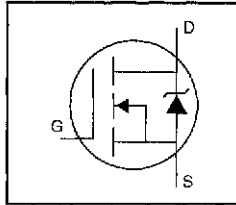


HEXFET® Power MOSFET

- Dynamic dv/dt Rating
- Logic-Level Gate Drive
- $R_{DS(on)}$ Specified at $V_{GS}=4V$ & $5V$
- $175^{\circ}C$ Operating Temperature
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements



$$V_{DSS} = 60V$$

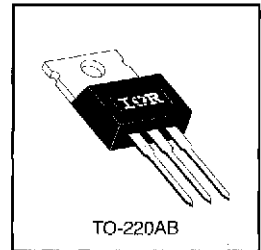
$$R_{DS(on)} = 0.050\Omega$$

$$I_D = 30A$$

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.



TO-220AB

DATA SHEETS

Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_C = 25^{\circ}C$	Continuous Drain Current, $V_{GS} @ 5.0 V$	30	
$I_D @ T_C = 100^{\circ}C$	Continuous Drain Current, $V_{GS} @ 5.0 V$	21	A
I_{DM}	Pulsed Drain Current ①	110	
$P_D @ T_C = 25^{\circ}C$	Power Dissipation	88	W
	Linear Derating Factor	0.59	W/°C
V_{GS}	Gate-to-Source Voltage	± 10	V
E_{AS}	Single Pulse Avalanche Energy ②	220	mJ
dv/dt	Peak Diode Recovery dv/dt ③	4.5	V/ns
T_J	Operating Junction and	-55 to +175	
T_{STG}	Storage Temperature Range		°C
	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	
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	—	0.50	—	°C/W
$R_{\theta JA}$	Junction-to-Ambient	—	—	62	

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

Parameter	Min.	Typ.	Max.	Units	Test Conditions	
$V_{(BR)DSS}$	60	—	—	V	$V_{GS}=0V, I_D=250\mu A$	
$\Delta V_{(BR)DSS}/\Delta T_J$	—	0.070	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D=1mA$	
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	0.050	Ω	$V_{GS}=5.0V, I_D=18A$ ③	
		—	0.070		$V_{GS}=4.0V, I_D=15A$ ④	
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	2.0	V	$V_{DS}=V_{GS}, I_D=250\mu A$
g_{fs}	Forward Transconductance	12	—	—	S	$V_{DS}=25V, I_D=18A$ ④
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	$V_{DS}=60V, V_{GS}=0V$
		—	—	250		$V_{DS}=48V, V_{GS}=0V, T_J=150^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage Gate-to-Source Reverse Leakage	—	—	100	nA	$V_{GS}=10V$
		—	—	-100		$V_{GS}=-10V$
Q_g	Total Gate Charge	—	—	35	nC	$I_D=30A$
Q_{gs}	Gate-to-Source Charge	—	—	7.1		$V_{DS}=48V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	25		$V_{DS}=5.0V$ See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	14	—		ns
t_r	Rise Time	—	170	—	$I_D=30A$	
$t_{d(off)}$	Turn-Off Delay Time	—	30	—	$R_G=6.0\Omega$	
t_f	Fall Time	—	56	—	$R_D=1.0\Omega$ 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	—	1600	—	pF	$V_{GS}=0V$
C_{oss}	Output Capacitance	—	660	—		$V_{DS}=25V$
C_{riss}	Reverse Transfer Capacitance	—	170	—		$f=1.0MHz$ See Figure 5

Source-Drain Ratings and Characteristics

Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	—	—	30	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	—	—	110		
V_{SD}	—	—	1.6	V	$T_J=25^\circ\text{C}, I_S=30A, V_{GS}=0V$ ④
t_{rr}	—	120	180	ns	$T_J=25^\circ\text{C}, I_F=30A$
Q_{rr}	—	0.70	1.3	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 $V_{DD}=25V$, starting $T_J=25^\circ\text{C}$, $L=285\mu H$, $R_G=25\Omega$, $I_{AS}=30A$ (See Figure 12)
- ③ $I_{SD}\leq 30A$, $di/dt\leq 200A/\mu s$, $V_{DD}\leq V_{(BR)DSS}$, $T_J\leq 175^\circ\text{C}$
- ④ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.

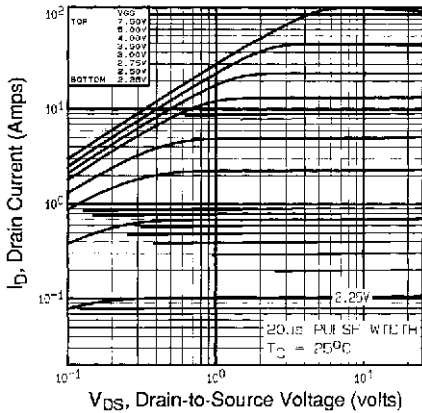


Fig 1. Typical Output Characteristics, $T_C=25^\circ\text{C}$

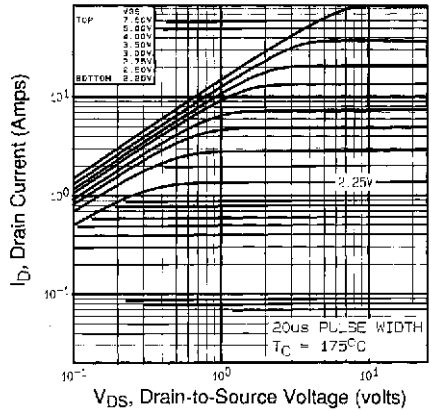


Fig 2. Typical Output Characteristics, $T_C=175^\circ\text{C}$

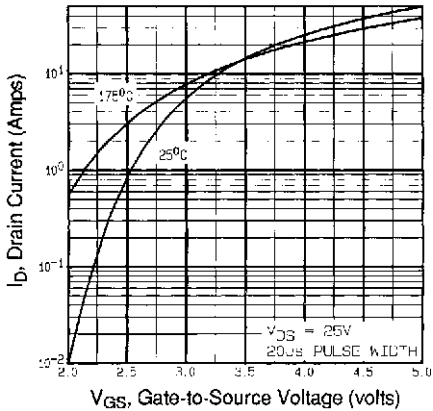


Fig 3. Typical Transfer Characteristics

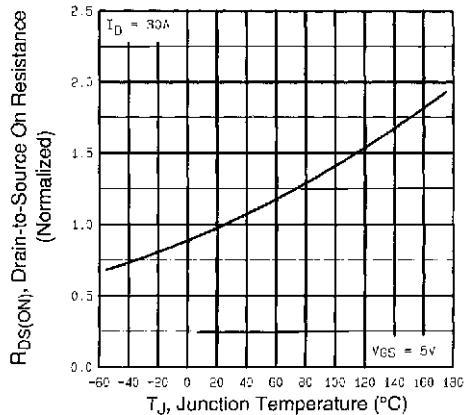


Fig 4. Normalized On-Resistance Vs. Temperature

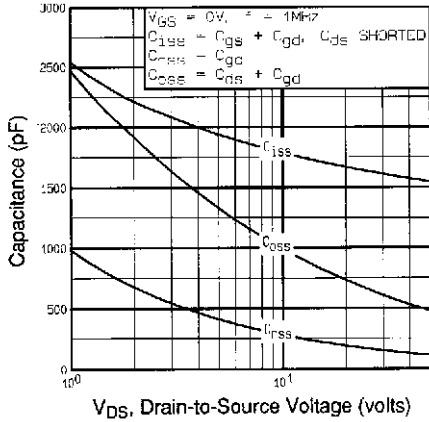


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

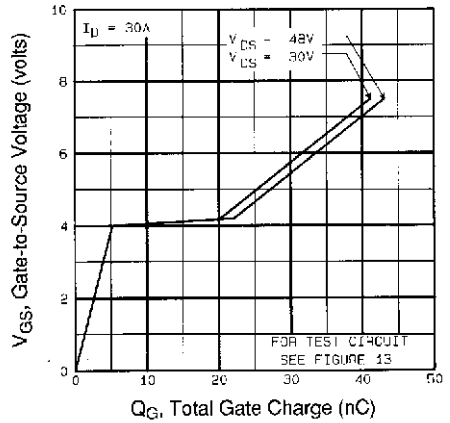


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

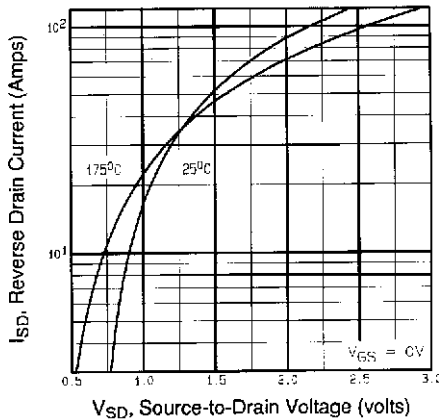


Fig 7. Typical Source-Drain Diode Forward Voltage

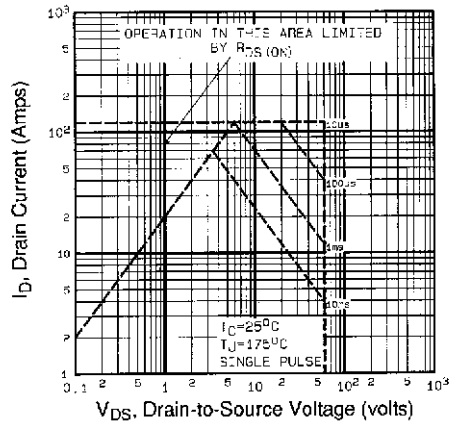


Fig 8. Maximum Safe Operating Area

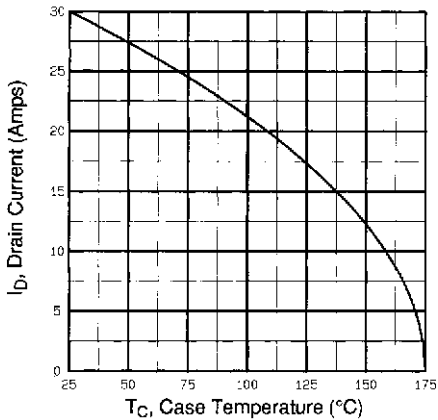


Fig 9. Maximum Drain Current Vs. Case Temperature

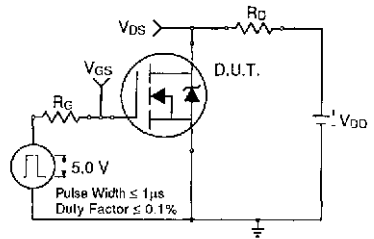


Fig 10a. Switching Time Test Circuit

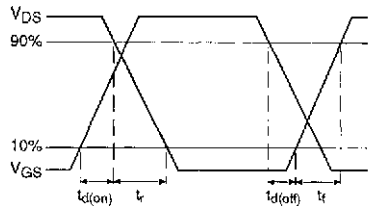


Fig 10b. Switching Time Waveforms

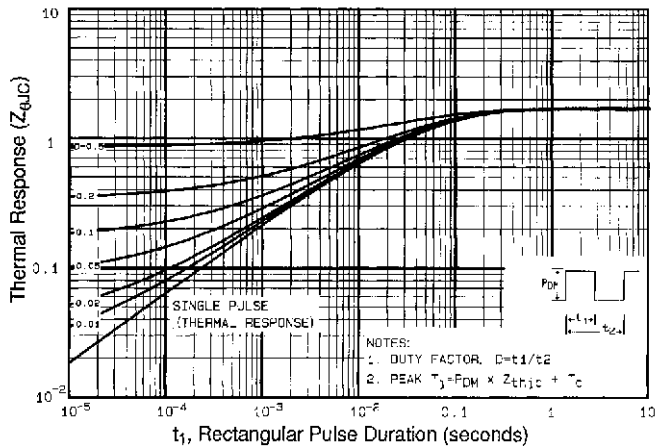


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

DATA SHEETS

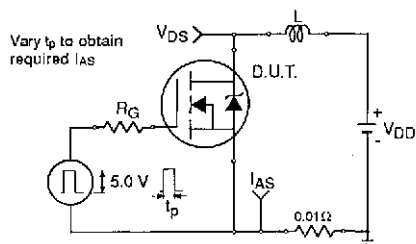


Fig 12a. Unclamped Inductive Test Circuit

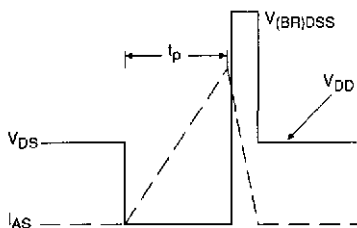


Fig 12b. Unclamped Inductive Waveforms

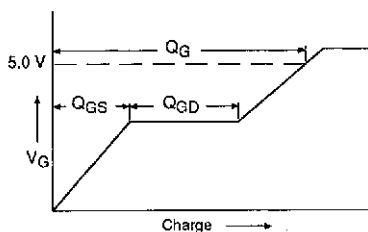


Fig 13a. Basic Gate Charge Waveform

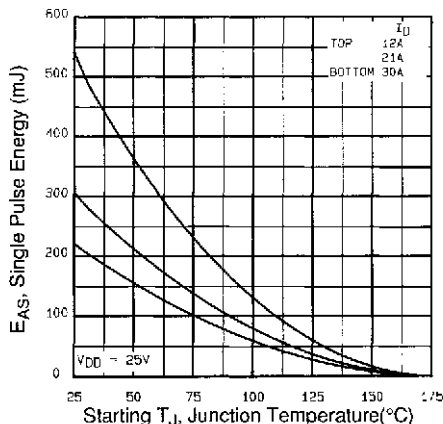


Fig 13c. Maximum Avalanche Energy Vs. Drain Current

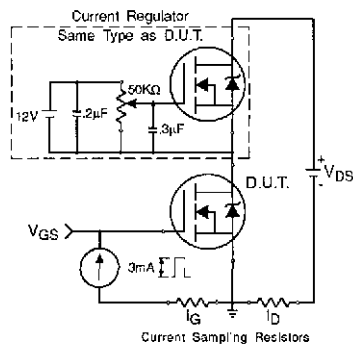


Fig 13b. Gate Charge Test Circuit

Appendix A: Figure 14, Peak Diode Recovery dv/dt Test Circuit – See page 1505

Appendix B: Package Outline Mechanical Drawing – See page 1509

Appendix C: Part Marking Information – See page 1516

Appendix E: Optional Leadforms – See page 1525



Notice

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