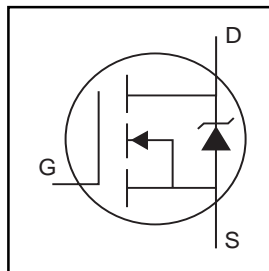


- Advanced Process Technology
- Surface Mount
- Optimized for 4.5V-7.0V Gate Drive
- Ideal for CPU Core DC-DC Converters
- Fast Switching

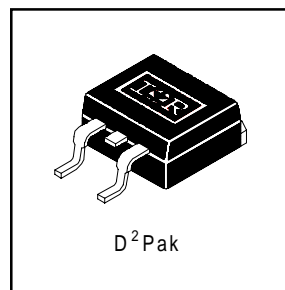


| |
|-----------------------|
| $V_{DSS} = 20V$ |
| $R_{DS(on)} = 0.020W$ |
| $I_D = 39A$ |

Description

These HEXFET Power MOSFETs were designed specifically to meet the demands of CPU core DC-DC converters. Advanced processing techniques combined with an optimized gate oxide design results in a die sized specifically to offer maximum efficiency at minimum cost.

The D²Pak is a surface mount power package capable of accommodating die sizes up to HEX-4. It provides the highest power capability and the lowest possible on-resistance in any existing surface mount package. The D²Pak is suitable for high current applications because of its low internal connection resistance and can dissipate up to 2.0W in a typical surface mount application.



Absolute Maximum Ratings

| | Parameter | Max. | Units |
|---------------------------|---|--------------|-------|
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 4.5V$ ⑤ | 39 | A |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 4.5V$ ⑤ | 25 | |
| I_{DM} | Pulsed Drain Current ①⑤ | 160 | |
| $P_D @ T_C = 25^\circ C$ | Power Dissipation | 57 | W |
| | Linear Derating Factor | 0.45 | W/°C |
| V_{GS} | Gate-to-Source Voltage | ± 10 | V |
| E_{AS} | Single Pulse Avalanche Energy②⑤ | 130 | mJ |
| I_{AR} | Avalanche Current① | 23 | A |
| E_{AR} | Repetitive Avalanche Energy① | 5.7 | mJ |
| dv/dt | Peak Diode Recovery dv/dt ③⑤ | 5.0 | V/ns |
| T_J | Operating Junction and | -55 to + 150 | °C |
| T_{STG} | Storage Temperature Range | | |
| | Soldering Temperature, for 10 seconds | | |

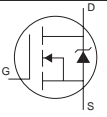
Thermal Resistance

| | Parameter | Typ. | Max. | Units |
|-----------------|--|------|------|-------|
| $R_{\theta JC}$ | Junction-to-Case | — | 2.2 | °C/W |
| $R_{\theta JA}$ | Junction-to-Ambient (PCB Mounted, steady-state)** | — | 40 | |

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

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|---------------------|--------------------------------------|------|-------|-------|---------|--|
| $V_{(BR)DSS}$ | Drain-to-Source Breakdown Voltage | 20 | — | — | V | $V_{GS} = 0V, I_D = 250\mu A$ |
| $dV_{(BR)DSS}/dT_J$ | Breakdown Voltage Temp. Coefficient | — | 0.022 | — | V/°C | Reference to 25°C , $I_D = 1\text{mA}$ ⑤ |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | — | 0.023 | m | $V_{GS} = 4.5V, I_D = 23A$ ④ |
| | | — | — | 0.020 | | $V_{GS} = 7.0V, I_D = 23A$ ④ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 0.70 | — | — | V | $V_{DS} = V_{GS}, I_D = 250\mu A$ |
| g_{fs} | Forward Transconductance | 21 | — | — | S | $V_{DS} = 10V, I_D = 23A$ ⑤ |
| I_{DSS} | Drain-to-Source Leakage Current | — | — | 25 | μA | $V_{DS} = 20V, V_{GS} = 0V$ |
| | | — | — | 250 | | $V_{DS} = 10V, V_{GS} = 0V, T_J = 150^\circ\text{C}$ |
| I_{GSS} | Gate-to-Source Forward Leakage | — | — | 100 | nA | $V_{GS} = 10V$ |
| | Gate-to-Source Reverse Leakage | — | — | -100 | | $V_{GS} = -10V$ |
| Q_g | Total Gate Charge | — | — | 31 | nC | $I_D = 23A$ |
| Q_{gs} | Gate-to-Source Charge | — | — | 5.7 | | $V_{DS} = 16V$ |
| Q_{gd} | Gate-to-Drain ("Miller") Charge | — | — | 13 | | $V_{GS} = 4.5V$, See Fig. 6 ④⑤ |
| $t_{d(on)}$ | Turn-On Delay Time | — | 7.2 | — | ns | $V_{DD} = 10V$ |
| t_r | Rise Time | — | 110 | — | | $I_D = 23A$ |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 41 | — | | $R_G = 9.5\text{m}\Omega, V_{GS} = 4.5V$ |
| t_f | Fall Time | — | 89 | — | | $R_D = 2.4\text{m}\Omega$, ④⑤ |
| L_S | Internal Source Inductance | — | 7.5 | — | nH | Between lead, and center of die contact |
| C_{iss} | Input Capacitance | — | 1300 | — | pF | $V_{GS} = 0V$ |
| C_{oss} | Output Capacitance | — | 520 | — | | $V_{DS} = 15V$ |
| C_{rss} | Reverse Transfer Capacitance | — | 190 | — | | $f = 1.0\text{MHz}$, See Fig. 5⑤ |

Source-Drain Ratings and Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------|--|---|------|------|-------|--|
| I_S | Continuous Source Current (Body Diode) | — | — | 39 | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I_{SM} | Pulsed Source Current (Body Diode) ①⑤ | — | — | 160 | | |
| V_{SD} | Diode Forward Voltage | — | — | 1.3 | V | $T_J = 25^\circ\text{C}, I_S = 23A, V_{GS} = 0V$ ④ |
| t_{rr} | Reverse Recovery Time | — | 62 | 94 | ns | $T_J = 25^\circ\text{C}, I_F = 23A$ |
| Q_{rr} | Reverse Recovery Charge | — | — | 110 | 160 | nC $di/dt = 100A/\mu s$ ④⑤ |
| t_{on} | Forward Turn-On Time | Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D) | | | | |

Notes:

① Repetitive rating; pulse width limited by max. junction temperature.

② Starting $T_J = 25^\circ\text{C}$, $L = 0.49\text{mH}$
 $R_G = 25\text{m}\Omega, I_{AS} = 23A$.

③ $I_{SD} \leq 23A, di/dt \leq 97A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 150^\circ\text{C}$

④ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.

⑤ Uses IRL3302 data and test conditions

** When mounted on FR-4 board using minimum recommended footprint.

For recommended footprint and soldering techniques refer to application note #AN-994.

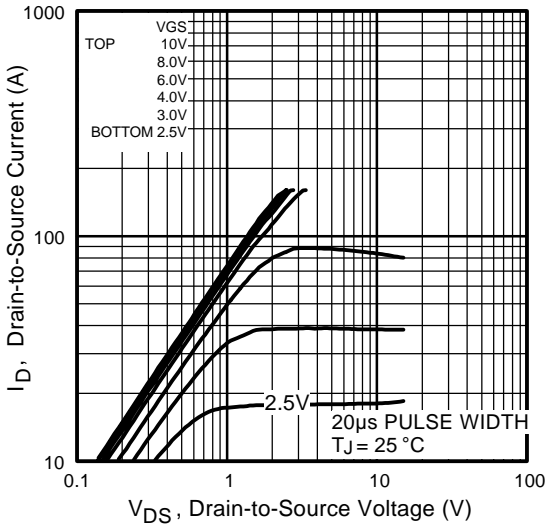


Fig 1. Typical Output Characteristics

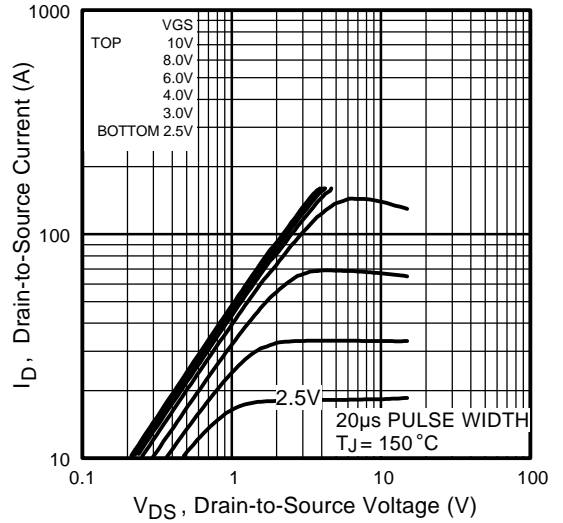


Fig 2. Typical Output Characteristics

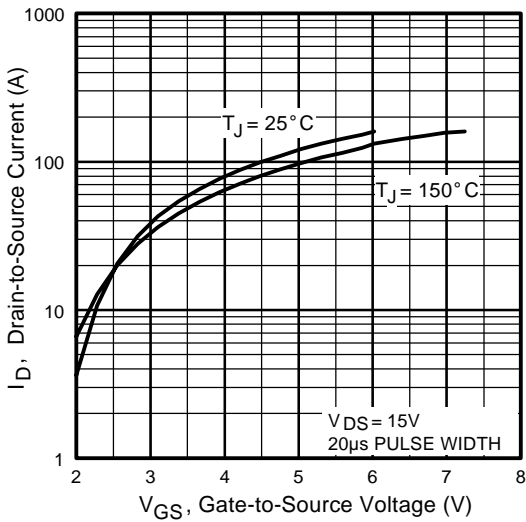


Fig 3. Typical Transfer Characteristics

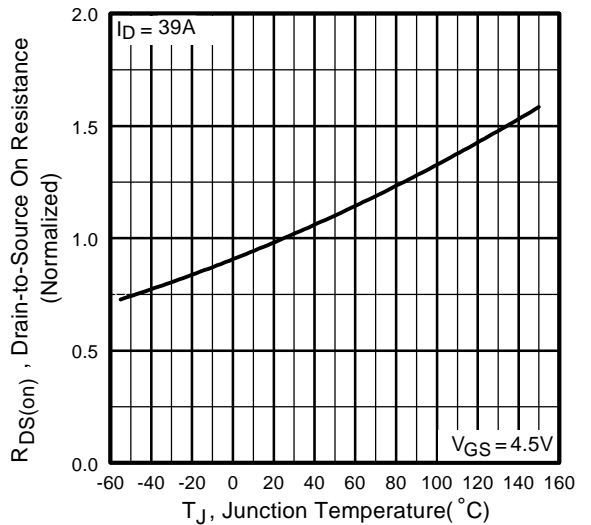


Fig 4. Normalized On-Resistance Vs. Temperature

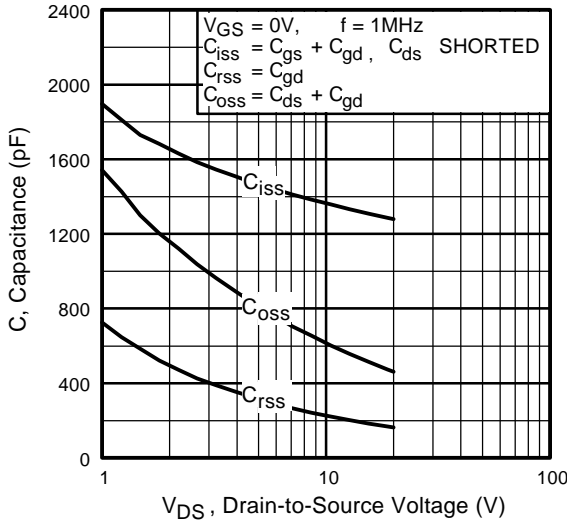


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

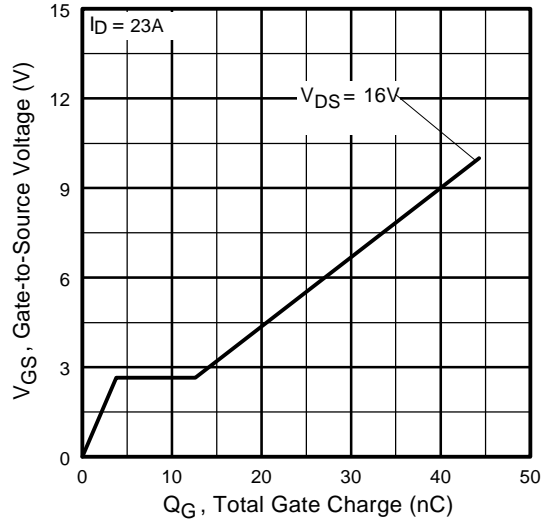


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

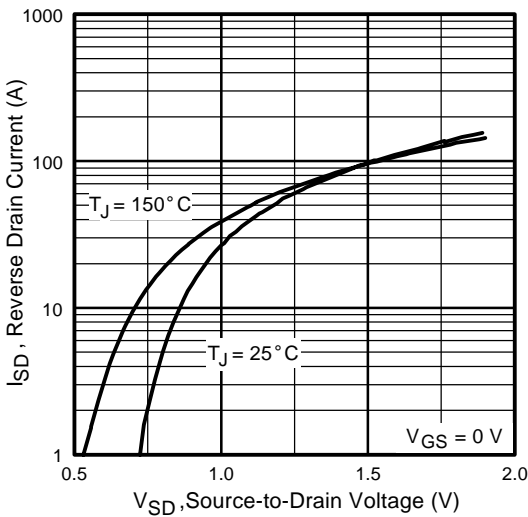


Fig 7. Typical Source-Drain Diode Forward Voltage

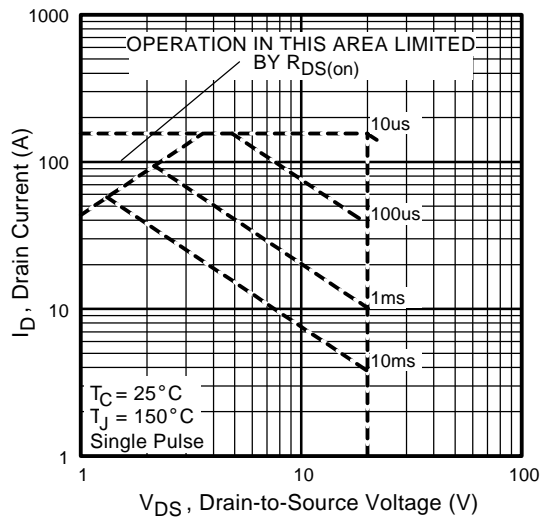


Fig 8. Maximum Safe Operating Area

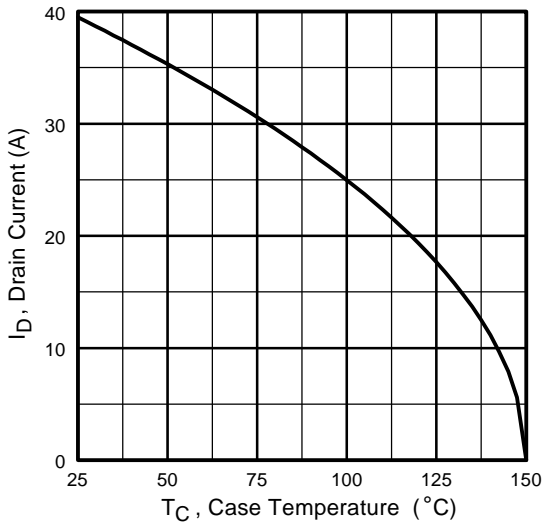


Fig 9. Maximum Drain Current Vs. Case Temperature

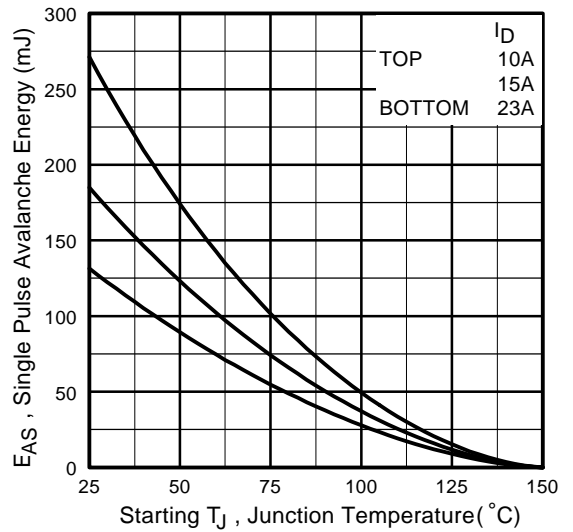


Fig 10. Maximum Avalanche Energy Vs. Drain Current

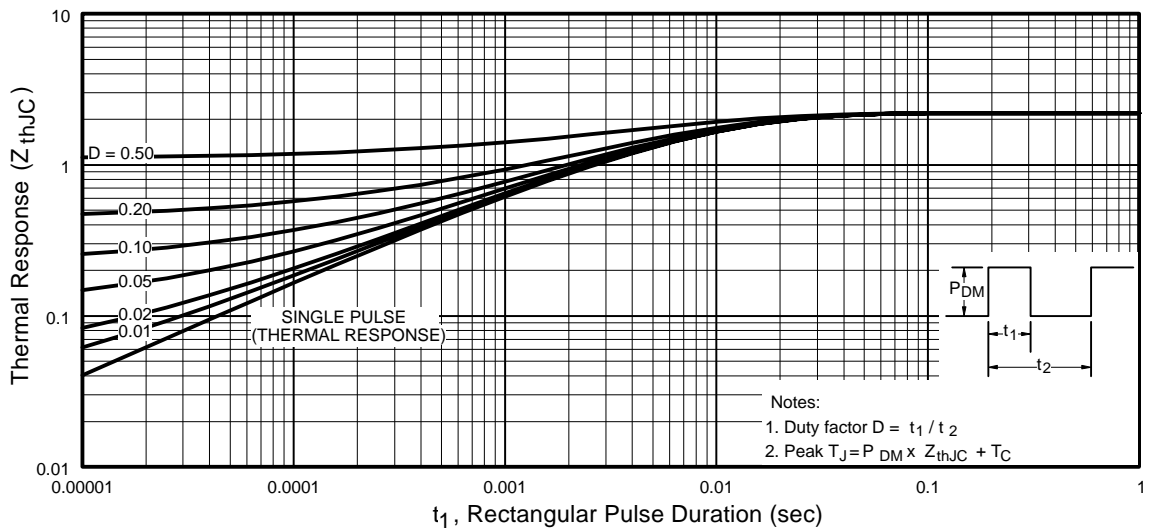


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

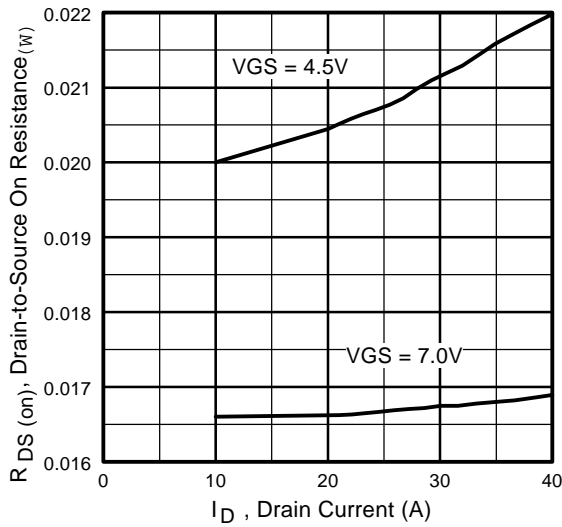


Fig 12. On-Resistance Vs. Drain Current

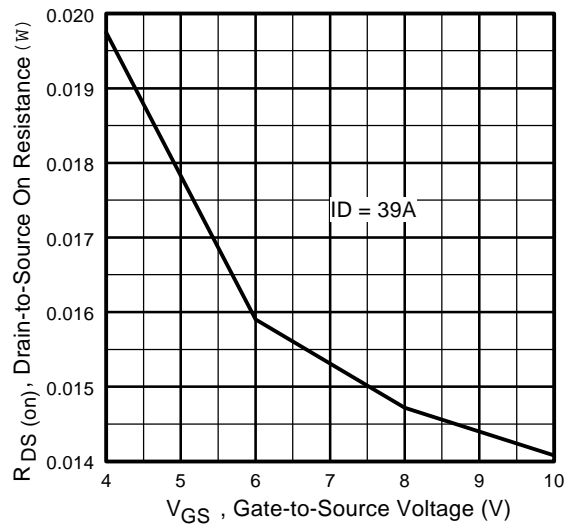
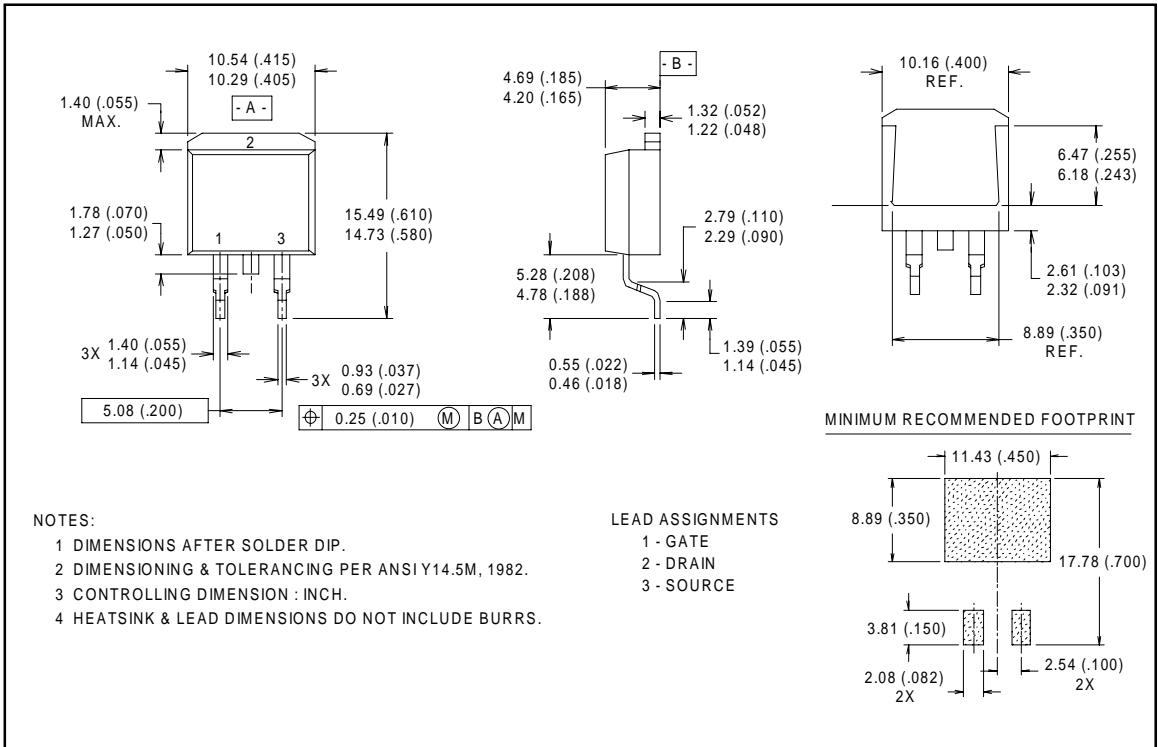


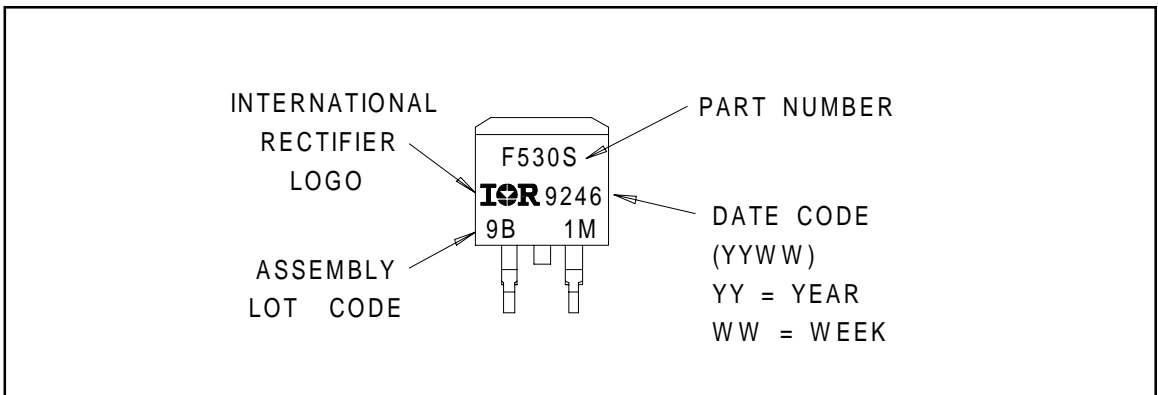
Fig 13. On-Resistance Vs. Gate Voltage

D²Pak Package Outline



Part Marking Information

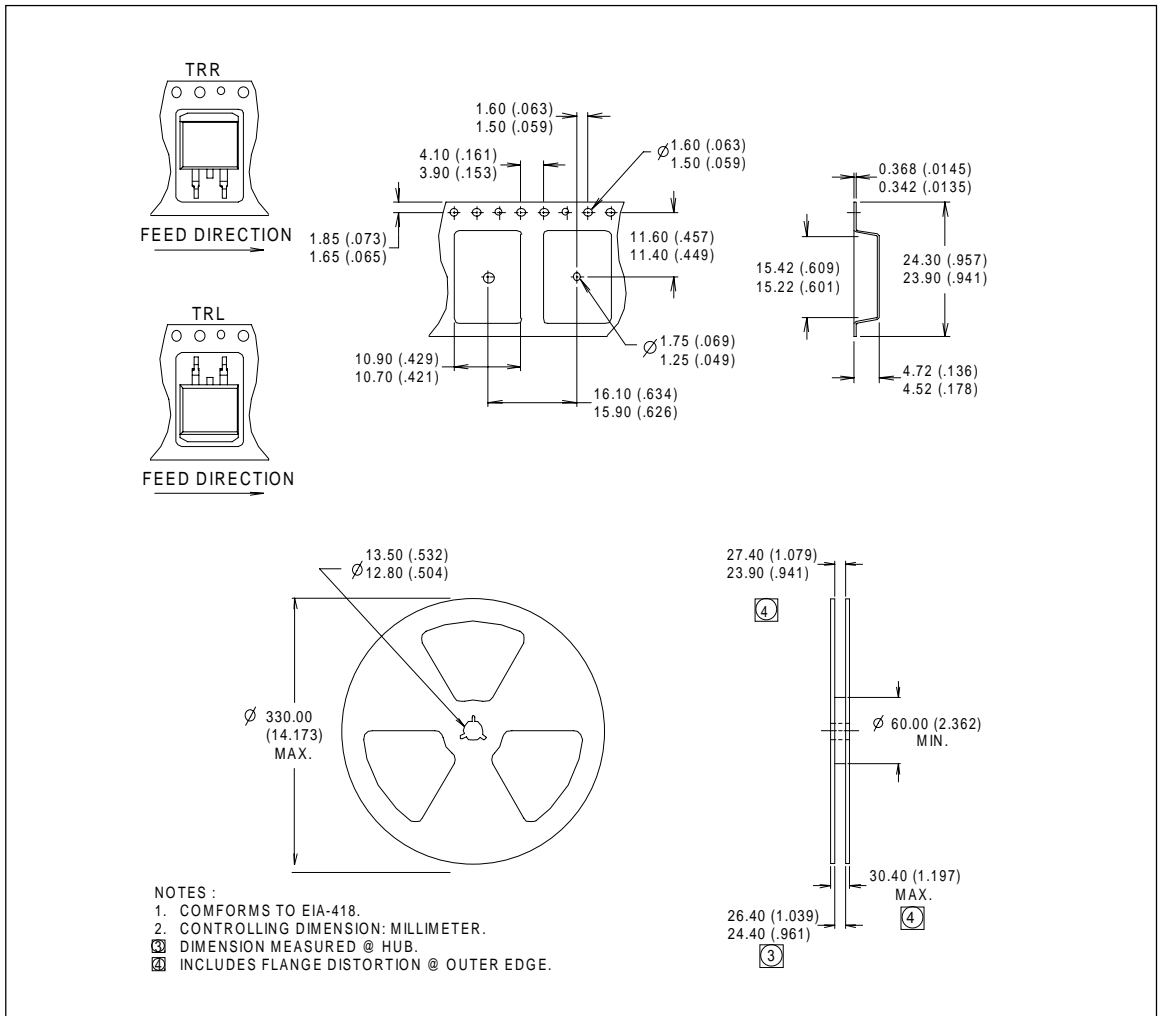
D²Pak



IRL3302S

Tape & Reel Information

D²Pak



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