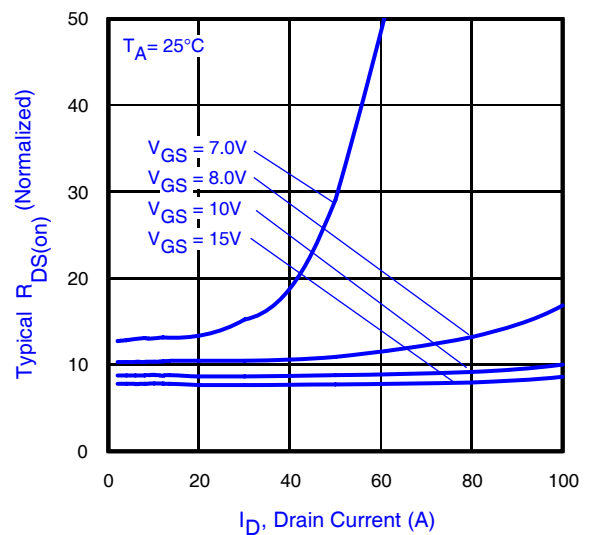


Fig 9. Typical On-Resistance vs. Drain Current

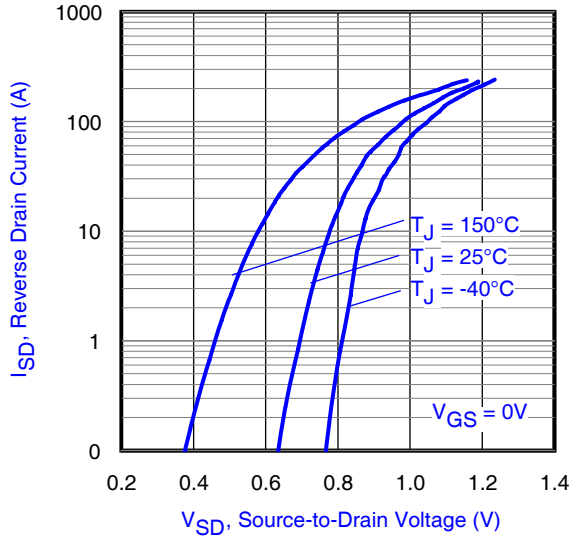


Fig 10. Typical Source-Drain Diode Forward Voltage

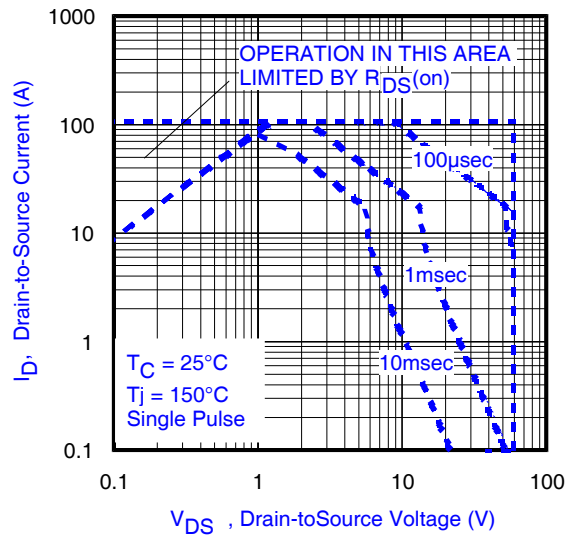


Fig11. Maximum Safe Operating Area

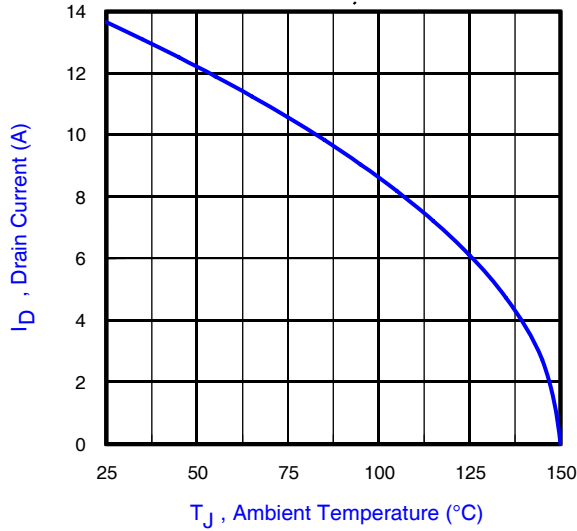


Fig 12. Maximum Drain Current vs. Ambient Temperature

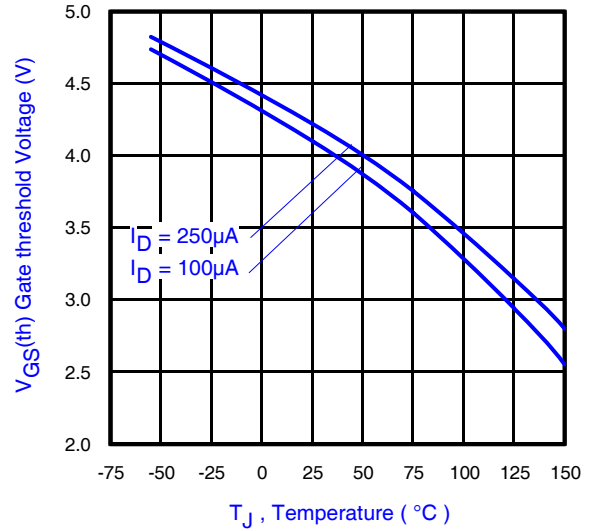


Fig 13. Typical Threshold Voltage vs. Junction Temperature

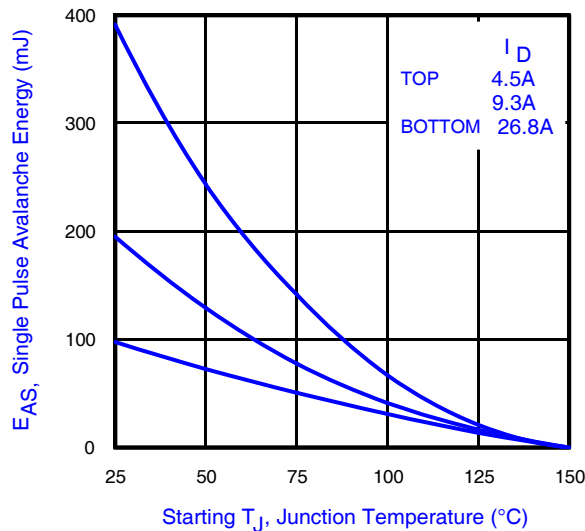


Fig 14. Maximum Avalanche Energy vs. Drain Current

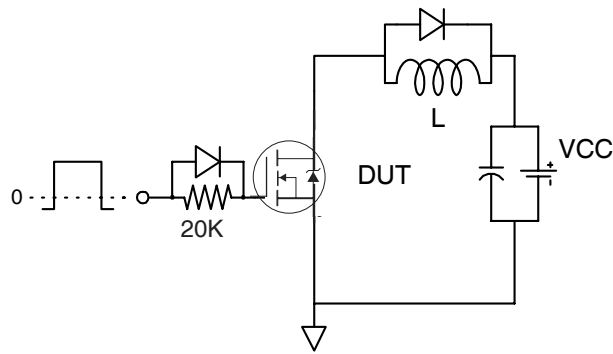


Fig 15a. Gate Charge Test Circuit

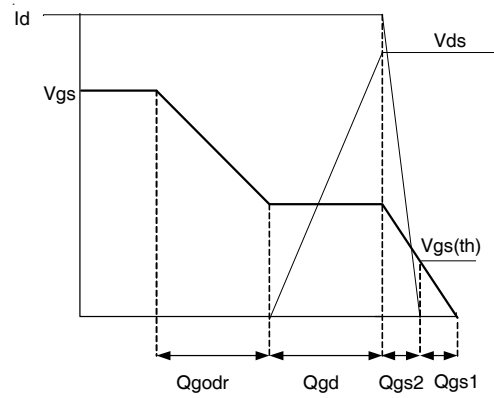


Fig 15b. Gate Charge Waveform

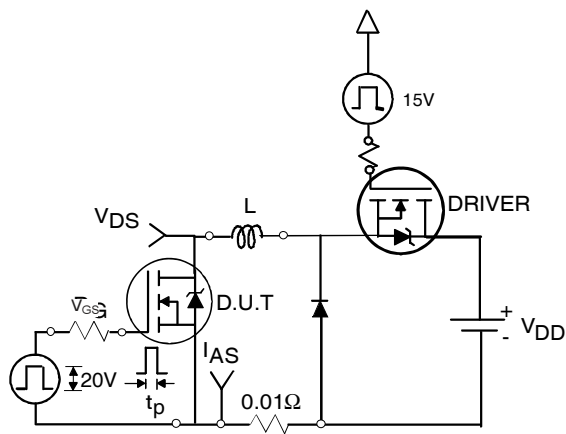


Fig 16a. Unclamped Inductive Test Circuit

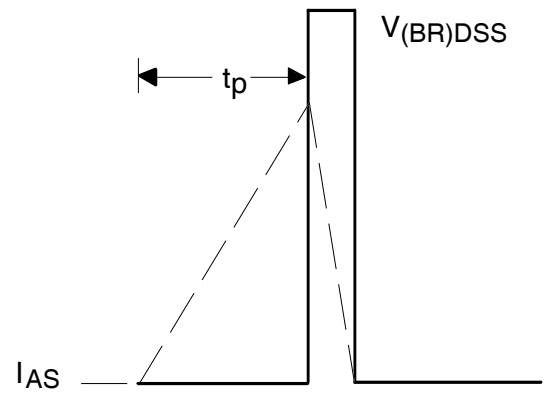


Fig 16b. Unclamped Inductive Waveforms

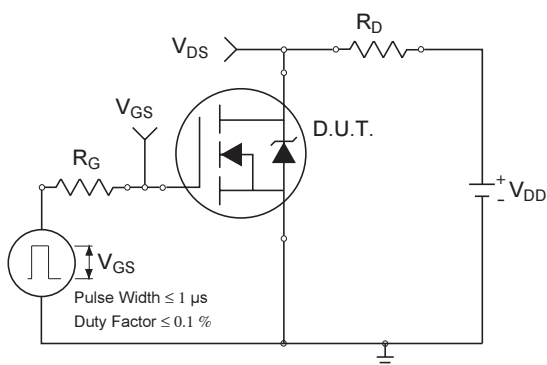


Fig 17a. Switching Time Test Circuit

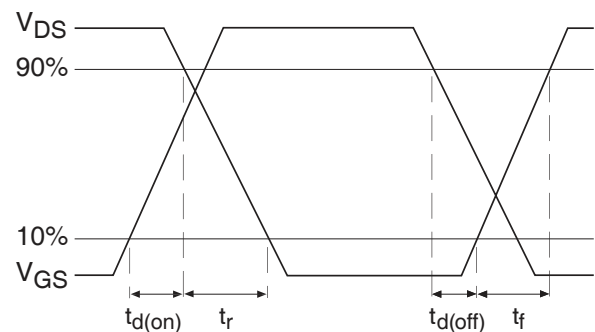


Fig 17b. Switching Time Waveforms

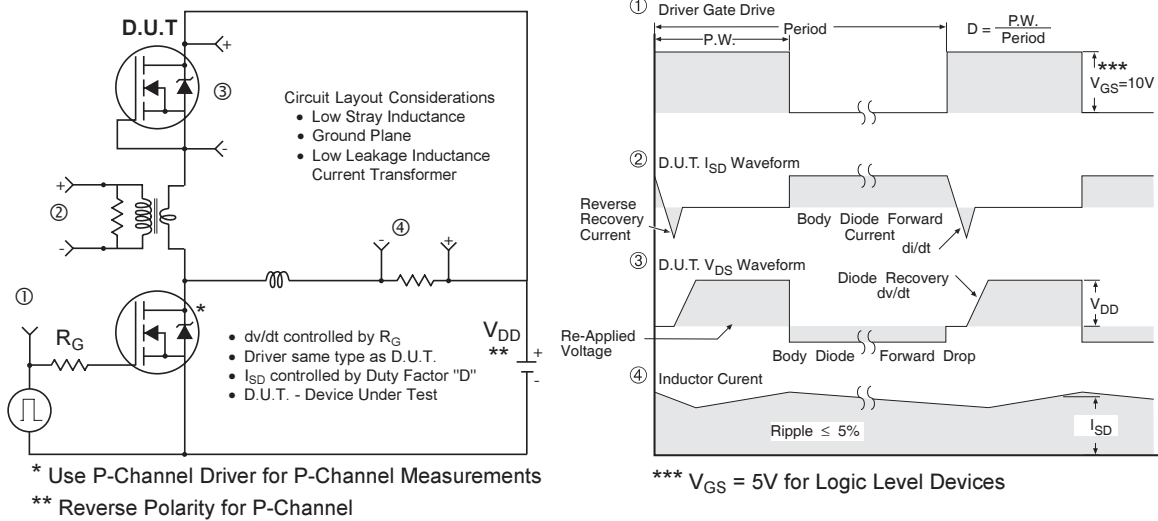
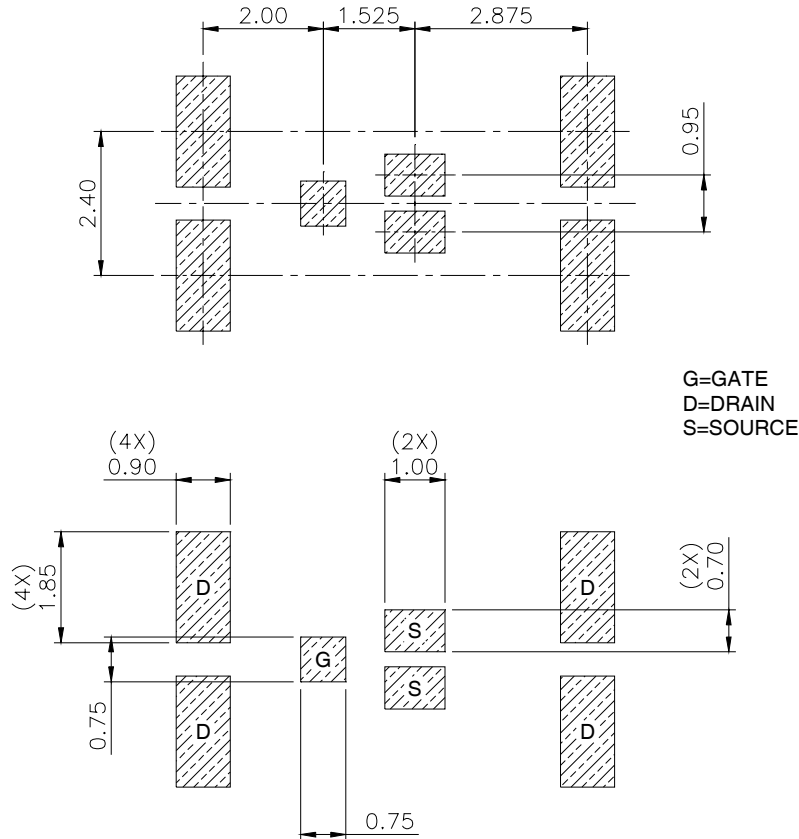


Fig 18. Diode Reverse Recovery Test Circuit for HEXFET® Power MOSFETs

DirectFET™ Substrate and PCB Layout, MZ Outline (Medium Size Can, Z-Designation).

Please see AN-1035 for DirectFET assembly details and stencil and substrate design recommendations

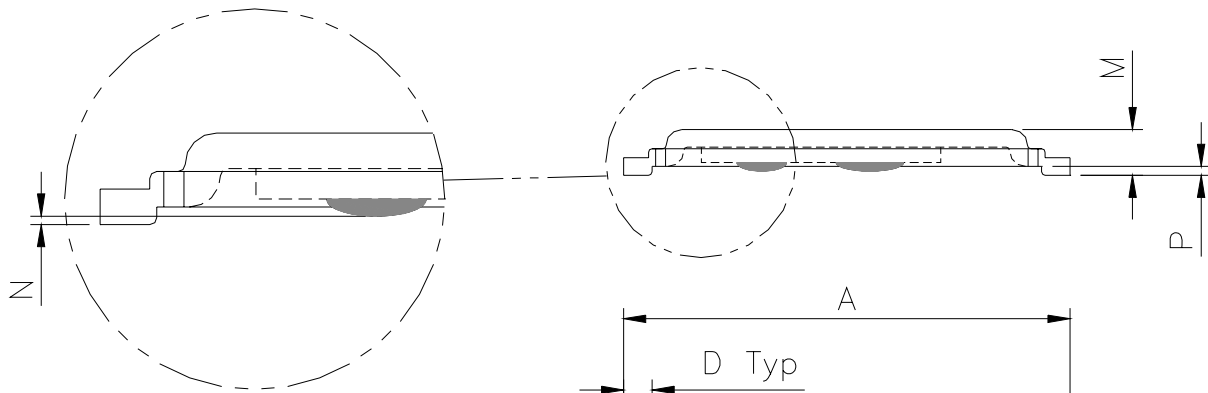


Note: For the most current drawing please refer to IR website at <http://www.irf.com/package>
www.irf.com

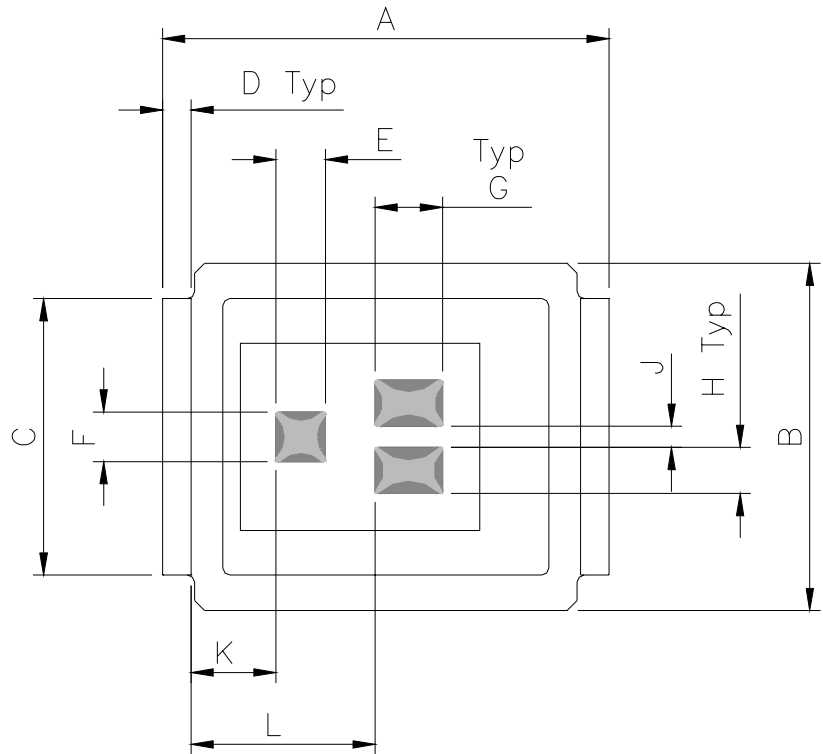
IRF6674TRPbF

DirectFET™ Outline Dimension, MZ Outline (Medium Size Can, Z-Designation).

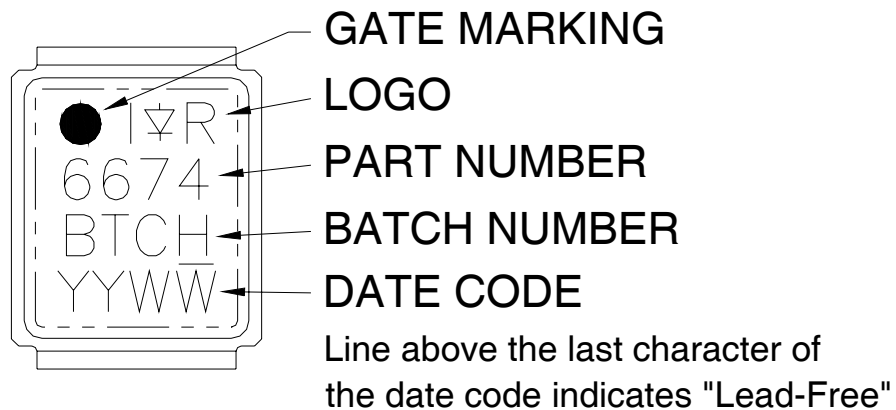
Please see AN-1035 for DirectFET assembly details and stencil and substrate design recommendations



| DIMENSIONS | | | | |
|------------|--------|------|----------|-------|
| CODE | METRIC | | IMPERIAL | |
| | MIN | MAX | MIN | MAX |
| A | 6.25 | 6.35 | 0.246 | 0.250 |
| B | 4.80 | 5.05 | 0.189 | 0.201 |
| C | 3.85 | 3.95 | 0.152 | 0.156 |
| D | 0.35 | 0.45 | 0.014 | 0.018 |
| E | 0.68 | 0.72 | 0.027 | 0.028 |
| F | 0.68 | 0.72 | 0.027 | 0.028 |
| G | 0.93 | 0.97 | 0.037 | 0.038 |
| H | 0.63 | 0.67 | 0.025 | 0.026 |
| J | 0.28 | 0.32 | 0.011 | 0.013 |
| K | 1.13 | 1.26 | 0.044 | 0.050 |
| L | 2.53 | 2.66 | 0.100 | 0.105 |
| M | 0.59 | 0.70 | 0.023 | 0.028 |
| N | 0.03 | 0.08 | 0.001 | 0.003 |
| P | 0.08 | 0.17 | 0.003 | 0.007 |

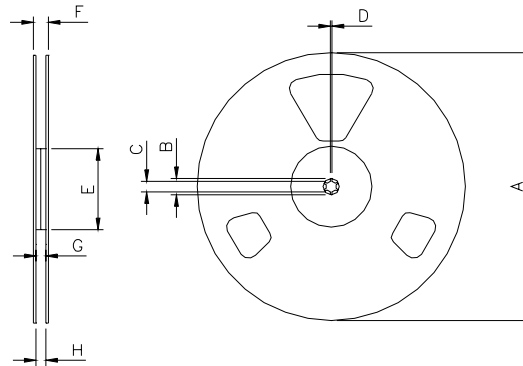


DirectFET™ Part Marking



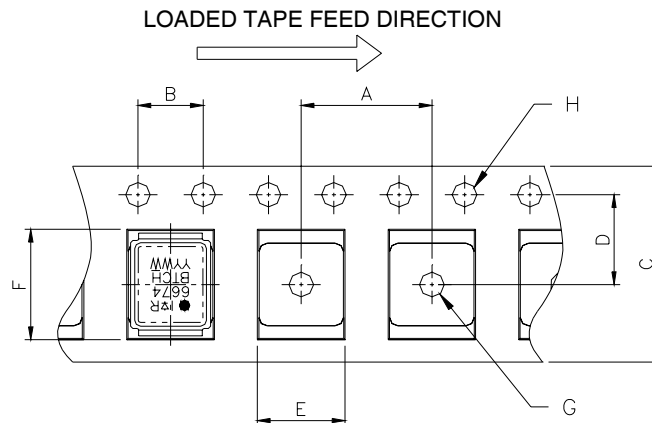
Note: For the most current drawing please refer to IR website at <http://www.irf.com/package>

DirectFET™ Tape & Reel Dimension (Showing component orientation).



NOTE: Controlling dimensions in mm
 Std reel quantity is 4800 parts. (ordered as IRF6674MTRPBF). For 1000 parts on 7" reel, order IRF6674MTR1PBF

| REEL DIMENSIONS | | | | | | | | |
|-----------------|----------------------------|------|----------|-------|-----------------------|-------|----------|------|
| CODE | STANDARD OPTION (QTY 4800) | | | | TR1 OPTION (QTY 1000) | | | |
| | METRIC | | IMPERIAL | | METRIC | | IMPERIAL | |
| | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX |
| A | 330.0 | N.C | 12.992 | N.C | 177.77 | N.C | 6.9 | N.C |
| B | 20.2 | N.C | 0.795 | N.C | 19.06 | N.C | 0.75 | N.C |
| C | 12.8 | 13.2 | 0.504 | 0.520 | 13.5 | 12.8 | 0.53 | 0.50 |
| D | 1.5 | N.C | 0.059 | N.C | 1.5 | N.C | 0.059 | N.C |
| E | 100.0 | N.C | 3.937 | N.C | 58.72 | N.C | 2.31 | N.C |
| F | N.C | 18.4 | N.C | 0.724 | N.C | 13.50 | N.C | 0.53 |
| G | 12.4 | 14.4 | 0.488 | 0.567 | 11.9 | 12.01 | 0.47 | N.C |
| H | 11.9 | 15.4 | 0.469 | 0.606 | 11.9 | 12.01 | 0.47 | N.C |



NOTE: CONTROLLING DIMENSIONS IN MM

| CODE | DIMENSIONS | | | |
|------|------------|-------|----------|-------|
| | METRIC | | IMPERIAL | |
| | MIN | MAX | MIN | MAX |
| A | 7.90 | 8.10 | 0.311 | 0.319 |
| B | 3.90 | 4.10 | 0.154 | 0.161 |
| C | 11.90 | 12.30 | 0.469 | 0.484 |
| D | 5.45 | 5.55 | 0.215 | 0.219 |
| E | 5.10 | 5.30 | 0.201 | 0.209 |
| F | 6.50 | 6.70 | 0.256 | 0.264 |
| G | 1.50 | N.C | 0.059 | N.C |
| H | 1.50 | 1.60 | 0.059 | 0.063 |

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.

IMPORTANT NOTICE

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffheitsgarantie").

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies office (www.infineon.com).

WARNINGS

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.