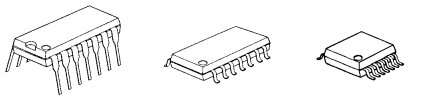
Headphone Amplifier with Electronic Volume

■ 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

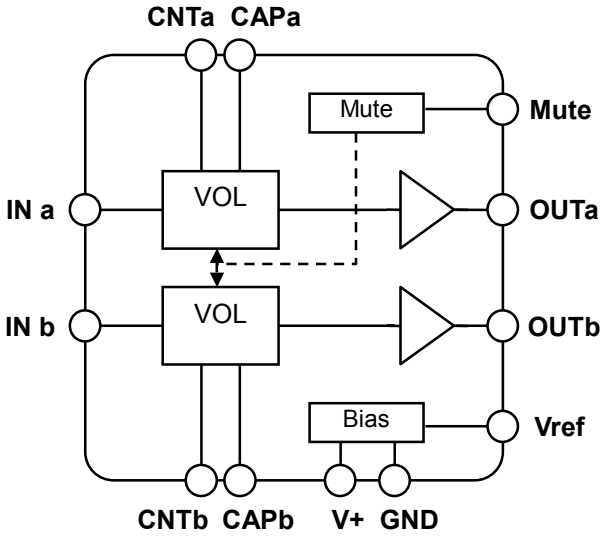


NJM2777D NJM2777M NJM2777V

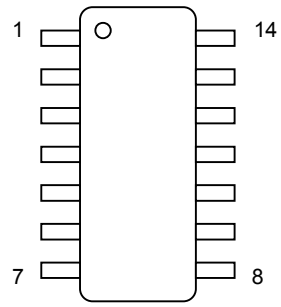
■ FEATURES

- 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, Gv=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	ΔGv		-1.5	0	1.5	dB
Maximum Input Voltage	V_{IM}	Gv=-10dB THD=3%	8.9 (2.8)	9.5 (3.0)	-	dBV (Vrms)
Output Power	P_O	Gv=10dB, THD=10%	70	100	-	mW
Total Harmonic Distortion	THD		-	0.1	1	%
Channel Separation	CS	Rg=600Ω, Vin = 0dBV	70	80	-	dB
Mute Level	Mute	"Mute" terminal=H, Vin = 0dBV	-	-85	-75	dB
Output Noise Voltage 1	V_{NO1}	Rg=0Ω, A-Weighted	-	-95 (18)	-85 (56)	dBV (μVrms)
Output Noise Voltage 2	V_{NO2}	"Mute" terminal =H Rg=0Ω, A-Weighted	-	-105 (5.6)	-95 (18)	dBV (μVrms)
Power Supply Ripple Rejection	PSRR	Vripple=-20dBV Rg=0Ω	-	70	-	dB

●CONTROL

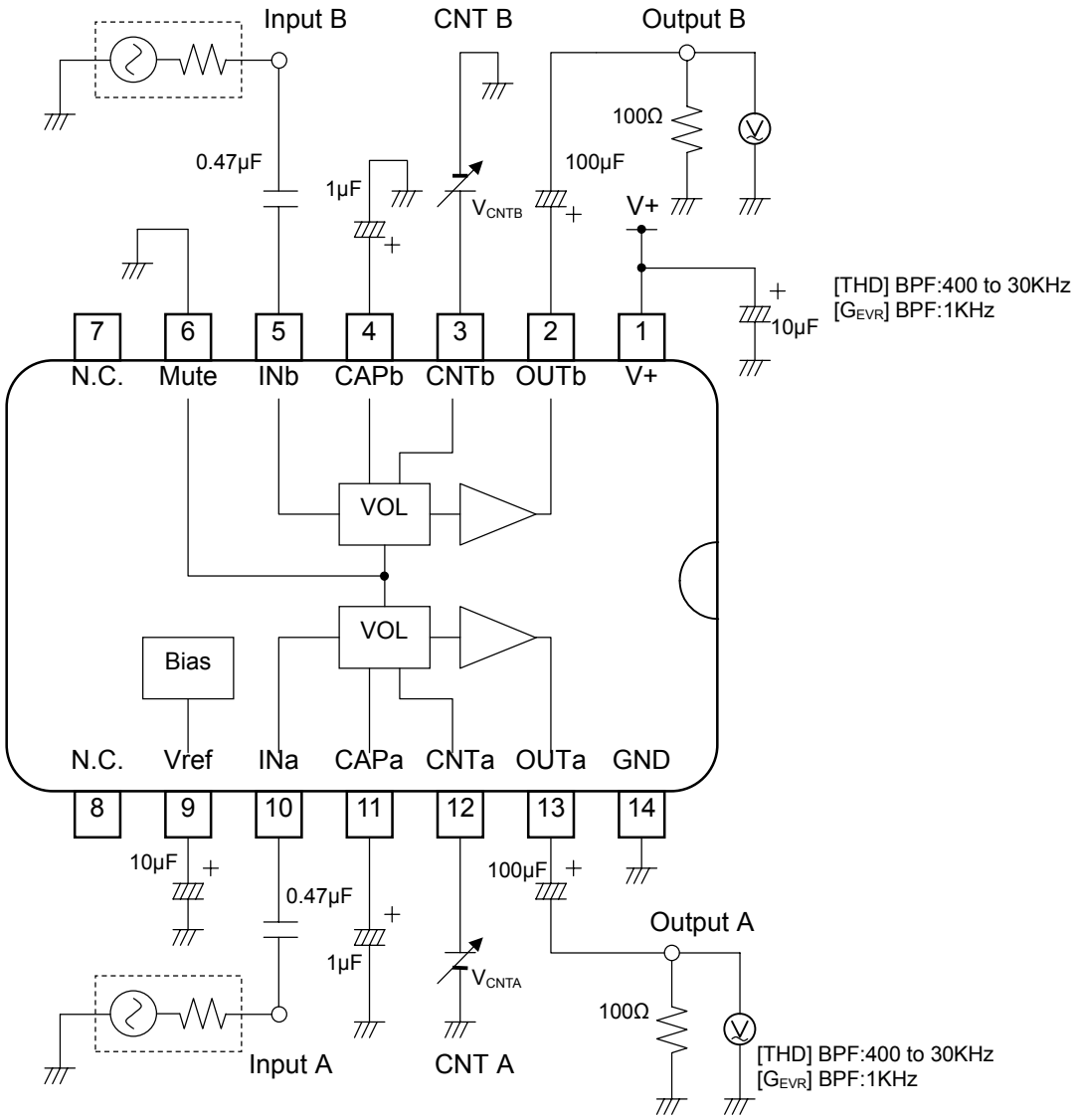
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
High Level Input Voltage	V_{IH}		2	-	V^+	V
Low Level Input Voltage	V_{IL}		0	-	0.4	V

■ CONTROL TERMINAL

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

■ **TEST CIRCUIT**

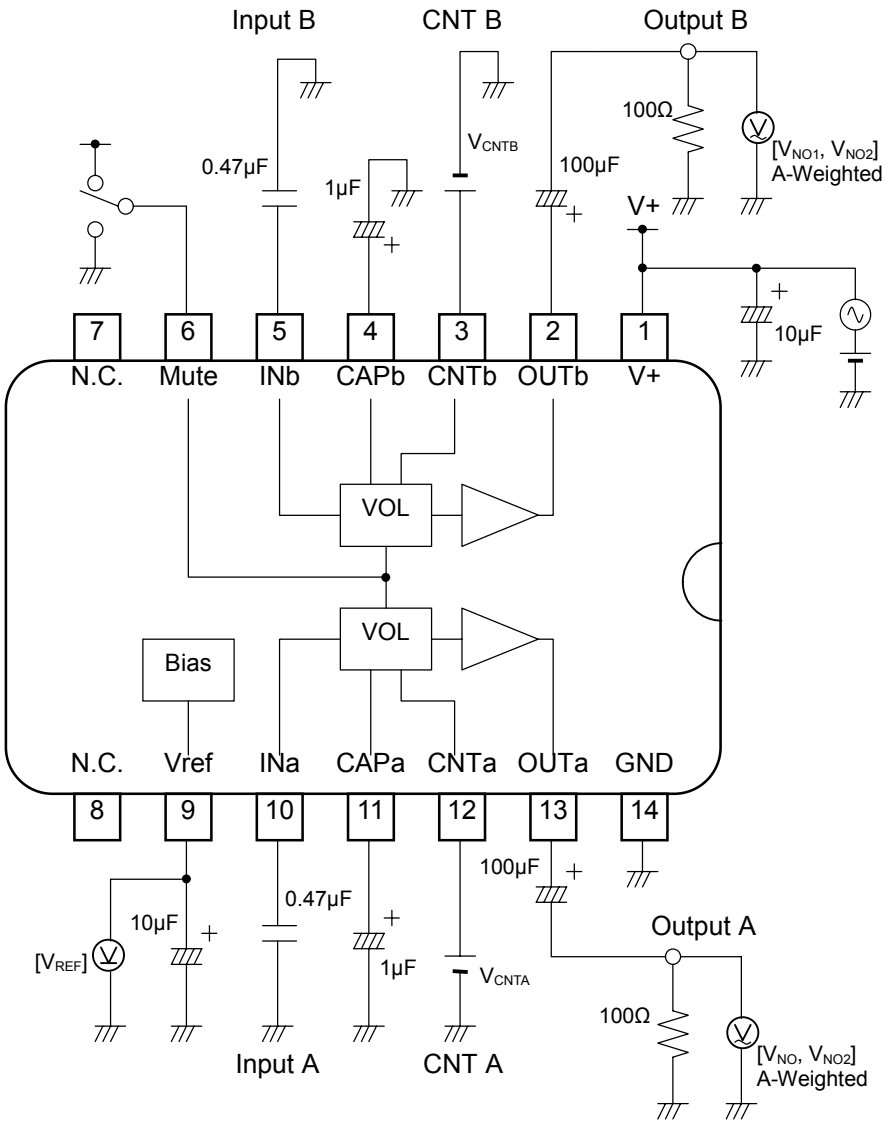
TEST CIRCUIT1 (THD, GEVR, VIM, PO)



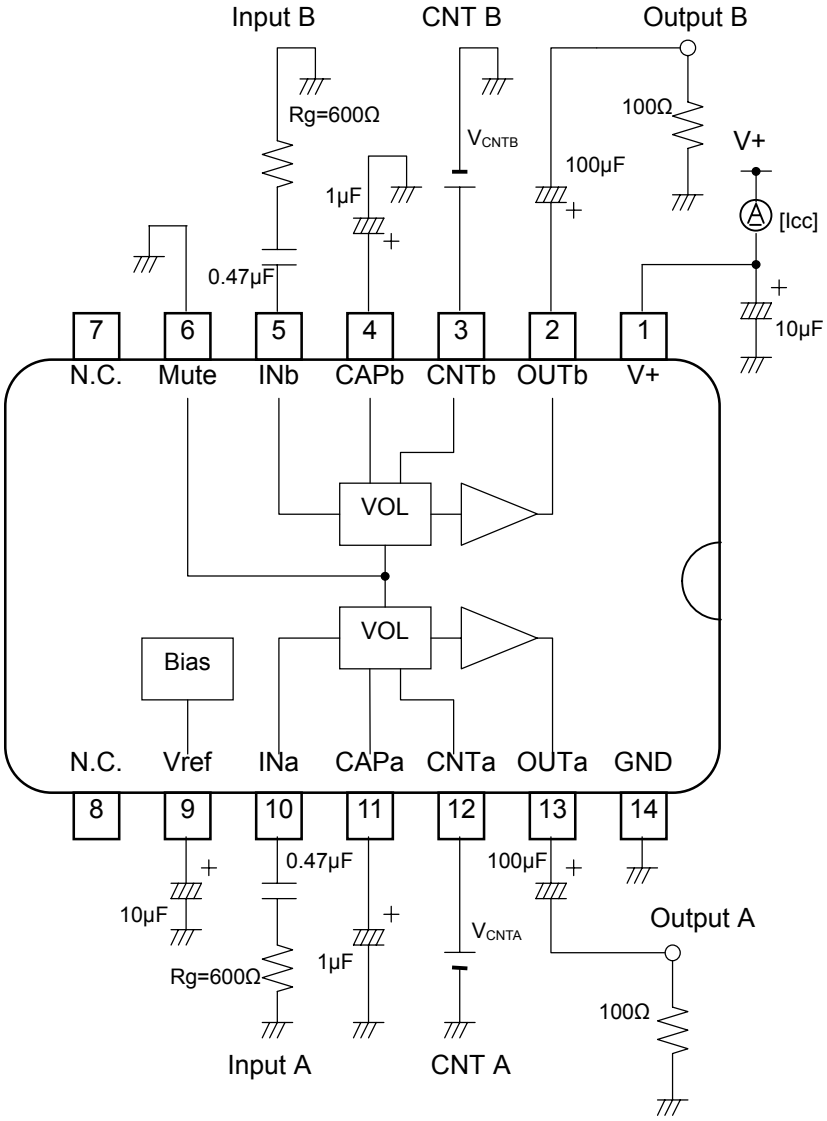
Volume Range : $G_{EVR} = 20\log\frac{Vo\max}{Vo\min}$

[Vomin : Output voltage at VCNT=0V
Vomax : Output voltage at VCNT=3.3V]

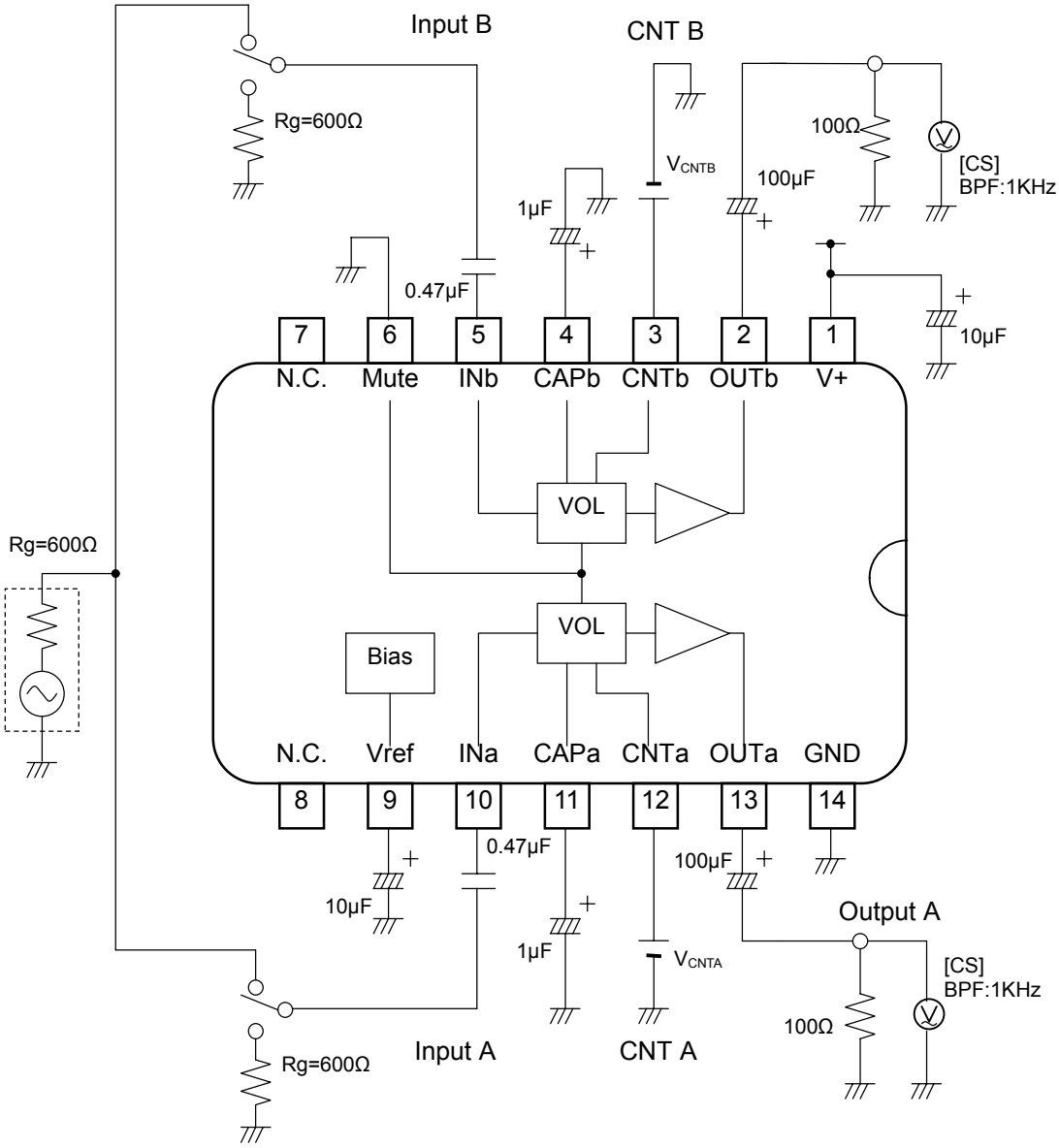
TEST CIRCUIT 2 (VNO1,VNO2,VREF)



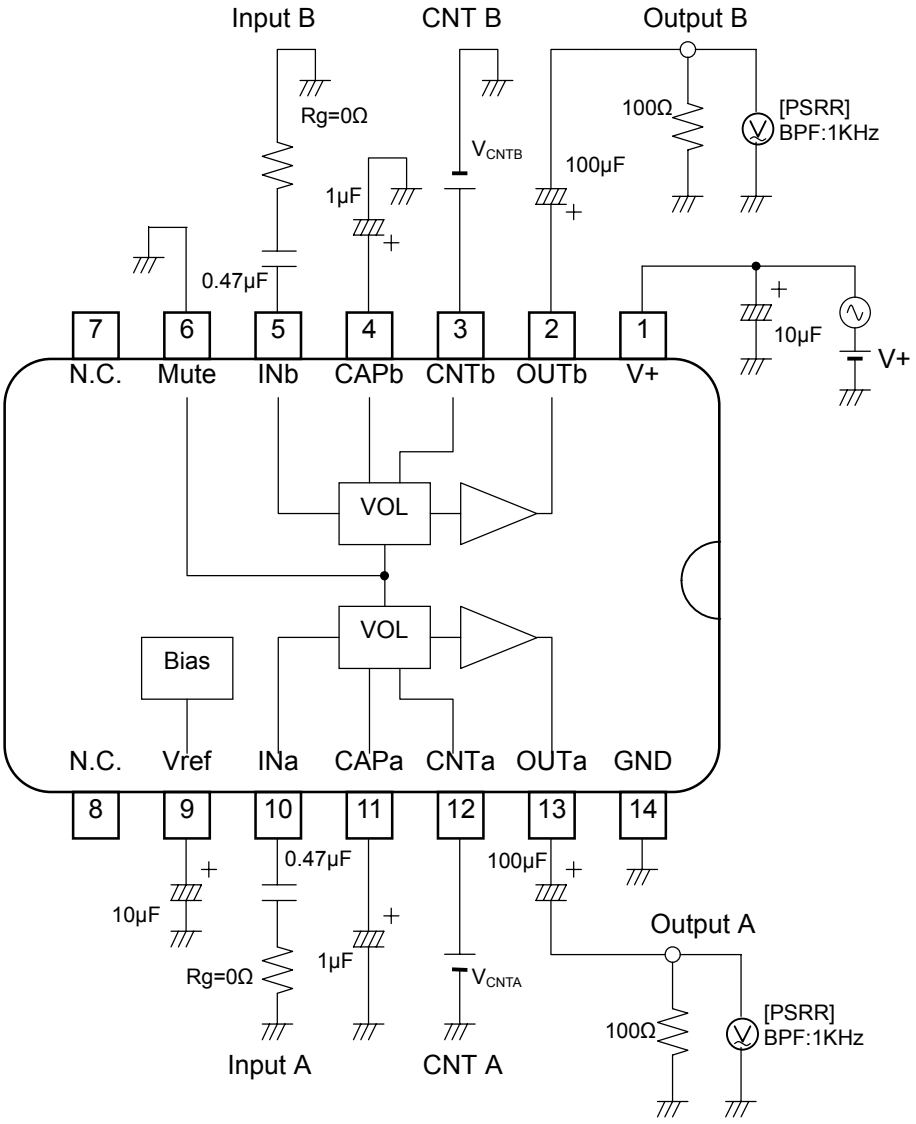
TEST CIRCUIT 3 (Icc)



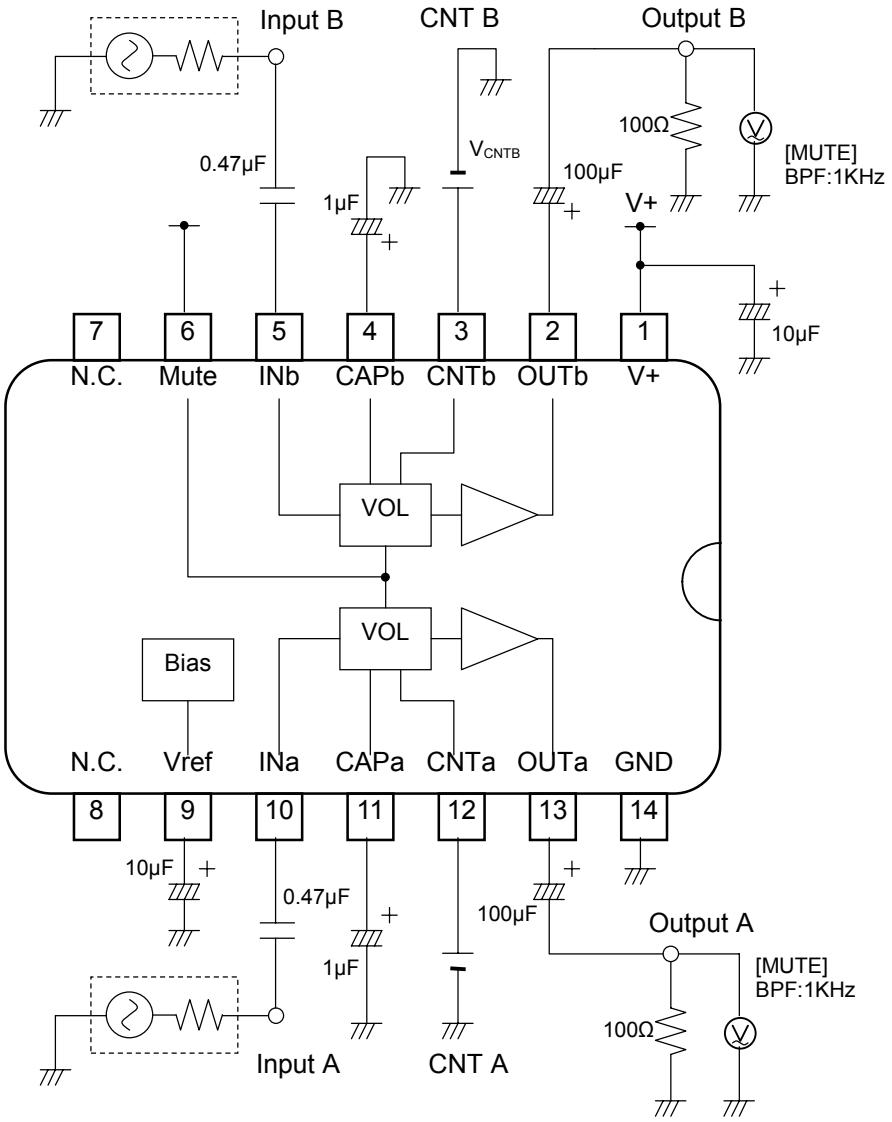
TEST CIRCUIT 4 (CS)



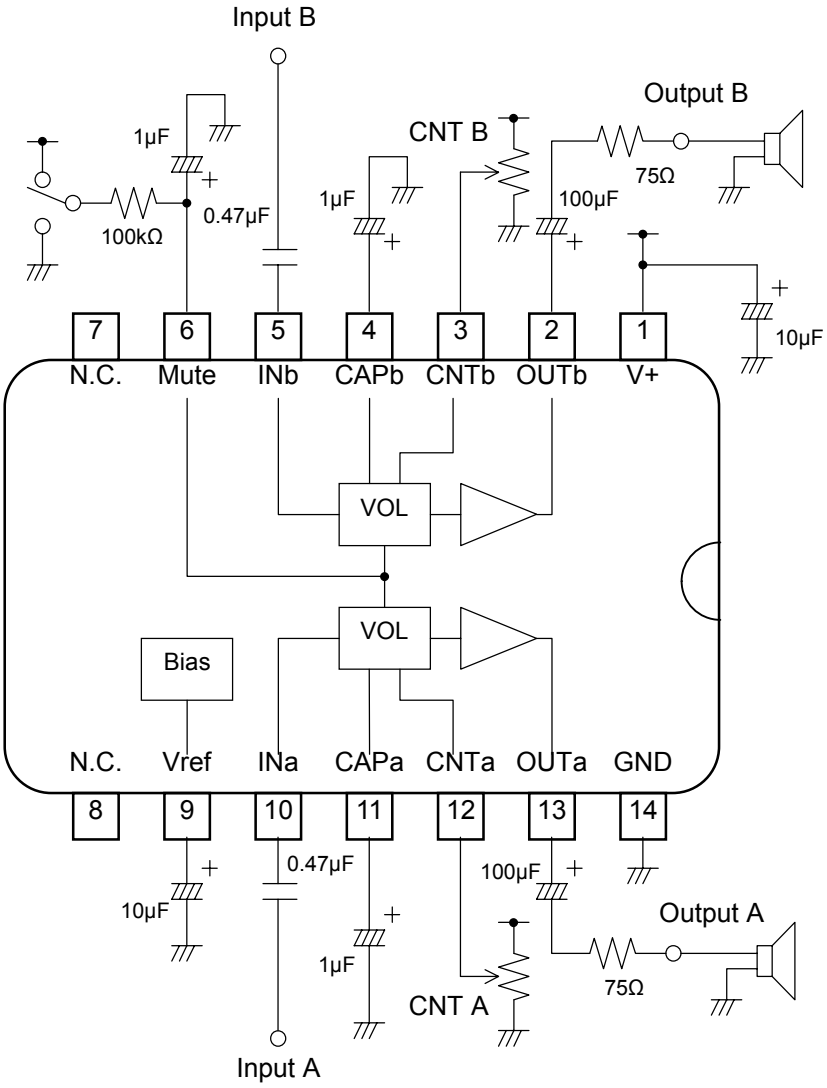
TEST CIRCUIT 5 (PSRR)



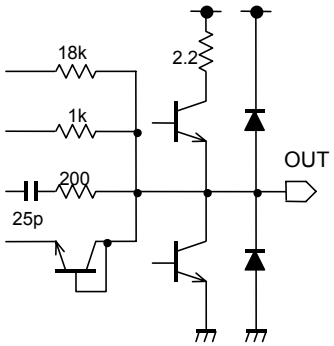
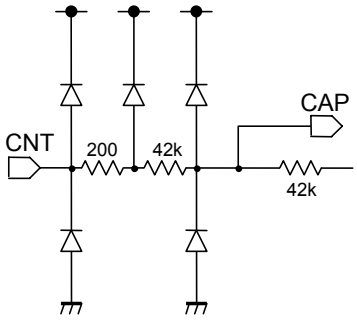
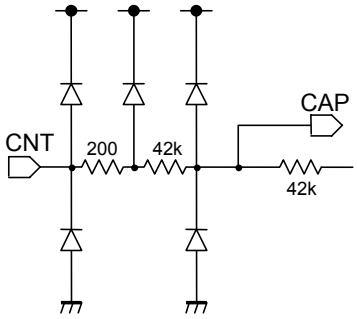
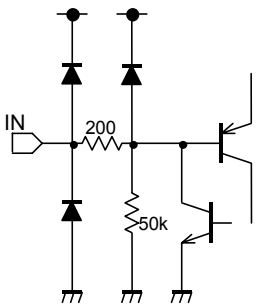
TEST CIRCUIT 6 (MUTE)



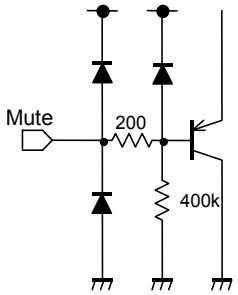
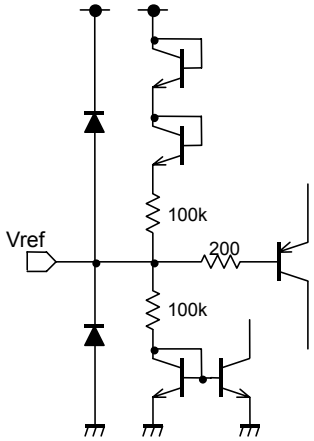
■ **APPLICATION CIRCUIT**



■ **TERMINAL DESCRIPTION**

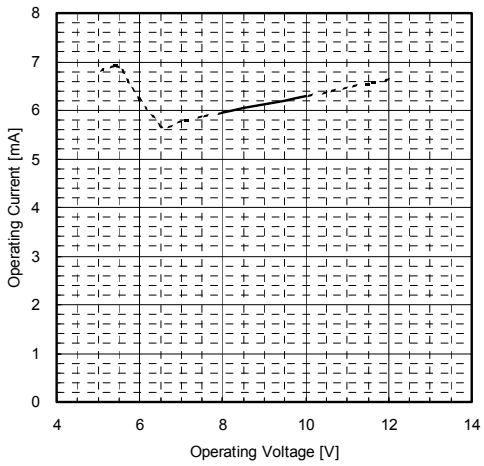
PIN NO.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	TERMINAL VOLTAGE
2 13	OUTb OUTa	Bch Output Ach Output		V+/2
3 12	CNTb CNTa	Bch Volume Control Ach Volume Control		-
4 11	CAPb CAPa	Bch Volume control click noise absorbing capacitor connect terminal Ach Volume control click noise absorbing capacitor connect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

■ **TERMINAL DESCRIPTION**

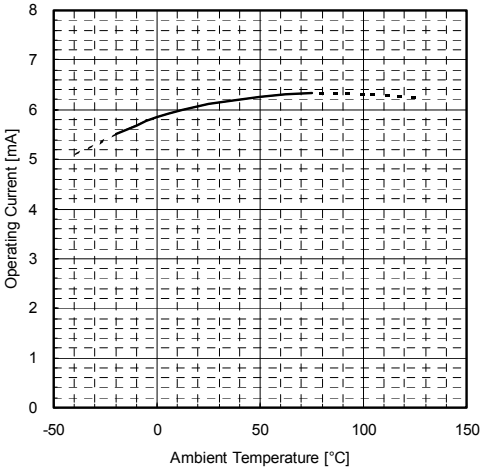
PIN NO.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	TERMINAL VOLTAGE
6	Mute	Mute Control		GND
9	Vref	Reference voltage stabilized capacitor connect terminal		V+/2

■ TYPICAL CHARACTERISTICS

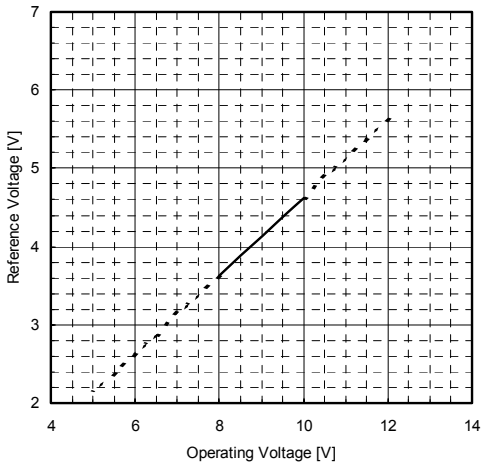
Operating Current vs. Operating Voltage
No signal, MUTE=L, Ta=25°C



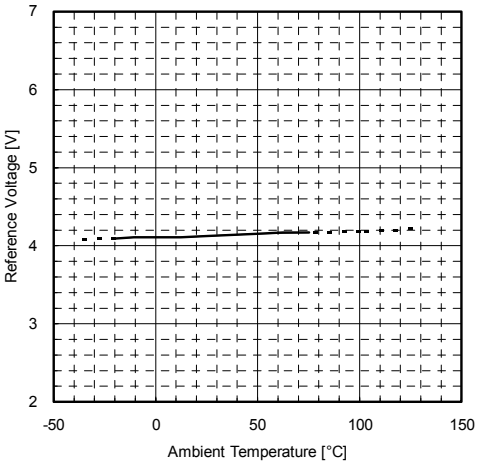
Operating Current vs. Ambient Temperature
V+=9V, No signal, MUTE=L



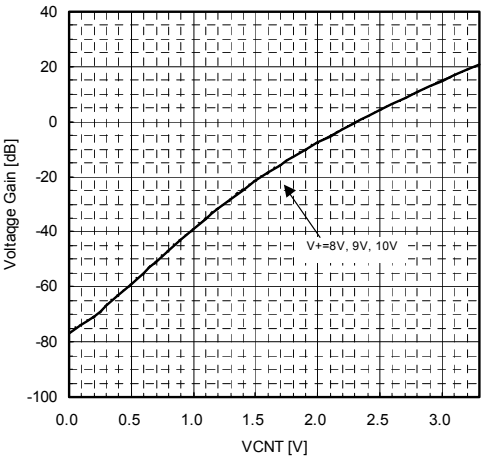
Reference Voltage vs. Operating Voltage
No signal, MUTE=L, Ta=25°C



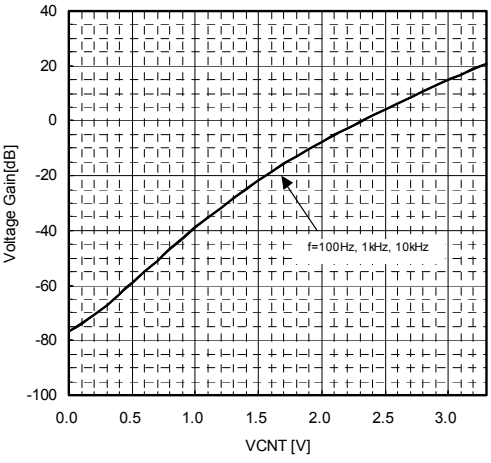
Reference Voltage vs. Ambient Temperature
V+=9V, No signal, MUTE=L



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

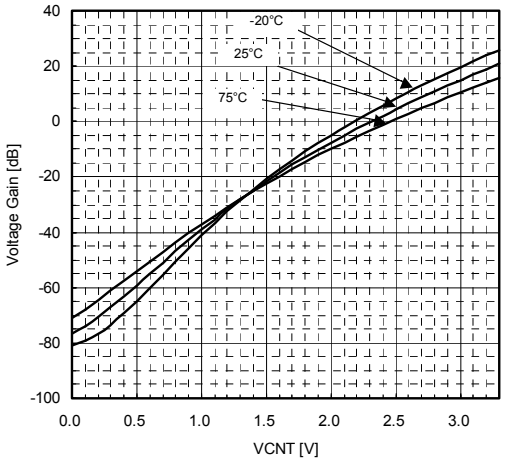


Voltage Gain vs. Control Voltage (Frequency)
V+=9V, Vin=-20dBV, RL=100Ω, Ta=25°C

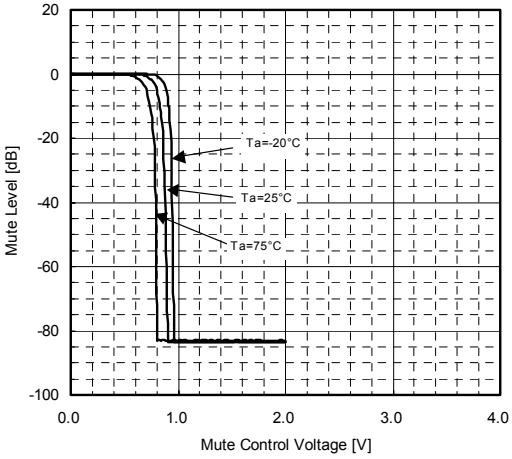


■ TYPICAL CHARACTERISTICS

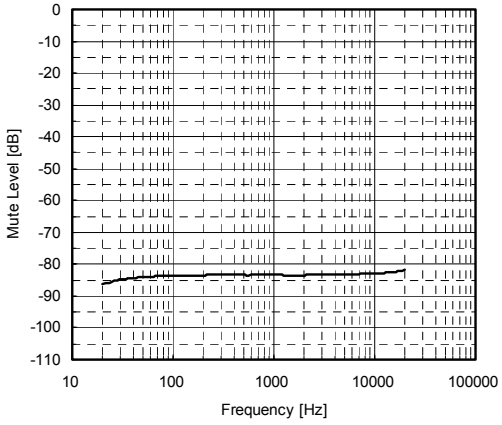
Voltage Gain vs. Control Voltage (Ambient Temperature)
V+=9V, Vin=-20dBV, f=1kHz, RL=100Ω



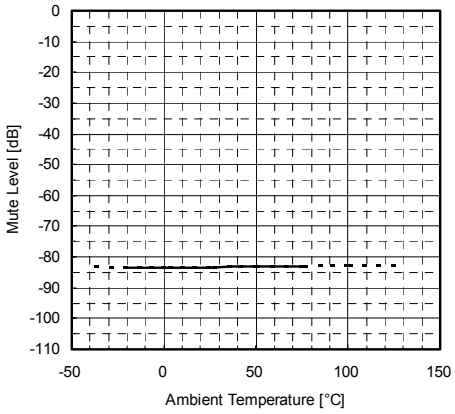
Mute Level vs. Mute Control Voltage
V+=9V, Vin=0dBV, f=1kHz, Gv=0dB, RL=100Ω



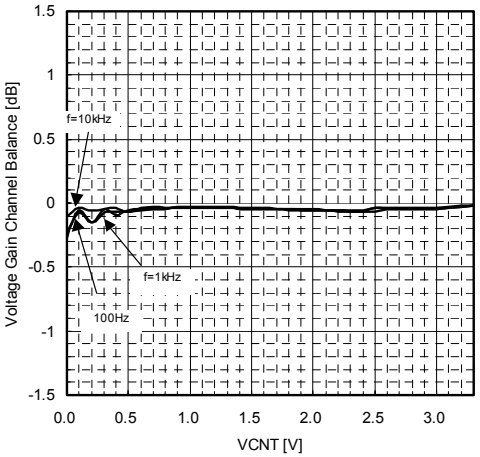
Mute Level vs. Frequency
V+=9V, Vin=0dBV, Gv=0dB, RL=100Ω, MUTE=H, Ta=25°C



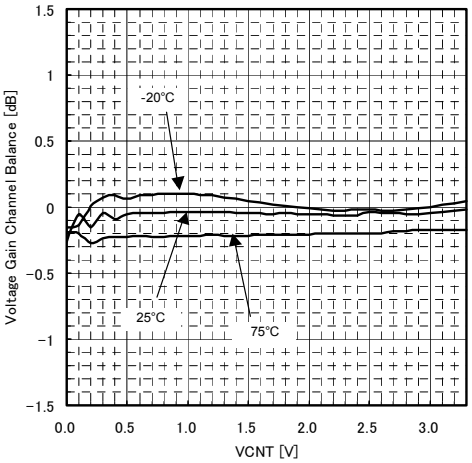
Mute Level vs. AMbient Temperature
V+=9V, Vin=0dBV, f=1kHz, Gv=0dB, RL=100Ω, MUTE=H



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

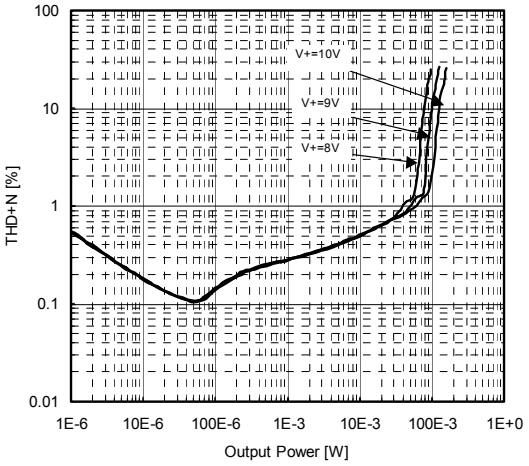


Voltage Gain Channel Balance vs. Control Voltage (Ambient Temperature)
V+=9V, Vin=-20dBV, f=1kHz, RL=100Ω

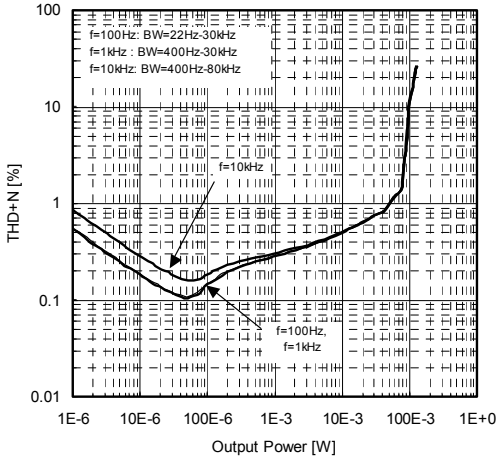


■ TYPICAL CHARACTERISTICS

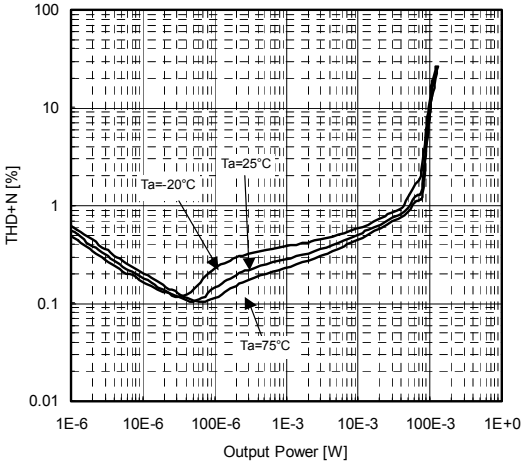
THD+N vs. Output Power (Operating Voltage)
f=1kHz, Gv=10dB, RL=100Ω, BW=400Hz-30kHz, Ta=25°C



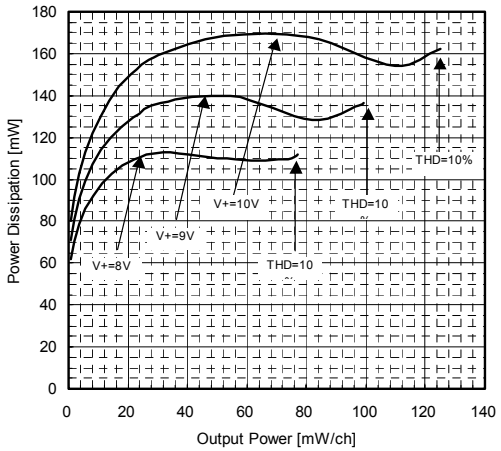
THD+N vs. Output Power (Frequency)
V+=9V, Gv=10dB, RL=100Ω, Ta=25°C



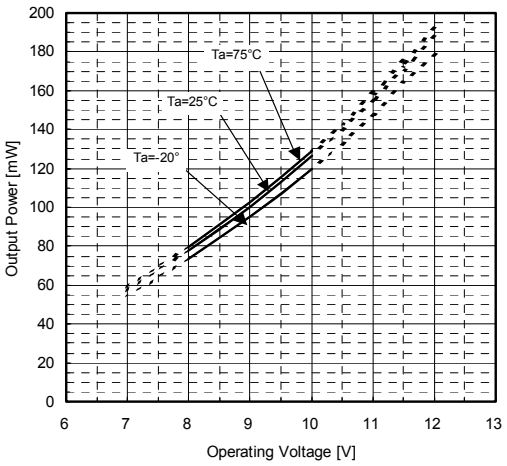
THD+N vs. Output Power (Ambient Temperature)
V+=9V, f=1kHz, Gv=10dB, RL=100Ω, BW=400Hz-30kHz



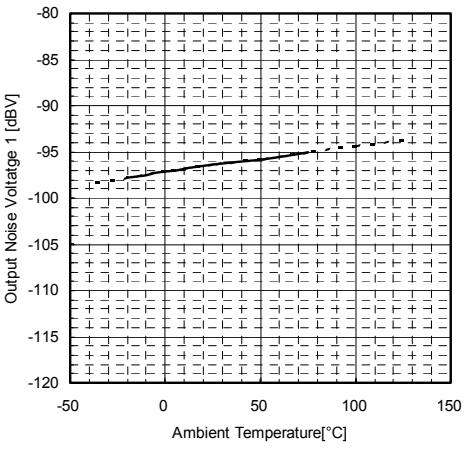
Power Dissipation vs. Output Power
f=1kHz, Gv=10dB, RL=100Ω, BW=400Hz-30kHz, Ta=25°C, 2ch Input



Output Power vs. Operating Voltage
f=1kHz, THD=10%, Gv=10dB, RL=100Ω, BW=400Hz-30kHz

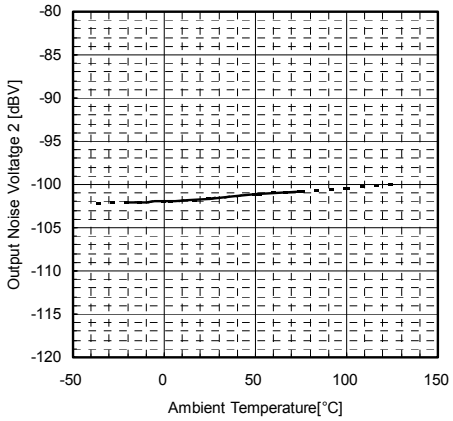


Output Noise Voltatge 1 vs. Ambient Temperature
V+=9V, Gv=0dB, RL=100Ω, Rg=0Ω, A-Weighted, MUTE=L



■ TYPICAL CHARACTERISTICS

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



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