

Sound Processors for Home Theater Systems

5.1ch Sound Processor


BD3811K1, BD3818KS

No.10081EAT02

●Description

BD3811K1 and BD3818KS are 5.1ch sound processors, with built-in Mode Selector/Input Selector. Functions, including 6-ch Volume, Gain Amp, Bass, Treble, Mixing (BD3818KS), Dynamic Bass Boost (BD3818KS) and Bass Boost (BD3811K1) are integrated into a single chip.

●Features

- 1) Independent 6 channels for Master Volume (0 to -103dB, 1dB/Step, MUTE, BD3811K1)
(0 to -95dB 1dB/Step, MUTE, BD3818KS)
Implementation of a resistance ladder type circuit reduces residual noise and a shock sound at switching.
- 2) Low current consumption design achieved by adopting the BiCMOS process
- 3) Maximum output voltage (BD3818KS): 4.3Vrms (Vcc=7V, VEE=-7V, RL=10kΩ)
Maximum output voltage (BD3811K1): 4.2Vrms (Vcc=7V, VEE=-7V, RL=10kΩ)
- 4) Built-in Input Gain Amp useful for adjusting the output signal voltages
- 5) Built-in Operational Amplifier useful for filter construction (BD3818KS)
- 6) Built-in Dynamic Bass Boost circuit (BD3818KS)
- 7) 2-wire serial control (BD3818KS for 5V, BD3811K1 for both 3.3V and 5V)
- 8) Built-in Output Gain Amp useful for adjusting the output signal voltages (BD3811K1)
- 9) REC output terminal with a REC input/output switch useful for monitoring Equalizer Amp (BD3811K1)
- 10) Output mute controlled by either serial data or an external control terminal

●Applications

AV receivers, home theater systems and mini-audio systems.

●Line up matrix

| Parameter | BD3811K1 | BD3818KS |
|----------------|-----------------------|---|
| Input Selector | 8 inputs | 5 inputs |
| Input Gain | 2Step | 4 Step or 2 Step |
| Volume | 0 to -103dB 1dB/Step | 0 to -95dB 1dB/Step |
| Bass, Treble | ±14dB 2dB/Step | ±14dB 2dB/Step |
| Output Gain | 0, 6 to 18dB 2dB/Step | Variable depending on the external resistance |
| Mixing | No | Yes |
| Bass Boost | 0 to 12dB, 4dB/Step | 0 to 12dB, 4dB/Step Dynamic type |
| Package | QFP80 | SQFP80 |

● Absolute maximum ratings (Ta=25°C)

| Parameter | Symbol | Ratings | Unit |
|-----------------------------|--------|--------------------|------|
| Power Supply Voltage | VCC | 7.5 ^{*1} | V |
| | VEE | -7.5 | |
| Input Signal Voltage | VIN | VCC+0.3 to VEE-0.3 | V |
| Power Dissipation | Pd | 1200 ^{*2} | mW |
| Operating Temperature range | Topr | -20 to +75 | °C |
| Storage Temperature range | Tastg | -55 to +125 | °C |

*1 Even in the specified range of Power Supply Voltage, applying voltage only to the VCC side may cause an excessive current to give a permanent damage to the IC.

When starting up power supplies, VEE and VCC should be powered on simultaneously or VEE first; then followed by VCC.

*2 Reduced by 12 mW/°C over 25°C, when installed on the standard board (size: 70x70x1.6mm).

● Operating range

It must function normally at Ta=25°C.

| Part No. | Parameter | Symbol | Ratings | | | Unit |
|----------|--------------------------|--------|---------|------|------|------|
| | | | Min. | Typ. | Max. | |
| BD3811K1 | Operating Supply Voltage | VCC | 5 | 7 | 7.3 | V |
| | | VEE | -7.3 | -7 | -5 | |
| BD3818KS | Operating Supply Voltage | VCC | 5 | 7 | 7.4 | V |
| | | VEE | -7.4 | -7 | -5 | |

● Electrical characteristics

1) BD3811K1 (Ta=25°C, VCC=7V, VEE=-7V, f=1kHz, Vin=1Vrms, RL=10kΩ, Rg=600Ω, Input ATT=0dB, Input gain=0dB, Master volume=0dB, Output gain=0dB, Bass, Treble and bass boost=0dB, unless otherwise noted.)

| | Parameter | Symbol | Limits | | | Unit | Conditions |
|----------------------------------|-------------------------------------|--------|--------|-------|------|-------------------------------------|---|
| | | | Min. | Typ. | Max. | | |
| Total Output | Circuit Current | VCC | — | 15 | 30 | mA | No signal |
| | | VEE | -30 | -15 | — | | |
| | Output Voltage Gain 1ch | Gv1 | -2 | 0 | 2 | dB | Measure : Pin55 |
| | Output Voltage Gain 2ch | Gv2 | -2 | 0 | 2 | dB | Measure : Pin57 |
| | Total Harmonic Distortion Ratio 1ch | THD1 | — | 0.005 | 0.09 | % | Measure : Pin55 BW=400~30kHz |
| | Total Harmonic Distortion Ratio 2ch | THD2 | — | 0.005 | 0.09 | % | Measure : Pin57 BW=400~30kHz |
| | Maximum Output Voltage 1ch | Vomax1 | 3.4 | 4.2 | — | Vrms | Measure : Pin55 THD=1% |
| | Maximum Output Voltage 2ch | Vomax2 | 3.4 | 4.2 | — | Vrms | Measure : Pin57 THD=1% |
| | Output Noise Voltage 1ch | Vno1 | — | 2.5 | 12 | μVrms | Measure : Pin 55 Rg=0Ω, Tone: ON BW=IHF-A |
| | | | — | 2.0 | 9.0 | μVrms | Measure : Pin 55 Rg=0Ω, By Pass mode BW=IHF-A |
| | Output Noise Voltage 2ch | Vno2 | — | 2.5 | 12 | μVrms | Measure : Pin 57 Rg=0Ω, Tone: ON BW=IHF-A |
| | | | — | 2.0 | 9.0 | μVrms | Measure : Pin 57 Rg=0Ω, By Pass mode BW=IHF-A |
| | Input Impedance 1ch | Rin1 | 28 | 47 | 70 | kΩ | Measure : Pin1, 3, 5, 7, 9, 11, 77, 79 |
| | Input Impedance 2ch | Rin2 | 28 | 47 | 70 | kΩ | Measure : Pin2, 4, 6, 8, 10, 12, 78, 80 |
| | Cross-talk between Channels 1ch→2ch | CTC12 | — | -100 | -70 | dB | Measure : Pin57(OUT2) Rg=0Ω, BW=IHF-A Reference : Pin55(OUT1)=1Vrms |
| | Cross-talk between Channels 2ch→1ch | CTC21 | — | -100 | -70 | dB | Measure : Pin55(OUT1) Rg=0Ω, BW=IHF-A Reference : Pin57(OUT2)=1Vrms |
| Cross-talk between Selectors 1ch | CTS1 | — | -100 | -70 | dB | Measure : Pin 55 Rg=0Ω, BW=IHF-A | |
| Cross-talk between Selectors 2ch | CTS2 | — | -100 | -70 | dB | Measure : Pin 57 Rg=0Ω, BW=IHF-A | |

| | Parameter | Symbol | Limits | | | Unit | Conditions |
|-------------------|---------------------------------------|--------|--------|-------|------|------------|--|
| | | | Min. | Typ. | Max. | | |
| REC Out | R Output Impedance 1ch | RoutR1 | — | 100 | 200 | Ω | Measure : Pin 71, 73, 75 |
| | R Output Impedance 2ch | RoutR2 | — | 100 | 200 | Ω | Measure : Pin 72, 74, 76 |
| | R Voltage Gain 1ch | GVR1 | -2 | 0 | 2 | dB | Measure : Pin 71, 73, 75 RL=47k Ω , Vin =0.4Vrms |
| | R Voltage Gain 2ch | GVR2 | -2 | 0 | 2 | dB | Measure : Pin 72, 74, 76 RL=47k Ω , Vin =0.4Vrms |
| | R Total Harmonic Distortion Ratio 1ch | THDR1 | — | 0.005 | 0.09 | % | Measure : Pin 71, 73, 75 RL=47k Ω , Vin =0.4Vrms BW=400~30kHz |
| | R Total Harmonic Distortion Ratio 2ch | THDR2 | — | 0.005 | 0.09 | % | Measure : Pin 72, 74, 76 RL=47k Ω , Vin =0.4Vrms BW=400~30kHz |
| Volume Output | V Output Voltage Gain 1ch | GVV1 | -2 | 0 | 2 | dB | Measure : Pin 36, 38 |
| | V Output Voltage Gain 2ch | GVV2 | -2 | 0 | 2 | dB | Measure : Pin 35, 37 |
| | V Total Harmonic Distortion Ratio 1ch | THDV1 | — | 0.005 | 0.09 | % | Measure : Pin 36, 38 BW=400~30kHz |
| | V Total Harmonic Distortion Ratio 2ch | THDV2 | — | 0.005 | 0.09 | % | Measure : Pin 35, 37 BW=400~30kHz |
| | V Output Noise Voltage 1ch | VnoV1 | — | 1.5 | 8 | μ Vrms | Measure : Pin 36, 38 Rg=0 Ω , BW=IHF-A |
| | V Output Noise Voltage 2ch | VnoV2 | — | 1.5 | 8 | μ Vrms | Measure : Pin 35, 37 Rg=0 Ω , BW=IHF-A |
| | Volume Control Range 1ch | GVR1 | -106 | -103 | -100 | dB | Measure : Pin 36, 38, 55 Vin =3Vrms |
| | Volume Control Range 2ch | GVR2 | -106 | -103 | -100 | dB | Measure : Pin 35, 37, 57 Vin =3Vrms |
| | Volume Setting Error 1 1ch | VE11 | -2 | 0 | 2 | dB | Measure : Pin 36, 38, 55 0 to -53dB, Vin =3Vrms |
| | Volume Setting Error 1 2ch | VE12 | -2 | 0 | 2 | dB | Measure : Pin 35, 37, 57 0 to -53dB, Vin =3Vrms |
| | Volume Setting Error 2 1ch | VE21 | -3 | 0 | 3 | dB | Measure : Pin 36, 38, 55 -54 to -103dB, Vin =3Vrms |
| | Volume Setting Error 2 2ch | VE22 | -3 | 0 | 3 | dB | Measure : Pin 35, 37, 57 -54 to -103dB, Vin =3Vrms |
| | Maximum Attenuation 1ch | Vmin1 | — | -118 | -105 | dB | Measure : Pin 36, 38, 55 Vin =3Vrms, BW=IHF-A |
| | Maximum Attenuation 2ch | Vmin2 | — | -118 | -105 | dB | Measure : Pin 35, 37, 57 Vin =3Vrms, BW=IHF-A |
| Input Attenuation | Input Attenuation Control Range 1ch | GIA1 | -20 | -18 | -16 | dB | Measure : Pin 19, 20 |
| | Input Attenuation Control Range 2ch | GIA2 | -20 | -18 | -16 | dB | Measure : Pin 17, 18 |
| | Input Attenuation Setting Error 1ch | AE1 | -2 | 0 | 2 | dB | Measure : Pin 19, 20 |
| | Input Attenuation Setting Error 2ch | AE2 | -2 | 0 | 2 | dB | Measure : Pin 17, 18 |
| Input Gain | Input Gain Control Range 1ch | GIG1 | 4 | 6 | 8 | dB | Measure : Pin 36, 38, 55 Vin =0.4Vrms |
| | Input Gain Control Range 2ch | GIG2 | 4 | 6 | 8 | dB | Measure : Pin 35, 37, 57 Vin =0.4Vrms |
| | Input Gain Setting Error 1ch | GIE1 | -2 | 0 | 2 | dB | Measure : Pin 36, 38, 55 Vin =0.4Vrms |
| | Input Gain Setting Error 2ch | GIE2 | -2 | 0 | 2 | dB | Measure : Pin 35, 37, 57 Vin =0.4Vrms |

| | Parameter | Symbol | Limits | | | Unit | Conditions |
|-------------|--------------------------------|--------|--------|------|------|------|--|
| | | | Min. | Typ. | Max. | | |
| Treble | Treble Maximum Boost Gain 1ch | GTB1 | 12 | 14 | 16 | dB | Measure : Pin 55 f=15kHz, Vin =0.4Vrms |
| | Treble Maximum Boost Gain 2ch | GTB2 | 12 | 14 | 16 | dB | Measure : Pin 57 f=15kHz, Vin =0.4Vrms |
| | Treble Maximum Cut Gain 1ch | GTC1 | -16 | -14 | -12 | dB | Measure : Pin 55 f=15kHz, Vin =0.4Vrms |
| | Treble Maximum Cut Gain 2ch | GTC2 | -16 | -14 | -12 | dB | Measure : Pin 57 f=15kHz, Vin =0.4Vrms |
| | Treble Step Resolution 1ch | TR1 | — | 2 | — | dB | Measure : Pin 55 f=15kHz, Vin =0.4Vrms |
| | Treble Step Resolution 2ch | TR2 | — | 2 | — | dB | Measure : Pin 57 f=15kHz, Vin =0.4Vrms |
| | Treble Gain Setting Error 1ch | TE1 | -2 | 0 | 2 | dB | Measure : Pin 55 f=15kHz, Vin =0.4Vrms |
| | Treble Gain Setting Error 2ch | TE2 | -2 | 0 | 2 | dB | Measure : Pin 57 f=15kHz, Vin =0.4Vrms |
| Bass | Bass Maximum Boost Gain 1ch | GBB1 | 12 | 14 | 16 | dB | Measure : Pin 55 fo=100Hz, Vin=0.4Vrms |
| | Bass Maximum Boost Gain 2ch | GBB2 | 12 | 14 | 16 | dB | Measure : Pin 57 fo=100Hz, Vin =0.4Vrms |
| | Bass Maximum Cut Gain 1ch | GBC1 | -16 | -14 | -12 | dB | Measure : Pin 55 fo=100Hz, Vin =0.4Vrms |
| | Bass Maximum Cut Gain 2ch | GBC2 | -16 | -14 | -12 | dB | Measure : Pin 57 fo=100Hz, Vin =0.4Vrms |
| | Bass Step Resolution 1ch | BR1 | — | 2 | — | dB | Measure : Pin 55 fo=100Hz, Vin =0.4Vrms |
| | Bass Step Resolution 2ch | BR2 | — | 2 | — | dB | Measure : Pin 57 fo=100Hz, Vin =0.4Vrms |
| | Bass Gain Setting Error 1ch | BE1 | -2 | 0 | 2 | dB | Measure : Pin 55 fo=100Hz, Vin =0.4Vrms |
| | Bass Gain Setting Error 2ch | BE2 | -2 | 0 | 2 | dB | Measure : Pin 57 fo=100Hz, Vin =0.4Vrms |
| Bass Boost | Bass Boost Maximum Gain 1ch | GBBB1 | 10 | 12 | 14 | dB | Measure : Pin 55 fo=70Hz, Vin =0.4Vrms |
| | Bass Boost Maximum Gain 2ch | GBBB2 | 10 | 12 | 14 | dB | Measure : Pin 57 fo=70Hz, Vin =0.4Vrms |
| | Bass Boost Step Resolution 1ch | BBR1 | — | 4 | — | dB | Measure : Pin 55 fo=70Hz, Vin =0.4Vrms |
| | Bass Boost Step Resolution 2ch | BBR2 | — | 4 | — | dB | Measure : Pin 57 fo=70Hz, Vin =0.4Vrms |
| | Bass Boost Setting Error 1ch | BBE1 | -2 | 0 | 2 | dB | Measure : Pin 55 fo=70Hz, Vin =0.4Vrms |
| | Bass Boost Setting Error 2ch | BBE2 | -2 | 0 | 2 | dB | Measure : Pin 57 fo=70Hz, Vin =0.4Vrms |
| Output Gain | Output Gain Control Range 1ch | GOG1 | 16 | 18 | 20 | dB | Measure : Pin 36, 38, 55 Vin =0.4Vrms |
| | Output Gain Control Range 2ch | GOG2 | 16 | 18 | 20 | dB | Measure : Pin 35, 37, 57 Vin =0.4Vrms |
| | Output Gain Setting Error 1ch | GOE1 | -2 | 0 | 2 | dB | Measure : Pin 36, 38, 55 Vin =0.4Vrms |
| | Output Gain Setting Error 2ch | GOE2 | -2 | 0 | 2 | dB | Measure : Pin 35, 37, 57 Vin =0.4Vrms |

* Note: This IC is not designed to be radiation-resistant.

2) BD3818KS (Ta=25°C VCC=7V, VEE=-7V, f=1kHz, Vin=500mVrms, RL=10kΩ, Rg=600Ω
 Input gain=0dB (FL,FR), 12.6dB (C,LS,RS), 15.6dB (SUB), Master volume=0dB, Bass and Treble =0dB,
 Gain amp=0dB (C,LS,RS,SUB), C,LS and RS mixing=OFF, unless otherwise noted.)

| | Parameter | Symbol | Limits | | | Unit | Conditions |
|---------------------------------------|---------------------------------------|-------------------|--------|-------|------|---|---|
| | | | Min. | Typ. | Max. | | |
| Total Output | Circuit Current | IQ | — | 28 | 40 | mA | No signal |
| | Output Voltage Gain 1 Line | GV1 | 3 | 5 | 7 | dB | Measure : Pin36,39 Vin =0.5Vrms, Line Mode |
| | Output Voltage Gain 1 DVD | GV1DVD | -2 | 0 | 2 | dB | Measure : Pin36,39 Vin =0.5Vrms, DVD Mode |
| | Output Voltage Gain 1 DSP | GV1DSP | 10 | 12 | 14 | dB | Measure : Pin36,39 Vin =0.2Vrms, DSP Mode |
| | Output Voltage Gain 1 EXT | GV1EXT | -2 | 0 | 2 | dB | Measure : Pin36,39 Vin =0.5Vrms, EXT Mode |
| | Output Voltage Gain 2 | GV2 | 10.6 | 12.6 | 14.6 | dB | Measure : Pin 23,25,27 Vin =0.2Vrms |
| | Output Voltage Gain 3 | GV3 | 13.6 | 15.6 | 17.6 | dB | Measure : Pin 21 Vin =0.15Vrms |
| | Total Harmonic Distortion Ratio 1 | THD1 | — | 0.002 | 0.03 | % | Measure : Pin36,39 BW=400~30kHz Vin =0.5Vrms, Line Mode |
| | Total Harmonic Distortion Ratio 2 | THD2 | — | 0.003 | 0.03 | % | Measure : Pin 23,25,27 BW=400~30kHz Vin =0.3Vrms |
| | Total Harmonic Distortion Ratio 3 | THD3 | — | 0.003 | 0.03 | % | Measure : Pin 21 BW=400~30kHz Vin =0.3Vrms |
| | Maximum Output Voltage | Vomax | 3.6 | 4.3 | — | Vrms | Measure : Pin36,39 THD=1% |
| | Residual Noise Voltage 1 | V _{NOR1} | — | 2.7 | 9 | μVrms | Measure : Pin36,39 Rg=0Ω, Volume= -∞ BW=IHF-A |
| | Residual Noise Voltage 2 | V _{NOR2} | — | 1.0 | 6 | μVrms | Measure : Pin 21,23,25,27 Rg=0Ω, Volume= -∞BW=IHF-A, Output amp=0dB |
| | Cross-talk between Selectors | CTS | — | -90 | -75 | dB | Measure : Pin36,39 Rg=0Ω, BW=IHF-A |
| | Cross-talk between Channels Lch→Rch | CTCLR | — | -90 | -75 | dB | Measure : Pin36(OUTFR) Rg=0Ω, BW=IHF-A Reference : Pin39(OUTFL)=1Vrms |
| | Cross-talk between Channels Rch→Lch | CTCRL | — | -90 | -75 | dB | Measure : Pin39(OUTFL) Rg=0Ω, BW=IHF-A Reference : Pin36(OUTFR)=1Vrms |
| | Cross-talk between Channels LSch→RSch | CTCLRS | — | -90 | -75 | dB | Measure : Pin 23(OUTRS) Rg=0Ω, BW=IHF-A Reference :Pin 25(OUTLS) =1Vrms |
| | Cross-talk between Channels RSch→LSch | CTCRLS | — | -90 | -75 | dB | Measure : Pin 25(OUTLS) Rg=0Ω, BW=IHF-A Reference :Pin 23(OUTRS) =1Vrms |
| | Cross-talk between Channels Cch→SUBch | CTCCSU | — | -85 | -70 | dB | Measure : Pin 21(OUTSUB) Rg=0Ω, BW=IHF-A Reference :Pin 27(OUTC) =1Vrms |
| Cross-talk between Channels SUBch→Cch | CTCSUC | — | -90 | -75 | dB | Measure : Pin 27(OUTC) Rg=0Ω, BW=IHF-A Reference :Pin 21(OUTSUB) =1Vrms | |

| | Parameter | Symbol | Limits | | | Unit | Conditions |
|---------------|--|--------|--------|-------|------|------|---|
| | | | Min. | Typ. | Max. | | |
| Volume Output | Volume Control Range | VOL | -97 | -95 | -93 | dB | Measure : Pin 21,23,25,27, 36,39 VOUT=3Vrms (VOL=0dB) |
| | Volume Setting Error 1 | VOLE1 | -1.5 | 0 | 1.5 | dB | Measure : Pin 21,23,25,27,36,39 0 to -53dB, VOUT=3Vrms (at VOL=0dB) |
| | Volume Setting Error 2 | VOLE2 | -2 | 0 | 2 | dB | Measure : Pin 21,23,25,27,36,39 -54 to -95dB, VOUT=3Vrms (at VOL=0dB) |
| | Maximum Attenuation | VOLmin | — | -115 | -105 | dB | Measure : Pin 21,23,25,27,36,39 BW=IHF-A VOUT=3Vrms (at VOL=0dB) |
| Treble | Treble Maximum Boost Gain | GTB | 12 | 14 | 16 | dB | Measure : Pin36,39, f=15kHz, Vin=0.1Vrms, Line Mode |
| | Treble Maximum Cut Gain | GTC | -16 | -14 | -12 | dB | Measure : Pin36,39, f=15kHz, Vin =0.1Vrms, Line Mode |
| | Treble Step Resolution | TR | — | 2 | — | dB | Measure : Pin36,39, f=15kHz, Vin =0.1Vrms, Line Mode |
| | Treble Gain Setting Error | TE | -2 | 0 | 2 | dB | Measure : Pin36,39, f=15kHz, Vin =0.1Vrms, Line Mode |
| Bass | Bass Maximum Boost Gain | GBB | 12 | 14 | 16 | dB | Measure : Pin36,39, f=100Hz, Vin =0.1Vrms, Line Mode |
| | Bass Maximum Cut Gain | GBC | -16 | -14 | -12 | dB | Measure : Pin36,39, f=100Hz, Vin =0.1Vrms, Line Mode |
| | Bass Step Resolution | BR | — | 2 | — | dB | Measure : Pin36,39, f=100Hz, Vin =0.1Vrms, Line Mode |
| | Bass Gain Setting Error | BE | -2 | 0 | 2 | dB | Measure : Pin36,39, f=100Hz, Vin =0.1Vrms, Line Mode |
| Input Gain | Input Gain Control Range 1 | GIG1 | 7 | 9 | 11 | dB | Measure : Pin36,39 Vin =0.1Vrms |
| | Input Gain Setting Error 1 | GE1 | -2 | 0 | 2 | dB | Measure : Pin36,39 Vin =0.1Vrms |
| | Input Gain Control Range 2 | GIG2 | 13.6 | 15.6 | 17.6 | dB | Measure : Pin23,25,27 Vin =0.1Vrms |
| | Input Gain Setting Error 2 | GE2 | -2 | 0 | 2 | dB | Measure : Pin23,25,27 Vin =0.1Vrms |
| | Input Gain Control Range 3 | GIG3 | 16.6 | 18.6 | 20.6 | dB | Measure : Pin21 Vin =0.1Vrms |
| | Input Gain Setting Error 3 | GE3 | -2 | 0 | 2 | dB | Measure : Pin21 Vin =0.1Vrms |
| Gain Amp | Gain Amp Control Range | GAG | 10 | 12 | 14 | dB | Measure : Pin 32 Vin =0.2Vrms |
| | Output Gain Setting Error | GAE | -2 | 0 | 2 | dB | Measure : Pin 32 Vin =0.2Vrms |
| Line Out | Line out Voltage Gain | GVLI | 6 | 8 | 10 | dB | Measure : Pin 59,60 Vin =0.3Vrms |
| | Line out Total Harmonic Distortion Ratio | THDLI | — | 0.003 | 0.03 | % | Measure : Pin 59,60 BW=400~30kHz, Vin =0.3Vrms |

* Note: This IC is not designed to be radiation-resistant.

●Timing chart

1. Signal Timing Conditions

- Data is read on the rising edge of the clock.
- Latch is read on the falling edge of the clock.
- Latch signal must terminate with the LOW state.
- * To avoid malfunctions, clock and data signals must terminate with the LOW state.

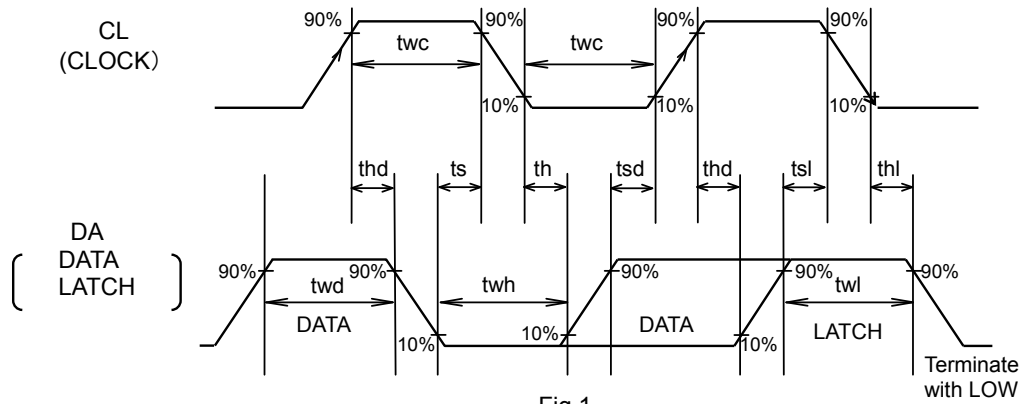


Fig.1

| Parameter | Symbol | Limits | | | Unit |
|-------------------------------|--------|--------|------|------|------|
| | | Min. | Typ. | Max. | |
| Minimum Clock Width | twc | 2.0 | - | - | μS |
| Minimum Data Width | twd | 2.0 | - | - | μS |
| Minimum Latch Width | twl | 2.0 | - | - | μS |
| LOW Hold Width | twh | 2.0 | - | - | μS |
| Data Set-up Time (DATA→CLK) | tsd | 1.0 | - | - | μS |
| Data Hold Time (CLK→DATA) | thd | 1.0 | - | - | μS |
| Latch Set-up Time (CLK→LATCH) | tsl | 1.0 | - | - | μS |
| Latch Hold Time (DATA→LATCH) | thl | 1.0 | - | - | μS |
| Latch Low Set-up Time | ts | 1.0 | - | - | μS |
| Latch Low Hold Time | th | 1.0 | - | - | μS |

2. External Mute (Pin48) Voltage (BD3811K1)

| Parameter | Limits | | | Unit | Conditions |
|-----------------|--------|------|------------|------|----------------------------------|
| | Min. | Typ. | Max.(≤Vcc) | | |
| Volume Mute OFF | 0 | — | 1.0 | V | Vcc=5 to 7.3V VEE=-5 to -7.3V |
| Volume Mute ON | 2.2 | — | 5.5 | | |

3. Voltage Conditions for Control Signals

| Parameter | Limits | | | | | | Unit | Conditions |
|-------------------|----------|------|------------|----------|------|------------|------|-----------------|
| | BD3811K1 | | | BD3818KS | | | | |
| | Min. | Typ. | Max.(≤Vcc) | Min. | Typ. | Max.(≤Vcc) | | |
| “H” Input Voltage | 2.2 | — | 5.5 | 3.0 | — | 5.5 | V | Vcc=5 to 7.4V |
| “L” Input Voltage | 0 | — | 1.0 | 0 | — | 1.5 | V | VEE=-5 to -7.4V |

4. Basic Configuration of Control Data Formats

BD3811K1

← Data input direction

| | | | | | | | | | | | | | | | | | |
|------|------|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----------------|-----|----|
| | MSB | | | | | | | | | | | | | | | LSB | |
| Data | D16 | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| | Data | | | | | | | | | | | | | | Select Address | | |

• Control Data Formats

← Data input direction

| | | | | | | | | | | | | | | | | | | |
|----------|--------------------|-----|-----|-----------------------|---------|---------|-----------|--------------------|------|-----------------|----------------|------------|-----------------|----|----|----|----------------|---|
| | | | | | | | | | | | | | | | | | Select Address | |
| Data (1) | D16 | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| | Master Volume Rch | | | | | | | Master Volume Lch | | | | | | | 0 | 0 | 0 | |
| Data (2) | D16 | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| | Master Volume SRch | | | | | | | Master Volume SLch | | | | | | | 0 | 0 | 1 | |
| Data (3) | D16 | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| | Master Volume Cch | | | | | | | Master Volume SWch | | | | | | | 0 | 1 | 0 | |
| Data (4) | D16 | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| | Input select | | | REC SW1/ REC IN SW | REC SW3 | REC SW2 | Input ATT | | | 5.1ch Mode 1 | 5.1ch Mode2 | Input gain | * | 0 | 1 | 1 | | |
| Data (5) | D16 | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| | Treble | | | | Bass | | | | Tone | Bass boost | | | Output gain amp | | | 1 | 0 | 0 |

BD3818KS

← Data input direction

| | | | | | | | | | | | | | | | | | |
|------|------|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----------------|-----|----|
| | MSB | | | | | | | | | | | | | | | LSB | |
| Data | D16 | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| | Data | | | | | | | | | | | | | | Select Address | | |

• Control Data Formats

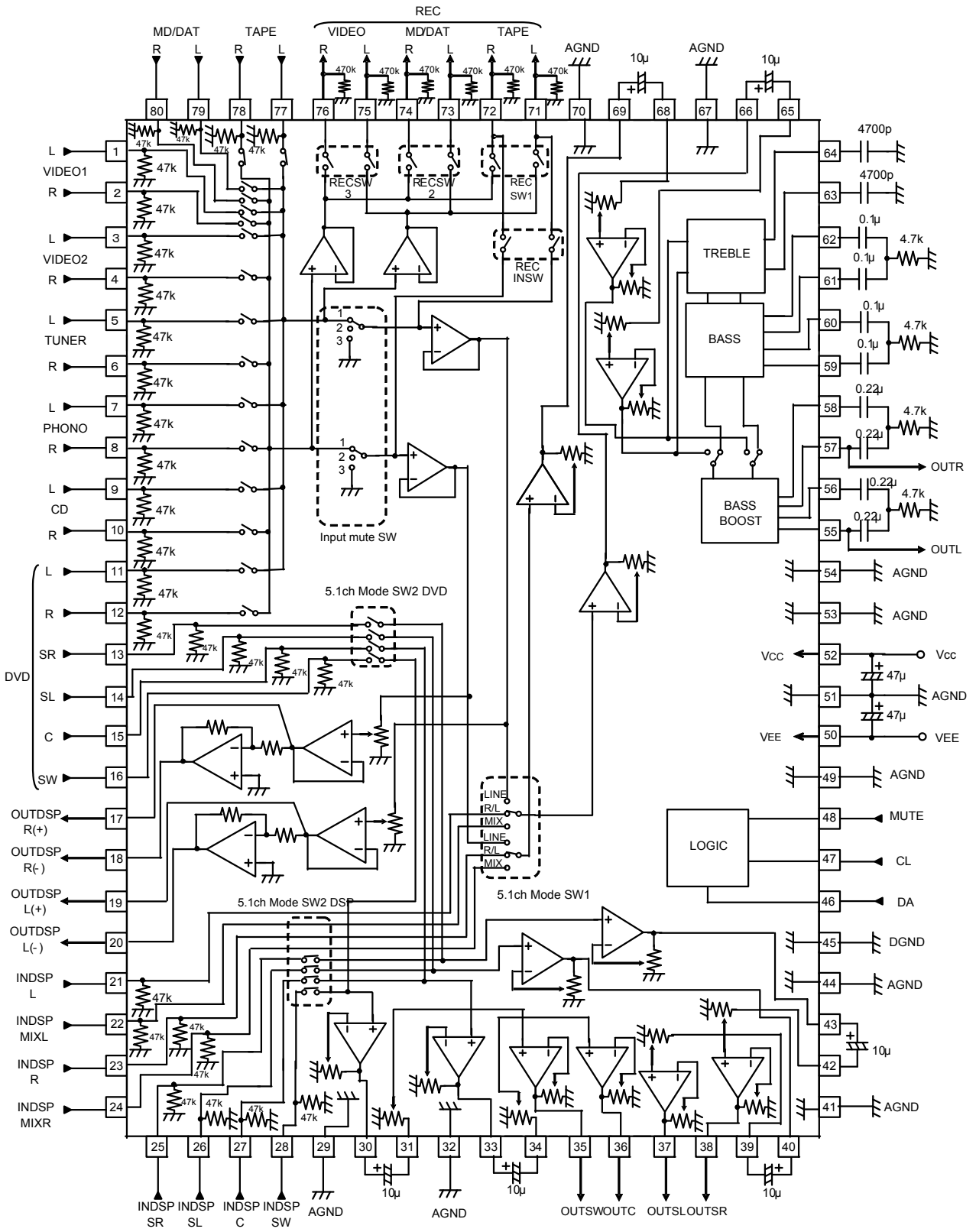
← Data input direction

| | | | | | | | | | | | | | | | | | | |
|----------|---------------|-----|-------|------------|-------------|------|----------------|---------------|--------------|----------------|----------------|------|-------|----|----|----|----------------|---|
| | | | | | | | | | | | | | | | | | Select Address | |
| Data (1) | D16 | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| | Treble | | | | Bass | | | | Tone | * | * | * | 0 | 0 | 0 | 0 | 0 | |
| Data (2) | D16 | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| | Input select | | | FLR select | LRS select | | | C select | SUB select | Input switch | AOUT select | Line | 0 | 1 | 0 | 0 | 0 | |
| Data (3) | D16 | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| | Mix LRS | | Mix C | Mix amp | Gain select | | Input gain FLR | | Input gain C | Input gain LRS | Input gain SUB | 1 | 0 | 0 | 0 | 0 | | |
| Data (4) | D16 | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| | Master volume | | | | | FLch | | Master volume | | | | | FRch | | | 0 | 0 | 1 |
| Data (5) | D16 | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| | Master volume | | | | | LSch | | Master volume | | | | | RSch | | | 0 | 1 | 0 |
| Data (6) | D16 | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| | Master volume | | | | | Cch | | Master volume | | | | | SUBch | | | 0 | 1 | 1 |

* Indicates 0 or 1.

●Block diagram, application circuit, pin assignment

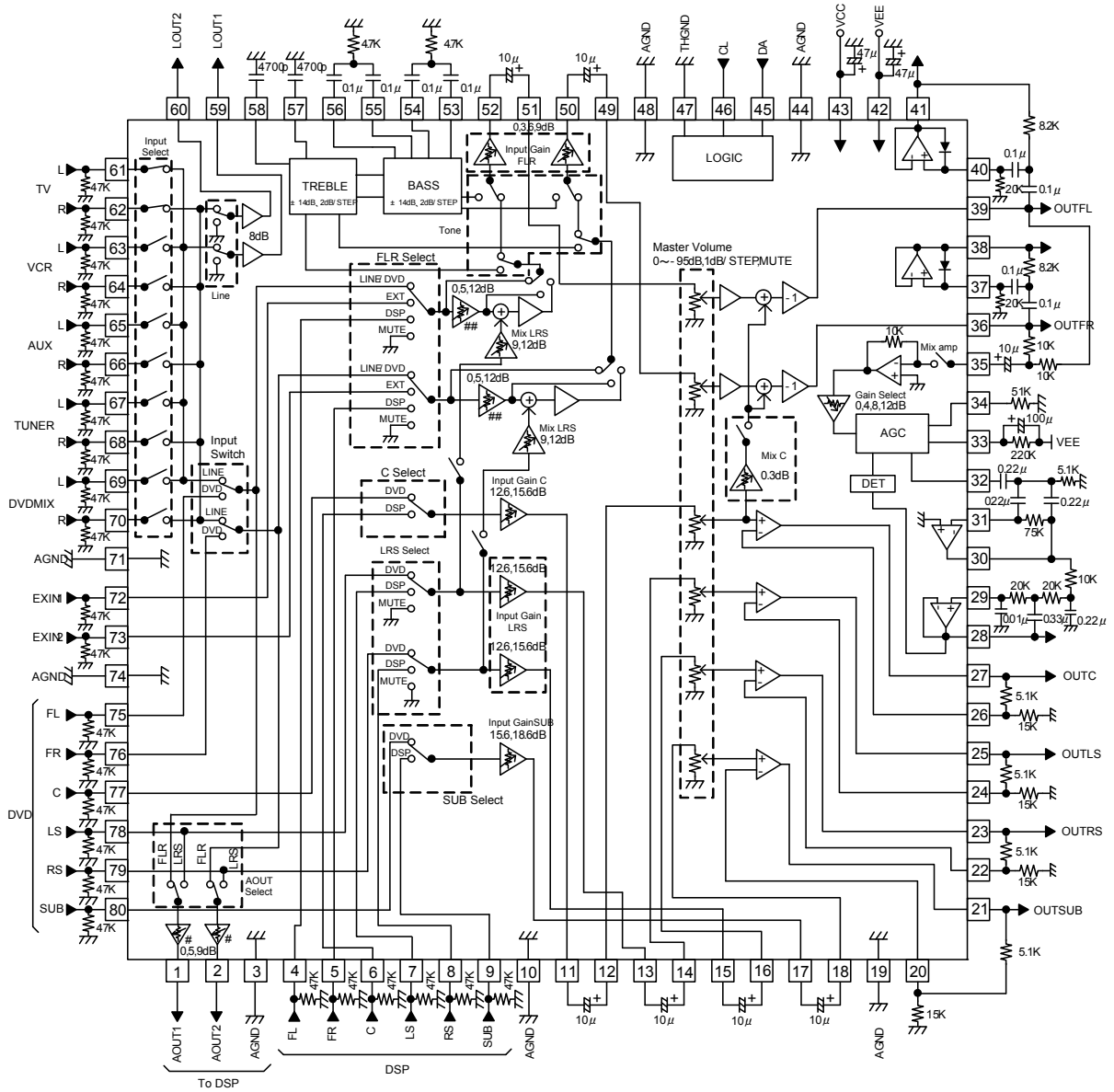
1) BD3811K1



UNIT
RESISTANCE : Ω
CAPACITOR : F

Fig.2

2)BD3818KS



(#)

| INPUT | AOUT |
|------------|------|
| LINE | 5dB |
| DVD(FL,FR) | 0dB |
| DVD(LS,RS) | 9dB |

(##)

| INPUT | GAIN |
|-------|------|
| LINE | 5dB |
| DVD | 0dB |
| DSP | 12dB |
| EXT | 0dB |

UNIT
RESISTANCE : Ω
CAPACITOR : F

Fig.3

●Setting constants for tone control filters

1. Treble filter

$$f_c = 1/2\pi(R_2)C \quad (\text{Hz})$$

$$G = 20\log(R_1 + R_2 + Z_c)/(R_2 + Z_c) \quad (\text{dB})$$

$$Z_c = 1/j\omega C \quad (\Omega)$$

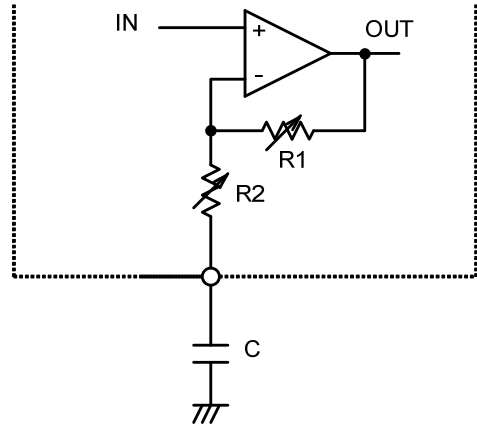


Fig.4

Standard values of R1, R2 (reference)

| Treble Boost Amount Cut Amount | Resistance (KΩ) ^{*Typ.} | |
|-----------------------------------|----------------------------------|------|
| | R1 | R2 |
| 0dB | 0 | 20 |
| ±2dB | 4.1 | 15.9 |
| ±4dB | 7.3 | 12.7 |
| ±6dB | 10.3 | 9.7 |
| ±8dB | 12.3 | 7.7 |
| ±10dB | 14.0 | 6.0 |
| ±12dB | 15.4 | 4.6 |
| ±14dB | 16.5 | 3.5 |

*The actual boost cut level may deviate from the standard values in some degree.

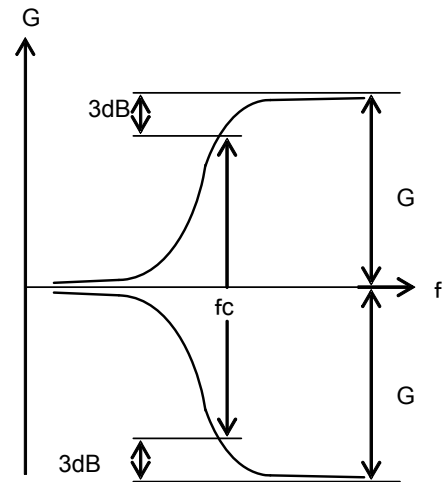
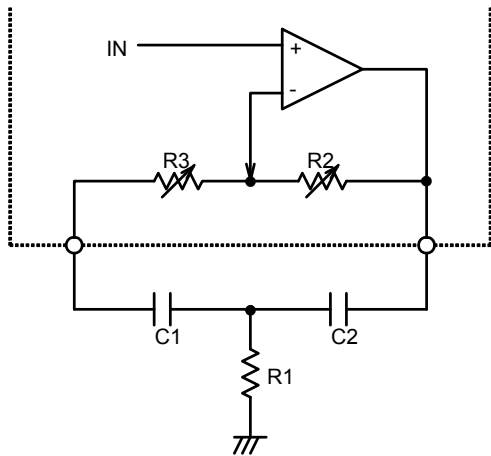


Fig.5

2. Bass filter



$$f_0 = \frac{1}{2\pi\sqrt{R1 R2 + R3} C1 C2} \text{ (Hz)}$$

$$Q = \frac{1}{C1 + C2} \sqrt{\frac{C1 C2 R2}{R1}}$$

When C1=C2

$$G = 20 \log \frac{\frac{R2 + R3}{R1} + 2}{\frac{R3}{R1} + 2} \text{ (dB)}$$

Standard values of R2, R3 (reference)
(R1=4.7KΩ, C1=C2=0.1μF)

| Boost Amount Cut Amount | Resistance (KΩ) ^{*Typ.} | |
|----------------------------|----------------------------------|------|
| | R2 | R3 |
| 0dB | 0 | 41.0 |
| ±2dB | 10.8 | 30.2 |
| ±4dB | 19.3 | 21.7 |
| ±6dB | 26.0 | 15.0 |
| ±8dB | 31.2 | 9.8 |
| ±10dB | 35.4 | 5.6 |
| ±12dB | 38.4 | 2.6 |
| ±14dB | 41.0 | 0 |

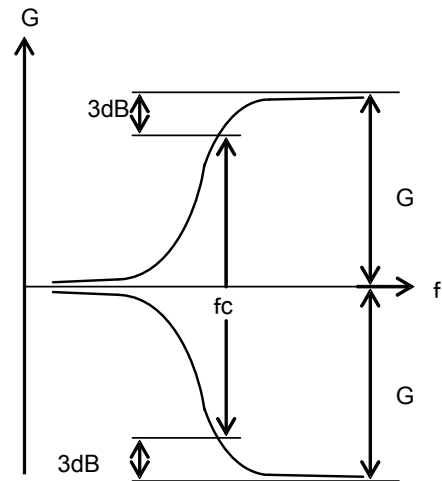


Fig.7

*The actual boost/cut levels may deviate from the standard values in some degree.

* Bass Filter Feature

To be able to set the f0 and Q factors of Bass characteristics to desired values, part of the Bass Filter is constructed of the external components shown in the upper-left figure.

● Reference data

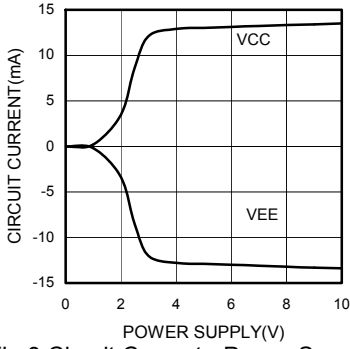


Fig.8 Circuit Current - Power Supply (BD3811K1)

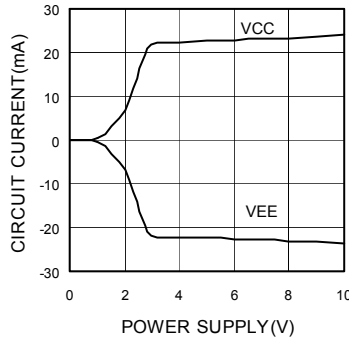


Fig.9 Circuit Current - Power Supply (BD3818KS)

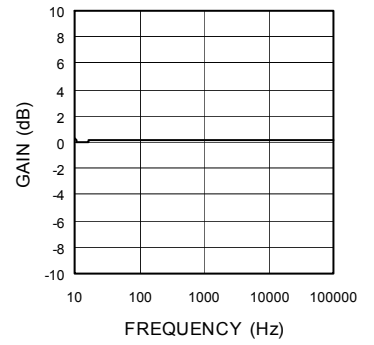


Fig.10 Voltage Gain - Frequency (BD3811K1)

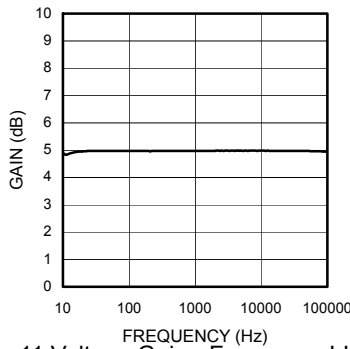


Fig.11 Voltage Gain - Frequency LINE (BD3818KS)

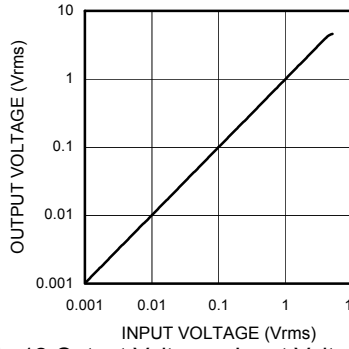


Fig.12 Output Voltage - Input Voltage (BD3811K1)

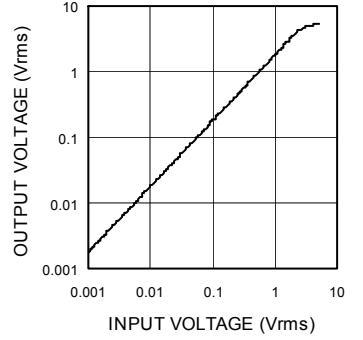


Fig.13 Output Voltage - Input Voltage LINE (BD3818KS)

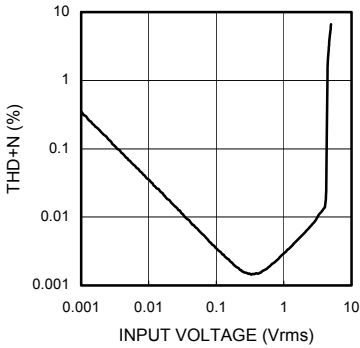


Fig.14 THD+N - Input Voltage (BD3811K1)

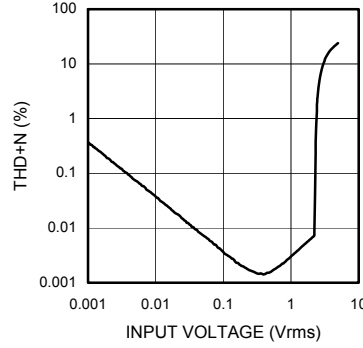


Fig.15 THD+N - Input Voltage LINE (BD3818KS)

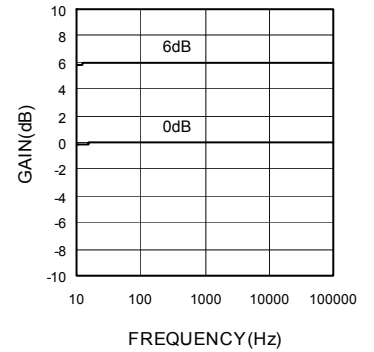


Fig.16 Input Gain - Frequency (BD3811K1)

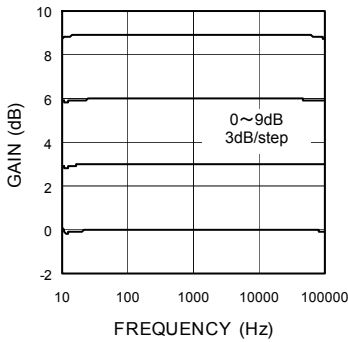


Fig.17 Input Gain - Frequency (BD3818KS)

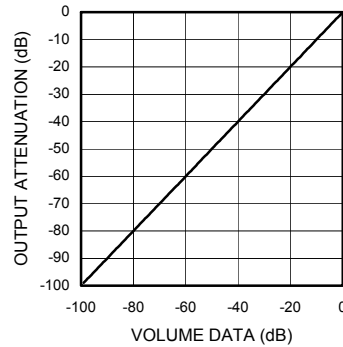


Fig.18 Volume Attenuation - Volume Setting (BD3811K1)

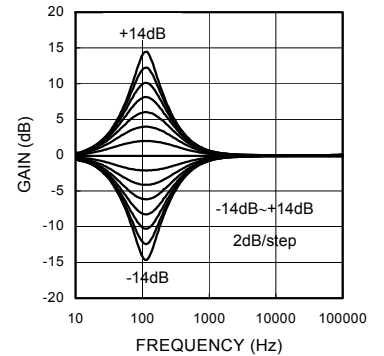


Fig.19 Bass Gain - Frequency (BD3811K1)

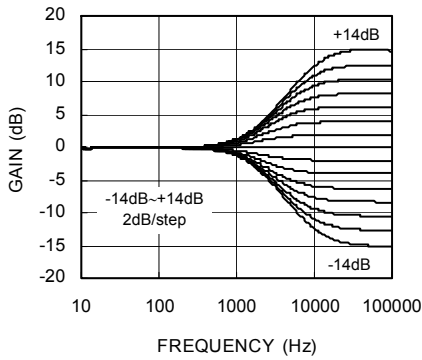


Fig.20 Treble Gain - Frequency

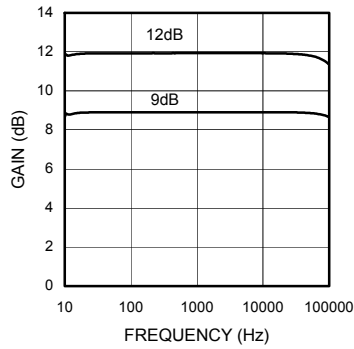


Fig.21 Surround Mixing - Frequency (BD3818KS)

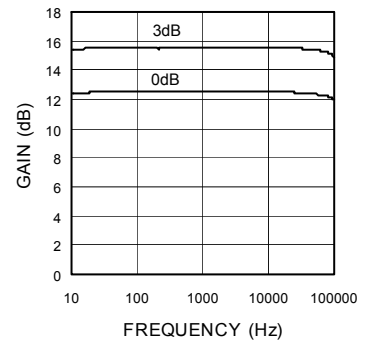


Fig.22 Center Mixing - Frequency (BD3818KS)

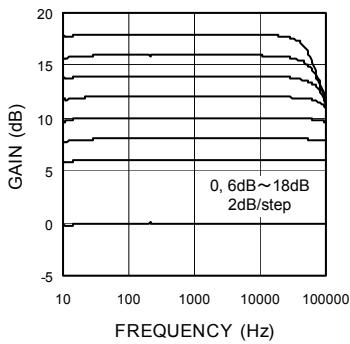


Fig.23 Output Gain - Frequency (BD3811K1)

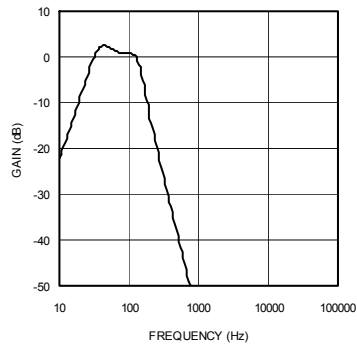


Fig.24 Dynamic Bass - Frequency (BD3818KS)

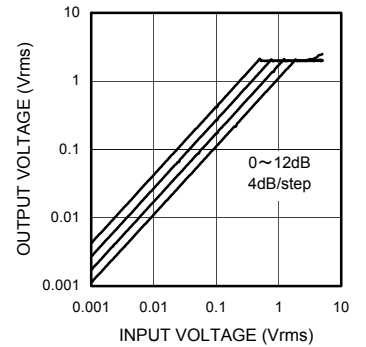


Fig.25 AGC Output Voltage - Input Voltage (BD3818KS)

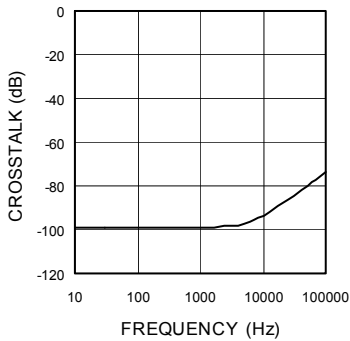


Fig.26 Cross-talk - Frequency (BD3818KS)

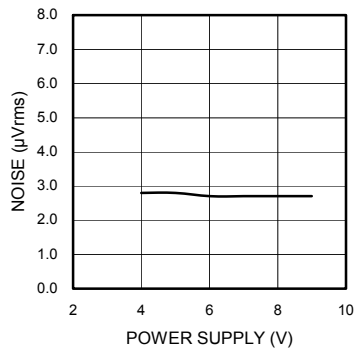


Fig.27 Output Noise Voltage (FL,FR)- Power Supply Voltage (BD3818KS)

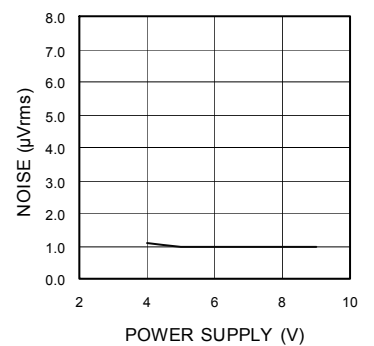


Fig.28 Output Noise Voltage (C,LS,RS,SW)- Power Supply Voltage (BD3818KS)

● Notes for use

1. Numbers and data in entries are representative design values and are not guaranteed values of the items.
2. Although ROHM is confident that the example application circuit reflects the best possible recommendations, be sure to verify circuit characteristics for your particular application. Modification of constants for other externally connected circuits may cause variations in both static and transient characteristics for external components as well as this Rohm IC. Allow for sufficient margins when determining circuit constants.
3. Absolute maximum ratings
Use of the IC in excess of absolute maximum ratings, such as the applied voltage or operating temperature range (Topr), may result in IC damage. Assumptions should not be made regarding the state of the IC (short mode or open mode) when such damage is suffered. A physical safety measure, such as a fuse, should be implemented when using the IC at times where the absolute maximum ratings may be exceeded.
4. VEE potential
Make the VEE pin voltage such that it is the lowest voltage even when operating below it. Actually confirm that the voltage of each pin does not become a lower voltage than the VEE pin, including transient phenomena.
5. Thermal design
Perform thermal design, in which there are adequate margins, by taking into account the power dissipation (Pd) in actual states of use.
6. Short circuit between terminals and erroneous mounting
Pay attention to the assembly direction of the ICs. Wrong mounting direction or shorts between terminals, GND, or other components on the circuits, can damage the IC.
7. Operation in strong electromagnetic field
Using the ICs in a strong electromagnetic field can cause operation malfunction.
8. Serial control
For the CL and DA terminals, the patterned and other wirings should be routed not to cause interference with the analog-signal-related lines.
9. Power ON/OFF
 - (a) At power ON/OFF, a shock sound will be generated. Therefore, use MUTE on the set.
 - (b) When turning on power supplies, VEE and VCC should be powered on simultaneously, or VEE first followed by VCC. If the VCC side is started up first, an excessive current may flow from VCC to VEE.
10. Function switching
For the CL and DA terminals, the patterned and other wirings should be routed as not to cause interference with the analog-signal-related lines.
11. Ground line
The ground pin: 47pin (BD3818KS) should be connected to the ground line with as low noise as the AGND pin.
12. Switching noise reduction at switching volume from -3dB to -4dB (BD3811K1 only)
In order to reduce a switching noise at the switching volume from -3dB to -4dB, the -4dB-step switch should be switched first, and then the -1dB-step switch by -1dB.

● Thermal derating characteristics

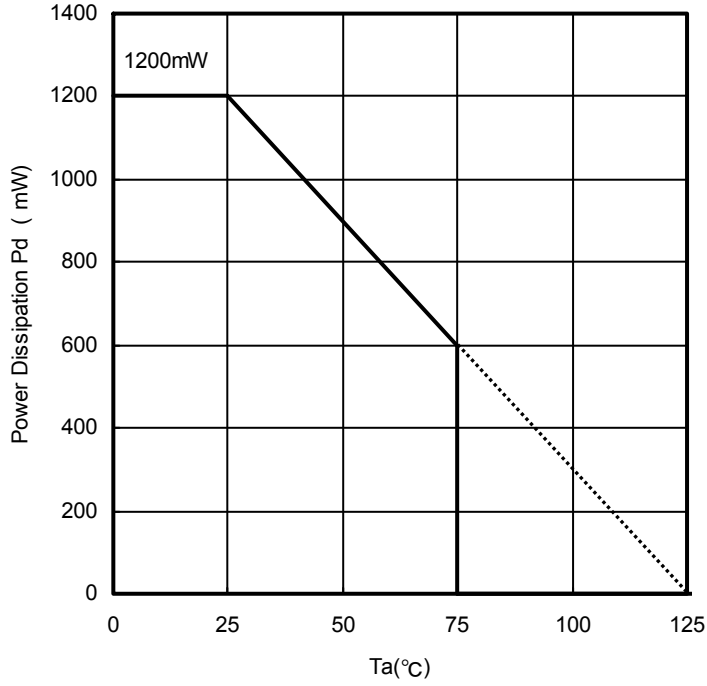


Fig.29

BD3811K1, BD3818KS
ROHM standard board packaging time value
Board size: 70 x 70 x 1.6mm Raw material: FR4 glass epoxy board (copper area 3% or below)

● Ordering part number

| | |
|---|---|
| B | D |
|---|---|

Part No.

| | | | |
|---|---|---|---|
| 3 | 8 | 1 | 1 |
|---|---|---|---|

Part No.
3811
3818

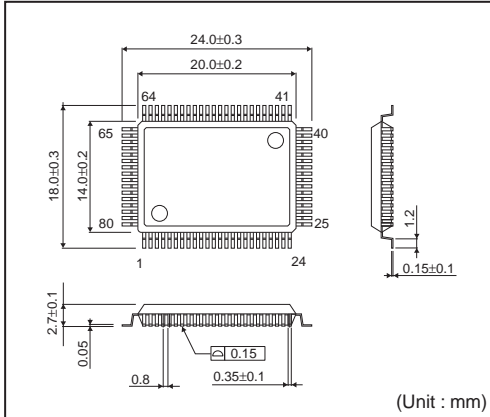
| | |
|---|---|
| K | 1 |
|---|---|

Package
K1: QFP80
KS: SQFP80

| | |
|--|--|
| | |
|--|--|

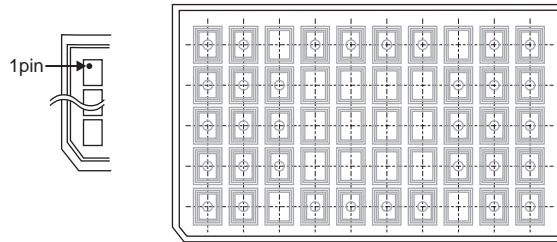
Packaging and forming specification
None: Tray,

QFP80



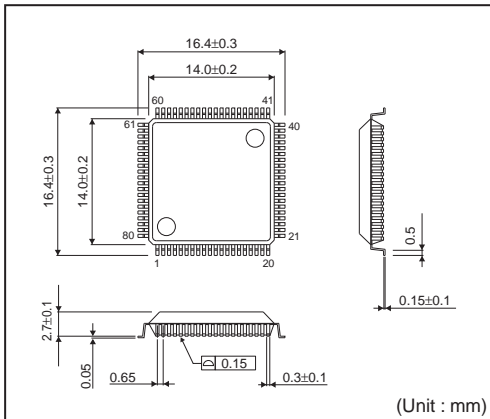
<Tape and Reel information>

| | |
|-------------------|---|
| Container | Tray (with dry pack) |
| Quantity | 500pcs |
| Direction of feed | Direction of product is fixed in a tray |



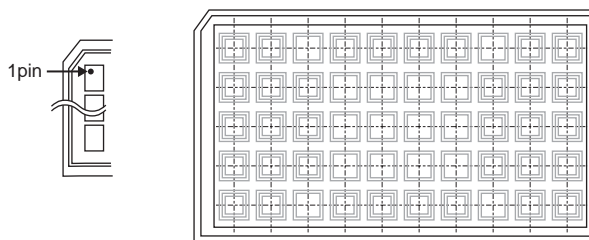
*Order quantity needs to be multiple of the minimum quantity.

SQFP80



<Tape and Reel information>

| | |
|-------------------|---|
| Container | Tray (with dry pack) |
| Quantity | 500pcs |
| Direction of feed | Direction of product is fixed in a tray |



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

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