4-channel BTL driver for CD

BA6998FP

The BA6998FP ICs contain a 4-channel BTL driver, 5V regulator (which requires an externally connected PNP transistor), multi-purpose operational amplifier, and reset output for use with CD players. Also equipped with an input pin for gain adjustment for all channels of the driver block so that the gain can be adjusted to the desired value for your application. Furthermore, a built-in level shift circuit exists to further reduce the amount of external components required.

●Features

1) 4ch Driver for BTL.
2) Small surface mounting power package (HSOP 28pin).
3) Adjustable gain by the external resistors.
4) Incorporates a thermal shut down circuit.
5) Incorporates a voltage regulator (5V) (PNP Tr is needed outside).
6) Incorporates an operational amplifier.
7) Incorporates a reset-output terminal.

●Applications

CD players, CD-ROM, and other optical disc equipment

●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Supply voltage	V_{CC}	13.5	V
Power dissipation	P_D	1.7 ∗	W
Operating temperature	T_{opr}	−35 to +85	°C
Storage temperature	T_{stg}	−55 to +150	°C

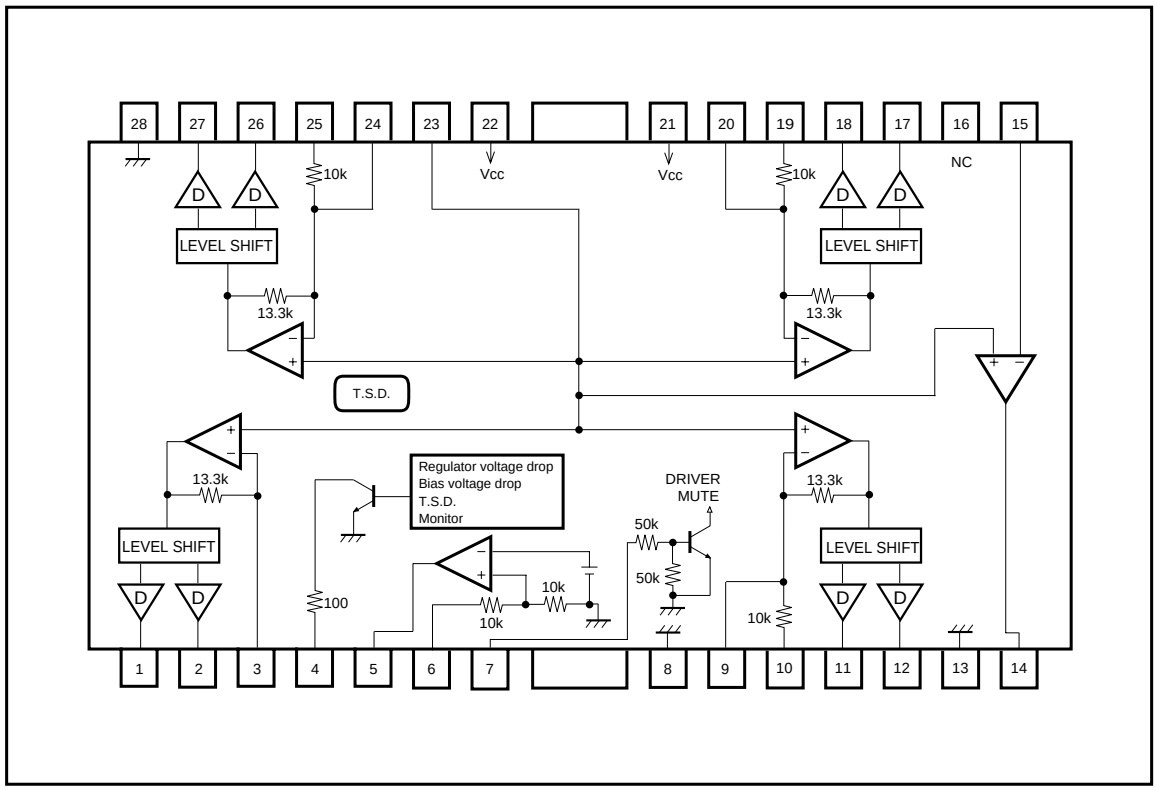
∗ Derating is done at 13.6mW/°C for operation above Ta=25°C.
On less than 3% (percentage occupied by copper foil), 70 x 70mm^2 , t =1.6mm, glass epoxy mounting.

●Recommended operating conditions (Ta=25°C)

Parameter	Symbol	Limits	Unit
Supply voltage	V_{CC}	6 to 9 ∗	V

∗ The driver blocks operate on condition that supply voltage is over 5.5V.

●**Block diagram**



T.S.D : Thermal shut down
D.BUF : Driver buffer

●**Pin description**

No	Symbol	Function	No	Symbol	Function
1	OUT1-B	Inverted output of CH1	15	OPIN-B	Inverting input for OP-amp.
2	OUT1-A	Noninverted output of CH1	16	NC	NC
3	IN1	Gain adjustment of CH1	17	OUT3-B	Inverted output of CH3
4	RESET	Output for reset	18	OUT3-A	Noninverted output of CH3
5	REG-B	Connection with BASE of PNP Tr	19	IN3	Input for CH3
6	REGOUT	Output for regulator ∗1	20	IN3'	Gain adjustment of CH3
7	MUTE	Mute control	21	VCC	Vcc
8	GND	Ground	22	VCC	Vcc
9	IN2'	Gain adjustment of CH2	23	VREFIN	Input for reference voltage (bias)
10	IN2	Input for CH2	24	IN4'	Gain adjustment of CH4
11	OUT2-A	Noninverted output of CH2	25	IN4	Input for CH4
12	OUT2-B	Inverted output of CH2	26	OUT4-A	Noninverted output of CH4
13	GND	Substrate ground	27	OUT4-B	Inverted output of CH4
14	OPOUT	Output for OP-amp.	28	GND	Substrate ground

∗1 Connect COLLECTOR of external PNP Tr.

●**Electrical characteristics** (Unless otherwise noted, Ta=25°C, V_{CC}=8V, f =1kHz, R_L=8Ω)

Parameter	Symbol	Limit			Unit	Conditions
		Min.	Typ.	Max.		
Quiescent current	I_Q	6.0	10.0	14.0	mA	R_L=∞
Output offset voltage	V_{OO}	–40	0	+40	mV	
High level output voltage	V_{OHD}	5.60	6.0	–	V	
Low level output voltage	V_{OLD}	–	1.20	1.45	V	
Closed loop voltage gain	G_{VC}	7.40	8.40	9.40	dB	V_{IN}=0.1V (except for CH1)
Ripple rejection	RR	–	60	–	dB	V_{IN}=0.1Vrms, 100Hz
Slew rate	SR	–	1.0	–	V/μs	100kHz square wave output $3V_{P-P}$
Voltage for mute-off	Vmoff	2.0	–	–	V	
(REGULATOR)						
Output voltage	Vreg	4.75	5.00	5.25	V	I_L=100mA
Load regulation	V_{RL}	–70	0	+10	mV	I_L=0 to 200mA
Line regulation	V_{VCC}	–10	0	+35	mV	I_L=100mA, V_{CC}=6V to 9V
(OPERATIONAL AMPLIFIER)						
Offset voltage	V_{OFOP}	–5	0	+5	mV	
Input bias current	I_{BIAS}	–	–	300	nA	
High level output voltage	V_{OHOP}	7.0	–	–	V	
Low level output voltage	V_{OLOP}	–	–	1.1	V	
Output source current	I_{SOU}	10	40	–	mA	Output short to GND by 50Ω
Output sink current	I_{SIN}	10	50	–	mA	Output short to V_{CC} by 50Ω
Open loop voltage gain	G_{VO}	–	78	–	dB	V_{IN}= –75dBV, 1kHz
Slew rate	SR_{OP}	–	1	–	V/μs	100kHz square wave output $4V_{P-P}$
Ripple rejection	RR_{OP}	50	65	–	dB	V_{IN}= –20dBV, 100Hz
(RESET)						
Threshold (RESET ON)	V_{THR}	–	4.0	–	V	Sense of regulator output
Output voltage (RESET ON)	V_{RON}	–	–	0.5	V	Output short to 5V by 10kΩ

∗ This product is not designd for protection against radioactive rays.

●**Application circuit**

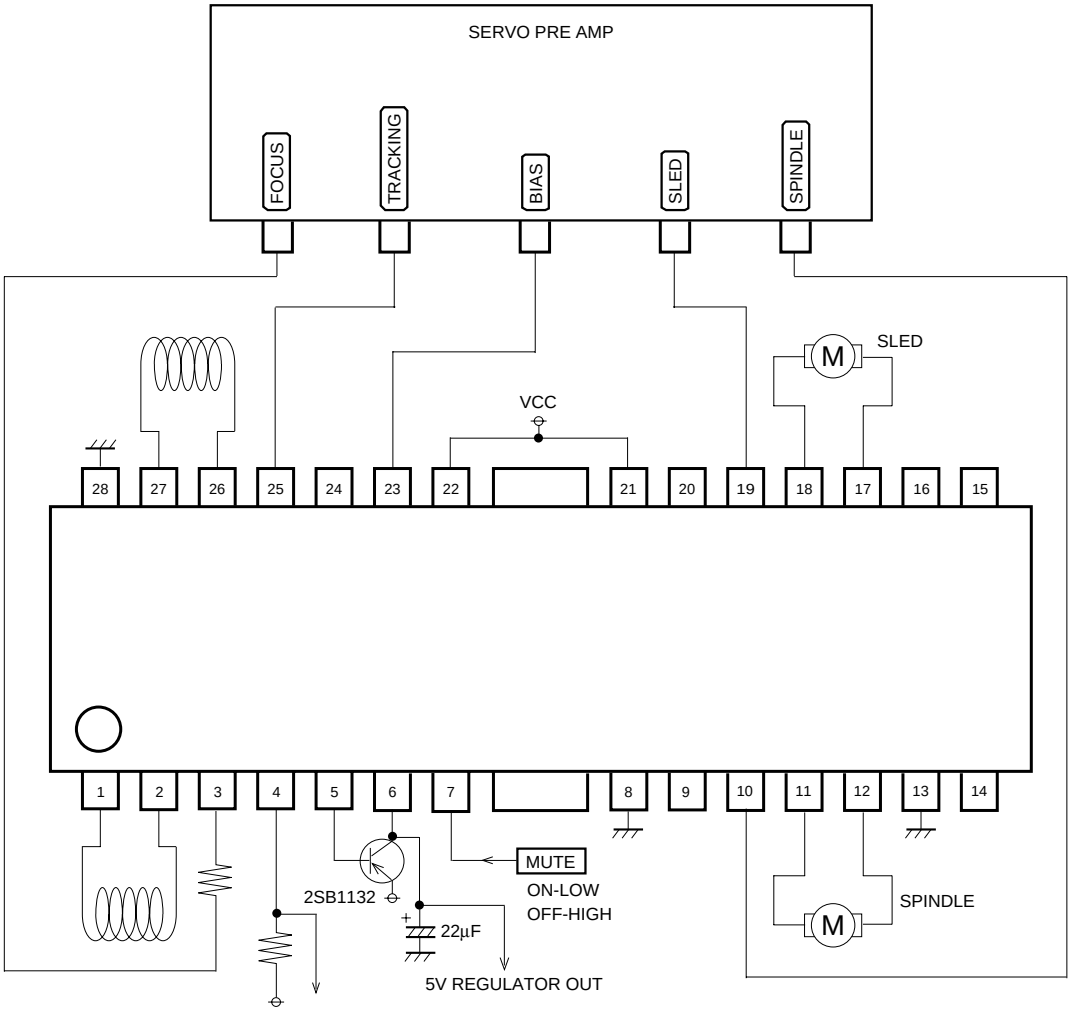


Fig.1

●Operation notes

(1) Relation between mute and reset.

Functions	MUTE	RESET
Regulator drop	ON	'H' to 'L'
Bias drop	ON	'H' to 'L'
Thermal shut down	ON	'H' to L'
Mute (Pin.15)	ON	constant

Regulator drop . . . In case regulator voltage below 4.0V(Typ.), output current is muted and reset output is 'L'. Next time regulator voltage rises to 4.2V(Typ.), output current is active and reset output is 'H'.

Bias drop . . . In case bias-pin (Pin.23) voltage falls below 0.7V(Typ.), output current is muted and reset output is 'L'. Make sure that under normal operating conditions, this pin is at 1.2V or above.

T.S.D. . . . In case IC chip temperature rise to 175°C (Typ.), thermal shut down circuit operates and output current is muted and reset output is 'L'. Next time IC chip temperature falls bellow 150°C (Typ.),the driver blocks start..

Mute (Pin.7) . . . In case mute-pin (Pin.7) voltage is under 0.5V or opened, output current is muted.

(2) The output current is muted in the event of a T.S.D., mute-on, a bias voltage drop, or a regulator voltage drop. Only the drivers are muted. When muted, the internal bias voltage of the output pin becomes roughly (V_{CC}-VF/2).

(3) Insert the by-pass capacitor between V_{CC} and GND as possible as near (about 0.1μF).

(4) The capacitor between regulator output (Pin.6) and GND combines with prevention of oscillation. The capacitor with small temperature coefficient should be recommendable.

(5) When it is not to use regulator, output of regulator (Pin.6) is connected with V_{CC} and base terminal of PNP(Pin.5) is opened.

(6) Fin should be connected to outside ground.

(7) Please lay out pattern with care, as Pin.8 GND electric potential is not below SUBGND electric potential include transitional condition.Because only Pin.8 GND of three GND do not connect with IC's substrate.

●Electrical characteristics curves

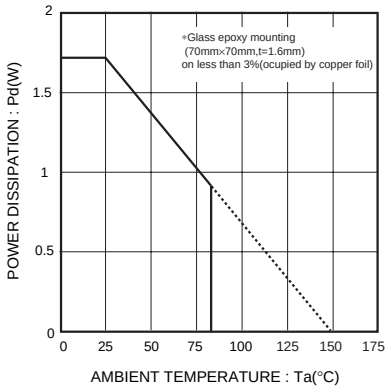


Fig.2 Thermal dissipation curve

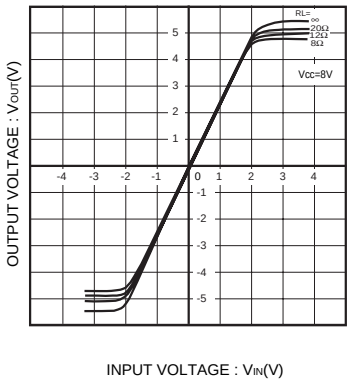


Fig.3 Driver input/output characteristics (When load changed)

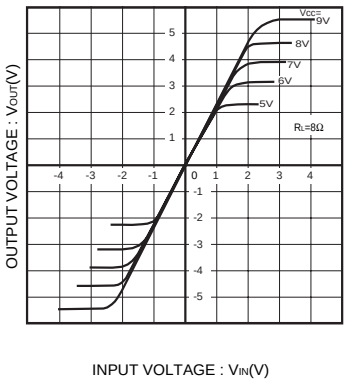


Fig.4 Driver input/output characteristics (When supply voltage changed)

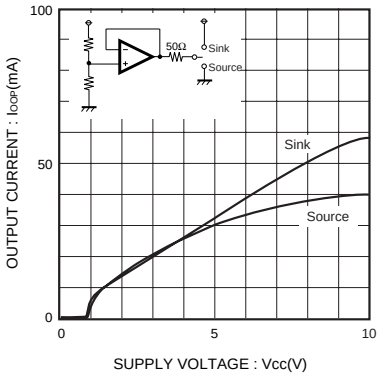


Fig.5 Power supply voltage vs. op-amplifier operating current

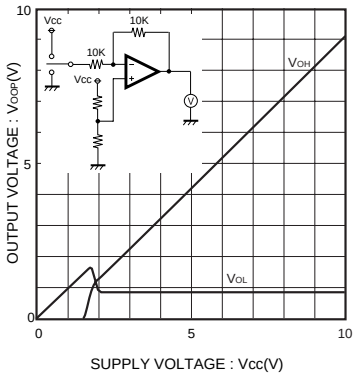


Fig.6 Power supply voltage vs. op-amplifier "H" and "L"level output voltage

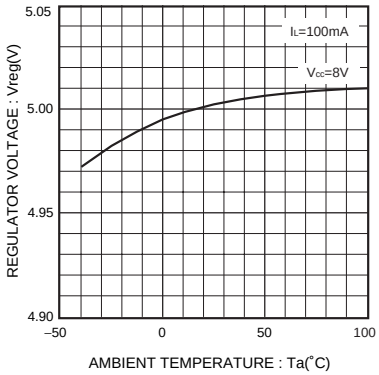


Fig.7 Regulator voltage vs. temperature characteristics

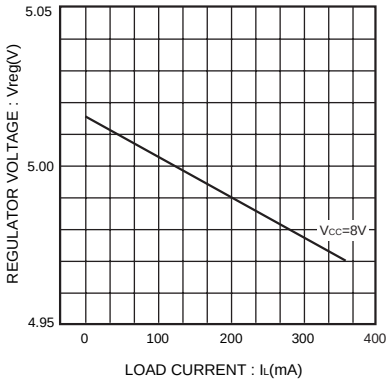
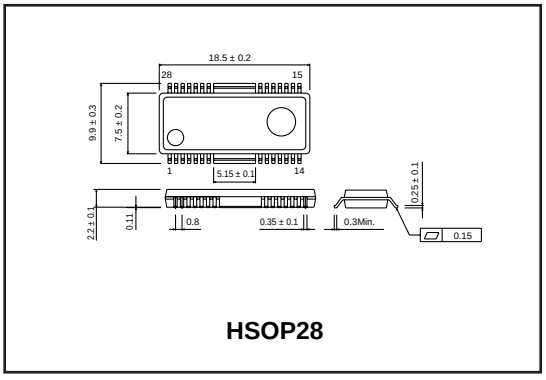


Fig.8 Load current vs. regulator voltage

●**External dimensions** (Unit : mm)



Notes

- No technical content pages of this document may be reproduced in any form or transmitted by any means without prior permission of ROHM CO.,LTD.
- The contents described herein are subject to change without notice. The specifications for the product described in this document are for reference only. Upon actual use, therefore, please request that specifications to be separately delivered.
- Application circuit diagrams and circuit constants contained herein are shown as examples of standard use and operation. Please pay careful attention to the peripheral conditions when designing circuits and deciding upon circuit constants in the set.
- Any data, including, but not limited to application circuit diagrams information, described herein are intended only as illustrations of such devices and not as the specifications for such devices. ROHM CO.,LTD. disclaims any warranty that any use of such devices shall be free from infringement of any third party's intellectual property rights or other proprietary rights, and further, assumes no liability of whatsoever nature in the event of any such infringement, or arising from or connected with or related to the use of such devices.
- Upon the sale of any such devices, other than for buyer's right to use such devices itself, resell or otherwise dispose of the same, no express or implied right or license to practice or commercially exploit any intellectual property rights or other proprietary rights owned or controlled by
- ROHM CO., LTD. is granted to any such buyer.
- Products listed in this document are no antiradiation design.

The products listed in this document are designed to be used with ordinary electronic equipment or devices (such as audio visual equipment, office-automation equipment, communications devices, electrical appliances and electronic toys).
Should you intend to use these products with equipment or devices which require an extremely high level of reliability and the malfunction of with would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), please be sure to consult with our sales representative in advance.

About Export Control Order in Japan

Products described herein are the objects of controlled goods in Annex 1 (Item 16) of Export Trade Control Order in Japan.
In case of export from Japan, please confirm if it applies to "objective" criteria or an "informed" (by MITI clause) on the basis of "catch all controls for Non-Proliferation of Weapons of Mass Destruction.