

BIPOLAR ANALOG INTEGRATED CIRCUIT

μ PC1330HA

REC/PB AUDIO HEAD SWITCH

DESCRIPTION

The μ PC1330HA is a monolithic integrated circuit designed for the recording/playback head turnover switch of a tape deck.

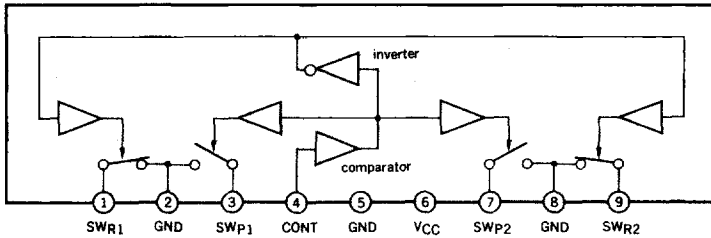
It is composed of two REC/PB switches with control circuit.

The IC is encapsulated in 9 pin single-in-line plastic package.

FEATURES

- High Isolation Voltage: 130 V_{p-p} MIN. (100 kHz)
- Low On Resistance.
- TTL Level Operation.

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (T_a = 25 °C)

Supply Voltage	V _{CC}	18	V
Power Dissipation	P _D	370*	mW
Operating Temperature Range	T _{opt}	-20 to +70	°C
Storage Temperature Range	T _{stg}	-40 to +125	°C
Pin 3, 7 Input Voltage (DC)	V _{in 3} , V _{in 7}	±75(DC)	V
Pin 3, 7 Input Current	I _{in 3} , I _{in 7}	±1.5	mA
Pin 1, 9 Input Voltage	V _{in 1} , V _{in 9}	±0.2	V
Pin 1, 9 Input Current	I _{in 1} , I _{in 9}	±10	mA

*Value at T_a = 70 °C

RECOMMENDED OPERATING CONDITION (T_a = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V _{CC}	4.5	9	15	V
Input Voltage (3, 7 pin)	V _{I3} , V _{I7}	-	-	130	V _{P-P}
Input Voltage (4 pin)	V _{4H} **	2.5	-	V _{CC}	V
Input Voltage (4 pin)	V _{4L} ***	0	-	1.5	V

**PIN 1, 9 switches are turn-on, PIN 3, 7 switches are turn-off.

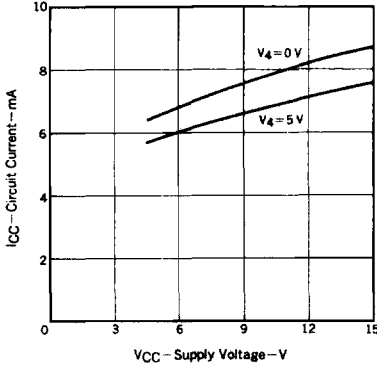
***PIN 1, 9 switches are turn-off, PIN 3, 7 switches are turn-on.

ELECTRICAL CHARACTERISTICS (T_a = 25 °C, V_{CC} = 9.0 V)

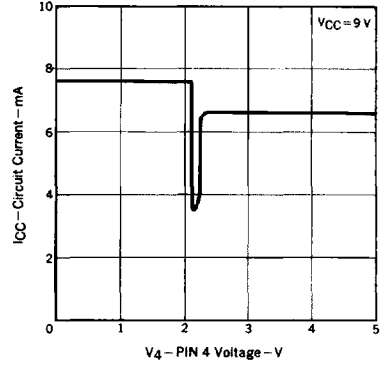
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Supply Current 1	I _{CC 1}		7.5	10	mA	V ₄ = 0 V
Supply Current 2	I _{CC 2}		6.5	10	mA	V ₄ = 5 V
High Level Input Current	I ₄		50	100	μA	V ₄ = 5 V
Pin 1, 9 ON Resistance	R _{1, 9}		5	10	Ω	I _R = ±1 mA, V ₄ = 5 V
Pin 3, 7 ON Resistance	R _{3, 7}		10	20	Ω	I _p = ±1 mA, V ₄ = 0 V
Pin 1, 9 Leak Current	I _{L 1, 9}			±2	μA	V _{1, 9} = ±0.1 V, V ₄ = 0 V
Pin 3, 7 Leak Current	I _{L 3, 7}			±10	μA	V _{3, 7} = ±60 V, V ₄ = 5 V
Pin 1, 9 Offset Voltage	V _{1, 9}		3	6	mV	V ₄ = 5 V, I _{1, 9} = 0
Pin 3, 7 Offset Voltage	V _{3, 7}		4	15	mV	V ₄ = 0 V, I _{3, 7} = 0

TYPICAL CHARACTERISTICS

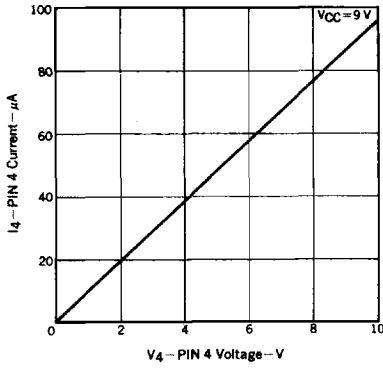
SUPPLY VOLTAGE CHARACTERISTICS



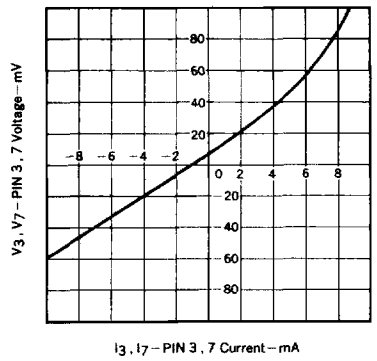
CIRCUIT CURRENT vs. PIN4 VOLTAGE



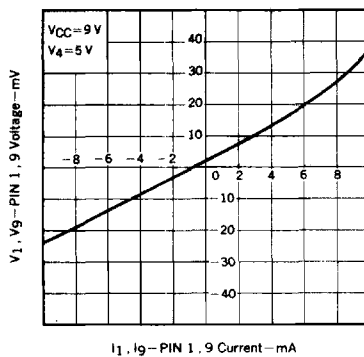
PIN4 CHARACTERISTICS



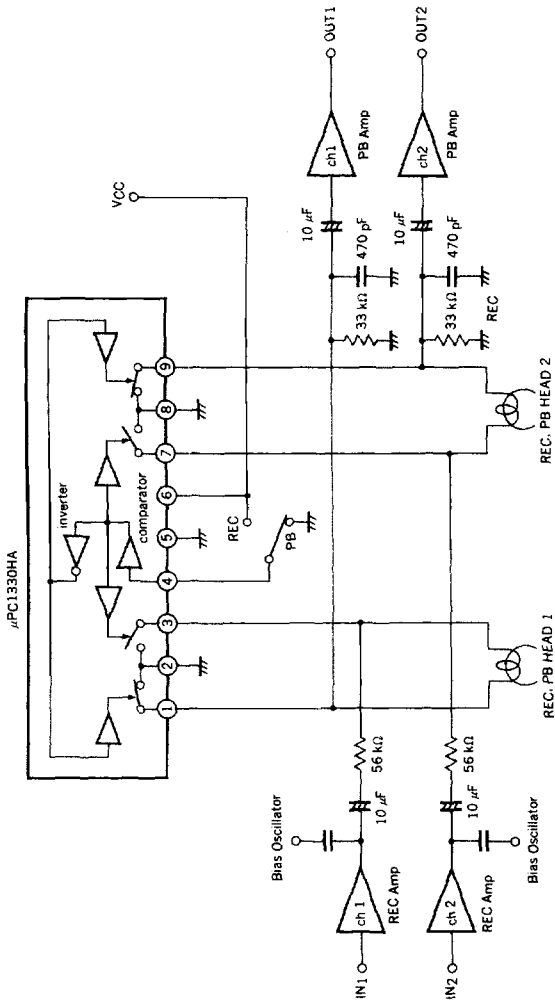
PIN 3, 7 SW ON CHARACTERISTICS



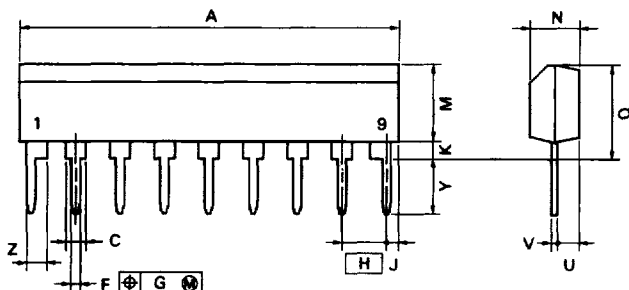
PIN 1, 9 SW ON CHARACTERISTICS



APPLICATION CIRCUIT



9 PIN PLASTIC DIP



NOTE

Each lead centerline is located within 0.25 mm (0.01 inch) of its true position (T.P.) at maximum material condition.

PSHA-254B

ITEM	MILLIMETERS	INCHES
A	22.86 MAX.	0.9 MAX.
C	1.1 MIN.	0.043 MIN.
F	0.5 ^{+0.1}	0.02 ^{±0.008}
G	0.25	0.01
H	2.54	0.1
J	1.27 MAX.	0.05 MAX.
K	0.51 MIN.	0.02 MIN.
M	5.08 MAX.	0.2 MAX.
N	2.8 ^{+0.2}	0.11 ^{±0.008}
Q	5.75 MAX.	0.227 MAX.
U	1.5 MAX.	0.059 MAX.
V	0.25 ^{±0.008}	0.01 ^{±0.003}
Y	3.2 ^{+0.5}	0.126 ^{±0.02}
Z	1.1 MIN.	0.043 MIN.

1. INTRODUCTION

1.1 General

The μ PC1330HA is a silicon monolithic integrated circuit to switch the circuit connection of two recording/playback heads used in a tape deck according to recording or playback condition.

The μ PC1330HA can be used instead of mechanical switch or relay due to it has very high isolation voltage (higher than 130 V_{p-p}) and it controlled at TTL level.

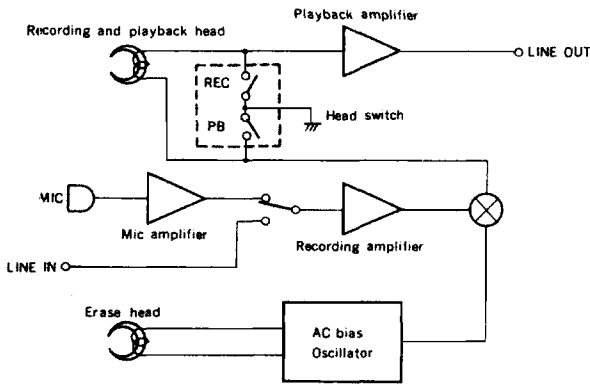
1.2 Features

- (1) High isolation voltage. (higher than 130 V_{p-p})
- (2) Low switch-on resistance $R_R < 10 \Omega$, $R_P < 20 \Omega$
- (3) Controlled by comparator input at TTL levels.
- (4) High reliability (Without mechanical contacts).
- (5) 2 channels in a chip.

2. AUDIO TAPE DECK SYSTEM

Fig. 1 is a block diagram of the system showing basic configuration of Tape Deck.

Fig. 1 Tape Deck Blocks (for One Channel)



In the playback condition, the PB switch of the head switch unit is turned on and the REC switch is turned off. A low level audio signal from the recording and playback head is amplified by the playback amplifier.

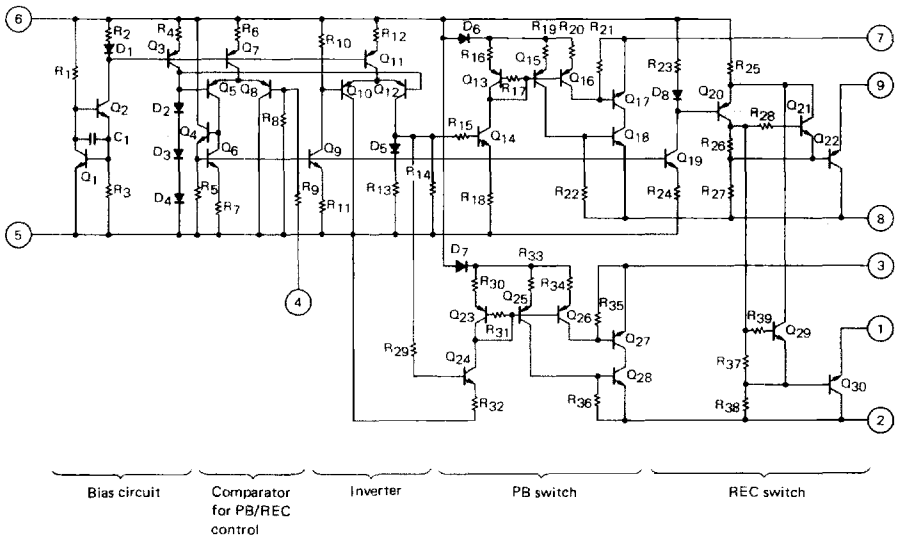
In the recording condition, the PB switch is turned off and the REC switch is turned on. The signal mixed the audio signal from the recording amplifier and the bias signal from the bias oscillator goes into the recording and playback head.

Because the signal fed to the head in the recording condition is very high A.C. voltage (50 to 130 V_{p-p}), the PB switch element must have high isolation voltage. And because this signal frequency is very high (50 to 150 kHz), the PB switch capacitance must be low.

The μ PC1330HA has two sets of such switches for two channels.

3. DESCRIPTION OF CIRCUIT

Fig. 2 Equivalent circuit of μ PC1330HA



3.1 PB mode

The control terminal (pin 4) is fed to low voltage. Then, transistor Q_8 turns on, Q_4 , Q_5 , Q_6 , Q_9 and Q_{19} turn off, Q_{10} turns off, Q_{12} and all of PB switch driver transistor turn on, and then switch element transistors Q_{17} , Q_{18} , Q_{27} and Q_{28} of PB switches turn on.

The other switch element transistors Q_{22} and Q_{28} of REC switches turn off due to Q_{19} , Q_{20} , Q_{21} and Q_{29} turn off. The REC switch elements consist of each one transistor because a high voltage isolation is not required.

3.2 REC mode

The control terminal (PIN 4) is fed to high voltage. Then, all transistors (omit Bias circuit) become opposite condition.

The PB switch elements consist of each two transistors for high voltage isolation.

4. NOTES FOR USE

4.1 Comparator Input Voltage (PIN 4)

The switching threshold voltage for comparator input (pin 4) is about 2 V.

Input voltage levels should be as follows:

Mode	Input voltage of comparator
REC	2.5 V to V_{CC}
PB	0 to 1.5 V

4.2 Switch Element

(1) On-State characteristics

The switch element consists of transistors (see Section 3). Figures 3 and 4 show the switch-on resistance characteristics, which is very low.

As shown, a offset voltage exists due to transistor characteristics when current on the pin is 0 mA.

$$V_{PO} < 15 \text{ mV} \quad (V_{CC} = 9 \text{ V}, V_4 = 5 \text{ V})$$

$$V_{RO} < 6 \text{ mA} \quad (V_{CC} = 9 \text{ V}, V_4 = 0 \text{ V})$$

The DC current for switch transistors drive appears the GND pins (pin 2 and pin 8). Accordingly, the impedance of GND pins should be low.

Fig. 3 PB SW ON Resistance Characteristics

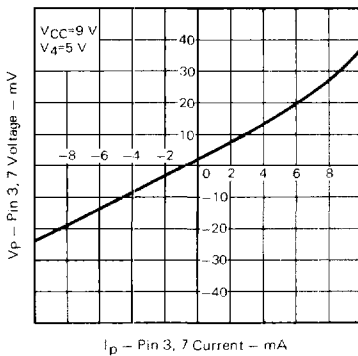
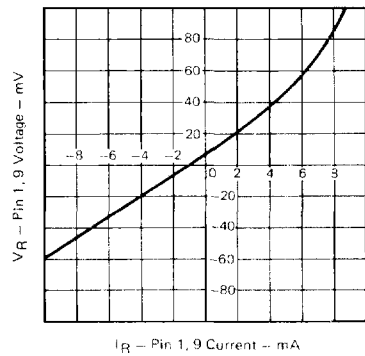


Fig. 4 REC SW ON Resistance Characteristics



(2) Off-State Characteristic

The off-state characteristics of the PB switch (pins 3 and 7) are significant.

The high voltage isolation is kept by V_{CEr} of transistors Q17, Q18, Q27 and Q28 (see Section 3).

When frequency on this pin is higher, the leakage current also increases due to the switch capacitance.

The input waveform distortion is greater starting at about 100 kHz (see Figure 5) due to this leakage current.

Figure 6 shows the relationship between leakage current and frequency.

The recommended voltage on the PB switch (V_{D-P}) is less than 130 V_{D-P} (at frequency of 100 kHz).

Fig. 5 Pin 3, 7 Voltage vs. Frequency

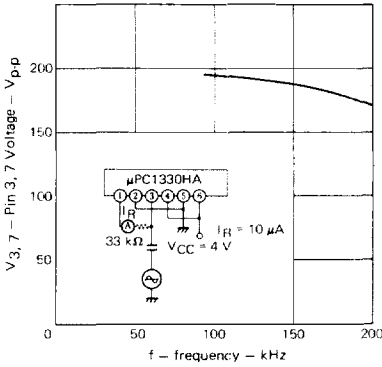


Fig. 6 Leakage Current vs. Pin 3, 7 Voltage

