

5-channel BTL driver for CD players

BA6395AFP

The BA6395AFP is a 5-channel BTL driver for CD player motors and actuators. This IC has an internal 5V regulator, and is suited to a wide range of applications.

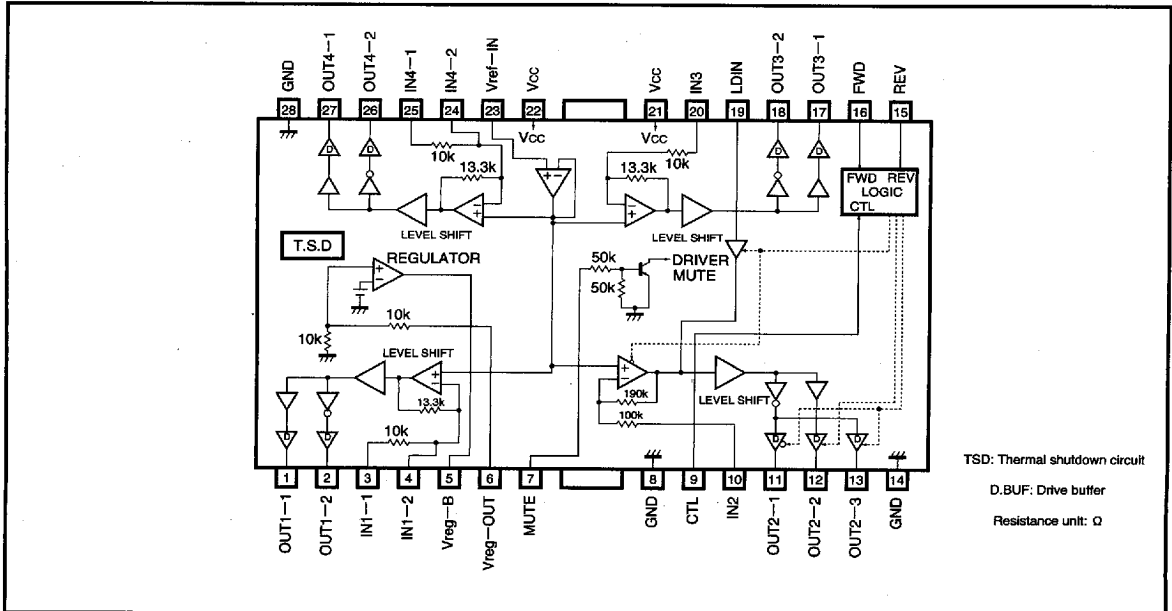
●Applications

CD players and CD-ROM drives

●Features

- 1) Internal drivers for focus coils, tracking coils, spindle motors, feed motors and loading. (The loading and spindle motor output pins are dual-use output pins and are switched between drivers using a control input.)
- 2) HSOP 28-pin package allows for miniaturization of applications.
- 3) Low number of external components.
- 4) Driver gain is adjustable with a single attached resistor.
- 5) Internal 5V regulator. (requires attached PNP transistor)
- 6) Internal thermal shutdown circuit.

●Block diagram



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● Pin descriptions

Pin No.	Pin name	Description
1	OUT1—1	Driver CH1 negative output
2	OUT1—2	Driver CH1 positive output
3	IN1—1	Driver CH1 input
4	IN1—2	Driver CH1 input, gain adjustment pin
5	Vreg—B	Connect to external transistor base
6	Vreg—OUT	Constant voltage output, connects to external transistor collector
7	MUTE	Mute control input
8	GND	Ground
9	CTL	Loading and driver CH2 switch
10	IN2	Driver CH2 input
11	OUT2—1	Driver CH2 positive output
12	OUT2—2	Driver CH2 negative output/loading output pin
13	OUT2—3	Loading negative output pin
14	GND	Ground
15	REV	Loading input, reverse
16	FWD	Loading input, forward
17	OUT3—1	Driver CH3 negative output
18	OUT3—2	Driver CH3 positive output
19	LDIN	Loading input
20	IN3	Driver CH3 input
21	Vcc	Power supply
22	Vcc	Power supply
23	Vref—IN	Bias amplifier input
24	IN4—2	Driver CH4 gain adjustment pin
25	IN4—1	Driver Ch4 input
26	OUT4—2	Driver CH4 positive output
27	OUT4—1	Driver CH4 negative output
28	GND	Ground

Note: "Positive output" and "negative output" indicate polarity relative to input.

CD/CD-ROM Drivers (5~6 channels)

For CDs/CD-ROMs

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● Input/output circuits

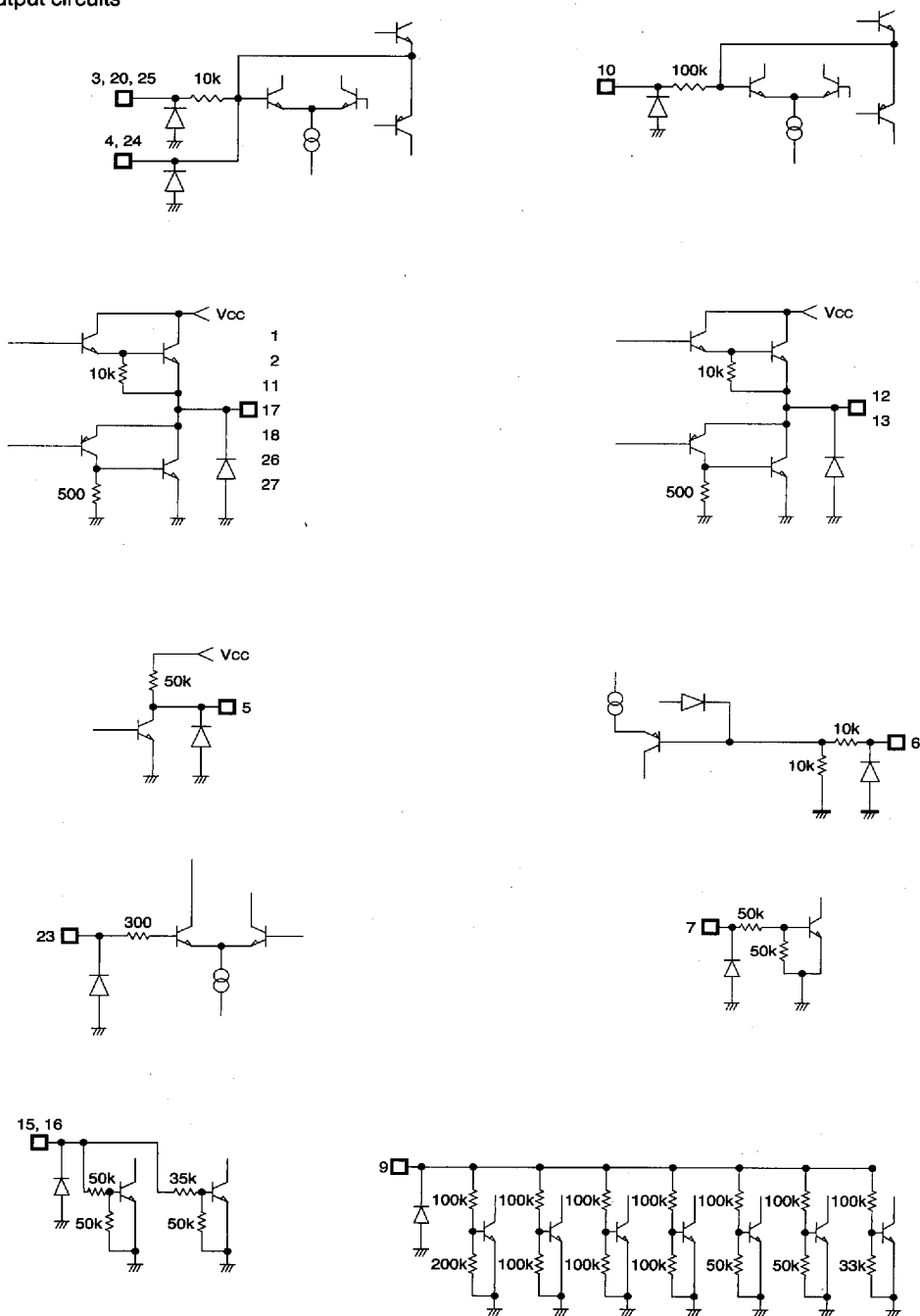


Fig. 1

●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V _{CC}	18	V
Power dissipation	P _d	1.7*1	W
Operating temperature	T _{opr}	−35~85	°C
Storage temperature	T _{stg}	−55~150	°C

*1. When mounted to 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 range (Ta=25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V _{CC}	6~12*2	V

*2. The driver can operate as low as 4.8 V.

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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
Quiescent current	ICC	7.0	10.0	13.0	mA	No load
Mute-off voltage	V _{MOFF}	2.0	—	—	V	
Mute-on voltage	V _{MON}	—	—	0.5	V	
〈Drivers (other than loading driver)〉						
Output offset voltage 1	V _{OO1}	—40	—	40	mV	CH1, CH3, CH4 drivers
Output offset voltage 2	V _{OO2}	—60	—	60	mV	CH2 driver (spindle)
Maximum output voltage 1	V _{OH1}	3.8	4.3	—	V	V _{in} =0.7V
Maximum output voltage 2	V _{OH2}	—	—4.3	—3.8	V	V _{in} =8V
Closed loop voltage gain 1	G _{VC1}	7.0	8.0	9.0	dB	V _{in} =0.5V (excluding spindle)
Closed loop voltage gain 2	G _{VC2}	8.5	11.0	13.5	dB	V _{in} =0.5V (pindle)
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
〈Loading driver〉						
Output voltage F	V _{OF}	2.7	3.2	3.7	V	V _{cc} =8V, RL=45Ω, VLD=3.0V
Output voltage R	V _{OR}	—2.5	—3.0	—3.5	V	
Output voltage range F	V _{OMF}	1.9	2.2	—	V	V _{cc} =5V, RL=10Ω, VLD=4.5V *1
Output voltage range R	V _{OMR}	—	—2.2	—1.9	V	
Load regulation F 1	ΔV _{F1}	—	250	500	mV	V _{cc} =8V, VLD=3.0V
Load regulation R 1	ΔV _{R1}	—	250	500	mV	I=100→400mA *2
Load regulation F 2	ΔV _{F2}	—	600	850	mV	V _{cc} =5V, VLD=4.5V
Load regulation R 2	ΔV _{R2}	—	600	850	mV	I=100→400mA *2
Line regulation F	ΔV _{FL}	—500	—	500	mV	V _{cc} =4.8V→12V, RL=∞
Line regulation R	ΔV _{RL}	—500	—	500	mV	
Output offset voltage	V _{OO}	—50	—	50	mV	
〈Controller CTL, FWD, REV pins〉						
Input voltage 1, high level	V _{IH1}	2.0	—	—	V	FWD (16pin)、REV (15pin) Determined by input pin voltage
Input voltage 1, low level	V _{IL1}	—	—	0.5	V	
Input voltage 2, high level	V _{IH2}	4.0	—	—	V	CTL (9pin) Determined by input pin voltage
Input voltage 2, low level	V _{IL2}	—	—	0.5	V	
Input current, high	I _{IH}	—	—	500	μA	V _{in} =5V
Input current, low	I _{IL}	—	—	500	μA	V _{in} =0V
〈5 V regulator〉						
Output voltage	V _{reg}	4.75	5.00	5.25	V	IL=100mA
Load regulation	ΔV _{RL}	—50	0	50	mV	IL=0~200mA
Line regulation	ΔV _{VCC}	—10	0	25	mV	(V _{cc} =6~9V) IL=0~100mA

*1 Vomf and Vomr remain roughly the same even when loading input VLD (pin 19) is opened.

*2 ΔV_{F1}、ΔV_{R1} indicate load variation at unclipped, 4.5 V output.

ΔV_{F2}、ΔV_{R2} indicate load variation when output is clipped to generate 4.5 V input at reduced voltage (5 V)

This is the load variation in this state.

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● Circuit operation

1. Driver

Inputs to the IC are the focus tracking error signal from the servo preamplifier and the control signal from the motor. The input signals, which normally center on 2.5V, are V/I converted by the preamplifier, generating a current corresponding to the input voltage. This current is passed through a resistor

and into the internal reference voltage component, the preamplifier output being a signal centering on the internal reference voltage. Two systems (positive phase and negative phase) are created during V/I conversion, generating BTL output via the driver buffer.

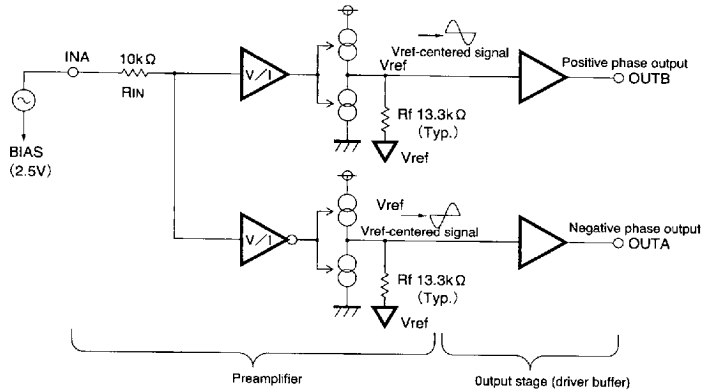


Fig. 2

2. Regulator

This is a typical series regulator that generates a reference voltage internally. A PNP low saturation transistor must be connected.

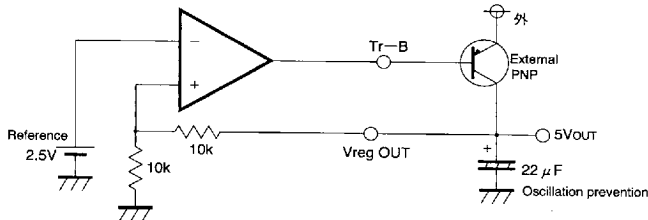


Fig. 3

3. Operational amplifier

A standard 4558 type.

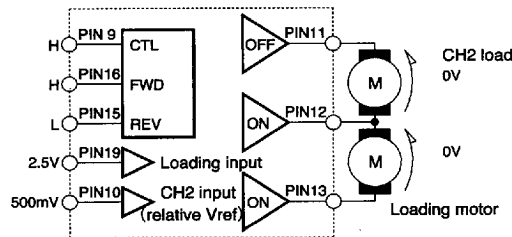
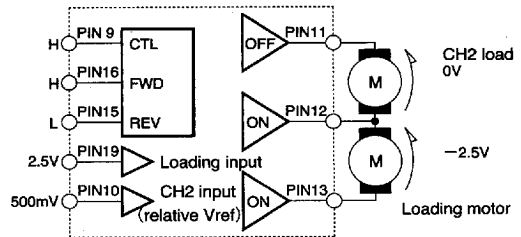
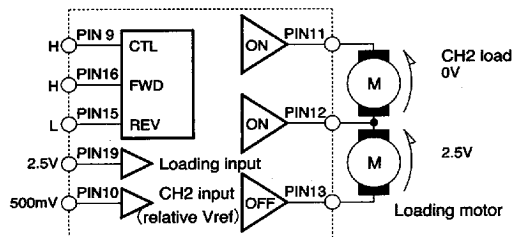
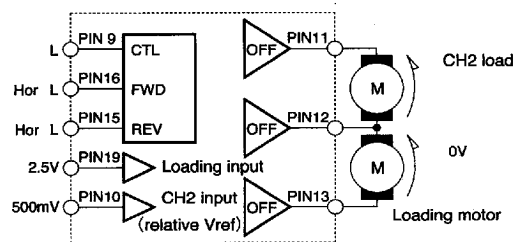
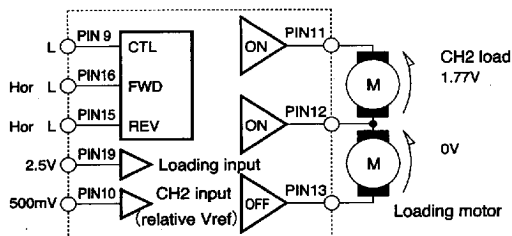
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● Circuit operation

4. CH2/loading motor driver output mode switching ($V_{CC}=8V$)

CTL	FWD	REV	CH2	Loading		Illustration
L	L	L	ON	OFF		Fig. 4
		H				
	H	L				
		H				
H	L	L	OFF	OFF	High impedance	Fig. 5
		H		ON	Reverse	Fig. 6
	H	Forward			Fig. 7	
		Brake			Fig. 8	



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5. Loading motor driver voltage setting

Example : Forward motor

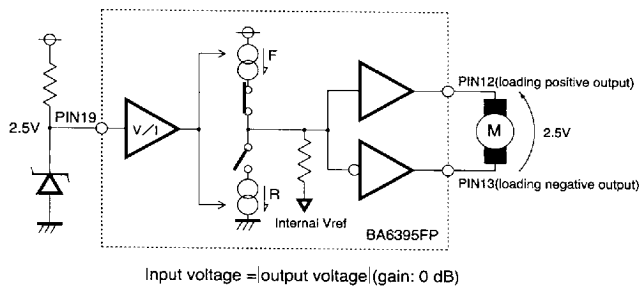


Fig. 9

※ Loading 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 opening the loading pin (pin 19).

●Application example

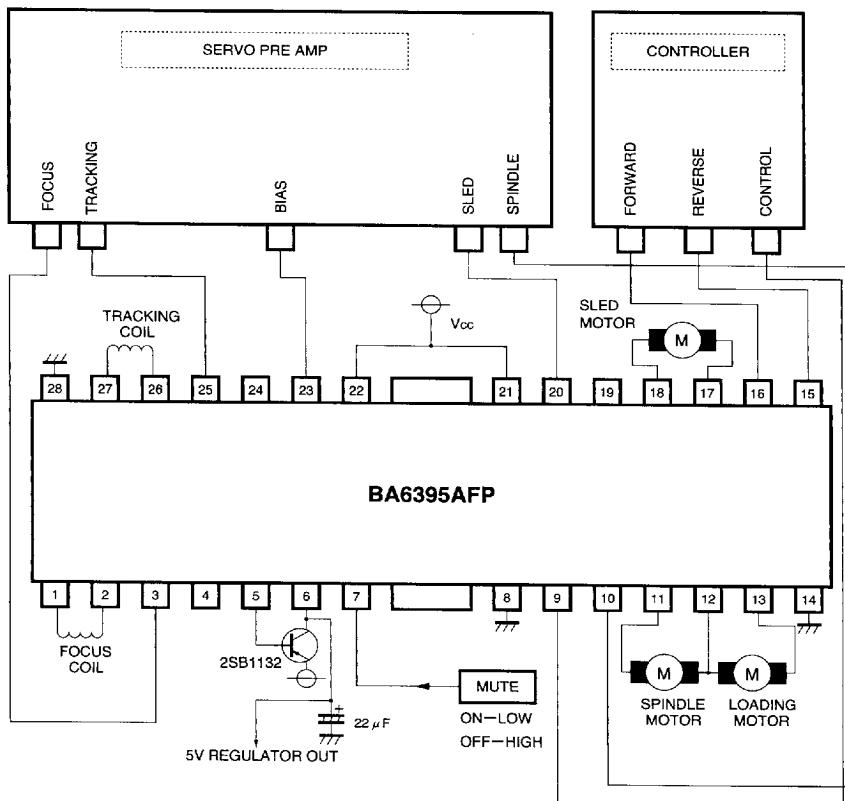


Fig. 10

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● Operation notes

1. The BA6795AFP has an internal thermal shutdown circuit. Output current is muted when the chip temperature exceeds 175°C (typically).
2. If the mute pin (7 pin) 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 (23 pin) is muted when lowered below 1.4V (typically). make sure it stays above 1.6V during normal use.
4. 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).
5. 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 $(V_{CC}-V_F)/2$.
6. The internal input resistor has a positive temperature coefficient of roughly 2000ppm/degree, and so when changing the gain using an attached resistor, gain will also change at a rate of roughly 2000ppm/degree. There is virtually no gain variation due to temperature when using the internal input resistor.
7. Be sure to connect the IC to a 0.1 μ F 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 (6 pin) and GND also serves to prevent oscillation of the IC, so select one with good temperature characteristics.

● Thermal reduction curves

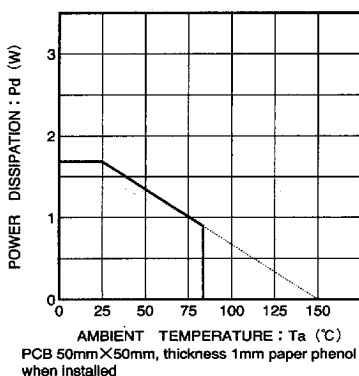


Fig. 11 Thermal derating curve

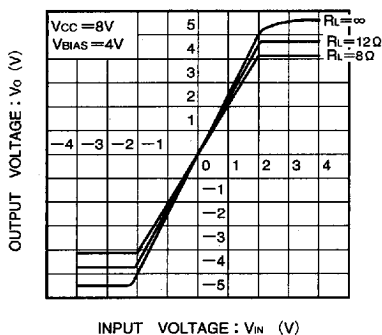


Fig. 12 Output voltage vs. input voltage (CH1, CH3 and CH4)

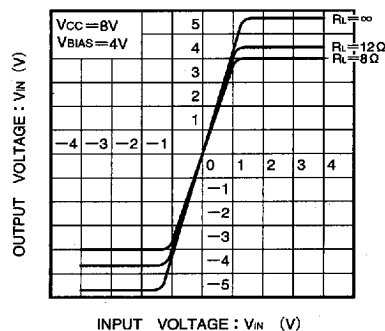


Fig. 13 Output voltage vs. input voltage (CH2)

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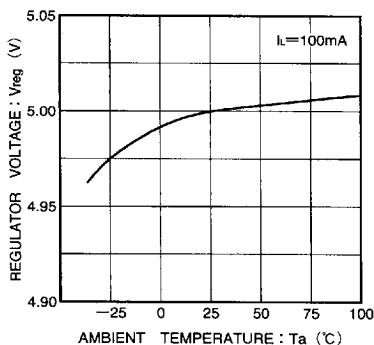
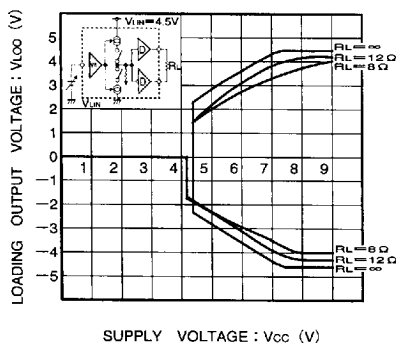
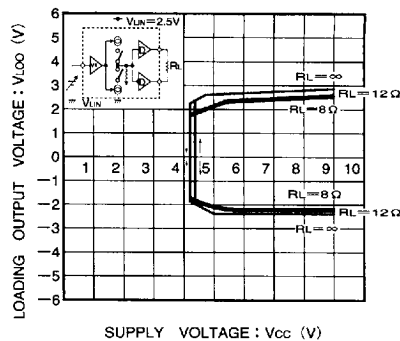
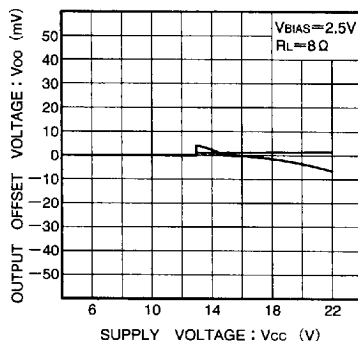
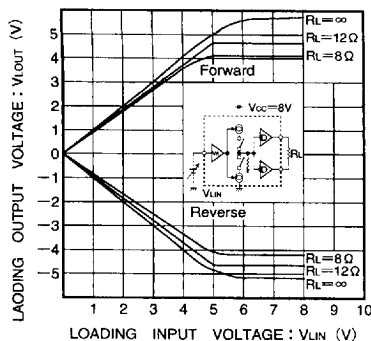
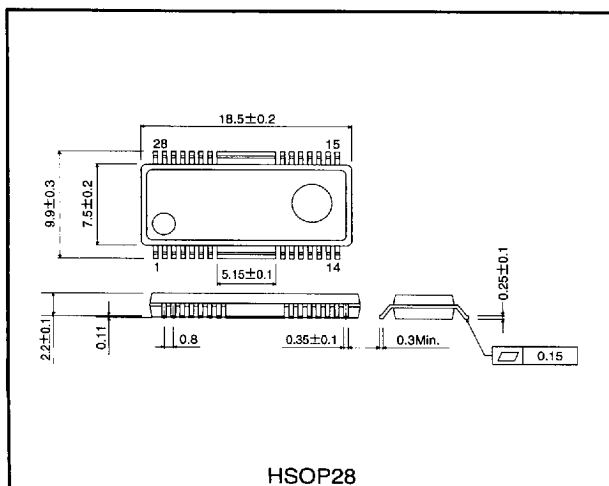


Fig. 17 Loading output vs. supply voltage

Fig. 18 Regulator voltage vs. ambient temperature

● External dimensions (Units: mm)



7 8 2 8 9 9 9 0 0 1 8 1 2 8 5 1 7

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