

# 2-channel reversible-motor driver

## BA6191

The BA6191 is a 2-channel motor driver for CD player changers and electric volume switches, among other applications. Because it uses a negative power supply, this IC uses the power supply of application products efficiently.

### ●Applications

CD player, etc.

### ●Features

- 1) Two-channel reversible-motor driver.
- 2) Four modes - forward, reverse, stop (free rotation) and brake are output according to control logic input (two inputs).
- 3) Output voltage is set with the Vref pin.
- 4) Internal power supply voltage drop mute circuit.
- 5) Internal thermal shutdown circuit.
- 6) Negative power supply.

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

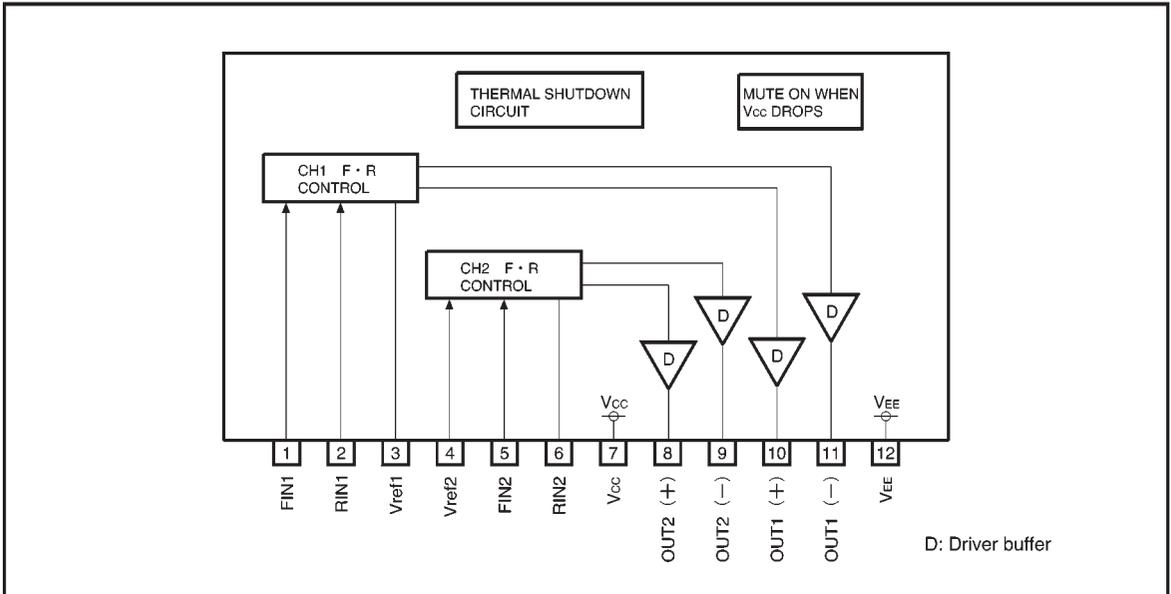
| Parameter               | Symbol                              | Limits   | Unit |
|-------------------------|-------------------------------------|----------|------|
| Applied voltage         | V <sub>CC</sub>                     | 18       | V    |
| Logic input pin voltage | V <sub>FIN</sub> , V <sub>RIN</sub> | 22       | V    |
| Power dissipation       | P <sub>d</sub>                      | 2.2      | W    |
| Operating temperature   | T <sub>opr</sub>                    | -25~+75  | °C   |
| Storage temperature     | T <sub>stg</sub>                    | -55~+150 | °C   |

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

| Parameter              | Symbol           | Limits                     | Unit |
|------------------------|------------------|----------------------------|------|
| Power supply voltage   | V <sub>CC</sub>  | 7~16*                      | V    |
| Vref pin input voltage | V <sub>ref</sub> | 1.0~V <sub>CC</sub> /2-1.0 | V    |

\* Set the power supply voltage according to power dissipation.

## ● Block diagram

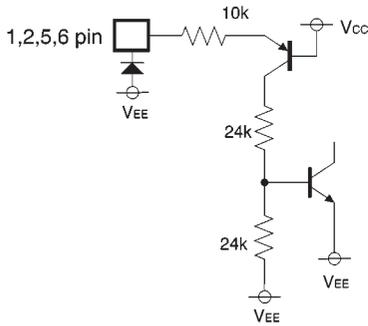


## ● Pin descriptions

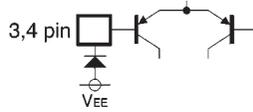
| Pin No. | Pin name | Function  |
|---------|----------|---|
| 1       | FIN1     | Input of channel 1 forward control signal           |
| 2       | RIN1     | Input of channel 1 reverse control signal           |
| 3       | Vref1    | Setting the high level voltage for channel 1 output |
| 4       | Vref2    | Setting the high level voltage for channel 2 output |
| 5       | FIN2     | Input of channel 2 forward control signal           |
| 6       | RIN2     | Input of channel 2 reverse control signal           |
| 7       | Vcc      | (+) power supply                                    |
| 8       | OUT2 (+) | Channel 2 output (positive)                         |
| 9       | OUT2 (-) | Channel 2 output (negative)                         |
| 10      | OUT1 (+) | Channel 1 output (positive)                         |
| 11      | OUT1 (-) | Channel 1 output (negative)                         |
| 12      | VEE      | (-) power supply                                    |

● Input/output circuits

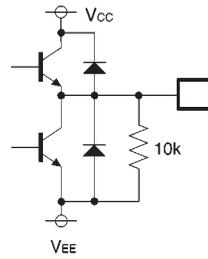
Logic input pins



Voltage setting pins



Output pins



Positive output  
8, 10 pin  
Negative output  
9, 11 pin

Fig. 1

●Electrical characteristics (unless otherwise noted,  $T_a=25^\circ\text{C}$ ,  $V_{CC}=10\text{V}$ ,  $V_{ref}=2.5\text{V}$ )

| Parameter                 | Symbol        | Min. | Typ. | Max. | Unit          | Conditions   |
|---------------------------|---------------|------|------|------|---------------|--|
| Supply current 1          | $I_{CC1}$     | 2.1  | 3.3  | 4.3  | mA            | Stop mode  |
| Supply current 2          | $I_{CC2}$     | 25   | 38   | 50   | mA            | Forward or reverse mode  |
| Supply current 3          | $I_{CC3}$     | 13   | 20   | 27   | mA            | Brake mode   |
| Input high level voltage  | $V_{IH}$      | 4.0  | —    | —    | V             | $V_{CC}$ =reference potential  |
| Input low level voltage   | $V_{IL}$      | —    | —    | 1.0  | V             | $V_{CC}$ =reference potential  |
| Input high level current  | $I_{IH}$      | —    | —    | 100  | $\mu\text{A}$ |  |
| Input low level current   | $I_{IL}$      | -1.0 | —    | +1.0 | $\mu\text{A}$ |  |
| Output saturation voltage | $V_{CE}$      | —    | 1.4  | 2.1  | V             | $I_o=100\text{ mA}$ , $V_{ref}=5\text{ V}$ , sum of the invalid voltages for the upper and lower transistor output |
| Vref source current       | $I_{ref}$     | —    | 0.02 | 1.0  | $\mu\text{A}$ | Forward or reverse mode  |
| Output voltage 1 *1       | $V_{OUT1}$    | 4.5  | 5.0  | 5.5  | V             | Forward mode $I_o=100\text{mA}$  |
| Output voltage 2 *1       | $V_{OUT2}$    | -4.5 | -5.0 | -5.5 | V             | Reverse mode $I_o=100\text{mA}$  |
| Output voltage 3 *1       | $V_{OUT3}$    | -50  | 0    | 50   | mV            | Brake mode $I_o=100\text{mA}$  |
| Output voltage 4 *1       | $V_{OUT4}$    | -50  | 0    | 50   | mV            | Stop mode  |
| Load regulation 1         | *2 $V_{OUT1}$ | —    | 230  | 350  | mV            | Output voltage differential between $I=400\text{ mA}$ and $I=100\text{ mA}$  |
| Load regulation 2         | *3 $V_{OUT2}$ | —    | 300  | 500  | mV            | Output voltage differential between $I=400\text{ mA}$ and $I=-100\text{ mA}$                                       |
| Mute On voltage           | $V_{CC1}$     | —    | —    | 3.5  | V             | Muted when $V_{CC}$ falls  |
| Mute Off voltage          | $V_{CC2}$     | 5.5  | —    | —    | V             |  |

\*1 Output voltage = (positive output pin voltage) - (negative output pin voltage)

\*2 Output voltage differential 1 = difference in voltage between 400 mA source and 100 mA source from HIGH level output pin in forward or reverse mode

\*3 Output voltage differential 2 = difference in voltage between 400 mA sink and 100 mA sink from LOW level output pin in forward or reverse mode

●Circuit operation

(1) Forward/reverse control block

The IC outputs the forward, reverse, stop (free rotation) or brake mode in accordance with the two control logic inputs.

⟨Forward and reverse modes⟩

An output voltage twice that of the reference voltage is generated.

⟨Stop mode⟩

Each pin changes to the high impedance state.

⟨Brake mode⟩

Each pin outputs 0V.

Logic input and output truth table

| $F_{IN}$ | $R_{IN}$ | OUT (+) | OUT (-) | Mode    |
|----------|----------|---------|---------|---------|
| L        | H        | H       | L       | Forward |
| H        | L        | L       | H       | Reverse |
| H        | H        | L       | L       | Brake   |
| L        | L        | OPEN    | OPEN    | Stop    |

- 1) Normal voltage is not output when the reference voltage is below 1.0V or about  $V_{CC}/2-1.0\text{V}$ .
- 2)  $V_{CC}$  is the reference voltage for the input voltage of logic input pins. In terms of potential relative to  $V_{EE}$ , the HIGH level are  $(V_{CC}+5.0)\text{V}$  and LOW level are  $(V_{CC})\text{V}$ .
- 3) Fig. 2 shows each pin's potential level.

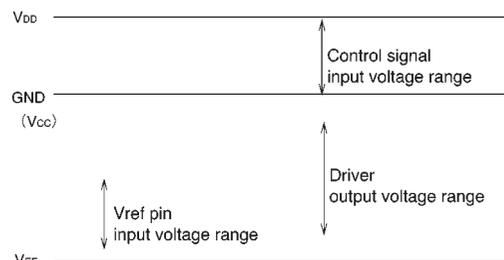


Fig. 2 Pin potential levels



● Thermal derating curve

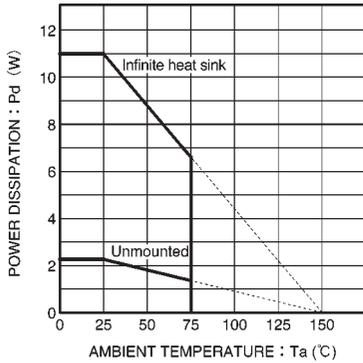


Fig. 4 Thermal derating curve

● Electrical characteristic curves

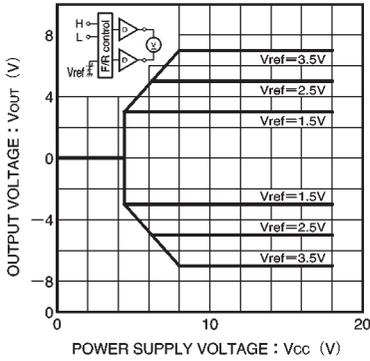


Fig. 5 Power supply voltage vs. output voltage

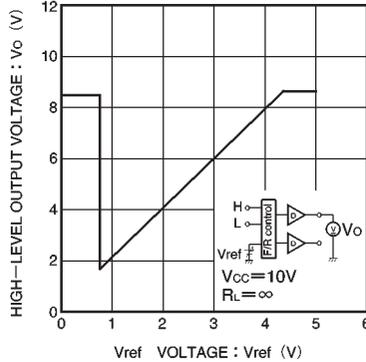


Fig. 6 Vref voltage vs. high-level output voltage

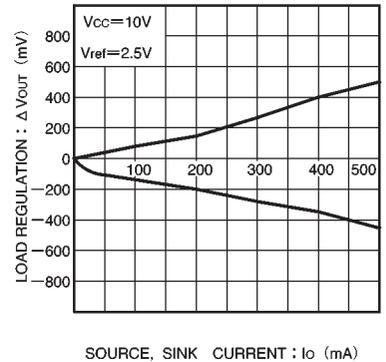


Fig. 7 SOURCE / SINK current vs. load regulation

● External dimensions (Units: mm)

