



LB1910

FDD Spindle Motor Driver

Overview

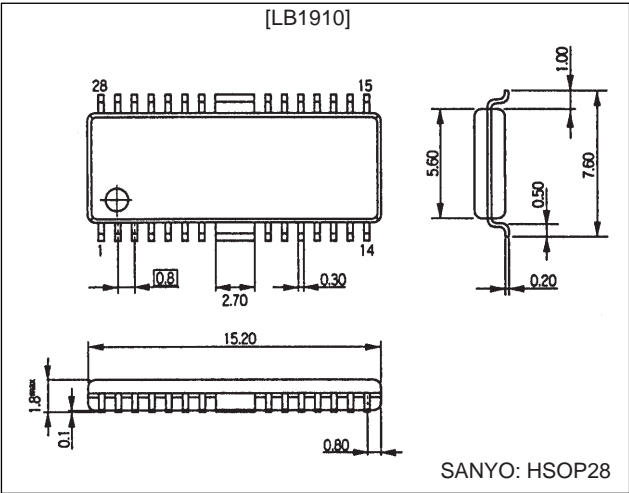
The LB1910 is a 3-phase disc drive motor driver that is optimal for use as a 3.5-inch FDD spindle motor driver.

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



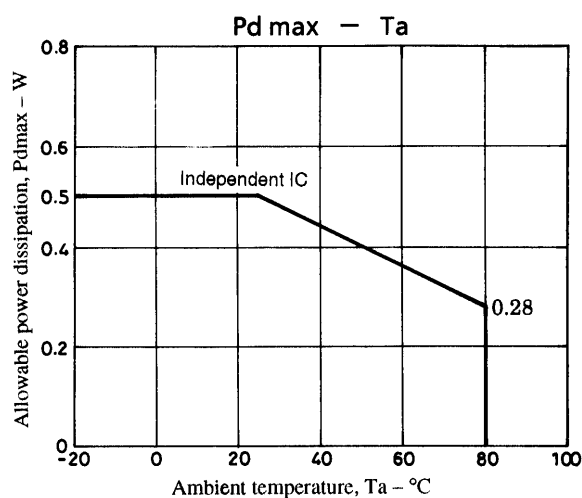
Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V <sub>CC</sub> max		7.0	V
Maximum output current	I <sub>O</sub> max1	t ≤ 0.5 s	1.0	A
Maximum steady-state output current	I <sub>O</sub> max2		0.7	A
Allowable power dissipation	P <sub>d</sub> max	Independent IC	0.5	W
Operating temperature	T <sub>opr</sub>		−20 to +80	°C
Storage temperature	T <sub>stg</sub>		−40 to +150	°C

Allowable Operating Ranges at Ta = 25°C

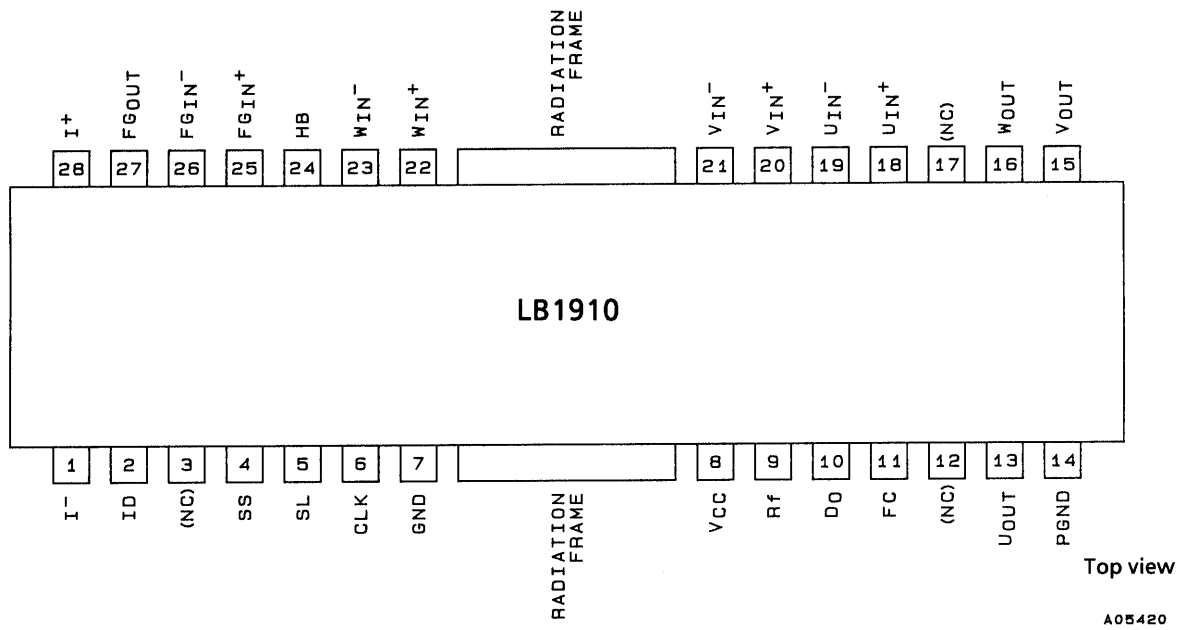
Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V <sub>CC</sub>		4.2 to 6.5	V


**Electrical Characteristics at Ta = 25°C, V<sub>CC</sub> = 5 V**

Parameter	Symbol	Conditions	min	typ	max	Unit
Current drain	I <sub>CCO</sub>	S/S = 5 V (standby)			10	μA
	I <sub>CC</sub>	S/S = 0 V (steady state)		12	18	mA
SL bias current	I <sub>SL</sub>	V <sub>SL</sub> = 0 V			10	μA
SL input low-level voltage	V <sub>SLL</sub>		0		1.0	V
SL input high-level voltage	V <sub>SLH</sub>		3.5		V <sub>CC</sub>	V
S/S bias current	I <sub>S/S</sub>			180	270	μA
S/S low-level voltage	V <sub>S/SL</sub>		0		0.8	V
S/S high-level voltage	V <sub>S/SH</sub>		3.5		V <sub>CC</sub>	V
Hall amplifier input bias current	I <sub>HB</sub>				10	μA
Common-mode input voltage range	V <sub>H</sub>		1.5		V <sub>CC</sub> - 1.0	V
Differential input voltage range	V <sub>dif</sub>		50		200	mVp-p
Hall bias output voltage	V <sub>H</sub>	I <sub>H</sub> = 5 mA		0.8		V
Leakage current	I <sub>HL</sub>	S/S = 5 V			±10	μA
Output saturation voltage	V <sub>sat</sub>	I <sub>O</sub> = 0.7 A, sink + source		1.3	1.8	V
Output leakage current	I <sub>OL</sub>				1.0	mA
Current limiter	V <sub>lim</sub>		0.27	0.3	0.33	V
Control amplifier voltage gain	G <sub>C</sub>			-7		dB
Voltage gain difference between phases	ΔG <sub>C</sub>				±1	dB
V/I conversion source current	I <sub>+</sub>		9	14	19	μA
V/I conversion sink current	I <sub>-</sub>		-9	-14	-19	μA
V/I conversion current ratio	I <sub>+</sub> /I <sub>-</sub>		0.8	1.0	1.2	
DSC buffer input current	I <sub>DSC</sub>				1.0	μA
FG Schmitt hysteresis	ΔV <sub>sh</sub>	*		50		mV
Speed discriminator counts	N			1041.5		
Discriminator operating frequency	F <sub>D</sub>	*			1.1	MHz
Oscillator frequency range	F <sub>OSC</sub>	*			1.1	MHz
Index output low-level voltage	V <sub>IDL</sub>	I <sub>O</sub> = 2 mA			0.4	V
Index output leakage current	I <sub>IDL</sub>				±10	μA
FG amplifier voltage gain	G <sub>FG</sub>	*		48		dB
FG amplifier input offset	V <sub>FG O</sub>				±10	mV
FG amplifier internal reference voltage	V <sub>FG B</sub>		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 → sink	Hall input		
		U	V	W
1	V phase → W phase	H	H	L
2	V phase → U phase	L	H	L
3	W phase → U phase	L	H	H
4	W phase → V phase	L	L	H
5	U phase → V phase	H	L	H
6	U phase → W phase	H	L	L

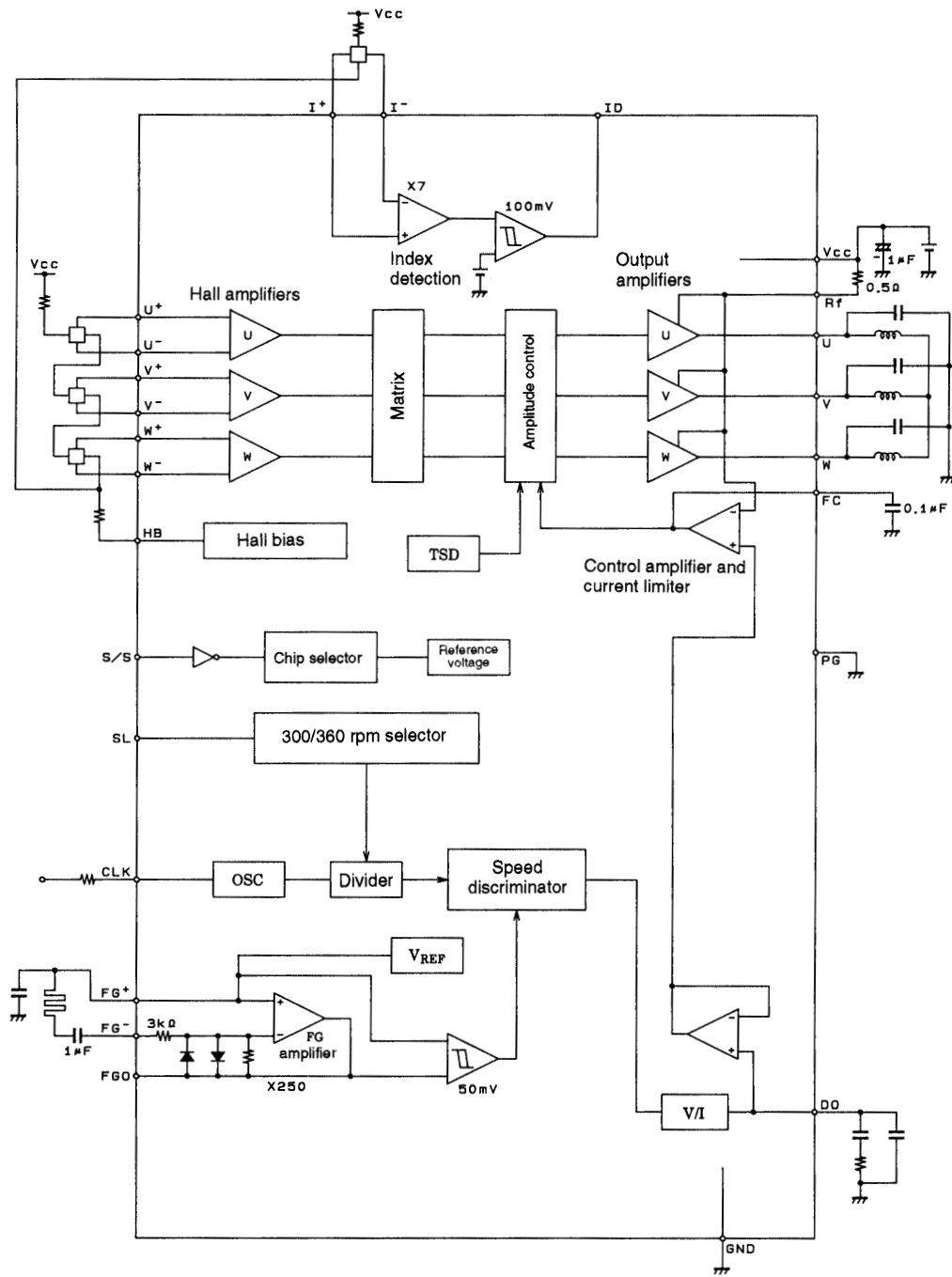
Note: Hall input high levels are defined as:

$U_{IN}^{+} > U_{IN}^{-}$

$V_{IN}^{+} > V_{IN}^{-}$

$W_{IN}^{+} > W_{IN}^{-}$

## Block Diagram



A05431

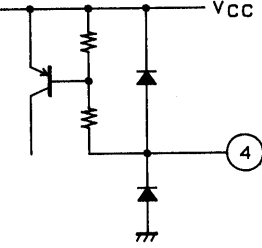
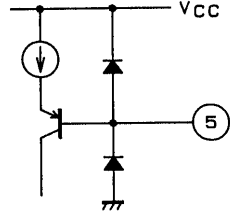
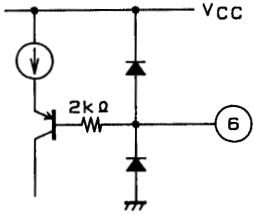
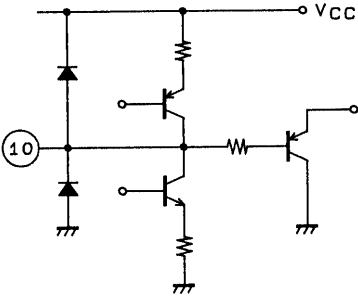
## Pin Functions

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		U phase Hall element input V phase Hall element input W phase Hall element input
24	HB	0.8 V typ ( $I_H = 5$ mA)		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		<ul style="list-style-type: none"> <li>• FG amplifier plus input A 2.5-V reference voltage is generated internally.</li> <li>• FG amplifier minus input</li> <li>• FG amplifier output</li> </ul>
28 1	$I^+$ $I^-$			Index input
2	ID	L: 0.4 V max H: 4.5 V min		Index output

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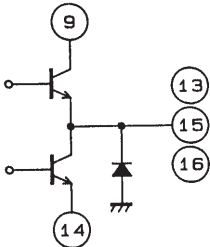
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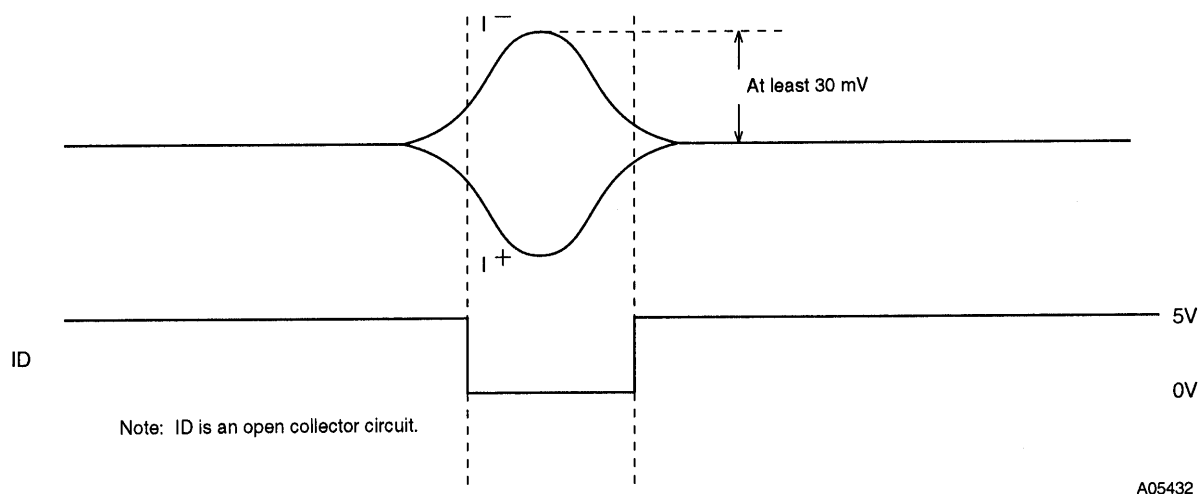
Pin No.	Symbol	Pin voltage	Equivalent circuit diagram	Function
4	SS	L: 0.8 V max H: 3.5 V min		Start/stop mode switching This is an active-low input.
5	SL	L: 1.0 V max H: 3.5 V min		Rotational speed switching
6	CLK	L: 1.0 V max H: $V_{CC} - 1.0$ V min		Reference clock input A 1-MHz input frequency corresponds to speeds of 300 and 360 rpm.
7	GND			<ul style="list-style-type: none"> <li>Ground</li> <li>This pin, pin 14, and the frame must all be grounded together.</li> </ul>
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			Speed discriminator
11	$F_C$			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	$U_{OUT}$ $V_{OUT}$ $W_{OUT}$		 <p style="text-align: right;">A05430</p>	U phase output V phase output W phase output
14	PGND			Output transistor ground connection

## Index Pulse Timing Chart



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