

# TOSHIBA INTEGRATED CIRCUIT

## TECHNICAL DATA

### TA7240AP, TA7241AP

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT  
SILICON MONOLITHIC

Unit in mm

5.8W DUAL AUDIO POWER AMPLIFIER.  
19W BTL AUDIO POWER AMPLIFIER.

The TA7240AP/TA7241AP are dual audio power amplifier for consumer applications. It is designed for high power, low distortion and low noise.

It also contains various kind of protectors.

It is suitable for car-audio power amplifier with high performance.

- Two Kinds of Pin Configuration are Available :  
Normal (TA7240AP) and Reverse (TA7241AP) for Easier Layout Design of Pc-board when Used in BTL-Stereo Application.
- Operating Supply Voltage Range :  $V_{CC(opr)}=9 \sim 18V$
- High Power

$V_{CC}=13.2V$ ,  $f=1kHz$ ,  $R_L=4\Omega$

BTL	19W (Typ.)	THD=10%
	15W (Typ.)	THD=1%
DUAL	5.8W (Typ.)	THD=10%

- Low Distortion

$V_{CC}=13.2V$ ,  $f=1kHz$ ,  $R_L=4\Omega$

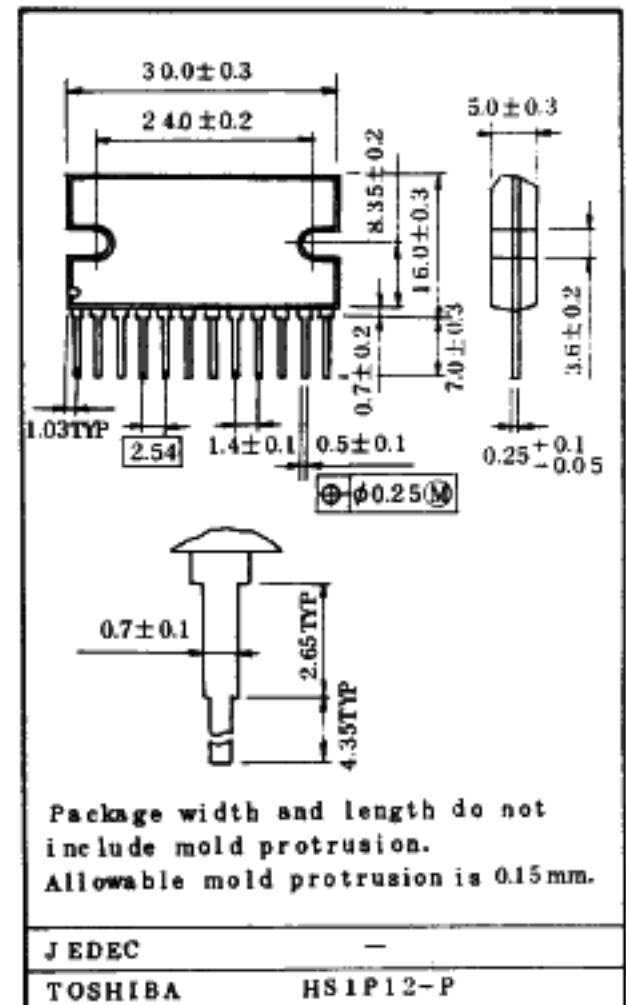
BTL	0.03% (TYP.)	$P_{OUT}=4W$ , $G_V=40dB$
DUAL	0.06% (TYP.)	$P_{OUT}=1W$ , $G_V=52dB$

- Low Noise

$V_{CC}=13.2V$ ,  $R_L=4\Omega$

BTL	0.14mV <sub>rms</sub> (TYP.)	$G_V=40dB$ , $R_g=0$ , DIN NOISE : DIN 45405
DUAL	0.7mV <sub>rms</sub> (TYP.)	$G_V=52dB$ , $R_g=10k\Omega$ , $BW=20Hz \sim 20kHz$

- Protector : Thermal Shut Down, Over Voltage Protection.  
BTL-OCL DC Short Protection.



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

CHARACTERISTIC	SYMBOL	RATING	UNIT
Peak Supply Voltage (0.2 sec)	VCC surge	45	V
DC Supply Voltage	VCC DC	25	V
Operating Supply Voltage	VCC opr	18	V
Output Current (peak)	I <sub>O</sub> (peak)	4.5	A
Power Dissipation	P <sub>D</sub>	25	W
Operating Temperature	T <sub>opr</sub>	-30 ~ 75	$^{\circ}\text{C}$
Storage Temperature	T <sub>stg</sub>	-55 ~ 150	$^{\circ}\text{C}$

## ELECTRICAL CHARACTERISTICS

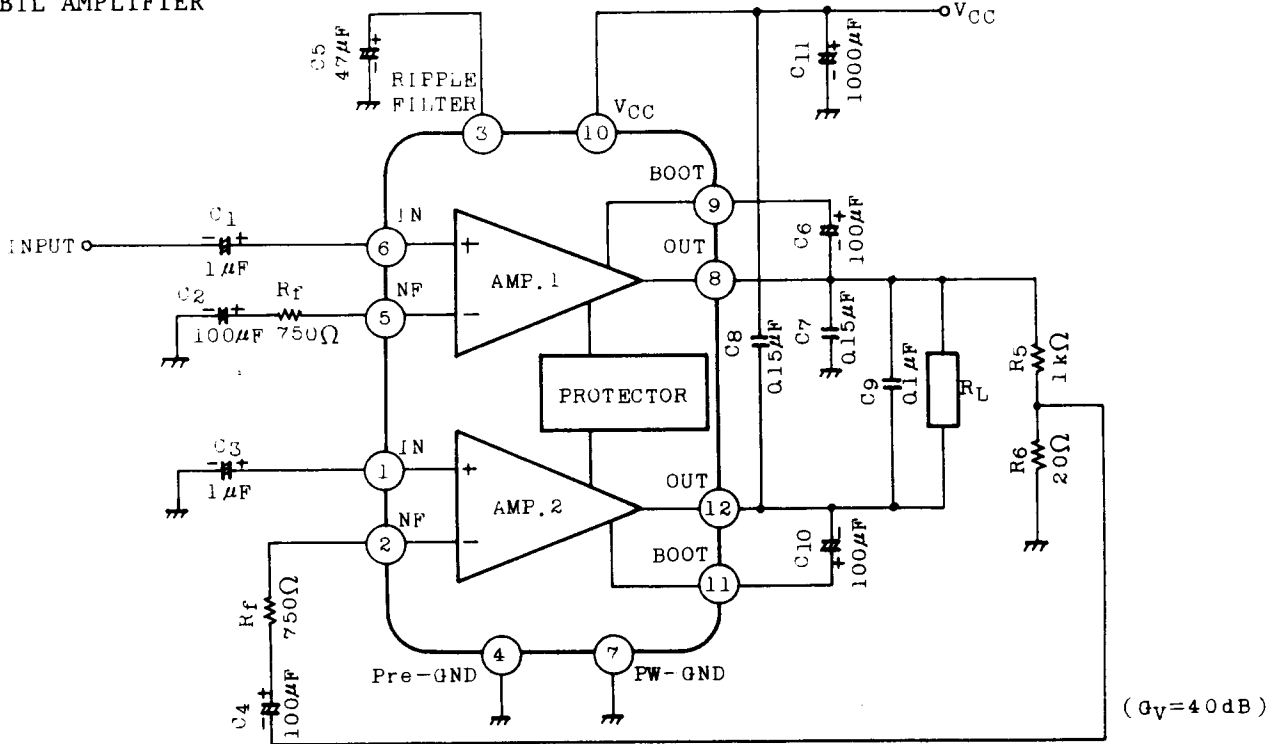
(Unless otherwise specified,  $V_{CC}=13.2\text{V}$ ,  $R_L=4\Omega$ ,  $R_g=600\Omega$ ,  $f=1\text{kHz}$ ,  $T_a=25^{\circ}\text{C}$ )

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current		I <sub>CCQ</sub>	2	V <sub>IN</sub> =0	-	80	145	mA
BTL CONNECTION MODE	Output Power	P <sub>OUT</sub> (1)	1	THD=10%	16	19	-	W
		P <sub>OUT</sub> (2)	1	THD=1%	12	15	-	W
	Total Harmonic Distortion	THD(1)	1	P <sub>OUT</sub> =4W, G <sub>v</sub> =40dB	-	0.03	0.25	%
	Output Offset Voltage	V <sub>OFF</sub>	1	V <sub>IN</sub> =0	-	0	0.35	V
	Voltage Gain	G <sub>v</sub> (1)	1	V <sub>OUT</sub> =0dBm	-	40	-	dB
	Output Noise Voltage	V <sub>NO</sub> (1)	1	R <sub>g</sub> =0 DIN45405 Noise Filter	-	0.14	-	mV <sub>rms</sub>
	Ripple Rejection Ratio	R.R(1)	1	f <sub>ripple</sub> =100Hz V <sub>ripple</sub> =0dBm	-	-52	-40	dB
DUAL MODE	Output Power	P <sub>OUT</sub> (3)	2	THD=10%	5	5.8	-	W
	Total Harmonic Distortion	THD(2)	2	P <sub>OUT</sub> =1W	-	0.06	0.30	%
	Voltage Gain	G <sub>v</sub> (2)	2	V <sub>OUT</sub> =0dBm	50	52	54	dB
	Voltage Gain Ratio	ΔG <sub>v</sub>	2	V <sub>OUT</sub> =0dBm	-1	0	1	dB
	Output Noise Voltage	V <sub>NO</sub> (2)	2	R <sub>g</sub> =10kΩ BW=20Hz ~ 20kHz	-	0.7	1.5	mV <sub>rms</sub>
	Ripple Rejection Ratio	R.R(2)	2	f <sub>ripple</sub> =100Hz V <sub>ripple</sub> =0dBm	-	-52	-40	dB
	Cross Talk	C.T	2	V <sub>OUT</sub> =0dBm	-	-57	-	dB
Input Resistance	R <sub>IN</sub>	2	f=1kHz	-	33	-	kΩ	

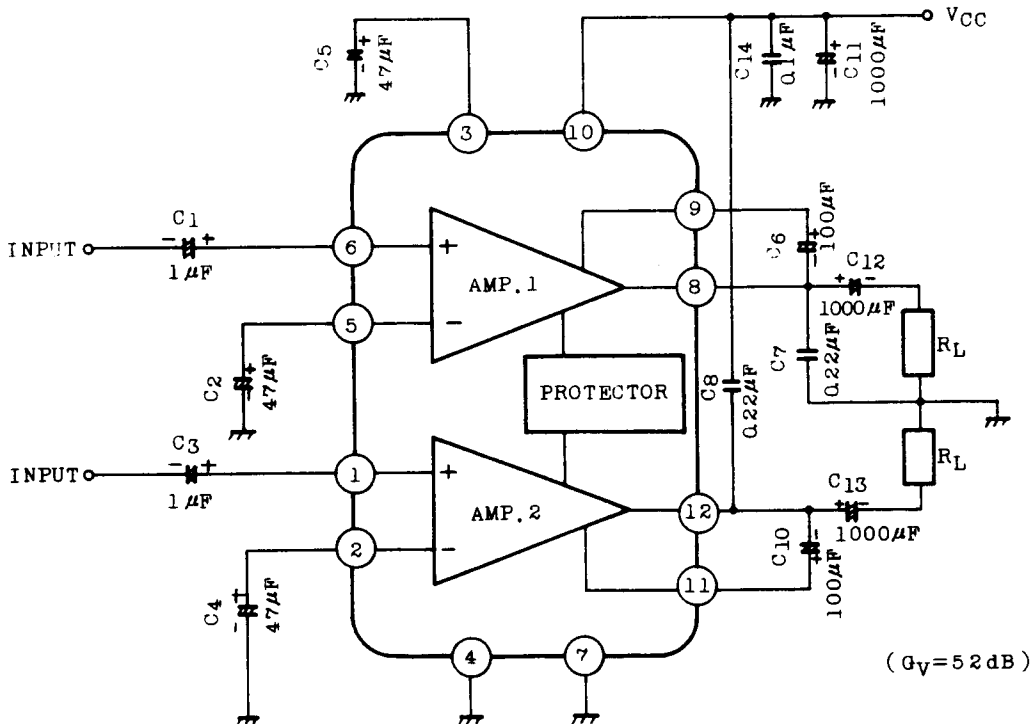
TEST CIRCUIT/APPLICATION CIRCUIT

TA7240AP

(1) BTL AMPLIFIER



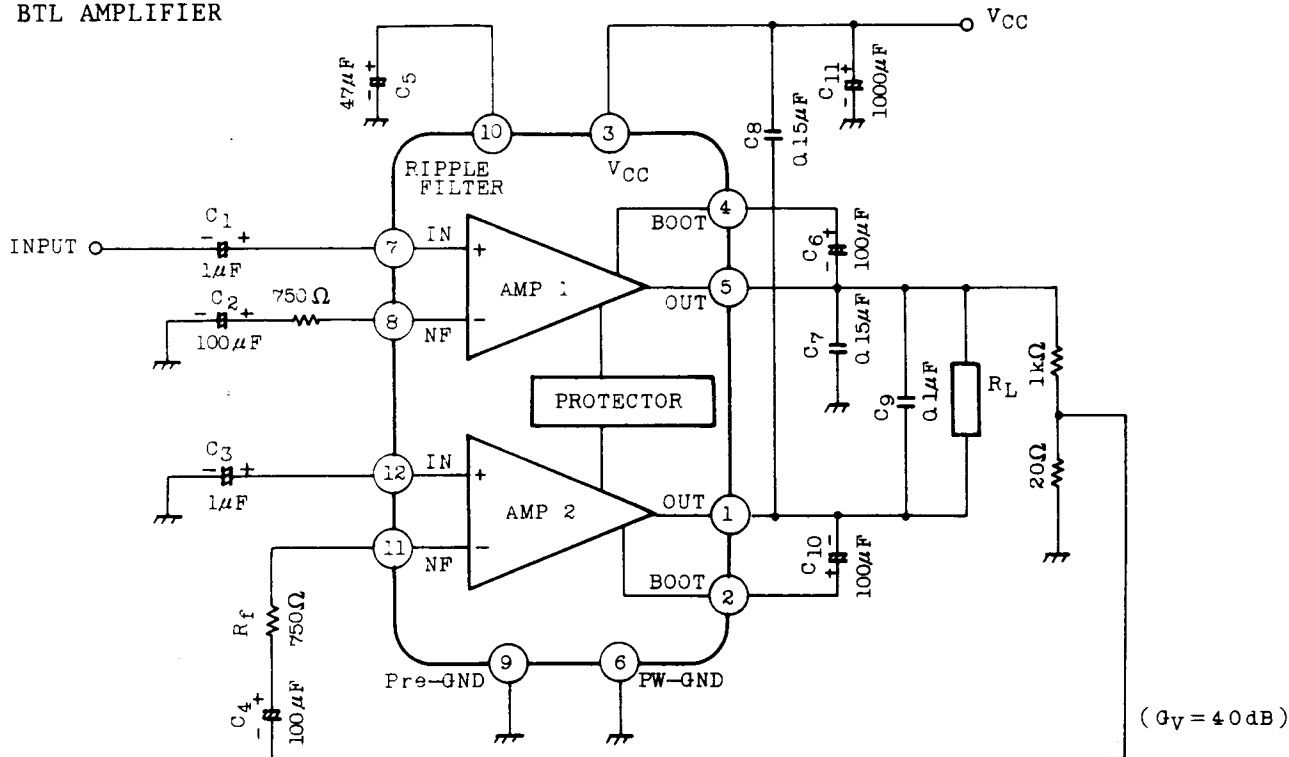
(2) DUAL AMPLIFIER



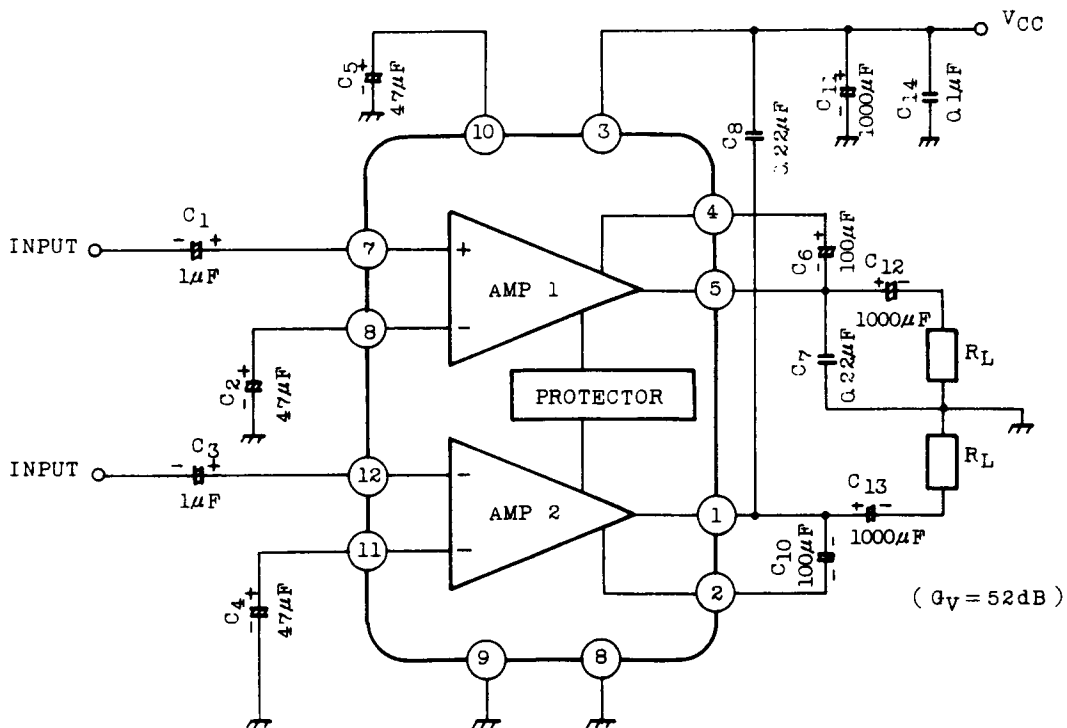
TEST CIRCUIT/APPLICATION CIRCUIT

TA7241AP

(1) BTL AMPLIFIER



(2) DUAL AMPLIFIER



TYPICAL DC VOLTAGE OF EACH TERMINAL

( $V_{CC}=13.2V$ ,  $T_a=25^{\circ}C$ , DUAL MODE TEST CIRCUIT)

TERMINAL No.		1	2	3	4	5	6	7	8	9	10	11	12
DC Voltage (V)	TA7240AP	1.5	1.5	4.4	GND	1.5	1.5	GND	6.6	12.7	$V_{CC}$	12.7	6.6
	TA7241AP	6.6	12.7	$V_{CC}$	12.7	6.6	GND	1.5	1.5	GND	4.4	1.5	1.5

APPLICATION INFORMATION

(This explanatory terminal number is for TA7240AP)

1. VOLTAGE GAIN

(1) Dual Mode

The closed loop voltage gain  $G_v$  is determined by  $R_1$ ,  $R_2$ ,  $R_3$ ,  $R_4$  and  $R_f$ .

$$G_v \doteq 20 \log \frac{R_2 + R_f + R_1}{R_f + R_1} + 20 \log \frac{R_3 + R_4}{R_4} \text{ (dB)}$$

when  $R_f=0$ ,  $G_v=52\text{dB(Typ.)}$

is given.

The recommended voltage gain is more than 40dB.

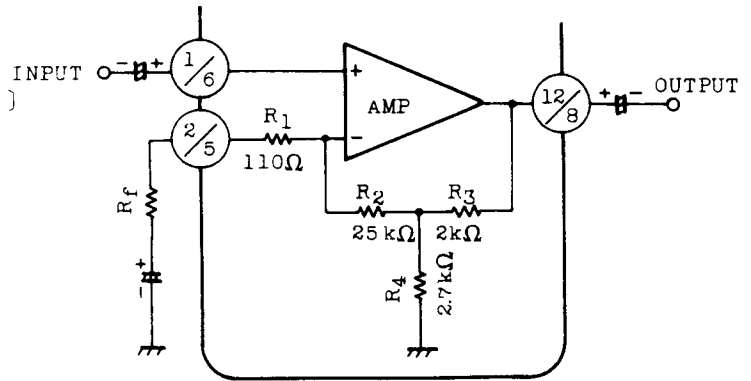


Fig 1

(2) BTL Mode

The recommended BTL connection amplifier is shown in Figure 2.

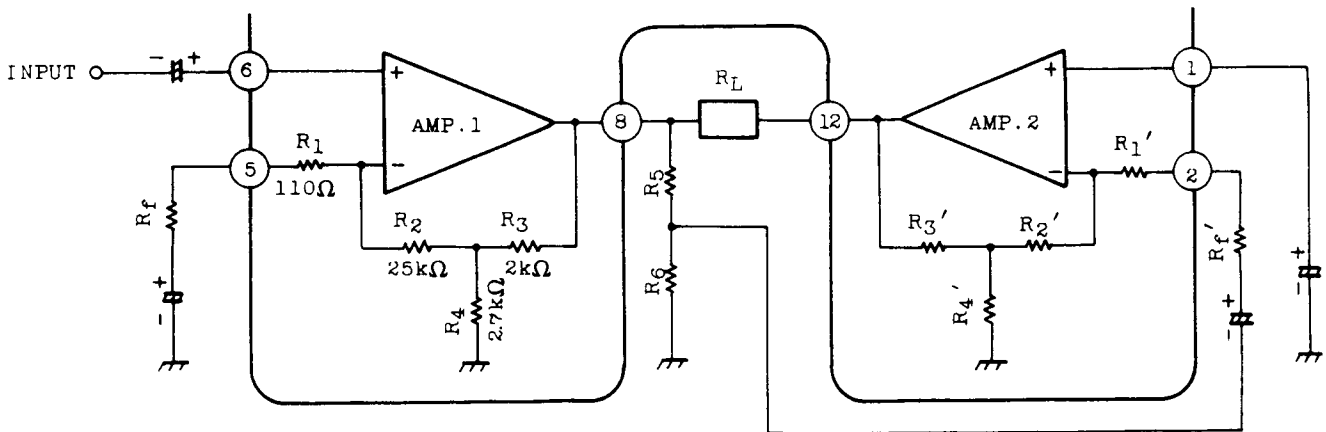


Fig. 2

AMP.1 is noninverting amplifier and AMP.2 is inverting one. The output voltage is divided by resistors R5 and R6.

This divided voltage is applied to inverting input of AMP.2. R5 and R6 are determined in the following equation.

$$\frac{R5+R6}{R5} = 20 \log \frac{R1'+Rf'+R2'}{R1'+Rf'} + 20 \log \frac{R3'+R4'}{R4'} \dots Gv \text{ in Dual Mode}$$

The voltage gain in this circuit is 6dB higher than that in dual mode.

$$Gv = 20 \log \frac{R1+Rf+R2}{R1+Rf} + 20 \log \frac{R3+R4}{R4} + 6 \quad [\text{dB}]$$

In case of Rf=0

$$Gv=52+6=58[\text{dB}]$$

In case of Rf=750Ω

$$Gv=34+6=40[\text{dB}]$$

**2. MUTING**

Audio muting can be accomplished by connecting pin ③ (ripple filter) to GND as shown in Fig.3.

Then, the bias circuits are cut off.

Amount of muting attenuation is more than 60dB.

Precaution in muting operation is as follows.

- (1) The recovery time at muting off depends on Capacitance C2, C4 and C5 in the test Circuit.
- (2) As this muting system is operated by the short-circuit of ripple filter : C5, the ripple rejection ratio becomes worse in a muting mode.  
Note that some "POP-Noise" occur when bias is shut off with mute-on.

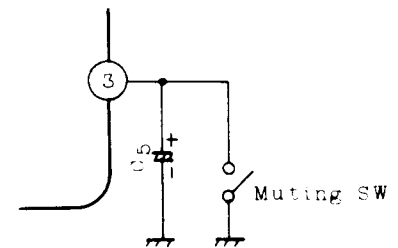


Fig.3

**3. CAPACITOR C7, C8**

The purpose of capacitor C7, C8 is to prevent oscillation.

These capacitors need to be small temperature coefficient. So celamic capacitor is unsuitabel.

A voltage gain less than 40dB results occasionally in a parastic oscillation.

Stability for parastic oscillation is promoted by connecting capacitor of 500 ~ 1000pF between pin ① and pin ② (pin ⑤ and pin ⑥ ).

The additional capacitors are recommended to be inserted.

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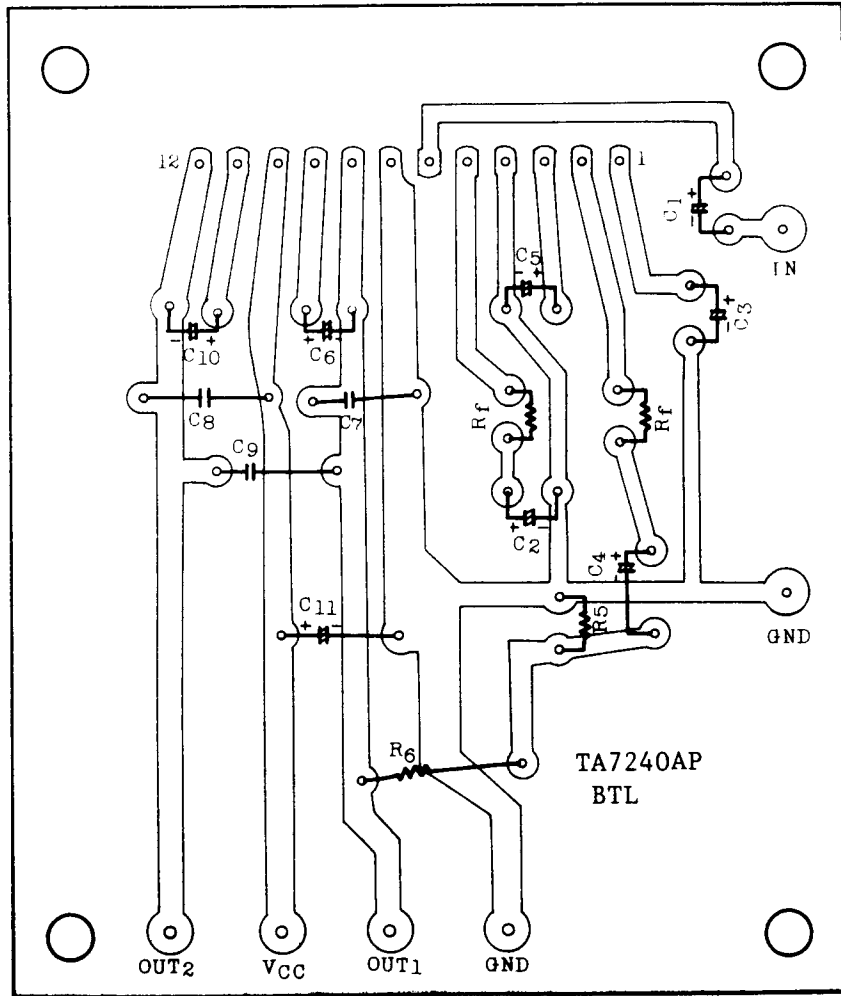
4. PRECAUTION AT PRINT BOARD DESIGN

- (1) Print Pattern board should be designed in consideration of stability for parasitic oscillation.

The following parts-layout is recommended.

- 1st. Capacitors C6 and C10 are spaced most close to the output pin.
  - 2nd. Capacitor C7 or C8 is spaced close to the output pin next to C6 and C10.
  - 3rd. Capacitor C9 is spaced close to it next to C7 and C8.
  - 4th. Capacitor C11 is spaced close to it next to C9.
- (2) Input line (pin ⑥) and PW-GND line (pin ⑦) should not be spaced in parallel. In the parallel layout, output current signal in PW-GND line is fed back to input line by electromagnetic coupling. Then it deteriorates the total harmonic distortion, especially at high audio frequency region.
- (3) Undesirable terminating of capacitors deteriorates "pop" noise or THD. Capacitors C2, C4 and C5 should be terminated to Pre-GND (pin ④). Capacitors C7, C11, and C14 should be terminated to PW-GND (pin ⑦).
- (4) It is recommended to refer the standard print board.

STANDARD P.C.B  
(TA7240AP BTL AMPLIFIER)

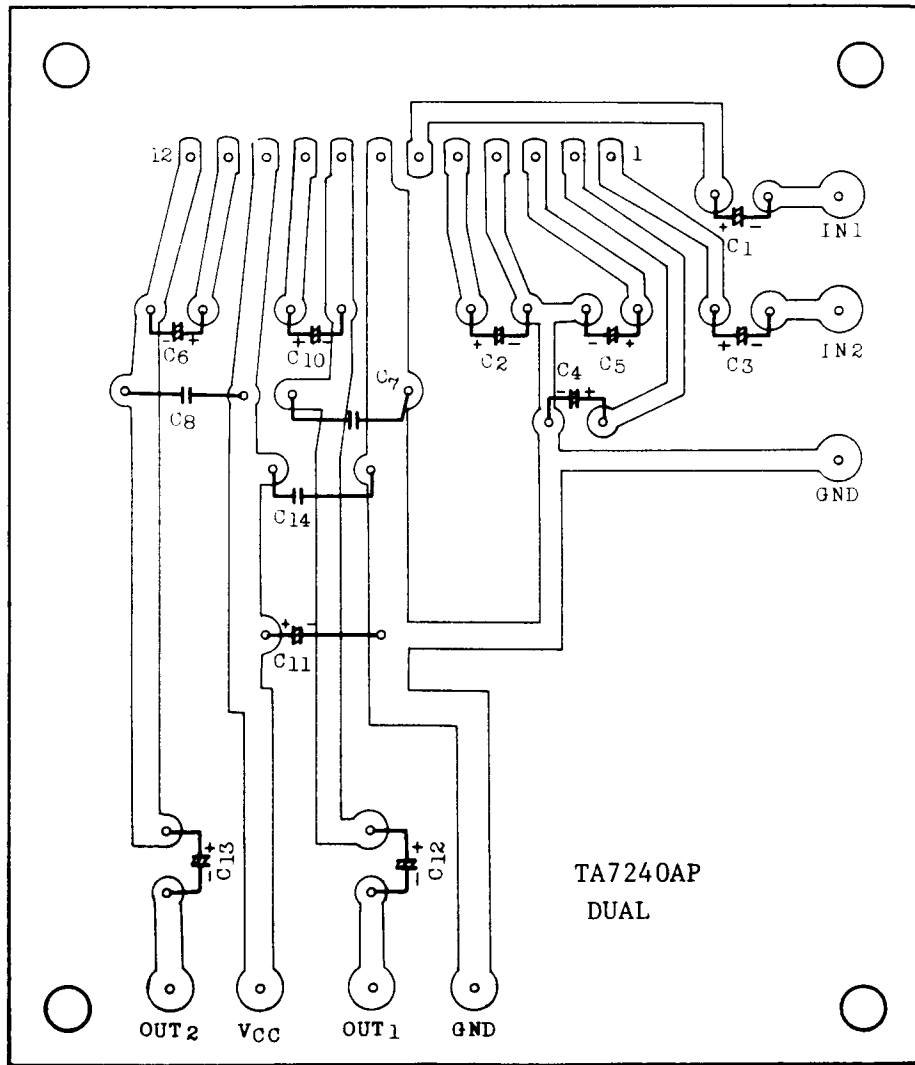


BOTTOM VIEW



STANDARD P.C.B

(TA7240AP DUAL AMPLIFIER)



BOTTOM VIEW

TA7240AP-9

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