

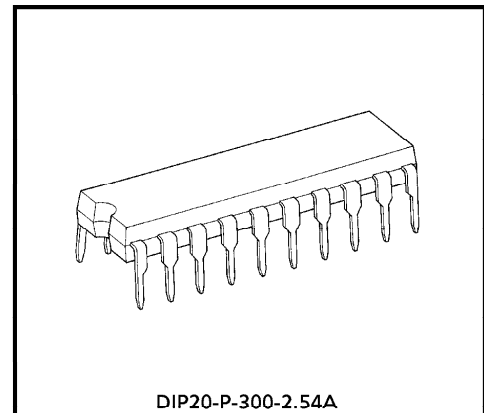
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

# TA8413P

## 3 PHASE BI-DIRECTIONAL HALL MOTOR CONTROL IC

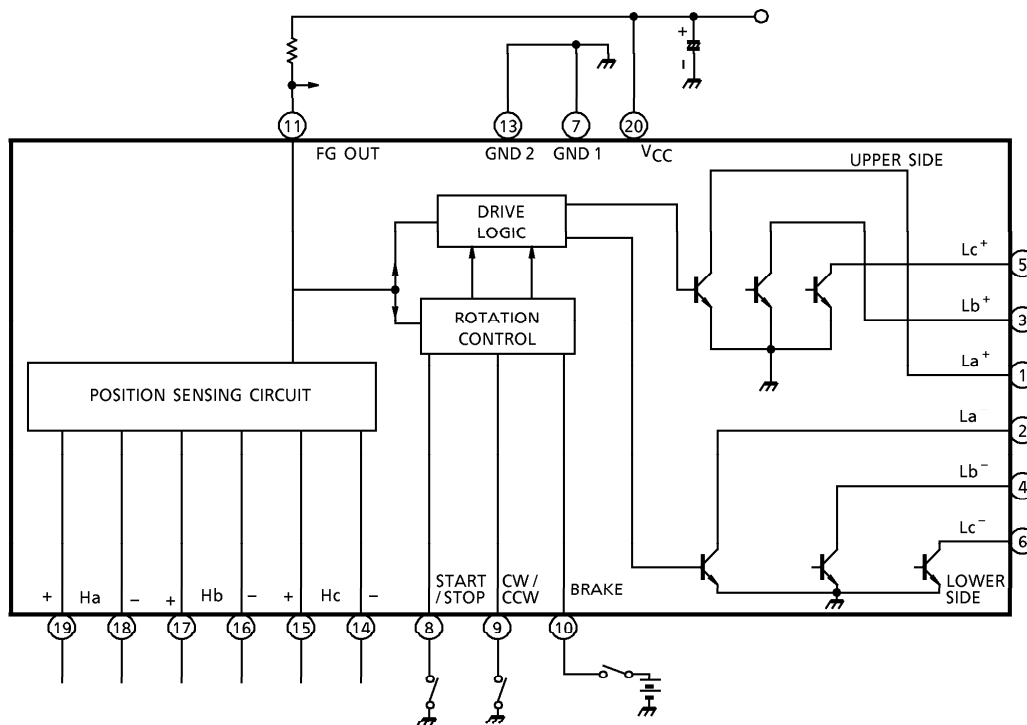
### FEATURES

- FG is not required.  
(System for obtaining rotation signal through position sensing)
- Start/stop, CW/CCW and brake function is provided.
- Gain of position sensing circuit is high, and hysteresis is provided.
- Rotation signal output is provided.  
(Frequency signal of three times the position sensing output (hall element output) can be obtained.)
- External transistor type.



Weight : 2.25g (Typ.)

### BLOCK DIAGRAM



961001EBA2

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**PIN FUNCTION**

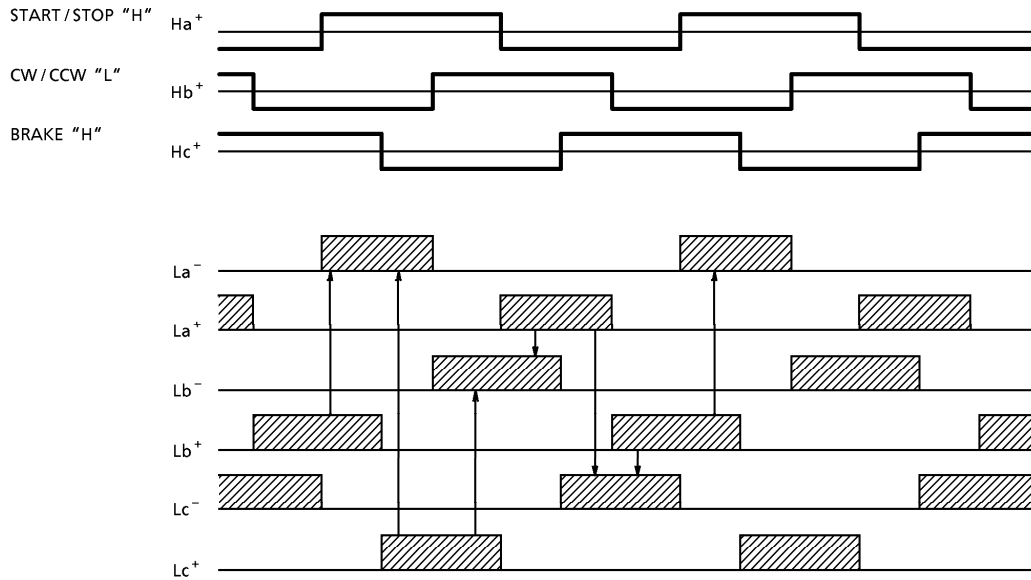
PIN No.	SYMBOL	FUNCTION DESCRIPTION
1	La <sup>+</sup>	a-phase upper drive output terminal.
2	La <sup>-</sup>	a-phase lower drive output terminal.
3	Lb <sup>+</sup>	b-phase upper drive output terminal.
4	Lb <sup>-</sup>	b-phase lower drive output terminal.
5	Lc <sup>+</sup>	c-phase upper drive output terminal.
6	Lc <sup>-</sup>	c-phase lower drive output terminal.
7	GND1	GND1 terminal.
8	START/STOP	Start/stop control terminal.
9	CW/CCW	Forward /Reverse rotation control terminal.
10	BRAKE	Breake terminal.
11	FG OUT	FG signal output terminal.
12	N. C.	Non connection.
13	GND2	GND2 terminal.
14	Hc <sup>-</sup>	c-phase Hall Amp. negative input terminal.
15	Hc <sup>+</sup>	c-phase Hall Amp. positive input terminal.
16	Hb <sup>-</sup>	b-phase Hall Amp. negative input terminal.
17	Hb <sup>+</sup>	b-phase Hall Amp. positive input terminal.
18	Ha <sup>-</sup>	a-phase Hall Amp. negative input terminal.
19	Ha <sup>+</sup>	a-phase Hall Amp. positive input terminal.
20	VCC	Power supply input terminal.

961001EBA2'

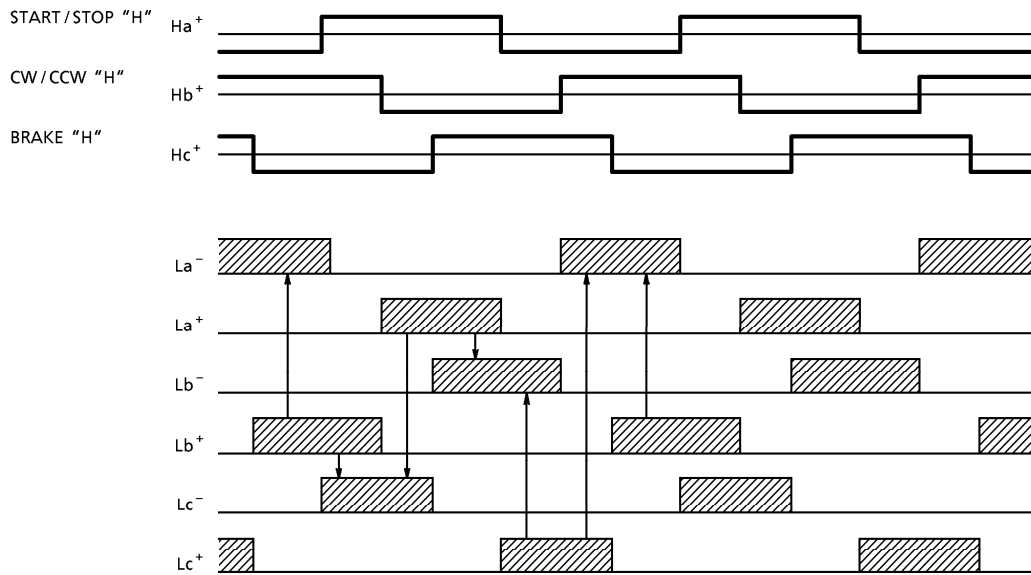
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**TIMING CHART**

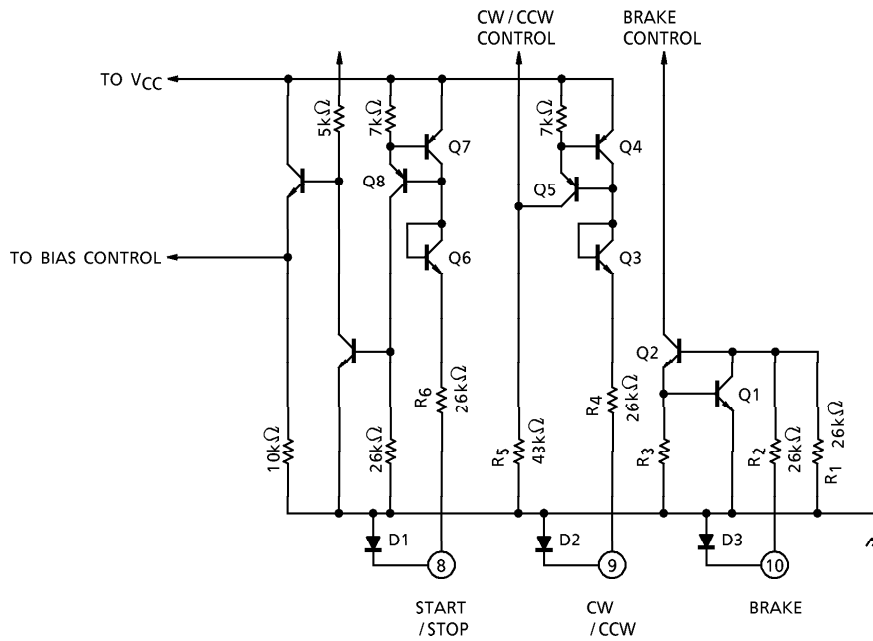
Forward rotation (Position sensing signal advances Ha→Hb→Hc.)



Reverse rotation (Position sensing signal advances Ha→Hc→Hb.)



(1) Control input circuit



START/STOP and CW/CCW inputs are Low Active and BRAKE input is High Active type. D1~D3 are input protect diodes.

Input current of START/STOP and CW/CCW are calculated by following equations.

$$I_{IN C} = \frac{V_{CC} - V_{INC} - V_{BEQ3} - V_{BEQ4} - V_{BEQ5}}{R_4} \cong \frac{V_{CC} - V_{INC} - 2.1}{26 \times 10^3} \quad (A)$$

(Pin⑨)

$$I_{IN R} = \frac{V_{CC} - V_{INR} - V_{BEQ6} - V_{BEQ7} - V_{BEQ8}}{R_6} \cong \frac{V_{CC} - V_{INR} - 2.1}{26 \times 10^3} \quad (A)$$

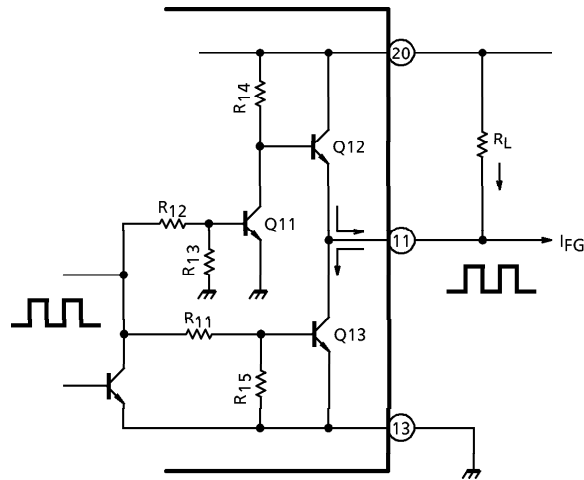
(Pin⑧)

And also input current of BRAKE (Pin⑩) is calculated by following equation.

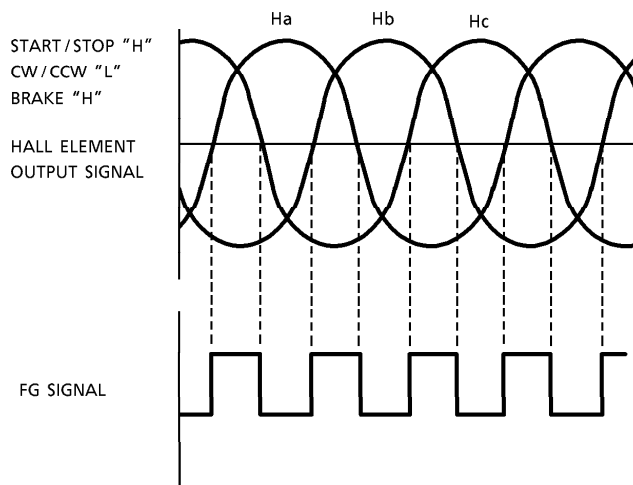
$$I_{IN B} = \frac{V_{INB} - V_{BEQ2} - V_{BEQ3}}{R_2} \cong \frac{V_{INB} - 1.4}{26 \times 10^3} \quad (A)$$

(Pin⑩)

(2) FG output circuit



FG signal is generated by the using 3 phase hall signals.  
 FG output transistors of Q12 and Q13 work push-pull.  
 Specified output voltage generates if load resistor connect to FG output to V<sub>CC</sub>.



**MAXIMUM RATINGS** (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Power Supply Voltage	V <sub>CC</sub>	18	V
Output Current	I <sub>O</sub>	± 100	mA
Position Sensing Circuit Input Voltage (T <sub>j</sub> = 25°C)	V <sub>H</sub>	400	mV <sub>p-p</sub>
Power Dissipation	P <sub>D</sub> (Note)	1.2	W
Operating Temperature	T <sub>opr</sub>	- 30~75	°C
Storage Temperature	T <sub>stg</sub>	- 55~150	°C

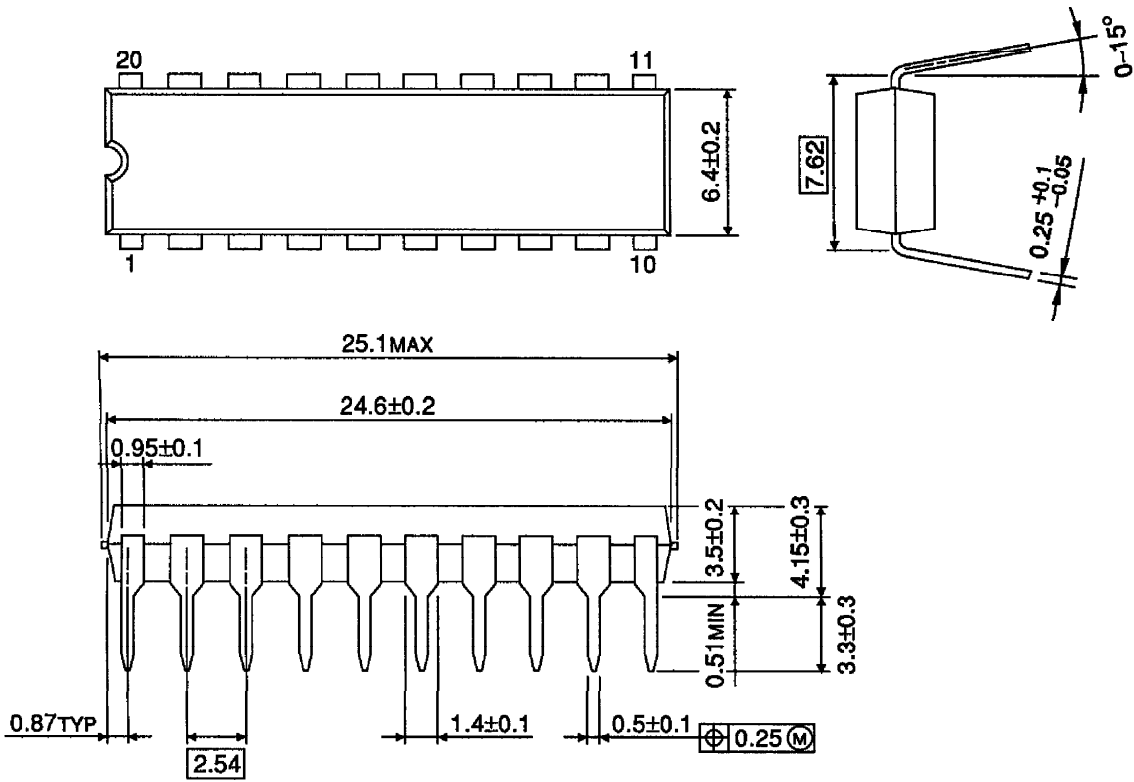
(Note) No heat sink

**ELECTRICAL CHARACTERISTICS** (Unless otherwise specified, V<sub>CC</sub> = 5V, Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Operation Power Supply Voltage		V <sub>CC (opr)</sub>	—		4.0	—	18	V	
Power Supply Current		I <sub>CC1</sub>	1	Stop state	—	4	—	mA	
		I <sub>CC2</sub>		Output open	—	4	—		
Saturation Voltage	Upper Side	V <sub>SAT (U-1)</sub>	2	I <sub>O</sub> = 10mA	—	1.5	—	V	
		V <sub>SAT (U-2)</sub>		I <sub>O</sub> = 100mA	—	2.0	—		
	Lower Side	V <sub>SAT (L-1)</sub>		I <sub>O</sub> = 10mA	—	0.4	—		
		V <sub>SAT (L-2)</sub>		I <sub>O</sub> = 100mA	—	0.5	1.0		
Leak Current	Upper Side	I <sub>L (U)</sub>	2	V = 18V	—	—	100	μA	
	Lower Side	I <sub>L (L)</sub>			—	—	100		
Position Sensing Input	Common Mode Voltage Range		—		2.0	—	V <sub>CC</sub> - 0.5	V	
	Input Sensitivity				V <sub>H</sub>	20	—	—	mV <sub>p-p</sub>
	Input Hysteresis				V <sub>H - Hys</sub>	2	7	15	mV
START Input (Low Act)	Operation Input Voltage	"H"	V <sub>IN R (H)</sub>	2	V <sub>CC</sub> - 0.9	—	V <sub>CC</sub>	V	
		"L"	V <sub>IN R (L)</sub>	2	—	—	1.0		
	Input Current	"L"	I <sub>IN R</sub>	2	V <sub>IN R</sub> = 1.0V	—	70	200	μA
CW / CCW Input (Low Act)	Operation Input Voltage	"H"	V <sub>IN C (H)</sub>	2	V <sub>CC</sub> - 0.9	—	V <sub>CC</sub>	V	
		"L"	V <sub>IN C (L)</sub>	2	—	—	1.0		
	Input Current	"L"	I <sub>IN C</sub>	2	V <sub>IN C</sub> = 1.0V	—	70	200	μA
BRAKE Input (High Act)	Operation Input Voltage	"H"	V <sub>IN B (H)</sub>	2	4.0	—	V <sub>CC</sub>	V	
		"L"	V <sub>IN B (L)</sub>	2	—	—	1.0		
	Input Current	"L"	I <sub>IN B</sub>	3	V <sub>IN B</sub> = 4V	—	100	250	μA
FG Output	Output Voltage	"H"	V <sub>FGH</sub>	3	I <sub>FG</sub> = 1mA	V <sub>CC</sub> - 1.0	—	—	V
	Output Voltage	"L"	V <sub>FG L</sub>	3		—	—	0.5	

OUTLINE DRAWING  
DIP20-P-300-2.54A

Unit : mm



Weight : 2.25g (Typ.)