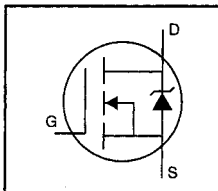


HEXFET® Power MOSFET

- Dynamic dv/dt Rating
- Repetitive Avalanche Rated
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements



$$V_{DSS} = 450V$$

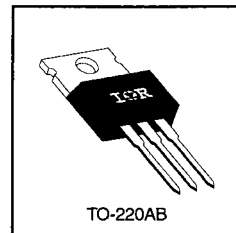
$$R_{DS(on)} = 1.2\Omega$$

$$I_D = 4.9A$$

Description

Third Generation HEXFETs from International Rectifier provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

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.




Absolute Maximum Ratings

| | Parameter | Max. | Units |
|---------------------------|---|-----------------------|-------|
| $I_D @ T_C = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10 V$ | 4.9 | A |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10 V$ | 3.1 | |
| I_{DM} | Pulsed Drain Current ① | 20 | |
| $P_D @ T_C = 25^\circ C$ | Power Dissipation | 74 | W |
| | Linear Derating Factor | 0.59 | W/°C |
| V_{GS} | Gate-to-Source Voltage | ± 20 | V |
| E_{AS} | Single Pulse Avalanche Energy ② | 330 | mJ |
| I_{AR} | Avalanche Current ① | 4.9 | A |
| E_{AR} | Repetitive Avalanche Energy ① | 7.4 | mJ |
| dv/dt | Peak Diode Recovery dv/dt ③ | 4.0 | V/ns |
| T_J | Operating Junction and | -55 to +150 | °C |
| T_{STG} | Storage Temperature Range | | |
| | Soldering Temperature, for 10 seconds | 300 (1.6mm from case) | |
| | Mounting Torque, 6-32 or M3 screw | 10 lbf•in (1.1 N•m) | |


Thermal Resistance

| | Parameter | Min. | Typ. | Max. | Units |
|-----------------|-------------------------------------|------|------|------|-------|
| $R_{\theta JC}$ | Junction-to-Case | — | — | 1.7 | °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)

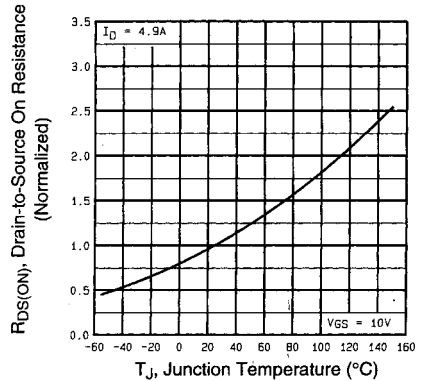
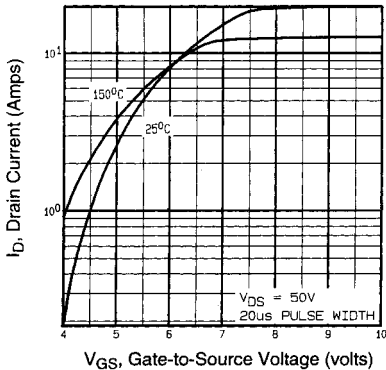
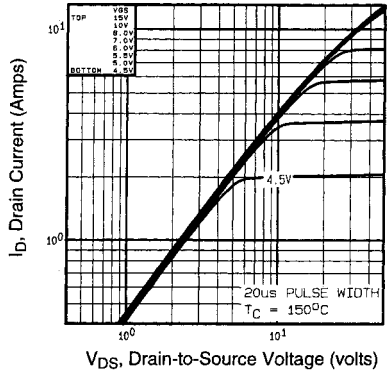
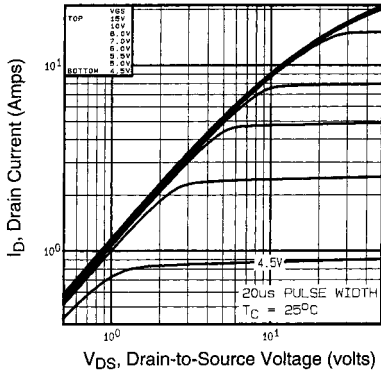
| | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|---------------------------------|--------------------------------------|------|------|------|--------------------|---|
| $V_{(BR)DSS}$ | Drain-to-Source Breakdown Voltage | 450 | — | — | V | $V_{GS}=0V, I_D=250\mu A$ |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient | — | 0.63 | — | $V/^\circ\text{C}$ | Reference to $25^\circ\text{C}, I_D=1\text{mA}$ |
| $R_{DS(on)}$ | Static Drain-to-Source On-Resistance | — | — | 1.2 | Ω | $V_{GS}=10V, I_D=2.9A$ ④ |
| $V_{GS(th)}$ | Gate Threshold Voltage | 2.0 | — | 4.0 | V | $V_{DS}=V_{GS}, I_D=250\mu A$ |
| g_{fs} | Forward Transconductance | 3.0 | — | — | S | $V_{DS}=50V, I_D=2.9A$ ④ |
| I_{DSS} | Drain-to-Source Leakage Current | — | — | 25 | μA | $V_{DS}=450V, V_{GS}=0V$ |
| | | — | — | 250 | | $V_{DS}=360V, V_{GS}=0V, T_J=125^\circ\text{C}$ |
| I_{GSS} | Gate-to-Source Forward Leakage | — | — | 100 | nA | $V_{GS}=20V$ |
| | Gate-to-Source Reverse Leakage | — | — | -100 | | $V_{GS}=-20V$ |
| Q_g | Total Gate Charge | — | — | 45 | nC | $I_D=4.9A$ |
| Q_{gs} | Gate-to-Source Charge | — | — | 6.6 | | $V_{DS}=360V$ |
| Q_{gd} | Gate-to-Drain ("Miller") Charge | — | — | 24 | | $V_{GS}=10V$ See Fig. 6 and 13 ④ |
| $t_{d(on)}$ | Turn-On Delay Time | — | 5.9 | — | ns | $V_{DD}=225V$ |
| t_r | Rise Time | — | 22 | — | | $I_D=4.9A$ |
| $t_{d(off)}$ | Turn-Off Delay Time | — | 40 | — | | $R_G=12\Omega$ |
| t_f | Fall Time | — | 21 | — | | $R_D=45\Omega$ See Figure 10 ④ |
| L_D | Internal Drain Inductance | — | 4.5 | — | nH | Between lead, 6 mm (0.25in.) from package and center of die contact |
| L_S | Internal Source Inductance | — | 7.5 | — | |  |
| C_{iss} | Input Capacitance | — | 680 | — | pF | $V_{GS}=0V$ |
| C_{oss} | Output Capacitance | — | 190 | — | | $V_{DS}=25V$ |
| C_{rss} | Reverse Transfer Capacitance | — | 75 | — | | $f=1.0\text{MHz}$ See Figure 5 |

Source-Drain Ratings and Characteristics

| | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|----------|--|---|------|------|---------|--|
| I_S | Continuous Source Current (Body Diode) | — | — | 4.9 | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I_{SM} | Pulsed Source Current (Body Diode) ① | — | — | 20 | | |
| V_{SD} | Diode Forward Voltage | — | — | 2.0 | V | $T_J=25^\circ\text{C}, I_S=4.9A, V_{GS}=0V$ ④ |
| t_{rr} | Reverse Recovery Time | — | 460 | 690 | ns | $T_J=25^\circ\text{C}, I_F=4.9A$ |
| Q_{rr} | Reverse Recovery Charge | — | 1.8 | 2.7 | μC | $di/dt=100A/\mu s$ 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 (See Figure 11)
- ② $V_{DD}=50V$, starting $T_J=25^\circ\text{C}$, $L=24\text{mH}$, $R_G=25\Omega$, $I_{AS}=4.9A$ (See Figure 12)
- ③ $I_{SD}\leq 4.9A$, $di/dt\leq 80A/\mu s$, $V_{DD}\leq V_{(BR)DSS}$, $T_J\leq 150^\circ\text{C}$
- ④ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.



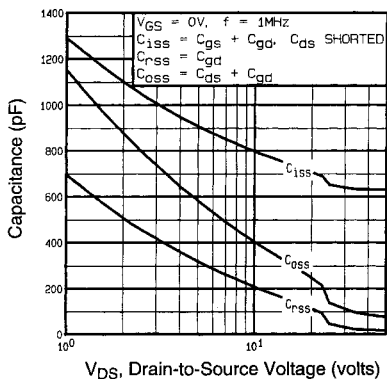


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

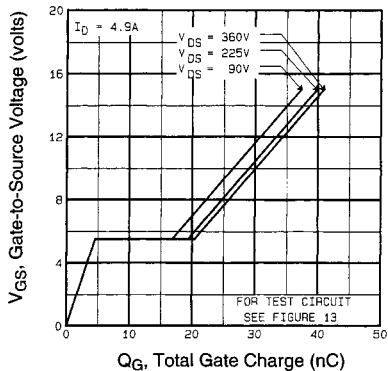


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

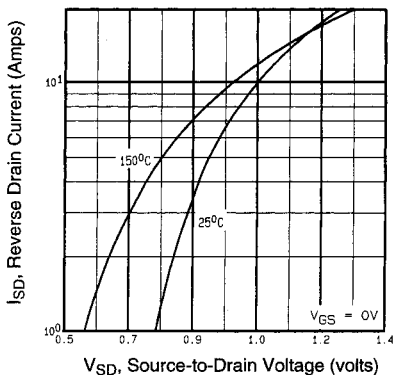


Fig 7. Typical Source-Drain Diode Forward Voltage

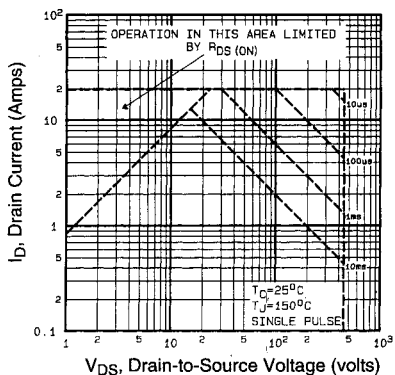


Fig 8. Maximum Safe Operating Area

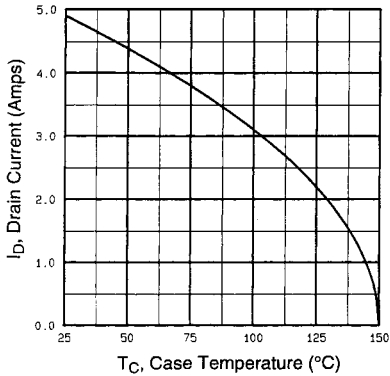


Fig 9. Maximum Drain Current Vs. Case Temperature

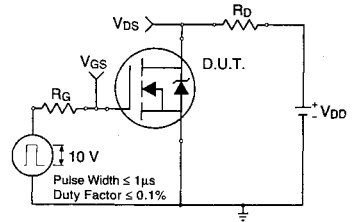


Fig 10a. Switching Time Test Circuit

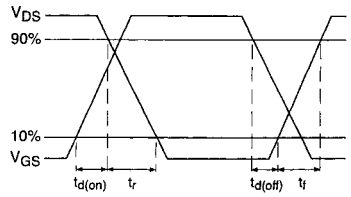


Fig 10b. Switching Time Waveforms

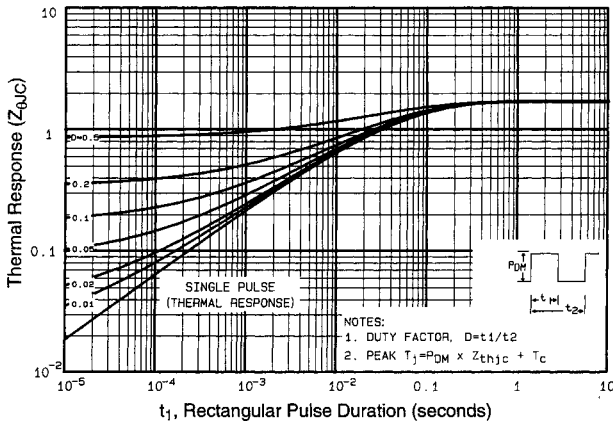


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

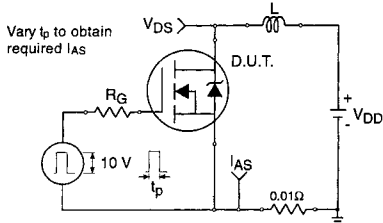


Fig 12a. Unclamped Inductive Test Circuit

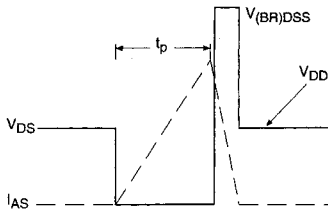


Fig 12b. Unclamped Inductive Waveforms

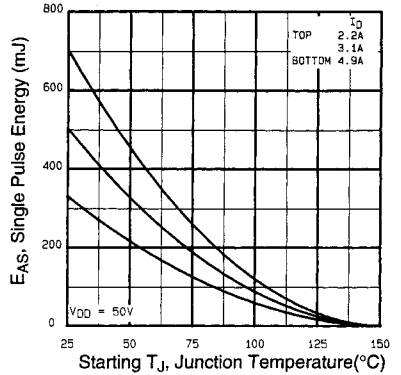


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

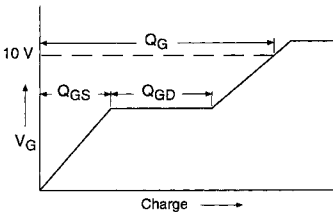


Fig 13a. Basic Gate Charge Waveform

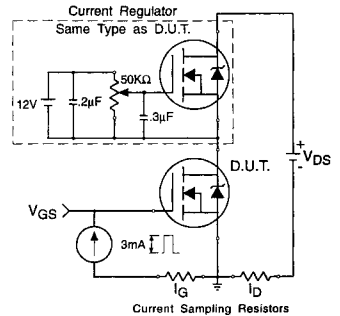


Fig 13b. Gate Charge Test Circuit

Appendix A: Figure 14, Peak Diode Recovery dv/dt Test Circuit

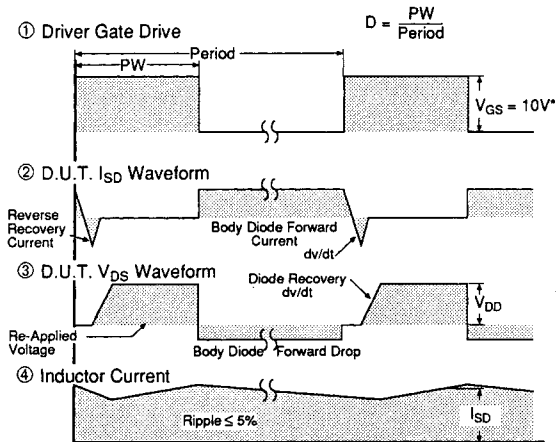
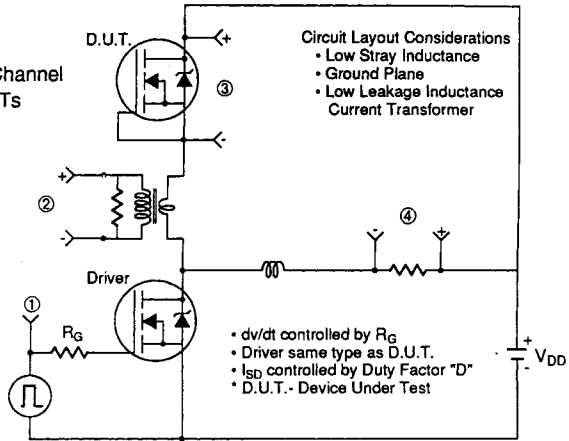
Appendix B: Package Outline Mechanical Drawing

Appendix C: Part Marking Information

Appendix A

Peak Diode Recovery dv/dt Test Circuit

Fig 14. For N-Channel HEXFETs



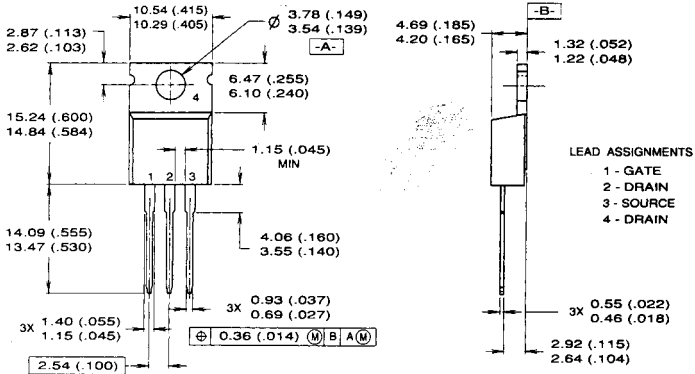
* $V_{GS} = 5V$ for Logic Level Devices

Package Outline

Appendix B

TO-220AB Outline

Dimensions are shown in millimeters (inches)



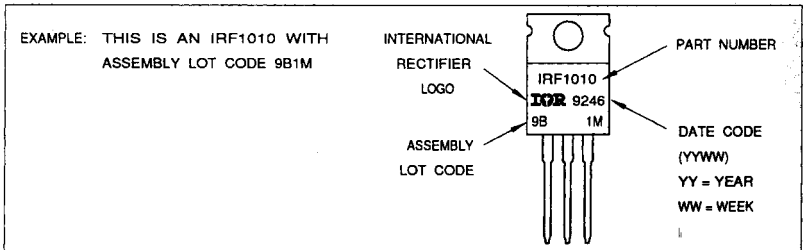
NOTES:

- 1 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
- 2 CONTROLLING DIMENSION : INCH.
- 3 OUTLINE CONFORMS TO JEDEC OUTLINE TO-220-AB.
- 4 HEATSINK & LEAD MEASUREMENTS DO NOT INCLUDE BURRS.

Part Marking Information

Appendix C

TO-220AB



Printed on Signet recycled offset:
made from 50% recycled waste paper, including
10% de-inked, post-consumer waste.



International Rectifier

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