Ordering number : ENN6200A

Monolithic Digital IC

LB1877V

Brushless Motor Driver with Speed Control for Portable Cassette Recorders

Overview

The LB1877V is a motor driver well suited for driving motors of minicassette recorders, headphone stereos, and microcasette recorders that use a 3V power supply.

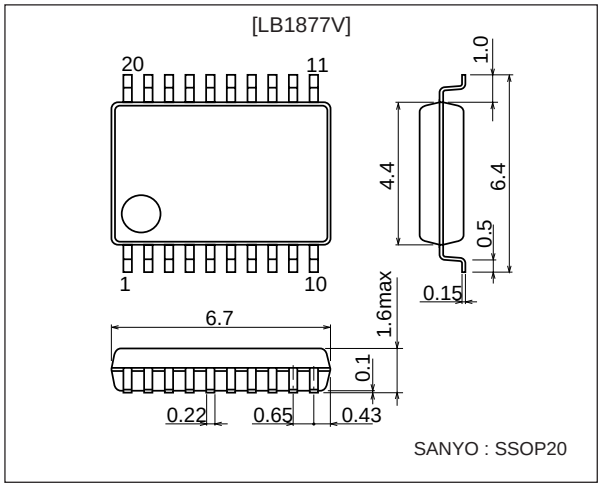
Functions and Features

- 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

3179A-SSOP20



Specifications

Absolute Maximum Ratings at Ta = 25°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	Pd max		0.35	W
Operating temperature	Topr		–10 to +80	°C
Storage temperature	Tstg		–40 to +150	°C

Allowable Operating Ranges at Ta = 25°C

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

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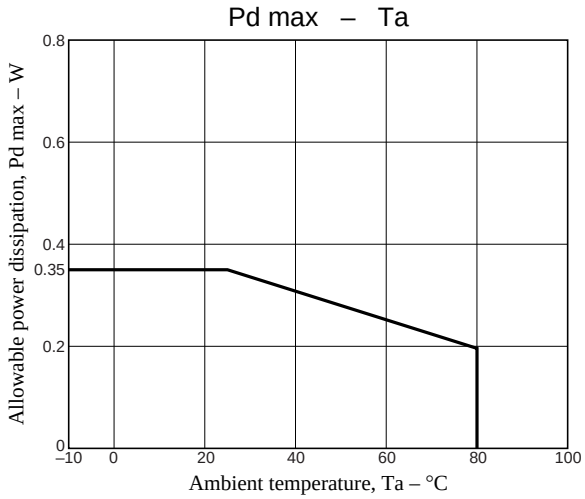
Electrical Characteristics at Ta = 25°C, V_{CC} = 2.4V

Parameter	Symbol	Conditions	Ratings			Unit	Measurement circuit
			min	typ	max		
Power supply current	$I_{CC}1$	S/S pin High level		4.0		mA	1
	$I_{CC}2$	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	V_{REF}	Output current 0 μA	0.8	0.9	1.0	V	11
Output current	I_{REF}	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	$\Delta I_{REF}/\Delta Ta$	V_{CC} 2.4V	– 0.1		+0.3	mV/°C	Target
[OSC pin]							
Charge current	Isc		3.0	4.5	6.0	μA	14
[COM pin]							
Sink current	I_{COM}		17	24	33	μA	15
[LB pin]							
Charge current	I_{LB}		4.5	6.5	9.0	μA	16
[VSP pin]							
Input voltage range	V_{IN}	V_{CC} = 2.4V	0.15		1.8	V	17
Speed signal detection precision	V_{SP}	V_{IN} = 1V	420	500	580	mV	18
Speed signal relative precision	R_{SP}		– 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	$\Delta V_{SP}/\Delta Ta$		– 0.1		+0.2	mV/°C	Target
[IN+ pin]							
Input voltage range	V_{IN}+	V_{CC} = 2.4V	0.1		VCC – 0.7	V	20
[OUT pin]							
Output current	I_{OUT}	V_{IN}+ = 1V	25	30	47.3	μA	21
[RI pin]							
Current detection precision	V_{RI}	RI = 10 kΩ U, V, Wout = 2.3V	10	20	35	mV	22
[U, V, WOUT pins]							
Output saturation voltage	Vsat	I_O = 200 mA			0.25	V	23
[Thermal]							
Thermal protection trigger temperature	TTSD			180		°C	Target
Temperature hysteresis width	ΔTTSD			15		°C	Target

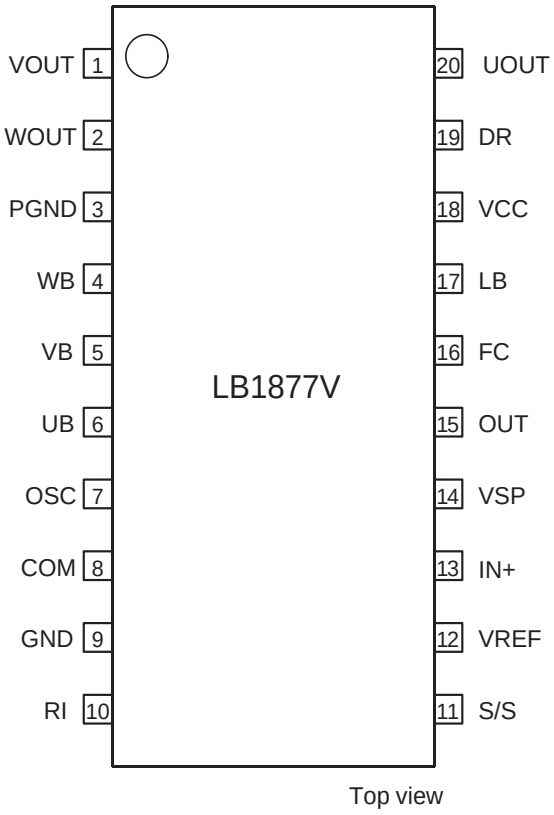
Note: Items shown to be “Target” are not measured.



Pin Description

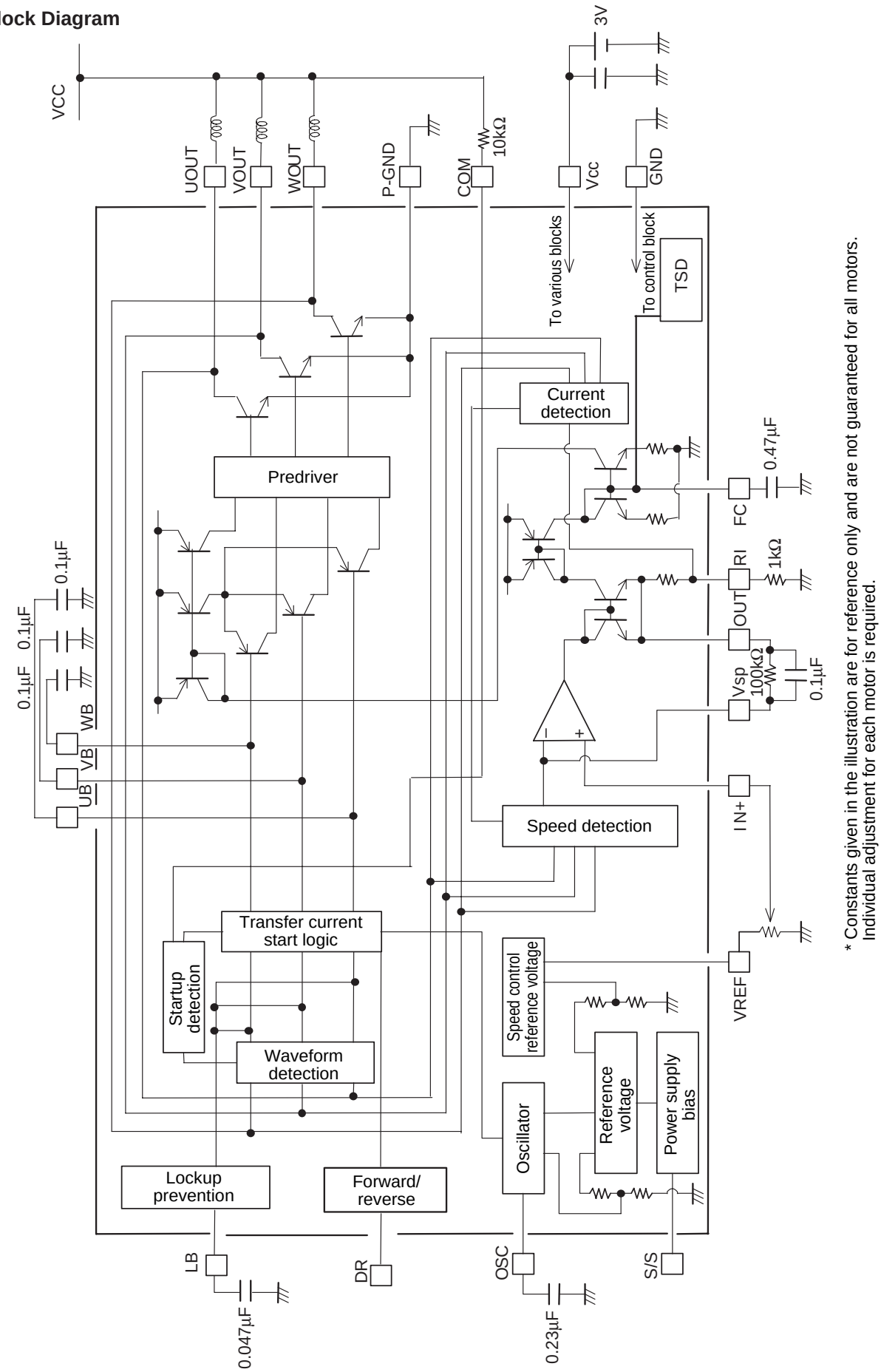
Pin number	Pin name	Function
20	UOUT	U-phase output
1	VOUT	V-phase output
2	WOUT	W-phase output
6	UB	U-phase base of 3-phase differential
5	VB	V-phase base of 3-phase differential
4	WB	W-phase base of 3-phase differential
18	VCC	Power supply
7	OSC	Startup oscillator pin
8	COM	Output waveform detection 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



Top view

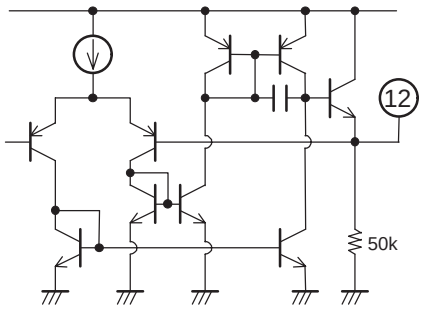
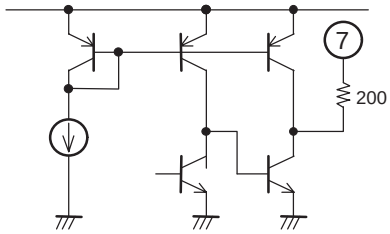
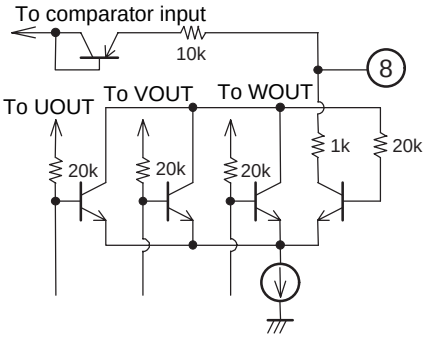
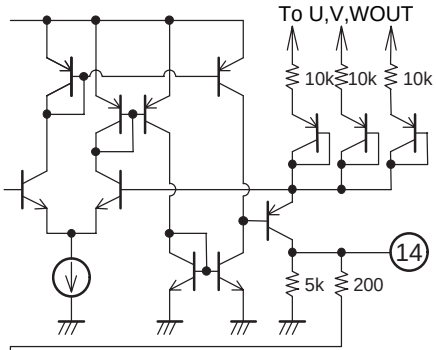
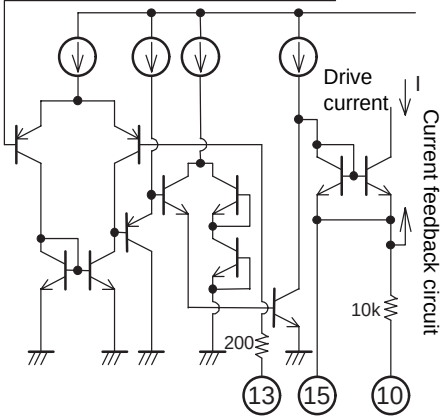
Block Diagram



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

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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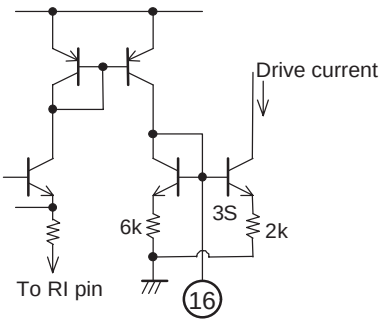
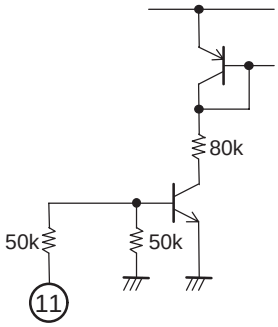
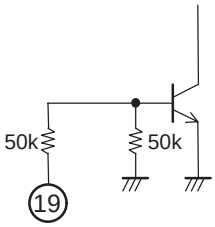
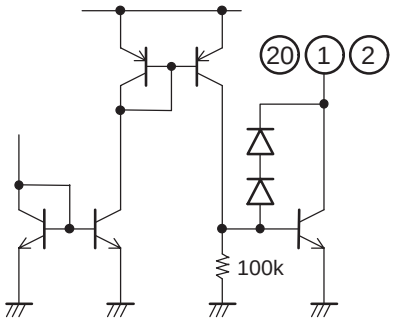
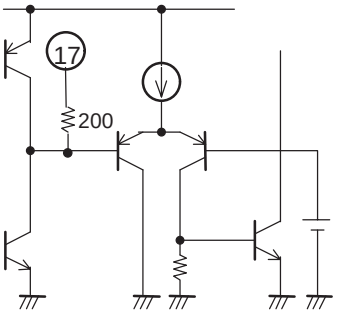
Unit (Resistance: Ω, capacitance: F)

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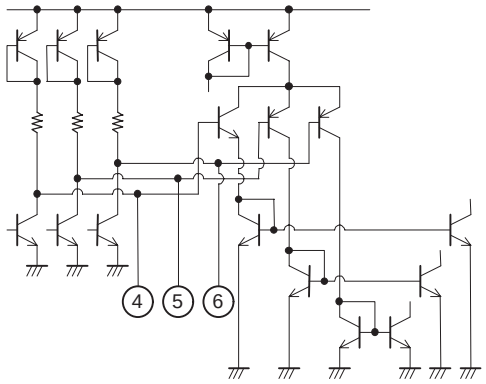
Pin number	Pin name	Pin voltage	Equivalent circuit	Pin function
4 5 6	WB VB UB	Voltage input not allowed		Base pins for U, V, W differential. Connect to ground via capacitor for soft switching