AN8481SB

Spindle motor driver IC for optical disk

■ Overview

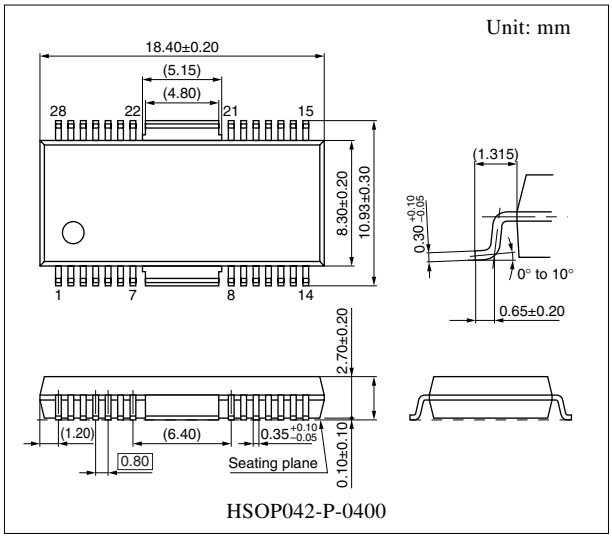
The AN8481SB is a high performance IC suited for driving a spindle motor of an optical disk such as CD-ROM, PD, DVD, CD-R, CD-RW, etc.

■ Features

- Adopting the 3-phase full-wave soft switch system
- With switching regulator control function
- With start and stop pin
- Reverse breaking by EC/ECR voltage
- With Hall bias pin
- Surface-mount small package

■ Applications

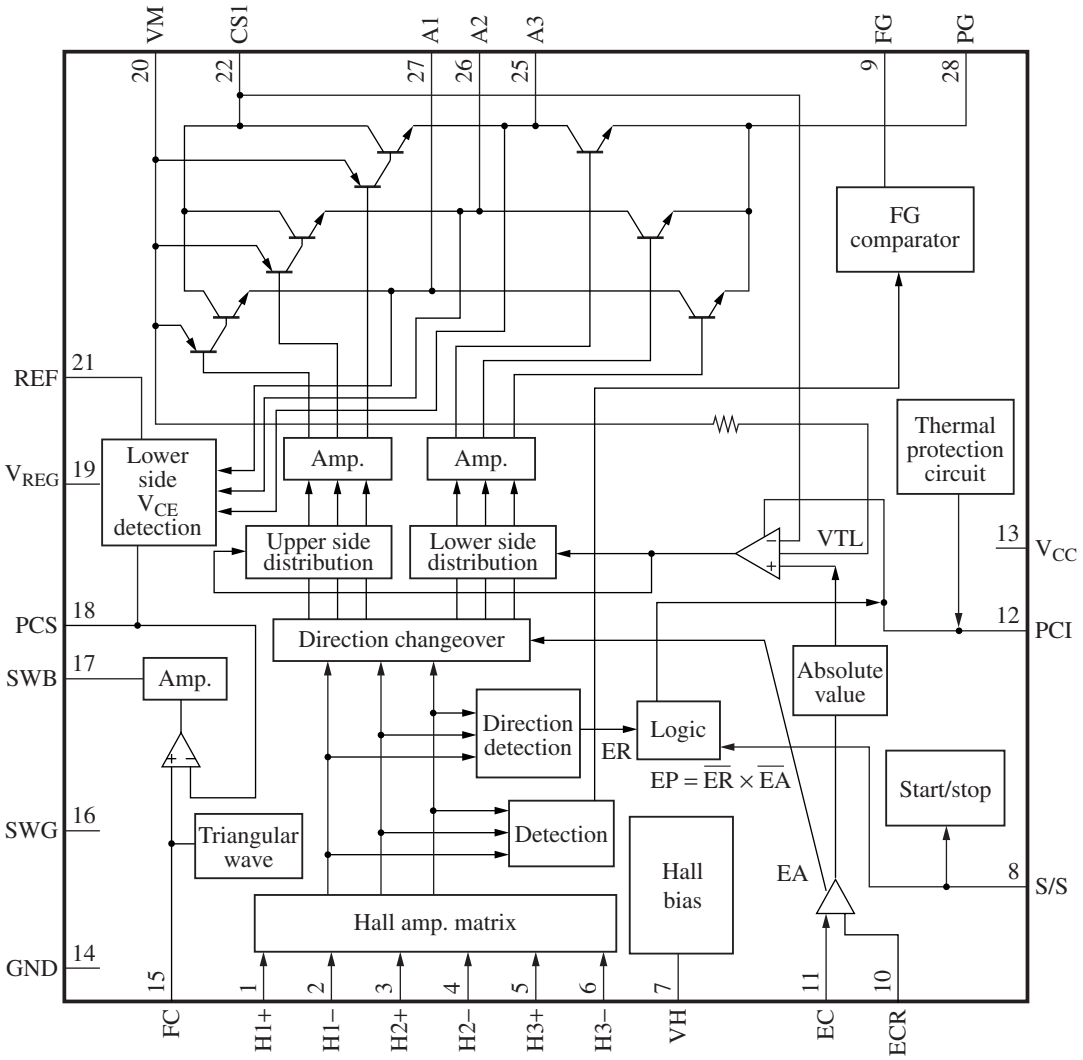
- High speed CD-ROM drive
- PD, DVD, CD-R, CD-RW drives



HSOP042-P-0400

Note) The package of this product will be changed to lead-free type (HSOP042-P-0400D). See the new package dimensions section later of this datasheet.

■ Block Diagram



■ Pin Descriptions

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	H1+	Hall element-1 positive input pin	11	EC	Torque command input pin
2	H1−	Hall element-1 negative input pin	12	PCI	Current feedback phase compensation pin
3	H2+	Hall element-2 positive input pin	13	V_{CC}	Supply voltage pin
4	H2−	Hall element-2 negative input pin	14	SG	Signal GND pin
5	H3+	Hall element-3 positive input pin	15	FC	Triangular wave oscillation pin
6	H3−	Hall element-3 negative input pin	16	SWG	SW-REG system GND pin
7	VH	Hall bias pin	17	SWB	SW-REG driving pin
8	SS	Start/stop changeover pin	18	PCS	SW-REG system phase compensation pin
9	FG	FG signal output pin	19	V_{REG}	Fixed power supply pin
10	ECR	Torque command reference input pin	20	VM	Motor supply voltage pin

■ Pin Descriptions (continued)

Pin No.	Symbol	Description	Pin No.	Symbol	Description
21	REF	SW-REG reference setting pin	25	A3	Drive output 3
22	CS1	Current det. pin 1	26	A2	Drive output 2
23	N.C.	N.C.	27	A1	Drive output 1
24	N.C.	N.C.	28	PG	Power GND pin

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC}	7.0	V
	V_M	14.4	
	V_{REG}		
Control signal input voltage *4	$V_{(n)}$	0 to V_{CC}	V
Supply current	I_{CC}	30	mA
Output current *3	$I_{O(n)}$	±1 200	mA
Hall bias current	I_{HB}	50	mA
Power dissipation *2	P_D	667	mW
Operating ambient temperature *1	T_{opr}	−20 to +70	°C
Storage temperature *1	T_{stg}	−55 to +150	°C

Note) Do not apply external currents or voltages to any pins not specifically mentioned.
For circuit currents, '+' denotes current flowing into the IC, and '−' denotes current flowing out of the IC.
∗1: Except for the operating ambient temperature and storage temperature, all ratings are for T_a = 25°C.
∗2: For 70°C and IC alone.
∗3: n = 22, 25, 26, 27, 28
∗4: n = 1, 2, 3, 4, 5, 6, 8, 10, 11

■ Recommended Operating Range

Parameter	Symbol	Range	Unit
Supply voltage	V_{CC}	4.25 to 5.5	V
	V_M	4.5 to 14	
	V_{REG}		

■ Electrical Characteristics at T_a = 25°C

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Overall						
Circuit current 1	I_{CC1}	V_{CC} = 5 V in power save mode	—	0	0.1	mA
Circuit current 2	I_{CC2}	V_{CC} = 5 V, I_O = 0 mA	—	8	16	mA
Start/stop						
Start voltage	V_{START}	Voltage with which a circuit operates at V_{CC} = 5 V and L → H	3.5	—	—	V
Stop voltage	V_{STOP}	Voltage with which a circuit becomes off at V_{CC} = 5 V and H → L	—	—	1.0	V

■ Electrical Characteristics at T_a = 25°C (continued)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Hall bias						
Hall bias voltage	V_{HB}	V_{CC} = 5 V, I_{HB} = 20 mA	0.7	1.2	1.6	V
Hall amplifier						
Input bias current	I_{BH}	V_{CC} = 5 V	—	1	5	µA
In-phase input voltage range	V_{HBR}	V_{CC} = 5 V	1.5	—	4.0	V
Minimum input level	V_{INH}	V_{CC} = 5 V	60	—	—	mV[p-p]
Torque command						
In-phase input voltage range	EC	V_{CC} = 5 V	1	—	3.9	V
Offset voltage	EC_{OF}	V_{CC} = 5 V	−150	0	150	mV
Dead zone	EC_{DZ}	V_{CC} = 5 V	50	100	150	mV
Input current	EC_{IN}	V_{CC} = 5 V, EC = ECR = 2.5 V	−5	−1	—	µA
Input/output gain	A_{CS}	V_{DD} = 5 V, R_{CS} = 0.5 Ω	0.31	0.41	0.51	A/V
Output						
High-level output saturation voltage	V_{OH}	V_{CC} = 5 V, I_O = −300 mA	—	0.9	1.6	V
Low-level output saturation voltage	V_{OL}	V_{CC} = 5 V, I_O = 300 mA	—	0.2	0.6	V
Torque limit current	I_{TL}	V_{CC} = 5 V, R_{CS} = 0.5 Ω	390	530	670	mA
FG						
FG output high-level	FG_H	V_{CC} = 5 V, I_{FG} = − 0.01 mA	3.0	—	V_{CC}	V
FG output low-level	FG_L	V_{CC} = 5 V, I_{FG} = 0.01 mA	—	—	0.5	V
In-phase input voltage range	V_{FGR}	V_{CC} = 5 V, Input D-range at H2+, H2−	1.5	—	3.0	V
FG hysteresis width	H_{FG}	V_{CC} = 5 V	1	10	20	mV
Triangular wave oscillation circuit						
Charging current	I_{CH}	V_{CC} = 5 V, FC = 0.5 V	−100	−50	−25	µA
Discharging current	I_{DCH}	V_{CC} = 5 V, FC = 2.5 V	25	50	100	µA
Lower side voltage detection circuit						
Input to output gain	G_{V1}	V_{CC} = 5 V	5	10	20	times
SW-REG driving circuit						
PNP driving current	I_{SWB}	V_{CC} = 5 V	10	50	—	mA

• Design reference data

Note) The characteristics listed below are theoretical values based on the IC design and are not guaranteed.

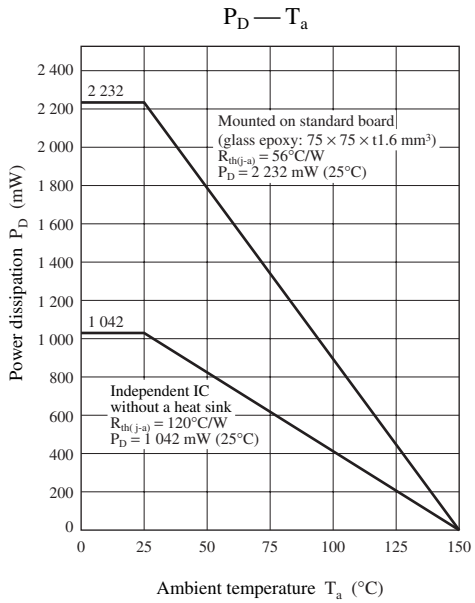
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Thermal protection						
Thermal protection operating temperature	T_{SDON}	V_{CC} = 5 V, ΔEC = 100 mV	—	170	—	°C
Thermal protection hysteresis width	ΔT_{SD}	V_{CC} = 5 V, ΔEC = 100 mV	—	45	—	°C

■ Usage Notes

Prevent this IC from being line-to-ground fault. (To be concrete, do not short-circuit any of pins A1 (pin 27), A2 (pin 26) and A3 (pin 25) to V_{REG} pin (pin 19) or VM pin (pin 20).)

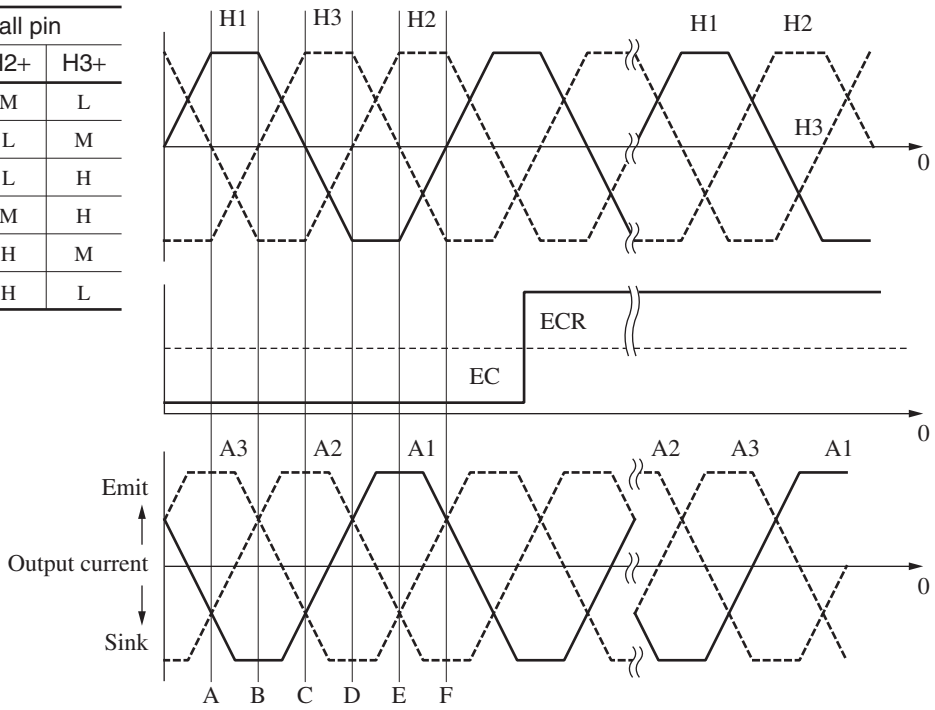
■ Application Notes

• P_D — T_a curves of HSOP042-P-0400

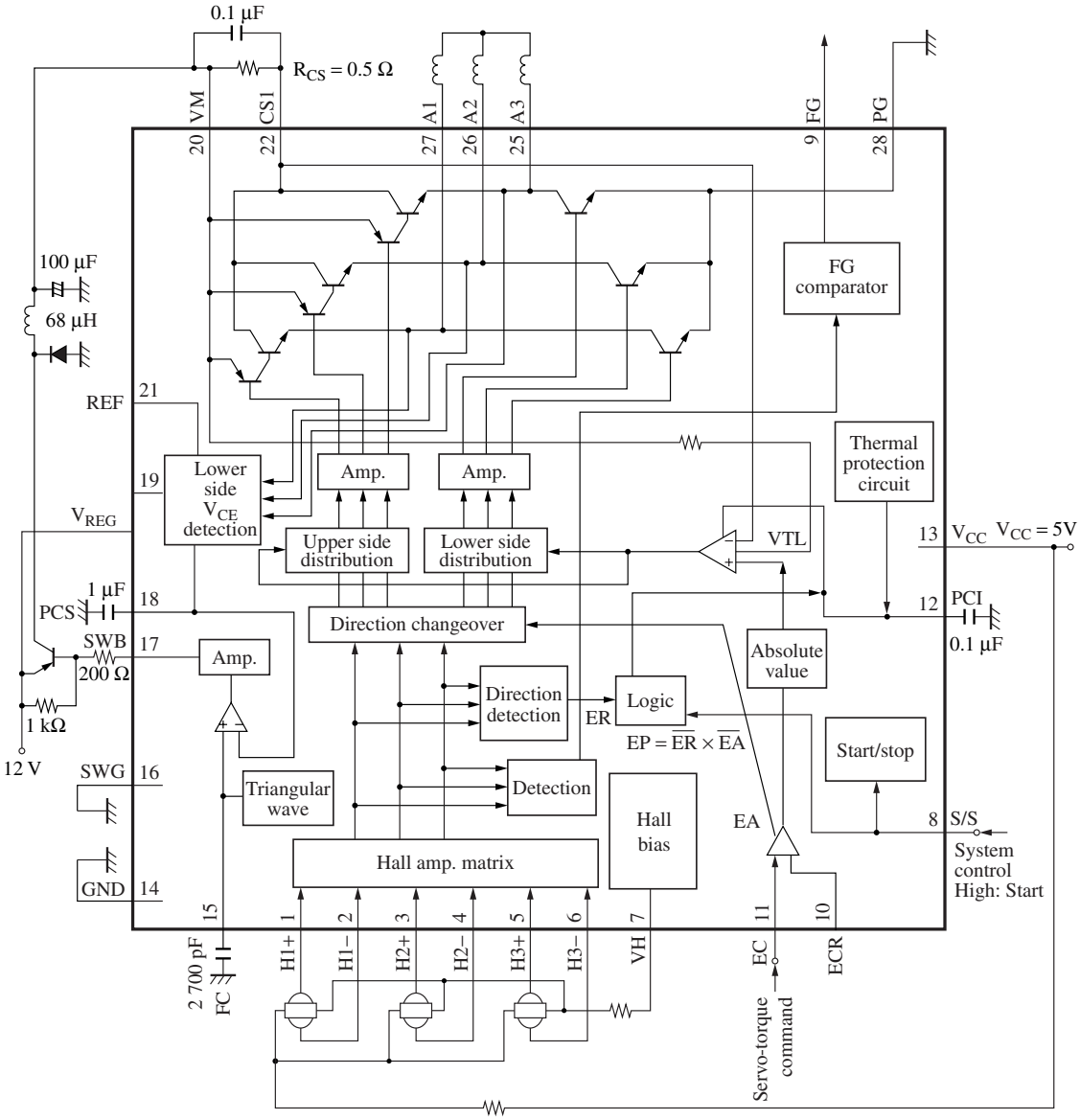


• Phase conditions between Hall input and output current

Phase of Hall pin			
	H1+	H2+	H3+
A	H	M	L
B	H	L	M
C	M	L	H
D	L	M	H
E	L	H	M
F	M	H	L

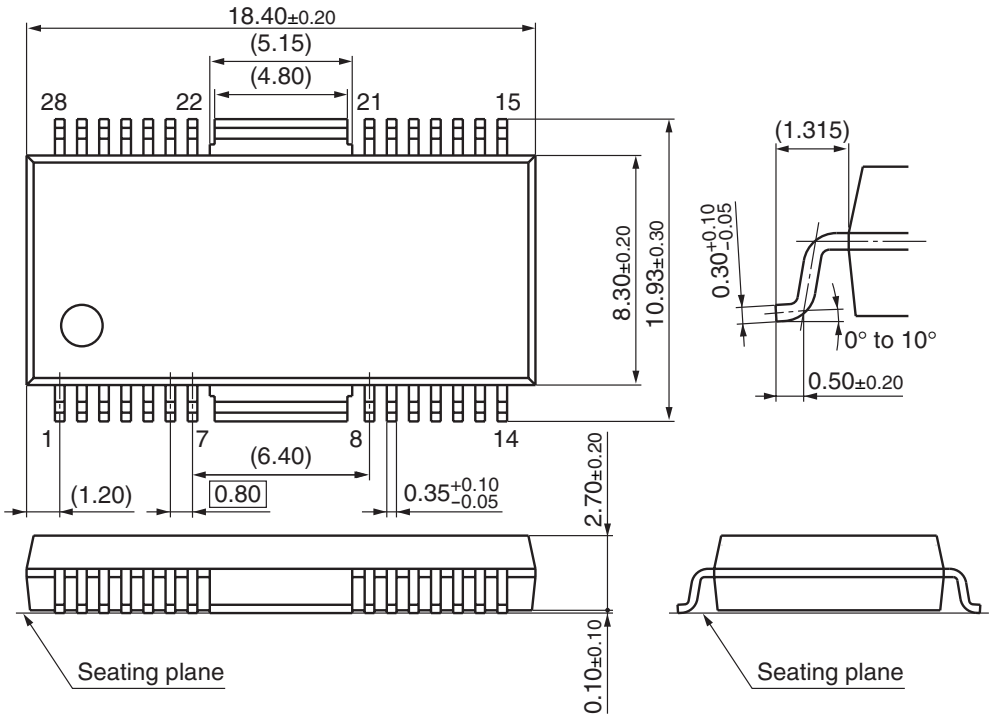


■ Application Circuit Example



■ New Package Dimensions (Unit: mm)

• HSOP042-P-0400D (Lead-free package)



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