AUDIO PROCESSOR

■GENERAL DESCRIPTION

The **NJW1142A** is a sound processor includes all of the functions required to process the audio signal for TV, such as tone control, balance, volume, mute, and AGC functions.

Also the **NJW1142A** performs NJRC Surround "eala" which is regenerated 3D surround sound with only two speakers.

All of the internal status and variables are controlled by I^2C BUS interface.

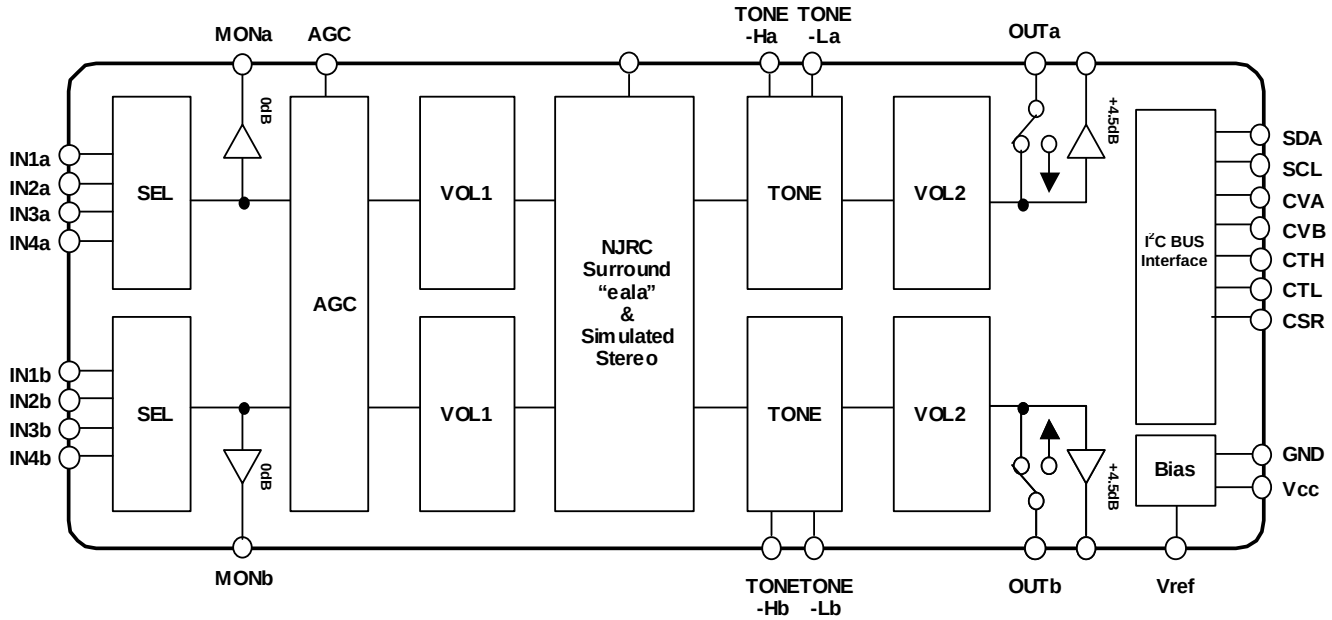
■ PACKAGE OUTLINE

NJW1142AV

■FEATURES

- Operating Voltage 8 to 10V
- Internal 4 Input Audio Selectors and Monitor Output
- Low Noise VCA
- NJRC Surround "eala"
- Simulated Stereo
- Variable AGC Compression Level via I^2C (4-levels)
- Bi-CMOS Technology
- Package Outline SSOP32

■BLOCK DIAGRAM



■PIN CONFIGURATION

No.	Symbol	Function		Symbol	Function
1	IN1a	Ach Input 1	17	NC	No Connect
2	IN2a	Ach Input 2	18	V+	Power Supply Treminal
3	IN3a	Ach Input 3	19	Vref	Reference Voltage
4	IN4a	Ach Input 4	20	CTL	Pop Noise reduction for Bass Control
5	MONa	Ach Monitor Output	21	CTH	Pop Noise reduction for Treble Control
6	SR FIL	Surround Filter	22	AGC	AGC Filter
7	TONE-Ha	Ach Treble Filter	23	OUTb	Bch Output
8	TONE-La	Ach Bass Filter	24	LINEb	Bch LINE Output (+4.5dB)
9	LINEa	Ach LINE Output (+4.5dB)	25	TONE-Lb	Bch Bass Filter
10	OUTa	Ach Output	26	TONE-Hb	Bch Treble Filter
11	CVA	Pop Noise Reduction for Ach Volume & Balance	27	CSR	Pop Noise Reduction for Surround Control
12	CVB	Pop Noise Reduction for Bch Volume & Balance	28	MONb	Bch Monitor Output
13	SDA	SDA Data Input (I^2C BUS)	29	IN4b	Bch Input 4
14	SCL	SCL Clock Input (I^2C BUS)	30	IN3b	Bch Input 3
15	GND	GND Terminal	31	IN2b	Bch Input 2
16	NC	No Connect	32	IN1b	Bch Input 1

■**ABSOLUTE MAXIMUM RATING** (Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V^+	12	V
Power Dissipation	P_D	800 NOTE: EIA/JEDEC STANDARD Test board (76.2x114.3x1.6mm, 2layer, FR-4) mounting	mW
Operating Temperature Range	Topr	-20 to +75	°C
Storage Temperature Range	Tstg	-40 to +125	°C

■**ELECTRICAL CHARACTERISTICS** (Ta=25°C, V^+=9V, Rg=600Ω, R_L=47kΩ, Vin=100mVrms/1kHz)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V^+		8.0	9.0	10.0	V
Supply Current	I_{CC}	No Signal	-	10.0	25.0	mA
Reference Voltage	V_{REF}	No Signal	4.0	4.5	5.0	V
Maximum Input Voltage	V_{IM}	VOL=-20dB, THD=3%	2.8	3.0	-	Vrms
Maximum Output Voltage1	V_{OM1}	OUTPUT VOL=0dB, THD=1%	-	2.5	-	Vrms
Maximum Output Voltage2	V_{OM2}	LINEOUT VOL=0dB, THD=1%	-	2.5	-	Vrms
MON OUT Gain	G_{VMON}	MON OUT	-1.0	0.0	1.0	dB
LINEOUT Gain	G_{VLINE}	LINEOUT, VOL=0dB	2.5	4.5	6.5	dB
Maximum Gain	G_{VMAX}	VOL=0dB	-2.0	0.0	2.0	dB
Minimum Gain	G_{VMIN}	VOL=Mute, Vin=1Vrms BW=400Hz to 30kHz	-	-	-70	dB
Channel Balance	G_{CB}	VOL=0dB	-1.5	0.0	1.5	dB
Balance Boost A	BA_{BST}	CHS="0",BAL="11111"	-2.0	0.0	2.0	dB
Balance Cut A	BA_{CUT}	CHS="1",BAL="11111" Vin = 1Vrms BW=400Hz to 30kHz	-	-	-70	dB
Balance Boost B	BB_{BST}	CHS="1",BAL="11111"	-2.0	0.0	2.0	dB
Balance Cut B	BB_{CUT}	CHS="0",BAL="11111" Vin = 1Vrms BW=400Hz to 30kHz	-	-	-70	dB
Total Harmonic Distortion	THD	Vo=0.5Vrms BW=400Hz to 30kHz	-	-	0.5	%
Input Selector Cross Talk	CT	Vin=1Vrms BW=400Hz to 30kHz	-	-	-70	dB
Channel Separation	CS	Vin=1Vrms BW=400Hz to 30kHz	-	-	-70	dB
Output Noise 1	V_{NO1}	VOL=0dB BW=400Hz to 30kHz	- -	-90 (31.6)	-85 (56.2)	dBV (μVrms)
Output Noise 2	V_{NO2}	VOL=Mute BW=400Hz to 30kHz	- -	-106 (5.0)	-96 (15.8)	dBV (μVrms)
Output Noise 3	V_{NO3}	LINEOUT, VOL=0dB BW=400Hz to 30kHz	- -	-85 (56.2)	-80 (100)	dBV (μVrms)
Output Noise 4	V_{NO4}	LINEOUT, VOL=Mute BW=400Hz to 30kHz	- -	-101 (8.9)	-91 (28.2)	dBV (μVrms)

■**ELECTRICAL CHARACTERISTICS** (Ta=25°C, V^+=9V, Rg=600Ω, R_L=47kΩ, Vin=100mVrms/1kHz)

• **TONE CONTROL** (Tone Control-ON)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
High Frequency Boost	HF_{BST}	TREBLE=+15dB, f=10kHz	12.5	15.0	17.5	dB
High Frequency Flat	HF_{FLT}	TRBE=0dB, f=10kHz	-2.0	0.0	2.0	dB
High Frequency Cut	HF_{CUT}	TREBLE=-15dB, f=10kHz	-17.5	-15.0	-12.5	dB
Low Frequency Boost	LF_{BST}	BASS=+15dB, f=100Hz	12.5	15.0	17.5	dB
Low Frequency Flat	LF_{FLT}	BASS=0dB, f=100Hz	-2.0	0.0	2.0	dB
Low Frequency Cut	LF_{CUT}	BASS=-15dB, f=100Hz	-17.5	-15.0	-12.5	dB

• **AGC** (AGC-ON)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
AGC BOOST	AGC_{BST}	Vin=50mVrms	1.5	3.5	5.5	dB
AGC FLAT 1	AGC_{FLT1}	Vin=300mVrms	-2.5	0.0	2.5	dB
AGC FLAT 2	AGC_{FLT2}	Vin=400mVrms	-2.5	0.0	2.5	dB
AGC FLAT 3	AGC_{FLT3}	Vin=500mVrms	-2.5	0.0	2.5	dB
AGC FLAT 4	AGC_{FLT4}	Vin=600mVrms	-2.5	0.0	2.5	dB
AGC CUT	AGC_{CUT}	Vin=2Vrms	-14	-10	-6.0	dB

• **SURROUND** (SURROUND-ON)

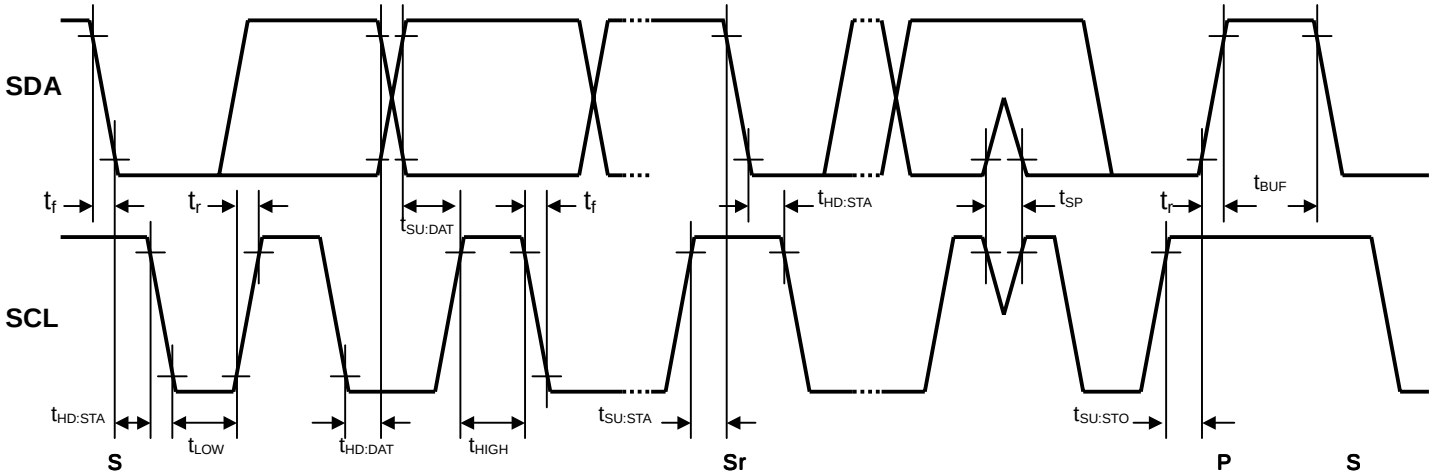
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Simulated Stereo A	SR_{SIMA}	Ain+Bin → Aout, f=1kHz	1.0	3.0	5.0	dB
Simulated Stereo B	SR_{SIMB}	Ain+Bin → Bout, f=1kHz	1.0	3.0	5.0	dB
Surround 3D1	SR_{3D1}	Ain → Aout, f=100Hz	8.0	10.0	12.0	dB
Surround 3D2	SR_{3D2}	Ain → Aout, f=10kHz	-2.0	0.0	2.0	dB
Surround 3D3	SR_{3D3}	Ain → Bout, f=100Hz	4.5	6.5	8.5	dB

■I²C BUS BLOCK CHARACTERISTICS (SDA,SCL)

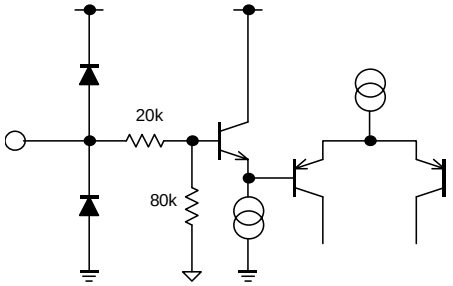
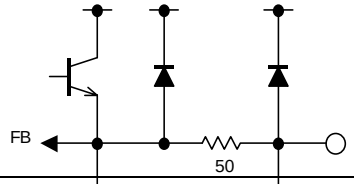
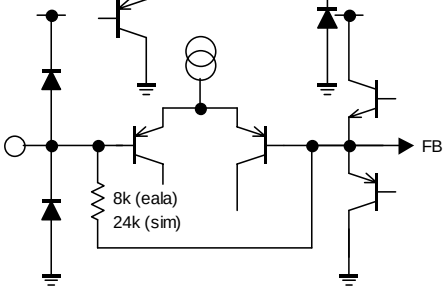
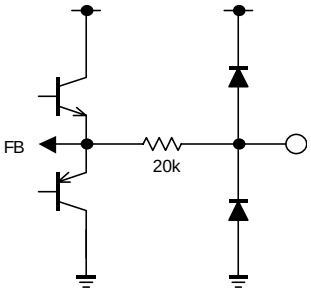
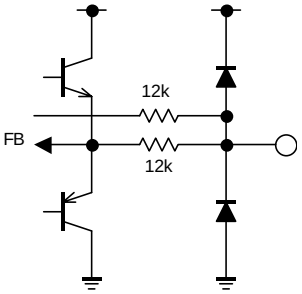
I²C BUS Load Conditions: Pull up resistance 4kΩ (Connected to +5V), Load capacitance 200pF (Connected to GND)

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	-	5.0	2.7	-	5.0	V
Hysteresis of Schmitt trigger inputs	V_{hys}	-	-	-	0.25	-	-	V
Low level output voltage (3mA at SDA pin)	V_{OL}	0	-	0.4	0	-	0.4	V
Output fall time from V_{IHmin} to V_{ILmax} with a bus capacitance from 10pF to 400pF	t_{of}	-	-	250	$\frac{20}{+0.1C_b}$	-	250	ns
Pulse width of spikes which must be suppressed by the input filter	t_{SP}	-	-	-	0	-	50	ns
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
Capacitance for each I/O pin	C_i	-	-	10	-	-	10	pF
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	$t_{HD:DAT}$	0	-	3.45	0	-	0.9	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

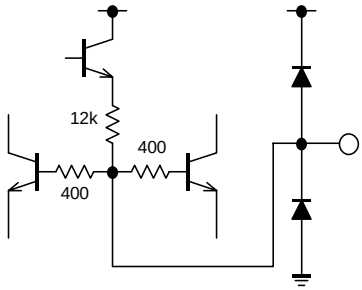
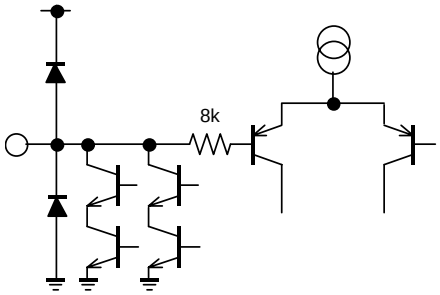
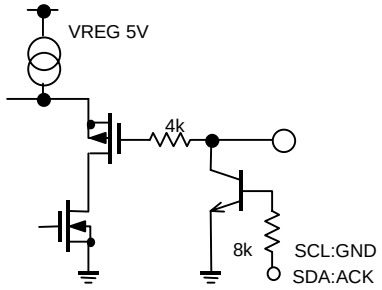
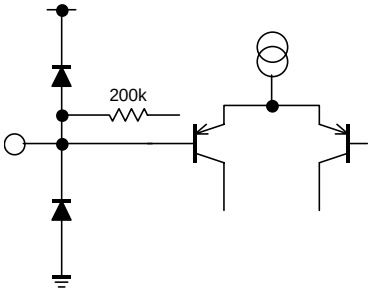
C_b ; total capacitance of one bus line in pF.



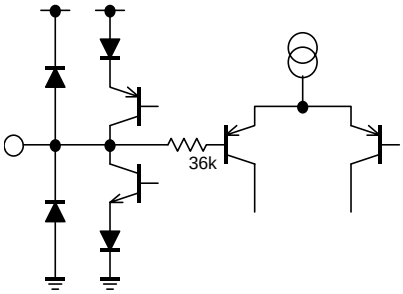
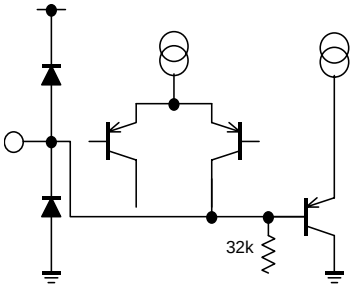
■TERMINAL DESCRIPTION

No.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
1 2 3 4 29 30 31 32	IN1a IN2a IN3a IN4a IN4b IN3b IN2b IN1b	Ach Input 1 Ach Input 2 Ach Input 3 Ach Input 4 Bch Input 4 Bch Input 3 Bch Input 2 Bch Input 1		V+/2
5 9 10 23 24 28	MONa LINEa OUTa OUTb LINEb MONb	Ach Monitor Output (0dB) Ach LINE Output (4.5dB) Ach Output (0dB) Bch Output (0dB) Bch LINE Output (4.5dB) Bch Monitor Output (0dB)		V+/2
6	SR FIL	Surround Filter		V+/2
7 26	TONE-Ha TONE-Hb	Ach Treble Filter Bch Treble Filter		V+/2
8 25	TONE-La TONE-Lb	Ach Bass Filter Bch Bass Filter		V+/2

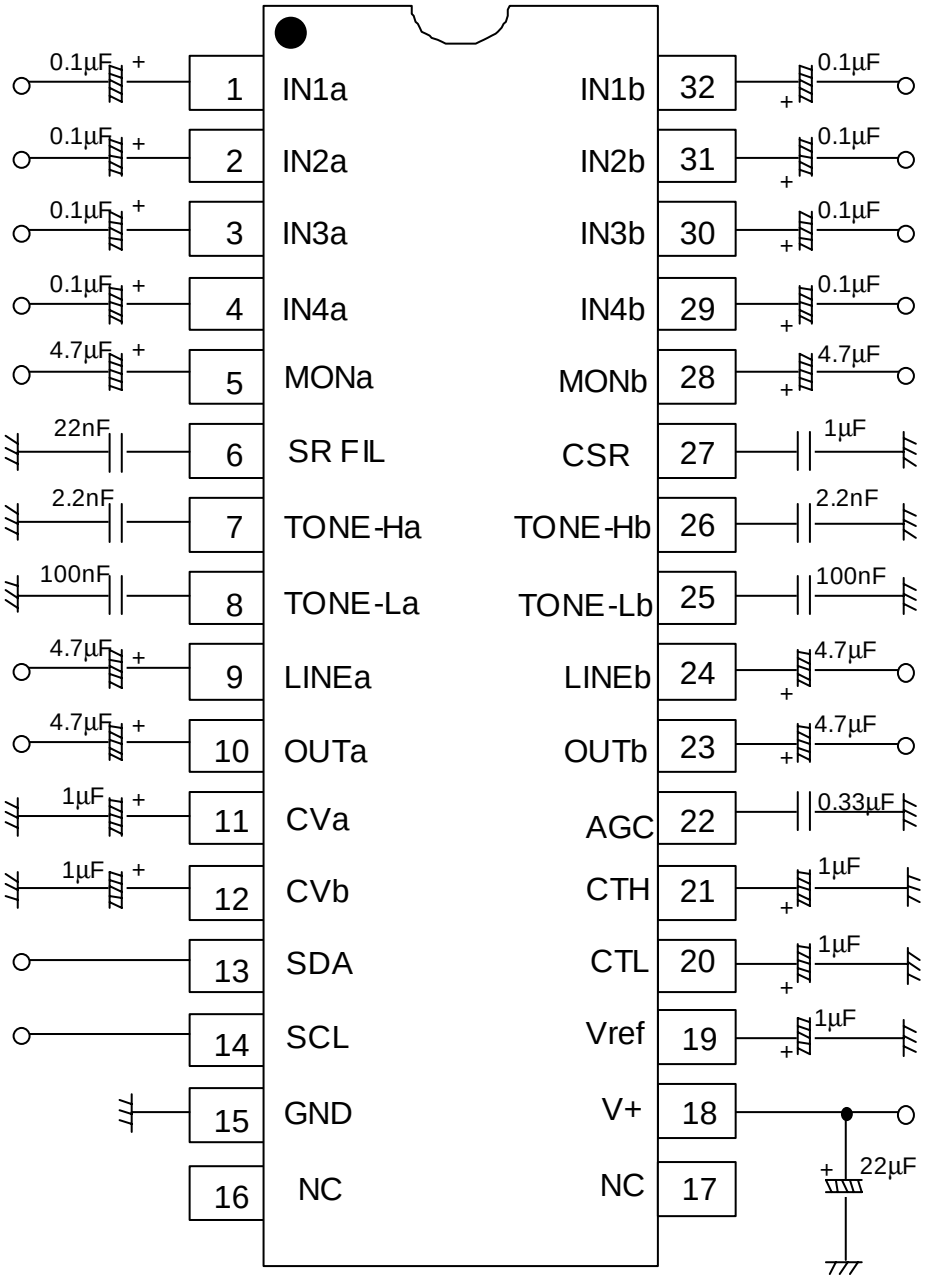
■TERMINAL DESCRIPTION

No.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
22	AGC	AGC Filter		0.6V
11 12	CVa CVb	Pop Noise Reduction for Ach Volume & Balance Pop Noise Reduction for Bch Volume & Balance		V+/2 - 0.7V
13 14	SDA SCL	SDA Data Input (I^2C BUS) SCL Clock Input (I^2C BUS)		-
15	GND	GND Terminal	———	0V
18	V+	Power Supply Terminal	———	V+
19	Vref	Reference Voltage		V+/2

■TERMINAL DESCRIPTION

No.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
20 21	CTL CTH	Pop Noise reduction for Bass Control Pop Noise reduction for Treble Control		V+/2 - 0.7V
27	CSR	Pop Noise Reduction for Surround Control		0.6V

■APPLICATION CIRCUIT



(NOTE)

1. Separate the I^2C bus line from the following terminals for avoiding digital noise problem.

Pin No.	Symbol	Pin No.	Symbol	Pin No.	Symbol
6	SS FIL	8	TONE-La	26	TONE-Hb
7	TONE-Ha	25	TONE-Lb	-	-

■DEFINITION OF I²C REGISTER

♦ 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

MSB							LSB
1	0	0	0	0	0	1	R/$\overline{W}$

R/$\overline{W}$=0: Write mode for register setting
R/$\overline{W}$=1: Not available

♦ CONTROL REGISTER TABLE

The select address sets each function (Volume, Balance, AGC, Surround, Tone Control, AUX).
The auto increment function cycles the select address as follows.
00H→01H→02H→03H→04H→05H→00H

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
00H	VOL							
01H	CHS	BAL					SUR1	SUR0
02H	BCB	BASS				BCSB	SUB-BASS	
03H	BCT	TREB				BCST	SUB-TREB	
04H	Don't Care							
05H	OUT	SEL			AGC1	AGC0	AGC	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
05H	0	0	0	0	0	0	0	0

■ I²C CONTROL COMMAND DESCRIPTION

• MASTER VOLUME CONTROL

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
00H	VOL							

The volume control for both Ach and Bch (0.33dB/step).
The volume is consisted of volume1 and volume2 and the level is divided into half to each volume1 and volume2.

• BALANCE, AGC AND SURROUND SETTING

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
01H	CHS	BAL					SR1	SR0

- CHS: Channel select for balance control
  "0": Ach "Bch is attenuated"
  "1": Bch "Ach is attenuated"
- BAL: Balance control for both Ach and Bch (1dB/Step)
  The balance is consisted of volume1 and volume2 and the level is divided into half to each volume1 and volume2.
- "SR1", "SR0": Surround Mode select

Surround Mode	SR1 (D1)	SR0 (D0)
Surround Off (Bypass)	0	0
Simulated Stereo	0	1
eala effect large	1	0
eala effect small	1	1

• TONE CONTROL BASS SETTING

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
02H	BCB	BASS				BCSB	SUB-BASS	

- BCB: Boost cut select for Bass control
  "0": Cut
  "1": Boost
- BASS: BASS control
  Cut Level: -15dB to 0dB (1dB/Step)
  Boost Level: 0dB to +15dB (1dB/Step)
- BCSB: Boost cut select for SUB-BASS control
  "0": Cut
  "1": Boost
- SUB-BASS: SUB- BASS control (1dB/Step)
  Sub-Cut Level: -3dB to 0dB (1dB/Step)
  Sub-Boost Level: 0dB to +3dB (1dB/Step)

• **TONE CONTROL TREBLE SETTING**

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
03H	BCT	TREB				BCST	SUB-TREB	

- BCT: Boost cut select for Treble control
  "0": Cut
  "1": Boost
- TREB: Treble control (1dB/step)
  Cut Level: -15dB to 0dB (1dB/Step)
  Boost Level: 0dB to +15dB (1dB/Step)
- BCST: Boost cut select for Sub-Treble control
  "0": Cut
  "1": Boost
- SUB-TREB: Sub-Treble control (1dB/step)
  Sub-Cut Level: -3dB to 0dB (1dB/Step)
  Sub-Boost Level: 0dB to +3dB (1dB/Step)

• **OUTPUT AND AUXILIARY SETTING**

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
05H	OUT	SEL			AGC1	AGC0	AGC	Don't Care

- OUT: ON/OFF Switch for OUTPUT
  "0": OFF (MUTE)
  "1": ON

- SEL: Input Selector

Input Select	SEL		
	D6	D5	D4
IN1a and IN1b	0	1	0
IN2a and IN2b	0	1	1
IN3a and IN3b	1	0	0
IN4a and IN4b	1	0	1

- AGC1: AGC Level Setting

AGC Level	AGC1 (D3)	AGC0 (D2)	AGC (D1)
AGC Flat 1 (300mVrms)	0	0	1
AGC Flat 2 (400mVrms)	0	1	1
AGC Flat 3 (500mVrms)	1	0	1
AGC Flat 4 (600mVrms)	1	1	1
AGC Off	✻	✻	0

✻ Don't Care

■MASTER VOLUME (Select Address: 00H)

		VOL							
Gain (dB)	HEX	D7	D6	D5	D4	D3	D2	D1	D0
0	FF	1	1	1	1	1	1	1	1
-1	FC	1	1	1	1	1	1	0	0
-2	F9	1	1	1	1	1	0	0	1
-3	F6	1	1	1	1	0	1	1	0
-4	F3	1	1	1	1	0	0	1	1
-5	F0	1	1	1	1	0	0	0	0
-6	ED	1	1	1	0	1	1	0	1
-7	EA	1	1	1	0	1	0	1	0
-8	E7	1	1	1	0	0	1	1	1
-9	E4	1	1	1	0	0	1	0	0
-10	E1	1	1	1	0	0	0	0	1
-11	DE	1	1	0	1	1	1	1	0
-12	DB	1	1	0	1	1	0	1	1
-13	D8	1	1	0	1	1	0	0	0
-14	D5	1	1	0	1	0	1	0	1
-15	D2	1	1	0	1	0	0	1	0
-16	CF	1	1	0	0	1	1	1	1
-17	CC	1	1	0	0	1	1	0	0
-18	C9	1	1	0	0	1	0	0	1
-19	C6	1	1	0	0	0	1	1	0
-20	C3	1	1	0	0	0	0	1	1
-21	C0	1	1	0	0	0	0	0	0
-22	BD	1	0	1	1	1	1	0	1
-23	BA	1	0	1	1	1	0	1	0
-24	B7	1	0	1	1	0	1	1	1
-25	B4	1	0	1	1	0	1	0	0
-26	B1	1	0	1	1	0	0	0	1
-27	AE	1	0	1	0	1	1	1	0
-28	AB	1	0	1	0	1	0	1	1
-29	A8	1	0	1	0	1	0	0	0
-30	A5	1	0	1	0	0	1	0	1
-31	A2	1	0	1	0	0	0	1	0
-32	9F	1	0	0	1	1	1	1	1
-33	9C	1	0	0	1	1	1	0	0
-34	99	1	0	0	1	1	0	0	1
-35	96	1	0	0	1	0	1	1	0
-36	93	1	0	0	1	0	0	1	1
-37	90	1	0	0	1	0	0	0	0
-38	8D	1	0	0	0	1	1	0	1
-39	8A	1	0	0	0	1	0	1	0
-40	87	1	0	0	0	0	1	1	1
-41	84	1	0	0	0	0	1	0	0
-42	81	1	0	0	0	0	0	0	1

■MASTER VOLUME (Cont'd)

		VOL							
Gain (dB)	HEX	D7	D6	D5	D4	D3	D2	D1	D0
-43	7E	0	1	1	1	1	1	1	0
-44	7B	0	1	1	1	1	0	1	1
-45	78	0	1	1	1	1	0	0	0
-46	75	0	1	1	1	0	1	0	1
-47	72	0	1	1	1	0	0	1	0
-48	6F	0	1	1	0	1	1	1	1
-49	6C	0	1	1	0	1	1	0	0
-50	69	0	1	1	0	1	0	0	1
-51	66	0	1	1	0	0	1	1	0
-52	63	0	1	1	0	0	0	1	1
-53	60	0	1	1	0	0	0	0	0
-54	5D	0	1	0	1	1	1	0	1
-55	5A	0	1	0	1	1	0	1	0
-56	57	0	1	0	1	0	1	1	1
-57	54	0	1	0	1	0	1	0	0
-58	51	0	1	0	1	0	0	0	1
-59	4E	0	1	0	0	1	1	1	0
-60	4B	0	1	0	0	1	0	1	1
-61	48	0	1	0	0	1	0	0	0
-62	45	0	1	0	0	0	1	0	1
-63	42	0	1	0	0	0	0	1	0
-64	3F	0	0	1	1	1	1	1	1
-65	3C	0	0	1	1	1	1	0	0
-66	39	0	0	1	1	1	0	0	1
-67	36	0	0	1	1	0	1	1	0
-68	33	0	0	1	1	0	0	1	1
-69	30	0	0	1	1	0	0	0	0
-70	2D	0	0	1	0	1	1	0	1
-71	2A	0	0	1	0	1	0	1	0
-72	27	0	0	1	0	0	1	1	1
-73	24	0	0	1	0	0	1	0	0
-74	21	0	0	1	0	0	0	0	1
-75	1E	0	0	0	1	1	1	1	0
-76	1B	0	0	0	1	1	0	1	1
-77	18	0	0	0	1	1	0	0	0
-78	15	0	0	0	1	0	1	0	1
-79	12	0	0	0	1	0	0	1	0
-80	0F	0	0	0	0	1	1	1	1
-81	0C	0	0	0	0	1	1	0	0
-82	09	0	0	0	0	1	0	0	1
-83	06	0	0	0	0	0	1	1	0
-84	03	0	0	0	0	0	0	1	1
Mute	00	0	0	0	0	0	0	0	0

■**BALANCE (Select Address: 01H)**

Channel Select (CHS)	D7
Ach (Bch is attenuated)	0
Bch (Ach is attenuated)	1

	BAL				
Gain (dB)	D6	D5	D4	D3	D2
0	0	0	0	0	0
-1	0	0	0	0	1
-2	0	0	0	1	0
-3	0	0	0	1	1
-4	0	0	1	0	0
-5	0	0	1	0	1
-6	0	0	1	1	0
-7	0	0	1	1	1
-8	0	1	0	0	0
-9	0	1	0	0	1
-10	0	1	0	1	0
-11	0	1	0	1	1
-12	0	1	1	0	0
-13	0	1	1	0	1
-14	0	1	1	1	0
-15	0	1	1	1	1
-16	1	0	0	0	0
-17	1	0	0	0	1
-18	1	0	0	1	0
-19	1	0	0	1	1
-20	1	0	1	0	0
-21	1	0	1	0	1
-22	1	0	1	1	0
-23	1	0	1	1	1
-24	1	1	0	0	0
-25	1	1	0	0	1
-26	1	1	0	1	0
-27	1	1	0	1	1
-28	1	1	1	0	0
-29	1	1	1	0	1
-30	1	1	1	1	0
Mute	1	1	1	1	1

■TONE CONTROL BASS (Select Address: 02H)

Bass Cut or Boost	BCB D7
Cut	0
Boost	1

		BASS			
Cut Gain (dB)	Boost Gain (dB)	D6	D5	D4	D3
-15	15	1	1	1	1
-14	14	1	1	1	0
-13	13	1	1	0	1
-12	12	1	1	0	0
-11	11	1	0	1	1
-10	10	1	0	1	0
-9	9	1	0	0	1
-8	8	1	0	0	0
-7	7	0	1	1	1
-6	6	0	1	1	0
-5	5	0	1	0	1
-4	4	0	1	0	0
-3	3	0	0	1	1
-2	2	0	0	1	0
-1	1	0	0	0	1
0	0	0	0	0	0

■TONE CONTROL SUB-BASS (Select Address: 02H)

Sub-Bass Cut or Boost	BCSB D2
Cut	0
Boost	1

		SUB-BASS	
Cut Gain (dB)	Boost Gain (dB)	D1	D0
-3	3	1	1
-2	2	1	0
-1	1	0	1
0	0	0	0

■TONE CONTROL TREBLE (Select Address: 03H)

Treble Cut or Boost	BCT D7
Cut	0
Boost	1

Cut Gain (dB)	Boost Gain (dB)	TREB D6	D5	D4	D3
-15	15	1	1	1	1
-14	14	1	1	1	0
-13	13	1	1	0	1
-12	12	1	1	0	0
-11	11	1	0	1	1
-10	10	1	0	1	0
-9	9	1	0	0	1
-8	8	1	0	0	0
-7	7	0	1	1	1
-6	6	0	1	1	0
-5	5	0	1	0	1
-4	4	0	1	0	0
-3	3	0	0	1	1
-2	2	0	0	1	0
-1	1	0	0	0	1
0	0	0	0	0	0

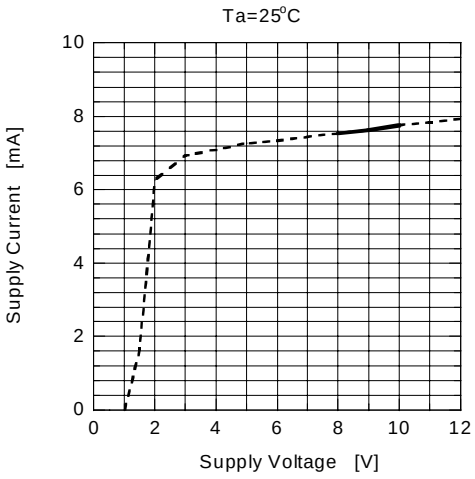
■TONE CONTROL SUB-TREBLE (Select Address: 03H)

Sub-Treble Cut or Boost	BCST D2
Cut	0
Boost	1

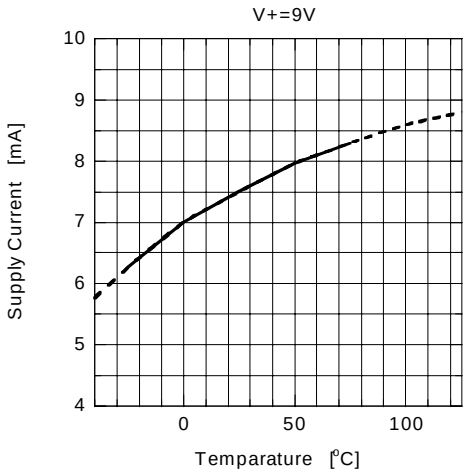
Cut Gain (dB)	Boost Gain (dB)	SUB-TREB D1	D1
-3	3	1	1
-2	2	1	0
-1	1	0	1
0	0	0	0

■TYPICAL CHARACTERISTICS

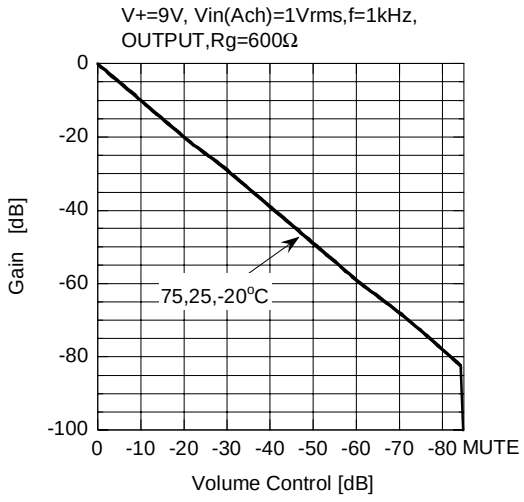
Supply Current vs Supply Voltage



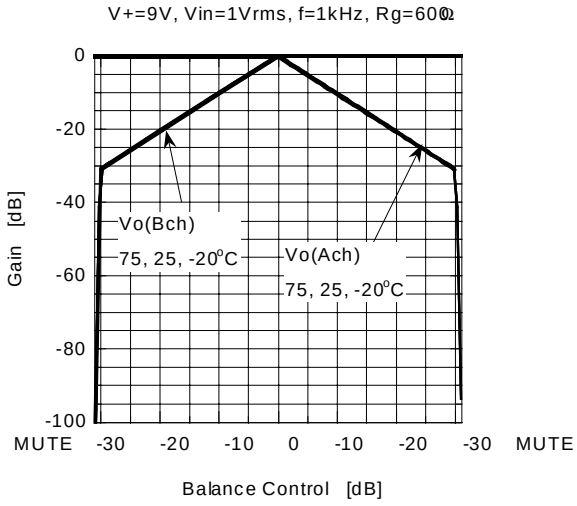
Supply Current vs Temparature



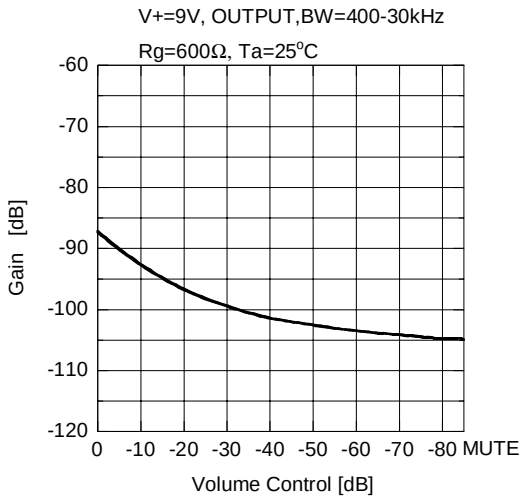
Gain vs Volume Control



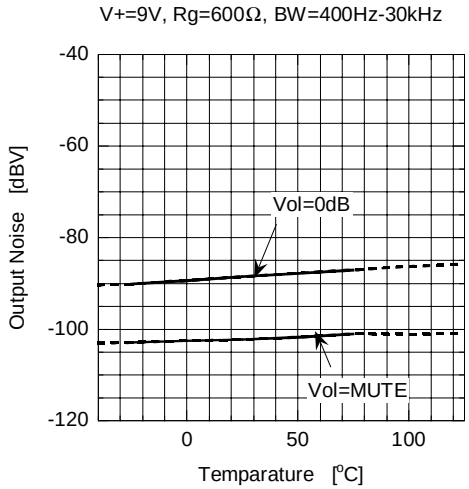
Gain vs Balance Control



Output Noise vs Volume Control



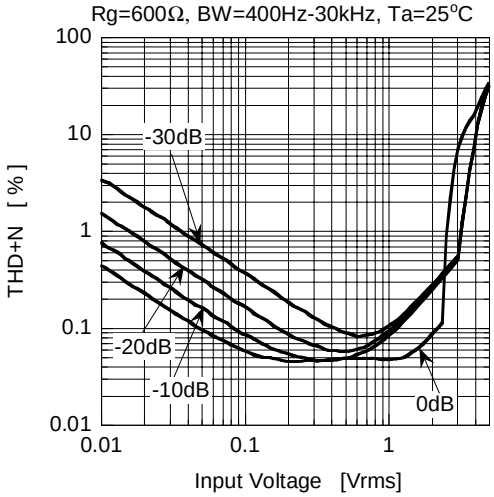
Output Noise vs Temperature



■TYPICAL CHARACTERISTICS

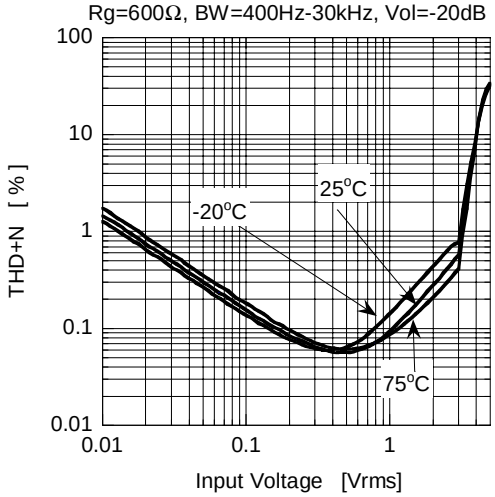
THD+N vs Input Voltage

V+=9V, Vin(Ach), f=1kHz, Vo(Ach)OUTPUT
Rg=600Ω, BW=400Hz-30kHz, Ta=25°C



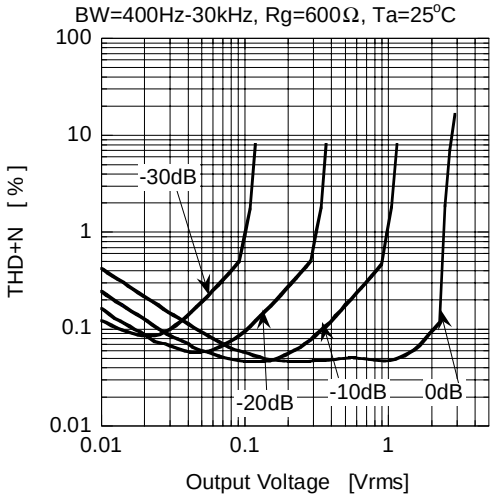
THD+N vs Input Voltage

V+=9V, Vin(Ach), f=1kHz, Vo(Ach)OUTPUT
Rg=600Ω, BW=400Hz-30kHz, Vol=-20dB



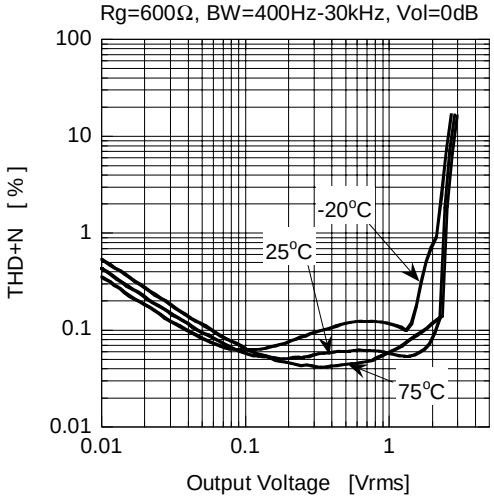
THD+N vs Output Voltage

V+=9V, Vin(Ach), f=1kHz, Vo(Ach)OUTPUT
BW=400Hz-30kHz, Rg=600Ω, Ta=25°C



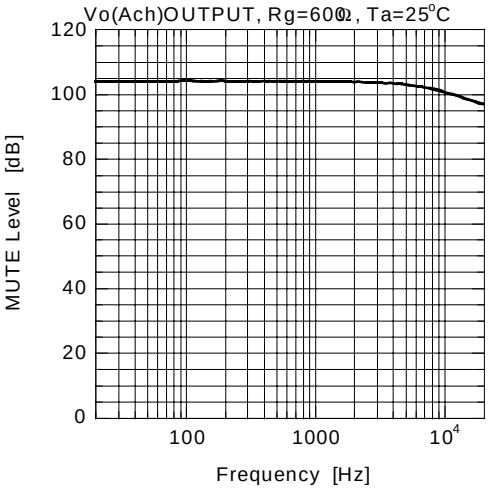
THD+N vs Output Voltage

V+=9V, Vin(Ach), f=1kHz, Vo(Ach)OUTPUT
Rg=600Ω, BW=400Hz-30kHz, Vol=0dB



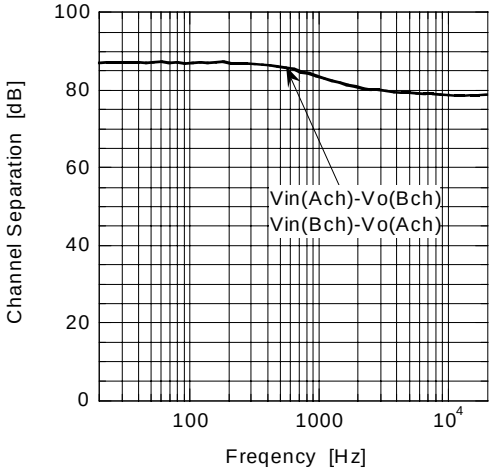
MUTE Level vs Frequency

V+=9V, Vin(Ach)=1Vrms, Vol=MUTE
Vo(Ach)OUTPUT, Rg=600Ω, Ta=25°C



Channel Separation vs Frequency

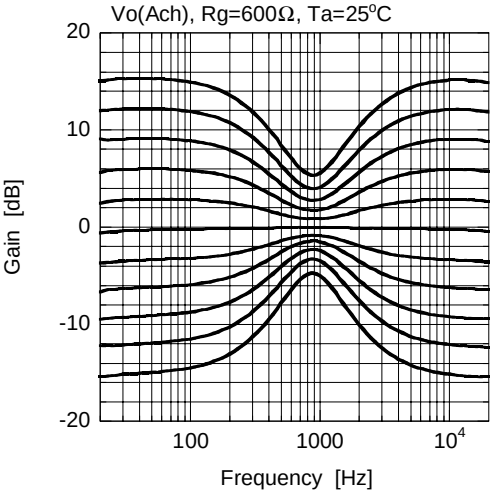
V+=9V, Vin=1Vrms, f=1kHz, Vo=OUTPUT
Rg=600Ω, Vol=0dB, Ta=25°C



■TYPICAL CHARACTERISTICS

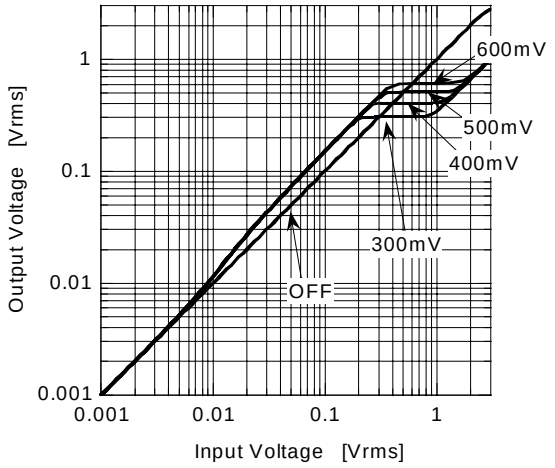
Gain vs Frequency (TONE)

V+=9V, Vin(Ach)=0.1Vrms,Gv:3dB steps
Vo(Ach), Rg=600Ω, Ta=25°C



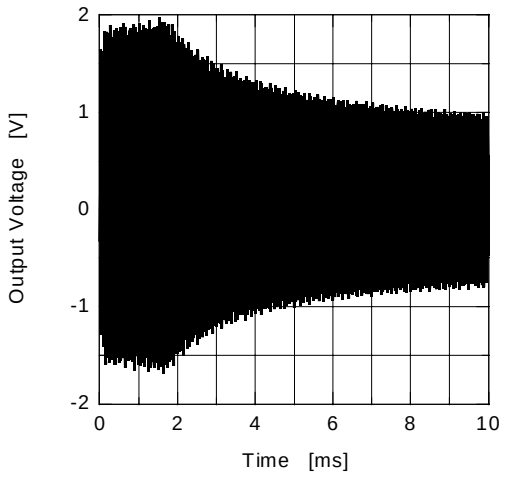
AGC Control

V+=9V, Vin(Ach+Bch), f=1kHz, Vo(Ach)OUTPUT
Rg=600Ω, Ta=25°C



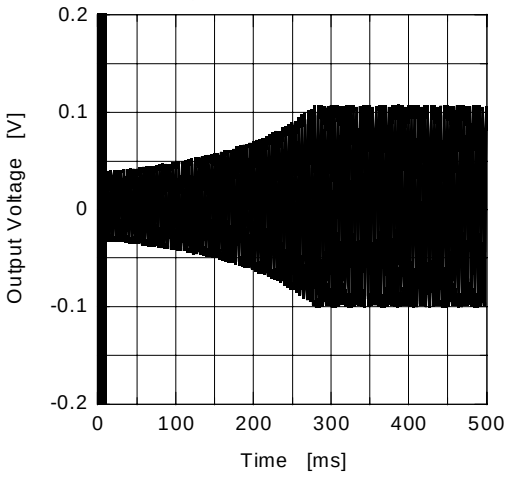
AGC Attack Time (C:20pin=0.33μF)

V+=9V, Vin(Ach+Bch)=1Vrms,f=20kHz,Vo(Ach)OUTPUT
AGC level=0.3V,Rg=600Ω,Ta=25°C



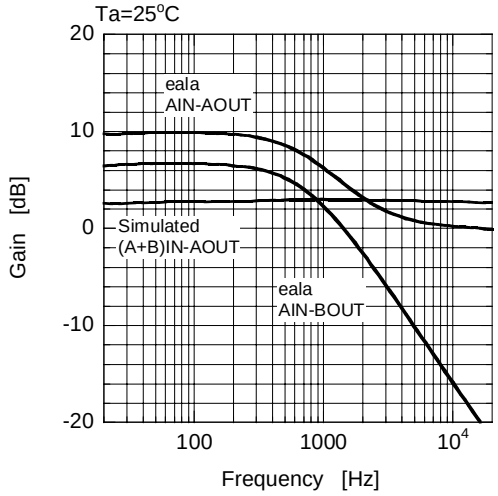
AGC Recovery Time (C:20pin=0.33μF)

V+=9V, Vin(Ach+Bch)=1Vrms, f=10kHz,Vo(Ach)OUTPUT
AGC level=0.3V,Rg=600Ω,Ta=25°C



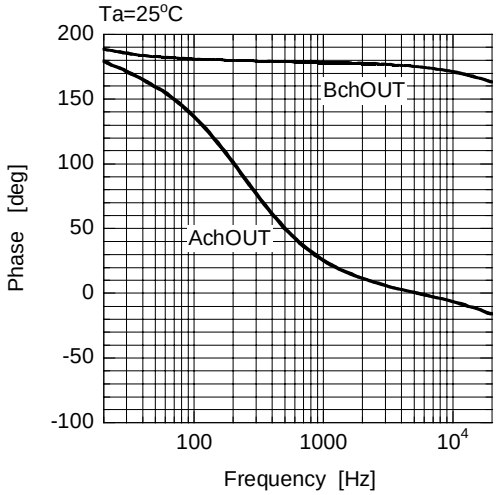
Gain vs Frequency (eala&Simulated)

V+=9V, Vin=0.1Vrms,OUTPUT, Rg=600Ω,
Ta=25°C



Phase vs Frequency (Simulated)

V+=9V, Vin(A+Bch)=0.1Vrms, Rg=600Ω,
Ta=25°C



[CAUTION]
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