ANTREX Electronics

Electronic Components Sourcing Information

Product Reference Information

Part Number:	NJU72342V-TE2
Manufacturer:	Nisshinbo Micro Devices Inc.
Package:	14-LSSOP (0.173", 4.40mm Width)
Availability:	Please confirm with sales

Product Page:

https://antrexco.com/product/details/nisshinbo-micro-devices-inc/nju72342v-te2.html

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Supplier verification and packaging condition review

CoC / RoHS / REACH documents available on request

Secure sourcing support for OEM / EMS projects

Note:

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.

4 Channels Electronic Volume

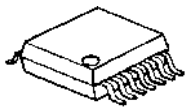
■GENERAL DESCRIPTION

The NJU72342 is a 4 channels I^2C electronic volume IC with external mute controls.

The NJU72342 has many characteristics that are useful in audio application, such as low noise, low distortion, and wide operating voltage range.

All functions are controlled by I^2C BUS interface.

■PACKAGE OUTLINE

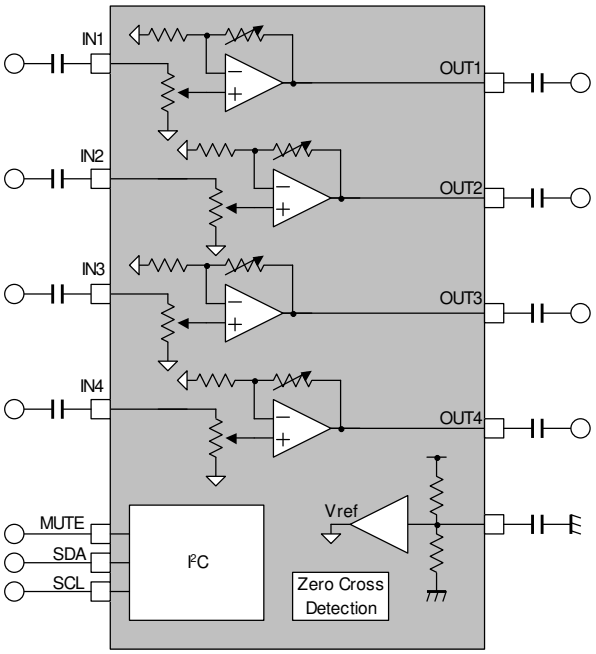


SSOP14

■FEATURES

- Operating Voltage V_+=4.5V ~ 14.5V
- Input Gain 0dB/+3dB/+6dB/+9dB
- Volume 0~-95dB/Mute ,1dBstep
- Low Distortion 0.002% typ.
- Low Noise 2.0μVrms typ.
- External Mute
- Zero Cross Detection
- I^2C BUS Control
- CMOS Technology
- Small Package SSOP14

■BLOCK DIAGRAM



■PIN CONFIGURATION

No.	Symbol	Function
1	IN1	Input Terminal 1
2	IN2	Input Terminal 2
3	IN3	Input Terminal 3
4	IN4	Input Terminal 4
5	MUTE	Mute Terminal
6	SDA	I^2C Data Input Terminal /Acknowledge Output
7	SCL	I^2C Clock Terminal
8	V+	Power Supply Terminal
9	VREF	Reference Voltage Terminal
10	GND	Ground Terminal
11	OUT4	Output Terminal 4
12	OUT3	Output Terminal 3
13	OUT2	Output Terminal 2
14	OUT1	Output Terminal 1

■ABSOLUTE MAXIMUM RATING (Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V_+	+15	V
Power Dissipation	P_D	560 (Note1)	mW
Maximum Input Voltage	V_{IMAX}	0 ~ V_+ (Note2)	V
Operating Temperature Range	Topr	-40 ~ +85	°C
Storage Temperature Range	Tstg	-40 ~ +150	°C

(Note1) EIA/JEDEC STANDARD Test board (76.2x114.3x1.6mm, 2layer, FR-4) mounting
(Note2) Don't put Input Voltage more than Power Supply Voltage.

■ELECTRICAL CHARACTERISTICS

(Ta=25°C, V^+=9V, R_L=47kΩ, V_{IN}=1.5Vrms, f=1kHz, all controls flat unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V_+		4.5	9	14.5	V
Supply Current	I_{DD}	No signal	-	10	16	mA
Reference Voltage	V_{REF}	No signal	4.0	4.5	5.0	V
Maximum Input Voltage	V_{INS}	Main Volume=-6dB,THD=1%	-	3.6	-	Vrms
Maximum Output Voltage	V_{OM}	THD=1%	2.2	2.6	-	Vrms
Voltage Gain 1	G_{V1}	Input Gain=+6dB, V_{IN}=100mVrms	4	6	8	dB
Voltage Gain 2	G_{V2}		-1.5	0	1.5	dB
Voltage Gain 3	G_{V3}	Main Volume=Mute, BW=400Hz-30kHz	-	-100	-95	dB
Channel Balance	G_{CB}	Main Volume=0dB	-1	0	1	dB
Total Harmonic Distortion	THD	Vo=1.5Vrms,BW=400Hz~30kHz	-	0.002	0.01	%
Output Noise Voltage	V_{NO}	Main Volume=0dB	-	2.0	7.0	μVrms
Channel Separation	CS	R_g=0	-	-110	-90	dB

MUTE TERMINAL CONTROL CHARACTERISTICS(Ta=25°C, all controls flat unless otherwise specified)

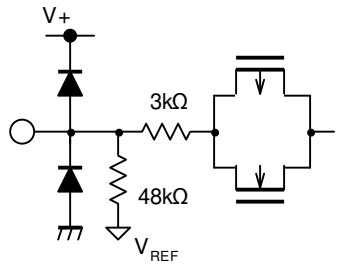
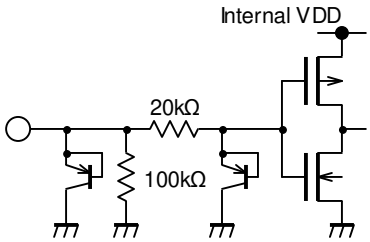
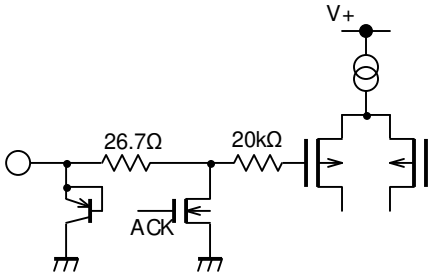
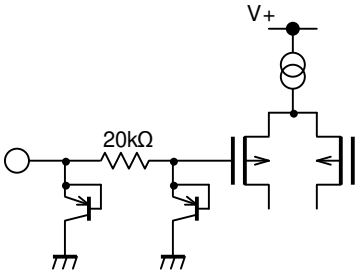
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Low Level Input Voltage	V_{IL}		0	-	0.6	V
High Level Input Voltage	V_{IH}		2.0	-	V^+	V

■CONTROL TERMINAL EXPLANATION –Mute Terminal-

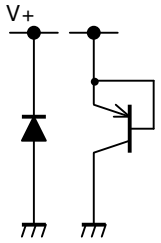
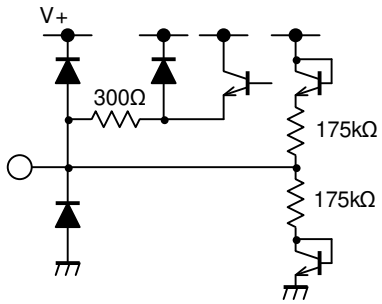
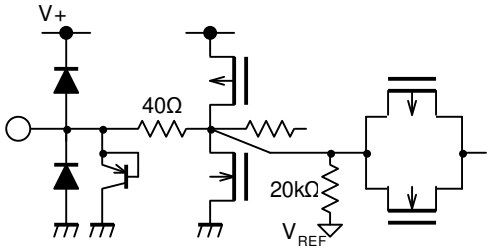
(Ta=25°C, V^+=9V, R_L=47kΩ, V_{IN}=1.5Vrms, f=1kHz, all controls flat unless otherwise specified)

MODE	STATUS	TEST CONDITION
Mute ON	H	Mute is Active
Mute OFF	L	Mute is NOT Active

■TERMINAL DESCRIPTION

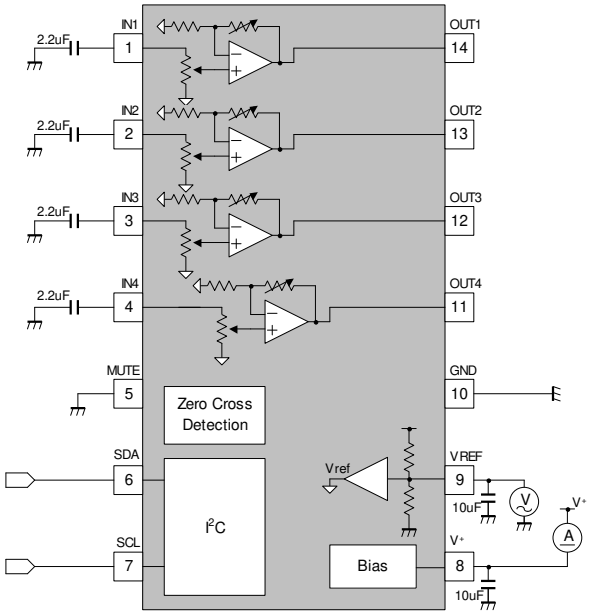
Terminal	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
1 2 3 4	IN1 IN2 IN3 IN4	AC Input		$V^+/2$
5	MUTE	MUTE Control		0V
6	SDA	I^2C Data Input /Acknowledge Output		-
7	SCL	I^2C Clock Input		-

■TERMINAL DESCRIPTION

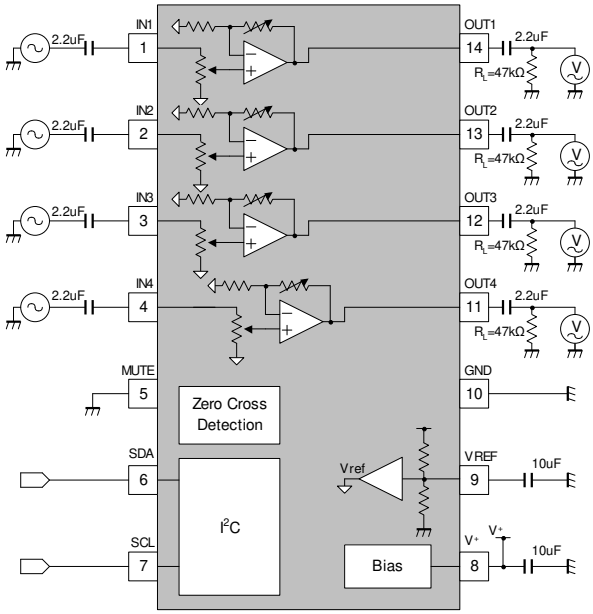
Terminal	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
8	V+	Supply Voltage		V^+
9	VREF	Reference Voltage		$V^+/2$
11 12 13 14	OUT4 OUT3 OUT2 OUT1	AC Output		$V^+/2$

■TEST CIRCUIT

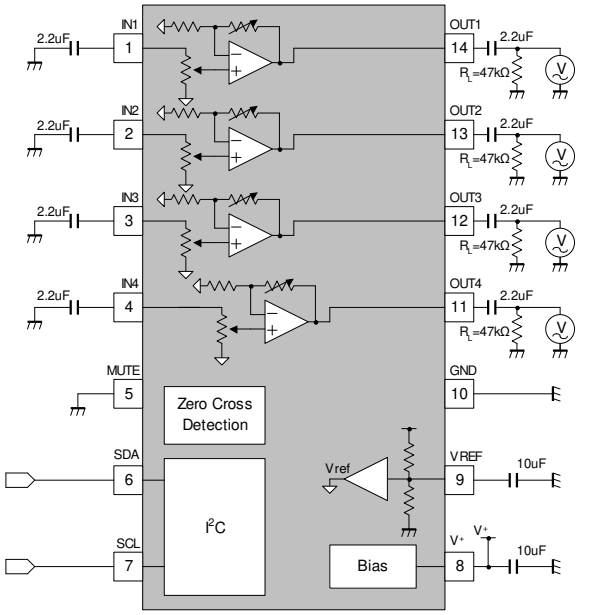
♦ I_{DD} / V_{REF}



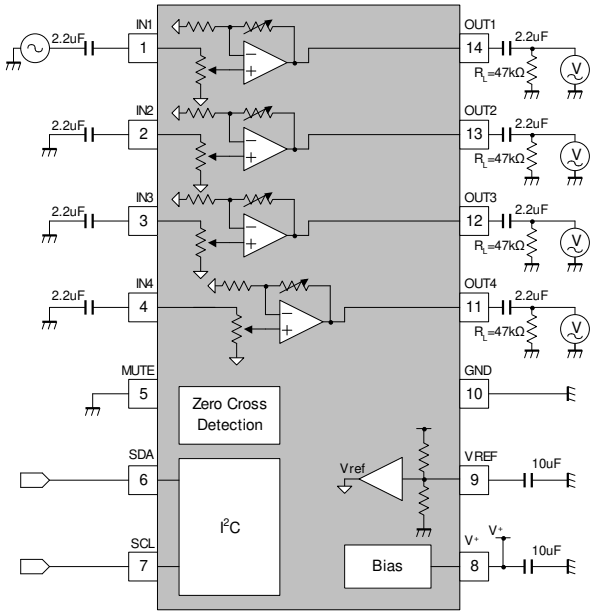
♦ V_{INS} / V_{OM} / G_{V1} / G_{V2} / G_{V3} / G_{CB} / THD



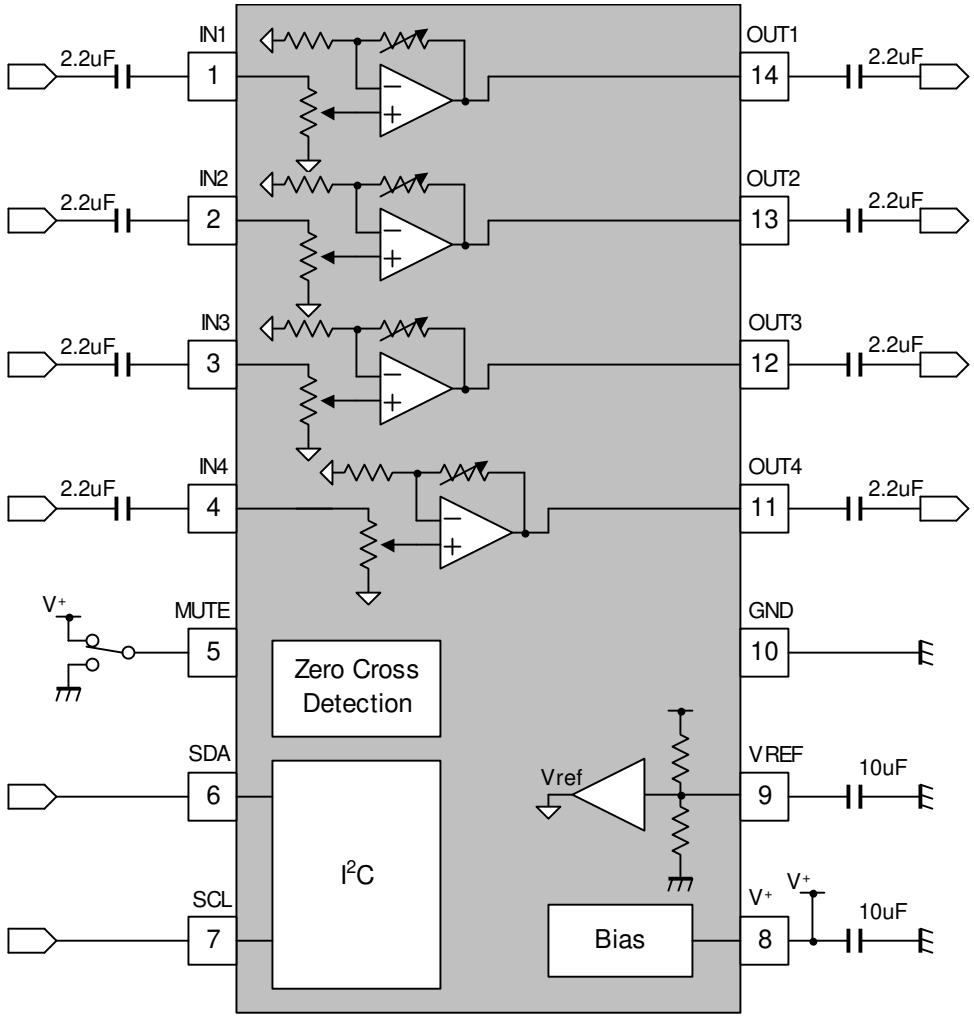
♦ V_{NO}



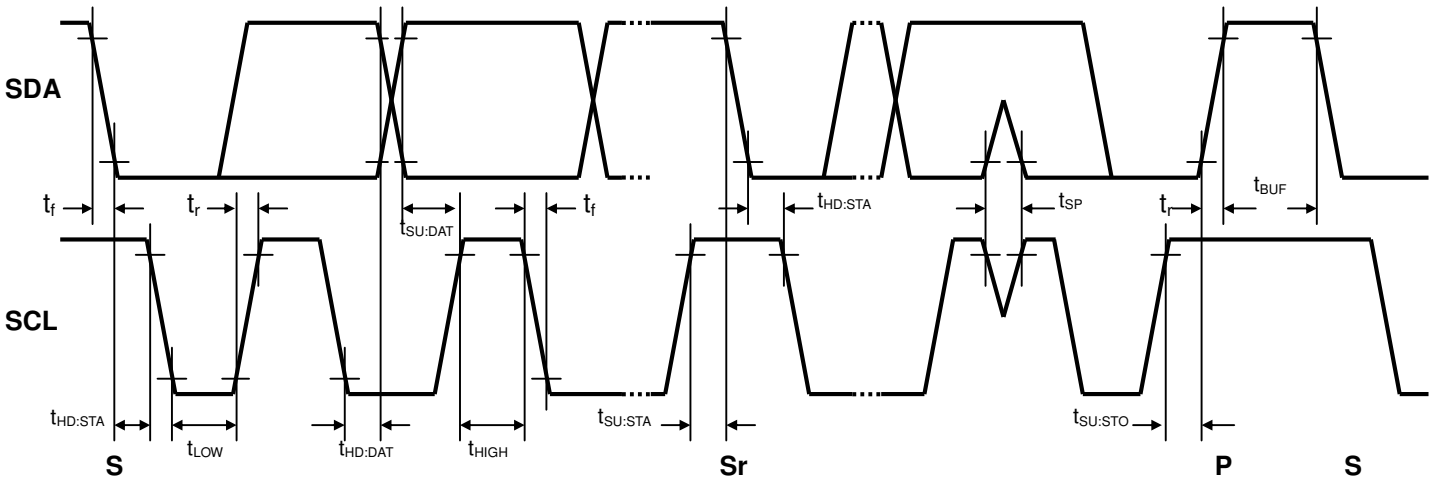
♦ CS



■APPLICATION CIRCUIT



■TIMING ON THE I²C BUS (SDA,SCL)



■CHARACTERISTICS OF I/O STAGES FOR I2C BUS (SDA,SCL)

I²C BUS Load Conditions

STANDARD MODE : Pull up resistance 4kΩ (Connected to +5V), Load capacitance 200pF (Connected to GND)

FAST MODE : Pull up resistance 4kΩ (Connected to +5V), Load capacitance 50pF (Connected to GND)

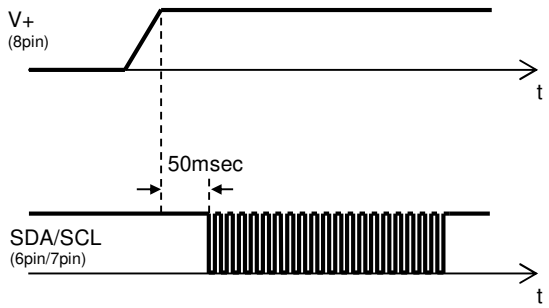
PARAMETER	SYMBOL	Standard mode			Fast mode			UNIT
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Low Level Input Voltage	V_{IL}	0.0	-	1.5	0.0	-	1.5	V
High Level Input Voltage	V_{IH}	2.7	-	5.5	2.7	-	5.5	V
Low level output voltage (3mA at SDA pin)	V_{OL}	0	-	0.4	0	-	0.4	V
Input current each I/O pin with an input voltage between $0.1V_{DD}$ and $0.9V_{DDmax}$	I_i	-10	-	10	-10	-	10	μA

■CHARACTERISTICS OF BUS LINES (SDA,SCL) FOR I²C-BUS DEVICES

PARAMETER	SYMBOL	Standard mode			Fast mode			UNIT
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
SCL clock frequency	f_{SCL}	-	-	100	-	-	400	kHz
Hold time (repeated) START condition.	$t_{HD:STA}$	4.0	-	-	0.6	-	-	μs
Low period of the SCL clock	t_{LOW}	4.7	-	-	1.3	-	-	μs
High period of the SCL clock	t_{HIGH}	4.0	-	-	0.6	-	-	μs
Set-up time for a repeated START condition	$t_{SU:STA}$	4.7	-	-	0.6	-	-	μs
Data hold time NOTE)	$t_{HD:DAT}$	0	-	-	0	-	-	μs
Data set-up time	$t_{SU:DAT}$	250	-	-	100	-	-	ns
Rise time of both SDA and SCL signals	t_r	-	-	1000	-	-	300	ns
Fall time of both SDA and SCL signals	t_f	-	-	300	-	-	300	ns
Set-up time for STOP condition	$t_{SU:STO}$	4.0	-	-	0.6	-	-	μs
Bus free time between a STOP and START condition	t_{BUF}	4.7	-	-	1.3	-	-	μs
Capacitive load for each bus line	C_b	-	-	400	-	-	400	pF
Noise margin at the Low level	V_{nL}	0.5	-	-	0.5	-	-	V
Noise margin at the High level	V_{nH}	1	-	-	1	-	-	V

C_b ; total capacitance of one bus line in pF.

■ RECOMMENDED POWER-UP SEQUENCE



■ DEFINITION OF I²C REGISTER

Note) Please don't send except specified data for avoiding an incorrect operation.

♦I²C BUS FORMAT

	MSB LSB		MSB LSB		MSB LSB		
S	Slave Address	A	Select Address	A	Data	A	P
1bit	8bit	1bit	8bit	1bit	8bit	1bit	1bit

S: Starting Term
A: Acknowledge Bit
P: Ending Term

♦SLAVE ADDRESS

Slave Address								Hex
MSB							LSB	-
1	0	0	0	0	0	0	0	80(h)

♦CONTROL REGISTER TABLE

The select address sets each function
(Volume A, Volume 1B, Volume 2B, Volume 3B, Volume 4B).
The auto increment function cycles the select address as follows.
00H→01H→02H→03H→04H→00H

<Write Mode>

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
00H	VOLUME 4A		VOLUME 3A		VOLUME 2A		VOLUME 1A	
01H	ZERO 1	VOLUME 1B						
02H	ZERO 2	VOLUME 2B						
03H	ZERO 3	VOLUME 3B						
04H	ZERO 4	VOLUME 4B						

*: Don't Care

♦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
03H	0	0	0	0	0	0	0	0
04H	0	0	0	0	0	0	0	0

Note.) This product starts up by MUTE setting in power "ON". Use it after removing MUTE of each setting.
If any audio signal is inputted in input signal terminal before power "ON", it may cause initial condition abnormality.
In conditions of use such as the above, it prevents that abnormality by setting MUTE before power "OFF"

■INSTRUCTION CODE

a) VOLUME_A SETTING

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
00H	VOLUME 4A		VOLUME 3A		VOLUME 2A		VOLUME 1A	

•VOLUME1A/2A/3A/4A: 0 to +9dB (3dB/Step)

b) VOLUME_B SETTING

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
01H	ZERO 1	VOLUME 1B						
02H	ZERO 2	VOLUME 2B						
03H	ZERO 3	VOLUME 3B						
04H	ZERO 4	VOLUME 4B						

•ZERO 1/2/3/4: Ch1/Ch2/Ch3/Ch4 Zero Cross Detection ON/OFF setting
"0": OFF
"1": ON

•VOLUME1B/2B/3B/4B: Volume 1B/2B/3B/4B setting 0 to -95 dB (1dB/Step) / Mute

■VOLUME A (Select Address : 00H)

		VOLUME A	
Gain(dB)	Ch 1	D1	D0
	Ch 2	D3	D2
	Ch 3	D5	D4
	Ch 4	D7	D6
0*		0	0
+3		0	1
+6		1	0
+9		1	1

*: Default Value

■ZERO CROSS DETECTION (Select Address : 01H/02H/03H/04H)

		ZERO
ZERO CROSS DETECTION	Ch 1	D7
	Ch 2	D7
	Ch 3	D7
	Ch 4	D7
OFF*		0
ON		1

*: Default Value

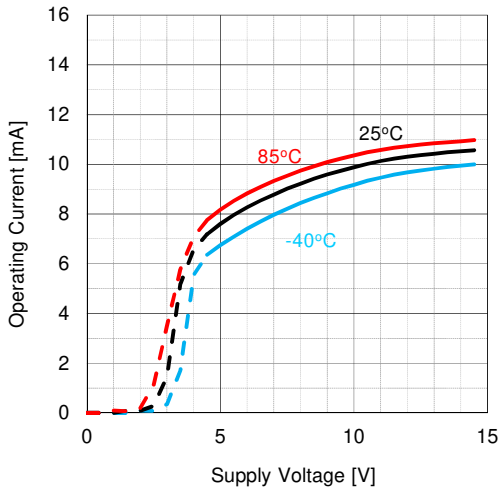
■ **VOLUME B (Select Address : 01H/02H/03H/04H)**

		VOLUME B						
Gain(dB)	Ch 1	D6	D5	D4	D3	D2	D1	D0
	Ch 2	D6	D5	D4	D3	D2	D1	D0
	Ch 3	D6	D5	D4	D3	D2	D1	D0
	Ch 4	D6	D5	D4	D3	D2	D1	D0
Mute		1	1	1	1	1	1	1
• • •		• • •						
Mute		1	1	1	1	0	0	0
0		1	1	1	0	1	1	1
-1		1	1	1	0	1	1	0
-2		1	1	1	0	1	0	1
-3		1	1	1	0	1	0	0
-4		1	1	1	0	0	1	1
-5		1	1	1	0	0	1	0
-6		1	1	1	0	0	0	1
• • •		• • •						
-90		0	0	1	1	1	0	1
-91		0	0	1	1	1	0	0
-92		0	0	1	1	0	1	1
-93		0	0	1	1	0	1	0
-94		0	0	1	1	0	0	1
-95		0	0	1	1	0	0	0
Mute		0	0	1	0	1	1	1
• • •		• • •						
Mute*		0	0	0	0	0	0	0

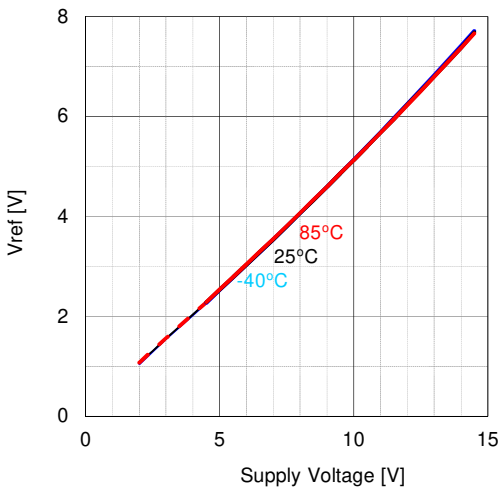
*: Default Value

■ TYPICAL CHARACTERISTICS

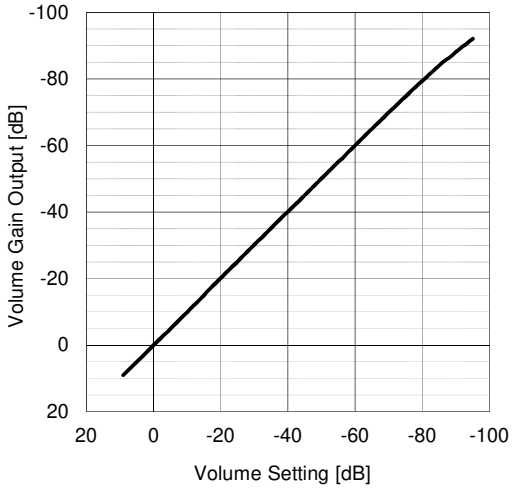
Operating Current vs Supply Voltage
Vin=no signal, R_L=No Load



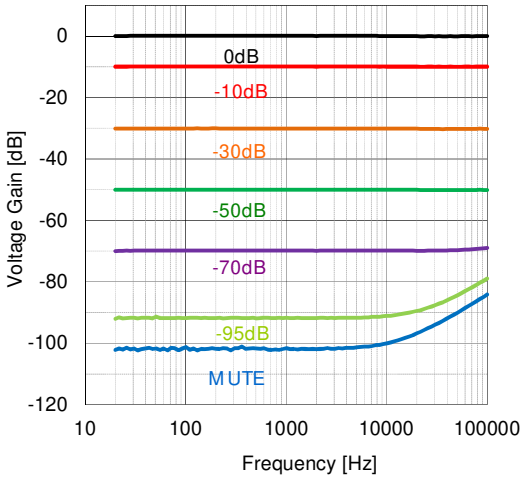
Reference Voltage vs Supply Voltage
Vin=no signal, R_L=No Load



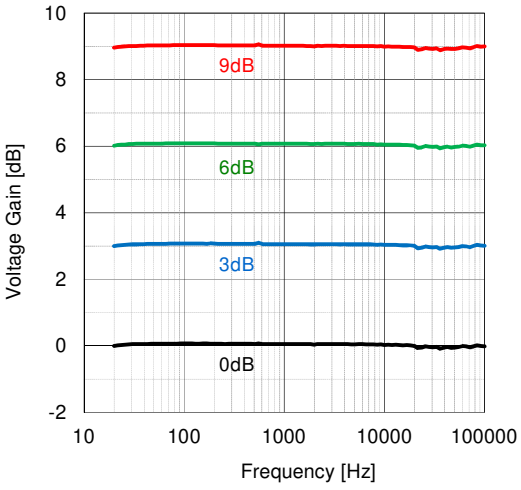
Volume Gain Output vs Volume Setting
V_+=9V, Ta=25°C, f=1kHz, Bandpass



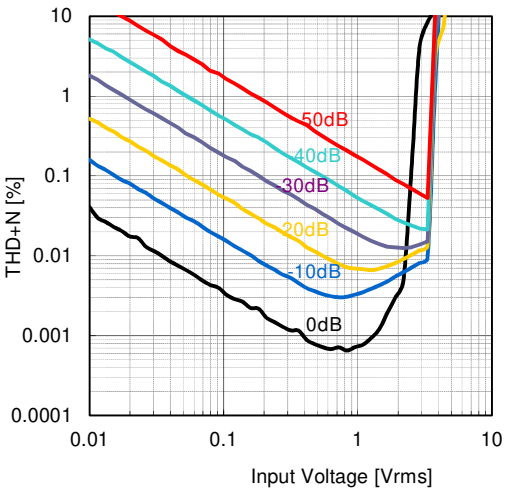
Voltage Gain Output vs Frequency
V⁺=9V, Ta=25°C, Vin=1.5Vrms, Bandpass



Voltage Gain Output vs Frequency
V⁺=9V, Ta=25°C, Vin=0.1Vrms, Bandpass

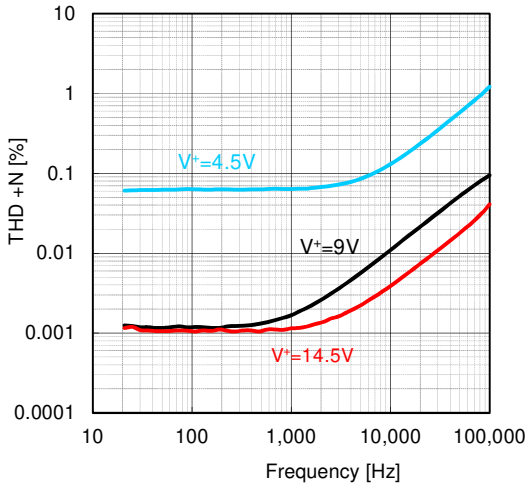


THD+N vs Vin -Volume
V⁺=9V, Ta=25°C, f=1kHz, BW=400Hz-30kHz

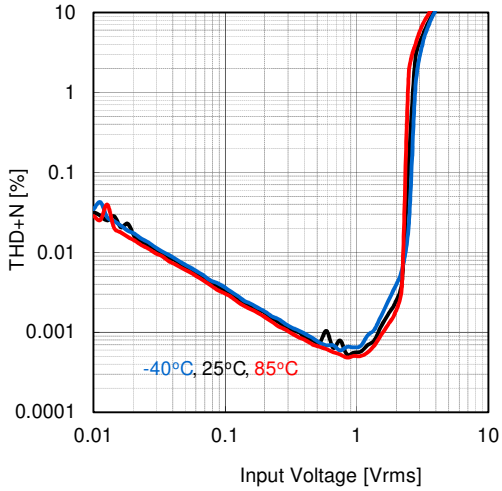


■ TYPICAL CHARACTERISTICS

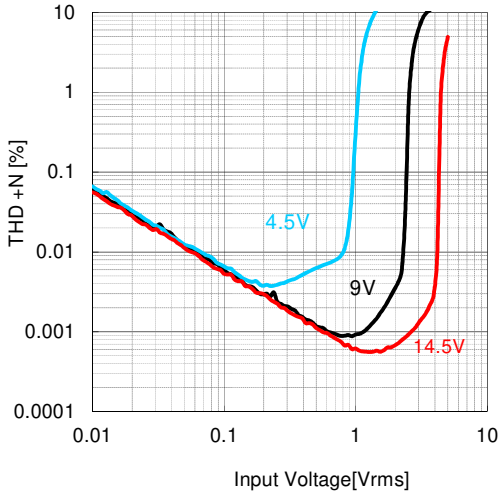
THD+N vs Frequency
Ta=25ºC, Vin= 1.5Vrms (0.8Vrms for V⁺=4.5V), Vol =0dB



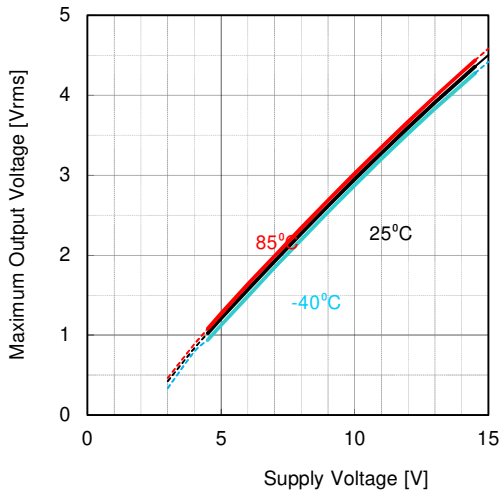
THD+N vs Vin - Temperature
V⁺=9V, f=1kHz, BW=400Hz-30KHz, Vol =0dB



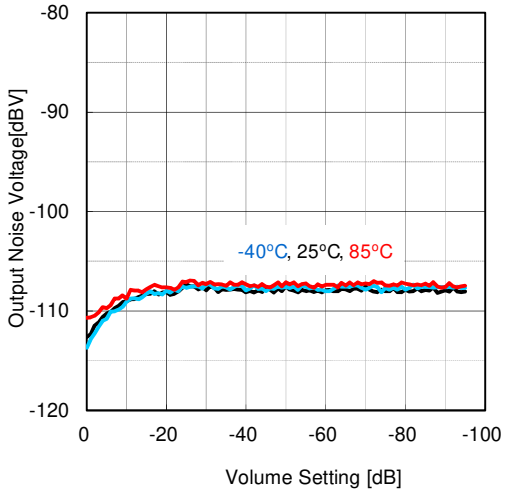
THD+N vs Vin - Supply
Ta=25ºC, f=1kHz, BW=400Hz-30kHz, Gain=0dB



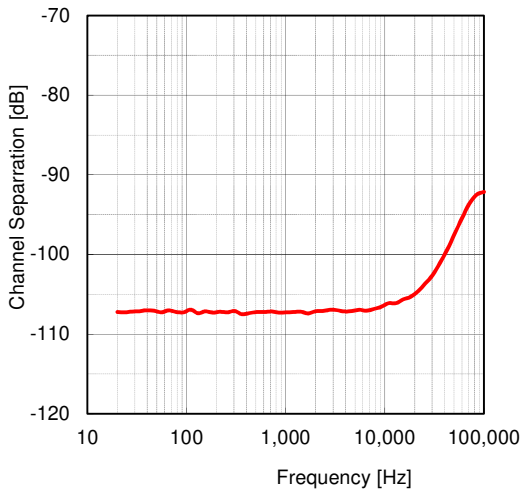
Maximum Ouput Voltage vs Supply Voltage
f=1kHz THD=1% ,Gain =0dB



Output Noise Voltage vs Volume Setting
V⁺=9V, Ta=25ºC,Rg=0, A-Weight filter



Channel Separation vs Frequency
V⁺=9V, Vin=1.5Vrms, Vol =0dB, BW:10-80kHz
Ch1in-Ch2out



■ TYPICAL CHARACTERISTICS