## 3－channel BTL driver for CD，CD－ROM， DVD，and DVD－ROM BA5973FP

The BA5973FP is a 3－channel BTL driver developed for use as the actuator and loading motor driver for CD and DVD players．Since the gain and frequency characteristics for the actuator can be set to any desired value with external com－ ponents，it is can be used in a wide range of applications．

## －Features

1）3－channel BTL driver for CD players．
2）The HSOP－28 package allows for the design of smaller sets．
3）Internal thermal shutdown circuit with hysteresis．

〈Actuator driver〉
4）Gain is adjustable with external resistor．
5）Contains both positive and negative input systems for compatibility with a variety of input formats such as reverse phase input．
〈Loading driver〉
6）Internal brake function．
7）Internal back－rush voltage protection diode．
－Absolute maximum ratings $\left(\mathrm{Ta}=25^{\circ} \mathrm{C}\right)$

| Parameter | Symbol | Limits | Unit |
| :--- | :---: | :---: | :---: |
| Power supply voltage | Vcc，PVcc | 13.5 | V |
| Power dissipation | Pd | $1.7^{* 1}$ | W |
| Allowable current | lomax． | $0.8^{* 2}$ | A |
| Operating temperature | Topr | $-35 \sim+85$ | ${ }^{\circ} \mathrm{C}$ |
| Storage temperature | Tstg | $-55 \sim+150$ | ${ }^{\circ} \mathrm{C}$ |

＊1 Reduced by 13.6 mW for each increase in Ta of $1^{\circ} \mathrm{C}$ over $25^{\circ} \mathrm{C}$ ．
＊2 Should not exceed Pd and ASO values．

Recommended operating conditions

| Parameter | Symbol | Limits | Unit |
| :---: | :---: | :---: | :---: |
| Power supply voltage <br> （pre－block） | Vcc | $4.5 \sim+13.5$ | V |
| Power supply voltage <br> （power－block） | PVcc | $4.5 \sim+8.5$ | V |



Units of resistance values are $\Omega$

- Pin descriptions

| Pin No. | Pin name | Function | Pin No. | Pin name |  |
| :---: | :---: | :--- | :---: | :---: | :--- |
| 1 | MUTE | Mute* | 15 | PVcc | Vcc (output H bridge block) |
| 2 | OPIN11+ | Op-amp non-inverse input | 16 | LDOUT+ | Loading (+) output |
| 3 | FWD1 | Forward input | 17 | FWD | Loading forward input* |
| 4 | REV1 | Reverse input | 18 | OUT2+ | Driver output |
| 5 | OPIN11- | Op-amp inverse input | 19 | OUT2- | Driver output |
| 6 | OPOUT11 | Op-amp output | 20 | OPOUT22 | Op-amp output |
| 7 | OPIN12- | Op-amp inverse input | 21 | Vcc | Vcc (pre-block) |
| 8 | GND | Substrate GND | 22 | OPIN22- | Op-amp inverse input |
| 9 | OPOUT12 | Op-amp output | 23 | OPOUT21 | Op-amp output |
| 10 | SW | Analog switch input* | 24 | OPIN21- | Op-amp inverse input |
| 11 | OUT1- | Driver output | 25 | REV2 | Reverse input |
| 12 | OUT1+ | Driver output | 26 | FWD2 | Forward input |
| 13 | REV | Loading reverse input* | 27 | OPIN21+ | Op-amp non-inverse input |
| 14 | LDOUT- | Loading (一) output | 28 | VREF | Reference voltage output |

* Refer to the truth table in circuit operation explanation on page 695.

Electrical characteristics（unless otherwise noted， $\mathrm{Ta}=25^{\circ} \mathrm{C}, \mathrm{V} \mathrm{Cc}=12 \mathrm{~V}, \mathrm{PV} \mathrm{cc}=5 \mathrm{~V}, \mathrm{f}=1 \mathrm{kHz}, \mathrm{RL}=8 \Omega$ ）

| Parameter | Symbol | Min． | Typ． | Max． | Unit | Conditions |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Quiescent current 1 | lo1 | － | 11.5 | 21.5 | mA | No load，loading driver in open mode |
| Quiescent current 2 | lo2 | － | 17.0 | 32.0 | mA | No load，loading driver in forward／reverse mode |
| Quiescent current 3 | la3 | － | 20.0 | 30.0 | mA | No load，loading driver in brake mode |
| 〈Internal reference〉 |  |  |  |  |  |  |
| Output voltage | Vref | 2.30 | 2.50 | 2.70 | $v$ | － |
| Maximum output current source | loso | 10 | 30 | － | mA | － |
| Maximum output current sink | losi | 10 | 15 | － | mA | － |
| 〈Actuator driver〉 |  |  |  |  |  |  |
| Output offset voltage | Voo | －70 | 0 | 70 | mV | － |
| Maximum output amplitude | Vom | 3.5 | 4.0 | － | V | － |
| Closed－loop voltage gain | Gvc | 4.5 | 6.0 | 7.5 | dB | － |
| Ripple rejection | RR | － | 60 | － | dB | $\mathrm{Vosc}=0.1 \mathrm{Vrms}, 100 \mathrm{kHz}$ |
| 〈Analog switch input〉 |  |  |  |  |  |  |
| Input high level voltage | $\mathrm{V}_{\mathrm{H}}$ | 2.0 | － | Vcc | V | － |
| Input low level voltage | VIL | －0．3 | － | 0.5 | V | － |
| Input high level current | Ін | － | 90 | 135 | $\mu \mathrm{A}$ | $\mathrm{V}_{1 \times}=5 \mathrm{~V}$ |
| Input low level current | IL． | －10 | 0 | 10 | $\mu \mathrm{A}$ | $\mathrm{V}_{\mathrm{in}}=0 \mathrm{~V}$ |
| 〈Loading driver〉 |  |  |  |  |  |  |
| Output saturation voltage 1 | Vsat1 | － | 0.4 | 0.8 | V | Upper＋lower IL＝200mA |
| Output saturation voltage 1 F／R difference | $\Delta \mathrm{V}$ sat1 | － | － | 0.1 | V | F／R difference for output saturation voltage 1 |
| Output saturation voltage 2 | Vsat2 | － | 0.9 | 1.5 | V | Output saturation voltage at lı $=500 \mathrm{~mA}$ |
| 〈Loading logic〉 |  |  |  |  |  |  |
| Input high level voltage | Vihlo | 2.0 | － | Vcc | V | － |
| Input low level voltage | VıLை | －0．3 | － | 0.5 | V | － |
| Input high level current | lıLD | － | 180 | 270 | $\mu \mathrm{A}$ | － |
| Input low level current | IILD | －10 | 0 | 10 | $\mu \mathrm{A}$ | － |

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## -Measurement circuit



Fig. 1

## -Circuit operation

The analog switch pin 10, the mute pin 1, and the loading driver input logic operate as shown below.
(1) Mute input (pin 1) truth table

| Input | Function |
| :---: | :---: |
| L | Mute on for actuator driver |
| $H$ | Mute off for actuator driver |

(2) Analog switch input (pin 10) truth table

| Input | Function |
| :---: | :---: |
| L | Connects driver buffer input to pin 6 |
| $H$ | Connects driver buffer input to pin 9 |

-Application example

Fig. 2
(3) Loading driver logic input (pins 13 and 17) truth table

| FWD | REV | Function |
| :---: | :---: | :--- |
| L | L | Open mode |
| L | H | Reverse mode |
| H | L | Forward mode |
| H | H | Brake mode |



## -Operation notes

(1) The BA5973FP contains a thermal shutdown circuit.
When the chip temperature reaches $175^{\circ} \mathrm{C}$ (Typ.), the output current is muted. If the chip temperature then drops below $150^{\circ} \mathrm{C}$ (Typ.), then the driver circuits start up.
(2) Connect a bypass capacitor (approx. $0.1 \mu \mathrm{~F}$ ) between the bases of the power supply pins of this IC.
(3) Be sure to connect the radiation fins to an external ground.

- Electrical characteristic curves


Fig. 3 Thermal derating curve


INPUT VOLTAGE : Vin (V)
Fig. 4 Channel 1 driver I/O characteristics (during load regulation)


Fig. 7 Power supply voltage vs. op-amp maximum output current


INPUT VOLTAGE: VIN (V)
Fig. 5 Channel 2 driver l/O characteristics


Fig. 6 Power supply voltage vs. Vref amplifier maximum output current


Fig. 8 Power supply voltage vs. output offset voltage


Fig. 9 Loading output current vs. output voltage


Fig. 10 Loading output voltage vs. power supply voltage (during load regulation)

External dimensions (Units: mm)



[^0]:    ONot designed for radiation resistance．

