

4-channel BTL driver for CD player and CD-ROM drives

BA5921FP

The BA5921FP is an IC with an internal 4-channel BTL driver for CD players and CD-ROM driver actuators and motors, as well as an internal standard operational amplifier. In addition, the 28-pin HSOP package allows for application miniaturization.

●Applications

CD players, CD-ROM drives

●Features

- 1) 4-channel BTL driver.
- 2) HSOP 28-pin power package allows for application miniaturization.
- 3) Wide dynamic range. (typically 3.6V when $V_{CC} = 5V$ and $R_L = 8\Omega$)
- 4) Internal thermal shutdown circuit.
- 5) Gain is adjustable with an attached resistor.
- 6) Internal standard operational amplifier.
- 7) Output current is mutable with an external mute pin.

●Absolute maximum ratings ($T_a = 25^\circ\text{C}$)

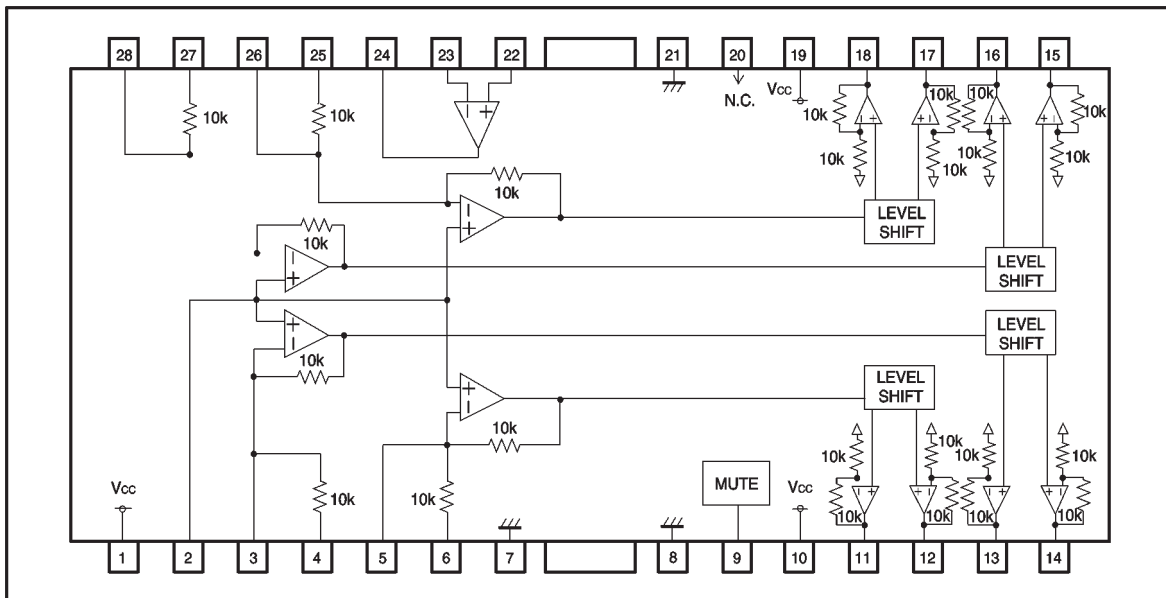
Parameter	Symbol	Limits	Unit
Power supply voltage	V_{CC}	7	V
Power dissipation	P_d	1.7*1	W
Operating temperature	T_{opr}	$-35 \sim +85$	$^\circ\text{C}$
Storage temperature	T_{stg}	$-35 \sim +150$	$^\circ\text{C}$

*1 Reduced by 13.6 mW for each increase in T_a of 1°C over 25°C .
When mounted on a $50 \times 50 \times 1$ mm paper phenol board.

●Recommended operating conditions ($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V_{CC}	4.3	—	6.6	V

● Block diagram



● Pin descriptions

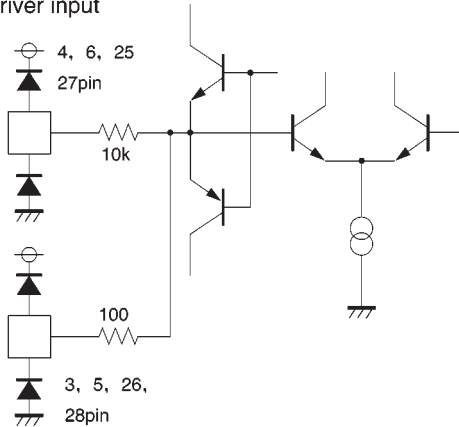
Pin No.	Pin name	Function	Pin No.	Pin name	Function
1	V _{CC}	V _{CC}	15	VO4 (+)	Driver channel 4 positive output
2	BIAS IN	Bias amplifier input	16	VO4 (-)	Driver channel 4 negative output
3	VIN1'	Driver channel 1 gain adjustment input	17	VO3 (+)	Driver channel 3 positive output
4	VIN1	Driver channel 1 input	18	VO3 (-)	Driver channel 3 negative output
5	VIN2'	Driver channel 2 gain adjustment input	19	V _{CC}	V _{CC}
6	VIN2	Driver channel 2 input	20	N.C.	—
7	GND	Ground	21	GND	Ground
8	GND	Ground	22	OP IN (+)	Operational amplifier positive input
9	MUTE	Mute control	23	OP IN (-)	Operational amplifier negative input
10	V _{CC}	V _{CC}	24	OP OUT	Operational amplifier output
11	VO2 (-)	Driver channel 2 negative output	25	VIN3	Driver channel 3 input
12	VO2 (+)	Driver channel 2 positive output	26	VIN3'	Driver channel 3 gain adjustment input
13	VO1 (-)	Driver channel 1 negative output	27	VIN4	Driver channel 4 input
14	VO1 (+)	Driver channel 1 positive output	28	VIN4'	Driver channel 4 gain adjustment input

Note: Positive and negative output of the driver is relative to the polarity of the input pins.

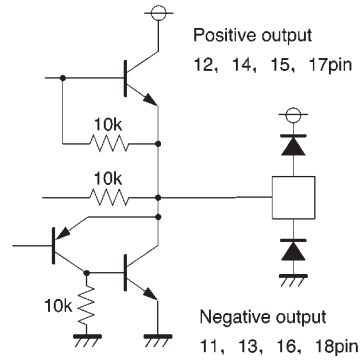
When the input pin is at the high level, the negative output pin is at the low level and the positive output pin at the high level.

● Pin equivalent circuit diagrams

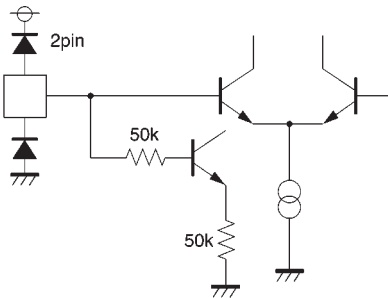
Driver input



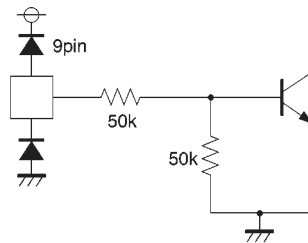
Driver output



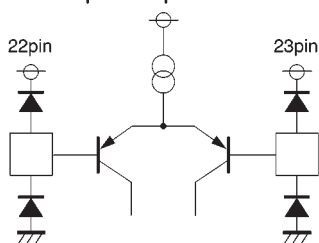
Bias



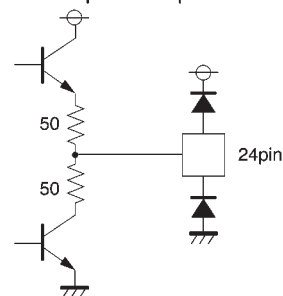
Mute



Operational amplifier input



Operational amplifier output



●Electrical characteristics (unless otherwise noted, Ta = 25°C, V_{CC} = 5V, BIAS = 2.5V, R_L = 8Ω)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Quiescent current dissipation	I _{CC}	—	13	20	mA	No load
Output offset voltage	V _{OO}	—40	—	40	mV	
Maximum output amplitude	V _{OM}	3.1	3.6	—	V	
Closed loop voltage gain	G _{VC}	10.4	11.8	13.2	dB	V _{in} =0.1V _{rms} , 1kHz
Mute-on voltage	V _{MON}	—	—	0.5	V	
Mute-off voltage	V _{MOFF}	2.0	—	—	V	
〈Operational amplifier〉						
Offset voltage	V _{OFOF}	—6	0	6	mV	
Input bias current	V _{BOP}	—	—	300	nA	
Output high level voltage	V _{OHO}	3.9	4.35	—	V	
Output low level voltage	V _{OLO}	—	0.75	1.1	V	
Output drive current (sink)	I _{SI}	10	30	—	mA	V _{CC} at 50 Ω
Output drive current (source)	I _{SO}	10	25	—	mA	Ground at 50 Ω
Slew rate	SR _{OP}	—	1	—	V/μs	100 kHz square wave, 2 V _{P-P} output

© Not designed for radiation resistance.

● Measurement circuit

The diagram illustrates a measurement circuit for an audio amplifier, featuring four input channels (VINAC1, VINAC2, VINAC3, VINAC4) and four output channels (VO1, VO2, VO3, VO4). The circuit includes a central VOPIN=2.5V input, a MUTE control, and various feedback and level shifters. The power supply is VCC=5V, and the current source I_{CC} is 100µA. The output voltage VMUTE is 2.0V (when normal) and 0.5V (when mute is ON). The circuit is powered by VCC=5V and includes a 10µF capacitor and a 100µA current source (I_{CC}).

ROHT

● Measurement circuit switch table

(1) Driver (OPIN→1, NF→1, OPRL→1, VOPIN = 2.5V)

Symbol	Switch	Input	Note	Test point
	RL	V _{INDC}		
I _{CC}	OFF	—		I _{CC}
V _{OO}	ON	0V		V _{O1~4}
V _{OM}	↓	±2.5V		V _{O1~4}
G _{VC}	↓	—	V _{INAC} =0.1V _{rms} , 1kHz	V _{O1~4}

(2) Operational amplifier (R_L→OFF)

Symbol	Switch			Input	Note	Test point
	OPIN	NF	OPRL	VOPIN		
V _{OFOF}	1	1	1	2.5V		V _{OFOF}
V _{BOP}	2	2	1	2.5V		V _{BOP1~2}
V _{OHO}	1	1	1	5V		V _{OOP}
V _{OLO}	1	1	1	0V		V _{OOP}
I _{SI}	1	1	2	2.5V		V _{OOP}
I _{SO}	1	1	3	2.5V		V _{OOP}
S _{RO}	3	1	1	2V	V _{INSR} = 100 kHz, square wave, 2 V _{P-P} output	V _{OOP}

● Application example

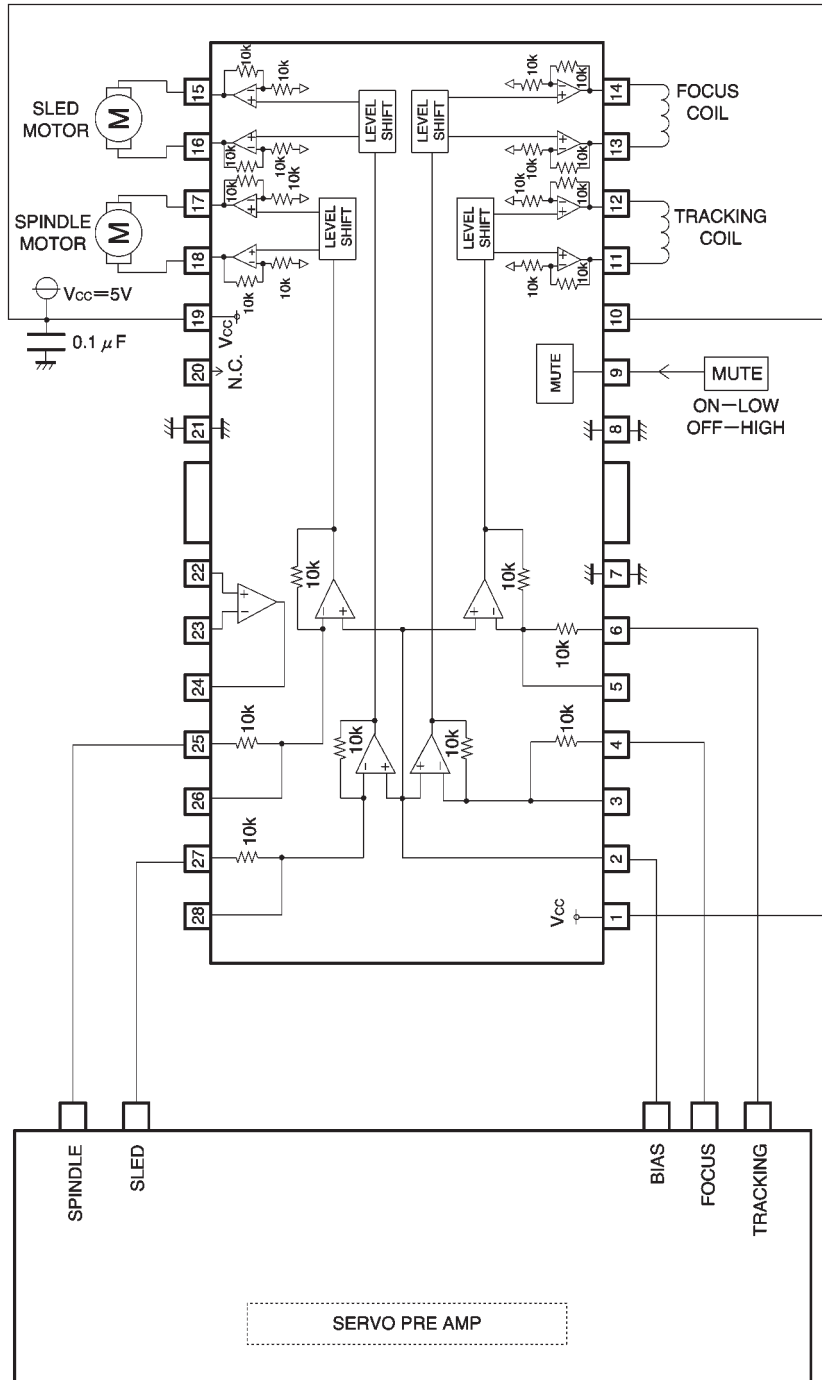


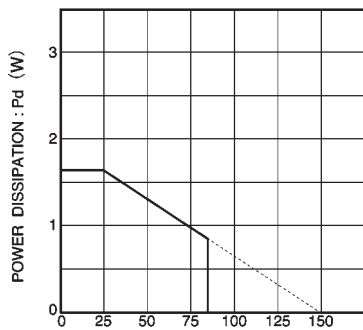
Fig. 3

● Operation notes

- (1) The BA5921FP has a thermal shutdown circuit. The output current is muted when the chip temperature rises above 175°C (typically). When the chip temperature falls to 150°C (typically), the driver circuit starts up again.
- (2) The output current can be muted by opening the mute pin (pin 9) or lowering it below 0.5V. During ordinary use, pin 9 should be pulled up above 2.0V.
- (3) Muting also occurs when the bias pin (pin 2) drops below 1.4V (typically). Make sure it stays above 1.7V during normal use.

- (4) The internal circuits turn off when the supply voltage drops below 3.8V (typically), and turn on again when it rises above 4.0V (typically).
- (5) Muting occurs during thermal shutdown, mute-on operations or a drop in the bias pin voltage or supply voltage. In each case, only the drivers are muted. During muting, the output pins remain at the internal bias voltage, roughly $(V_{CC} - V_F)/2$.
- (6) Connect the IC to a 0.1μF bypass capacitor between power supplies, at the base of the IC.
- (7) The radiating fin is connected to the package's internal GND, but should also be connected to an external ground.

● Electrical characteristic curves



AMBIENT TEMPERATURE : T_a (°C)
When mounted on a 50×50×1 mm paper phenol board.

Fig. 4 Thermal derating curve

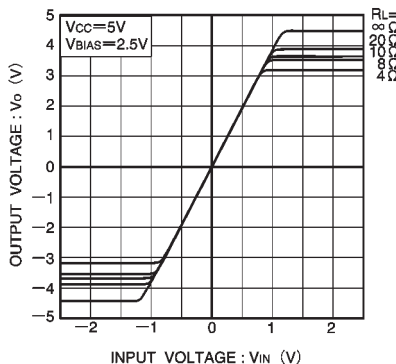


Fig. 5 Driver I/O characteristics

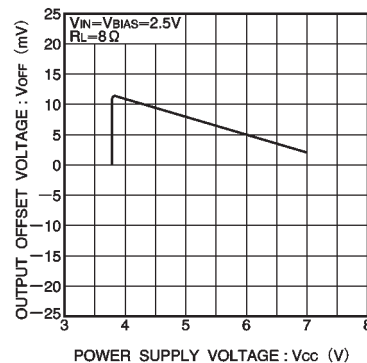


Fig. 6 Power supply voltage vs. output offset voltage

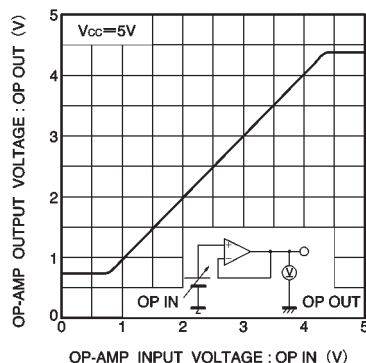


Fig. 7 Operational amplifier I/O characteristics

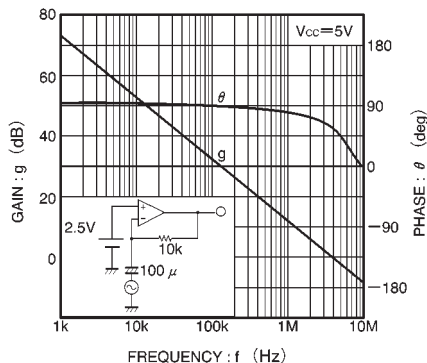


Fig. 8 Operational amplifier vs. open loop

●External dimensions (Units: mm)

