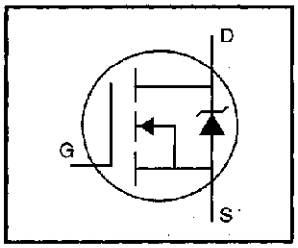
International
IOR Rectifier

PD - 95364

IRF510PbF

HEXFET® Power MOSFET

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



V_{DSS} = 100V

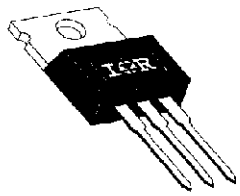
$R_{DS(on)}$ = 0.54Ω

I_D = 5.6A

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

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10 V	5.6	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10 V	4.0	
I_{DM}	Pulsed Drain Current ①	20	
P_D @ T_C = 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	100	mJ
I_{AR}	Avalanche Current ①	5.6	A
E_{AR}	Repetitive Avalanche Energy ①	4.3	mJ
dv/dt	Peak Diode Recovery dv/dt ③	5.5	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +175	°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	—	—	3.5	°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°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	100	—	—	V	V_{GS}=0V, I_D= 250μA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.12	—	V/°C	Reference to 25°C, I_D= 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.54	Ω	V_{GS}=10V, I_D=3.4A ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	V_{DS}=V_{GS}, I_D= 250μA
g_{fs}	Forward Transconductance	1.3	—	—	S	V_{DS}=50V, I_D=3.4A ④
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	V_{DS}=100V, V_{GS}=0V
		—	—	250		V_{DS}=80V, 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
Q_g	Total Gate Charge	—	—	8.3	nC	I_D=5.6A
Q_{gs}	Gate-to-Source Charge	—	—	2.3		V_{DS}=80V
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	3.8		V_{GS}=10V See Fig. 6 and 13 ④
$t_{d(on)}$	Turn-On Delay Time	—	6.9	—	ns	V_{DD}=50V
t_r	Rise Time	—	16	—		I_D=5.6A
$t_{d(off)}$	Turn-Off Delay Time	—	15	—		R_G=24Ω
t_f	Fall Time	—	9.4	—		R_D=8.4Ω 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	—	180	—	pF	V_{GS}=0V
C_{oss}	Output Capacitance	—	81	—		V_{DS}=25V
C_{rss}	Reverse Transfer Capacitance	—	15	—		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)	—	—	5.6	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	—	—	2.5	V	T_J=25°C, I_S=5.6A, V_{GS}=0V ④
t_{rr}	Reverse Recovery Time	—	100	200	ns	T_J=25°C, I_F=5.6A
Q_{rr}	Reverse Recovery Charge	—	0.44	0.88	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)

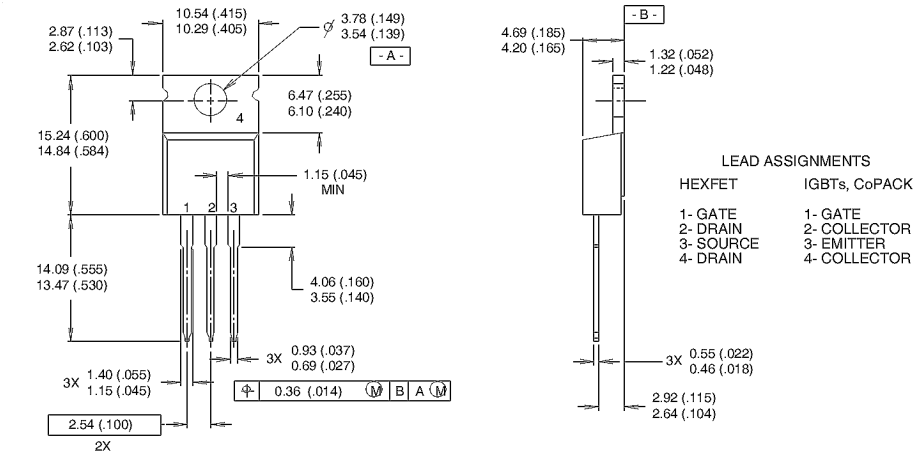
② V_{DD}=25V, starting T_J=25°C, L=4.8mH R_G=25Ω, I_{AS}=5.6A (See Figure 12)

③ I_{SD}≤5.6A, di/dt≤75A/μs, V_{DD}≤$V_{(BR)DSS}$, T_J≤175°C

④ Pulse width ≤ 300 μs; duty cycle ≤2%.

TO-220AB Package Outline

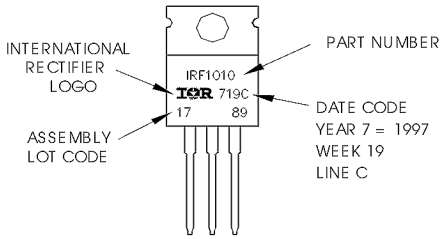
Dimensions are shown in millimeters (inches)



NOTES:

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

TO-220AB Part Marking Information

EXAMPLE: THIS IS AN IRF1010
LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"

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