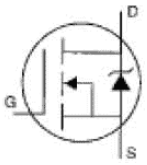
IRFZ10

HEXFET® Power MOSFET

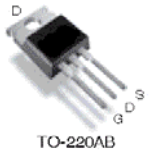
Dynamic dv/dt Rating
175°C Operating Temperature
Fast Switching
Ease of Paralleling
Simple Drive Requirements



V_{DSS}=60V

$R_{DS(on)}$ =0.20Ω

I_D=10A



G:Gate
D: Drain
S: Source

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.

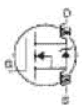
Absolute Maximum Ratings

	Parameter	Max.	Units
I_D@ Tc=25°C	Continuous Drain Current, V_{GS} @ 10V	10	A
I_D@ Tc=100°C	Continuous Drain Current, V_{GS} @ 10V	7.2	
I_{DM}	Pulsed Drain Current ①	40	
P_D@ TC=25°C	Power Dissipation	43	W
	Linear Derating Factor	0.29	W/°C
V_{GS}	Gate-to-Source Voltage	±20	V
E_{AS}	Single Pulse Avalanche Energy ②	47	mJ
dv/dt	Peak Diode Recovery dv/dt ③	4.5	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +175	°C
	Soldering Temperature, for 10 seconds	300 (1.8mm from case)	
	Mounting Torque, 6-32 or M3 screw	10 lbf•in (1.1N•m)	

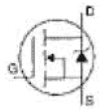
Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\Theta JC}$	Junction-to-Case	-	-	3.5	°C/W
$R_{\Theta CS}$	Case-to-Sink, Flat, Greased Surface	-	0.50	-	
$R_{\Theta JA}$	Junction-to-Ambient	-	-	62	

Electrical Characteristics @ TJ=25°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=250μA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	-	0.063	-	V/°C	Reference to 25°C,I_D=1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	-	-	0.20	Ω	V_{GS}=10V, I_D=6.0A
$V_{GS(th)}$	Gate Threshold Voltage	2.0	-	4.0	V	V_{DS}=V_{GS}, I_D=250μA
g_{fs}	Forward Transconductance	2.4	-	-	S	V_{DS}=25V, I_D=6.0A
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°C
I_{GSS}	Gate-to-Source Forward Leakage	-	-	100	nA	V_{GS}=20V
	Gate-to-Source Reverse Leakage	-	-	-100		V_{GS}=-20V
Qg	Total Gate Charge	-	-	11	nC	I_D=10A
Q_{gs}	Gate-to-Source Charge	-	-	3.1		V_{DS}=48V
Q_{gd}	Gate-to-Drain (“Miller”) Charge	-	-	5.8		V_{GS}=10V See Fig. 6 and 13④
$t_{d(on)}$	Turn-On Delay Time	-	10	-	ns	V_{DD}=30V
tr	Rise Time	-	50	-		I_D=10A
$t_{d(off)}$	Turn-Off Delay Time	-	13	-		R_G=24Ω
tf	Fall Time	-	19	-		R_D=2.7Ω See Figure 10④
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	-		
Ciss	Input Capacitance	-	300	-	pF	V_{GS}=0V
Coss	Output Capacitance	-	160	-		V_{DS}=25V
Crss	Reverse Transfer Capacitance	-	29	-		F=1.0MHz See Figure 5

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
Is	Continuous Source Current (Body Diode)	-	-	10	A	MOSFET symbol showing the integral reverse p-n junction diode 
I_{SM}	Pulsed Source Current (Body Diode) ①	-	-	40		
V_{SD}	Diode Forward Voltage	-	-	1.6	V	T_J=25°C, I_S=10A, V_{GS}=0V ④
trr	Reverse Recovery Time	-	70	140	ns	TJ=25°C, IF=10A
Qrr	Reverse Recovery Charge	-	0.20	0.40	μC	di/dt=100A/μs 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)

③ I_{SD}≤10A, di/dt ≤ 90A/μs, V_{DD}≤$V_{(BR)DSS}$, T_J≤175°C

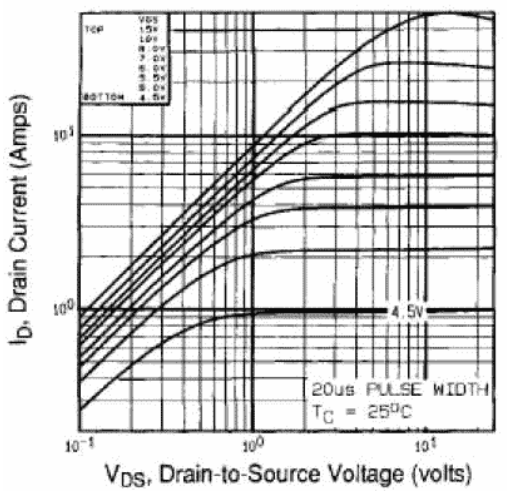


Fig 1. Typical Output Characteristics, Tc=25°C

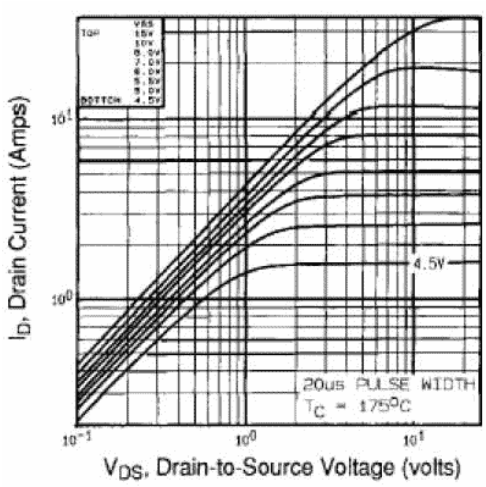


Fig 2. Typical Output Characteristics, Tc=175°C

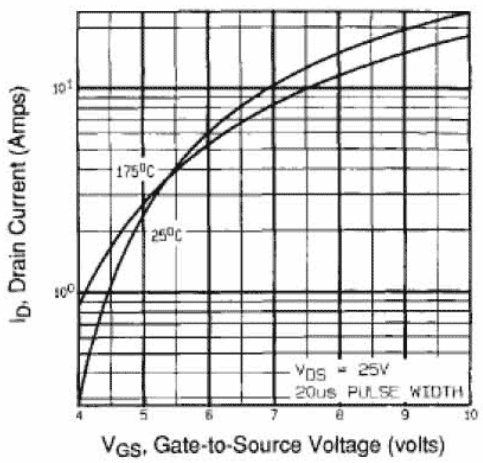


Fig 3. Typical Transfer Characteristics

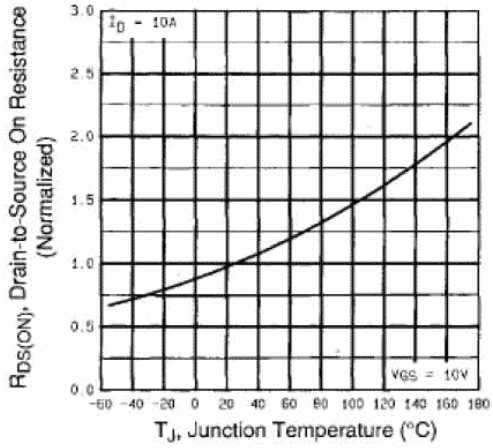


Fig 4. Normalized On-Resistance Vs. Temperature

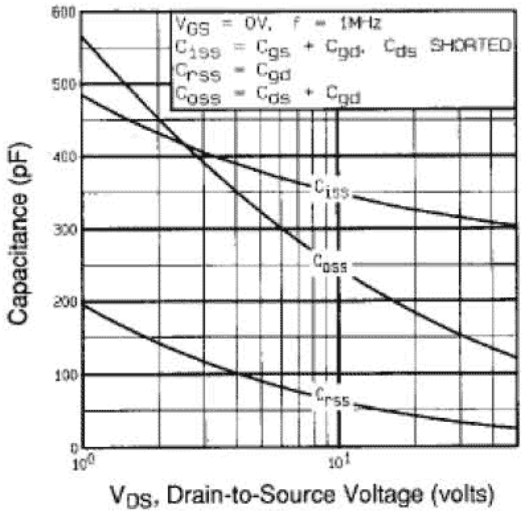


Fig 5. Typical Capacitance Vs.
Drain-to-Source Voltage

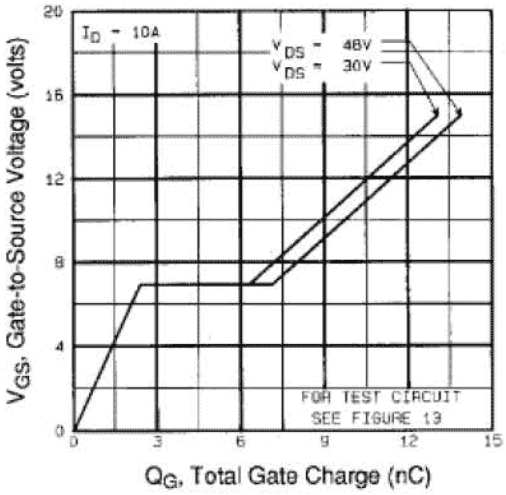


Fig 6. Typical Gate Charge Vs.
Gate-to-Source Voltage

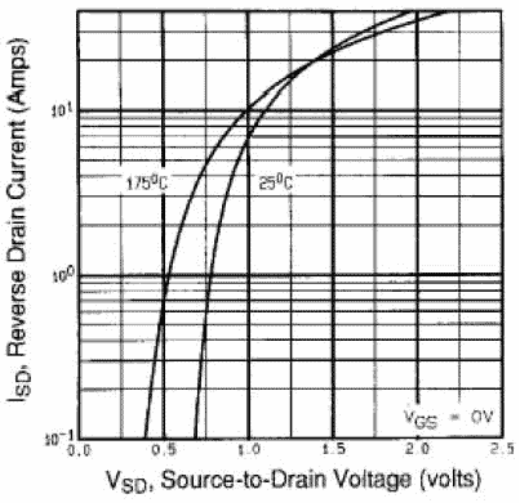


Fig 7. Typical Source-Drain Diode
Forward Voltage

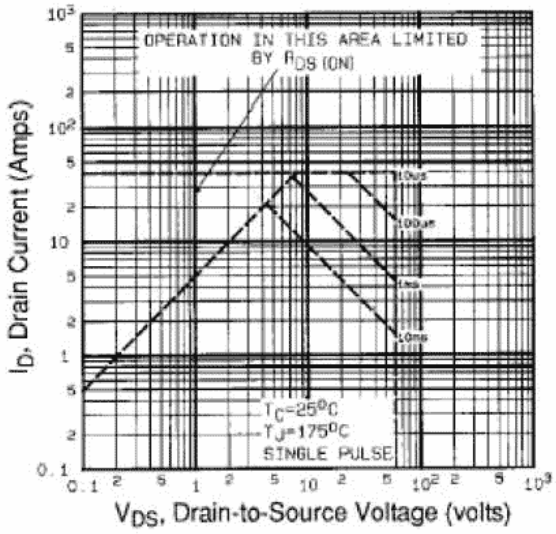


Fig 8. Maximum Safe Operating Area

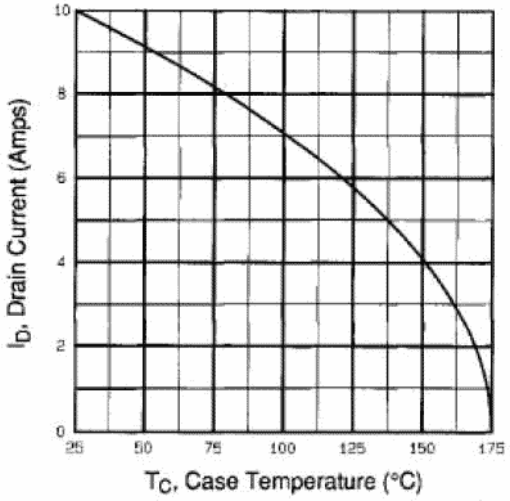


Fig 9. Maximum Drain Current Vs. Case Temperature

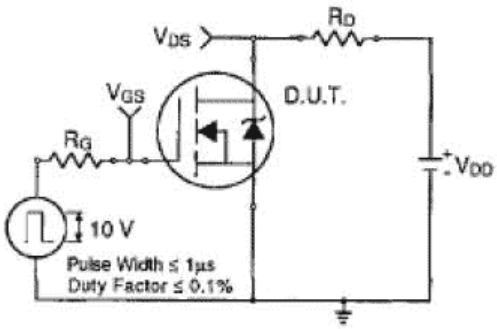


Fig 10a. Switching Time Test Circuit

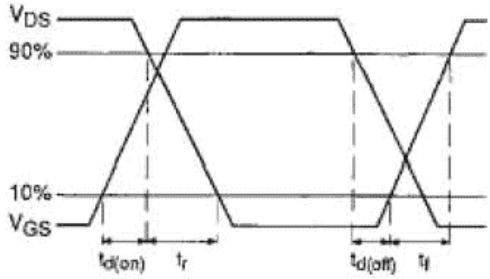


Fig 10b. Switching Time Waveforms

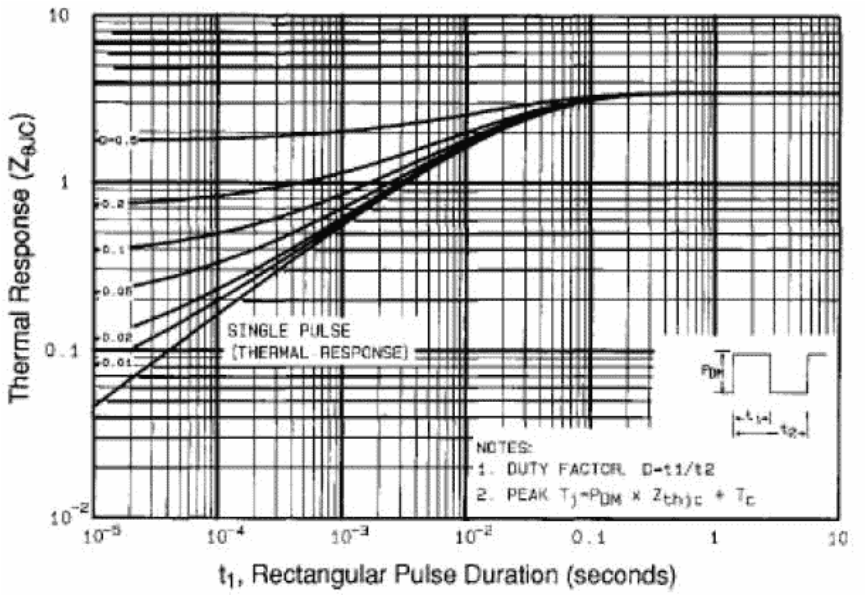


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

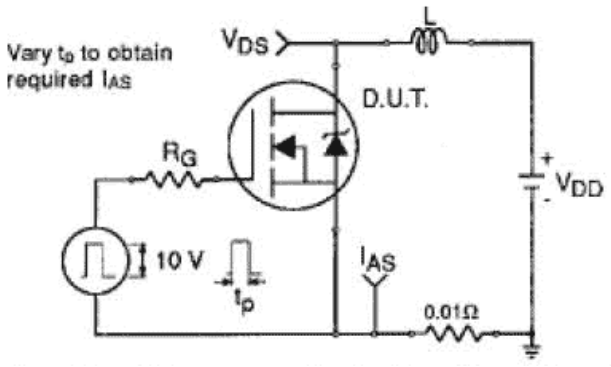


Fig 12a. Unclamped Inductive Test Circuit

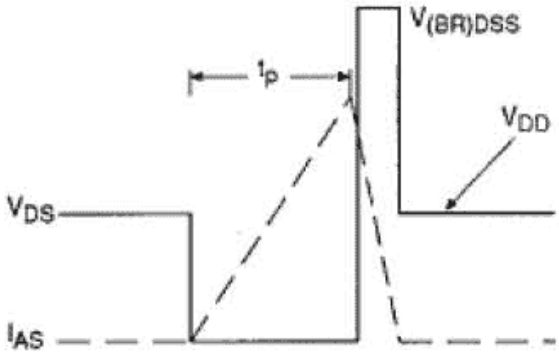


Fig 12b. Unclamped Inductive Waveforms

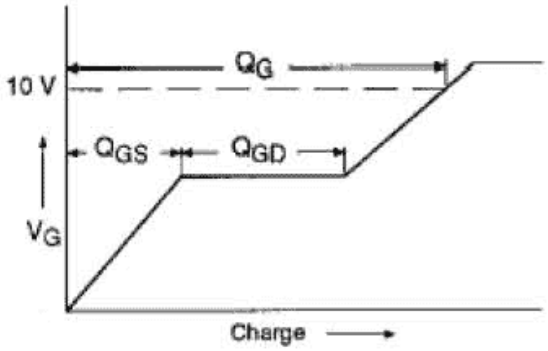


Fig 13a. Basic Gate Charge Waveform

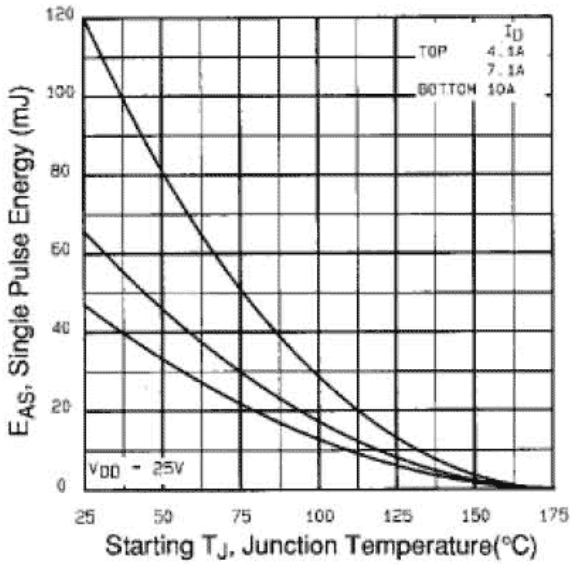


Fig 12C. Maximum Avalanche Energy Vs. Drain Current

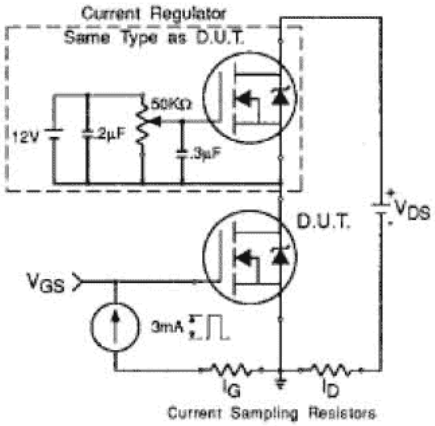
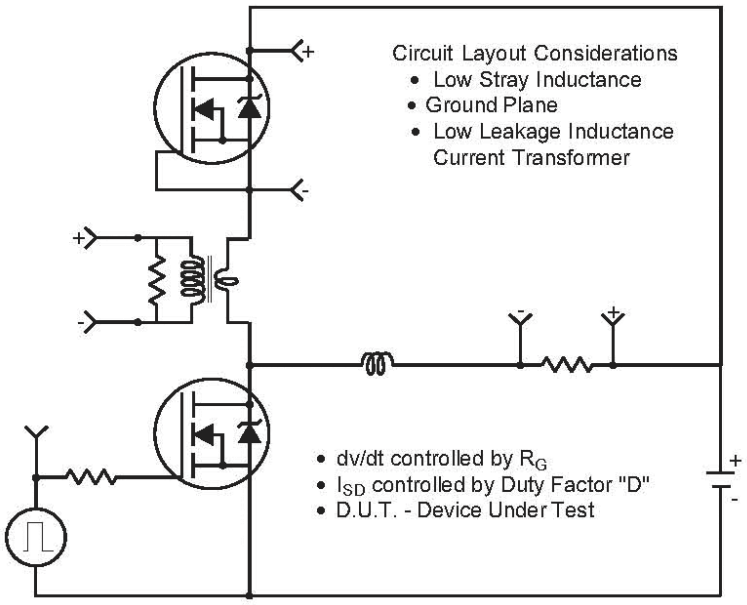


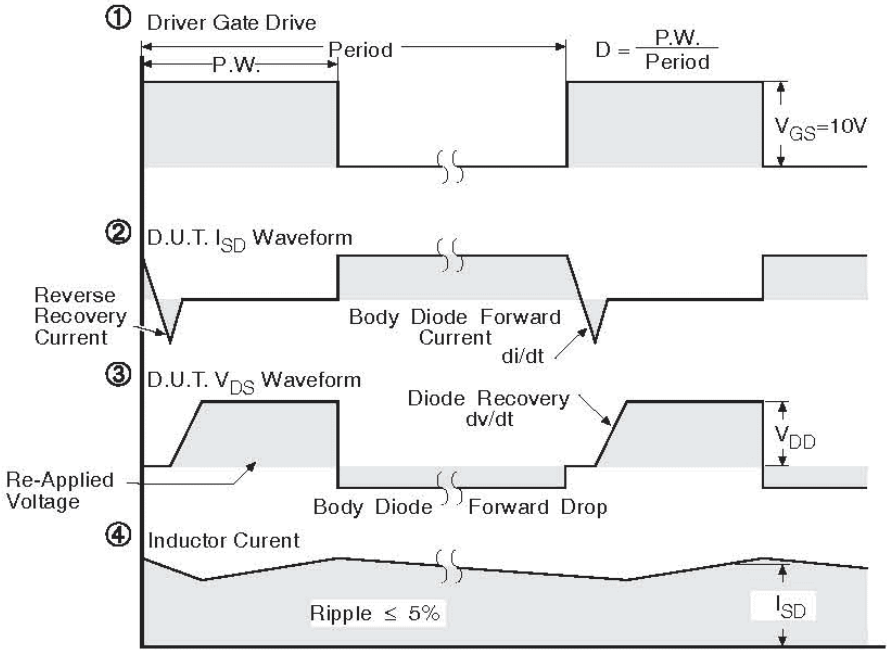
Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



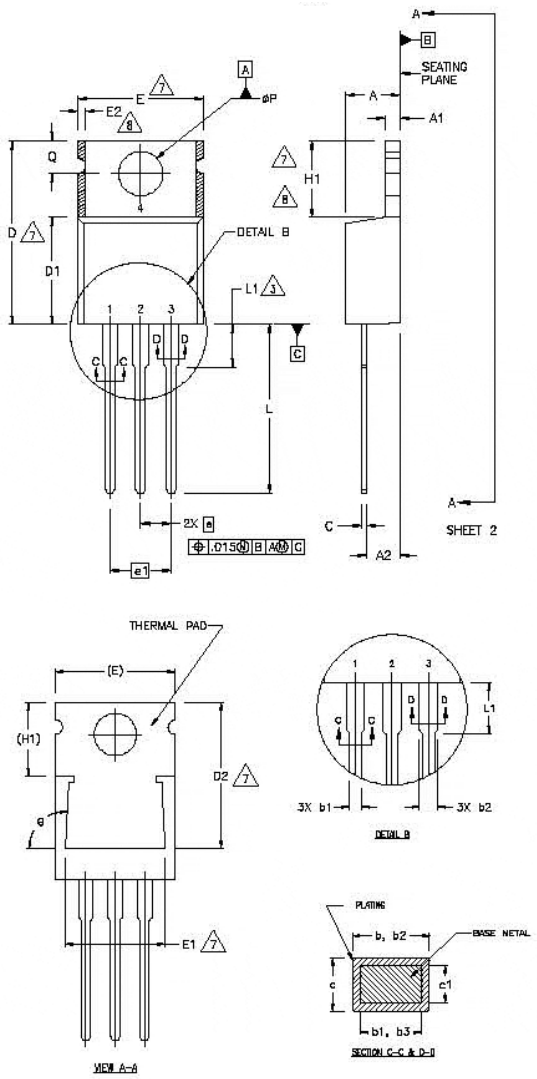
* Reverse Polarity for P-Channel

** Use P-Channel Driver for P-Channel Measurements



*** V_{GS} = 5.0V for Logic Level and 3V Drive Devices

TO-220AB Package Outline (Dimensions are shown in millimeters (inches))



NOTES:

1 DIMENSIONING AND TOLERANCING PER ASME Y14.5 M– 1994.
2 DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS].
3 LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
4 DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
5 DIMENSION b1 & c1 APPLY TO BASE METAL ONLY.
6 CONTROLLING DIMENSION : INCHES.
7 THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS E,H1,D2 & E1
8 DIMENSION E2 X H1 DEFINE A ZONE WHERE STAMPING AND SINGULATION IRREGULARITIES ARE ALLOWED.

LEAD ASSIGNMENTS

HEXFET
1.– GATE
2.– DRAIN
3.– SOURCE

IGBTs, CoPACK
1.– GATE
2.– COLLECTOR
3.– EMITTER

DIODES
1.– ANODE/OPEN
2.– CATHODE
3.– ANODE

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	3.56	4.82	.140	.190	
A1	0.51	1.40	.020	.055	
A2	2.04	2.92	.080	.115	
b	0.38	1.01	.015	.040	
b1	0.38	0.96	.015	.038	5
b2	1.15	1.77	.045	.070	
b3	1.15	1.73	.045	.068	
c	0.36	0.61	.014	.024	
c1	0.36	0.56	.014	.022	5
D	14.22	16.51	.560	.650	4
D1	8.38	9.02	.330	.355	
D2	12.19	12.88	.480	.507	7
E	9.66	10.66	.380	.420	4,7
E1	8.38	8.89	.330	.350	7
e	2.54 BSC		.100 BSC		
e1	5.08		.200 BSC		
H1	5.85	6.55	.230	.270	7,8
L	12.70	14.73	.500	.580	
L1	–	6.35	–	.250	3
øP	3.54	4.08	.139	.161	
Q	2.54	3.42	.100	.135	
ø	90°–93°		90°–93°		