

## 3-channel BTL driver for CD Players

### BA6199FP

The BA6199FP, an IC for CD players, has an internal 3-channel H-bridge BTL power driver, 5V regulator (attached PNP transistor required), standard operational amplifier, and reset output.

#### ●Applications

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

#### ●Features

- 1) HSOP 28-pin package allows for miniaturization of applications.
- 2) Wide dynamic range.
- 3) Reset output pin.
- 4) Internal thermal shutdown circuit.
- 5) Gain is adjustable with an attached resistor.
- 6) Internal 5V regulator. (attached PNP transistor required)
- 7) Internal standard operational amplifier.

#### ●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>	1700*1	mW
Operating temperature range	T <sub>opr</sub>	-30~85	°C
Storage temperature range	T <sub>stg</sub>	-50~150	°C
Rated current	I <sub>oMax</sub>	1.4*2	A

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

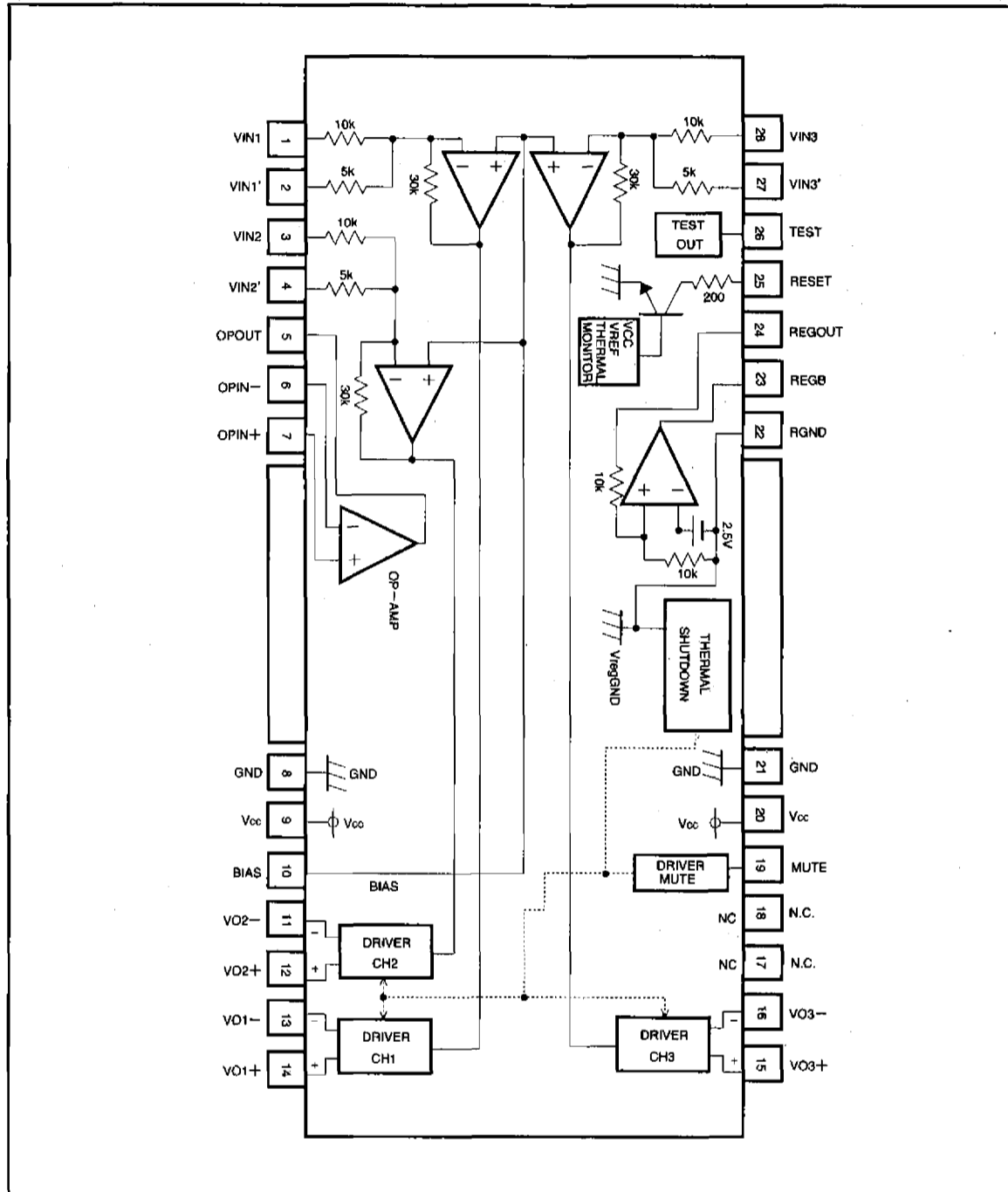
\*2 Within the range of power dissipation and safe operational area (ASO)

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

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V <sub>cc</sub>	6	—	11	V
		4.8	—	11	V*3

\*3 Without regulator

●Block diagram



For CDs/CD-ROMs  CD/CD-ROM Drivers (1~3 channels)

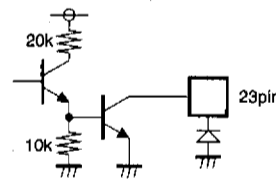
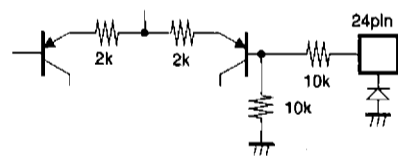
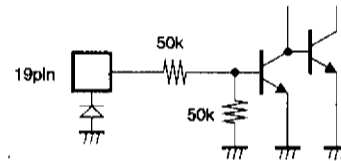
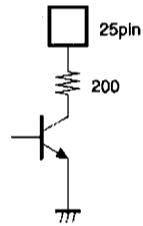
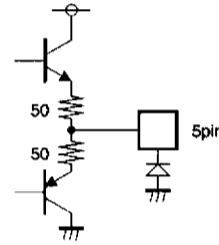
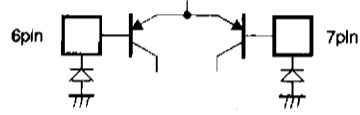
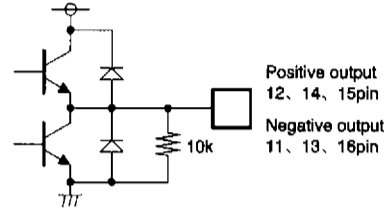
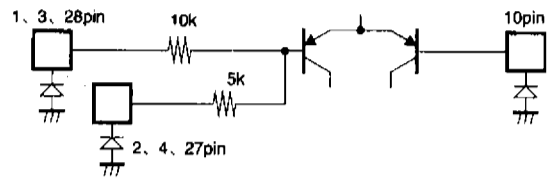
Optical Disc ICs

## ● Pin descriptions

Pin No.	Pin name	Function
1	VIN1	Channel 1 input
2	VIN1'	Changing channel 1 gain
3	VIN2	Channel 2 input
4	VIN2'	Changing channel 2 gain
5	OPOUT	Operational amplifier output
6	OPIN-	Operational amplifier negative input
7	OPIN+	Operational amplifier positive input
8	GND	Substrate ground
9	Vcc	Vcc
10	BIAS	Bias input
11	VO2-	Channel 2 negative output
12	VO2+	Channel 2 positive output
13	VO1-	Channel 1 negative output
14	VO1+	Channel 1 positive output
15	VO3+	Channel 3 positive output
16	VO3-	Channel 3 negative output
17	N.C	
18	N.C	
19	MUTE	Mute control
20	Vcc	Vcc
21	GND	Substrate ground
22	RGND	Regulator ground
23	REGB	Connect to base of attached transistor
24	REGOUT	5 V output (Note 4)
25	RESET	Reset output
26	TEST	Test pin
27	VIN3'	Changing Channel 3 gain
28	VIN3	Channel 3 input

Notes: 1. "Driver positive output" and "driver negative output" indicate polarity relative to input.  
 2. The radiating fin is internally shorted by pin 8 (GND).  
 3. Pin 22 is the ground pin for the regulator and internal voltage source and so must be connected to a ground even if the regulator is not used.  
 4. Attach a PNP transistor collector.

● Input/output circuits



CD/CD-ROM Drivers (1~3 channels)  
For CDs/CD-ROMs

●Electrical characteristics (unless otherwise noted, Ta=25°C, Vcc=8V, RL=8Ω)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement Circuit
(Driver)							
Quiescent current	I <sub>o</sub>	1.5	5.0	7.5	mA	No load	Fig.1
Input voltage, offset	V <sub>oi</sub>	-5	0	5	mV		Fig.1
Output voltage, offset	V <sub>oc</sub>	-5	0	5	mV		Fig.1
Dead zone	V <sub>oe</sub>	10	20	30	mV	(Total for positive and negative)	Fig.1
Max. output amplitude	V <sub>om</sub>	5.6	6.0	—	V	Differential output	Fig.1
Voltage gain	G <sub>vc</sub>	7.0	9.5	11.5	dB	V <sub>in</sub> = 500 mV, differential output	Fig.1
Positive/negative output voltage gain differential	ΔG <sub>vc</sub>	-0.9	0	0.9	dB	as above	Fig.1
Ripple rejection	RR	—	80	—	dB	V <sub>in</sub> =0.1Vrms, 100Hz	Fig.1
Mute-off voltage	V <sub>MOFF</sub>	2.0	—	—	V		Fig.1
Mute-on voltage	V <sub>MON</sub>	—	—	0.5	V		Fig.1
Reset-on threshold voltage	V <sub>RON</sub>	4.75	5.00	5.25	V	V <sub>cc</sub> reset-on voltage	Fig.1
Reset hysteresis voltage	ΔV <sub>RH</sub>	0.15	0.30	0.66	V	V <sub>cc</sub> reset hysteresis amplitude	Fig.1
Reset-off output voltage	V <sub>RESOFF</sub>	4.0	—	—	V	30KΩ at 5V	Fig.1
Reset-on output voltage	V <sub>RESON</sub>	—	—	0.5	V	as above	Fig.1
(5 V regulator)							
Output voltage	V <sub>REG</sub>	4.75	5.00	5.25	V	I <sub>L</sub> =100mA	Fig.1
Output load differential	ΔV <sub>RL</sub>	-50	0	10	mV	I <sub>L</sub> =0~200mA	Fig.1
Input variation	ΔV <sub>VCC</sub>	-10	0	40	mV	(V <sub>cc</sub> =6~11V) I <sub>L</sub> =100mA	Fig.1
Drop voltage	V <sub>DIF</sub>	—	0.3	0.6	V	V <sub>cc</sub> =4.7V, I <sub>L</sub> =200mA *1	Fig.1
Vreg amplifier output current	I <sub>REG</sub>	8	20	—	mA	V <sub>cc</sub> = 4.7V, 3 v impressed *2	Fig.1
(Operational amplifier)							
Offset voltage	V <sub>OFOP</sub>	-5	0	5	mV		Fig.1
Input bias current	I <sub>BOP</sub>	—	—	300	nA		Fig.1
Output voltage, H level	V <sub>OHOP</sub>	6.5	7.2	—	V		Fig.1
Output voltage, L level	V <sub>LOP</sub>	—	—	1.8	V		Fig.1
Output drive current (sink)	I <sub>SINK</sub>	10	40	—	mA	50Ω at V <sub>cc</sub>	Fig.1
Output drive current (source)	I <sub>SOURCE</sub>	10	40	—	mA	50Ω at GND	Fig.1
Open loop voltage gain	G <sub>vo</sub>	—	72	—	dB	V <sub>in</sub> =-75dBV, 1KHz	Fig.1
Slew rate	SR	—	1	—	V/μS	100 Hz square wave	Fig.1

© Not designed for radiation resistance

\*1 When power transformer satisfies characteristic V<sub>sa</sub>: < 0.2 V at 200 mA (IC).

\*2 24-pin = open



● Measurement circuit switch table

Symbol	Switch										Input		Note
	RL	CH1IN	CH2IN	CH3IN	RIPPLE	REG1	REG2	NF	OPIN	GVO	OPI	BIAS	
<b>(Driver)</b>													
I <sub>o</sub>	OFF	OFF	ON	ON	NORM	SHORT	OPEN	OFF	OPEN	2.5V	2V		
V <sub>oi</sub>	ON	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓		
V <sub>oo</sub>	↓	ON (2.5V)	↓	↓	↓	↓	↓	↓	↓	↓	↓		
V <sub>DB</sub>	↓	ON (Approx. 2.5V)	↓	↓	↓	↓	↓	↓	↓	↓	↓		
V <sub>OM</sub>	↓	ON (1V, 7V)	↓	↓	↓	↓	↓	↓	↓	4V	↓		
G <sub>vc</sub>	↓	ON (2V, 3V)	↓	↓	↓	↓	↓	↓	↓	2.5V	↓		
ΔG <sub>vc</sub>	↓	ON (2V, 3V)	↓	↓	↓	↓	↓	↓	↓	↓	↓		
RR	↓	ON (2.5V)	OFF	↓	↓	↓	↓	↓	↓	↓	↓		SG1 : 0.1Vrms, 100Hz
V <sub>MOFF</sub>	↓	ON (3V)	ON	↓	↓	↓	↓	↓	↓	↓	↓		
V <sub>MON</sub>	↓	ON (3V)	↓	↓	↓	↓	↓	↓	↓	↓	0.5V		
V <sub>RON</sub>	—	OFF	↓	↓	↓	↓	↓	↓	↓	↓	2V		
ΔV <sub>RH</sub>	—	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓		
V <sub>RESON</sub>	—	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓		
V <sub>RESOFF</sub>	—	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓		
V <sub>RESON</sub>	—	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓		
<b>(5 V regulator)</b>													
V <sub>REG</sub>	OFF	OFF	ON	ON	NORM	SHORT	OPEN	OFF	OPEN	2.5V	2V		I <sub>L</sub> =100mA
ΔV <sub>RL</sub>	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓		I <sub>L</sub> =0~200mA
ΔV <sub>VCC</sub>	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓		I <sub>L</sub> =100mA, V <sub>CC</sub> =6~11V
V <sub>DIF</sub>	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓		V <sub>CC</sub> =4.7A, I <sub>L</sub> =200mA
I <sub>REG</sub>	↓	↓	↓	OFF	I <sub>REG</sub>	↓	↓	↓	↓	↓	↓		V <sub>CC</sub> =4.7A
<b>(Operational amplifier)</b>													
V <sub>OFP</sub>	OFF	OFF	ON	ON	NORM	SHORT	OPEN	OFF	OPEN	2.5V	2V		
I <sub>BOP</sub>	↓	↓	↓	↓	↓	1M	↓	↓	↓	↓	↓		
V <sub>OHP</sub>	↓	↓	↓	↓	↓	10k	GND	↓	↓	↓	↓		
V <sub>OLP</sub>	↓	↓	↓	↓	↓	↓	V <sub>CC</sub>	↓	↓	↓	↓		
I <sub>SINK</sub>	↓	↓	↓	↓	↓	SHORT	OPEN	↓	V <sub>CC</sub>	↓	↓		
I <sub>SOURCE</sub>	↓	↓	↓	↓	↓	↓	↓	↓	GND	↓	↓		
G <sub>VO</sub>	↓	↓	↓	↓	↓	10k	↓	ON	↓	↓	↓		SG2 : -75dBV, 1kHz
SR	↓	↓	↓	↓	↓	SHORT	↓	OFF	↓	↓	↓		SG3: 100 MHz, 3 Vp-p output

● Application example

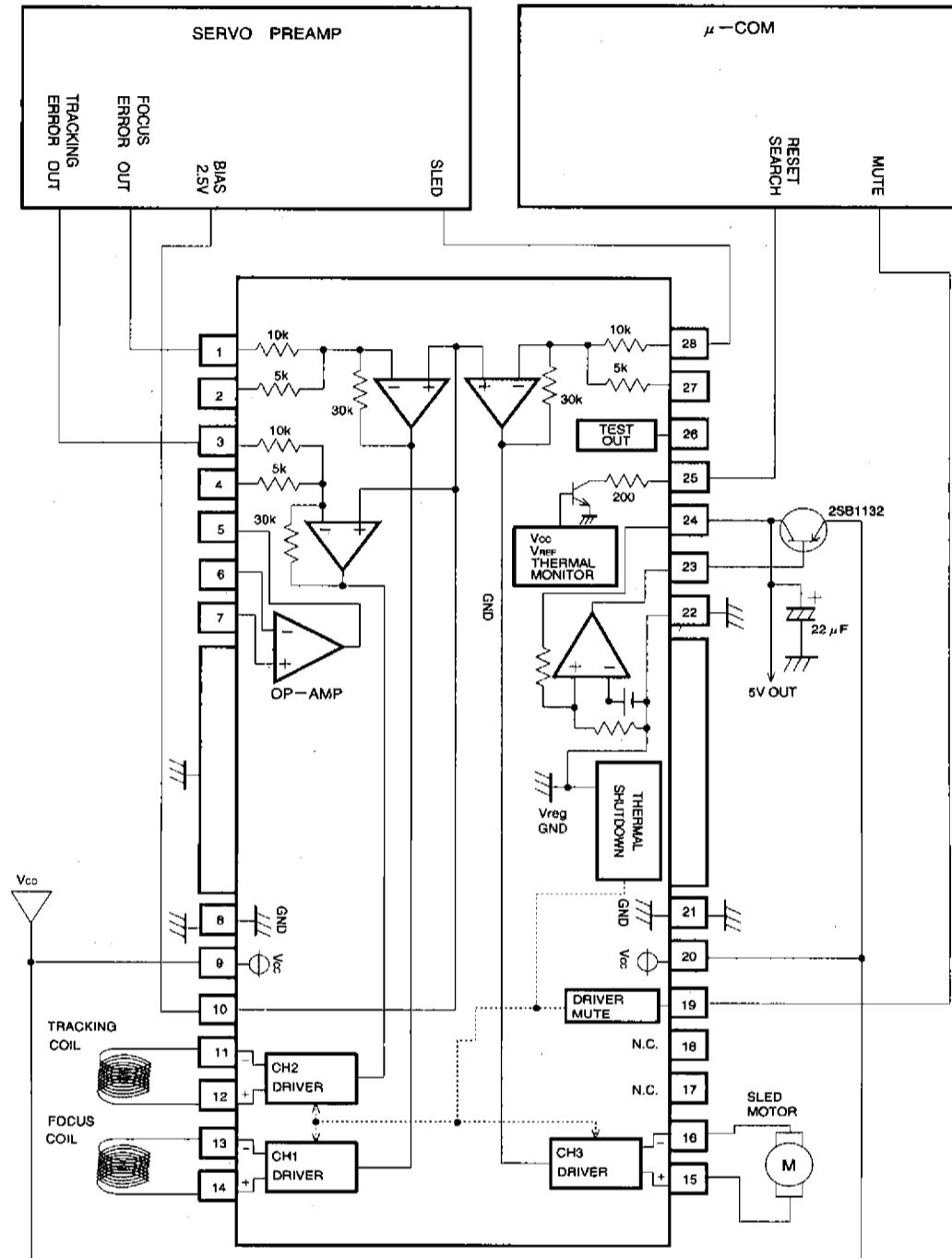


Fig.2

For CDs/CD-ROMs  
 CD/CD-ROM Drivers (1~3 channels)



● Operation notes

1. Relationship between reset output and muting

	Muting	Reset output
Supply voltage drop	OFF	'H' → 'L'
Bias drop	ON	'H' → 'L'
Thermal shutdown	ON	'H' → 'L'
Muting	ON	No change

Reset output changes to LOW when the supply voltage drops below 5.0V (typically) and changes to HIGH when the supply voltage rises above 5.3V (typically).

Bias drop

When the bias pin (pin 23) voltage drops below 1.4V, the circuit is muted and reset output changes to LOW.

Thermal shutdown

If the chip reduces a temperature of 175°C (Typ.) or more, the circuit is muted and the reset output changes to LOW.

Muting

When the mute pin (pin 7) voltage is opened or lowered below 0.5V, the circuit is muted, but reset output does not change.

2. All three driver output channels are muted during thermal shutdown, muting and a drop in bias pin voltage. No other components are muted.

3. Dead zone

Dead zone width is determined as follows :

$$\text{Dead zone width} = \text{input resistance} \times 1 \mu\text{A}$$

When using the internal resistor (10kΩ), dead zone width is 10mV (typically one side). Because the input resistance and 1 μA temperature characteristics are canceled out, there is virtually no variation due to temperature as long as the internal input resistor is used. However, when connecting an attached resistor in series in order to change the gain, dead zone width varies according to temperature and is determined as follows :

$$\text{Dead zone width} = (\text{internal input resistance} + \text{attached resistance}) \times 1 \mu\text{A}$$

- Be sure to connect the IC to a 0.1 μF bypass capacitor to the power supply, at the base of the IC.
- The capacitor between regulator output (24 pin) and GND also serves to prevent oscillation of the IC, so select one with good temperature characteristics.
- Pin 26 is the test pin and should be left open during normal operation.
- Pins 17 and 18 are NC pins and are not connected internally.

● Electrical characteristic curves

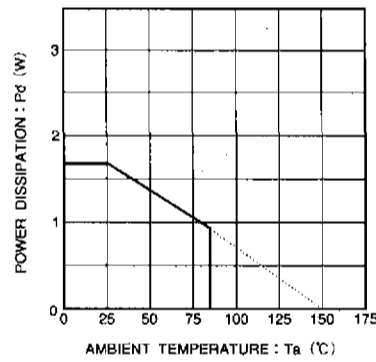


Fig. 3 Thermal derating curve

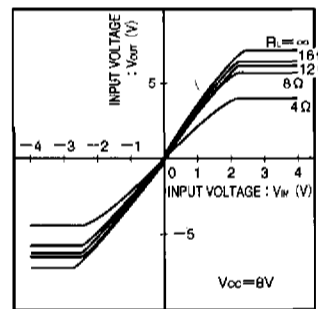


Fig. 4 Driver I/O characteristics (when load changes)

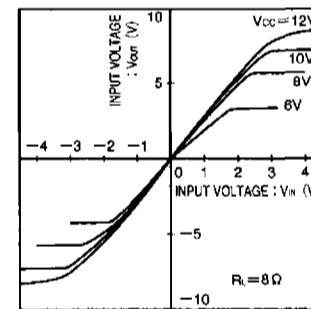


Fig. 5 Driver/O characteristics (when supply voltage changes)

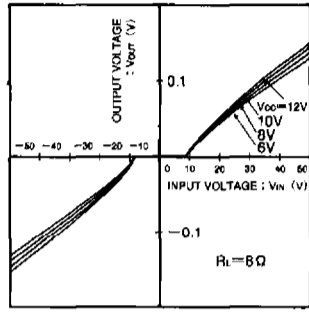


Fig. 6 Driver I/O characteristics when micro-input when supply voltage changes

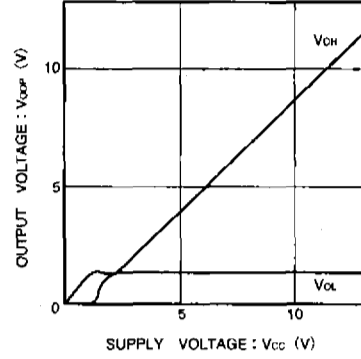


Fig. 7 Supply voltage vs. operational amplifier high level/low level voltage

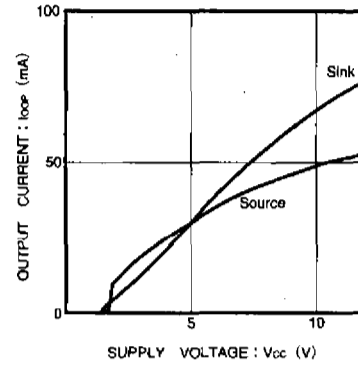


Fig. 8 Supply voltage vs. operational amplifier Output drive current

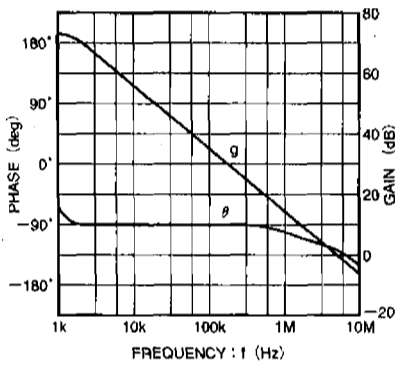


Fig. 9 Operational amplifier vs. open loop

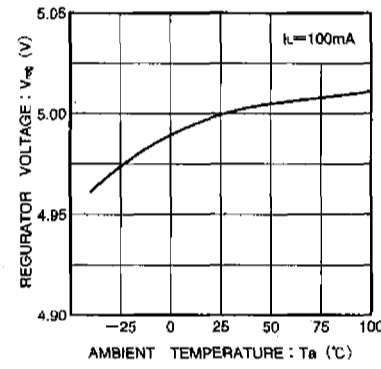


Fig. 10 Regulator voltage vs. temperature

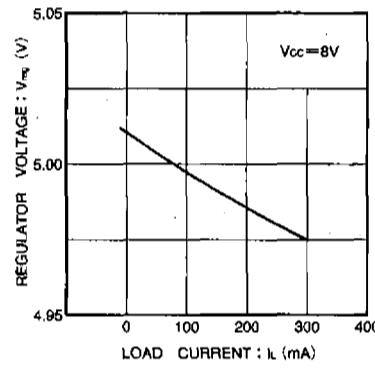
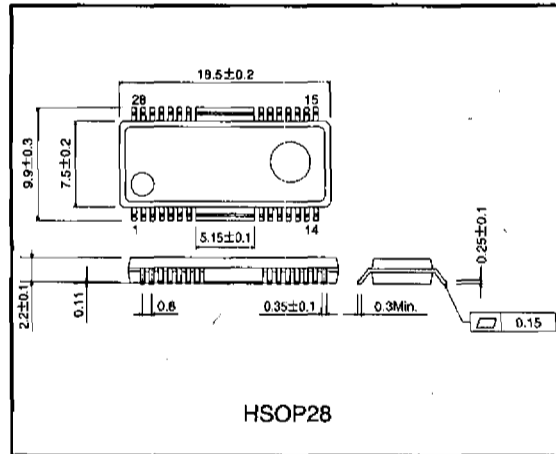


Fig. 11 Load current vs. regulator voltage

●External dimensions (Units: mm)



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