

# 4-channel BTL driver for CD players

## BA6897S / BA6897FP

The BA6897S and BA6897FP are a 4-channel BTL driver for CD player motors and actuators. It has an internal 5V regulator and standard operational amplifier, and is suited to a wide range of applications.

### ●Applications

CD players, CD-ROM drives

### ●Features

- 1) Minimal number of external components.
- 2) Driver gain is adjustable with just one attached resistor.
- 3) Internal 5V regulator (attached PNP transistor necessary).
- 4) Internal standard operational amplifier.
- 5) Internal thermal shutdown circuit.

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

| Parameter             |          | Symbol           | Limits   | Unit |
|-----------------------|----------|------------------|----------|------|
| Power supply voltage  |          | V <sub>CC</sub>  | 18       | V    |
| Power dissipation     | BA6897S  | P <sub>d</sub>   | 1.7*1    | W    |
|                       | BA6897FP |                  | 1.7*2    |      |
| Operating temperature |          | T <sub>opr</sub> | −35~+85  | °C   |
| Storage temperature   |          | T <sub>stg</sub> | −55~+150 | °C   |

\*1 Unmounted

\*2 When mounted on a 50 × 50 × 1 mm paper phenol board

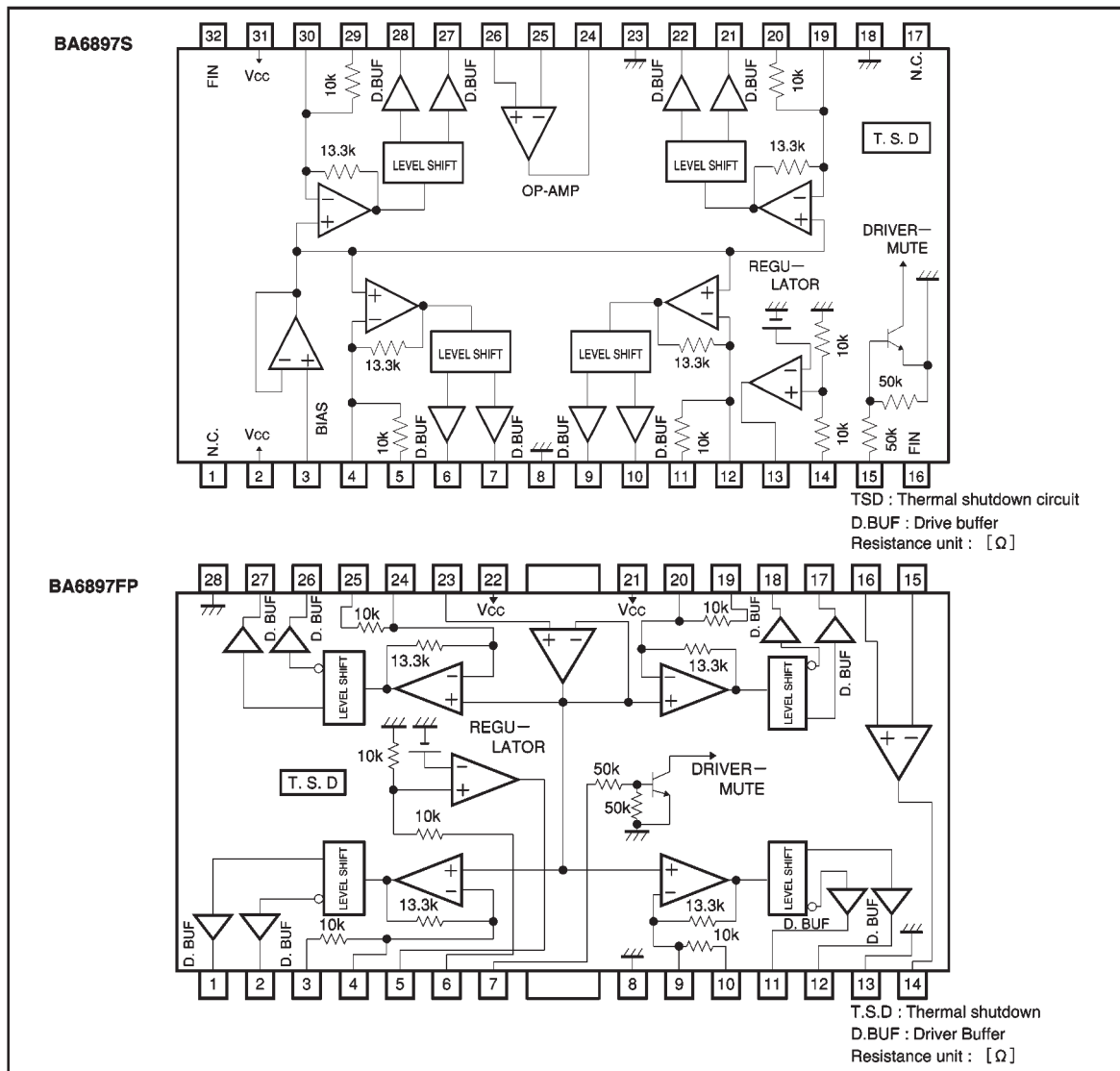
Reduced by 13.6 mW for each increase in Ta of 1°C over 25°C.

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

| Parameter            | Symbol          | Limits | Unit |
|----------------------|-----------------|--------|------|
| Power supply voltage | V <sub>CC</sub> | 6~9*2  | V    |

\*2 However, the driver can operate at up to 4.5V.

## ● Block diagram



## ● Pin descriptions

BA6897S

| Pin No. | Pin name        | Function                                                                 |
|---------|-----------------|--------------------------------------------------------------------------|
| 1       | N.C.            | N.C.                                                                     |
| 2       | V <sub>CC</sub> | Power supply                                                             |
| 3       | BIAS IN         | Bias amplifier input                                                     |
| 4       | VIN1'           | Input for adjusting the driver channel 1 gain                            |
| 5       | VIN1            | Driver channel 1 input                                                   |
| 6       | VO1 (+)         | Driver channel 1 positive output                                         |
| 7       | VO1 (−)         | Driver channel 1 negative output                                         |
| 8       | GND             | Substrate ground                                                         |
| 9       | VO2 (−)         | Driver channel 2 negative output                                         |
| 10      | VO2 (+)         | Driver channel 2 positive output                                         |
| 11      | VIN2            | Driver channel 2 input                                                   |
| 12      | VIN2'           | Input for adjusting the driver channel 2 gain                            |
| 13      | REG−B           | Connect to base of attached transistor                                   |
| 14      | REG OUT         | Constant voltage output<br>(connect to collector of attached transistor) |
| 15      | MUTE            | Mute control                                                             |
| 16      | FIN             | FIN                                                                      |
| 17      | N.C.            | N.C.                                                                     |
| 18      | GND             | GND                                                                      |
| 19      | VIN3'           | Input for adjusting the driver channel 3 gain                            |
| 20      | VIN3            | Driver channel 3 input                                                   |
| 21      | VO3 (+)         | Driver channel 3 positive output                                         |
| 22      | VO3 (−)         | Driver channel 3 negative output                                         |
| 23      | GND             | Substrate ground                                                         |
| 24      | OP OUT          | Operational amplifier output                                             |
| 25      | OP IN (−)       | Operational amplifier negative input                                     |
| 26      | OP IN (+)       | Operational amplifier positive input                                     |
| 27      | VO4 (−)         | Driver channel 4 positive output                                         |
| 28      | VO4 (+)         | Driver channel 4 negative output                                         |
| 29      | VIN4            | Driver channel 4 input                                                   |
| 30      | VIN4'           | Input for adjusting the driver channel 4 gain                            |
| 31      | V <sub>CC</sub> | Power supply                                                             |
| 32      | FIN             | FIN                                                                      |

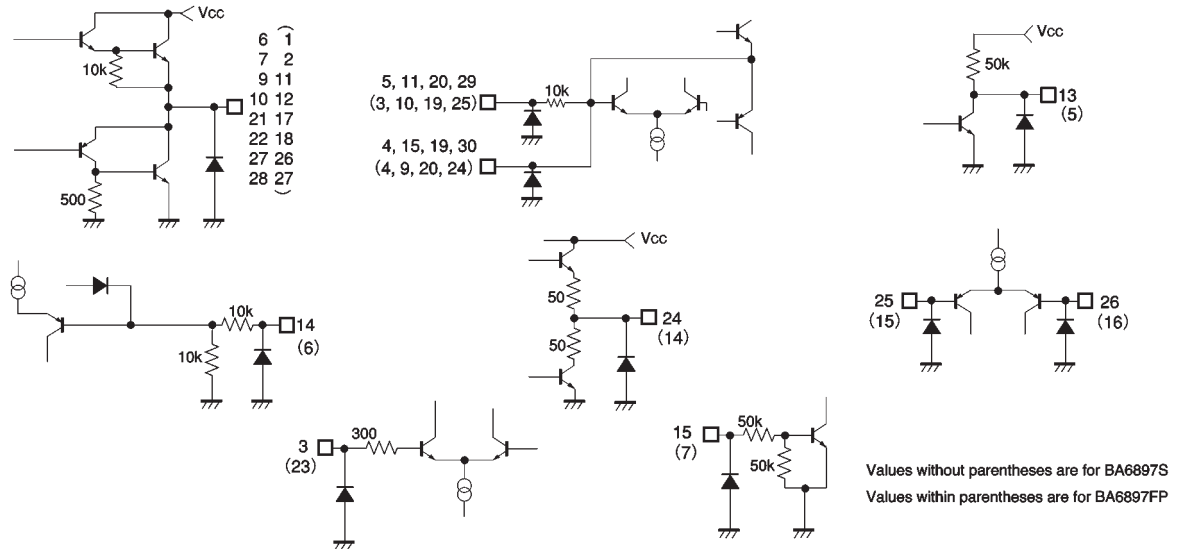
\*Positive and negative output is relative to the polarity of the input pins.

## BA6897FP

| Pin No. | Pin name        | Description                                                           |
|---------|-----------------|-----------------------------------------------------------------------|
| 1       | VO1 (—)         | Driver channel 1 negative output                                      |
| 2       | VO1 (+)         | Driver channel 1 Positive output                                      |
| 3       | VIN1            | Driver channel 1 input                                                |
| 4       | VIN1'           | Driver channel 1 input, gain adjustment pin                           |
| 5       | REG—B           | Connect to external transistor base                                   |
| 6       | REG OUT         | Constant voltage output,<br>connects to external transistor collector |
| 7       | MUTE            | Driver mute control input                                             |
| 8       | GND             | Ground                                                                |
| 9       | VIN2'           | Driver channel 2 input, gain adjustment pin                           |
| 10      | VIN2            | Driver channel 2 input                                                |
| 11      | VO2 (+)         | Driver channel 2 positive output                                      |
| 12      | VO2 (—)         | Driver channel 2 negative output                                      |
| 13      | GND             | Substrate ground                                                      |
| 14      | OP OUT          | Operational amplifier output                                          |
| 15      | OP IN(—)        | Operational amplifier input, negative                                 |
| 16      | OP IN(+)        | Operational amplifier input, positive                                 |
| 17      | VO3 (—)         | Driver channel 3 negative output                                      |
| 18      | VO3 (+)         | Driver channel 3 Positive output                                      |
| 19      | VIN3            | Driver channel 3 input                                                |
| 20      | VIN3'           | Driver channel 3 input, gain adjustment pin                           |
| 21      | V <sub>cc</sub> | Power supply                                                          |
| 22      | V <sub>cc</sub> | Power supply                                                          |
| 23      | BIAS IN         | Bias amplifier input                                                  |
| 24      | VIN4'           | Driver channel 4 input, gain adjustment pin                           |
| 25      | VIN4            | Driver channel 4 input                                                |
| 26      | VO4 (+)         | Driver channel 4 positive output                                      |
| 27      | VO4 (—)         | Driver channel 4 negative output                                      |
| 28      | GND             | Substrate ground                                                      |

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

## ● Input/output circuits



●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>     | 6.0  | 10.0 | 14.0 | mA   | No load                                        |
| Output voltage, offset            | V <sub>OO</sub>     | −40  | —    | 40   | mV   | —                                              |
| Max. output voltage, HIGH         | V <sub>OHD</sub>    | 5.2  | 5.6  | —    | V    | —                                              |
| Max. output voltage, LOW          | V <sub>OLD</sub>    | —    | 1.3  | 1.55 | V    | —                                              |
| Closed loop voltage gain          | G <sub>VC</sub>     | 7.0  | 8.0  | 9.0  | dB   | V <sub>IN</sub> =0.1V <sub>rms</sub> , 1kHz    |
| Ripple rejection                  | RR                  | —    | 60   | —    | dB   | V <sub>IN</sub> =0.1V <sub>rms</sub> , 100Hz   |
| Slew rate                         | SR                  | —    | 2.0  | —    | V/μs | 100 kHz square wave, 3 V <sub>P-P</sub> output |
| Mute Off voltage                  | V <sub>MOFF</sub>   | 2.0  | —    | —    | V    | —                                              |
| 〈5 V regulator〉                   |                     |      |      |      |      |                                                |
| Output voltage                    | V <sub>REG</sub>    | 4.75 | 5.00 | 5.25 | V    | I <sub>L</sub> =100mA                          |
| Output load differential          | ΔV <sub>RL</sub>    | −50  | 0    | 10   | mV   | I <sub>L</sub> =0~200mA                        |
| Power supply voltage differential | ΔV <sub>VCC</sub>   | −10  | 0    | 25   | mV   | (V <sub>CC</sub> =6~9V) I <sub>L</sub> =100mA  |
| 〈Operational amplifier〉           |                     |      |      |      |      |                                                |
| Offset voltage                    | V <sub>OFOF</sub>   | −5   | 0    | 5    | mV   | —                                              |
| Input bias current                | V <sub>BOP</sub>    | —    | —    | 300  | nA   | —                                              |
| Output high level voltage         | V <sub>OHO</sub>    | 6.0  | —    | —    | V    | —                                              |
| Output low level voltage          | V <sub>OLO</sub>    | —    | —    | 1.8  | V    | —                                              |
| Output drive current (sink)       | I <sub>SINK</sub>   | 10   | 50   | —    | mA   | 50Ω at V <sub>CC</sub>                         |
| Output drive current (source)     | I <sub>SOURCE</sub> | 10   | 40   | —    | mA   | 50Ω at GND                                     |
| Open loop voltage gain            | G <sub>VO</sub>     | —    | 78   | —    | dB   | V <sub>IN</sub> =−75dBV, 1kHz                  |
| Slew rate                         | SR <sub>OP</sub>    | —    | 1    | —    | V/μs | 100 kHz square wave, 4 V <sub>P-P</sub> output |
| Ripple rejection                  | RR <sub>OP</sub>    | —    | 65   | —    | dB   | V <sub>IN</sub> =−20dBV, 100Hz                 |
| Common mode rejection ratio       | CMRR                | —    | 84   | —    | dB   | V <sub>IN</sub> =−20dBV, 1kHz                  |

## ● Measurement circuit (BA6897S)

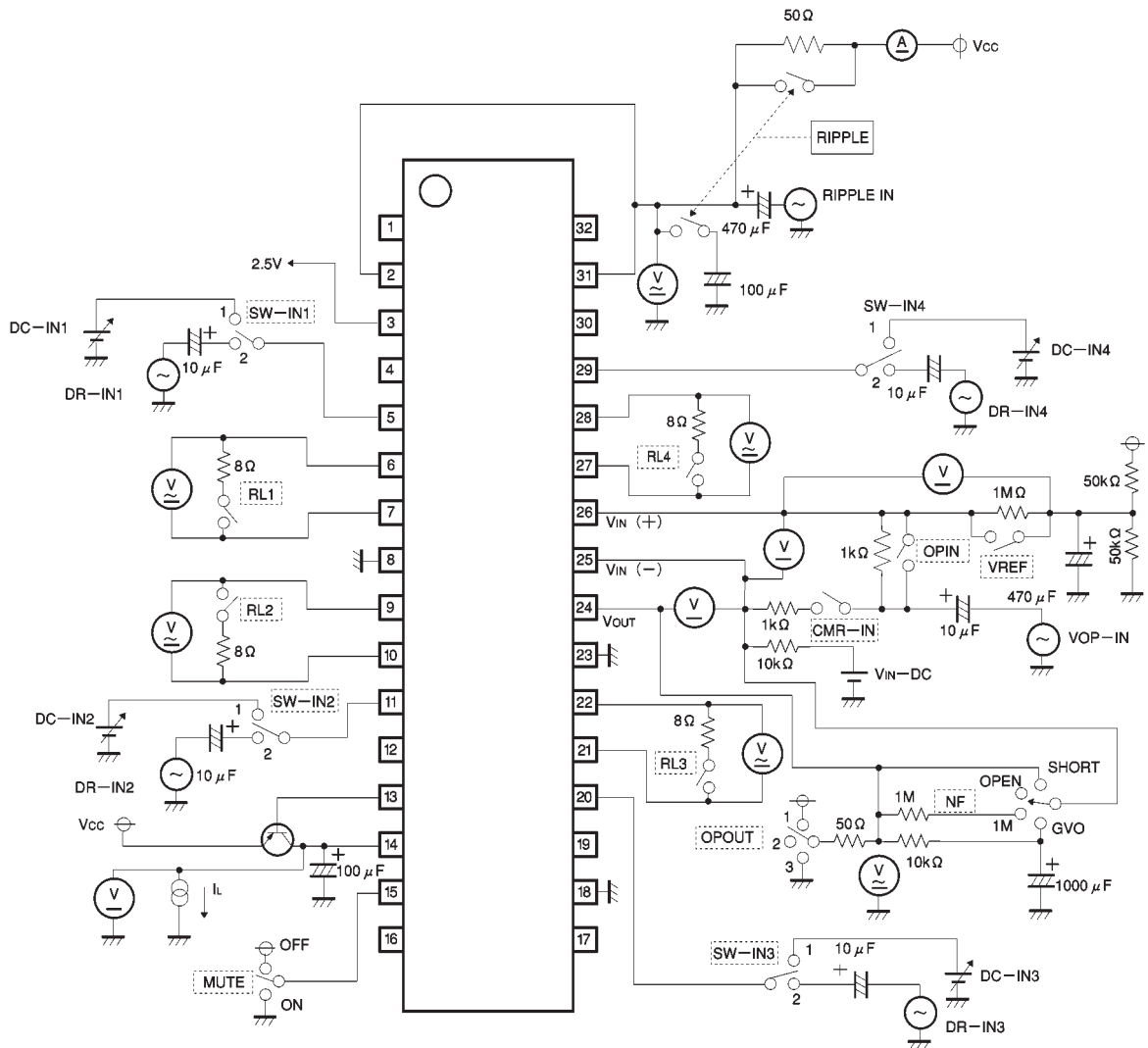


Fig.1

### ● 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.

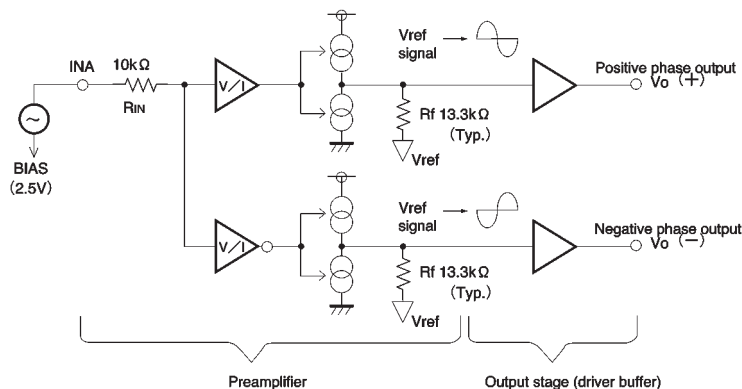


Fig. 2

#### (2) Regulator

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

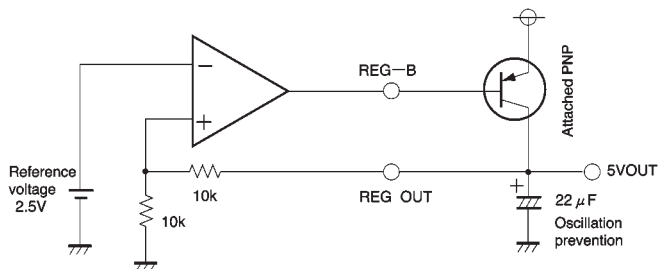


Fig. 3

#### (3) Amplifier

General 4558 type.



## ● Application examples

## BA6897S

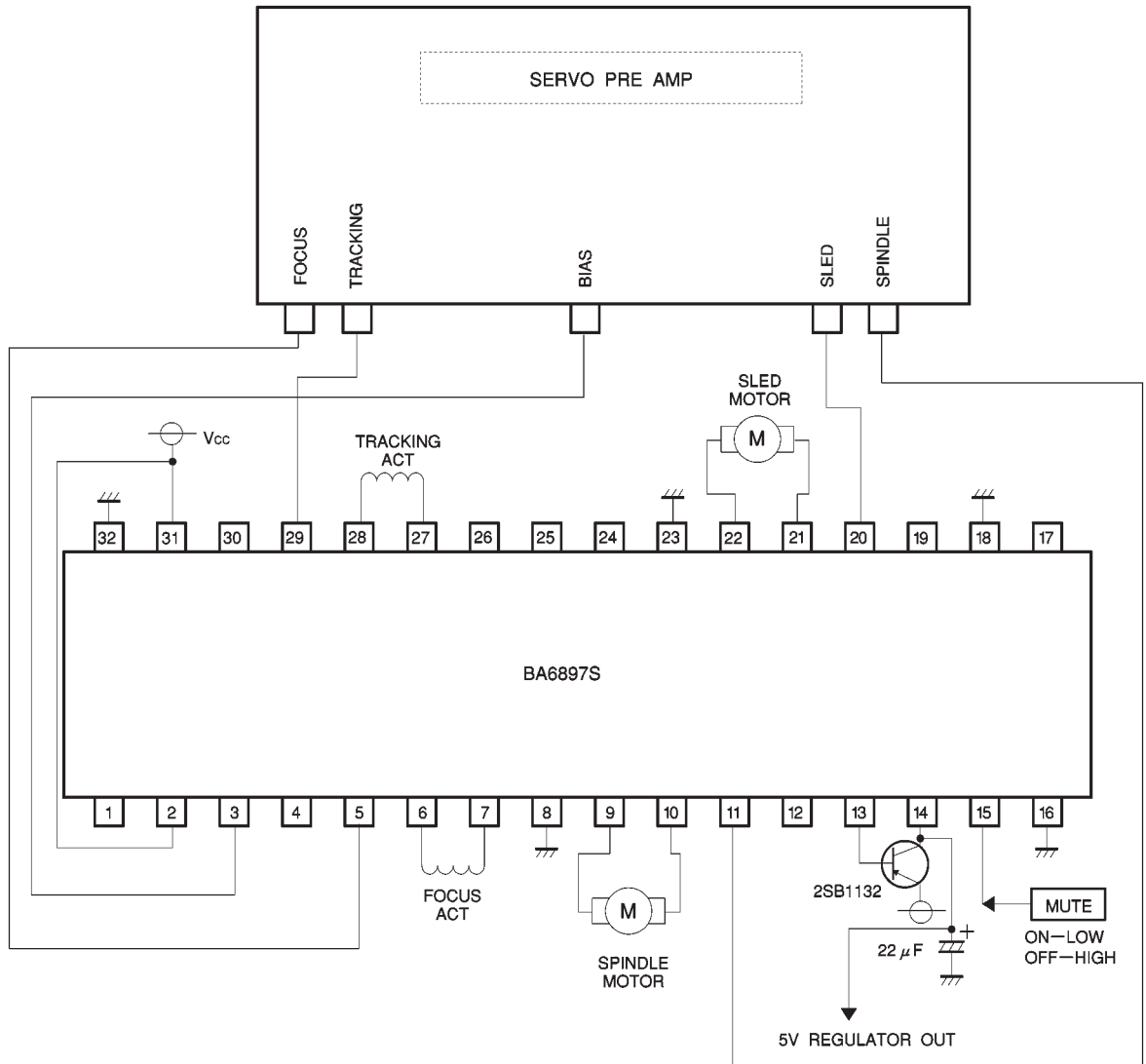


Fig.4

## BA6897FP

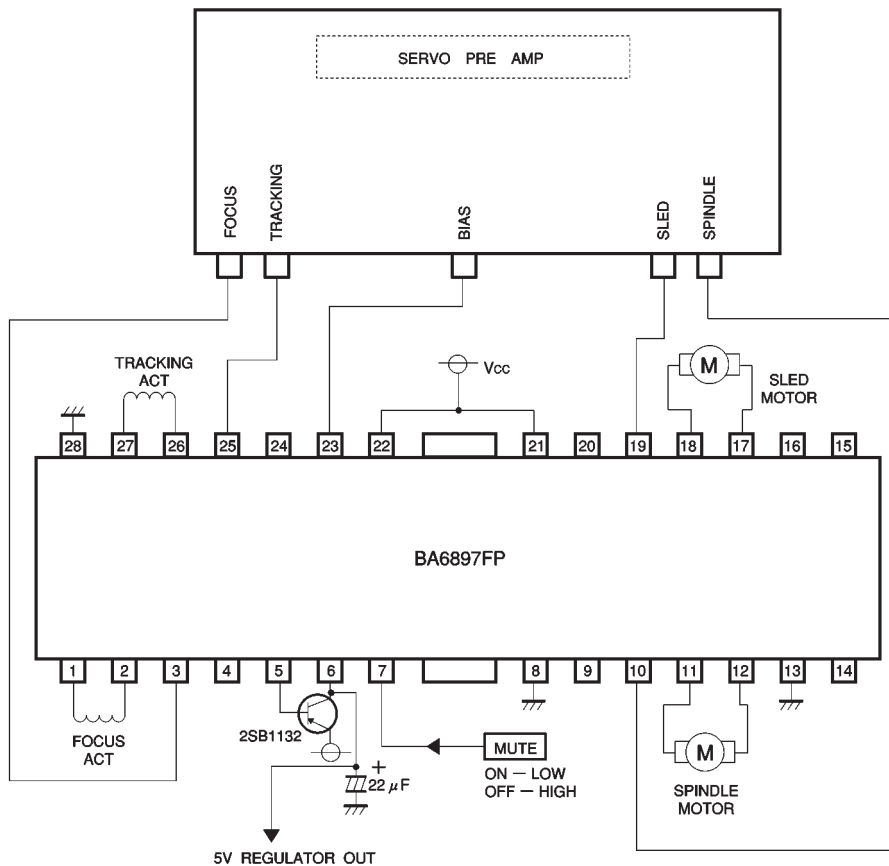


Fig.5

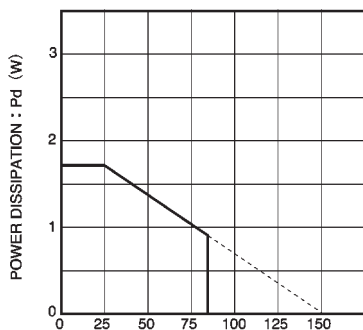
### ● Operation notes

- (1) The BA6897S and BA6897FP have an internal thermal shutdown circuit. Output current is muted when the chip temperature exceeds 175°C (typically).
- (2) If the mute pin voltage is opened or lowered below 0.5V, the output current will be muted. The mute pin should be pulled up above 2.0V during normal use.
- (3) The bias pin 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.

age. 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) Be sure to connect the IC to a 0.1μF bypass capacitor to the power supply, at the base of the IC.
- (6) The radiating fin is connected to the packages internal GND, but should also be connected to an external ground.
- (7) 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



AMBIENT TEMPERATURE :  $T_a$  (°C)  
BA6897S, When separate  
BA 6897FP, PCB When mounted  
on a 50×50×1 mm paper phenol board.

Fig. 6 Thermal derating curve

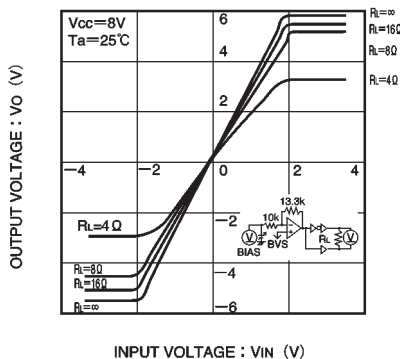


Fig. 7 Driver I/O characteristics  
(variable load)

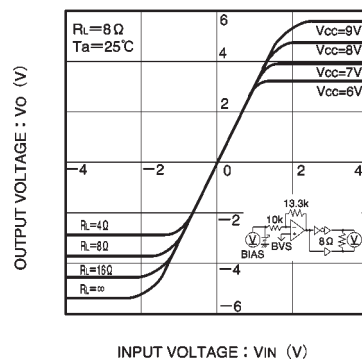


Fig. 8 Driver I/O characteristics  
(variable  $V_{CC}$ )

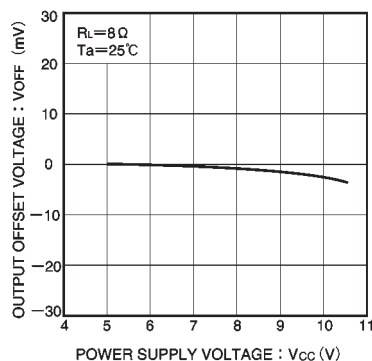


Fig. 9 Power supply voltage vs.  
output voltage (offset)

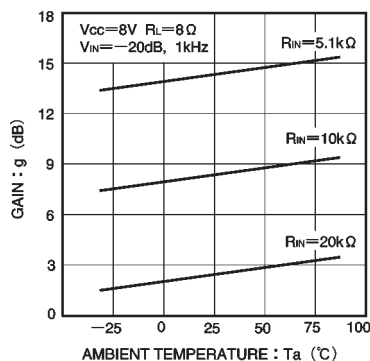


Fig. 10 Driver gain vs. temperature  
( $R_{IN}$  connected via gain adjustment pin)

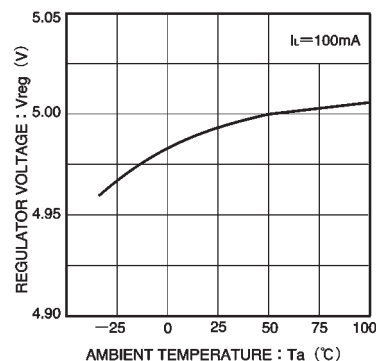


Fig. 11 Regulator voltage vs.  
temperature

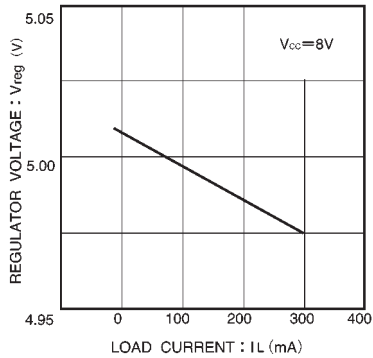


Fig. 12 Load current vs. regulator current

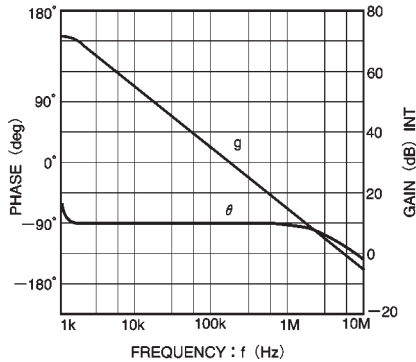


Fig. 13 Operational amplifier vs. open loop

● External dimensions (Units: mm)

