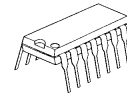


Headphone Amplifier with Electronic Volume

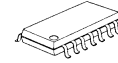
■ GENERAL DESCRIPTION

NJM2777 is a headphone amplifier with electronic volume. It includes widely gain adjustable volume, +20 to -80 dB, and mute function. These are controlled by DC voltage. The NJM2777 is suitable for headphone output on TV set.

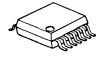
■ PACKAGE OUTLINE



NJM2777D



NJM2777M

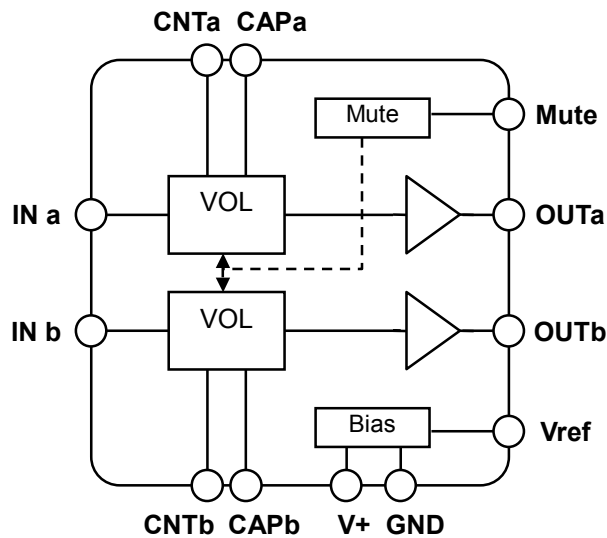


NJM2777V

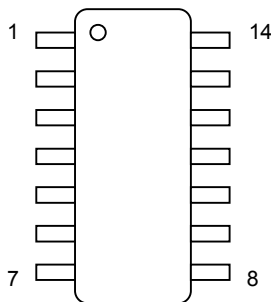
■ FEATURES

- Operating Voltage 8 to 10 V
- Electronic Volume +20dB to -80dB
- Mute Function
- Bipolar
- Package Outline DIP14, DMP14, SSOP14

■ BLOCK DIAGRAM



■ PIN FUNCTION



| No. | SYMBOL | FUNCTION | No. | SYMBOL | FUNCTION |
|-----|--------|---|-----|--------|---|
| 1 | V+ | Power Supply | 8 | N.C. | No connecting |
| 2 | OUTb | Bch Output | 9 | Vref | Reference voltage stabilized capacitor connect terminal |
| 3 | CNTb | Bch Volume control voltage input | 10 | INa | Ach Input |
| 4 | CAPb | Bch Volume control click noise absorbing capacitor connect terminal | 11 | CAPa | Ach Volume control click noise absorbing capacitor connect terminal |
| 5 | INb | Bch Input | 12 | CNTa | Ach Volume control voltage input |
| 6 | Mute | Mute control | 13 | OUTa | Ach Output |
| 7 | N.C. | No connecting | 14 | GND | Ground |

■ ABSOLUTE MAXIMUM RATING (Ta=25°C)

| PARAMETER | SYMBOL | RATING | UNIT |
|-----------------------------|----------------|--|------|
| Supply Voltage | V ⁺ | 12 | V |
| Power Dissipation | P _D | DIP14 : 500 DMP14 : 500* SSOP14 : 440* | mW |
| Operating Temperature Range | Topr | -20 to +75 | °C |
| Storage Temperature Range | Tstg | -40 to +125 | °C |

*(Note) EIA/JEDEC STANDARD Test board(76.2 x 114.3 x 1.6mm, 2layers, FR-4)mounting

■ ELECTRICAL CHARACTERISTICS

(V⁺=9V, V_{IN}=-20dBV, f=1kHz, R_L=100Ω, G_v=0dB, "Mute" terminal =L, Ta=25°C)

●POWER SUPPLY

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|-------------------|------------------|----------------|------|------|------|------|
| Operating Voltage | V ⁺ | | 8 | 9 | 10 | V |
| Operating Current | I _{CC} | No Signal | - | 5 | 8 | mA |
| Reference Voltage | V _{REF} | | 4 | 4.1 | 4.2 | V |

●AMPLIFIER

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|-------------------------------|------------------|--|--------------|---------------|-------------|-----------------------------|
| Volume Operating Range | G _{EVR} | V _{CNTa} , V _{CNTb} = 0 to 3.3V | 80 | 100 | - | dB |
| Voltage Gain Channel Balance | ΔG _v | | -1.5 | 0 | 1.5 | dB |
| Maximum Input Voltage | V _{IM} | G _v =-10dB THD=3% | 8.9 (2.8) | 9.5 (3.0) | - | dBV (V _{rms}) |
| Output Power | P _O | G _v =10dB, THD=10% | 70 | 100 | - | mW |
| Total Harmonic Distortion | THD | | - | 0.1 | 1 | % |
| Channel Separation | CS | R _g =600Ω, V _{in} = 0dBV | 70 | 80 | - | dB |
| Mute Level | Mute | "Mute" terminal=H, V _{in} = 0dBV | - | -85 | -75 | dB |
| Output Noise Voltage 1 | V _{NO1} | R _g =0Ω, A-Weighted | - | -95 (18) | -85 (56) | dBV (μV _{rms}) |
| Output Noise Voltage 2 | V _{NO2} | "Mute" terminal =H R _g =0Ω, A-Weighted | - | -105 (5.6) | -95 (18) | dBV (μV _{rms}) |
| Power Supply Ripple Rejection | PSRR | V _{ripple} =-20dBV R _g =0Ω | - | 70 | - | dB |

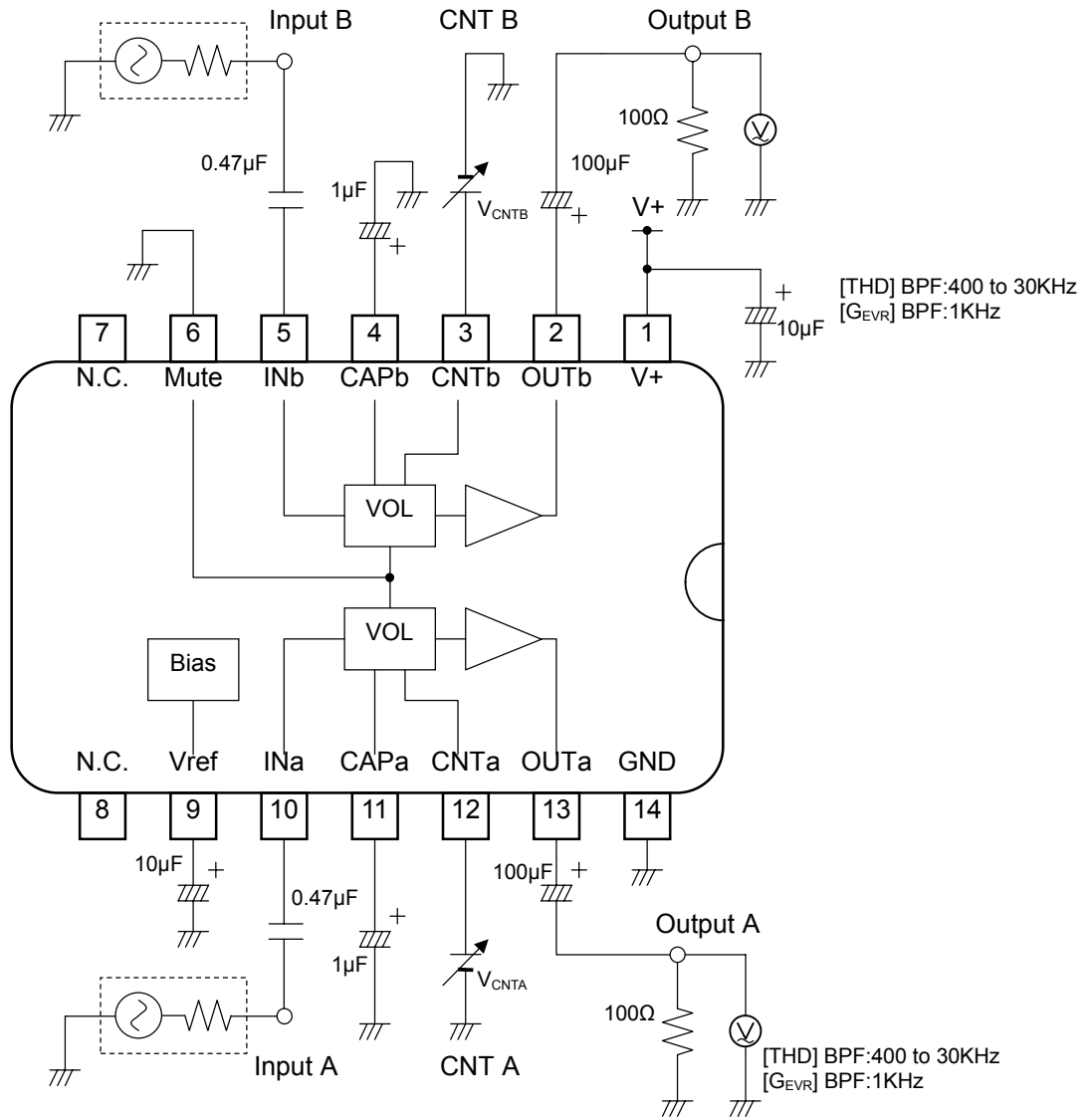
●CONTROL

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|--------------------------|-----------------|----------------|------|------|----------------|------|
| High Level Input Voltage | V _{IH} | | 2 | - | V ⁺ | V |
| Low Level Input Voltage | V _{IL} | | 0 | - | 0.4 | V |

■ CONTROL TERMINAL

| Operating Condition | Control Terminal | | Description |
|---------------------|------------------|---------|-------------------|
| | Mute Terminal | | |
| Operating Condition | Mute | H | Mute the signal |
| | Active | L, OPEN | Output the signal |

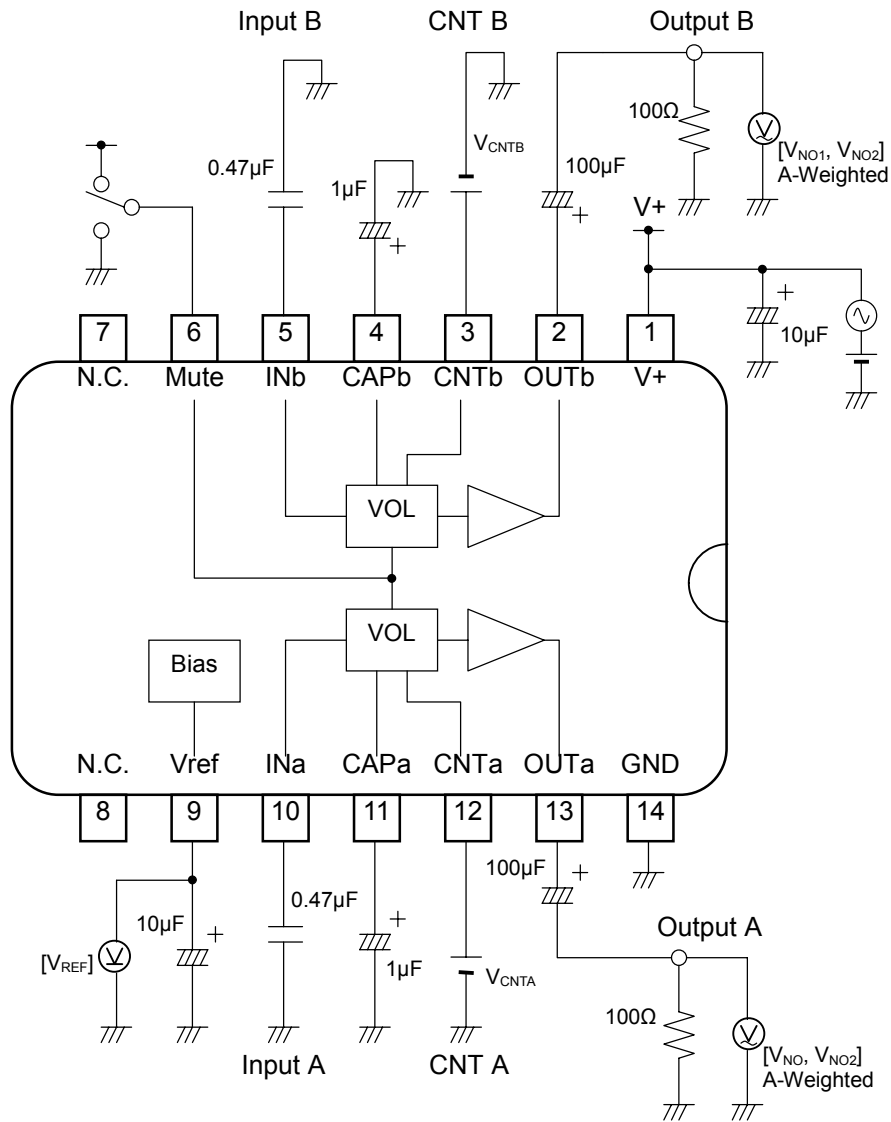
TEST CIRCUIT
TEST CIRCUIT1 (THD, GEVR, VIM, PO)



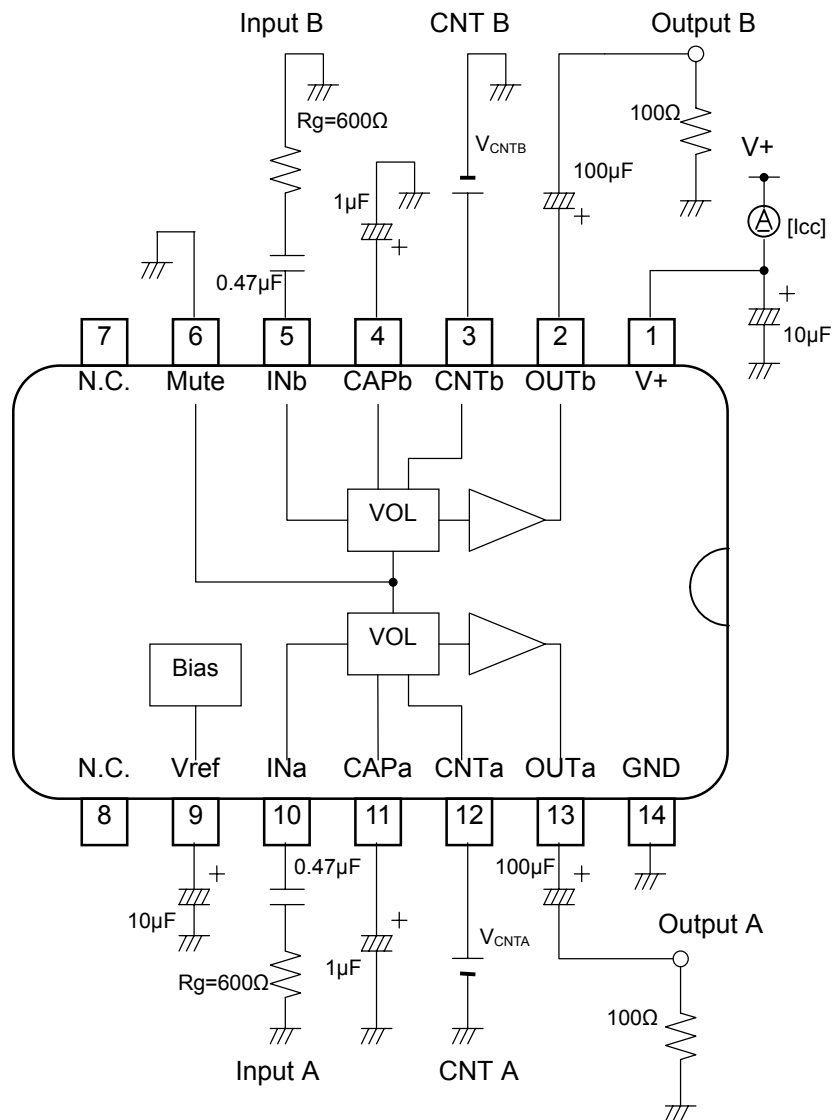
$$\text{Volume Range : } GEVR = 20 \log \frac{V_{o \max}}{V_{o \min}}$$

[$V_{o \min}$: Output voltage at $V_{CNT} = 0V$]
 [$V_{o \max}$: Output voltage at $V_{CNT} = 3.3V$]

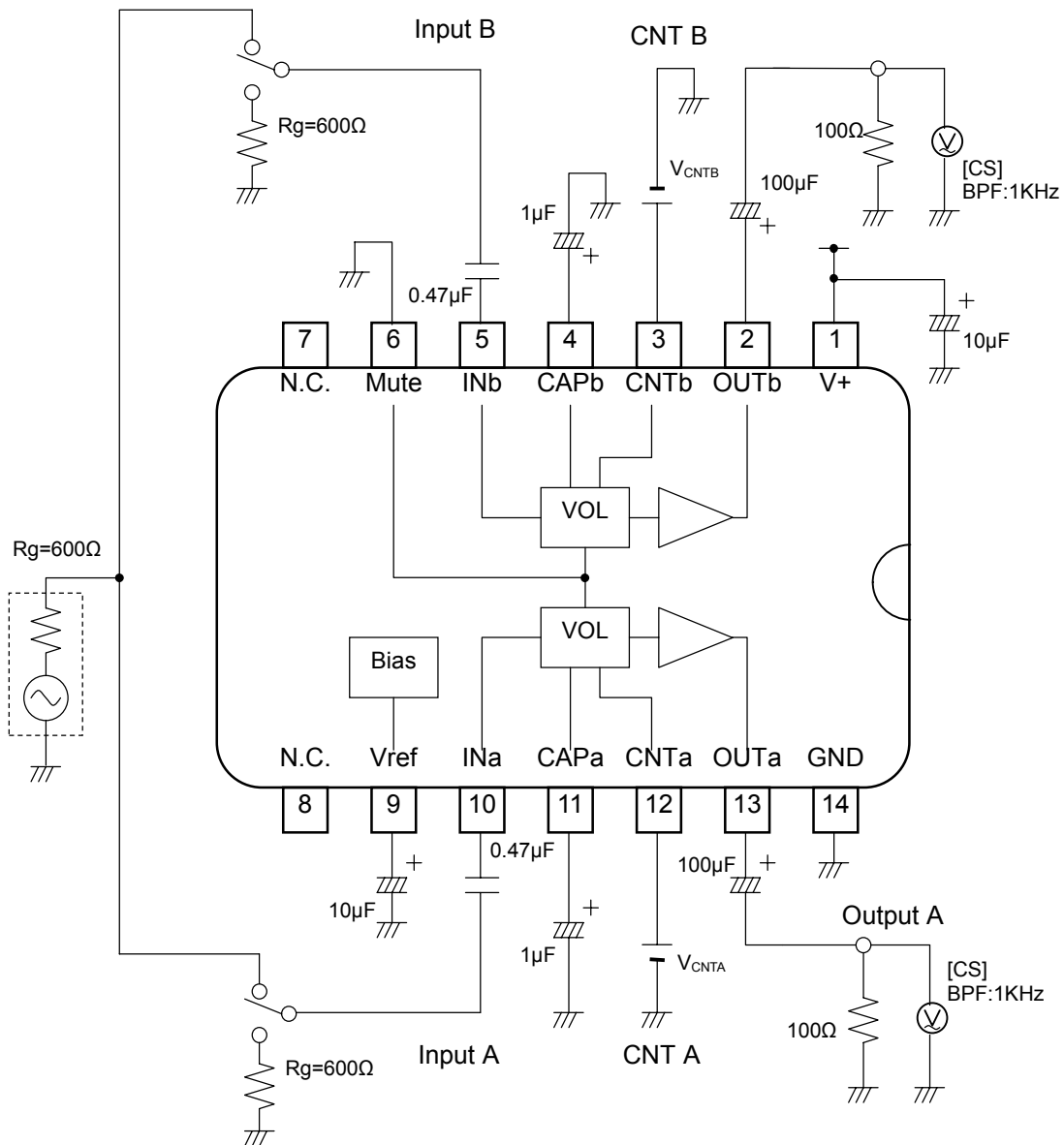
TEST CIRCUIT 2 (VNO1,VNO2,VREF)



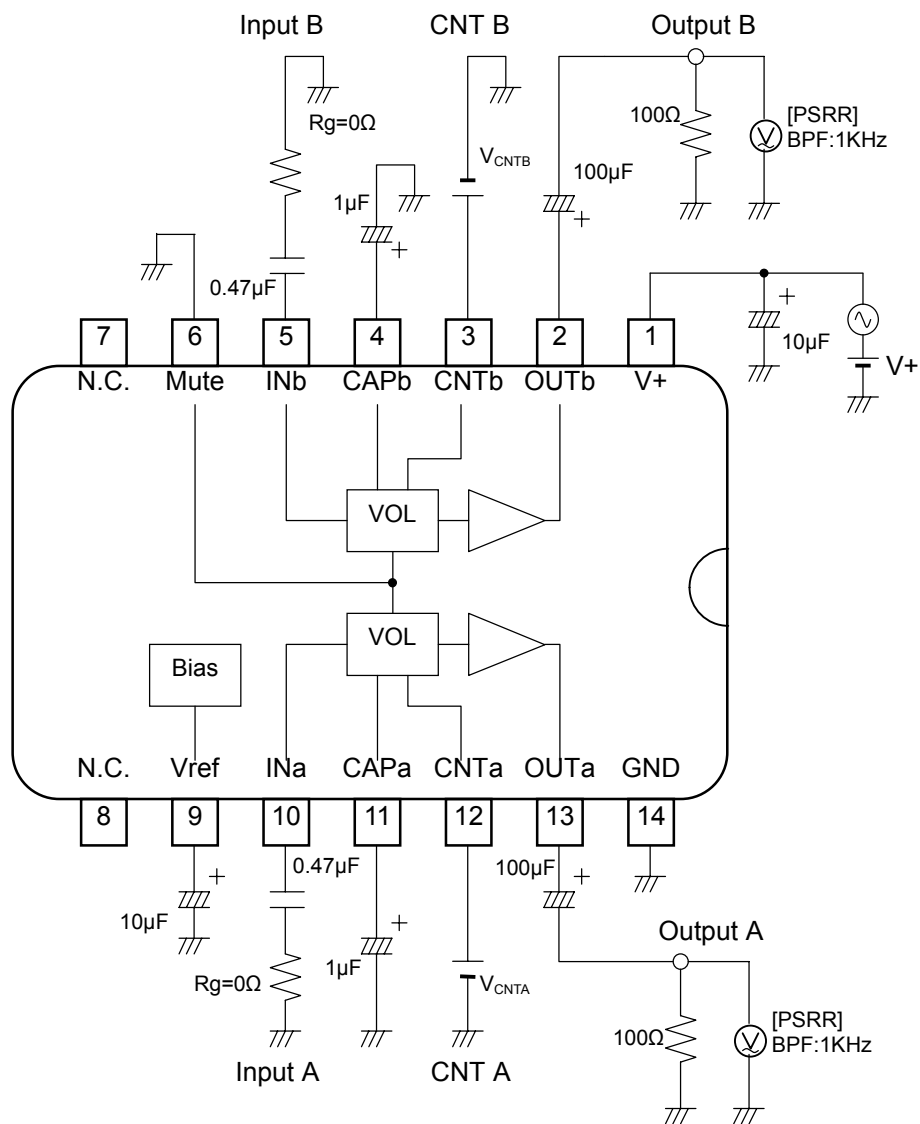
TEST CIRCUIT 3 (I_{cc})



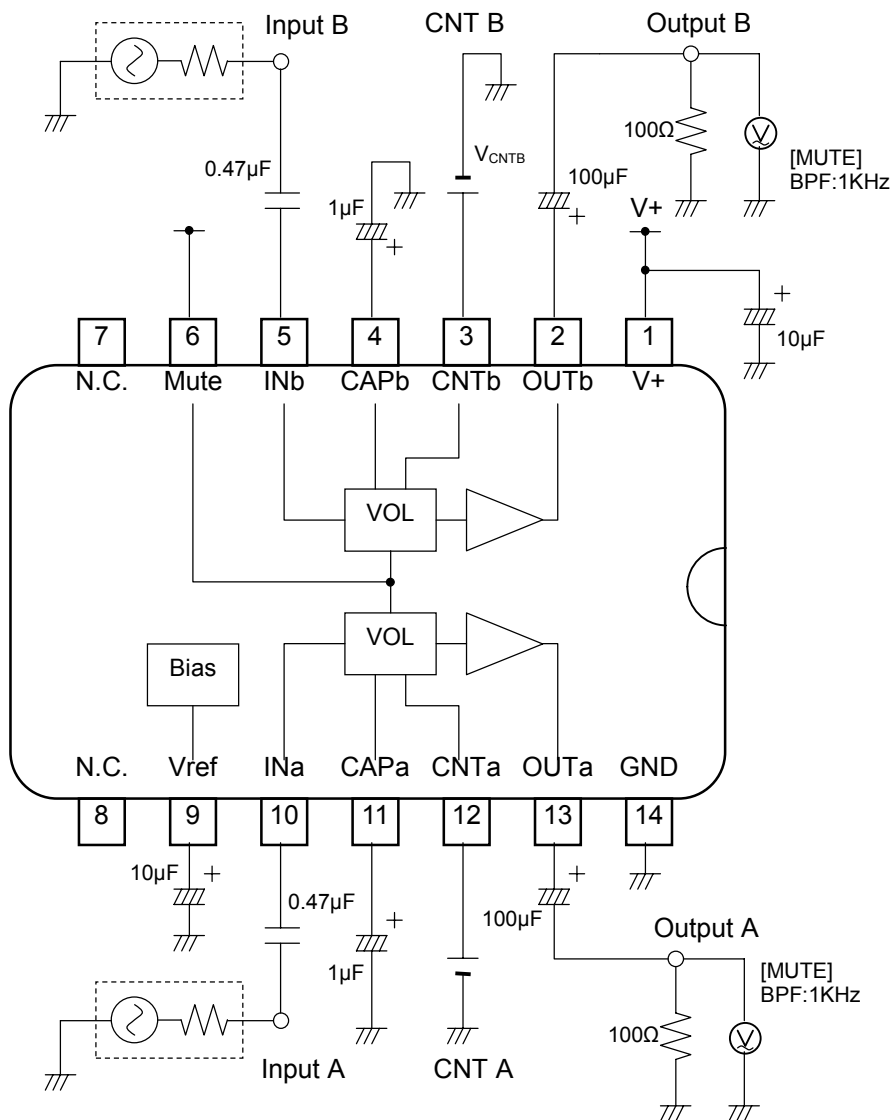
TEST CIRCUIT 4 (CS)



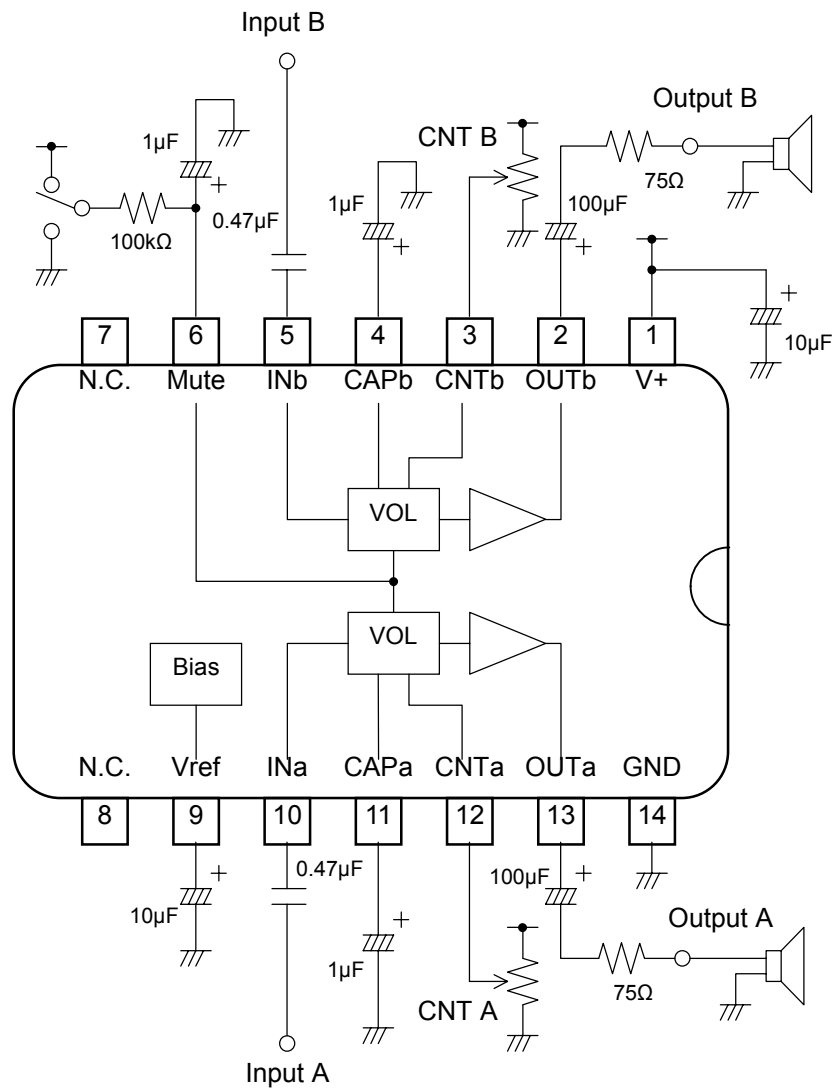
TEST CIRCUIT 5 (PSRR)



TEST CIRCUIT 6 (MUTE)



APPLICATION CIRCUIT



■ TERMINAL DESCRIPTION

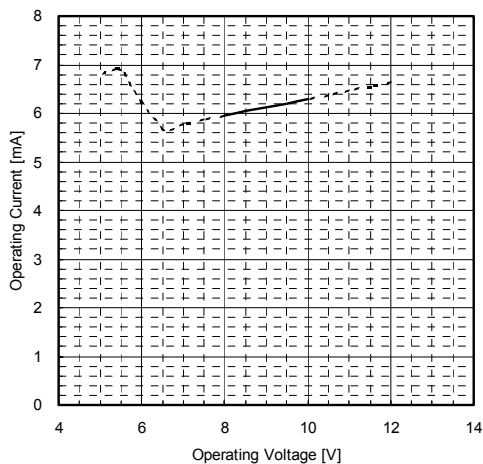
| PIN NO. | SYMBOL | FUNCTION | EQUIVALENT CIRCUIT | TERMINAL VOLTAGE |
|---------|--------------|--|--------------------|------------------|
| 2 13 | OUTb OUTa | Bch Output Ach Output | | V+/2 |
| 3 12 | CNTb CNTa | Bch Volume Control Ach Volume Control | | - |
| 4 11 | CAPb CAPa | Bch Volume control click noise absorbing capacitor connect terminal Ach Volume control click noise absorbing capacitor connect terminal | | - |
| 5 10 | INb INa | Bch Input Ach Input | | GND |

■ TERMINAL DESCRIPTION

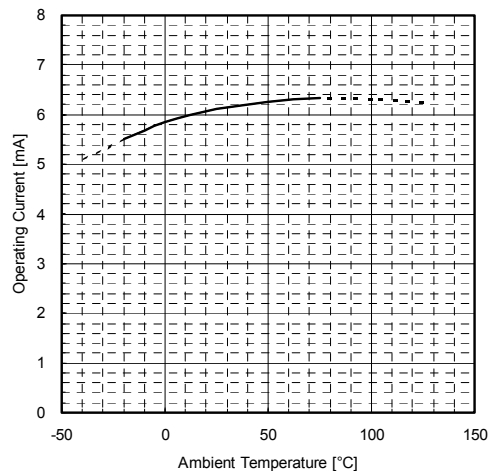
| PIN NO. | SYMBOL | FUNCTION | EQUIVALENT CIRCUIT | TERMINAL VOLTAGE |
|---------|--------|---|--------------------|------------------|
| 6 | Mute | Mute Control | | GND |
| 9 | Vref | Reference voltage stabilized capacitor connect terminal | | $V+/2$ |

■ TYPICAL CHARACTERISTICS

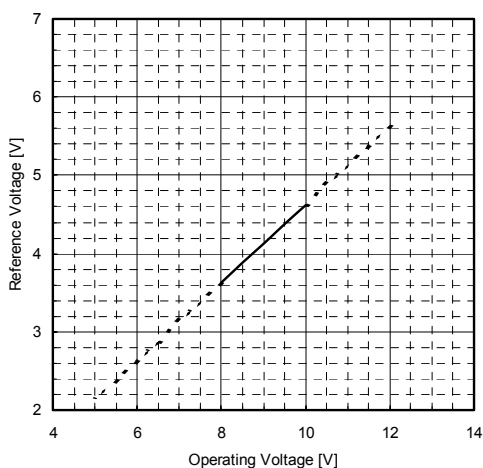
Operating Current vs. Operating Voltage
No signal, MUTE=L, Ta=25°C



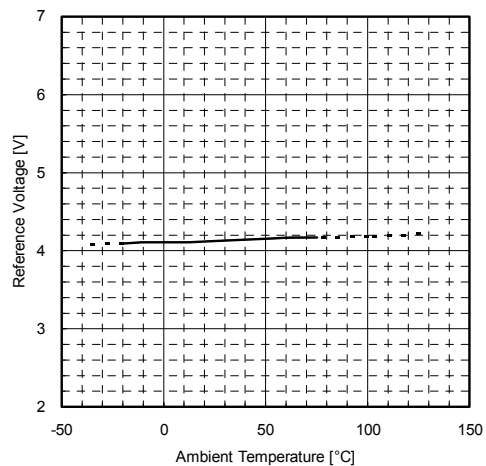
Operating Current vs. Ambient Temperature
V+=9V, No signal, MUTE=L



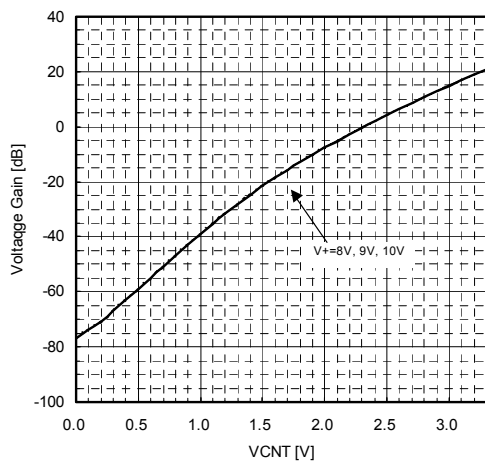
Reference Voltage vs. Operating Voltage
No signal, MUTE=L, Ta=25°C



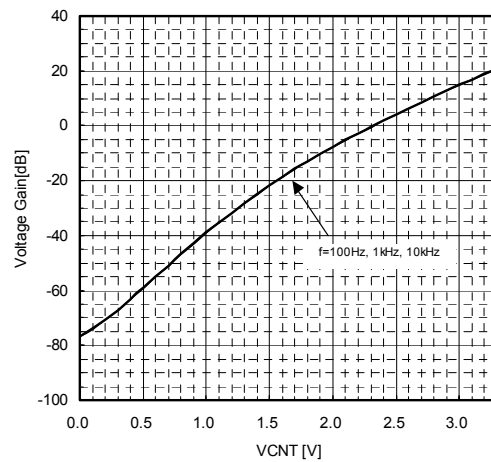
Reference Voltage vs. Ambient Temperature
V+=9V, No signal, MUTE=L



Voltage Gain vs. Control Voltage (Operating Voltage)
Vin=-20dBV, f=1kHz, RL=100Ω, Ta=25°C

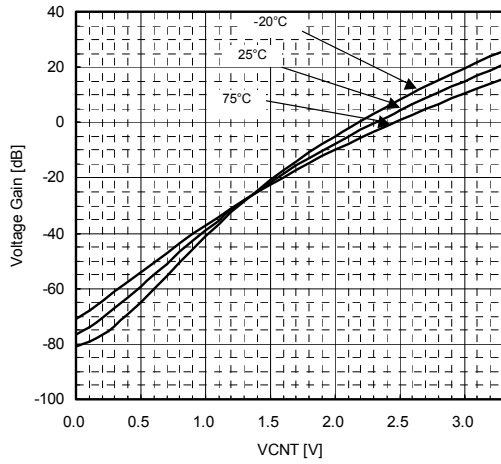


Voltage Gain vs. Control Voltage (Frequency)
V+=9V, Vin=-20dBV, RL=100Ω, Ta=25°C

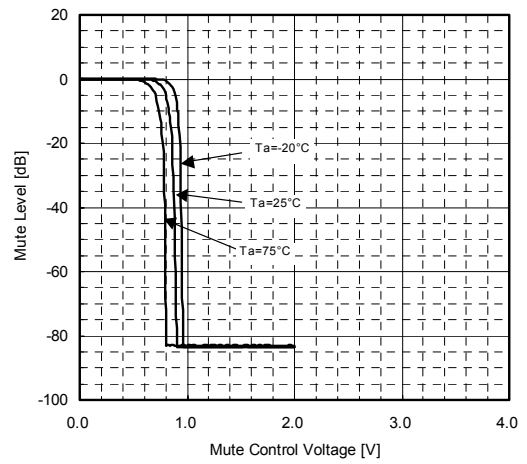


TYPICAL CHARACTERISTICS

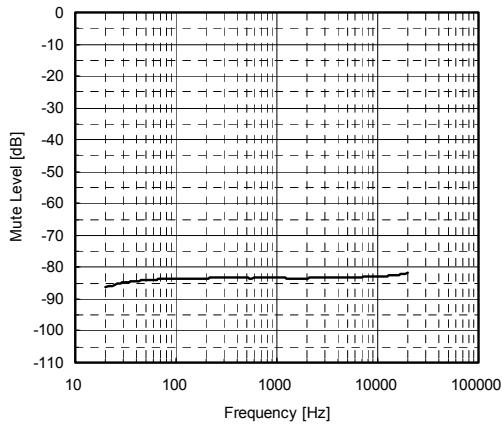
Voltage Gain vs. Control Voltage (Ambient Temperature)
 $V_+ = 9V, V_{in} = -20dBV, f = 1kHz, R_L = 100\Omega$



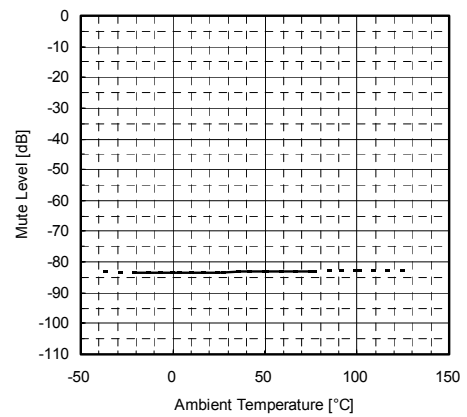
Mute Level vs. Mute Control Voltage
 $V_+ = 9V, V_{in} = 0dBV, f = 1kHz, G_v = 0dB, R_L = 100\Omega$



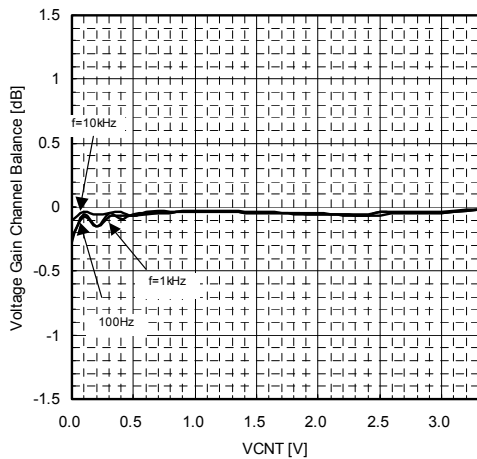
Mute Level vs. Frequency
 $V_+ = 9V, V_{in} = 0dBV, G_v = 0dB, R_L = 100\Omega, MUTE = H, T_a = 25^\circ C$



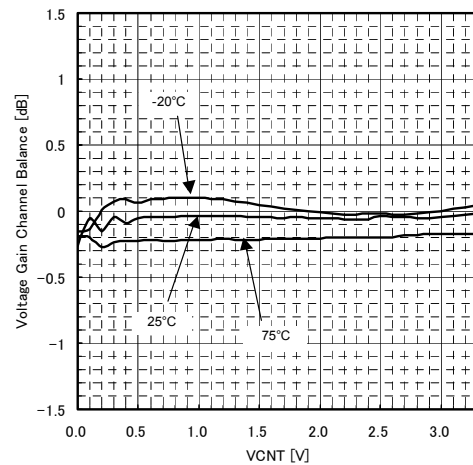
Mute Level vs. Ambient Temperature
 $V_+ = 9V, V_{in} = 0dBV, f = 1kHz, G_v = 0dB, R_L = 100\Omega, MUTE = H$



Voltage Gain Channel Balance vs. Control Voltage (Frequency)
 $V_+ = 9V, V_{in} = -20dBV, R_L = 100\Omega, T_a = 25^\circ C$

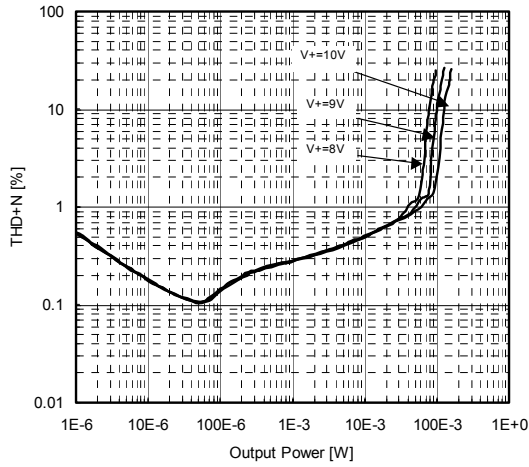


Voltage Gain Channel Balance vs. Control Voltage (Ambient Temperature)
 $V_+ = 9V, V_{in} = -20dBV, f = 1kHz, R_L = 100\Omega$

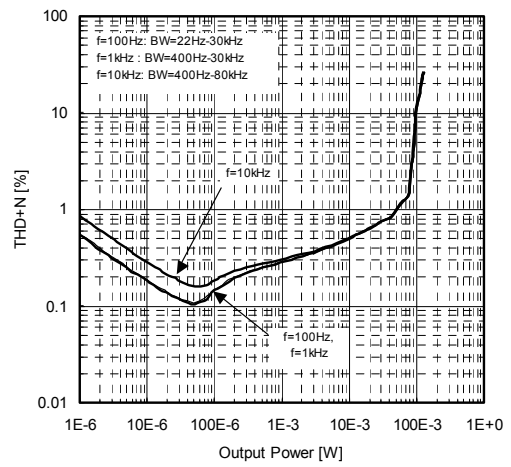


TYPICAL CHARACTERISTICS

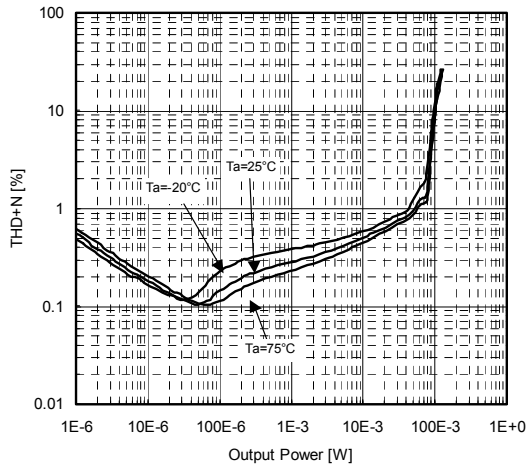
THD+N vs. Output Power (Operating Voltage)
 $f=1\text{kHz}$, $G_v=10\text{dB}$, $R_L=100\Omega$, $BW=400\text{Hz-}30\text{kHz}$, $T_a=25^\circ\text{C}$



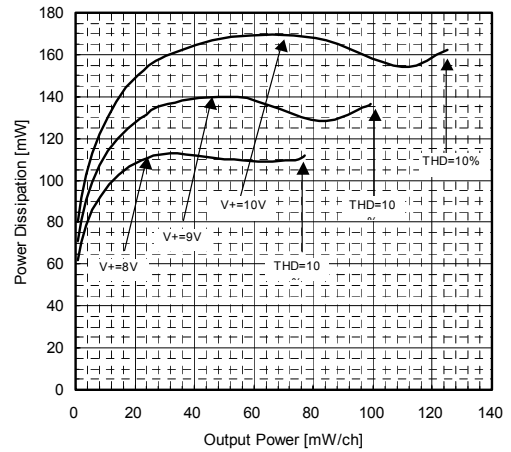
THD+N vs. Output Power (Frequency)
 $V_+=9\text{V}$, $G_v=10\text{dB}$, $R_L=100\Omega$, $T_a=25^\circ\text{C}$



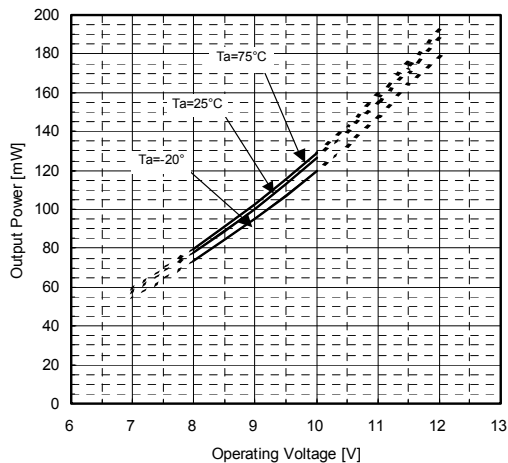
THD+N vs. Output Power (Ambient Temperature)
 $V_+=9\text{V}$, $f=1\text{kHz}$, $G_v=10\text{dB}$, $R_L=100\Omega$, $BW=400\text{Hz-}30\text{kHz}$



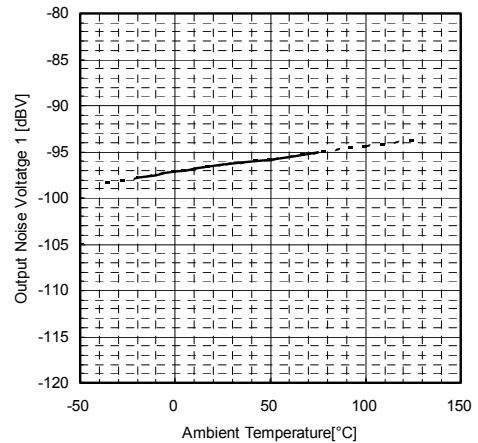
Power Dissipation vs. Output Power
 $f=1\text{kHz}$, $G_v=10\text{dB}$, $R_L=100\Omega$, $BW=400\text{Hz-}30\text{kHz}$, $T_a=25^\circ\text{C}$, 2ch Input



Output Power vs. Operating Voltage
 $f=1\text{kHz}$, $\text{THD}=10\%$, $G_v=10\text{dB}$, $R_L=100\Omega$, $BW=400\text{Hz-}30\text{kHz}$

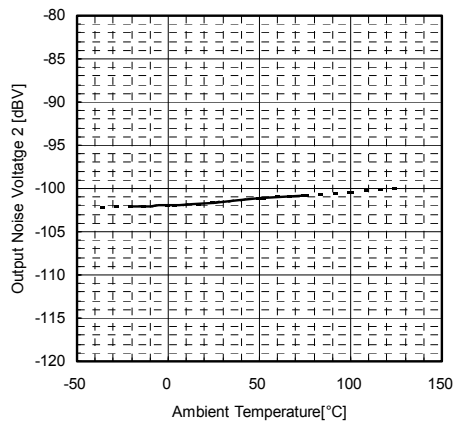


Output Noise Voltage 1 vs. Ambient Temperature
 $V_+=9\text{V}$, $G_v=0\text{dB}$, $R_L=100\Omega$, $R_g=0\Omega$, A-Weighted, MUTE=L



■ TYPICAL CHARACTERISTICS

Output Noise Voltage 2 vs. Ambient Temperature
 V+=9V, RL=100Ω, Rg=0Ω, A-Weighted, MUTE=H



[CAUTION]

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