PD - 96909

International
IOR Rectifier

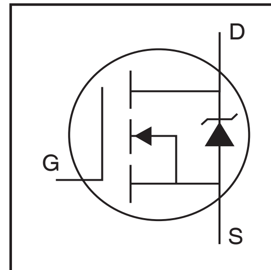
DIGITAL AUDIO MOSFET

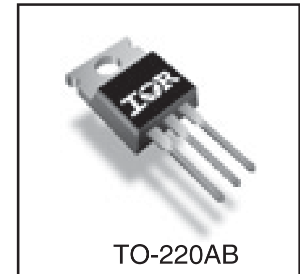
IRFB4103PbF

Features

- Key parameters optimized for Class-D audio amplifier applications
- Low R_{DSON} for improved efficiency
- Low Q_G and Q_{SW} for better THD and improved efficiency
- Low Q_{RR} for better THD and lower EMI
- 175°C operating junction temperature for ruggedness
- Can deliver up to 300W per channel into 8Ω load in half-bridge topology

Key Parameters		
V_{DS}	200	V
$R_{DS(ON)}$ typ. @ 10V	139	mΩ
Q_g typ.	25	nC
Q_{sw} typ.	15	nC
$R_{G(int)}$ typ.	1.0	Ω
T_J max	175	°C




TO-220AB

Description

This Digital Audio MOSFET is specifically designed for Class-D audio amplifier applications. This MOSFET utilizes the latest processing techniques to achieve low on-resistance per silicon area. Furthermore, Gate charge, body-diode reverse recovery and internal Gate resistance are optimized to improve key Class-D audio amplifier performance factors such as efficiency, THD and EMI. Additional features of this MOSFET are 175°C operating junction temperature and repetitive avalanche capability. These features combine to make this MOSFET a highly efficient, robust and reliable device for ClassD audio amplifier applications.

Absolute Maximum Ratings

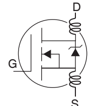
	Parameter	Max.	Units
V_{DS}	Drain-to-Source Voltage	200	V
V_{GS}	Gate-to-Source Voltage	±30	
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	17	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	12	
I_{DM}	Pulsed Drain Current ①	68	
P_D @T_C = 25°C	Power Dissipation ④	140	W
P_D @T_C = 100°C	Power Dissipation ④	71	
	Linear Derating Factor	0.95	W/°C
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 seconds (1.6mm from case)	300	
	Mounting torque, 6-32 or M3 screw	10lb·in (1.1N·m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ④	—	1.05	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient ④	—	62	

Notes ① through ⑤ are on page 2

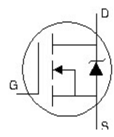
Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	200	–––	–––	V	V_{GS} = 0V, I_D = 250μA
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	–––	0.21	–––	V/°C	Reference to 25°C, I_D = 1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	–––	139	165	mΩ	V_{GS} = 10V, I_D = 12A ③
$V_{GS(th)}$	Gate Threshold Voltage	3.0	–––	5.5	V	$V_{DS} = V_{GS}$, I_D = 250μA
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Coefficient	–––	-13	–––	mV/°C	
I_{DSS}	Drain-to-Source Leakage Current	–––	–––	25	μA	V_{DS} = 200V, V_{GS} = 0V
		–––	–––	250		V_{DS} = 200V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage	–––	–––	100	nA	V_{GS} = 30V
	Gate-to-Source Reverse Leakage	–––	–––	-100		V_{GS} = -30V
g_{fs}	Forward Transconductance	7.1	–––	–––	S	V_{DS} = 50V, I_D = 12A
Q_g	Total Gate Charge	–––	25	38		
Q_{gs1}	Pre-Vth Gate-to-Source Charge	–––	5.4	–––		V_{DS} = 160V
Q_{gs2}	Post-Vth Gate-to-Source Charge	–––	2.9	–––	nC	V_{GS} = 10V
Q_{gd}	Gate-to-Drain Charge	–––	12	–––		I_D = 12A
Q_{godr}	Gate Charge Overdrive	–––	4.7	–––		See Fig. 6 and 19
Q_{sw}	Switch Charge (Q_{gs2} + Q_{gd})	–––	15	–––		
$R_{G(int)}$	Internal Gate Resistance	–––	1.0	–––	Ω	
$t_{d(on)}$	Turn-On Delay Time	–––	9.6	–––		V_{DD} = 100V, V_{GS} = 10V ③
t_r	Rise Time	–––	40	–––		I_D = 12A
$t_{d(off)}$	Turn-Off Delay Time	–––	16	–––	ns	R_G = 2.5Ω
t_f	Fall Time	–––	5.4	–––		
C_{iss}	Input Capacitance	–––	900	–––		V_{GS} = 0V
C_{oss}	Output Capacitance	–––	120	–––	pF	V_{DS} = 50V
C_{rss}	Reverse Transfer Capacitance	–––	22	–––		ƒ = 1.0MHz, See Fig.5
C_{oss}	Effective Output Capacitance	–––	150	–––		V_{GS} = 0V, V_{DS} = 0V to 160V
L_D	Internal Drain Inductance	–––	4.5	–––	nH	Between lead, 6mm (0.25in.)
L_S	Internal Source Inductance	–––	7.5	–––		from package and center of die contact 

Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy②	–––	130	mJ
I_{AR}	Avalanche Current ⑤	See Fig. 14, 15, 17a, 17b		A
E_{AR}	Repetitive Avalanche Energy ⑤			mJ

Diode Characteristics

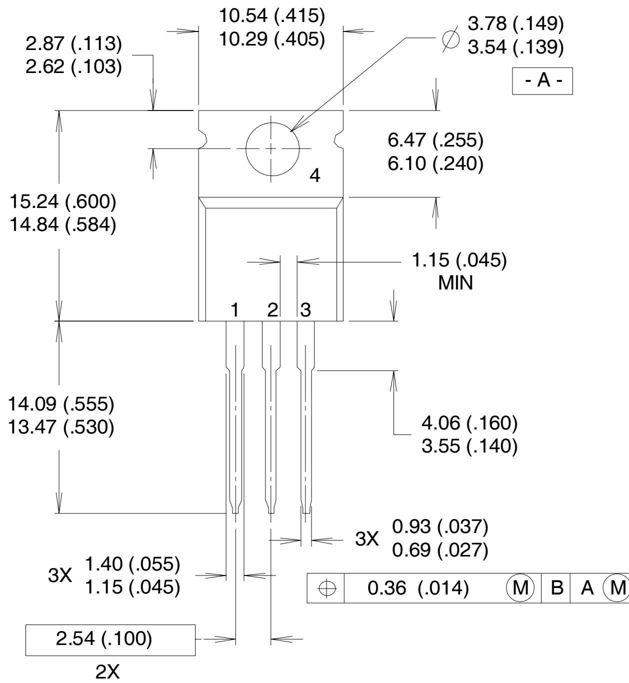
	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S @ T_C = 25°C	Continuous Source Current (Body Diode)	–––	–––	17	A	MOSFET symbol showing the
I_{SM}	Pulsed Source Current (Body Diode) ①	–––	–––	68		integral reverse p-n junction diode. 
V_{SD}	Diode Forward Voltage	–––	–––	1.7	V	T_J = 25°C, I_S = 10A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	–––	130	200	ns	T_J = 25°C, I_F = 12A
Q_{rr}	Reverse Recovery Charge	–––	730	110	nC	di/dt = 100A/μs ③

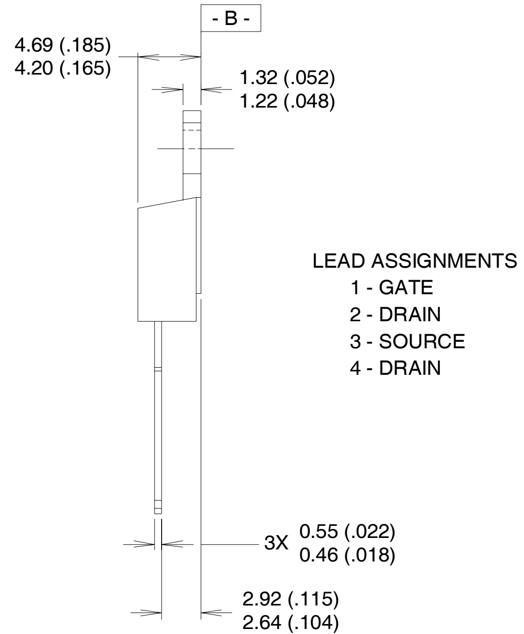
Notes:

① Repetitive rating; pulse width limited by max. junction temperature.
② Starting T_J = 25°C, L = 1.78mH, R_G = 25Ω, I_{AS} = 12A.
③ Pulse width ≤ 400μs; duty cycle ≤ 2%.
④ R_θ is measured at T_J of approximately 90°C.
⑤ Limited by Tjmax. See Figs. 14, 15, 17a, 17b for repetitive avalanche information

TO-220AB Package Outline

Dimensions are shown in millimeters (inches)





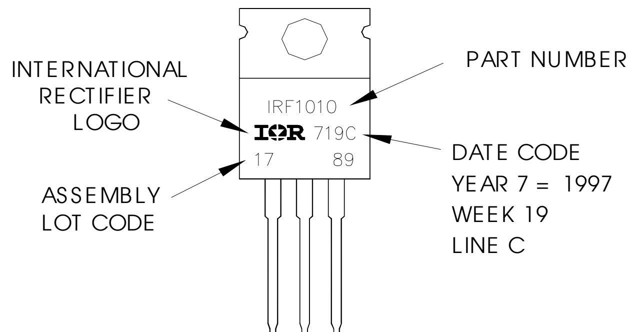
NOTES:

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"



TO-220AB packages are not recommended for Surface Mount Application.

Data and specifications subject to change without notice.
This product has been designed and qualified for the Industrial market.