

NEC
ELECTRONIC DEVICE

BIPOLAR ANALOG INTEGRATED CIRCUIT

μ PC1043C

MOTOR CONTROL CIRCUIT

SILICON MONOLITHIC BIPOLAR INTEGRATED CIRCUIT

The μ PC1043C is a silicon monolithic integrated circuit developed by NEC for Frequency Generator DC Motor speed control of Hi-Fi player and VTR etc.

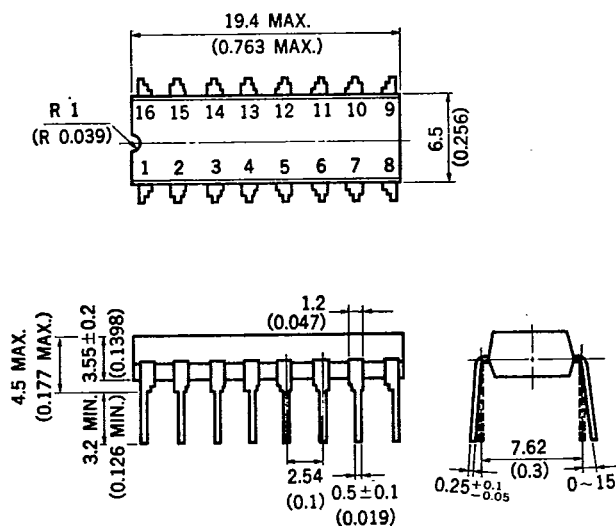
The package is 16-Pin plastic Dual In-Line Package.

FEATURES

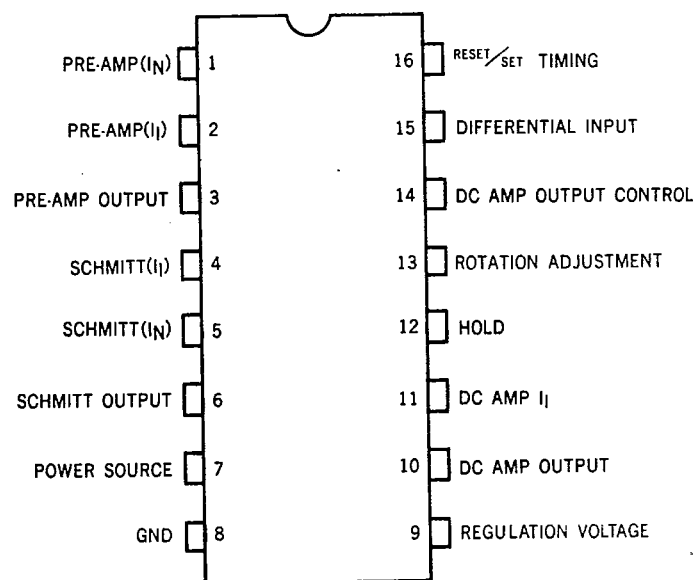
- Operating at wide range supply voltage.
($V_{CC} = 9$ to 28 V)
- Available for wide range FG. Servomotor.
($f = 20$ to $3\,000$ Hz
 $v_{in} = 1$ to $2\,000$ mV_{p-p})
- Applicable for any kind of motors by choosing the external power transistor.

PACKAGE DIMENSIONS

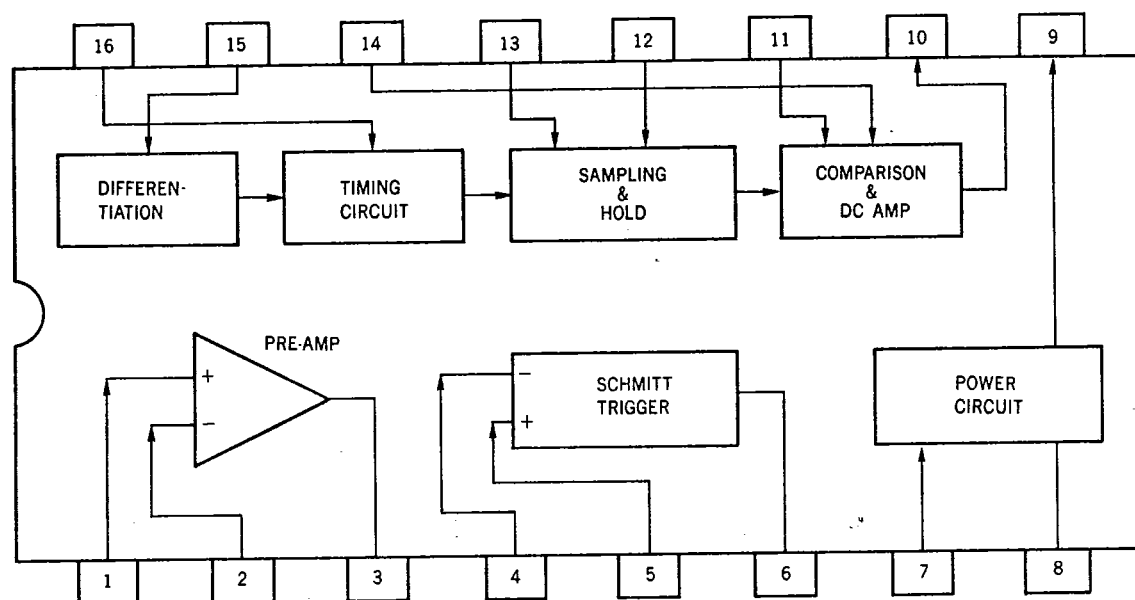
in millimeters (inches)



CONNECTION DIAGRAM (Top View)



BLOCK DIAGRAM (Top View)

ABSOLUTE MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

Supply Voltage	V_{CC}	15*	V
Circuit Current	I_{CC}	100	mA
Power Dissipation ($T_a = 75^\circ\text{C}$)	P_D	350	mW
Operating Temperature Range	T_{opt}	-20 to +75	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-40 to +125	$^\circ\text{C}$

* Power source directly applied to No. 7 pin.

RECOMMENDED OPERATING CONDITIONS

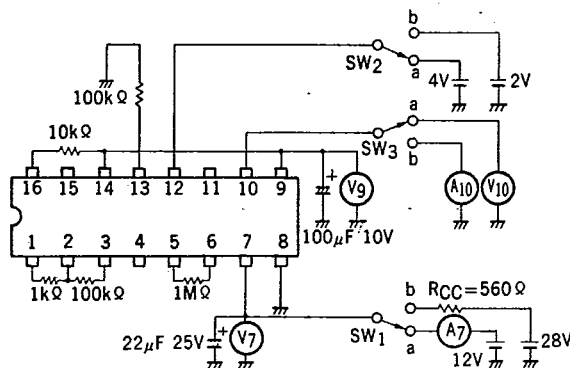
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage ($R_{CC} = 0$)	V_{CC1}	9	12	15	V
Supply Voltage ($R_{CC} = 560\ \Omega$)	V_{CC2}	19	24	28	V
FG Frequency	f_{ref}	20		3000	Hz
PRE-AMP Voltage Gain	A_V	20		60	dB
Threshold Voltage	V_{TH}	± 20		± 200	mV
Operating Temperature Range	T_{opt}	-20		+60	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($V_{CC} = 12\text{ V}$, $T_a = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Circuit Current	I_{CC}	4	7	10	mA	Non-signal input, Output current = 0
Regulation Voltage	V_g	5.1	5.7	6.3	V	Voltage at No. 9 pin
Maximum Output Voltage	$V_O \text{ max.}$	3.5	4.25		V	Output Current = 0
Maximum Output Current	$I_O \text{ max.}$	8	12	17	mA	Output Voltage = 0
Shunt Regulation Voltage	V_{7ON}	15	16.3	18	V	$V_{CC} = 28\text{ V}$, $R_{CC} = 560\ \Omega$
PRE-AMP Voltage Gain	A_{VO}	75	84		dB	$f = 100\text{ Hz}$ Test Circuit - 2 S.G. output terminated 700 mV _{r.m.s.}
Rotation Temperature Coefficient	ΔN_A		0	0.02	%/°C	$V_{CC} = 28\text{ V}$, $R_{CC} = 560\ \Omega$ $T_a = -20\text{ to }+60^\circ\text{C}$ Rotation $N_{\text{max.}} - N_{\text{min.}}/N(25^\circ\text{C})/80^\circ\text{C}$
Rotation Coefficient Input Voltage	ΔN_V		0	0.02	%/V	Variation of Rotation at $V_{CC} = 19\text{ to }28\text{ V}$, $R_{CC} = 560\ \Omega$
Rotation Drift	ΔN_T		0	0.1	%	Variation of Rotation 10 s to 30 min. after V_{CC} on at $V_{CC} = 24\text{ V}$, $R_{CC} = 560\ \Omega$
Output Ripple Voltage	v_o		20	35	mV _{p-p}	Test Circuit - 4
Schmitt Noise Voltage	V_{TN}		0	0.7	V _{p-p}	Test Circuit - 5
ON Resistance	$R_{Q48\text{ ON}}$		100	300	Ω	Test Circuit - 6

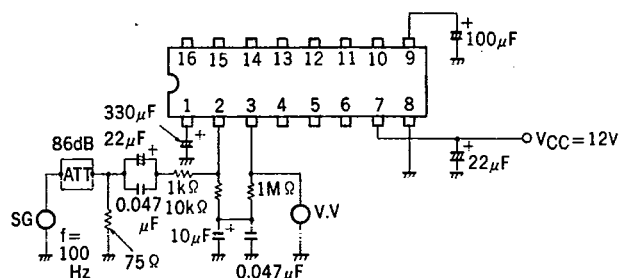
TEST CIRCUIT - 1

(I_{CC} , V_9 , V_0 max, I_0 max, V_7 ON)



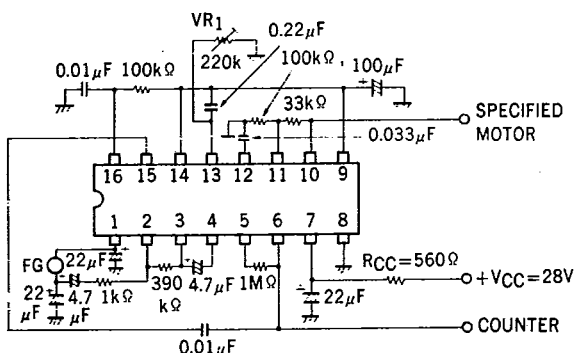
ITEM	SWITCH			MEASUREMENT POINT
	SW1	SW2	SW3	
I_{CC}	a	a	a	A7
V_9	a	a	a	V9
V_0 max.	a	b	a	V10
I_0 max.	a	b	b	A10
V_7 ON	b	a	a	V7

TEST CIRCUIT - 2 (A_{VO})



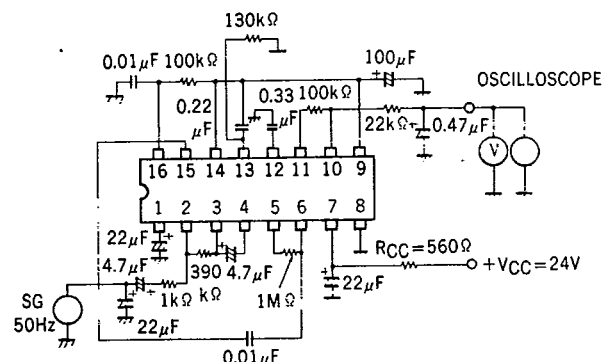
*SG Output Impedance=75 Ω
*ATT Input Output Impedance=75 Ω

TEST CIRCUIT - 3 (ΔN_A , ΔN_V , ΔN_T)



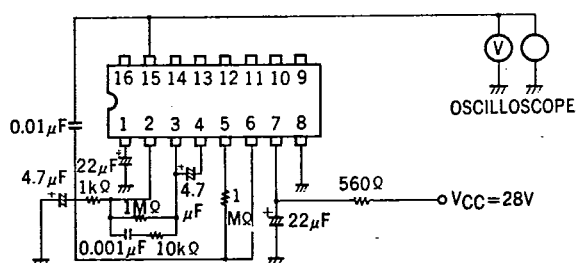
*Adjust VR1 so that the measured value by counter becomes 20 ms.

TEST CIRCUIT - 4 (v_o)

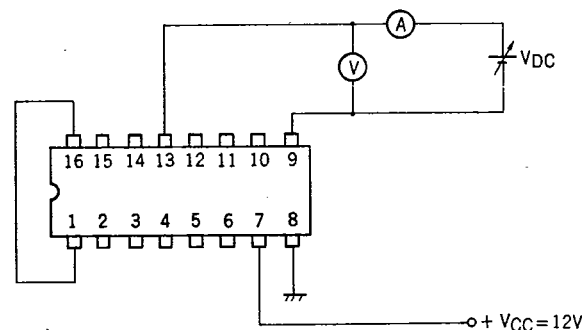


*Adjust SG frequency to obtain 1.4 to 1.5 V DC Voltage on NO. 10 pin, and then measure with oscilloscope.

TEST CIRCUIT - 5 (V_{TN})

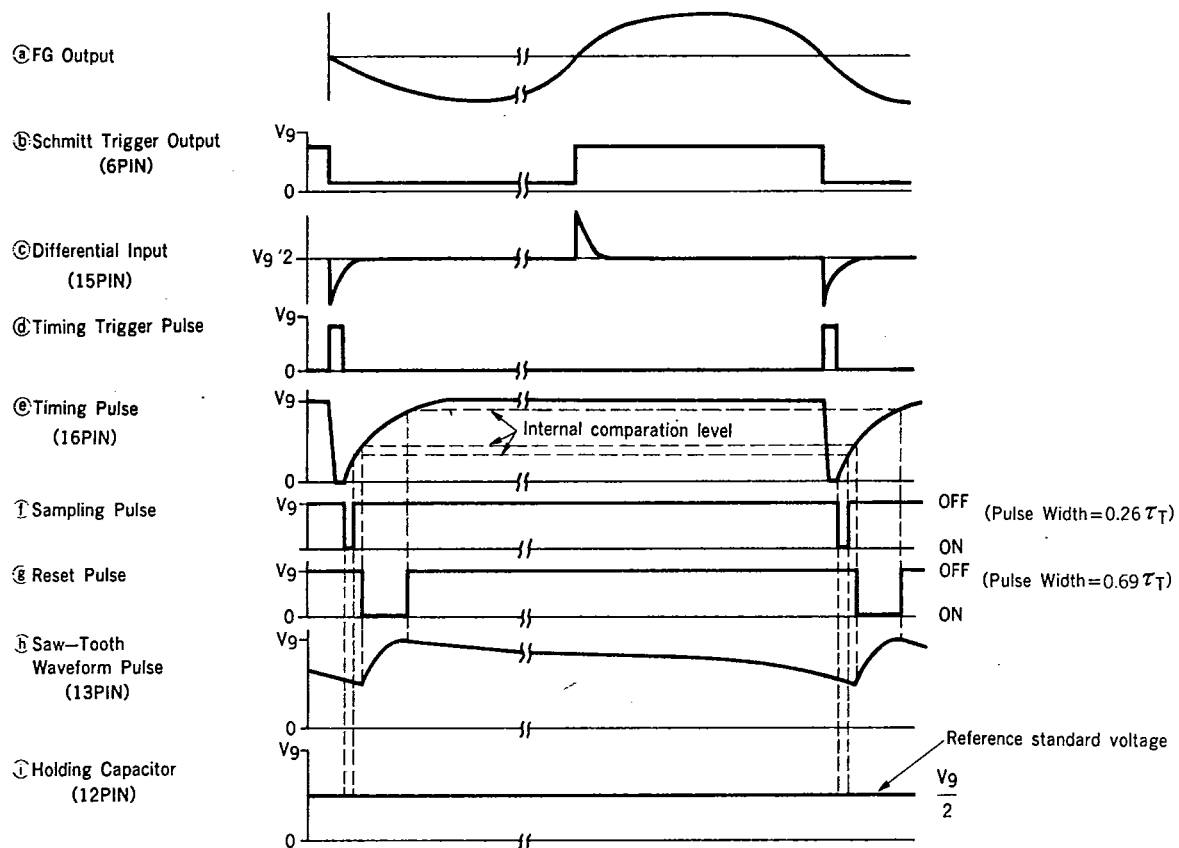


TEST CIRCUIT - 6 (R_{Q48} ON)

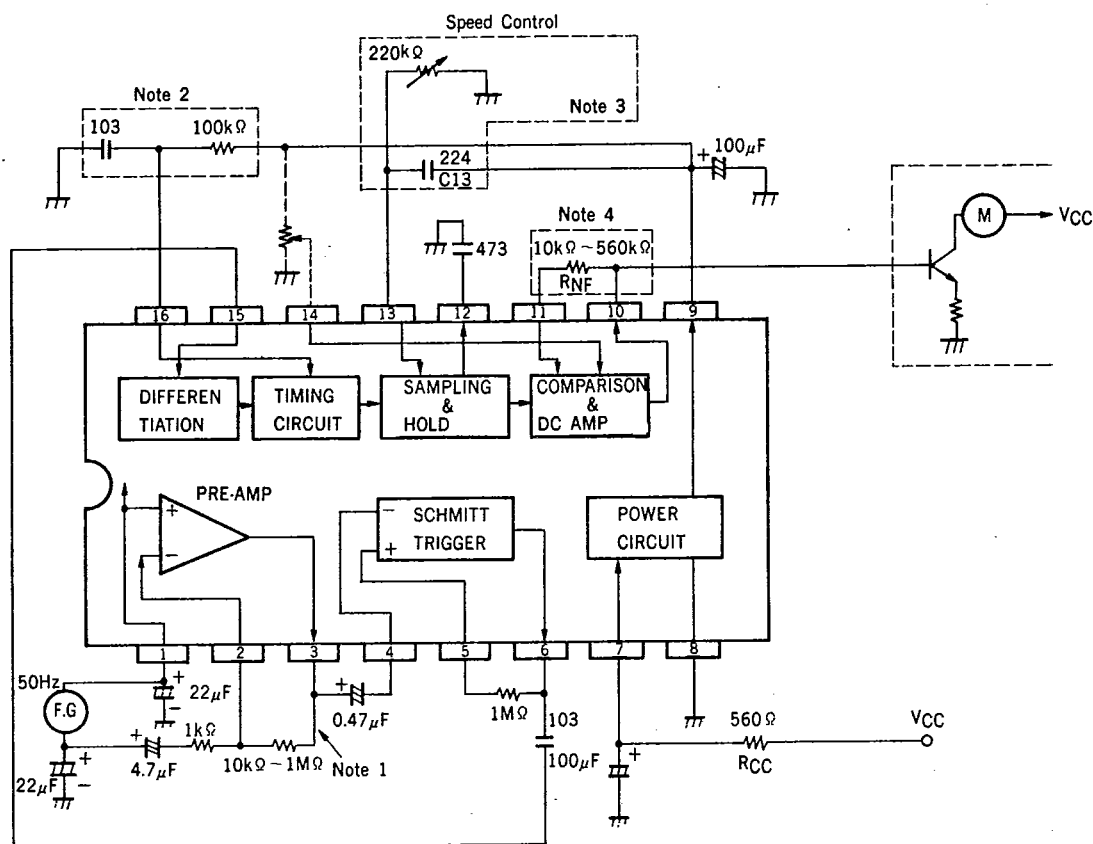


*Adjust V_{DC} to obtain voltage of 1.5 V between NO.13 and NO.9 pin, measure current. and calculate by $V(1.5 \text{ V}) A$.

μ PC1043C TIMING CHART



APPLICATION CIRCUIT



Note 1: Set preamplifier gain so that about 2 V_{p-p} voltage is obtained here.

Note 2: Setting timing time constant τ_{16} on No. 16 pin.

$$\tau_{16} = \frac{1}{f_{ref}} \times 0.05 \dots (5 \% \text{ of FG period})$$

Note 3: Setting time constant τ_{13} on No. 13 pin for waveform generator.

$$\tau_{13} = \frac{1}{f_{ref} \cdot \ln 0.5} = C_{13} \cdot R_{13}$$

C₁₃ can be obtained by the formula.

$$C_{13} \leq \frac{0.69 \cdot \tau_{16}}{3000}$$

Note 4: DC amplifier gain is determined as shown below.

$$A_v = \frac{R_{NF}}{6.8 \times 10^3}$$

$$V_{CC} = 24 \text{ V}$$

Nippon Electric Co., Ltd.

NEC Building, 33-1, Shiba Gochome, Minato-ku, Tokyo 108, Japan
Tel: Tokyo 454-1111
Telex Address: NECTOK J22686
Cable Address: MICROPHONE TOKYO

IC-1408
JULY-20-82M
Printed in Japan