



AUDIO PROCESSOR

■GENERAL DESCRIPTION

The **NJW1133A** is an audio processor. It includes all of functions processing audio signal for TV, such as tone control, balance, volume, mute, and AGC(Auto Gain Control) functions.

All of internal status and variables are controlled by I²C BUS interface.

■PACKAGE OUTLINE

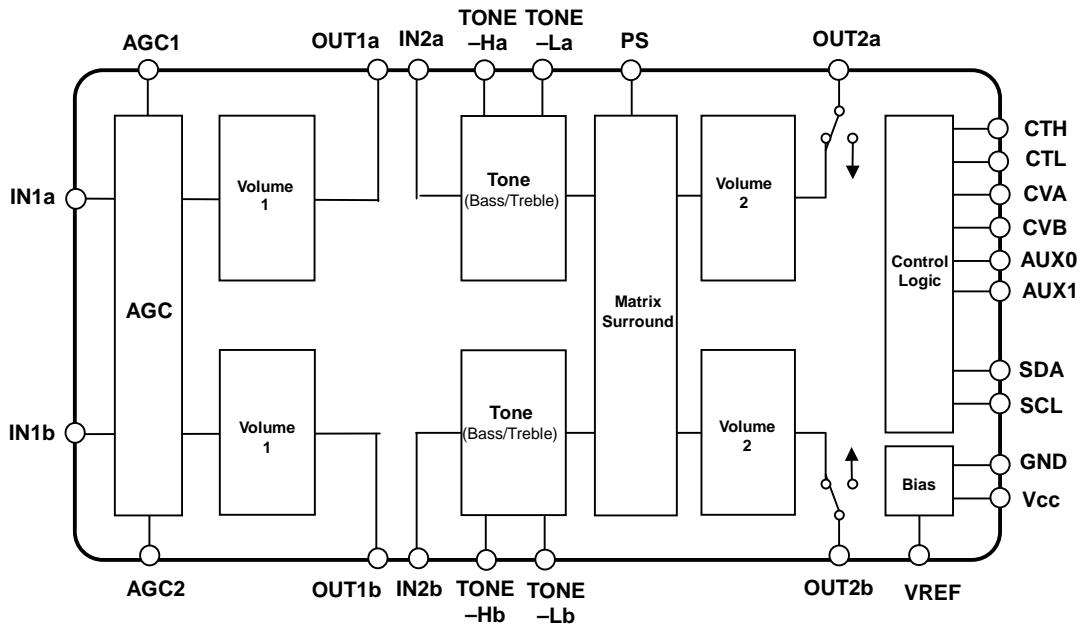


NJW1133AM

■FEATURES

- Operating Voltage 8 to 13V
- I²C BUS Interface
- AGC Circuit (It reduces volume difference among input sources.)
- Matrix Surround
- Bi-CMOS Technology
- Package Outline SDMP30

■BLOCK DIAGRAM



■PIN FUNCTION

| | | | |
|----|---------|---------|----|
| 1 | IN1a | IN1b | 30 |
| 2 | NC | NC | 29 |
| 3 | NC | NC | 28 |
| 4 | OUT1a | OUT1b | 27 |
| 5 | IN2a | IN2b | 26 |
| 6 | TONE-Ha | TONE-Hb | 25 |
| 7 | TONE-La | TONE-Lb | 24 |
| 8 | OUT2a | OUT2b | 23 |
| 9 | AGC1 | PS | 22 |
| 10 | AGC2 | VREF | 21 |
| 11 | CVB | CTH | 20 |
| 12 | CVA | CTL | 19 |
| 13 | SDA | AUX0 | 18 |
| 14 | SCL | AUX1 | 17 |
| 15 | GND | Vcc | 16 |

| No. | Symbol | Function | No. | Symbol | Function |
|-----|---------|---------------------------------------|-----|---------|--------------------------------------|
| 1 | IN1a | Ach Input | 16 | Vcc | Supply Voltage |
| 2 | NC | No Connected | 17 | AUX1 | Auxiliary Output1 |
| 3 | NC | No Connected | 18 | AUX0 | Auxiliary Output0 |
| 4 | OUT1a | Ach Output for the Other Accessories | 19 | CTL | DAC Output for Tone Low Frequency |
| 5 | IN2a | Ach Input From the Other Accessories | 20 | CTH | DAC Output for Tone High Frequency |
| 6 | TONE-Ha | Ach Treble Filter | 21 | VREF | Reference Voltage |
| 7 | TONE-La | Ach Bass Filter | 22 | PS | Surround Phase Shift Filter |
| 8 | OUT2a | Ach Output | 23 | OUT2b | Bch Output |
| 9 | AGC1 | AGC1 | 24 | TONE-Lb | Bch Bass Filter |
| 10 | AGC2 | AGC2 | 25 | TONE-Hb | Bch Treble Filter |
| 11 | CVB | DAC Output for Bch Volume & Balance | 26 | IN2b | Bch Input from the Other Accessories |
| 12 | CVA | DAC Output for Ach Volume & Balance | 27 | OUT1b | Bch Output for the Other Accessories |
| 13 | SDA | SDA Data Input (I ² C BUS) | 28 | NC | No Connected |
| 14 | SCL | SCL Data Input (I ² C BUS) | 29 | NC | No Connected |
| 15 | GND | GND | 30 | IN1b | Bch Input |

■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, RL=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 | - | 20 | 30 | mA |
| Reference Voltage | V _{REF} | No Signal | 4.0 | 4.5 | 5.0 | V |
| Maximum Input Voltage | V _{IM} | VOL=C3H,THD=1% | 2.3 | 2.5 | - | Vrms |
| Maximum Output Voltage | V _{OM} | OUTPUT VOL=FFH,THD=1% | - | 2.5 | - | Vrms |
| Channel Balance | G _{CB} | VOL=FFH | -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 | - | - | -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 | - | - | -70 | dB |
| Total Harmonic Distortion | THD | Vo=0.5Vrms BW=400Hz to 30kHz | - | - | 0.5 | % |
| Maximum Gain | G _{VMAX} | VOL=FFH(0dB) | -2.0 | 0.0 | 2.0 | dB |
| Minimum Gain | G _{VMIN} | VOL=00H(MUTE) | - | - | -70 | dB |
| Channel Separation | CS | Vin=2Vrms | - | - | -70 | dB |
| Output Noise 1 | V _{NO1} | VOL=FFH(0dB) BW=400Hz to 30kHz | - | -80 (100) | -70 (316) | dBV (μVrms) |
| Output Noise 2 | V _{NO2} | VOL=00H(MUTE) BW=400Hz to 30kHz | - | -90 (31.6) | -82 (79.4) | dBV (μVrms) |
| AUX Output Voltage | V _{AUX} | Logic Output : High | 4.5 | - | 5.0 | V |
| | | Logic Output : Low | 0 | - | 0.3 | |

BW : Band Width

●TONE CONTROL (Ta=25°C, V⁺=9V, R_g=600Ω, R_L=47kΩ, Vin=100mVrms/1kHz)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---------------------------------|-------------------|------------------------------|-------|-------|-------|------|
| High Frequency Boost | HF _{BST} | BCT="1",TREB="1111", f=10kHz | 12.5 | 15.0 | 17.5 | dB |
| High Frequency Flat | HF _{FLT} | TREB="0000",f=10kHz | -2.0 | 0.0 | 2.0 | dB |
| High Frequency Cut | HF _{CUT} | BCT="0",TRBE="1111", f=10kHz | -17.5 | -15.0 | -12.5 | dB |
| Low Frequency Boost | LF _{BST} | BCB="1",BASS="1111", f=100Hz | 12.5 | 15.0 | 17.5 | dB |
| Low Frequency Flat | LF _{FLT} | BASS="0000",f=100Hz | -2.0 | 0.0 | 2.0 | dB |
| Low Frequency Cut | LF _{CUT} | BCB="0",BASS="1111", f=100Hz | -17.5 | -15.0 | -12.5 | dB |
| High Frequency Cut DC Offset1 | HF _{DC1} | BCT="0",TREB="1111" →"0000" | -1.0 | 0.0 | 1.0 | V |
| High Frequency Boost DC Offset2 | HF _{DC2} | BCT="1",TREB="1111" →"0000" | -1.0 | 0.0 | 1.0 | V |
| Low Frequency Cut DC Offset1 | LF _{DC1} | BCB="0",BASS="1111" →"0000" | -1.0 | 0.0 | 1.0 | V |
| Low Frequency Boost DC Offset2 | LF _{DC2} | BCB="1",BASS="1111" →"0000" | -1.0 | 0.0 | 1.0 | V |

●SUB-TONE CONTROL (Ta=25°C, V⁺=9V, R_g=600Ω, R_L=47kΩ, Vin=100mVrms)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|----------------------|--------------------|---------------------------------|------|------|------|------|
| High Frequency Boost | SHF _{BST} | BCST="0",SUB-TREB="11", f=10kHz | 2.0 | 3.0 | 4.0 | dB |
| High Frequency Flat | SHF _{FLT} | SUB-TREB="00",f=10kHz | -2.0 | 0.0 | 2.0 | dB |
| High Frequency Cut | SHF _{CUT} | BCST="0",SUB-TREB="11", f=10kHz | -4.0 | -3.0 | -2.0 | dB |
| Low Frequency Boost | SLF _{BST} | BCSB="1",SUB-BASS="11", f=100Hz | 2.0 | 3.0 | 4.0 | dB |
| Low Frequency Flat | SLF _{FLT} | SUB-BASS="00",f=100Hz | -2.0 | 0.0 | 2.0 | dB |
| Low Frequency Cut | SLF _{CUT} | BCSB="1",SUB-BASS="11", f=100Hz | -4.0 | -3.0 | -2.0 | dB |

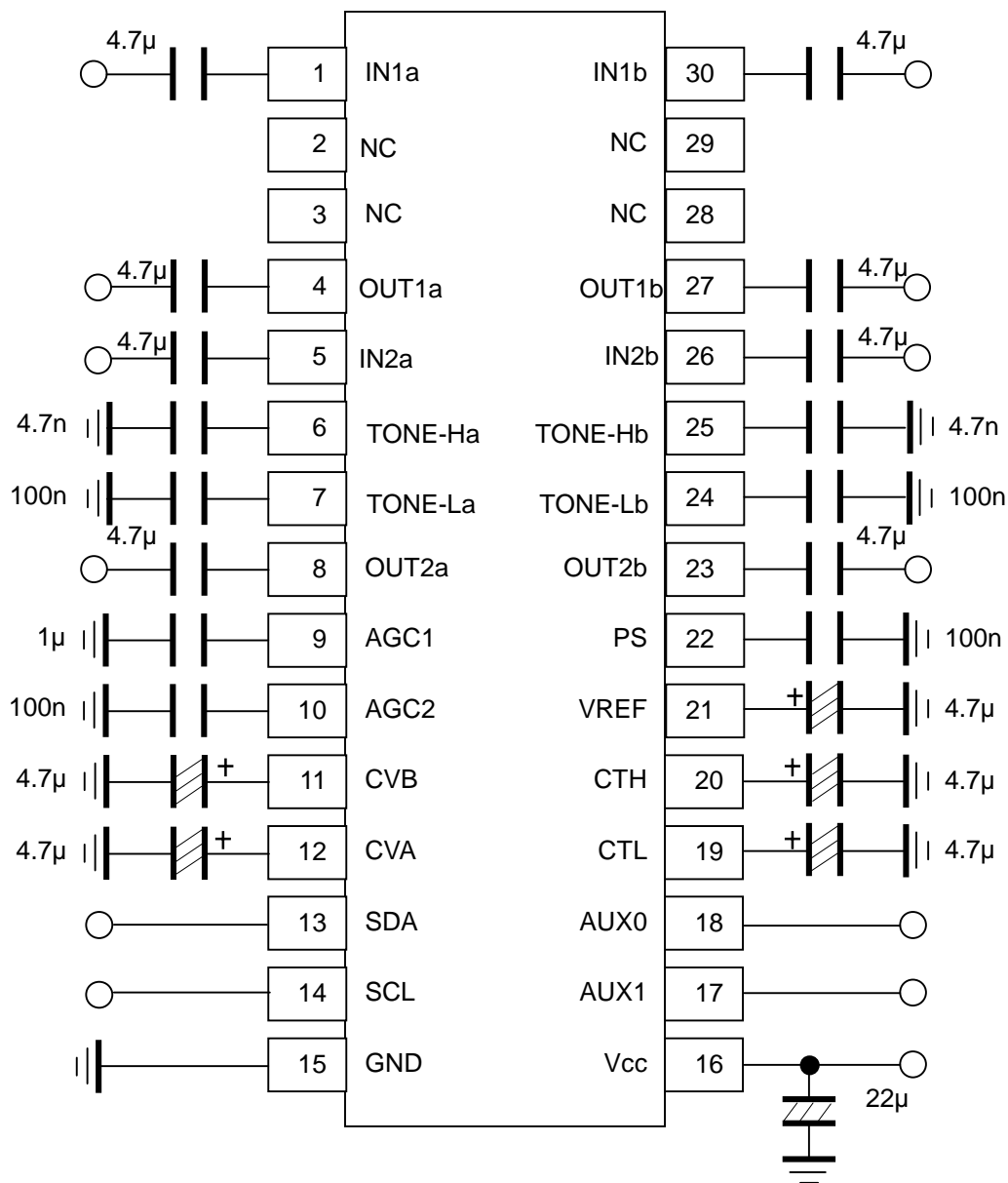
●AGC CONTROL: AGC=1H (AGC-ON) (Ta=25°C, V⁺=9V, R_g=600Ω, R_L=47kΩ)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|-----------|--------------------|----------------------|------|------|------|------|
| AGC BOOST | AGC _{BST} | Vin=50mVrms, f=1kHz | 1.5 | 3.5 | 5.5 | dB |
| AGC FLAT | AGC _{FLT} | Vin=150mVrms, f=1kHz | -2.5 | 0.0 | 2.5 | dB |
| AGC CUT | AGC _{CUT} | Vin=2Vrms, f=1kHz | -14 | -10 | -6.0 | dB |

●SURROUND CONTROL (Ta=25°C, V⁺=9V, R_g=600Ω, R_L=47kΩ, Vin=100mVrms/1kHz)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|----------------|--------------------|------------------|------|------|------|------|
| SURROUND MIX 1 | SR _{MIX1} | Ain → Bout | -2.0 | 0.0 | 2.0 | dB |
| SURROUND MIX 2 | SR _{MIX2} | Bin → Aout | -2.0 | 0.0 | 2.0 | dB |
| SURROUND DEF | SR _{DEF} | Ain-Bin(-180deg) | 8.0 | 10.0 | 12.0 | dB |
| DC Offset | SR _{DC} | SUR="0" →"1" | -1.0 | 0.0 | 1.0 | V |

APPLICATION CIRCUIT

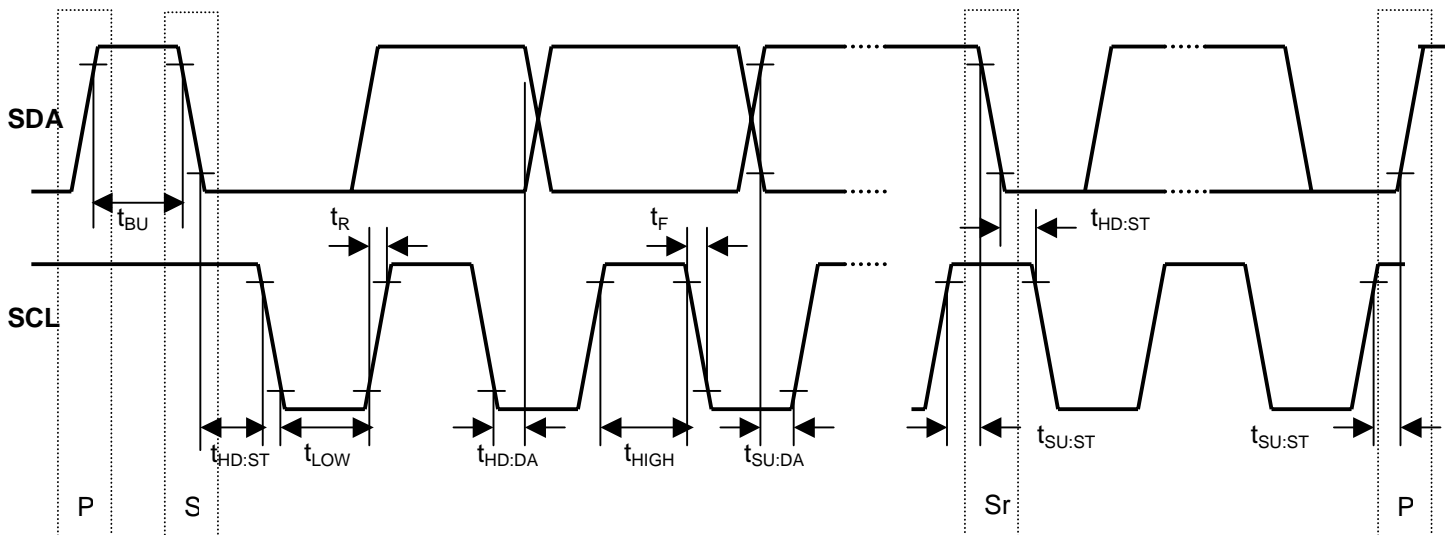


NJW1133A

■I²C BUS CHARACTERISTICS (SDA,SCL)

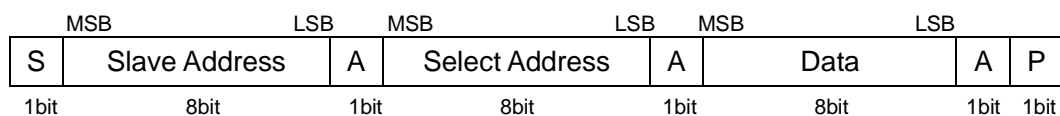
| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|---------------------|------|------|------|------|
| High Level Input Voltage | V _{IH} | 3.0 | - | 5.0 | V |
| Low Level Input Voltage | V _{IL} | 0 | - | 1.5 | V |
| High Level Input Current | I _{IH} | - | - | 10 | μA |
| Low Level Input Current | 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} | 0 | - | 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} | 4.7 | - | - | μs |

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



■ DEFINITION OF I²C BUS REGISTER

● I²C BUS FORMAT



S: Starting Term

A: Acknowledge

P: Ending Term

● SLAVE ADDRESS

| | | | | | | | | |
|---|-----|---|---|---|---|---|---|-----|
| | MSB | | | | | | | LSB |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | R/W |

R/W=0: Slave Receive

R/W=1: Not Output Data

● 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 | | | | AGC | SUR | |
| 02H | BCB | BASS | | | BCSB | SUB-BASS | | |
| 03H | BCT | TREB | | | BCST | SUB-TREB | | |
| 04H | Don't Care | | | | | | | |
| 05H | OUT | Don't care | | | | AUX1 | AUX0 | |

● 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 | Don't Care | | | | | | | |
| 05H | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Send the I²C BUS data after 30 ms from turn on.

■INSTRUCTION CODE

a) MASTER VOLUME SETTING

| 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.

b) BALANCE, AGC AND SURROUND SETTING

| Select Address | BIT | | | | | | | |
|----------------|-----|-----|----|----|----|----|-----|-----|
| | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| 01H | CHS | BAL | | | | | AGC | SUR |

- 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.

- AGC : AGC switch

“0” : AGC OFF

“1” : AGC ON

- SUR : Surround mode switch

“0” : Surround OFF

“1” : Surround ON

c)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(1dB/Step)

- BCSB : Boost cut select for SUB-BASS control

“0” : Cut

“1” : Boost

- SUB-BASS: SUB- BASS control(1dB/Step)

d) 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)
- BCST : Boost cut select for Sub-Treble control
 "0" : Cut
 "1" : Boost
- SUB-TREB: Sub-Treble control(1dB/step)

e) OUTPUT AND AUXILIARY SETTING

| Select Address | BIT | | | | | | | |
|----------------|-----|------------|----|----|----|------|------|----|
| | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| 05H | OUT | Don't Care | | | | AUX1 | AUX0 | |

- OUT: ON/OFF Switch for OUTPUT
 "0" : OFF
 "1" : ON
- AUX1/AUX2: Auxiliary port High/Low
 "0" : Logic output "Low"
 "1" : Logic output "High"

■MASTER VOLUME (Select Address : 00H)

| Gain (dB) | HEX | VOL | | | | | | | |
|-----------|-----|-----|----|----|----|----|----|----|----|
| | | 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 |

| | | 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 |

NJW1133A

■BALANCE(Select Address : 01H)

| Channel Select (CHS) | D7 |
|----------------------|----|
| Ach | 0 |
| Bch | 1 |

| Gain(dB) | BAL | | | | |
|----------|-----|----|----|----|----|
| | 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)

| | BCB |
|--------------------------|-----------|
| Bass Cut or Boost | 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)

| | BCSB |
|------------------------------|-----------|
| Sub-Bass Cut or Boost | 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)

| | BCT |
|----------------------------|-----------|
| Treble Cut or Boost | D7 |
| Cut | 0 |
| Boost | 1 |

| | | TREB | | | |
|--------------|----------------|------|----|----|----|
| 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-TREBLE (Select Address : 03H)

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

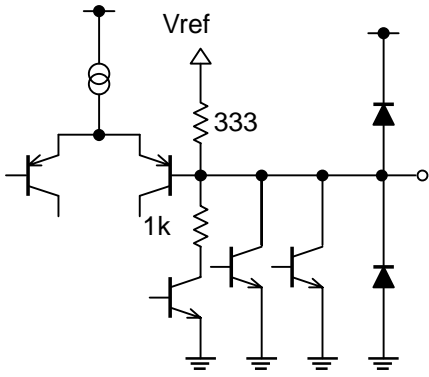
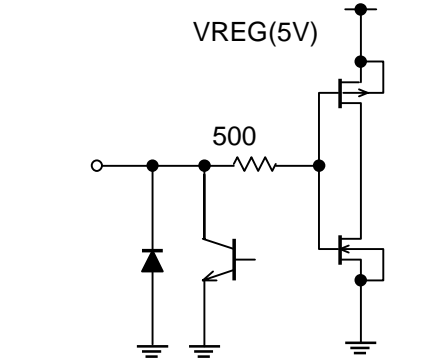
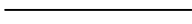

| | | SUB-TREB | |
|--------------|----------------|----------|----|
| Cut Gain(dB) | Boost Gain(dB) | D1 | D0 |
| -3 | 3 | 1 | 1 |
| -2 | 2 | 1 | 0 |
| -1 | 1 | 0 | 1 |
| 0 | 0 | 0 | 0 |

■TERMINAL DESCRIPTION

| No. | SYMBOL | FUNCTION | EQUIVALENT CIRCUIT | VOLTAGE |
|---------|--------------------|----------------------------------|--------------------|---------|
| 1 30 | IN1a IN1b | Input Pin | | VCC/2 |
| 4 27 | OUT1a OUT1b | Output for the Other Accessories | | VCC/2 |
| 5 26 | IN2a IN2b | Input From the Other Accessories | | VCC/2 |
| 6 25 | TONE-Ha TONE-Hb | A/Bch Treble Filter | | VCC/2 |

NJW1133A

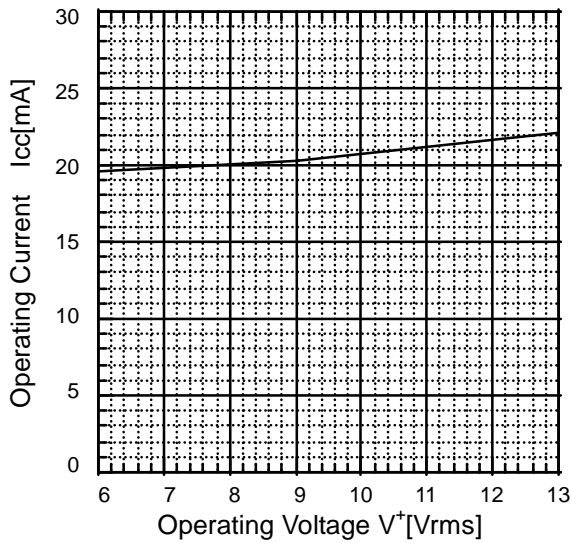
| No. | SYMBOL | FUNCTION | EQUIVALENT CIRCUIT | VOLTAGE |
|---------|--------------------|-------------------|--------------------|---------|
| 7 24 | TONE-La TONE-Lb | A/Bch Bass Filter | | VCC/2 |
| 8 23 | OUT2a OUT2b | Output Pin | | VCC/2 |
| 9 | AGC1 | AGC1 | | 0.7V |
| 10 | AGC2 | AGC2 | | VCC/2 |

| No. | SYMBOL | FUNCTION | EQUIVALENT CIRCUIT | VOLTAGE |
|----------|------------|--|--|---------|
| 11 12 | CVB CVA | DAC Output for A/Bch Volume & Balance |  | 1.4V |
| 13 14 | SDA SCL | SDA Data Input (I ² C BUS) SCL Data Input (I ² C BUS) |  | - |
| 15 | GND | GND Pin |  | - |
| 16 | VCC | Voltage Supply Pin |  | - |

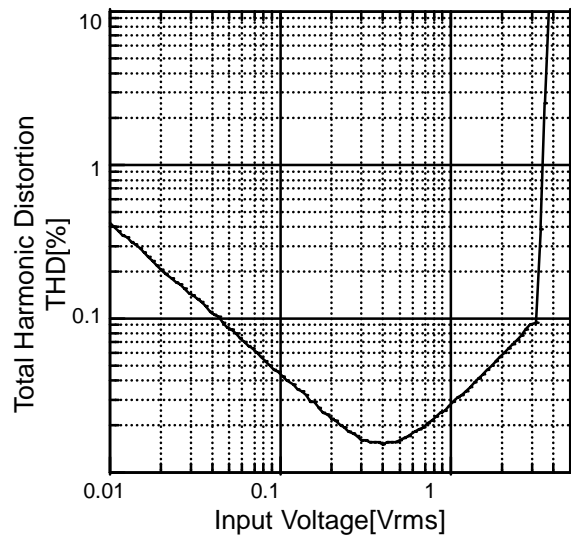
| No. | SYMBOL | FUNCTION | EQUIVALENT CIRCUIT | VOLTAGE |
|----------|--------------|---|--------------------|----------|
| 17 18 | AUX1 AUX0 | Auxiliary Output | | 5V 0V |
| 19 20 | CTL CTH | DAC Output for Tone Low Frequency DAC Output for Tone High Frequency | | 1.4V |
| 21 | VREF | Reference Voltage | | VCC/2 |
| 22 | PS | Surround Phase Shift Filter | | VCC/2 |

■ TYPICAL CHARACTERISTICS

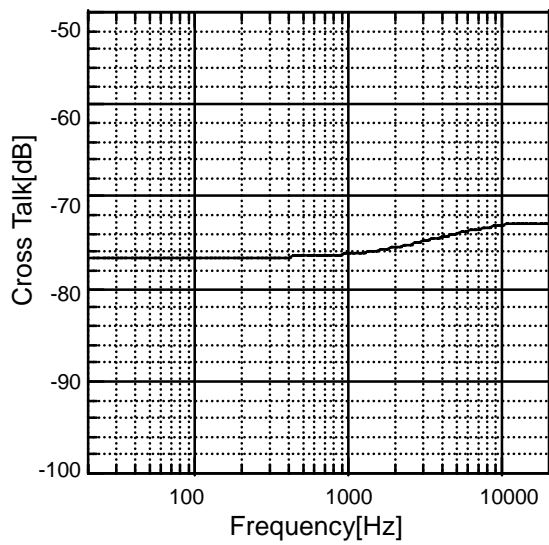
Operating Current vs Operating Voltage
No Signal



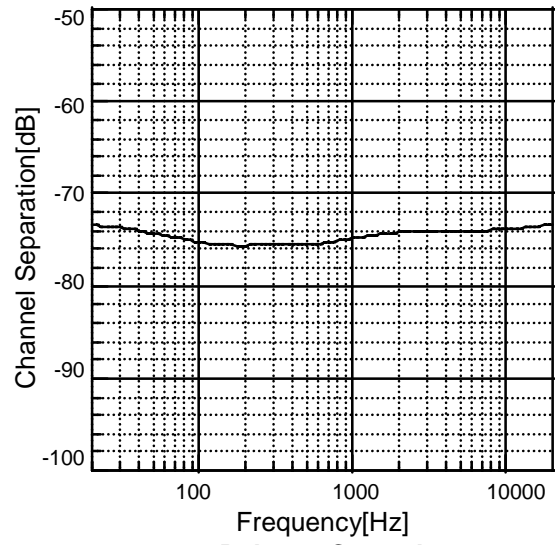
Total Harmonic Distortion vs. Input Voltage
 $f=1\text{kHz}$



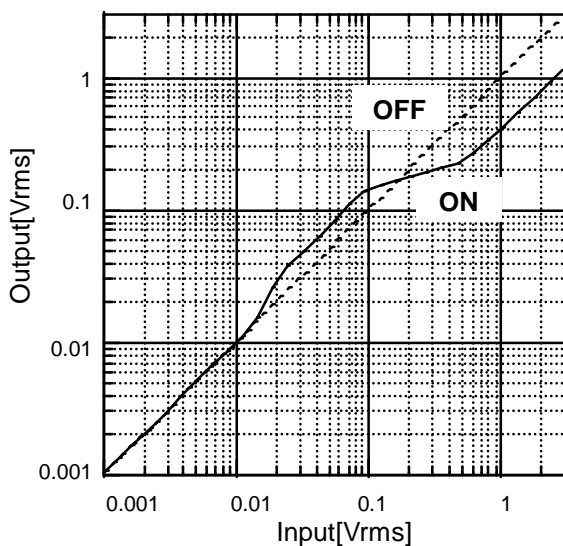
Cross Talk
 $V_{in} = 6\text{dBV}(2\text{Vrms})$



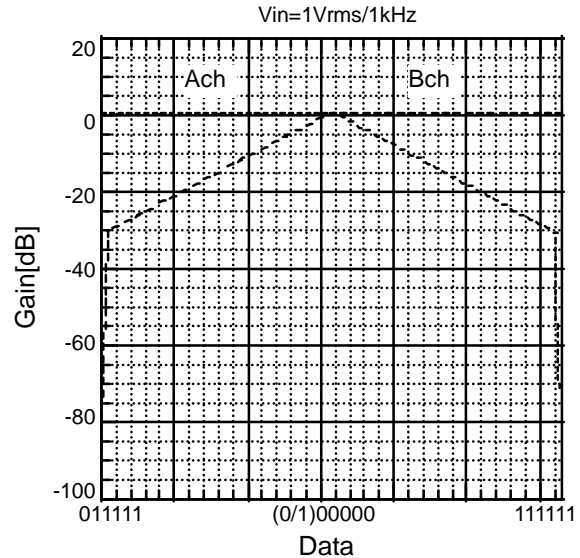
Channel Separation
 $V_{in} = +6\text{dBV}(2\text{Vrms})$



AGC

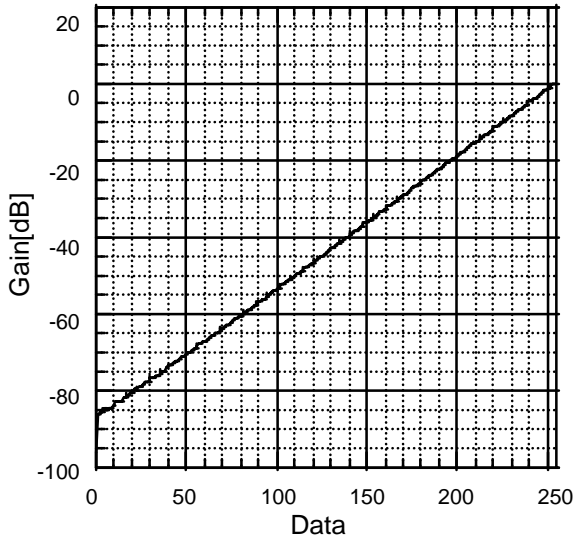


Balance Control



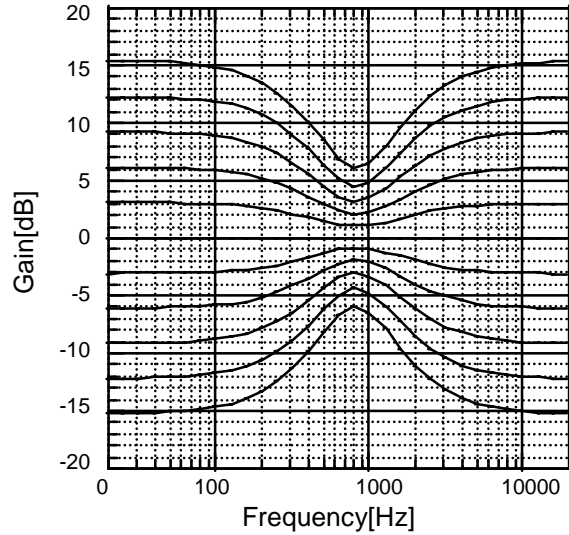
Master Volume

$V_{in} = 1V_{rms} / 1kHz$



Tone Control

$V_{in} = 100mV_{rms}$



NOTE

The NJW1133A is manufactured by New Japan Radio Co., Ltd.

Purchase of I²C components of New Japan Radio Co., Ltd or one of its sublicensed Associated Companies conveys a license under the Philips I²C Patent Rights to use these components in an I²C system, provided that the system conforms to the I²C Standard Specification as defined by Philips.

[CAUTION]
 The specifications on this databook are only given for information, without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.