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LB11683H

Monolithic Digital IC Three-Phase Sensorless Motor Driver

Overview

The LB11683H 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 LB11683H 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 $T_a = 25^\circ\text{C}$

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	P_d max1	Independent IC	0.8	W
	P_d max2	Mounted on a board *	1.85	W
Operating temperature	T_{opr}		-30 to +85	$^\circ\text{C}$
Storage temperature	T_{stg}		-55 to +150	$^\circ\text{C}$

* Specified board: 114.3mm × 76.1mm × 1.6mm, glass epoxy board.

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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

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 $T_a = 25^\circ\text{C}$, $V_{CC} = 12\text{V}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Supply current	I_{CC}	$V_C = V_{CC}$ $V_{FC} = 0\text{V}$		10	15	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-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	$V_{COIN} = 5\text{V}$		0.1	0.2	μA
VCO minimum frequency	fVCOMIN	$V_{COIN} = \text{open}$ $C_X = 0.022\mu\text{F}$	330	400	500	Hz
VCO maximum frequency	fVCOMAX	$V_{COIN} = 5\text{V}$ $C_X = 0.022\mu\text{F}$	14.8	18.5	22.3	kHz
C1, C2 source current ratio	RSOURCE	$1 - (I_{C1SOURCE} / I_{C2SOURCE})$	-12		+12	%
C1, C2 sink current ratio	RSINK	$1 - (I_{C1SINK} / I_{C2SINK})$	-12		+12	%
C1 source, sink current ratio	RC1	$I_{C1SOURCE} / I_{C1SINK}$		50		%
C2 source, sink current ratio	RC2	$I_{C2SOURCE} / I_{C2SINK}$		50		%
Counter-electromotive FG output ON voltage	VOL	$I_{FGO} = 1\text{mA}$			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	$I_O = 1\text{mA}$		100	400	mV
Current limiter setting voltage			0.45	0.5	0.55	V
Thermal shutdown operating temperature	TTSD	Design target *	150	180	210	$^\circ\text{C}$
Thermal shutdown hysteresis	ΔTTSD	Design target *		15		$^\circ\text{C}$

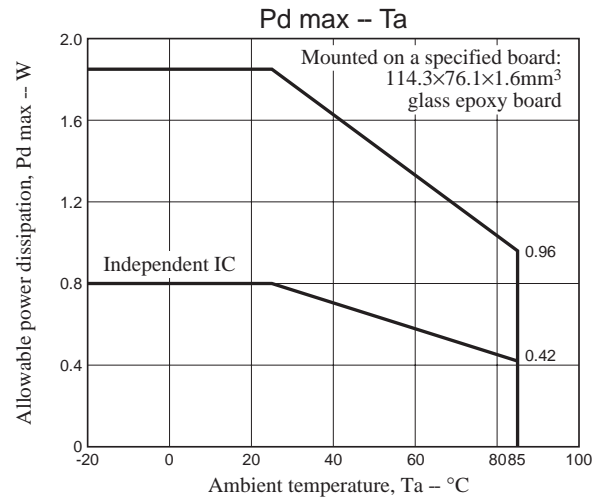
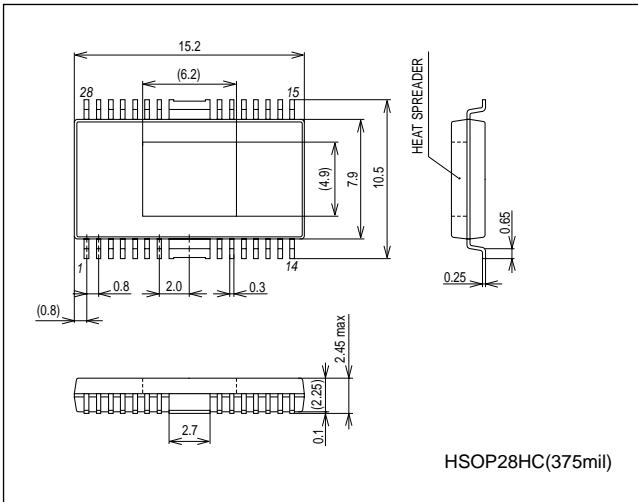
*: Design target value and no measurement is made.

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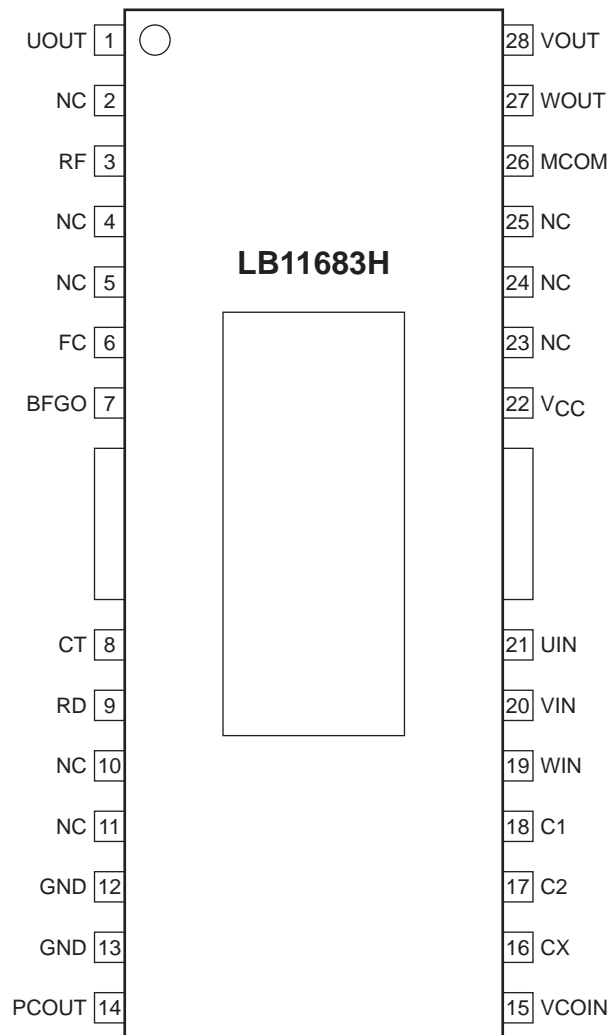
Package Dimensions

unit : mm (typ)

3315

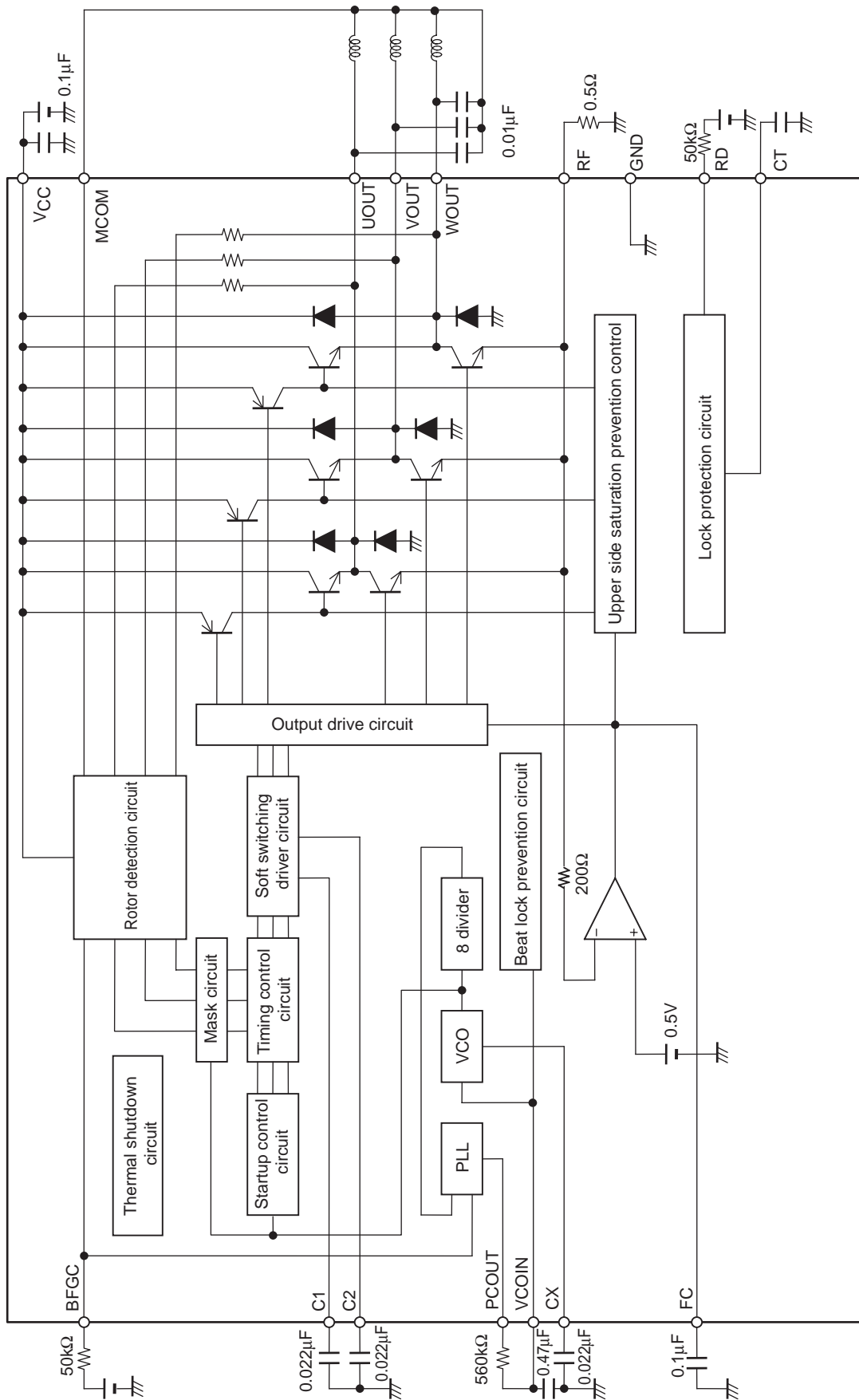


Pin Assignment



Top view

Block Diagram



ILB01810

Pin Functions

Pin No.	Symbol	Description	Pin Voltage	Equivalent Circuit
1	UOUT	3-phase motor driver output		
28	VOUT			
27	WOUT			
3	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.		
22	VCC	Power supply	8 to 13.8V	
26	MCOM	Motor coil neutral point input pin. The coil voltage waveform is detected with reference to this voltage.		
21	UIN	Coil waveform detection comparator input pin. This pin is connected to each phase output through the internal 10kΩ resistor.		
20	VIN			
19	WIN			
18	C1	Triangular wave generating capacitor connection pin. This triangular wave performs soft-switching of the coil output waveforms.		
17	C2			
16	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.		
15	VCOIN	VCO circuit voltage input pin. The PCOUT pin voltage is input via CR filter.		

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Pin No.	Symbol	Description	Pin Voltage	Equivalent Circuit
14	PCOUT	VCO circuit PLL output		
12 13	GND	Ground for all other than the output transistor		
7	BFGO	Motor counter-electromotive voltage detection FG output (single-phase only). Open collector output		
6	FC	Frequency characteristics compensation pin. Insertion of a capacitor between this pin and ground stops oscillation of the closed loop of current control system.		
9	RD	Lock detection output. When motor is running: low-level When motor is locked: high-level Open collector output		
8	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.		

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