PD-96095

International
IOR Rectifier

IRF9Z30PbF

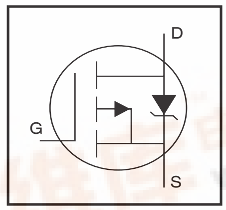
HEXFET® POWER MOSFET

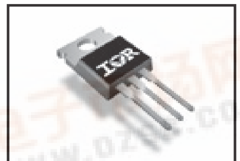
Features

- P-Channel Verasatility
- Compact Plastic Package
- Fast Switching
- Low Drive Current
- Ease of Paralleling
- Excellent Temperature Stability
- Lead-Free

Product Summary

Part Number	V_{DS}(V)	R_{DSON} (Ω)	I_D (A)
IRF9Z30PbF	-50	0.14	-18





TO-220AB

Description

The HEXFET® technology is the key to International Rectifier's advanced line of power MOSFET transistors. The efficient geometry and unique processing of the HEXFET design achieve very low on-state resistence combined with high transconductance and extreme device ruggedness.
The P-Channel HEXFETs are designed for applications which require the convenience of reverse polarity operation. They retain all of the features of the more common N-Channel HEXFETs such as voltage control, very fast switching, ease of paralleling, and excellent temperature stability.
P-Channel HEXFETs are intended for use in power stages where complementary symmetry with N-Channel devices offers circuit simplification. They are also very useful in drive stages because of the circuit versatility offered by the reverse polarity connection. Applications include motor control, audio amplifiers, switched mode converters, control circuit and pulse amplifiers.

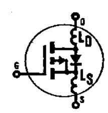
Absolute Maximum Ratings

	Parameter	Max.	Units
V_{DS}	Drain-to-Source Voltage ①	-50	V
V_{DGR}	Drain-to-Gate Voltage (R_{GS} =20KΩ) ①	-50	
V_{GS}	Gate-to-Source Voltage	±20	
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS}	-18	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS}	-11	
I_{DM}	Pulsed Drain Current ②	-60	
P_D @T_C = 25°C	Max. Power Dissipation	74	W
	Linear Derating Factor	0.59	W/°C
I_{LM}	Inductive Current, Clamped (L= 100µH) See Fig. 14	-60	A
I_L	Unclamped Inductive Current(Avalanche Current) ③ See Fig. 15	-3.1	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C
Lead Temperature	300 (0.063 in. (1.6mm) from case for 10s)		

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	–––	1.7	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	1.0	–––	
$R_{\theta JA}$	Junction-to-Ambient	–––	80	

Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	-50	——	——	V	V_{GS} = 0V, I_D = -250µA
$V_{GS(th)}$	Gate Threshold Voltage	-2.0	——	-4.0	V	V_{DS} = V_{GS}, I_D = -250µA
I_{GSS}	Gate-to-Source Forward Leakage	——	——	-500	nA	V_{GS} = -20V
	Gate-to-Source Reverse Leakage	——	——	500		V_{GS} = 20V
I_{DSS}	Drain-to-Source Leakage Current	——	——	-250	µA	V_{DS} = Max. Rating, V_{GS} = 0V
		——	——	-1000		V_{DS} = Max. Rating x 0.8, V_{GS} = 0V, T_J = 125°C
$I_{D(on)}$	On- State Drain Current ④	-18	——	——	A	V_{DS} > $I_{D(on)}$ X $R_{DS(ON)}$ (max)., V_{GS} = -10V
$R_{DS(on)}$	Static Drain-to-Source On-Resistance④	——	0.093	0.14	Ω	V_{GS} = -10V, I_D = -9.3A
g_{fs}	Forward Transconductance④	3.1	4.7	——	S	V_{DS} = 2 X V_{GS}, I_{DS} = -9.0A
C_{iss}	Input Capacitance	——	900	——	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	——	570	——		V_{DS} = -25V
C_{rss}	Reverse Transfer Capacitance	——	140	——		ƒ = 1.0MHz, See Fig.10
$t_{d(on)}$	Turn-On Delay Time	——	12	18	ns	V_{DD} = -25V, ID = -18A, RG = 13Ω, RD = 1.3Ω
t_r	Rise Time	——	110	170		See Fig.16
$t_{d(off)}$	Turn-Off Delay Time	——	21	32		(MOSFET switching times are essentially independent
t_f	Fall Time	——	64	96		of operating temperature)
Q_g	Total Gate Charge (Gate -Source Plus Gate-Drain)	——	26	39	nC	VGS = -10V, ID = -18A, V_{DS} = 0.8 Max. Rating
Q_{gs}	Post-Vth Gate-to-Source Charge	——	6.9	10		See Fig.17 for test circuit (Gate charge is essentially
Q_{gd}	Gate-to-Drain Charge	——	9.7	15		independent of operating temperature.)
L_D	Internal Drain Inductance	——	4.5	——	nH	Measured from the drain lead, 6mm (0.25 in.) from package to center of die. / Modified MOSFET symbol showing the internal device inductances. 
L_S	Internal Source Inductance	——	7.5	——		Measured from the source lead, 6mm (0.25 in.) from package to source bonding pad.

Source-Drain Diode Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	——	——	-18	A	MOSFET symbol showing the integral reverse p-n junction rectifier. 
I_{SM}	Pulsed Source Current (Body Diode) ③	——	——	-60		
V_{SD}	Diode Forward Voltage ②	——	——	-6.3	V	T_J = 25°C, I_S = -18A, V_{GS} = 0V
t_{rr}	Reverse Recovery Time	54	120	250	ns	T_J = 25°C, I_F = -18A
Q_{rr}	Reverse Recovery Charge	0.20	0.47	1.1	µC	di/dt = 100A/µs
T_{on}	Forward Turn-on Time	Intrinsic turn-on time is negligible. Turn-on speed is substantially controlled by L_S + L_D.				

Note:

① T_J = 25°C to 150°C
② Repetitive Rating :Pulse width limited by max. junction tempeature. See Transient Thermal Impedance Curve (Fig.5).
③ @ V_{dd} = -25V, T_J= 25°C, L = 100µH, R_G = 25Ω.
④ Pulse Test : Pulse width ≤ 300ms, Duty Cycle ≤ 2%.

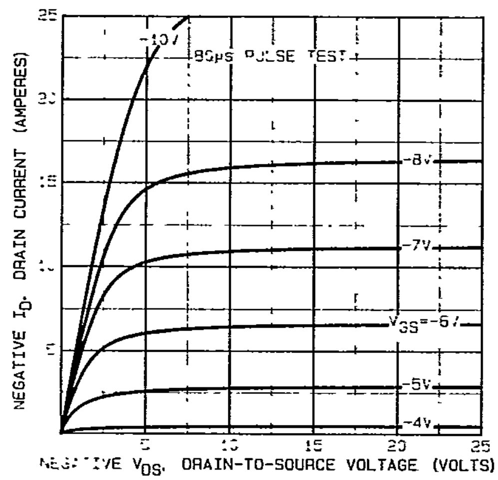


Fig. 1 — Typical Output Characteristics

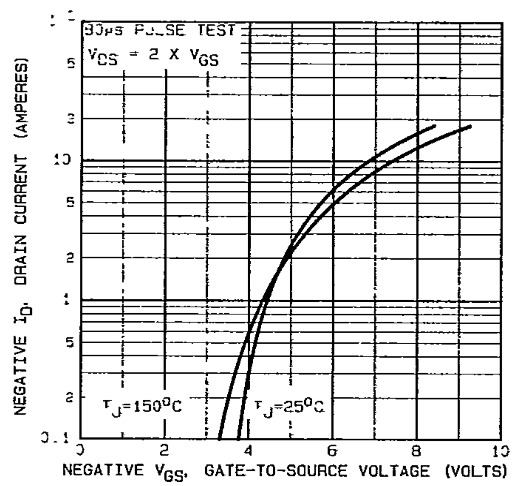


Fig. 2 — Typical Transfer Characteristics

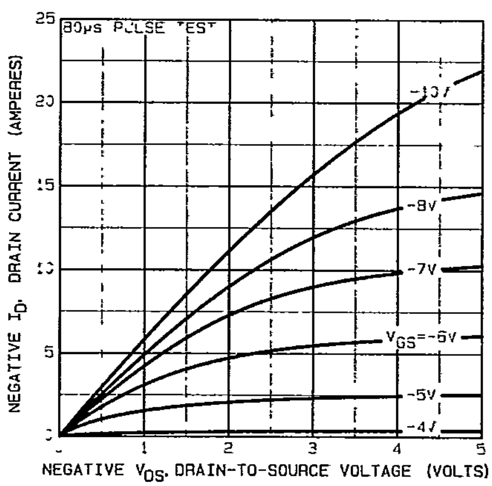


Fig. 3 — Typical Saturation Characteristics

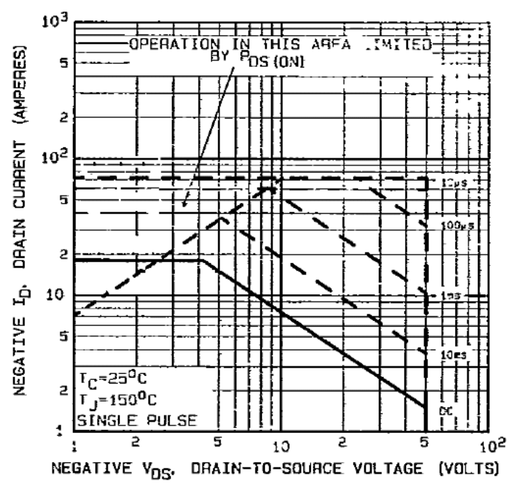


Fig. 4 — Maximum Safe Operating Area

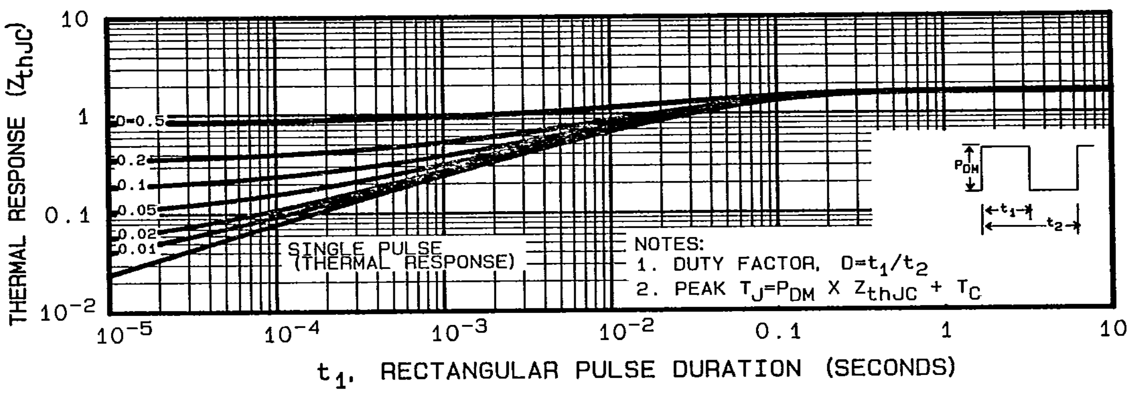


Fig. 5 — Maximum Effective Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration

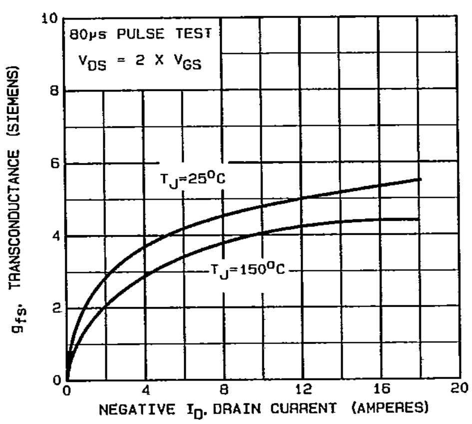


Fig. 6 — Typical Transconductance Vs. Drain Current

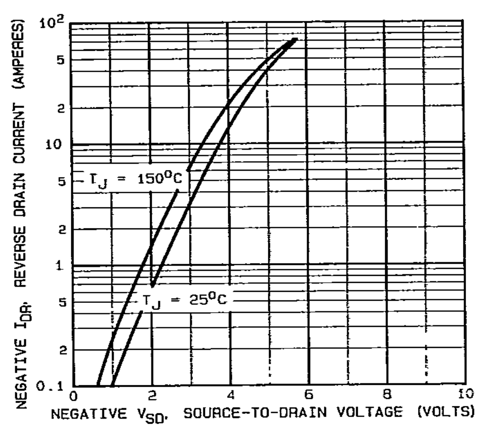


Fig. 7 — Typical Source-Drain Diode Forward Voltage

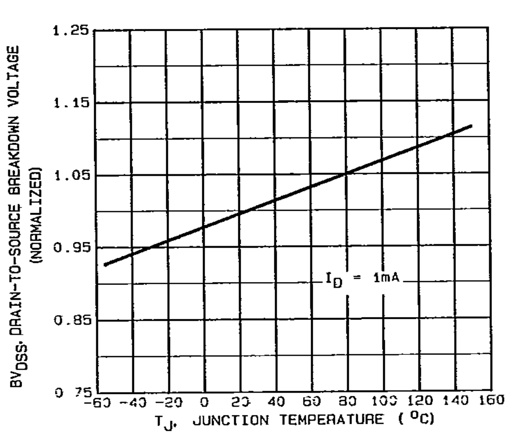


Fig. 8 — Breakdown Voltage Vs. Temperature

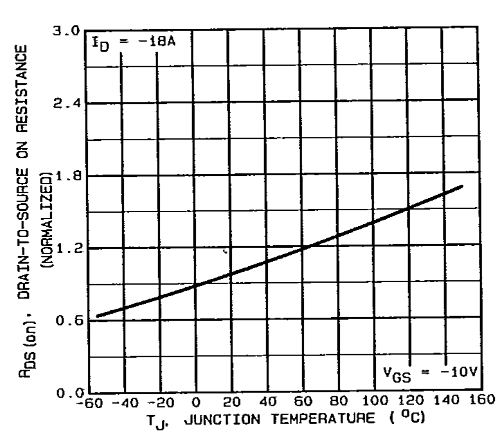


Fig. 9 — Normalized On-Resistance Vs. Temperature

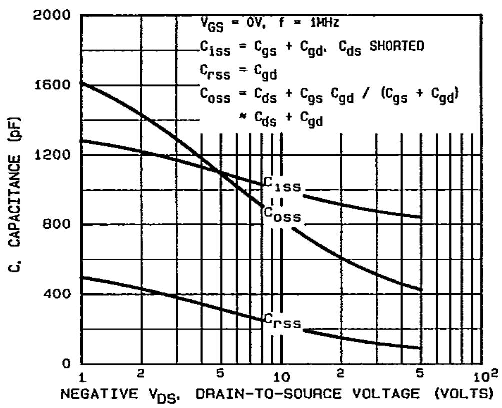


Fig. 10 — Typical Capacitance Vs. Drain-to-Source Voltage

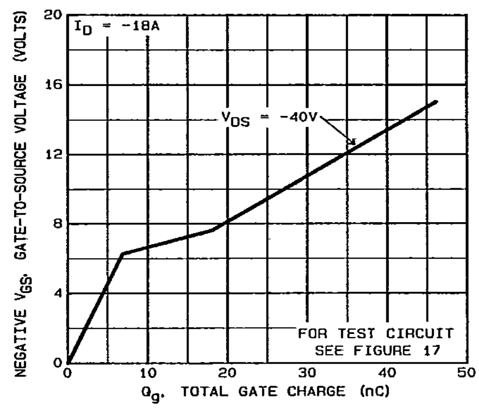


Fig. 11 — Typical Gate Charge Vs. Gate-to-Source Voltage

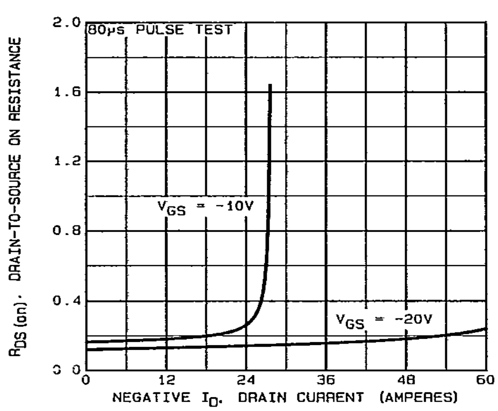


Fig. 12 — Typical On-Resistance Vs. Drain Current

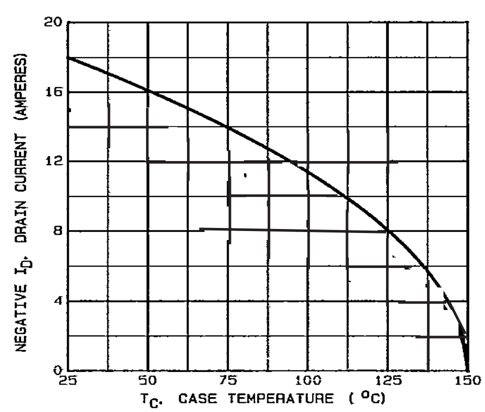


Fig. 13 — Maximum Drain Current Vs. Case Temperature

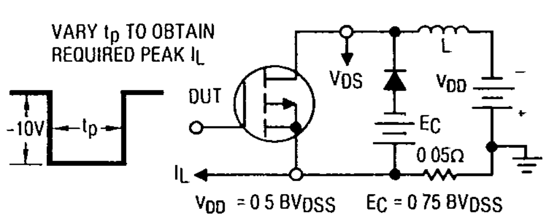


Fig. 14a — Clamped Inductive Test Circuit

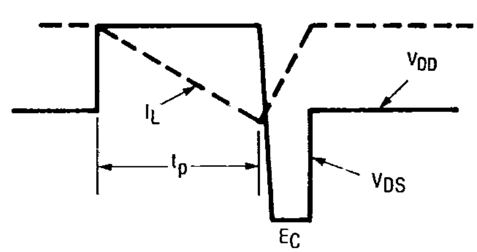


Fig. 14b — Clamped Inductive Waveforms

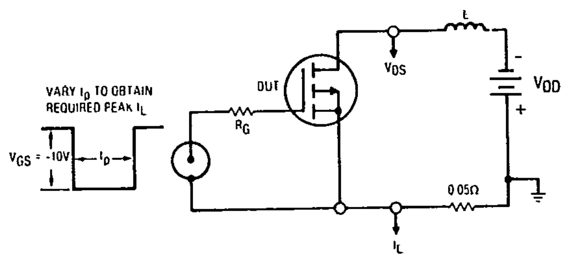


Fig. 15a — Unclamped Inductive Test Circuit

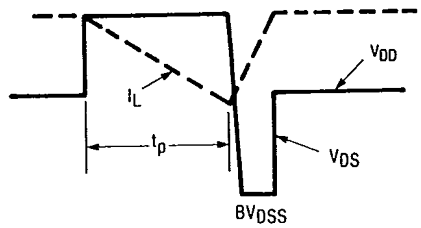


Fig. 15b — Unclamped Inductive Load Test Waveforms

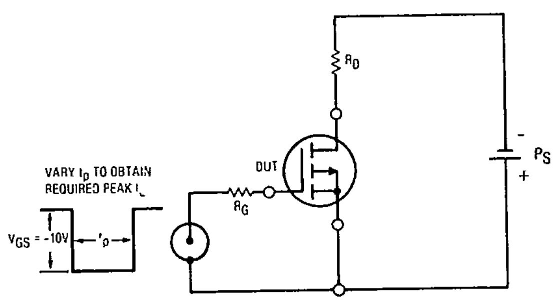


Fig. 16 — Switching Time Test Circuit

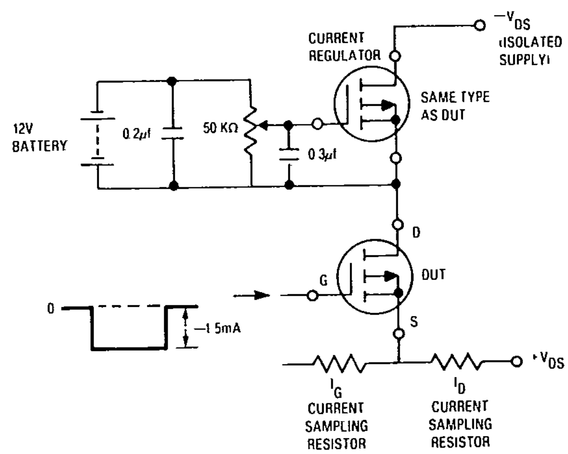
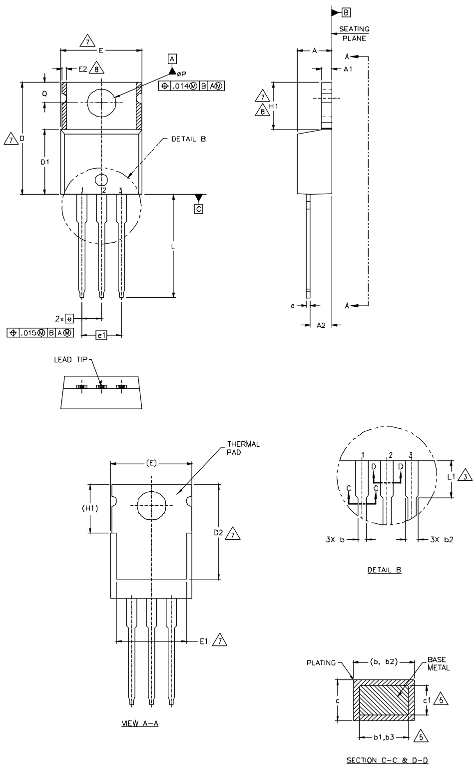


Fig. 17 — Gate Charge Test Circuit

*The data shown is correct as of April 15, 1987. This information is updated on a quarterly basis; for the latest reliability data, please contact your local IR field office.

TO-220AB Package Outline

Dimensions are shown in millimeters (inches)



NOTES:

1.– DIMENSIONING AND TOLERANCING AS PER ASME Y14.5 M- 1994.
2.– DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS].
3.– LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
4.– DIMENSION D, D1 & 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, b3 & 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.
9.– OUTLINE CONFORMS TO JEDEC TO-220, EXCEPT A2 (max.) AND D2 (min.) WHERE DIMENSIONS ARE DERIVED FROM THE ACTUAL PACKAGE OUTLINE.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	3.56	4.83	.140	.190	
A1	0.51	1.40	.020	.055	
A2	2.03	2.92	.080	.115	
b	0.38	1.01	.015	.040	
b1	0.38	0.97	.015	.038	5
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
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	11.68	12.88	.460	.507	7
E	9.65	10.67	.380	.420	4,7
E1	6.86	8.89	.270	.350	7
E2	–	0.76	–	.030	8
e	2.54 BSC		.100 BSC		
e1	5.08 BSC		.200 BSC		
H1	5.84	6.86	.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	

LEAD ASSIGNMENTS

HEXFET
1.– GATE
2.– DRAIN
3.– SOURCE

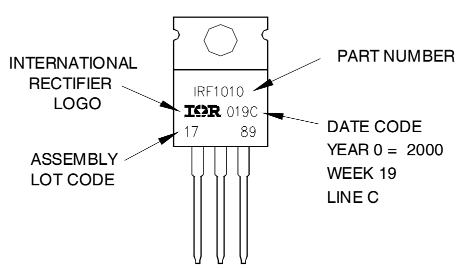
IGBTs, CoPACK
1.– GATE
2.– COLLECTOR
3.– EMITTER

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

TO-220AB Part Marking Information

EXAMPLE: THIS IS AN IRF1010
LOT CODE 1789
ASSEMBLED ON WW 19, 2000
IN THE ASSEMBLY LINE "C"

Note: "P" in assembly line position indicates "Lead - Free"



Data and specifications subject to change without notice.
This product has been designed and qualified for the Industrial market.
Qualification Standards can be found on IR's Web site.

International
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