

NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μ PC2132

4 CHANNEL READ/WRITE AMPLIFIER FOR HARD DISK DRIVE

The μ PC2132 is a low noise, high speed monolithic bipolar integrated circuit for hard disk drives, performing both read and write functions. The μ PC2132 is applicable for four center tapped read/write heads and features low noise and high bandwidth, so the μ PC2132 is suitable for high density small size (2.5/3.5 inch) hard disk drives.

FEATURES

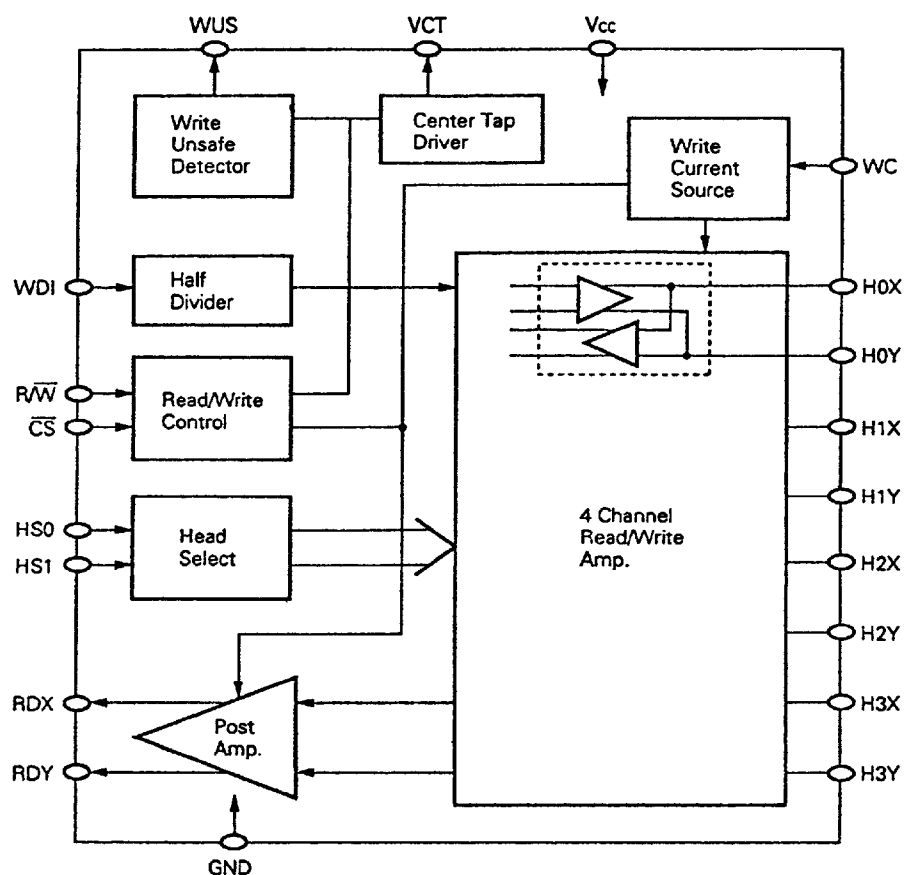
- Low Noise and Low Input Capacitance: 0.85 nV/ $\sqrt{\text{Hz}}$ (TYP.), 8 pF (TYP.)
- High Bandwidth: 70 MHz (typ.)
- Power Supply: + 5 V only
- Power Save Mode
- Write Current Range: 10 to 50 mA
- Write Unsafe Detection
- Package: 20 Pin SSOP (300 mil)

ORDERING INFORMATION

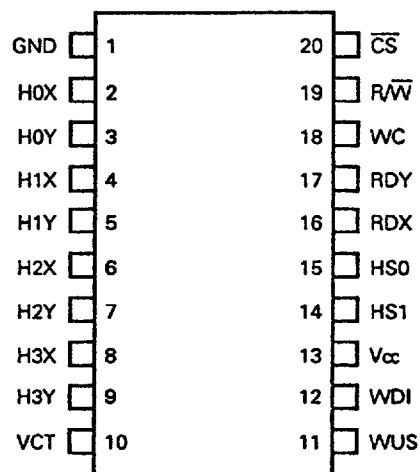
Order Code	Package	Quality Grade
μ PC2132GS-GJG	20-pin SSOP (300 mil)	Standard

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

BLOCK DIAGRAM



PIN CONFIGURATION



ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Conditions	Rating	Unit
Supply voltage	V _{CC}		7	V
Write current	I _w		60	mA
Digital input voltage	V _{DI}	$\overline{CS}$, R/W, WDI, HS0, HS1	-0.3 to V _{CC} + 0.3	V
Write unsafe output	V _{wus}	WUS	-0.3 to V _{CC} + 0.3	V
	I _{wus}	WUS	12	mA
Center tap output current	I _{vCT}		-60	mA
Read data output current	I _{ORD}	RDX, RDY	-10	mA
Head input voltage	V _{HIN}	H0X to H3X, H0Y to H3Y	0 to V _{CC}	V
Differential head voltage swing	V _{FB}	HnX HnY	5.5	V
Storage temperature	T _{stg}		-50 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	Condition	MIN.	TYP.	MAX.	Unit
Supply voltage						
Supply voltage	V _{CC}		4.5	5.0	5.5	V
Digital interface						
Low level input voltage	V _{IL}		0		0.8	V
High level input voltage	V _{IH}		2.0		V _{CC}	V
Read/write						
Head inductance	L _H		3	5	10	μH
Dumping resistor	R _T		500	750	2000	Ω
Differential head voltage swing	V _{FB}	I _w = 45 mA, L _H = 10 μH			5.0	V
Write current range	I _w		10		50	mA

ELECTRICAL CHARACTERISTICS

Power Supply and Dissipation

(T_a = 0 to +70 °C, V_{CC} = 5 V ± 10 %)

Item	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Supply current	I _{CCR}	Read mode		30	40	mA
	I _{CCW}	Write mode		40 + I _w	50 + I _w	mA
	I _{CCPS}	Power save mode		1	1.5	mA
Power dissipation	P _{D-R}	Read mode		150	220	mW
	P _{D-W}	Write mode I _w = 45 mA			530	mW
	P _{D-PS}	Power save mode		5	8.25	mW

Digital Interface

(T_a = 0 to +70 °C, V_{CC} = 5 V ± 10 %)

Item	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Low level input current	I _{IL}	V _{IL} = 0.8 V		1	100	μA
High level input current	I _{IH}	V _{IH} = 2.0 V		0	100	μA
Low level output voltage	V _{OL}	I _{OL} = 8 mA, WUS pin			0.5	V
High level output current	I _{OH}	V _{OH} = 5.0 V, WUS pin			100	μA
Read to write transition time	t _{DRW}	Delay to 90 % of write current		250	600	ns
Write to read transition time	t _{DWR}	Delay to 90 % of 10 MHz read signal envelope write current delay of 10 %		400	600	ns
Head select switching delay	t _{DHS}	Read or write mode		130	600	ns
Chip disable transition time	t _{DCS}	Power save to read or write R _L = 3 kΩ, C _L = 1 800 pF		1.5	5.0	μs
Unsafe to safe delay	t _{OUS}	I _w = 25 mA, L _H = 5 μH f = 5 MHz			1.0	μs
Safe to unsafe delay	t _{OSU}	I _w = 25 mA, L _H = 5 μH f = 5 MHz	1.2		9.0	μs

Read Mode(T_a = 0 to +70 °C, V_{cc} = 5 V ± 10 %)

Item	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Differential voltage gain	A _v	V _{IN} = 1 m V _{r-p} , f = 300 kHz Z _L = 3 kΩ per side T _a = 25 °C	165	220	270	V/V
Voltage band width (-3 dB)	f _c	Z _s < 5 kΩ, V _{IN} = 1 m V _{r-p} f _{mid-band} = 300 kHz	40	70		MHz
Input noise voltage	V _N	BW = 15 MHz, Z _s = 0, T _a = 25 °C		0.85	1.0	nV/√Hz
Differential input capacitance	C _{IN}	f = 5 MHz		8	15	pF
Differential input resistance	R _{IN}	f = 5 MHz	5.0			kΩ
Input bias current	I _{IN}	Read mode		60	180	μA
Dynamic range	V _{DR}	THD ≤ 1 %	3.0			mV _{r-p}
Common mode rejection ratio	CMRR	V _{IN} 100 m V _{r-p} , f = 5 MHz	50	70		dB
Power supply rejection ratio	PSRR	100 m V _{r-p} on V _{cc} f = 5 MHz	50	70		dB
Channel separation	XT	Unselected channels driven with V _{IN} = 100 mV _{r-p} , f = 5 MHz	50	90		dB
Common mode output voltage	V _{OUT}			1.9		V
Single ended output voltage	R _{OUT}	f = 5 MHz			30	Ω
Output offset voltage	V _{OFF}	Read mode			400	mV
Output voltage change	V _{OFFWR}	Write to read mode output DC level change			100	mV
Center tap voltage	VCT(R)		3.0	3.2	3.4	V

Write mode

($T_a = 0$ to $+70$ °C, $V_{cc} = 5\text{ V} \pm 10\%$)

Item	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Write current constant	K	$K = I_w \cdot R_{wc}$, $T_a = 25$ °C	46	50	54	
Head current rise time 1	t_{H1}	$I_w = 45\text{ mA}$, $L_H = 0\text{ }\mu\text{H}$			20	ns
Head current delay	Time	$I_w = 45\text{ mA}$, $L_H = 0\text{ }\mu\text{H}$ V_{IL} input to 50 % output 1 ns max input switching			30	ns
	Asymmetry				1.5	ns
Unselected differential head current	ΔI_w	$I_w = 45\text{ mA}$, $L_H = 0\text{ }\mu\text{H}$			1	mA
Center tap voltage	VCT(W)	$V_{cc} - V_{CT}$ $I_w = 25\text{ mA}$		0.3	0.5	V

FUNCTION TABLE

Head Select

HSI	HSO	Selected Head
L	L	0
L	H	1
H	L	2
H	H	3

Mode Select

$\overline{\text{CS}}$	R/ $\overline{\text{W}}$	Operation Mode
L	L	Write
L	H	Read
H	L	Idle*
H	H	Idle*

* Power Save

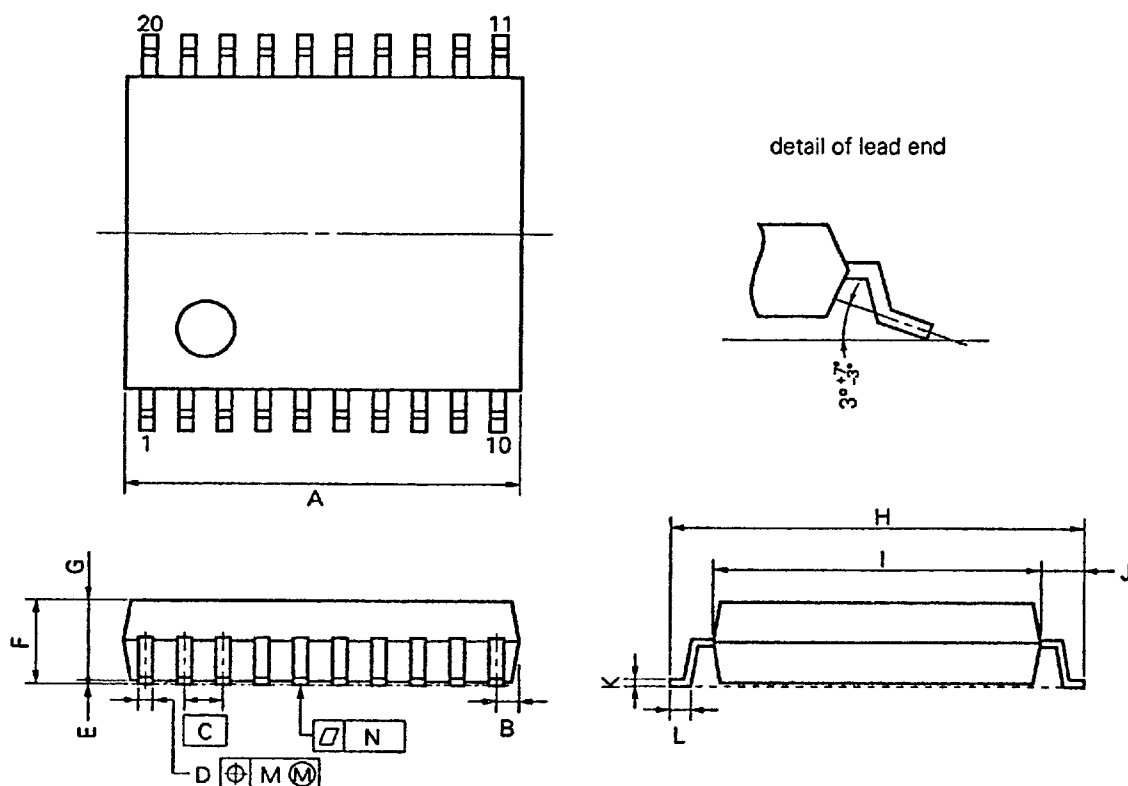
WRITE UNSAFE OPERATION

Write unsafe (WUS) detection whenever following error conditions exist as a high level on the write unsafe open collector output. (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.

Package Outline

20 PIN PLASTIC SHRINK SOP (300 mil)



NOTE

Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

P20GM-65-300B-1

ITEM	MILLIMETERS	INCHES
A	7.00 MAX.	0.276 MAX.
B	0.575 MAX.	0.023 MAX.
C	0.65 (T.P.)	0.026 (T.P.)
D	0.30 $\pm$ 0.10	0.012 $^{+0.004}_{-0.005}$
E	0.1 $\pm$ 0.1	0.004 $\pm$ 0.004
F	2.0 MAX.	0.079 MAX.
G	1.7	0.067
H	8.1 $\pm$ 0.3	0.319 $\pm$ 0.012
I	6.1 $\pm$ 0.2	0.240 $\pm$ 0.008
J	1.0 $\pm$ 0.2	0.039 $^{+0.009}_{-0.008}$
K	0.15 $^{+0.10}_{-0.05}$	0.006 $^{+0.004}_{-0.002}$
L	0.5 $\pm$ 0.2	0.020 $^{+0.008}_{-0.009}$
M	0.12	0.005
N	0.10	0.004

[RECOMMENDED SOLDERING CONDITIONS]

The following conditions (see table below) must be met when soldering this product.

Please consult with our sales offices in case other soldering process is used, or in case soldering is done under different conditions.

<TYPES OF SURFACE MOUNT DEVICE>

For more details, refer to our document "SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL" (IEI-1207).

[IR-30-00-1 VP-15-00-1]

Soldering process	Soldering conditions	Symbol
Infrared ray reflow	Peak package's surface temperature : 230 °C or below, Reflow time : 30 seconds or below (210 °C or higher), Number of reflow process : 1, Exposure limit : None	IR30-00
VPS	Peak package's surface temperature : 215 °C or below, Reflow time : 40 seconds or below (200 °C or higher), Number of reflow process : 1, Exposure limit : None	VP15-00
Partial heating method	Terminal temperature : 300 °C or below, Flow time : 10 seconds or below, Exposure limit : None	○