



LB1877M

Brushless Motor Driver with Speed Control for Portable Cassette Recorders

Overview

The LB1877M is a motor driver well suited for driving motors of minicassette recorders, headphone stereos, and microcassette recorders that use a 3V power supply.

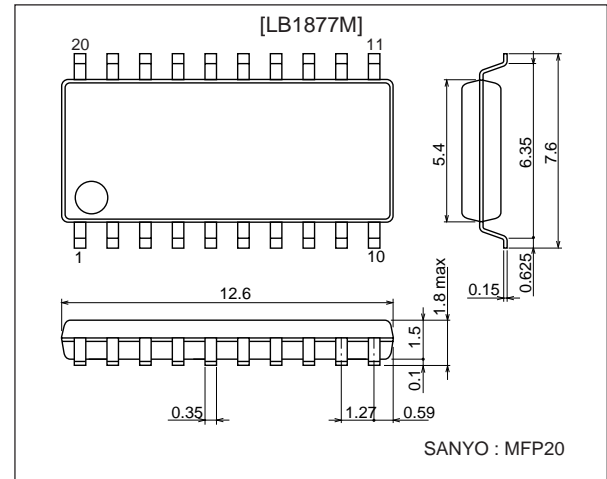
Functions and Features

- Brushless sensorless motor drive (3-phase half-wave drive)
- Forward/reverse drive possible
- Built-in speed control function (voltage servo)
- Built-in reference voltage (0.9V)
- Soft switching

Package Dimensions

unit: mm

3036B-MFP20



Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		6.0	V
Maximum output current	I_O max		0.5	A
Allowable power dissipation	P_d max		0.5	W
Operating temperature	T_{opr}		-10 to +80	$^\circ\text{C}$
Storage temperature	T_{stg}		-40 to +150	$^\circ\text{C}$

Allowable Operating Ranges at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Power supply voltage	V_{CC}		1.8 to 5.0	V

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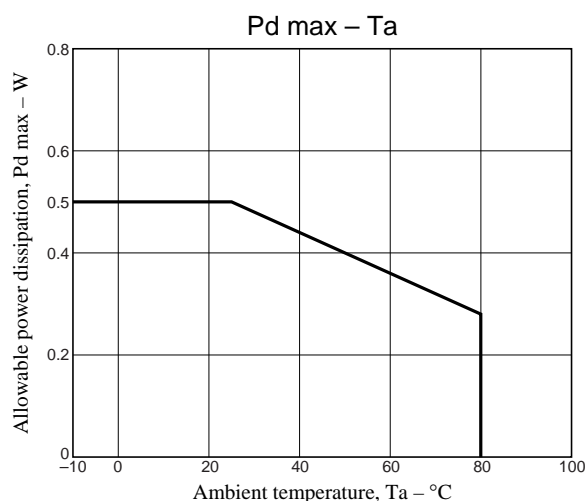
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Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = 2.4\text{V}$

Parameter	Symbol	Conditions	Ratings			Unit	Measurement circuit
			min	typ	max		
Power supply current	ICC1	S/S pin High level		4.0		mA	1
	ICC2	S/S pin Low level (standby)			20	μA	2
[S/S pin]							
S/S pin High level	SSH	Start	1.5		V_{CC}	V	3
S/S pin Low level	SSL	Stop	0		0.3	V	4
[DR pin]							
DR pin High level	DRH	Reverse	1.5		V_{CC}	V	9
DR pin Low level	DRL	Normal direction	0		0.3	V	10
[Internal reference voltage]							
Internal reference voltage	VREF	Output current 0 μA	0.8	0.9	1.0	V	11
Output current	IREF	Output current 250 μA			25	mV/250 μA	12
Reference voltage to power supply voltage characteristics	$\Delta V_{REF}/\Delta V_{CC}$	$V_{CC} = 1.8$ to 5.0V			5	mV/V	13
Reference voltage to temperature characteristics	$\Delta I_{REF}/\Delta T_a$	$V_{CC} = 2.4\text{V}$	-0.1		0.3	mV/ $^\circ\text{C}$	Target
[OSC pin]							
Charge current	Isc		3.0	4.5	6.0	μA	14
[COM pin]							
Sink current	ICOM		17	24	33	μA	15
[LB pin]							
Charge current	ILB		4.5	6.5	9.0	μA	16
[VSP pin]							
Input voltage range	VIN	$V_{CC} = 2.4\text{V}$	0.15		1.8	V	17
Speed signal detection precision	VSP	$VIN = 1\text{V}$	420	500	580	mV	18
Speed signal relative precision	RSP		-6		6	%	Target
Speed signal to power supply voltage characteristics	$\Delta V_{SP}/\Delta V_{CC}$	$V_{CC} = 1.8$ to 5.0V			2.5	mV/V	19
Speed signal to temperature characteristics	$\Delta V_{SP}/\Delta T_a$		-0.1		0.2	mV/ $^\circ\text{C}$	Target
[IN+ pin]							
Input voltage range	VIN+	$V_{CC} = 2.4\text{V}$	0.1		$V_{CC} - 0.7$	V	20
[OUT pin]							
Output current	IOUT	$VIN+ = 1\text{V}$	25	30	47.3	μA	21
[RI pin]							
Current detection precision	VRI	$RI = 10\text{ k}\Omega$ U, V, $W_{out} = 2.3\text{V}$	10	20	35	mV	22
[U, V, WOUT pins]							
Output saturation voltage	Vsat	$IO = 200\text{ mA}$			0.25	V	23
[Thermal]							
Thermal protection trigger temperature	TTSD			180		$^\circ\text{C}$	Target
Temperature hysteresis width	$\Delta TTSD$			15		$^\circ\text{C}$	Target

Note: Items shown to be Target are not measured.

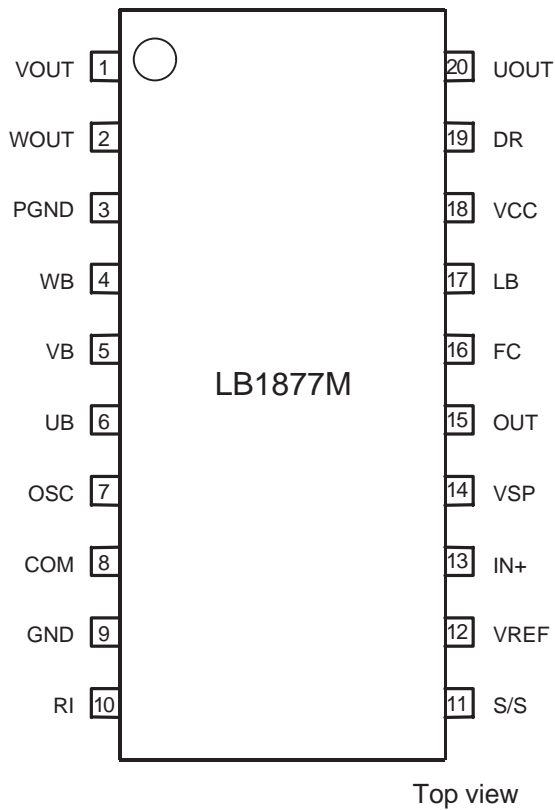


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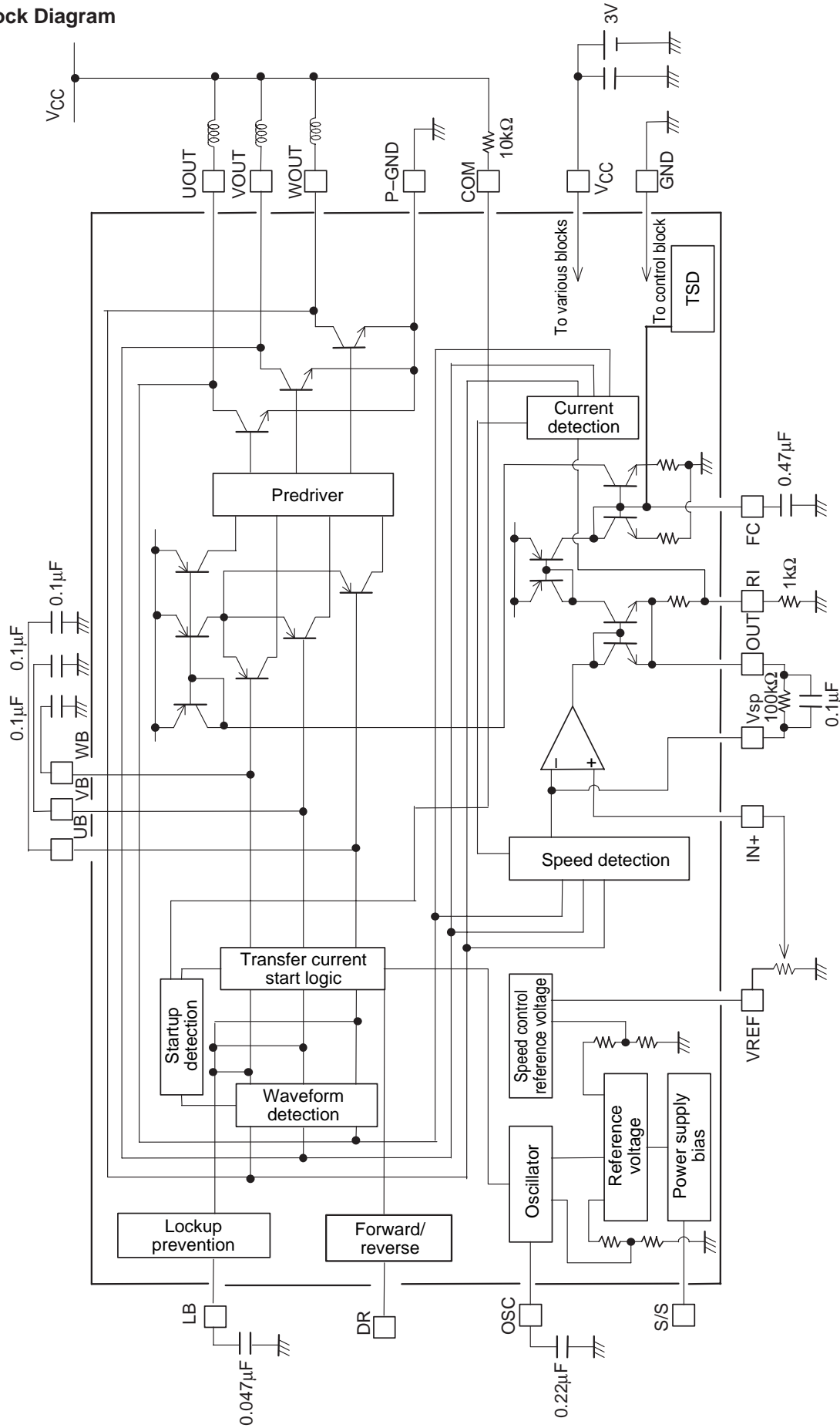
Pin Function

Pin number	Pin name	Function
20	UOUT	U-phase output
1	VOUT	V-phase output
2	WOUT	W-phase output
6	UB	U-phase base of 3-phase differential
5	VB	V-phase base of 3-phase differential
4	WB	W-phase base of 3-phase differential
18	VCC	Power supply
7	OSC	Startup oscillator pin
8	COM	Output waveform detection comparator voltage
3	P – GND	Output transistor and predriver ground
9	GND	Ground pin
11	S/S	Start/stop pin
19	DR	Forward/reverse pin
12	VREF	Reference voltage 0.9V
14	VSP	Output waveform peak detection pin
13	IN+	Error amp non-inverted pin
15	OUT	Error amp output pin
10	RI	Current feedback resistor connection pin
16	FC	Frequency response adjustment pin
17	LB	Motor start lockup prevention. Connect to GND via capacitor

Pin Assignment



Block Diagram



* Constants given in the illustration are for reference only and are not guaranteed for all motors. Individual adjustment for each motor is required.

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Pin Description

Unit (resistance: Ω, capacitance: F)

Pin number	Pin name	Pin voltage	Equivalent circuit	Pin function
18	VCC	1.8V to 5.0V		Power supply for all circuits
9	GND			Ground for all circuits except FC and power block.
12	VREF	0.7V to 0.9V		Internal reference voltage. Connected as speed control voltage to IN+ pin via external resistor.
7	OSC	1V to Vcc		Startup oscillator pin. Adjusts self-excitation frequency via external capacitor.
8	COM	1.3V to Vcc		Determines threshold voltage of waveform detection circuit. Connected to Vcc via an external resistor. Varies the startup threshold voltage.
14	VSP	0.1V to Vcc - 0.7V		Peak detection circuit output pin.
13	IN+			Error amplifier non-inverted pin. Controls rotation speed via input pin voltage.
15	OUT			Error amplifier output pin. Connect external resistor between Vsp pins for feedback.
10	RI			Current feedback output pin. Connect external resistor between this pin and ground for current feedback adjustment.

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Unit (resistance: Ω , capacitance: F)

Pin number	Pin name	Pin voltage	Equivalent circuit	Pin function
16	FC	Voltage input not allowed		Frequency characteristics adjustment pin. Connect to ground via capacitor.
11	S/S	0 to Vcc		Start/stop pin.
19	DR	0 to Vcc		Forward/reverse rotation pin.
20 1 2	UOUT VOUT WOUT	0 to 8V		U, V, W phase output pins. Connect to motor coils
17	LB	0 to 1V		Motor start lockup prevention.
3	P - GND			Power block ground.

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Pin number	Pin name	Pin voltage	Equivalent circuit	Pin function
4 5 6	WB VB UB	Voltage input not allowed		Base pins for U, V, W differential. Connect to ground via capacitor for soft switching

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