

Ordering number : ENN5805

Monolithic Digital IC

SANYO**LB1817W****FDD Spindle Motor Driver**

Overview

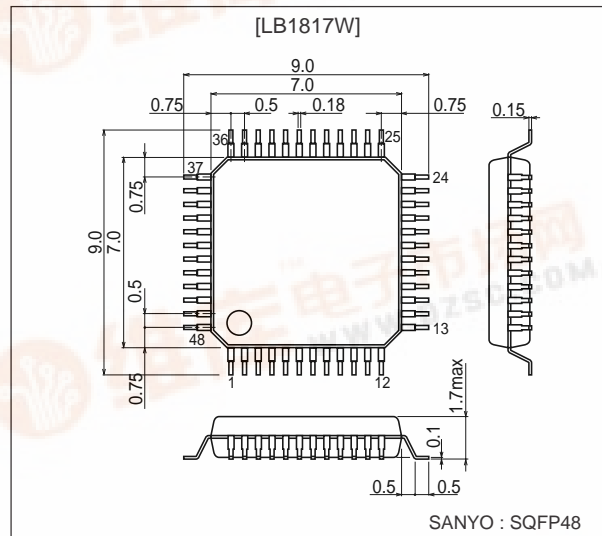
The LB1817W is a spindle motor driver for low-profile floppy disk drives.

Functions and Features

- Three-phase full-wave linear drive (with external PNP transistor)
- Low saturation voltage
- Built-in digital speed control
- Start/stop circuit (Low active)
- Switchable rotation speed
- Current limiter circuit
- Built-in index processing circuit
- Index timing adjustable by VR
- AGC circuit
- Thermal protection circuit

Package Dimensions

unit: mm

3163A-SQFP48

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 _{CC} max1	t ≤ 0.5s	1.5	A
Maximum constant output current	I _O max2		1.0	A
Allowable power dissipation	P _d max1	IC only	0.45	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
Power supply voltage	V _{CC}		4.2 to 6.5	V

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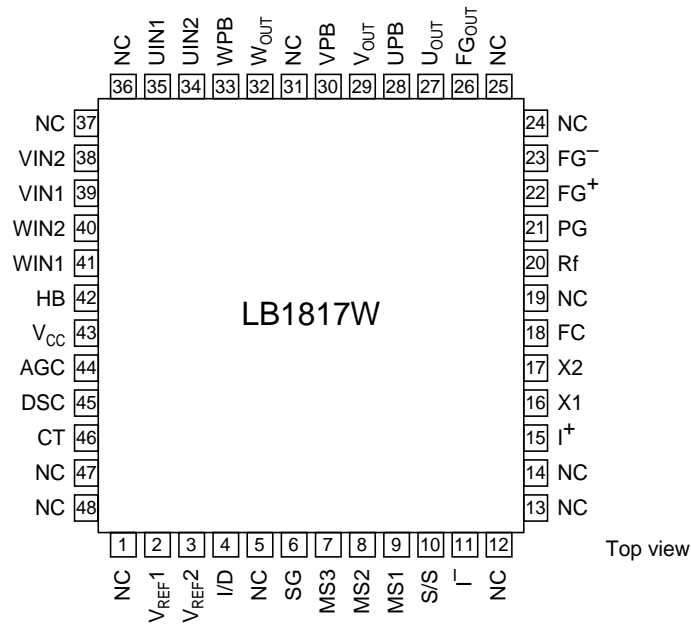
Electrical Characteristics at Ta = 25°C, VCC = 5V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain	I _{CCO}	S/S = 5V (Standby)		70	100	μA
	I _{CC}	S/S = 0V (Normal)		25	35	mA
MS1 bias current	I _{MS1}	V _{MS1} = 5V		180	270	μA
MS1 Low input voltage	V _{MS1L}		0.0		0.8	V
MS1 High input voltage	V _{MS1H}		2		V _{CC}	V
MS2 bias current	I _{MS2}	V _{MS2} = 5V		90	135	μA
MS2 Low input voltage	V _{MS2L}		0.0		0.8	V
MS2 High input voltage	V _{MS2H}		2		V _{CC}	V
MS3 bias current	I _{MS3}	V _{MS3} = 5V		90	135	μA
MS3 Low input voltage	V _{MS3L}		0.0		0.8	V
MS3 High input voltage	V _{MS3H}		2		V _{CC}	V
S/S bias current	I _{S/S}				20	μA
S/S Low voltage	V _{S/SL}		0.0		0.8	V
S/S High voltage	V _{S/SH}		2		V _{CC}	V
Hall amplifier input bias current	I _{HB}				15	μA
Common mode input voltage range	V _H		2.0		V _{CC} -0.7	V
Differential input voltage range	V _{dif}		50		200	mVp-p
Input offset voltage	V _{ho}	*			±10	mV
Hall bias output voltage	V _H	I _H = 5 mA	0.5	0.8	1.1	V
Leakage current	V _{HL}	S/S = 5V			±10	μA
Output saturation voltage	V(sat)	I _O = 0.8A		0.45	0.64	V
Output leakage current	I _{OL}				1	mA
Current limiter	I _{lim}	R _F = 3 kΩ, R _{OUT} = 100Ω	6.3	7.5	8.7	mA
Control amplifier voltage gain	G _C		-7.5	-5.5	-3.5	dB
Voltage gain phase differential	ΔG _C				±1	dB
V/I conversion source current	I ⁺		19	28	37	μA
V/I conversion sink current	I ⁻		-19	-28	-37	μA
V/I conversion current ratio	I ⁺ /I ⁻		0.8	1.0	1.2	
DSC buffer input current	I _{DSC}				1	μA
FG amplifier input voltage	V _{FG}	f _{FG} = 300 Hz	2		20	mVp-p
FG amplifier voltage gain	G _{FG}	Open loop*		60		dB
FG amplifier input offset	V _{FGO}	*			±10	mV
FG amplifier internal reference voltage	V _{FGB}		2.2	2.5	2.8	V
FG Schmitt hysteresis width	ΔV _{sh1}	High → Low*		25		mV
	ΔV _{sh2}	Low → High*		25		mV
Speed discriminator count	N			1390/2		
Discriminator operating frequency	F _D	*			1.1	MHz
Oscillator frequency	F _{OSC}	*			1.1	MHz
Oscillator frequency tolerance	ΔF _{OSC}				±0.2	%
Index output Low voltage	V _{IDL}	I _O = 2 mA			0.4	V
Index output leakage current	I _{IDL}				±10	μA
Index amplifier common mode input voltage range	V _I		0.2		V _{CC} -0.7	V
Index amplifier differential input voltage range	V _{DIF}	Hysteresis width < 25 mA	25		100	mV
Index amplifier hysteresis set current	I _{HYS}		2.9	4.2	5.5	μA
Timing adjustment at High level	V _{TH}	MS1 = L	1.15	1.26	1.35	V
Timing adjustment at Low level	V _{TL}	MS1 = L	0.40	0.52	0.60	V
Timing adjustment ratio	T _{HL}	V _{TH} (MS1 = L) / V _{TH} (MS1 = H)		1.148		
Reference voltage	V _{REF1}		2.20	2.50	2.80	V
	V _{REF2}		1.85	2.15	2.45	V
Thermal protection operating temperature	TSD	*	150	180		°C
Hysteresis width	ΔTSD	*		10		°C

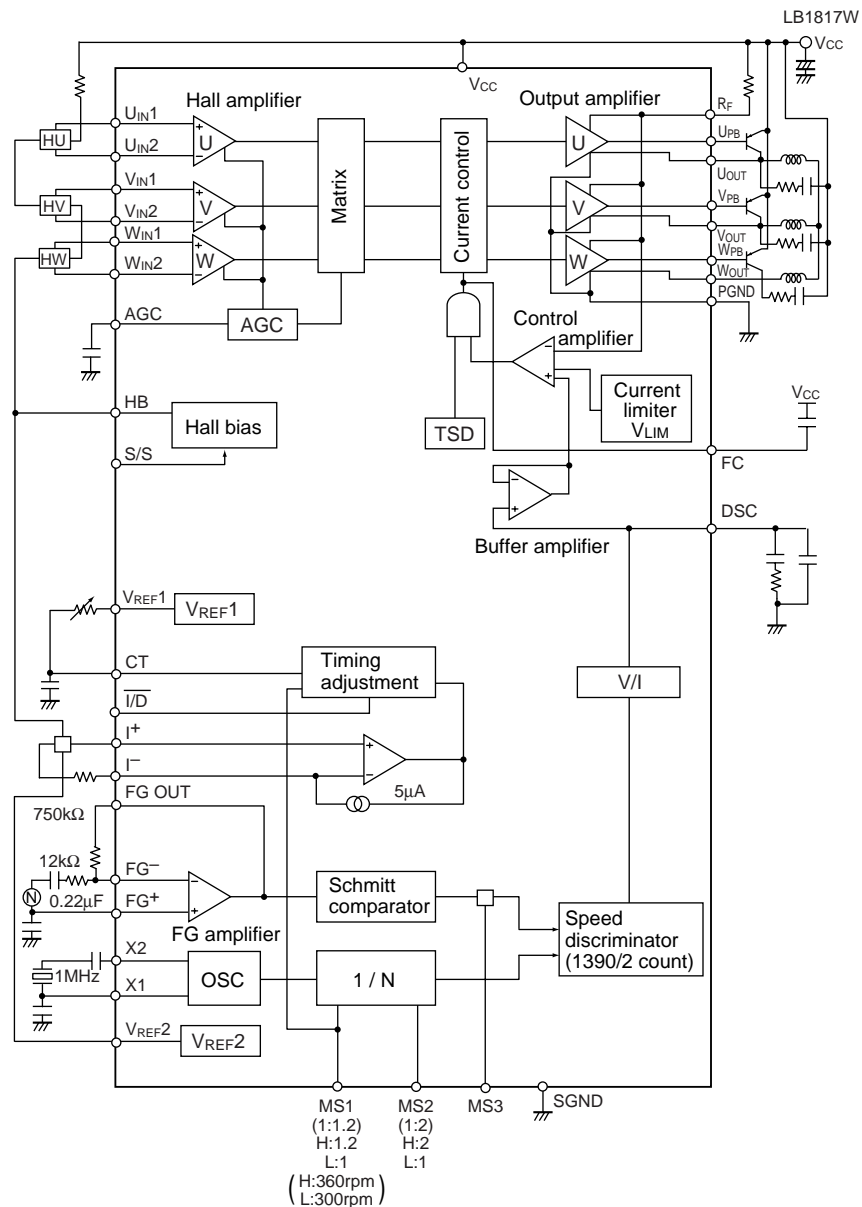
Note: Items shown to be "*" are not measured.

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Pin Assignment



Block Diagram



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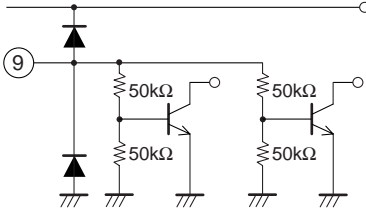
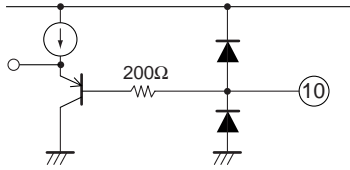
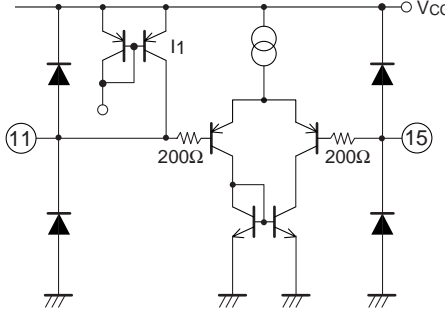
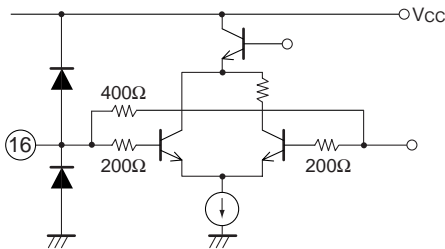
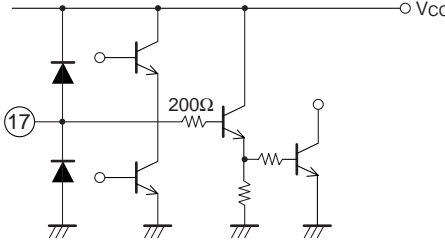
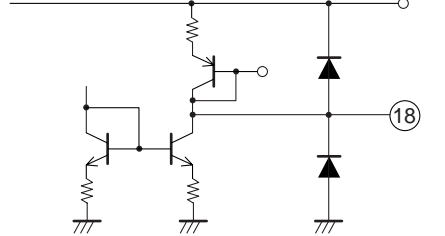
Pin Descriptions

Pin number	Pin name	Pin voltage	Equivalent circuit	Pin function
1, 5 12, 13 14, 19 24, 25 31, 36 37, 47 48	NC			<ul style="list-style-type: none"> Pins not used
2	V _{REF1}	2.5V typ		<ul style="list-style-type: none"> V_{REF1} pin. Used as power supply for external CR serving for index timing adjustment.
3	V _{REF2}	2.15V typ		<ul style="list-style-type: none"> V_{REF2} pin. Used as bias pin for external index sensor.
4	I/D			<ul style="list-style-type: none"> Index pulse output pin.
6	SG			<ul style="list-style-type: none"> Signal ground pin. Connect to ground together with pin 21.
7	MS3	H: 2.0V min L: 0.8V max		<ul style="list-style-type: none"> FG switching pin. High: FG set to through Low: FG set to 1-stage division
8	MS2	H: 2.0V min L: 0.8V max		<ul style="list-style-type: none"> CLK switching pin. High: Clock set to through Low: Clock set to 1-stage division

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Pin number	Pin name	Pin voltage	Equivalent circuit	Pin function
9	MS1	H: 2.0V min L: 0.8V max		<ul style="list-style-type: none"> Rotation speed switching pin. High: 360 rpm Low: 300 rpm For details, see rotation speed switching table.
10	S/S	H: 2.0V min L: 0.8V max		<ul style="list-style-type: none"> Start/stop switching pin. Low: active
11 15	I ⁻ I ⁺			<ul style="list-style-type: none"> External index – input pin. External index + input pin. When I⁻ pin is High, constant current I1 flows. When pin is Low, constant current I1 is cut off. Resistor externally connected to I⁻ pin determines hysteresis width.
16	X1			<ul style="list-style-type: none"> Reference clock generator pin.
17	X2			
18	FC			<ul style="list-style-type: none"> Frequency characteristics compensation pin. To prevent current control loop oscillation, insert a capacitor between this pin and VCC.

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Pin number	Pin name	Pin voltage	Equivalent circuit	Pin function
20	RF			<ul style="list-style-type: none"> Output current detection pin. <p>To detect output current as a voltage, insert a resistor R_f between this pin and V_{CC}. The voltage is used for the current limiter. The detection level is about 1/50 of the output current.</p>
21	PG			<ul style="list-style-type: none"> Output transistor ground pin. <p>Connect to ground together with pin 6.</p>
22 23	FG ⁺ FG ⁻	2.5V typ		<ul style="list-style-type: none"> FG amplifier + pin FG amplifier - pin
26	FGout			<ul style="list-style-type: none"> FG amplifier output pin.
27 28 29 30 32 33	U _{OUT} U _{PB} V _{OUT} V _{PB} W _{OUT} W _{PB}			<ul style="list-style-type: none"> U phase output pin. U phase external PNP transistor base connection. V phase output pin. V phase external PNP transistor base connection. W phase output pin. W phase external PNP transistor base connection.
34 35 38 39 40 41	U _{IN2} U _{IN1} V _{IN2} V _{IN1} W _{IN2} W _{IN1}			<ul style="list-style-type: none"> U phase Hall input pin. <p>Logic High means $U_{IN1} > U_{IN2}$.</p> <ul style="list-style-type: none"> V phase Hall input pin. <p>Logic High means $V_{IN1} > V_{IN2}$.</p> <ul style="list-style-type: none"> W phase Hall input pin. <p>Logic High means $W_{IN1} > W_{IN2}$.</p>

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Pin number	Pin name	Pin voltage	Equivalent circuit	Pin function
42	HB			<ul style="list-style-type: none"> Hall bias negative-side pin. <p>In stop mode, the pin is open and Hall bias is cut off.</p>
43	V _{CC}			<ul style="list-style-type: none"> Power supply pin. <p>The voltage supplied to this pin must be stabilized to prevent ripple noise or other noises from inputting to this pin.</p>
44	AGC			<ul style="list-style-type: none"> AGC pin. <p>Controls the Hall amplifier gain according to Hall input amplitude. An external capacitor is used.</p>
45	DSC			<ul style="list-style-type: none"> Speed discriminator pin.
46	CT			<ul style="list-style-type: none"> Timing adjustment pin. <p>External CR for time constant circuit is connected here.</p>

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Truth Table

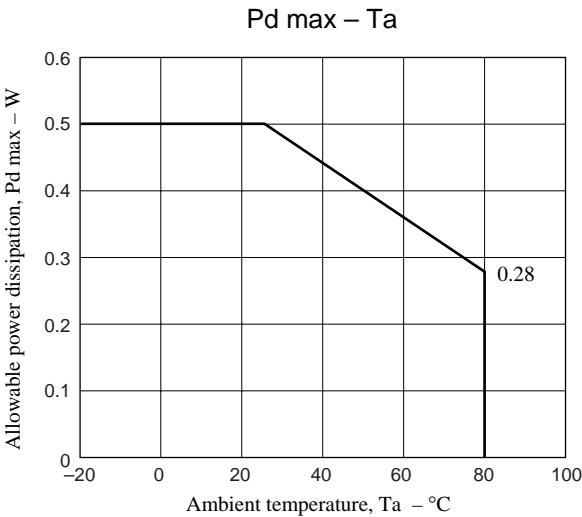
	Source -> Sink	Hall input		
		U	V	W
1	V phase -> W phase	H	H	L
2	V phase -> U phase	L	H	L
3	W phase -> U phase	L	H	H
4	W phase -> V phase	L	L	H
5	U phase -> V phase	H	L	H
6	U phase -> W phase	H	L	L

Hall input pin High means $U_{IN1} > U_{IN2}$
 $V_{IN1} > V_{IN2}$
 $W_{IN1} > W_{IN2}$

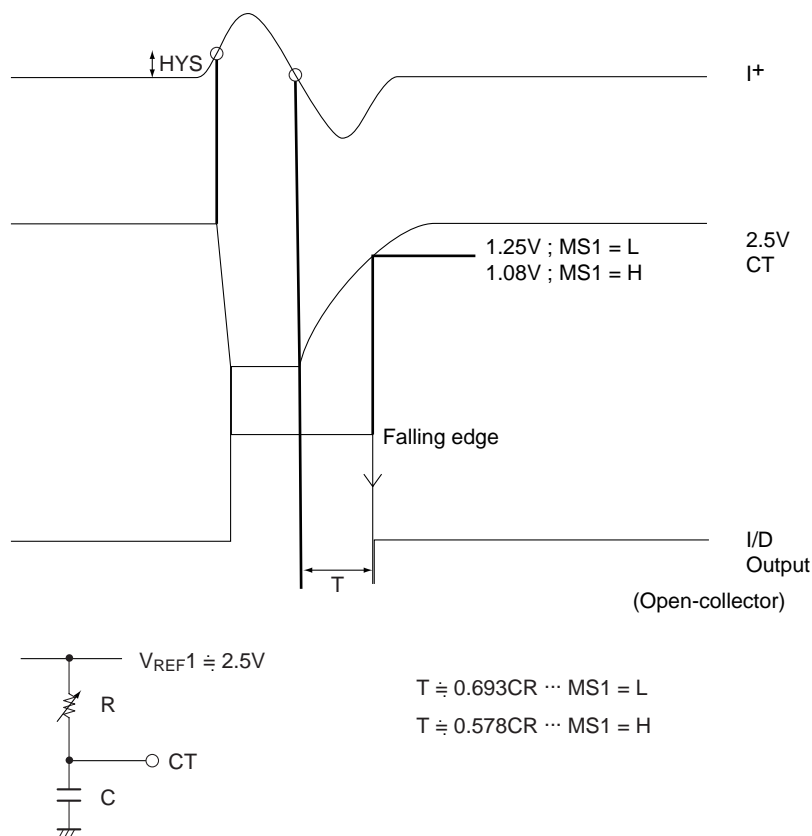
Rotation Speed Select Table

$f_{OSC} = 1\text{ MHz}$

MS1	H	L	H	L	H	L	H	L
MS2	H		L		H		L	
MS3	H		L		L		H	
$f_{FG}\text{ [Hz]}$	720	600	720	600	1440	1200	360	300



Index and Timing Chart



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