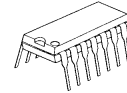


Headphone Amplifier with Electronic Volume

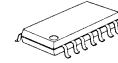
■ GENERAL DESCRIPTION

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.

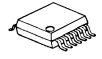
■ PACKAGE OUTLINE



NJM2777D



NJM2777M

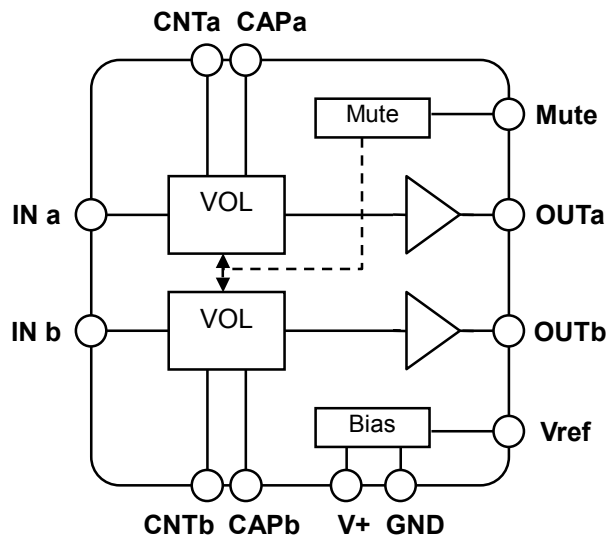


NJM2777V

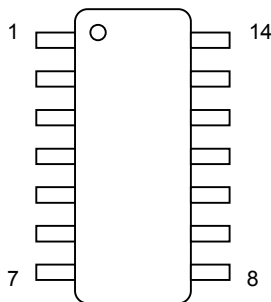
■ FEATURES

- 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

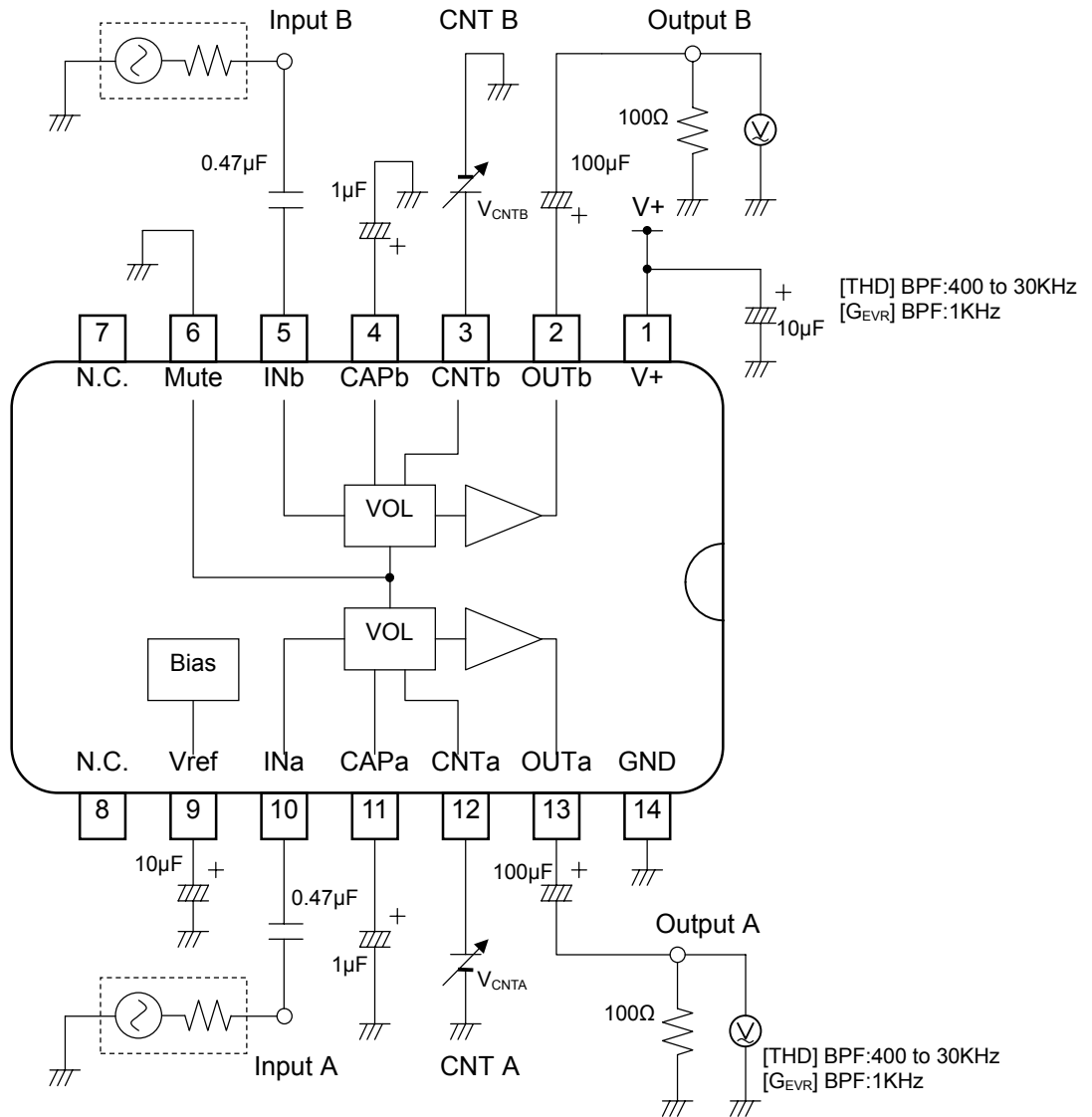
●CONTROL

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

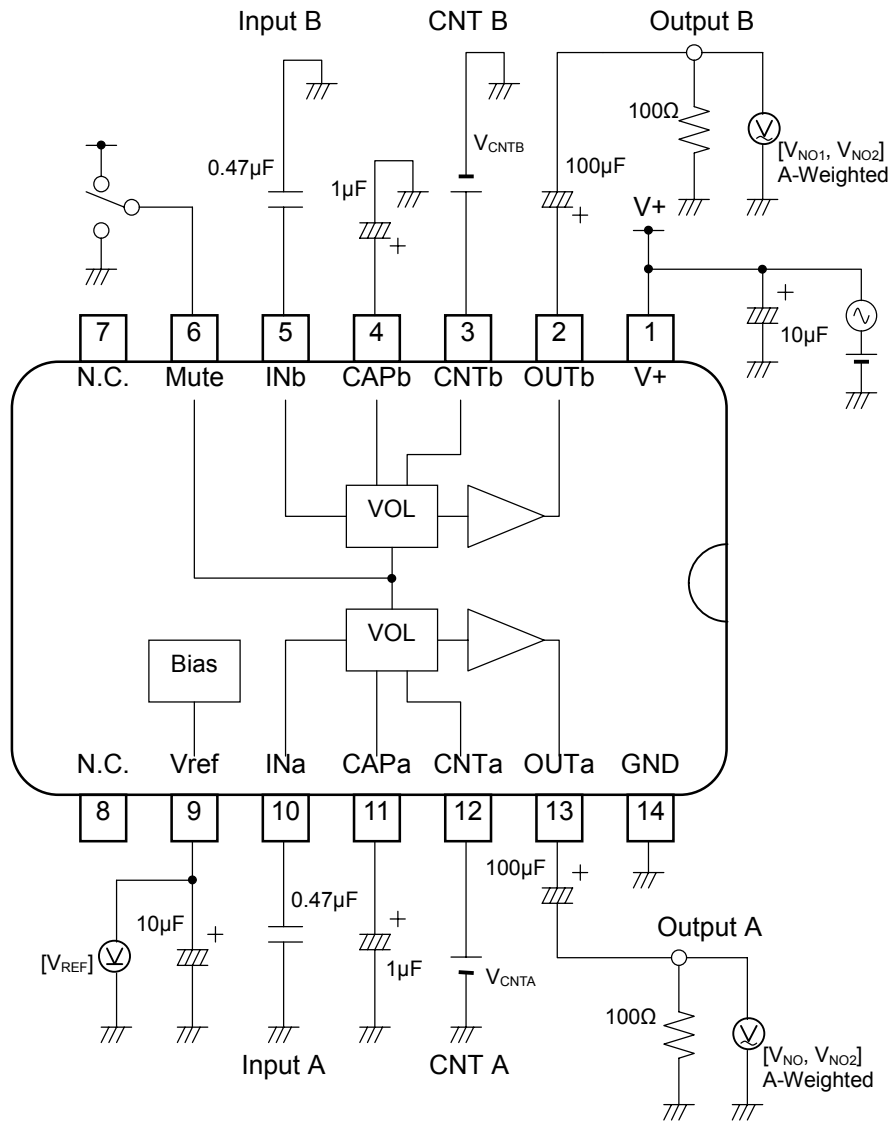
TEST CIRCUIT
TEST CIRCUIT1 (THD, GEVR, VIM, PO)



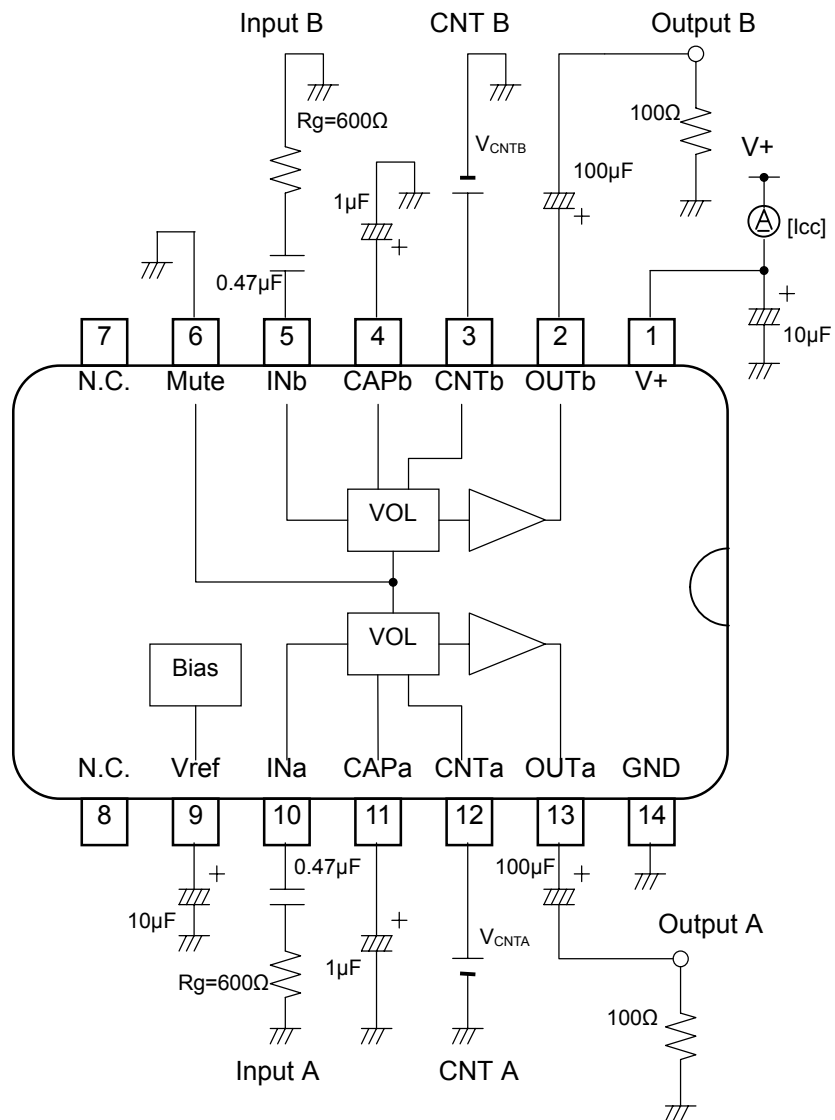
$$\text{Volume Range : } GEVR = 20 \log \frac{V_{o \max}}{V_{o \min}}$$

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

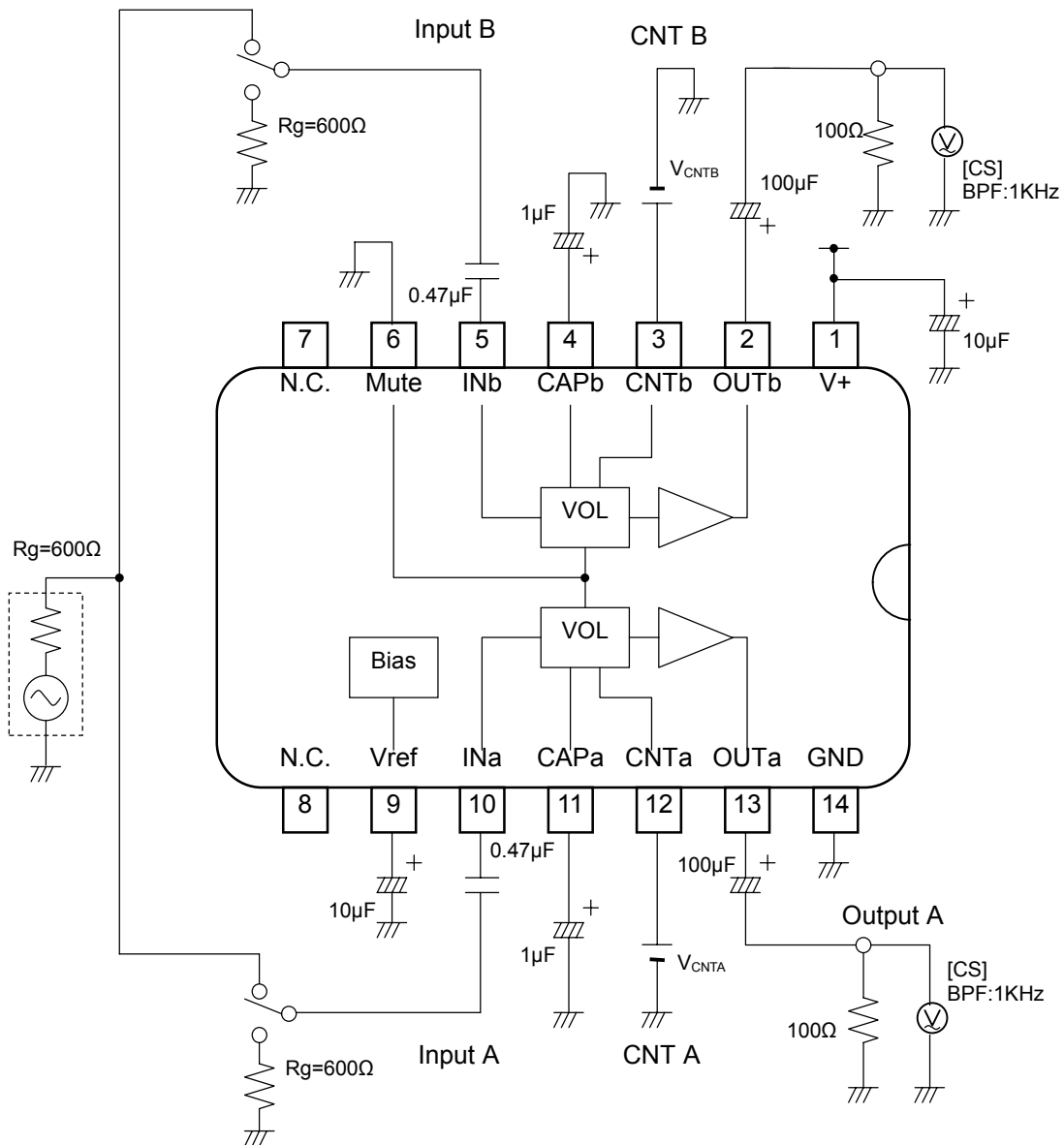
TEST CIRCUIT 2 (VNO1,VNO2,VREF)



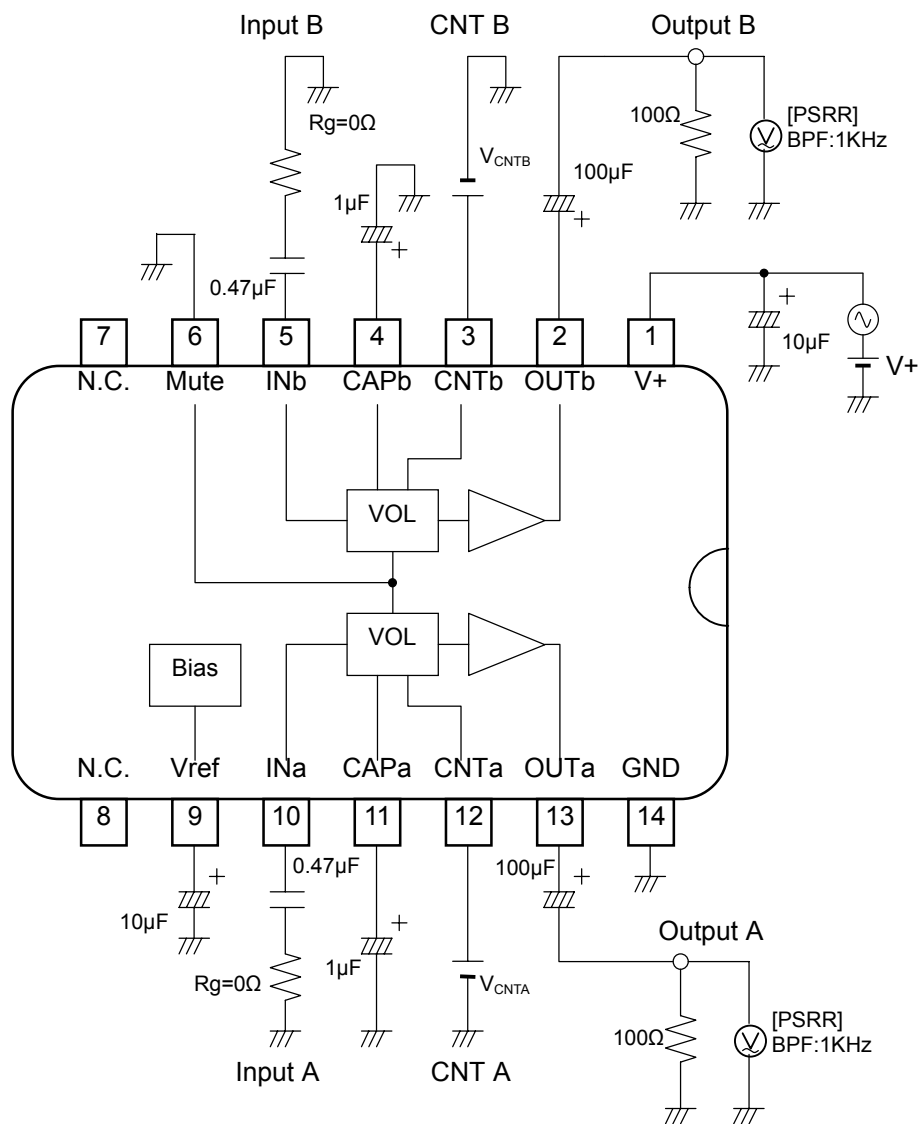
TEST CIRCUIT 3 (I_{cc})



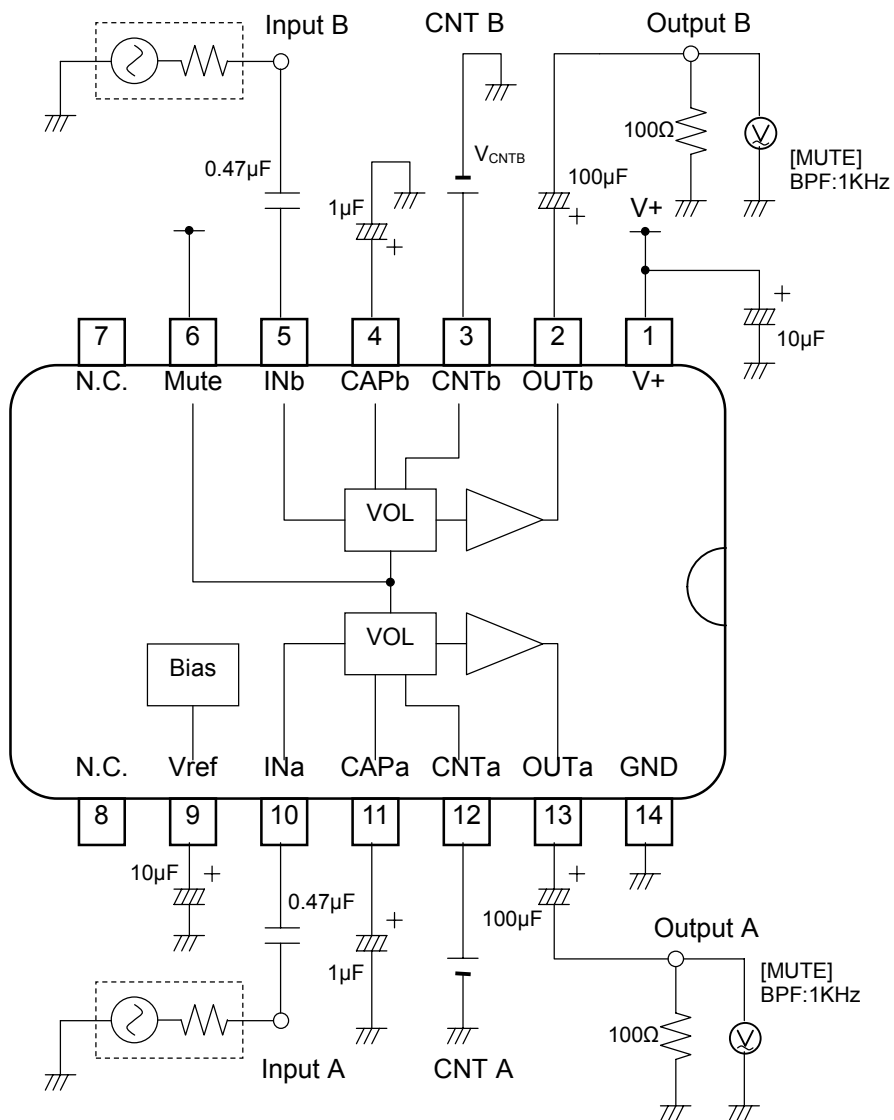
TEST CIRCUIT 4 (CS)



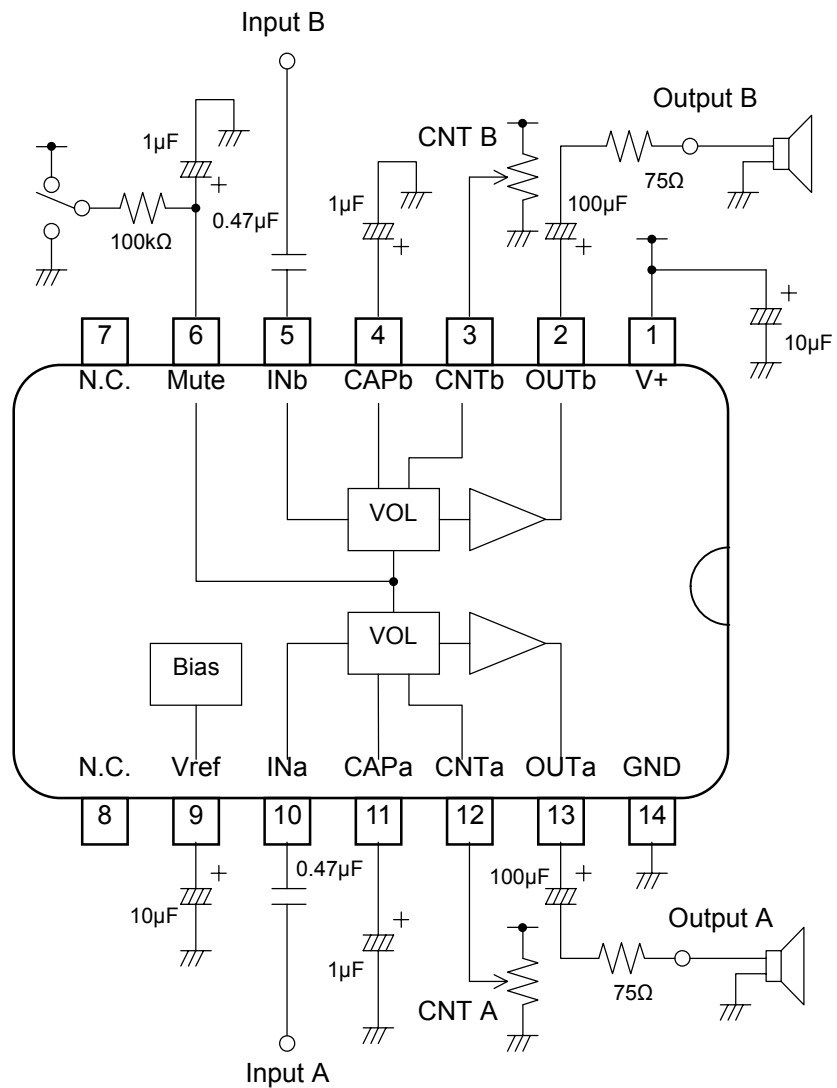
TEST CIRCUIT 5 (PSRR)



TEST CIRCUIT 6 (MUTE)



APPLICATION CIRCUIT



■ TERMINAL DESCRIPTION

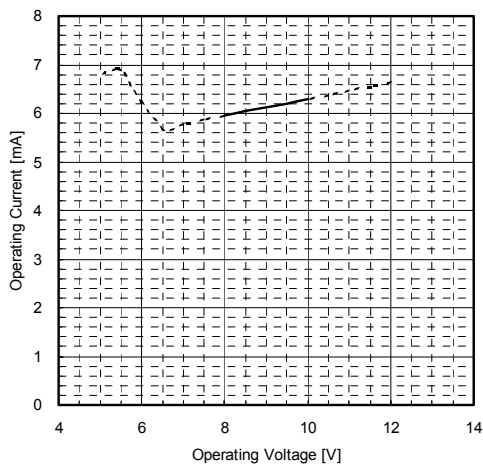
PIN NO.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	TERMINAL VOLTAGE
2 13	OUTb OUTa	Bch Output Ach Output		V+/2
3 12	CNTb CNTa	Bch Volume Control Ach Volume Control		-
4 11	CAPb CAPa	Bch Volume control click noise absorbing capacitor connect terminal Ach Volume control click noise absorbing capacitor connect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

■ TERMINAL DESCRIPTION

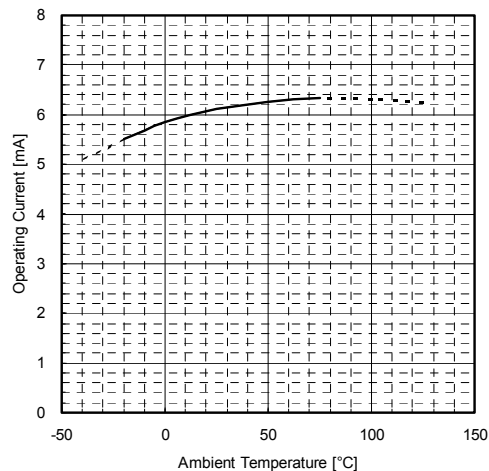
PIN NO.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	TERMINAL VOLTAGE
6	Mute	Mute Control		GND
9	Vref	Reference voltage stabilized capacitor connect terminal		$V+/2$

■ TYPICAL CHARACTERISTICS

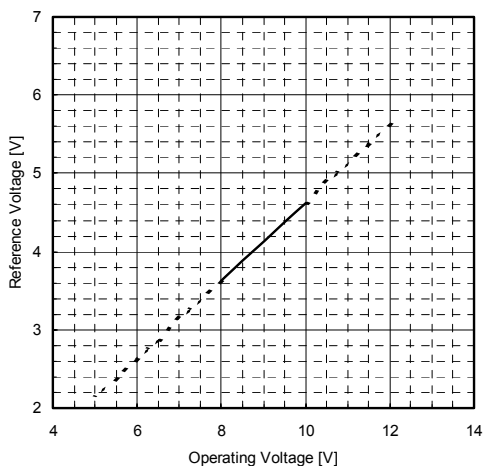
Operating Current vs. Operating Voltage
No signal, MUTE=L, Ta=25°C



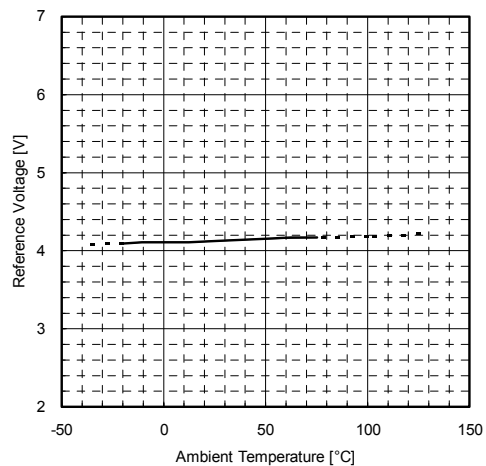
Operating Current vs. Ambient Temperature
V+=9V, No signal, MUTE=L



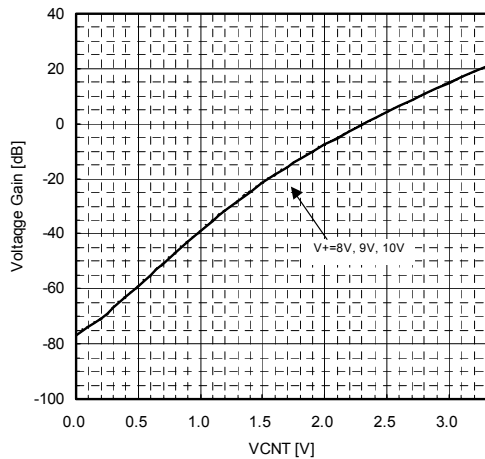
Reference Voltage vs. Operating Voltage
No signal, MUTE=L, Ta=25°C



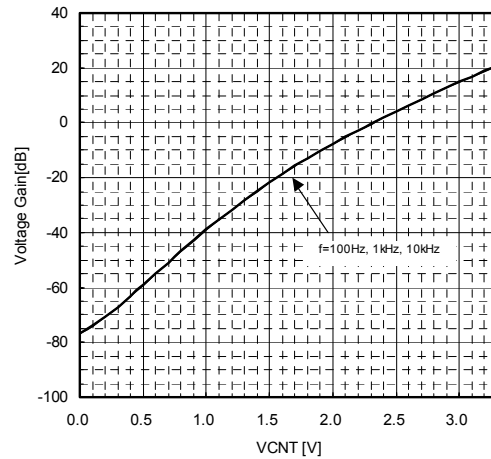
Reference Voltage vs. Ambient Temperature
V+=9V, No signal, MUTE=L



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

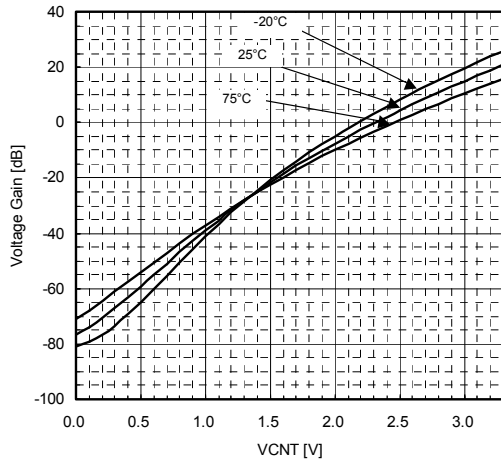


Voltage Gain vs. Control Voltage (Frequency)
V+=9V, Vin=-20dBV, RL=100Ω, Ta=25°C

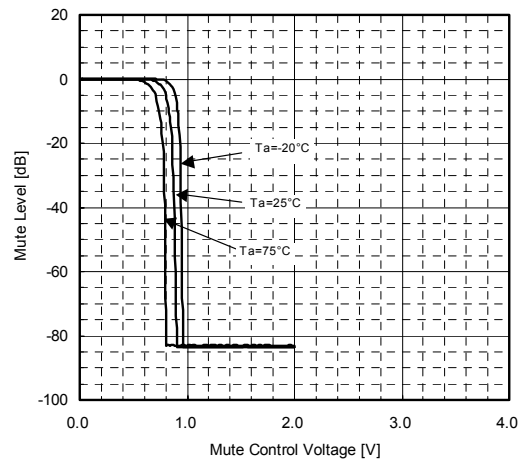


TYPICAL CHARACTERISTICS

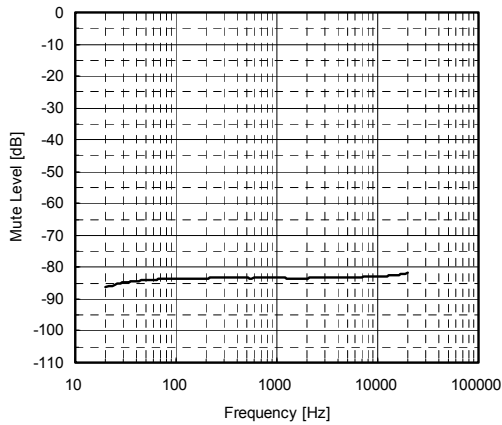
Voltage Gain vs. Control Voltage (Ambient Temperature)
 $V_+ = 9V, V_{in} = -20dBV, f = 1kHz, R_L = 100\Omega$



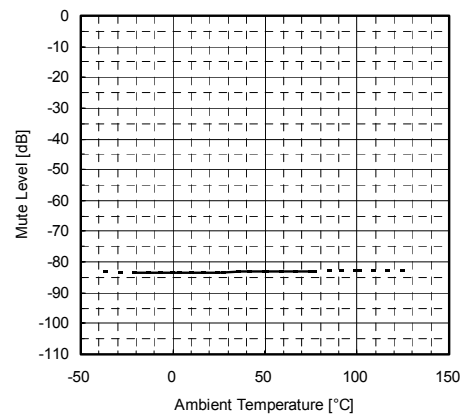
Mute Level vs. Mute Control Voltage
 $V_+ = 9V, V_{in} = 0dBV, f = 1kHz, G_v = 0dB, R_L = 100\Omega$



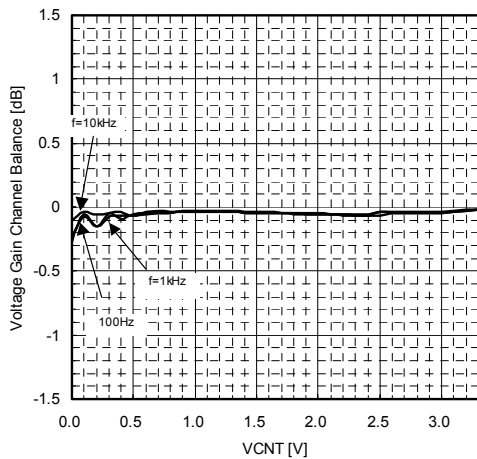
Mute Level vs. Frequency
 $V_+ = 9V, V_{in} = 0dBV, G_v = 0dB, R_L = 100\Omega, MUTE = H, T_a = 25^\circ C$



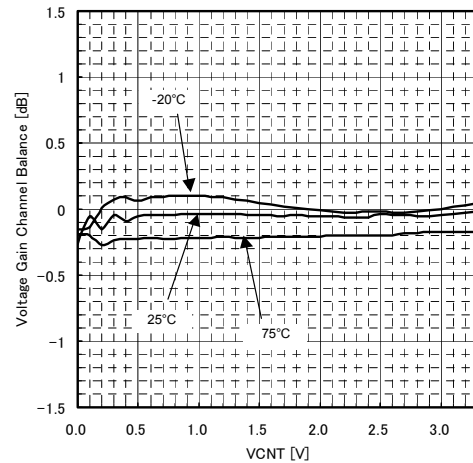
Mute Level vs. Ambient Temperature
 $V_+ = 9V, V_{in} = 0dBV, f = 1kHz, G_v = 0dB, R_L = 100\Omega, MUTE = H$



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

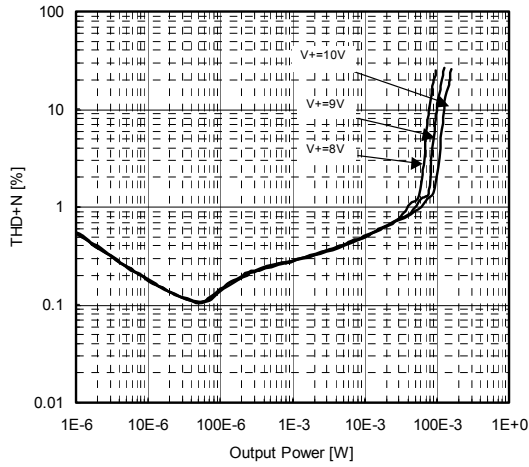


Voltage Gain Channel Balance vs. Control Voltage (Ambient Temperature)
 $V_+ = 9V, V_{in} = -20dBV, f = 1kHz, R_L = 100\Omega$

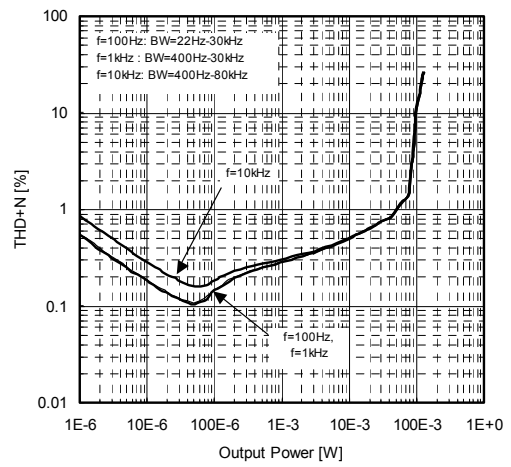


TYPICAL CHARACTERISTICS

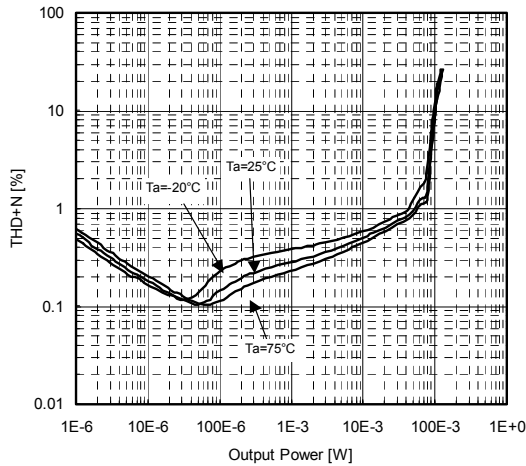
THD+N vs. Output Power (Operating Voltage)
 $f=1\text{kHz}$, $G_v=10\text{dB}$, $R_L=100\Omega$, $BW=400\text{Hz}-30\text{kHz}$, $T_a=25^\circ\text{C}$



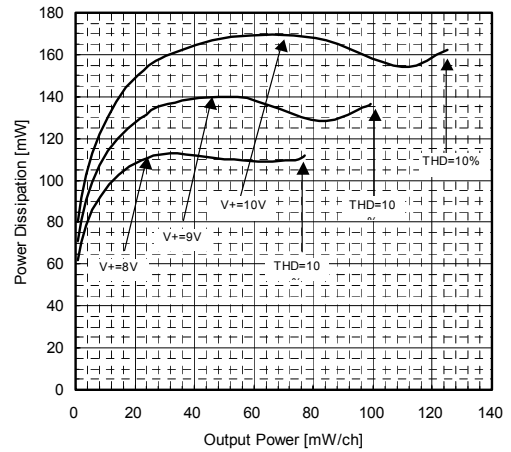
THD+N vs. Output Power (Frequency)
 $V_+=9\text{V}$, $G_v=10\text{dB}$, $R_L=100\Omega$, $T_a=25^\circ\text{C}$



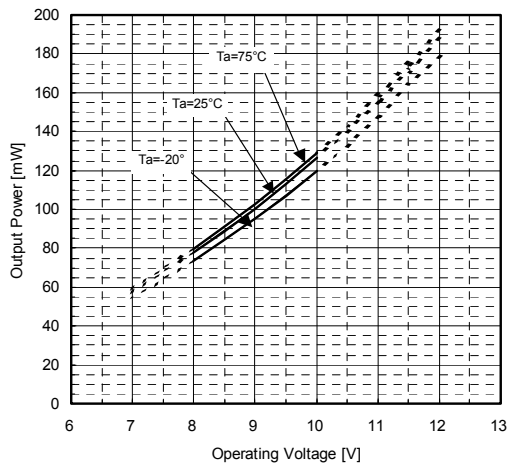
THD+N vs. Output Power (Ambient Temperature)
 $V_+=9\text{V}$, $f=1\text{kHz}$, $G_v=10\text{dB}$, $R_L=100\Omega$, $BW=400\text{Hz}-30\text{kHz}$



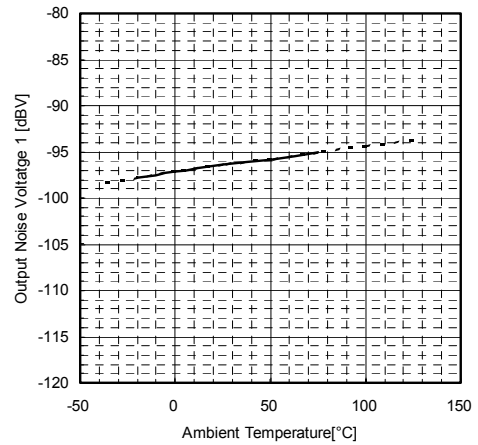
Power Dissipation vs. Output Power
 $f=1\text{kHz}$, $G_v=10\text{dB}$, $R_L=100\Omega$, $BW=400\text{Hz}-30\text{kHz}$, $T_a=25^\circ\text{C}$, 2ch Input



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

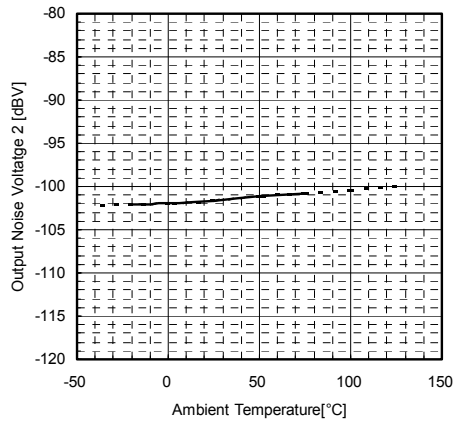


Output Noise Voltage 1 vs. Ambient Temperature
 $V_+=9\text{V}$, $G_v=0\text{dB}$, $R_L=100\Omega$, $R_g=0\Omega$, A-Weighted, MUTE=L



■ TYPICAL CHARACTERISTICS

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



[CAUTION]

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