

9097247 TOSHIBA, ELECTRONIC

02E 17046 D

TA7292P

TA7293P

T-74-05-01

5.8W DUAL AUDIO POWER AMPLIFIER.
22W BTL AUDIO POWER AMPLIFIER.

The TA7292P/TA7293P 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.

The kinds of pin configuration are Available: Normal (TA7292P) and Reverse (TA7293P) for easier layout design of PC-board when used in BTL-stereo application.

- High Power

$P_{OUT(1)}=22W(TYP.)$
($V_{CC}=14.4V$, $f=1kHz$, $THD=10\%$, $R_L=4\Omega$, BTL)

$P_{OUT(2)}=19W(TYP.)$
($V_{CC}=13.2V$, $f=1kHz$, $THD=10\%$, $R_L=4\Omega$, BTL)

$P_{OUT(3)}=15W(TYP.)$
($V_{CC}=13.2V$, $f=1kHz$, $THD=1\%$, $R_L=4\Omega$, BTL)

$P_{OUT(4)}=5.8W(TYP.)/ch$
($V_{CC}=13.2V$, $f=1kHz$, $THD=10\%$, $R_L=4\Omega$, DUAL)

- Low Distortion

$THD(1)=0.03\%(TYP.)$
($V_{CC}=13.2V$, $f=1kHz$, $P_{OUT}=4W$, $R_L=4\Omega$, $G_v=40dB$, BTL)

$THD(2)=0.06\%(TYP.)$
($V_{CC}=13.2V$, $f=1kHz$, $P_{OUT}=1W$, $R_L=4\Omega$, $G_v=52dB$, DUAL)

- Low Noise

$V_{NO(1)}=0.14mV_{rms}(TYP.)$
($V_{CC}=13.2V$, $R_L=4\Omega$, $G_v=40dB$, $R_g=0$, DIN Noise: DIN45405)

$V_{NO(2)}=0.7mV_{rms}(TYP.)$
($V_{CC}=13.2V$, $R_L=4\Omega$, $G_v=52dB$, $R_g=10k\Omega$, $BW=20Hz\sim 20kHz$, DUAL)

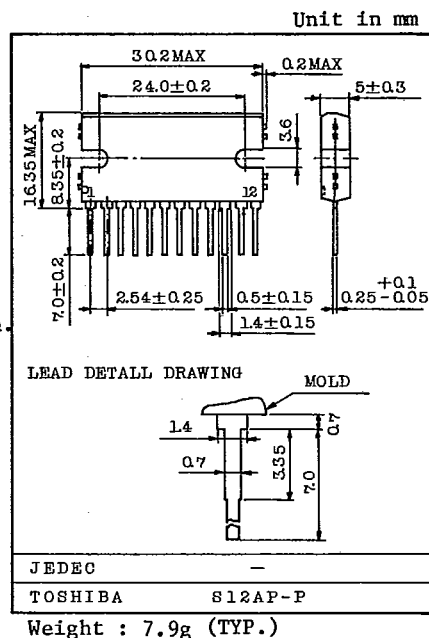
- Protector Circuit

Thermal Shut Down, Over Voltage Protection.

Out- V_{CC} Short, Out-GND Short and Out-Out Short Protection.

- Operating Supply Voltage Range

$V_{CC(opr.)}=9\sim 18V$



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MAXIMUM RATINGS (Ta=25°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) | IO(peak) | 4.5 | A |
| Power Dissipation | PD | 25 | W |
| Operating Temperature | Topr | -30~85 | °C |
| Storage Temperature | Tstg | -55~150 | °C |

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, VCC=13.2V, RL=4Ω, Rg=600Ω, f=1kHz, Ta=25°C)

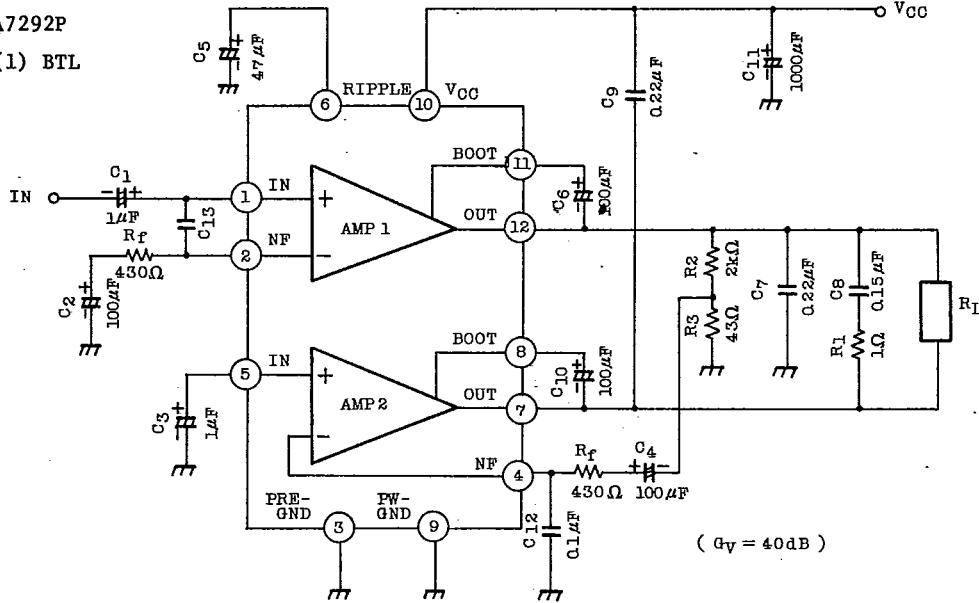
| CHARACTERISTIC | SYMBOL | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT | |
|---------------------------|---------------------------|---------------|-------------------------------|-------------------------------|------|------|-------|-------|
| Quiescent Current | ICQ | 2 | VIN=0 | - | 80 | 145 | mA | |
| Output Power | POUT(1) | 1 | VCC=14.4V, THD=10% | - | 22 | - | W | |
| | POUT(2) | 1 | THD=10% | 16 | 19 | - | | |
| | POUT(3) | 1 | THD=1% | 12 | 15 | - | | |
| | THD(1) | 1 | POUT=4W, Gv=40dB | - | 0.03 | 0.25 | | % |
| Total Harmonic Distortion | | | | | | | | |
| Output Offset Voltage | VOFF | 1 | VIN=0 | - | 0 | 0.35 | V | |
| Voltage Gain | Gv(1) | 1 | VOUT=0dBm | - | 40 | - | dB | |
| Output Noise Voltage | VNO(1) | 1 | Rg=0 DIN45405 Noise Filter | - | 0.14 | - | mVrms | |
| Ripple Rejection Ratio | R.R(1) | 1 | fripple=100Hz Vripple=0dBm | - | -52 | -40 | dB | |
| Output Power | POUT(4) | 2 | THD=10% | 5 | 5.8 | - | W | |
| | Total Harmonic Distortion | THD(2) | 2 | POUT=1W | - | 0.06 | 0.30 | % |
| | Voltage Gain | Gv(2) | 2 | VOUT=0dBm | 50 | 52 | 54 | dB |
| | Voltage Gain Ratio | 4Gv | 2 | VOUT=0dBm | -1 | 0 | 1 | dB |
| | Output Noise Voltage | VNO(2) | 2 | Rg=10kΩ BW=20Hz~20kHz | - | 0.7 | 1.5 | mVrms |
| | Ripple Rejection Ratio | R.R(2) | 2 | fripple=100Hz Vripple=0dBm | - | -52 | -40 | dB |
| | Cross Talk | C.T | 2 | VOUT=0dBm | - | -57 | - | dB |
| Input Resistance | RIN | 2 | f=1kHz | - | 33 | - | kΩ | |

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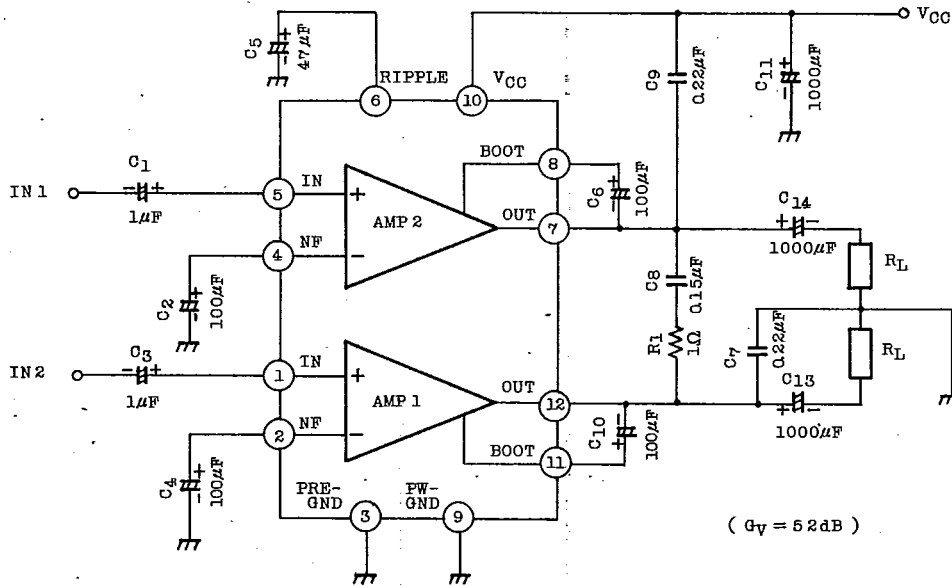
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TEST CIRCUIT/APPLICATION CIRCUIT

TA7292P
(1) BTL



(2) DUAL



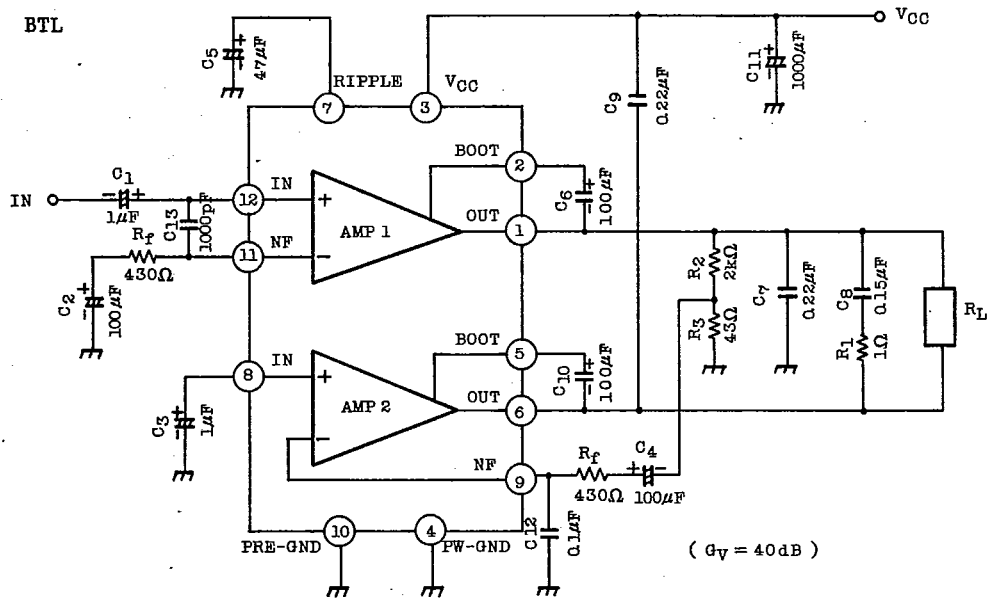
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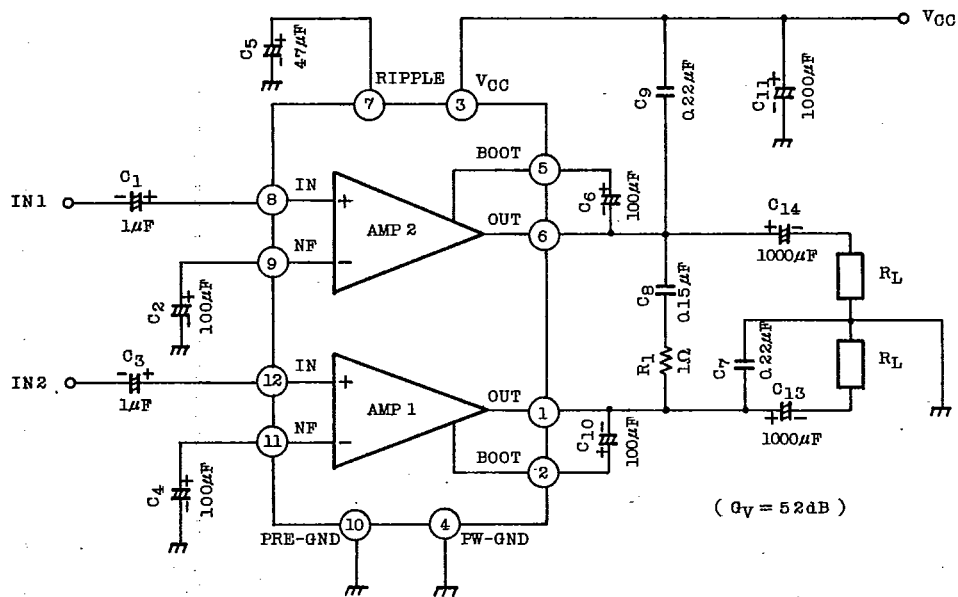
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(1) BTL



(2) DUAL



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TYPICAL DC VOLTAGE OF EACH TERMINAL

(V_{CC}=13.2V, T_a=25°C, DUAL MODE CIRCUIT)

| TERMINAL No. | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|----------------|---------|-----|------|-----------------|-----|------|-----|-----|------|-----|-----------------|------|-----|
| DC VOLTAGE (V) | TA7292P | 1.5 | 1.5 | GND | 1.5 | 1.5 | 6.4 | 6.4 | 12.3 | GND | V _{CC} | 12.3 | 6.4 |
| | TA7293P | 6.4 | 12.3 | V _{CC} | GND | 12.3 | 6.4 | 6.4 | 1.5 | 1.5 | GND | 1.5 | 1.5 |

APPLICATION INFORMATION

(This explanatory terminal number is for TA7292P)

1. VOLTAGE GAIN ADJUSTMENT

(1) DUAL AMPLIFIER

The voltage gain G_v is determined by R₁, R₂ and R_f in Fig. 1.

$$G_v = 20 \log \frac{R_f + R_1 + R_2}{R_f + R_1} \quad (\text{dB})$$

In case of R_f=0

The voltage gain is set as follows:

$$G_v = 52 \text{dB (TYP.)}$$

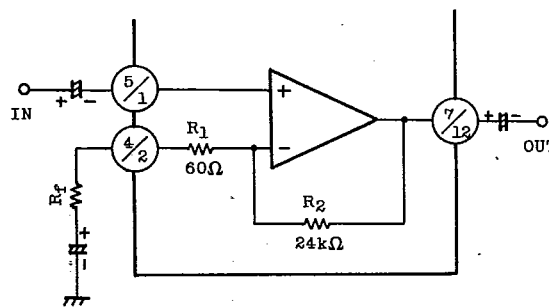


Fig. 1

(2) BTL AMPLIFIER

The recommended BTL connection amplifier shown in Fig. 2.

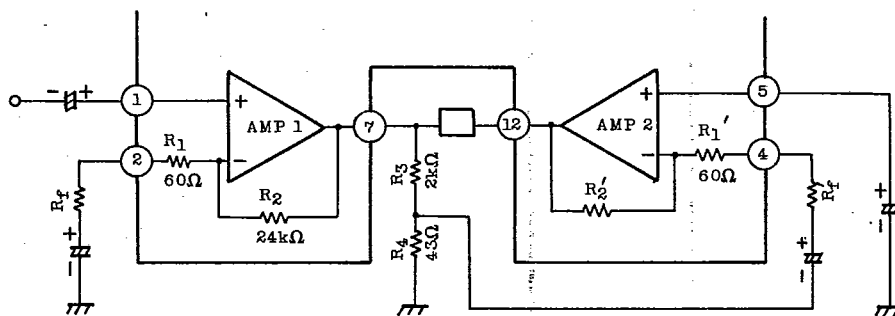


Fig. 2

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AMP. 1 is noninverting amplifier and AMP. 2 is invert one.
 The output voltage is divided by resistors R3 and R4.
 The divided voltage is applied to inverting input of AMP. 2.
 R3 and R4 are determined in the following equation.

$$\frac{R3+R4}{R3} = 20 \log \frac{Rf+R1+R2}{Rf+R1} \quad (\text{dB}) \quad \text{Gv in Dual Mode}$$

The voltage gain in this circuit is 6dB higher than that in Dual Mode.

$$\text{Gv} = 20 \log \frac{Rf+R1+R2}{Rf+R1} + 6 \quad (\text{dB})$$

In case of $Rf=0$

$$\text{Gv} = 52 + 6 = 58 \quad (\text{dB})$$

In case of $Rf=430$

$$\text{Gv} = 34 + 6 = 40 \quad (\text{dB})$$

Each voltage gain can be set as shown above.

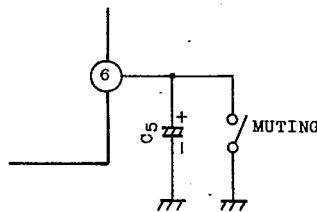
2. MUTING

Audio muting can be accomplished by connecting pin 6 (ripple filter) to GND as shown in Fig. 3.

Then, the bias circuits are cut off.

However, caution must be exercised to the following items.

- (1) The recovery time from the muting operation is determined by the capacities of the ripple filter capacitor between 6 pin and GND, and of the capacitor for NF.
- (2) As this muting system is operated by the short-circuit of ripple filter: C5, the ripple rejection ratio becomes worse in the muting condition.
 At mute ON, some pop noises of breaking the bias are produced.



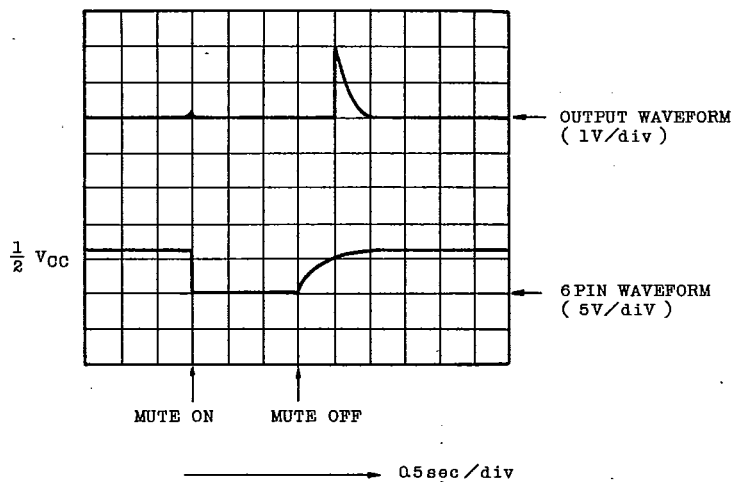
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The output waveform at muting ON/OFF during BTL, are shown in Fig. 4.

(Provided $V_{CC}=13.2V$, $R_L=4\Omega$, non-signal.)

50dB or more can be obtained for muting amount.



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

Fig. 4

3. MEASURES AGAINST OSCILLATION

C7, C8, C9, C12 : The capacitor of polyester film having small variation of the temperature characteristics is recommended as the capacitor for oscillation prevention.

C13 : Reduces the gain in the high range frequency (150kHz or over) and increases the oscillation allowance.

R1 : Increases the oscillation allowance at output clipping of the low range frequency (100Hz or less).

Since the oscillation allowance varies according to the following items, carry out the temperature test to confirm the oscillation allowance.

1. Gain to be used (Gv setting).
2. Capacity of capacitor
3. Kinds of capacitor
4. Layout of printed board

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It is recommended to use the capacitor having the capacity exceeding the oscillation stopping value.

At using with the voltage gain G_V lowered or with the high range frequency and the oscillation becomes liable to be produced.

Therefore, application with $G_V=40\text{dB}$ or over is advisable.

Especially for using with the gain lowered in DUAL operation, insert 1000pF between NF (2 pin and 4 pin) and GND.

This capacitor reduces the gain of the high range frequency and is effective for oscillation prevention.

4. OUTPUT WAVEFORM AT POWER SUPPLY ON/OFF

BTL and dual Amplifier DC output waveforms in the condition of $V_{CC}=13.2\text{V}$, $R_L=4\Omega$ at non-signal (input short) are shown in Fig. 5 and 6.

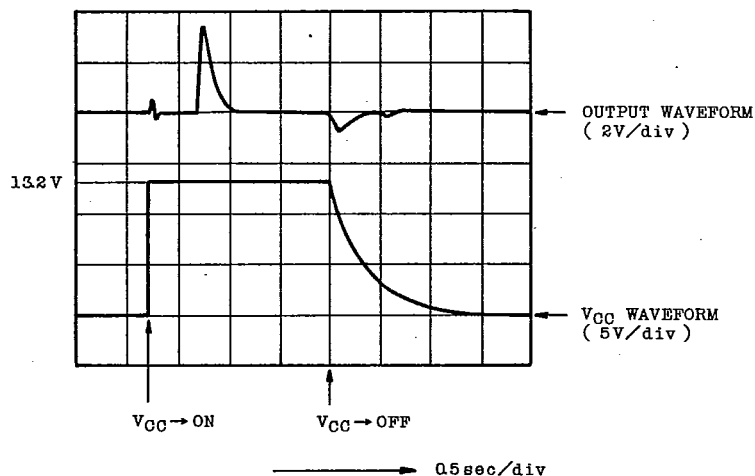


Fig. 5 BTL OPERATION

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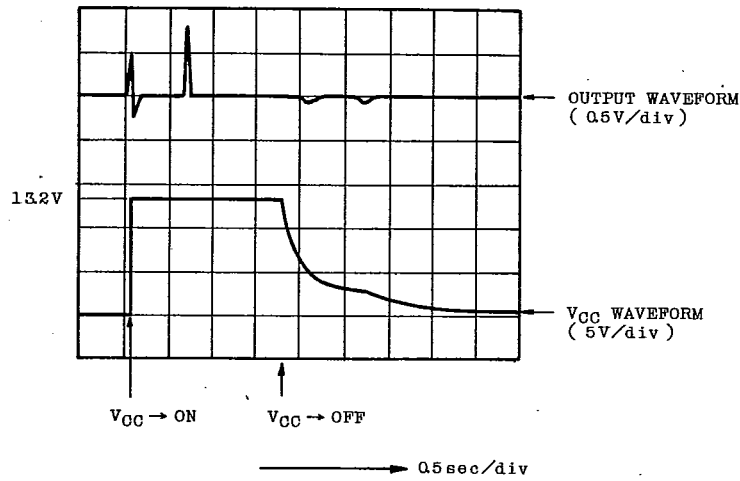


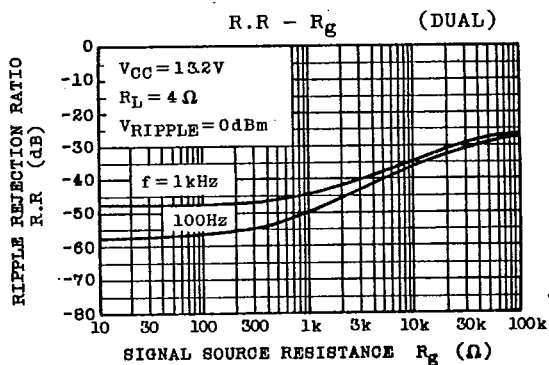
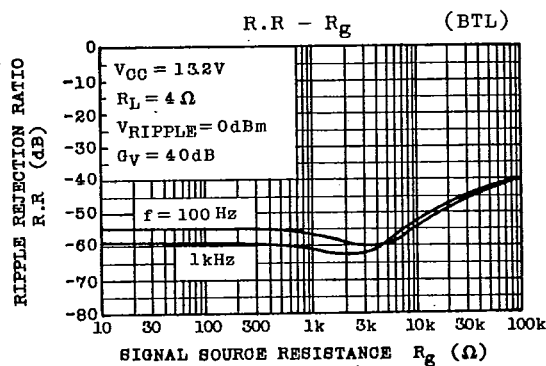
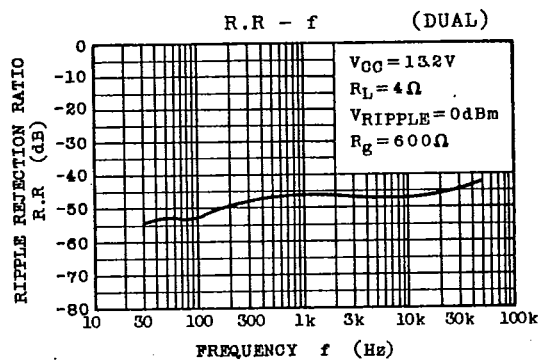
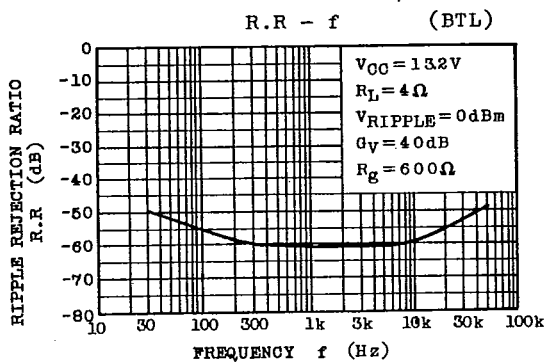
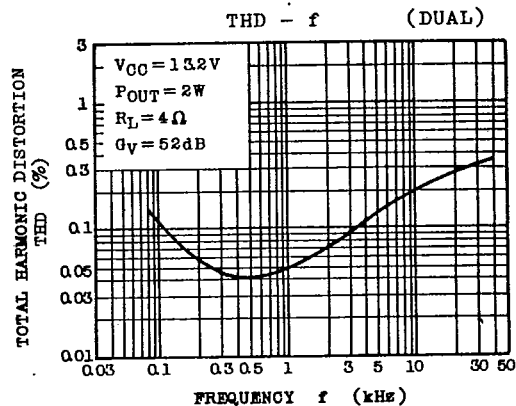
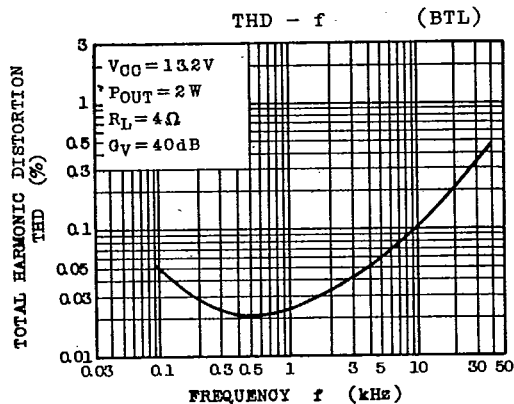
Fig. 6 DUAL OPERATION

The popping time at power supply ON/OFF varies according to the rise and fall times.

The condition in which the power supply is rapidly and repeatedly made ON/OFF, that is, the condition in which the charge is made on the external capacitor of IC is different from the conditions shown in Fig. 5 and Fig. 6.

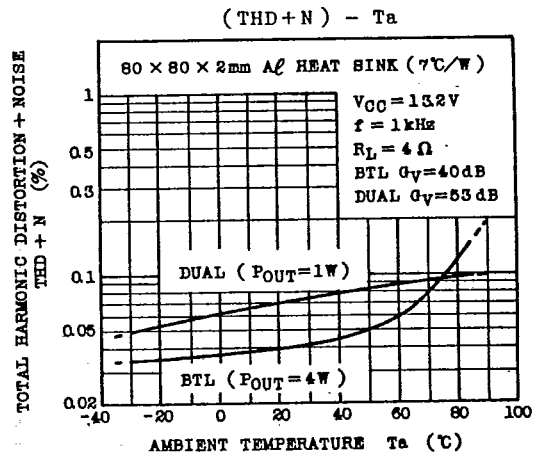
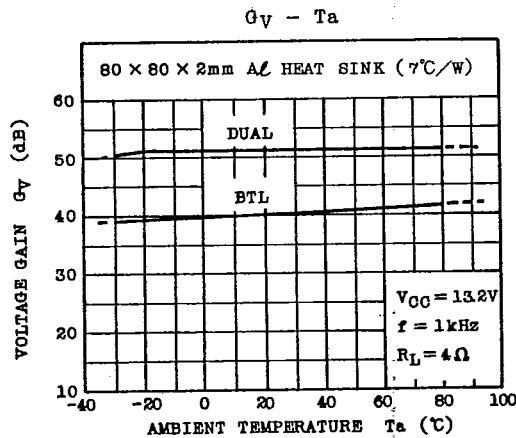
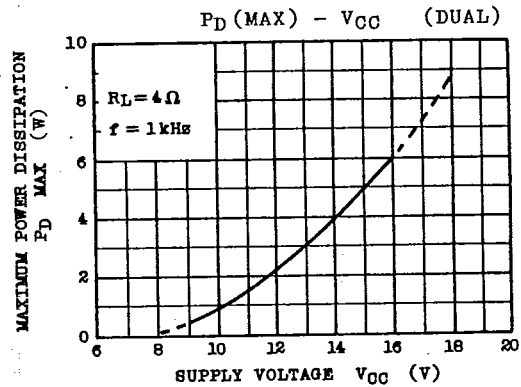
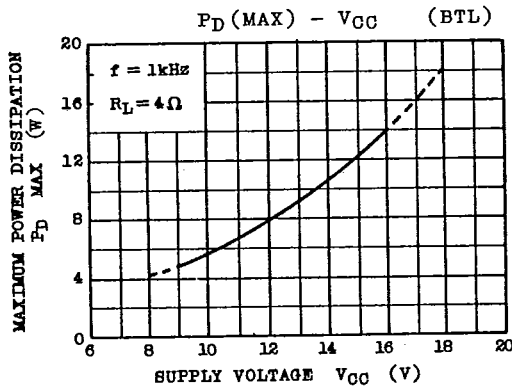
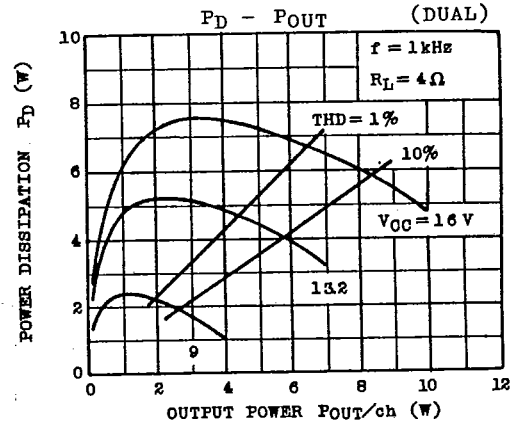
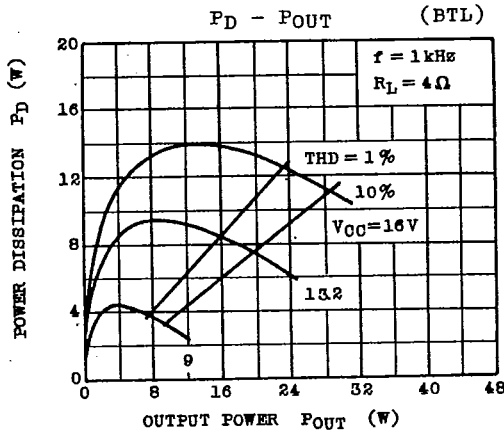
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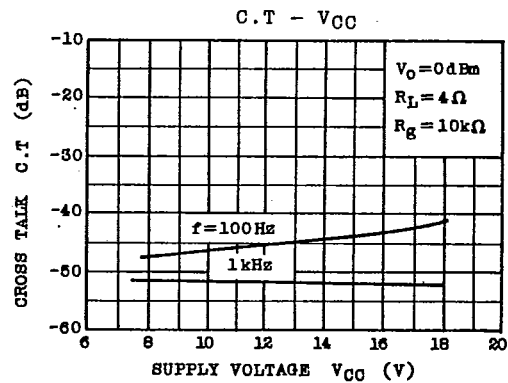
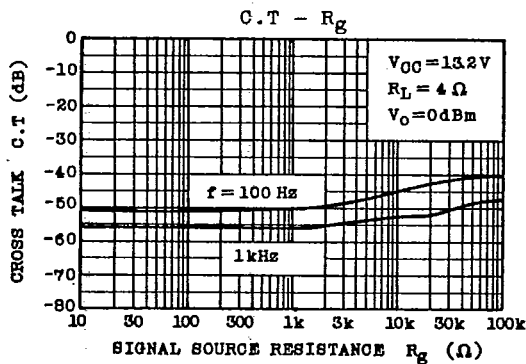
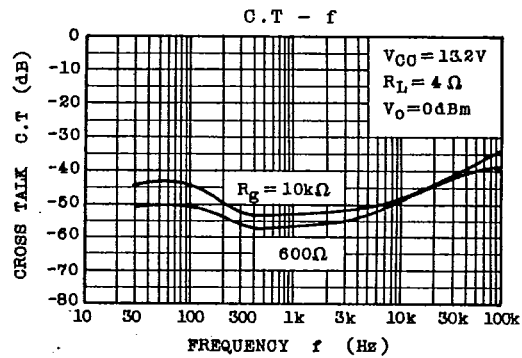
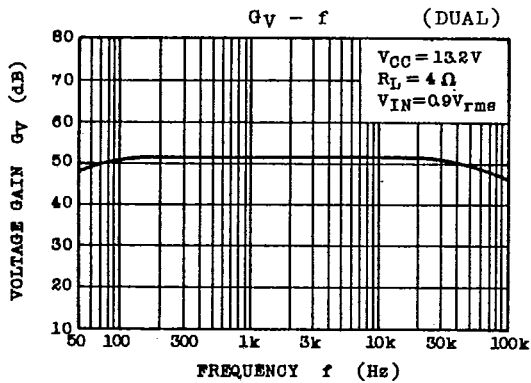
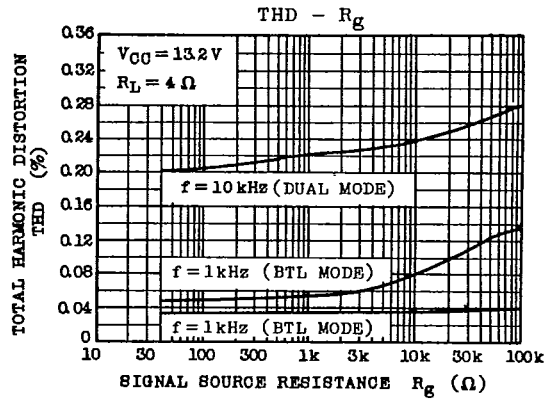
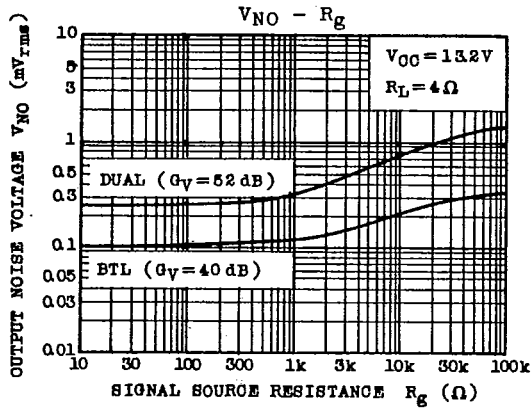
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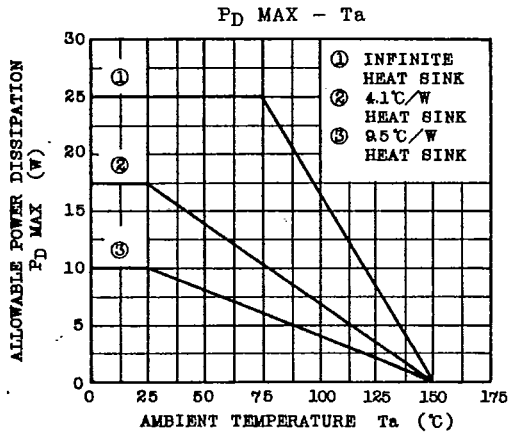
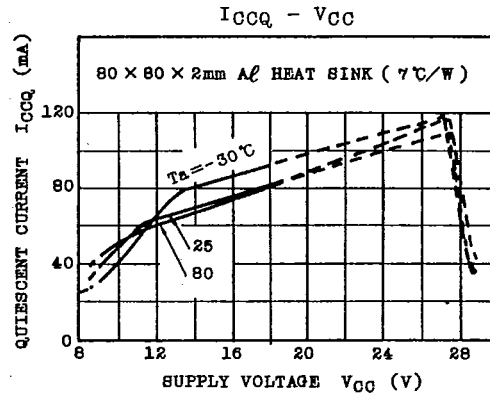
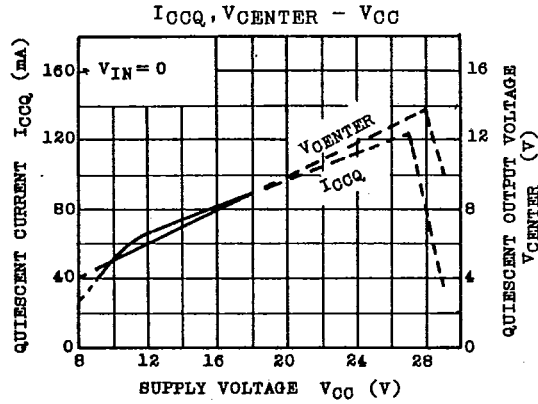
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