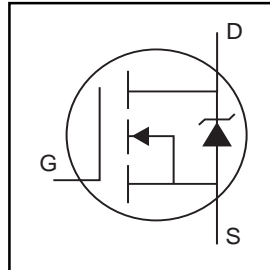


- Advanced Process Technology
- Optimized for 4.5V-7.0V Gate Drive
- Ideal for CPU Core DC-DC Converters
- Fast Switching

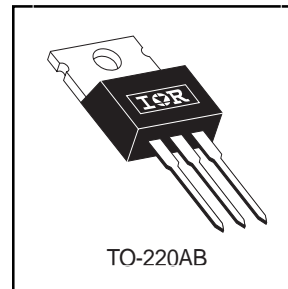
Description

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

The TO-220 package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 50 watts. The low thermal resistance and low package cost of the TO-220 contribute to its wide acceptance throughout the industry.



| |
|-----------------------|
| $V_{DSS} = 20V$ |
| $R_{DS(on)} = 0.016W$ |
| $I_D = 48A$ |



Absolute Maximum Ratings

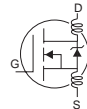
| | Parameter | Max. | Units |
|---------------------------|--|--------------------|-------|
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 4.5V$ | 48 | A |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 4.5V$ | 30 | |
| I_{DM} | Pulsed Drain Current ① | 190 | |
| $P_D @ T_C = 25^\circ C$ | Power Dissipation | 69 | W |
| | Linear Derating Factor | 0.56 | W/°C |
| V_{GS} | Gate-to-Source Voltage | ± 10 | V |
| V_{GSM} | Gate-to-Source Voltage (Start Up Transient, $t_p = 100\mu s$) | 14 | V |
| E_{AS} | Single Pulse Avalanche Energy② | 270 | mJ |
| I_{AR} | Avalanche Current① | 29 | A |
| E_{AR} | Repetitive Avalanche Energy① | 6.9 | mJ |
| dv/dt | Peak Diode Recovery dv/dt ③ | 5.0 | V/ns |
| T_J | Operating Junction and | -55 to + 150 | °C |
| T_{STG} | Storage Temperature Range | | |
| | Soldering Temperature, for 10 seconds | | |
| | Mounting torque, 6-32 or M3 screw | 10 lbf•in (1.1N•m) | |

Thermal Resistance

| | Parameter | Typ. | Max. | Units |
|-----------------|-------------------------------------|------|------|-------|
| $R_{\theta JC}$ | Junction-to-Case | — | 1.8 | °C/W |
| $R_{\theta CS}$ | Case-to-Sink, Flat, Greased Surface | 0.50 | — | |
| $R_{\theta JA}$ | Junction-to-Ambient | — | 62 | |

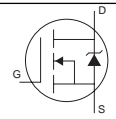
Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

| | 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 | — | 0.029 | — | V/ $^\circ\text{C}$ | Reference to $25^\circ\text{C}, I_D = 1\text{mA}$ |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | — | 0.019 | m | $V_{GS} = 4.5V, I_D = 29A$ ④ |
| | | — | — | 0.016 | | $V_{GS} = 7.0V, I_D = 29A$ ④ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 0.70 | — | — | V | $V_{DS} = V_{GS}, I_D = 250\mu A$ |
| g_{fs} | Forward Transconductance | 28 | — | — | S | $V_{DS} = 16V, I_D = 29A$ |
| 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 | — | — | 43 | nC | $I_D = 29A$ |
| Q_{gs} | Gate-to-Source Charge | — | — | 12 | | $V_{DS} = 16V$ |
| Q_{gd} | Gate-to-Drain ("Miller") Charge | — | — | 13 | | $V_{GS} = 4.5V$, See Fig. 6 ④ |
| $t_{d(on)}$ | Turn-On Delay Time | — | 9.8 | — | ns | $V_{DD} = 10V$ |
| t_r | Rise Time | — | 100 | — | | $I_D = 29A$ |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 63 | — | | $R_G = 9.5\text{m}\Omega, V_{GS} = 4.5V$ |
| t_f | Fall Time | — | 82 | — | | $R_D = 0.3\text{m}\Omega$, ④ |
| L_D | Internal Drain Inductance | — | 4.5 | — | nH | Between lead, 6mm (0.25in.) from package and center of die contact |
| L_S | Internal Source Inductance | — | 7.5 | — | | |
| C_{iss} | Input Capacitance | — | 2000 | — | pF | $V_{GS} = 0V$ |
| C_{oss} | Output Capacitance | — | 800 | — | | $V_{DS} = 15V$ |
| C_{rss} | Reverse Transfer Capacitance | — | 290 | — | | $f = 1.0\text{MHz}$, See Fig. 5 |



Source-Drain Ratings and Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------|---|---|------|------|-------|---|
| I_S | Continuous Source Current (Body Diode) | — | — | 48 | A | MOSFET symbol showing the integral reverse p-n junction diode. |
| I_{SM} | Pulsed Source Current (Body Diode) ① | — | — | 190 | | |
| V_{SD} | Diode Forward Voltage | — | — | 1.3 | V | $T_J = 25^\circ\text{C}, I_S = 29A, V_{GS} = 0V$ ④ |
| t_{rr} | Reverse Recovery Time | — | 68 | 100 | ns | $T_J = 25^\circ\text{C}, I_F = 29A$ |
| Q_{rr} | Reverse Recovery Charge | — | 130 | 190 | nC | $di/dt = 100A/\mu s$ ④ |
| 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 $T_J = 25^\circ\text{C}$, $L = 0.64\text{mH}$
 $R_G = 25\text{m}\Omega, I_{AS} = 29A$.

③ $I_{FD} \leq 29A, di/dt \leq 63A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 150^\circ\text{C}$

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

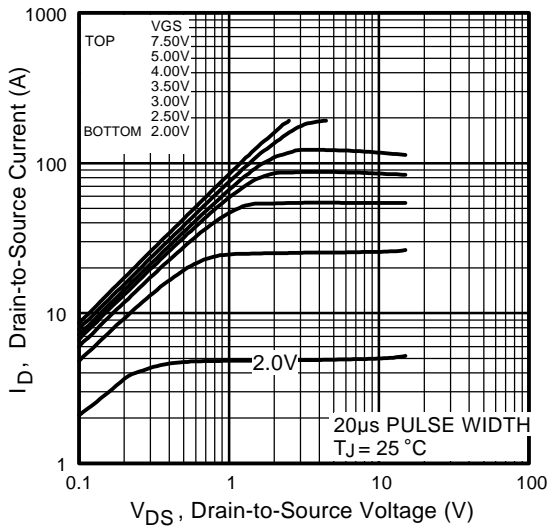


Fig 1. Typical Output Characteristics

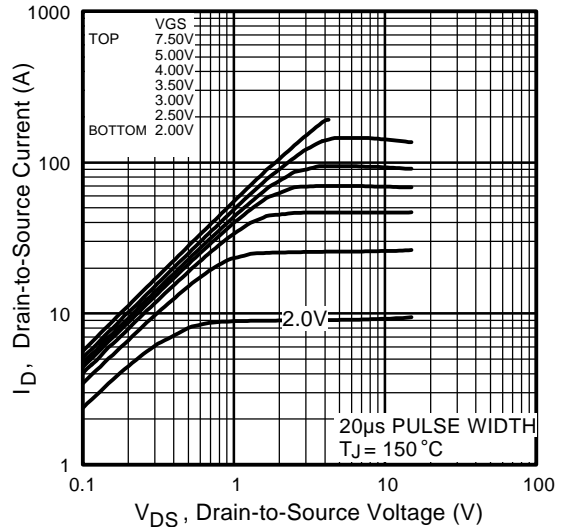


Fig 2. Typical Output Characteristics

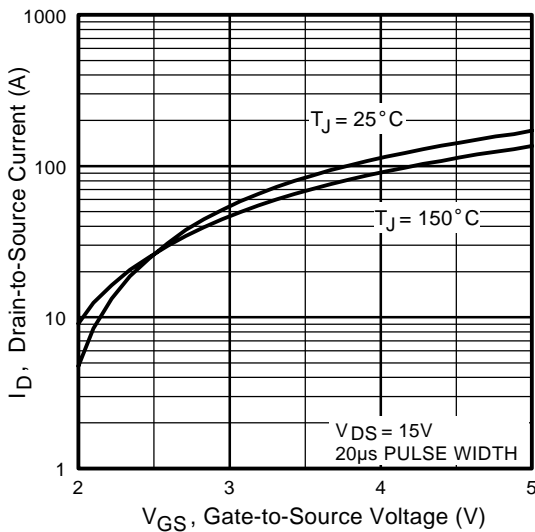


Fig 3. Typical Transfer Characteristics

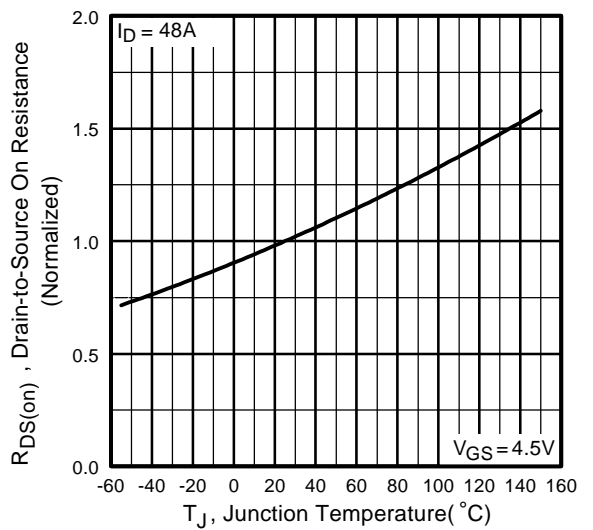


Fig 4. Normalized On-Resistance Vs. Temperature

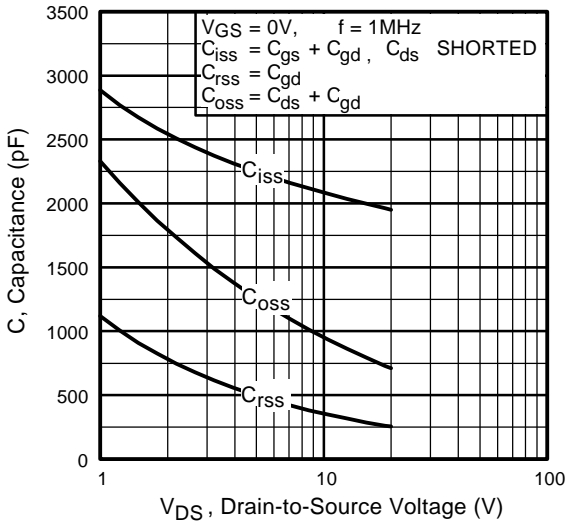


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

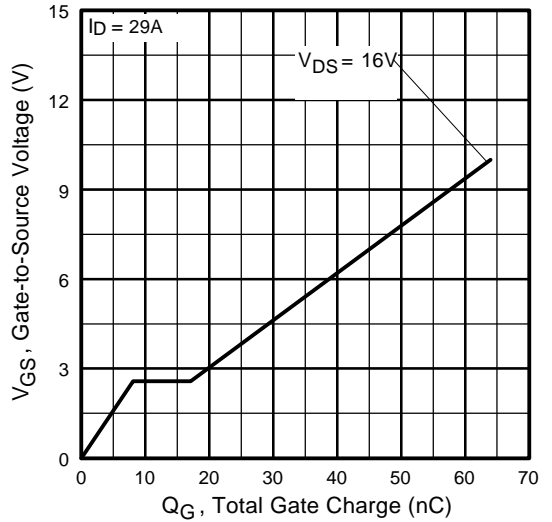


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

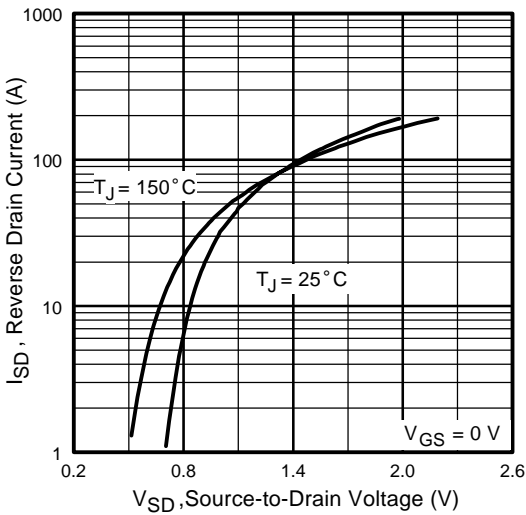


Fig 7. Typical Source-Drain Diode Forward Voltage

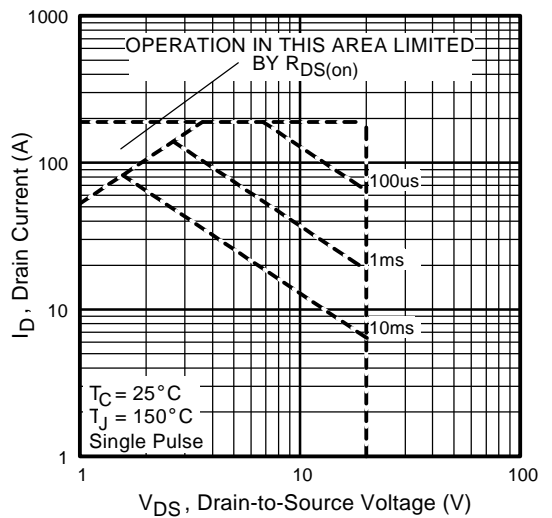


Fig 8. Maximum Safe Operating Area

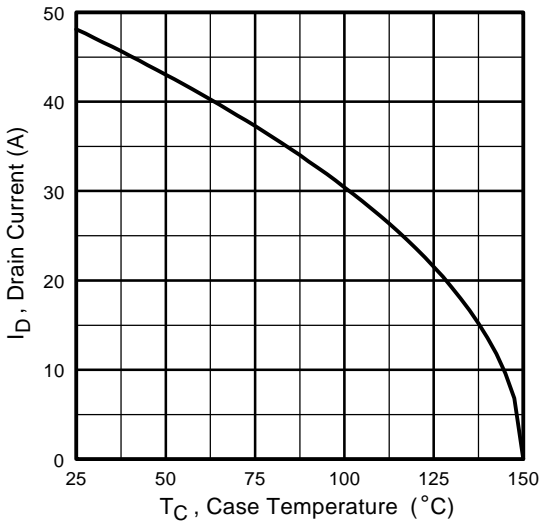


Fig 9. Maximum Drain Current Vs. Case Temperature

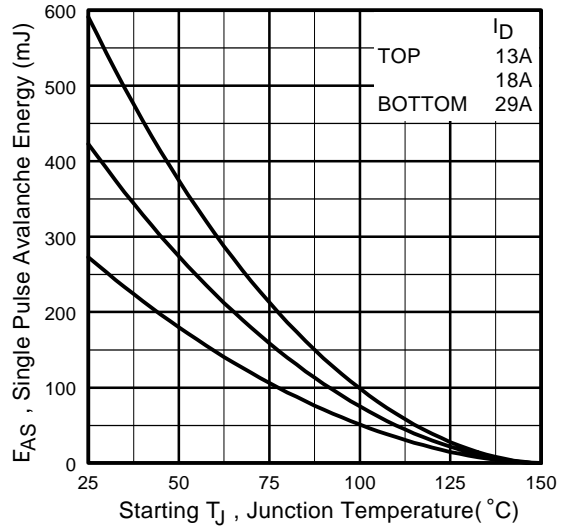


Fig 10. Maximum Avalanche Energy Vs. Drain Current

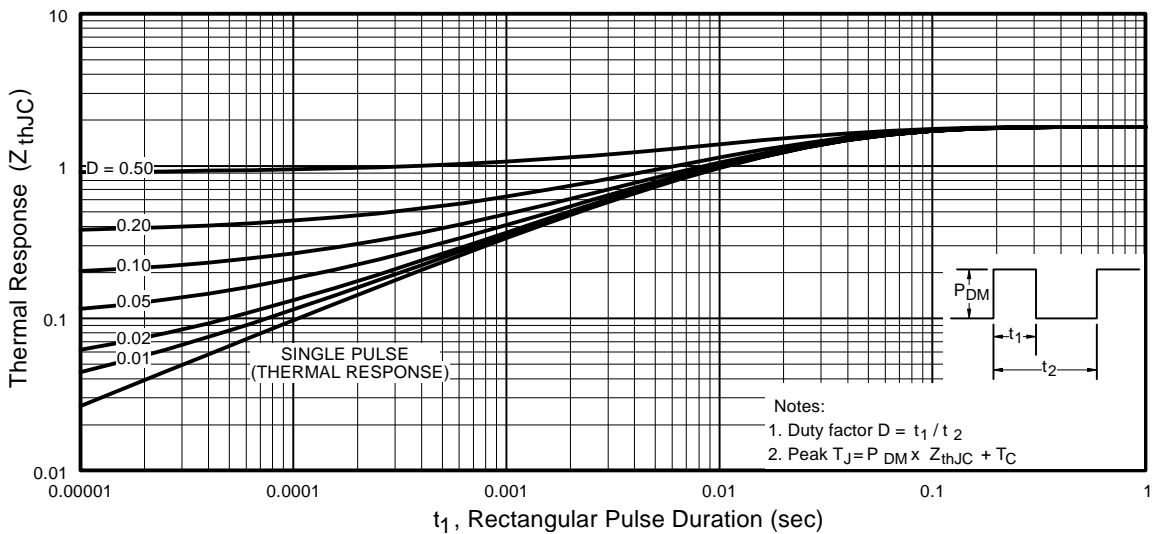


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

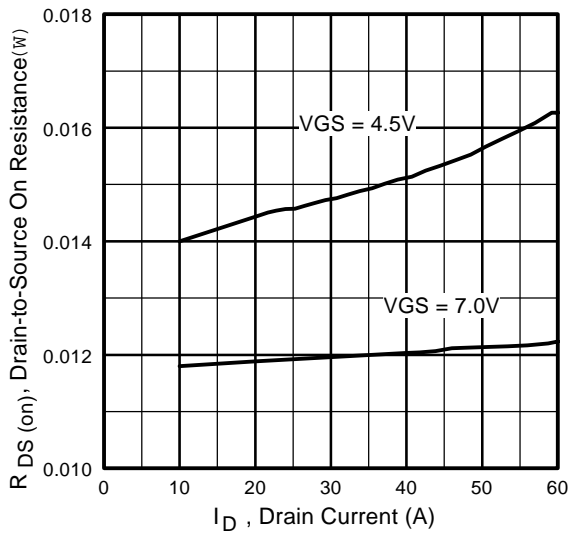


Fig 12. On-Resistance Vs. Drain Current

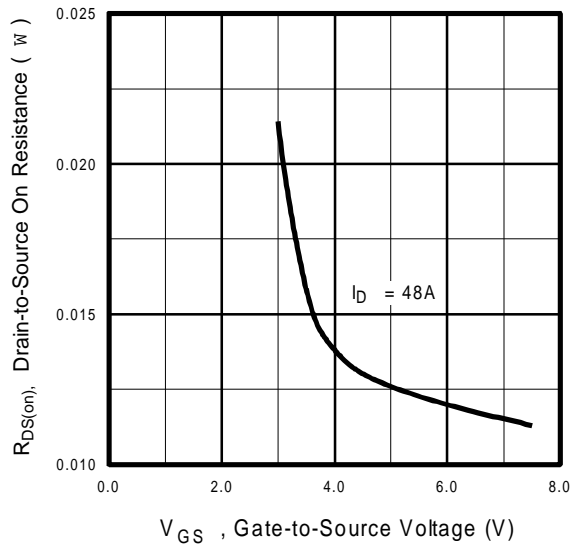
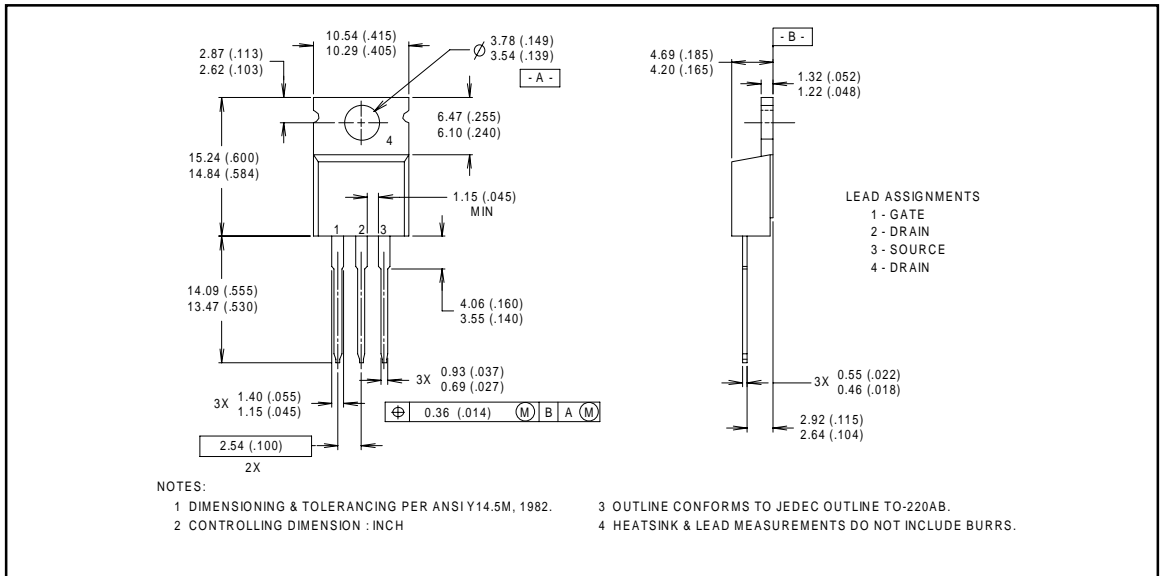


Fig 13. On-Resistance Vs. Gate Voltage

Package Outline

TO-220AB Outline

Dimensions are shown in millimeters (inches)



Part Marking Information

TO-220AB

EXAMPLE : THIS IS AN IRF1010
 WITH ASSEMBLY
 LOT CODE 9B1M

