AN8473SA

Spindle motor driver IC for optical disk

Overview

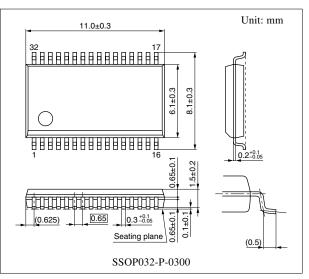
The AN8473SA is an optical disk driver IC, featuring direct PWM drive, DMOS power drive, low ON resistance of output power MOS and 120° of duty-factor.

Features

- $R_{ON} = 0.5 \ \Omega$ (for both upper and lower)
- 5 V single power source
- Circuit current 7 mA (including step-up circuit current)

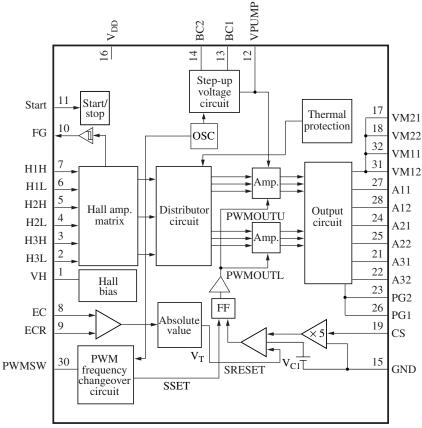
Applications

• Optical disk



Note) The package of this product will be changed to lead-free type (SSOP032-P-0300B). See the new package dimensions section later of this datasheet.





Pin Descriptions

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	VH	Hall bias pin	17	VM21	Motor supply voltage pin 2
2	H3L	Hall element-3 negative input pin	18	VM22	Motor supply voltage pin 2
3	НЗН	Hall element-3 positive input pin	19	CS	Current det. pin
4	H2L	Hall element-2 negative input pin	20	N.C.	N.C.
5	H2H	Hall element-2 positive input pin	21	A31	Drive output 3
6	H1L	Hall element-1 negative input pin	22	A32	Drive output 3
7	H1H	Hall element-1 positive input pin	23	PG2	Power current det. pin 2
8	EC	Torque command input pin	24	A21	Drive output 2
9	ECR	Torque command reference input pin	25	A22	Drive output 2
10	FG	FG signal output pin	26	PG1	Power current det. pin 1
11	Start	Start/stop changeover pin	27	A11	Drive output 1
12	VPUMP	Booster pin	28	A12	Drive output 1
13	BC1	Booster capacitor connection pin 1	29	N.C.	N.C.
14	BC2	Booster capacitor connection pin 2	30	PWMSW	PWM frequency changeover pin
15	GND	Ground pin	31	VM12	Motor supply voltage pin 1
16	V _{DD}	Supply voltage pin	32	VM11	Motor supply voltage pin 1

Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage *2	V _{DD}	6.5	V
	V _{M11, 12}		
	V _{M21, 22}		
Drive output voltage *5	V _(m)	15	V
Control signal input voltage *6	V _(n)	0 to V_{DD}	V
Supply current	I _{DD}	30	mA
Drive output current *4	I _(o)	±1 200	mA
Hall bias current *7	I _{HB(n)}	30	mA
Power dissipation *3	P _D	293	mW
Operating ambient temperature *1	T _{opr}	-30 to +85	°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 $T_a = 25^{\circ}C$.

*2: The voltage in the step-up voltage circuit exceeds the supply voltage.

For the allowable value of the step-up voltage, refer to "Electrical Characteristics".

*3: The power dissipation shown is the value of independent IC without a heat sink at $T_a = 70^{\circ}$ C. Refer to the $P_D - T_a$ curves of the " \blacksquare Application Notes" for details.

*4: o = 17, 18, 21, 22, 23, 24, 25, 26, 27, 28, 31, 32 *6: n = 2, 3, 4, 5, 6, 7, 8, 9, 11, 30 *5: m = 21, 22, 24, 25, 27, 28

Recommended Operating Range

Parameter	Symbol	Range	Unit
Supply voltage	V _{DD}	4.5 to 5.5	V
	V _{M11, 12}		
	V _{M21, 22}		

\blacksquare Electrical Characteristics at $T_a = 25^{\circ}C$

Parameter	Symbol	Conditions	Min	Тур	Max	Unit			
Overall									
Circuit current 1	I _{DD1}	$V_{DD} = 5$ V in power save mode		0	0.2	mA			
Circuit current 2	I _{DD2}	$V_{DD} = 5$ V including step-up circuit		7	14	mA			
Start/stop									
Start voltage	V _{START}	Voltage with which a circuit operates at $V_{DD} = 5$ V and L \rightarrow H	2.7			V			
Stop voltage	V _{STOP}	Voltage with which a circuit becomes off at $V_{DD} = 5$ V and $H \rightarrow L$			0.7	V			
Hall bias									
Hall bias voltage	V _{HB}	$V_{DD} = 5 \text{ V}, I_{HB} = 20 \text{ mA}$	0.7	1.2	1.6	V			
Hall amplifier					L	<u> </u>			
Input bias current	I _{BH}	$V_{DD} = 5 V$		1	5	μA			
In-phase input voltage range	V _{HBR}	$V_{DD} = 5$ V, except for H2H, H2L	1.5		4.0	V			
Minimum input level	V _{INH}	$V_{DD} = 5 V$	60	_		mV[p-p]			
Torque command									
In-phase input voltage range	EC	$V_{DD} = 5 V$	0.5		3.9	V			
Offset voltage	EC _{OF}	$V_{DD} = 5 V$	-100	0	100	mV			
Dead zone	zone EC_{DZ} $V_{DD} = 5 V$		0	75	150	mV			
Input current	ECIN	$V_{\rm IN}$ V _{DD} = 5 V, EC = ECR = 2.5 V		-1		μΑ			
Input/output gain	A _{CS}	$V_{DD} = 5 \text{ V}, R_{CS} = 0.33 \Omega$	0.36	0.48	0.60	A/V			
Output									
High-level output saturation voltage	V _{OH}	$V_{DD} = 5 \text{ V}, I_{O} = -500 \text{ mA}$		0.15	0.30	V			
Low-level output saturation voltage	V _{OL}	$V_{DD} = 5 \text{ V}, I_0 = 500 \text{ mA}$		0.15	0.30	V			
Torque limit current	I _{TL}	$V_{DD} = 5 \text{ V}, R_{CS} = 0.33 \Omega$	455	570	685	mA			
FG									
FG output high-level	FG _H	$V_{DD} = 5 \text{ V}, I_{FG} = -0.01 \text{ mA}$	3			V			
FG output low-level $FG_L = V_{DD} =$		$V_{DD} = 5 \text{ V}, I_{FG} = 0.01 \text{ mA}$			0.5	V			
In-phase input voltage range	se input voltage range V_{FGR} V_D		1.5	_	3.0	V			
FG hysteresis width H		$V_{DD} = 5 V$	5	10	20	mV			
Step-up circuit									
Step-up voltage	V _{PUMP}	$V_{DD} = 5 V$	7		10	V			

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

Parameter	Symbol	Conditions	Min	Тур	Max	Unit
PWM oscillation changeover						
Input high-level PWM _H		$V_{DD} = 5 V$	4.5		_	V
Input low-level	PWML	$V_{DD} = 5 V$	_		0.5	V

• Design reference data

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

Parameter	Symbol	Conditions	Min	Тур	Max	Unit	
PWM oscillation changeover							
PWM frequency high-level	f _{PWMH}	$V_{DD} = 5 V$, PWMSW = Low		80		kHz	
PWM frequency low-level	f _{PWML}	$V_{DD} = 5 V$, PWMSW = High		40		kHz	
Thermal protection	Thermal protection						
Thermal protection operating	T _{SDON}	$V_{DD} = 5 V$		150		°C	
temperature							
Thermal protection hysteresis width	ΔT_{SD}	$V_{DD} = 5 V$		40		°C	

Usage Notes

• Prevent this IC from being line-to-ground fault.

(To be concrete, do not short-circuit any of A31 (pin 21), A32 (pin 22), A21 (pin 24), A22 (pin 25), A11 (pin 27) and A12 (pin 28) with GND pin (pin 15).)

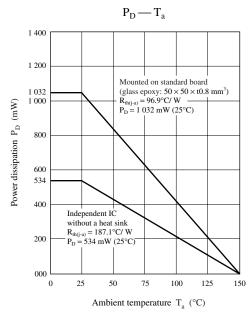
• Be careful of the following three pins because their static breakdown voltages are low. (C = 200 pF, R = 0 Ω)

Pin 23: breakdown at 120 V

Pin 26: breakdown at 120 V

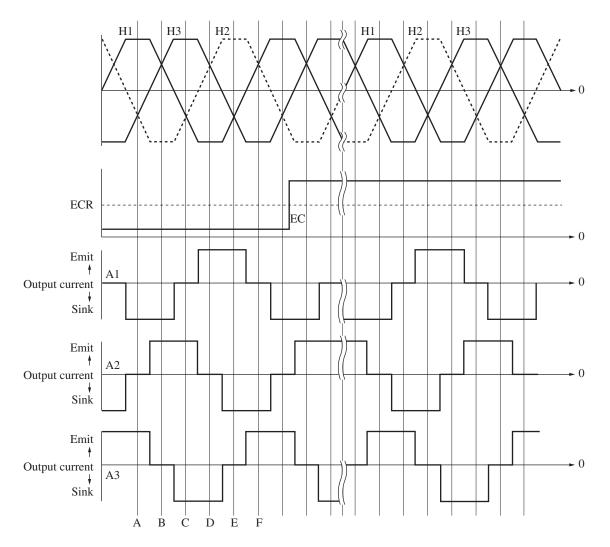
Application Notes

• P_D — T_a curves of SSOP032-P-0300



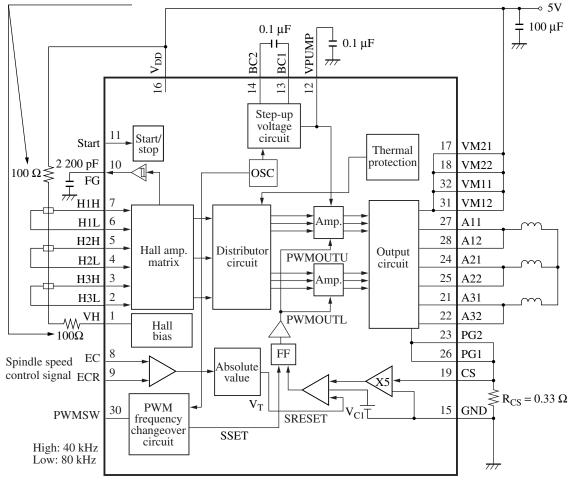
- Application Notes (continued)
- Phase conditions between Hall input and output current

Phase of Hall pin									
H1H H2H H3H									
А	Н	ML	ML						
В	MH	L	MH						
С	ML	ML	Н						
D	L	MH	MH						
Е	ML	Н	ML						
F	MH	MH	L						

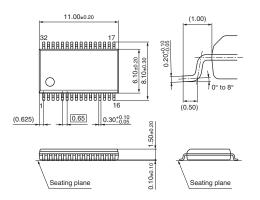


Application Circuit Example

(Check the stipulated value of electrical characteristics and then determine resistance value.)



- New Package Dimensions (Unit: mm)
- SSOP032-P-0300B (Lead-free package)



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