

# 5-channel BTL driver for CD players

## BA6795FP

The BA6795FP is a 5-channel BTL power driver for CD players and has an internal 5V regulator (attached PNP transistor required). The loading and spindle motor output pins are dual-use output pins and are switched between drivers using a control input. In addition, the internal level shifting circuit reduces the number of external components.

### ●Applications

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

### ●Features

- 1) 5-channel BTL driver in a HSOP 28-pin package, ideal for application miniaturization.
- 2) Internal level shifting circuit reduces the number of external components.
- 3) Gain is adjustable with an attached resistor.
- 4) Internal thermal shutdown circuit.
- 5) Internal 5V regulator. (attached PNP transistor required)

### ●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V <sub>CC</sub>	18	V
Power dissipation	P <sub>d</sub>	1.7*1	W
Operating temperature	T <sub>opr</sub>	−35~+85	°C
Storage temperature	T <sub>stg</sub>	−55~+150	°C

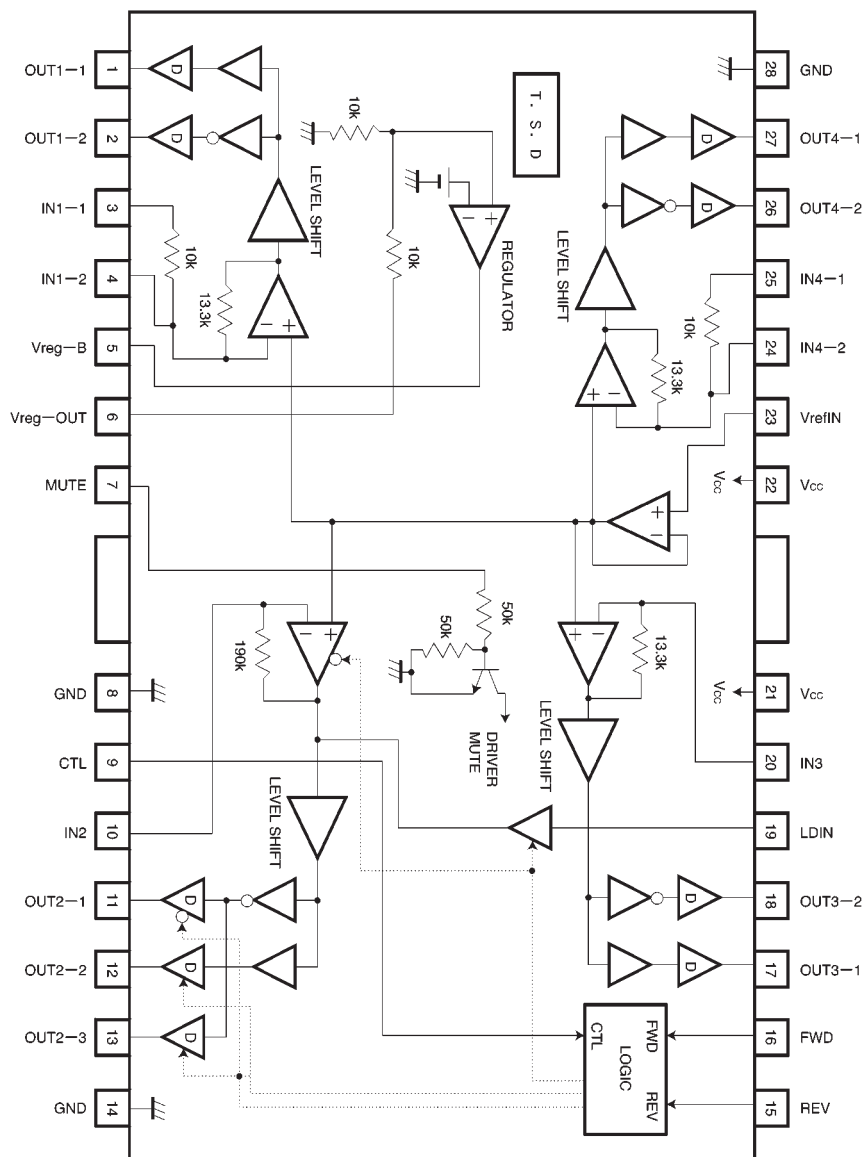
\*1 When mounted on a 50 mm×50 mm×1.0 mm paper phenol board  
Reduced by 13.6 mW for each increase in Ta of 1°C over 25°C.

### ●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V <sub>CC</sub>	4.8	—	12.0	V
		6.0	—	12.0	V*2

\*2 Without regulator

● Block diagram



## ● Pin descriptions

Pin No.	Pin name	Function
1	OUT—1	Channel 1 negative output
2	OUT—2	Channel 1 positive output
3	IN 1—1	Channel 1 input
4	IN 1—2	Channel 1 gain adjustment input
5	Vreg—B	Attached transistor base connection
6	Vreg—OUT	Constant voltage output (attached transistor collector connection)
7	MUTE	Mute-on control
8	GND	Ground
9	CTL	Loading/spindle switching
10	IN 2	Channel 2 gain adjustment input
11	OUT—1	Channel 2 positive output
12	OUT—2	Channel 2 negative output/Loading positive output
13	OUT—3	Loading negative output
14	GND	Substrate ground
15	REV	Loading reverse input
16	FWD	Loading forward input
17	OUT3—1	Channel 3 negative output
18	OUT3—2	Channel 3 positive output
19	LDIN	Loading input
20	IN 3	Channel 3 gain adjustment input
21	V <sub>CC</sub>	V <sub>CC</sub>
22	V <sub>CC</sub>	V <sub>CC</sub>
23	VrefIN	Bias amplifier input
24	IN 4—2	Channel 4 gain adjustment input
25	IN 4—1	Channel 4 input
26	OUT4—2	Channel 4 positive output
27	OUT4—1	Channel 4 negative output
28	GND	Substrate ground

Note 1: Positive and negative output is relative to the polarity of the input pins.

Note 2: Loading positive output and loading negative output indicate the phase relative to the mode.

●Electrical characteristics (unless otherwise noted, Ta = 25°C, V<sub>CC</sub> = 8V, f = 1kHz, R<sub>L</sub> = 8Ω)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Quiescent current dissipation	I <sub>CC</sub>	7.0	10.0	13.0	mA	No load
Mute-off voltage	V <sub>MOFF</sub>	2.0	—	—	V	
Mute-on voltage	V <sub>MON</sub>	—	—	0.5	V	
〈Drivers (other than loading drive)〉						
Output offset voltage 1	V <sub>OO1</sub>	−40	—	40	mV	Channels 1, 3 and 4, Driver
Output offset voltage 2	V <sub>OO2</sub>	−60	—	60	V	Channel 2 driver (spindle)
Maximum output voltage 1	V <sub>OH1</sub>	3.8	4.3	—	V	V <sub>IN</sub> =8V
Maximum output voltage 2	V <sub>OH2</sub>	—	−4.3	−3.8	V	V <sub>IN</sub> =0.7V
Closed loop voltage gain 1	G <sub>VC1</sub>	5.5	8.0	10.5	dB	V <sub>IN</sub> = μ 0.5V *1
Closed loop voltage gain 2	G <sub>VC2</sub>	7.5	11.0	14.5	dB	V <sub>IN</sub> = μ 0.5V *2
Ripple rejection	RR	—	60	—	dB	V <sub>IN</sub> =0.1V <sub>rms</sub> , 100Hz
Slew rate	SR	—	2.0	—	V/μs	100 Hz square wave, 3V <sub>P-P</sub> output
〈Loading drivers〉						
Output voltage F	V <sub>OF</sub>	2.7	3.2	3.7	V	V <sub>CC</sub> =8V, R <sub>L</sub> =45Ω, V <sub>LD</sub> =3.0V
Output voltage R	V <sub>OR</sub>	−2.5	−3.0	−3.5	V	
Output voltage range F	V <sub>OMF</sub>	1.9	2.2	—	V	V <sub>CC</sub> =8V, R <sub>L</sub> =45Ω, V <sub>LD</sub> =4.5V *3
Output voltage range R	V <sub>OMR</sub>	—	−2.2	−1.9	V	
Output load variation F1	Δ V <sub>F1</sub>	—	250	500	mV	V <sub>CC</sub> =8V, V <sub>LD</sub> =3.0V I=100→400mA *4
Output load variation R1	Δ V <sub>R1</sub>	—	250	500	mV	
Output load variation F2	Δ V <sub>F2</sub>	—	600	850	mV	V <sub>CC</sub> =5V, V <sub>LD</sub> =4.5V I=100→400mA *5
Output load variation R2	Δ V <sub>R2</sub>	—	600	850	mV	
Supply voltage variation F	Δ V <sub>FL</sub>	−500	—	500	mV	V <sub>CC</sub> =4.8V→12V, R <sub>L</sub> =∞
Supply voltage variation R	Δ V <sub>RL</sub>	−500	—	500	mV	
Output offset voltage	V <sub>OOL</sub>	−50	2.0	50	mV	When braking: Output voltage
〈Controllers CTL, FWD and REV〉						
Input high level voltage 1	V <sub>IH1</sub>	2.0	—	—	V	FWD (pin 16), REV (pin 15) Determined by input pin voltage
Input low level voltage 1	V <sub>IL1</sub>	—	—	0.5	V	
Input high level voltage 2	V <sub>IH2</sub>	4.0	—	—	V	CTL (pin 9) Determined by input pin voltage
Input low level voltage 2	V <sub>IL2</sub>	—	—	0.5	V	
Input high level current	I <sub>IH</sub>	—	—	500	μA	V <sub>IN</sub> =5V
Input low level current	I <sub>IL</sub>	—	—	500	μA	V <sub>IN</sub> =0V
〈5 V regulator〉						
Output voltage	V <sub>reg</sub>	4.75	5.00	5.25	V	I <sub>L</sub> =100mA
Output load variation	Δ V <sub>RL</sub>	−50	0	50	mV	I <sub>L</sub> =0~200mA
Supply voltage variation	Δ V <sub>VCC</sub>	−50	0	25	mV	(V <sub>CC</sub> =6~9V) I <sub>L</sub> =100mA

◎Not designed for radiation resistance.

\*1 Attach a 10 kΩ resistor to the inputs (channel 1, channel 3 and channel 4).

\*2 Attach a 100 kΩ resistor to the inputs (channel 2).

\*3 V<sub>omf</sub> and V<sub>omr</sub> remain roughly the same even when loading input V<sub>LD</sub> (pin 19) is opened.

\*4 Δ V<sub>r1</sub>, Δ V<sub>r1</sub> indicate load variation at unclipped, 3.0 V output.

\*5 Δ V<sub>r2</sub>, Δ V<sub>r2</sub> indicate load variation when output is clipped to generate 4.5 V input at reduced voltage (5 V).

## ● Measurement circuit

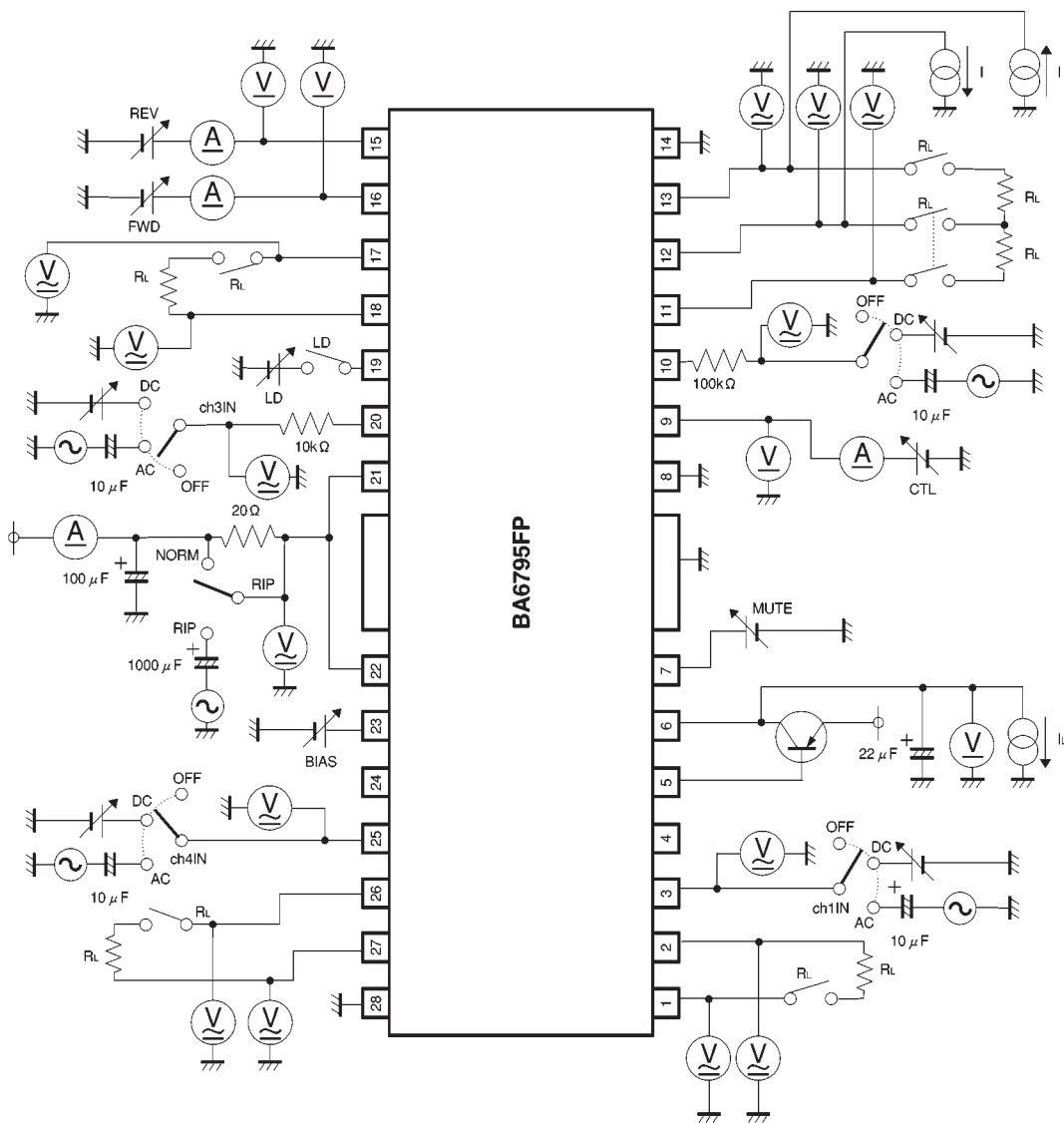


Fig.1

## ● Measurement circuit switch table

Parameter	Switch								Note
	RL	RL'	LD	RIP	CH1	CH2	CH3	CH4	
Quiescent current dissipation	OFF	OFF	OFF	NORM	OFF	OFF	OFF	OFF	
Mute-off voltage	ON	ON	↓	↓	DC	DC	DC	DC	DC : V <sub>CC</sub> or GND
Mute-on voltage	ON	ON	↓	↓	DC	DC	DC	DC	DC : V <sub>CC</sub> or GND
〈Drivers (other than loading driver)〉									
Output offset voltage	ON	ON	OFF	NORM	DC	DC	DC	DC	DC: bias voltage
Maximum output voltage	↓	↓	↓	↓	↓	↓	↓	↓	DC : V <sub>CC</sub> or 0.7V
Closed loop voltage gain 1	↓	↓	↓	↓	↓	↓	↓	↓	DC: bias $\pm 0.5$ V
Closed loop voltage gain 2	↓	↓	↓	↓	↓	↓	↓	↓	DC: bias $\pm 0.5$ V
Ripple rejection	↓	↓	↓	RIP	↓	↓	↓	↓	DC: bias voltage
Slew rate	↓	↓	↓	NORM	AC	AC	AC	AC	AC: 100 Hz square wave
〈Loading drivers〉									
Output voltage F	ON	ON	ON	NORM	OFF	DC	OFF	OFF	DC: bias voltage
Output voltage R	↓	↓	↓	↓	↓	↓	↓	↓	DC: bias voltage
Output voltage range F	↓	↓	↓	↓	↓	↓	↓	↓	DC: bias voltage
Output voltage range R	↓	↓	↓	↓	↓	↓	↓	↓	DC: bias voltage
Load regulation F	↓	OFF	↓	↓	↓	↓	↓	↓	DC: bias voltage
Load regulation R	↓	↓	↓	↓	↓	↓	↓	↓	DC: bias voltage
Line regulation	↓	↓	↓	↓	↓	↓	↓	↓	DC: bias voltage
Output offset voltage	↓	ON	OFF	↓	↓	↓	↓	↓	DC: bias voltage (brake mode)
〈Controller pins〉									
Input high level voltage 1	ON	ON	OFF	NORM	OFF	DC	OFF	OFF	
Input low level voltage 1	↓	↓	↓	↓	↓	↓	↓	↓	
Input high level voltage 2	↓	↓	↓	↓	↓	↓	↓	↓	
Input low level voltage 2	↓	↓	↓	↓	↓	↓	↓	↓	
Input low level current	OFF	OFF	OFF	↓	↓	OFF	↓	↓	
〈5 V regulator〉									
Output voltage	OFF	OFF	OFF	NORM	OFF	OFF	OFF	OFF	
Load regulation	↓	↓	↓	↓	↓	↓	↓	↓	
Line regulation	↓	↓	↓	↓	↓	↓	↓	↓	

\* When measuring drivers (excluding loading driver), CTL voltage should be under 0.5 V.

\* I and I<sub>L</sub>, used in the test circuit diagram, are the same as the symbols used in electrical characteristics table.

●Circuit operation

(1) Switching between spindle and loading motor driver output modes ( $V_{CC} = 8V$ )

CTL	FWD	REV	Spindle	Loading		Dimensions
L	L	L	ON	OFF		Fig. 2
		H				
	H	L				
		H				
H	L	L	OFF	OFF	High impedance	Fig. 3
		H		ON	Reverse	Fig. 4
	H	L			Forward	Fig. 5
		H			Brake	Fig. 6

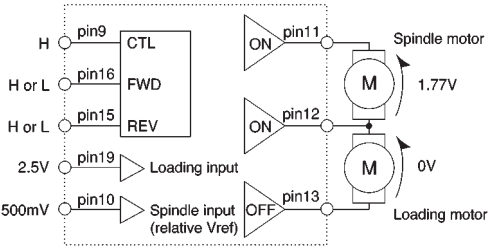


Fig. 2

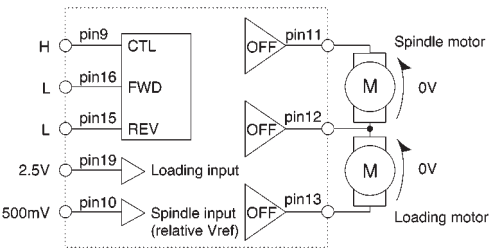


Fig.3

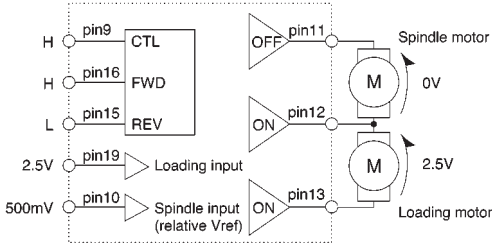


Fig. 4

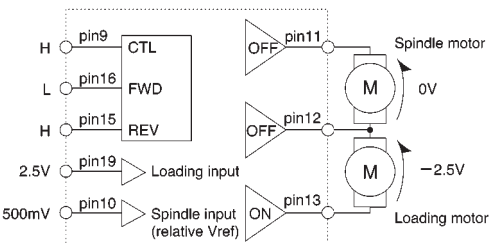


Fig. 5

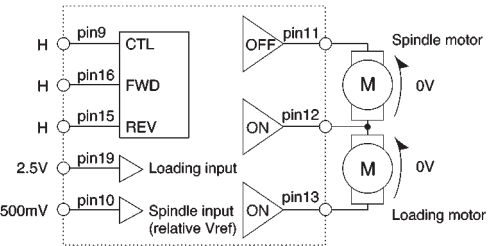
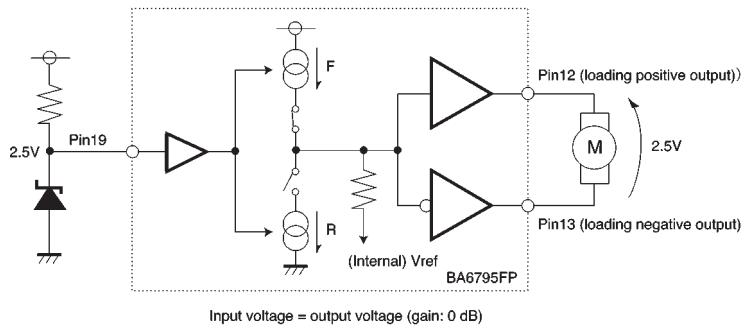


Fig. 6

Note: Gains for spindle driver (channel 2) and loading driver are 11dB and 0dB, respectively.

● Circuit operation

(2) Loading motor driver voltage setting (forward mode)



Note: When the loading input pin (pin 19) is opened, a voltage corresponding to the dynamic range of the power supply being used is output according to the mode.

Fig. 7



## ●Application example

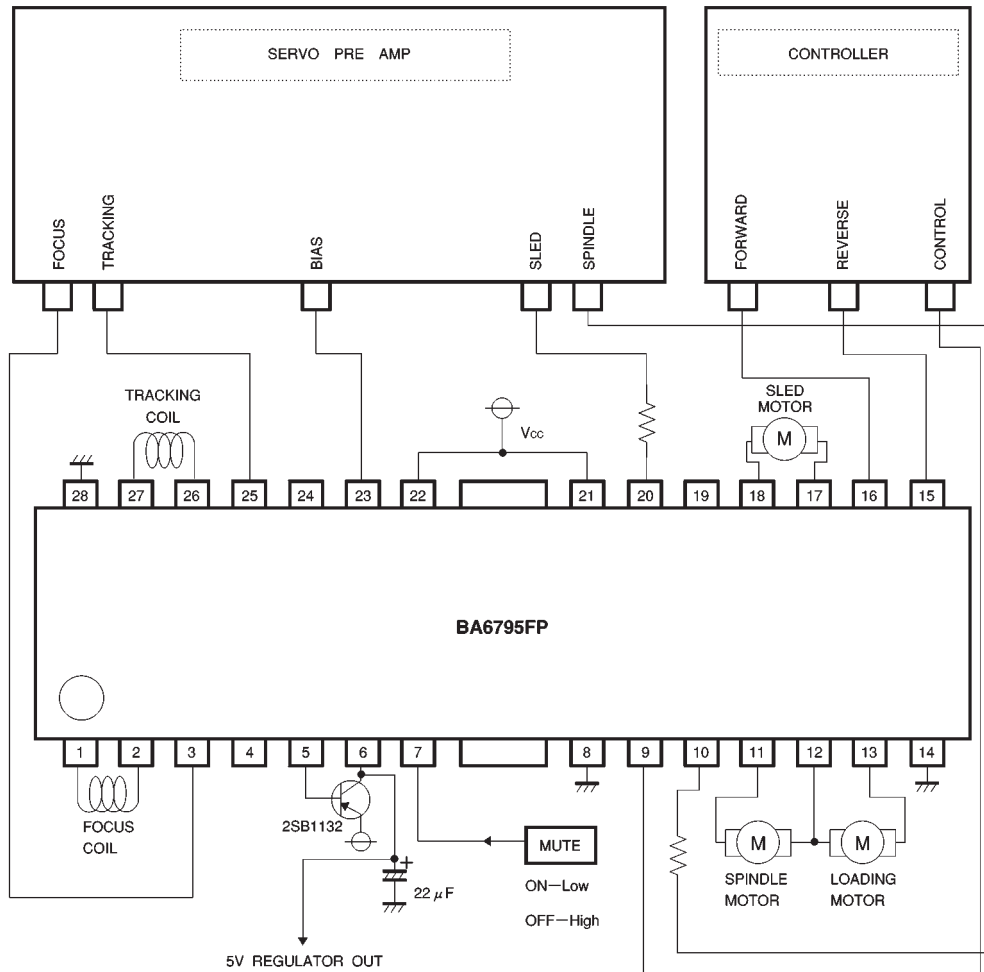


Fig.8

### ● Operation notes

- (1) The BA6795FP has an internal thermal shutdown circuit. Output current is muted when the chip temperature exceeds 175°C (typically).
- (2) If the mute pin (pin 7) voltage is opened or lowered below 0.5V, the output current will be muted. Pin 7 should be pulled up above 2.0V during normal use.
- (3) The bias pin (pin 23) is muted when lowered below 1.4V (typically). Make sure it stays above 1.6V during normal use.
- (4) 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  $(V_{CC}-V_F)/2$ .

- (5) The driver circuit shuts down when the supply voltage drops below 4.3V (typically), and starts up again when the voltage rises above 4.5V (typically).
- (6) Fluctuation due to temperature occurs in the gain when using an attached resistor as the input resistor for a driver other than the spindle driver (typically 2200ppm per degree) or for the spindle driver (typically 4600ppm per degree). (Only when using the gain adjustment pin.)
- (7) Be sure to connect the IC to a 0.1μF bypass capacitor to the power supply, at the base of the IC.
- (8) The radiating fin is connected to the package's internal GND, but should also be connected to an external ground.
- (9) The capacitor between regulator output (pin 6) and GND also serves to prevent oscillation of the IC, so select one with good temperature characteristics.

### ● Electrical characteristic curves

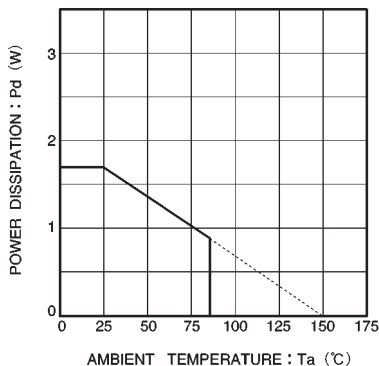


Fig. 9 Thermal derating curve

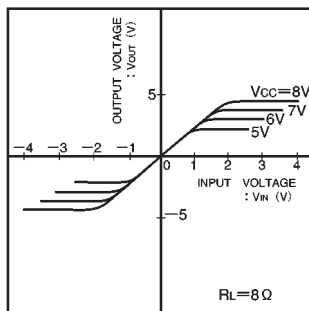


Fig. 10 Driver I / O characteristics (when load changes) (except channel 2)

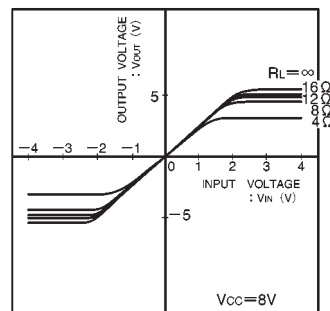


Fig. 11 Driver I / O characteristics (when power supply voltage power changes) (except channel 2)

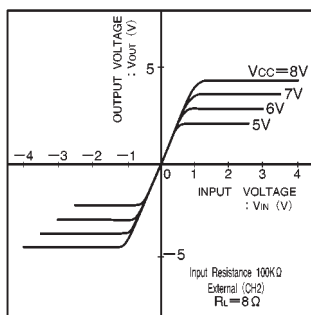


Fig. 12 Driver I / O characteristics (channel 2)

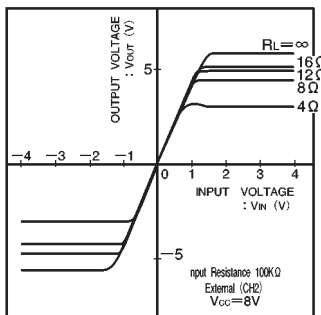
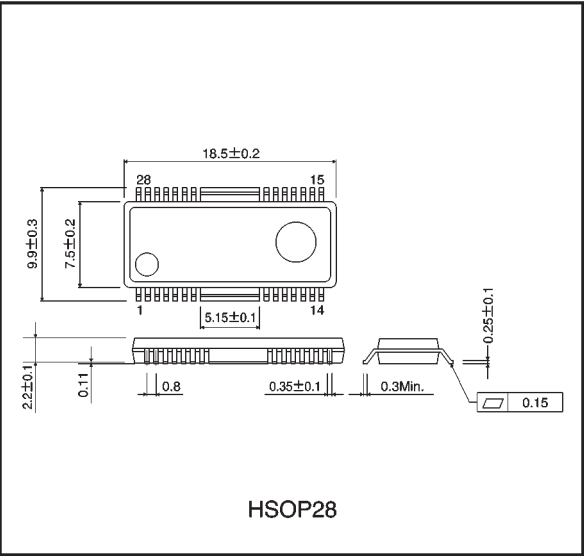


Fig. 13 Driver I / O characteristics (channel 2)

●External dimensions (Units: mm)



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