



2-CHANNEL ELECTRONIC VOLUME WITH INPUT SELECTOR

■ GENERAL DESCRIPTION

NJW1156 is a two channel electronic volume with 5 input selector. It's suitable for Input signal trimmer of audio equipments such as DVD / HDD recorder and VCR. These functions are controlled by I²C Bus.

■ PACKAGE OUTLINE



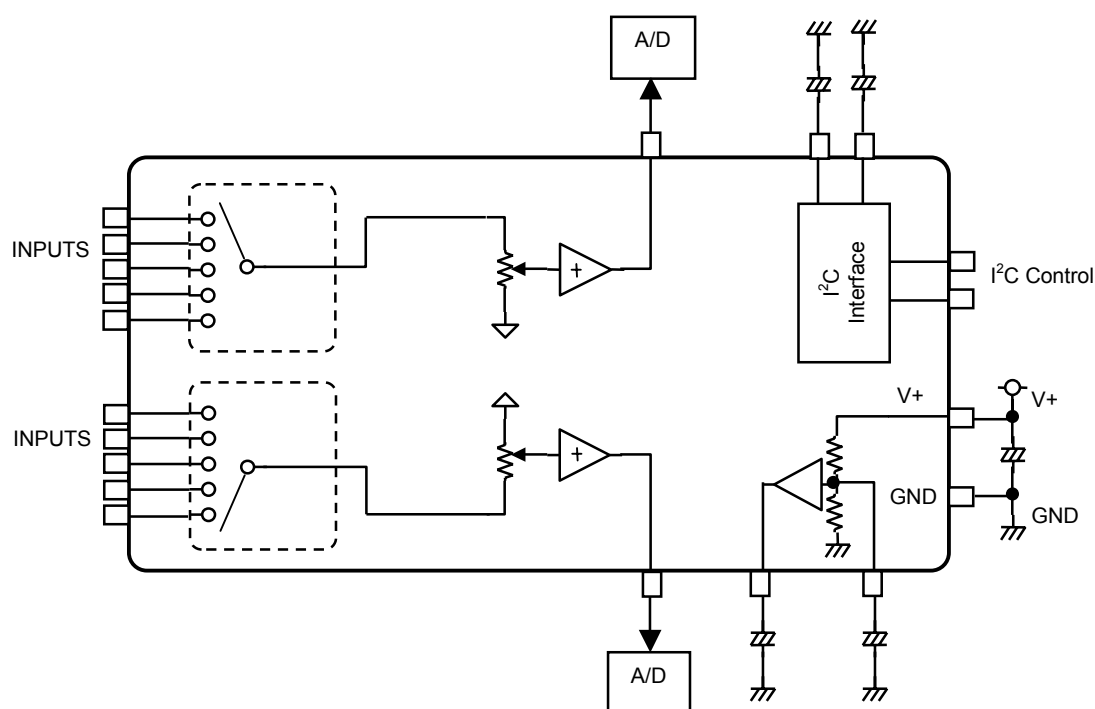
NJW1156V

NJW1156M

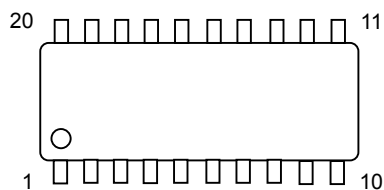
■ FEATURES

- | | |
|--------------------------------|------------------------------|
| ● Operating Voltage | 8 to 13V |
| ● I ² C Bus control | |
| ● 5 Input Selector | |
| ● Volume | 0 to -39.5dB/0.5dBstep, MUTE |
| ● Bi-CMOS Technology | |
| ● Package Outline | SSOP20, DMP20 |

■ BLOCK DIAGRAM



PIN FUNCTION



No.	SYMBOL	FUNCTION
1	GND	Ground
2	R1IN	R channel Input 1
3	R2 IN	R channel Input 2
4	R3IN	R channel Input 3
5	R4IN	R channel Input 4
6	R5IN	R channel Input 5
7	ROUT	R channel Output
8	VSSOUT	Internal VSS Noise Rejection Capacitor Terminal
9	SCL	I ² C Clock Input
10	SDA	I ² C Data Input
11	VDDOUT	Internal VDD Noise Rejection Capacitor Terminal
12	VREFOUT	Reference Voltage Output
13	V+	Power Supply
14	VREFIN	Reference Voltage Noise Rejection Capacitor Terminal
15	LOUT	L channel Output
16	L5IN	L channel Input 5
17	L4IN	L channel Input 4
18	L3IN	L channel Input 3
19	L2IN	L channel Input 2
20	L1IN	L channel Input 1

ABSOLUTE MAXIMUM RATING (Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Power Supply Voltage	V+	15	V
Power Dissipation	P _D	375	mW
Operating Temperature Range	Topr	-20 to +75	°C
Storage Temperature Range	Tstg	-40 to +125	°C

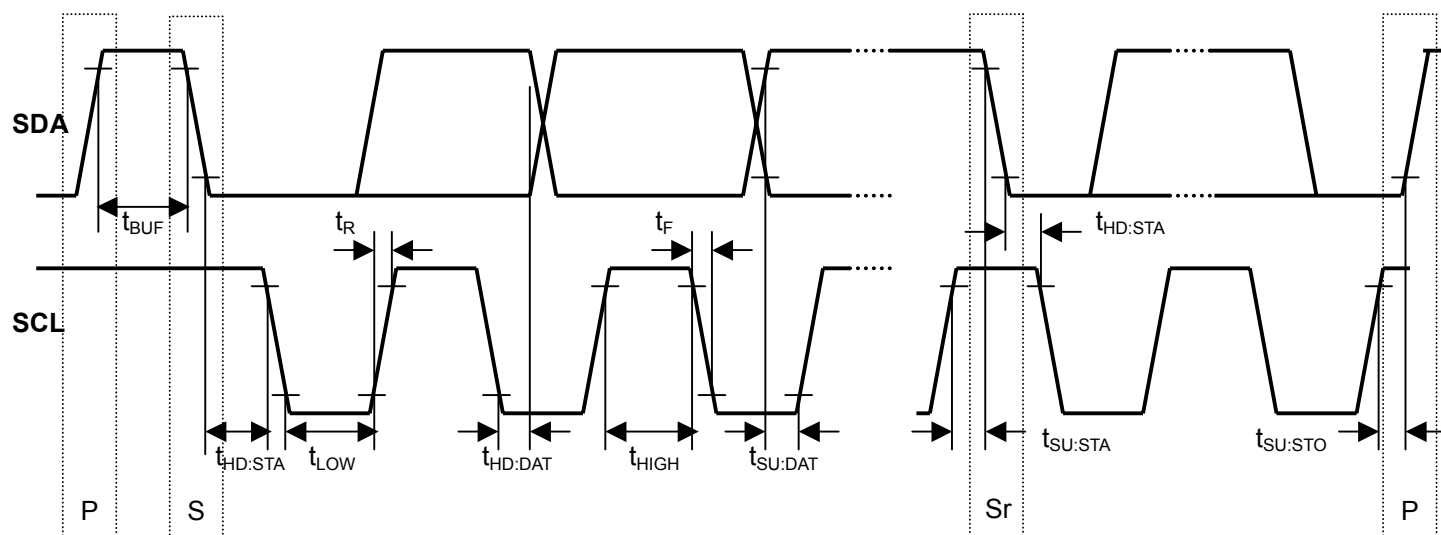
ELECTRICAL CHARACTERISTICS (Ta=25°C, V⁺=+12V)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
◆ Power Supply						
Operating Voltage	V+	-	8	12	13	V
Reference Voltage	V _{ref}	-	5.5	6	6.5	V
Supply Current	I _{CC}	No signal	-	4.5	6.8	mA
◆ Input/Output Characteristics						
Maximum Output Voltage	V _{OM}	f=1kHz, THD=1% Volume=0dB	3.0	4.0	-	V _{rms}
Voltage Gain 1	G _{V1}	V _{IN} =1V _{rms} , f=1kHz Volume=0dB	-0.5	0	0.5	dB
Voltage Gain 2	G _{V2}	V _{IN} =1V _{rms} , f=1kHz Volume=-20dB	-21	-20	-19	dB
Voltage Gain 3	G _{V3}	V _{IN} =1V _{rms} , f=1kHz Volume=-39.5dB	-42.0	-39.5	-37.0	dB
Voltage Gain Error	ΔG _V	V _{IN} =1V _{rms} , f=1kHz Volume=-20dB, A _{ch} - B _{ch}	-0.5	0	0.5	dB
Mute Level	Mute	f=1kHz, V _{IN} =1V _{rms} Volume=Mute, A-weight	-	-100	-	dB
Output Noise	V _{NO}	Volume=0dB, R _g =0Ω, A-weight	-	-110 (3.2μ)	-100 (10μ)	dBV (V _{rms})
Total Harmonic Distortion	THD	f=1kHz, V _o =1V _{rms} , Volume=0dB BW : 400Hz - 30kHz	-	0.0015	0.05	%
Channel Separation	CS	f=1kHz, V _o =1V _{rms} , Volume=0dB R _g =0Ω, A-weight	-	-100	-90	dB

■ I²C BUS BLOCK CHARACTERISTICS (SDA,SCL)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
High Level Input Voltage	V _{IH}	2.5	-	5.0	V
Low Level Input Voltage	V _{IL}	0	-	1.5	V
High Level Input Current	I _{IH}	-	-	10	μA
Low Level Input Current	I _{IL}	-	-	10	μA
Low Level Output Voltage (3mA at SDA pin)	V _{OL}	0	-	0.4	V
Maximum Output Current	I _{OL}	-3.0	-	-	mA
Maximum Clock Frequency	f _{SCL}	-	-	100	kHz
Data Change Minimum Waiting Time	t _{BUF}	4.7	-	-	μs
Data Transfer Start Minimum Waiting Time	t _{HD:STA}	4.0	-	-	μs
Low Level Clock Pulse Width	t _{LOW}	4.7	-	-	μs
High Level Clock Pulse Width	t _{HIGH}	4.0	-	-	μs
Minimum Start Preparation Waiting Time	t _{SU:STA}	4.7	-	-	μs
Minimum Data Hold Time	t _{HD:DAT}	5.0	-	-	μs
Minimum Data Preparation Time	t _{SU:DAT}	250	-	-	ns
Rise Time	t _R	-	-	1.0	μs
Fall Time	t _F	-	-	300	ns
Minimum Stop Preparation Waiting Time	t _{SU:STO}	4.0	-	-	μs

I²C BUS Load Condition: Pull up resistance 4kΩ (Connected to +5V)
Load capacitance 200pF (Connected to GND)



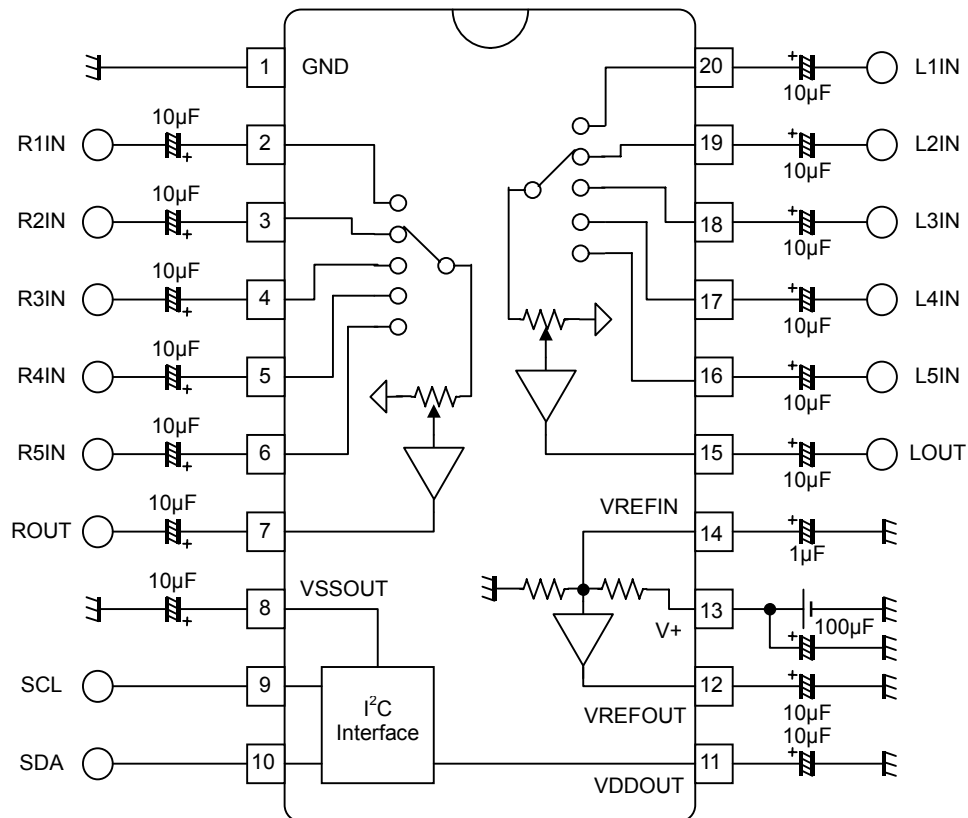
■ TERMINAL DESCRIPTION

PIN NO.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	TERMINAL DC VOLTAGE
2 3 4 5 6 16 17 18 19 20	R1IN R2IN R3IN R4IN R5IN L5IN L4IN L3IN L2IN L1IN	R channel Input 1 R channel Input 2 R channel Input 3 R channel Input 4 R channel Input 5 L channel Input 5 L channel Input 4 L channel Input 3 L channel Input 2 L channel Input 1		$V^+/2$
7 15	ROUT LOUT	Rch Output Lch Output		$V^+/2$
8 11	VSS_OUT VDD_OUT	Internal VSS Noise Rejection Capacitor Terminal Internal VDD Noise Rejection Capacitor Terminal		$VSS_OUT = V_{ref} - 2.5V$ $VDD_OUT = V_{ref} + 2.5V$
9	SCL	I ² C Clock Input		-

■ TERMINAL DESCRIPTION

PIN NO.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	TERMINAL DC VOLTAGE
10	SDA	I ² C Data Input		-
12	VREFOUT	Reference Voltage Output		V ⁺ /2
13	V+	Power Supply		V ⁺
14	VREFIN	Reference Voltage Noise Rejection Capacitor Terminal		V ⁺ /2

■ APPLICATION CIRCUIT



■ DEFINITION OF I²C REGISTER

◆ I²C BUS FORMAT



S: Starting Term

A: Acknowledge Bit

P: Ending Term

◆ SLAVE ADDRESS

MSB							LSB
1	0	0	0	0	0	1	0

◆ CONTROL REGISTER TABLE

The select address sets each function (Volume, Selector).

The auto increment function cycles the select address as follows.

00H→01H→02H→00H

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
00H	Don't Care	VOLa						
01H	Don't Care	VOLb						
02H	Don't Care	TEST	OFF	Don't Care		Selector		

◆ CONTROL REGISTER DEFAULT VALUE

Control register default value is all "0".

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
00H	0	0	0	0	0	0	0	0
01H	0	0	0	0	0	0	0	0
02H	0	0	0	0	0	0	0	0

■ CONTROL COMMAND TABLE

a) Master Volume

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
00H	Don't Care	VOLa						
01H	Don't Care	VOLb						

•VOLa / VOLb : Ach and Bch volume level setting from 0dB to -39.5dB with 0.5dB step.

Gain (dB)	VOLa / VOLb						
	D6	D5	D4	D3	D2	D1	D0
0	0	0	0	0	0	0	0
-0.5	0	0	0	0	0	0	1
-1	0	0	0	0	0	1	0
-1.5	0	0	0	0	0	1	1
-2	0	0	0	0	1	0	0
-2.5	0	0	0	0	1	0	1
-3	0	0	0	0	1	1	0
-3.5	0	0	0	0	1	1	1
-4	0	0	0	1	0	0	0
-4.5	0	0	0	1	0	0	1
-5	0	0	0	1	0	1	0
-5.5	0	0	0	1	0	1	1
-6	0	0	0	1	1	0	0
-6.5	0	0	0	1	1	0	1
-7	0	0	0	1	1	1	0
-7.5	0	0	0	1	1	1	1
-8	0	0	1	0	0	0	0
-8.5	0	0	1	0	0	0	1
-9	0	0	1	0	0	1	0
-9.5	0	0	1	0	0	1	1
-10	0	0	1	0	1	0	0
-10.5	0	0	1	0	1	0	1
-11	0	0	1	0	1	1	0
-11.5	0	0	1	0	1	1	1
-12	0	0	1	1	0	0	0
-12.5	0	0	1	1	0	0	1
-13	0	0	1	1	0	1	0
-13.5	0	0	1	1	0	1	1
-14	0	0	1	1	1	0	0
-14.5	0	0	1	1	1	0	1
-15	0	0	1	1	1	1	0
-15.5	0	0	1	1	1	1	1
-16	0	1	0	0	0	0	0
-16.5	0	1	0	0	0	0	1
-17	0	1	0	0	0	1	0
-17.5	0	1	0	0	0	1	1
-18	0	1	0	0	1	0	0
-18.5	0	1	0	0	1	0	1
-19	0	1	0	0	1	1	0
-19.5	0	1	0	0	1	1	1
-20	0	1	0	1	0	0	0
...
-39.5	1	0	0	1	1	1	1
Mute	1	1	1	1	1	1	1

b)Input Selector

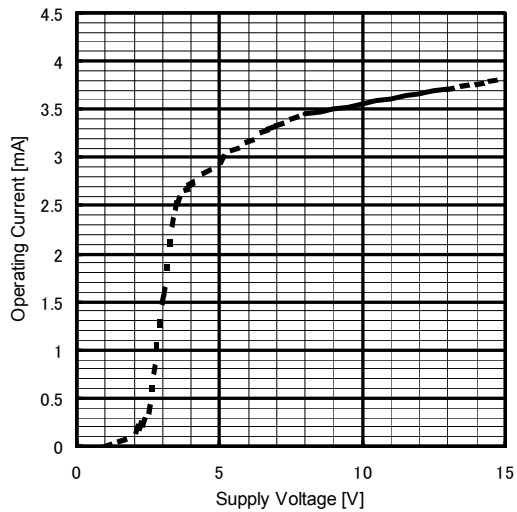
Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
01H	Don't Care	TEST	OFF	Don't Care		Selector		

•Selector : Input signal selecting

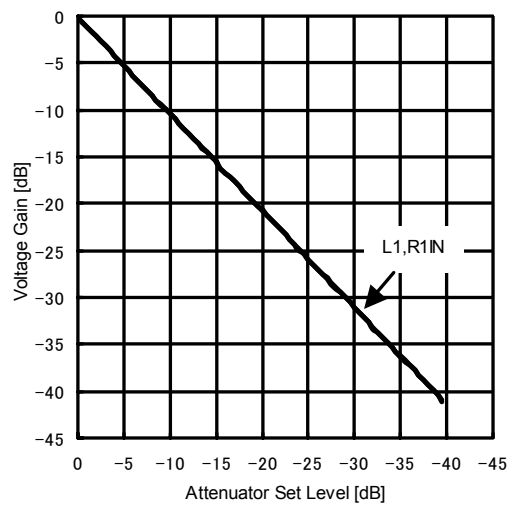
	Selector		
Input	D2	D1	D0
L1IN / R1IN	0	0	0
L2IN / R2IN	0	0	1
L3IN / R3IN	0	1	0
L4IN / R4IN	0	1	1
L5IN / R5IN	1	0	0

TYPICAL CHARACTERISTICS

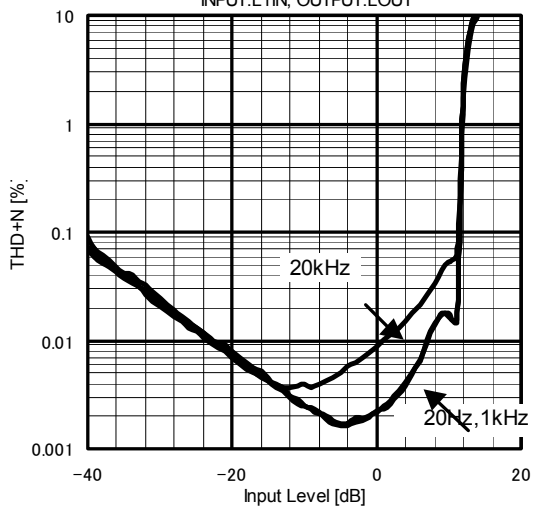
Operating Current vs. Supply Voltage
Ta=25°C



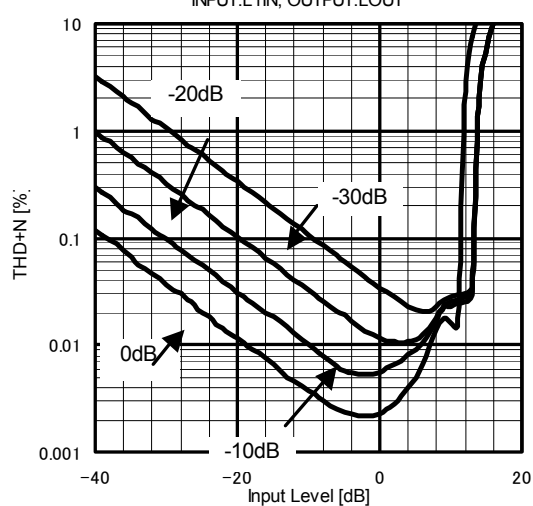
Voltage Gain vs. Attenuator Set Level
Ta=25°C



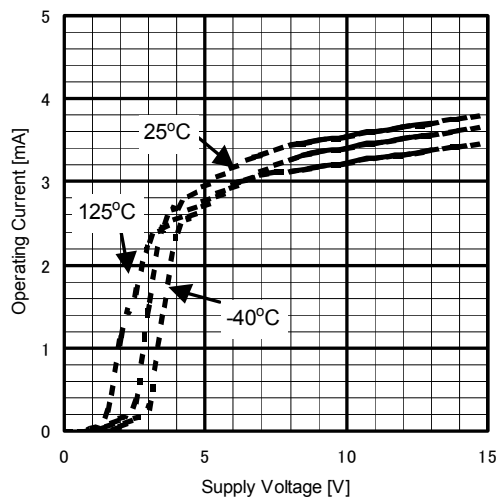
THD+N vs. Input Level
V+=12V, VOL=0dB, BW=10Hz-80kHz
INPUT:L1IN, OUTPUT:LOUT



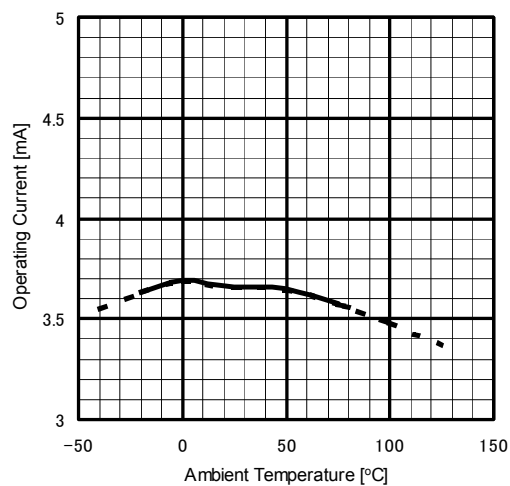
THD+N vs. Input Level
V+=12V, f=1kHz, BW=10Hz-80kHz
INPUT:L1IN, OUTPUT:LOUT



Operating Current vs. Supply Voltage

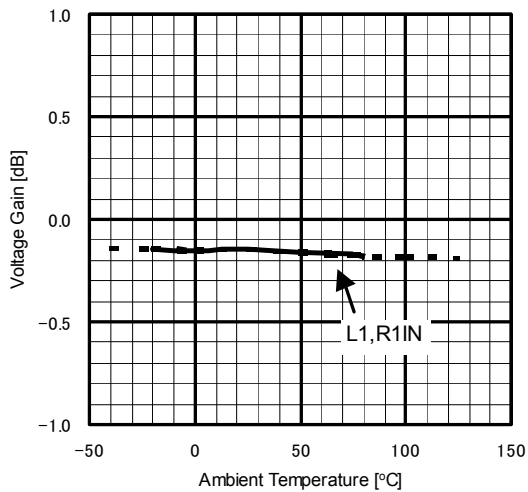


Operating Current vs. Ambient Temperature
V+=12V

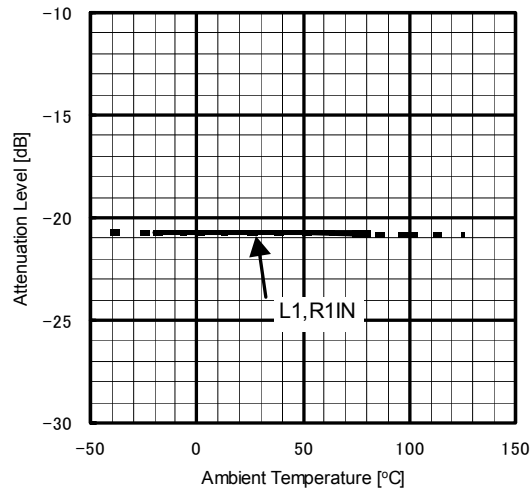


TYPICAL CHARACTERISTICS

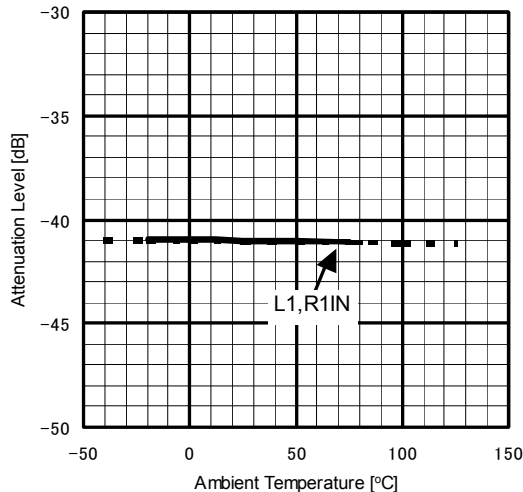
Voltage Gain vs. Ambient Temperature
 $V^+=12V, V_{in}=1V, f=1kHz, Vol=0dB$



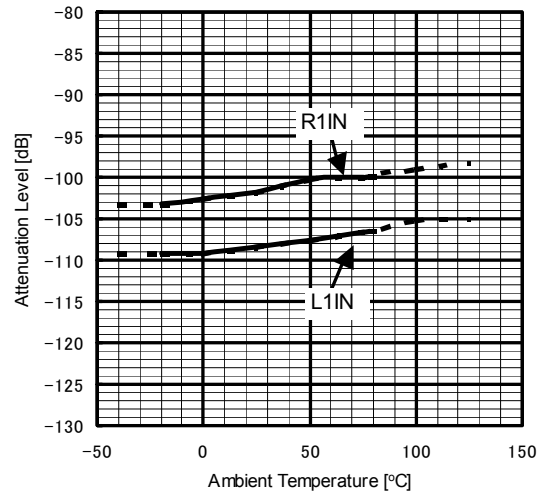
Attenuation Level vs. Ambient Temperature
 $V^+=12V, V_{in}=1V, f=1kHz, Vol=-20dB$



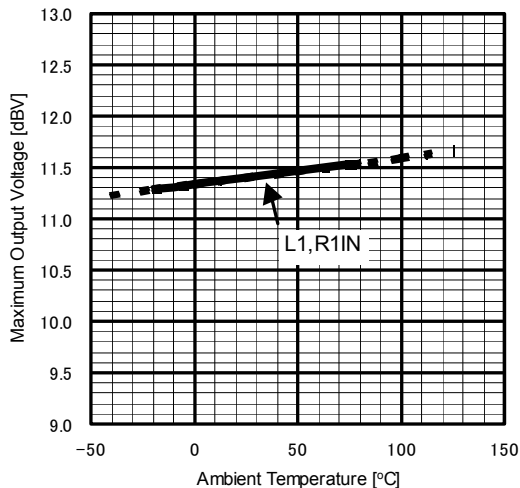
Attenuation Level vs. Ambient Temperature
 $V^+=12V, V_{in}=1V, f=1kHz, Vol=-39.5dB$



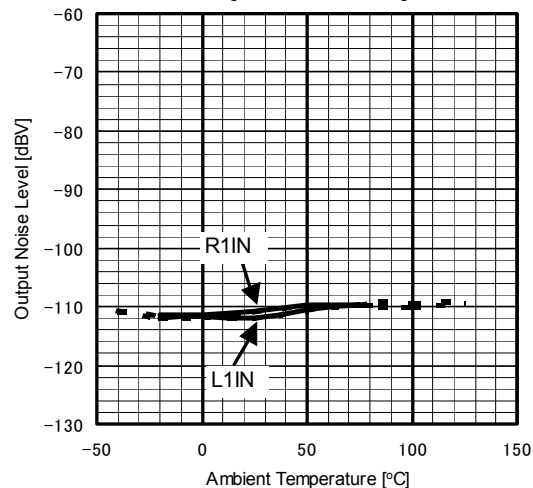
Attenuation Level vs. Ambient Temperature
 $V^+=12V, V_{in}=1V, f=1kHz, Vol=Mute$



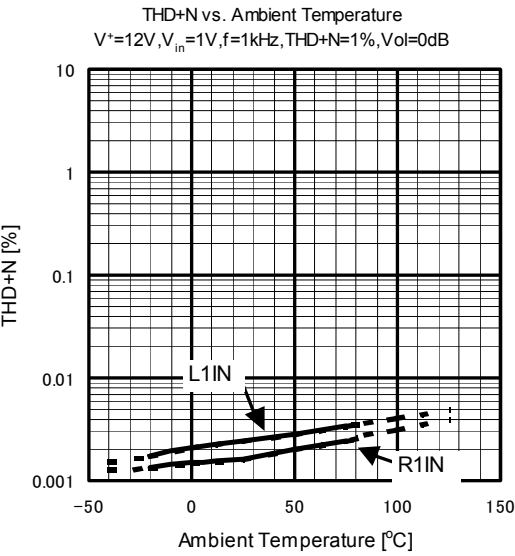
Maximum Output Voltage vs. Ambient Temperature
 $V^+=12V, f=1kHz, THD+N=1\%, Vol=0dB$



Output Noise Level vs. Ambient Temperature
 $V^+=12V, R_g=0\Omega, Vol=0dB, A-weight$



■ TYPICAL CHARACTERISTICS



■NOTE

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