

LB1910

FDD Spindle Motor Driver

Overview

The LB1910 is a 3-phase disc drive motor driver that is optimal for use as a 3.5-inch FDD spindle motor driver.

Functions and Features

- Three-phase full-wave linear driver
- Digital speed control circuit
- Start and stop circuits (active low)
- RPM switching H: 300 rpm
- L: 360 rpm
- Current limiter circuit
- Built-in index comparator
- Thermal shutdown circuit

Package Dimensions

unit: mm

3222-HSOP28



Specifications

Absolute Maximum Ratings at $Ta = 25^{\circ}C$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V _{CC} max		7.0	V
Maximum output current	I _O max1	$t \le 0.5 \text{ s}$	1.0	А
Maximum steady-state output current	I _O max2		0.7	А
Allowable power dissipation	Pd max	Independent IC	0.5	W
Operating temperature	Topr		-20 to +80	°C
Storage temperature	Tstg		-40 to +150	°C

Allowable Operating Ranges at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V _{CC}		4.2 to 6.5	V

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Electrical Characteristics at Ta = 25° C, V_{CC} = 5 V

Parameter	Symbol	Conditions	min	typ	max	Unit
Current drain	Icco	S/S = 5 V (standby)			10	μA
	I _{CC}	S/S = 0 V (steady state)		12	18	mA
SL bias current	I _{SL}	V _{SL} = 0 V			10	μA
SL input low-level voltage	V _{SLL}		0		1.0	V
SL input high-level voltage	V _{SLH}		3.5		V _{CC}	V
S/S bias current	I _{S/S}			180	270	μA
S/S low-level voltage	V _{S/SL}		0		0.8	V
S/S high-level voltage	V _{S/SH}		3.5		V _{CC}	V
Hall amplifier input bias current	I _{HB}				10	μA
Common-mode input voltage range	Vh		1.5		V _{CC} – 1.0	v
Differential input voltage range	Vdif		50		200	mVp-p
Hall bias output voltage	V _H	I _H = 5 mA		0.8		V
Leakage current	I _{HL}	S/S = 5 V			±10	μA
Output saturation voltage	Vsat	$I_{O} = 0.7 \text{ A}, \text{ sink + source}$		1.3	1.8	V
Output leakage current	I _{OL}				1.0	mA
Current limiter	Vlim		0.27	0.3	0.33	V
Control amplifier voltage gain	G _C			-7		dB
Voltage gain difference between phases	ΔG_{C}				±1	dB
V/I conversion source current	+		9	14	19	μA
V/I conversion sink current	ŀ		-9	-14	-19	μA
V/I conversion current ratio	I+/I−		0.8	1.0	1.2	
DSC buffer input current	IDSC				1.0	μA
FG Schmitt hysteresis	ΔVsh	*		50		mV
Speed discriminator counts	Ν			1041.5		
Discriminator operating frequency	FD	*			1.1	MHz
Oscillator frequency range	Fosc	*			1.1	MHz
Index output low-level voltage	V _{IDL}	I _O = 2 mA			0.4	V
Index output leakage current	IDL				±10	μA
FG amplifier voltage gain	G _{FG}	*		48		dB
FG amplifier input offset	V _{FG O}				±10	mV
FG amplifier internal reference voltage	V _{FG B}		2.2	2.5	2.8	v
Thermal shutdown temperature	TSD	*	150	180		°C
Hysteresis	ΔTSD	*		40		°C

Note: * Items marked with an asterisk are design target values and are not measured.

Pin Assignment



Truth Table

	Source	Hall input			
		U	V	W	
1	V phase \rightarrow W phase	Н	Н	L	
2	V phase \rightarrow U phase	L	Н	L	
3	W phase \rightarrow U phase	L	Н	Н	
4	W phase \rightarrow V phase	L	L	Н	
5	U phase \rightarrow V phase	Н	L	Н	
6	U phase \rightarrow W phase	Н	L	L	

Note: Hall input high levels are defined as: $U_{IN^+} > U_{IN^-} \\ V_{IN^+} > V_{IN^-} \\ W_{IN^+} > W_{IN^-}$

Block Diagram



Pin Functions

Pin No.	Symbol	Pin voltage	Equivalent circuit diagram	Function
18 19 20 21 22 23	U _{IN} + U _{IN} - V _{IN} + V _{IN} - W _{IN} + W _{IN} -	1.5 V min V _{CC} – 1.0 V max	VCC 18 1ka 20 VCC 19 1ka 21 W 23 W A05421	U phase Hall element input V phase Hall element input W phase Hall element input
24	НВ	0.8 V typ (I _H = 5 mA)	24 	Minus side connection for providing the Hall bias current This pin becomes open in the stopped state, thus cutting the Hall bias current.
25 26 27	FG _{IN} + FG _{IN} − FG _{OUT}	2.5 V	26 VCC 750ka VCC 27 VCCC 27 VCCCC 27 VCCCC 27 VCCCC 27 VCCCC 27 VCCCCC 27 VCCCCC 27 VCCCCC 27 VCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC	 FG amplifier plus input A 2.5-V reference voltage is generated internally. FG amplifier minus input FG amplifier output
28 1	+ -			Index input
2	D	L: 0.4 V max H: 4.5 V min	2 	Index output

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Pin No.	Symbol	Pin voltage	Equivalent circuit diagram	Function
4	SS	L: 0.8 V max H: 3.5 V min		Start/stop mode switching This is an active-low input.
5	SL	L: 1.0 V max H: 3.5 V min	VCC VCC 5 405427	Rotational speed switching
6	CLK	L: 1.0 V max H: V _{CC} – 1.0 V min		Reference clock input A 1-MHz input frequency corresponds to speeds of 300 and 360 rpm.
7	GND			 Ground This pin, pin 14, and the frame must all be grounded together.
8	V _{CC}			Power supply This voltage must be stabilized so that ripple and noise do not enter the IC.
9	Rf			Output current detection The output current is detected as a voltage by connecting the resistor Rf between this pin and V_{CC} . The current limiter operates by detecting the voltage on this pin.
10	Do		10 WCC WCC M M M M M M M M M M M M M	Speed discriminator
11	Fc			Frequency characteristics compensation Current control system loop oscillation is prevented by connecting a capacitor between this pin and ground.

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Pin No.	Symbol	Pin voltage	Equivalent circuit diagram	Function
13 15 16	U _{OUT} Vout Wout		9 (13) (15) (16) (14) A05430	U phase output V phase output W phase output
14	PGND			Output transistor ground connection

Index Pulse Timing Chart





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