STRUCTURE Silicon monolithic integrated circuits

PRODUCT SERIES 3-phase spindle motor driver

TYPE **BA6664FM**

FUNCTION
- 3-phase, full-wave pseudo linear driving system
- Suitable for 3.3V DSP

○Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limit	Unit
Supply voltage	VCC	7	V
	VM	15	V
Power dissipation	Pd	2200*1	mW
Input voltage	VIN	0～VCC	V
Output current	IOUT	1300*2	mA
Operating temperature range	Topr	-40～+85	℃
Storage temperature range	Tstg	-55～+150	℃
Junction temperature	Tjmax	150	℃

※1 70mm×70mm×1.6mm glass epoxy board. Derating is done at 17.6mW/℃ for operating above Ta=25℃.

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

○Operating conditions (Ta= -40～+85℃)

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	VCC	4.5	5	5.5	V
	VM	3	12	14	V
Output current	IOUT	-	-	1000*2	mA

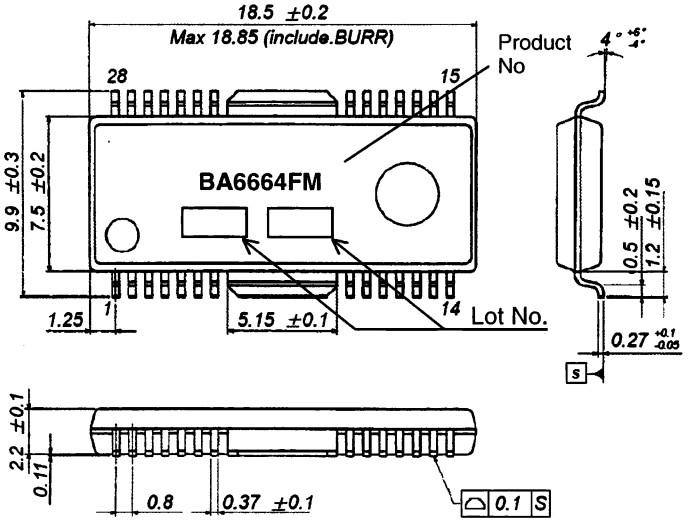
This product isn't designed for protection against radioactive rays.

Status of this document
The Japanese version of this document is the formal specification.
A customer may use this translation version only for a reference to help reading the formal version.
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○Electrical characteristics (Unless otherwise specified, Ta=25℃, VCC=5.0V, VM=12V)

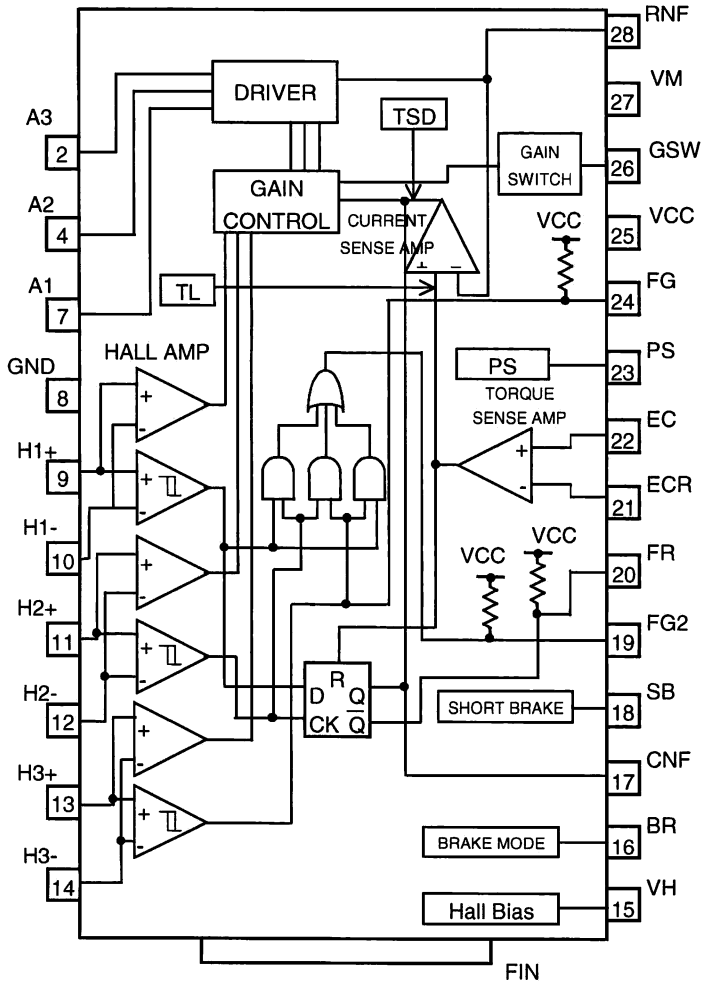
Parameter	Symbol	Limit			Unit	Conditions
		Min	Typ	Max		
Overall						
Circuit current 1	I_{CC1}	–	0	0.2	mA	PS=L, GSW=OPEN
Circuit current 2	I_{CC2}	–	6.2	9.1	mA	PS=H, GSW=OPEN
Power save						
ON voltage range	V_{PSON}	–	–	1.0	V	Circuit OFF
OFF voltage range	V_{PSOFF}	2.5	–	–	V	Circuit ON
Hall Bias						
Hall bias voltage	V_{HB}	0.5	0.9	1.5	V	I_{HB}=10mA
Hall amp						
Input bias current	I_{HA}	–	0.7	3.0	μA	
In-phase input voltage range	V_{HAR}	1.0	–	4.0	V	
Minimum input level	V_{INH}	50	–	–	mVpp	
H3 hysteresis level	V_{HYS}	5	20	40	mV	
Torque control						
Input voltage range	E_C, E_{CR}	0	–	VCC	V	(Linear range 0.5V～3.3V)
Offset voltage -	E_{COFF-}	-75	-45	-15	mV	E_{CR}=1.65V, GSW=L
Offset voltage +	E_{COFF+}	15	45	75	mV	E_{CR}=1.65V, GSW=L
Input bias current	E_{CIN}	-3	–	3	μA	E_C=E_{CR}
Input-output gain L	G_{ECL}	0.52	0.65	0.78	A/V	GSW=L, RNF=0.5Ω
Input-output gain M	G_{ECM}	1.04	1.3	1.56	A/V	GSW=OPEN, RNF=0.5Ω
Input-output gain H	G_{ECH}	2.24	2.8	3.36	A/V	GSW=H, RNF=0.5Ω
FG						
FG output HI voltage	V_{FGH}	4.5	4.8	–	V	I_{FG}=-20μA
FG output LOW voltage	V_{FGL}	–	0.2	0.4	V	I_{FG}=3.0mA
FG2						
FG output HI voltage	V_{FG2H}	4.6	4.9	–	V	I_{FG2}=-20μA
FG output LOW voltage	V_{FG2L}	–	0.2	0.4	V	I_{FG2}=3.0mA
Rotation detect						
FR output voltage H	V_{FRH}	4.1	4.4	–	V	I_{FR}=-20μA
FR output voltage L	V_{FRL}	–	0.2	0.4	V	I_{FR}=3.0mA
Output						
Saturation voltage H	V_{OH}	–	1.0	1.35	V	IOUT=-600mA
Saturation voltage L	V_{OL}	–	0.4	0.65	V	IOUT=600mA
Pre-drive current	I_{VML}	–	35	70	mA	E_C=0V, Output open
Torque limit current	I_{TL}	560	700	840	mA	RNF=0.5Ω
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
Gain switch						
LOW voltage range	V_{GSWL}	–	–	1.0	V	
HI voltage range	V_{GSWH}	3.0	–	–	V	
OPEN voltage	V_{GSWOP}	–	2.0	–	V	

○Package outline



HSOP-M28 (Unit:mm)

○Block diagram



○Pin No. / Pin name

Pin No.	Pin name	Pin No.	Pin name
1	N.C.	15	VH
2	A3	16	BR
3	N.C.	17	CNF
4	A2	18	SB
5	N.C.	19	FG2
6	N.C.	20	FR
7	A1	21	ECR
8	GND	22	EC
9	H1+	23	PS
10	H1-	24	FG
11	H2+	25	VCC
12	H2-	26	GSW
13	H3+	27	VM
14	H3-	28	RNF
		FIN	FIN

＊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. 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	15

(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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U.S.A / San Diego	TEL : +1(858)625-3630	FAX : +1(858)625-3670
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Germany / Dusseldorf	TEL : +49(2154)9210	FAX : +49(2154)921400
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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
Malaysia / Kuala Lumpur	TEL : +60(3)7958-8355	FAX : +60(3)7958-8377
Philippines / Manila	TEL : +63(2)807-6872	FAX : +63(2)809-1422
Thailand / Bangkok	TEL : +66(2)254-4890	FAX : +66(2)256-6334

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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