

LB1910N



FDD Spindle Motor Driver

Overview

The LB1910N is a 3-phase disc drive motor driver that is optimal for use as a 3.5-inch FDD spindle motor driver.

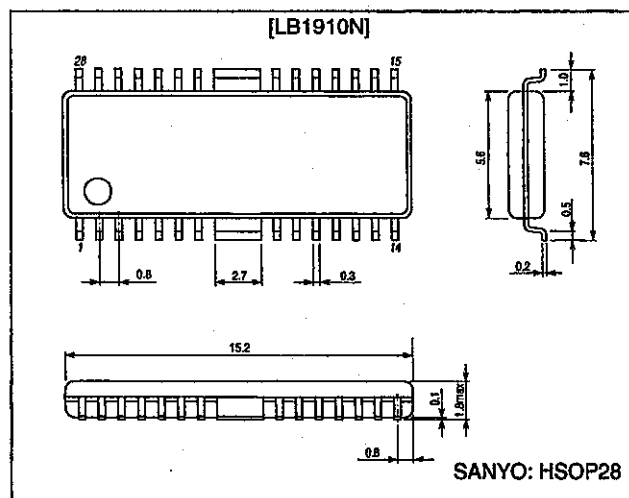
Functions and Features

- 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 _{CC} max		7.0	V
Maximum output current	I _O max1	t ≤ 0.5 s	1.0	A
Maximum steady-state output current	I _O max2		0.7	A
Allowable power dissipation	Pd max	Independent IC	0.5	W
Operating temperature	T _{opr}		-20 to +80	°C
Storage temperature	T _{stg}		-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

LB1910N

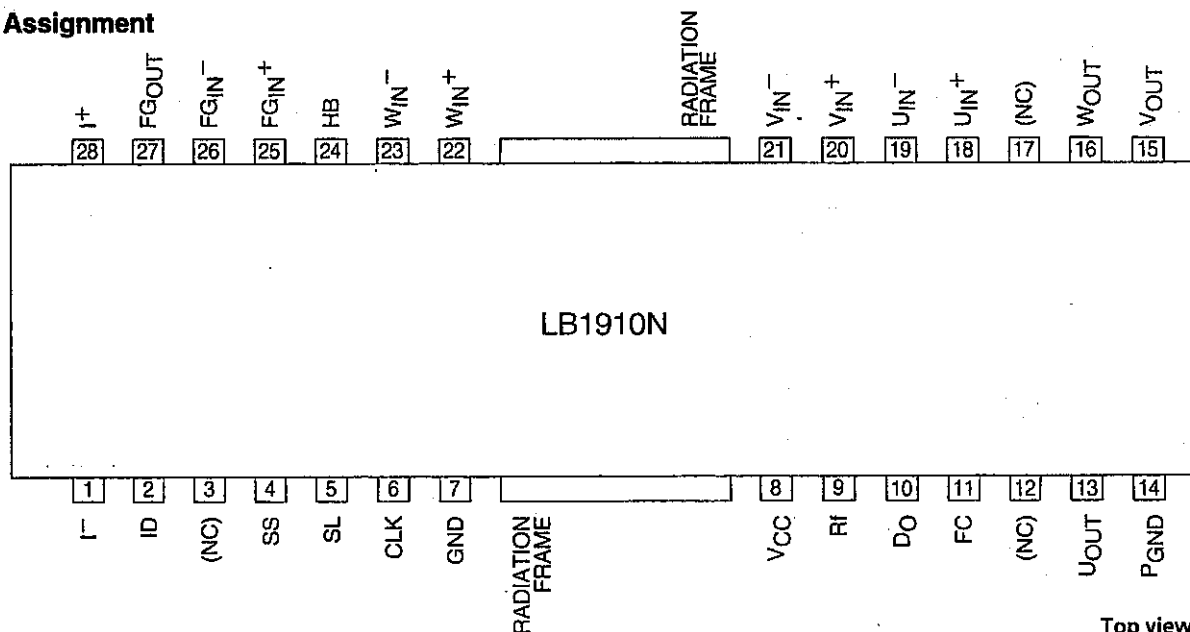
Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = 5\text{ V}$

Parameter	Symbol	Conditions	min	typ	max	Unit
Current drain	I_{CCO}	S/S = 5 V (standby)			10	μA
	I_{CC}	S/S = 0 V (steady state)		12	18	mA
SL bias current	I_{SL}	$V_{SL} = 0\text{ V}$			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	V_h		1.5		$V_{CC} - 1.0$	V
Differential input voltage range	V_{dif}		50		200	mVp-p
Hall bias output voltage	V_H	$I_H = 5\text{ mA}$		0.8		V
Leakage current	I_{HL}	S/S = 5 V			± 10	μA
Output saturation voltage	V_{sat}	$I_O = 0.7\text{ A}$, sink + source		1.3	1.8	V
Output leakage current	I_{OL}				1.0	mA
Current limiter	V_{lim}		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	I^+		9	14	19	μA
V/I conversion sink current	I^-		-9	-14	-19	μA
V/I conversion current ratio	I^+/I^-		0.8	1.0	1.2	
DSC buffer input current	I_{DSC}				1.0	μA
FG Schmitt hysteresis	ΔV_{sh}	*		50		mV
Speed discriminator counts	N			1041.5		
Discriminator operating frequency	F_D	*			1.1	MHz
Oscillator frequency range	F_{OSC}	*			1.1	MHz
Index input hysteresis	V_{IDH}		18	23	28	mV
Index input	V_{IDO}	$I_O = 2\text{ mA}$	-5	0	+5	mV
Index output low-level voltage	V_{IDL}	$I_O = 2\text{ mA}$			0.4	V
Index output leakage current	I_{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	T_{SD}	*	150	180		$^\circ\text{C}$
Hysteresis	ΔT_{SD}	*		40		$^\circ\text{C}$

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

LB1910N

Pin Assignment



Top view

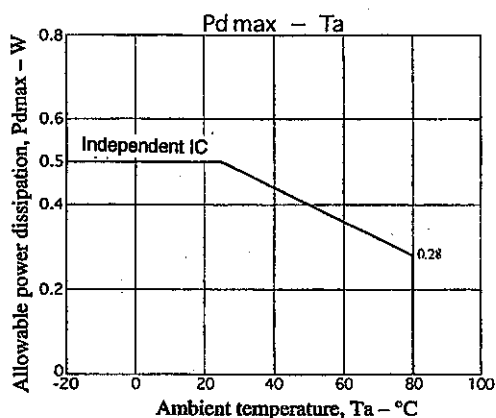
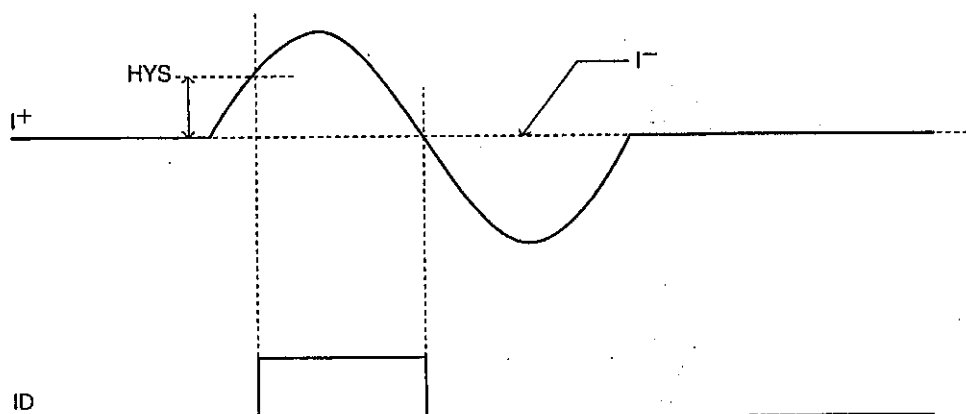
A06533

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

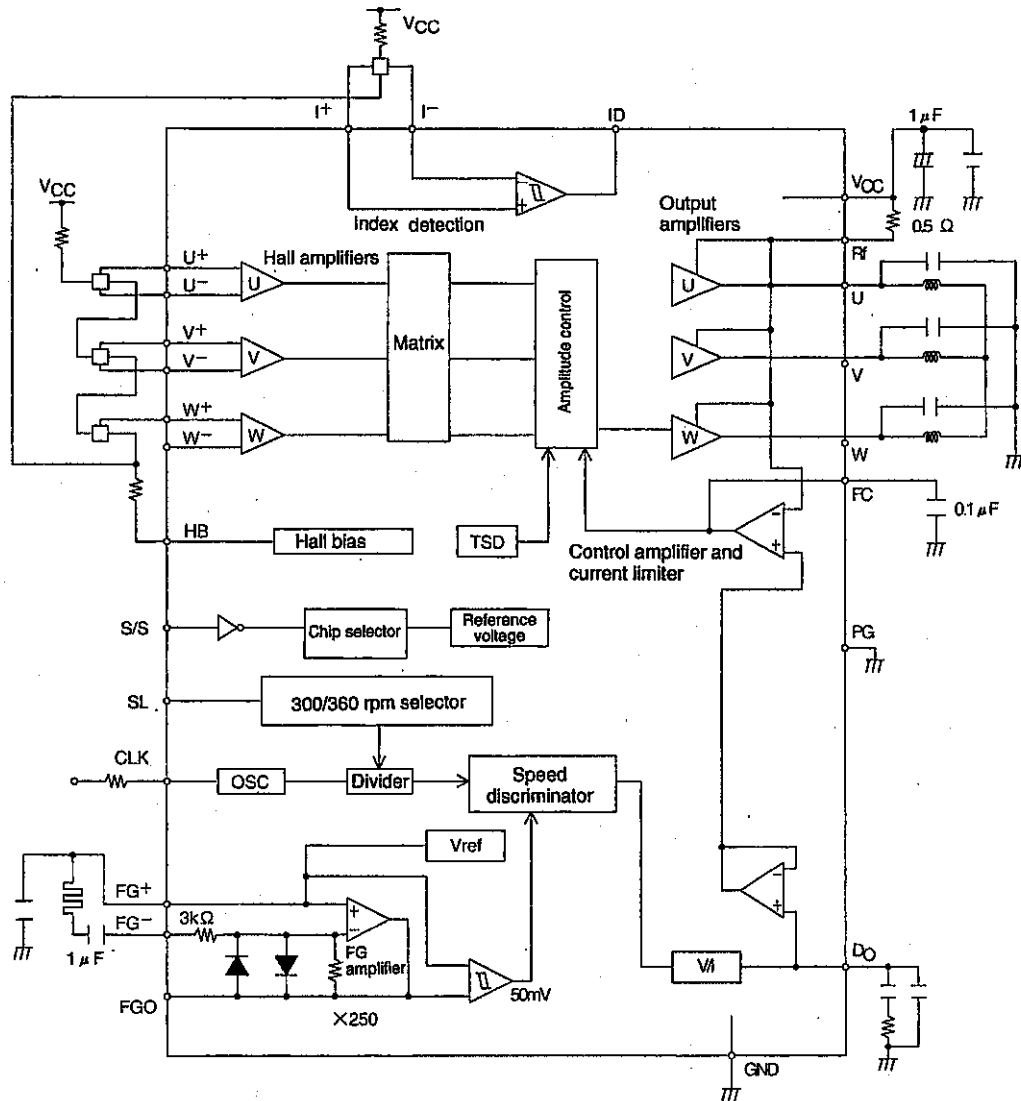
Note: Hall input high levels are defined as:
 $U_{IN}^+ > U_{IN}^-$
 $V_{IN}^+ > V_{IN}^-$
 $W_{IN}^+ > W_{IN}^-$

Index Pulse Timing Chart



A06534

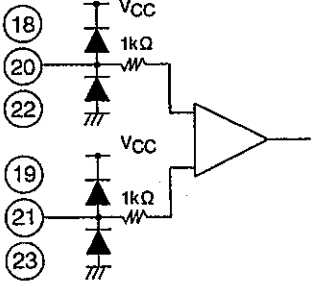
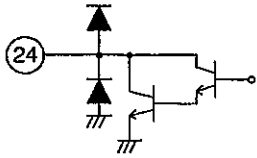
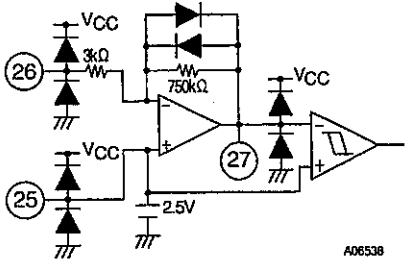
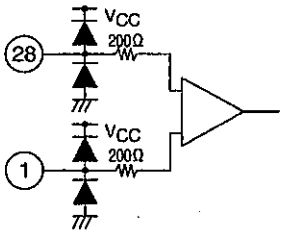
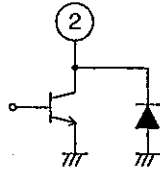
Block Diagram



A06535

LB1910N

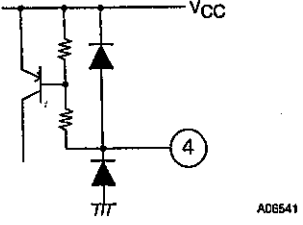
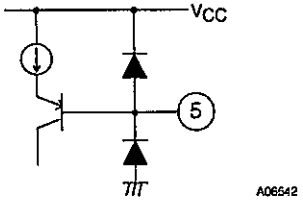
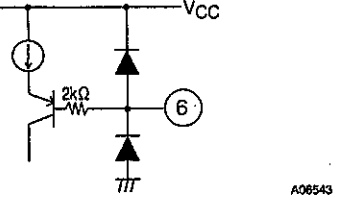
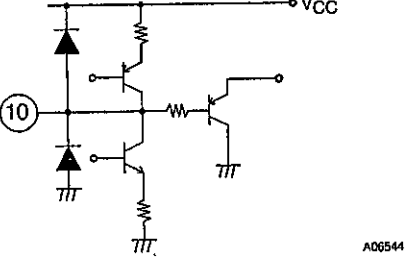
Pin Functions

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	 <p>A06536</p>	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)	 <p>A06537</p>	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	 <p>A06538</p>	<ul style="list-style-type: none"> FG amplifier plus input A 2.5-V reference voltage is generated internally. FG amplifier minus input FG amplifier output
28 1	I^+ I^-		 <p>A06539</p>	Index input
2	ID	L: 0.4 V max H: 4.5 V min	 <p>A06540</p>	Index output

Continued on next page.

LB1910N

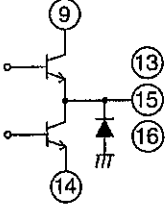
Continued from preceding page.

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"> • 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	R_f			Output current detection The output current is detected as a voltage by connecting the resistor R_f between this pin and V_{CC} . The current limiter operates by detecting the voltage on this pin.
10	D_O			Speed discriminator
11	F_C			Frequency characteristics compensation Current control system loop oscillation is prevented by connecting a capacitor between this pin and ground.

Continued on next page.

LB1910N

Continued from preceding page.

Pin No.	Symbol	Pin voltage	Equivalent circuit diagram	Function
13 15 16	U _{OUT} V _{OUT} W _{OUT}			U phase output V phase output W phase output
14	P _{GND}			Output transistor ground connection

- No products described or contained herein are intended for use in surgical implants, life-support systems, aerospace equipment, nuclear power control systems, vehicles, disaster/crime-prevention equipment and the like, the failure of which may directly or indirectly cause injury, death or property loss.
- Anyone purchasing any products described or contained herein for an above-mentioned use shall:
 - ① Accept full responsibility and indemnify and defend SANYO ELECTRIC CO., LTD., its affiliates, subsidiaries and distributors and all their officers and employees, jointly and severally, against any and all claims and litigation and all damages, cost and expenses associated with such use:
 - ② Not impose any responsibility for any fault or negligence which may be cited in any such claim or litigation on SANYO ELECTRIC CO., LTD., its affiliates, subsidiaries and distributors or any of their officers and employees jointly or severally.
- Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production. SANYO believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

This catalog provides information as of March, 1997. Specifications and information herein are subject to change without notice.