Ordering number : ENA0674

SANYO Semiconductors
DATA SHEET

LB11683V — Monolithic Digital IC Three-Phase Sensorless Motor Driver

Overview

The LB11683V is a three-phase full-wave current-linear-drive motor driver IC. It adopts a sensorless control system without the use of a Hall effect device. For quieter operation, the LB11683V features a current soft switching circuit and is optimal for driving the cooling fan motors used in refrigerators, etc.

Functions

- Current linear drive
- Built-in current limiter circuit
- Output stage oversaturation prevention circuit
- Coil counter-electromotive FG output
- Built-in thermal shutdown circuit
- Beat lock prevention circuit
- Lock protection circuit
- Lock detection output

Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{CC} max		14.5	V
Output applied voltage	V_O max		14.5	V
Input applied voltage	V_I max		-0.3 to V_{CC}+0.3	V
Output current	I_O max		1.5	A
Allowable power dissipation	Pd max	Independent IC	0.5	W
Operating temperature	Topr		-30 to +85	°C
Storage temperature	Tstg		-55 to +150	°C

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Allowable Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage 1	V_{CC}	All operating circuits other than internal 5V Reg.	5.5 to 7.0	V
Supply voltage 2	V_{CC}	All operating circuits.	7.0 to 13.8	V

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

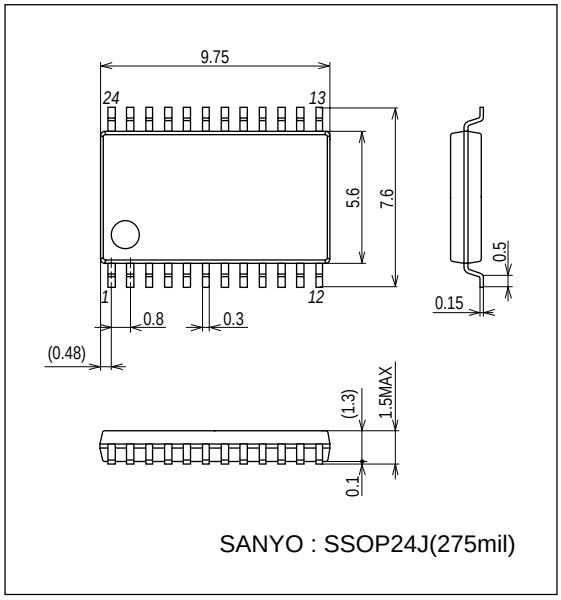
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Supply current	I_{CC}	VC=V_{CC} VFC=0V		10	15	mA
Output saturation voltage 1	V_OSAT1	I_O=0.4A, Source+Sink		1.4	2.0	V
Output saturation voltage 2	V_OSAT2	I_O=0.8A, Source+Sink, R_F=0Ω		1.8	2.6	V
MCOM pin common-phase input voltage range	VIC		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 CX=0.022μF	330	400	500	Hz
VCO maximum frequency	fVCOMAX	VCOIN=5V CX=0.022μF	14.8	18.5	22.3	kHz
C1, C2 source current ratio	RSOURCE	1-(IC1SOURCE/IC2SOURCE)	-12		+12	%
C1, C2 sink current ratio	RSINK	1-(IC1SINK/IC2SINK)	-12		+12	%
C1 source, sink current ratio	RC1	IC1SOURCE/IC1SINK		50		%
C2 source, sink current ratio	RC2	IC2SOURCE/IC2SINK		50		%
Counter-electromotive FG output ON voltage	VOL	IFGO=1mA			0.4	V
CT pin charge current	ICT1	Source current	1.2	1.6		μA
CT pin discharge current	ICT2	Sink current	50	77		nA
Lock protection detection voltage	VRD1		2.3	2.45	2.6	V
Lock protection reset voltage	VRD2		1.13	1.26	1.39	V
RD pin leak current	IRDLEAK				10	μA
RD pin output L_O voltage	VRDL	I_O=1mA		100	400	mV
Current limiter setting voltage			0.45	0.5	0.55	V
Thermal shutdown operating temperature	TTSD	Design target *	150	180	210	°C
Thermal shutdown hysteresis	ΔTTSD	Design target *		15		°C

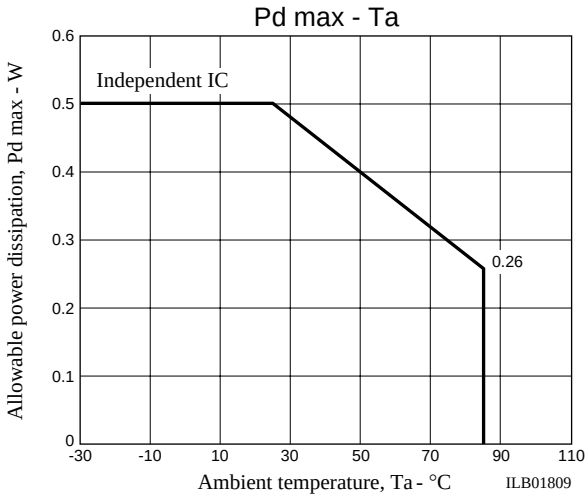
*: Design target value and no measurement is made.

Package Dimensions

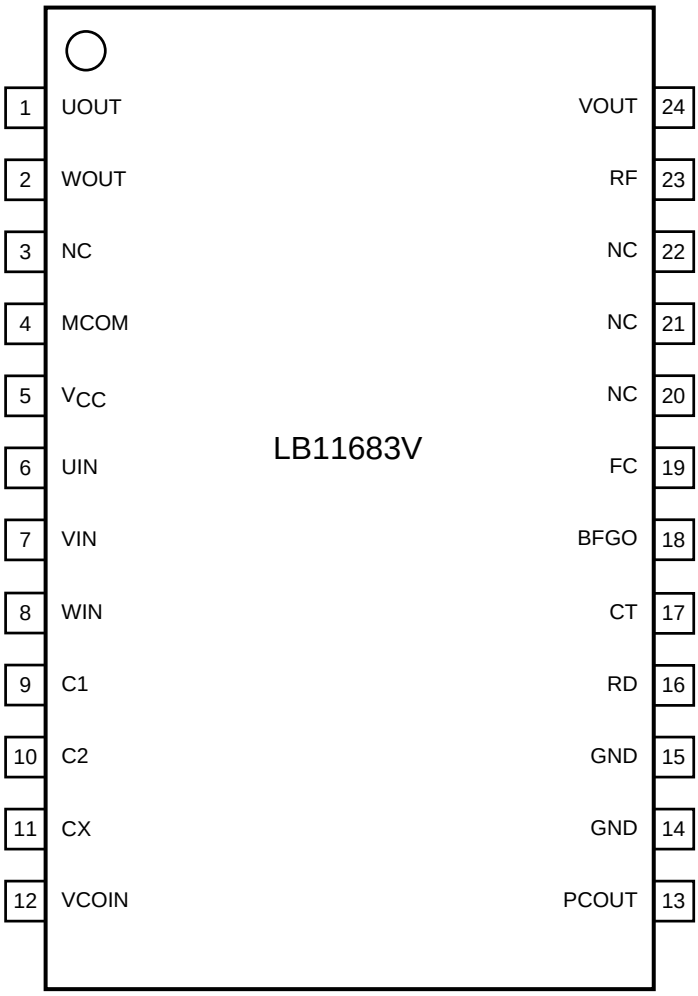
unit : mm (typ)

3315



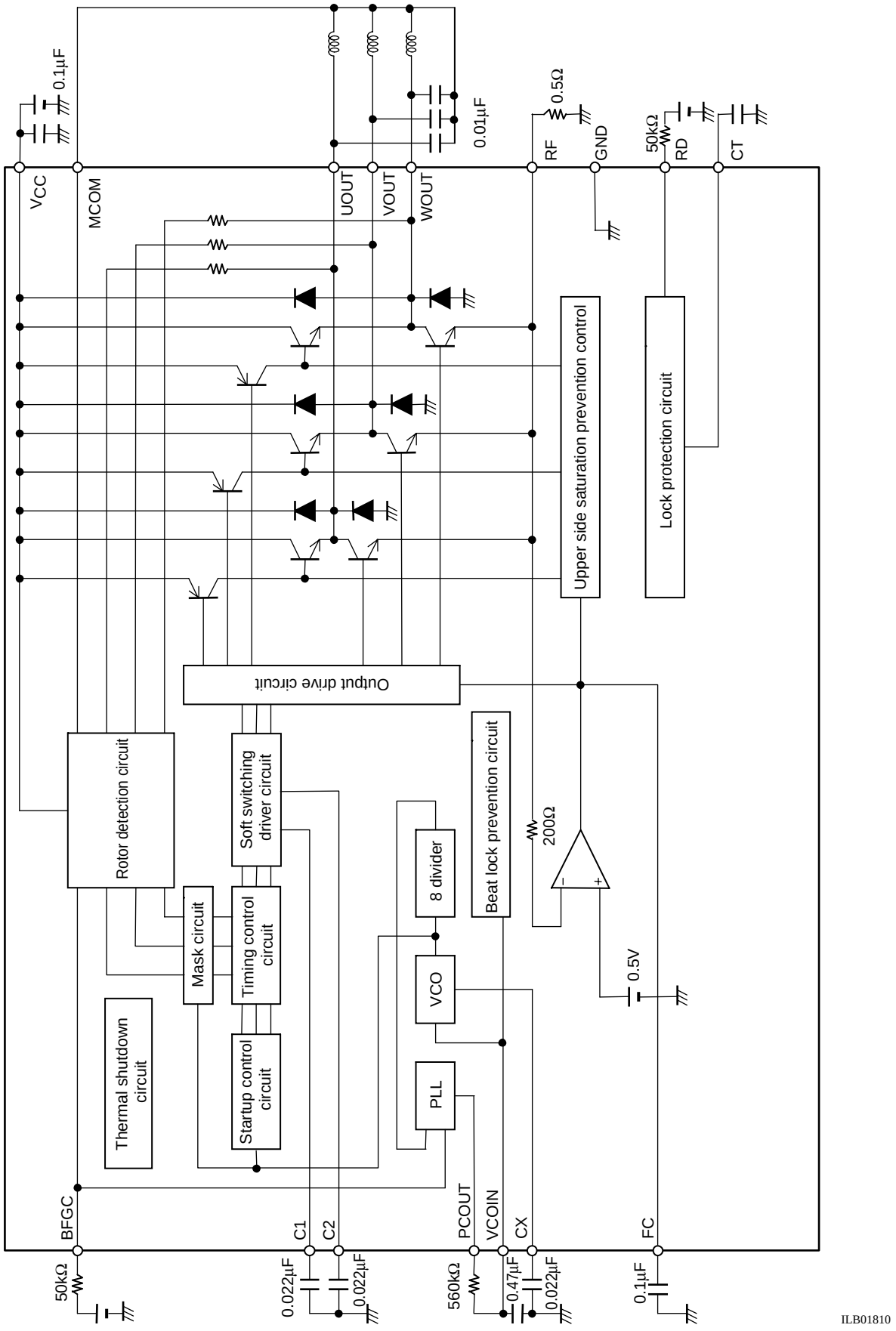


Pin Assignment

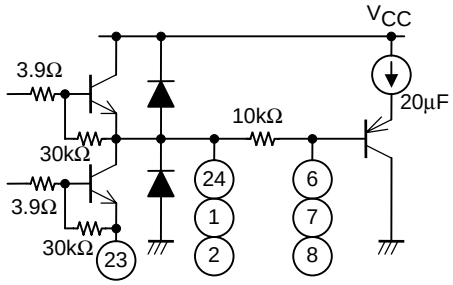
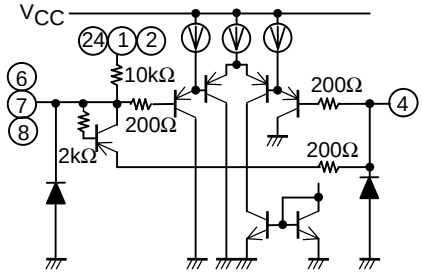
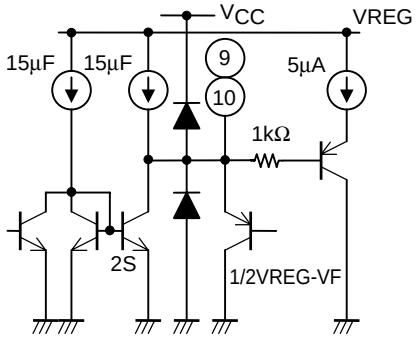
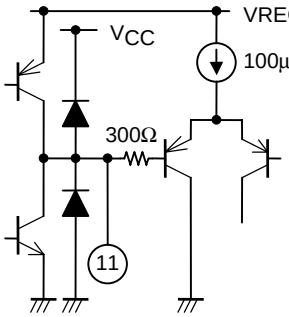
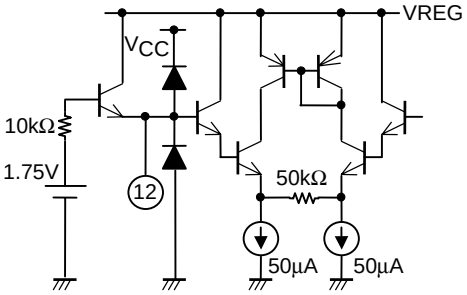


Top view

Block Diagram



Pin Functions

Pin No.	Symbol	Pin Voltage	Equivalent Circuit Diagram	Description
24	UOUT			3-phase motor driver output
1	VOUT			
2	WOUT			
23	RF			Minimum potential of 3-phase motor driver output transistor. Constant current control is made through detection of this voltage. The current limiter also functions by detecting this potential.
5	V_{CC}	8 to 13.8V		Power supply
4	MCOM			Motor coil neutral point input pin. The coil voltage waveform is detected with reference to this voltage.
6	UIN			Coil waveform detection comparator input pin. This pin is connected to each phase output through the internal 10kΩ resistor.
7	VIN			
8	WIN			
9	C1			Triangular wave generating capacitor connection pin. This triangular wave performs soft-switching of the coil output waveforms.
10	C2			
11	CX			In the VCO circuit, the operation frequency range and minimum operation frequency are determined by means of the capacitor value connected this pin and ground.
12	VCOIN			VCO circuit voltage input pin. The PCOUT pin voltage is input via CR filter.

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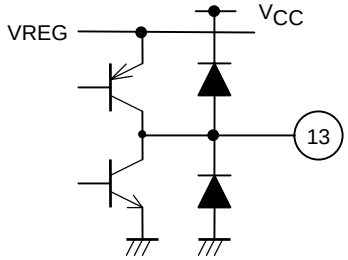
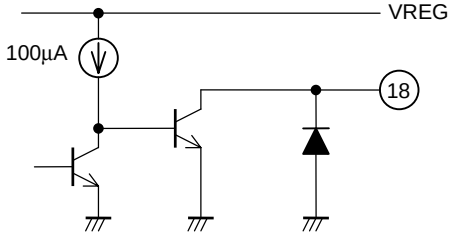
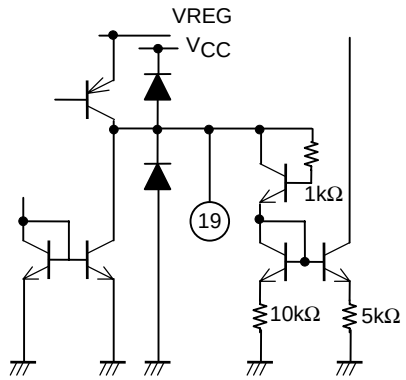
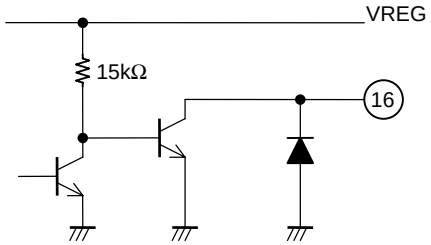
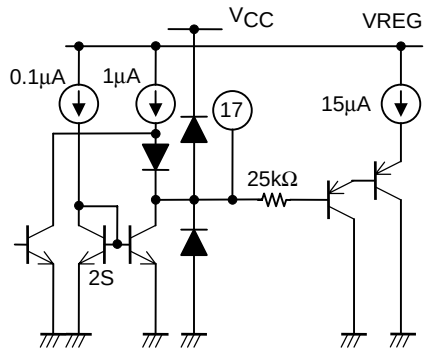
Pin No.	Symbol	Pin Voltage	Equivalent Circuit Diagram	Description
13	PCOUT			VCO circuit PLL output
14 15	GND			Ground for all other than the output transistor
18	BFGO			Motor counter-electromotive voltage detection FG output (single-phase only). Open collector output
19	FC			Frequency characteristics compensation pin. Insertion of a capacitor between this pin and ground stops oscillation of the closed loop of current control system.
16	RD			Lock detection output. When motor is running: low-level When motor is locked: high-level Open collector output
17	CT			Lock protection ON/OFF time setting capacitor connection pin. The capacitor connected between this pin and ground determines the driver ON/OFF time when the motor is locked.