NEC ELECTRON DEVICE

BIPOLAR ANALOG INTEGRATED CIRCUIT
μPC1043C

MOTOR CONTROL CIRCUIT
SILICON MONOLITHIC BIPOLAR INTEGRATED CIRCUIT

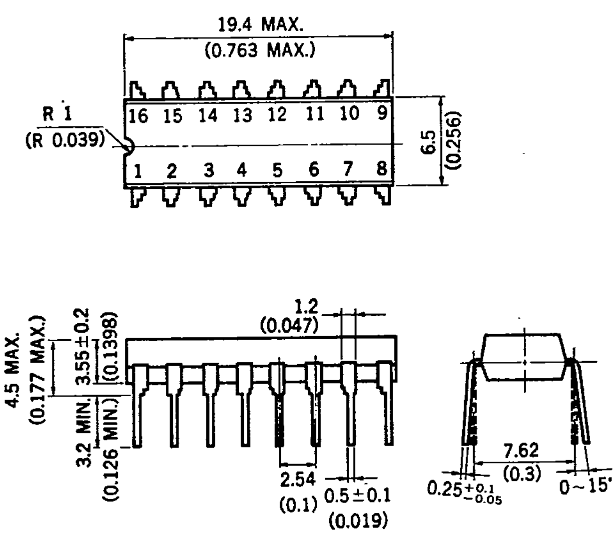
The μPC1043C is a silicon monolithic integrated circuit developed by NEC for Frequency Generator DC Motor speed control of Hi-Fi player and VTR etc.
The package is 16-Pin plastic Dual In-Line Package.

FEATURES

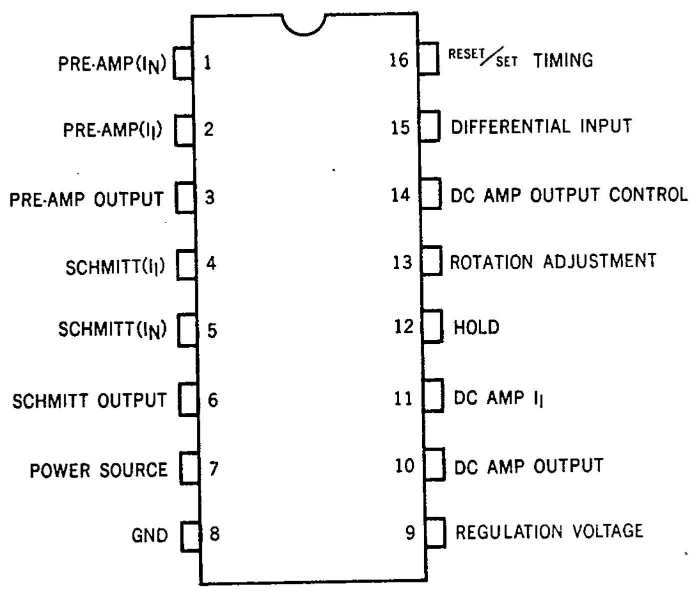
- Operating at wide range supply voltage.
  (V_{CC} = 9 to 28 V)
- Available for wide range FG. Servomotor.
  (f = 20 to 3 000 Hz, v_{in} = 1 to 2 000 $mV_{p\text{-}p}$)
- Applicable for any kind of motors by choising the external power transistor.

PACKAGE DIMENSIONS

in millimeters (inches)



CONNECTION DIAGRAM (Top View)



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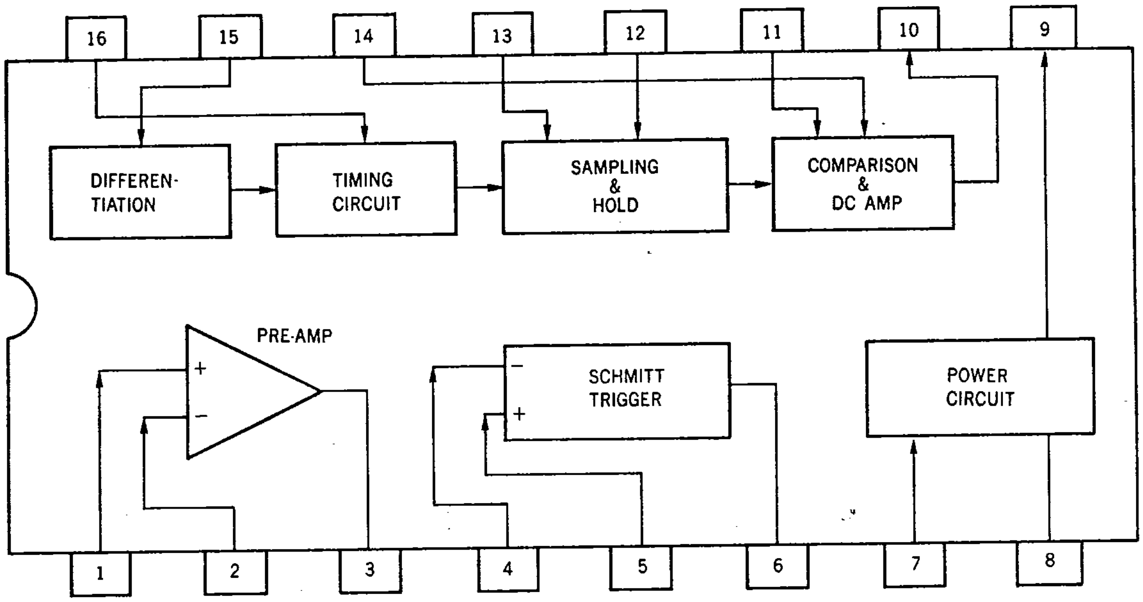
BLOCK DIAGRAM (Top View)



ABSOLUTE MAXIMUM RATINGS (T_a = 25 °C)

Supply Voltage	V_{CC}	15*	V
Circuit Current	I_{CC}	100	mA
Power Dissipation (Ta = 75 °C)	P_D	350	mW
Operating Temperature Range	T_{opt}	−20 to +75	°C
Storage Temperature Range	T_{stg}	−40 to +125	°C

* Power source directly applied to No. 7 pin.

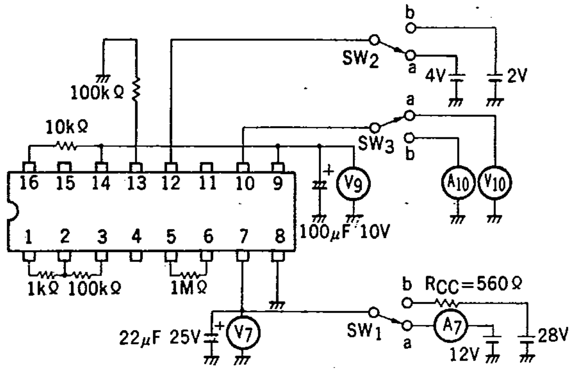
RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage (R_{CC} = 0)	V_{CC1}	9	12	15	V
Supply Voltage (R_{CC} = 560 Ω)	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	°C

ELECTRICAL CHARACTERISTICS (V_{CC} = 12 V, T_a = 25 °C)

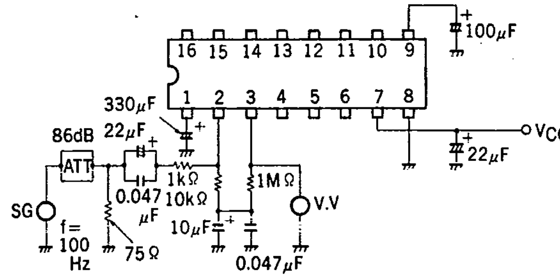
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Circuit Current	I_{CC}	4	7	10	mA	Non-signal input, Output current = 0
Regulation Voltage	V_9	5.1	5.7	6.3	V	Voltage at No. 9 pin
Maximum Output Voltage	$V_{O\ max.}$	3.5	4.25		V	Output Current = 0
Maximum Output Current	$I_{O\ max.}$	8	12	17	mA	Output Voltage = 0
Shunt Regulation Voltage	V_{7ON}	15	16.3	18	V	V_{CC} = 28 V, R_{CC} = 560 Ω
PRE-AMP Voltage Gain	A_{vo}	75	84		dB	f = 100 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 V, R_{CC} = 560 Ω Ta = –20 to +60 °C Rotation $N_{max.} - N_{min.}$/N (25 °C)/80 °C
Rotation Coefficient Input Voltage	ΔN_V		0	0.02	%/ V	Variation of Rotation at V_{CC} = 19 to 28 V, R_{CC} = 560 Ω
Rotation Drift	ΔN_T		0	0.1	%	Variation of Rotation 10 s to 30 min. after V_{CC} on at V_{CC} = 24 V, R_{CC} = 560 Ω
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	$R_{O48\ ON}$		100	300	Ω	Test Circuit – 6

TEST CIRCUIT – 1
(I_{CC}, V_9, $V_{O\,max}$, $I_{O\,max}$, $V_{7\,ON}$)



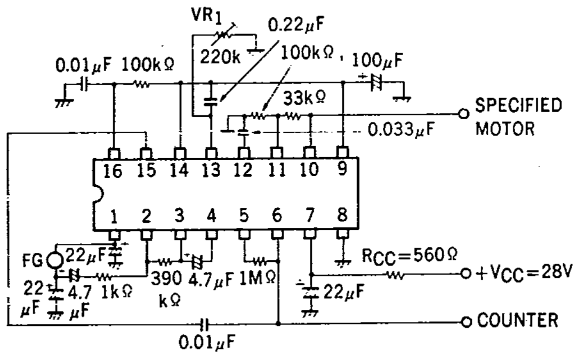
ITEM	SWITCH SW1	SW2	SW3	MEASUREMENT POINT
I_{CC}	a	a	a	A_7
V_9	a	a	a	V_9
$V_{O\,max.}$	a	b	a	V_{10}
$I_{O\,max.}$	a	b	b	A_{10}
V_{7ON}	b	a	a	V_7

TEST CIRCUIT – 2 (A_{VO})



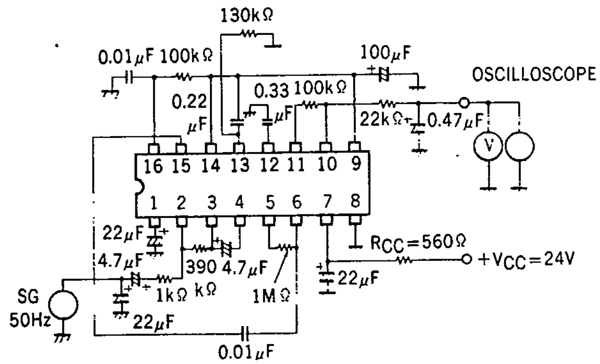
*SG Output Impedance=75 Ω
*ATT Input Output Impedance=75 Ω

TEST CIRCUIT – 3 (ΔN_A, ΔN_V, ΔN_T)



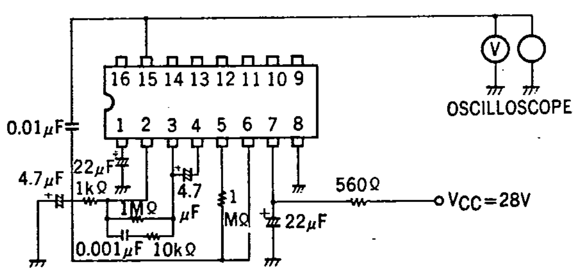
*Adjust VR1 so that the measured volue by counter becomes 20 ms.

TEST CIRCUIT – 4 (v_o)

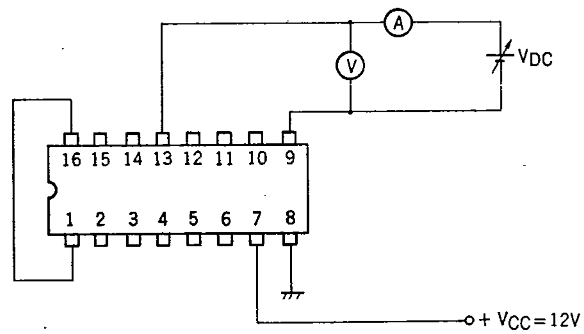


*Adjust SG frequency to obtain 1.4 to 1.5 V DC Voltage on NO. 10 pin, and then measure with oscilloscope.

TEST CIRCUIT – 5 (V_{TN})

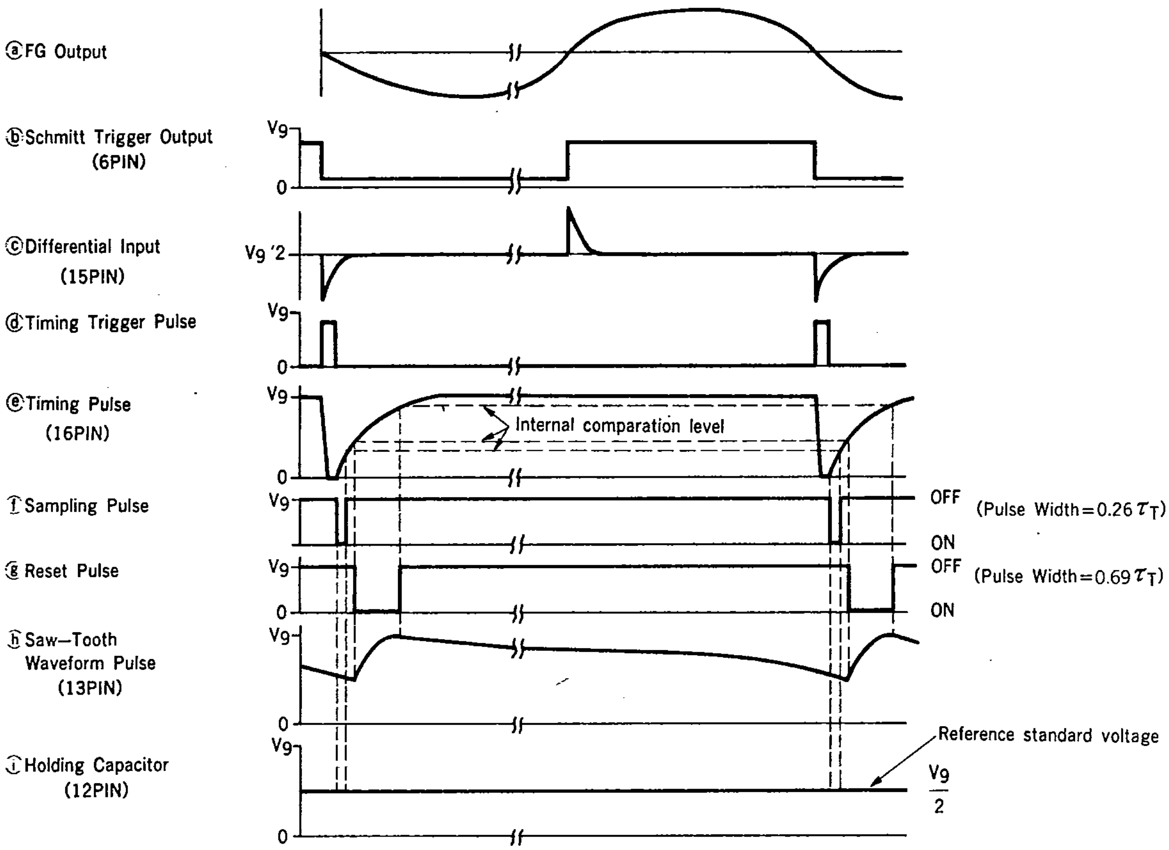


TEST CIRCUIT – 6 ($R_{Q48\,ON}$)

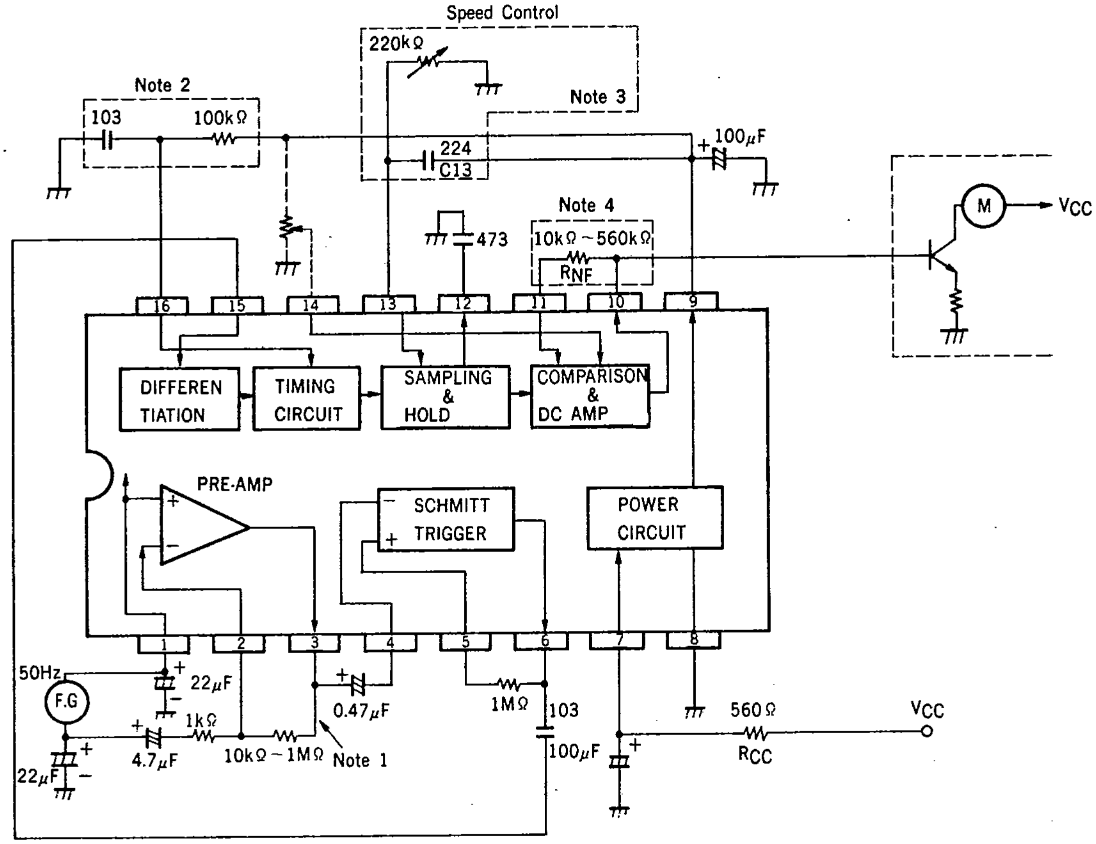


*Adjust V_{DC} to obtain voltage of 1.5 V between NO.13 and NO.9 pin, measure current. and calculate by V(1.5 V) A.

μPC1043C TIMING CHART



APPLICATION CIRCUIT



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

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

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

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

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

C_{13} 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.

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

$V_{CC} = 24$ V

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