2-channel reversible-motor driver
BA6193

The BA6193 is a 2-channel motor driver for CD player changers and electric volume switches, and other applications as well. Because it uses a negative power supply, this IC uses the power supply of application products efficiently.

●Applications

CD players and CD-ROM drives with loading features, etc.

●Features

1) Reversible-motor driver with dual independent channels.
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 V_{ref} 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
Power supply voltage	V_{CC}	18	V
Logic input pin voltage	V_{FIN}, V_{RIN}	22	V
Power dissipation	Pd	1000*	mW
Operating temperature	Topr	−25～+75	℃
Storage temperature	Tstg	−55～+150	℃

＊ Reduced by 10 mW for each increase in Ta of 1℃ over 25℃.

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V_{CC}	7	—	16*	V
Vref pin input voltage	V_{ref}	1.0	—	$(V_{CC} / 2) - 1.0$	V

＊ Set the power supply voltage according to power dissipation.

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●Block diagram

D: Driver buffer
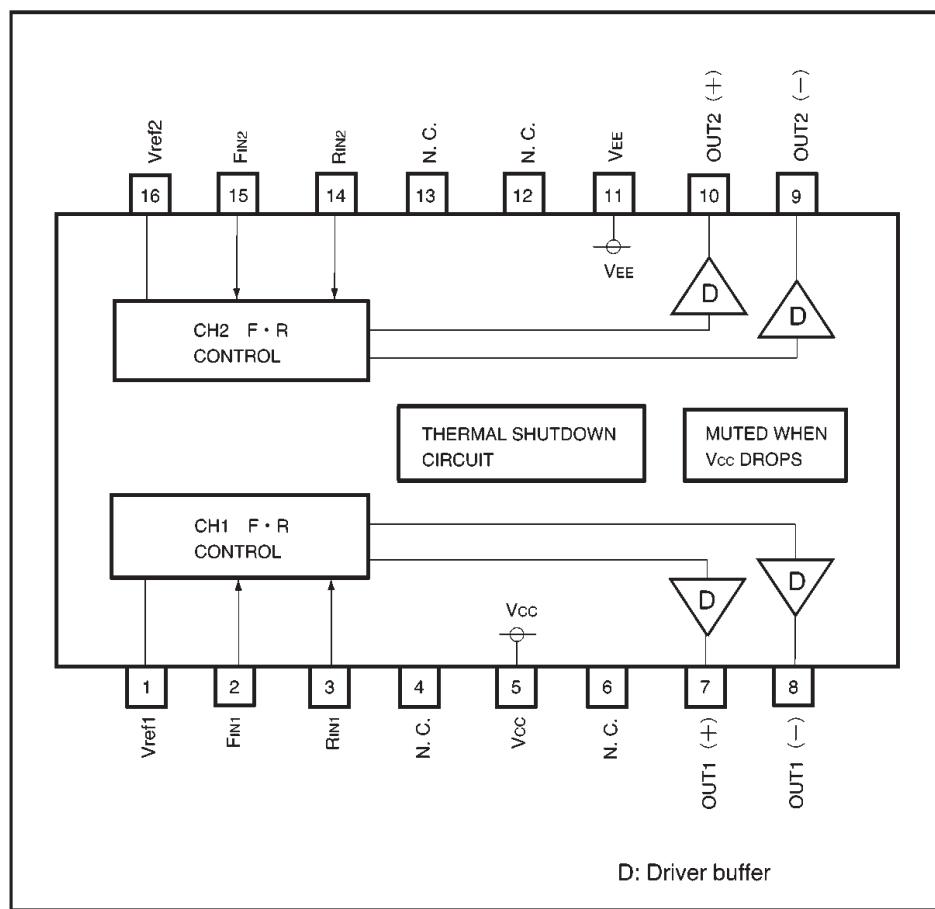
●Pin descriptions

Pin No.	Pin name	Function	Pin No.	Pin name	Function
1	Vref1	Setting the high level voltage for channel 1 output	9	OUT2 (−)	Channel 2 output (negative)
2	F_{IN1}	Input of channel 1 forward control signal	10	OUT2 (+)	Channel 2 output (positive)
3	R_{IN1}	Input of channel 1 reverse control signal	11	V_{EE}	(−) power supply
4	N.C.		12	N.C.	
5	V_{CC}	(+) power supply	13	N.C.	
6	N.C.		14	R_{IN2}	Input of channel 2 reverse control signal
7	OUT1 (+)	Channel 1 output (positive)	15	F_{IN2}	Input of channel 2 forward control signal
8	OUT1 (−)	Channel 1 output (negative)	16	Vref2	Setting the high level voltage for channel 2 output

●Input/output circuits

Pin function	Equivalent circuit
Logic input pin	
Voltage setting pin	
Output pin	
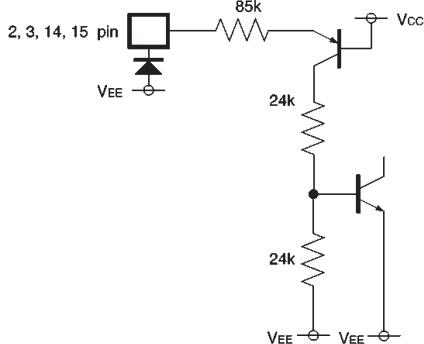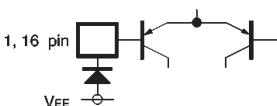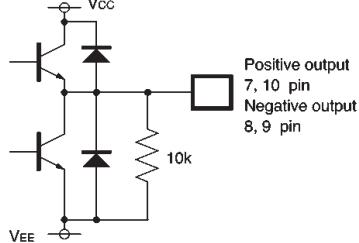
●Electrical characteristics (unless otherwise noted, Ta = 25°C, V_{CC} = 25°C, V_{ref} = 2.5V)

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	Vcc = reference potential
Input low level voltage	V_{IL}	−	−	1.0	V	Vcc = reference potential
Output saturation voltage	V_{CE}	−	1.4	2.1	V	Io = 100 mA, Vref = 5 V, sum of the invalid voltages for the upper and lower transistor output
Output voltage 1 *1	V_{OUT1}	4.5	5.0	5.5	V	Forward mode Io=100mA
Output voltage 2 *1	V_{OUT2}	−4.5	−5.0	−5.5	V	Reverse mode Io=100mA
Output voltage 3 *1	V_{OUT3}	−50	0	50	mV	Brake mode Io=100mA
Output voltage 4 *1	V_{OUT4}	−50	0	50	mV	Stop mode
Load regulation 1 *2	ΔV_{OUT1}	−	230	350	mV	Output volt. differential between I = 400 mA and I = 100 mA
Load regulation 2 *3	ΔV_{OUT2}	−	300	500	mV	Output volt. differential between I = 400 mA and I = 100 mA
Mute ON voltage	V_{CC1}	−	−	3.5	V	Muted when Vcc falls
Mute OFF voltage	V_{CC2}	5.5	−	−	V	

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

*2 Optputal 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

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●Measurement circuit
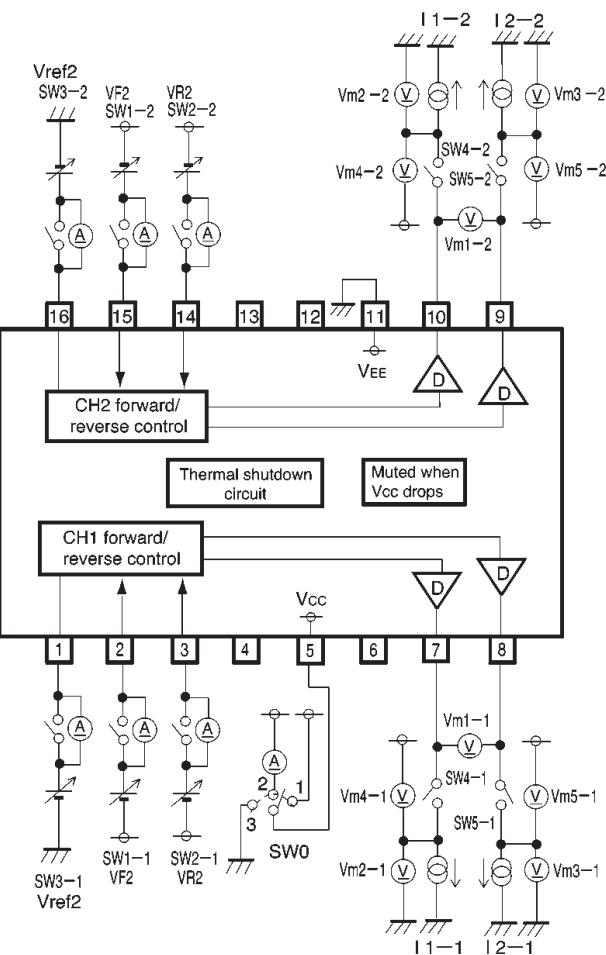
Note: Arrows indicate the positive current direction (Source)

Fig. 1

●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

●Application example

Fig. 2

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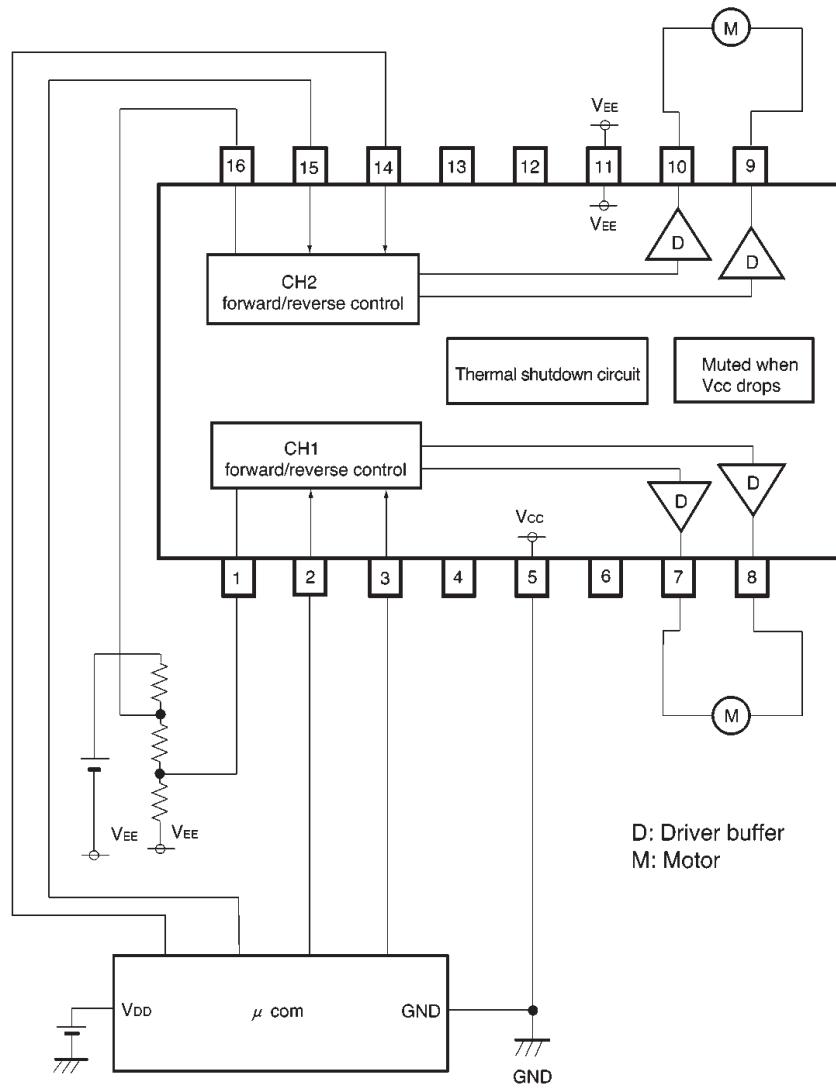
●Operation notes

1)   The BA6193 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).

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

3)   In the forward and reverse modes, an output voltage twice that of the reference voltage is generated.

However, normal voltage is not output when the reference voltage is below 1.0V or about $V_{CC}/2-1.0V$.

4)   Vcc is the reference voltage for the input voltage of logic input pins. In terms of potential relative to V_{EE}, the HIGH level is ($V_{CC}+5.0$)V and the LOW level is V_{CC}. Fig. 6 shows each pin's potential level.

5)   Be sure to attach a bypass capacitor to the power supply, at the base of the IC.
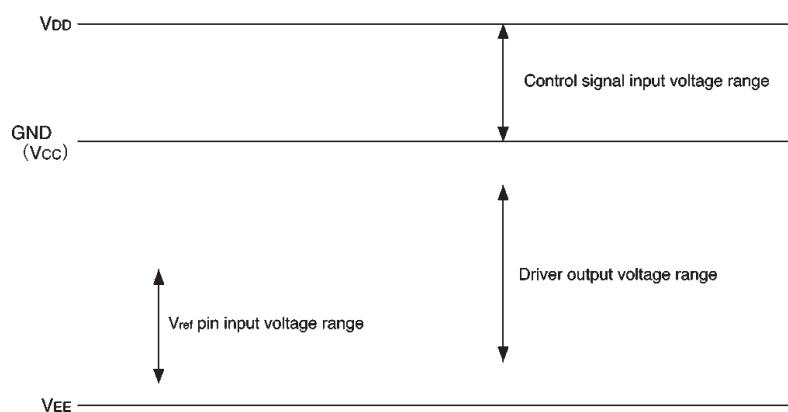

Fig. 3   Pin potential levels

●Electrical characteristic curves
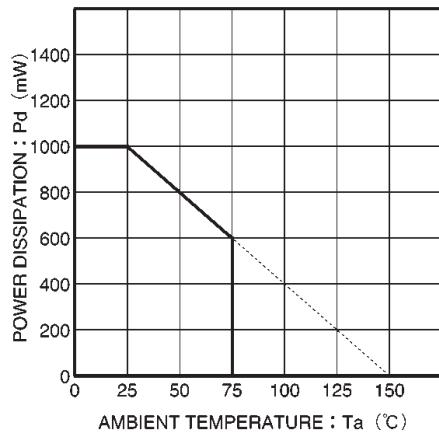

Fig. 4   Thermal derating curve
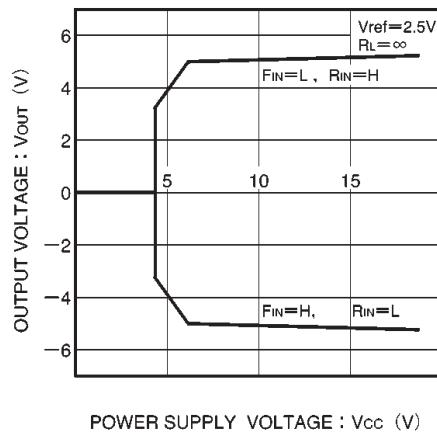
Fig. 5   Power supply voltage vs. output voltage
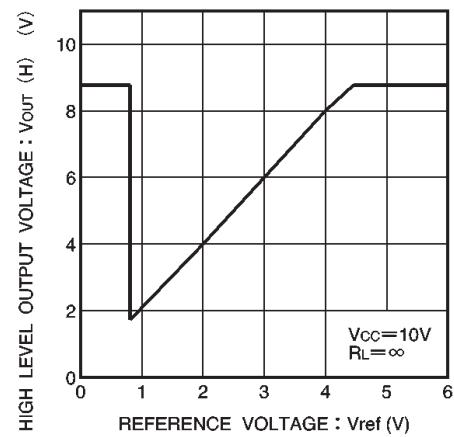
Fig. 6   Vref voltage vs. high-level output voltage
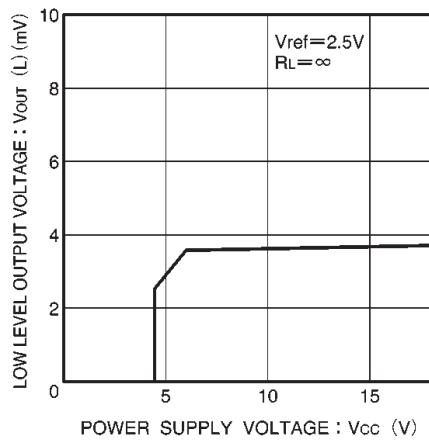
Fig. 7 Vcc vs. LOW level
output pin voltage
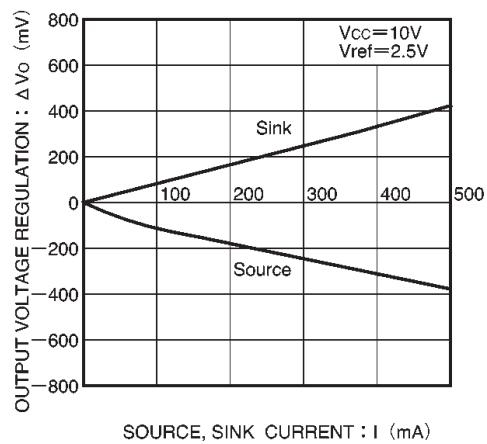
Fig. 8 Source / sink current vs.
load regulation

●External dimensions (Units: mm)

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