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.

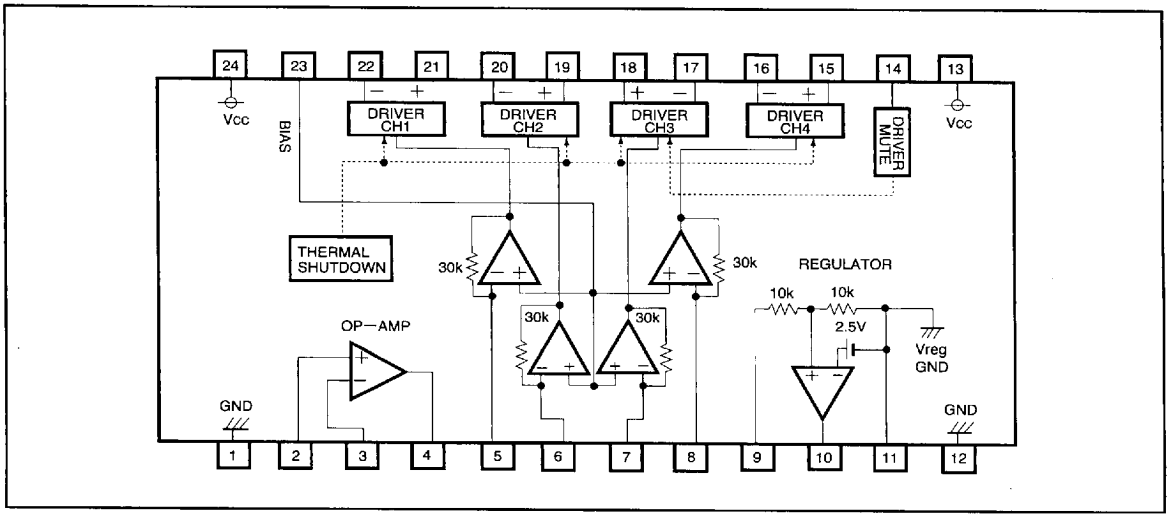
●Applications

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



●Absolute maximum ratings (Ta=25℃)

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

* Unmounted
Reduced by 24.8 mW for each increase in Ta of 1℃ over 25℃.

●Recommended operating conditions (Ta=25℃)

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 PNPTr base connection pin
11	RGND	Regulator ground
12	GND	Substrate ground

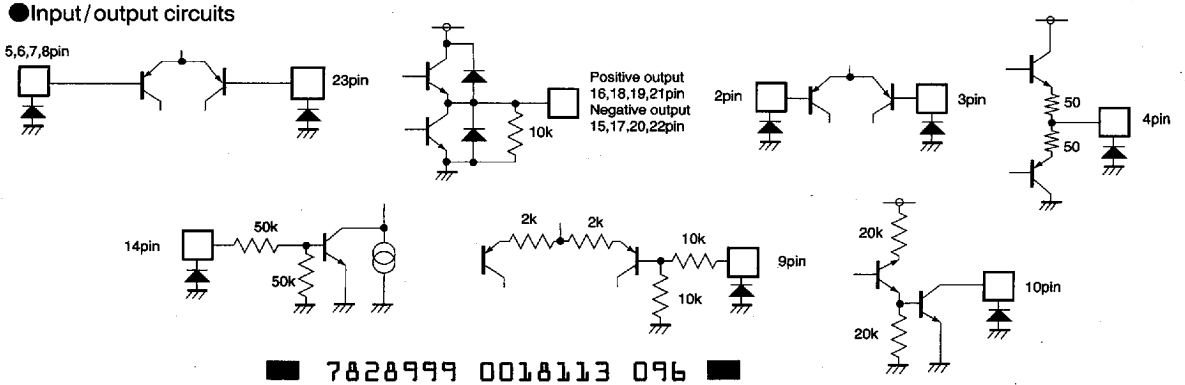
Pin No.	Pin name	Function
13	Vcc	Vcc
14	MUTE	Mute control
15	VO4−	Channel 4 negative output
16	VO4+	Channel 4 positive output
17	VO3−	Channel 3 negative output
18	VO3+	Channel 3 positive output
19	VO2+	Channel 2 positive output
20	VO2−	Channel 2 negative output
21	VO1+	Channel 1 positive output
22	VO1−	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, Ta=25℃, V_{CC}=8V, R_L=8Ω)

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	Vin = 500 mV DC, differential output
Total voltage gain for positive and negative	ΔG_{VC1}	−1.0	0	1.0	dB	Vin = 500 mV DC, differential output
Ripple rejection ratio	RR	—	80	—	dB	V_{IN}=0.1Vrms、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	IL=100mA
Output load variation	ΔV_{RL}	−50	0	10	mV	IL=0～200mA
Input variation	ΔV_{VCC}	−10	0	60	mV	(V_{CC}=6～14V) IL=100mA
Drop voltage	V_{DIF}	—	0.3	0.6	V	V_{CC}=4.7V、IL=200mA*3
Vreg amplitude output current	I_{REG}	8	20	—	mA	=4.7V、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	50Ω at V
Output drive voltage (source)	I_{SOURCE}	10	40	—	mA	50Ω at GND
Open loop voltage gain	G_{VO}	—	72	—	dB	V_{IN}=−75dBV、1kHz
Slew rate	SR	—	1	—	V/μs	

◎ Not designed for radiation resistance.

*1 The drive limits when input resistance is 10 kΩ.

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

*3 Under conditions in which the power transistor satisfies the characteristic Vsat < 0.2 V when Ic = 200 mA.

*4 Pin 9 = open

●Measruement circuit

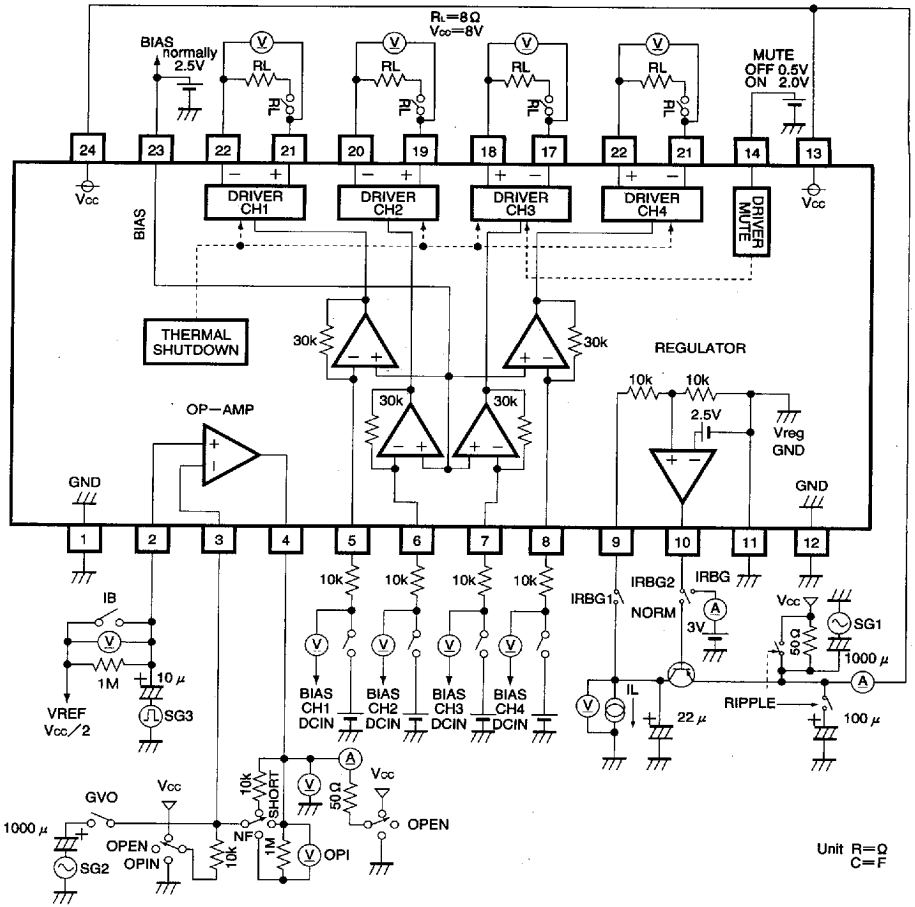


Fig. 1

●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.

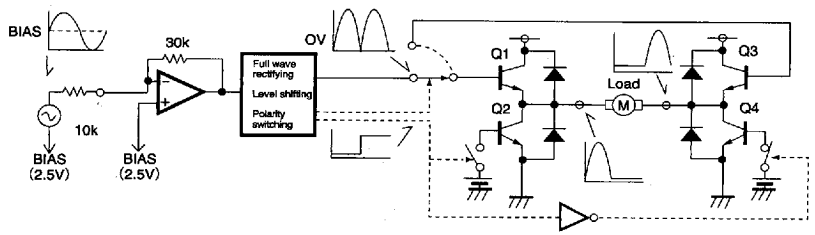


Fig. 2

2. Regulator

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

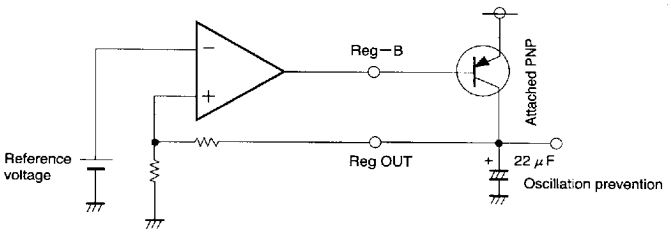


Fig. 3

3. Operational amplifier

A standard 4558 type.

●Application example

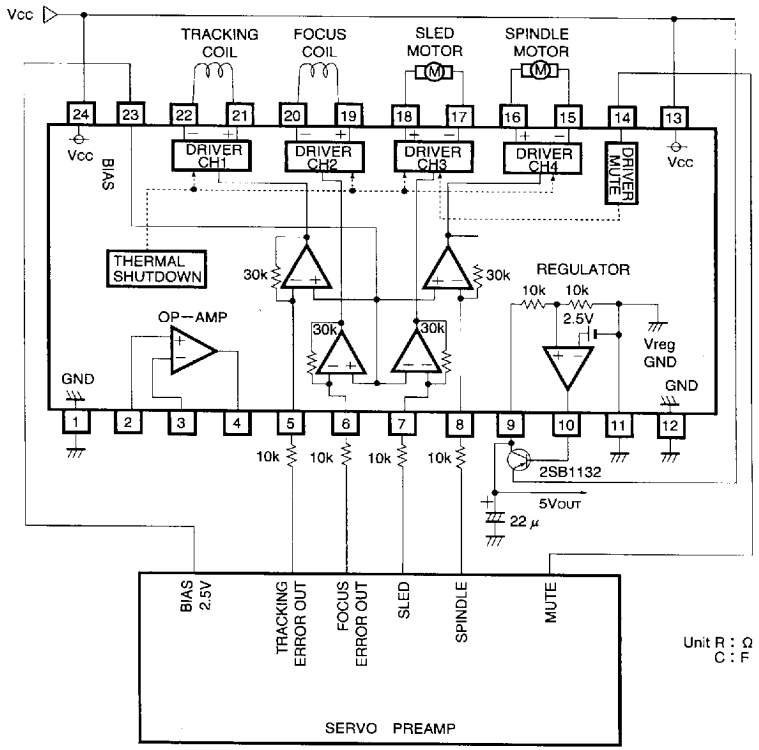


Fig. 4

●Operation notes

1. The BA6899AS has an internal thermal shutdown circuit. The output voltage is muted when chip temperature exceeds 175℃ (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×1 μA
   Temperature change in the dead zone width is −4000ppm for each degree.
6. The temperature characteristics of gain are 4000ppm/℃ (typically).
7. Attach a bypass capacitor (roughly 0.1 μF) 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

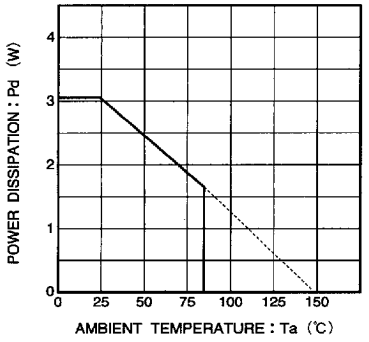


Fig. 5 Thermal derating curve (unmounted)

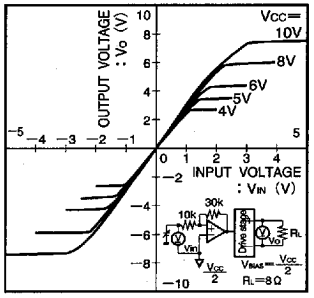


Fig. 6 Driver I/O characteristics (variable power supply)

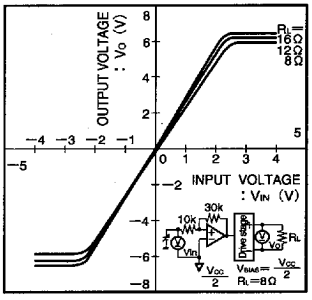


Fig. 7 Driver I/O characteristics (variable load)

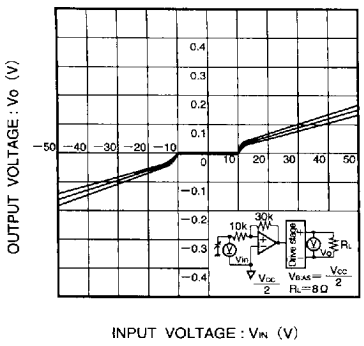


Fig. 8 I/O characteristics near the dead zone width

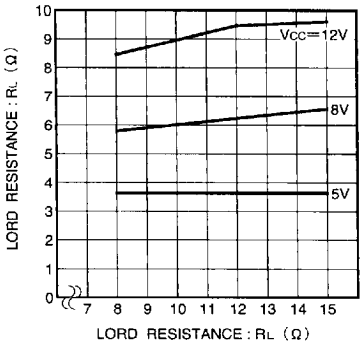


Fig. 9 Load resistance vs. maximum output amplitude

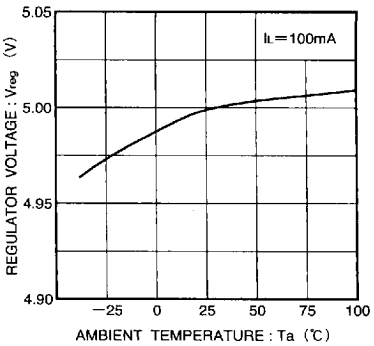


Fig. 10 Regulator voltage vs. temperature characteristics

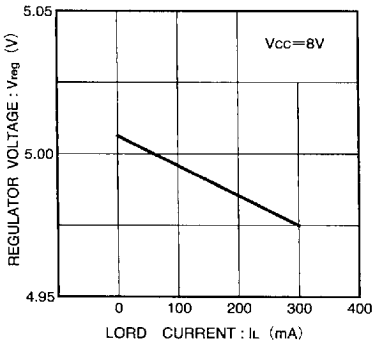


Fig. 11 Load current vs. regulator voltage

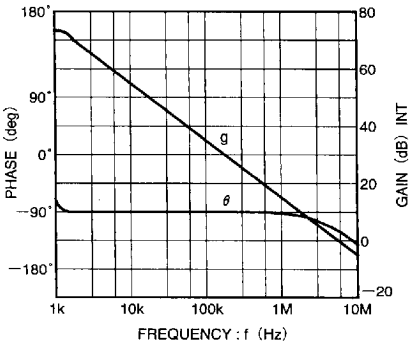
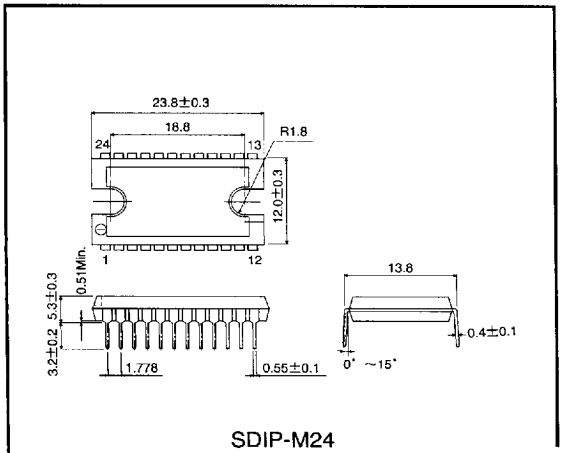


Fig. 12 Operational amplifier vs. open loop characteristics

●External dimensions (Units: mm)



SDIP-M24