

4-channel BTL driver for CD players

BA6197FP

The BA6197FP, an IC for CD players, has a 4-channel BTL driver, 5V regulator (attached PNP transistor required), standard operational amplifier, and internal reset output linked to an internal thermal shutdown circuit. The driver has gain adjustment input pins for each channel, allowing gain to be set to the desired value. Also, the internal level shift circuit helps reduce the number of attached components.

●Applications

CD players, CD-ROM drives and other optical disc devices

●Features

- 1) 4-channel BTL driver in a HSOP 28-pin package, for miniaturization of applications.
- 2) Gain is adjustable with an attached resistor.
- 3) Internal thermal shutdown circuit with hysteresis capabilities.
- 4) Internal 5V regulator. (required attached PNP transistor)
- 5) Internal standard operational amplifier.
- 6) Reset output pin.

●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V _{CC}	18	V
Power dissipation	P _d	1700 *1	mW
Operating temperature range	T _{opr}	-35~85	°C
Storage temperature range	T _{stg}	-55~150	°C

*1 16-pin DIP only. Reduced by 13.6 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	V _{CC}	6.0	—	10.0	V
		5.5	—	10.0	V *2

*2 Without regulator

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The diagram illustrates the internal circuitry of the T.S.D. (Tape Switch Decoder) integrated circuit. The chip is a square package with 28 pins. The top half (pins 1-14) contains a 'Reset output' section with a transistor, a 'MUTE' section with a transistor and resistors, and a 'DRIVER MUTE' section with a transistor and resistors. The bottom half (pins 15-28) contains an 'OP-AMP' section with an operational amplifier and several 'Level shift' sections. The circuit is powered by Vcc (pin 22) and GND (pin 28).

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● Pin description

Pin No.	Pin name	Function
1	OUT1-B	Channel 1 negative output
2	OUT1-A	Channel 1 positive output
3	IN1'	Input for adjusting channel 1 gain
4	RESET	Reset output
5	REG-B	Connect to base of attached regulator transistor
6	REGOUT	Connect the base of attached regulator transistor (output)
7	MUTE	Mute control
8	GND	Ground
9	IN2'	Input for adjusting channel 2 gain
10	IN2	Channel 2 input
11	OUT2-A	Channel 2 positive output
12	OUT2-B	Channel 2 negative output
13	GND	Substrate ground
14	OPOUT	Operational amplifier output
15	OPIN-B	Operational amplifier input (negative)
16	OPIN-A	Operational amplifier input (positive)
17	OUT3-B	Channel 3 negative output
18	OUT3-A	Channel 3 positive output
19	IN3	Channel 3 input
20	IN3'	Input for adjusting channel 3 gain
21	V _{cc}	Power supply
22	V _{cc}	Power supply
23	VREFIN	Reference amplifier input (bias)
24	IN4'	Input for adjusting channel 4 gain
25	IN4	Channel 4 input
26	OUT4-A	Channel 4 positive output
27	OUT4-B	Channel 4 negative output
28	GND	Substrate ground

* "Positive Input" and "negative input" indicate polarity relative to input:
HIGH input -> positive output (HIGH), negative output (LOW).

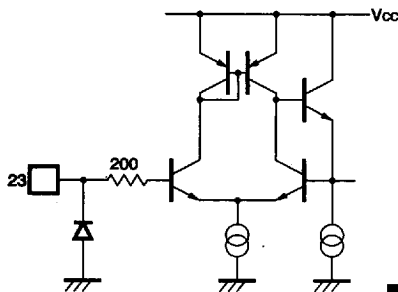
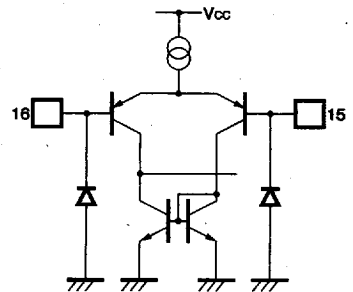
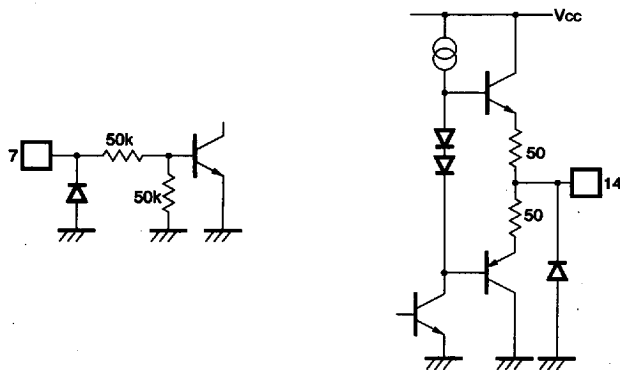
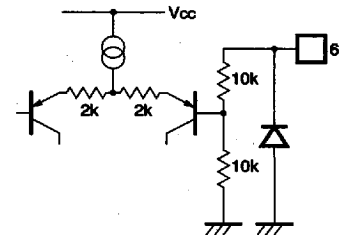
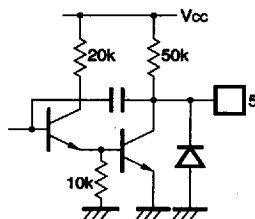
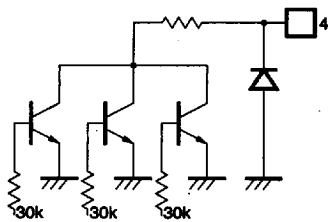
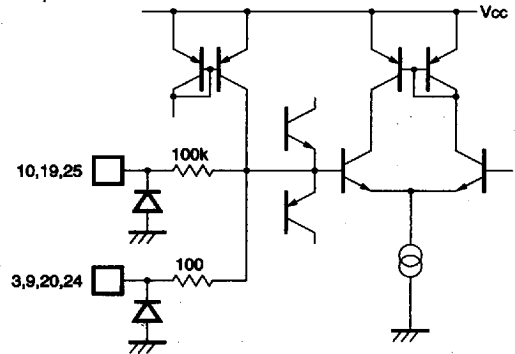
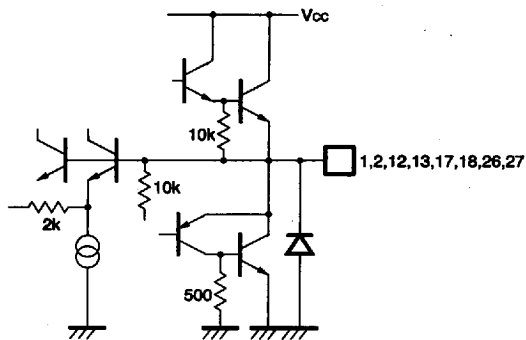
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● Input/output circuits



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●Electrical characteristics (Unless otherwise noted, Ta=25°C, Vcc=8V, f=1kHz, RL=8Ω)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement Circuit
Quiescent current	Icc	6.0	10.0	14.0	mA	No load	Fig.1
Output voltage, offset	Voo	-50	—	50	mV		Fig.1
Maximum output amplitude	Vod	3.65	4.30	—	V		Fig.1
Driver input resistance	RIN	75	100	125	kΩ	(CH1 except)	Fig.1
Closed circuit voltage gain1	Gvc	4.5	6.0	7.5	dB	Vin=0.1V (CH1 except)	Fig.1
Closed circuit voltage gain 2	Gvc	4.0	6.0	8.0	dB	Vin=0.1V (CH1, input 100kΩ attached)	Fig.1
Ripple rejection ratio	RR	—	60	—	dB	Vin=0.1Vrms, 100Hz	Fig.1
Slew rate	SR	—	2.0	—	V/μS	100 kHz square wave, 3 Vp-p output	Fig.1
MUTE OFF voltage	VMOFF	2.0	—	—	V		Fig.1
<5 V regulator>							
Output voltage	Vreg	4.75	5.00	5.25	V	IL=100mA	Fig.1
Output load differential	ΔVRL	-50	0	10	mV	IL=0~200mA	Fig.1
Power supply voltage differential	ΔVvcc	-10	0	25	mV	(Vcc=6~9V) IL=100mA	Fig.1
<OP-AMP>							
Offset voltage	VOFOP	-5	0	5	mV		Fig.1
Input bias current	IBIAS	—	—	300	nA		Fig.1
H level output voltage	VOHOP	6.0	—	—	V		Fig.1
L level output voltage	VOLOP	—	—	1.1	V		Fig.1
Output drive current (source)	ISOU	10	40	—	mA	50Ω at GND	Fig.1
Output drive current (sink)	ISIN	10	50	—	mA	50Ω at Vcc	Fig.1
Voltage gain (open circuit)	Gvo	—	78	—	dB	Vin=-75dBV, 1kHz	Fig.1
Slew rate	SRop	—	1	—	V/μS	100 kHz square wave, 3Vp-p output	Fig.1
Ripple rejection ratio	RRop	50	65	—	dB	Vin=-20dBV, 100Hz	Fig.1
Common mode rejection ratio	CMRR	70	84	—	dB	Vin=-20dBV, 1kHz	Fig.1

○ Not designed for radiation resistance.

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● Measurement circuit switch table

Parameter	Switch								Input					Condition
	RIP PLE	RL	OPIN	VREF	CMR -IN	NF	OP OUT	SW -IN	DR -IN	DC -IN	PIPPLE IN	VOP IN	VIN DC	
Quiescent current	ON	OFF	ON	ON	OFF	SHORT	2	2	0	0	0	0	OFF	
Output voltage, offset	↓	ON	↓	↓	↓	↓	↓	1	↓	2.5V	↓	↓	↓	
Maximum output voltage	↓	↓	↓	↓	↓	↓	↓	2	↓	2.0 Vrms	↓	↓	↓	Only one chan- nel on at a time
Closed loop voltage gain	↓	↓	↓	↓	↓	↓	↓	↓	0.1 Vrms	0	↓	↓	↓	
Ripple rejection ratio	OFF	↓	↓	↓	↓	↓	↓	1	0	2.5V	0.1 Vrms	↓	↓	
Slew rate	ON	↓	↓	↓	↓	↓	↓	2	⌋	0	0	↓	↓	
〈Regulator〉														
Output voltage	↓	OFF	↓	↓	↓	↓	↓	↓	0	↓	↓	↓	↓	
Output load variation	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	
Supply voltage variation	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	
〈Operational amplifier〉														
Offset voltage	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	
Input bias current	↓	↓	↓	OFF	↓	1M	↓	↓	↓	↓	↓	↓	↓	
Output voltage, H level	↓	↓	↓	ON	↓	OPEN	↓	↓	↓	↓	↓	↓	2V	
Output voltage, L level	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	6V	
Output driver current (sink)	↓	↓	↓	↓	↓	SHORT	1	↓	↓	↓	↓	↓	OFF	
Output driver current (source)	↓	↓	↓	↓	↓	↓	3	↓	↓	↓	↓	↓	↓	
Voltage gain (open loop)	↓	↓	↓	↓	↓	GVO	2	↓	↓	↓	↓	-75 dBV	↓	
Slew rate	↓	↓	↓	↓	↓	SHORT	↓	↓	↓	↓	↓	⌋	↓	
Ripple rejection ratio	OFF	↓	↓	↓	↓	↓	↓	↓	↓	↓	0.1 Vrms	0	↓	
Synchronous signal ratio	ON	↓	OFF	ON	ON	1M	↓	↓	↓	↓	0	0.1 Vrms	↓	

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● Application example

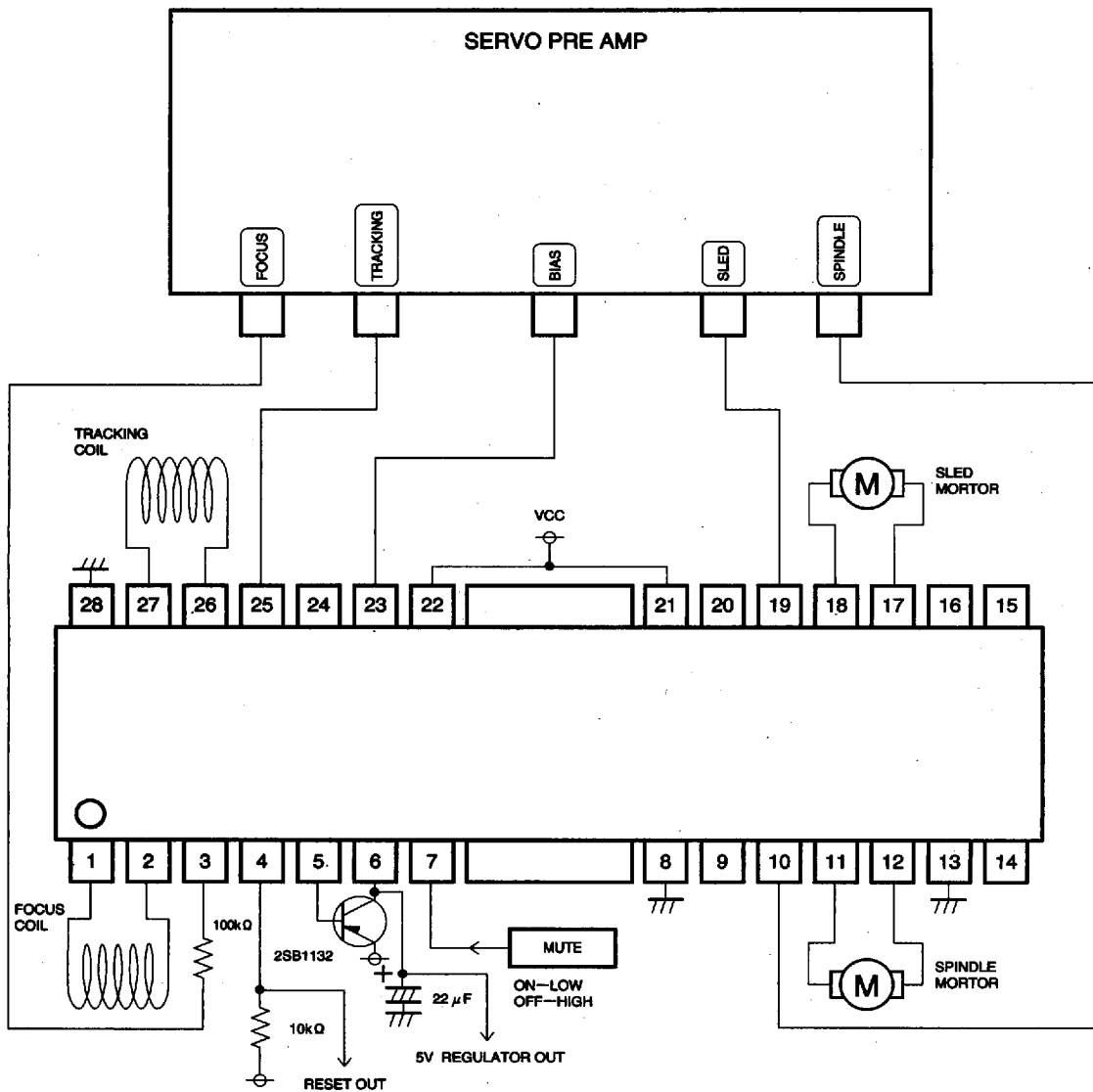


Fig.2

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● Operation notes

1. Muting and resetting

Function	Mute	Reset	Operational conditions *1 (typ)	Operational conditions *2 (typ)	Hysteresis width (typ)
Thermal shutdown	○	○	$T_J \geq 175^\circ\text{C}$ *3	$T_J \leq 150^\circ\text{C}$	25°C *4
External muting *5	○		$V_{\text{MUTE}} \leq 1.4\text{V}$ or open	$V_{\text{MUTE}} \geq 1.4\text{V}$	none

*1 Condition for mute = ON, reset output = LOW

*2 Condition for mute = OFF, reset output = HIGH

*3 Allow for variation of approximately $\pm 25^\circ\text{C}$ *4 Allow for variation of approximately $\pm 5^\circ\text{C}$

*5 Should be below 0.5 V (mute ON) and above 2.0 V (mute OFF)

- The circuit is muted during thermal shutdown and during the mute-on state. In each case, only the drivers are muted. During muting, the output pins remain at the internal bias voltage, roughly $(V_{\text{CC}} - V_f)/2$.
- When using an attached resistor to change the gain, the temperature characteristics of the internal feedback resistors results in temperature variation in the gain (relative to the typical value) of +4600ppm per degree. There is virtually no temperature variation in error due to resistance variation.
- Be sure to connect the IC to a $0.1\ \mu\text{F}$ bypass capacitor to the power supply, at the base of the IC.
- The radiating fin is connected to the package's internal GND, but should also be connected to an external ground.
- The capacitor between regulator output (6 pin) and GND also serves to prevent oscillation of the IC, so select one with good temperature characteristics.
- Pins 5 and 6 may be left open when the regulator is not used.
- Pins 14, 15 and 16 may be left open when the operational amplifier is not used.

● Electrical characteristic curves

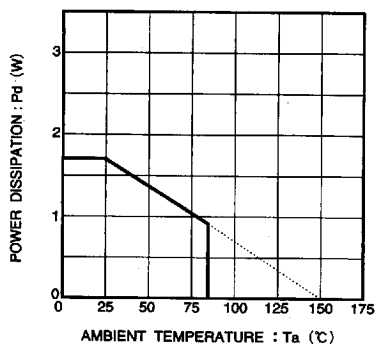


Fig. 3 Thermal derating curve

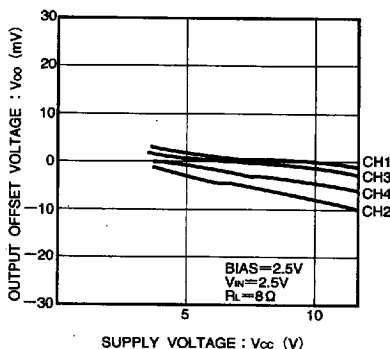


Fig. 4 Supply voltage vs. driver output offset voltage

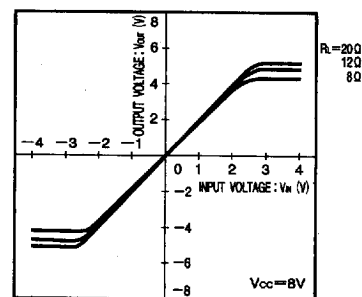


Fig. 5 Driver I/O characteristics (variable load)

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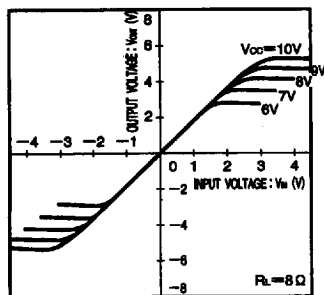


Fig. 6 Driver I/O characteristics (variable supply voltage)

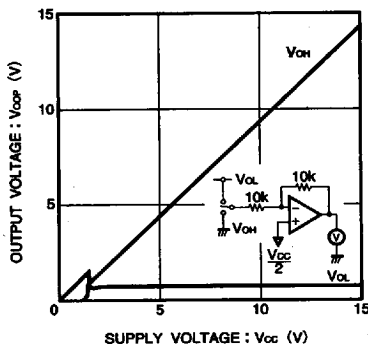


Fig. 7 Operational amplifier output voltage (high and low level)

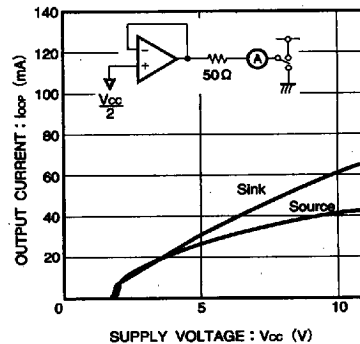


Fig. 8 Supply voltage vs. operational amplifier drive voltage

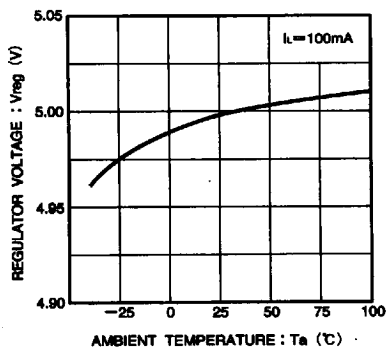


Fig. 9 Regulator voltage vs. temperature characteristics

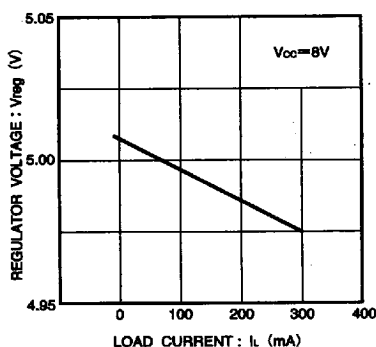


Fig. 10 Load current vs. regulator voltage

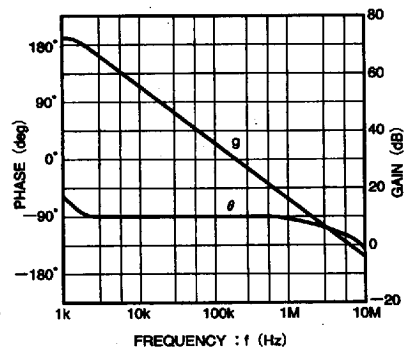
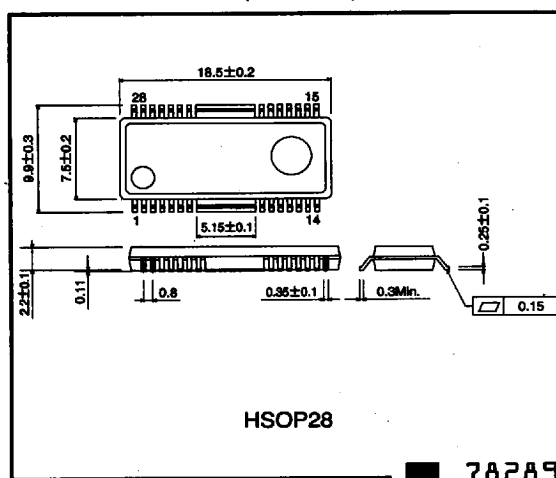


Fig. 11 Operational amplifier vs. open loop characteristics

● External dimensions (Units: mm)



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