5-channel BTL driver for CD players
BA6995FP

The BA6995FP is 5-channel BTL driver for CD and MD player actuators and spindle, thread and loading motors. The spindle driver and loading driver share a single buffer, and either can be driven via the control pin.

●Applications

CD, MD players and other optical disc applications

●Features

1) 28-pin HSOP package allows for miniaturization of applications.
2) Gain is adjustable with a single attached resistor.
3) Wide dynamic range (5 or 4V when V_{CC}=8V)
4) Adaptable for low-voltage servos.

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V_{CC}	18	V
Power dissipation	Pd	1800*1 2900*2	mW
Operating temperature	Topr	−35～+85	℃
Storage temperature	Tstg	−55～+150	℃

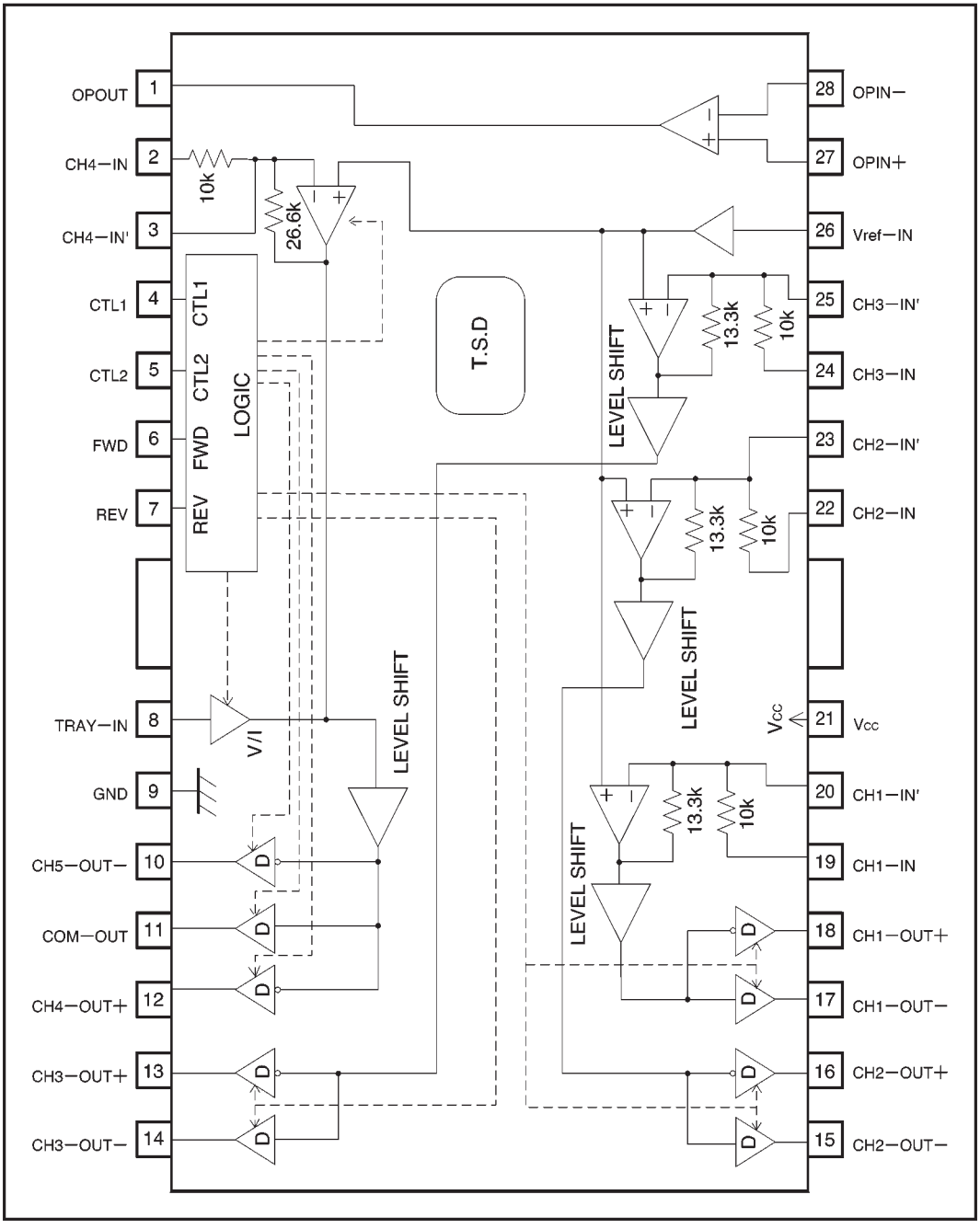
*1 When mounted on a 70 mm × 70 mm × 1.6 mm glass epoxy board with less than 3% copper foil
Reduced by 14.4 mW for each increase in Ta of 1℃ over 25℃.

*2 When mounted on a 70 mm × 70 mm × 1.6 mm glass epoxy board with less than 60% copper foil
Reduced by 23.2 mW for each increase in Ta of 1℃ over 25℃.

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V_{CC}	5	—	12	V

●Block diagram



●Pin descriptions

Pin No.	Pin name	Function
1	OPOUT	Operational amplifier output
2	CH4−IN	Channel 4 input
3	CH4−IN'	Channel 4 gain adjustment input
4	CTL1	Control 1 input
5	CTL2	Control 2 input
6	FWD	Tray forward input
7	REV	Tray reverse input
8	TRAY−IN	Tray input
9	GND	Substrate ground
10	CH5−OUT−	Tray negative output
11	COM−OUT	Tray positive output / channel 4 negative output
12	CH4−OUT+	Channel 4 positive output
13	CH3−OUT+	Channel 3 positive output
14	CH3−OUT−	Channel 3 negative output
15	CH2−OUT−	Channel 2 negative output
16	CH2−OUT+	Channel 2 positive output
17	CH1−OUT−	Channel 1 negative output
18	CH1−OUT+	Channel 1 positive output
19	CH1−IN	Channel 1 input
20	CH1−IN'	Channel 1 gain adjustment input
21	V_{CC}	V_{CC}
22	CH2−IN	Channel 2 input
23	CH2−IN'	Channel 2 gain adjustment input
24	CH3−IN	Channel 3 input
25	CH3−IN'	Channel 3 gain adjustment input
26	Vref−IN	Bias amplifier input
27	OPIN+	Operational amplifier non-inverted input
28	OPIN−	Operational amplifier inverted input

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Quiescent current dissipation	I_{CC}	—	13	18	mA	No load
Output voltage 1, offset	Voo	−40	—	40	mV	Channel 1～channel 3
Output voltage 2, offset	Voo	−100	—	100	mV	Channel 4
Maximum output pin voltage 1	V_{OHD1}	4.8	5.4	—	V	V_{IN}=V_{CC}
Maximum output pin voltage 2	V_{OHD2}	—	−5.4	−4.8	V	V_{IN}=GND
Closed loop voltage gain 1	G_{VC1}	6.5	8.0	9.5	dB	V_{IN}=±0.5V (excluding CH4)
Closed loop voltage gain 2	G_{VC2}	11.5	14.0	16.5	dB	V_{IN}=±0.5V（CH4）
Ripple rejection	RR	—	60	—	dB	V_{IN}=0.1V_{rms}，100Hz
Slew rate	SR	—	2.0	—	V/μs	100 Hz square wave, 3 V_{P-P} output
〈Tray driver〉						
Output voltage F	V_{OF}	2.5	3.0	3.5	V	Pin 8 voltage=3 V
Output voltage R	V_{OR}	−3.5	−3.0	−2.5	V	Pin 8 voltage=3 V
Output voltage range F	V_{OMF}	4.8	5.4	—	V	Pin 8 voltage=6 V
Output voltage range R	V_{OMR}	—	−5.4	−4.8	V	Pin 8 voltage=6 V
Load requlation F	$\triangle V_{FI}$	—	250	500	mV	I_L=100～400 mA, pin 8 voltage=2.5 V
Load requlation R	$\triangle V_{FI}$	—	250	500	mV	I_L=100～400 mA, pin 8 voltage=2.5 V
Line requlation F	$\triangle V_{FL}$	—	300	600	mV	V_{CC}=5～12 V, pin 8 voltage=2.5 V
Line requlation R	$\triangle V_{RL}$	—	300	600	mV	V_{CC}=5～12 V, pin 8 voltage=2.5 V
Output voltage, offset	V_{OOL}	−50	—	50	mV	Braking, output voltage
〈Logic: CT1, CTL2, FWD and REV〉						
Input high level voltage	V_{IH}	2.0	—	V_{CC}	V	
Input low level voltage	V_{IL}	−0.3	—	0.5	V	
Input high level current	I_{IH}	—	—	500	μA	
Input low level current	I_{IL}	—	—	500	μA	
〈Operational amplifier〉						
Offset voltage	V_{OFOP}	−6	0	6	mV	
Input bias current	I_{BIAS}	—	30	300	nA	
Output high level voltage	V_{OHOP}	7.1	7.8	—	V	
Output low level voltage	V_{OLOP}	—	0.2	0.9	V	
Output drive current (source)	I_{OSO}	1	3	—	mA	GND at 50Ω
Output drive current (sink)	I_{OSI}	10	30	—	mA	Vcc at 50Ω
Slew rate	SR_{OP}	—	1	—	V/μs	100 Hz square wave, 4 V_{P-P} output
Ripple rejection	SR_{OP}	—	60	—	dB	V_{IN}=0.1V_{rms}，100Hz
Common mode rejection ratio	CMRR	—	84	—	dB	V_{IN}=0.1V_{rms}，1kHz

●Measurement circuit

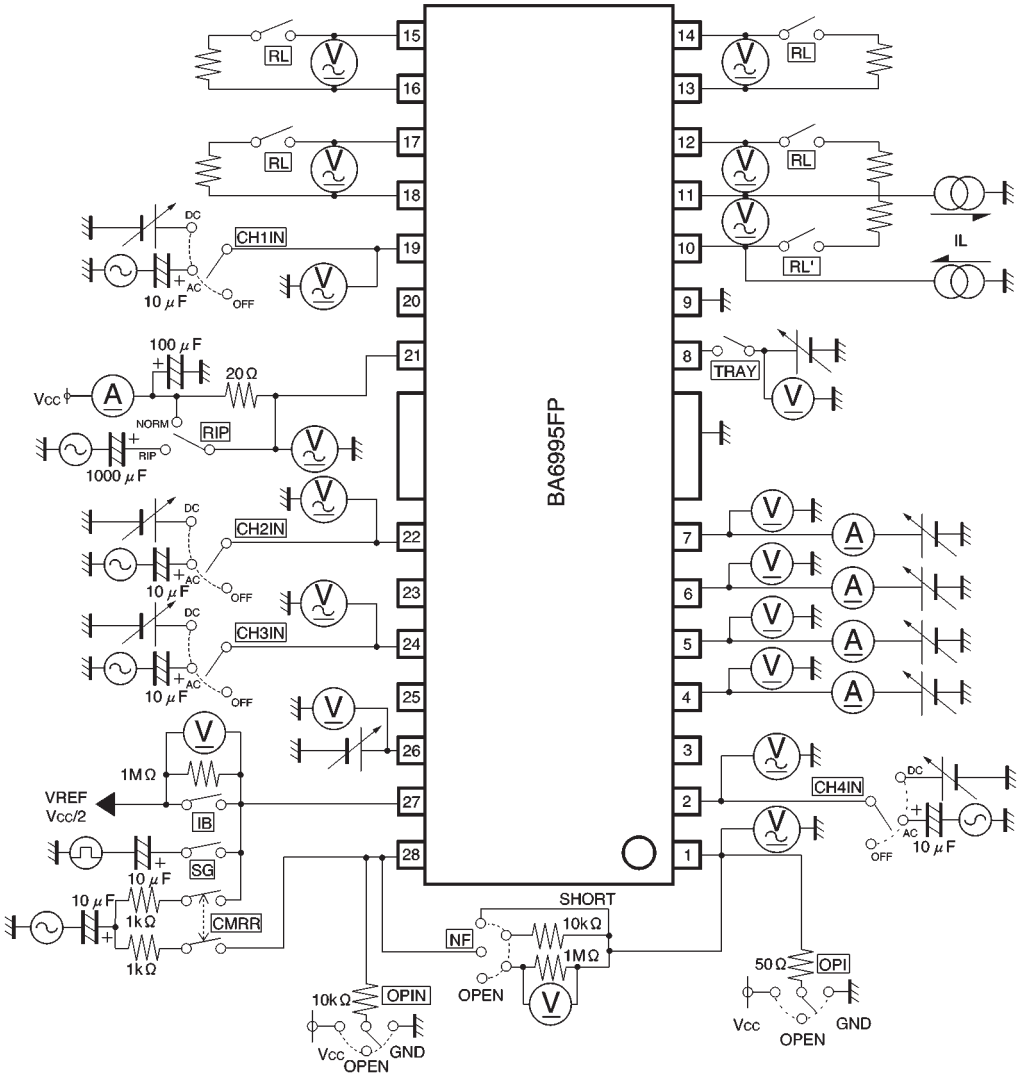


Fig.1

●Function description

CTL1 and CTL2

CTL1	CTL2	CH1	CH2	CH3	CH4	CH5
L	L	OFF				ON
L	H					
H	L	ON				OFF
H	H	OFF		ON	OFF	ON

Note: Output is at high impedance when OFF.

Forward and reverse (enabled only when channel 5 control and channel 5 are ON)

F	R	Output mode
L	L	High impedance
L	H	Reverse
H	L	Forward
H	H	Brake (free rotation)

●Application example

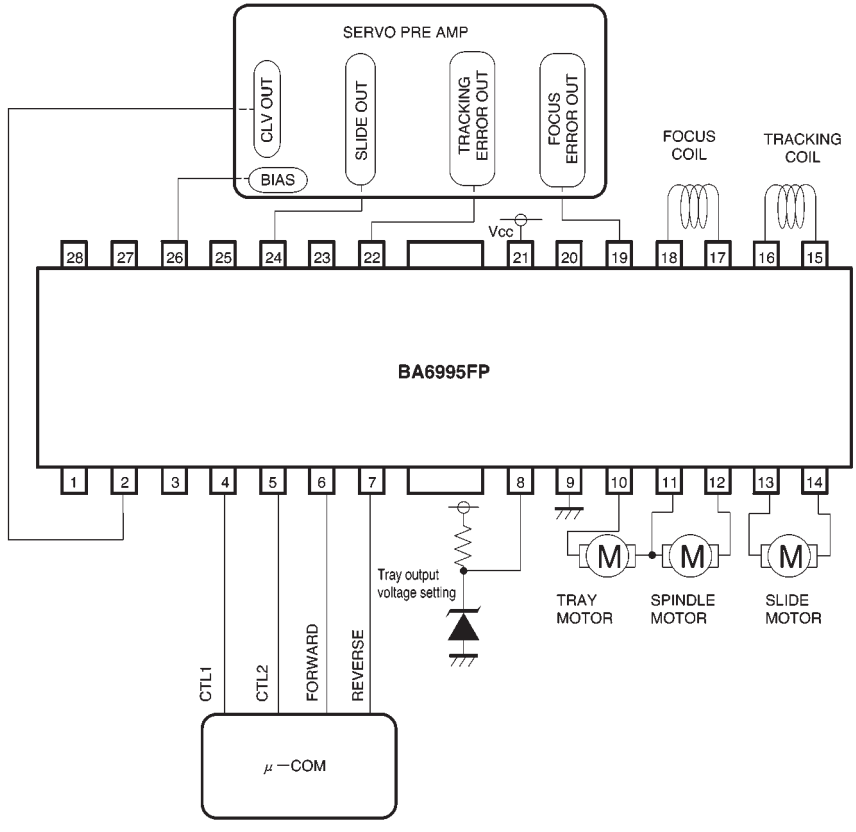
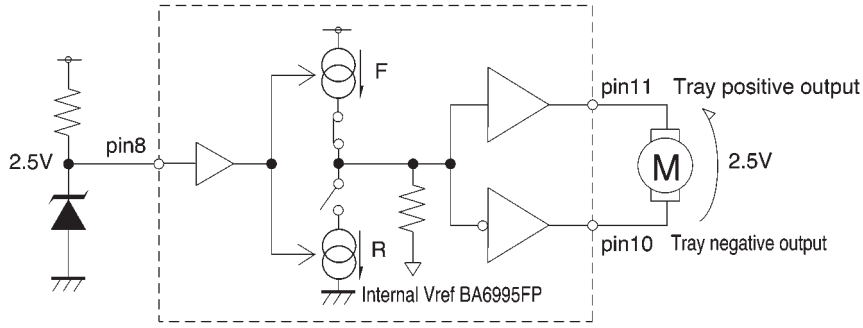


Fig. 2

●Operation notes

(1) Tray motor driver voltage setting (forward mode)



Input voltage = output voltage (gain: 0 dB)

Note: Tray driver output voltage cannot be set higher than the maximum output voltage for the power supply. The example above applies only when setting below the maximum output voltage. Maximum output voltage for the power supply can be output by pulling up the tray input pin (pin 8), or by connecting it to V_{CC}.

(2) Muting

〈Thermal shutdown〉

The output current is muted when the chip temperature exceeds 175°C (typically).

〈Supply voltage drop muting〉

The internal circuits turn off when the supply voltage drops below 4.3V (typically), and turn on again when it rises above 4.5V (typically).

(3) Muting occurs during thermal shutdown and when the supply voltage drops. In either case, only the driver is muted. The output pin voltage during muting is the internal bias voltage, roughly V_{CC} / 2.

(4) Be sure to connect the IC to a 0.1µF bypass capacitor to the power supply, at the base of the IC.

(5) Connect the radiating fin to an external ground.

●Electrical characteristic curves

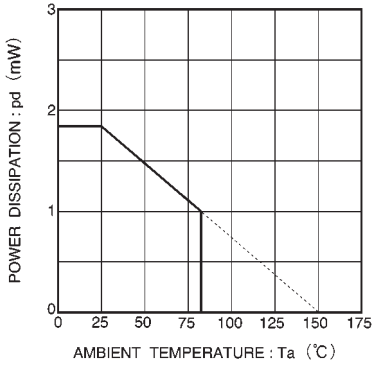


Fig. 3 Thermal derating curve

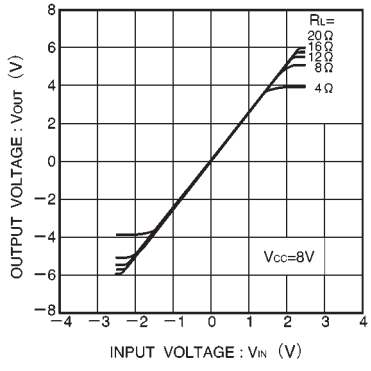


Fig. 4 CH1-CH3 driver I / O characteristics (variable load)

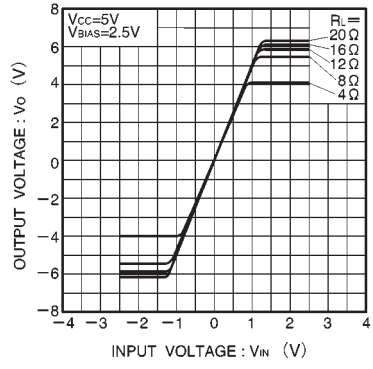


Fig. 5 Driver I / O characteristics

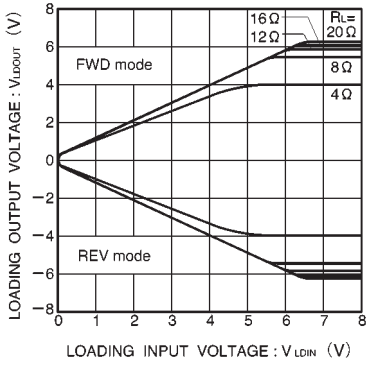


Fig. 6 CH5 loading driver I / O characteristics

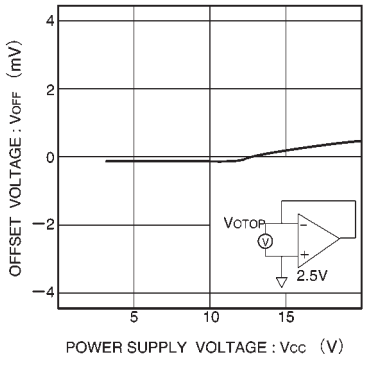


Fig. 7 Power supply voltage vs. I / O offset voltage

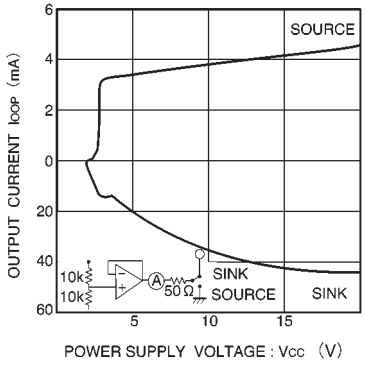


Fig. 8 Power supply voltage vs. operational amplifier drive current

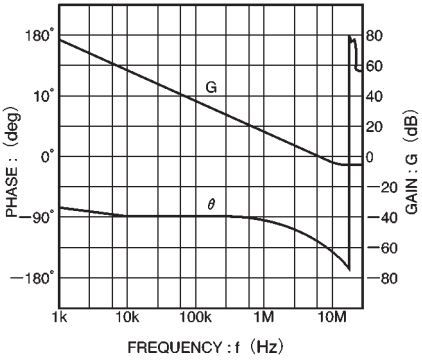
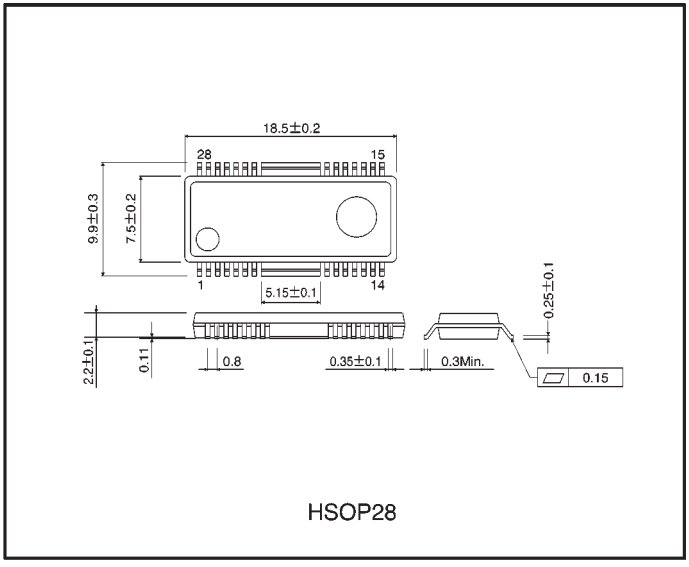


Fig. 9: Operational amplifier vs. open loop

●External dimensions (Units: mm)



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