



LB11983

3-Phase Sensorless Motor Driver for Fan Motor Driver for Refrigerator

Overview

The LB11983 is a 3-phase full-wave current linear sensorless motor driver. It is optimal for refrigerator fan motor drive.

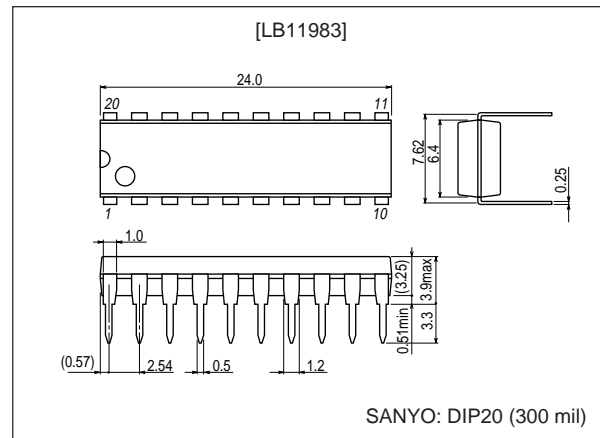
Features

- current linear driving technique
- current limiter circuit
- Over saturation prevention circuit for output stage
- Provides coil back EMF FG output
- Thermal shutdown circuit
- Beat lock prevention circuit

Package Dimensions

unit: mm

3021C-DIP20



Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{CC} max		14.5	V
Output application voltage	V_O max		14.5	V
Input application voltage	V_I max		-0.3 to $V_{CC} + 0.3$	V
Output current	I_O max		1.0	A
Internal allowable loss	P_d max	Independent IC	1.0	W
Operating temperature	T_{opr}		-30 to $+85$	$^\circ\text{C}$
Storage temperature	T_{stg}		-55 to $+150$	$^\circ\text{C}$

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

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{CC}		7 to 13.8	V

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SANYO Electric Co., Ltd. Semiconductor Company

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

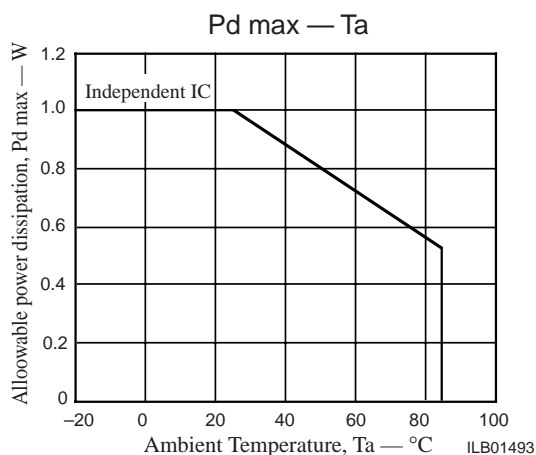
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Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = 12.0\text{ V}$

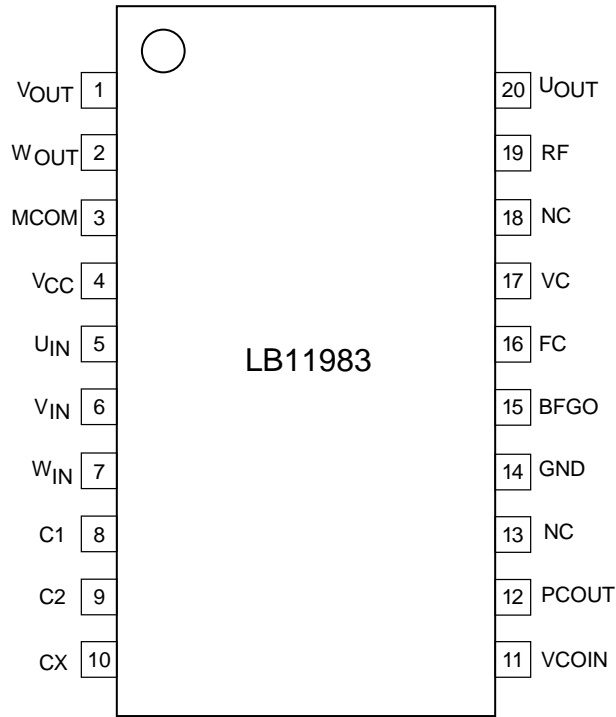
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Supply current	I_{CC}	$V_C = V_{CC}$		20	30	mA
Output saturation voltage 1	V_{Osat1}	$I_O = 0.4\text{ A}$, Source + Sink		1.4	2.0	V
Output saturation voltage 2	V_{Osat2}	$I_O = 0.8\text{ A}$, Source + Sink, $R_F = 0\ \Omega$		1.8	2.6	V
MCOM pin common-mode input voltage range	VIC		0		$V_{CC} - 2$	V
PCOUT output current 1	IPCOU	Source side		-90		μA
PCOUT output current 2	IPCOD	Sink side		90		μA
VCOIN input current	IVCOIN	$V_{COIN} = 5\text{ V}$		0.1	0.2	μA
VCO minimum frequency	fVCOMIN	$V_{COIN} = \text{open}$		400		Hz
VCO maximum frequency	fVCOMAX	$V_{COIN} = 5\text{ V}$		18.5		kHz
C1, C2 source current ratio	RSOURCE	IC1SOURCE/IC2SOURCE	-12		+12	%
C1, C2 sink current ratio	RSINK	IC1SINK/IC2SINK	-12		+12	%
C1 source and sink current ratio	RC1	IC1SOURCE/IC1SINK	-35		+15	%
C2 source and sink current ratio	RC2	IC2SOURCE/IC2SINK	-35		+15	%
Counter FG output ON voltage	V_{OL}				0.4	V
Counter FG output OFF voltage	V_{OH}		4			V
Thermal shutdown operating temperature	TTSD	Design target value*	150	180	210	$^\circ\text{C}$
Thermal shutdown hysteresis	ΔTTSD	Design target value*		15		$^\circ\text{C}$

Note*: These items are design target values and are not tested.



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Pin Arrangement



Top view

Pin Functions

Pin No.	Symbol	Pin voltage	Description	Equivalent circuit
20	U _{OUT}		Drum motor driver output pin.	
1	V _{OUT}			
2	W _{OUT}			
19	RF		Minimum potential of the drum motor driver output transistor. This voltage is detected for constant-current control. The current limiter is also activated upon detection of this potential.	
4	V _{CC}	8 to 13.8 V	Power supply pin	

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Pin No.	Symbol	Pin voltage	Description	Equivalent circuit
3	MCOM		Middle point input pin of motor coil. The coil waveform is detected with reference to this voltage.	
5	U_{IN}		Input pin of the coil waveform detection comparator. Connected to each phase output with a built-in resistor of 10 kΩ	
6	V_{IN}			
7	W_{IN}			
8	C1		Triangular wave generating capacitor connection pin. This triangular wave causes soft switching of coil output waveform.	
9	C2			
10	CX		The operating frequency range and minimum operating frequency are determined from the value of capacitor connected to this pin and GND in the VCO circuit.	
11	VCOIN		VCO circuit voltage input pin Inputs the PCOUT pin voltage through CR filtering.	

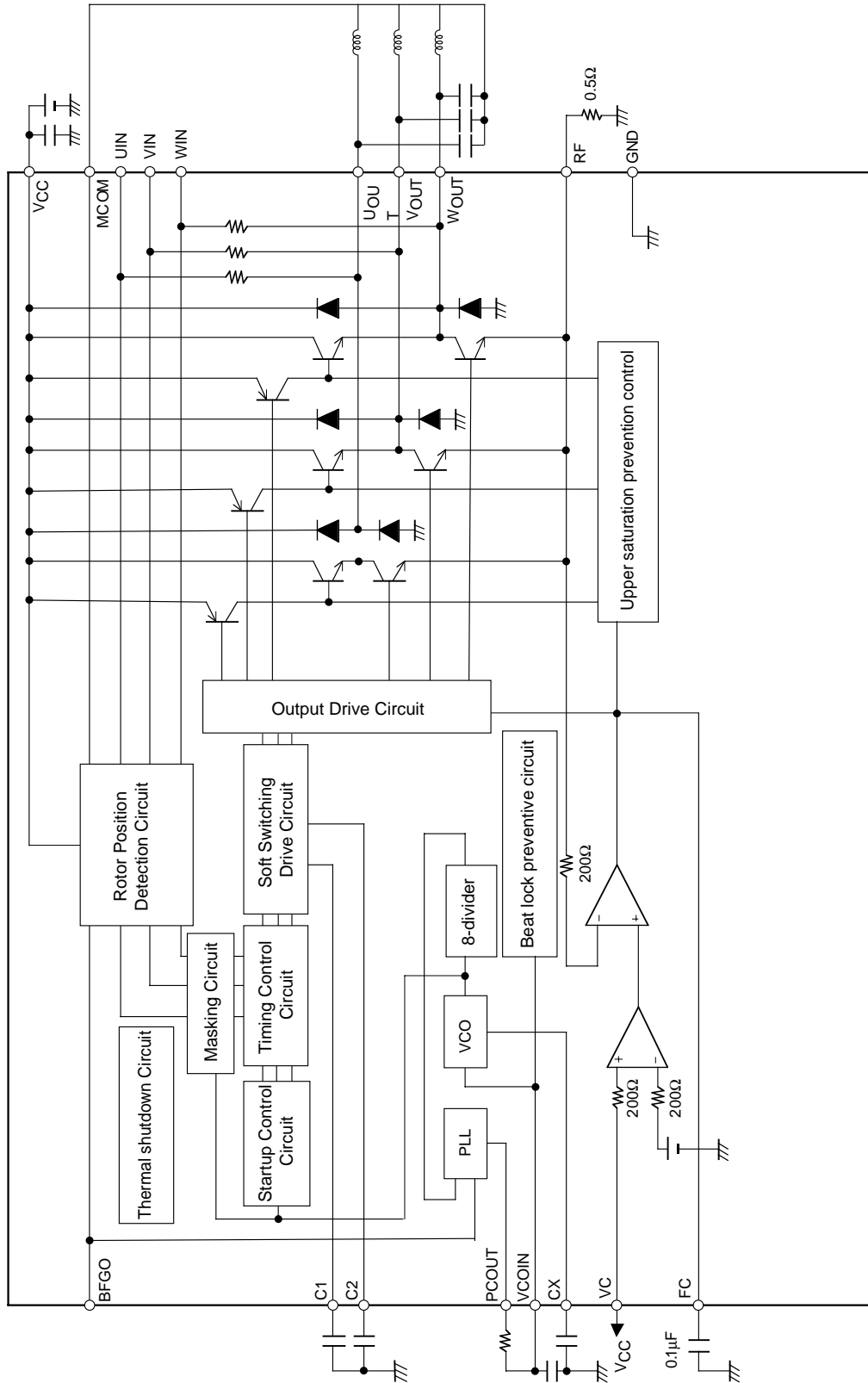
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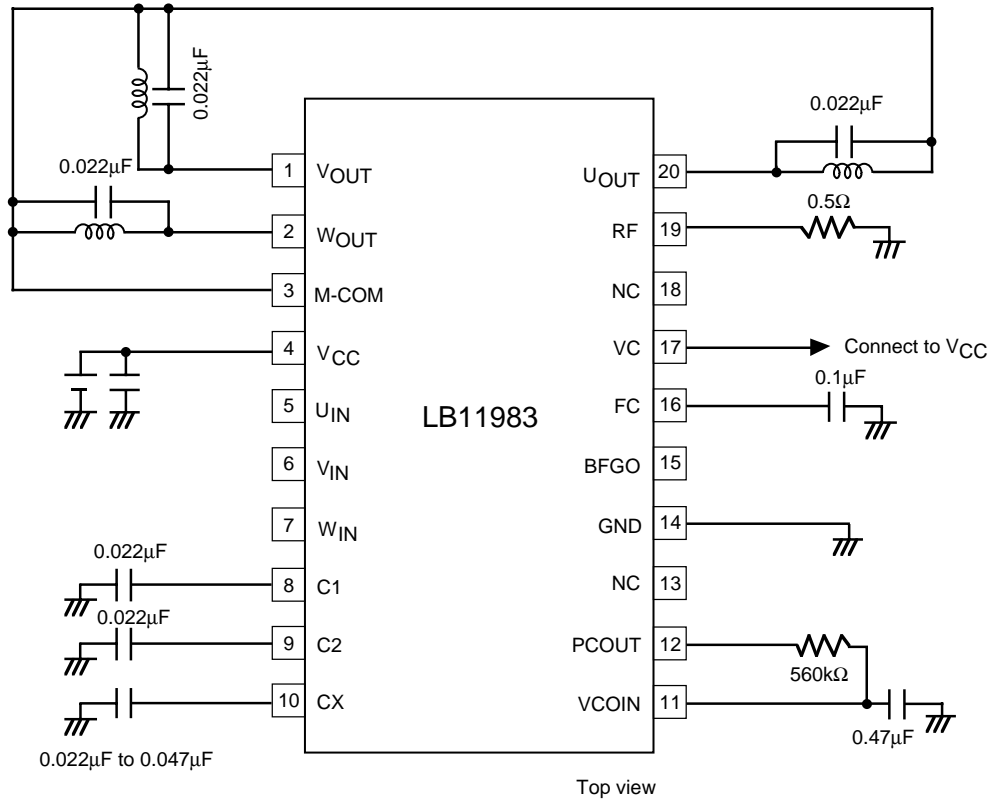
Pin No.	Symbol	Pin voltage	Description	Equivalent circuit
12	PCOUT		VCO circuit PLL output pin.	
14	GND		GND for others than the output transistor.	
15	BFGO		FG output to detect motor reverse feeder voltage. (Composition of three phases)	
16	FC		Frequency characteristics compensation pin. Insertion of a capacitor between this pin and GND stops oscillation of the current control closed loop.	
17	VC		Speed control pin. The control is a constant-current control under current feedback from RF. Normally, this pin is connected to V _{CC} for use.	

Block Diagram (External constant may vary depending on the motor used.)



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Sample Application Circuit (Reference)



- Notes
1. Be sure to connect the VC pin to V_{CC} directly before use.
 2. For the constant of capacitor, etc., our value established through examination is given for reference. Adjust the value according to the motor to be used when considering this IC.
 3. If the output is not oscillated with the motor used, a capacitor inserted between output coil ends is not necessary.
 4. Pins 5 through 7 (U_{IN} , V_{IN} , and W_{IN}) are not to be used by a user. These are connected inside IC and should always be kept independent and open.
 5. NC pins (14 and 18) are not connected inside IC and can be used as relay pins.

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