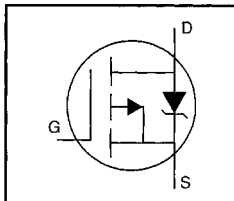


## HEXFET® Power MOSFET

- Dynamic  $dv/dt$  Rating
- Repetitive Avalanche Rated
- P-Channel
- 175°C Operating Temperature
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements



$$V_{DSS} = -60V$$

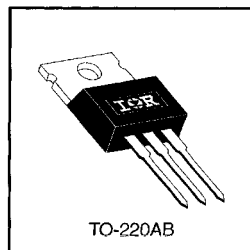
$$R_{DS(on)} = 0.14\Omega$$

$$I_D = -18A$$

## 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.



DATA  
SHEETS

## Absolute Maximum Ratings

|                             | Parameter                                  | Max.                                         | Units |
|-----------------------------|--------------------------------------------|----------------------------------------------|-------|
| $I_D$ @ $T_C = 25^\circ C$  | Continuous Drain Current, $V_{GS}$ @ -10 V | -18                                          | A     |
| $I_D$ @ $T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS}$ @ -10 V | -13                                          |       |
| $I_{DM}$                    | Pulsed Drain Current ①                     | -72                                          |       |
| $P_D$ @ $T_C = 25^\circ C$  | Power Dissipation                          | 88                                           | W     |
|                             | Linear Derating Factor                     | 0.59                                         | W/°C  |
| $V_{GS}$                    | Gate-to-Source Voltage                     | $\pm 20$                                     | V     |
| $E_{AS}$                    | Single Pulse Avalanche Energy ②            | 370                                          | mJ    |
| $I_{AR}$                    | Avalanche Current ①                        | -18                                          | A     |
| $E_{AR}$                    | Repetitive Avalanche Energy ①              | 8.8                                          | mJ    |
| $dv/dt$                     | Peak Diode Recovery $dv/dt$ ③              | -4.5                                         | V/ns  |
| $T_J$                       | Operating Junction and                     | -55 to +175                                  | °C    |
| $T_{STG}$                   | Storage Temperature Range                  |                                              |       |
|                             | Soldering Temperature, for 10 seconds      |                                              |       |
|                             | Mounting Torque, 6-32 or M3 screw          | 300 (1.6mm from case)<br>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)

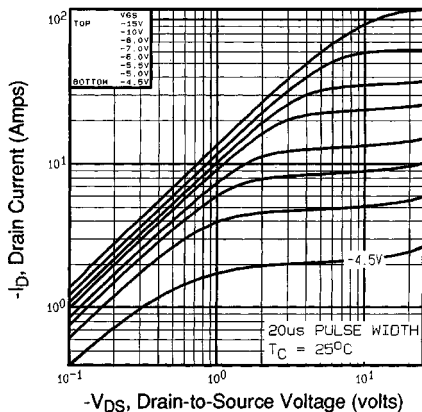
|                                 | Parameter                            | Min. | Typ.   | Max. | Units               | Test Conditions                                                     |
|---------------------------------|--------------------------------------|------|--------|------|---------------------|---------------------------------------------------------------------|
| $V_{(BR)DSS}$                   | Drain-to-Source Breakdown Voltage    | -60  | —      | —    | V                   | $V_{GS}=0V$ , $I_D=-250\mu A$                                       |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient  | —    | -0.060 | —    | V/ $^\circ\text{C}$ | Reference to $25^\circ\text{C}$ , $I_D=-1mA$                        |
| $R_{DS(on)}$                    | Static Drain-to-Source On-Resistance | —    | —      | 0.14 | $\Omega$            | $V_{GS}=-10V$ , $I_D=-11A$ 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             | 5.9  | —      | —    | S                   | $V_{DS}=-25V$ , $I_D=-11A$ ④                                        |
| $I_{DSS}$                       | Drain-to-Source Leakage Current      | —    | —      | -100 | $\mu A$             | $V_{DS}=-60V$ , $V_{GS}=0V$                                         |
| $I_{GSS}$                       | Gate-to-Source Forward Leakage       | —    | —      | -100 | nA                  | $V_{DS}=-48V$ , $V_{GS}=0V$ , $T_J=150^\circ\text{C}$               |
|                                 | Gate-to-Source Reverse Leakage       | —    | —      | 100  | nA                  | $V_{DS}=-20V$                                                       |
| $Q_g$                           | Total Gate Charge                    | —    | —      | 34   | nC                  | $I_D=-18A$                                                          |
| $Q_{gs}$                        | Gate-to-Source Charge                | —    | —      | 9.9  | nC                  | $V_{DS}=-48V$                                                       |
| $Q_{gd}$                        | Gate-to-Drain ("Miller") Charge      | —    | —      | 16   | nC                  | $V_{GS}=-10V$ See Fig. 6 and 13 ④                                   |
| $t_{d(on)}$                     | Turn-On Delay Time                   | —    | 18     | —    | ns                  | $V_{DD}=-30V$                                                       |
| $t_r$                           | Rise Time                            | —    | 120    | —    | ns                  | $I_D=-18A$                                                          |
| $t_{d(off)}$                    | Turn-Off Delay Time                  | —    | 20     | —    | ns                  | $R_G=12\Omega$                                                      |
| $t_f$                           | Fall Time                            | —    | 58     | —    | ns                  | $R_D=1.5\Omega$ 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    | —    | nH                  |                                                                     |
| $C_{iss}$                       | Input Capacitance                    | —    | 1100   | —    | pF                  | $V_{DS}=0V$                                                         |
| $C_{oss}$                       | Output Capacitance                   | —    | 620    | —    | pF                  | $V_{DS}=-25V$                                                       |
| $C_{rss}$                       | Reverse Transfer Capacitance         | —    | 100    | —    | pF                  | $f=1.0MHz$ See Figure 5                                             |

## Source-Drain Ratings and Characteristics

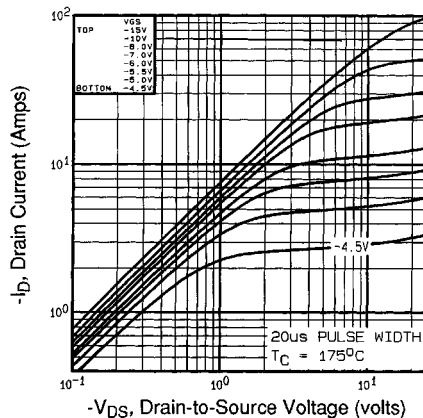
|          | Parameter                              | Min.                                                                      | Typ. | Max. | Units   | Test Conditions                                                                                                                                   |
|----------|----------------------------------------|---------------------------------------------------------------------------|------|------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_S$    | Continuous Source Current (Body Diode) | —                                                                         | —    | -18  | A       | MOSFET symbol showing the integral reverse p-n junction diode.  |
| $I_{SM}$ | Pulsed Source Current (Body Diode) ①   | —                                                                         | —    | -72  | A       |                                                                                                                                                   |
| $V_{SD}$ | Diode Forward Voltage                  | —                                                                         | —    | -6.3 | V       | $T_J=25^\circ\text{C}$ , $I_S=-18A$ , $V_{GS}=0V$ ④                                                                                               |
| $t_{rr}$ | Reverse Recovery Time                  | —                                                                         | 100  | 200  | ns      | $T_J=25^\circ\text{C}$ , $I_F=-18A$                                                                                                               |
| $Q_{rr}$ | Reverse Recovery Charge                | —                                                                         | 0.28 | 0.52 | $\mu C$ | $di/dt=100A/\mu s$ ④                                                                                                                              |
| $t_{on}$ | Forward Turn-On Time                   | Intrinsic turn-on time is negligible (turn-on is dominated by $L_S+L_D$ ) |      |      |         |                                                                                                                                                   |

### Notes:

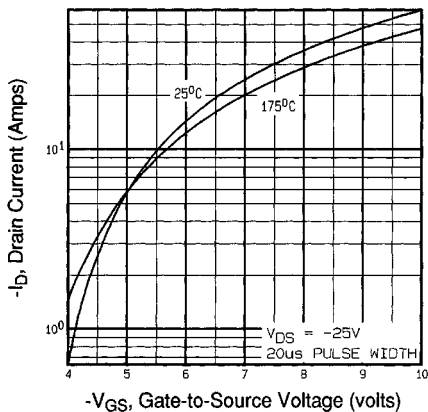
- ① Repetitive rating; pulse width limited by max. junction temperature (See Figure 11)
- ②  $V_{DD}=-25V$ , starting  $T_J=25^\circ\text{C}$ ,  $L=1.3mH$ ,  $R_G=25\Omega$ ,  $I_{AS}=-18A$  (See Figure 12)
- ③  $I_{SD}\leq -18A$ ,  $di/dt\leq 170A/\mu s$ ,  $V_{DD}\leq V_{(BR)DSS}$ ,  $T_J\leq 175^\circ\text{C}$
- ④ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .



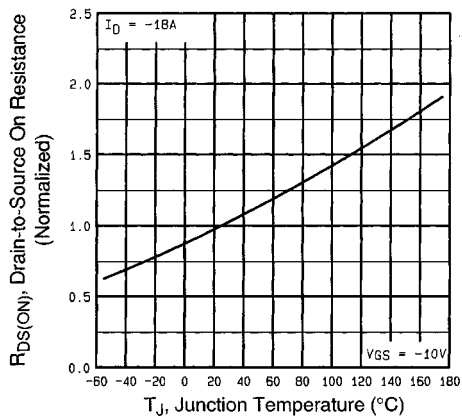
**Fig 1.** Typical Output Characteristics,  
 $T_C=25^\circ\text{C}$



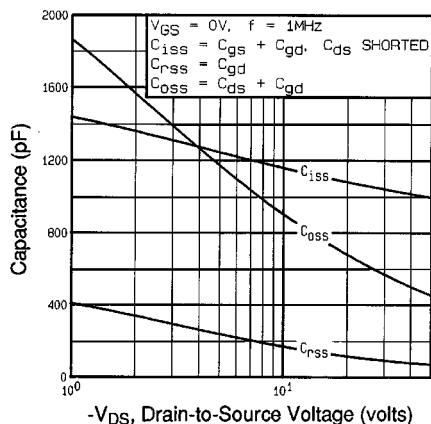
**Fig 2.** Typical Output Characteristics,  
 $T_C=175^\circ\text{C}$



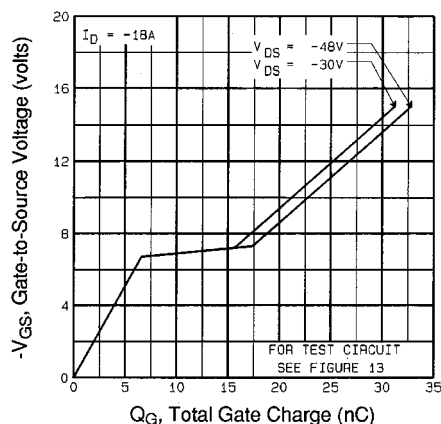
**Fig 3.** Typical Transfer Characteristics



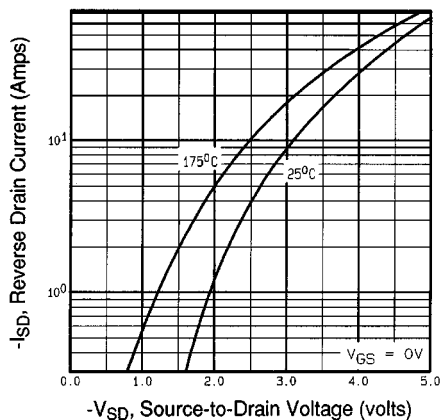
**Fig 4.** Normalized On-Resistance  
Vs. Temperature



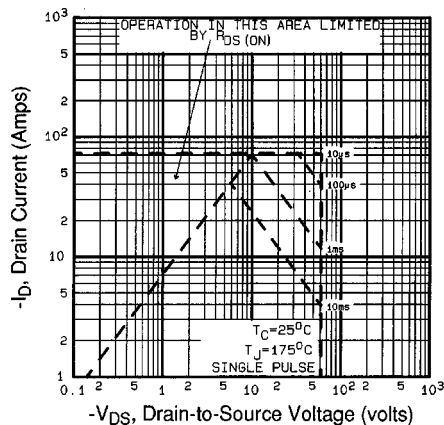
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



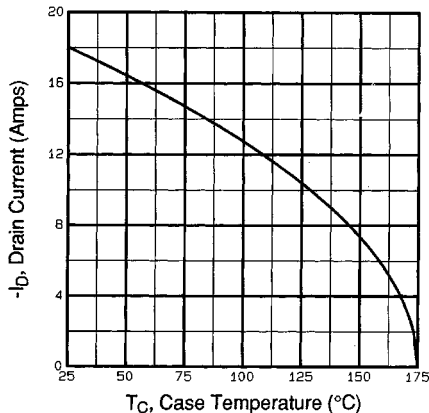
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



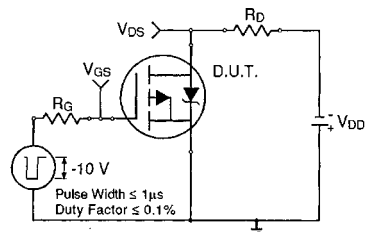
**Fig 7.** Typical Source-Drain Diode Forward Voltage



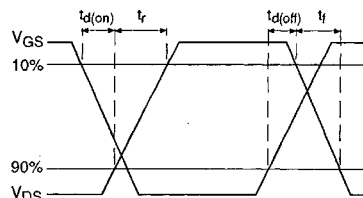
**Fig 8.** Maximum Safe Operating Area



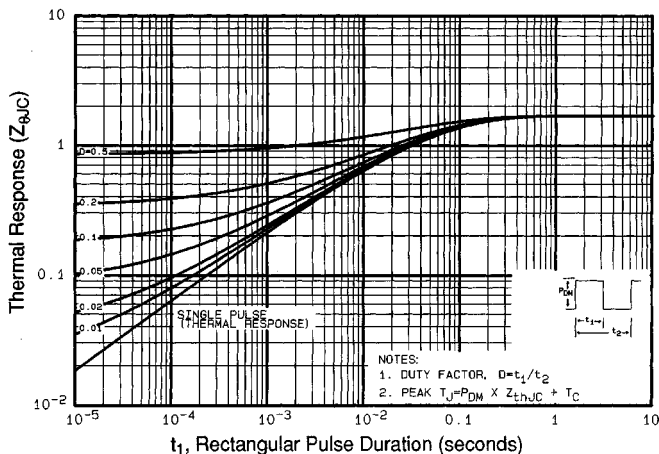
**Fig 9.** Maximum Drain Current Vs. Case Temperature



**Fig 10a.** Switching Time Test Circuit



**Fig 10b.** Switching Time Waveforms



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

