Ordering number : EN7117B

SANYO Semiconductors
DATA SHEET

An ON Semiconductor Company

Monolithic Digital IC

LB11983 — For Fan Motor Driver for Refrigerator 3-Phase Sensorless Motor Driver

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 shoutdown circuit.
- Beat lock pervention circuit.

Specifications

Maximum Ratings at Ta = 25°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
Allowable power dissipation	Pd max	Independent IC	1.0	W
Operating temperature	Topr		-30 to +85	°C
Storage temperature	Tstg		-55 to +150	°C

Operating Conditions at Ta = 25°C

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

Electrical Characteristics at Ta = 25°C, V_{CC} = 12V

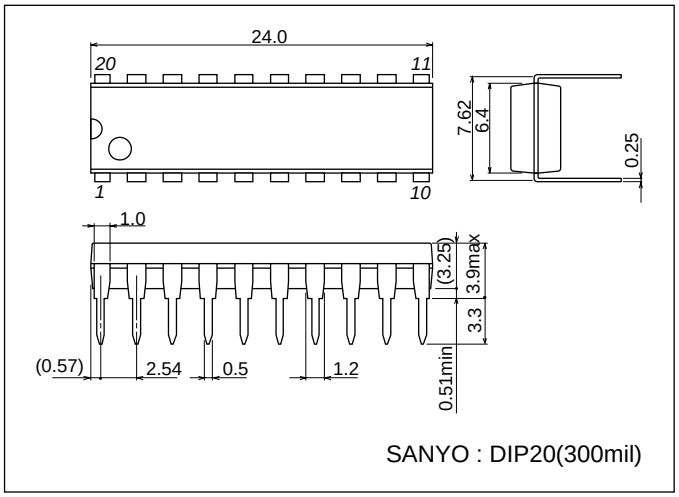
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Supply current	I_{CC}	VC = V_{CC}		20	30	mA
Output saturation voltage 1	$V_O$sat1	I_O = 0.4A, Source + Sink		1.4	2.0	V
Output saturation voltage 2	$V_O$sat2	I_O = 0.8A, Source + Sink, RF = 0Ω		1.8	2.6	V
MCOM pin common-mode input voltage range	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	VCOIN = 5V		0.1	0.2	μA
VCO minimum frequency	fVCOMIN	VCOIN = open		400		Hz
VCO maximum frequency	fVCOMAX	VCOIN = 5V		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 volt	V_{OL}				0.4	V
Counter FG output OFF vol	V_{OH}		4			V
Thermal shutdown operating temperature	TTSD	Design target value *	150	180	210	°C
Thermal shutdown hysteresis	ΔTTSD	Design target value *		15		°C

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

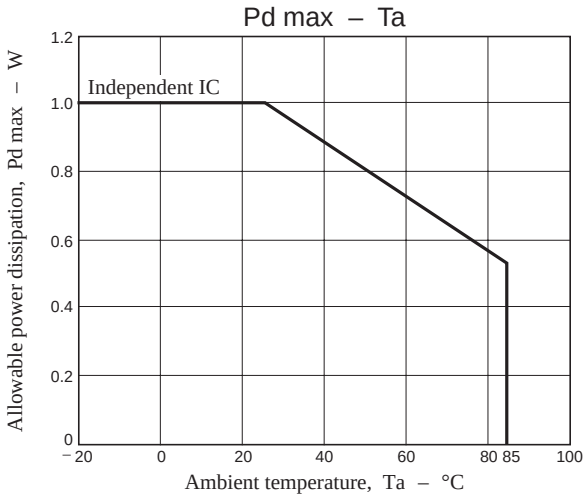
Package Dimensions

unit : mm (typ)

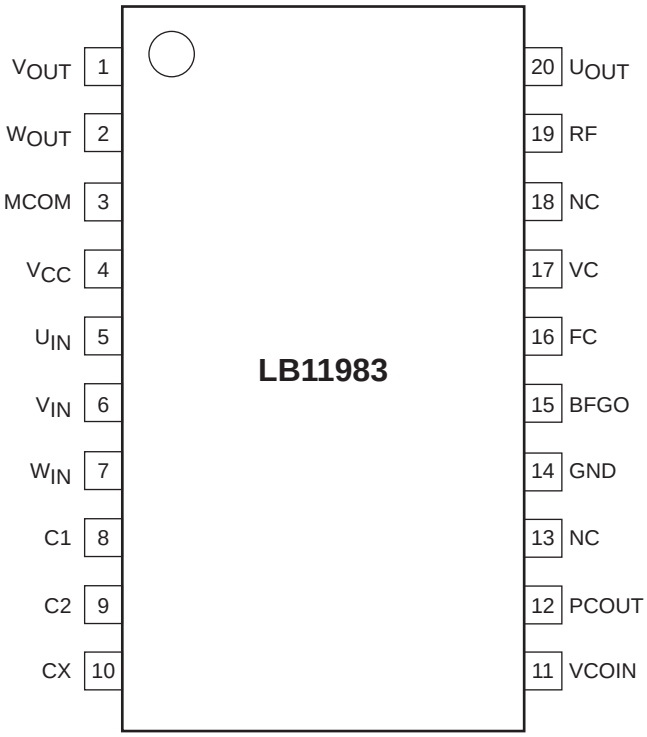
3021C



SANYO : DIP20(300mil)

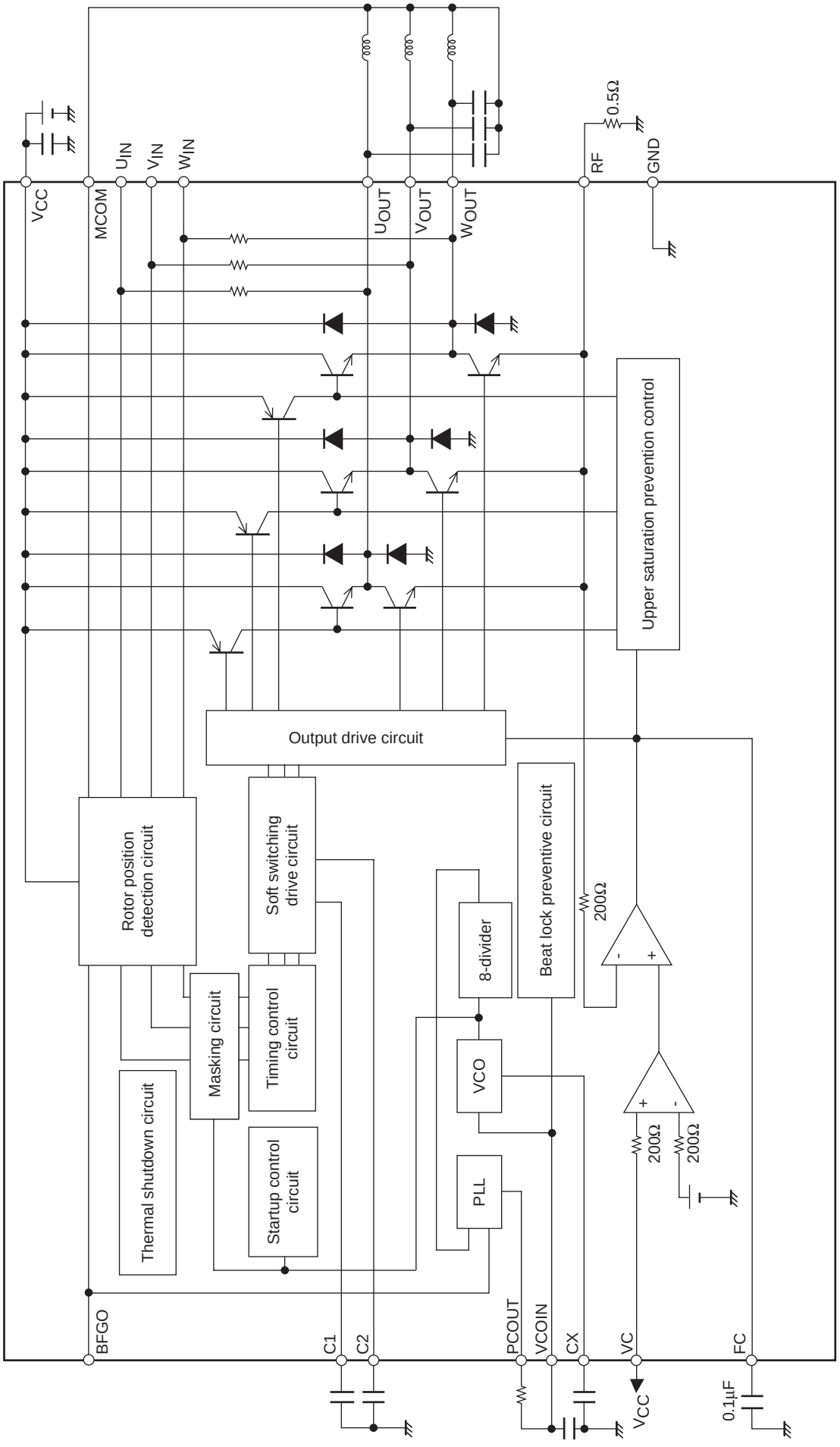


Pin Assignment

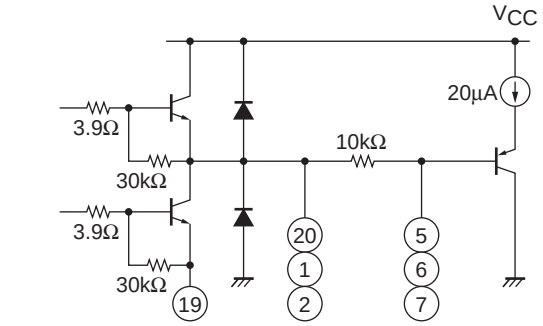
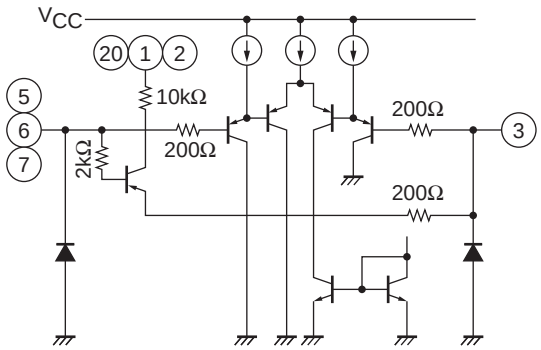
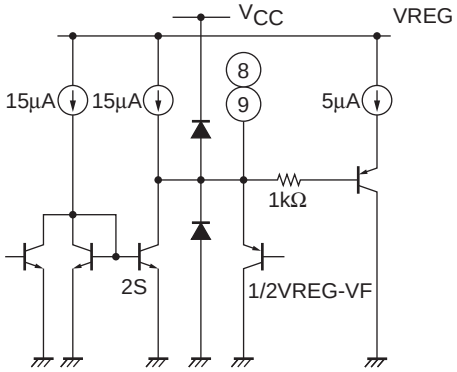
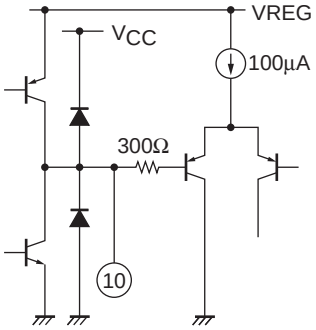
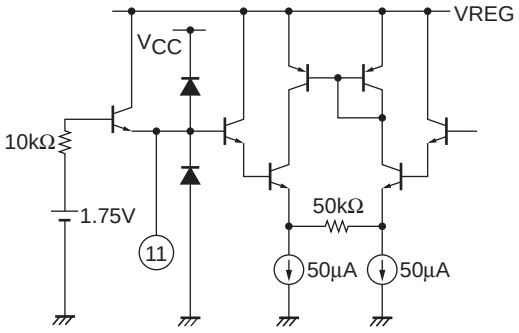


Top view

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



Pin Functions

Pin No.	Pin name	Function	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 constantcurrent control. The current limiter is also activated upon detection of this potential.	
4	V_{CC}	Power supply pin. (8 to 13.8V)	
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 10kΩ	
6	V_{IN}		
7	W_{IN}		
8	C1	Triangular wave generating capacitor connection pin. This triangsular 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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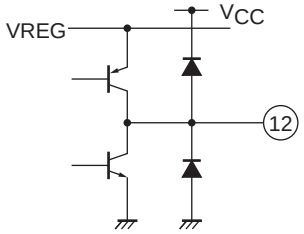
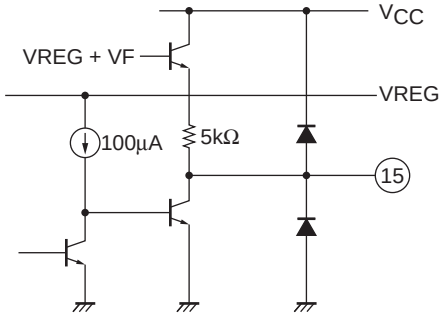
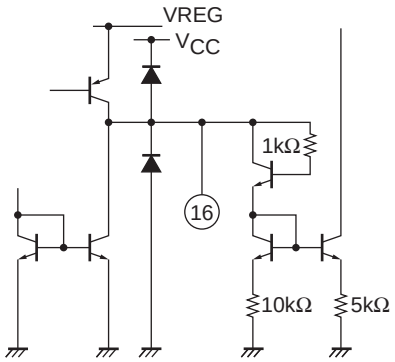
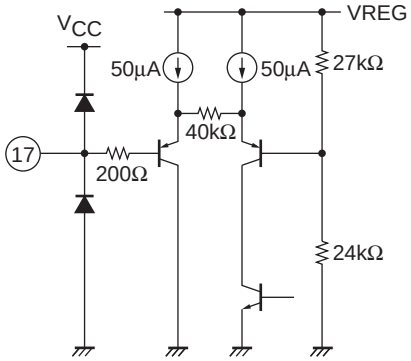
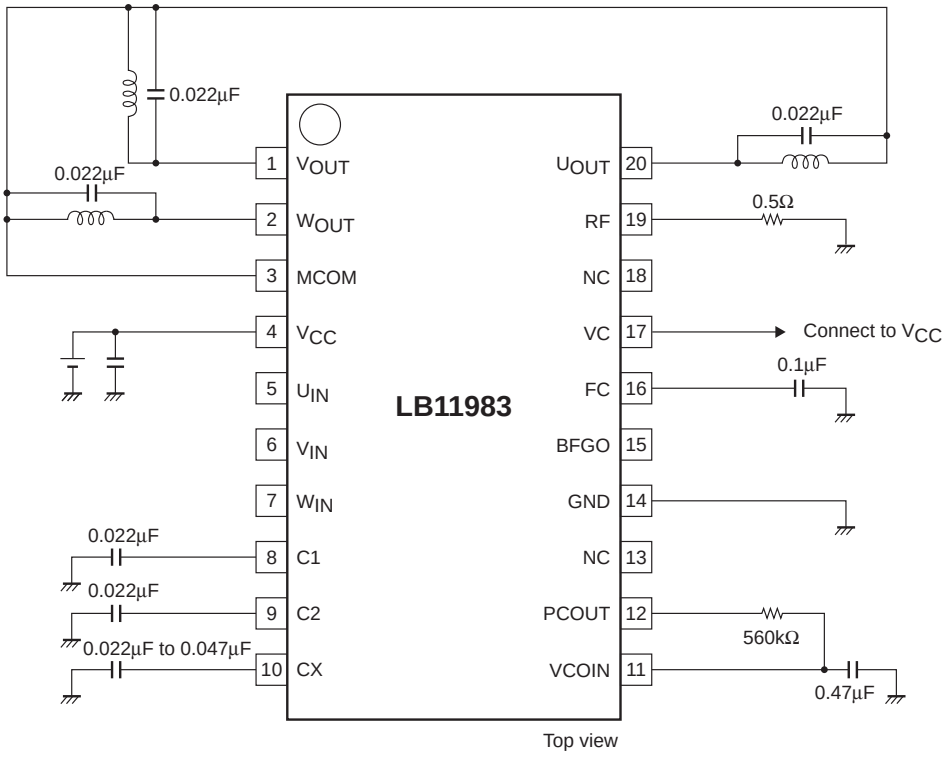
Pin No.	Pin name	Function	Equivalent circuit
12	PCOUT	VCO circuit PLL output pin.	
14	GND	GND for others than the output transistor.	
15	BFGO	FG output to detect motor reverse feeder voltage. (Composition of three phases)	
16	FC	Frequency characteristics compensation pin. Insertion of a capacitor between 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.	

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.