AUDIO PROCESSOR

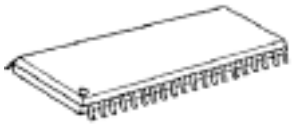
■ GENERAL DESCRIPTION

The **NJW1145** is a audio processor with sound enhancement (BBE). It includes all of the functions processing audio signal for TV, such as tone control, balance, volume, mute, and AGC functions.

Also the **NJW1145** performs surround and sound enhancement. The sound enhancement regenerates high definitive and nearly real sound.

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

■ PACKAGE OUTLINE

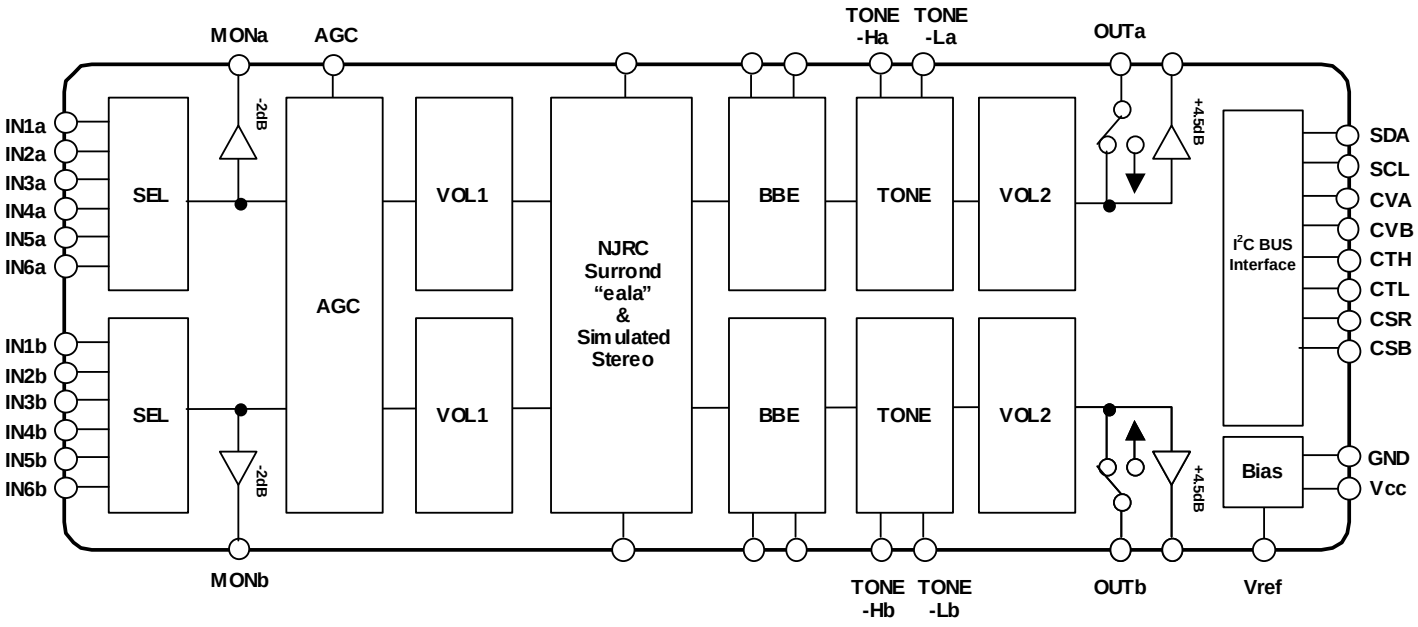


NJW1145GK1

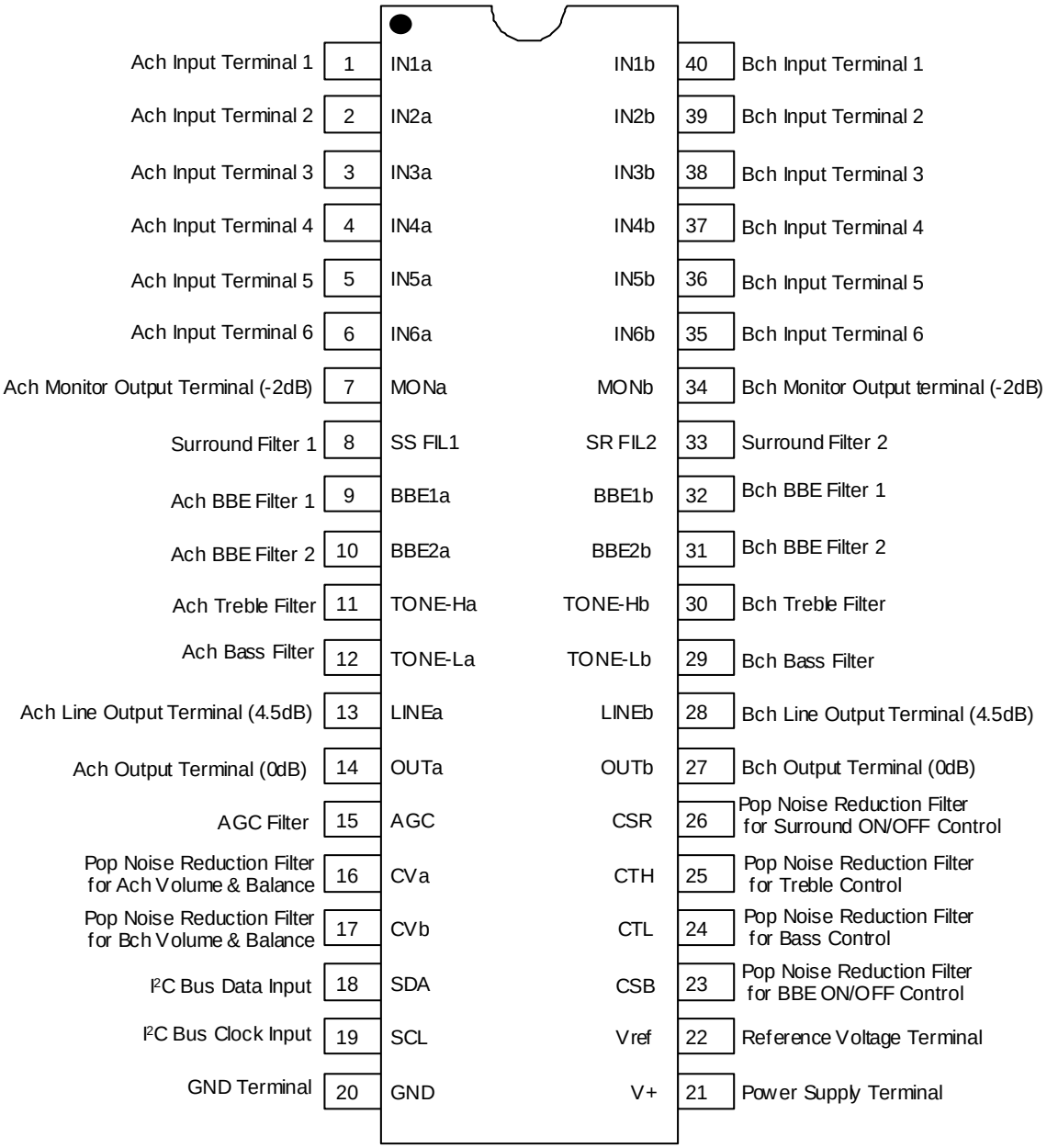
■ FEATURES

- Operating Voltage 8 to 13V
- I^2C BUS Interface
- BBE Sound Enhancement (Low Boost and High Boost: 15dB max.)
- Internal 6 Input Audio Selectors and Monitor Output
- The AGC circuit reduces volume difference among input sources.
- Variable AGC Compression Level via I^2C (4-levels)
- NJRC Surround "eala" and Simulated Surround
- Variable Surround Effect Level via I^2C
- Low Noise VCA
- Bi-CMOS Technology
- Package Outline SOP40

■ BLOCK DIAGRAM



■ PIN CONFIGURATION



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

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V^+	14	V
Power Dissipation	P_D	700	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	13.0	V
Supply Current	I_{CC}	No Signal	-	13	25	mA
Reference Voltage	V_{REF}	No Signal	4.0	4.5	5.0	V
Maximum Input Voltage	V_{IM}	VOL=-20dB, THD=1%	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	-	-2.0	-	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 Level A-A	BAL_{AA}	CHS="0",BAL="11111"	-2.0	0.0	2.0	dB
Balance Level A-B	BAL_{AB}	CHS="1",BAL="11111" Vin = 1Vrms BW=400Hz to 30kHz	-	-	-70	dB
Balance Level B-B	BAL_{BB}	CHS="1",BAL="11111"	-2.0	0.0	2.0	dB
Balance Level B-A	BAL_{BA}	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

● **SUB-TONE CONTROL** (Sub-Tone Control-ON)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
High Frequency Boost	SHF_{BST}	SUB-TREBLE=+3dB, f=10kHz	2.0	3.0	4.0	dB
High Frequency Flat	SHF_{FLT}	SUB-TREBLE=0dB, f=10kHz	-2.0	0.0	2.0	dB
High Frequency Cut	SHF_{CUT}	SUB-TREBLE=-3dB, f=10kHz	-4.0	-3.0	-2.0	dB
Low Frequency Boost	SLF_{BST}	SUB-BASS=+3dB, f=100Hz	2.0	3.0	4.0	dB
Low Frequency Flat	SLF_{FLT}	SUB-BASS=0dB, f=100Hz	-2.0	0.0	2.0	dB
Low Frequency Cut	SLF_{CUT}	SUB-BASS=-3dB, f=100Hz	-4.0	-3.0	-2.0	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

● **BBE** (BBE-ON)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
BBE Low Frequency Boost Level	BBE_{LOW}	BBE-Low=+15dB	-	15.0	-	dB
BBE High Frequency Boost Level	BBE_{HIGH}	BBE-High=+15dB	-	15.0	-	dB

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

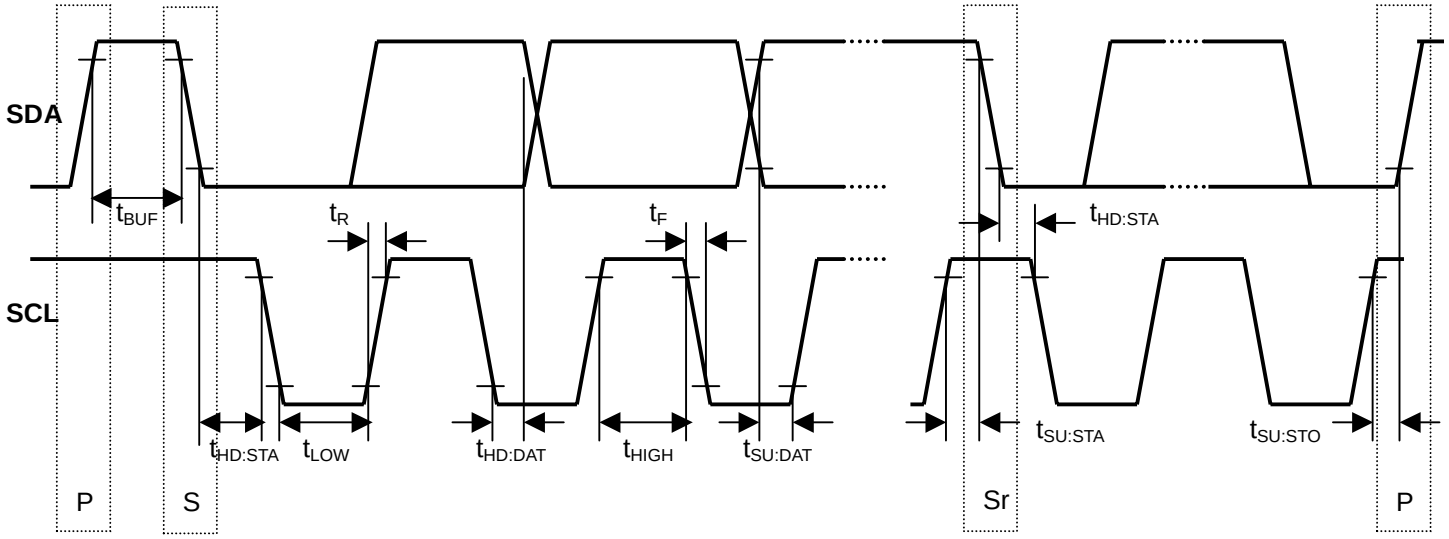
● **SURROUND**

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
SURROUND SIM A	SR_{SIMA}	Ain+Bin → Aout, f=1kHz	1.0	3.0	5.0	dB
SURROUND SIM B	SR_{SIMB}	Ain+Bin → Bout, f=1kHz	1.0	3.0	5.0	dB
SURROUND 3D 1	SR_{3D1}	Ain → Aout, f=100Hz	8.0	10.0	12.0	dB
SURROUND 3D 2	SR_{3D2}	Ain → Aout, f=10kHz	-2.0	0.0	2.0	dB
SURROUND 3D 3	SR_{3D3}	Ain → Bout, f=100Hz	4.5	6.5	8.5	dB

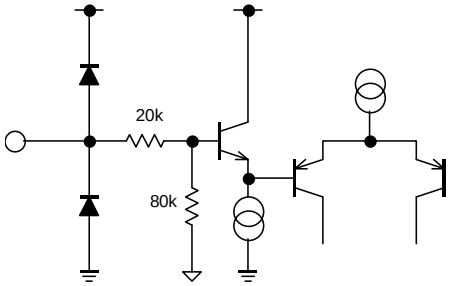
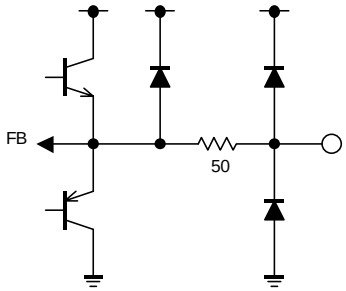
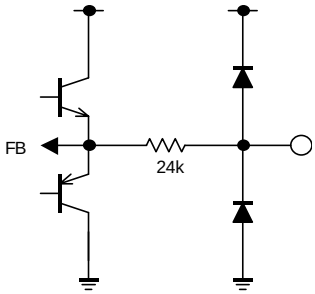
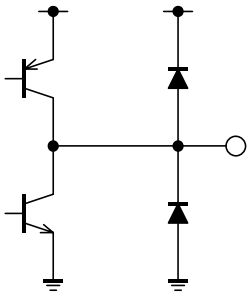
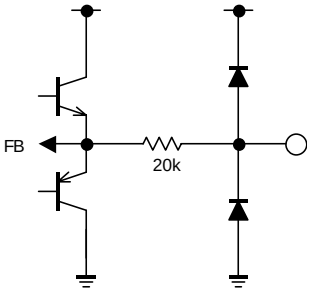
■ **I²C BUS Block CHARACTERISTICS (SDA, SCL)**

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
High Level Input Voltage	V_{IH}	3.0	-	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

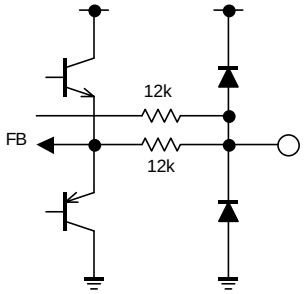
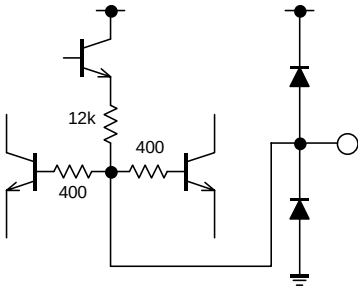
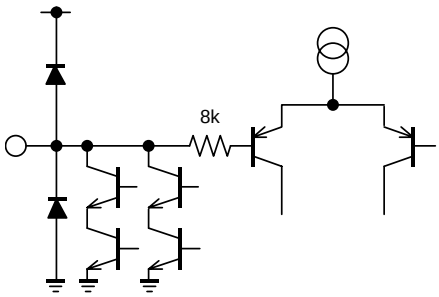
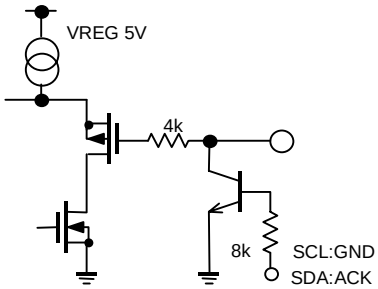
I²C BUS Load Condition: Pull up resistance 4kΩ (Connected to +5V)
Load capacitance 200pF (Connected to GND)



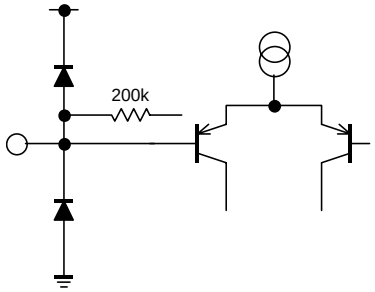
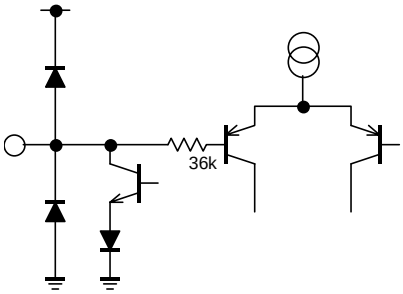
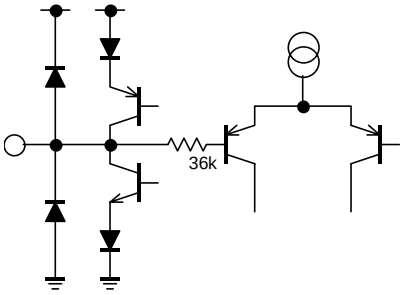
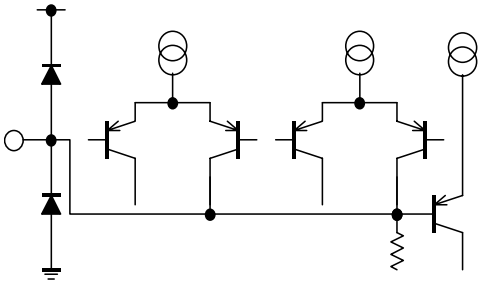
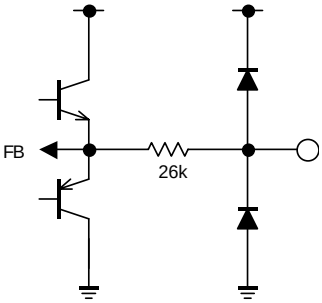
■TERMINAL DESCRIPTION

No.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
1	IN1a	Ach Input Terminal 1		V+/2
2	IN2a	Ach Input Terminal 2		
3	IN3a	Ach Input Terminal 3		
4	IN4a	Ach Input Terminal 4		
5	IN5a	Ach Input Terminal 5		
6	IN6a	Ach Input Terminal 6		
35	IN6b	Bch Input Terminal 6		
36	IN5b	Bch Input Terminal 5		
37	IN4b	Bch Input Terminal 4		
38	IN3b	Bch Input Terminal 3		
39	IN2b	Bch Input Terminal 2		
40	IN1b	Bch Input Terminal 1		
7	MONa	Ach Monitor Output Terminal (-2dB)		V+/2
13	LINEa	Ach Line Output Terminal (4.5dB)		
14	OUTa	Ach Output Terminal (0dB)		
27	OUTb	Bch Output Terminal (0dB)		
28	LINEb	Bch Line Output Terminal (4.5dB)		
34	MONb	Bch Monitor Output Terminal (-2dB)		
8	SS FIL	Surround Filter 1		V+/2
9	BBE1a	Ach BBE Filter 1		V+/2
10	BBE2a	Ach BBE Filter 2		
31	BBE2b	Bch BBE Filter 2		
32	BBE1b	Bch BBE Filter 1		
11	TONE-Ha	Ach Treble Filter		V+/2
30	TONE-Hb	Bch Treble Filter		

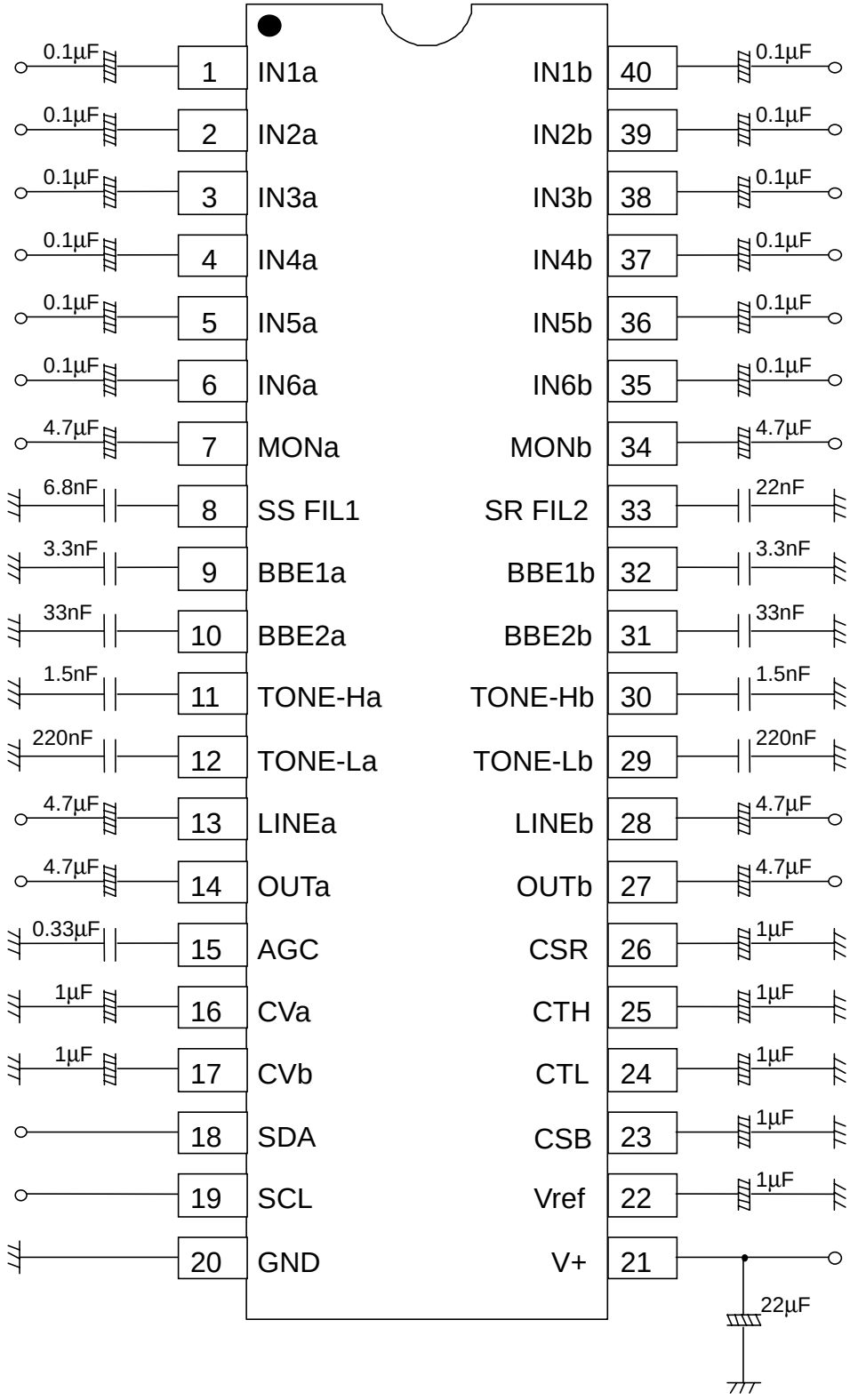
■TERMINAL DESCRIPTION

No.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
12 29	TONE-La TONE-Lb	Ach Bass Filter Bch Bass Filter		V+/2
15	AGC	AGC Filter		0.9V
16 17	CVa CVb	Pop Noise Reduction Filter for Ach Volume & Balance Pop Noise Reduction Filter for Bch Volume & Balance		V+/2 - 0.7V
18 19	SDA SCL	I^2C Bus Data Input I^2C Bus Clock Input		-
20	GND	GND Terminal	———	0V
21	V+	Power Supply Terminal	———	GND

■TERMINAL DESCRIPTION

No.	SYMBOL	FUNCTION	EQUIVALENT CIRCUIT	VOLTAGE
22	Vref	Reference Voltage		V+/2
23	CSB	Pop Noise Reduction Filter for BBE ON/OFF Control		V+/2
24 25	CTL CTH	Pop Noise Reduction Filter for Bass Control Pop Noise Reduction Filter for Treble Control		V+/2
26	CSR	Pop Noise Reduction Filter for Surround ON/OFF Control		V+/2
33	SR FII2	Surround Filter 2		V+/2

■ **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	Pin No.	Symbol	Pin No.	Symbol
8	SS FIL1	10	BBE2a	12	TONE-La	30	TONE-Hb	32	BBE1b
9	BBE1a	11	TONE-Ha	29	TONE-Lb	31	BBE2b	33	SR FIL2

■ 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

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
00H	VOL							
01H	CHS	BAL					SR1	SR0
02H	BCB	BASS				BCSB	SUB-BASS	
03H	BCT	TREB				BCST	SUB-TREB	
04H	BBE-Low				BBE-High			
05H	OUT	SEL			AGC1	AGC0	AGC	BBE

● CONTROL REGISTER DEFAULT VALUE

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 attenuator is consisted of both the Volume1 and Volume2. The total attenuation level is summing of each attenuation level of the Volume1 and Volume2. The attenuation for both the Volume1 and Volume2 are always synchronized to have the same attenuation levels for each other, and are not controllable independently for each other.

- "VOL": Sets the total attenuation level for the both Ach and Bch (up to 84dB, 0.33dB/step)

●CHANNEL BALANCE AND SURROUND MODE CONTROL

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

◆Channel Balance Control

To control the balance between Ach and Bch, the both commands "CHS" and "BAL" should be set. For example, to move a sound image to Ach-side, Bch should be attenuated with no attenuation on Ach. The command "CHS" defines the channel should be attenuate, and the command "BAL" defines the attenuation level itself. The attenuation for the balance control is consisted of the both Volume1 and Volume2, has the same structure with Master Volume Control described above.

- "CHS": Defines the channel should be attenuated

The channel should be attenuated	CHS (D7)
Bch	0
Ach	1

- "BAL": Defines the attenuation level for the specified channel with command "CHS" (up to 30dB, 1dB/Step)

◆Surround Mode Control

- "SR1", "SR0": Surround Mode Switch

Surround Mode	SR1 (D1)	SR0 (D0)
Surround OFF (Bypass)	0	0
Simulated Surround	0	1
3D Surround – High Mode	1	0
3D Surround – Low Mode	1	1

●BASS-TONE CONTROL SETTING

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

•"BCB": Defines the Bass-Tone Control Mode as Boost or Cut

Bass Tone Control Mode	BCB (D7)
Cut	0
Boost	1

•"BASS": Sets the Cut or Boost level for Bass-Tone Control (up to 15dB, 1dB/Step)
•"BCSB": Defines the Sub-Bass-Tone Control Mode as Boost or Cut

Sub-Bass Tone Control Mode	BCSB (D2)
Cut	0
Boost	1

•"SUB-BASS": Sets the Cut or Boost level for Sub-Bass-Tone Control (up to 3dB, 1dB/Step)

●TREBLE-TONE CONTROL SETTING

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

•"BCT": Defines the Treble-Tone Control Mode as Boost or Cut

Treble-Tone Control Mode	BCT (D7)
Cut	0
Boost	1

•"TREB": Sets the Cut or Boost level for Treble-Tone Control (up to 15dB, 1dB/Step)
•"BCST": Defines the Sub-Treble-Tone Control Mode as Boost or Cut

Sub-Treble-Tone Control Mode	BCST (D2)
Cut	0
Boost	1

•"SUB-TREB": Sets the Cut or Boost level for Sub-Treble-Tone Control (up to 3dB, 1dB/Step)

●BBE BOOST LEVEL SETTING

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
04H	BBE-Low				BBE-High			

The command "BBE-Low" and "BBE-High" can set the only BBE boost level, not BBE ON/OFF control.
To activate the BBE, the command "BBE" (Address=05H) must be ON.

•"BBE-Low": Sets the BBE low frequency boost level (up to 15dB, 1dB/Step)
•"BBE-High": Sets the BBE high frequency boost level (up to 15dB, 1dB/Step)

●OUTPUT ON/OFF, INPUT SELECTOR, AGC and BBE ON/OFF CONTROL

Select Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
05H	OUT	SEL			AGC1	AGC0	AGC	BBE

◆Output ON/OFF

•"OUT": Output ON/OFF Switch

Output	OUT (D7)
Output OFF (Mute)	0
Output ON	1

◆Input Selector

•"SEL": Input Selector Control

	SEL		
Input Select	D6	D5	D4
IN1a and IN1b	0	0	0
IN2a and IN2b	0	0	1
IN3a and IN3b	0	1	0
IN4a and IN4b	0	1	1
IN5a and IN5b	1	0	0
IN6a and IN6b	1	0	1

◆AGC Control

•"AGC1", "AGC0": Set the AGC Flat Level

•"AGC": AGC ON/OFF Switch

AGC Flat Level	AGC1 (D3)	AGC0 (D2)	AGC (D0)
300mVrms	0	0	1
400mVrms	0	1	1
500mVrms	1	0	1
600mVrms	1	1	1
AGC OFF	-	-	0

◆BBE ON/OFF Control

•"BBE": BBE ON/OFF Switch

BBE ON/OFF	BBE (D0)
BBE OFF	0
BBE ON	1

●MASTER VOLUME CONTROL (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

●**MASTER VOLUME CONTROL** (cont'd)

		VOL							
Gain (dB)	**HEX**	**D7**	**D6**	**D5**	**D4**	**D3**	**D2**	**D1**	**D0**
-41	84	1	0	0	0	0	1	0	0
-42	81	1	0	0	0	0	0	0	1
-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

●CHANNEL BALANCE CONTROL (Select Address: 01H)

	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

●BASS-TONE CONTROL (Select Address: 02H)
/ TREBLE-TONE CONTROL (Select Address: 03H)

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

●SUB-BASS-TONE CONTROL (Select Address: 02H)
/ SUB-TREBLE-TONE CONTROL (Select Address: 03H)

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

●BBE Low-Frequency Boost Level (Select Address: 04H)

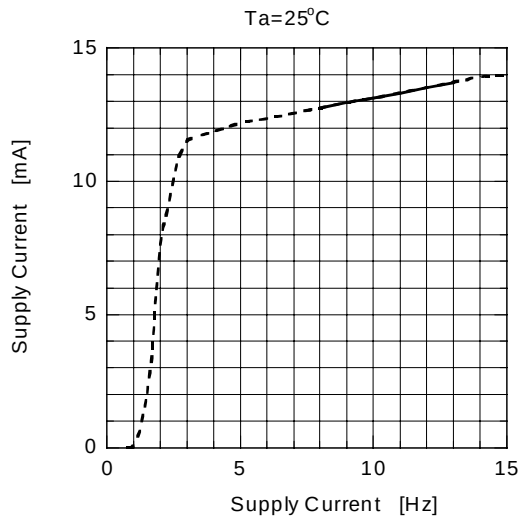
	BBE-Low			
Boost Gain (dB)	**D6**	**D5**	**D4**	**D3**
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1

●BBE High-Frequency Boost Level (Select Address: 04H)

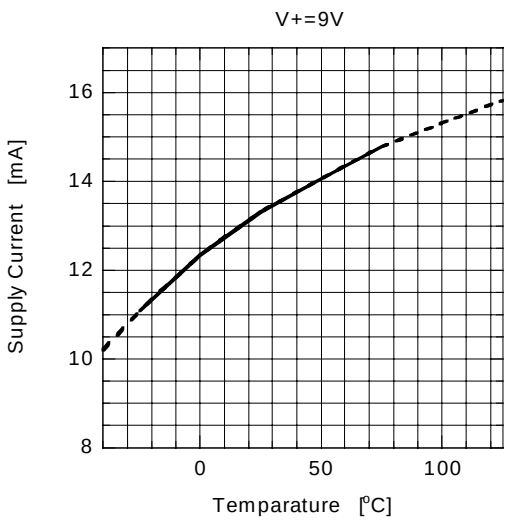
	BBE-High			
Boost Gain (dB)	**D3**	**D2**	**D1**	**D0**
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1

■TYPICAL CHARACTERISTICS

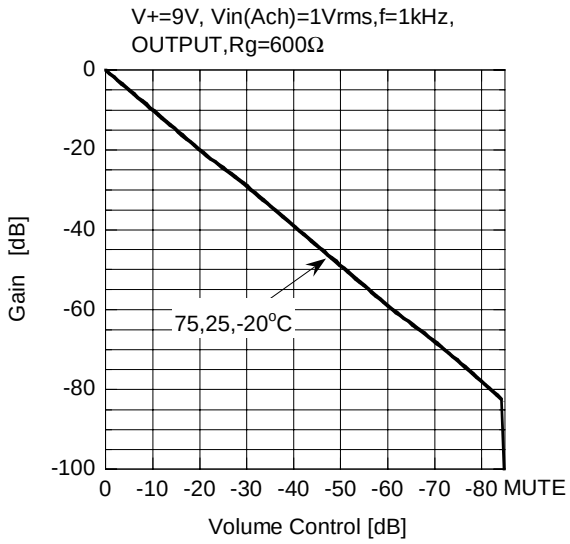
Supply Current vs Supply Voltage



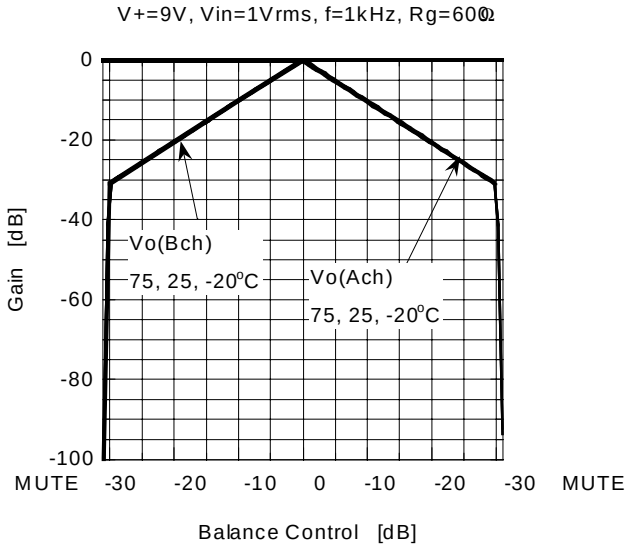
Supply Current vs Temparature



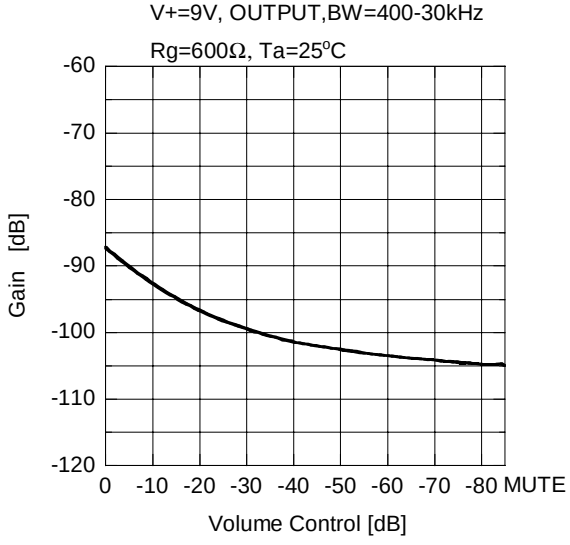
Gain vs Volume Control



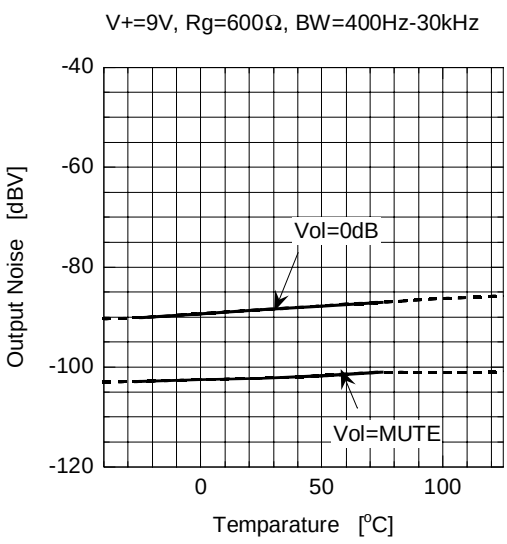
Gain vs Balance Control



Output Noise vs Volume Control



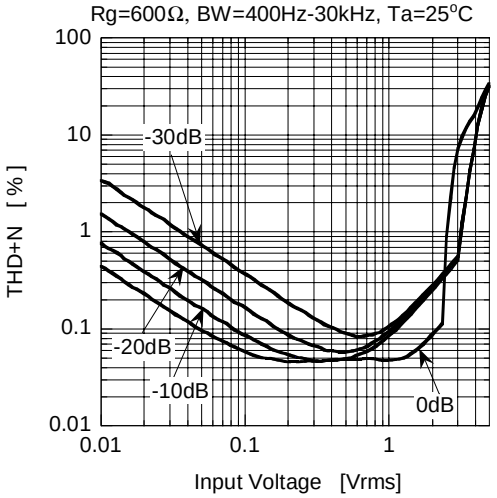
Output Noise vs Temperature



■TYPICAL CHARACTERISTICS

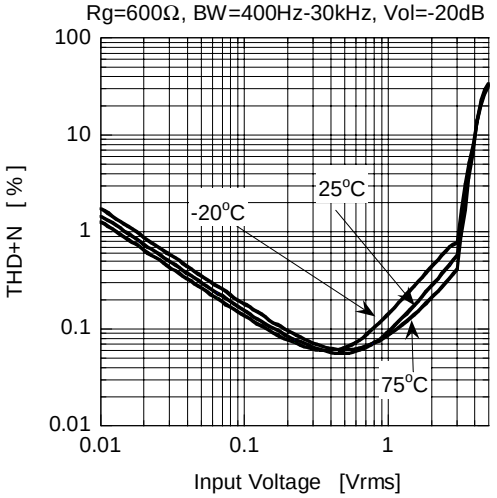
THD+N vs Input Voltage

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



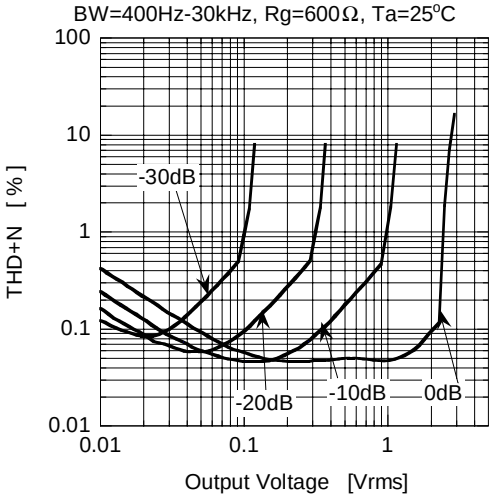
THD+N vs Input Voltage

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



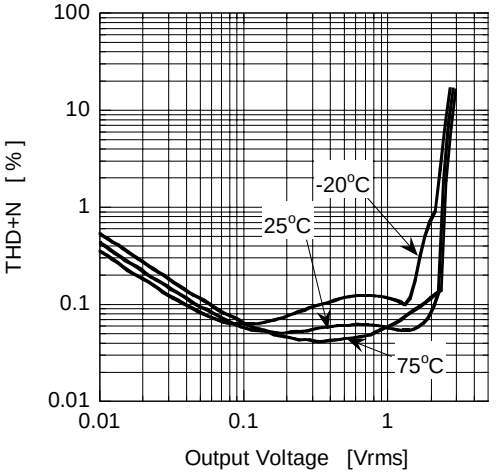
THD+N vs Output Voltage

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



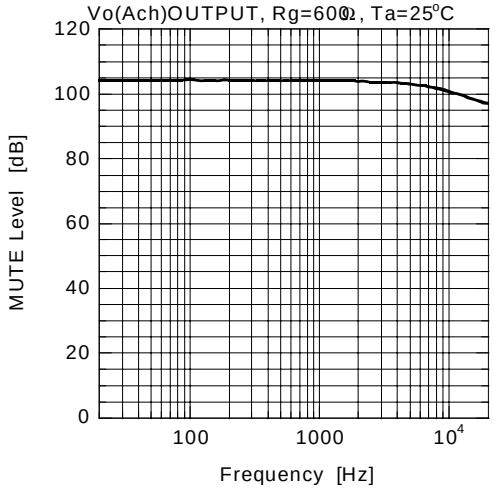
THD+N vs Output Voltage

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



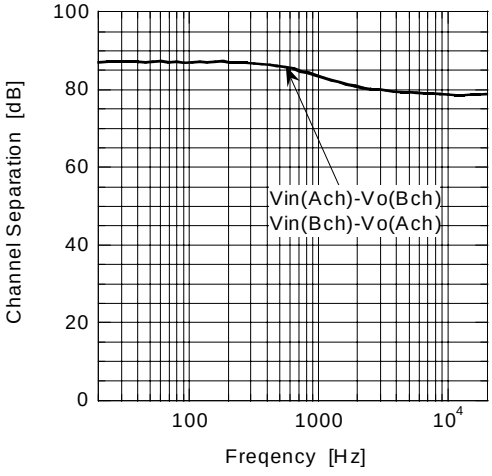
MUTE Level vs Frequency

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

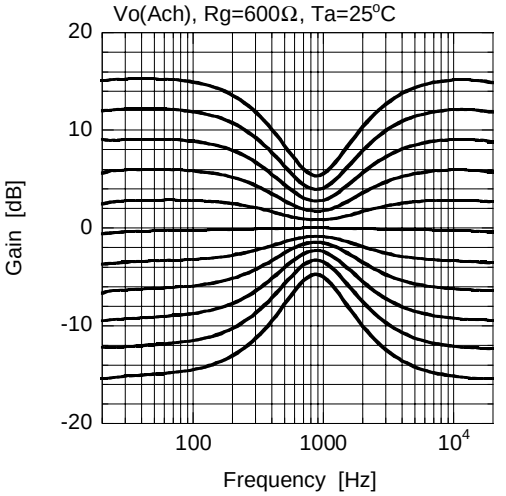


■TYPICAL CHARACTERISTICS

Gain vs Frequency (TONE)

V+=9V, Vin(Ach)=0.1Vrms,Gv:3dB steps

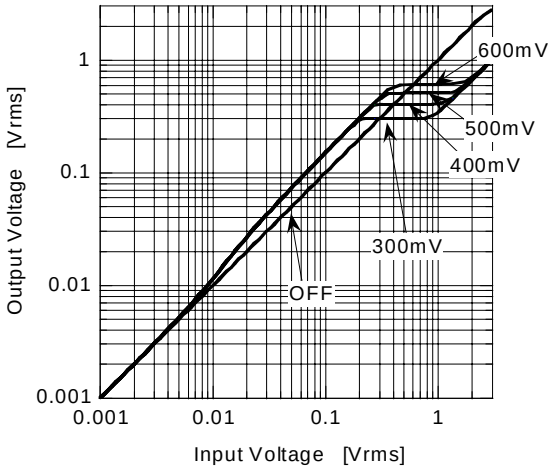
Vo(Ach), Rg=600Ω, Ta=25°C



AGC Control

V+=9V, Vin(Ach+Bch), f=1kHz, Vo(Ach)OUTPUT

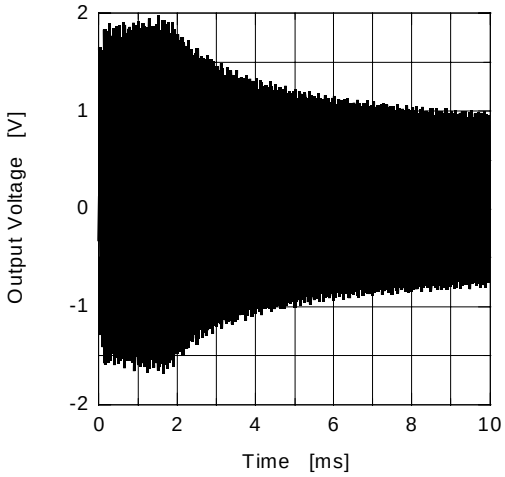
Rg=600Ω, Ta=25°C



AGC Attack Time (C:20pin=0.33μF)

V+=9V, Vin(Ach+Bch)=1Vrms,f=20kHz,Vo(Ach)OUTPUT

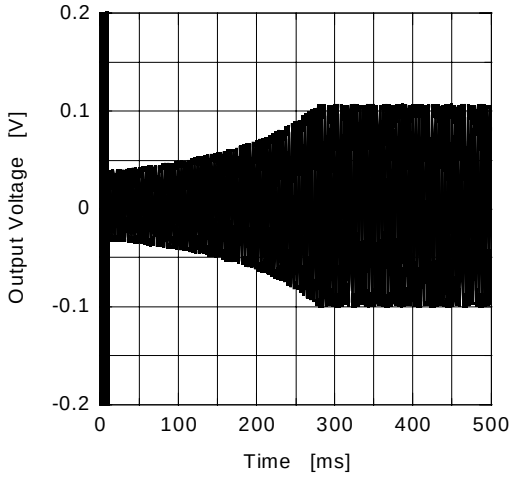
AGC level=0.3V,Rg=600Ω,Ta=25°C



AGC Recovery Time (C:20pin=0.33μF)

V+=9V, Vin(Ach+Bch)=1Vrms, f=10kHz,Vo(Ach)OUTPUT

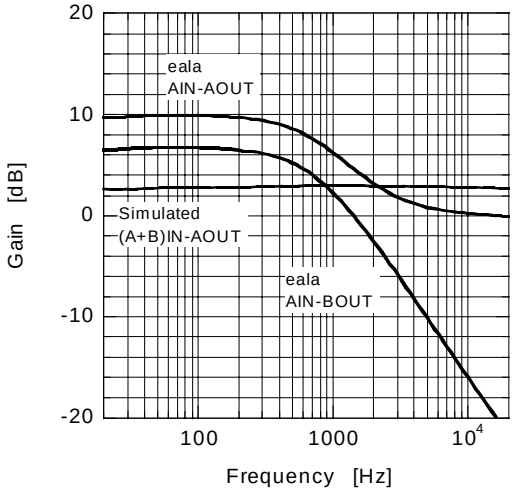
AGC level=0.3V,Rg=600Ω,Ta=25°C



Gain vs Frequency (eala&Simulated)

V+=9V, Vin=0.1Vrms,OUTPUT, Rg=600Ω,

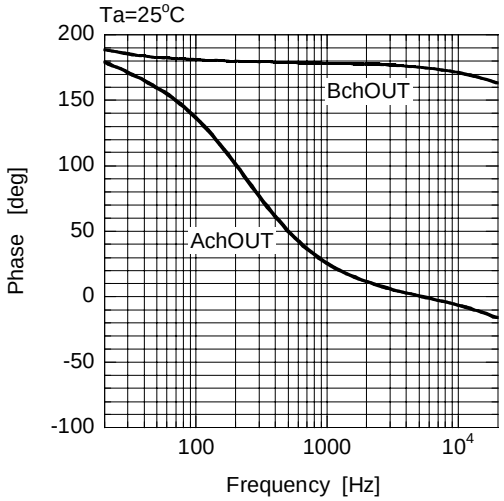
Ta=25°C



Phase vs Frequency (Simulated)

V+=9V, Vin(A+Bch)=0.1Vrms, Rg=600Ω,

Ta=25°C

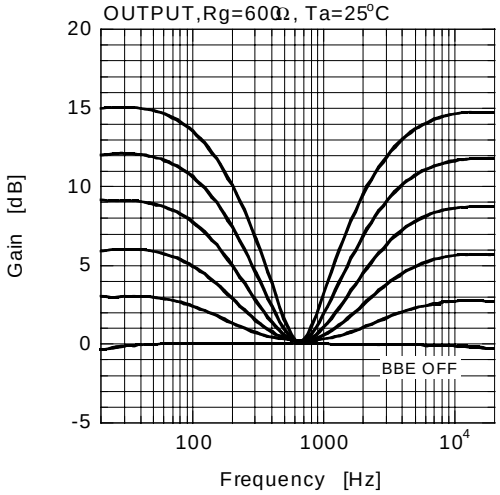


■TYPICAL CHARACTERISTICS

Gain vs Frequency (BBE)

V+=9V, Vin(Ach)=0.1Vrms,Gv=3dB steps

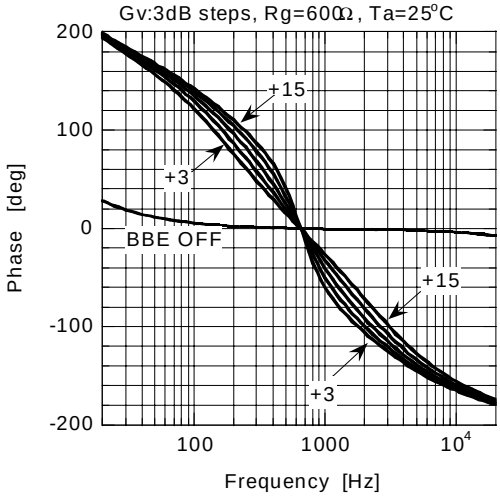
OUTPUT,Rg=600Ω, Ta=25°C



Phase vs Frequency (BBE)

V+=9V, Vin(Ach)=0.1Vrms, Vo(Ach)

Gv:3dB steps, Rg=600Ω, Ta=25°C



■ **NOTE**

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