# AN7522

## Dual 3-W BTL audio power amplifier

### ■ Overview

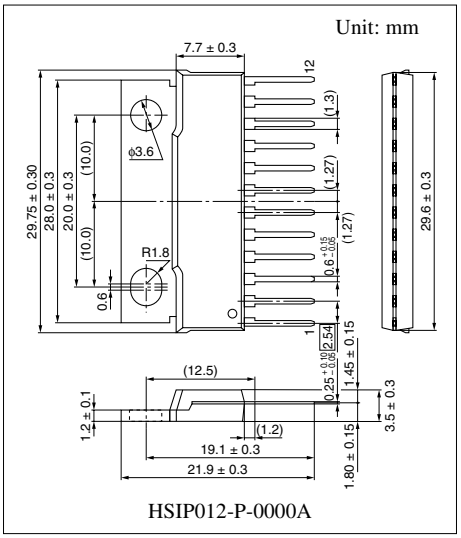
AN7522 is an audio power amplifier IC for the stereo system. In the BTL (balanced transformerless) method, fewer external parts and easier design for applications are required.

### ■ Features

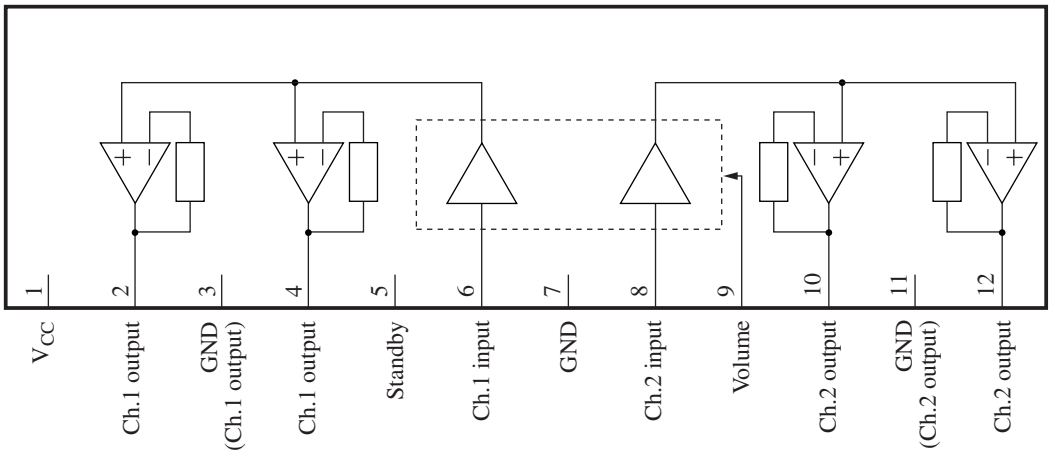
- 3-W output (8 Ω) with supply voltage of 8 V
- On-chip standby function
- On-chip volume function

### ■ Applications

- Televisions, audio equipment, personal computers, and active speakers




### ■ Block Diagram



## ■ Pin Descriptions

| Pin No. | Descriptions | Pin No. | Descriptions |
|---|---|---|---|
| 1 | Supply voltage | 7 | Ground (input) |
| 2 | Ch.1 + output | 8 | Ch.2 input |
| 3 | Ground (output ch.1) | 9 | Volume (max. volume if this pin is open.) |
| 4 | Ch.1 − output | 10 | Ch.2 − output |
| 5 | Standby (standby state if this pin is open.) | 11 | Ground (output ch.2) |
| 6 | Ch.1 input | 12 | Ch.2 + output |

## ■ Absolute Maximum Ratings

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Supply voltage *2 | $V_{CC}$ | 14 | V |
| Supply current | $I_{CC}$ | 2.0 | A |
| Power dissipation *3 | $P_D$ | 1.92 | W |
| Operating ambient temperature *1 | $T_{opr}$ | −25 to +70 | °C |
| Storage temperature *1 | $T_{stg}$ | −55 to +150 | °C |

Note) ∗1: Except for the operating ambient temperature and storage temperature, all ratings are for $T_a$ = 25°C.

∗2: At no signal.

∗3: The power dissipation shown is the value for $T_a$ = 70°C.

## ■ Recommended Operating Range

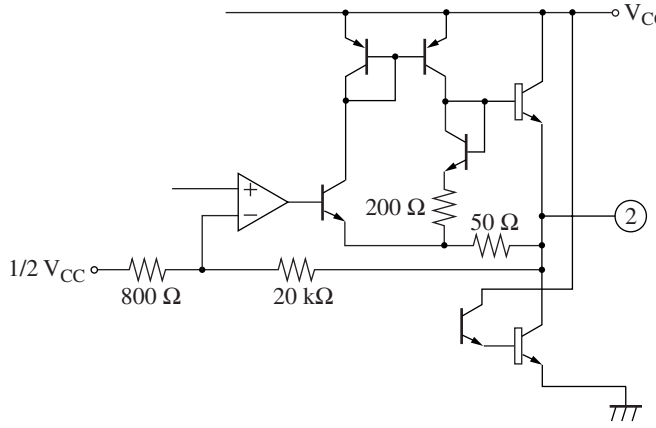
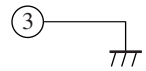
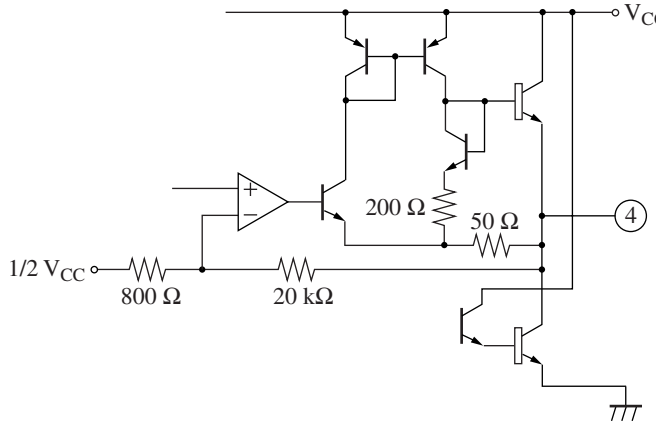
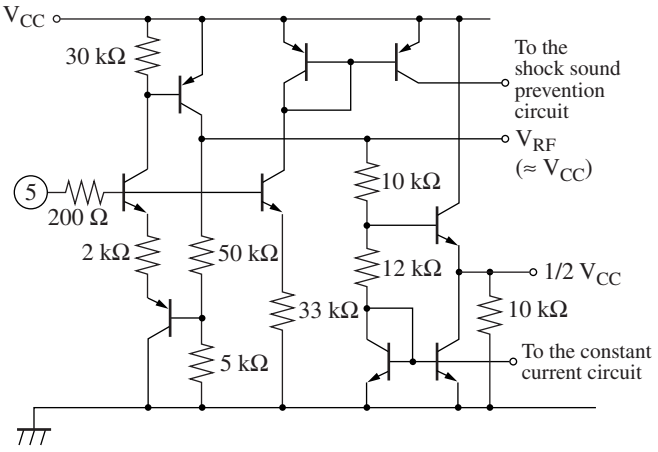
| Parameter | Symbol | Range | Unit |
|---|---|---|---|
| Supply voltage | $V_{CC}$ | 3.5 to 13.5 | V |

## ■ Electrical Characteristics at $V_{CC}$ = 8.0 V, $R_L$ = 8 Ω, f = 1 kHz, $T_a$ = 25°C ± 2°C

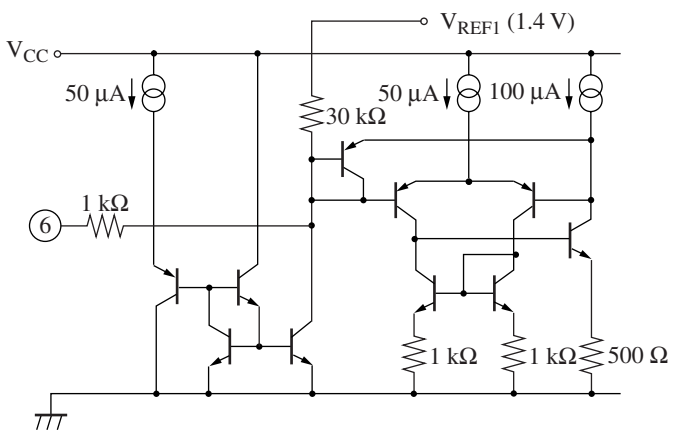
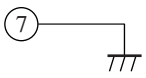
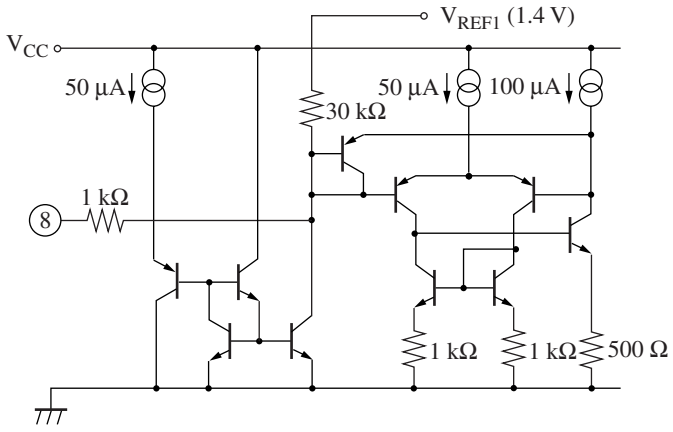
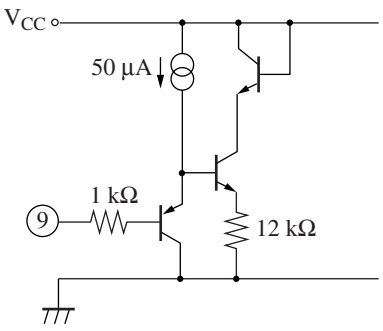
| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Quiescent circuit current | $I_{CQ}$ | $V_{IN}$ = 0 mV, Vol. = 0 V | — | 45 | 100 | mA |
| Standby current | $I_{STB}$ | $V_{IN}$ = 0 mV, Vol. = 0 V | — | 1 | 10 | µA |
| Output noise voltage * | $V_{NO}$ | $R_g$ = 10 kΩ, Vol. = 0 V | — | 0.10 | 0.4 | mV[rms] |
| Voltage gain | $G_V$ | $P_O$ = 0.5 W, Vol. = 1.25 V | 31 | 33 | 35 | dB |
| Total harmonic distortion | THD | $P_O$ = 0.5 W, Vol. = 1.25 V | — | 0.10 | 0.5 | % |
| Maximum output power | $P_{O1}$ | THD = 10%, Vol. = 1.25 V | 2.4 | 3.0 | — | W |
| Ripple rejection ratio * | RR | $R_g$ = 10 kΩ, Vol. = 0 V, $V_R$ = 1 V[rms], $f_R$ = 120 Hz | 30 | 50 | — | dB |
| Output offset voltage | $V_{OFF}$ | $R_g$ = 10 kΩ, Vol. = 0 V | −250 | 0 | 250 | mV |
| Volume attenuation rate * | Att | $P_O$ = 0.5 W, Vol. = 0 V | 70 | 85 | — | dB |
| Channel balance 1 | CB1 | $P_O$ = 0.5 W, Vol. = 1.25 V | −1 | 0 | 1 | dB |
| Channel balance 2 | CB2 | $P_O$ = 0.5 W, Vol. = 0.6 V | −3 | 0 | 3 | dB |
| Intermediate voltage gain | $G_{VM}$ | $P_O$ = 0.5 W, Vol. = 0.6 V | 20.5 | 23.5 | 26.5 | dB |
| Channel crosstalk | CT | $P_O$ = 0.5 W, Vol. = 1.25 V | 40 | 55 | — | dB |

Note) ∗: In measuring, the filter for the range of 15 Hz to 30 kHz (12 dB/OCT) is used.

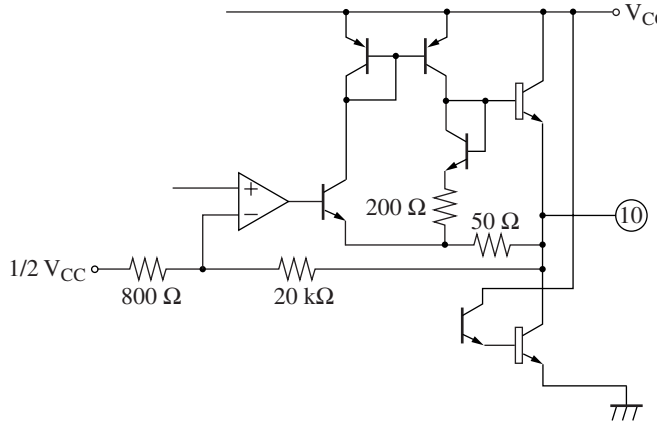
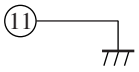
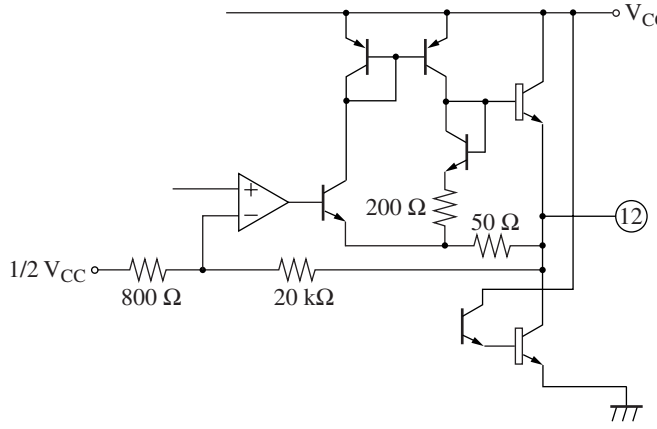
■ Terminal Equivalent Circuits

| Pin No. | Pin name | Equivalent circuit | Voltage |
|---|---|---|---|
| 1 | $V_{CC}$ | — | 5.0 V |
| 2 | Ch.1 + output pin |   | 2.15 V |
| 3 | GND |   | 0 V |
| 4 | Ch.1 – output pin |   | 2.15 V |
| 5 | Standby pin |   | 5 V |

■ Terminal Equivalent Circuits (continued)

| Pin No. | Pin name | Equivalent circuit | Voltage |
|---|---|---|---|
| 6 | Ch.1 input pin |  | 0 mV to 10 mV |
| 7 | GND |  | 0 V |
| 8 | Ch.2 input pin |  | 0 mV to 10 mV |
| 9 | Volume pin |  | — |

■ Terminal Equivalent Circuits (continued)

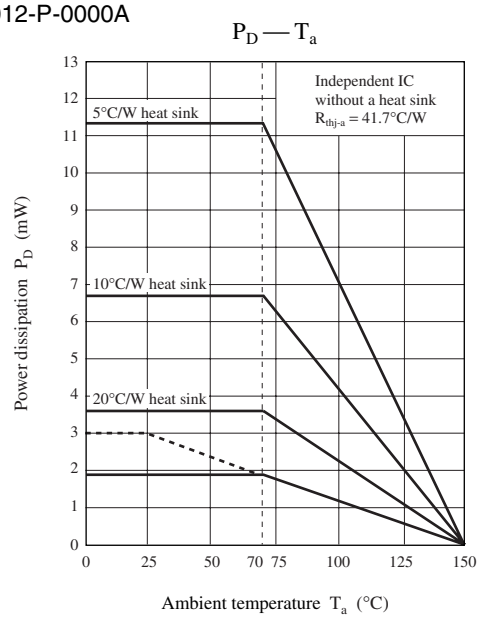
| Pin No. | Pin name | Equivalent circuit | Voltage |
|---|---|---|---|
| 10 | Ch.2 – output pin |   | 2.15 V |
| 11 | GND |   | 0 V |
| 12 | Ch.2 + output pin |   | 2.15 V |

■ Usage Notes

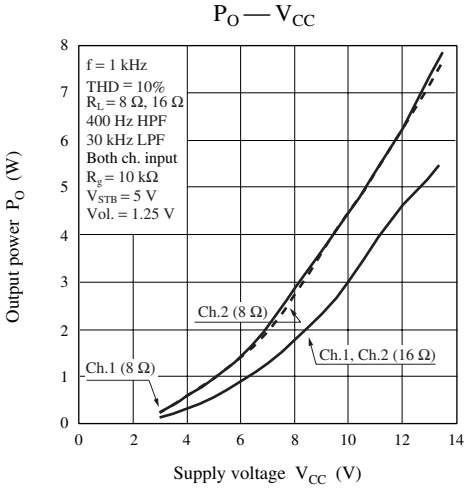
- Please avoid the short-circuits to $V_{CC}$ , ground, or load short-circuit.
- Please connect the cooling fin with the GND potential.
- The thermal shutdown circuit operates at about $T_j$ = 150°C. However, the thermal shutdown circuit is reset automatically if the temperature drops.
- Please carefully design the heat radiation especially when you take out high power at high $V_{CC}$ .
- Please connect only the ground of signal with the signal GND of the amplifier in the previous stage.

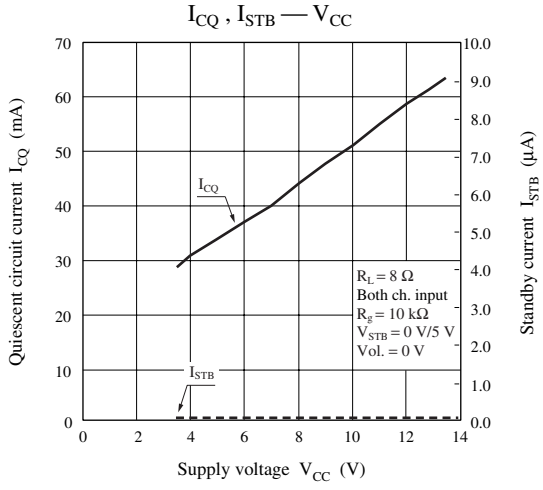
## ■ Technical Data

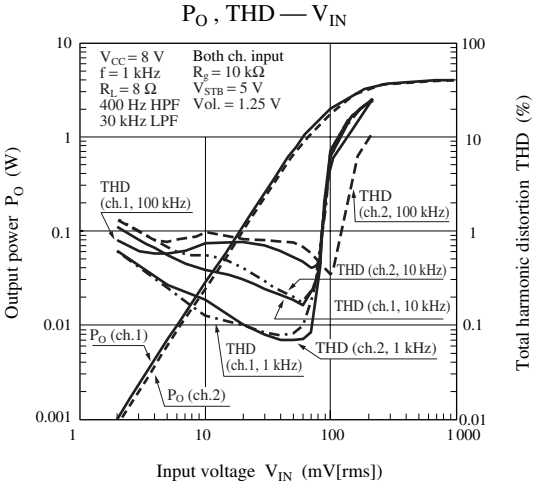
• $P_D$ — $T_a$ curves of HSIP012-P-0000A

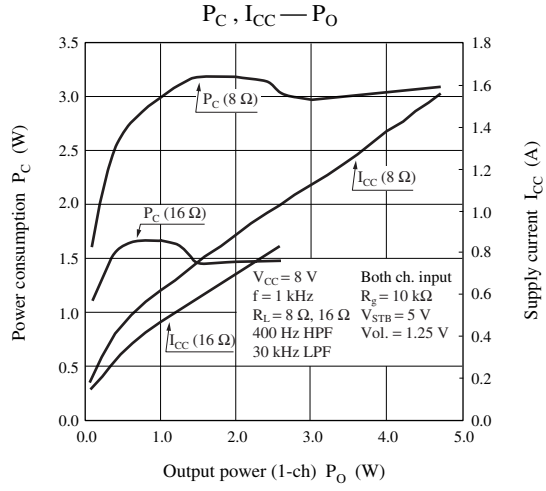



• Main characteristics



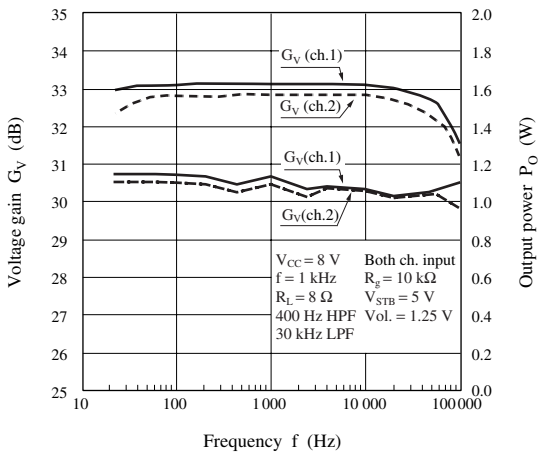



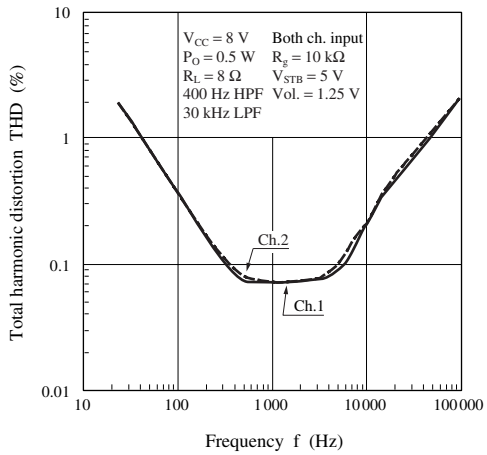
## ■ Technical Data (continued)

• Main characteristics (continued)

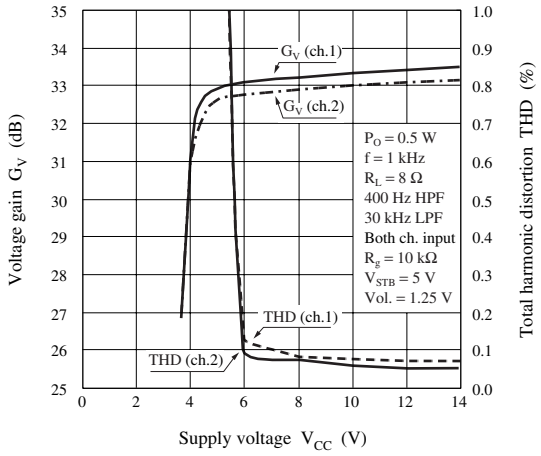
$G_V$ , $P_O$ — f



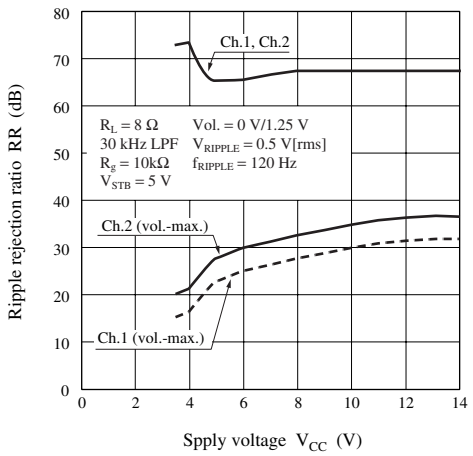

THD — f



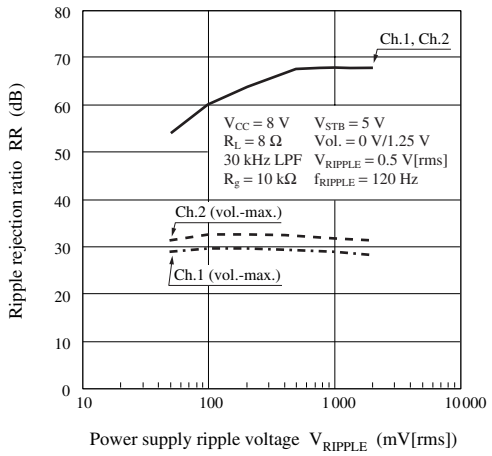

$G_V$ , THD — $V_{CC}$



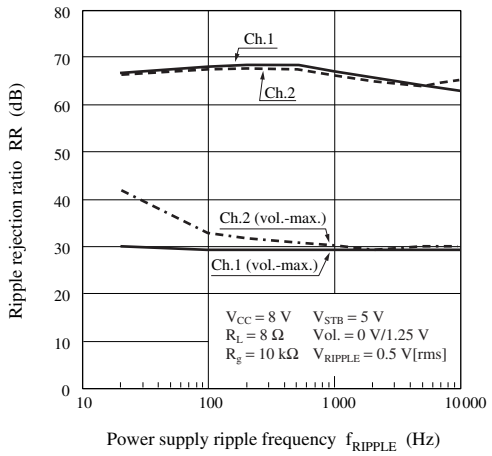

RR — $V_{CC}$




RR — $V_{RIPPLE}$



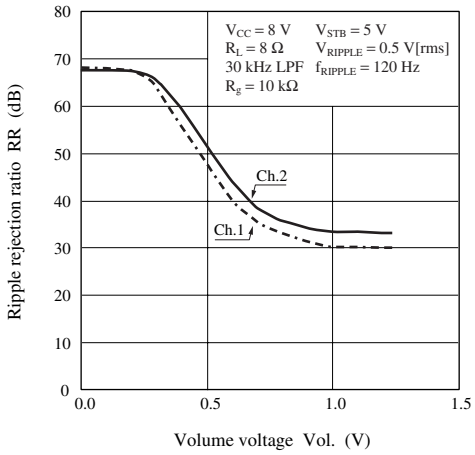

RR — $f_{RIPPLE}$



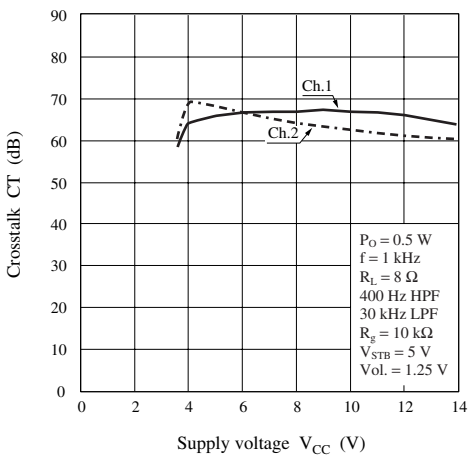
## ■ Technical Data (continued)

• Main characteristics (continued)

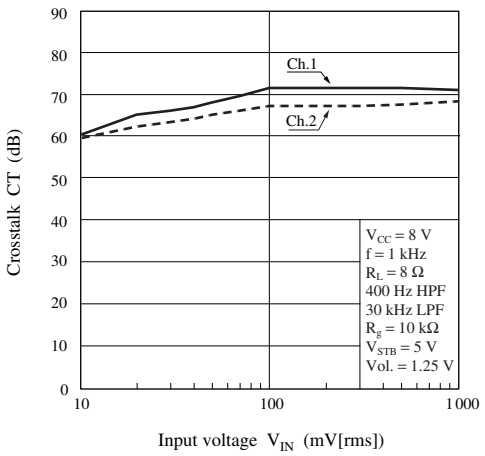
RR — Vol.



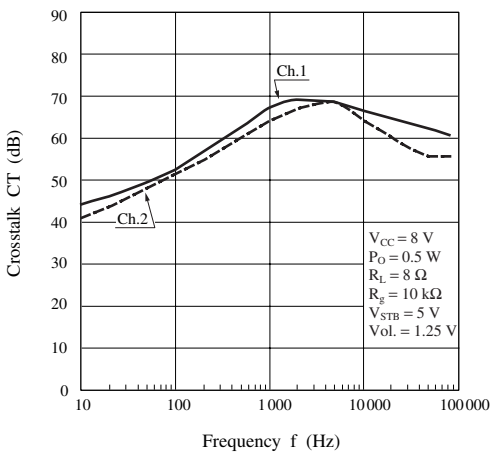

CT — $V_{CC}$



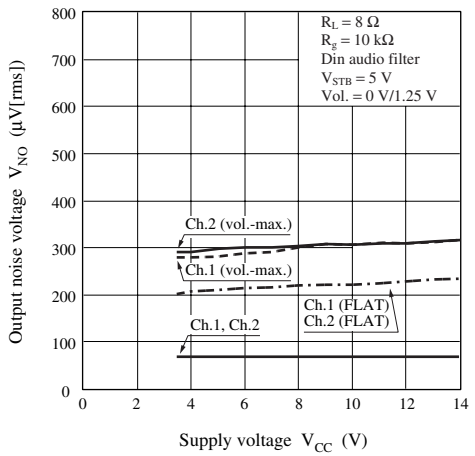

CT — $V_{IN}$



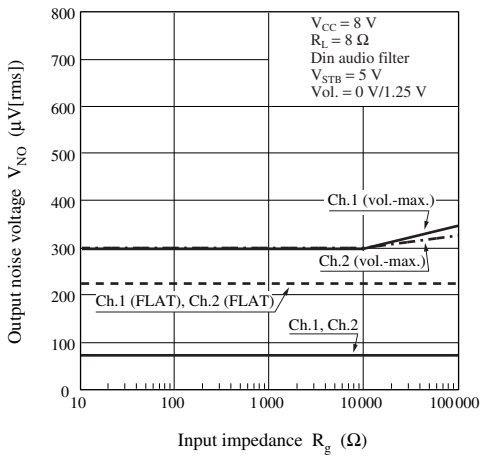

CT — f




$V_{NO}$ — $V_{CC}$



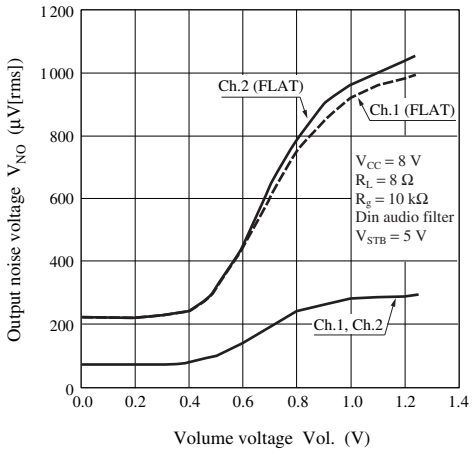

$V_{NO}$ — $R_g$



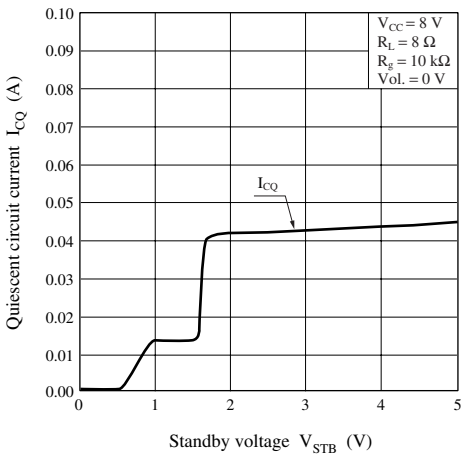
## ■ Technical Data (continued)

• Main characteristics (continued)

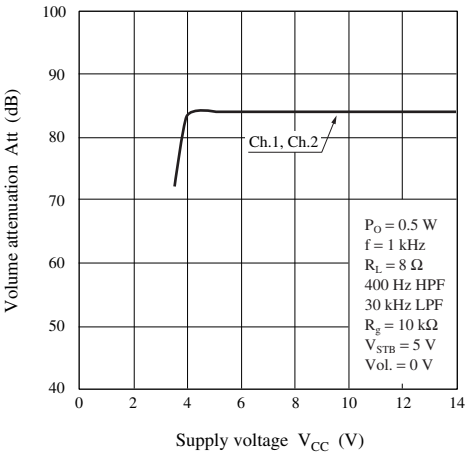
$V_{NO}$ — Vol.



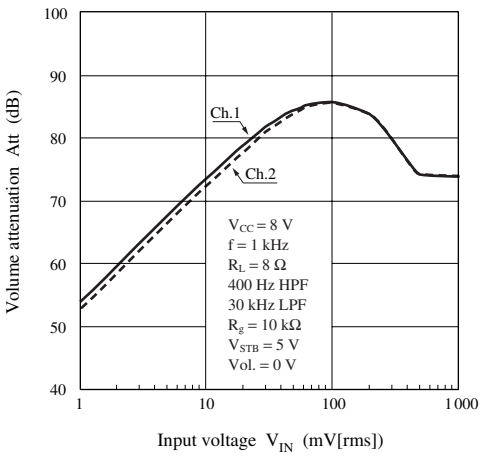

$I_{CQ}$ — $V_{STB}$



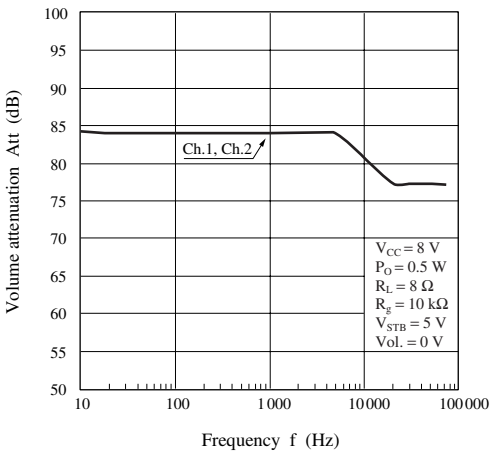

Att — $V_{CC}$



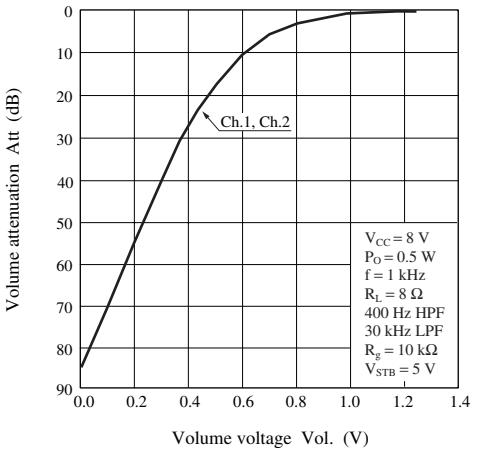

Att — $V_{IN}$




Att — f



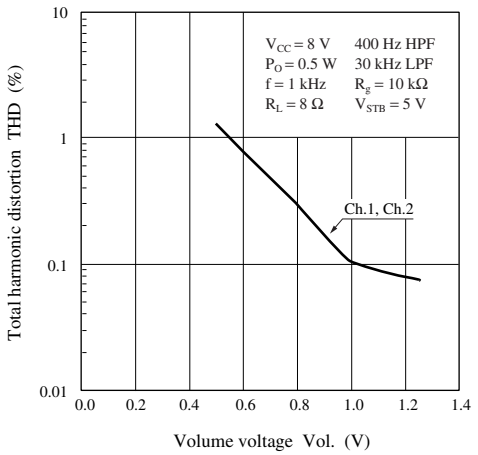

Att — Vol.



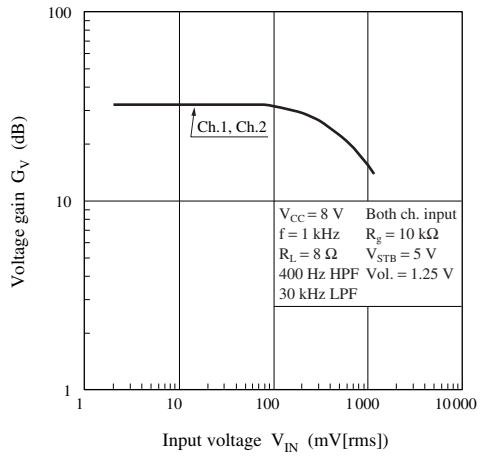
## ■ Technical Data (continued)

• Main characteristics (continued)

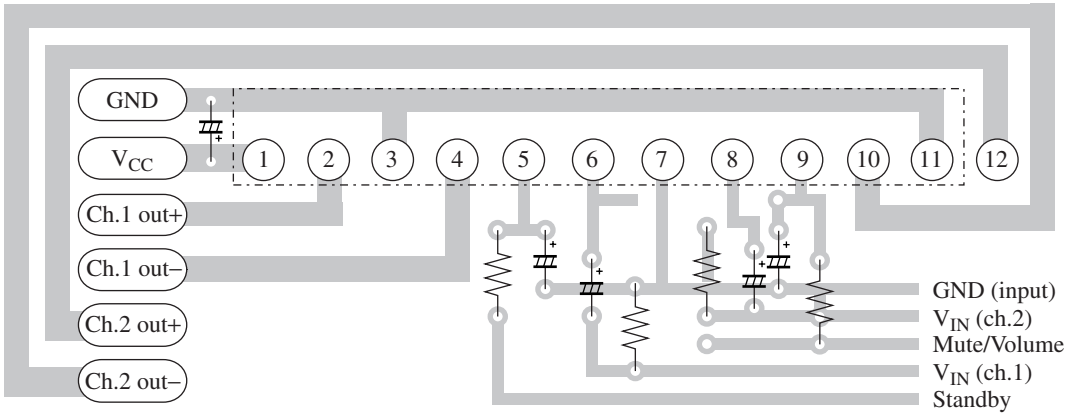
THD — Vol.




$G_V$ — $V_{IN}$




• Example of PCB pattern




## ■ Application Circuit Example