# 3-phase motor driver BA6840BFS / BA6840BFP / BA6842BFS

The BA6840BFS, BA6840BFP-Y, BA6840BFP, and BA6842BFS are one-chip ICs designed for driving CD-ROM motors. They are high performance-ICs with a 3-phase, full-wave, pseudo-linear drive system.

#### Applications

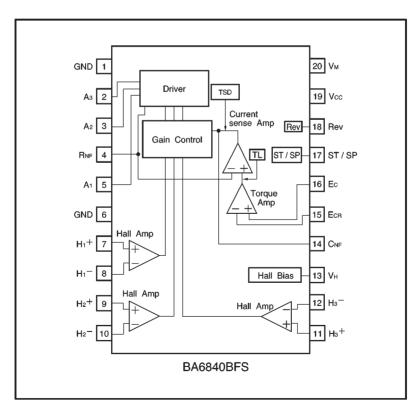
CD-ROM/RW, DVD-ROM/PLAYER

#### Features

- 1) 3-phase, full-wave, pseudo-linear drive system.
- 2) Start / stop pin; power saving during stop mode.
- 3) Internal current limit circuit.

- 4) Internal thermal shutdown circuit.
- Internal hall bias circuit.

# Block diagram



# ● Absolute maximum ratings (Ta = 25°C)

Pa	rameter	Symbol	Limits	Unit	
Power supply voltage		Vcc	7	v	
rower suppr	y voitage	Vм	16	V	
Power dissipation	BA6840BFS		930*1		
	BA6840BFP-Y	- Pd	1450* <sup>2</sup>	101	
	BA6840BFP		1700*3	mW	
	BA6842BFS		1000*4		
Operating temperature		Topr	-20~ <del>+</del> 75	Ç	
Storage temperature		Tstg	<b>−55~</b> +150	Ç	
Output curre	Output current		1300	mA	

<sup>\*1</sup> Reduced by 7.5 mW for each increase in Ta of 1°C over 25°C.

# Recommended operating conditions

Parameter	Symbol	Min.	Тур.	Max.	Unit
Operating power cumply voltage	Vcc	4.25	_	5.50	٧
Operating power supply voltage	Vм	3.0	_	15	V

<sup>\*2</sup> Reduced by 11.6 mW for each increase in Ta of 1°C over 25°C.

<sup>\*3</sup> Reduced by 13.6 mW for each increase in Ta of 1°C over 25°C.

<sup>\*4</sup> Reduced by 8.0 mW for each increase in Ta of 1°C over 25°C.

<sup>\*1∼4</sup> When mounted on a 90×50×1.6 mm glass epoxy board. Should not exceed Pd or ASO values.

●Electrical characteristics (unless otherwise noted, Ta = 25°C, Vcc = 5V, V<sub>M</sub> = 12V)

Parameter	Symbol	Min.	Тур.	Max.	Unit	Conditions	
(Overall)							
Supply current 1	lcc1	_		0.2	mA	Start / stop OFF	
Supply current 2	lcc2	_	3.6	6.0	mA	Start / stop ON inputs : H, M and L	
⟨Start / stop⟩							
ON voltage	VPSON	3.5	_	_	V		
OFF voltage	VPSOFF	_	_	1.5	V		
⟨Hall bias⟩	(Hall bias)						
Hall bias voltage	V <sub>HB</sub>	_	0.9	1.5	V	I <sub>HB</sub> =10mA	
〈Hall amplifier〉	⟨Hall amplifier⟩						
Input bias current	Іна	_	0.25	1.0	μΑ		
Common-mode input voltage	VHAR	1.5	_	4.0	V		
Minimum input level	VINH	50	_	_	mV <sub>P-P</sub>		
⟨Torque control⟩	⟨Torque control⟩						
Input voltage	Ec	1.0	_	4.0	V		
Offset voltage +	Ecofs+	20	50	80	mV	For Ecn= 2.5 V	
Offset voltage —	Ecofs-	-80	-50	-20	m∨		
Input current	Ecin	_	0.5	2.0	μΑ	Ec =EcR=2.5V	
Input/output gain	GEC	0.41	0.51	0.61	A/V	$R_{NF}$ =0.5 $\Omega$ , when measured at $E_{C}$ =2points: 1.5V and 2.0V $E_{C}$ =2points: 3.0V and 3.5V	
⟨Output⟩							
Output saturation high level voltage	Vон	_	1.0	1.6	٧	Io=-600mA	
Output saturation low level voltage	Vol	_	0.4	0.9	٧	Io=600mA	
Torque limit current	l⊤∟	560	700	840	mA	R <sub>NF</sub> =0.5Ω	

ONot designed for radiation resistance

# Electrical characteristic curves

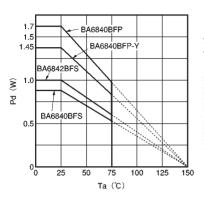


Fig.1 Power dissipation curves

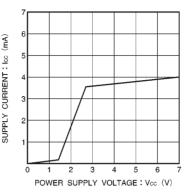


Fig.2 Supply current vs. power supply voltage

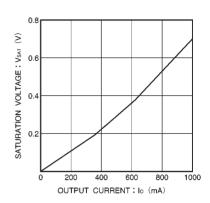


Fig.3 Low-level output saturation voltage vs. output current

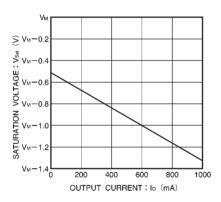


Fig.4 High-level output saturation voltage vs. output current

#### Circuit operation

#### (1) Hall input ~ output

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. 5.

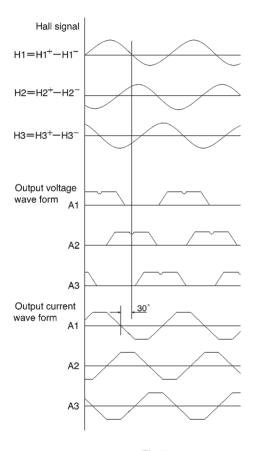


Fig. 5

### (2) Torque control pin

The  $R_{NF}$ -pin current depends on the torque control input voltage (EC) as shown in Fig. 6.

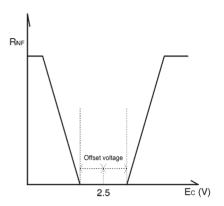


Fig. 6

	Reverse pin voltage		
	Н	L	
Ecr < Ec	Reverse	Forward	
Ecr > Ec	Stop	Reverse	

### (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 1.5V or less.

# (4) Power ground pin (RNF pin)

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

# (5) Phase compensation pin (CNF pin)

Connect and adjust a capacitor between this pin and the around if the output tends to oscillate.

# Pin descriptions

Pin name	BA6840BFS	BA6840BFP-Y	BA6840BFP	BA6842BFS	Function
GND	1	FIN	FIN	8, 9, 23, 24, 25	Ground
<b>A</b> 3	2	3	3	1	Output
A2	3	4	4	4	Output
RNF	4	6	5	5	Current detector ouput
A1	5	7	6	7	Output
GND	6	8	7	10	Ground
H <sub>1</sub> +	7	9	9	11	Hall signal input
H <sub>1</sub> -	8	10	10	12	Hall signal input
H <sub>2</sub> +	9	11	13	13	Hall signal input
H <sub>2</sub> <sup>-</sup>	10	12	14	15	Hall signal input
H <sub>3</sub> +	11	13	15	16	Hall signal input
H <sub>3</sub> -	12	14	16	17	Hall signal input
VH	13	15	17	18	Hall bias
C <sub>NF</sub>	14	17	20	21	Capacitor for phase compensation connection
Ecr	15	18	21	22	Standard output current control
Ec	16	19	22	26	Output current control
ST / SP	17	20	23	27	Start / stop switch
REV	18	22	24	29	Reverse
Vcc	19	23	25	30	Power supply
Vм	20	24	26	31	Motor power supply

# ●Input / output circuits

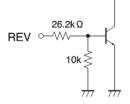
# (1) Start / stop

# 

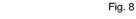
(Resistances are typical values.)

Fig. 7

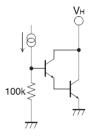
(2) Reversing pin



(Resistances are typical values.)



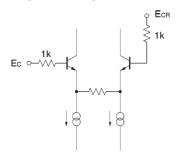
(3) Hall bias



(Resistances are typical values.)

Fig. 9

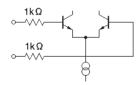
#### (4) Torque control input



(Resistances are typical values.)

Fig. 10

## (6) Hall input (H1<sup>+</sup>, H1<sup>-</sup>, H2<sup>+</sup>, H2<sup>-</sup>, H3<sup>+</sup>, H3<sup>-</sup>)



(Resistances are typical values.)

Fig. 12

#### Operation notes

#### (1) Start / stop

The I / O equivalent circuit of the start / stop pin is shown in Fig. 7. The pin has a temperature dependence of -7mV /  $^{\circ}\text{C}$ , and the resistance can vary  $\pm30\%$ . Take the temperature effect into consideration when designing your application.

#### (2) Hall input

The Hall input equivalent circuit is shown in Fig. 12. The Hall devices can be connected in either series or parallel.

#### (3) Thermal shutdown circuit (TSD)

The circuit puts the coil outputs  $(A_1, A_2, \text{ and } A_3)$  to the open state at the temperature of 175°C (typical). There is a temperature difference of about 15°C between the temperatures at which the circuit is activated and deactivated.

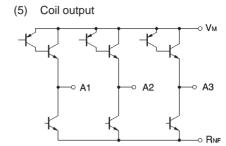


Fig. 11

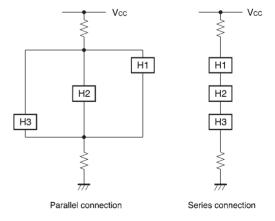


Fig. 13



# Application example

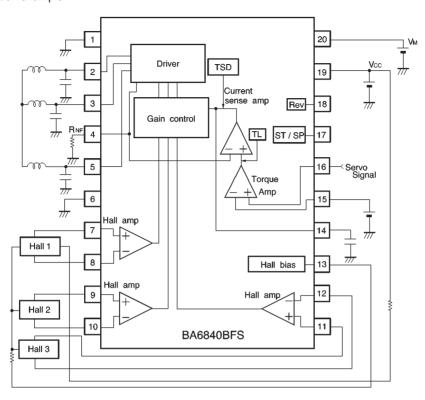


Fig.14

#### External dimensions (Units: mm)

