



BIPOLAR ANALOG INTEGRATED CIRCUIT

μ PC2130

READ/WRITE AMPLIFIER FOR RIGID DISK DRIVE

The μ PC2130 is a low noise, high speed monolithic bipolar integrated circuit for rigid disk drives, performing both read and write functions. The μ PC2130 is applicable for eight center-tapped read/write heads and features low noise and high bandwidth, so the μ PC2130 is suitable for high density small size (5.25/3.5 inch) rigid disk drive.

The μ PC2130 consists of eight write drivers, eight read preamplifiers, a switching matrix to select one of eight heads, and associated control and monitoring functions.

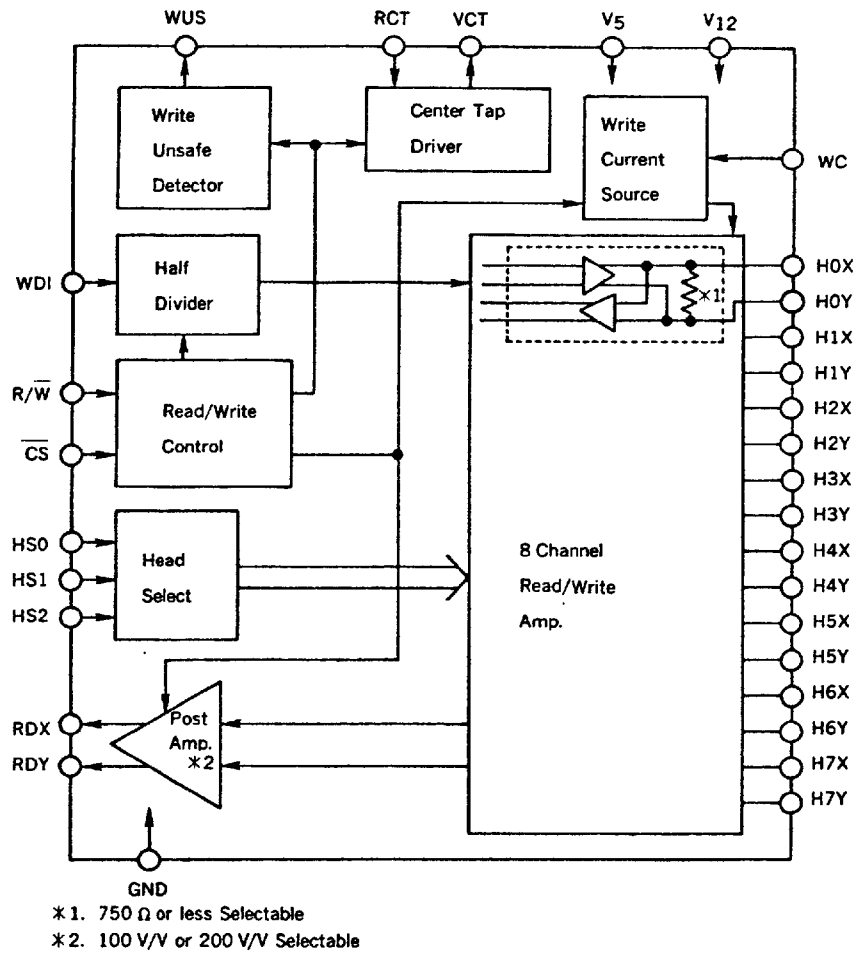
FEATURES

- Low Noise and Low Capacitance: $0.8 \text{ nV}/\sqrt{\text{Hz}}$ (typ.), 10 pF (typ.)
- High Bandwidth: 70 MHz (typ.)
- Selectable Gain and Internal Dumping Resistor:
 - Gain: 100 V/V or 200 V/V
 - Internal Resistor: 750Ω or less
 - Read Data Output: High Impedance or Low Impedance expect Read Mode
- Applicable for Eight Center-tapped Read/Write Heads
- TTL Compatible Interface
- Power Supply: $+5 \text{ V}$ and $+12 \text{ V}$
- Package: 48 Pin QFP

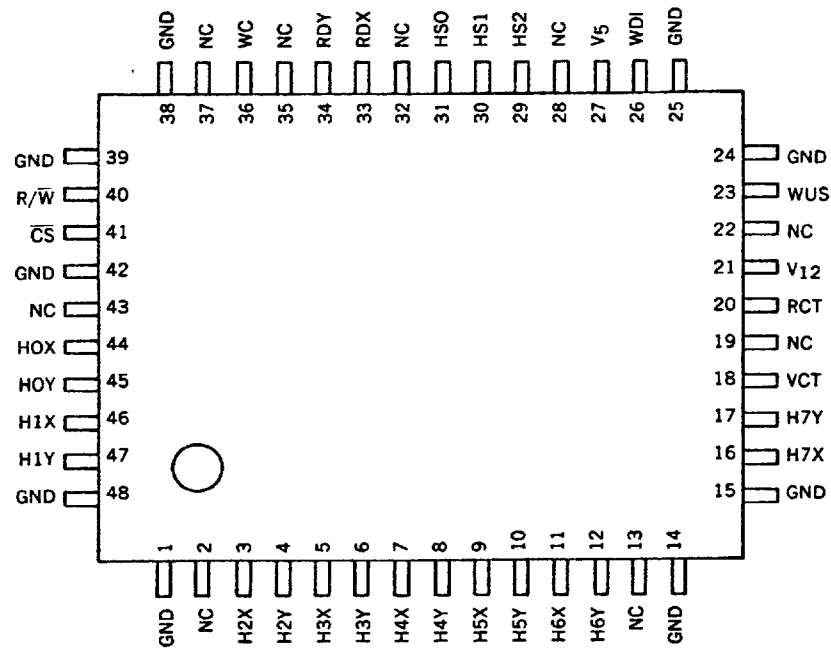
ORDERING INFORMATION

Order Code	Gain	Read Data Output	Internal Resistor
μ PC2130GH-001-2A5	100	Low Impedance	less
μ PC2130GH-002-2A5	100	High Impedance	less
μ PC2130GH-003-2A5	200	Low Impedance	750Ω

BLOCK DIAGRAM



PIN CONFIGURATION



ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	RATING	UNIT	CONDITIONS
Plus 5 V Supply Voltage	V ₅	7.0	V	
Plus 12 V Supply Voltage	V ₁₂	14	V	
Write Current	I _W	40	mA	
Digital Input Voltage	V _{DI}	-0.3 to V ₅ +0.3	V	$\overline{CS}$, R/ $\overline{W}$, WDI, HS0, HS1, HS2
Write Unsafe Output	V _{WUS}	-0.3 to V ₁₂ +0.3	V	WUS
	I _{WUS}	12	mA	WUS
Center Tap Output Current	I _{VCT}	-40	mA	VCT
Read Data Output Current	I _{ORD}	-10	mA	RDX, RDY
Head Input Output Voltage	V _{HIN}	0 to V ₁₂	V	H0X to H7X, H0Y to H7Y
Differential Head Voltage Swing	V _{FB}	7.0	V	HnX-HnY
Storage Temperature	T _{stg}	-40 to +150	°C	
Operating Temperature	T _{opt}	0 to +70	°C	
Operating Junction Temperature	T _j	0 to +125	°C	

RECOMMENDED OPERATING CONDITIONS

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Supply Voltage						
Plus 5 V Supply Voltage	V ₅	4.5	5.0	5.5	V	
Plus 12 V Supply Voltage	V ₁₂	10.8	12.0	13.2	V	
Digital Interface						
Low Level Input Voltage	V _{IL}	-0.3		0.8	V	
High Level Input Voltage	V _{IH}	2.0		V ₅ +0.3	V	
Read/Write						
Head Inductance	L _H	5	15	20	μH	
Dumping Resistor	R _T	500	750	2 000	Ω	
RCT Resistor	RCT	114	120	126	Ω	1/2 W Resistor
Differential Head Voltage Swing	V _{FB}			6.5	V	I _W = 30 mA, L _H = 15 μH
Write Current Range	I _W	10		30	mA	

ELECTRICAL CHARACTERISTICS

Power Supply and Dissipation ($T_a = 0$ to $+70^\circ\text{C}$, $V_{12} = 12\text{ V} \pm 10\%$, $V_5 = 5\text{ V} \pm 10\%$)

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Supply Current	Plus 5 V	I_{5-R}		10	15	mA	Read Mode
		I_{5-W}		12	17	mA	Write Mode
		I_{5-I}		11	15	mA	Idle Mode
	Plus 12 V	I_{12-R}		29	40	mA	Read Mode
		I_{12-W}		$22 + I_W$	$30 + I_W$	mA	Write Mode
		I_{12-I}		21	30	mA	Idle Mode
Power Dissipation		P_{d-R}		400	610	mW	Read Mode
		P_{d-W1}		580	780	mW	Write Mode, $I_W = 30\text{ mA}$, $RCT = 120\ \Omega$
		P_{d-W2}		685	885	mW	Write Mode, $I_W = 30\text{ mA}$, $RCT = 0\ \Omega$
		P_{d-I}		305	480	mW	Idle Mode

Digital Interface ($T_a = 0$ to $+70^\circ\text{C}$, $V_{12} = 12\text{ V} \pm 10\%$, $V_5 = 5\text{ V} \pm 10\%$)

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Low Level Input Current	I_{IL}			400	μA	$V_{IL} = 0.8\text{ V}$
High Level Input Current	I_{IH}			400	μA	$V_{IH} = 2.0\text{ V}$

Read Mode ($T_a = 0$ to $+70^\circ\text{C}$, $V_{12} = 12\text{ V} \pm 10\%$, $V_5 = 5\text{ V} \pm 10\%$)

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Differential Voltage Gain	A_V	80	100	120	V/V	$V_{IN} = 1\text{ mV}_{p-p}$, $f = 300\text{ kHz}$ $Z_L = 5.1\text{ k}\Omega$ per side, $T_a = 25^\circ\text{C}$
		160	200	240		
Voltage Band Width (-3 dB)	f_C	40	70		MHz	$Z_s < 5\text{ }\Omega$, $V_{IN} = 1\text{ mV}_{p-p}$ $f_{\text{mid-band}} = 300\text{ kHz}$
Input Noise Voltage	V_N		0.8	1.0	nV/ $\sqrt{\text{Hz}}$	$B_W = 15\text{ MHz}$, $Z_s = 0$, $T_a = 25^\circ\text{C}$
Differential Input Capacitance	C_{IN}		10	15	pF	$f = 5\text{ MHz}$
Differential Input Resistance	R_{IN}	2			k Ω	$f = 5\text{ MHz}$
		600	750	900	Ω	Internal Dumping Resistor, $f = 5\text{ MHz}$
Input Bias Current	I_{IN}		35	100	μA	Read Mode (per side)
Dynamic Range	V_{DR}	10			mV $_{p-p}$	Gain 100 V/V
		5.0				Gain 200 V/V
Common Mode Rejection Ratio	CMRR	50	70		dB	$V_{IN} = 100\text{ mV}_{p-p}$, $f = 5\text{ MHz}$
Power Supply Rejection Ratio	PSRR	50	70		dB	100 mV $_{p-p}$ on V_5 or V_{12} , $f = 5\text{ MHz}$
Channel Separation	XT	45			dB	Unselected Channels driven with $V_{IN} = 100\text{ mV}_{p-p}$, $f = 5\text{ MHz}$
Output Offset Voltage	V_{OFR}			200	mV	Gain 100 V/V
				400		Gain 200 V/V
	V_{OFRI}			100	mV	Write Mode, Idle Mode Read Data Output: Low Impedance
Common Mode Output Voltage	V_{OUT}	5.0	6.0	7.0	V	$V_{IN} = 0\text{ mV}_{p-p}$
Single Ended Output Impedance	R_{OUT}			30	Ω	$f = 5\text{ MHz}$

Write Mode ($T_a = 0$ to $+70^\circ\text{C}$, $V_{12} = 12\text{ V} \pm 10\%$, $V_5 = 5\text{ V} \pm 10\%$)

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITION
Write Current Constant	K	129	140	151		$K = I_W \cdot R_{WC}$, $T_a = 25^\circ\text{C}$
Head Current Rise Time	T_R			20	ns	$I_W = 30\text{ mA}$, $L_H = 0\text{ }\mu\text{H}$
Head Current Delay	Time	T_d		30	ns	
	Asymmetry	ΔT_d		1.5	ns	
Unselected Differential Head Current	ΔI_W			1	mA	$I_W = 30\text{ mA}$, $L_H = 15\text{ }\mu\text{H}$

PIN FUNCTIONS

PIN No.	PIN SYMBOL	I/O	FUNCTION DESCRIPTION
1	GND		Ground
2	NC		Non connection
3	H2X	I/O	X, Y head connection No. 2
4	H2Y		
5	H3X	I/O	X, Y head connection No. 3
6	H3Y		
7	H4X	I/O	X, Y head connection No. 4
8	H4Y		
9	H5X	I/O	X, Y head connection No. 5
10	H5Y		
11	H6X	I/O	X, Y head connection No. 6
12	H6Y		
13	NC		Non connection
14	GND		Ground
16	GND		Ground
16	H7X	I/O	X, Y head connection No. 7
17	H7Y		
18	VCT	O	Voltage source for head center tap
19	NC		Non connection
20	RCT		Power supply for the center tap voltage source to limit internal power dissipation connect RCT through 120 ohms to V ₁₂ otherwise connect RCT to V ₁₂ directly
21	V ₁₂		+12 V power supply
22	NC		Non connection
23	WUS	O	Write unsafe indicator See write unsafe operation
24	GND		Ground
25	GND		Ground
26	WDI	I	Write data input A negative transition toggles the direction Initial write current after read mode flows X-side
27	V ₅		+5 V power supply
28	NC		Non connection
29	HS0	I	Head select See function tables
30	HS1		
31	HS2		
32	NC		Non connection
33	RDX	O	Read write mode select See function table
34	RDY		
35	NC		Non connection
36	WC		Set the magnitude of write current by following formula $I_W \text{ (mA)} = K/R_{WC} \text{ (k}\Omega\text{)}$
37	NC		Non connection
38	GND		Ground

PIN No.	PIN SYMBOL	I/O	FUNCTION DESCRIPTION
39	GND		Ground
40	R/ $\overline{W}$		Read write mode select See function tables
41	$\overline{CS}$		Chip select See function tables
42	GND		Ground
43	NC		Non connection
44	H0X	I/O	X, Y head connection No. 0
45	H0Y		
46	H1X	I/O	X, Y head connection No. 1
47	H1Y		
48	GND		Ground

FUNCTION TABLE

Head Select

HS2	HS1	HS0	Selected Head
L	L	L	0
L	L	H	1
L	H	L	2
L	H	H	3
H	L	L	4
H	L	H	5
H	H	L	6
H	H	H	7

Mode Select

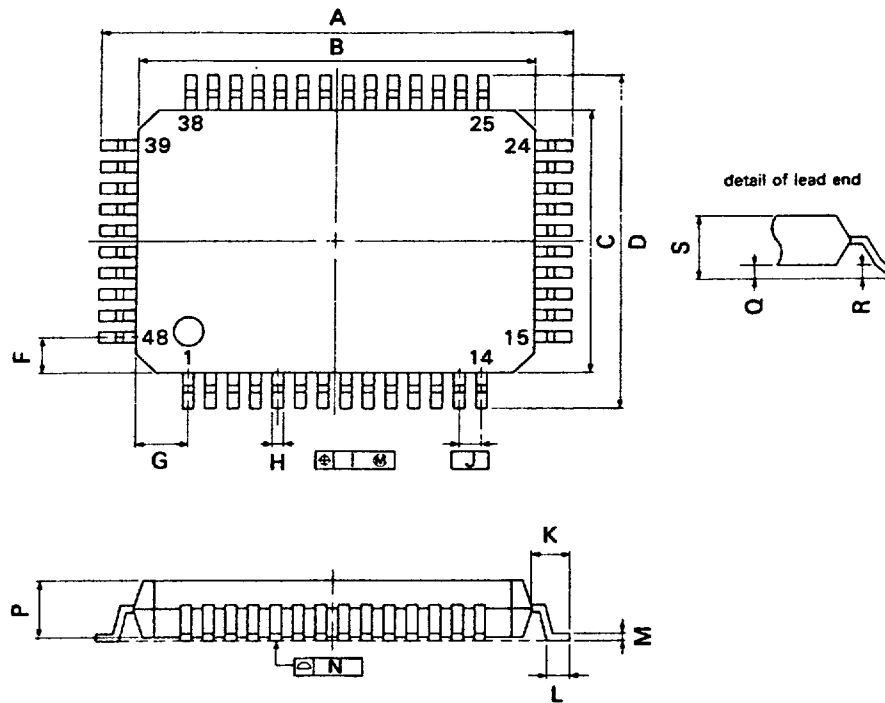
$\overline{CS}$	R/ $\overline{W}$	Selected Mode
L	L	Write
L	H	Read
H	L	Idle
H	H	Idle

WRITE UNSAFE OPERATION

Write unsafe (WUS) pulls high whenever following error conditions exist.
(Normal write mode operation level is low.)

- ① The head is directory connected to the GND.
- ② The head is unconnected. (open)
- ③ The head is connected each other.
- ④ The head is directory connected to the center tap.
- ⑤ The center tap is unconnected. (open)
- ⑥ Write data transition rate too low.
- ⑦ No write current.
- ⑧ Combination of above situation.
- ⑨ Read mode operation.
- ⑩ Idle mode operation.

48PIN PLASTIC QFP (10×14)



P48GH-80-2A5-1

NOTE

Each lead centerline is located within 0.15 mm (0.006 inch) of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS	INCHES
A	16.8 ^{+0.4}	0.661 ^{+0.017} _{-0.016}
B	14.0 ^{+0.2}	0.551 ^{+0.008}
C	10.0 ^{+0.2}	0.394 ^{+0.008} _{-0.008}
D	12.8 ^{+0.4}	0.504 ^{+0.016}
F	1.4	0.055
G	1.8	0.071
H	0.35 ^{+0.10}	0.014 ^{+0.004} _{-0.005}
I	0.15	0.006
J	0.8 (T.P.)	0.031 (T.P.)
K	1.4 ^{+0.2}	0.055 ^{+0.008}
L	0.6 ^{+0.2}	0.024 ^{+0.008} _{-0.008}
M	0.20 ^{+0.10} _{-0.08}	0.079 ^{+0.003} _{-0.003}
N	0.15	0.006
P	2.2 ^{+0.1}	0.087 ^{+0.004} _{-0.004}
Q	0.1 ^{+0.1}	0.004 ^{+0.004}
R	0.1 ^{+0.1}	0.004 ^{+0.004}
S	2.5 MAX.	0.099 MAX.