



# 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 microcassette recorders that use a 3V power supply.

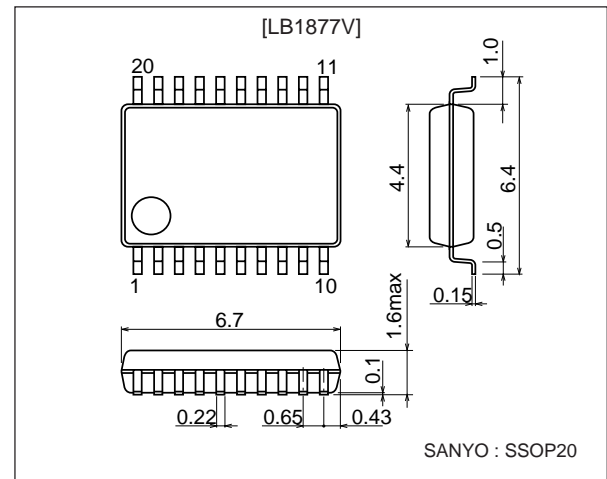
### Functions and Features

- 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

#### 3179A-SSOP20



### 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		0.35	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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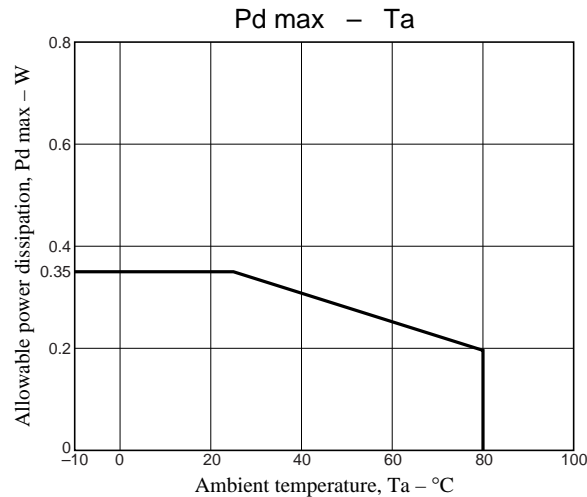
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# LB1877V

## Electrical Characteristics at Ta = 25°C, V<sub>CC</sub> = 2.4V

Parameter	Symbol	Conditions	Ratings			Unit	Measurement circuit
			min	typ	max		
Power supply current	I <sub>CC1</sub>	S/S pin High level		4.0		mA	1
	I <sub>CC2</sub>	S/S pin Low level (standby)			20	μA	2
[S/S pin]							
S/S pin High level	SSH	Start	1.5		V <sub>CC</sub>	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 <sub>CC</sub>	V	9
DR pin Low level	DRL	Normal direction	0		0.3	V	10
[Internal reference voltage]							
Internal reference voltage	V <sub>REF</sub>	Output current 0 μA	0.8	0.9	1.0	V	11
Output current	I <sub>REF</sub>	Output current 250 μA			25	mV/250 μA	12
Reference voltage to power supply voltage characteristics	ΔV <sub>REF</sub> /ΔV <sub>CC</sub>	V <sub>CC</sub> 1.8 to 5.0V			5	mV/V	13
Reference voltage to temperature characteristics	ΔI <sub>REF</sub> /ΔTa	V <sub>CC</sub> 2.4V	− 0.1		+0.3	mV/°C	Target
[OSC pin]							
Charge current	I <sub>sc</sub>		3.0	4.5	6.0	μA	14
[COM pin]							
Sink current	I <sub>COM</sub>		17	24	33	μA	15
[LB pin]							
Charge current	I <sub>LB</sub>		4.5	6.5	9.0	μA	16
[VSP pin]							
Input voltage range	V <sub>IN</sub>	V <sub>CC</sub> = 2.4V	0.15		1.8	V	17
Speed signal detection precision	V <sub>SP</sub>	V <sub>IN</sub> = 1V	420	500	580	mV	18
Speed signal relative precision	R <sub>SP</sub>		− 6		+6	%	Target
Speed signal to power supply voltage characteristics	ΔV <sub>SP</sub> /ΔV <sub>CC</sub>	V <sub>CC</sub> 1.8 to 5.0V			2.5	mV/V	19
Speed signal to temperature characteristics	ΔV <sub>SP</sub> /ΔTa		− 0.1		+0.2	mV/°C	Target
[IN+ pin]							
Input voltage range	V <sub>IN+</sub>	V <sub>CC</sub> = 2.4V	0.1		V <sub>CC</sub> − 0.7	V	20
[OUT pin]							
Output current	I <sub>OUT</sub>	V <sub>IN+</sub> = 1V	25	30	47.3	μA	21
[RI pin]							
Current detection precision	V <sub>RI</sub>	RI = 10 kΩ U, V, Wout = 2.3V	10	20	35	mV	22
[U, V, WOUT pins]							
Output saturation voltage	V <sub>sat</sub>	I <sub>O</sub> = 200 mA			0.25	V	23
[Thermal]							
Thermal protection trigger temperature	TTSD			180		°C	Target
Temperature hysteresis width	ΔTTSD			15		°C	Target

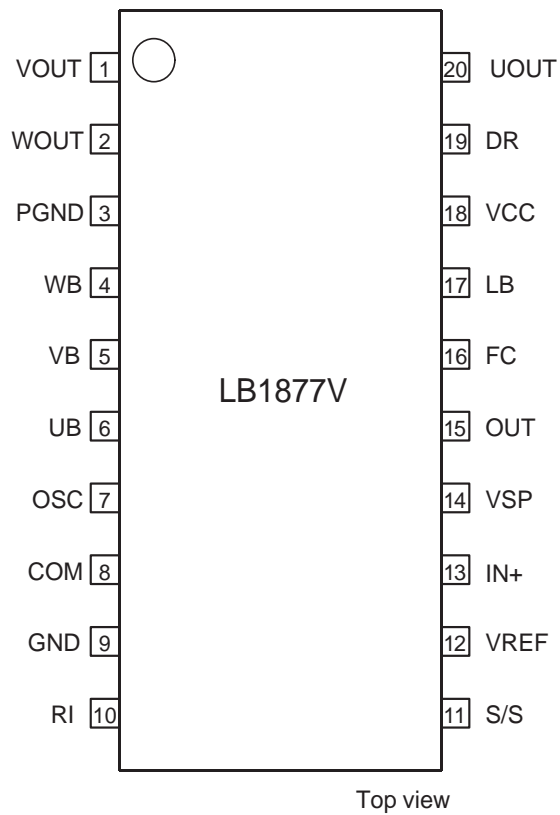
Note: Items shown to be "Target" are not measured.



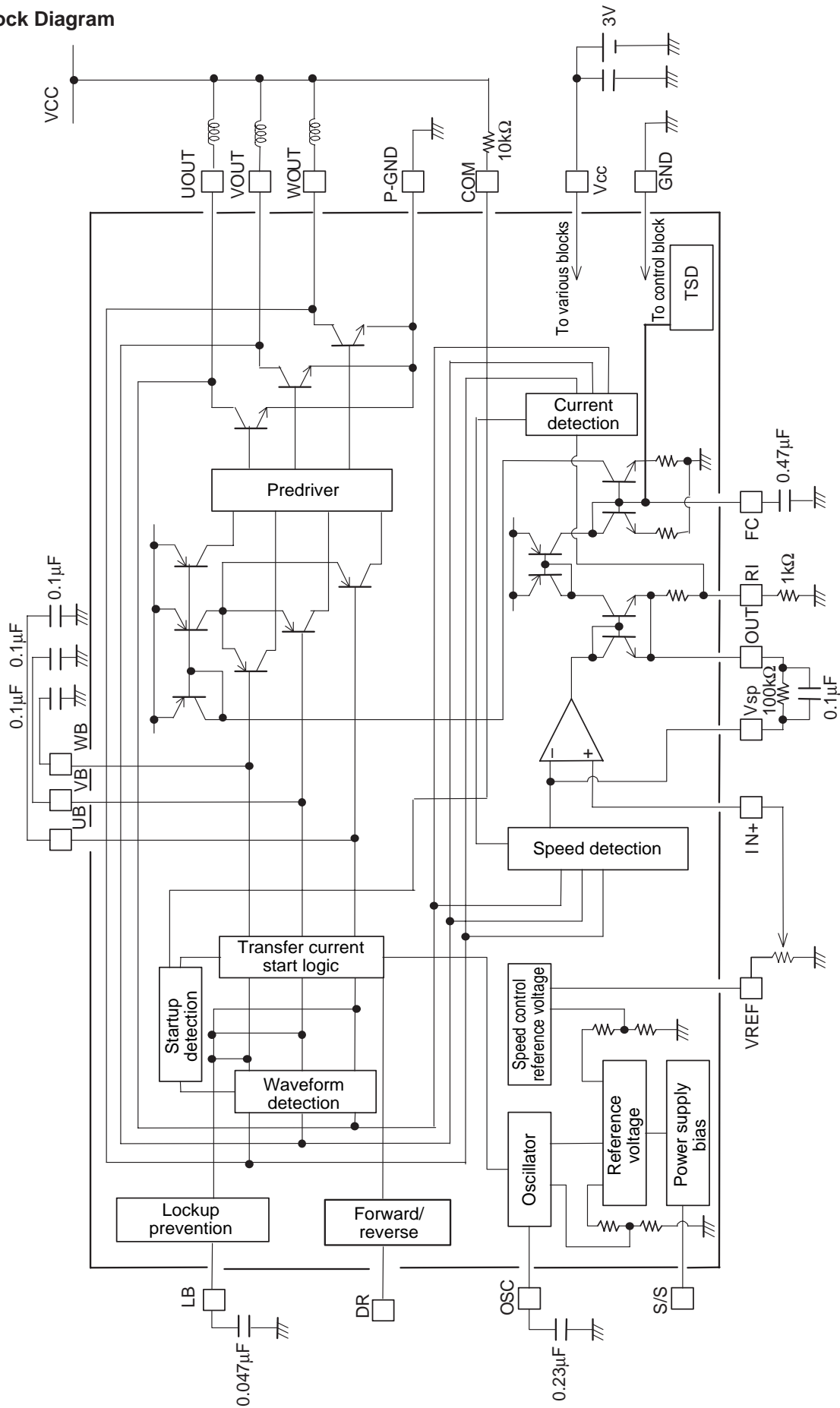
## Pin Description

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



Block Diagram

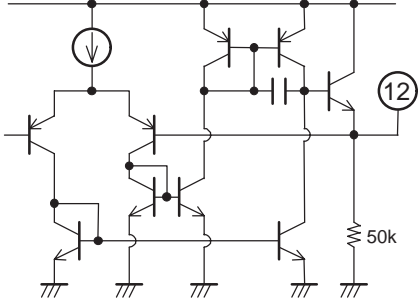
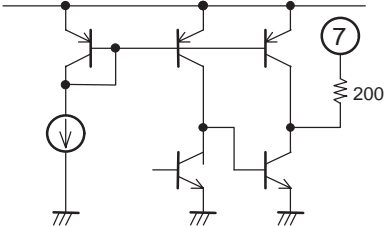
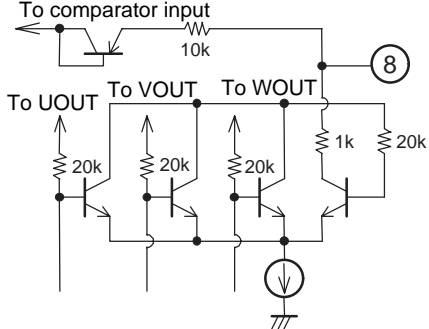
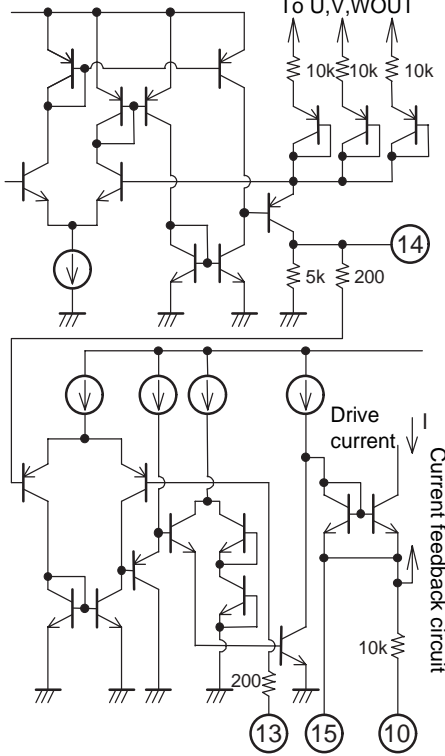


\* Constants given in the illustration are for reference only and are not guaranteed for all motors. Individual adjustment for each motor is required.

# LB1877V

## Pin Description

Unit (Resistance:  $\Omega$ , 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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# LB1877V

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Unit (Resistance:  $\Omega$ , 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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