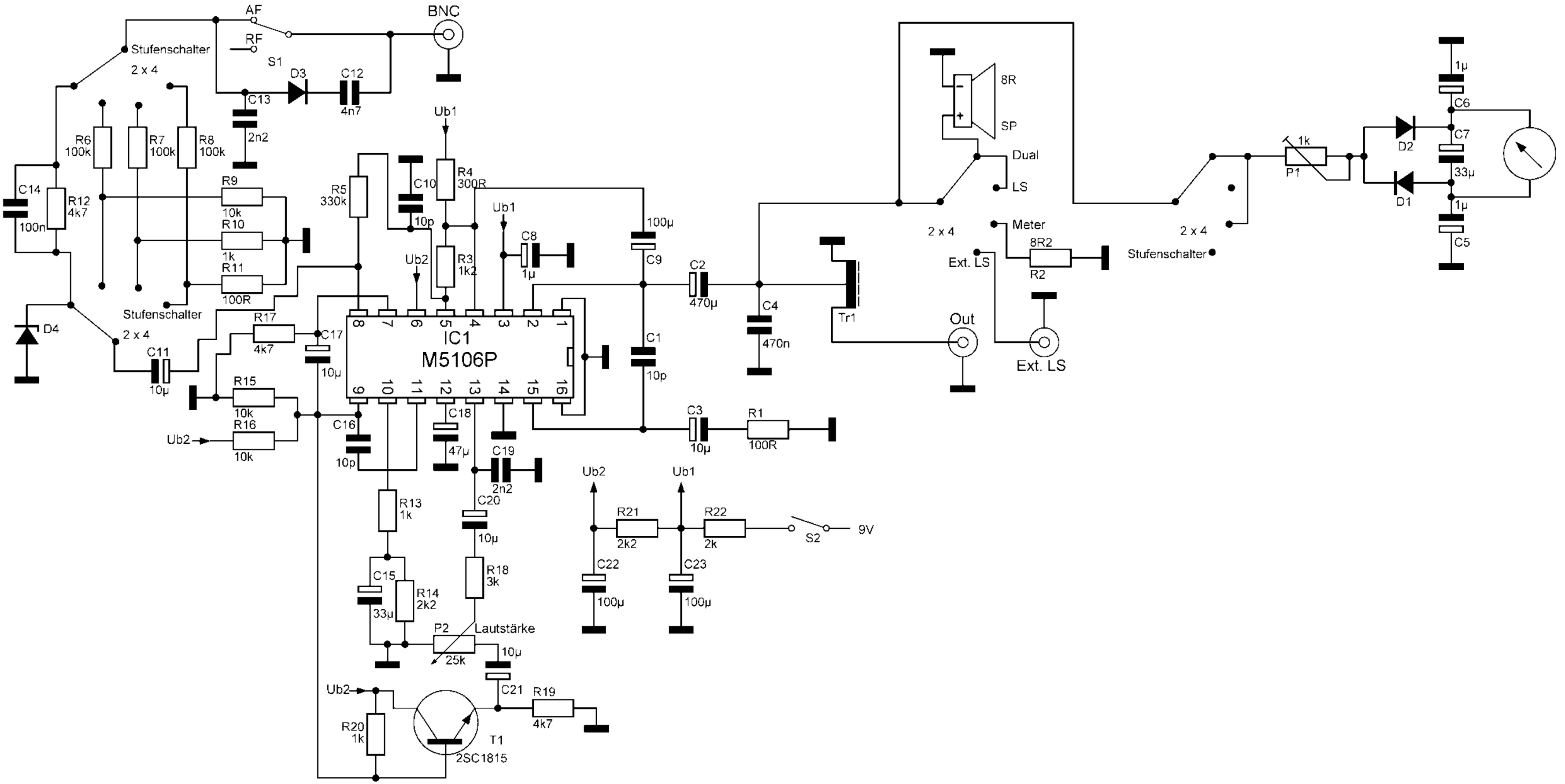
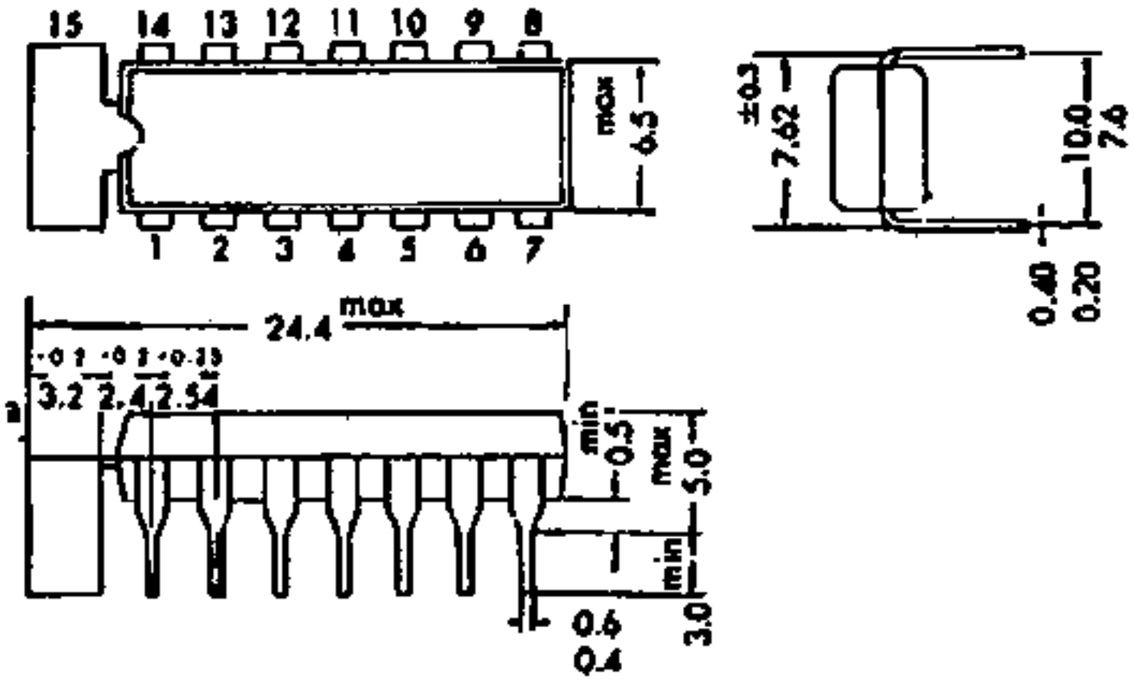



| Änderungen | | | Datum | Name | Bezeichnung | Blatt |
|---|---|---|---|---|---|---|
| Datum | Name | gez.: | 28.02.2011 | H.R. Fredel | **Signalverfolger SANSUI SE-360** | |
| | | gepr.: | | | **Schaltbild aus Platine erstellt** | |
| | | Norm: | | | | von |
| | | Dipl.-Ing. H.R. Fredel, Estermannstr. 124, 53117 Bonn | | | **(C) Hans - Rainer Fredel - 2011** | |

# ECG1097

## 1 WATT OTL AUDIO POWER AMPLIFIER AND 2 TRANSISTORS




### GENERAL DESCRIPTION

ECG1097 is a monolithic linear integrated circuit designed for 1 watt audio amplifier. It consists of three functional parts ; a power amplifier which can deliver 1 - watt into 8 ohms at Vcc = 9V with a heat sink, and two transistors which can provide an economical system design

### FEATURES

(1) High Output Power for Low Supply Voltage ···· 1W with Vcc = 9V

(2) Small Zero Signal Currents ·····20mA MAX.

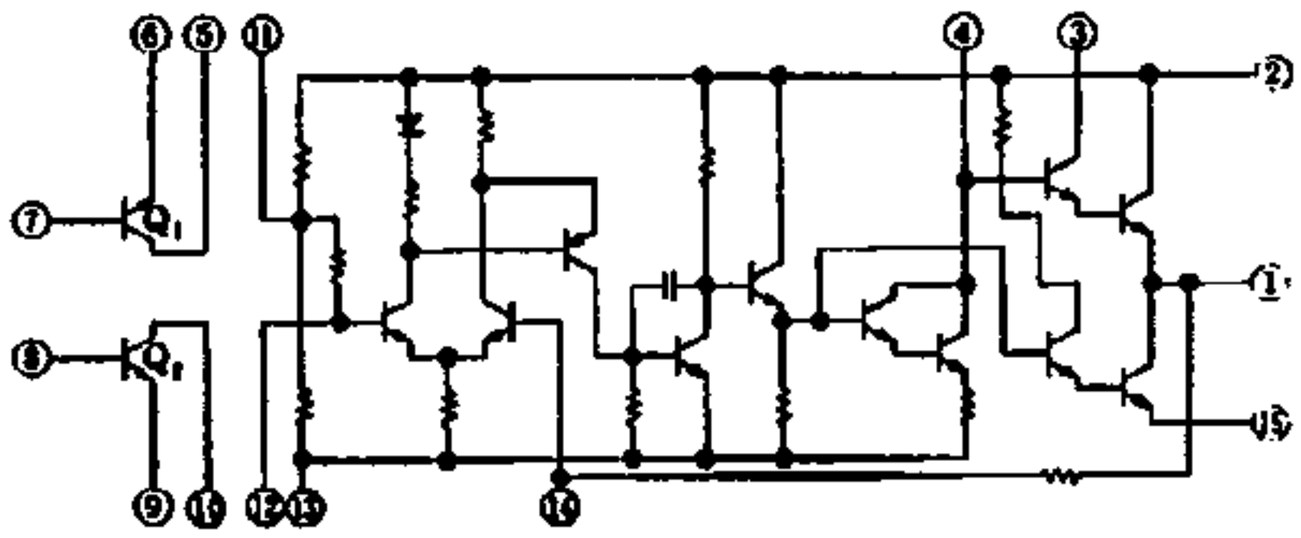
(3) Input, Output Transformerless Circuit.

(4) A pair of transistors are additionally included for use

### APPLICATION

Tape Recorder Player

### CIRCUIT SCHEMATIC




### ELECTRICAL CHARACTERISTICS (Ta = +·25°C, $R_L$ = 8Ω )

| Parameter | Symbol | Condition | | Rating | | | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| | | freq (kHz) | Supply Voltage (V) | MIN. | TYP. | MAX | | |
| DC Forward Current Transfer Ratio of $Q_1$, $Q_2$ | $h_{FE}$ | – | – | | 100 | – | – | $V_{CE}$ =3V $I_E$=10μA |
| Zero Signal Circuit Current | $I_{CC}$ | – | 9<br>6 | – | 13<br>10 | 20 | mA | Fig.1, 2, 4 |
| Open loop Voltage Gain | $G_{VO}$ | 1 | 9<br>6 | 60 | 70<br>68 | – | dB | Fig.1, 3, 5 |
| Maximum Power Output (THD ≤10%) | Po | 1 | 9<br>6 | 0.7 | 1<br>0.55 | – | W | Fig.1, 11 |
| Total Harmonic Distortion (Po=0.5W, $G_V$=40dB) | THD | 1 | 9 | ·· | 0.65 | – | % | Fig.9 |
| Bandwidth (Po=0.5W, THD≦3 %) | BW | – | 9 | – | 60~50k | – | Hz | |
| Input Resistance | Ri | 1 | 9 | – | 20 | – | kΩ | |
| Efficiency (Po=0.7W, THD≦2%) | η | 1 | 9 | – | 50 | ·· | % | Fig.11 |

## ABSOLUTE MAXIMUM RATINGS (Ta = +25°C)

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Power Supply Voltage | Vcc | 15 | V |
| Power Dissipation | Pd | 0.7 | W |
| Derating Slope above Ta=+25℃ | Kθ | 7 | mW/℃ |
| Circuit Current | Icc | 500 | mA |
| Transistor $Q_1$,$Q_3$ | | | |
| Collector Substrate Breakdown Voltage | BVcio | 50 | V |
| Collector Base Breakdown Voltage | BVcbo | 30 | V |
| Emitter Base Breakdown Voltage | BVebo | 5 | V |
| Collector Emitter Breakdown Voltage | BVceo | 12 | V |
| Collector Current | Ic | 30 | mA |
| Operating Ambient Temperature | Topg | −20~+75 | ℃ |
| Storage Temperature | Tstg | −40~+125 | ℃ |

## TEST CIRCUIT

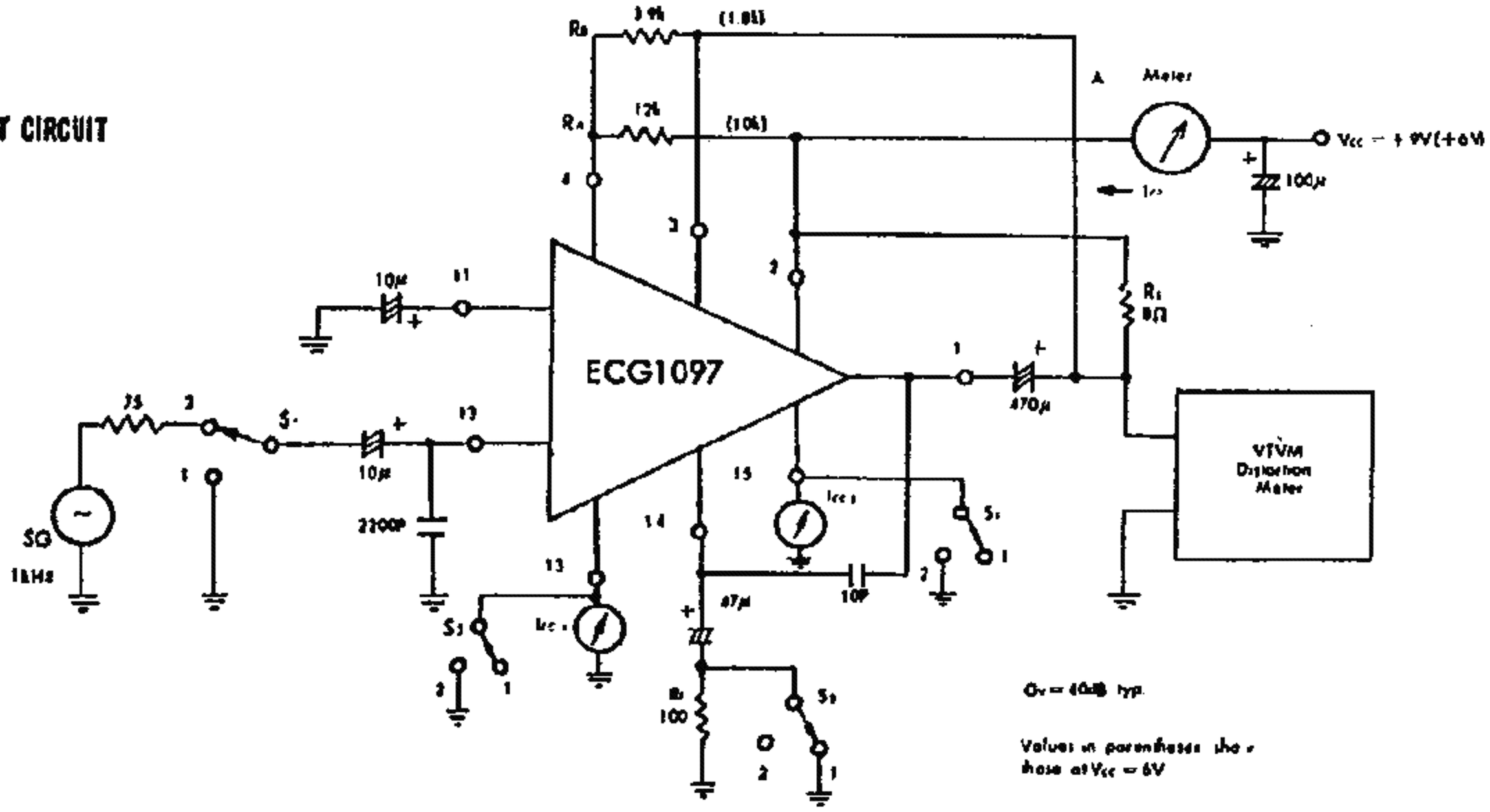



**Fig.1 Test Circuit**

## TEST PROCEDURE

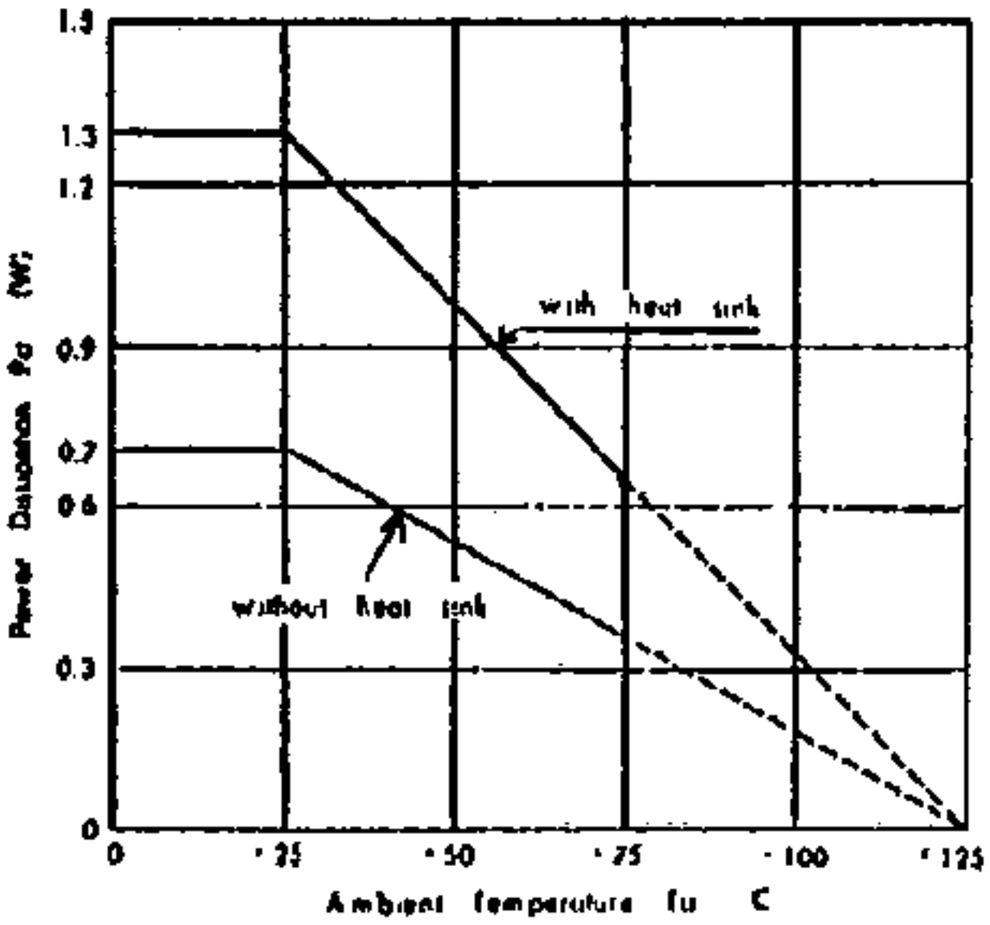
Icc : Quiescent-state meter reading with $S_1$, $S_3$ and $S_4$ at Position "1".

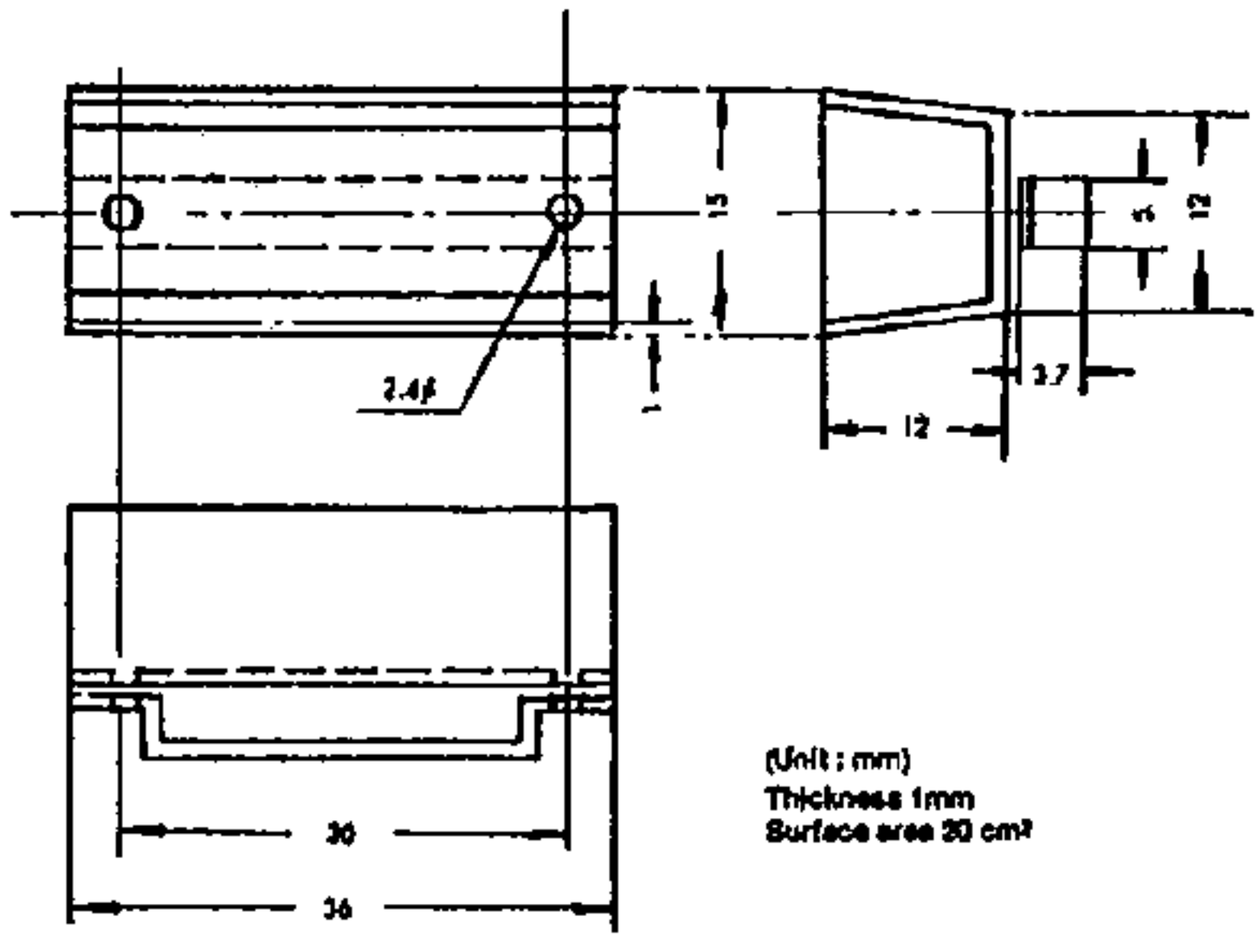
Gvo : VTVM reading for the input signal of 1kHz-0.5mV, with $S_1$ at "2" and $S_2$ at "1", $S_3$ and $S_4$ at "2".

Gv : VTVM reading for 1kHz-10mV input signal with $S_1$ ~ $S_4$ at "2".

Po : Read VTVM when the total harmonic distortion at the output is 10%(f = 1kHz). Then, Po = (VTVM Reading)$^2$/$R_L$ = $\frac{Vo^2}{R_L}$

## POWER DERATING CURVE




**Outline Drawing aluminum heat sink**

## TYPICAL CHARACTERISTICS

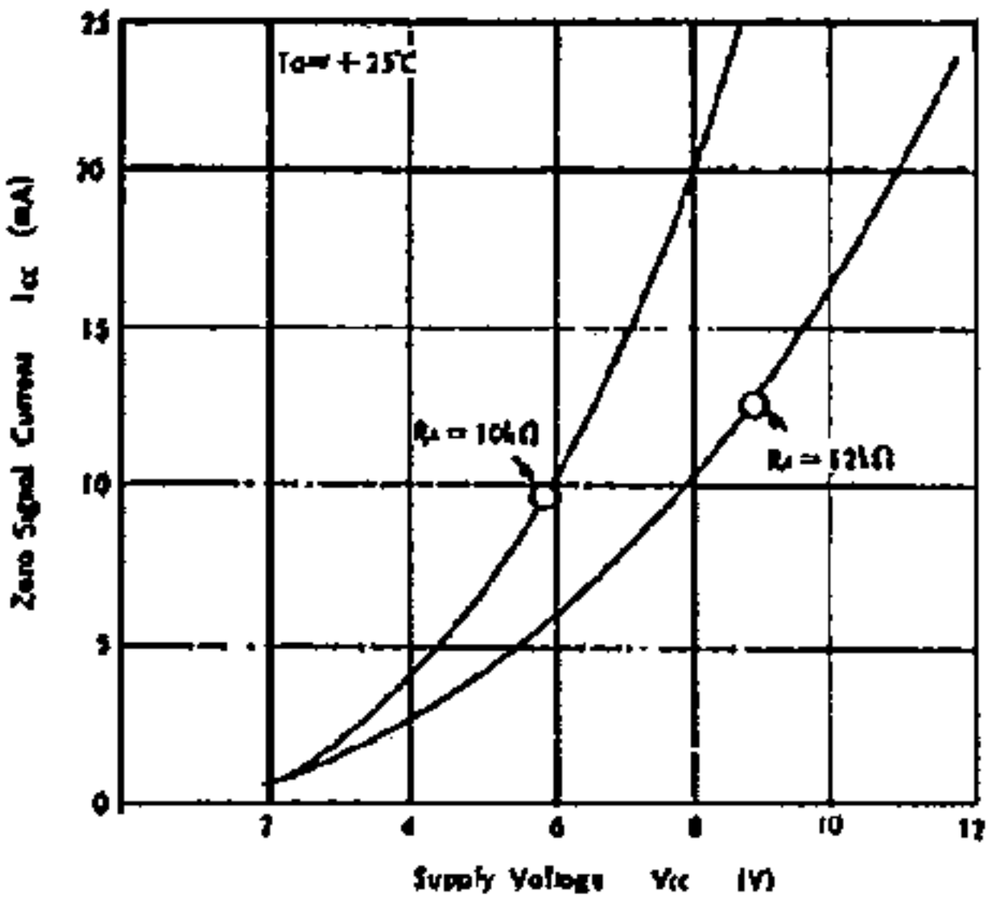



**Fig.2 Icc vs. Supply Voltage**

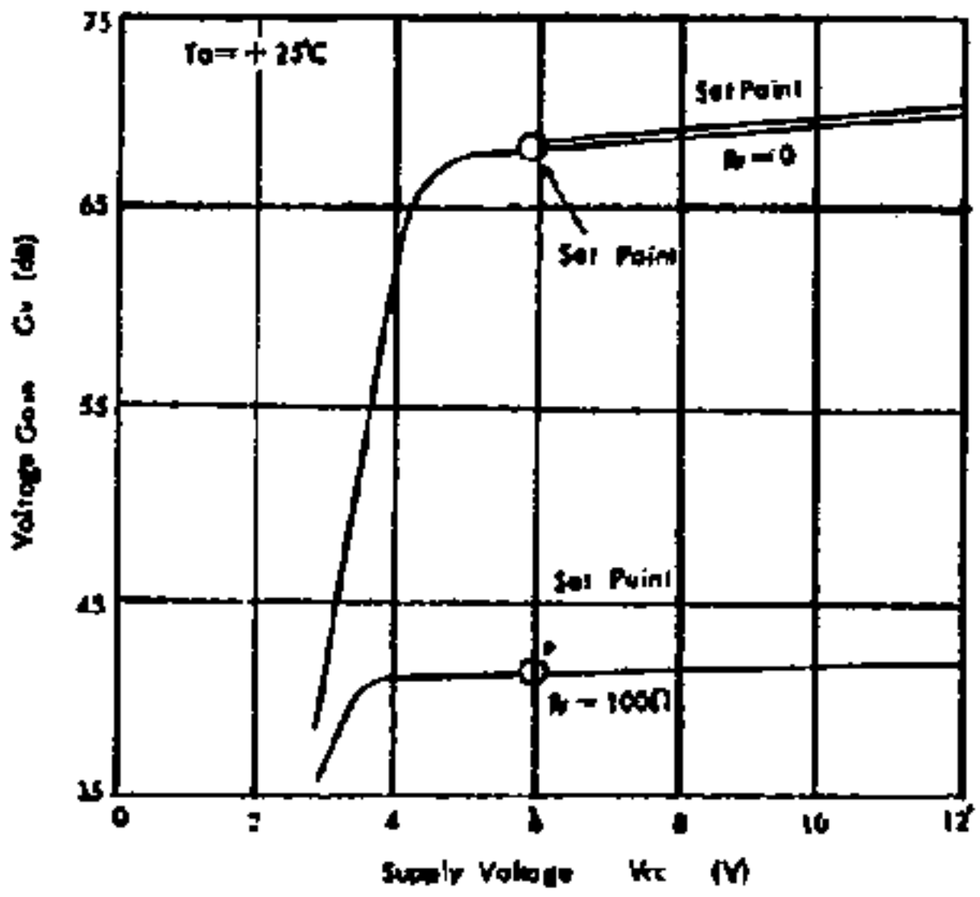



**Fig.3 Gv vs. Supply Voltage**

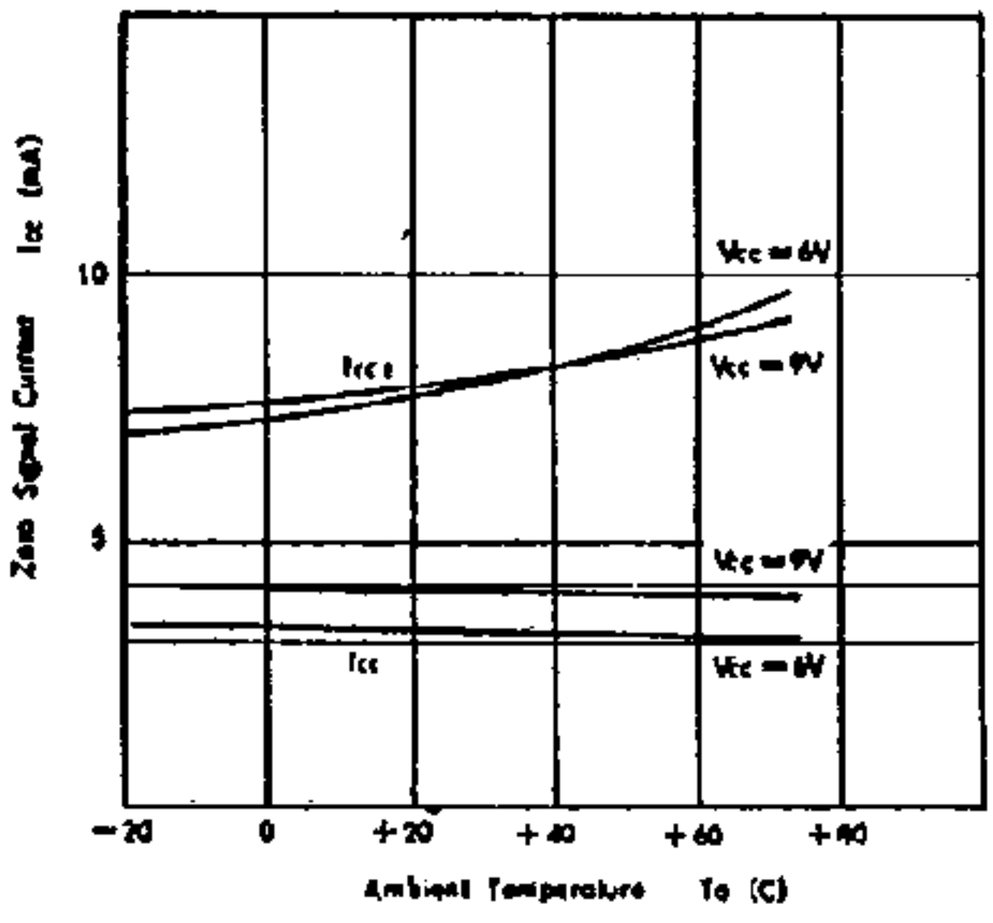



**Fig.4 Icc vs. Ambient Temperature**

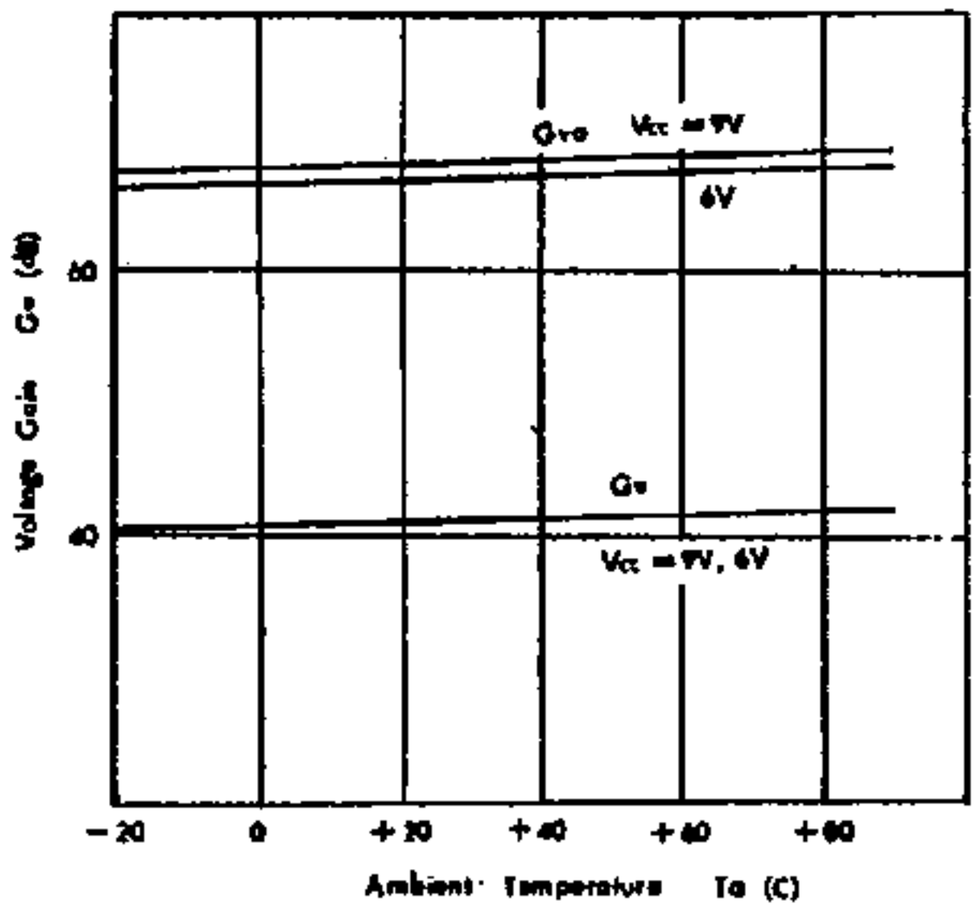



**Fig.5 Gv vs. Ambient Temperature**

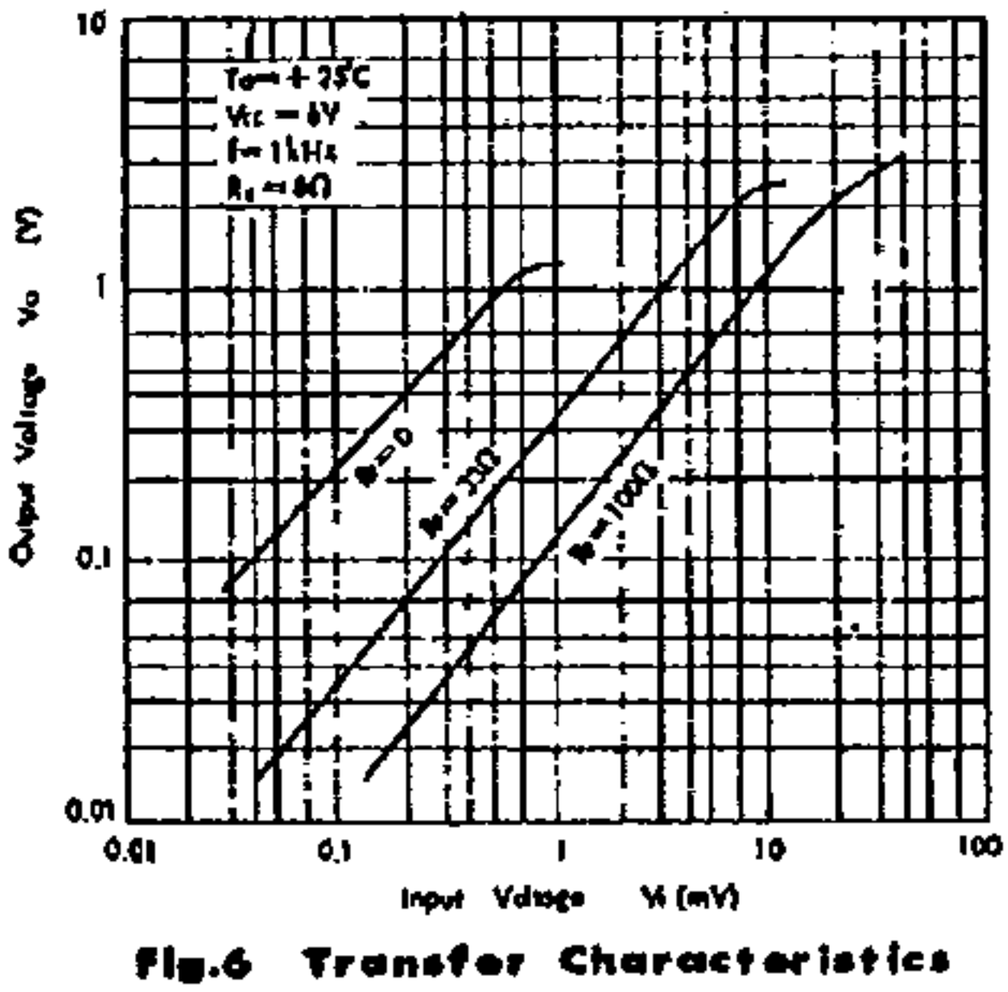



**Fig.6 Transfer Characteristics**

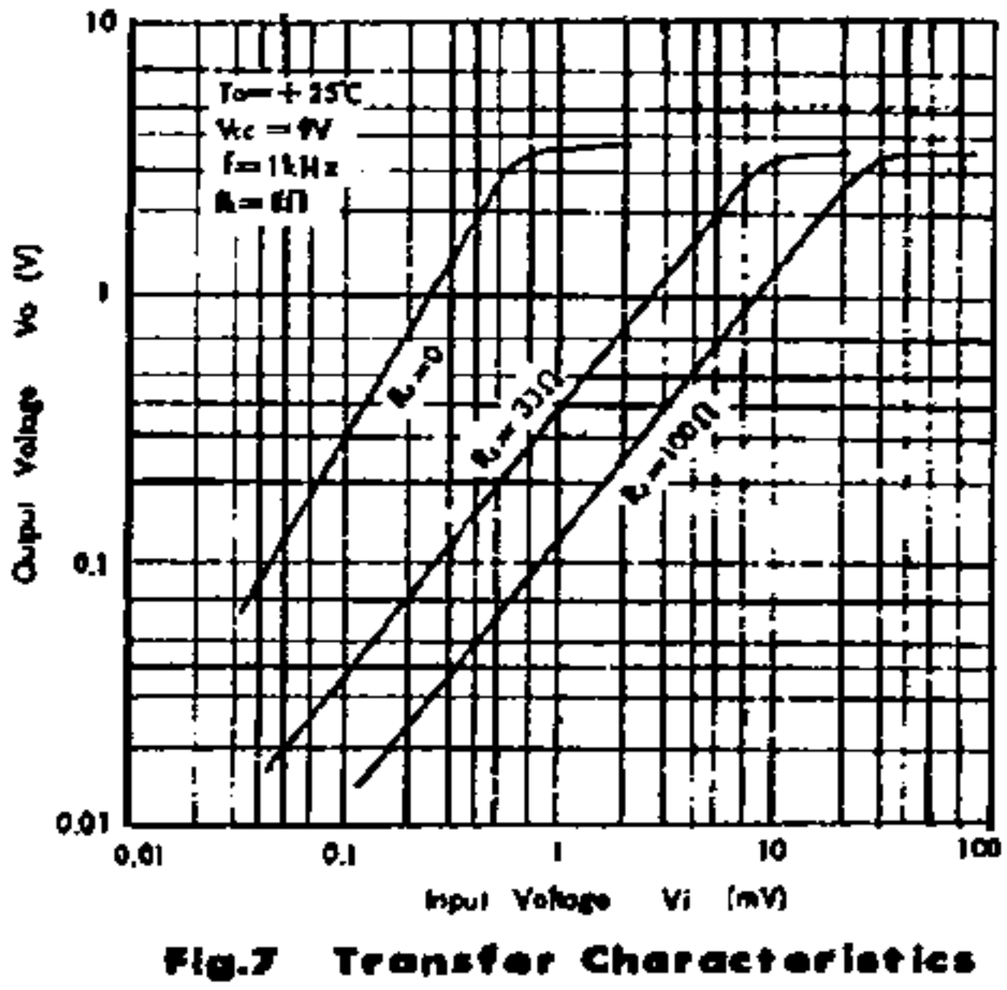



**Fig.7 Transfer Characteristics**

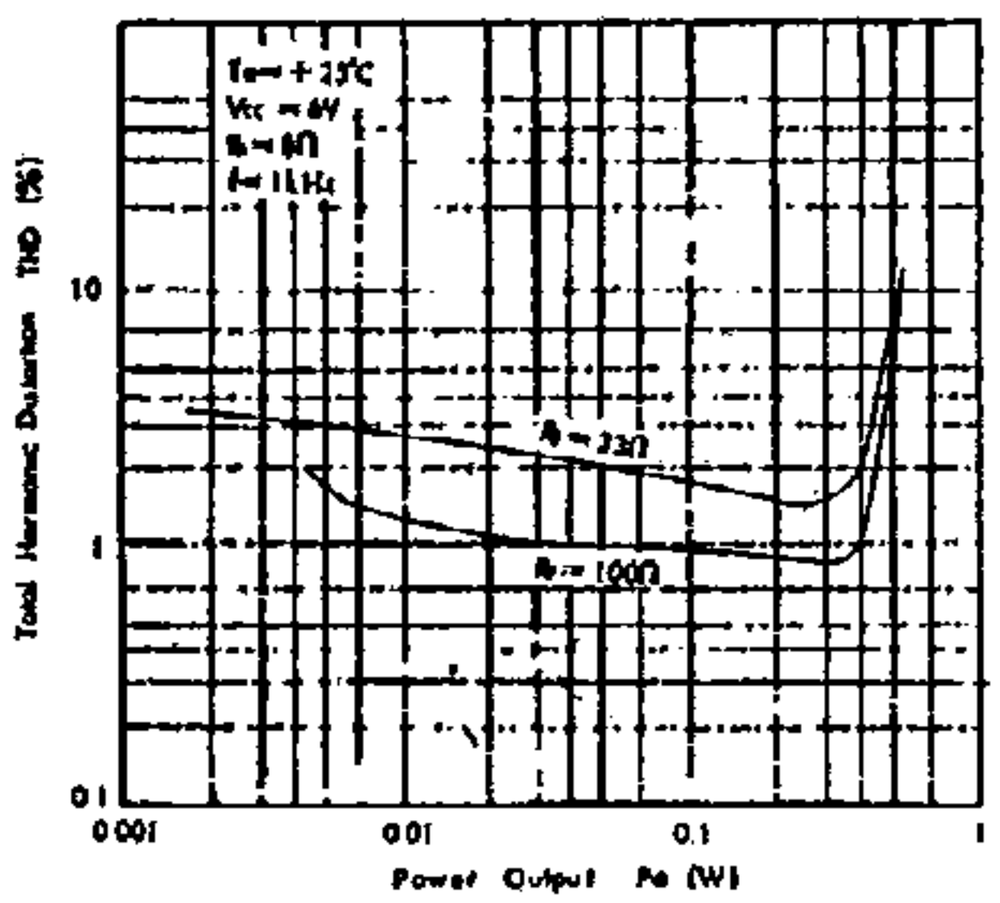



**Fig.8 Total Harmonic Distortion vs. Power Output**

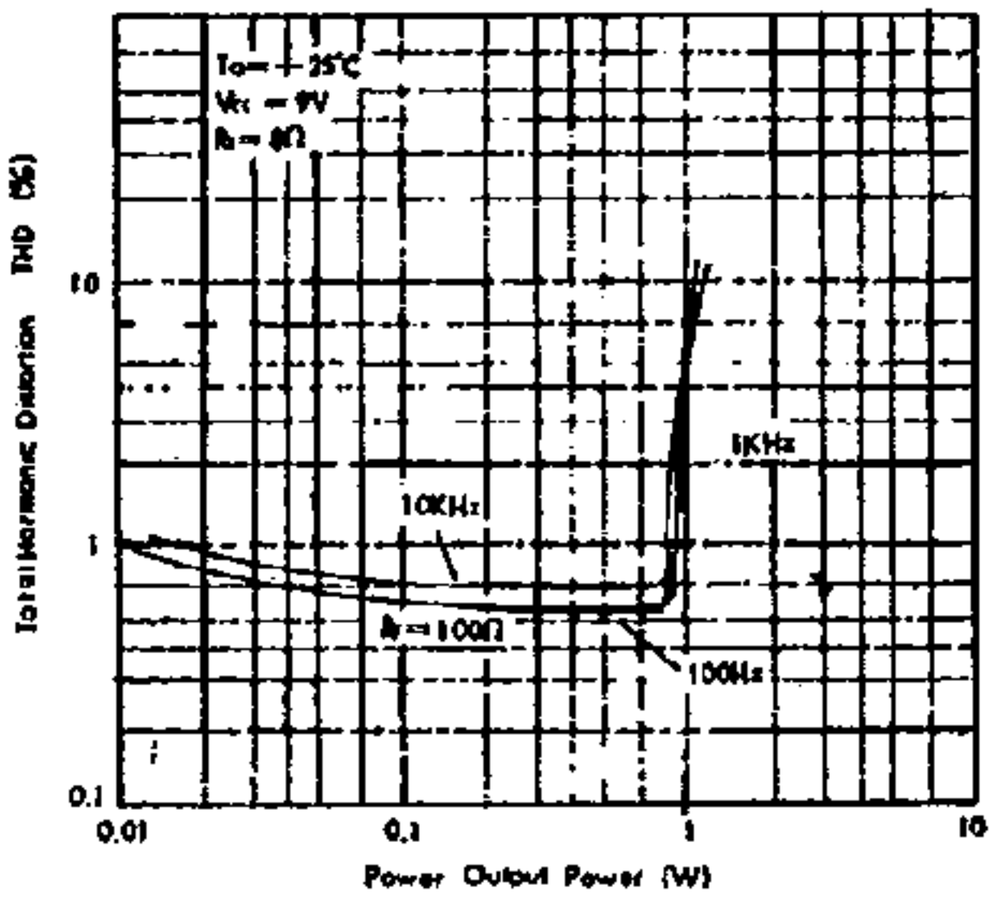



**Fig.9 Total Harmonic Distortion vs. Power Output**

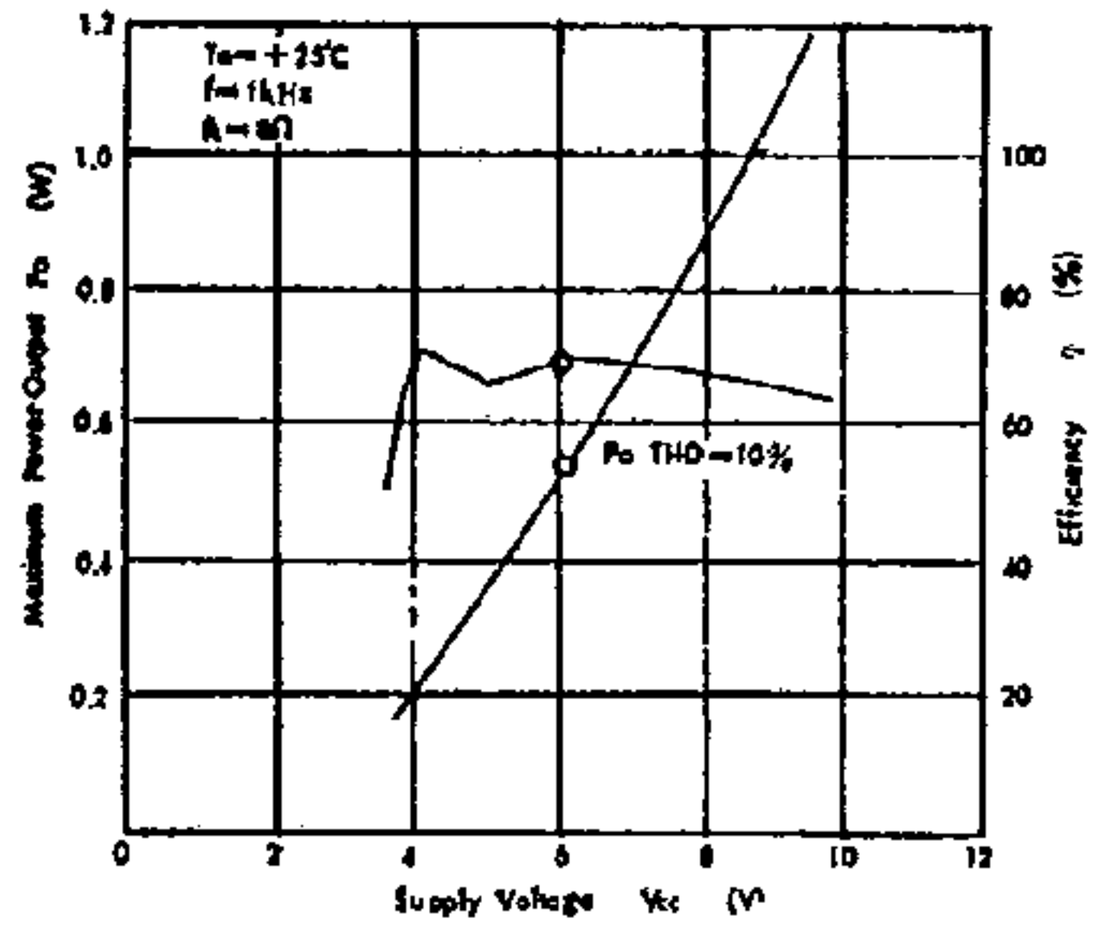



**Fig.10 Maximum Power Output, Effiefency vs. Supply Voltage**

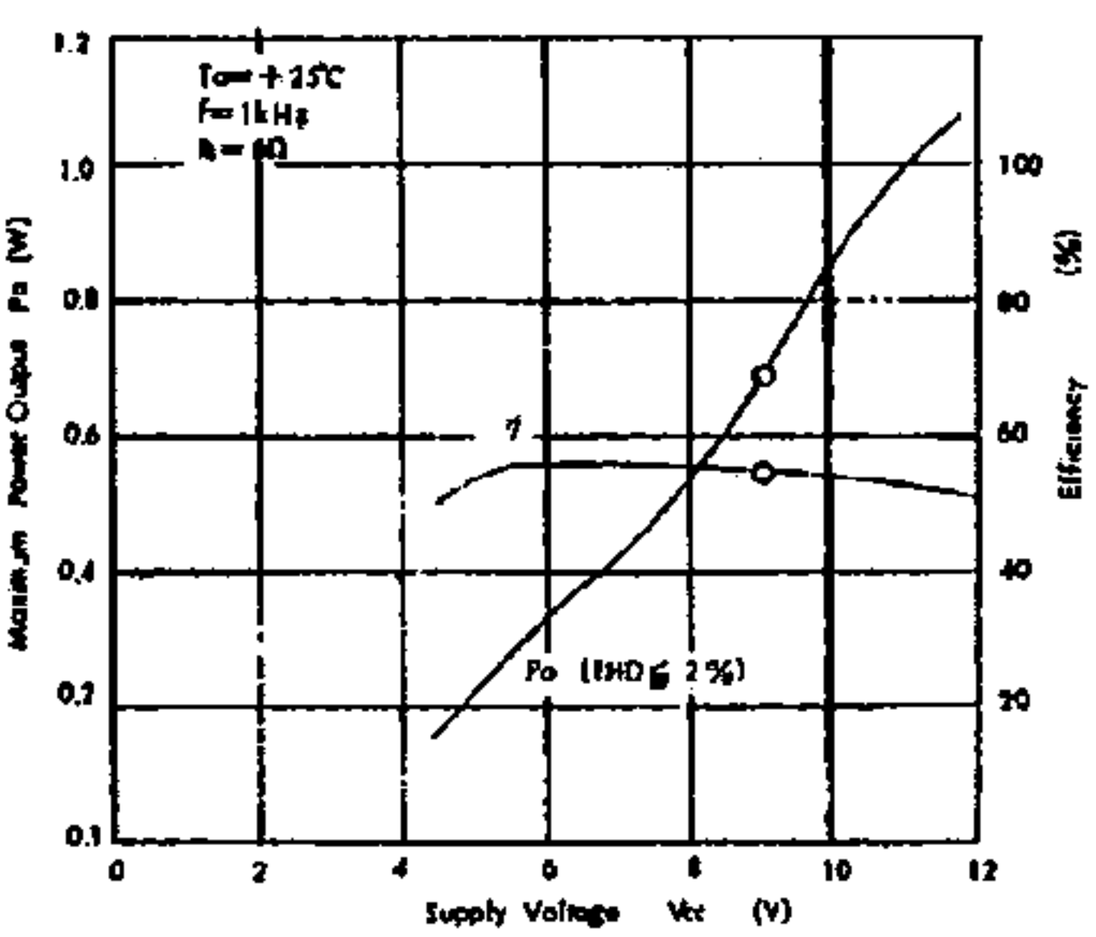



**Fig.11 Maximum Power Output, Efficiency vs. Supply Voltage**

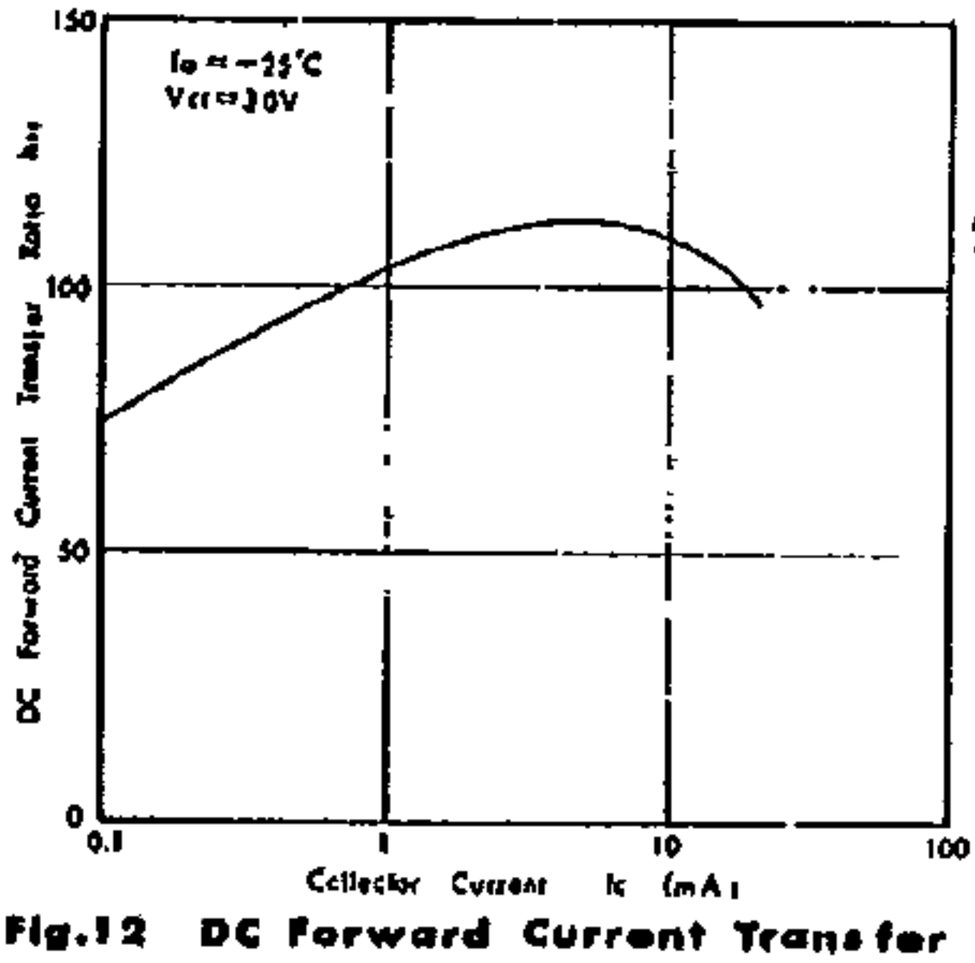



Fig.12 DC Forward Current Transfer Ratio vs. Collector Current

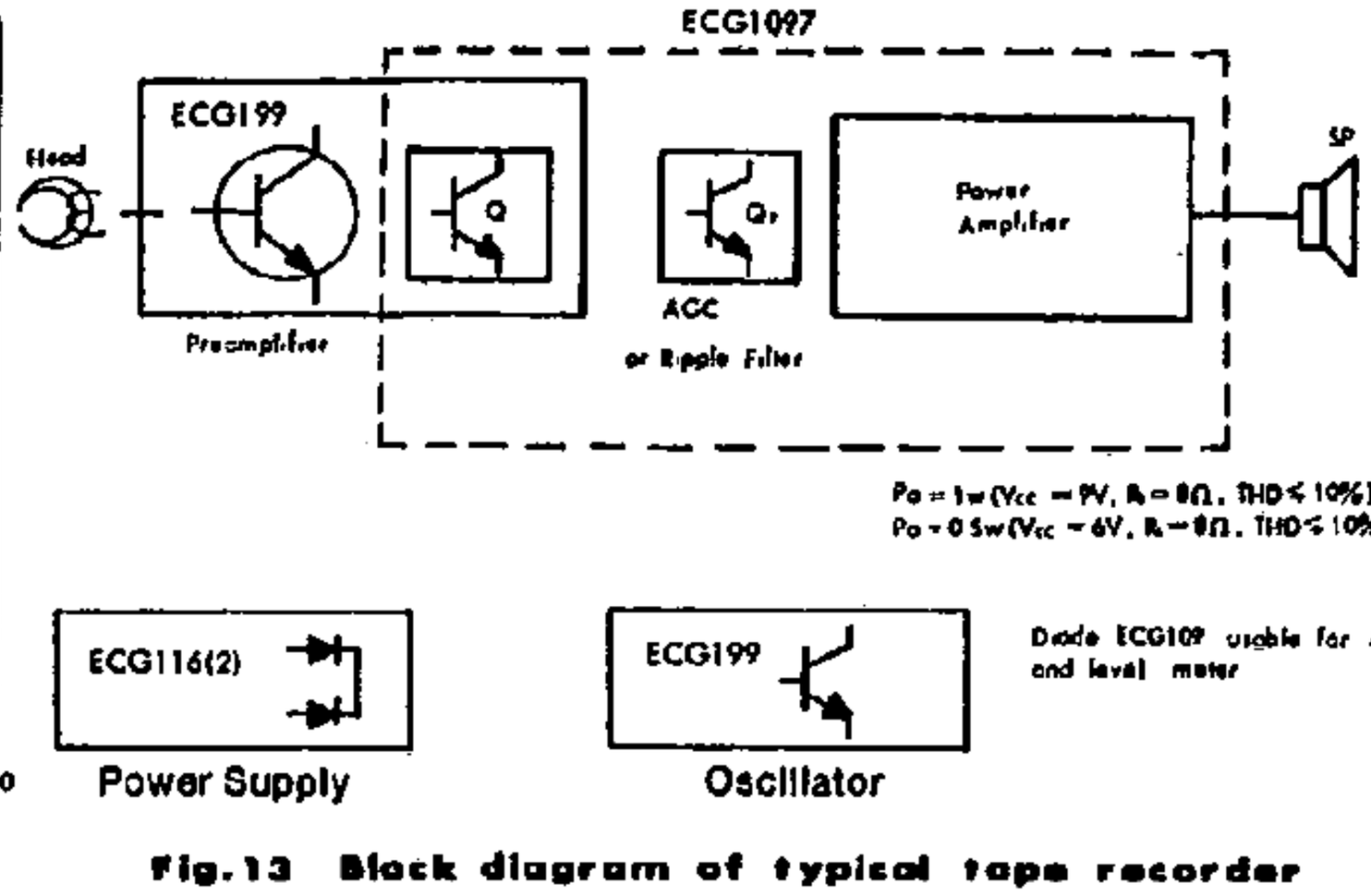



Fig.13 Block diagram of typical tape recorder

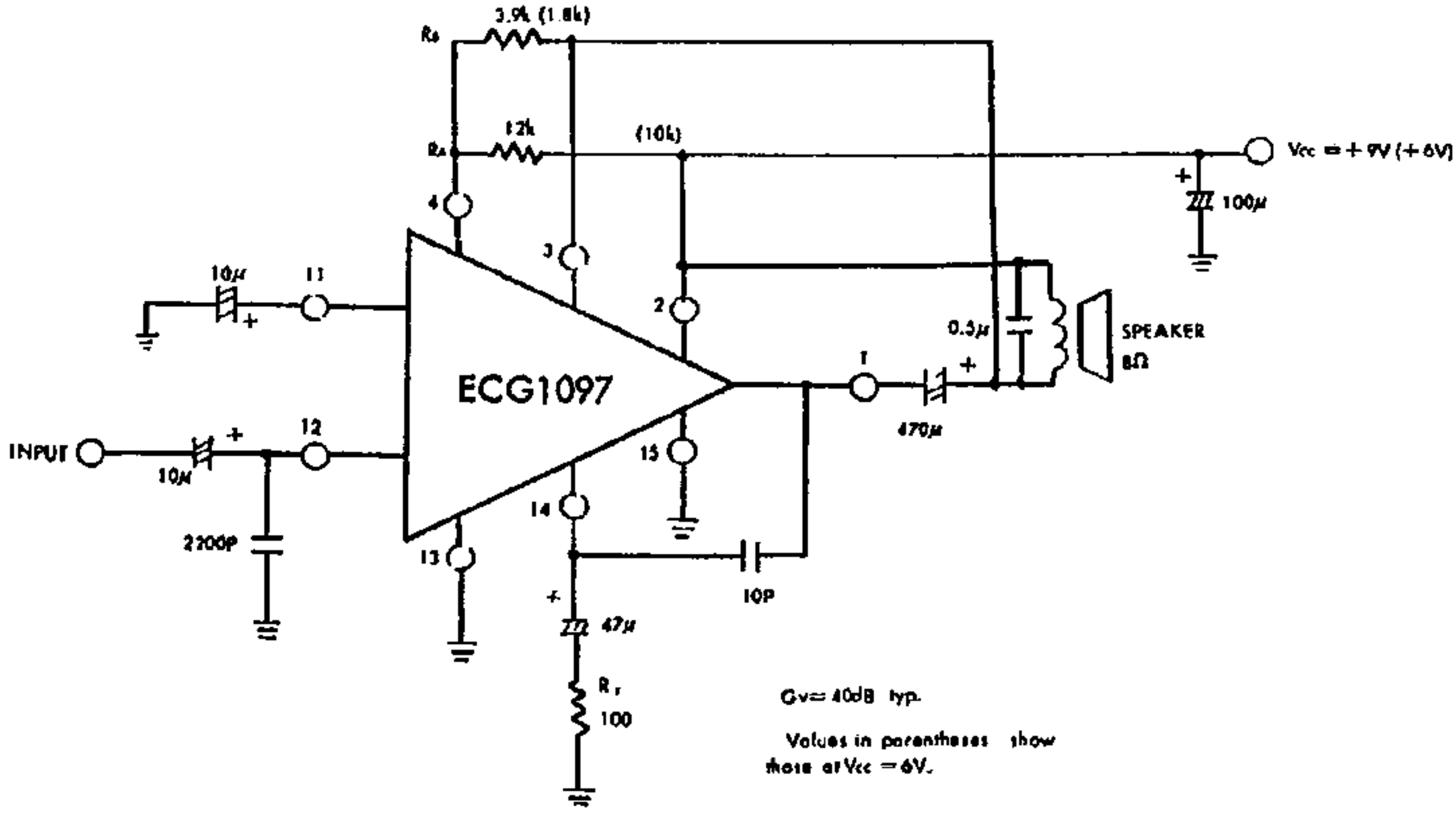



Fig.14 1 watt power amplifier using ECG1097

NOTE

(1) General care should be taken with respect to component layout, lead length and ground wiring. Especially, (—) sides of power supply and power supply capacitor [100 μF in the above figure] should be put near to the terminal 15.
Fig.15 shows how to place ground points.

(2) Closed Voltage Gain Gv is given by

$$Gv = 2C \log \left(1 + \frac{R_1}{R_F}\right) \quad (dB)$$

(3) The terminal 13 and 15 must be grounded.

(4) 4 - 10pF capacitor between terminal 1 and 14, a 2,200pF capacitor between terminal 12 and the ground are effective to prevent parasitic oscillation.

## Operation of grounded load circuit

Operation of grounded load circuit —

Fig. 16 shows the circuit in which one of the terminal of the load $R_L$ is grounded. Capacitor C is applied to feed back the positive cycle of the output signal. Resistors $R_1$, $R_2$ are determined from the condition of supply voltage and the quiescent current of the output stage. Typical values of $R_1$, $R_2$ are respectively 1.2kΩ, 330Ω at Vcc = 6 ~ 9V.

The quiescent current $I_2$ of the output stage(Fig. 17) is given by

$$I_2 = I_1\sqrt{A \times \exp(qI_2R_E/kT)}, \quad (1)$$

$$I_1 = (Vcc/2 - 2V_{BE}) / (R_1 + R_2), \quad (2)$$

where A is the ratio of the emitter area of $Q_{15}$, $Q_{13}$ to that of $Q_8$, $Q_9$. A ≒ 4

For example, $I_1$ at Vcc = 9V (6V) are about 2 (1) mA for R1 = 1.2kΩ, R2 = 75Ω, so $I_2$ are about 28 (7) mA.

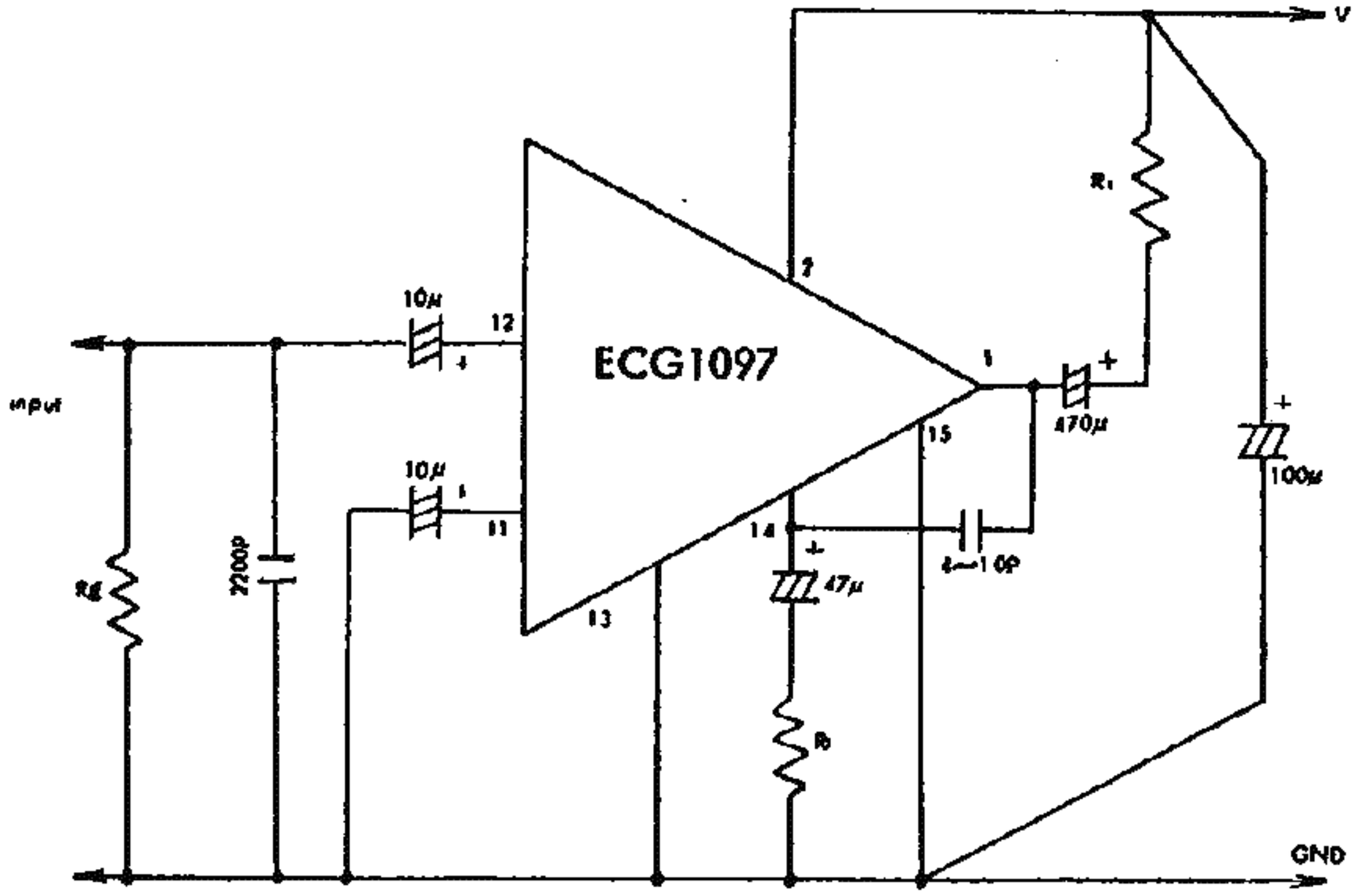



Fig.15 Arrangement of ground points

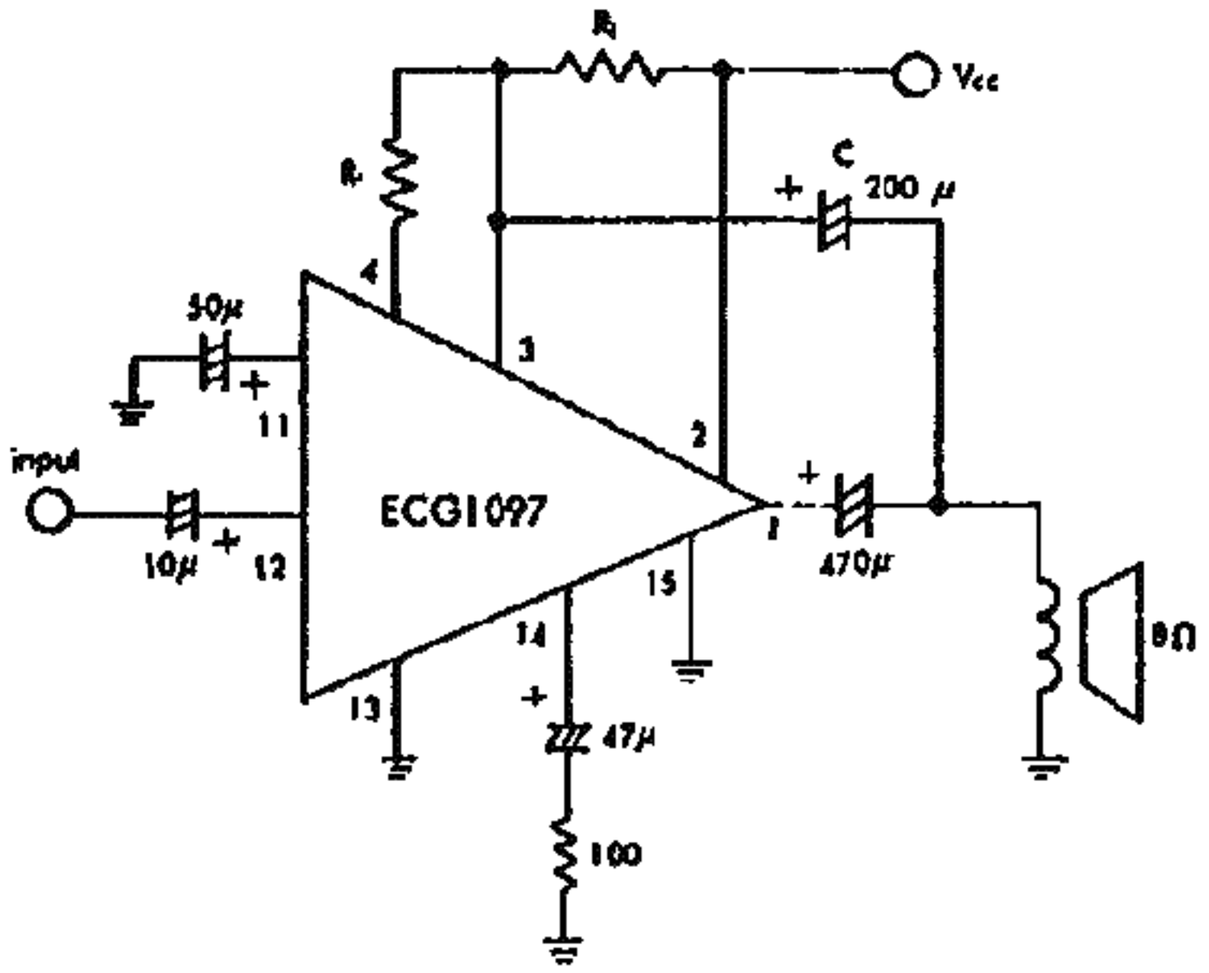



Fig.16 Grounded Load Circuit

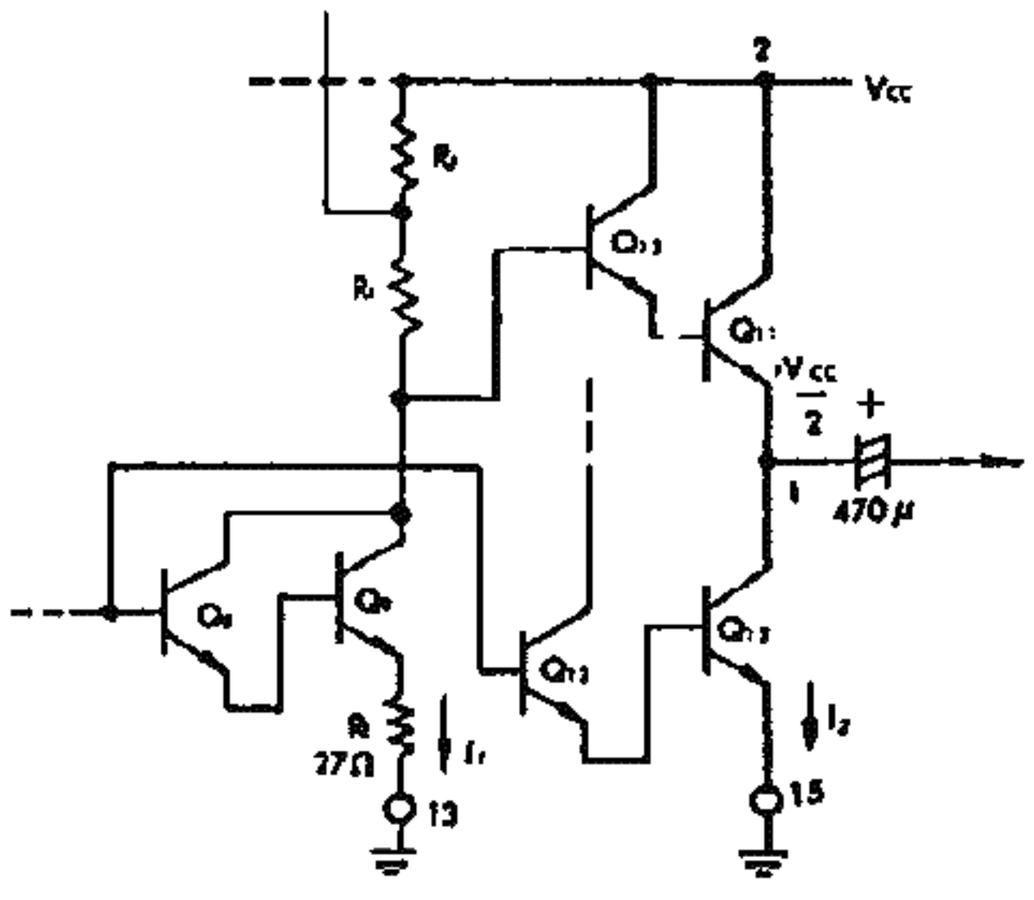



Fig.17 Output Stage of ECG1097