Stepping motor driver
BA6343

The BA6343 is a driver designed to drive the stepping motors used in printers and fax machines.

●Applications
Printers and facsimiles

●Features
1) Micro-step drive compatible.
2) Overheating protection circuit on chip.
3) Wide operating voltage range (7V to 33V).

●Absolute maximum ratings (Ta = 25°C)

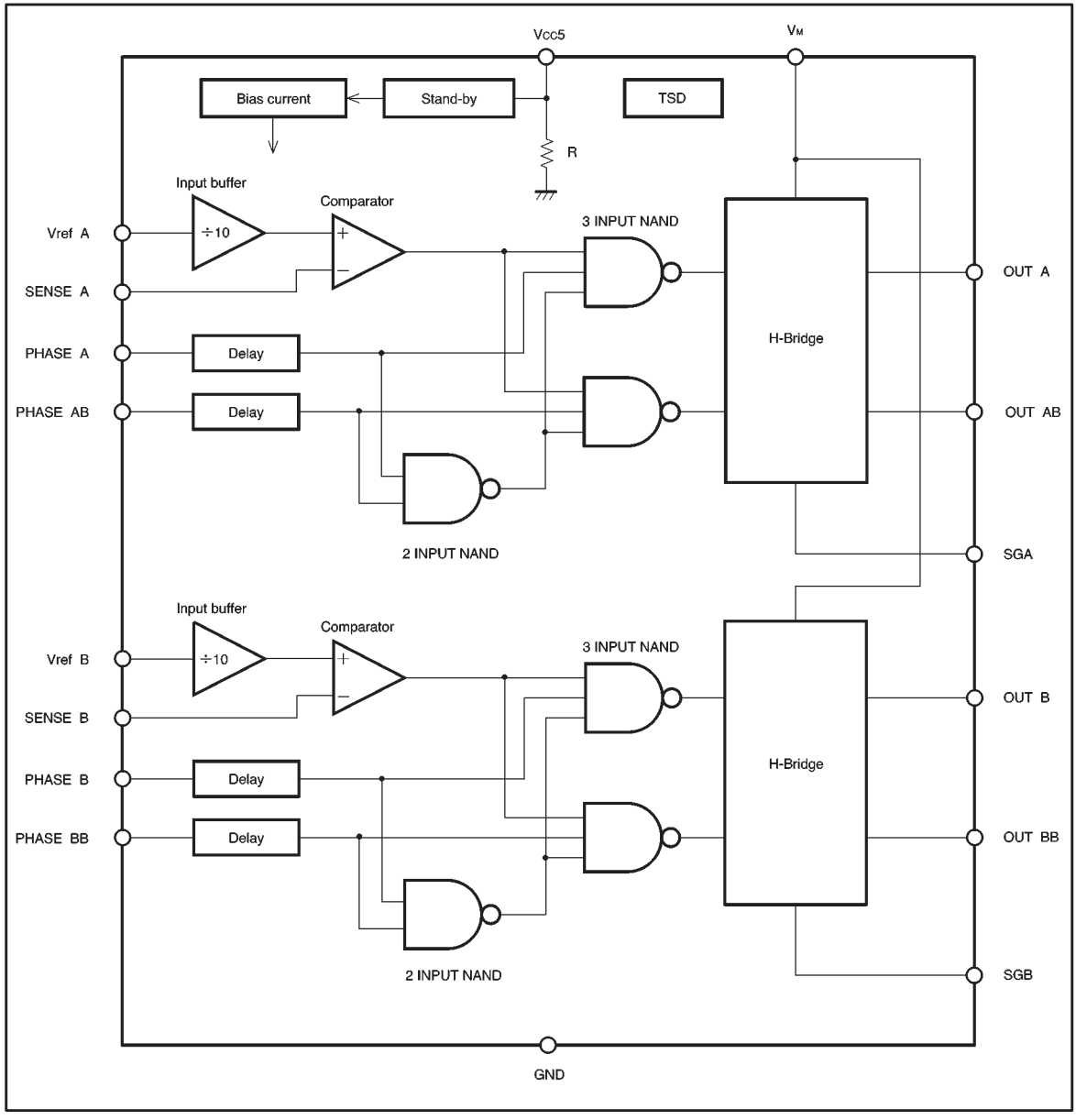
Parameter	Symbol	Limits	Unit
Power supply voltage 1	V_M	$V_{CC}5$～36	V
Power supply voltage 2	$V_{CC}5$	−0.01～+7	V
Analog input voltage	V_{analg}	−0.03～+7	V
Logic input voltage	V_{logic}	−0.03～+7	V
Power dissipation	P_d	1700*1	mW
Thermal derating	$K\theta$	13.6	mW / ℃
Junction temperature	T_j	150	℃
Operating temperature	Topr	0～75	℃
Storage temperature	Tstg	−55～+150	℃
Allowable output current	I_{OUT}	±500*2	mA

*1 Reduced by 13.6mW for each increase in Ta of 1℃ over 25℃
(when mounted on a 70mm × 70mm × 1.6mm glass epoxy board).
*2 Should not exceed Pd or ASO values.

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage 1	V_M	7～33	V
Power supply voltage 2	$V_{CC}5$	5.0±10%	V
Analog input voltage	V_{analg}	−0.03～$V_{CC}5$	V
Logic input voltage	V_{logic}	−0.03～$V_{CC}5$	V

●Block diagram



●Pin descriptions

Pin No.	Pin name	Function
1	OUT A	Motor output A
2	OUT AB	Motor output AB
3	SGA	Ground for channel A output block (connect resistor for detecting channel A output current)
4	SENSE A	Channel A detect signal input (channel A output current)
5	GND	GND
6	GND	GND
7	VrefA	Channel A reference voltage input (channel A output current setting)
8	PHASE A	Logic input A
9	PHASE AB	Logic input AB
10	$V_{CC}5$	Power supply
11	PHASE BB	Logic input BB
12	PHASE B	Logic input B
13	VrefB	Channel B reference voltage input (channel B output current setting)
14	SENSE B	Channel B detect signal input (channel B output current)
15	GND	GND
16	GND	GND
17	SGB	Ground for channel B output block (connect resistor for detecting channel B output current)
18	OUT BB	Motor output BB
19	OUT B	Motor output B
20	V_M	Motor power supply

●Input / output circuits

(1) Logic and analog inputs

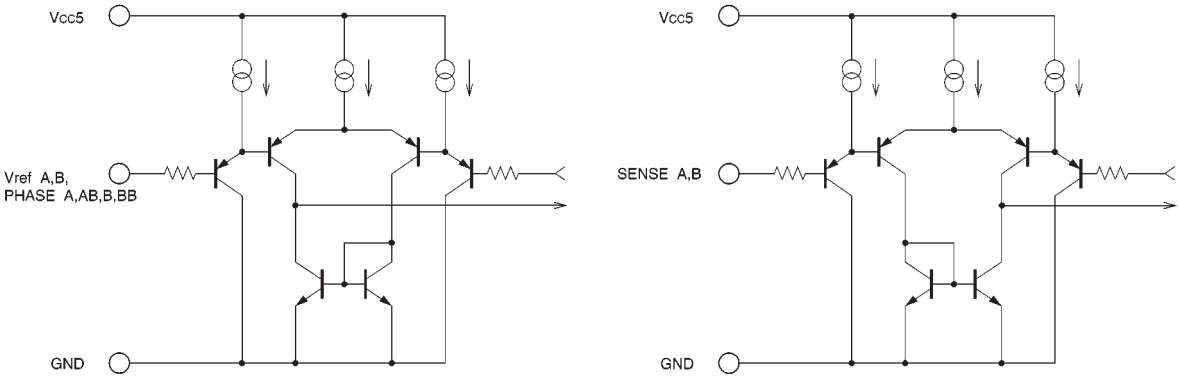


Fig.1 Logic and analog input circuits

(2) H-bridge output

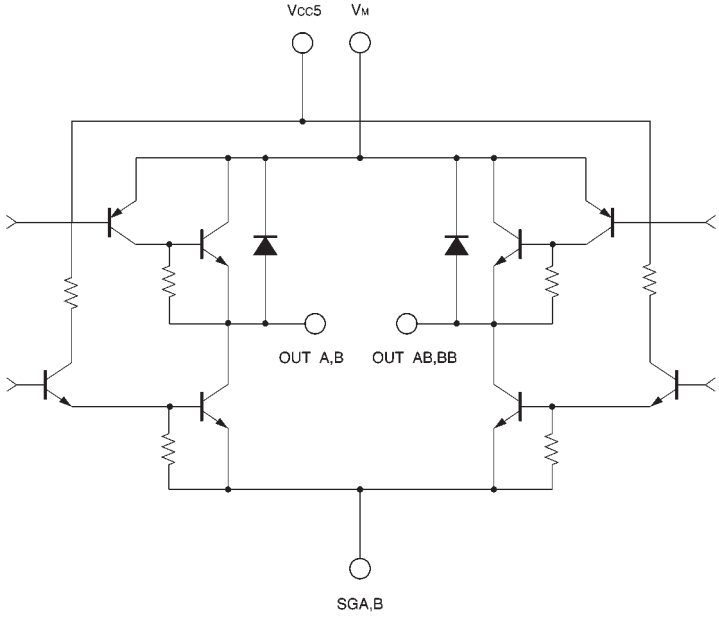


Fig.2 H-bridge output circuit

●Electrical characteristics (unless otherwise noted, Ta = 25°C, V_M = 13V, and V_{CC} = 5V)

(1) DC characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
V_M current at standby	I_{Moff}	—	0	10	μA	V_{CC}5=0V
V_M current when operating	I_{Mon}	—	8.0	14.0	mA	V_{phA}=V_{ph5}="H"
Circuit current	I_{CC5on}	—	32	60	mA	V_{phA}=V_{phB}="H"
V_{CC}5 input high level voltage	V_{CC5H}	4.5	5.0	5.5	V	
V_{CC}5 input low level voltage	V_{CC5L}	−0.01	—	0.4	V	I_M≦10 μA
Vref input voltage range	Vref	V_{Coff}	—	Vcc5-2	V	chA, B
Vref input bias current	Iref	—	—	0.25	μA	Vref=0V, chA, B
Comparator off reference voltage	V_{Coff}	0.1	0.2	0.3	V	V_{sen}=0V, chA, B
SENSE pin threshold voltage	V_{sen}	0.23	0.25	0.27	V	Vref=2.5V, chA, B
SENSE input bias current	I_{sen}	—	—	1.0	μA	V_{sen}=0V, chA, B
Logic input high level voltage	V_{INH}	2.0	—	V_{CC}5	V	phA, AB, B, BB
Logic input low level voltage	V_{INL}	−0.03	—	0.8	V	phA, AB, B, BB
Logic input high level current	I_{INH}	—	—	0.25	μA	V_{ph}=Vcc5, phA, AB, B, BB
Logic input low level current	I_{INL}	—	—	1.0	μA	V_{ph}=0V, phA, AB, B, BB
Output total saturation voltage	V_{sat}	—	1.2	1.6	V	I_O=350mA, phA, AB, B, BB
Output cutoff current	I_{off}	—	—	0.25	μA	V_{ph}="L", chA, B
Output high level clamp voltage	V_{CH}	—	—	1.6	V	I_O=350mA, phA, AB, B, BB
Output low level clamp voltage	V_{CL}	—	—	1.6	V	I_O=350mA, phA, AB, B, BB

(2) AC characteristics (channels A, AB, B, BB, and R_L = 100Ω)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Output turn on delay	T_{don}	—	—	3.0	μs	Vref=2.5V, V_{sen}=0.5V→0V
Output turn off delay	T_{doff}	—	—	7.0	μs	Vref=2.5V, V_{sen}=0V→0.5V
Amp response time for Vref	T_{damp}	—	—	12.0	μs	V_{sen}=0.25V, Vref=0V→3V
PHASE delay time	T_{dph}	—	—	3.0	μs	V_{ph}=0V→5V

◎Not designed for radiation resistance.

●Circuit operation

Input / output truth table

Input		Output	
PHASE A, (B)	PHASE A, (BB)	OUT A, (B)	OUT AB, (BB)
L	L	Z	Z
H	L	H	L
L	H	L	H
H	H	Z	Z

Setting: VrefA=VrefB=high level
SENSE A=SENSE B=low level
Z: high impedance

●Application example

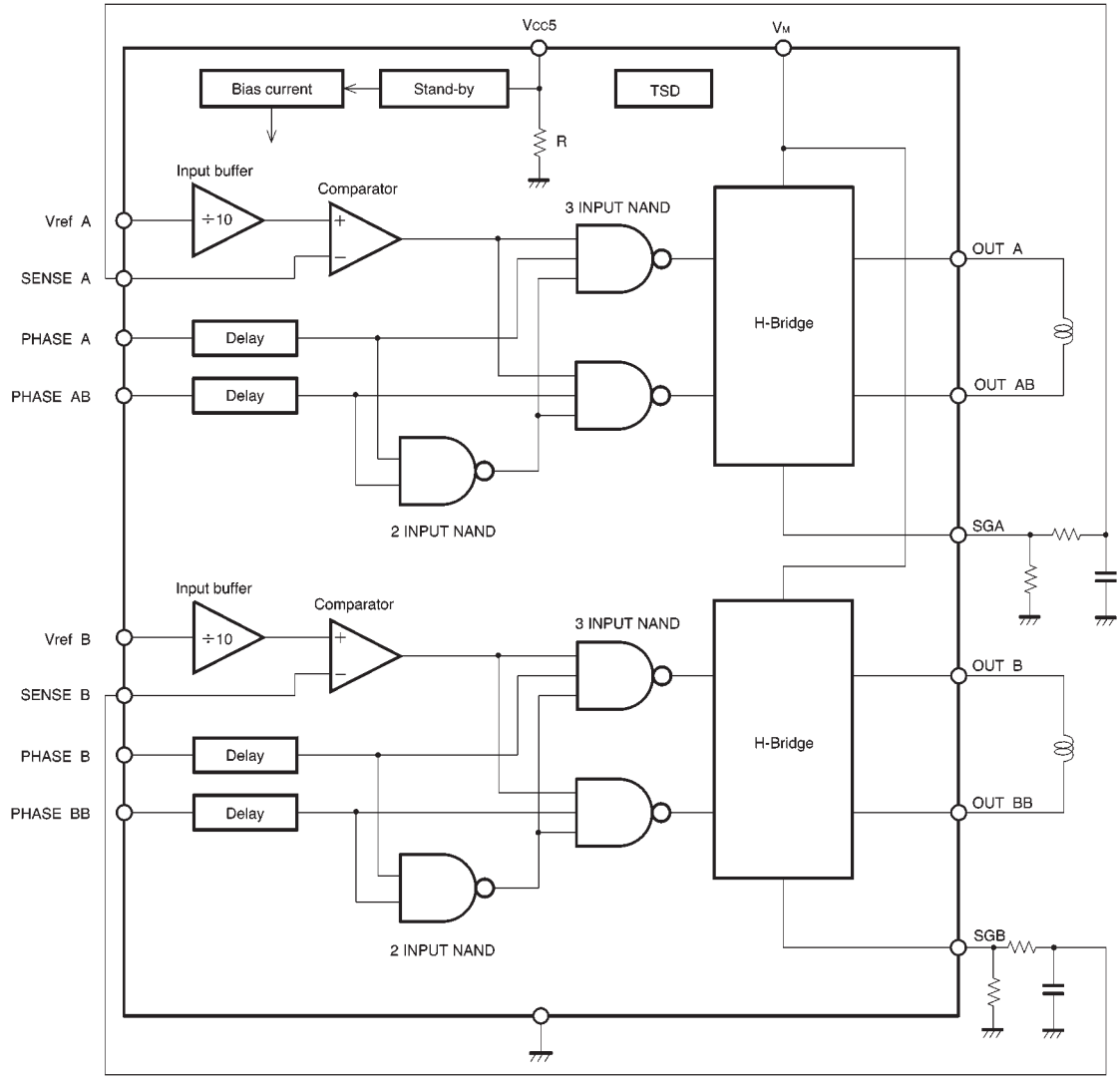


Fig.3

●Operation notes

(1) Power supply voltages 1 and 2 (V_M and V_{CC})

The rise and fall order for the power supply voltages 1 and 2 (V_M and $V_{CC}5$) is as follows.

Rise: power supply voltage 1 (V_M) on → power supply voltage 2 ($V_{CC}5$) on

Fall: power supply voltage 2 ($V_{CC}5$) off → power supply voltage 1 (V_M) off

(2) Logic and analog input pins

Due to the circuit construction, when the logic and analog input pins are open, it is equivalent to a high-level input.

(3) Thermal shutdown (TSD)

At Tj = 150°C (min.), all logic input voltages go low (channels A, AB, B and BB).

Therefore, the outputs (OUTA, AB, B and BB) all go high impedance.

The TSD has approximately 35°C of hysteresis.

(4) $V_{CC}5$ pin

When $V_{CC}5$ is open, it is internally pulled down to ground via a resistor (20kΩ (Typ.)).

(5) Heat sink

Be certain to connect the heatsink to GND.

●Electrical characteristics curve

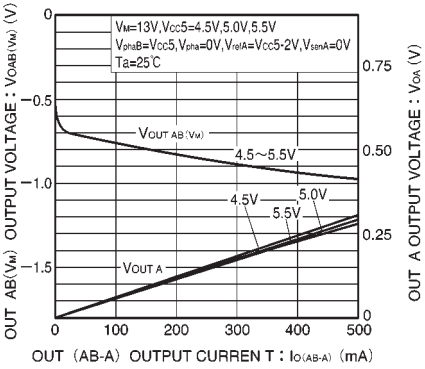
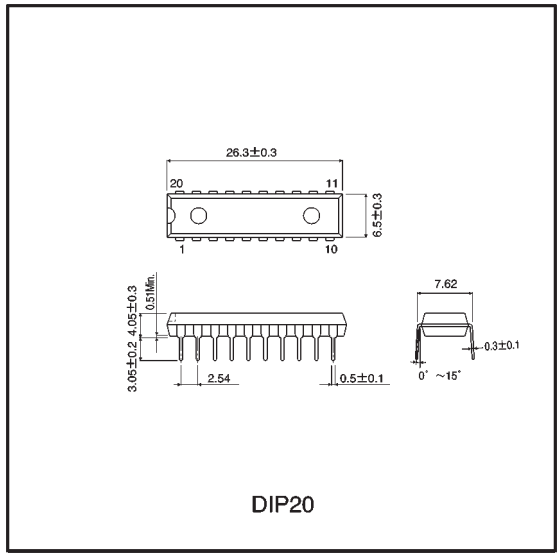


Fig.4 $I_{O(AB-A)}$ vs. $V_{OAB(VM)}$ and V_{OA}

●External dimensions (Units: mm)



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