Reversible motor driver BA6286 / BA6286N

The BA6286 and BA6286N are reversible-motor drivers with a maximum output current of 1.0A. Two logic inputs allow four output modes: forward, reverse, stop (idling), and brake. A built-in power saving circuit suppresses current consumption when the motor is in stop mode.

Applications

VCRs and audio equipment in general

Features

- Logic and power sections have separate ground pins; this allows the IC to drive speed-variable, reversible motors by connecting an electronic governor circuit.
- Built-in power saving circuit suppresses the stop mode current dissipation.
- 3) Output voltage can be set arbitrarily with the VREF pin.
- 4) Interfaces with TTL devices.
- 5) Built-in thermal shutdown circuit.

● Absolute maximum ratings (Ta = 25°C)

Para	ameter	Symbol	Limits	Unit	
Power supply voltage		Vcc	18	٧	
Power dissipation	BA6286	D4	2000*1	144	
	BA6286N	Pd	1050*2	mW	
Operating temperature		Topr	−20~ +75	Ĉ	
Storage temperature		Tstg	−55∼ +150	Ç	
Output current		Іоит	1000*3	mA	

^{*1} Reduced by 16.0 mW for each increase in Ta of 1°C over 25°C.

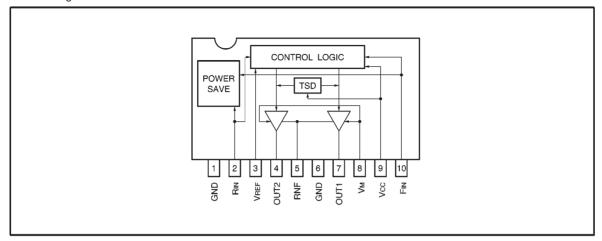
• Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Тур.	Max.	Unit
	Vcc	4.5	_	15	V
Operating power supply voltage	Vм	4.5	_	15	V
	VREF	4.5	-	15	V

^{*2} Reduced by 8.4 mW for each increase in Ta of 1°C over 25°C.

^{*3} Should not exceed pd-or ASO value.

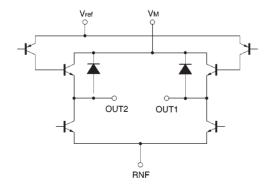
Block diagram

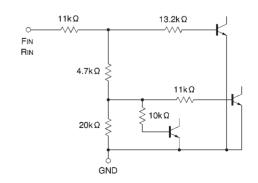


Pin descriptions

Pin No.	Pin name	Function
1	GND	GND
2	Rin	Logic input
3	VREF	HIGH level output voltage setting
4	OUT2	Motor output
5	RNF	Output section ground pin; resistor connection for detecting output current
6	GND	GND
7	OUT1	Motor output
8	Vм	Motor power supply
9	Vcc	Power supply
10	Fin	Logic input

●Input / output circuits

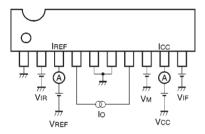




●Electrical characteristics (unless otherwise noted, Ta = 25°C, Vcc = 9V, V_M = 9V, V_{REF} = 9V)

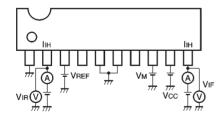
Parameter	Symbol	Min.	Тур.	Max.	Unit	Conditions	Measurement circuit
Supply current 1	lcc1	12	24	36	mA	Forward or reverse mode	
Supply current 2	lcc2	29	48	67	mA	Brake mode	
Standby supply current	İst	_	_	15	μΑ	Standby mode	Fig.1
V _{REF} pin sink current	IREF	6	12	18	mA	Forward or reverse mode Io=200mA	
Input high level voltage	ViH	2.0	_	_	٧		
Input low level voltage	VIL	_	_	0.8	٧		Fig.2
Input high level current	liн	45	90	135	μΑ	V _{IN} =2.0V	
Output saturation voltage	Vce	_	1.0	1.5	٧	lo=200mA Sum of output transistor high- and low-side voltages	Fig.3

Measurement circuit



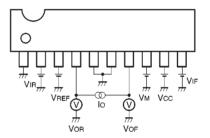
* Refer to the truth table for output mode. The supply current is represented by the Icc-value, and the VREF sink current is represented by the IREF-value. The direction of the Icc current is from the HIGH level to the LOW level output pin.

Fig.1



* Refer to the truth table for output mode. HIGH and LOW level input voltages correspond to the readings of V_{IF} voltmeters, respectively. The HIGH level input current is represented by the I_{IH} ammeter reading when V_{IN} = 2 V.

Fig.2



VcE is the sum of the high- and low-side output transistor C-E voltages. The direction of the locurrent is from the HIGH level to the LOW level output pin.

Fig.3

Circuit operation

(1) Input section

The four output modes are controlled by two logic inputs. Current flows from OUT1 to OUT2 when F_{IN} is HIGH and R_{IN} is LOW, and from OUT2 to OUT1 when R_{IN} is HIGH and F_{IN} is LOW (refer to the truth table). The input circuit can be operated by a logic circuit with a current capacity of $120 \sim 170 \mu A$.

(2) Output section

Current flows from OUT1 to OUT2 during forward rotation, and from OUT2 to OUT1 during reverse rotation. The output voltages V_{OH} and V_{OL} are given by :

Voh [V]=
$$V_{REF} - V_{CE (sat)} (PNP) - V_{BE (NPN)}$$

 V_{CE} and V_{BE} are functions of the output current (see electrical characteristic curves). The output current can be set with the V_{REF} pin.

(3) Power saving circuit

All circuits are turned off when the F_{IN} and R_{IN} input pins are both put to LOW level. This circuit saves power during standby mode by leaving the outputs OPEN.

(4) Thermal shutdown circuit

When the thermal shutdown circuit is activated at the chip temperature of about 175°C (typical), the outputs are left OPEN. The temperature difference between the activation and deactivation settings is about 15°C. When the thermal shutdown circuit is deactivated, the outputs revert to the status determined by input mode.

Input / output truth table

-					
	FIN	RIN	OUT2	OUT1	MODE
	Н	L	L	Н	Forward
•	L	Н	Н	L	Reverse
•	Н	Н	L	L	Brake
	L	L	OPEN	OPEN	Standby

Application example

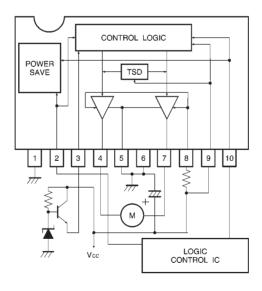


Fig.4

Operation notes

(1) The quality of these products have been carefully checked; however, use of the products with applied voltages, operating temperatures, or other parameters that exceed the absolute maximum rating given may result in the damage of the IC and the product it is used in. If the IC is damaged, the short mode and open modes cannot be specified, so if the IC is to be used in applications where parameters may exceed the absolute maximum ratings, then be sure to incorporate fuses, or other physical safety measures.

(2) GND potential

The potential for pin 1 must be kept lower than the potentials of the other pins regardless of the circumstances.

(3) Input pins

Voltage should never be applied to the input pins when the $V_{\rm CC}$ voltage is not applied to the IC. Similarly, when $V_{\rm CC}$ is applied, the voltage on each input pin should be less than $V_{\rm CC}$ and within the guaranteed range for the electrical characteristics.

(4) Back-rush voltage

Depending on the ambient conditions, environment, or motor characteristics, the back-rush voltage may fluctuate. Be sure to confirm that the back-rush voltage will not adversely affect the operation of the IC.

(5) Large current line

Large currents are carried by the motor power supply and motor ground for these ICs.

Therefore, the layout of the pattern of the PC board and the constants of certain parameters for external components, such as the capacitor between the power supply and ground, may cause this large output current to flow back to the input pins, resulting in output oscillation or other malfunctions. To prevent this, make sure that the PC board layout and external circuit constants cause no problems with the characteristics of these ICs.

(6) Power dissipation

The power dissipation will fluctuate depending on the mounting conditions of the IC and the ambient environment. Make sure to carefully check the thermal design of the application where these ICs will be used.

(7) Power consumption

The power consumption by the IC varies widely with the power supply voltage and the output current. Give full consideration to the power dissipation rating and the thermal resistance data and transient thermal resistance data, to provide a thermal design so that none of the ratings for the IC are exceeded.

(8) ASO

Make sure that the output current and supply voltage do not exceed the ASO values.

(9) Precautions for input mode switching

To ensure reliability, it is recommended that the mode switching for the motor pass once through the open mode.

(10) In-rush current

There are no circuits built into these ICs that prevent inrush currents. Therefore, it is recommended to place a current limiting resistor or other physical countermeasure.

(11) Factors regarding the thermal, power supply, and motor conditions

If the potential of the output pin sways greatly and goes below the potential of ground, the operation of the IC may malfunction or be adversely affected. In such a case, place a diode between the output and ground, or other measure, to prevent this.

(12) HIGH level output voltage setting pin

Ensure that the voltage applied to V_{REF} (pin 3) does not exceed the voltage on the motor power supply pin (pin 8) or the V_{CC} pin.

- (13) The input pins (pins 2 and 10) have temperaturedependent characteristics. Take the temperature effect into consideration when using the IC.
- (14) To eliminate motor noise, connect a capacitor between OUT1 (pin 7) and GND and between OUT2 (pin 4) and GND. Alternatively, connect a capacitor between OUT1 and OUT2, and also a diode between OUT1 and GND and between OUT2 and GND (see Fig. 5).



Fig.5

Electrical characteristic curves

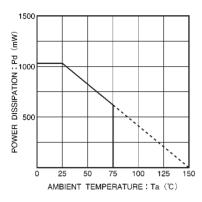


Fig.6 Temperature dependence of power dissipation curve (BA6286N)

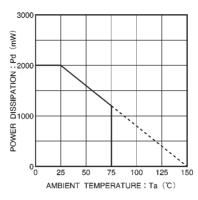


Fig7. Temperature dependence of power dissipation curve (BA6286)

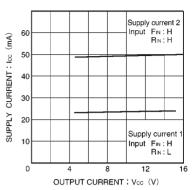


Fig.8 Supply current vs.output current

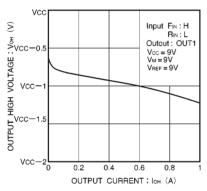


Fig.9 Output high level voltage vs. output current

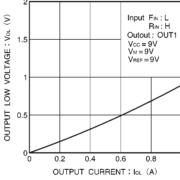


Fig.10 Output low level voltage vs. output current

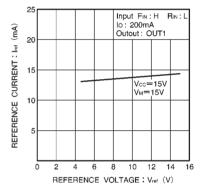


Fig.11 VREF pin input current vs. HIGH level reference voltage

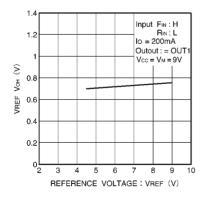
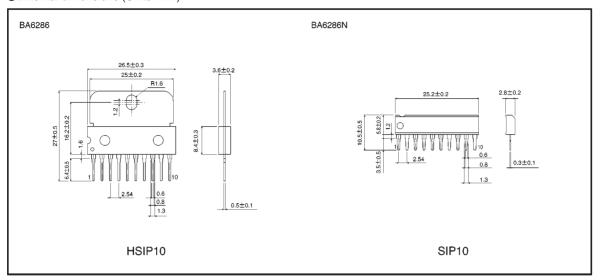


Fig.12 VREF-VOH voltage vs. VREF reference voltage

External dimensions (Units: mm)



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