

# 1-channel BTL driver for CD players

## BA6195FP-Y / BA6195

The BA6195FP-Y and BA6195 are ICs for CD players and have one internal BTL power driver circuit and one operational amplifier circuit with a wide output dynamic range. The wide dynamic range and internal operational amplifier make these ICs ideal for low voltage drive. The driver's internal level shift circuit reduces the number of attached components needed.

### ●Applications

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

### ●Features

- 1) HSOP 25-pin power package allows for miniaturization of applications (BA6195FP-Y).
- 2) Wide dynamic range. (typically 5.4V when  $V_{CC} = 8V$ ,  $R_L = 8\Omega$ )
- 3) Internal thermal shutdown circuit with hysteresis.
- 4) Internal level shift circuit, for a minimal number of attached components.
- 5) Internal operational amplifier with wide dynamic range.

### ●Absolute maximum ratings ( $T_a = 25^\circ\text{C}$ )

Parameter	Symbol	Limits	Unit
Power supply voltage	$V_{CC}$	18	V
Power dissipation	BA6195FP-Y	1450*1	mW
	BA6195	1250*2	
Operating temperature	$T_{opr}$	$-35 \sim +85$	$^\circ\text{C}$
Storage temperature	$T_{stg}$	$-55 \sim +150$	$^\circ\text{C}$

\*1 When mounted on a  $50 \times 50 \times 1.0$  mm PCB board.

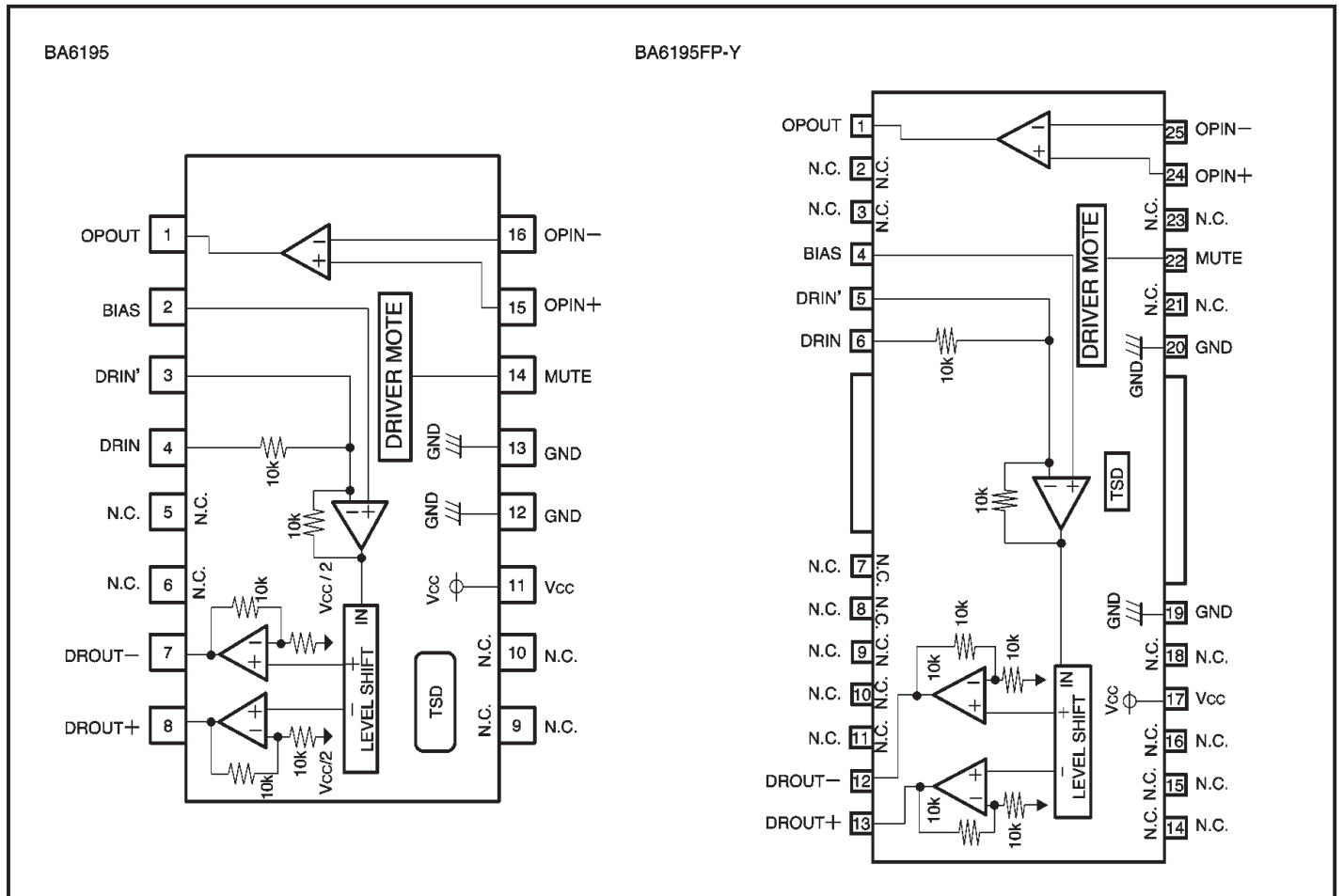
Reduced by 11.6 mW for each increase in  $T_a$  of  $1^\circ\text{C}$  over  $25^\circ\text{C}$ .

\*2 Reduced by 10 mW for each increase in  $T_a$  of  $1^\circ\text{C}$  over  $25^\circ\text{C}$ .

### ●Recommended operating conditions ( $T_a = 25^\circ\text{C}$ )

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	$V_{CC}$	4.5	—	13.5	V

●Block diagram



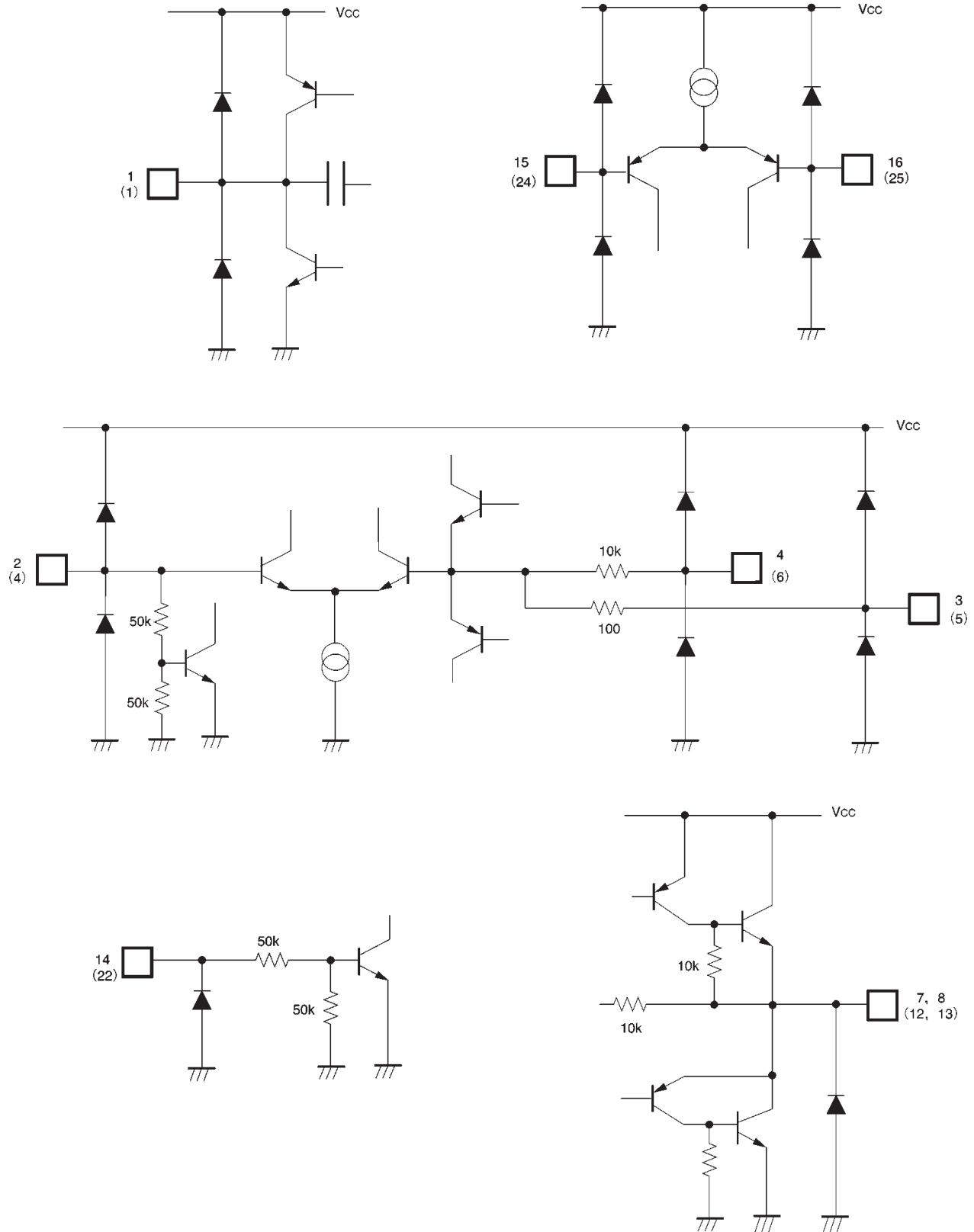
●Pin descriptions (BA6195)

Pin No.	Pin name	Function
1	OPOUT	Operational amplifier output
2	BIAS	Bias pin
3	DRIN'	Driver gain adjustment
4	DRIN	Driver gain input
5	N.C.	N.C (not connected internally)
6	N.C.	N.C (not connected internally)
7	DROUT-	Driver negative (relative to input) output
8	DROUT+	Driver positive (relative to input) output
9	N.C.	N.C. (not connected internally)
10	N.C.	N.C. (not connected internally)
11	Vcc	Vcc
12	GND	Substrate ground
13	GND	Substrate ground
14	MUTE	Mute
15	OPIN+	Operational amplifier noninverting input
16	OPIN-	Operational amplifier inverting input

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10	N.C.	—
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14	N.C.	—
15	N.C.	—
16	N.C.	—
17	Vcc	Vcc
18	N.C.	—
19	GND	Substrate ground
20	GND	Substrate ground
21	N.C.	—
22	MUTE	Mute
23	N.C.	—
24	OPIN+	Operational amplifier noninverting input
25	OPIN—	Operational amplifier inverting input

● Input / output circuits



Parentheses indicate pin numbers for BA6195FP-Y

●Electrical characteristics (unless otherwise noted,  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 8\text{V}$ ,  $f = 1\text{kHz}$ ,  $R_L = 8\Omega$ )

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement Circuit
Quiescent current dissipation	$I_Q$	—	6.5	9.0	mA	No load	Fig.1, 2
Output voltage, offset	$V_{OO}$	-40	—	40	mV	$V_{IN} = \text{BIAS} = 2.5\text{V}$	Fig.1, 2
Max. output amplitude	$V_{OM}$	5.0	5.4	—	V	—	Fig.1, 2
Closed loop voltage gain	$G_{VC}$	10.5	12.0	13.5	dB	$V_{IN} = 2\text{V}, 3\text{V}$ BIAS=2.5V	Fig.1, 2
Ripple rejection	RR	—	60	—	dB	$V_{IN} = 0.1\text{V}_{\text{rms}}, 100\text{Hz}$	Fig.1, 2
Slew rate	SR	—	2	—	$\text{V} / \mu\text{s}$	100 kHz square wave, 3 $V_{P-P}$ output	Fig.1, 2
Mute-off voltage	$V_{MOFF}$	GND	—	0.5	V	—	Fig.1, 2
Mute-on voltage	$V_{MON}$	2.0	—	$V_{CC}$	V	—	Fig.1, 2
〈Operational amplifier〉							
Offset voltage	$V_{OFOP}$	-6	0	6	mV	—	Fig.1, 2
Input bias current	$I_B$	—	30	300	nA	—	Fig.1, 2
Synch. input voltage	$V_{ICM}$	0	—	6.8	V	—	Fig.1, 2
Output high level voltage	$V_{OH}$	7.1	7.8	—	V	$V_{IN} = \text{GND}$ , inversion amplifier conf.	Fig.1, 2
Output low level voltage	$V_{OL}$	—	0.2	0.9	V	$V_{IN} = V_{CC}$ , inversion amplifier conf.	Fig.1, 2
Out. drive curr. (source)	$I_{OH}$	1	3	—	mA	GND at 50 $\Omega$ output	Fig.1, 2
Out. drive curr. (sink)	$I_{OL}$	10	30	—	mA	$V_{CC}$ at 50 $\Omega$ output	Fig.1, 2
Slew rate	$SR_{OP}$	—	1	—	$\text{V} / \mu\text{s}$	100 kHz square wave, 3 $V_{P-P}$ output	Fig.1, 2
Ripple rejection	RR	—	60	—	dB	$V_{IN} = 0.1\text{V}_{\text{rms}}, 100\text{Hz}$	Fig.1, 2

©Not designed for radiation resistance.

## ● Measurement circuit switch table

Symbol	Switch							Input							Note
	RIP	RL	VREF	DRIN	OP OUT	OP IN	NF	DRIN DC	DRIN AC	OPIN DC	OPIN AC	RIPPLE	BIAS	MUTE	
I <sub>Q</sub>	ON	OFF	ON	A	A	OFF	A	2.5V	0V	0V	0V	0V	2.5V	2.0V	
V <sub>OO</sub>	↓	ON	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	
V <sub>OM</sub>	↓	↓	↓	↓	↓	↓	↓	Note	↓	↓	↓	↓	4V	↓	0V, 8V
G <sub>VC</sub>	↓	↓	↓	↓	↓	↓	↓	Note	↓	↓	↓	↓	2.5V	↓	2V, 3V
RR	OFF	↓	↓	↓	↓	↓	↓	2.5V	↓	↓	↓	Note	↓	↓	0.1V <sub>rms</sub> , 100Hz
SR	ON	↓	↓	B	↓	↓	↓	0V	Note	↓	↓	0V	↓	↓	100 kHz, square wave
V <sub>MOFF</sub>	↓	↓	↓	↓	↓	↓	↓	↓	Note	↓	↓	↓	↓	↓	Desired sine wave
V <sub>MON</sub>	↓	↓	↓	↓	↓	↓	↓	↓	Note	↓	↓	↓	↓	0.5V	Desired sine wave
〈OP-AMP〉															
V <sub>OFOP</sub>	ON	OFF	ON	A	A	OFF	A	2.5V	0V	0V	0V	0V	2.5V	2.0V	
I <sub>B</sub>	↓	↓	OFF	↓	↓	↓	C	↓	↓	↓	↓	↓	↓	↓	
V <sub>ICM</sub>	↓	↓	ON	↓	↓	↓	A	↓	↓	↓	↓	↓	↓	↓	
V <sub>OH</sub>	↓	↓	↓	↓	↓	ON	B	↓	↓	↓	↓	↓	↓	↓	
V <sub>OL</sub>	↓	↓	↓	↓	↓	↓	↓	↓	↓	8V	↓	↓	↓	↓	
I <sub>OH</sub>	↓	↓	↓	↓	C	OFF	A	↓	↓	0V	↓	↓	↓	↓	
I <sub>OL</sub>	↓	↓	↓	↓	B	↓	↓	↓	↓	↓	↓	↓	↓	↓	
SR <sub>OP</sub>	↓	↓	↓	↓	A	↓	↓	↓	↓	↓	Note	↓	↓	↓	100 kHz, square wave
RR <sub>OP</sub>	OFF	↓	↓	↓	↓	↓	↓	↓	↓	↓	0V	Note	↓	↓	0.1V <sub>rms</sub> , 100Hz

● Measurement circuits

BA6195

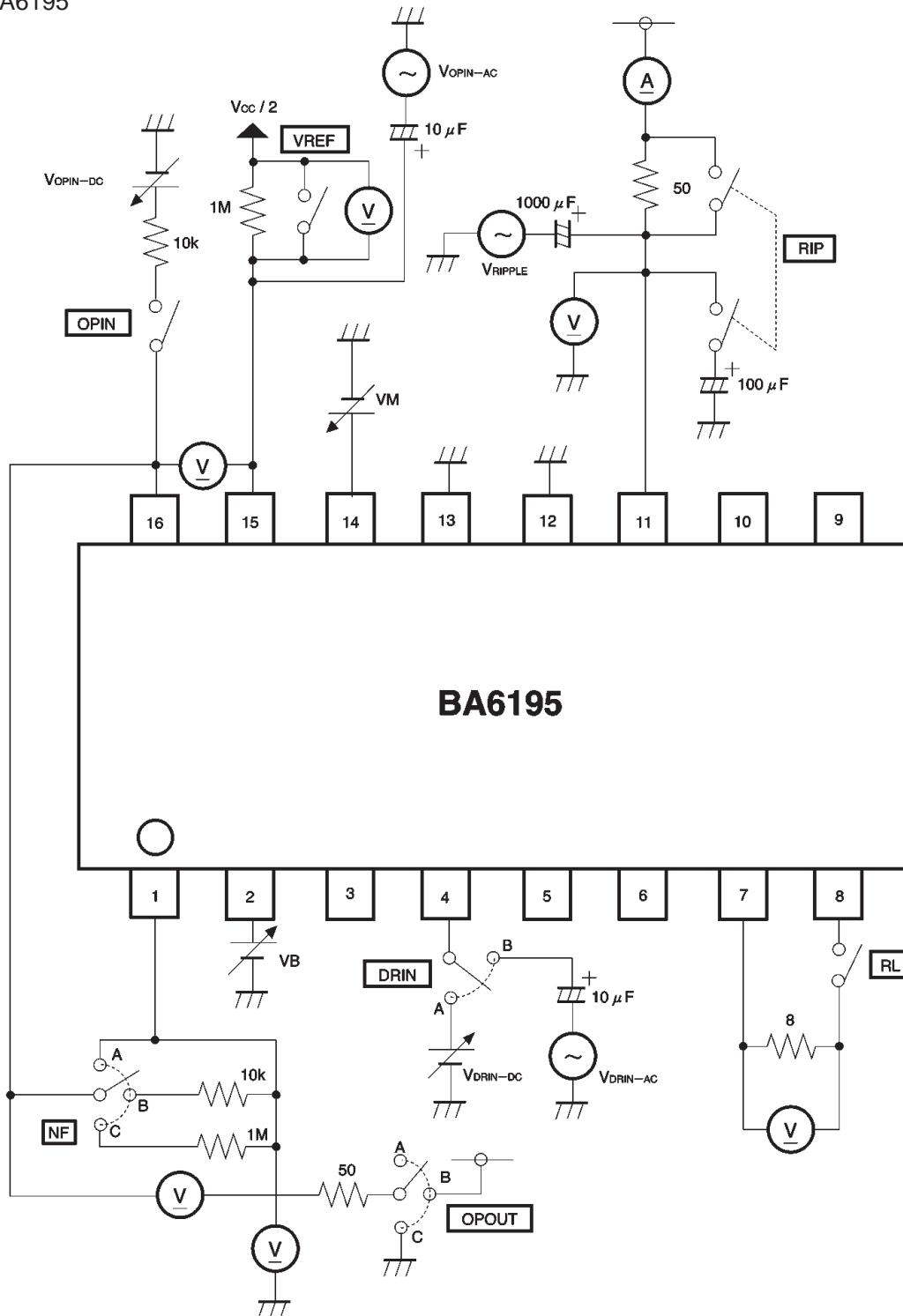


Fig. 1

BA6195FP-Y

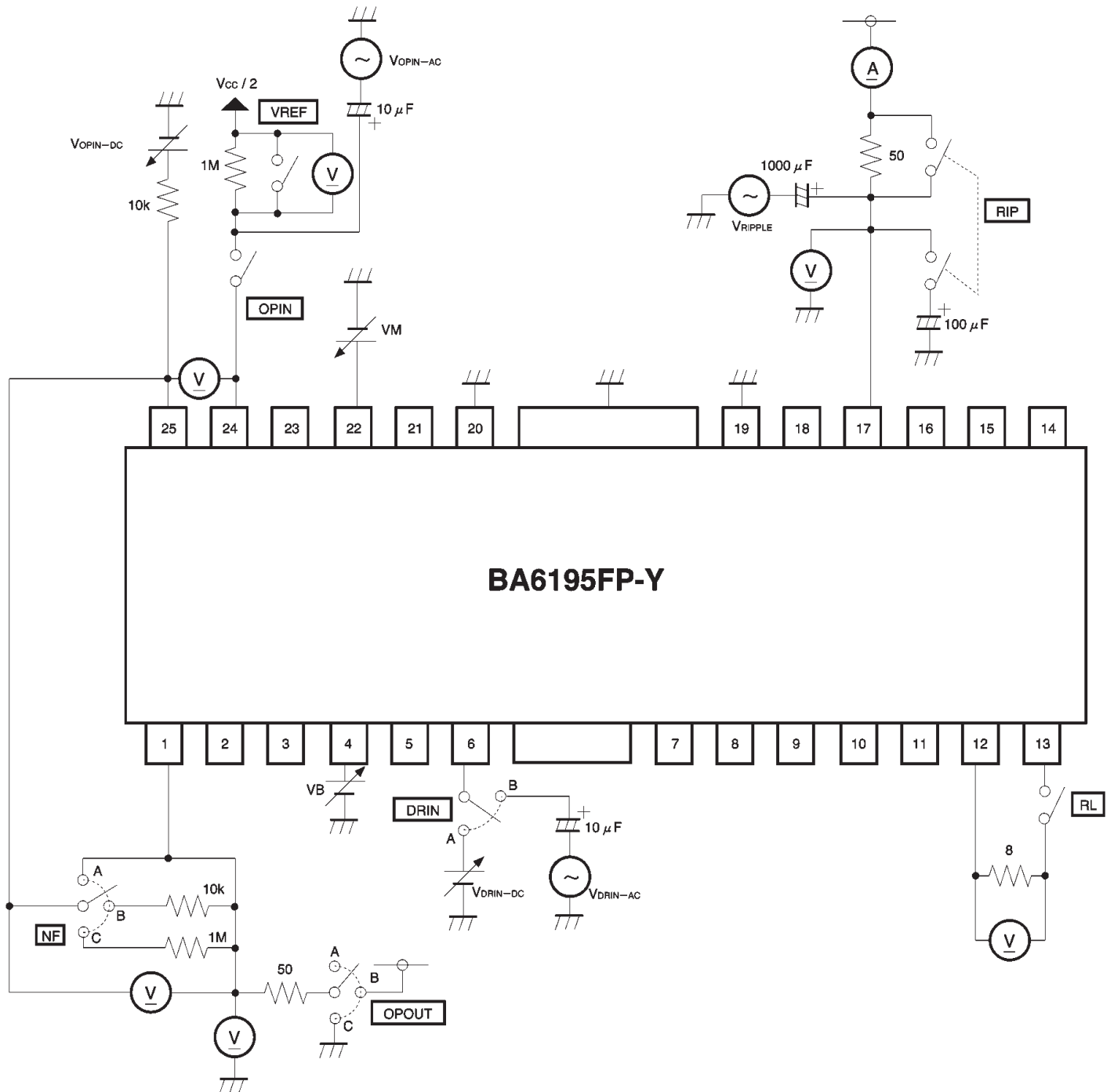


Fig. 2



●Application examples

BA6195

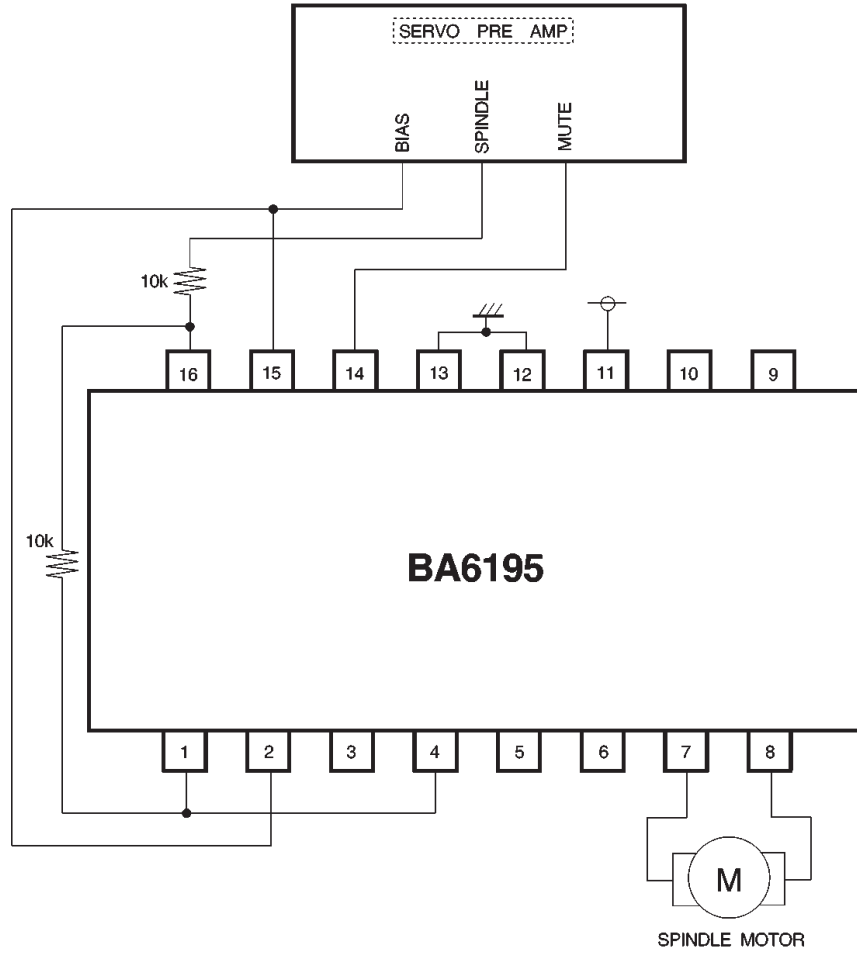


Fig. 3

BA6195FP-Y

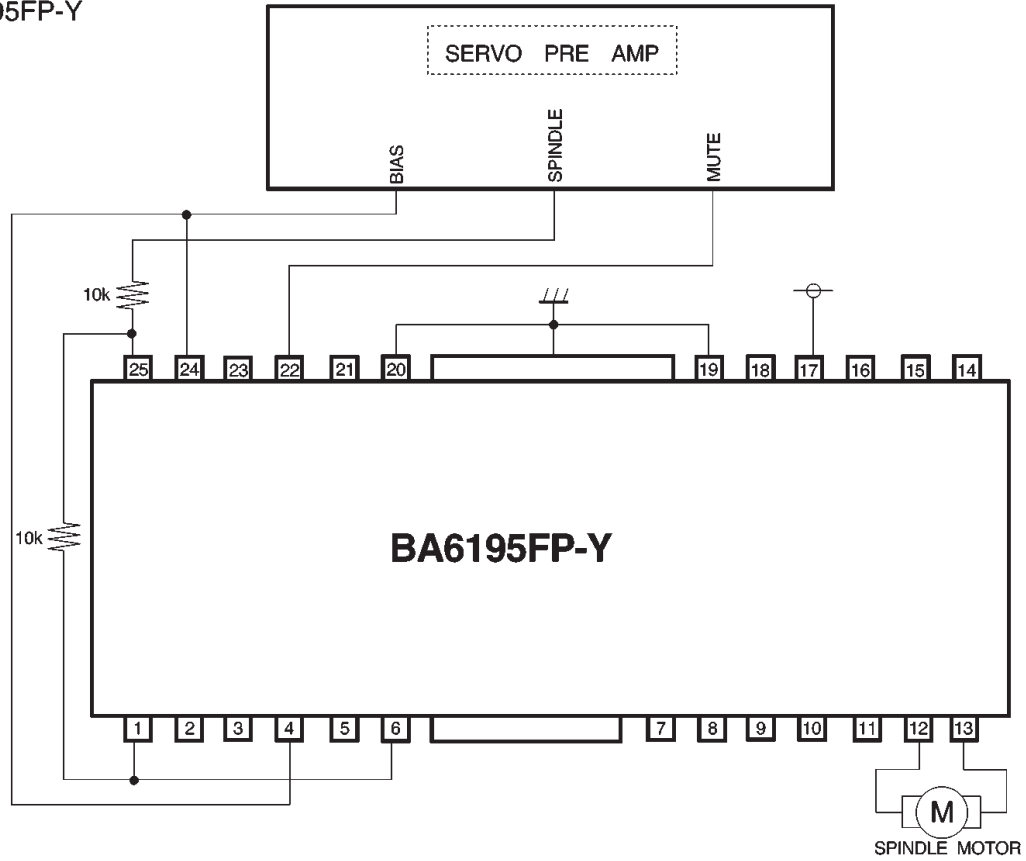


Fig. 4

● Operation notes

- 1) The thermal shutdown circuit mutes the output current when the chip temperature rises above 175°C (typically). Hysteresis width is set at 25°C (typically), and muting is canceled when the chip temperature drops below 150°C.
- 2) The output current can be muted by raising the external mute pin above 2.0V. Pin 14 should be pulled down below 0.5V during normal operation.

- 3) Muting occurs during thermal shutdown and external muting. In each case, only the drivers are muted. During muting, the output pins remain at the internal bias voltage, roughly ( $V_{CC} / 2$ ).
- 4) 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 (BA6195FP-Y).

● Electrical characteristic curves

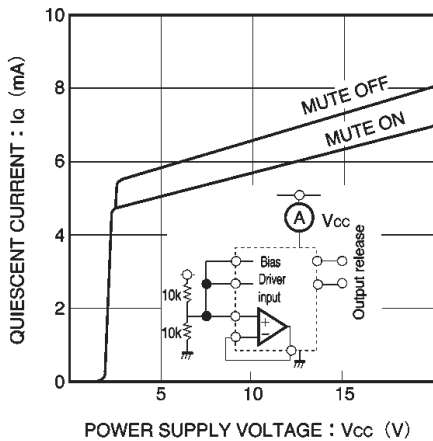


Fig. 5 Power supply voltage vs. quiescent current

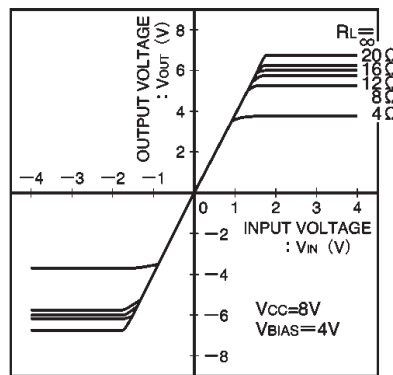


Fig. 6 I/O characteristics (variable load)

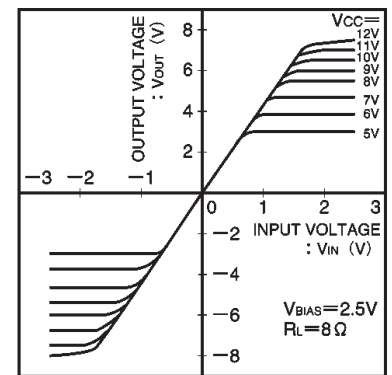


Fig. 7 I/O characteristics (variable supply voltage)

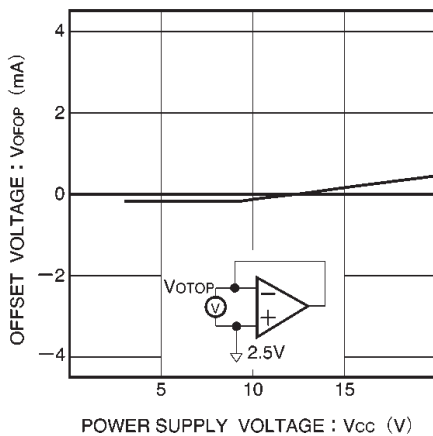


Fig. 8 Power supply voltage vs. input offset voltage

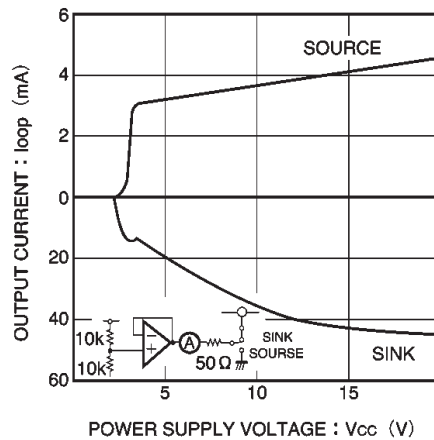


Fig. 9 Power supply voltage vs. operational amplifier output drive current

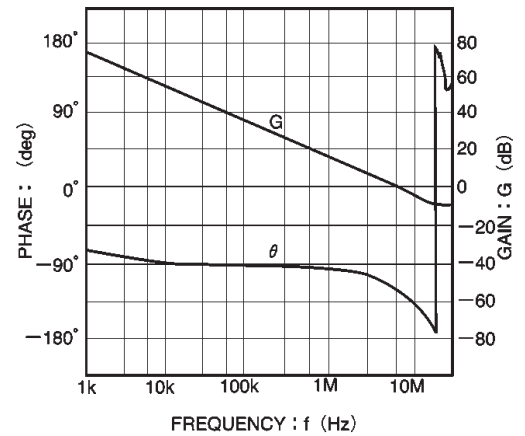


Fig. 10 Operational amplifier vs. openloop

● External dimensions (Units: mm)

