STRUCTURE Silicon monolithic integrated circuits

PRODUCT SERIES 3-phase spindle motor driver

TYPE **BA6859AFP-Y**

FUNCTION
- 3-phase full-wave pseudo linear driving system
- Built-in FG output

○Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limit	Unit
Supply voltage	VCC	7	V
	VM	15	V
Power dissipation	Pd	1450※1	mW
Input voltage	VIN	0～VCC	V
Maximum output current	IOUT	1300※2	mA
Operating temperature range	Topr	-20～+75	℃
Storage temperature range	Tstg	-55～+150※2	℃
Junction temperature	Tjmax	150	℃

※1 70mm×70mm×1.6mm glass epoxy board. Derating in done at 11.6mW/℃ for operating above Ta=25℃.

※2 Do not, however exceed Pd, ASO and Tjmax=150℃.

○Recommended operating conditions (Ta=-20～+75℃)

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	VCC	4.5	5	5.5	V
	VM	3	12	14	V
Output current	IOUT	-	-	1000※3	mA

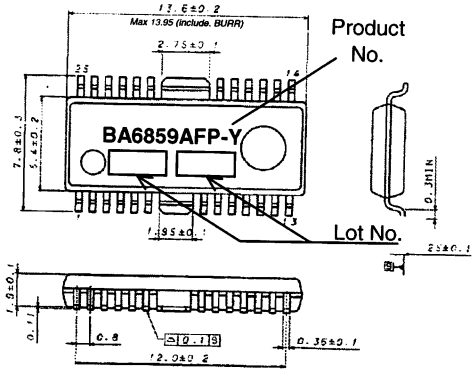
※3 Do not, however exceed Pd, ASO.

This product described in this specification isn't judged whether it applies to COCOM regulations.
Please confirm in case of export.
This product isn't designed for protection against radioactive rays.

○Electrical characteristics (Unless otherwise specified, Ta=25℃, VCC=5.0V, VM=12V)

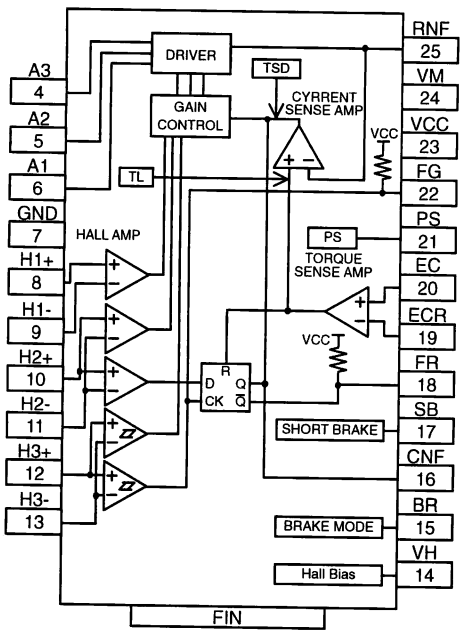
Parameter	Symbol	Limit			Unit	Conditions
		Min	Typ	Max		
Total device						
Circuit current 1	I_{CC1}	–	0	0.2	mA	Power save on
Circuit current 2	I_{CC2}	–	5.0	7.5	mA	Power save off
Power-save						
ON voltage range	V_{PSON}	–	–	1.0	V	
OFF voltage range	V_{PSOFF}	2.5	–	–	V	
Hall bias						
Hall bias voltage	V_{HB}	0.5	0.9	1.5	V	I_{HB}=10mA
Hall bias						
Input bias current	I_{HA}	–	0.7	3.0	μA	
Same phase input voltage range	V_{HAR}	1.0	–	4.0	V	
Mini. input level	V_{INH}	50	–	–	mVpp	
H3 Hysteresis level	V_{HYS}	5	20	40	mV	
Torque command						
Input voltage range	E_C, E_{CR}	0.5	–	3.3	V	0～Vcc
Offset voltage -	E_{COFF-}	-80	-50	-20	mV	E_{CR}=1.9V
Offset voltage +	E_{COFF+}	20	50	80	mV	E_{CR}=1.9V
Input bias current	E_{CIN}	-3	–	3	μA	E_C=E_{CR}
I/O gain	G_{EC}	0.56	0.70	0.84	A/V	E_C=1.2, 1.7V
FG						
FG output high-level voltage	V_{FGH}	4.5	4.8	–	V	I_{FG}=-20μA
FG output low-level voltage	V_{FGL}	–	0.25	0.4	V	I_{FG}=3.0mA
Duty (reference values)	D_U	–	50	–	%	
Rotation detection						
FR output high level voltage	V_{FRH}	4.1	4.4	–	V	I_{FR}=-20μA
FR output low level voltage	V_{FRL}	–	0.25	0.4	V	I_{FR}=3.0mA
Output						
Output saturation high level voltage	V_{OH}	–	1.0	1.4	V	IOUT=-600mA
Output saturation low level voltage	V_{OL}	–	0.4	0.7	V	IOUT=600mA
Pre-drive current	I_{VML}	–	35	70	mA	EC=0V, Output open
Output limit current	I_{TL}	560	700	840	mA	
Short brake						
ON voltage range	V_{SBON}	2.5	–	–	V	BR=0V
OFF voltage range	V_{SBOFF}	–	–	1.0	V	BR=0V
Brake mode						
ON voltage range	V_{BRON}	2.5	–	–	V	E_C>E_{CR},SB=Open
OFF voltage range	V_{BROFF}	–	–	1.0	V	E_C>E_{CR},SB=Open

○Package outline



HSOP-25 (Unit: mm)

○Block diagram



○Pin No. / Pin name

Pin No.	Pin name
1	N.C.
2	N.C.
3	N.C.
4	A3
5	A2
6	A1
7	GND
8	H1+
9	H1-
10	H2+
11	H2-
12	H3+
13	H3-
14	VH
15	BR
16	CNF
17	SB
18	FR
19	ECR
20	EC
21	PS
22	FG
23	V_{CC}
24	VM
25	RNF

＊FIN : GND

○Operation Notes

(1) Absolute maximum ratings

Use of the IC in excess of absolute maximum ratings such as the applied voltage or operating temperature range (Topr) may result in IC damage. Assumptions should not be made regarding the state of the IC (short mode or open mode) when such damage is suffered. The implementation of a physical safety measure such as a fuse should be considered when use of the IC in a special mode where the absolute maximum ratings may be exceeded is anticipated.

(2) Power supply lines

Regenerated current may flow as a result of the motor's back electromotive force. Insert capacitors between the power supply and ground pins to serve as a route for regenerated current. Determine the capacitance in full consideration of all the characteristics of the electrolytic capacitor, because the electrolytic capacitor may loose some capacitance at low temperatures. If the connected power supply does not have sufficient current absorption capacity, regenerative current will cause the voltage on the power supply line to rise, which combined with the product and its peripheral circuitry may exceed the absolute maximum ratings. It is recommended to implement a physical safety measure such as the insertion of a voltage clamp diode between the power supply and GND pins.

(3) Ground potential

Ensure a minimum GND pin potential in all operating conditions.

(4) Setting of heat

Use a thermal design that allows for a sufficient margin in light of the power dissipation (Pd) in actual operating conditions.

(5) Actions in strong magnetic field

Use caution when using the IC in the presence of a strong magnetic field as doing so may cause the IC to malfunction.

(6) ASO

When using the IC, set the output transistor for the motor so that it does not exceed absolute maximum ratings or ASO.

(7) Thermal shutdown circuit

This IC incorporates a TSD (thermal shutdown) circuit (TSD circuit). If the temperature of the chip reaches the following temperature, the motor coil output will be opened. The thermal shutdown circuit (TSD circuit) is designed only to shut the IC off to prevent runaway thermal operation. It is not designed to protect the IC or guarantee its operation. Do not continue to use the IC after operating this circuit or use the IC in an environment where the operation of this circuit is assumed.

TSD on temperature [°C] (typ.)	Hysteresis temperature [°C] (typ.)
175	25

(8) Ground Wiring Pattern

When using both small signal and large current GND patterns, it is recommended to isolate the two ground patterns, placing a single ground point at the application's reference point so that the pattern wiring resistance and voltage variations caused by large currents do not cause variations in the small signal ground voltage. Be careful not to change the GND wiring pattern of any external components, either.

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China / Hong Kong	TEL : +852(2)740-6262	FAX : +852(2)375-8971
Shanghai	TEL : +86(21)6279-2727	FAX : +86(21)6247-2066
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Beijing	TEL : +86(10)8525-2483	FAX : +86(10)8525-2489
Taiwan / Taipei	TEL : +866(2)2500-6956	FAX : +866(2)2503-2869
Korea / Seoul	TEL : +82(2)8182-700	FAX : +82(2)8182-715
Singapore	TEL : +65-6332-2322	FAX : +65-6332-5662
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Japan /
(Internal Sales)

Tokyo 2-1-1, Yaesu, Chuo-ku, Tokyo 104-0082
TEL : +81(3)5203-0321 FAX : +81(3)5203-0300

Yokohama 2-4-8, Shin Yokohama, Kohoku-ku, Yokohama, Kanagawa 222-8575
TEL : +81(45)476-2131 FAX : +81(45)476-2128

Nagoya Dainagayo Building 9F 3-28-12, Meieki, Nakamura-ku, Nagoya,Aichi 450-0002
TEL : +81(52)581-8521 FAX : +81(52)561-2173

Kyoto 579-32 Higashi Shiokouji-cho, Karasuma Nishi-iru, Shiokoujidori, Shimogyo-ku, Kyoto 600-8216
TEL : +81(75)311-2121 FAX : +81(75)314-6559

(Contact address for overseas customers in Japan)

Yokohama TEL : +81(45)476-9270 FAX : +81(045)476-9271

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