

4-channel H-bridge type BTL driver for CD players

BA6899AS

The BA6899AS is a 4-channel H bridge BTL driver designed for CD player motor and actuator drives. The internal 5V regulator and standard operational amplifier make this IC suitable for a wide spectrum of applications.

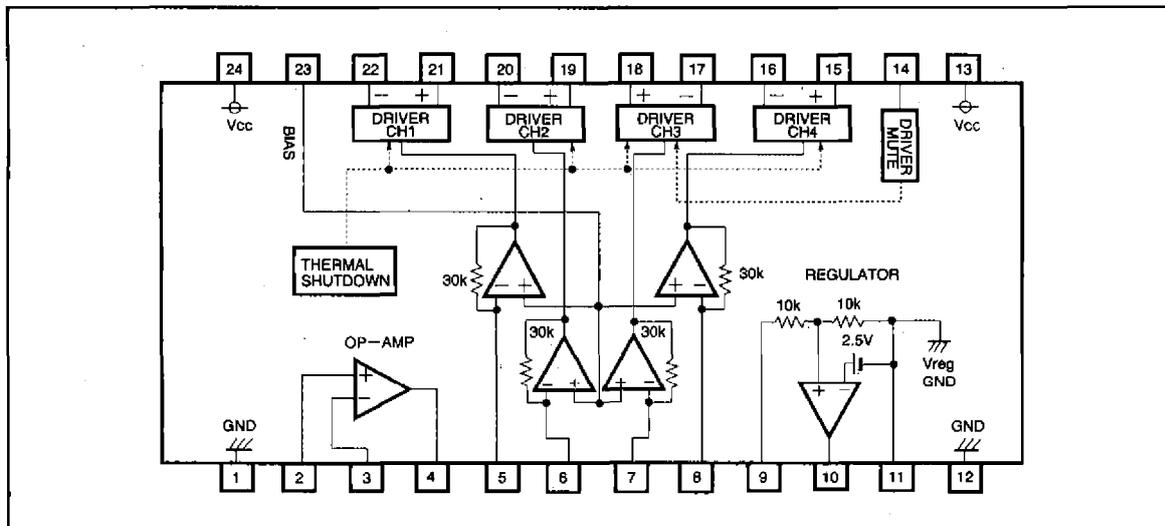
● Applications

CD players and CD-ROM drives

● Features

- 1) 4-channel H bridge BTL driver.
- 2) SDIP-M 24 pin package, for excellent package power.
- 3) Wide dynamic range.
- 4) Internal thermal shutdown circuit.
- 5) Gain is adjustable with an attached resistor.
- 6) Internal 5V regulator. (requires attached PNP transistor)
- 7) Standard operational amplifier.

● Block diagram



CD/CD-ROM Drivers (4 channels)

For CDs/CD-ROMs

● Absolute maximum ratings (Ta=25°C)

| Parameter | Symbol | Limits | Unit |
|-----------------------------|--------|---------|------|
| Power supply voltage | Vcc | 18 | V |
| Power dissipation | Pd | 3.1* | W |
| Operating temperature range | Topr | -30~85 | °C |
| Storage temperature range | Tstg | -55~150 | °C |

* Unmounted

Reduced by 24.8 mW for each increase in Ta of 1°C over 25°C.

● Recommended operating conditions (Ta=25°C)

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|----------------------|--------|------|------|------|------|
| Power supply voltage | Vcc | 6 | — | 14 | V |

*1. 4-14 V when the regulator is not used

*2. When the regulator is not used, pins 9 and 10 may be left open.

● Pin description

| Pin No. | Pin name | Function |
|---------|----------|--|
| 1 | GND | Substrate ground |
| 2 | OPIN+ | Operational amplifier positive input |
| 3 | OPIN- | Operational amplifier negative input |
| 4 | OPOUT | Operational amplifier output |
| 5 | VIN1 | Channel 1 input |
| 6 | VIN2 | Channel 2 input |
| 7 | VIN3 | Channel 3 input |
| 8 | VIN4 | Channel 4 input |
| 9 | REGOUT | 5 V output (Note 3) |
| 10 | REGB | External PNPT _r base connection pin |
| 11 | RGND | Regulator ground |
| 12 | GND | Substrate ground |

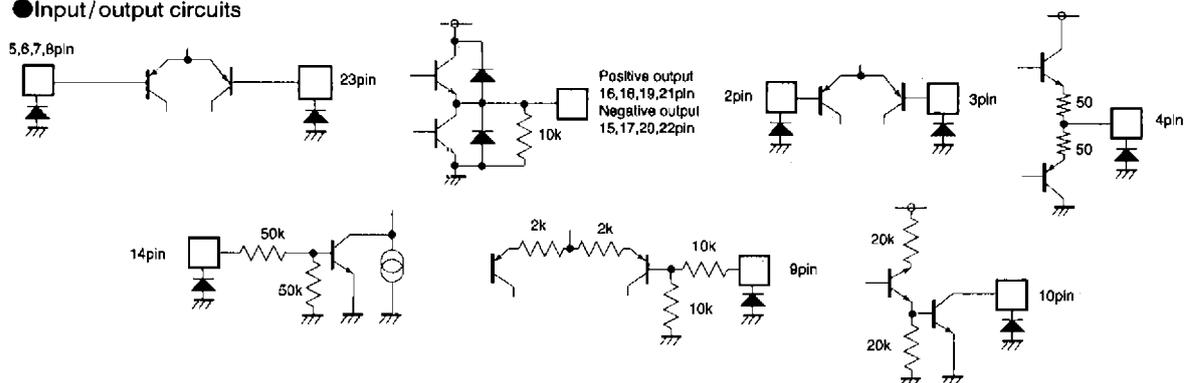
| Pin No. | Pin name | Function |
|---------|----------|---------------------------|
| 13 | Vcc | Vcc |
| 14 | MUTE | Mute control |
| 15 | VO4- | Channel 4 negative output |
| 16 | VO4+ | Channel 4 positive output |
| 17 | VO3- | Channel 3 negative output |
| 18 | VO3+ | Channel 3 positive output |
| 19 | VO2+ | Channel 2 positive output |
| 20 | VO2- | Channel 2 negative output |
| 21 | VO1+ | Channel 1 positive output |
| 22 | VO1- | Channel 1 negative output |
| 23 | BIAS | Bias input |
| 24 | Vcc | Vcc |

*1 "Driver positive output" and "driver negative output" represent polarity relative to input.

*2 Pin 11 is the ground for the regulator and the internal voltage, and so should be connected to GND even when the regulator is not used.

*3 Connect to an attached PNP transistor collector.

● Input/output circuits



● Electrical characteristics (Unless otherwise noted, $T_a=25^\circ\text{C}$, $V_{CC}=8\text{V}$, $R_L=8\ \Omega$)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|--|------------------|------|------|------|------------------|---|
| 〈Driver〉 *1 | | | | | | |
| Quiescent voltage | I_Q | 2.5 | 4.7 | 7.0 | mA | No load |
| Input offset voltage | V_{OI} | -5 | 0 | 5 | mV | |
| Output offset voltage | V_{OO} | -5 | 0 | 5 | mV | |
| Dead zone width | V_{DB} | 10 | 20 | 30 | mV | Total for positive and negative. |
| Maximum output amplitude | V_{OM1} | 5.6 | 6.0 | — | V | Differential output |
| Voltage gain | G_{VC1} | 6.8 | 10.3 | 13.8 | dB | $V_{in} = 500\text{ mV DC}$, differential output |
| Total voltage gain for positive and negative | ΔG_{VC1} | -1.0 | 0 | 1.0 | dB | $V_{in} = 500\text{ mV DC}$, differential output |
| Ripple rejection ratio | RR | — | 80 | — | dB | $V_{IN}=0.1\text{Vrms}$, 100Hz |
| MUTE-OFF voltage | V_{MOFF} | — | — | 0.5 | V | *2 |
| MUTE-ON voltage | V_{MON} | 2.0 | — | — | V | *2 |
| 〈5 V regulator〉 | | | | | | |
| Output voltage | V_{REG} | 4.75 | 5.00 | 5.25 | V | $I_L=100\text{mA}$ |
| Output load variation | ΔV_{RL} | -50 | 0 | 10 | mV | $I_L=0\sim 200\text{mA}$ |
| Input variation | ΔV_{VCC} | -10 | 0 | 60 | mV | ($V_{CC}=6\sim 14\text{V}$) $I_L=100\text{mA}$ |
| Drop voltage | V_{DIF} | — | 0.3 | 0.6 | V | $V_{CC}=4.7\text{V}$, $I_L=200\text{mA}$ *3 |
| Vreg amplitude output current | I_{REG} | 8 | 20 | — | mA | $=4.7\text{V}$, When 3V is added *4 |
| 〈Operational amplifier〉 | | | | | | |
| Offset voltage | V_{OFOP} | -5 | 0 | 5 | mV | |
| Input bias current | I_{BOP} | — | — | 300 | nA | |
| Output voltage, high level | V_{OHOP} | 6.5 | 7.2 | — | V | |
| Output voltage, low level | V_{OLOP} | — | — | 1.8 | V | |
| Output drive voltage (sink) | I_{SINK} | 10 | 40 | — | mA | 50 Ω at V |
| Output drive voltage (source) | I_{SOURCE} | 10 | 40 | — | mA | 50 Ω at GND |
| Open loop voltage gain | G_{VO} | — | 72 | — | dB | $V_{IN}=-75\text{dBV}$, 1kHz |
| Slew rate | SR | — | 1 | — | V/ μs | |

© Not designed for radiation resistance.

*1 The drive limits when input resistance is 10 k Ω .

*2 Only channel 3 (output from pins 17 and 18) is muted.

*3 Under conditions in which the power transistor satisfies the characteristic $V_{sat} < 0.2\text{ V}$ when $I_C = 200\text{ mA}$.

*4 Pin 9 = open

CD/CD-ROM Drivers (4 channels)

For CDs/CD-ROMs

● Measurement circuit

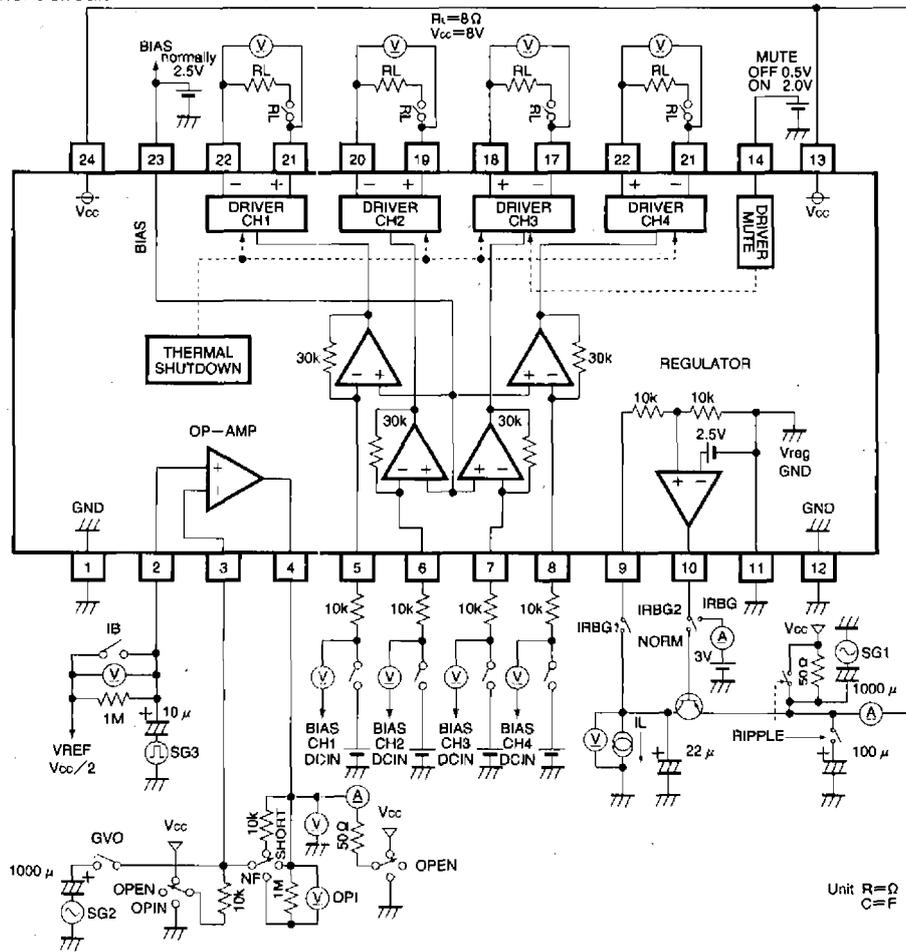


Fig. 1

● Circuit description

1. Driver

Inputs to the IC are the focus tracking error signal from the servo preamplifier and the control signal from the motor. The input signals normally center on 2.5V and switch polarity depending on voltage size relative to the bias voltage. When polarity is switched, power

transistors Q1 and Q4 or Q2 and Q3 turn on. Power transistor Q1 or Q3, whichever is turned on, is driven by the full wave rectified signal and the level shifted signal, and supplies current to the load. When there is no input, both output pins are at the ground level.

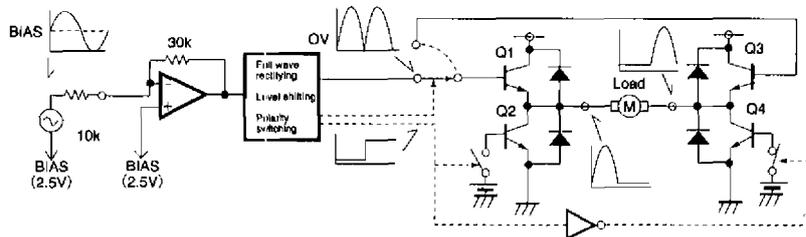


Fig. 2

2. Regulator

This is a typical series regulator that generates a reference voltage internally. A PNP low saturation transistor must be connected.

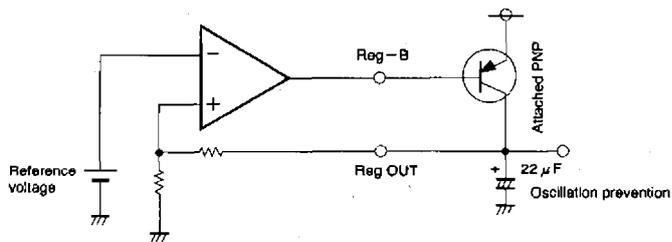


Fig. 3

3. Operational amplifier

A standard 4558 type.

● Application example

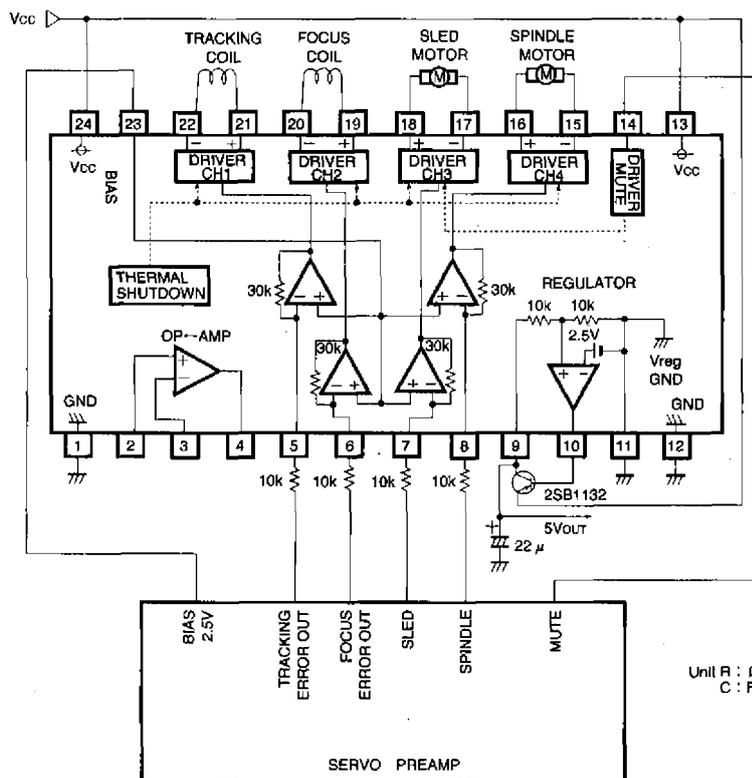


Fig. 4

CD/CD-ROM Drivers (4 channels)

For CDs/CD-ROMs

● Operation notes

1. The BA6899AS has an internal thermal shutdown circuit. The output voltage is muted when chip temperature exceeds 175°C (typically).
2. With the BA6899AS, channel 3 (the pin 17 and 18 output driver) can be muted alone by raising the pin 14 voltage above 2V. This pin should be kept below 0.5V during normal operation.
3. Muting also occurs when the bias pin (23 pin) voltage drops below 1.4V (typically). Keep this pin above 1.6V during normal operation.
4. All four driver output channels are muted during thermal shutdown, muting and a drop in bias pin voltage. No other components are muted.
5. Dead zone width is calculated as follows :
Dead zone width = input resistance \times 1 μ A
Temperature change in the dead zone width is -4000ppm for each degree.
6. The temperature characteristics of gain are 4000ppm/°C (typically).
7. Attach a bypass capacitor (roughly 0.1 μ F) to the power supply, at the base of the IC.
8. Because of the input pins' high gain, connecting a long wire to it may result in output oscillation due to free capacitance. Use caution when designing wires.
9. The capacitor between regulator output (9 pin) and GND also serves to prevent oscillation of the IC, so select one with good temperature characteristics.
10. Set input resistance so that the input current does not exceed 1mA. Exceeding this can result in malfunctioning, particularly at low temperatures.

● Electrical characteristic curves

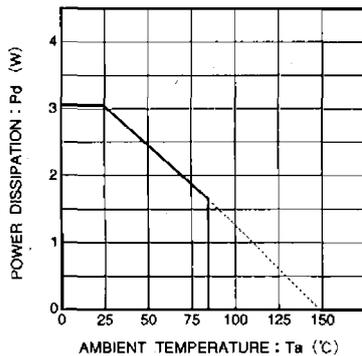


Fig. 5 Thermal derating curve (unmounted)

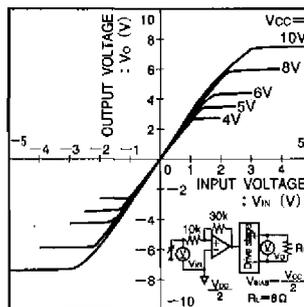


Fig. 6 Driver I/O characteristics (variable power supply)

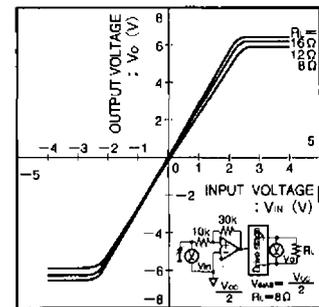


Fig. 7 Driver I/O characteristics (variable load)

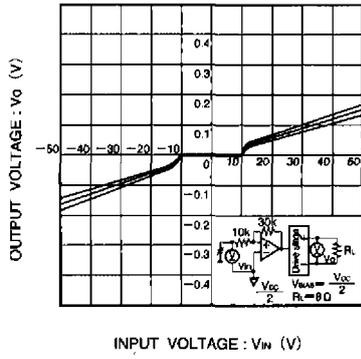


Fig. 8 I/O characteristics near the dead zone width

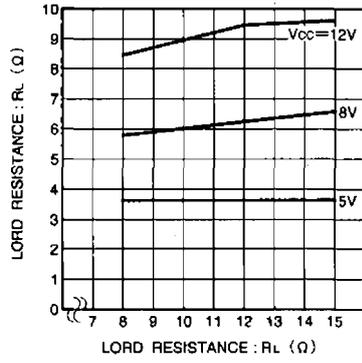


Fig. 9 Load resistance vs. maximum output amplitude

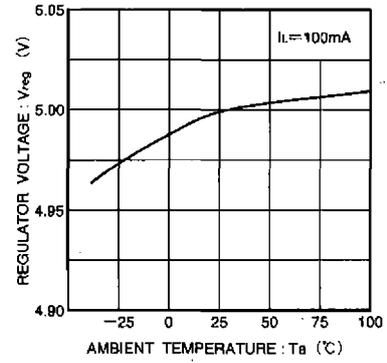


Fig. 10 Regulator voltage vs. temperature characteristics

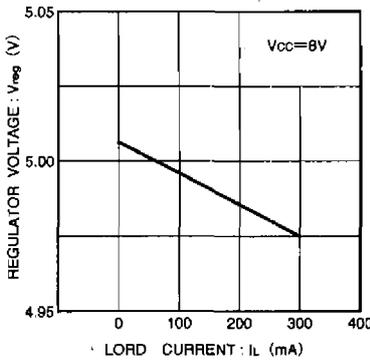


Fig. 11 Load current vs. regulator voltage

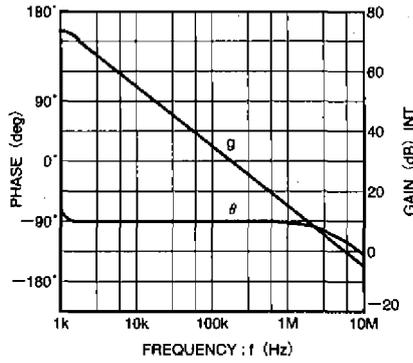
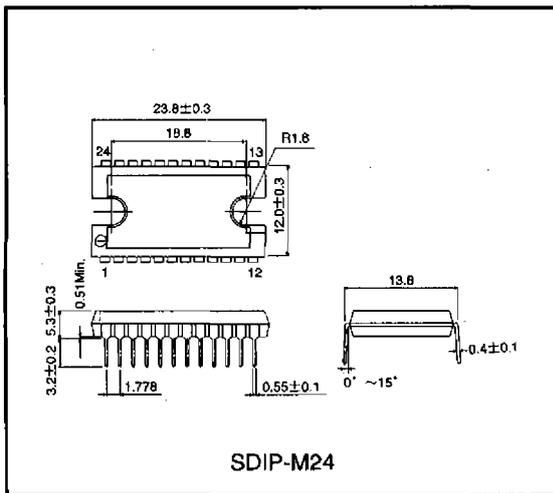


Fig. 12 Operational amplifier vs. open loop characteristics

● External dimensions (Units: mm)



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