

Structure : Silicon Monolithic Integrated Circuit  
Product Name : Power Driver For Compact Disc Players

Device Name : **BA5929FP**

- Features :
- 3-ch BTL driver
  - Use of an HSOP-25 PIN power package can achieve downsizing of the set.
  - A wide dynamic range ( $V_{cc12}=5V$ ,  $V_{cc3}=12V$ ,  $4.2V$  (typ.) when  $R_L=8\Omega$ )
  - A built-in thermal shutdown circuit is installed.
  - A built-in general operational amplifier installed.
  - Through the standby terminal, the power saving mode can be set.

#### ○ ABSOLUTE MAXIMUM RATINGS ( $T_a=25^\circ C$ )

| Parameter                   | Symbol                 | Limits             | Unit       |
|-----------------------------|------------------------|--------------------|------------|
| Power Supply Voltage        | $V_{cc12}$ , $V_{cc3}$ | 13.5               | V          |
| Power Dissipation           | $P_d$                  | 1.45 <sup>*1</sup> | W          |
| Operating Temperature Range | $T_{opr}$              | -35 to 85          | $^\circ C$ |
| Storage Temperature Range   | $T_{stg}$              | -55 to 150         | $^\circ C$ |

\*1 When mounted on the glass/epoxy board with the size: 70 mm×70 mm, the thickness: 1.6 mm, and the rate of copper foil occupancy area: 3% or less.  
Over  $T_a=25^\circ C$ , derating at the rate of  $11.6mW/^\circ C$

#### ○ OPERATING CONDITIONS

| Parameter            | Symbol                 | Limits      | Unit |
|----------------------|------------------------|-------------|------|
| Power Supply Voltage | $V_{cc12}$ , $V_{cc3}$ | 4.5 to 13.2 | V    |

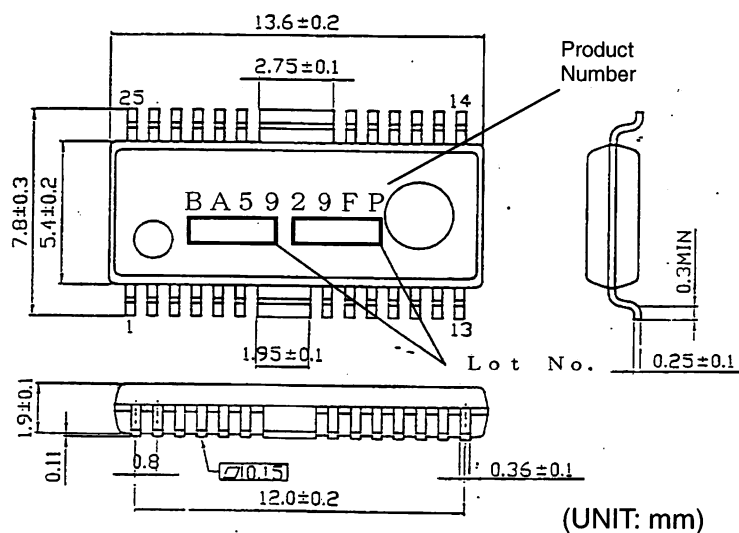
This product has not been checked for the strategic materials (or service) defined in the Foreign Exchange and Foreign Trade Control Law of Japan so that a verification work is required before exporting it.

Not designed for radiation resistance.

- ELECTRIC CHARACTERISTICS (Ta=25°C, Vcc12=5V, Vcc3=12V, BIAS=1.65V, RL=8Ω, unless otherwise noted.)

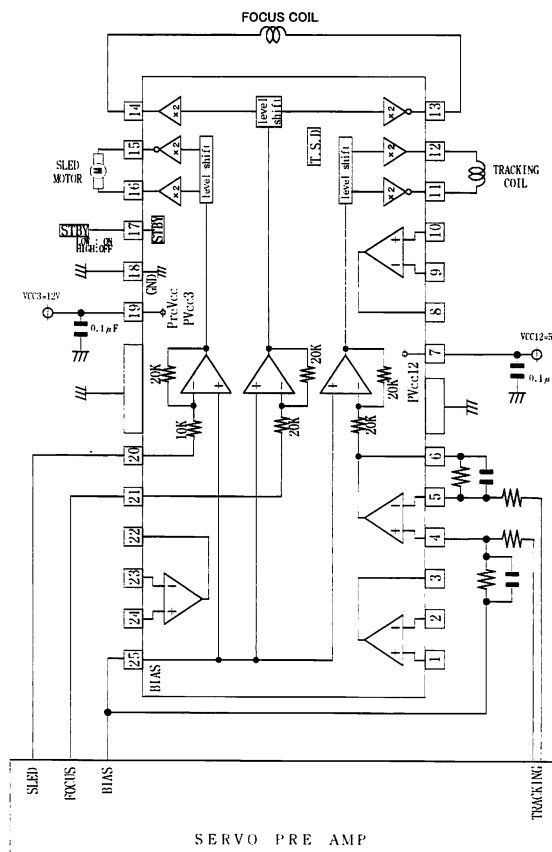
| Parameter                            | Symbol | MIN. | TYP  | MAX. | Unit | Condition                        |
|--------------------------------------|--------|------|------|------|------|----------------------------------|
| Standby Consumption Current          | IST    | -    | -    | 100  | μA   |                                  |
| Consumption Current (at no signal)   | IQ     | -    | 18   | 28   | mA   | No load applied                  |
| Output Offset Voltage                | Voof   | -70  | -    | 70   | mV   |                                  |
| Maximum Output Amplitude (CH1, 2)    | VOM12  | 3.8  | 4.2  | -    | V    |                                  |
| Maximum Output Amplitude (CH3)       | VOM3   | 8.5  | 9.5  | -    | V    |                                  |
| Closed Circuit Voltage Gain (CH1, 2) | GVC12  | 10.0 | 11.5 | 13.0 | dB   | VIN=0.1Vrms f=1KHz               |
| Closed Circuit Voltage Gain (CH3)    | GVC3   | 16.0 | 17.5 | 19.0 | dB   | VIN=0.1Vrms f=1KHz               |
| Standby Voltage                      | VSTBY  | -    | -    | 0.5  | V    |                                  |
| Standby Reset Voltage                | VSTOFF | 2.0  | -    | -    | V    |                                  |
| <OP-AMP>                             |        |      |      |      |      |                                  |
| Offset Voltage                       | VOFOP  | -6   | 0    | 6    | mV   |                                  |
| Input Bias Current                   | VBOP   | -    | -    | 300  | nA   |                                  |
| High-level Output Voltage            | VOHOP  | 10.0 | 11.3 | -    | V    |                                  |
| Low-level Output Voltage             | VOLOP  | -    | 0.1  | 0.4  | V    |                                  |
| Output Driving Current Sink          | ISI    | 1.0  | 5.0  | -    | mA   | VCC with 50Ω attached            |
| Output Driving Current Source        | ISO    | 8.0  | 12.0 | -    | mA   | GND with 50Ω attached            |
| Slew Rate                            | SROP   | -    | 1    | -    | V/μs | 100KHz square wave, 2Vp-p output |

- OUTLINE DIMENSIONS, SYMBOLS



(UNIT: mm)

# ○ APPLICATION CIRCUIT DIAGRAM



Resistance unit : [Ω]

# ○ PIN NUMBERS, PIN NAMES

| No. | Pin Name | Description                                | No. | Pin Name | Description                                |
|-----|----------|--------------------------------------------|-----|----------|--------------------------------------------|
| 1   | OPIN2P   | Operational amplifier 2 Non-inverted input | 14  | OUT2P    | Driver CH2 Positive output                 |
| 2   | OPIN2M   | Operational amplifier 2 Inverted input     | 15  | OUT3M    | Driver CH3 Negative output                 |
| 3   | OPOUT2   | Operational amplifier 2 Output             | 16  | OUT3P    | Driver CH3 Positive output                 |
| 4   | OPIN1P   | Operational amplifier 1 Non-inverted input | 17  | STBY     | Standby control terminal                   |
| 5   | OPIN1M   | Operational amplifier 1 Inverted input     | 18  | GND      | GND                                        |
| 6   | OPOUT1   | Operational amplifier 1 Output             | 19  | PVCC3    | VCC (CH3/pre-stage)                        |
| 7   | PVCC12   | VCC (CH1/CH2)                              | 20  | CH3IN    | CH3 Input                                  |
| 8   | OPOUT3   | Operational amplifier 2 Output             | 21  | CH2IN    | CH2 Input                                  |
| 9   | OPIN3M   | Operational amplifier 2 Inverted input     | 22  | OPOUT4   | Operational amplifier 4 Output             |
| 10  | OPIN3P   | Operational amplifier 2 Non-inverted input | 23  | OPIN4M   | Operational amplifier 4 Inverted input     |
| 11  | OUT1M    | Driver CH1 negative output                 | 24  | OPIN4P   | Operational amplifier 4 Non-inverted input |
| 12  | OUT1P    | Driver CH1 positive output                 | 25  | BIAS     | Bias input                                 |
| 13  | OUT2M    | Driver CH2 negative output                 |     |          |                                            |

Note) The positive or negative polarity of driver outputs is determined by the input polarity.  
 CH1: When the inverted AMP is used for the input stage OP-AMP, the H input results in L at the negative output pin and H at the positive output pin.  
 CH2/CH3: Applying the signal H to the input pin results in L at the negative output pin and H at the positive output pin.

## ○ CAUTIONS ON USE

- (1) Setting the standby terminal (pin 17) voltage to open or to 0.5V (typ.) or less, the driver will turn OFF and the power saving mode can be set.  
Under conditions of normal use, the pin 17 should be pulled-up to 2.0V or above.
- (2) On the Bias terminal (pin 25), the applied voltage of 0.7V (typ.) or less will activate a mute function.  
Under conditions of normal use, it should be set to 1.3V or above.
- (3) Thermal shutdown (TSD) or bias terminal voltage drop will activate the mute function, where only the driver part can be muted. While muting, the voltage at the output terminal will equal to the internal reference voltage (approximately  $V_{cc}/2$ ).
- (4) Connecting a capacitive load to the OP-AMP output results in a phase margin reduction of the amp and may cause an oscillation or a peak. When connecting a capacitive load, a resistance must be inserted in series between the output and the capacitive load. And after careful consideration of the frequency characteristics, the device should be used within the range where no problem is found in actual use.
- (5) The radiating fin must be connected to the external GND.
- (6) Short-circuit between output pin -VCC, output pin-GND, or output terminals (load short) must be avoided.  
Mounting the ICs in improper directions may damage themselves or produce smoke.
- (7) About absolute maximum ratings  
Exceeding the absolute maximum ratings, such as the applied voltage or the operating temperature range, may cause permanent device damage. As these cases cannot be limited to the broken short mode or the open mode, if a special mode where the absolute maximum ratings may be exceeded is assumed, it is recommended to take mechanical safety measures such as attaching fuses.
- (8) About power supply lines  
As a measure against the back current regenerated by a counter electromotive force of the motor, a capacitor to be used as a regenerated-current path can be installed between the power supply and GND and its capacitance value should be determined after careful check that any problems, for example, a leak capacitance of the electrolytic capacitor at low temperature, are not found in various characteristics.
- (9) About GND potential  
The electric potential of the GND terminal must be kept lowest in the circuitry at any operation states.
- (10) About thermal design  
With consideration of the power dissipation ( $P_d$ ) under conditions of actual use, a thermal design provided with an enough margin should be done.
- (11) About operations in a strong electric field  
When used in a strong electric field, note that a malfunction may occur.
- (12) ASO  
When using this IC, the output  $T_r$  must be set not to exceed the values specified in the absolute maximum ratings and ASO.
- (13) Thermal shutdown circuit  
This IC incorporates a thermal shutdown circuit (TSD circuit). When the chip temperature reaches the value shown below, the coil output to the motor will be set to open.  
The thermal shutdown circuit is designed only to shut off the IC from a thermal runaway and not intended to protect or guarantee the entire IC functions.  
Therefore, users cannot assume that the TSD circuit once activated can be used continuously in the subsequent operations.

| TSD ON Temperature<br>[°C] (typ.) | Hysteresis Temperature<br>[°C] (typ.) |
|-----------------------------------|---------------------------------------|
| 175                               | 25                                    |

- (14) About earth wiring patterns  
When a small signal GND and a large current GND are provided, it is recommended that the large current GND pattern and the small signal GND pattern should be separated and grounded at a single point of the reference point of the set in order to prevent the voltage of the *small signal GND* from being affected by a voltage change caused by the resistance of the pattern wiring and the large current. Make sure that the GND wiring patterns of the external components will not change, too.

- (15) This IC is a monolithic IC which has a P<sup>+</sup> isolations and P substrate to isolate elements each other. This P layer and an N layer in each element form a PN junction to construct various parasitic elements. Due to the IC structure, the parasitic elements are inevitably created by the potential relationship. Activation of the parasitic elements can cause interference between circuits and may result in a malfunction or, consequently, a fatal damage. Therefore, make sure that the IC must not be used under conditions that may activate the parasitic elements, for example, applying the lower voltage than the ground level (GND, P substrate) to the input terminals.
- In addition, do not apply the voltage to input terminals without applying the power supply voltage to the IC. Also while applying the power supply voltage, the voltage of each input terminal must not be over the power supply voltage, or within the guaranteed values in the electric characteristics.

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