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

BA5913FP-Y

The BA5913FP-Y 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 25-pin HSOP package allows for application miniaturization.

●Applications

CD players, CD-ROM drives

●Features

1) 4-channel BTL driver.
2) Wide dynamic range (typically 3.6V when V_{CC} = 5V and RL = 8Ω).
3) Internal thermal shutdown circuit.
4) Gain is adjustable with attached resistor.
5) Internal standard operational amplifier.
6) Can enter power save mode with standby pin.
7) HSOP 25-pin power package allows for application miniaturization.

●Absolute maximum ratings (Ta = 25°C)

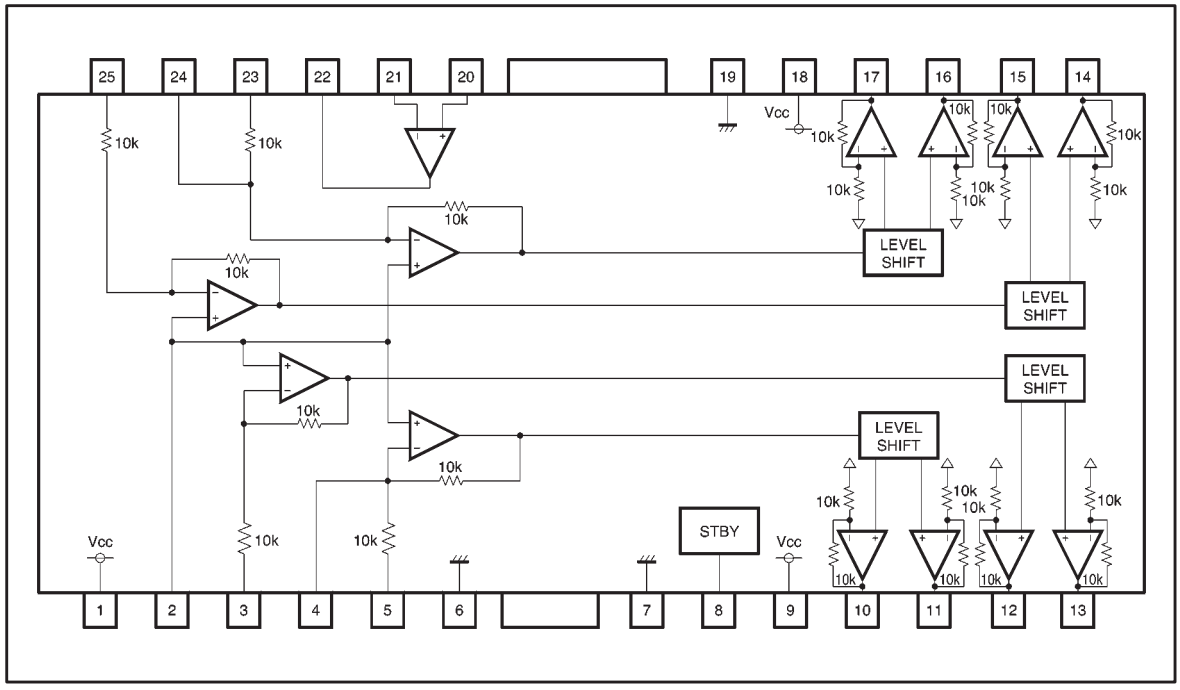
Parameter	Symbol	Limits	Unit
Power supply voltage	V_{CC}	7	V
Power dissipation	Pd	1.45*1	W
Operating temperature	Topr	−35～+85	℃
Storage temperature	Tstg	−55～+150	℃

*1 When mounted on a 70mm×70mm×1.5mm glass epoxy board with less than 3% foil coverage.
Reduced by 11.6mW for each increase increase in Ta of 1℃ over 25℃.

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V_{CC}	4.3	5	6.6	V

●Block diagram



●Pin descriptions

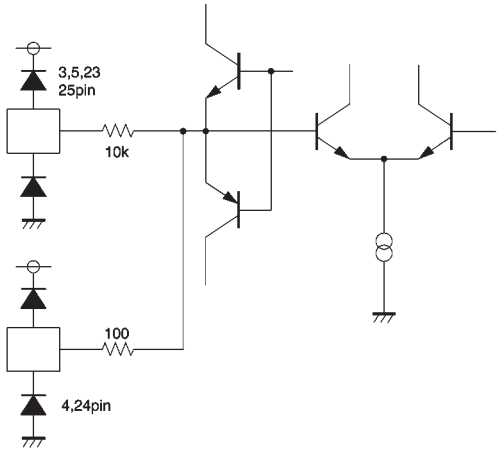
Pin No.	Pin name	Function	Pin No.	Pin name	Function
1	Vcc	Vcc	14	VO4 (+)	Driver channel 4 positive output
2	BIAS IN	Bias amplifier input	15	VO4 (−)	Driver channel 4 negative output
3	VIN1	Driver channel 1 input	16	VO3 (+)	Driver channel 3 positive output
4	VIN2'	Driver channel 2 gain adjustment input	17	VO3 (−)	Driver channel 3 negative output
5	VIN2	Driver channel 2 input	18	Vcc	Vcc
6	GND	Ground	19	GND	Ground
7	GND	Ground	20	OP IN (+)	Operational amplifier positive input
8	STBY	Standby control	21	OP IN (−)	Operational amplifier negative input
9	Vcc	Vcc	22	OP OUT	Operation amplifier output
10	VO2 (−)	Driver channel 2 negative output	23	VIN3	Driver channel 3 input
11	VO2 (+)	Driver channel 2 positive output	24	VIN3'	Driver channel 3 gain adjustment input
12	VO1 (−)	Driver channel 1 negative output	25	VIN4	Driver channel 4 input
13	VO1 (+)	Driver channel 1 positive output			

Note : The "driver positive output " and "driver negative ouutput " indicat polarity relative the input.

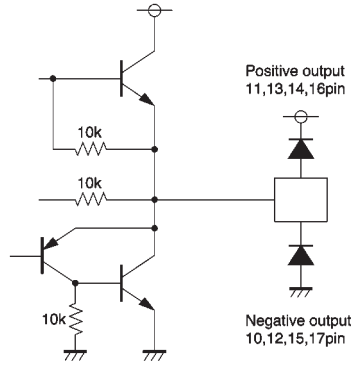
When the input pin is at the high level, the negative output pin is at the low level and the positive output pin is at the high level.

●Input / output circuit diagrams

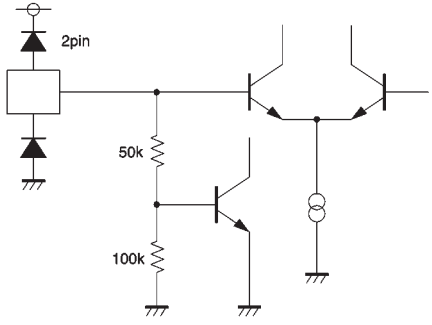
Driver input



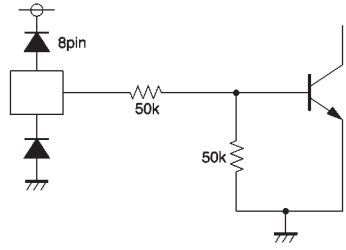
Driver output



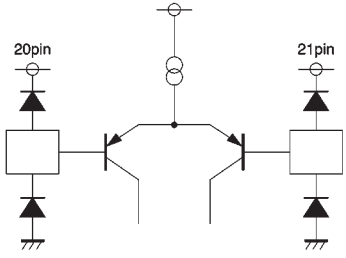
Bias



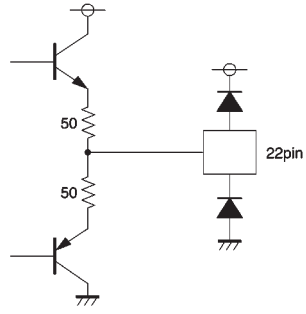
Standby



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	Measurement circuit
Current dissipation during standby	I_{ST}	—	—	200	μA	—	Fig.1
Quiescent current	I_{CC}	—	13	20	mA	No load	Fig.1
Output offset voltage	V_{OO}	−40	—	40	mV	—	Fig.1
Maximum output amplitude	V_{OM}	3.1	3.6	—	V	—	Fig.1
Closed loop voltage gain	G_{VC}	10.4	11.8	13.2	dB	V_{IN}=0.1Vrms, 1kHz	Fig.1
Standby voltage	V_{STBY}	—	—	0.5	V	—	Fig.1
Standby release voltage	V_{STOFF}	2.0	—	—	V	—	Fig.1
〈Operation amplifier〉							
Offset voltage	V_{OFOP}	−6	0	6	mV	—	Fig.2
Input bias current	V_{BOP}	—	—	300	nA	—	Fig.2
Output high level voltage	V_{OHOP}	3.9	4.35	—	V	—	Fig.2
Output low level voltage	V_{OLOP}	—	0.75	1.1	V	—	Fig.2
Output drive current (sink)	I_{SI}	10	30	—	mA	V_{CC} at 50Ω	Fig.2
Output drive current (source)	I_{SO}	10	25	—	mA	Ground at 50Ω	Fig.2
Slew rate	SR_{OP}	—	1	—	V / μs	100kHz square wave, $2V_{P-P}$ output	Fig.2

◎Not designed for radiation resistance.

●Measurement circuits

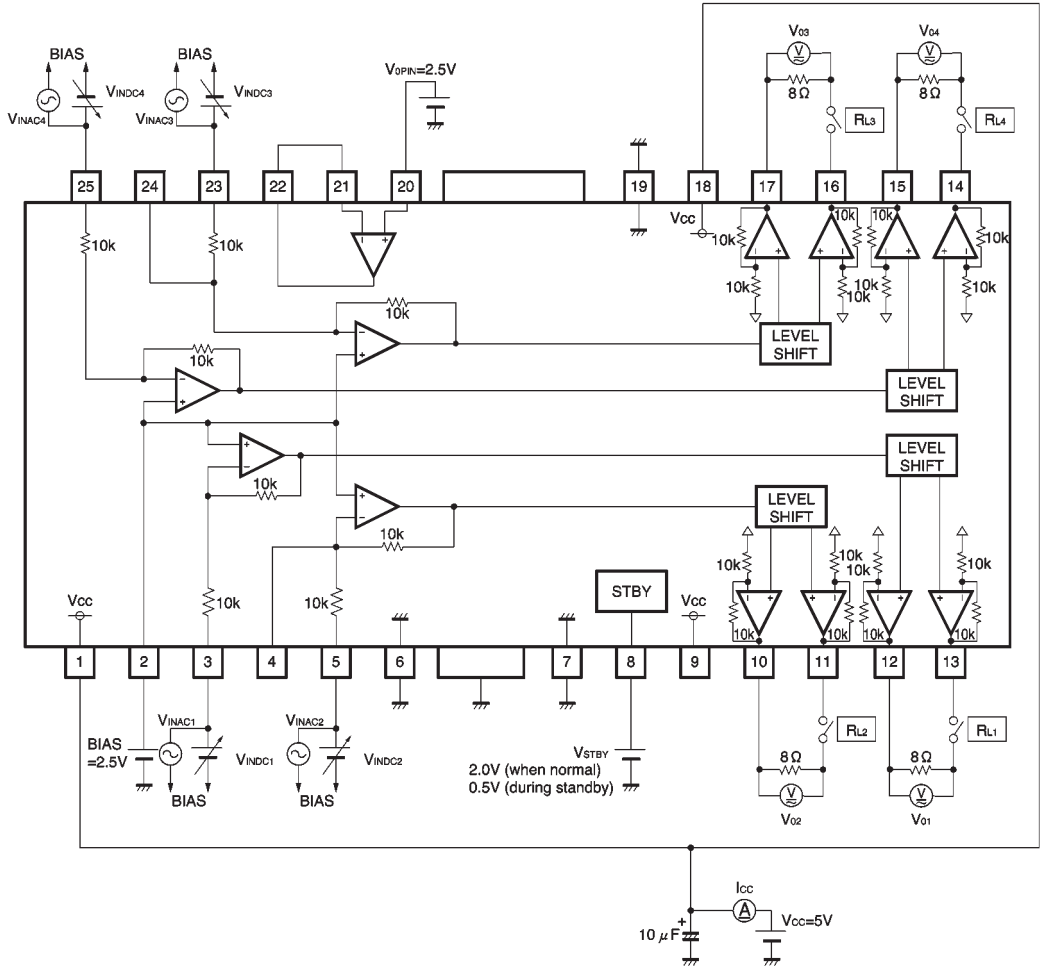


Fig.1 Driver measurement circuit

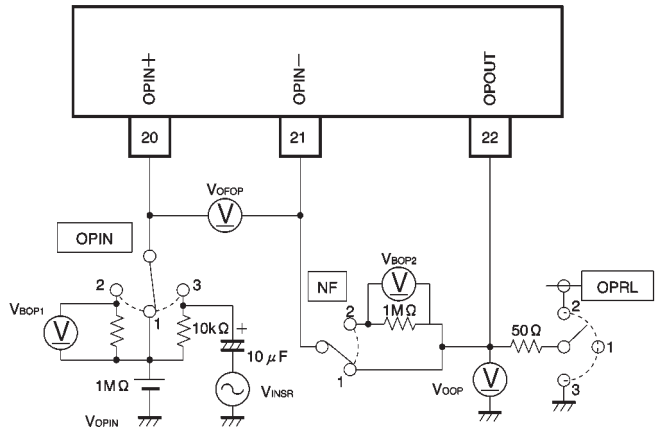


Fig.2 Operational amplifier measurement circuit

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_{ST}	OFF	—	V_{STBY}=0.5V	I_{CC}
I_{CC}	OFF	—	—	I_{CC}
V_{OO}	ON	0V	—	$V_{O1\sim4}$
V_{OM}	↓	±2.5V	—	$V_{O1\sim4}$
G_{VC}	↓	—	V_{INAC}=0.1V_{rms}, 1kHz	$V_{O1\sim4}$

(2) Operational amplifier (RL → OFF)

Symbol	Switch			Input	Note	Test point
	OPIN	NF	OPRL	V_{OPIN}		
V_{OFOP}	1	1	1	2.5V	—	V_{OFOP}
V_{BOP}	2	2	1	2.5V	—	$V_{BOP1\sim2}$
V_{OHOP}	1	1	1	5V	—	V_{OOP}
V_{OLOP}	1	1	1	0V	—	V_{OOP}
I_{SI}	1	1	2	2.5V	—	V_{OOP}
I_{SO}	1	1	3	2.5V	—	V_{OOP}
SR_{OP}	3	1	1	2V	V_{INSR}=100kHz, square wave, 2V_{P-P} output	V_{OOP}

●Application example

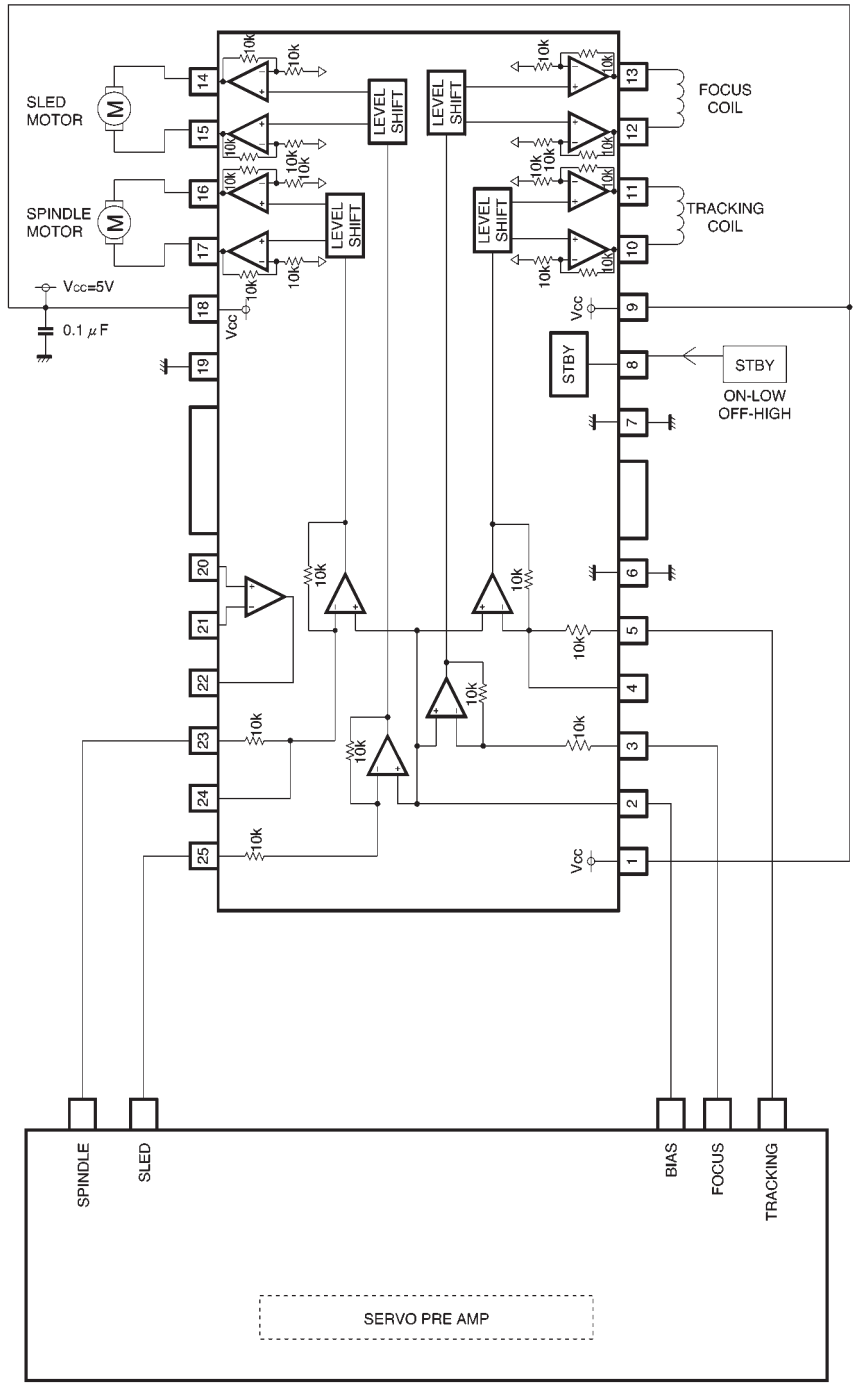


Fig.3

●Operation notes

(1) The BA5913FP-Y 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) Can be set that if the voltage of the standby pin (pin 8) is open or falls below 0.5V, the driver turns off and enters the power save mode. During normal operation, have pin 8 pulled up to over 2.0V.

(3) Muting occurs when the bias pin (pin 2) drops below 1.0V (typically). Make sure it stays above 1.4V during normal use.

(4) Muting occurs during thermal shutdown or a drop in the bias pin voltage. In each case, only drivers are muted. During muting, the output pins remain at the internal bias voltage, roughly (V_{CC}–VF) / 2.

(5) Connect the IC to a 0.1µF bypass capacitor between power supplies, at the base of the IC.

(6) Connect the heat radiation fin to an external ground.

●Electrical characteristic curves

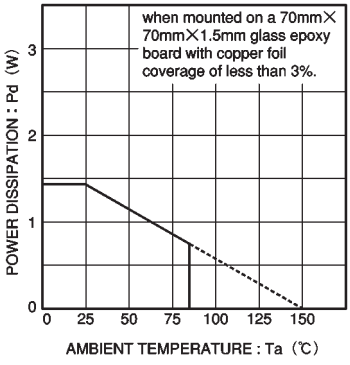


Fig.4 Thermal derating curve

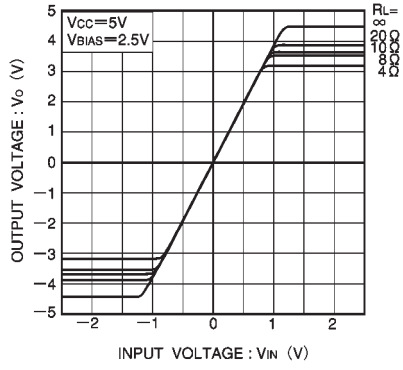


Fig.5 Driver I / O characteristics

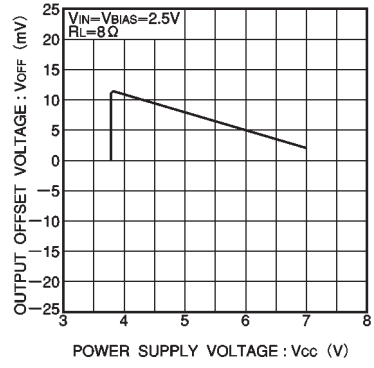


Fig.6 Power supply voltage vs. output offset voltage

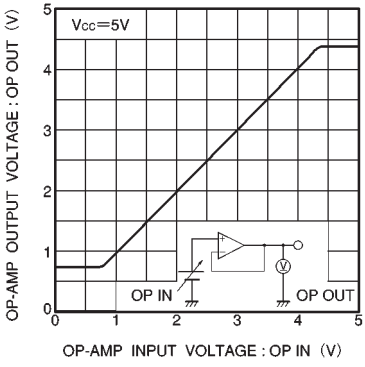


Fig.7 Operational amplifier I / O characteristics

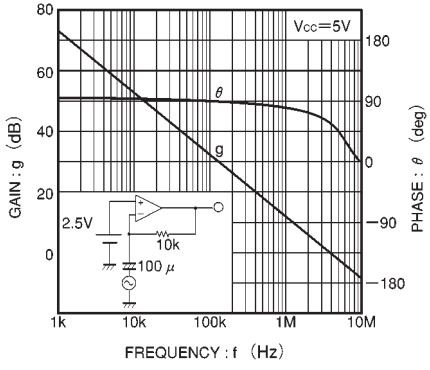


Fig.8 Operational amplifier open loop characteristics

●External dimensions (Units: mm)