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Sound Processors for Home Theater Systems

7.1ch Sound Processor

with Built-in Micro-step Volume

BD34701KS2

General description

The BD34701KS2 is an 8ch independent volume system. The system is designed in such a way, that it can be used as a 7.1ch surround system. Micro-step volume can reduce the switching shock noise when volume changes, so it can achieve a high-quality set. 8ch dual input selector for zone 2 and multi channel input enable the connection of a number of sources.

Key Specifications

- Total harmonic distortion: 0.0004%(Typ.)
- Maximum output voltage: 4.2Vrms(Typ.)
- Output noise voltage: 1.5uVrms(Typ.)
- Residual output noise voltage: 1.0uVrms(Typ.)
- Cross-talk between channels: -105dB(Typ.)
- Cross-talk between selectors: -105dB(Typ.)

Features

- 8ch input selectors
- Micro-step volume can reduce the switching shock noise when volume changes.
- Zone 2 can support.
- 2-wire serial bus control, corresponding to 3.3/5V.

Applications

- Most suitable for the AV receiver, home theater system

Package

SQFP-T52

W(Typ.) x D(Typ.) x H(Max.)

12.00mm x 12.00mm x 1.50mm



SQFP-T52

Typical Application Circuit

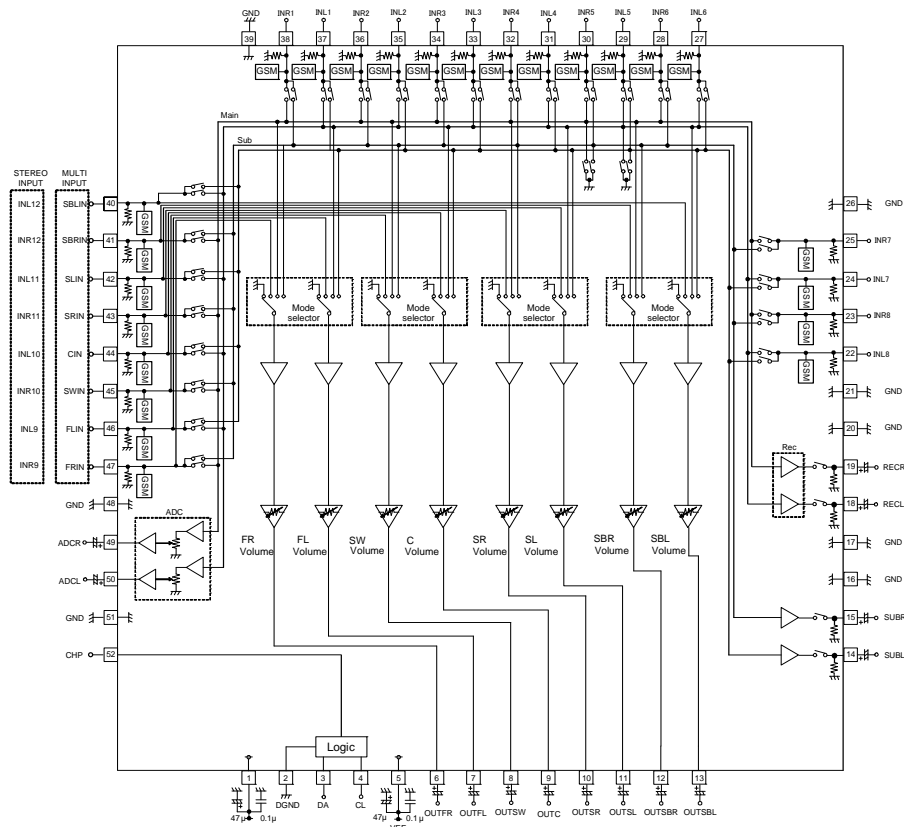


Figure 1. Application Circuit

○Product structure : Silicon monolithic integrated circuit ○This product is not designed protection against radioactive rays

Pin Configuration

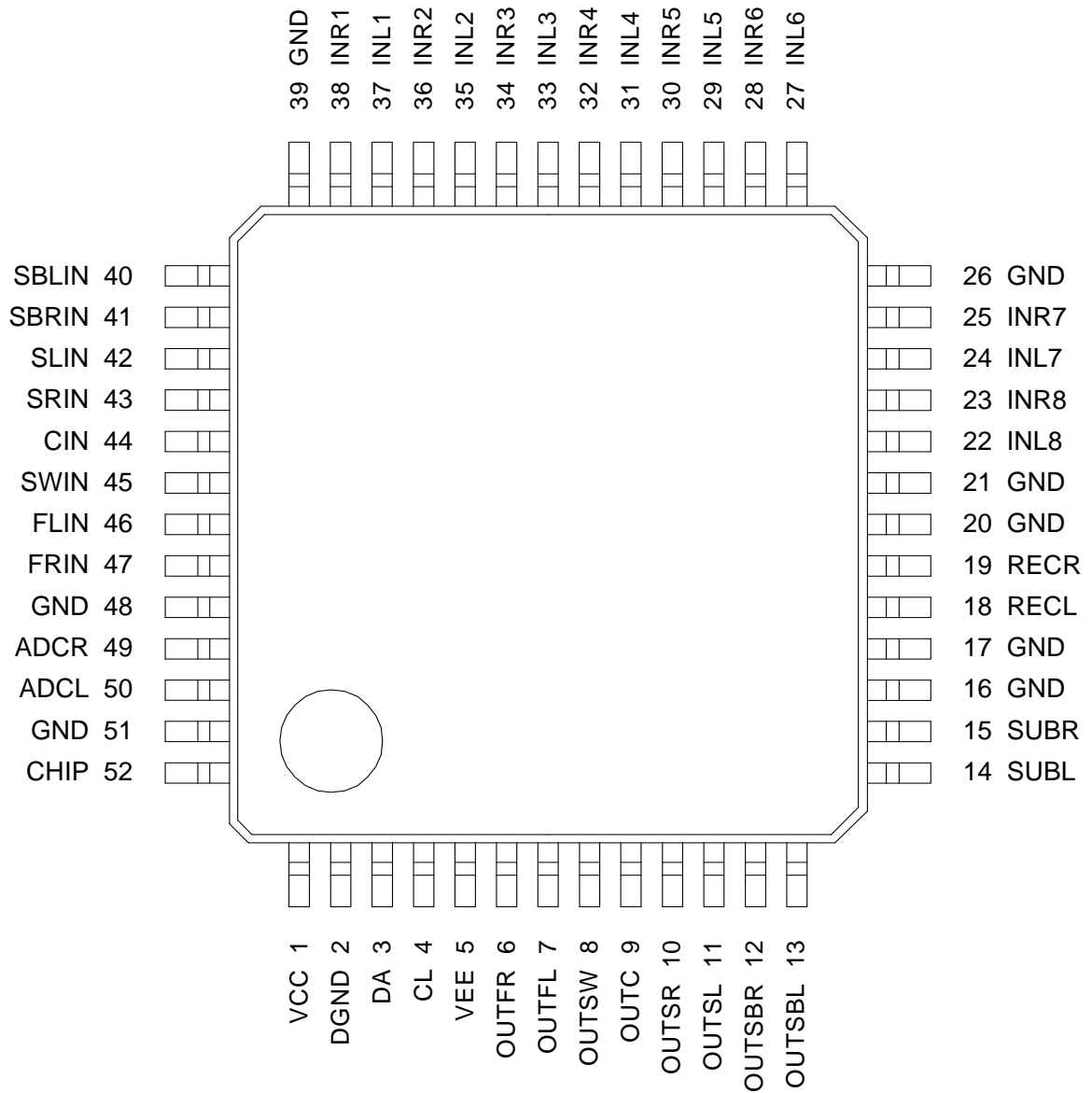


Figure 2. Pin Configuration

Description of terminal

| Terminal Number | Symbol | Function | Terminal Number | Symbol | Function |
|-----------------|--------|--------------------------------|-----------------|--------|------------------------------|
| 1 | VCC | Positive power supply terminal | 27 | INL6 | Lch input terminal 6 |
| 2 | DGND | Digital ground terminal | 28 | INR6 | Rch input terminal 6 |
| 3 | DA | Data and latch input terminal | 29 | INL5 | Lch input terminal 5 |
| 4 | CL | Clock input terminal | 30 | INR5 | Rch input terminal 5 |
| 5 | VEE | Negative power supply terminal | 31 | INL4 | Lch input terminal 4 |
| 6 | OUTFR | FRch Output terminal | 32 | INR4 | Rch input terminal 4 |
| 7 | OUTFL | FLch Output terminal | 33 | INL3 | Lch input terminal 3 |
| 8 | OUTSW | SWch Output terminal | 34 | INR3 | Rch input terminal 3 |
| 9 | OUTC | Cch Output terminal | 35 | INL2 | Lch input terminal 2 |
| 10 | OUTSR | SRch Output terminal | 36 | INR2 | Rch input terminal 2 |
| 11 | OUTSL | SLch Output terminal | 37 | INL1 | Lch input terminal 1 |
| 12 | OUTSBR | SBRch Output terminal | 38 | INR1 | Rch input terminal 1 |
| 13 | OUTSBL | SBLch Output terminal | 39 | GND | Analog ground terminal |
| 14 | SUBL | Lch SUB output terminal | 40 | SBLIN | SBLch input terminal for DSP |
| 15 | SUBR | Rch SUB output terminal | 41 | SBRIN | SBRch input terminal for DSP |
| 16 | GND | Analog ground terminal | 42 | SLIN | SLch input terminal for DSP |
| 17 | GND | Analog ground terminal | 43 | SRIN | SRch input terminal for DSP |
| 18 | RECL | Lch REC output terminal | 44 | CIN | Cch input terminal for DSP |
| 19 | RECR | Rch REC output terminal | 45 | SWIN | SWch input terminal for DSP |
| 20 | GND | Analog ground terminal | 46 | FLIN | FLch input terminal for DSP |
| 21 | GND | Analog ground terminal | 47 | FRIN | FRch input terminal for DSP |
| 22 | INL8 | Lch input terminal 8 | 48 | GND | Analog ground terminal |
| 23 | INR8 | Rch input terminal 8 | 49 | ADCR | Rch output terminal to ADC |
| 24 | INL7 | Lch input terminal 7 | 50 | ADCL | Lch output terminal to ADC |
| 25 | INR7 | Rch input terminal 7 | 51 | GND | Analog ground terminal |
| 26 | GND | Analog ground terminal | 52 | CHIP | Chip select |

Block Diagram

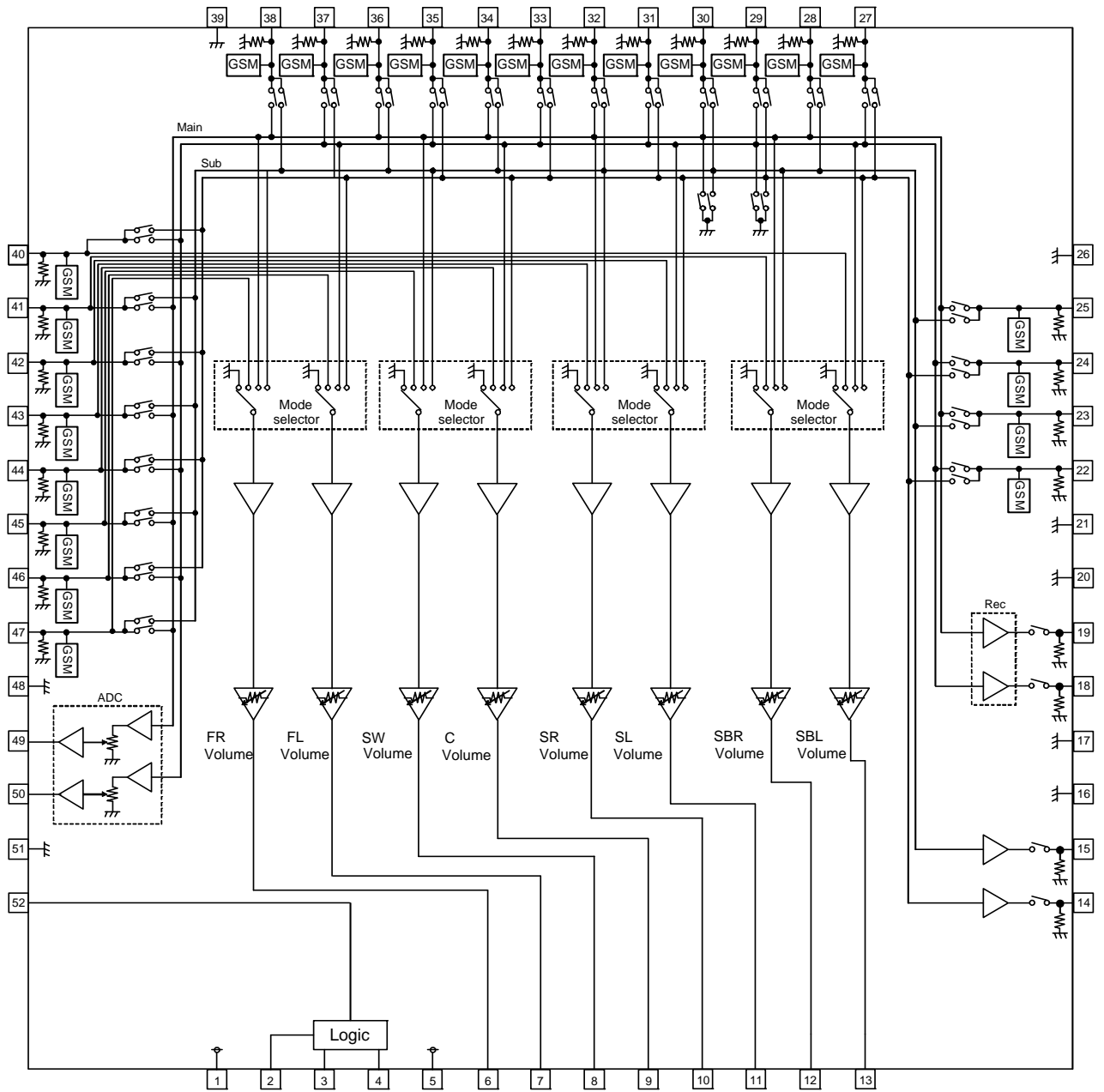


Figure 3. Block Diagram

Absolute Maximum Ratings

| Item | Symbol | Rating | Unit |
|-----------------------|--------|--------------------|------|
| Positive power supply | Vcc | +7.75 (Note1) | V |
| Negative power supply | Vee | -7.75 (Note1) | V |
| Power dissipation | Pd | 1.30 (Note2) | W |
| Input voltage | Vin | Vee-0.2 to Vcc+0.2 | V |
| Operating temperature | Topr | -40 to +85 (Note3) | °C |
| Storage temperature | Tastg | -55 to +125 | °C |

(Note1) The maximum voltage that can be applied based on GND.

(Note2) This value decreases 13.0mW/°C for Ta=25°C or more. A standard board, 70x70x1.6 mm, shall be mounted.

(Note3) If it within operation voltage range, circuit functions operation is guaranteed within operation temp.

Caution: Operating the IC over the absolute maximum ratings may damage the IC. The damage can either be a short circuit between pins or an open circuit between pins and the internal circuitry. Therefore, it is important to consider circuit protection measures, such as adding a fuse, in case the IC is operated over the absolute maximum ratings.

Operating Condition

| Item | Symbol | Rating | Unit |
|-----------------------|--------|------------------------|------|
| Positive power supply | Vcc | +6.5 to +7.5 (Note4,5) | V |
| Negative power supply | Vee | -6.5 to -7.5 (Note4,5) | V |

(Note4) Applying a voltage based on GND.

(Note5) Within operation temp range, basic circuit function Operation is guaranteed within operation voltage range.

But please confirm set up of constant and element, voltage set up and temp set up on use.

Please watch out except condition stipulated by electrical characteristics within the range, It cannot guarantee standard value of electrical characteristics. But it retains original function.

Electrical characteristic

Unless specified particularly, Ta=25°C, Vcc=7V, Vee=-7V, f=1kHz, Vin=1Vrms, RL=10kΩ,
Stereo input selector(MAIN, SUB)=IN1, Mode selector(FL, FRch)=MAIN, Mode selector(SW, C, SL, SRch)=MULTI,
Mode selector(SBL, SBRch)=MULTI, Input Att=0dB, Input gain=0dB, Volume=0dB.

| | Item | Symbol | Limit | | | Unit | Conditions |
|------------|-------------------------------|--------|-------|--------|------|-------|---|
| | | | Min. | Typ. | Max. | | |
| TOTAL | Positive circuit current | Iqp | - | 22 | 44 | mA | No signal |
| | Negative circuit current | Iqn | -44 | -22 | - | mA | No signal |
| | Output voltage gain | Gv | -1.5 | 0 | 1.5 | dB | 6 to 13pin output |
| | Channel balance | CB | -0.5 | 0 | 0.5 | dB | C Channel reference, 6 to 13pin output |
| | Total harmonic distortion | THD | - | 0.0004 | 0.02 | % | BW=400 to 30kHz 6 to 13pin output |
| | Maximum output voltage | Vom | 3.8 | 4.2 | - | Vrms | THD=1%, VOLUME=+10dB 6 to 13pin output |
| | Output noise voltage | Vno | - | 1.5 | 10 | μVrms | Rg=0Ω, BW=IHF-A 6 to 13pin output |
| | Residual output noise voltage | Vnor | - | 1 | 8 | μVrms | Volume=Mute, Rg=0Ω, BW=IHF-A 6 to 13pin output |
| | Cross-talk between channels | CT | - | -105 | -80 | dB | Rg=0Ω, BW=IHF-A 6, 7pin output |
| | Cross-talk between selectors | CS | - | -105 | -80 | dB | Rg=0Ω, BW=IHF-A 6, 7pin output |
| | Input impedance | Rin | 32 | 47 | 62 | kΩ | 22 to 25, 27 to 38 40 to 47pin input |
| VOLUME | Maximum attenuation | ATTmax | - | -115 | -100 | dB | Volume=Mute, BW=IHF-A |
| REC OUT | Total harmonic distortion | THDR | - | 0.0005 | 0.02 | % | BW=400 to 30kHz, RL=6.8kΩ 14,15,18,19pin output |

Typical Performance Curve(s)

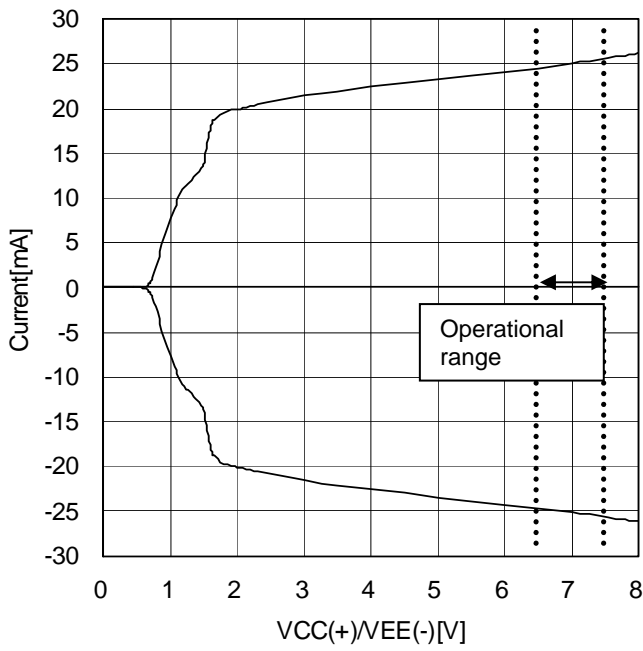


Figure 4. Circuit Currents vs. Circuit Voltage

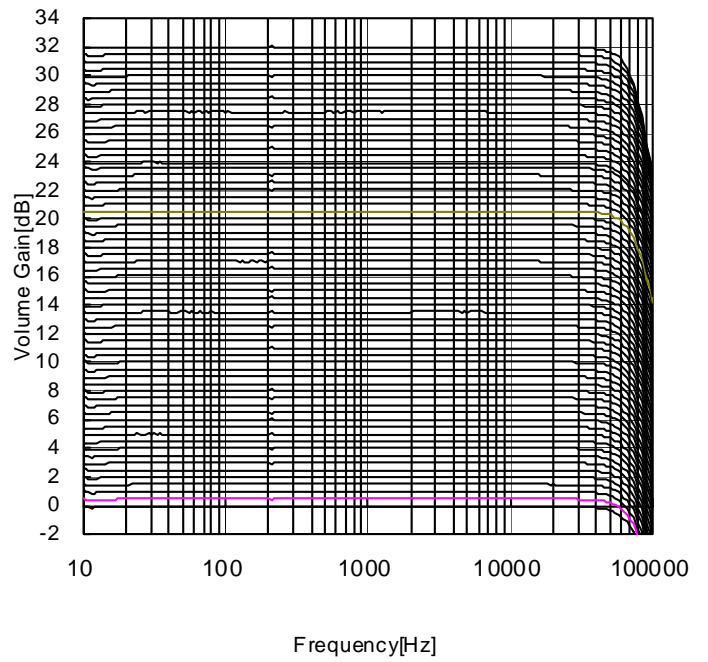


Figure 5. Volume Gain vs. Input Frequency (32dB to 0 dB setting)

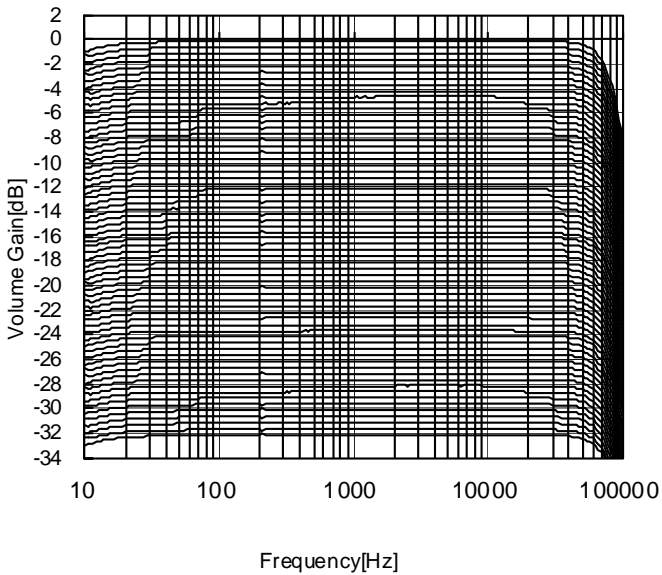


Figure 6. Volume Gain vs. Input Frequency (0dB to -32 dB setting)

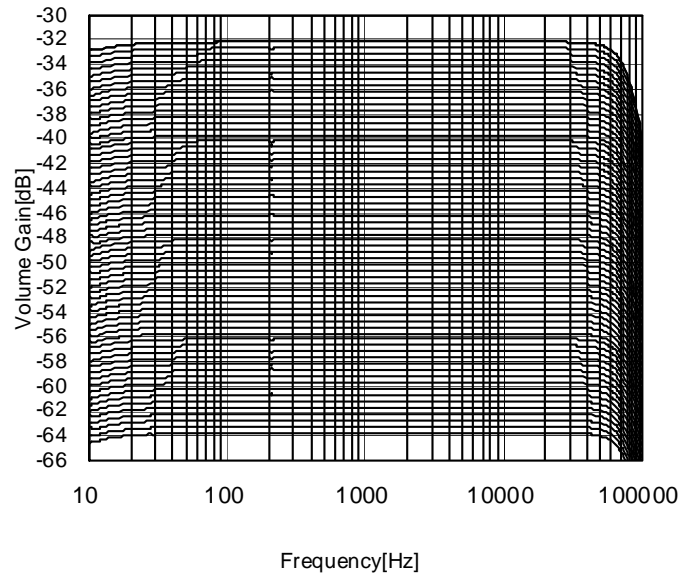


Figure 7. Volume Gain vs. Input Frequency (-32dB to -64 dB setting)

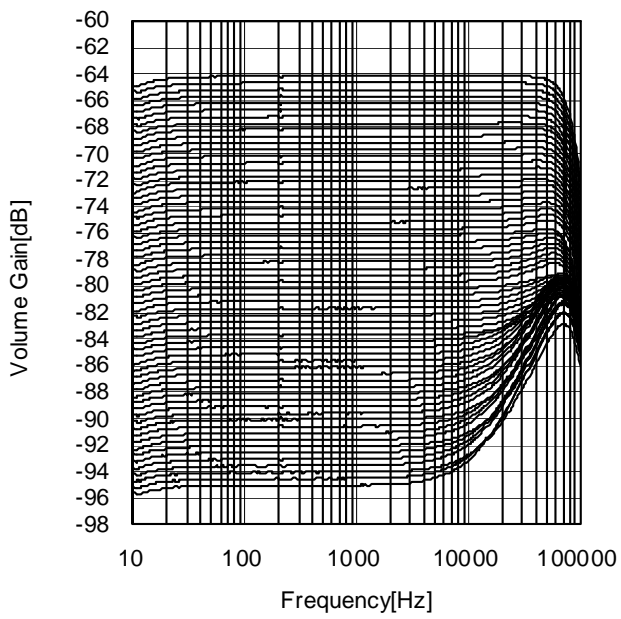


Figure 8. Volume Gain vs. Input Frequency (-64dB to -95 dB setting)

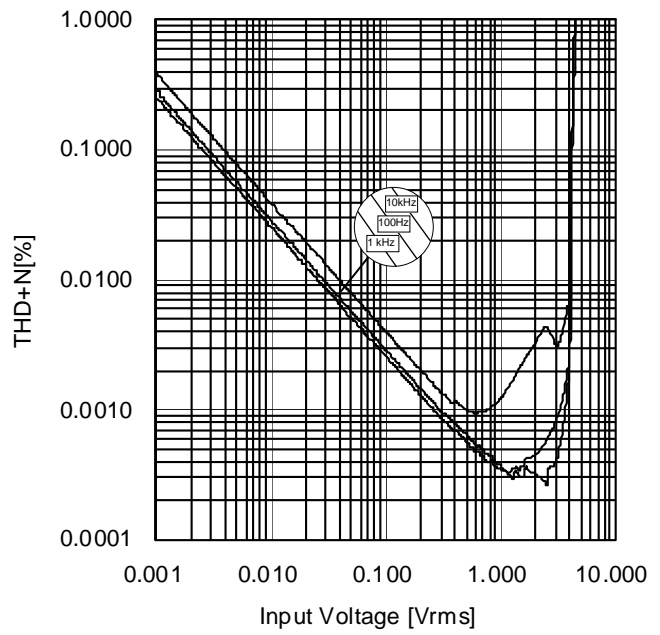


Figure 9. THD + N vs. Input Voltage

Specifications for Control Signal

(1) Timing of control signal

Data is read at a rising edge of clock.

Latch is read at a falling edge of clock. And Data on the latest 16bit are taken in the inside of this IC.

Be sure to set DA and CL to LOW after latching.

1byte=16bit

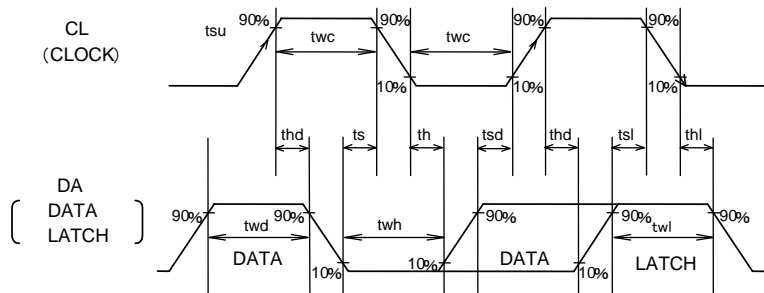


Figure 10. The timing definition of the control signal.

| Item | Symbol | Limit | | | Unit |
|------------------------------|--------|-------|------|------|------|
| | | Min. | Typ. | Max. | |
| Clock width | twc | 1.0 | - | - | μsec |
| Data width | twd | 1.0 | - | - | μsec |
| Latch width | twl | 1.0 | - | - | μsec |
| Low hold width | twh | 1.0 | - | - | μsec |
| Data setup time (DATA→CLK) | tsd | 0.5 | - | - | μsec |
| Data hold time (CLK→DATA) | thd | 0.5 | - | - | μsec |
| Latch setup time (CLK→LATCH) | tsl | 0.5 | - | - | μsec |
| Latch hold time | thl | 0.5 | - | - | μsec |
| Latch Low setup time | ts | 0.5 | - | - | μsec |
| Latch Low hold time | th | 0.5 | - | - | μsec |

(2) Voltage of control signal (CL, DA, CHIP)

| Item | Conditions | Limit | | | Unit |
|--------------------|--|-------|------|-------------|------|
| | | Min. | Typ. | Max. (<Vcc) | |
| High input voltage | Vcc=+6.5 to +7.5V Vee=-6.5 to -7.5V | 2.3 | - | 5.5 | V |
| Low input voltage | | 0 | - | 1.0 | V |

(3) Basic Structure of Control Data

← Input Direction

| | | | | | | | | | | | | | | | |
|------|-----|-----|-----|-----|-----|----|----|----|----|----|----|----------------|----|----|----|
| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| Data | | | | | | | | | | | | Select Address | | | |

(4) Table of Control Data

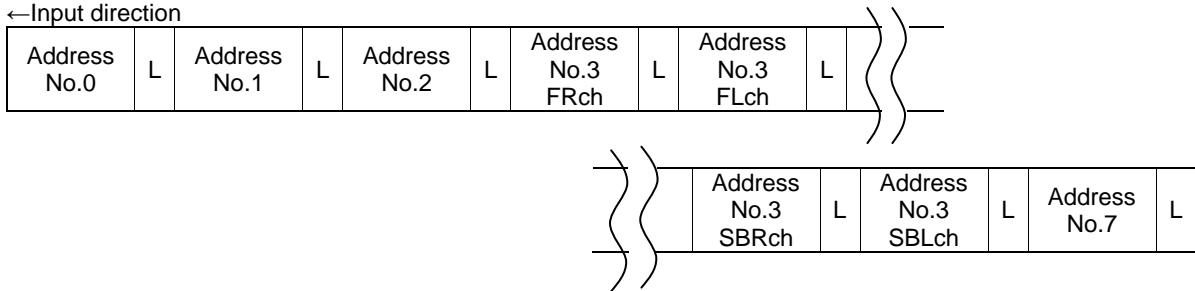
←Input Direction

| Select Address No. | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
|--------------------|-----------------------|-----|---------------------|-----|----------------------|-----|------------------------|--------------|----|------------|----|----|----------------------------|-------------|----|----|---|
| 0 | Input Selector (MAIN) | | | | | | REC ON/OFF | 0 | 0 | SUB ON/OFF | 1 | 0 | 0 | Chip Select | 0 | 0 | |
| 1 | Input Selector (SUB) | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 1 | |
| 2 | Mode Select FL, FRch | | Mode Select C, SWch | | Mode Select SL, SRch | | Mode Select SBL, SBRch | | 0 | ADC ATT | | | 0 | | 1 | 0 | |
| 3 | Volume channel Select | | Volume | | | | | | | | | | 0 | | 1 | 1 | |
| 7 | A→B switch-time | | B→A switch-time | | Base clock | 0 | 0 | System reset | 0 | 0 | 1 | 1 | 1 | | 1 | | |
| | | | | | | | | | | | | | BD3843FS (6ch Selector IC) | * | 1 | 0 | 0 |
| | | | | | | | | | | | | | BD3841FS (9ch Selector IC) | * | 1 | 0 | 1 |
| | | | | | | | | | | | | | BD3812F (2ch volume IC) | * | 1 | 1 | * |

- Serial control lines can be shared with BD3843FS(6ch selector IC), BD3841FS(9ch selector IC) and BD3812F(2ch volume IC).
- Initialize all data at every turning on the power supply.

(Example)

←Input direction



- At the second time after turning on the power supply, eight any data to be changed.

(5) Chip Select Setting Table

| CHP terminal condition | D2 |
|------------------------|----|
| 0 (LOW) | 0 |
| 1 (HIGH) | 1 |

BD34701KS2 can be operated in combination with another by setting the CHP terminal.

Select Address No.0 Setting Table

| Function & Setting | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | | | | | | |
|-----------------------|-------------|-----------------------|-----|-----|-----|-----|----|----|----|----|----|----|----|----|-------------|----|---|--|--|--|--|--|
| Input Selector (MAIN) | MUTE | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | |
| | IN1 | 0 | 0 | 0 | 0 | 0 | 1 | | | | | | | | | | | | | | | |
| | IN2 | 0 | 0 | 0 | 0 | 1 | 0 | | | | | | | | | | | | | | | |
| | IN3 | 0 | 0 | 0 | 0 | 1 | 1 | | | | | | | | | | | | | | | |
| | IN4 | 0 | 0 | 0 | 1 | 0 | 0 | | | | | | | | | | | | | | | |
| | IN5 | 0 | 0 | 0 | 1 | 0 | 1 | | | | | | | | | | | | | | | |
| | IN6 | 0 | 0 | 0 | 1 | 1 | 0 | | | | | | | | | | | | | | | |
| | IN7 | 0 | 0 | 0 | 1 | 1 | 1 | | | | | | | | | | | | | | | |
| | IN8 | 0 | 0 | 1 | 0 | 0 | 0 | | | | | | | | | | | | | | | |
| | IN9 | 0 | 0 | 1 | 0 | 0 | 1 | | | | | | | | | | | | | | | |
| | IN10 | 0 | 0 | 1 | 0 | 1 | 0 | | 0 | 0 | | 1 | 0 | 0 | Chip Select | 0 | 0 | | | | | |
| | IN11 | 0 | 0 | 1 | 0 | 1 | 1 | | | | | | | | | | | | | | | |
| | IN12 | 0 | 0 | 1 | 1 | 0 | 0 | | | | | | | | | | | | | | | |
| | Prohibition | 0 | 0 | 1 | 1 | 0 | 1 | | | | | | | | | | | | | | | |
| ⋮ | | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | | | | | | | | | | | | | | | | |
| 1 | | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | | | | |
| REC ON/OFF | OFF | Input Selector (MAIN) | | | | | | 0 | | | | | | | | | | | | | | |
| | ON | | | | | | | 1 | | | | | | | | | | | | | | |
| SUB ON/OFF | OFF | | | | | | | | | | | | | | | 0 | | | | | | |
| | ON | | | | | | | | | | | | | | | 1 | | | | | | |

 : Initial condition

Select Address No.1 Setting Table

| Function & Setting | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
|----------------------|-------------|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|-------------|----|---|
| Input Selector (SUB) | MUTE | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | |
| | IN1 | 0 | 0 | 0 | 0 | 0 | 1 | | | | | | | | | | |
| | IN2 | 0 | 0 | 0 | 0 | 1 | 0 | | | | | | | | | | |
| | IN3 | 0 | 0 | 0 | 0 | 1 | 1 | | | | | | | | | | |
| | IN4 | 0 | 0 | 0 | 1 | 0 | 0 | | | | | | | | | | |
| | IN5 | 0 | 0 | 0 | 1 | 0 | 1 | | | | | | | | | | |
| | IN6 | 0 | 0 | 0 | 1 | 1 | 0 | | | | | | | | | | |
| | IN7 | 0 | 0 | 0 | 1 | 1 | 1 | | | | | | | | | | |
| | IN8 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Chip Select | 0 | 1 |
| | IN9 | 0 | 0 | 1 | 0 | 0 | 1 | | | | | | | | | | |
| | IN10 | 0 | 0 | 1 | 0 | 1 | 0 | | | | | | | | | | |
| | IN11 | 0 | 0 | 1 | 0 | 1 | 1 | | | | | | | | | | |
| | IN12 | 0 | 0 | 1 | 1 | 0 | 0 | | | | | | | | | | |
| | Prohibition | 0 | 0 | 1 | 1 | 0 | 1 | | | | | | | | | | |
| ⋮ | | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | | | | | | | | | | | |
| 1 | | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | |

 : Initial condition


Select Address No.2 Setting Table

| Function & Setting | | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|--------------------------|-------------|------------------------|-----|-----------------------|-----|------------------------|-----|--------------------------|----|----|---------|----|----|----|-------------|----|----|
| Mode Selector FL, FRch | MUTE | 0 | 0 | Mode Selector C, SWch | | Mode Selector SL, SRch | | Mode Selector SBL, SBRch | | 0 | ADC ATT | | | 0 | Chip Select | 1 | 0 |
| | MAIN | 0 | 1 | | | | | | | | | | | | | | |
| | MULTI | 1 | 0 | | | | | | | | | | | | | | |
| | SUB | 1 | 1 | | | | | | | | | | | | | | |
| Mode selector C, SWch | MUTE | Mode Selector FL, FRch | | 0 | 0 | Mode Selector C, SWch | | Mode Selector SL, SRch | | 0 | ADC ATT | | | 0 | Chip Select | 1 | 0 |
| | MAIN | | | 0 | 1 | | | | | | | | | | | | |
| | MULTI | | | 1 | 0 | | | | | | | | | | | | |
| | SUB | | | 1 | 1 | | | | | | | | | | | | |
| Mode selector SL, SRch | MUTE | Mode Selector FL, FRch | | Mode Selector C, SWch | | 0 | 0 | Mode Selector SL, SRch | | 0 | ADC ATT | | | 0 | Chip Select | 1 | 0 |
| | MAIN | | | | | 0 | 1 | | | | | | | | | | |
| | MULTI | | | | | 1 | 0 | | | | | | | | | | |
| | SUB | | | | | 1 | 1 | | | | | | | | | | |
| Mode Selector SBL, SBRch | MUTE | Mode Selector FL, FRch | | Mode Selector C, SWch | | Mode Selector SL, SRch | | 0 | 0 | 0 | ADC ATT | | | 0 | Chip Select | 1 | 0 |
| | MULTI | | | | | | | 0 | 1 | | | | | | | | |
| | SUB | | | | | | | 1 | 0 | | | | | | | | |
| | MAIN | | | | | | | 1 | 1 | | | | | | | | |
| ADC ATT | MUTE | Mode Selector FL, FRch | | Mode Selector C, SWch | | Mode Selector SL, SRch | | Mode Selector SBL, SBRch | | 0 | 0 | 0 | 0 | 0 | Chip Select | 1 | 0 |
| | 0dB | | | | | | | | | | 0 | 0 | 1 | | | | |
| | -6dB | | | | | | | | | | 0 | 1 | 0 | | | | |
| | -6.5dB | | | | | | | | | | 0 | 1 | 1 | | | | |
| | -7.5dB | | | | | | | | | | 1 | 0 | 0 | | | | |
| | -9dB | | | | | | | | | | 1 | 0 | 1 | | | | |
| | -12dB | | | | | | | | | | 1 | 1 | 0 | | | | |
| | Prohibition | | | | | | | | | | 1 | 1 | 1 | | | | |

 : Initial condition

Select Address No.3 Setting Table

| Function & Setting | | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | | | |
|-----------------------|-------------|-----------------------|-----|-----|--------|-----|-----|----|----|----|----|----|----|----|-------------|----|----|-------------|---|---|
| Volume channel Select | FR | 0 | 0 | 0 | Volume | | | | | | | | | | | | 0 | Chip Select | 1 | 1 |
| | FL | 0 | 0 | 1 | | | | | | | | | | | | | | | | |
| | SW | 0 | 1 | 0 | | | | | | | | | | | | | | | | |
| | C | 0 | 1 | 1 | | | | | | | | | | | | | | | | |
| | SR | 1 | 0 | 0 | | | | | | | | | | | | | | | | |
| | SL | 1 | 0 | 1 | | | | | | | | | | | | | | | | |
| | SBR | 1 | 1 | 0 | | | | | | | | | | | | | | | | |
| | SBL | 1 | 1 | 1 | | | | | | | | | | | | | | | | |
| Volume | MUTE | Volume Channel Select | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | Chip Select | 1 | 1 | | | |
| | Prohibition | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | | | | | | | |
| | | | | | | : | : | : | : | : | : | : | : | | | | | | | |
| | +32.0dB | | | | | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | 1 | | |
| | +31.5dB | | | | | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | 0 | | |
| | +31.0dB | | | | | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | | | | | 1 | | |
| | +30.5dB | | | | | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | | | | | 0 | | |
| | +30.0dB | | | | | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | | | | | 1 | | |
| | +29.5dB | | | | | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | | | | | 0 | | |
| | +29.0dB | | | | | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | | | | | 1 | | |
| | +28.5dB | | | | | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | | | | | 0 | | |
| | +28.0dB | | | | | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | | | | | 1 | | |
| | +27.5dB | | | | | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | | | | | 0 | | |
| | +27.0dB | | | | | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | | | | | 1 | | |
| | +26.5dB | | | | | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | | | | | 0 | | |
| | +26.0dB | | | | | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | | | | | 1 | | |
| | +25.5dB | | | | | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | | | | | 0 | | |
| | +25.0dB | | | | | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | | | | | 1 | | |
| | +24.5dB | | | | | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | | | | | 0 | | |
| | +24.0dB | | | | | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | | | | | 1 | | |
| | +23.5dB | | | | | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | | | | | 0 | | |
| | +23.0dB | | | | | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | | | | | 1 | | |
| | +22.5dB | | | | | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | | | | | 1 | | |
| | +22.0dB | | | | | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | | | | | 1 | | |
| | +21.5dB | | | | | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | | | | | 0 | | |
| | +21.0dB | | | | | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | | | | | 1 | | |
| | +20.5dB | | | | | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | | | | | 1 | | |
| | +20.0dB | | | | | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | | | | | 1 | | |
| | +19.5dB | | | | | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | | | | | 0 | | |
| | +19.0dB | | | | | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | | | | | 1 | | |
| | +18.5dB | | | | | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | | | | | 1 | | |
| | +18.0dB | | | | | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | | | | | 1 | | |
| +17.5dB | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | | | | | | | | | | | |
| +17.0dB | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | | | | | | | | | | | |
| +16.5dB | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | | | | | | | | | | | |
| +16.0dB | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | |
| +15.5dB | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | |

 : Initial condition

Select Address No.3 Setting Table

| Function & Setting | | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | | | |
|--------------------|-------------|-----------------------|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|-------------|----|----|---|---|---|
| Volume | +15.0dB | Volume Channel Select | | | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | Chip Select | 1 | 1 | | | |
| | +14.5dB | | | | | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | | | | | | | |
| | +14.0dB | | | | | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | | | | | | | |
| | +13.5dB | | | | | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | | | | | | | |
| | +13.0dB | | | | | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | | | | | | | |
| | +12.5dB | | | | | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | | | | | | | |
| | +12.0dB | | | | | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | | | | | | | |
| | +11.5dB | | | | | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | | | | | | | |
| | +11.0dB | | | | | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | | | | | | | |
| | +10.5dB | | | | | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | | | | | | | |
| | +10.0dB | | | | | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | | | | | | | |
| | +9.5dB | | | | | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | | | | | | | |
| | +9.0dB | | | | | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | | | | | | | |
| | +8.5dB | | | | | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | | | | | | | |
| | +8.0dB | | | | | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | | | | | | | |
| | +7.5dB | | | | | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | | | | | | | |
| | +7.0dB | | | | | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | | | | | | | |
| | +6.5dB | | | | | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | | | | | | | |
| | +6.0dB | | | | | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | | | | | | | |
| | +5.5dB | | | | | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | | | | | | | |
| | +5.0dB | | | | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | | | | | | | | |
| | +4.5dB | | | | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | | | | | | | | |
| | +4.0dB | | | | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | | | | | | | | |
| | +3.5dB | | | | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | | | | | | | | |
| | +3.0dB | | | | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | | | | | | | | |
| | +2.5dB | | | | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | | | | | | | | |
| | +2.0dB | | | | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | | | | | | | | |
| | +1.5dB | | | | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | | | | | | | | |
| | +1.0dB | | | | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | | | | | | | | |
| | +0.5dB | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | | | | | | | | |
| | Prohibition | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | |
| | -0dB | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | 0 | 0 | 0 |
| | -0.5dB | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | 1 | | |
| | -1.0dB | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | | | | | 0 | | |
| | -1.5dB | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | | | | | 1 | | |
| | -2.0dB | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | | | | | 0 | | |
| | -2.5dB | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | | | | | 1 | | |
| | -3.0dB | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | | | | | 0 | | |
| | -3.5dB | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | | | | | 1 | | |
| | -4.0dB | | | | | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | | | | | | | |
| -4.5dB | 0 | 0 | 0 | 0 | | 1 | 0 | 0 | 1 | | | | | | | | | | | |
| -5.0dB | 0 | 0 | 0 | 0 | | 1 | 0 | 1 | 0 | | | | | | | | | | | |
| -5.5dB | 0 | 0 | 0 | 0 | | 1 | 0 | 1 | 1 | | | | | | | | | | | |
| -6.0dB | 0 | 0 | 0 | 0 | | 1 | 1 | 0 | 0 | | | | | | | | | | | |
| -6.5dB | 0 | 0 | 0 | 0 | | 1 | 1 | 0 | 1 | | | | | | | | | | | |
| -7.0dB | 0 | 0 | 0 | 0 | | 1 | 1 | 1 | 0 | | | | | | | | | | | |
| -7.5dB | 0 | 0 | 0 | 0 | | 1 | 1 | 1 | 1 | | | | | | | | | | | |

Select Address No.3 Setting Table

| Function & Setting | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|--------------------|--------|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|
| Volume | -8.0dB | | | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | | | |
| | | | | | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | | | | |
| | | | | | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | | | | |
| | | | | | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | | | | |
| | | | | | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | | | | |
| | | | | | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | | | | |
| | | | | | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | | | | |
| | | | | | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | | | | |
| | | | | | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | | | | |
| | | | | | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | | | | |
| | | | | | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | | | | |
| | | | | | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | | | | |
| | | | | | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | | | | |
| | | | | | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | | | | |
| | | | | | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | | | | |
| | | | | | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | | | | |
| | | | | | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | | | | |
| | | | | | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | | | | |
| | | | | | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | | | | |
| | | | | | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | | | | |
| | | | | | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | | | | |
| | | | | | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | | | | |
| | | | | | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | | | | |
| | | | | | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | | | | |
| | | | | | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | | | | |
| | | | | | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | | | | |
| | | | | | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | | | | |
| | | | | | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | | | | |
| | | | | | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | | | | |
| | | | | | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | | | | |
| | | | | | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | | | | |
| | | | | | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | | | | |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | | | | | | | | | |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | | | | | | | | | |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | | | | | | | | | |

Select Address No.3 Setting Table

| Function & Setting | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | | | |
|--------------------|-----------------------|-----|-----|-----|---------|-----|----|----|----|----|----|----|----|-------------|----|----|---|---|---|
| Volume | Volume Channel Select | | | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | Chip Select | 1 | 1 | | | |
| | | | | | -32.0dB | 0 | 1 | 0 | 0 | 0 | 0 | 0 | | | | | 0 | | |
| | | | | | -32.5dB | 0 | 1 | 0 | 0 | 0 | 0 | 0 | | | | | 0 | 1 | |
| | | | | | -33.0dB | 0 | 1 | 0 | 0 | 0 | 0 | 0 | | | | | 1 | 0 | |
| | | | | | -33.5dB | 0 | 1 | 0 | 0 | 0 | 0 | 0 | | | | | 1 | 1 | |
| | | | | | -34.0dB | 0 | 1 | 0 | 0 | 0 | 0 | 1 | | | | | 0 | 0 | |
| | | | | | -34.5dB | 0 | 1 | 0 | 0 | 0 | 0 | 1 | | | | | 0 | 1 | |
| | | | | | -35.0dB | 0 | 1 | 0 | 0 | 0 | 0 | 1 | | | | | 1 | 0 | |
| | | | | | -35.5dB | 0 | 1 | 0 | 0 | 0 | 0 | 1 | | | | | 1 | 1 | |
| | | | | | -36.0dB | 0 | 1 | 0 | 0 | 1 | 0 | 0 | | | | | 0 | 0 | |
| | | | | | -36.5dB | 0 | 1 | 0 | 0 | 1 | 0 | 0 | | | | | 0 | 1 | |
| | | | | | -37.0dB | 0 | 1 | 0 | 0 | 1 | 0 | 1 | | | | | 0 | 0 | |
| | | | | | -37.5dB | 0 | 1 | 0 | 0 | 1 | 0 | 1 | | | | | 0 | 1 | |
| | | | | | -38.0dB | 0 | 1 | 0 | 0 | 1 | 1 | 1 | | | | | 0 | 0 | |
| | | | | | -38.5dB | 0 | 1 | 0 | 0 | 1 | 1 | 1 | | | | | 0 | 1 | |
| | | | | | -39.0dB | 0 | 1 | 0 | 0 | 1 | 1 | 1 | | | | | 1 | 0 | |
| | | | | | -39.5dB | 0 | 1 | 0 | 0 | 1 | 1 | 1 | | | | | 1 | 1 | |
| | | | | | -40.0dB | 0 | 1 | 0 | 1 | 0 | 0 | 0 | | | | | 0 | 0 | |
| | | | | | -40.5dB | 0 | 1 | 0 | 1 | 0 | 0 | 0 | | | | | 0 | 1 | |
| | | | | | -41.0dB | 0 | 1 | 0 | 1 | 0 | 0 | 0 | | | | | 1 | 0 | |
| | | | | | -41.5dB | 0 | 1 | 0 | 1 | 0 | 0 | 0 | | | | | 1 | 1 | |
| | | | | | -42.0dB | 0 | 1 | 0 | 1 | 0 | 1 | 0 | | | | | 1 | 0 | 0 |
| | | | | | -42.5dB | 0 | 1 | 0 | 1 | 0 | 1 | 0 | | | | | 1 | 0 | 1 |
| | | | | | -43.0dB | 0 | 1 | 0 | 1 | 0 | 1 | 0 | | | | | 1 | 1 | 0 |
| | | | | | -43.5dB | 0 | 1 | 0 | 1 | 0 | 1 | 0 | | | | | 1 | 1 | 1 |
| | | | | | -44.0dB | 0 | 1 | 0 | 1 | 1 | 1 | 0 | | | | | 0 | 0 | 0 |
| | | | | | -44.5dB | 0 | 1 | 0 | 1 | 1 | 1 | 0 | | | | | 0 | 0 | 1 |
| | | | | | -45.0dB | 0 | 1 | 0 | 1 | 1 | 1 | 0 | | | | | 1 | 0 | 0 |
| | | | | | -45.5dB | 0 | 1 | 0 | 1 | 1 | 1 | 0 | | | | | 1 | 1 | 1 |
| | | | | | -46.0dB | 0 | 1 | 0 | 1 | 1 | 1 | 1 | | | | | 0 | 0 | 0 |
| | | | | | -46.5dB | 0 | 1 | 0 | 1 | 1 | 1 | 1 | | | | | 0 | 0 | 1 |
| | | | | | -47.0dB | 0 | 1 | 0 | 1 | 1 | 1 | 1 | | | | | 1 | 1 | 0 |
| | | | | | -47.5dB | 0 | 1 | 0 | 1 | 1 | 1 | 1 | | | | | 1 | 1 | 1 |
| | | | | | -48.0dB | 0 | 1 | 1 | 0 | 0 | 0 | 0 | | | | | 0 | 0 | 0 |
| -48.5dB | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | | | | | | | | | |
| -49.0dB | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | | | | | | | | | |
| -49.5dB | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | | | | | | | | | |
| -50.0dB | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | | | | | | | | | |
| -50.5dB | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | | | | | | | | | |
| -51.0dB | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | | | | | | | | | |
| -51.5dB | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | |
| -52.0dB | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | |
| -52.5dB | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | | | | | | | | | |
| -53.0dB | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | | | | | | | | | |
| -53.5dB | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | | | | | | | | | |
| -54.0dB | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | | | | | | | | | |
| -54.5dB | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | | | | | | | | | |

Select Address No.3 Setting Table

| Function & Setting | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|--------------------|---------|-----------------------|-----|-----|-----|-----|----|----|----|----|----|----|----|-------------|----|----|
| Volume | -55.0dB | Volume Channel Select | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | Chip Select | 1 | 1 |
| | -55.5dB | | | | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | | | | |
| | -56.0dB | | | | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | | | | |
| | -56.5dB | | | | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | | | | |
| | -57.0dB | | | | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | | | | |
| | -57.5dB | | | | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | | | | |
| | -58.0dB | | | | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | | | | |
| | -58.5dB | | | | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | | | | |
| | -59.0dB | | | | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | | | | |
| | -59.5dB | | | | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | | | | |
| | -60.0dB | | | | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | | | | |
| | -60.5dB | | | | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | | | | |
| | -61.0dB | | | | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | | | | |
| | -61.5dB | | | | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | | | | |
| | -62.0dB | | | | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | | | | |
| | -62.5dB | | | | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | | | | |
| | -63.0dB | | | | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | | | | |
| | -63.5dB | | | | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | |
| | -64.0dB | | | | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| | -64.5dB | | | | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | | | | |
| | -65.0dB | | | | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | | | | |
| | -65.5dB | | | | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | | | | |
| | -66.0dB | | | | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | | | | |
| | -66.5dB | | | | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | | | | |
| | -67.0dB | | | | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | | | | |
| | -67.5dB | | | | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | | | | |
| | -68.0dB | | | | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | | | | |
| | -68.5dB | | | | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | | | | |
| | -69.0dB | | | | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | | | | |
| | -69.5dB | | | | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | | | | |
| | -70.0dB | | | | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | | | | |
| | -70.5dB | | | | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | | | | |
| | -71.0dB | | | | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | | | | |
| | -71.5dB | | | | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | | | | |
| | -72.0dB | | | | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | | | | |
| | -72.5dB | | | | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | | | | |
| | -73.0dB | | | | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | | | | |
| | -73.5dB | | | | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | | | | |
| | -74.0dB | | | | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | | | | |
| | -74.5dB | | | | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | | | | |
| -75.0dB | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | | | | | | | | |
| -75.5dB | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | | | | | | | | |
| -76.0dB | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | | | | | | | | |
| -76.5dB | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | | | | | | | | |
| -77.0dB | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | | | | | | | | |
| -77.5dB | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | | | | | | | | |
| -78.0dB | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | | | | | | | | |

Select Address No.3 Setting Table

| Function & Setting | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|--------------------|---------|-----------------------------|-----|-----|-----|-----|----|----|----|----|----|----|----|----------------|----|----|
| Volume | -78.5dB | Volume Channel Select | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | Chip Select | 1 | 1 |
| | -79.0dB | | | | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | | | | |
| | -79.5dB | | | | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | | | | |
| | -80.0dB | | | | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | | | | |
| | -80.5dB | | | | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | | | | |
| | -81.0dB | | | | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | | | | |
| | -81.5dB | | | | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | | | | |
| | -82.0dB | | | | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | | | | |
| | -82.5dB | | | | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | | | | |
| | -83.0dB | | | | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | | | | |
| | -83.5dB | | | | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | | | | |
| | -84.0dB | | | | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | | | | |
| | -84.5dB | | | | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | | | | |
| | -85.0dB | | | | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | | | | |
| | -85.5dB | | | | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | | | | |
| | -86.0dB | | | | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | | | | |
| | -86.5dB | | | | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | | | | |
| | -87.0dB | | | | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | | | | |
| | -87.5dB | | | | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | | | | |
| | -88.0dB | | | | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | | | | |
| | -88.5dB | | | | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | | | | |
| | -89.0dB | | | | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | | | | |
| | -89.5dB | | | | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | | | | |
| | -90.0dB | | | | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | | | | |
| | -90.5dB | | | | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | | | | |
| | -91.0dB | | | | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | | | | |
| | -91.5dB | | | | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | | | | |
| | -92.0dB | | | | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | | | | |
| | -92.5dB | | | | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | | | | |
| | -93.0dB | | | | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | | | | |
| | -93.5dB | | | | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | | | | |
| | -94.0dB | | | | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | | | | |
| | -94.5dB | | | | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | | | | |
| | -95.0dB | | | | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | | | | |
| Prohibition | | | | | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | | | | |
| | | | | | : | : | : | : | : | : | : | : | | | | |
| | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | |

Select Address No.7 Setting Table

| Function & Setting | | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | | | | | | | | | | | | | | | |
|-----------------------|-------------|-----------------------|-----|-----|-----------------------|-----|-----|-----------------------|---------------|----|-----------------|----|----|----|----------------|----|----|-----------------------|--|--|---------------|---|---|-----------------|---|---|---|----------------|---|---|--|--|
| A→B switching-time | 11msec | 0 | 0 | 0 | B→A switching-time | | | Base clock | 0 | 0 | System Reset | 0 | 0 | 1 | Chip Select | 1 | 1 | | | | | | | | | | | | | | | |
| | 5msec | 0 | 0 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 7msec | 0 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 14msec | 0 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 3msec | 1 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 2msec | 1 | 0 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Prohibition | 1 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B→A switching-time | 11msec | A→B switching-time | | | 0 | 0 | 0 | Base clock | 0 | 0 | System Reset | 0 | 0 | 1 | Chip Select | 1 | 1 | | | | | | | | | | | | | | | |
| | 5msec | | | | 0 | 0 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 7msec | | | | 0 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 14msec | | | | 0 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 3msec | | | | 1 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 2msec | | | | 1 | 0 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Prohibition | | | | 1 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Base clock | x1 | A→B switching-time | | | B→A switching-time | | | 0 | Base clock | 0 | System Reset | 0 | 0 | 1 | Chip Select | 1 | 1 | | | | | | | | | | | | | | | |
| | x1/2 | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| System Reset | Normal | | | | | | | A→B switching-time | | | | | | | | | | B→A switching-time | | | Base clock | 0 | 0 | System Reset | 0 | 0 | 1 | Chip Select | 1 | 1 | | |
| | Reset | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | |

 : Initial condition

Volume changing needs the time that is following Figure. (Ex. It selected 11msec, 22msec need.)

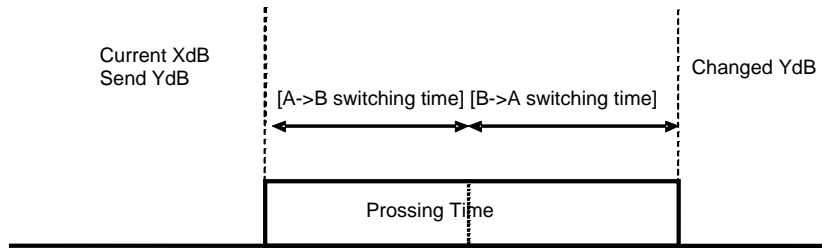


Figure 11. About [A→B switching-time] [B→A switching-time]

Base clock is able to change Internal Oscillator Frequency. For example, when Base clock select x1/2, A->B and B->A switching time is to be two times. (ex. 11msec->22msec)

○Caution on send data

When send the same channel data among the switching process, internal operation is as below.

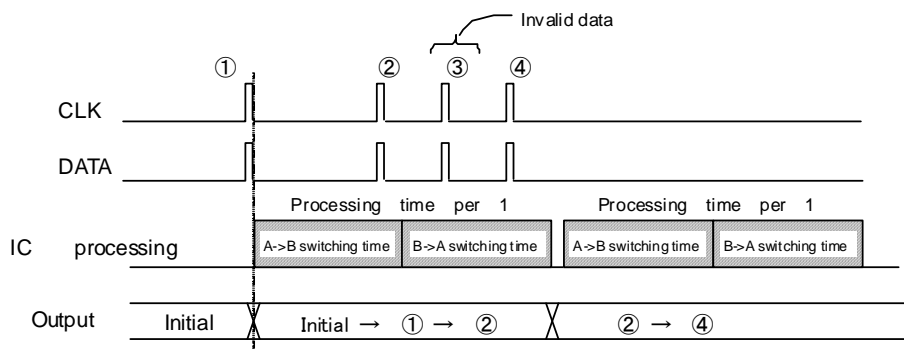


Figure 12. The switching process with send data

②data is sent during A -> B switching time, it is valid.

③data and ④data are sent during B -> A switching time, it is valid at the next processing time.

But ③data is replaced by ④data.

○About pop noise in gain changing

The level of the pop noise sometimes varies in the difference in output DC offset of the inside condition A and B.

Application Circuit Diagram

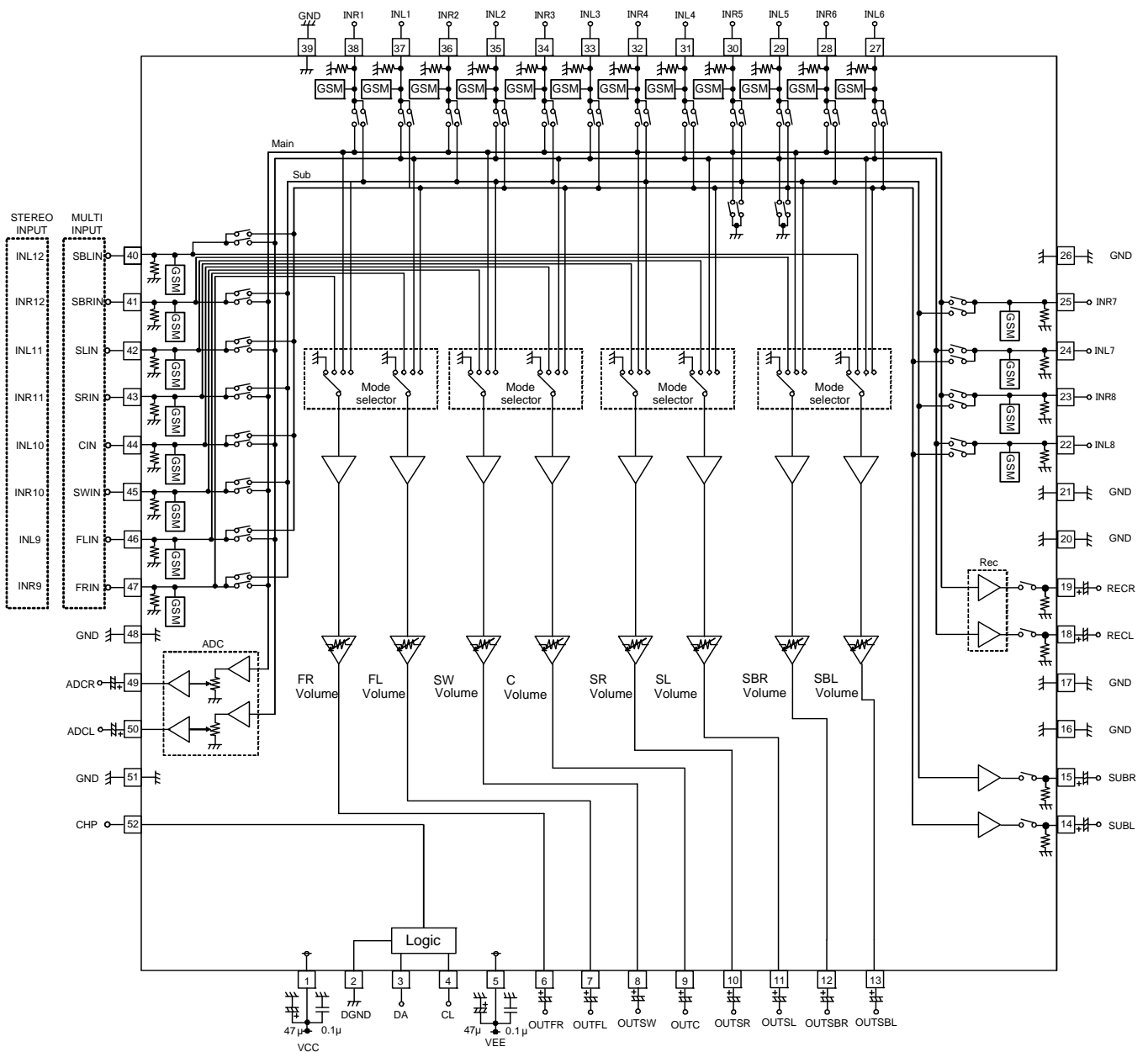


Figure 13. Application Circuit Diagram

Notes on wiring

- ① GND shall be wired from reference point and thicken.
- ② Wiring pattern of CL and DA shall be away from that of analog unit and cross-talk shall not be acceptable.
- ③ Lines of CL and DA of shall not be parallel if possible. The lines shall be shielded, if they are adjacent to each other.
- ④ Please pay attention the wiring pattern of the input terminal of the input selector to the cross talk. Recommend that wiring period is shielded.
- ⑤ Please connect the decoupling capacitor of a power supply in the shortest distance as much as possible to VCC and GND, VEE.

Power Dissipation

About the thermal design by the IC

Characteristics of an IC have a great deal to do with the temperature at which it is used, and exceeding absolute maximum ratings may degrade and destroy elements. Careful consideration must be given to the heat of the IC from the two standpoints of immediate damage and long-term reliability of operation.

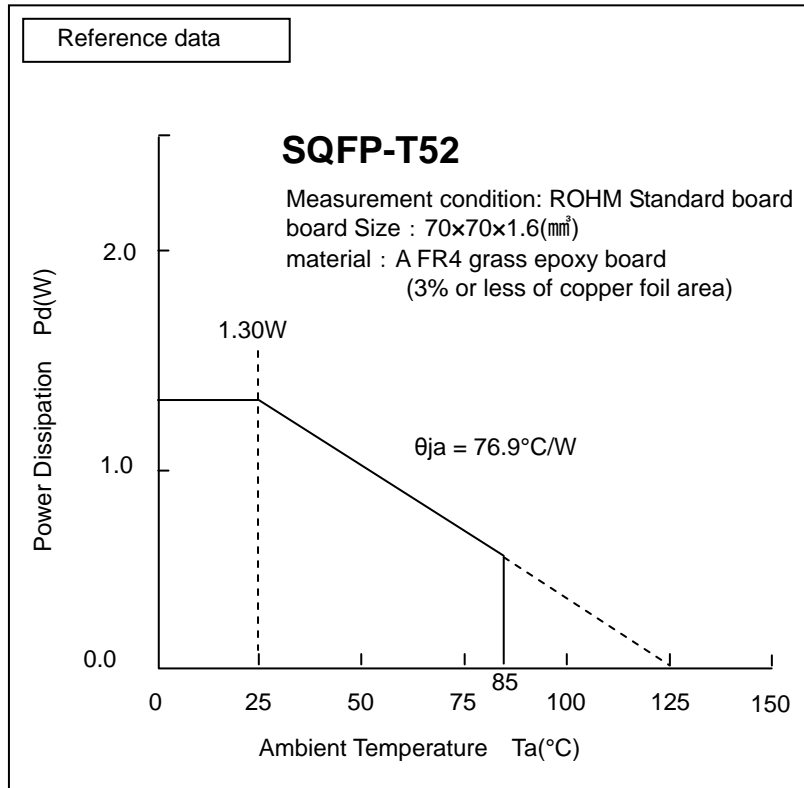
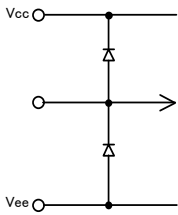
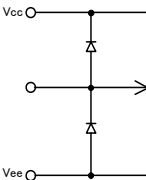
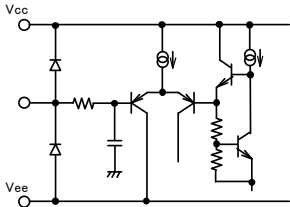
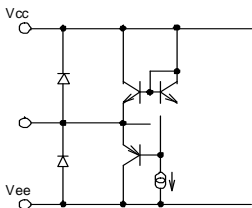
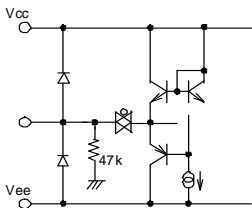


Figure 14. Temperature Derating Curve

Note) Value are actual measurements and are not guaranteed.

Power dissipation values vary according to the board on which the IC is mounted.

I/O equivalence circuit(s)

| Terminal Number | Terminal Name | Terminal Voltage (V) | Equivalent Circuit | Description of terminal |
|--|---|----------------------|---|--|
| 16 17 20 21 39 48 51 | AGND | 0 |  | Analog ground terminals. |
| 1 5 | VCC VEE | +7 -7 | | Positive power supply terminal and |
| 2 | DGND | 0 |  | Digital ground terminal. |
| 3 4 52 | DA CL CHP | - |  | Input terminals for a clock and data. |
| 6 7 8 9 10 11 12 13 49 50 | OUTFR OUTFL OUTSW OUTC OUTSR OUTSL OUTSBR OUTSBL ADCR ADCL | 0 |  | Output terminal s for analog sound signal. |
| 14 15 18 19 | SUBL SUBR RECL RECR | 0 |  | Output terminal s for analog sound signal. (SUB/REC) |

| Terminal Number | Terminal Name | Terminal Voltage (V) | Equivalent Circuit | Description of terminal |
|--|--|----------------------|--------------------|---|
| 22 23 24 25 27 28 29 30 31 32 33 34 35 36 37 38 | INL8 INR8 INL7 INR7 INL6 INR6 INL5 INR5 INL4 INR4 INL3 INR3 INL2 INR2 INL1 INR1 | 0 | | Input terminals for stereo sound signal. Input impedance is 47kΩ(Typ.). |
| 40 41 42 43 44 45 46 47 | SBLIN SBRIN SLIN SRIN CIN SWIN FLIN FRIN | 0 | | Input terminals for an analog multi sound signal. Input impedance is 47kΩ(Typ.). |

Operational Notes

1. Reverse Connection of Power Supply

Connecting the power supply in reverse polarity can damage the IC. Take precautions against reverse polarity when connecting the power supply, such as mounting an external diode between the power supply and the IC's power supply terminals.

2. Power Supply Lines

Design the PCB layout pattern to provide low impedance supply lines. Separate the ground and supply lines of the digital and analog blocks to prevent noise in the ground and supply lines of the digital block from affecting the analog block. Furthermore, connect a capacitor to ground at all power supply pins. Consider the effect of temperature and aging on the capacitance value when using electrolytic capacitors.

3. Vee Voltage

Ensure that no pins are at a voltage below that of the VEE pin at any time, even during transient condition.

4. Ground Wiring Pattern

GND pins which are digital ground(2pin) and analog ground(16,17,20,21,26,39,48,51pin) are not connected inside LSI. These ground pins traces should be routed separately but connected to a single ground at the reference point of the application board. Also ensure that the ground traces of external components do not cause variations on the ground voltage. The ground lines must be as short and thick as possible to reduce line impedance.

5. Thermal Consideration

Should by any chance the power dissipation rating be exceeded the rise in temperature of the chip may result in deterioration of the properties of the chip. The absolute maximum rating of the Pd stated in this specification is when the IC is mounted on a 70mm x 70mm x 1.6mm glass epoxy board. In case of exceeding this absolute maximum rating, increase the board size and copper area to prevent exceeding the Pd rating.

6. Recommended Operating Conditions

These conditions represent a range within which the expected characteristics of the IC can be approximately obtained. The electrical characteristics are guaranteed under the conditions of each parameter.

7. Rush Current

When power is first supplied to the IC, it is possible that the internal logic may be unstable and inrush current may flow instantaneously due to the internal powering sequence and delays, especially if the IC has more than one power supply. Therefore, give special consideration to power coupling capacitance, power wiring, width of ground wiring, and routing of connections.

8. Operation Under Strong Electromagnetic Field

Operating the IC in the presence of a strong electromagnetic field may cause the IC to malfunction.

9. Testing on Application Boards

When testing the IC on an application board, connecting a capacitor directly to IC pin may subject the IC to stress. Always discharge capacitors completely after each process or step. The IC's power supply should always be turned off completely before connecting or removing it from the test setup during the inspection process. To prevent damage from static discharge, ground the IC during assembly and use similar precautions during transport and storage.

10. Inter-pin Short and Mounting Errors

Ensure that the direction and position are correct when mounting the IC on the PCB. Incorrect mounting may result in damaging the IC. Avoid nearby pins being shorted to each other especially to ground, power supply and output pin. Inter-pin shorts could be due to many reasons such as metal particles, water droplets (in very humid environment) and unintentional solder bridge deposited in between pins during assembly to name a few.

11. Unused Input Terminals

Because the input impedance of the terminal becomes 47kΩ when the signal input terminal makes a terminal open, the plunge noise from outside sometimes becomes a problem. Please connect the no using input pin to GND. And please open the no using output pin.

Operational Notes – continued 1

12. Regarding the Input Pin of the IC

This monolithic IC contains P+ isolation and P substrate layers between adjacent elements in order to keep them isolated. P-N junctions are formed at the intersection of the P layers with the N layers of other elements, creating a parasitic diode or transistor. For example (refer to figure below):

When $V_{ee} > \text{Pin A}$ and $V_{ee} > \text{Pin B}$, the P-N junction operates as a parasitic diode.

When $V_{ee} > \text{Pin B}$, the P-N junction operates as a parasitic transistor.

Parasitic diodes inevitably occur in the structure of the IC. The operation of parasitic diodes can result in mutual interference among circuits, operational faults, or physical damage. Therefore, conditions that cause these diodes to operate, such as applying a voltage lower than the V_{ee} voltage to an input pin (and thus to the P substrate) should be avoided.

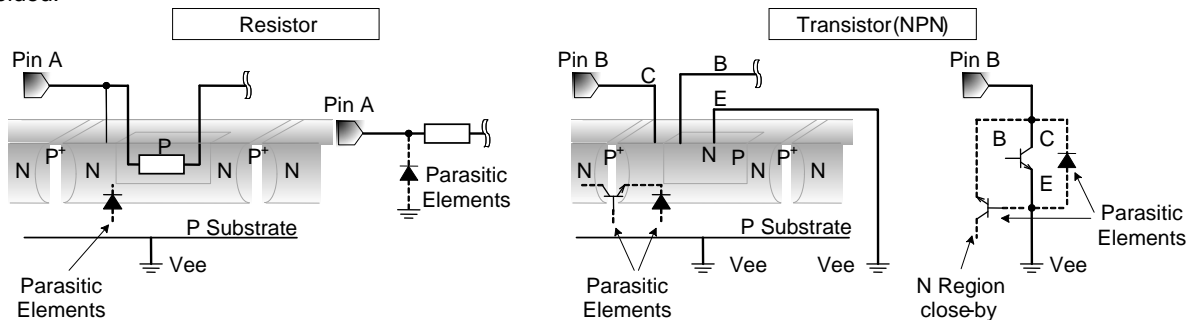


Figure 15. Example of monolithic IC structure

13. Ceramic Capacitor

When using a ceramic capacitor, determine the dielectric constant considering the change of capacitance with temperature and the decrease in nominal capacitance due to DC bias and others.

14. About power ON/OFF

1. At power ON/OFF, a shock sound will be generated and, therefore, use MUTE on the set.
2. When turning on power supplies, V_{ee} and V_{cc} should be powered on simultaneously or V_{ee} first; then followed by V_{cc} . If the V_{cc} side is started up first, an excessive current may pass V_{cc} through V_{ee} .

15. About function switching

When switching Input Selector, Mode selector or Input Gain, use MUTE on Volume.

16. Volume gain switching

In case of the boost of the volume when changing to the high gain which exceeds +20dB especially, the switching shock noise sometimes becomes big. In this case, we recommend changing every 1 dB step without changing a gain at once. Also, the shock noise sometimes can reduce by making micro-step volume switching time long, too.

Operational Notes – continued 2

17. Output load characteristic

The usages of load for output are below (reference). Please use the load more than 10 kΩ(TYP).

Output terminal

| Terminal No. | Terminal Name | Terminal No. | Terminal Name | Terminal No. | Terminal Name | Terminal No. | Terminal Name |
|--------------|---------------|--------------|---------------|--------------|---------------|--------------|---------------|
| 6 | OUTFR | 10 | OUTSR | 14 | SUBL | 49 | ADCR |
| 7 | OUTFL | 11 | OUTSL | 15 | SUBR | 50 | ADCL |
| 8 | OUTSW | 12 | OUTSBR | 18 | RECL | - | - |
| 9 | OUTC | 13 | OUTSBL | 19 | RECR | - | - |

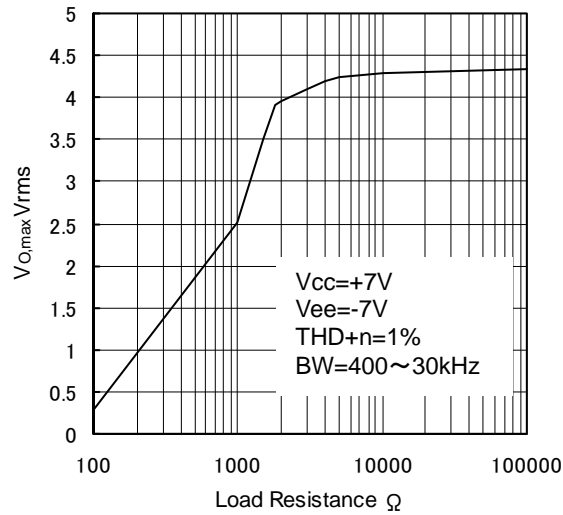
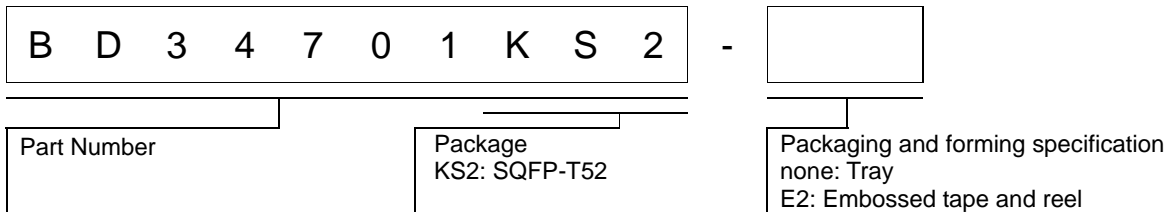
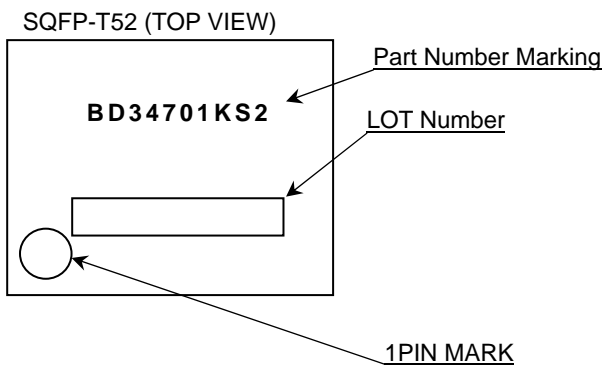


Figure 16. Output load characteristic at $V_{cc}=+7V$, $V_{ee}=-7V$ (Reference)

Ordering Information

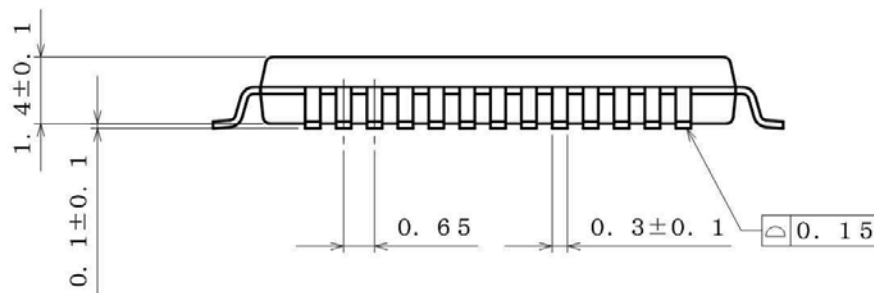
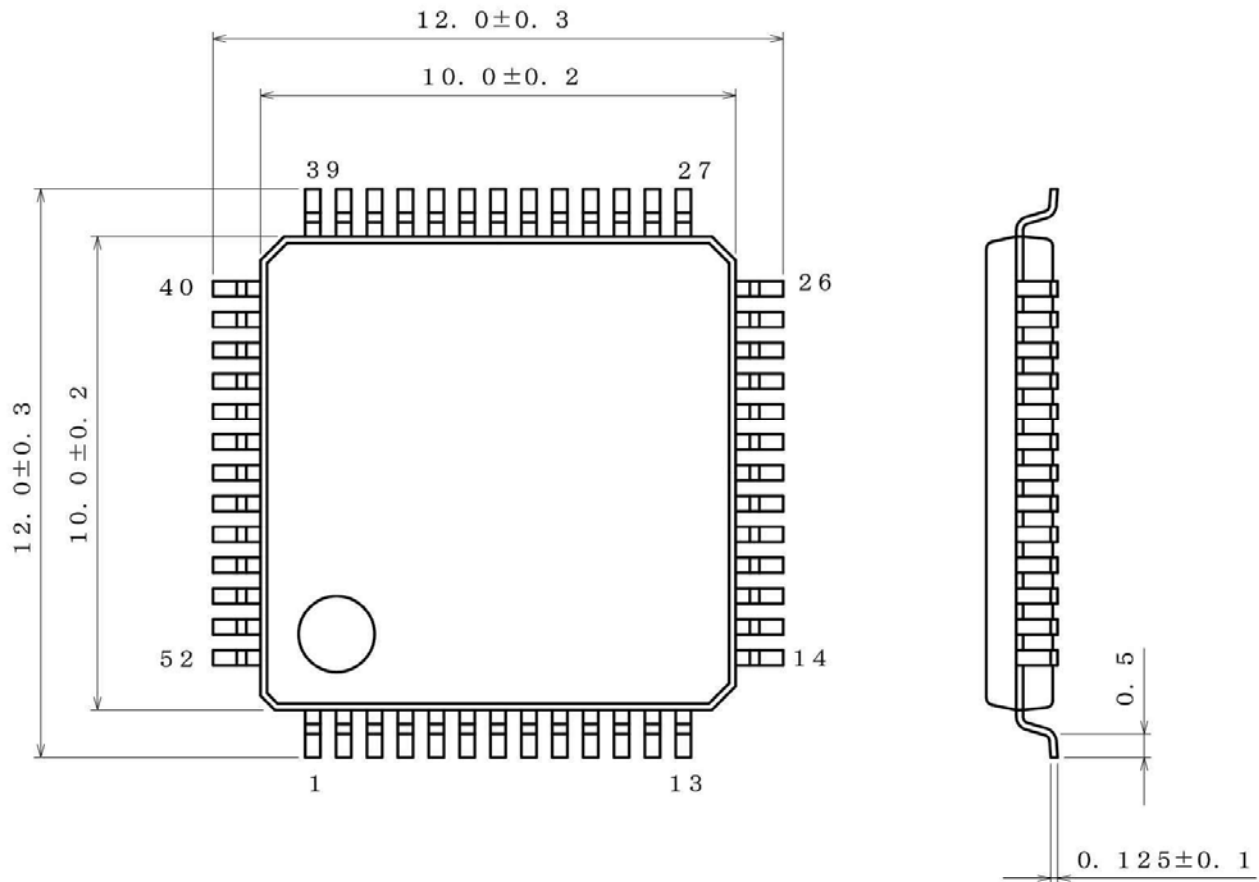


Marking Diagram(TOP VIEW)



Physical Dimension, Tape and Reel Information

| | |
|--------------|----------|
| Package Name | SQFP-T52 |
|--------------|----------|



(UNIT : mm)
 PKG : SQFP-T52
 Drawing No. B0033

<Tape and Reel information>

| | |
|-------------------|---|
| Container | Tray (with dry pack) |
| Quantity | 1000pcs |
| Direction of feed | Direction of product is fixed in a tray |

*Order quantity needs to be multiple of the minimum quantity.

Revision History

| Date | Revision | Changes |
|-------------|----------|--|
| 02.Sep.2013 | 001 | New Release |
| 17.Sep.2003 | 002 | P27. Delete "M" of "SQFP-T52M" in Marking Diagram. |

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- Our Products are designed and manufactured for application in ordinary electronic equipments (such as AV equipment, OA equipment, telecommunication equipment, home electronic appliances, amusement equipment, etc.). If you intend to use our Products in devices requiring extremely high reliability (such as medical equipment ^(Note 1), transport equipment, traffic equipment, aircraft/spacecraft, nuclear power controllers, fuel controllers, car equipment including car accessories, safety devices, etc.) and whose malfunction or failure may cause loss of human life, bodily injury or serious damage to property ("Specific Applications"), please consult with the ROHM sales representative in advance. Unless otherwise agreed in writing by ROHM in advance, ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of any ROHM's Products for Specific Applications.

(Note1) Medical Equipment Classification of the Specific Applications

| JAPAN | USA | EU | CHINA |
|-----------|-----------|------------|-----------|
| CLASS III | CLASS III | CLASS II b | CLASS III |
| CLASS IV | | CLASS III | |

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 - Installation of redundant circuits to reduce the impact of single or multiple circuit failure
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 - Use of our Products in places where the Products are exposed to sea wind or corrosive gases, including Cl₂, H₂S, NH₃, SO₂, and NO₂
 - Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves
 - Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
 - Sealing or coating our Products with resin or other coating materials
 - Use of our Products without cleaning residue of flux (even if you use no-clean type fluxes, cleaning residue of flux is recommended); or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
 - Use of the Products in places subject to dew condensation
- The Products are not subject to radiation-proof design.
- Please verify and confirm characteristics of the final or mounted products in using the Products.
- In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse. is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.
- De-rate Power Dissipation (Pd) depending on Ambient temperature (Ta). When used in sealed area, confirm the actual ambient temperature.
- Confirm that operation temperature is within the specified range described in the product specification.
- ROHM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

Precaution for Mounting / Circuit board design

- When a highly active halogenous (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.
- In principle, the reflow soldering method must be used; if flow soldering method is preferred, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

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 - [b] the temperature or humidity exceeds those recommended by ROHM
 - [c] the Products are exposed to direct sunshine or condensation
 - [d] the Products are exposed to high Electrostatic
2. Even under ROHM recommended storage condition, solderability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solderability before using Products of which storage time is exceeding the recommended storage time period.
3. Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.
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