

# 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)

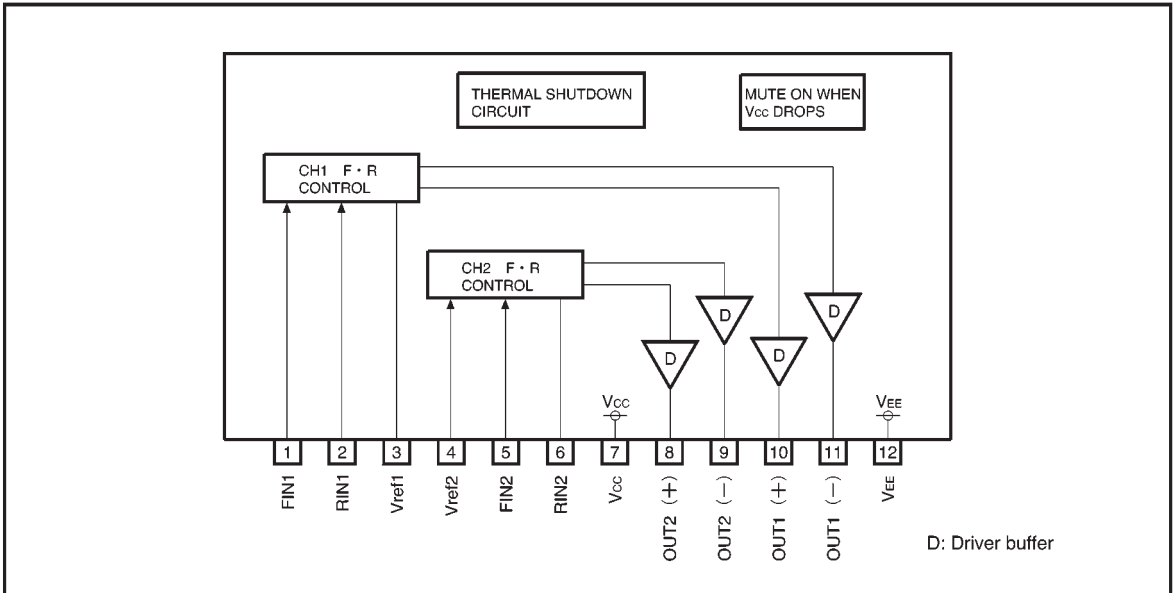
Parameter	Symbol	Limits	Unit
Applied voltage	V <sub>CC</sub>	18	V
Logic input pin voltage	V <sub>FIN</sub> , V <sub>RIN</sub>	22	V
Power dissipation	P <sub>d</sub>	2.2	W
Operating temperature	T <sub>opr</sub>	-25~+75	°C
Storage temperature	T <sub>stg</sub>	-55~+150	°C

### ●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

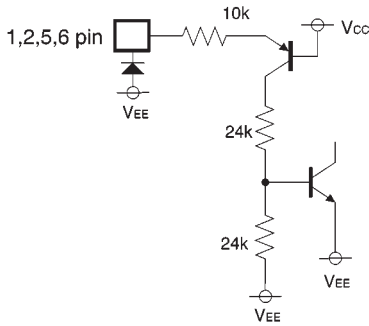


## ● Pin descriptions

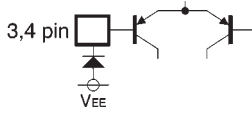
Pin No.	Pin name	Function
1	FIN1	Input of channel 1 forward control signal
2	RIN1	Input of channel 1 reverse control signal
3	Vref1	Setting the high level voltage for channel 1 output
4	Vref2	Setting the high level voltage for channel 2 output
5	FIN2	Input of channel 2 forward control signal
6	RIN2	Input 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

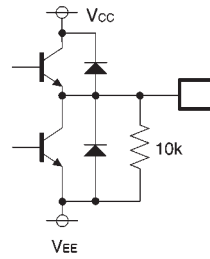
Logic input pins



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	$V_{CC}=\text{reference potential}$
Input low level voltage	$V_{IL}$	—	—	1.0	V	$V_{CC}=\text{reference potential}$
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.

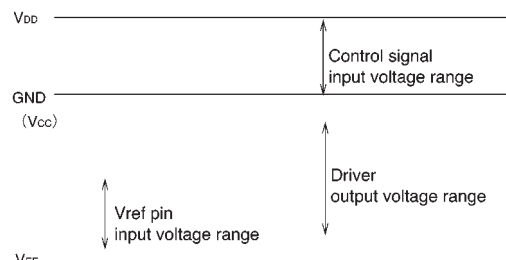


Fig. 2 Pin potential levels

● Circuit operation

(2) Thermal shutdown

The BA6191 has an internal shutdown circuit with hysteresis capabilities. Output current is muted when the chip temperature exceeds 175°C (typically) and restored when the chip temperature falls to 150°C (typically).

(3) Power supply voltage drop muting

The output current is muted when the power supply voltage ( $V_{CC}$ ) drops below 3.0V. During muting, the output voltage is  $V_{EE}$ .

● Application example

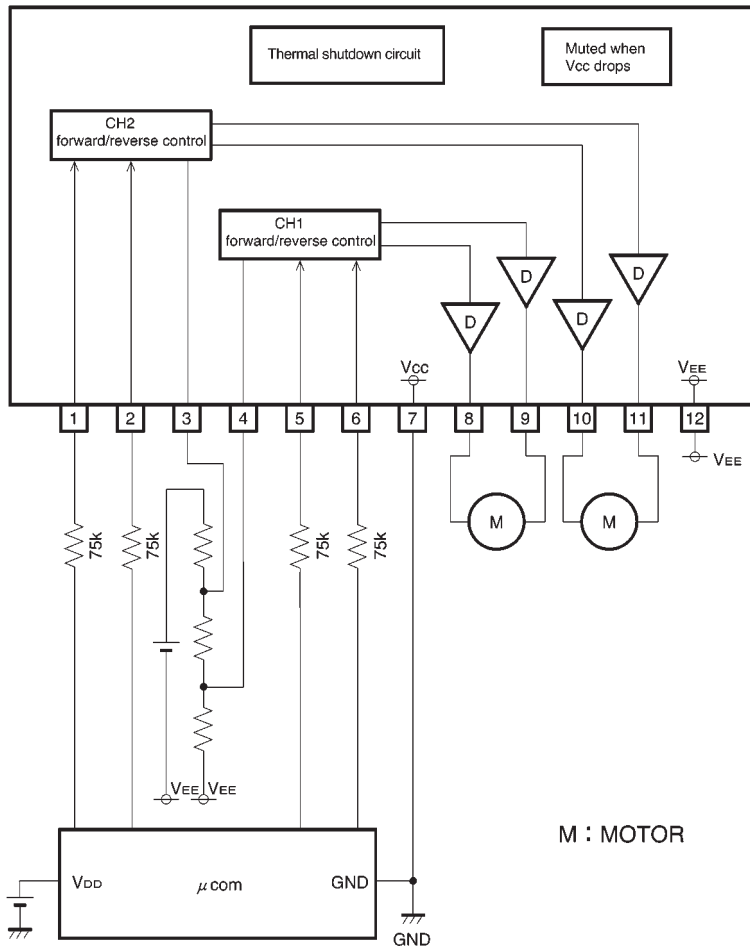


Fig. 3

● Operation notes

- (1) Attach a bypass capacitor (roughly 0.1 $\mu\text{F}$ ) to the power supply, at the base of the IC.
- (2) The radiating fin is internally grounded to the package and so should be connected to an external ground.

● Thermal derating curve

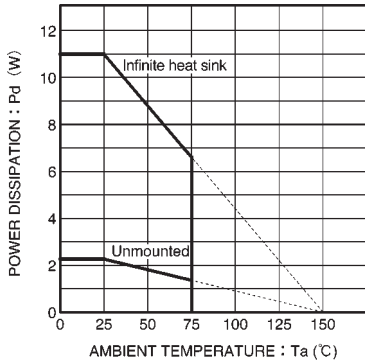


Fig. 4 Thermal derating curve

● Electrical characteristic curves

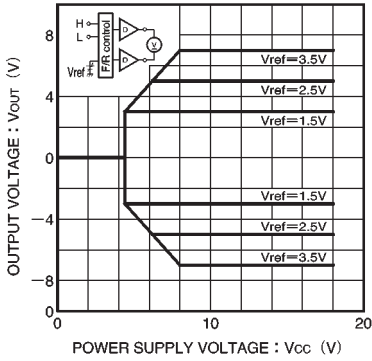


Fig. 5 Power supply voltage vs. output voltage

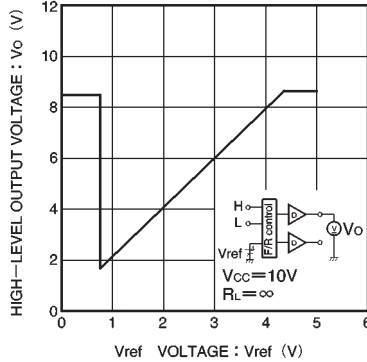


Fig. 6 Vref voltage vs. high-level output voltage

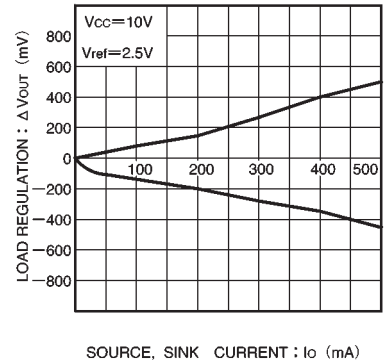


Fig. 7 SOURCE / SINK current vs. load regulation

● External dimensions (Units: mm)

