



SANYO Semiconductors

DATA SHEET

An ON Semiconductor Company

LB1868M — Monolithic Digital IC 2-phase Brushless Fan Motor Driver

Overview

The LB1868M is a 2-phase unipolar brushless motor driver. With only a few peripheral parts, lockup protection and automatic recovery can be implemented. The IC can be configured for 12V or 24V operation and a wide range of variations, from Low speed to H-High speed and from 60cm to 120cm square using the same PCB. This makes it easy to design highly reliable fan motor installations.

Features

- Output protection Zener diode with variable withstand voltage
Z1, Z2 pins open: $V_{OLM} = 57V$ (24V specification)
Z1, Z2 pins shorted: $V_{OLM} = 32V$ (12V specification)
External Zener diode connected across Z1 – V_{CC} pins: support for fans with large drive current
- External resistor allows configuration for 12V or 24V
- Direct Hall element connection possible (built-in Hall amplifier with hysteresis supports core without auxiliary electrode)
- Built-in output transistor with 1.0A output current (strengthened negative-current support for core without auxiliary electrode)
- Built-in rotation detection function: Low during rotation and High during stop
- Built-in lockup protection with automatic recovery
- ST pin for motor stop/drive (for standby mode of copiers etc.)
- BC pin for kickback noise reduction (with 2 external capacitors)
- FG output pin for rotation detection
- Built-in thermal shutdown

Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum input current	$I_{CC\ max}$	$t \leq 20ms$	200	mA
Maximum applied output voltage	$V_{OUT\ max}$		Internal	V
Maximum output current	$I_{OUT\ max}$		1.0	A
Current flowing into RD, FG	$I_{RD\ max}$		10	mA
RD, FG applied voltage	$V_{RD\ max}$		30	V
ST applied voltage	$V_{ST\ max}$		7.5	V
Allowable power dissipation	$P_d\ max$	Mounted on a specified board *	800	mW
Operating temperature	T_{opr}		-30 to +80	$^\circ C$
Storage temperature	T_{stg}		-55 to +150	$^\circ C$

* Specified board: 20mm × 15mm × 1.5mm, glass epoxy board.

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

Parameter	Symbol	Conditions	Ratings	Unit
Input current range	I_{CC}		6.0 to 50	mA
Common mode input voltage range	V_{ICM}		0.2 to $V_{IN}-1.5$	V
ST High voltage	V_{STH}		4.5 to 7.0	V
ST Low voltage	V_{STL}		0 to 0.5	V

Electrical Characteristics at $T_a = 25^\circ\text{C}$, $I_{CC} = 10\text{mA}$

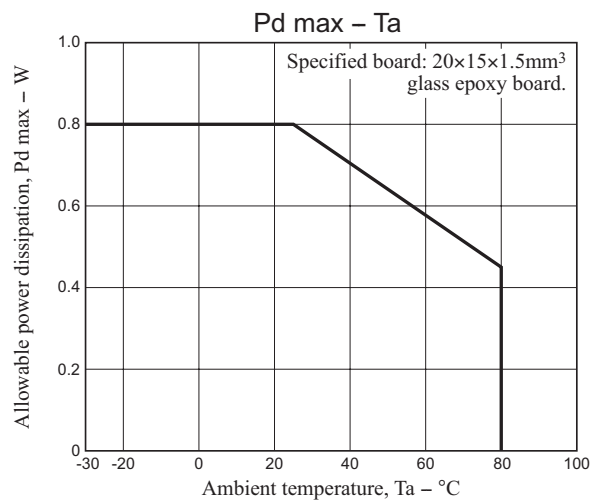
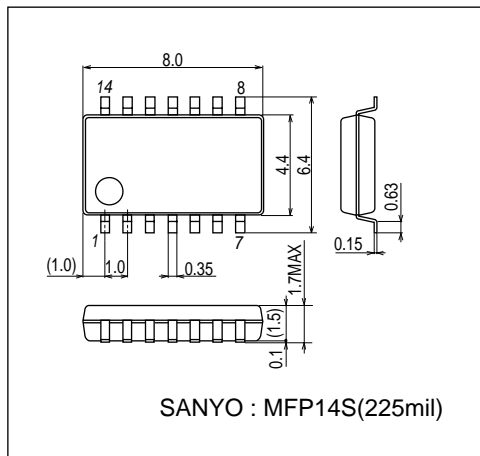
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output limiter withstand voltage	V_{OLM1}	Z1, Z2 open	54	57	60	V
	V_{OLM2}	Z1, Z2 short	31	33	35	V
Output saturation voltage	V_{Osat1}	$I_O = 0.5\text{A}$		0.95	1.2	V
	V_{Osat2}	$I_O = 1.0\text{A}$		1.15	1.5	V
V_{IN} voltage	V_{IN}	$I_{CC} = 7.0\text{mA}$	6.4	6.7	7.0	V
Hall input sensitivity (at zero peak)	V_{HN}	Including offset and hysteresis			20	mV
RD, FG output saturation voltage	V_{RDSat}	$I_{RD} = 5\text{mA}$		0.1	0.3	V
CT drain current	IC1	C = GND	2.7	3.8	4.9	μA
CT discharge current	IC2	C = V_{IN}	0.19	0.30	0.41	μA
Comp input threshold voltage	V_{TH1}		0.77	$0.8V_{IN}$	0.83	V
	V_{TH2}		0.42	$0.45V_{IN}$	0.48	V
ST input current	I_{ST}	$V_{ST} = 5\text{V}$		80	120	μA
Thermal protection operating temperature	TSD	Design target value *		180		$^\circ\text{C}$
Thermal protection circuit hysteresis	ΔTSD	Design target value *		40		$^\circ\text{C}$

* Design target value, Do not measurement.

Package Dimensions

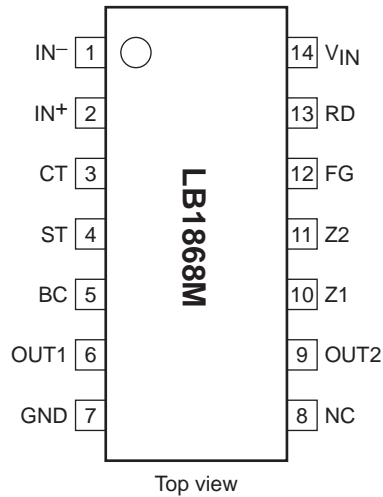
unit : mm (typ)

3111A



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Pin Assignment



Pin Function

Pin No.	Pin name	Function
1	IN ⁻	Hall input + pin. Hysteresis amplifier
2	IN ⁺	Hall input – pin. Hysteresis amplifier
3	CT	Lockup protection time setting capacitor pin (0.47 to 4.7 μ F).
4	ST	Start/stop pin.
5	BC	Output transistor common base pin.
6	OUT1	Output 1 pin.
9	OUT2	Output 2 pin.
7	GND	GND pin.
10	Z1	External Zener diode pin (external Zener diode to be connected between power supply and Z1).
11	Z2	Kickback absorption voltage alteration pin (shorted to Z1: 12V operation).
12	FG	Rotation frequency detector pin.
13	RD	Lockup detection pin (latch type).
14	V _{IN}	Regulated power supply input pin (limiting resistor to be inserted between power supply and V _{IN}).

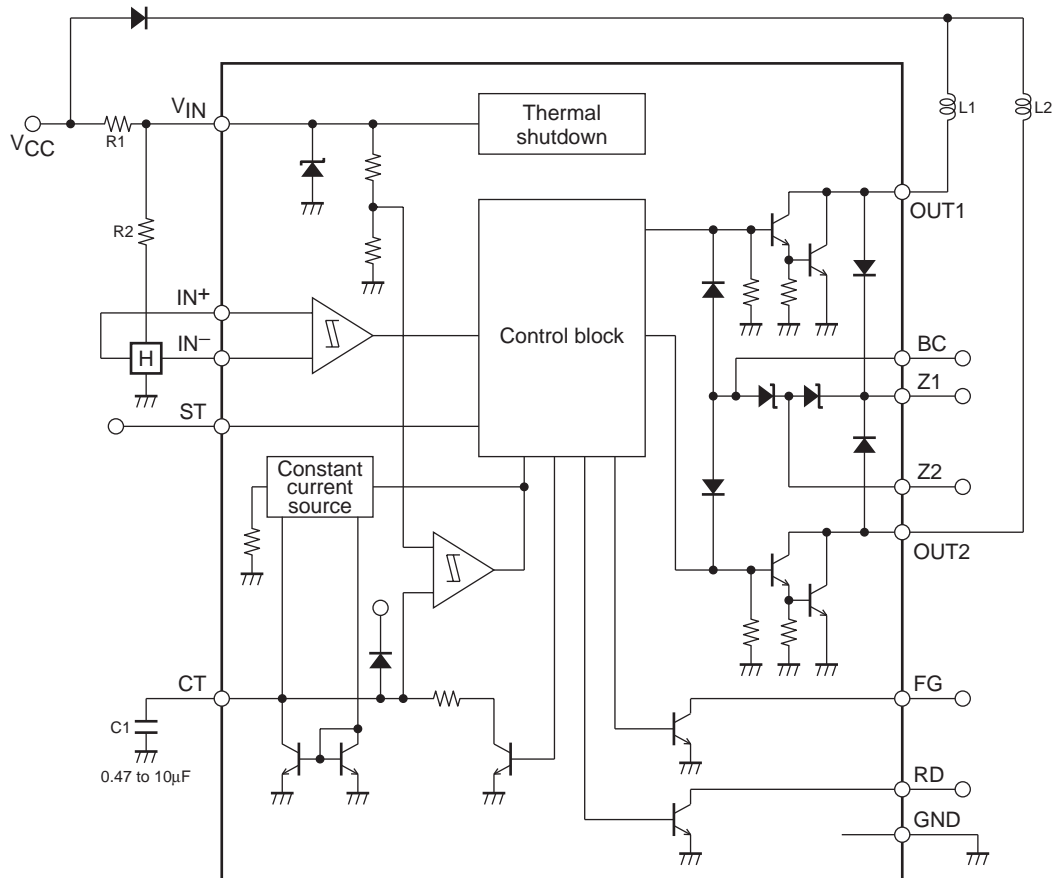
Truth Table

ST	IN ⁺	IN ⁻	CT	OUT1	OUT2	RD	FG
H	H	L	L	H	H	L	L
	L	H	L	H	H	L	H
L or OPEN	H	L	L	H	L	L	L
	L	H	L	L	H	L	H
	H	L	H	H	H	H	L
	L	H	H	H	H	H	H

* RD is a latch type output

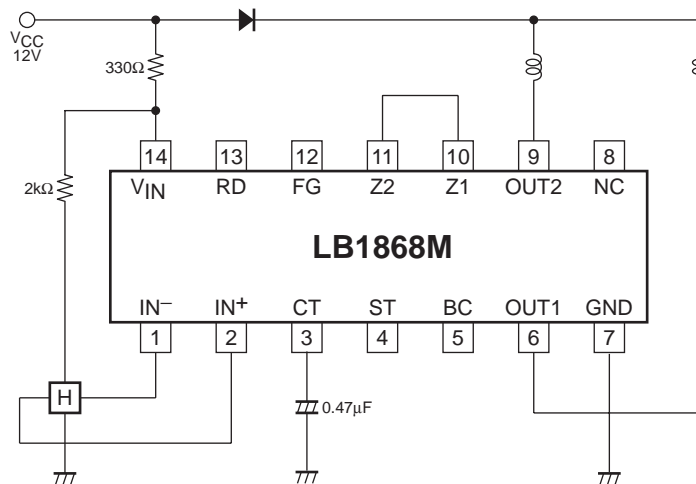
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Block Diagram



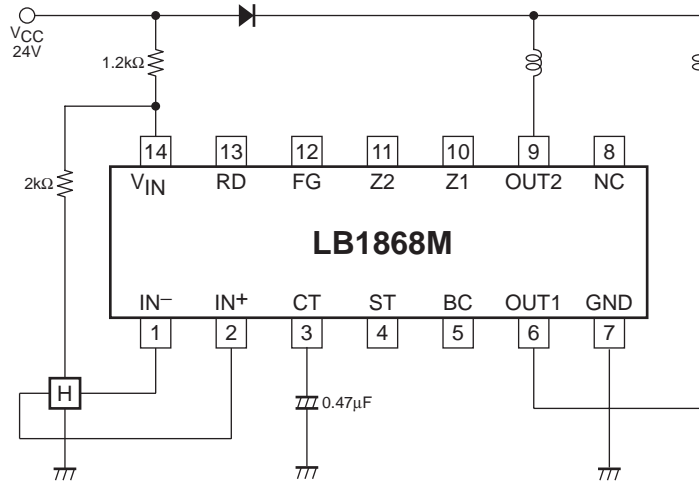
Application Circuit Example

(1) 12V supply voltage

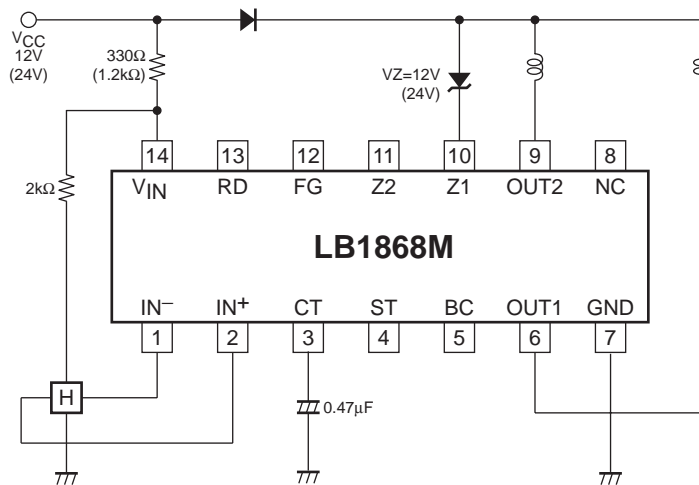


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(2) 24V supply voltage



(3) High-Power Fan (120mm-HH-Speed)



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