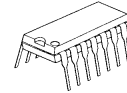


## Headphone Amplifier with Electronic Volume

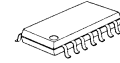
### ■ GENERAL DESCRIPTION

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.

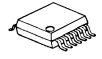
### ■ PACKAGE OUTLINE



NJM2777D



NJM2777M

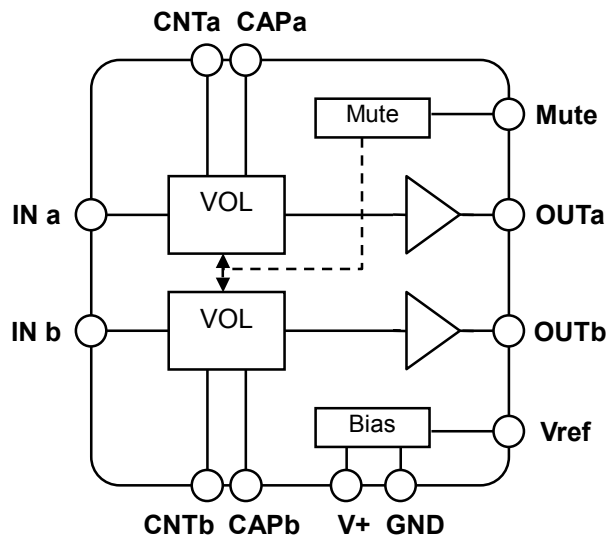


NJM2777V

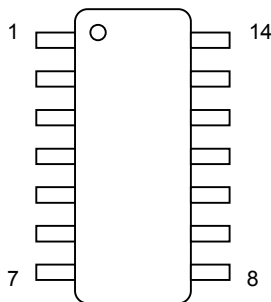
### ■ FEATURES

- 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 <sup>+</sup>	12	V
Power Dissipation	P <sub>D</sub>	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<sup>+</sup>=9V, V<sub>IN</sub>=-20dBV, f=1kHz, R<sub>L</sub>=100Ω, G<sub>v</sub>=0dB, "Mute" terminal =L, Ta=25°C)

### ●POWER SUPPLY

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V <sup>+</sup>		8	9	10	V
Operating Current	I <sub>CC</sub>	No Signal	-	5	8	mA
Reference Voltage	V <sub>REF</sub>		4	4.1	4.2	V

### ●AMPLIFIER

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

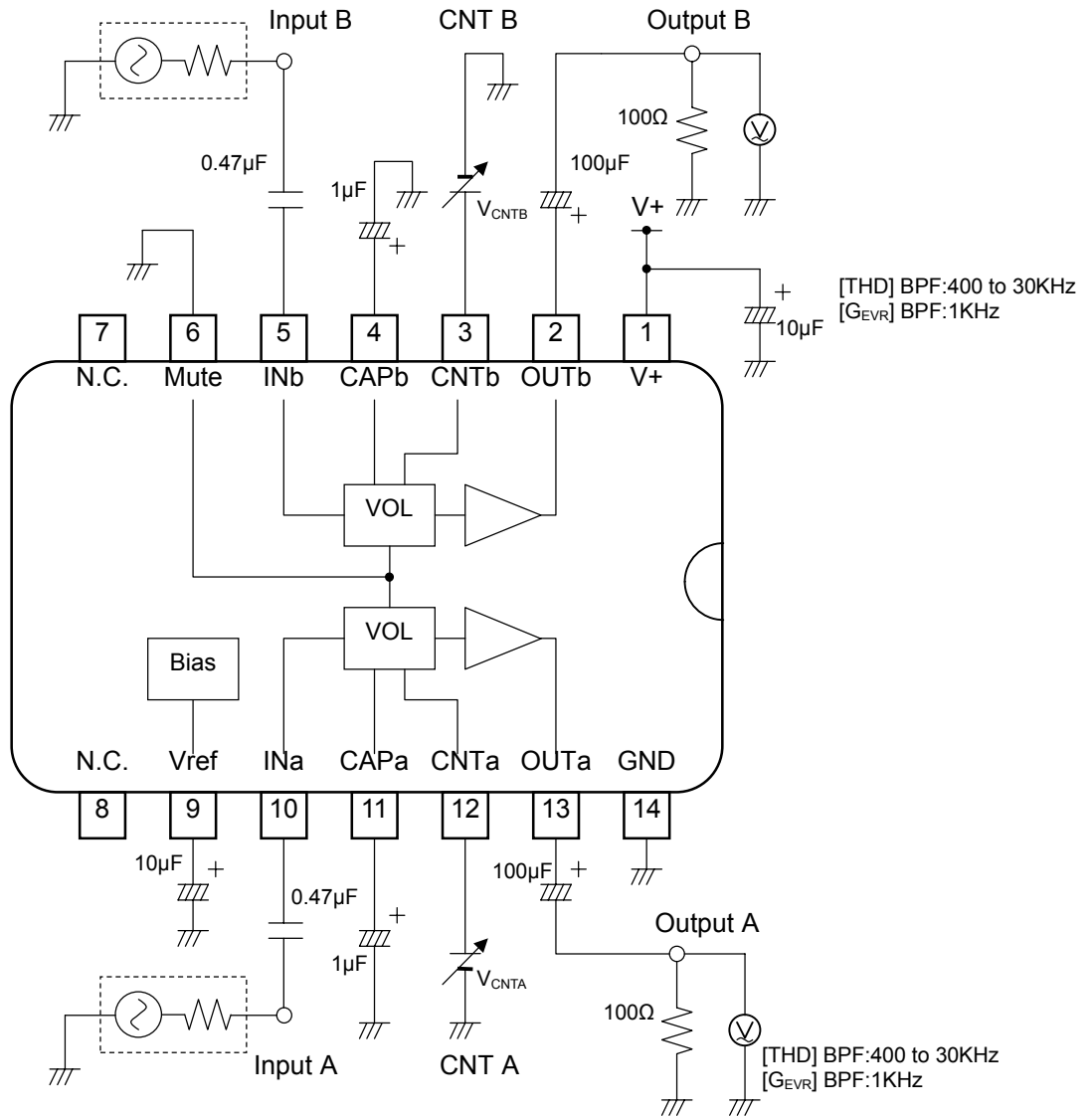
### ●CONTROL

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
High Level Input Voltage	V <sub>IH</sub>		2	-	V <sup>+</sup>	V
Low Level Input Voltage	V <sub>IL</sub>		0	-	0.4	V

## ■ CONTROL TERMINAL

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

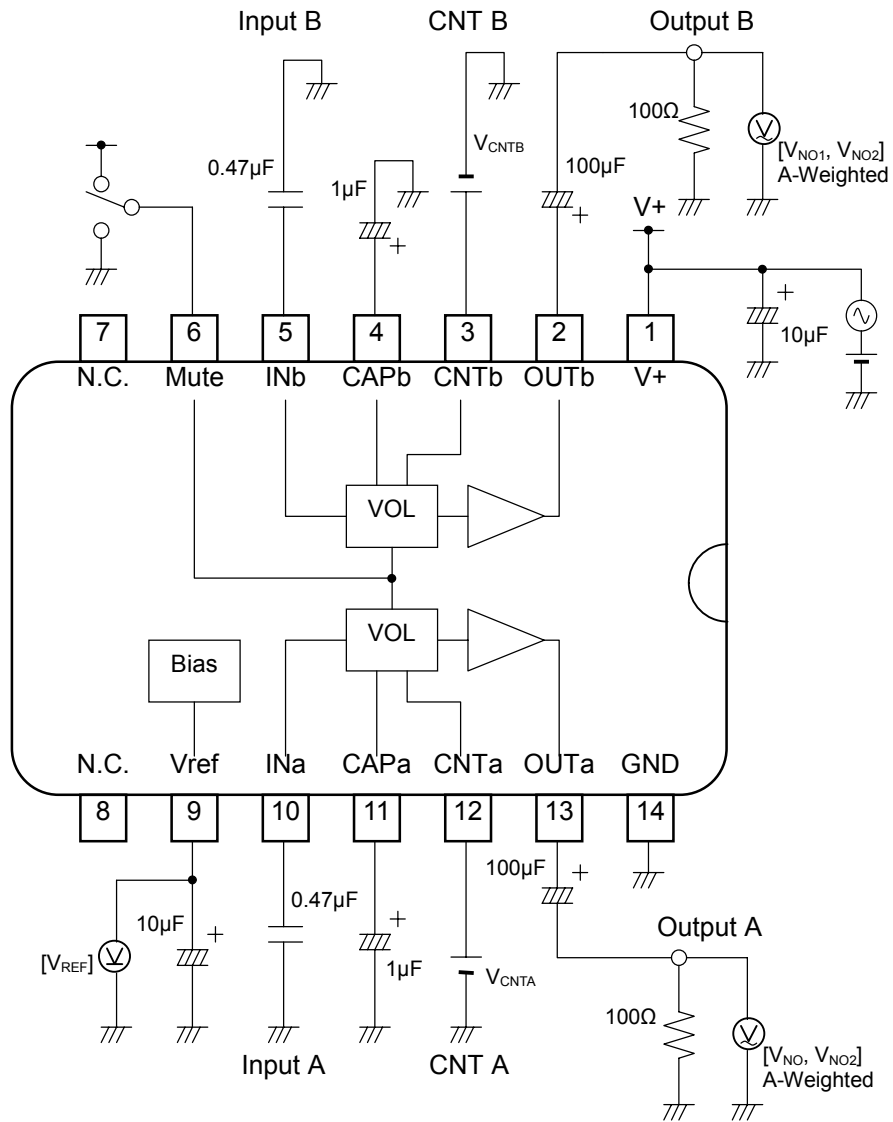
■ TEST CIRCUIT  
TEST CIRCUIT1 (THD, GEVR, VIM, PO)



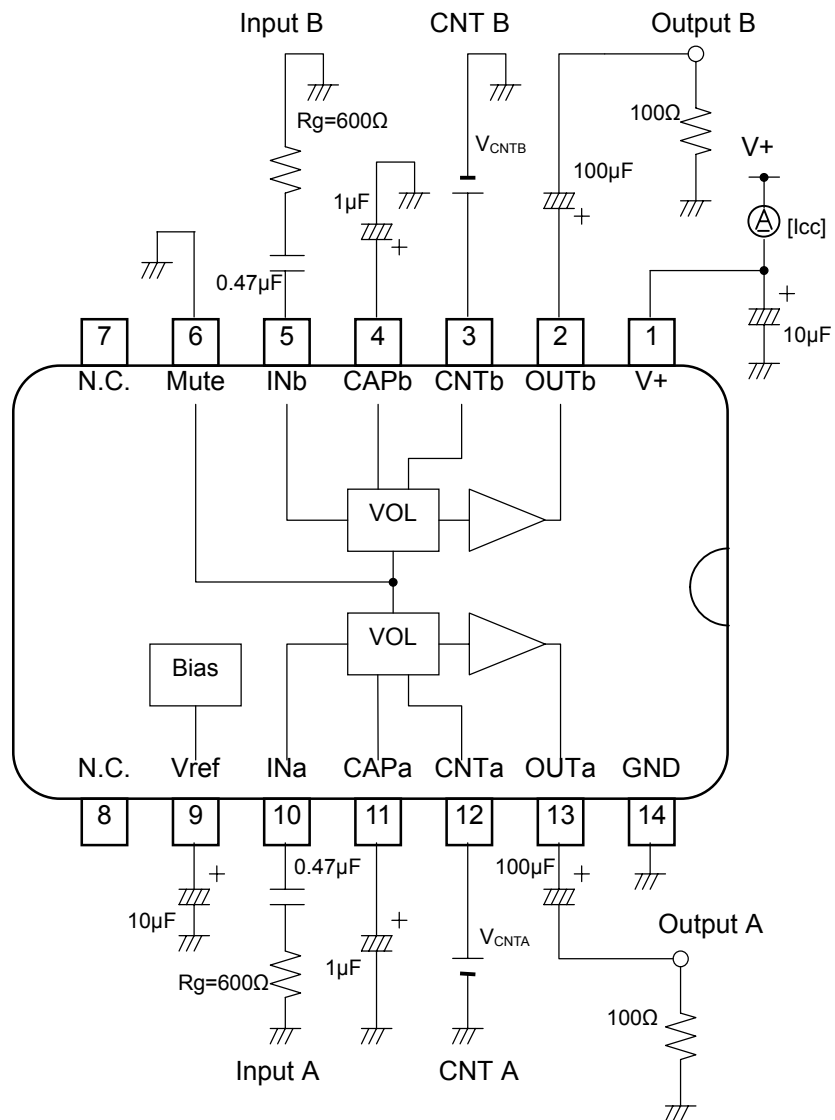
$$\text{Volume Range : } GEVR = 20 \log \frac{V_{o \max}}{V_{o \min}}$$

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

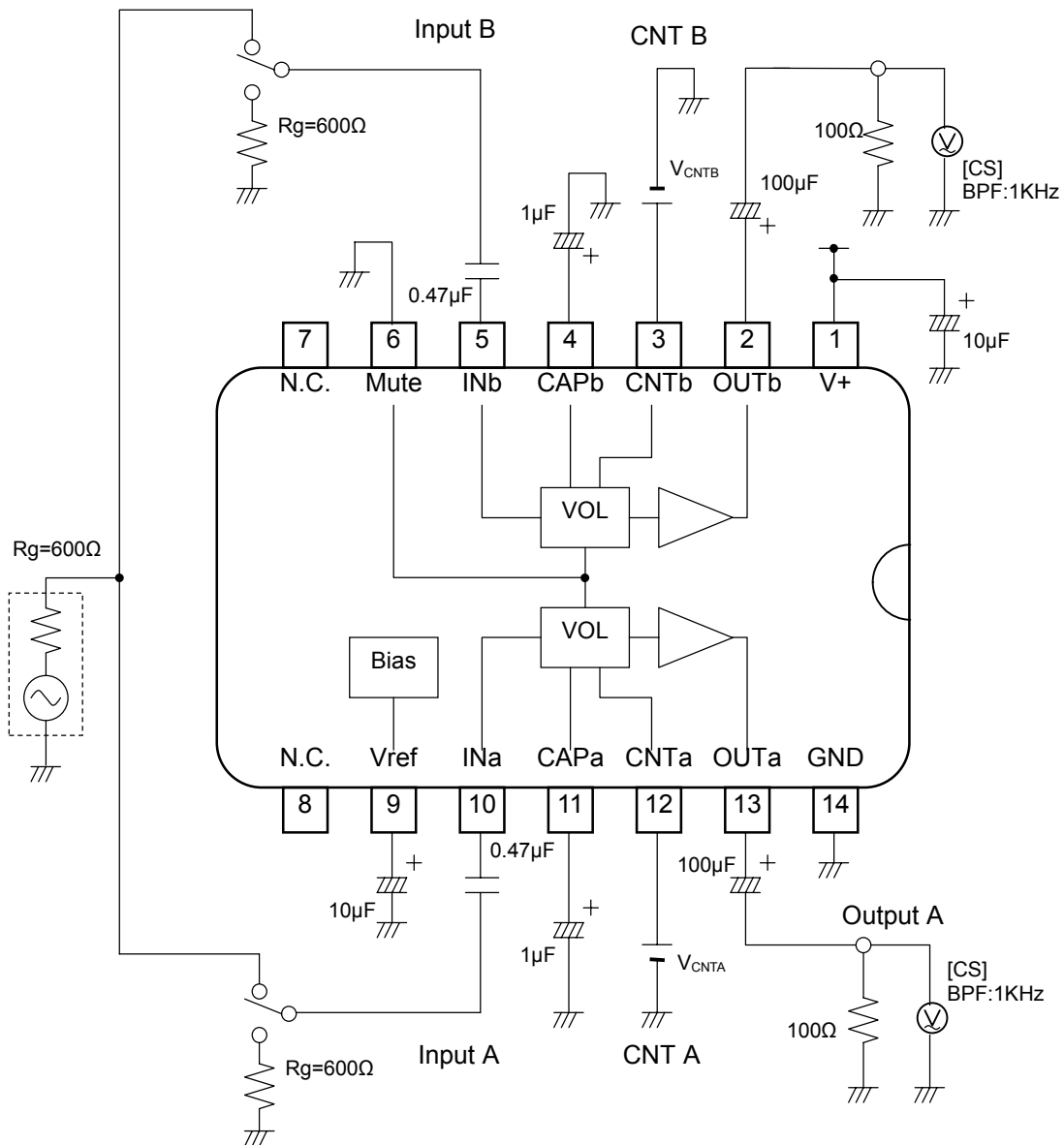
## TEST CIRCUIT 2 (VNO1,VNO2,VREF)



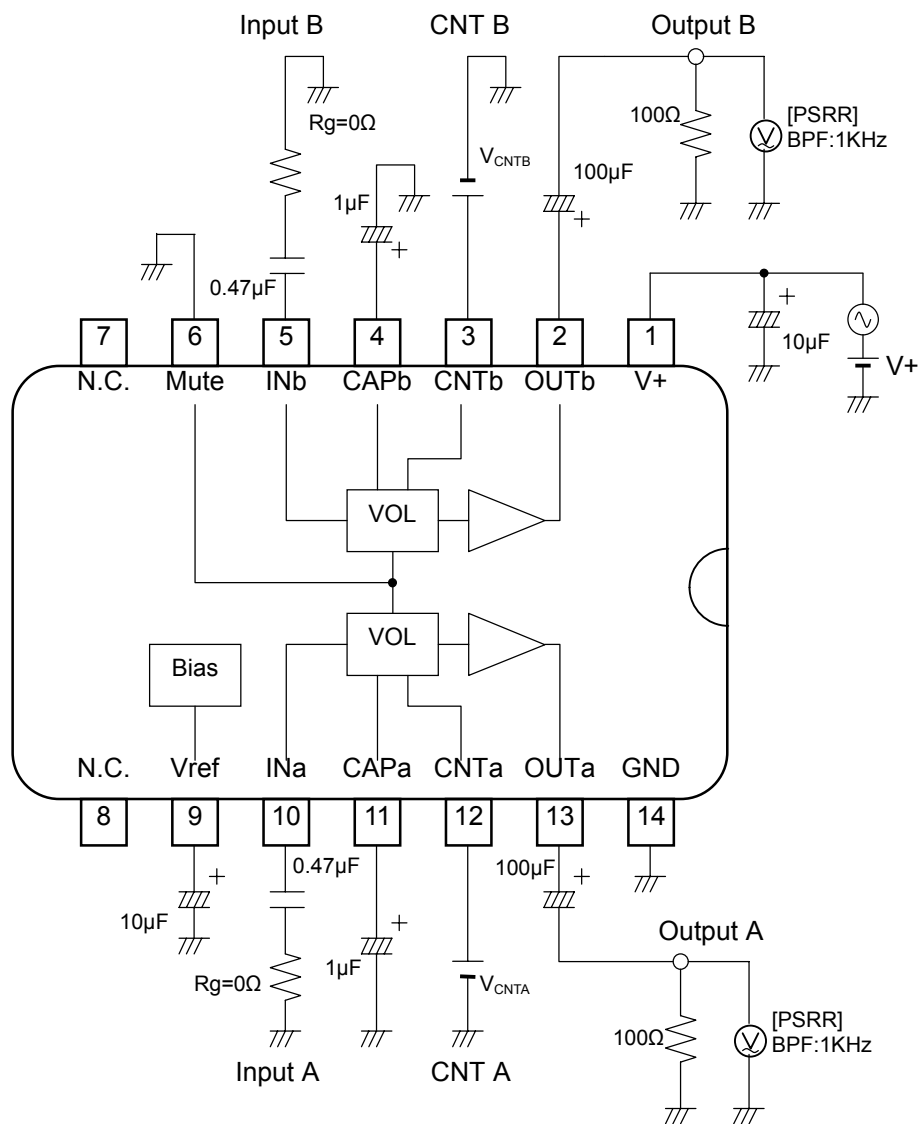
## TEST CIRCUIT 3 (I<sub>cc</sub>)



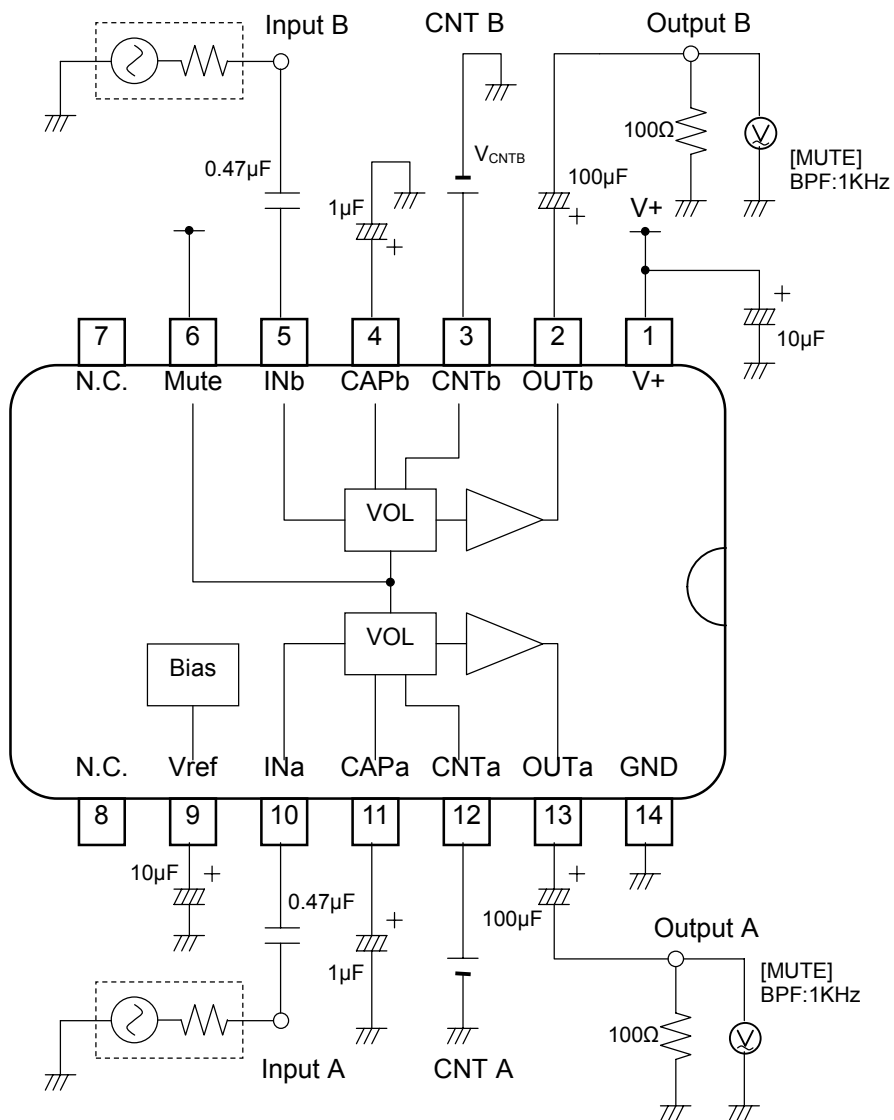
## TEST CIRCUIT 4 (CS)



## TEST CIRCUIT 5 (PSRR)

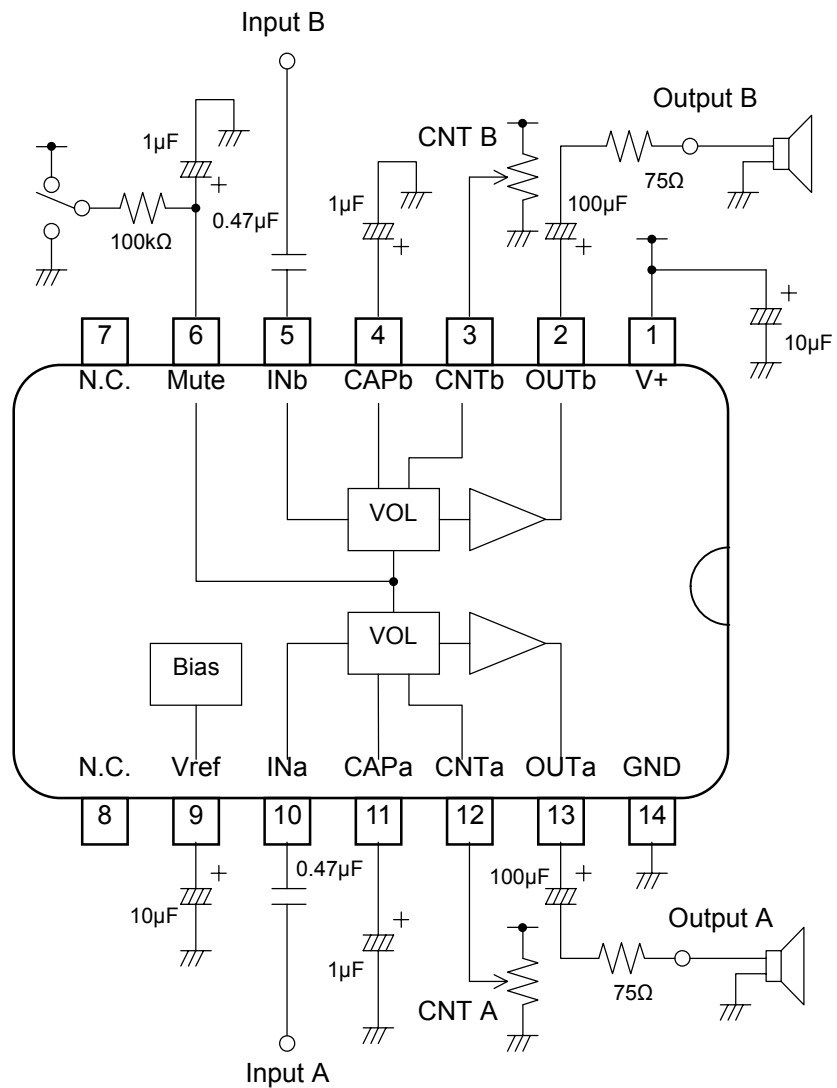


## TEST CIRCUIT 6 (MUTE)





## APPLICATION CIRCUIT



## ■ TERMINAL DESCRIPTION

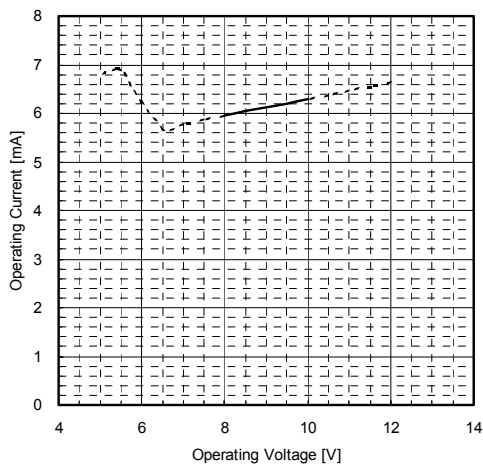
PIN NO.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	TERMINAL VOLTAGE
2 13	OUTb OUTa	Bch Output Ach Output		V+/2
3 12	CNTb CNTa	Bch Volume Control Ach Volume Control		-
4 11	CAPb CAPa	Bch Volume control click noise absorbing capacitor connect terminal Ach Volume control click noise absorbing capacitor connect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

## ■ TERMINAL DESCRIPTION

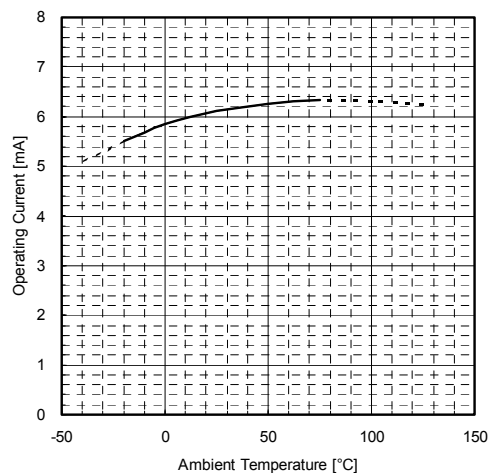
PIN NO.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	TERMINAL VOLTAGE
6	Mute	Mute Control		GND
9	Vref	Reference voltage stabilized capacitor connect terminal		$V+/2$

## ■ TYPICAL CHARACTERISTICS

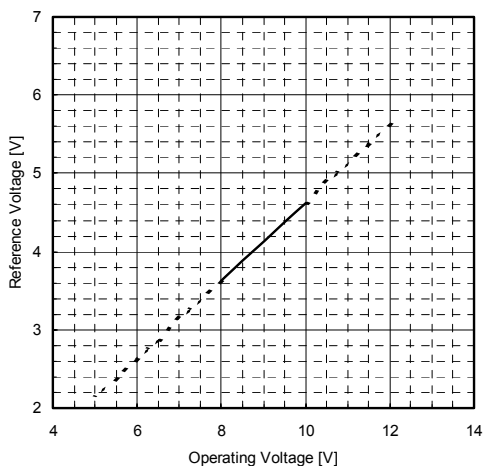
Operating Current vs. Operating Voltage  
No signal, MUTE=L, Ta=25°C



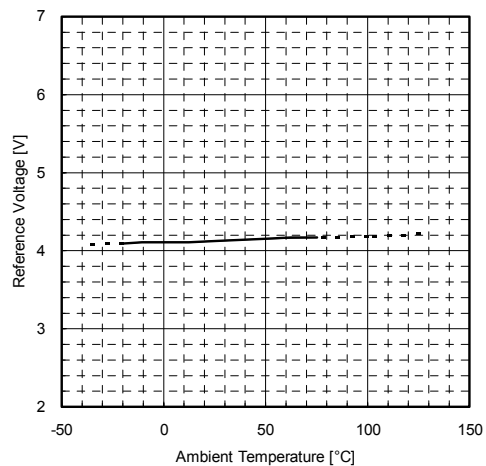
Operating Current vs. Ambient Temperature  
V+=9V, No signal, MUTE=L



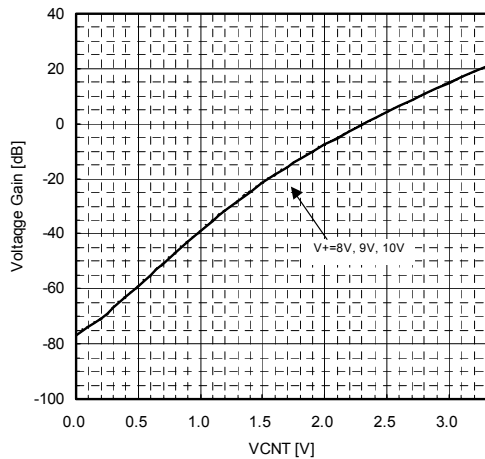
Reference Voltage vs. Operating Voltage  
No signal, MUTE=L, Ta=25°C



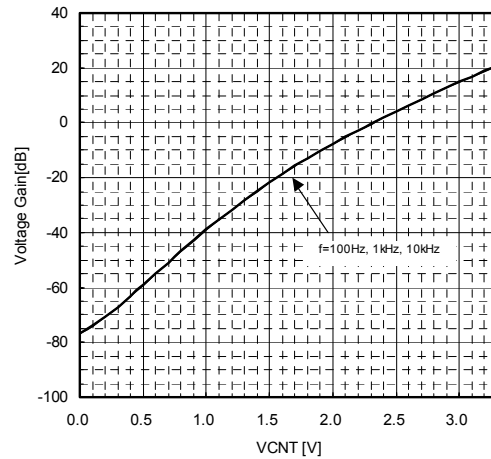
Reference Voltage vs. Ambient Temperature  
V+=9V, No signal, MUTE=L



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

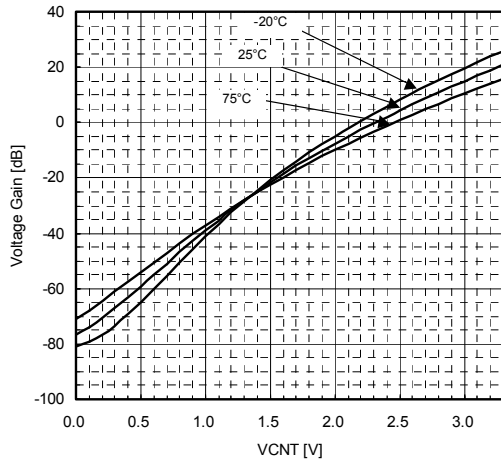


Voltage Gain vs. Control Voltage (Frequency)  
V+=9V, Vin=-20dBV, RL=100Ω, Ta=25°C

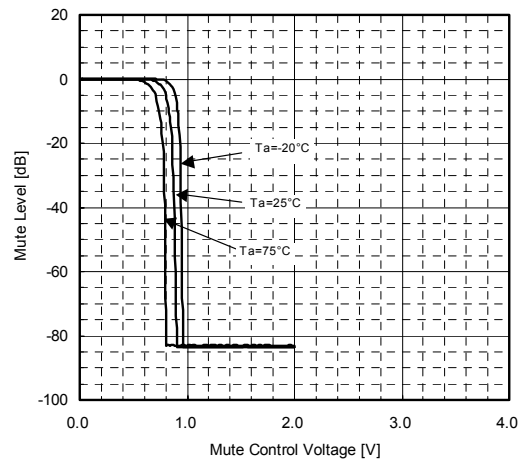


## TYPICAL CHARACTERISTICS

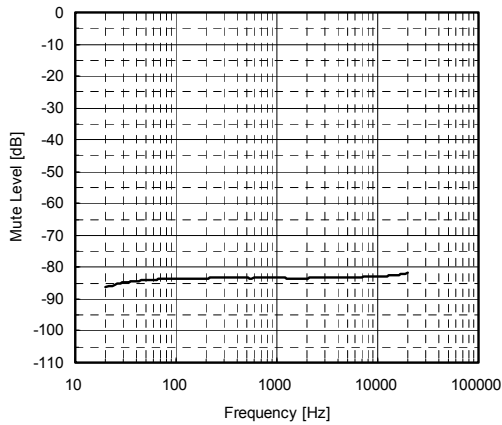
Voltage Gain vs. Control Voltage (Ambient Temperature)  
 $V_+ = 9V, V_{in} = -20dBV, f = 1kHz, R_L = 100\Omega$



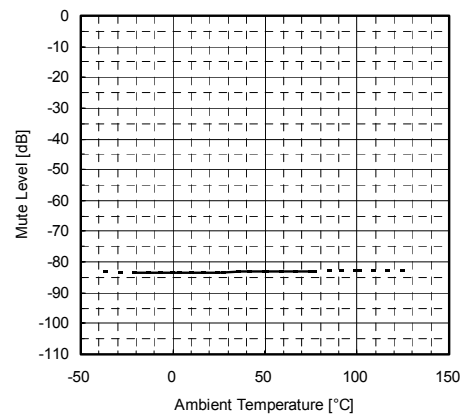
Mute Level vs. Mute Control Voltage  
 $V_+ = 9V, V_{in} = 0dBV, f = 1kHz, G_v = 0dB, R_L = 100\Omega$



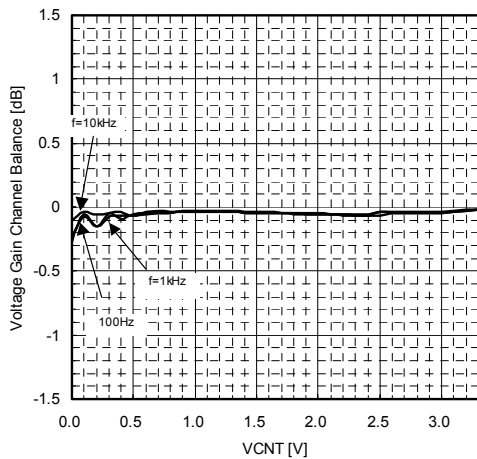
Mute Level vs. Frequency  
 $V_+ = 9V, V_{in} = 0dBV, G_v = 0dB, R_L = 100\Omega, MUTE = H, T_a = 25^\circ C$



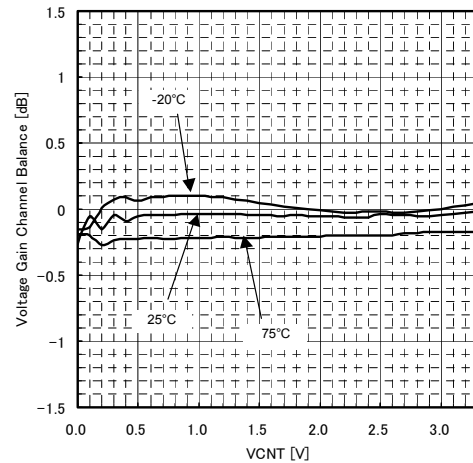
Mute Level vs. Ambient Temperature  
 $V_+ = 9V, V_{in} = 0dBV, f = 1kHz, G_v = 0dB, R_L = 100\Omega, MUTE = H$



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

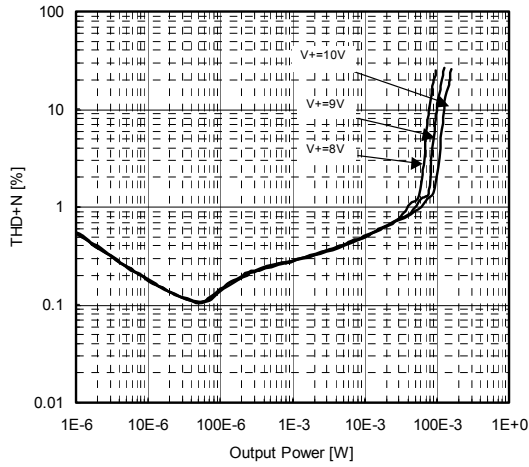


Voltage Gain Channel Balance vs. Control Voltage (Ambient Temperature)  
 $V_+ = 9V, V_{in} = -20dBV, f = 1kHz, R_L = 100\Omega$

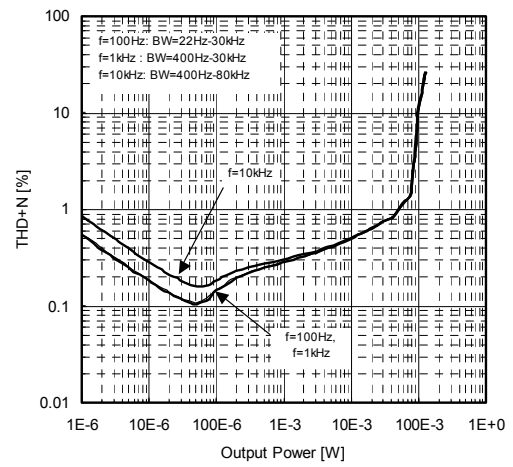


## TYPICAL CHARACTERISTICS

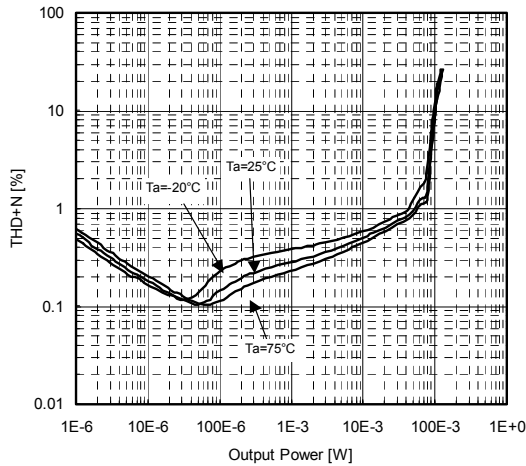
THD+N vs. Output Power (Operating Voltage)  
 $f=1\text{kHz}$ ,  $G_v=10\text{dB}$ ,  $R_L=100\Omega$ ,  $BW=400\text{Hz}-30\text{kHz}$ ,  $T_a=25^\circ\text{C}$



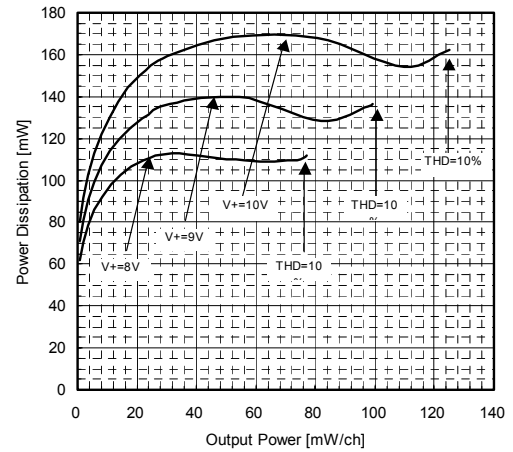
THD+N vs. Output Power (Frequency)  
 $V_+=9\text{V}$ ,  $G_v=10\text{dB}$ ,  $R_L=100\Omega$ ,  $T_a=25^\circ\text{C}$



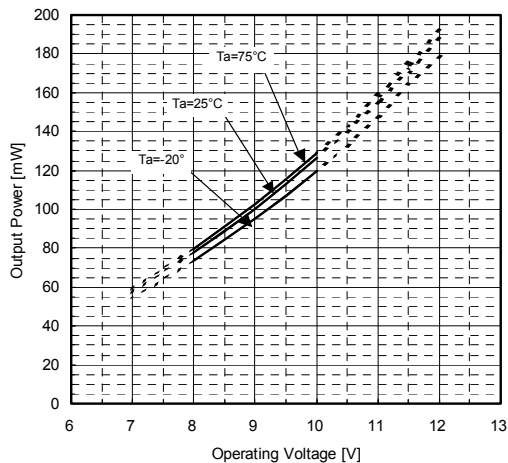
THD+N vs. Output Power (Ambient Temperature)  
 $V_+=9\text{V}$ ,  $f=1\text{kHz}$ ,  $G_v=10\text{dB}$ ,  $R_L=100\Omega$ ,  $BW=400\text{Hz}-30\text{kHz}$



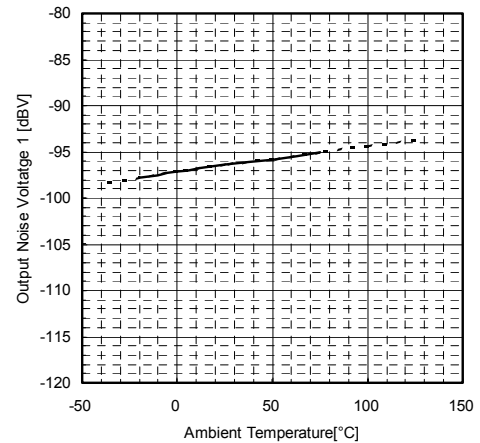
Power Dissipation vs. Output Power  
 $f=1\text{kHz}$ ,  $G_v=10\text{dB}$ ,  $R_L=100\Omega$ ,  $BW=400\text{Hz}-30\text{kHz}$ ,  $T_a=25^\circ\text{C}$ , 2ch Input



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

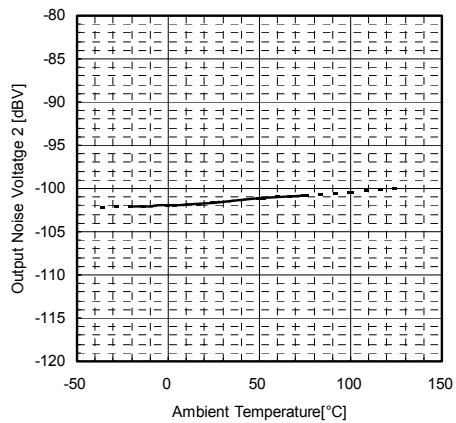


Output Noise Voltage 1 vs. Ambient Temperature  
 $V_+=9\text{V}$ ,  $G_v=0\text{dB}$ ,  $R_L=100\Omega$ ,  $R_g=0\Omega$ , A-Weighted, MUTE=L



## ■ TYPICAL CHARACTERISTICS

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



**[CAUTION]**

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