3-phase motor driver for VCR cylinder motors

BA6464FP-Y

The BA6464FP-Y is a 3-phase motor driver designed for VCR cylinder motors. It contains a power supply with a constant voltage of 5V, a short brake circuit, and a start/stop pin to open the output pins.

●Applications

VCR cylinder motors

●Features

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

●Absolute maximum ratings (Ta=25℃)

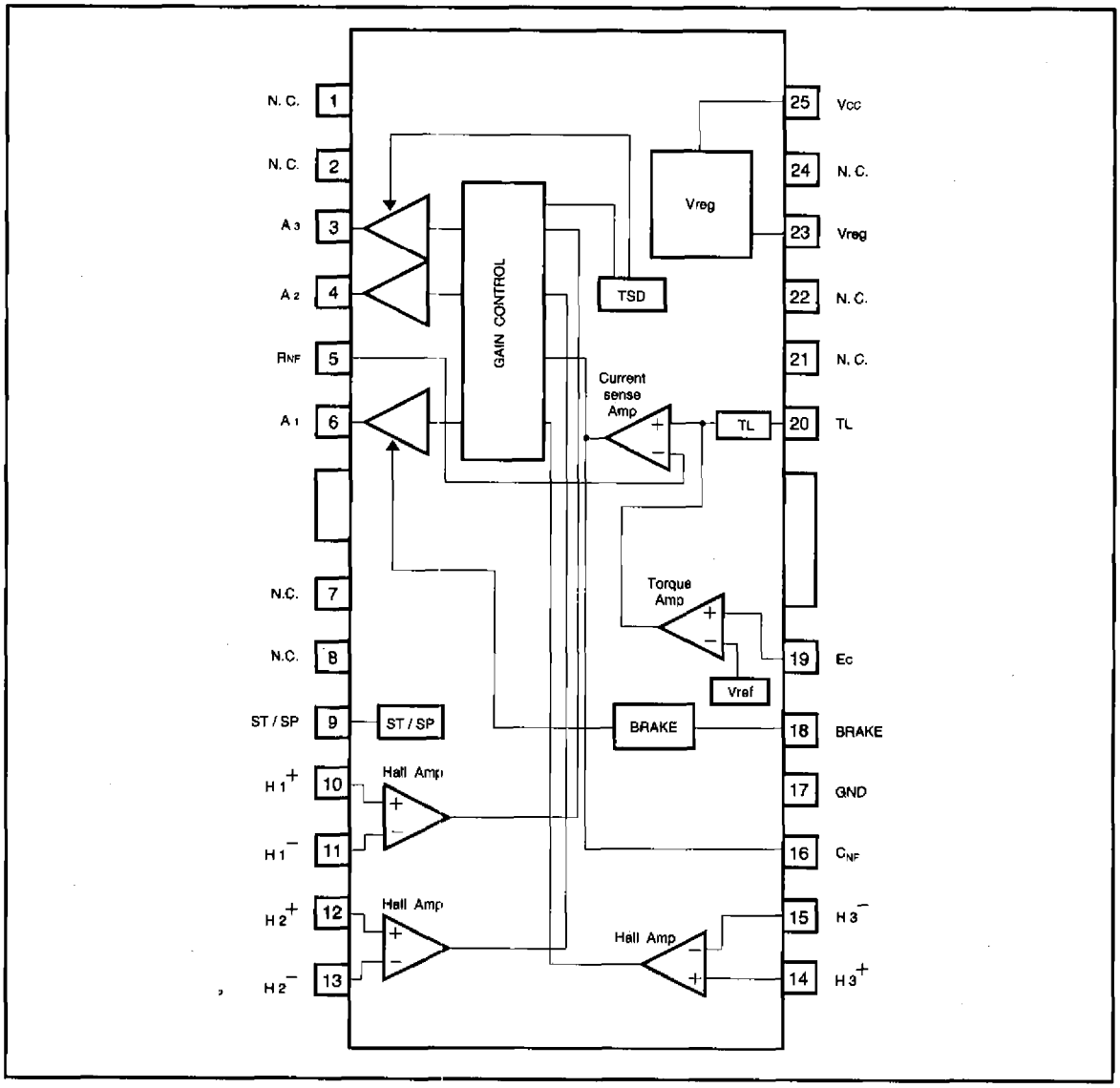
Parameter	Symbol	Limits	Unit
Applied voltage	V_{CC}	24	V
Power dissipation	Pd	1450*1	mW
Operating temperature	Topr	−20~75	℃
Storage temperature	Tstg	−55~150	℃
Output current	I_{OUT}	1000*2	mA

*1 Mounted on a glass epoxy PCB (90 X 50 X 1.6 mm).
Reduce power by 11.6 mW for each degree above 25 ℃.
*2 Should not exceed Pd- or ASO-value.

●Recommended operating conditions (Ta=25℃)

Parameter	Symbol	Limits	Unit
Operating power supply voltage	V_{CC}	7.5~20.0	V

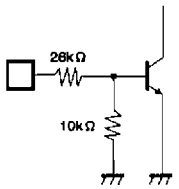
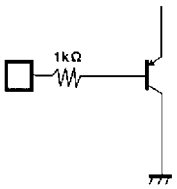
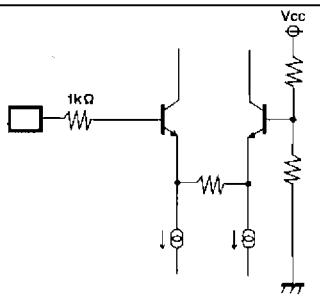
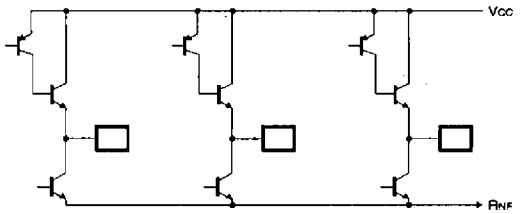
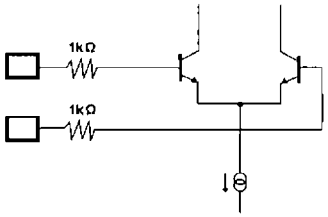
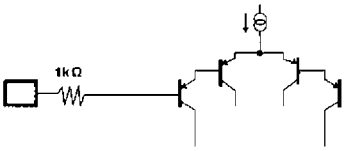
●Block diagram



●Pin descriptions

Pin No.	Pin name	Function
1	N.C	Not used
2	N.C	Not used
3	A_3	Output pin
4	A_2	Output pin
5	R_{NF}	Output current sensing pin; normally a resistor (0.5 Ω is connected between this pin and the ground)
6	A_1	Output pin
7	N.C	Not used
8	N.C	Not used
9	ST / SP	Start/stop switching pin; start mode when HIGH
10	H_1^+	Hall signal input pin
11	H_1^-	Hall signal input pin
12	H_2^+	Hall signal input pin
13	H_2^-	Hall signal input pin
14	H_3^+	Hall signal input pin
15	H_3^-	Hall signal input pin
16	C_{NF}	Capacitor connection pin for phase compensation; set the capacitor so that the output does not oscillate
17	GND	GND
18	BRAKE	BRAKE pin; connected to the E pin
19	E_C	Output current control pin; controls the motor current
20	TL	Torque limit pin; controls the motor current
21	N.C	Not used
22	N.C	Not used
23	V_{reg}	Internal constant voltage (5 V) output pin
24	N.C	Not used
25	V_{CC}	Power supply pin
FIN	FIN	Be sure to connect this fin to the ground

●Input/output circuits

Pin no.	Pin name	Pin description	I/O equivalent circuit
9	ST / SP	Start/stop switching pin	
20	TL	Torque limit pin	
19	E_C	Output current control pin	
3, 4, 6	A_3, A_2, A_1	Output pin	
10, 11, 12, 13, 14, 15	H_1^+, H_1^-, H_2^+ H_2^-, H_3^+, H_3^-	Hall signal input pin	
18	BRAKE	Brake pin	

●Electrical characteristics (Unless otherwise noted, Ta=25℃, Vcc=12V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Circuit current	I_{CC}	—	6.0	11.0	mA	
Constant output voltage	V_{reg}	4.5	5.0	5.5	V	
~MDA~						
Hall input bias current	I_{HB}	—	0.25	5.0	μA	H^+=Hi, H^-=Low or H^+=Low, H^-=Hi
Hall input common-mode voltage	V_{HB}	1.5	—	V_{reg}−1.0	V	
Hall device minimum input level	V_{INH}	60	—	—	mV_{P-P}	
Torque control input voltage	E_C	0	—	V_{reg}	V	
Torque control voltage offset	E_{coffs}	−150	0	+150	mV	For Ec = Vreg X 0.46
Output idle voltage	E_{cidle}	—	0	10	mV	Ec=2V, R_{NF}=0.5Ω
I/O gain	G_{EC}	0.5	0.6	0.7	A / V	Measured at Ec = 2.8 V, 3.3 V R_{NF}=0.5Ω
Start/stop pin threshold voltage	$V_{S/S}$ th	1.2	2.35	3.5	V	
HIGH level output saturation voltage	V_{OH}	—	1.05	1.75	V	Io=600mA
LOW level output saturation 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
~BRAKE~						
Brake pin threshold voltage	V_{BRK} th	1.5	1.6	1.7	V	When Vreg = 5V

* Tj is chip junction temperature.

◎ Not designed for radiation resistance.

●Circuit operation

(1) Hall I/O

The 3-phase Hall signal is amplified in the hall amplifiers and sent to the matrix section, 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.

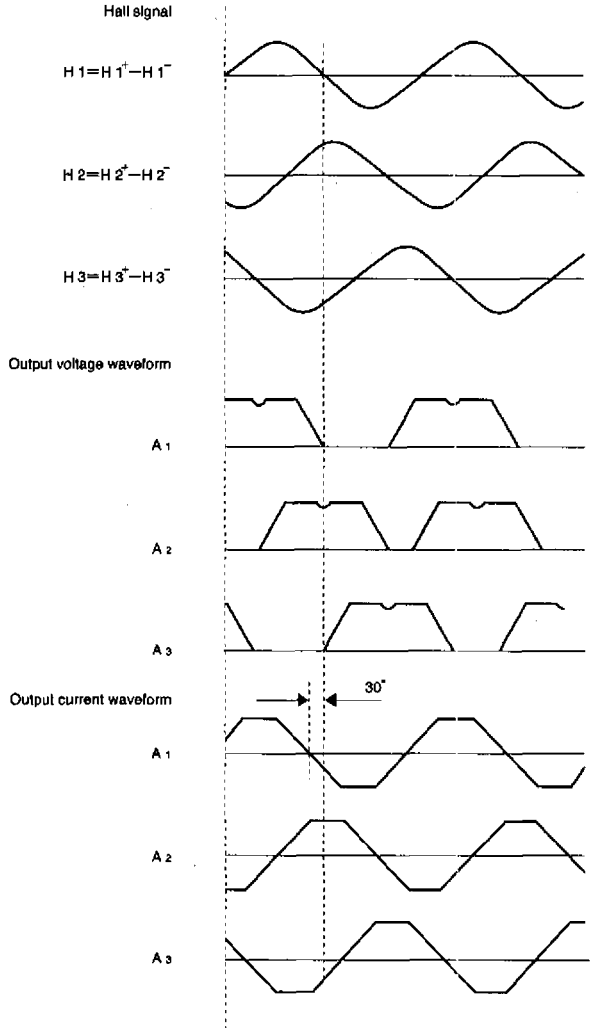


Fig.1

(2) Torque control pin (EC pin)

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

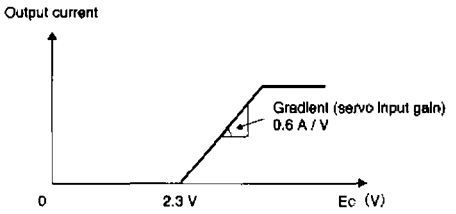


Fig.2

(3) Start/stop pin

The motor is in the run mode when the pin input voltage is 3.5V or more and in the idle 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 (CNF pin)

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

(6) BRAKE pin (BRAKE)

Connect this pin to the torque control pin.

●Application example

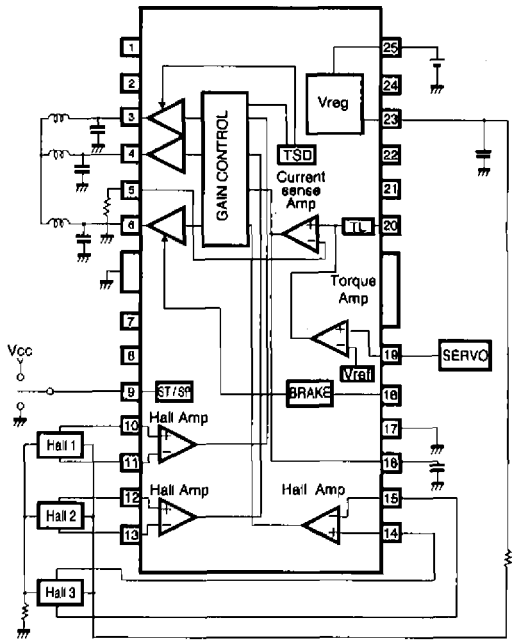


Fig.3

●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 the resistance can vary ± 30%. The voltage on this pin should be less than V_{REG}.

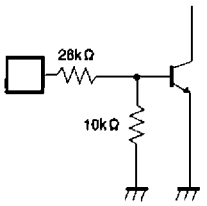


Fig.4

(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.

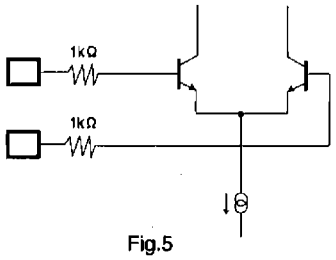


Fig.5

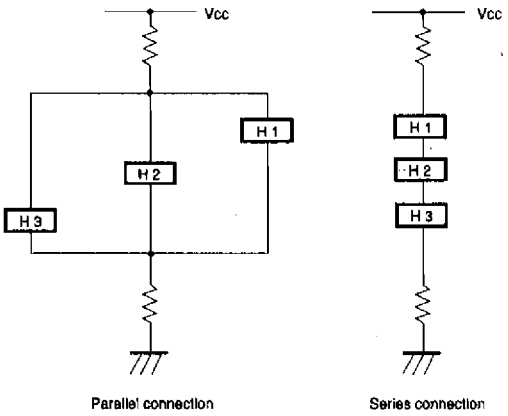


Fig.6

(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 pin to V_{REG} (pin 23) when the TL pin is not used.

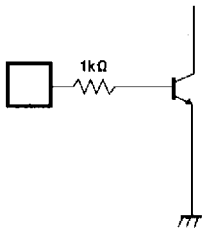


Fig.7

(4) Brake pin

Connect this pin to the EC pin. Do not use the brake pin in the open state.

(5) Thermal shutdown circuit

The circuit puts the driver outputs (A_1, A_2, and A_3) to the open state at the temperature of 175℃ (typical). There is a temperature difference of about 20℃ between the temperatures at which the circuit is activated and deactivated.

●Electrical characteristic curves

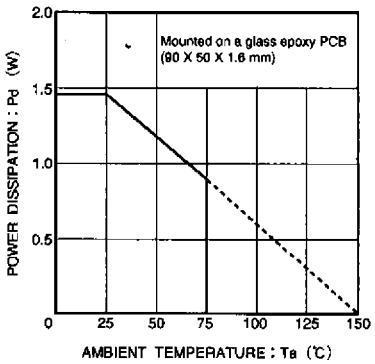


Fig.8 Power dissipation curves

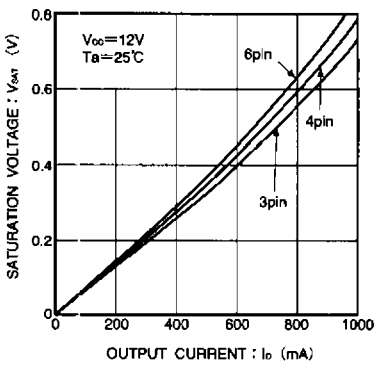


Fig.9 Low-side output saturation voltage vs.output current

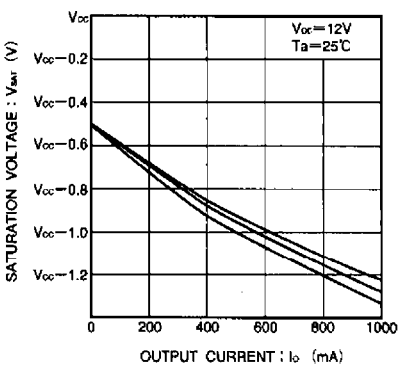
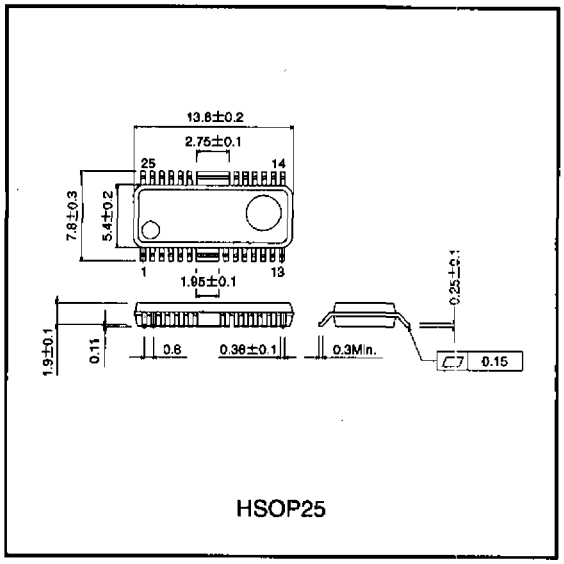


Fig.10 High-side output saturation voltaged vs. output current

●External dimensions (Units: mm)



HSOP25

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