3-phase motor driver
BA6463FP-Y

The BA6463FP-Y is a motor driver developed for cylinders, which a constant power supply of 5V, and the start and stop pins which opens output are incorporated.
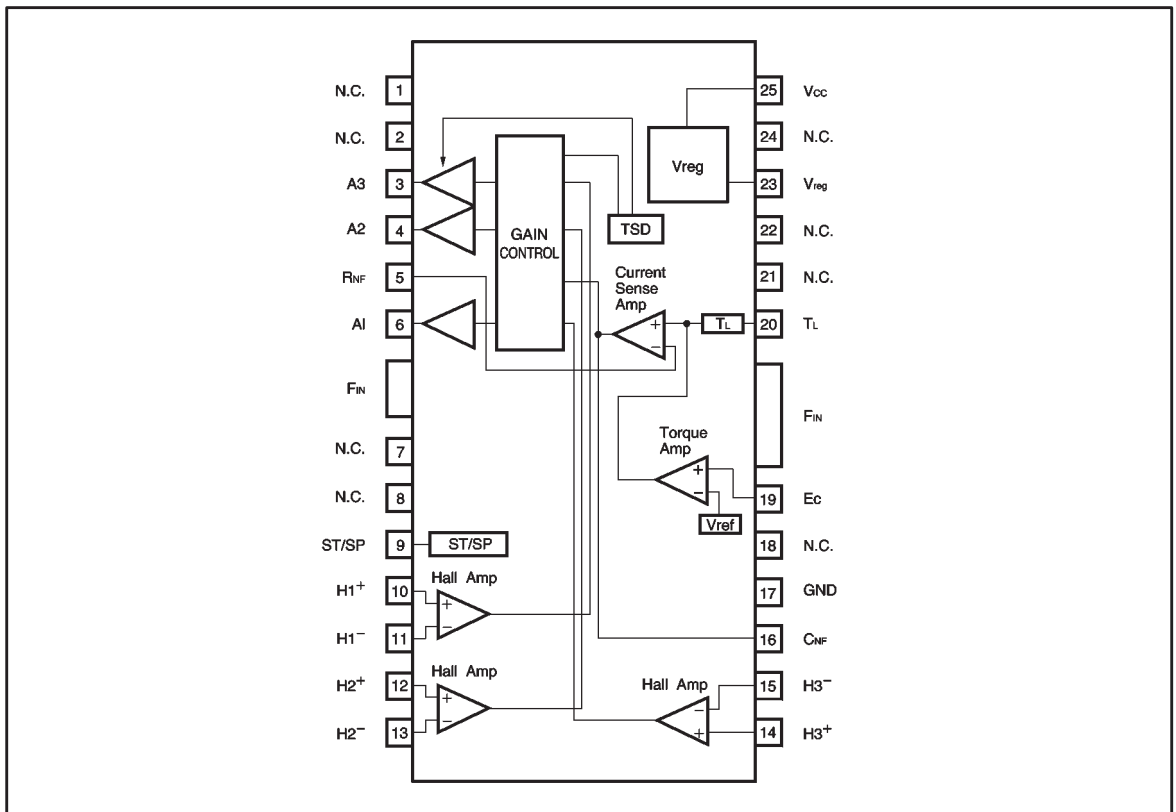
●Applications
VCR cylinder motors

●Features
1) 3-phase, full-wave, pseudo-linear drive system.
2) Internal constant voltage power supply. (5V)
3) Internal thermal shutdown circuit.

●Block diagram

●Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit
Power supply voltage	V_{CC}	24	V
Power dissipation	Pd	1450*1	mW
Operating temperature	Topr	$-20 \sim +75$	℃
Storage temperature	Tstg	$-55 \sim +150$	℃
Output current	I_{OUT}	1000*2	mA

*1 When mounted on a glass epoxy board (90×50×1.6 mm).
    Reduced by 11.6 mW for each increase in Ta of 1℃ over 25℃.
*2 Should not exceed Pd or ASO values.

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating power supply voltage	V_{CC}	8.0	—	20.0	V

●Electrical characteristics (unless otherwise noted, Ta = 25°C, V_{CC} = 12V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply current	I_{CC}	—	5.0	10.0	mA	
Constant output voltage	V_{reg}	4.5	5.0	5.5	V	
⟨MDA⟩						
Hall input bias current	I_{BH}	—	0.25	5.0	μA	H^+=High, H^-=Low or H =Low, H^-=High
Hall common-mode input voltage	V_{HB}	1.5	—	$V_{reg-1.0}$	V	
Hall element minimum input level	V_{INH}	60	—	—	mV_{P-P}	
Allowable torque command input voltage	E_C	0	—	V_{reg}	V	
Torque control voltage offset	E_{cofs}	−150	0	+150	mV	For $E_C=V_{reg}×0.46$
Output idle voltage	E_{cidle}	—	0	10	mV	E_C=2V, R_{NF}=0.5Ω
I / O gain	G_{EC}	0.41	0.5	0.59	A / V	Measured at E_C= 2.8V, 3.3V; R_{NF} = 0.5Ω
Start / stop ON voltage	$V_{S/S}$ ON	3.5	—	V_{reg}	V	
Start / stop OFF voltage	$V_{S/S}$ OFF	0	—	1.2	V	
Output saturation high level voltage	V_{OH}	—	1.05	1.75	V	Io=600mA
Output saturation low level voltage	V_{OL}	—	0.45	1.05	V	Io=600mA
Output drive current capacity	$I_{O (Max.)}$	800	—	—	mA	R_{NF}=0.5Ω *Tj=25℃
Torque limit current	I_{TL}	520	650	780	mA	TL=0.4V, R_{NF}=0.5Ω

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●Pin descriptions

Pin No.	Pin name	Function
1	N.C.	Not used
2	N.C.	Not used
3	A_3	Output
4	A_2	Output
5	R_{NF}	Output current sensing
6	A_1	Output
7	N.C.	Not used
8	N.C.	Not used
9	ST/SP	Start/stop switching
10	$H_1{}^+$	Hall signal input
11	$H_1{}^-$	Hall signal input
12	$H_2{}^+$	Hall signal input
13	$H_2{}^-$	Hall signal input
14	$H_3{}^+$	Hall signal input
15	$H_3{}^-$	Hall signal input
16	C_{NF}	Capacitor connection pin for phase compensation
17	GND	GND
18	N.C.	Not used
19	E_C	Output current control
20	TL	Torque limit
21	N.C.	Not used
22	N.C.	Not used
23	V_{reg}	Internal constant voltage
24	N.C.	Not used
25	V_{CC}	Power supply
FIN	FIN	Be sure to connect this radiation fin to the ground.

● Input / output circuits

Pin No.	Pin name	Pin description	I/O equivalent circuit
9	ST / SP	Start / stop switching pin	26kΩ 10kΩ
20	TL	Torque limit pin	1kΩ
19	Ec	Output current control pin	Vcc 1kΩ
3, 4, 6	A₃, A₂, A₃	Output pin	RNF
10, 11, 12, 13, 14, 15	H₁⁺, H₁⁻, H₂⁺, H₂⁻, H₃⁺, H₃⁻	Hall signal input pin	1kΩ 1kΩ

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●Circuit operation

(1) Hall I/O

The 3-phase Hall signal is amplified in the hall amplifiers and sent to the matrix circuit, where the signal is further amplified and combined. After the signal is converted to a current in the amplitude control circuit, the current is supplied to the output driver, which then provides a motor drive current. The phases of the Hall input signal, output voltage, and output current are shown in Fig. 1.
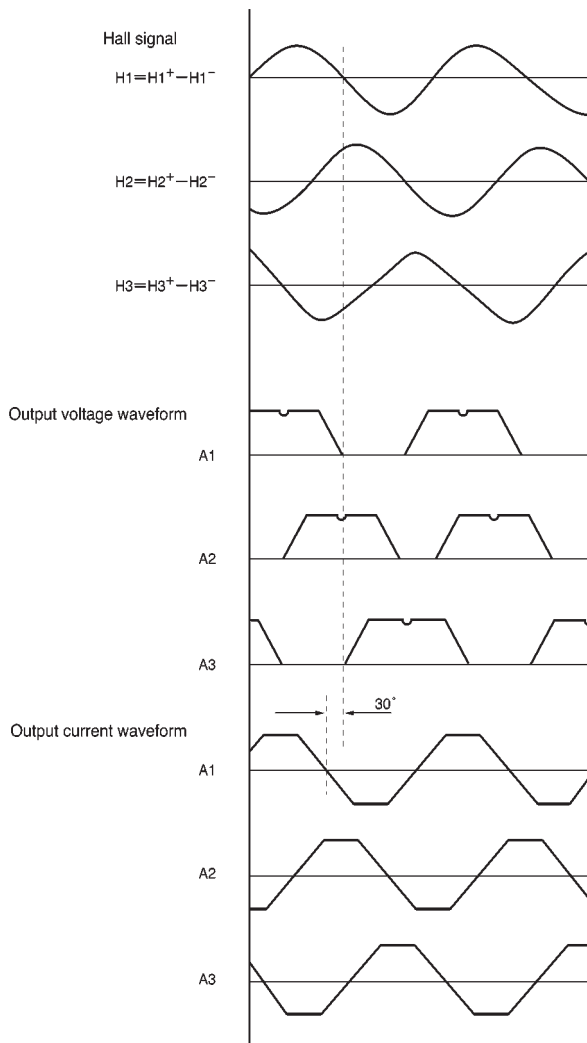
(2) Torque control pin (EC pin)

The output current can be controlled by adjusting the voltage applied to the torque control pin.
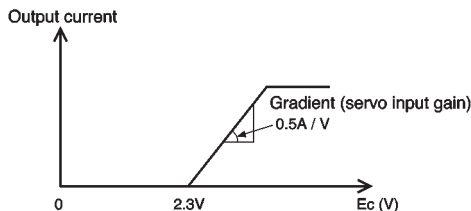
Fig.2

(3) Start/stop pin

The motor is in the run mode when the pin input voltage is 3.5V or more and in the standby mode (all output transistors are off) when the voltage is 1.2V or less.

(4) Power ground pin (R_{NF} pin)

The R_{NF} pin is the output stage ground pin. Connect a resistor (0.5Ω recommended) between this pin and the ground to monitor the output current.

(5) Phase compensation pin (C_{NF} pin)

Connect a capacitor between this pin and V_{CC} if the output tends to oscillate.
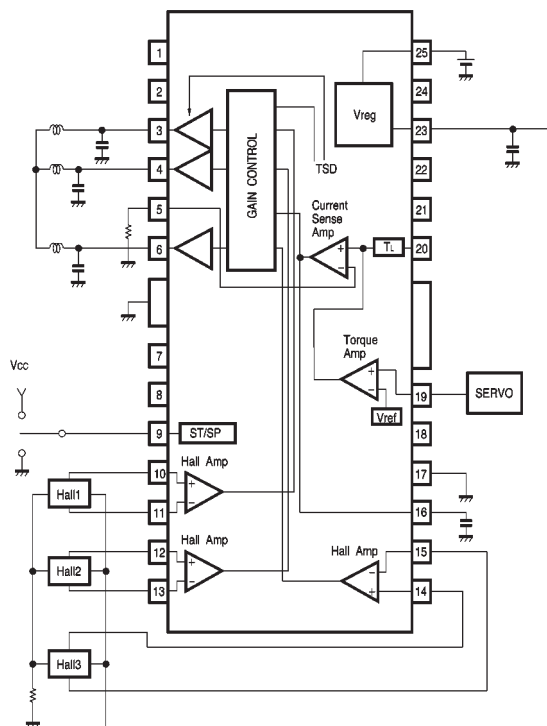
●Application example

Fig.1

Fig.3

●Operation notes

(1) Start/stop pin

The I/O equivalent circuit of the start/stop pin is shown in Fig. 4. The pin has a temperature dependence of –7mV/C, and its resistance can vary ± 30%. The voltage on this pin should be less than Vreg.
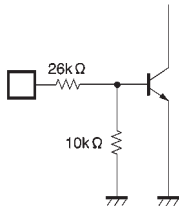

Fig.4

(2) Hall input

The I/O equivalent circuit of the Hall input pins is shown in Fig. 5. The Hall devices can be connected in either series or parallel. The input Hall signal should be within the range of the Hall input common-mode voltage.
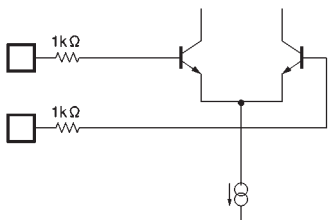

Fig.5

Parallel connection   Series connection

Fig.6

(3) Torque limit pin

The output current can be limited by applying a voltage to the torque limit pin. Control is provided so that this pin will have the same potential as the power ground pin (R_{NF}). Note that there is a voltage offset on this pin. The R_{NF}-pin voltage is 0.325V when the TL-pin voltage is 0.4V (typical) and the R_{NF}-pin resistance is 0.5Ω. Note that the voltage offset changes with the R_{NF}-pin resistance. Connect the TL Vreg (pin 23) when the TL pin is not used.
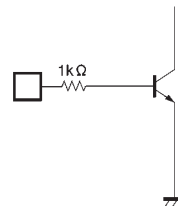

Fig.7

(4) Thermal shutdown circuit

The thermal shutdown circuit puts the driver outputs (A_1, A_2, and A_3) to the open state at the temperature of 175°C (typical). The circuit is deactivated when the temperature drops to about 150°C.
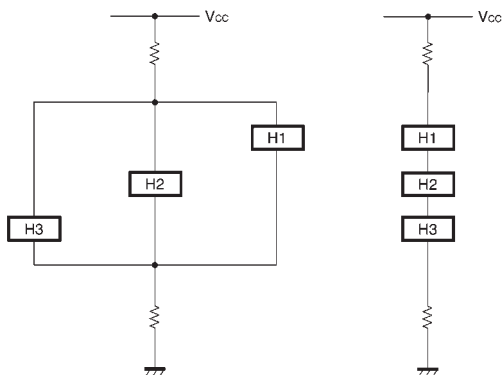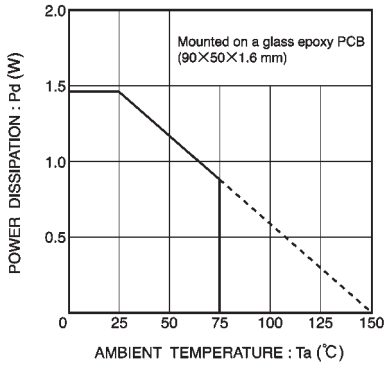
●Thermal derating curve

Fig.8

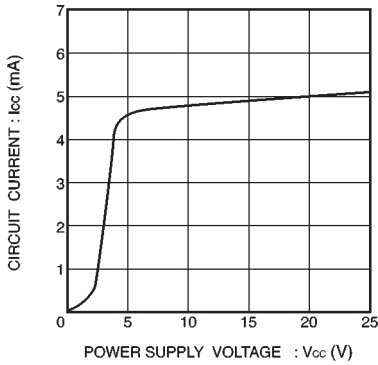●Electrical characteristic curves
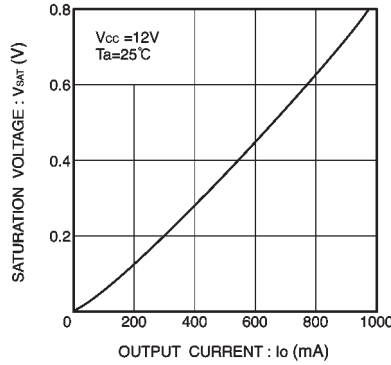

Fig.9 Supply current vs.
power supply voltage

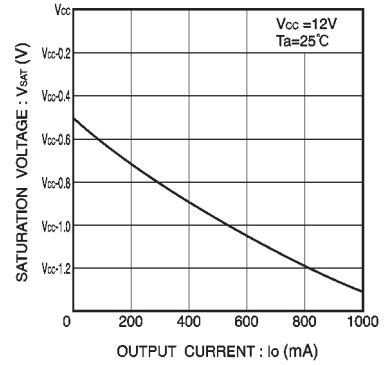Fig.10 Low-side output saturation
voltage vs. output current

Fig.11 High-side output saturation
voltage vs. output current

●External dimensions (Units: mm)

HSOP25