4-channel BTL driver for CD players

BA5915FP

The BA5915FP contains a 4-channel BTL driver for CD player motors and actuators and a multi-purpose operational amplifier. Perfect for compact applications with the use of the HSOP 28-pin package.

●Applications

CD players, CD-ROM

●Features

1) 4-channel BTL driver.
2) Wide dynamic range (3.55V (Typ.) when V_{CC} = 5V and R_L = 8Ω).
3) Internal thermal shutdown circuit.
4) Gain is adjustable with externally connected resistor.
5) Internal multi-purpose operational amplifier.
6) External mute pin enables the muting of the output current for channel 1.
7) Perfect for compact applications with the use of the HSOP 28-pin power package.

●Absolute maximum ratings (Ta = 25 °C)

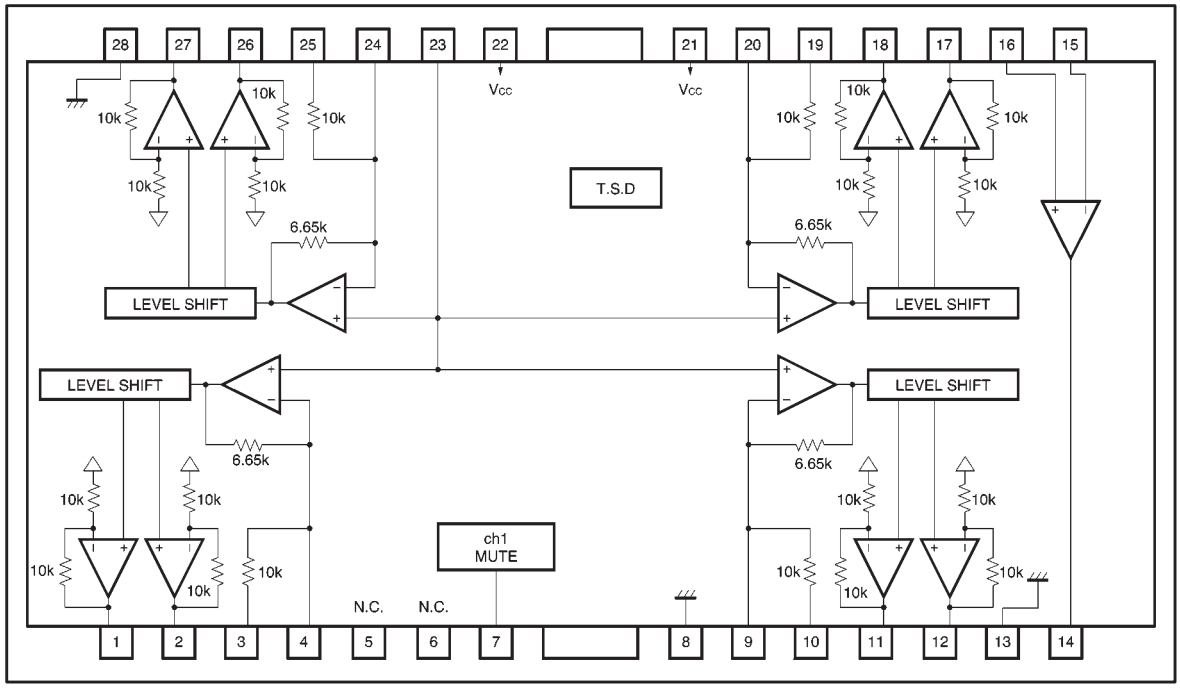
Parameter	Symbol	Limits	Unit
Power supply voltage	V_{CC}	12	V
Power dissipation	Pd	1.7*1	W
Operating temperature	Topr	−35～+85	℃
Storage temperature	Tstg	−55～+150	℃

*1 When mounted on a 50mm×50mm×1mm paper phenol board.
Reduced by 13.6mW 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}	4.3	5	9	V

●Block diagram



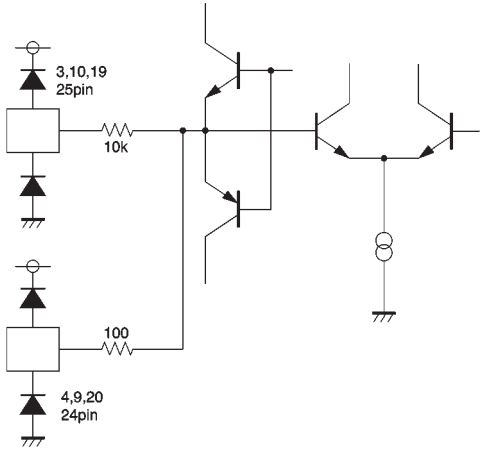
●Pin descriptions

Pin No.	Pin name	Function	Pin No.	Pin name	Function
1	VO1(−)	Driver channel 1 negative output	15	OP IN (−)	Op-amp negative input
2	VO1(+)	Driver channel 1 positive output	16	OP IN (+)	Op-amp positive input
3	$V_{IN}1$	Driver channel 1 input	17	VO3 (−)	Driver channel 3 negative output
4	$V_{IN}1'$	Input for driver channel 1 gain adjustment	18	VO3 (+)	Driver channel 3 positive output
			19	$V_{IN}3$	Driver channel 3 input
5	N.C.	N.C.	20	$V_{IN}3'$	Input for driver channel 3 gain adjustment
6	N.C.	N.C.			
7	MUTE	Mute control	21	V_{CC}	V_{CC}
8	GND	GND	22	V_{CC}	V_{CC}
9	$V_{IN}2'$	Input for driver channel 2 gain adjustment	23	BIAS IN	Bias amplifier input
			24	$V_{IN}4'$	Input for driver channel 4 gain adjustment
10	$V_{IN}2$	Driver channel 2 input			
11	VO2(+)	Driver channel 2 positive output	25	$V_{IN}4$	Driver channel 4 input
12	VO2(−)	Driver channel 2 negative output	26	VO4 (+)	Driver channel 4 positive output
13	GND	Substrate GND	27	VO4 (−)	Driver channel 4 negative output
14	OP OUT	Op-amp output	28	GND	Substrate GND

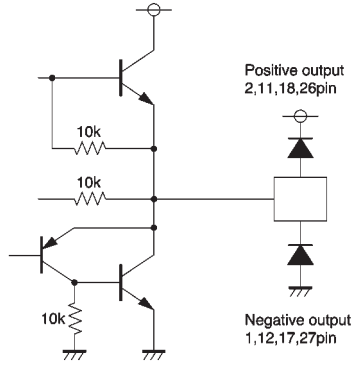
Note: Positive output and negative output are the polarities with respect to the input.
If the input pin is high, the negative output pin is low and the positive output pin is high.

●Input / output circuits

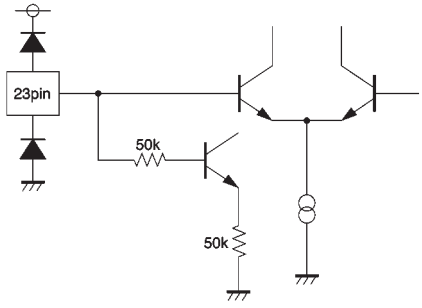
Driver input



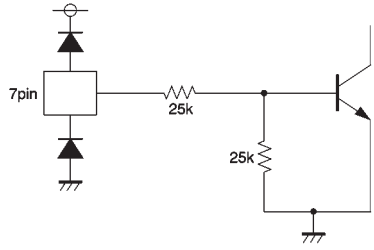
Driver output



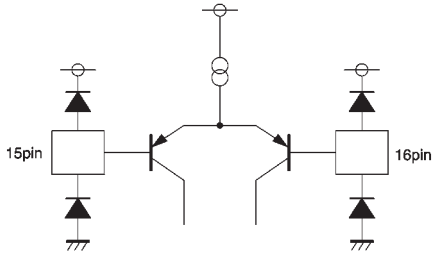
Bias



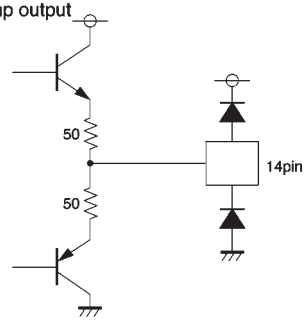
Mute



Op-amp input



Op-amp output



●Electrical characteristics (unless otherwise noted, Ta = 25 °C, V_{CC} = 5V, BIAS = 2.5V, R_L = 8Ω)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement circuit
Circuit current	I_{CC}	—	16	24	mA	No load	Fig.1
Output offset voltage	V_{OO}	−40	—	40	mV	—	Fig.1
Maximum output amplitude	V_{OM}	3.1	3.55	—	V	—	Fig.1
Closed-loop voltage gain	G_{VC}	7.2	8.4	9.6	dB	V_{IN}=0.1V_{rms},1kHz	Fig.1
Mute on voltage	V_{MON}	2.2	—	—	V	—	Fig.1
Mute off voltage	V_{MOFF}	—	—	0.4	V	—	Fig.1
〈Operational amplifier〉							
Offset voltage	V_{OFOP}	−5	0	5	mV	—	Fig.2
Input bias current	V_{BOP}	—	20	300	nA	—	Fig.2
Output high level voltage	V_{OHOP}	3.9	4.3	—	V	—	Fig.2
Output low level voltage	V_{OLOP}	—	0.8	1.1	V	—	Fig.2
Output drive current sink	I_{SI}	10	30	—	mA	50Ω at V_{CC}	Fig.2
Output drive current source	I_{SO}	10	25	—	mA	50Ω at GND	Fig.2
Slew rate	SROP	—	1	—	V/μs	100kHz rectangular wave, 2V_{P-P} output	Fig.2

◎Not designed for radiation resistance.

●Measurement circuits

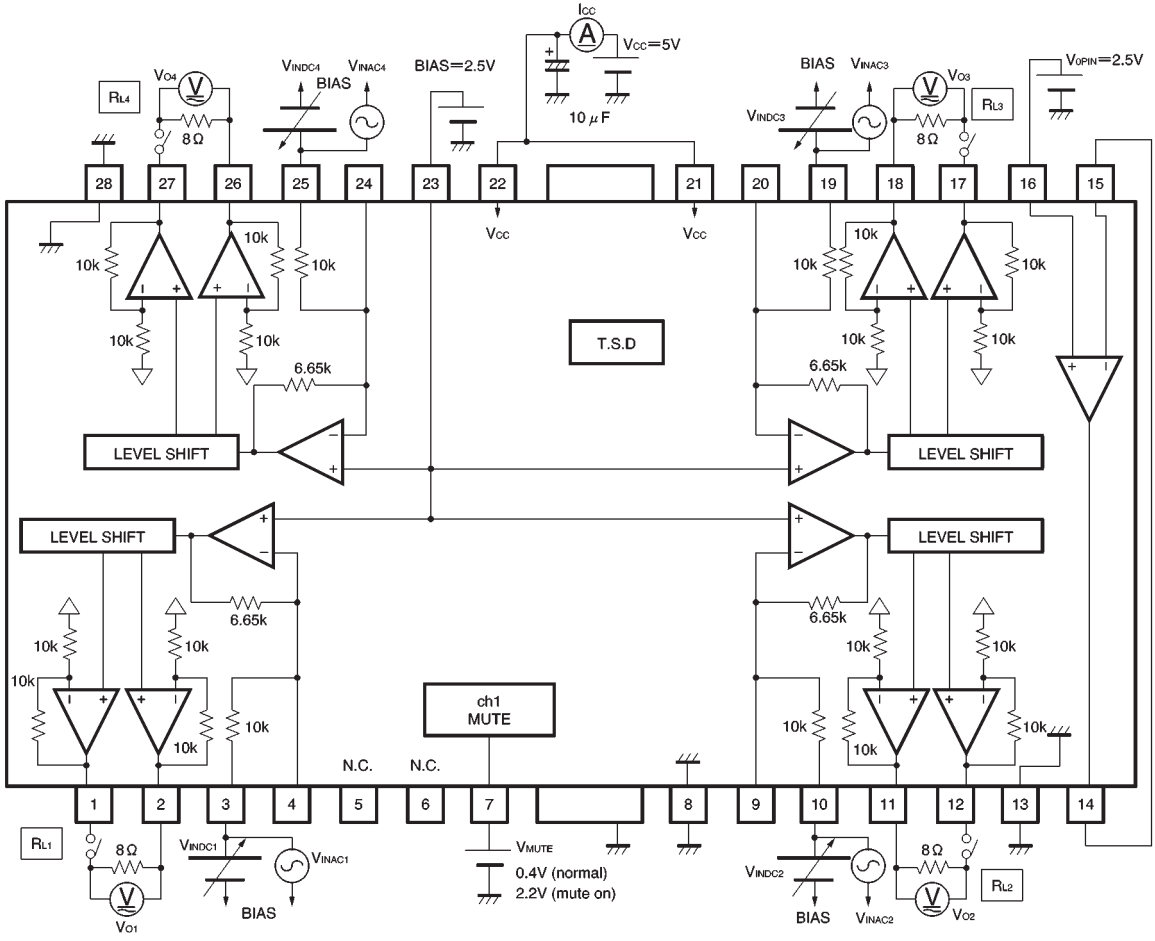


Fig.1

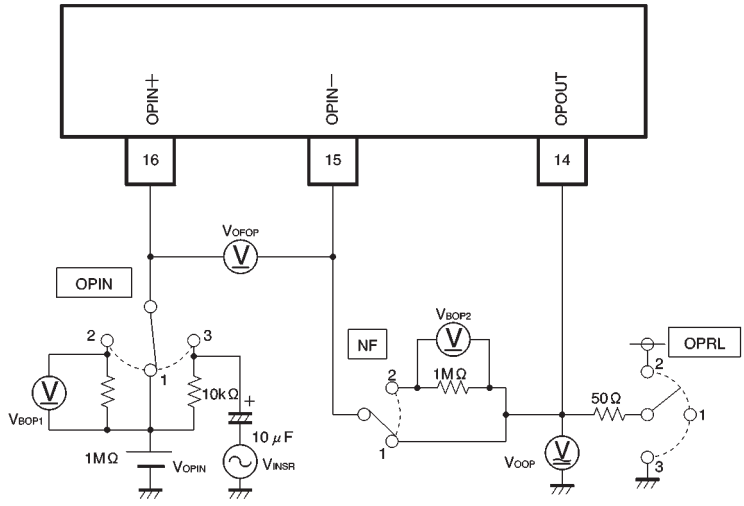


Fig.2

Measurement circuit switch table

(1) Driver block (OPIN → 1, NF → 1, OPRL → 1, VOPIN = 2.5V)

Symbol	Switch	Input	Remarks	Measurement point
	RL	V_{INDC}		
ICC	OFF	—	—	I_{CC}
VOO	ON	0V	—	$V_{O1\sim4}$
VOM	↓	±2.5V	—	$V_{O1\sim4}$
GVC	↓	—	V_{INAC}=0.1V_{rms}, 1kHz	$V_{O1\sim4}$

(2) Operational amplifier block (RL → OFF)

Symbol	Switch			Input	Remarks	Measurement point
	OPIN	NF	OPRL	VOPIN		
VOFOP	1	1	1	2.5V	—	V_{OFOP}
VBOP	2	2	1	2.5V	—	$V_{BOP1\sim2}$
VOHOP	1	1	1	5V	—	V_{OOP}
VOLOP	1	1	1	0V	—	V_{OOP}
ISI	1	1	2	2.5V	—	V_{OOP}
ISO	1	1	3	2.5V	—	V_{OOP}
SROP	3	1	1	2V	V_{INSR}=100kHz, rectangular wave, 2V_{P-P} output	V_{OOP}

●Application example

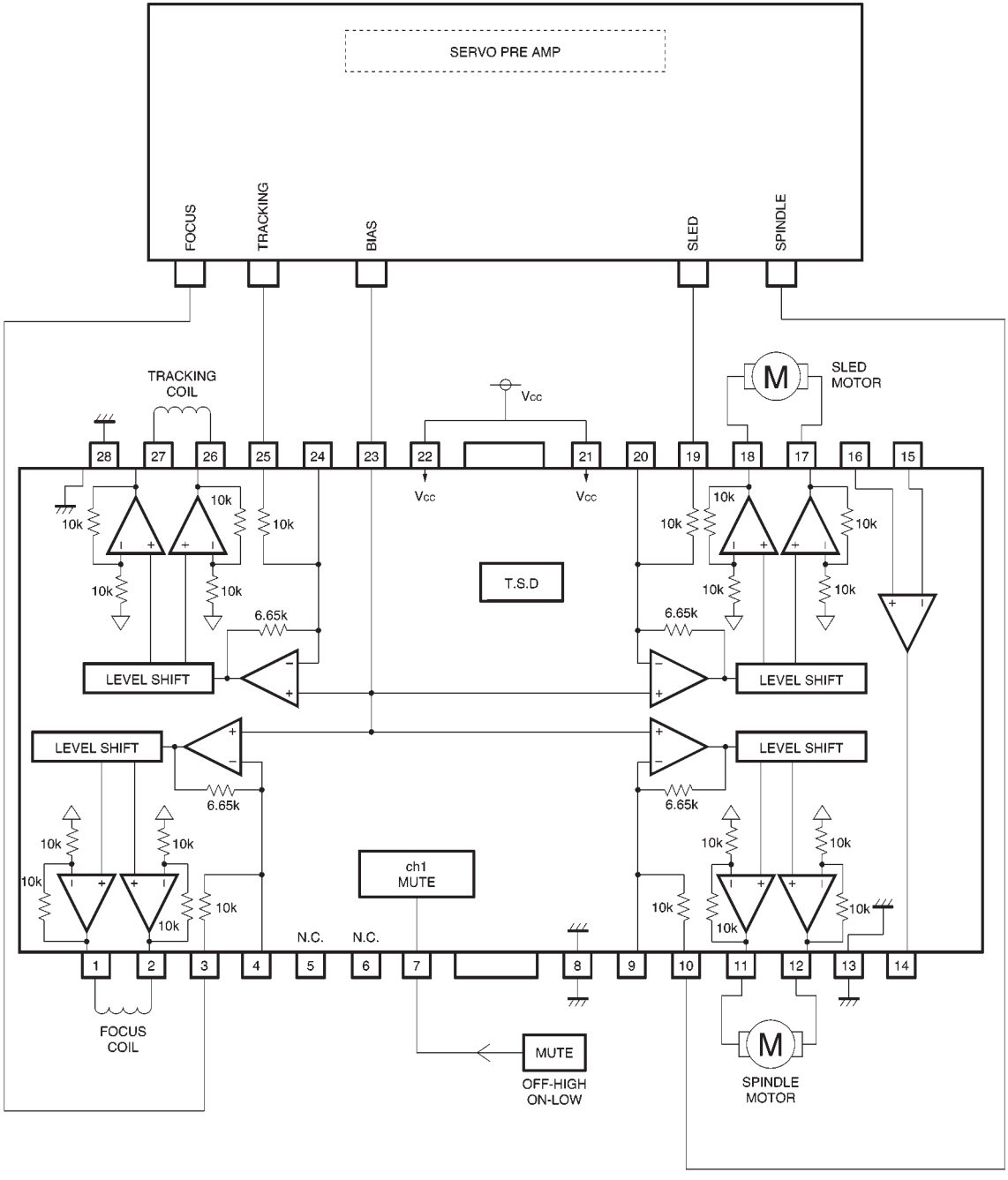


Fig.3

●Operation notes

(1) The BA5915FP contains a thermal shutdown circuit. When the chip temperature reaches 175 °C (Typ.), the output current is muted. If the chip temperature then drops below 150 °C (Typ.), then the mute is released.

(2) By having the mute pin (pin 7) voltage pulled up to 2.2V or greater, you can mute the output current for channel 1 (between pins 1 and 2). For normal conditions, have pin 7 open or at 0.4V or below.

(3) If the voltage of the bias pin (pin 23) drops below 1.4V (Typ.), outputs are muted. For normal conditions, have the voltage above 1.7V.

(4) If the power supply voltage drops below 3.8V (Typ.), internal circuits turn off. If the power supply voltage then rises to 4.0V (Typ.), the circuits turn on.

(5) If the voltage of the thermal shutdown, mute ON, or bias pin drops, or if the power supply voltage drops, the mute is activated; however, in these situations, only the drivers are muted. Also, the output pin voltage becomes the internal bias voltage (approx. V_{CC} - VF / 2).

(6) Connect a bypass capacitor (approx. 0.1µF) between the bases of the power supply pins of this IC.

(7) Even though the radiation fins are connected to ground within the package, be sure to also connect them to a ground externally as well.

●Electrical characteristic curves

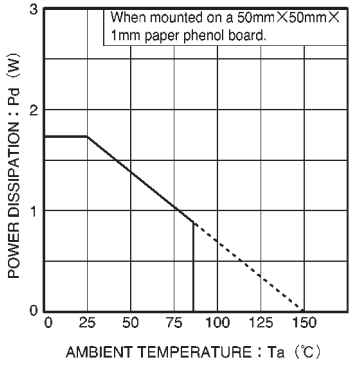


Fig.4 Thermal derating curve

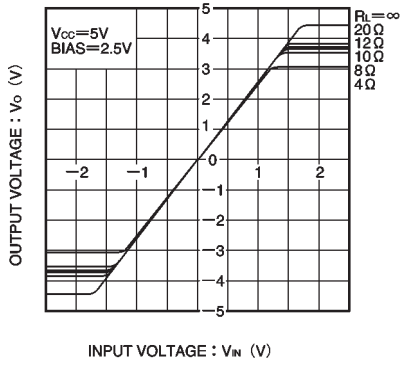


Fig.5 Driver I / O characteristics (VCC=5V)

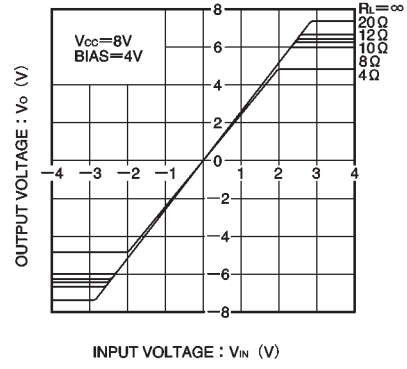


Fig.6 Driver I / O characteristics (VCC=8V)

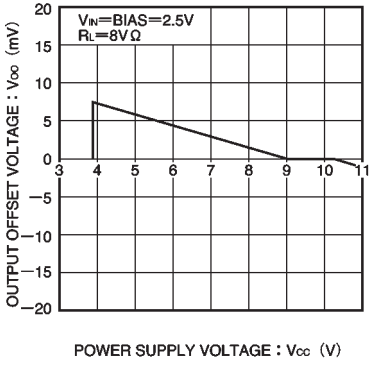


Fig.7 Power supply voltage vs. output offset voltage

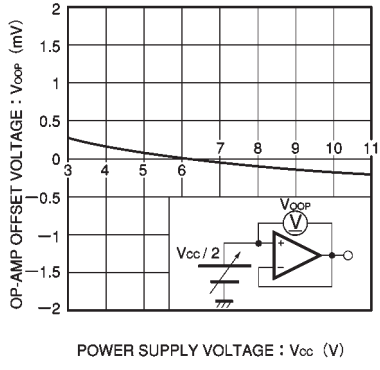


Fig.8 Power supply voltage vs. op-amp offset voltage

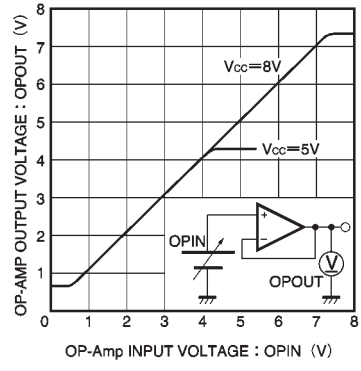


Fig.9 Op-amp I / O characteristics

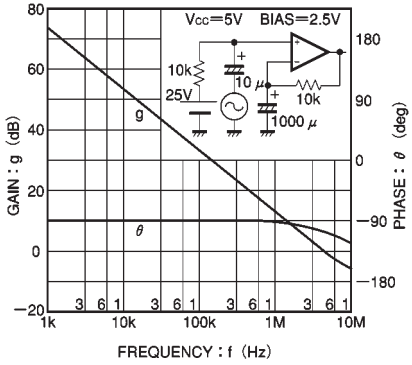
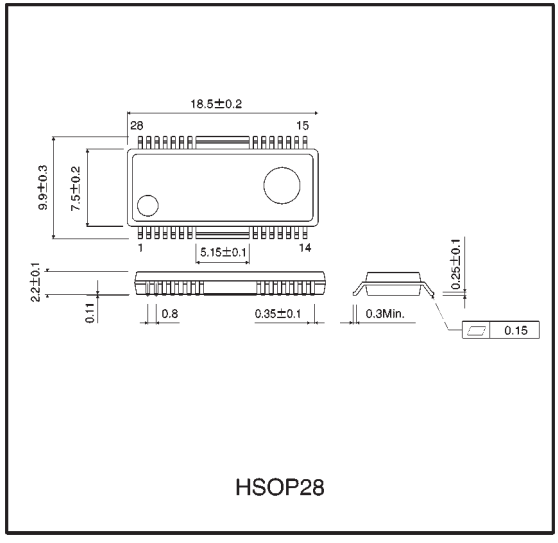


Fig.10 Op-amp open loop characteristics

●External dimensions (Units: mm)



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