



# LB1868M

## Two-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 60 cm to 120 cm square using the same PCB. This makes it easy to design highly reliable fan motor installations.

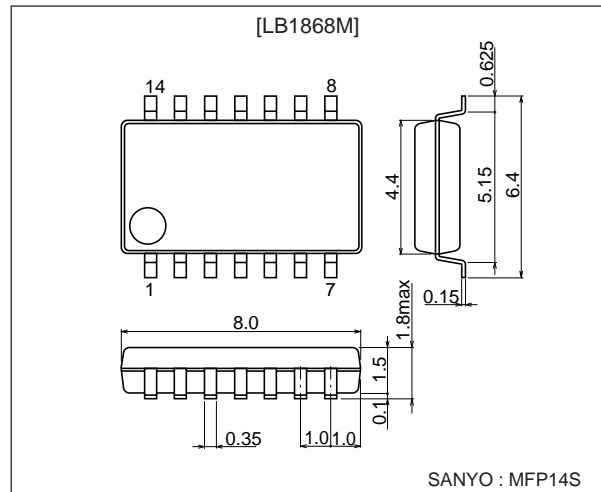
### Functions and Features

- 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 between Z1 and  $V_{CC}$  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.)
- FG output pin for rotation detection
- BC pin for kickback noise reduction (with 2 external capacitors)
- Built-in thermal shutdown

### Package Dimensions

unit: mm

#### 3111-MFP14S



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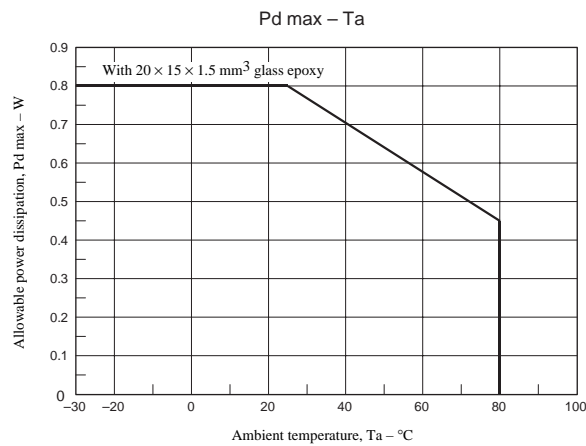
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Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum input current	I <sub>CC</sub> max	t ≤ 20 ms	200	mA
Maximum applied output voltage	V <sub>OUT</sub> max		Internal	V
Maximum output current	I <sub>OUT</sub> max		1.0	A
Current flowing into RD, FG	IRD max		10	mA
RD, FG applied voltage	V <sub>RD</sub> max		30	V
ST applied voltage	V <sub>ST</sub> max		7.5	V
Allowable power dissipation	Pd max	*With specified substrate	800	mW
Operating temperature	Topr		-30 to +80	°C
Storage temperature	Tstg		-55 to +150	°C

\*Printed circuit board: 20 × 15 × 1.5 mm<sup>3</sup> glass epoxy



Allowable Operating Ranges at Ta = 25°C

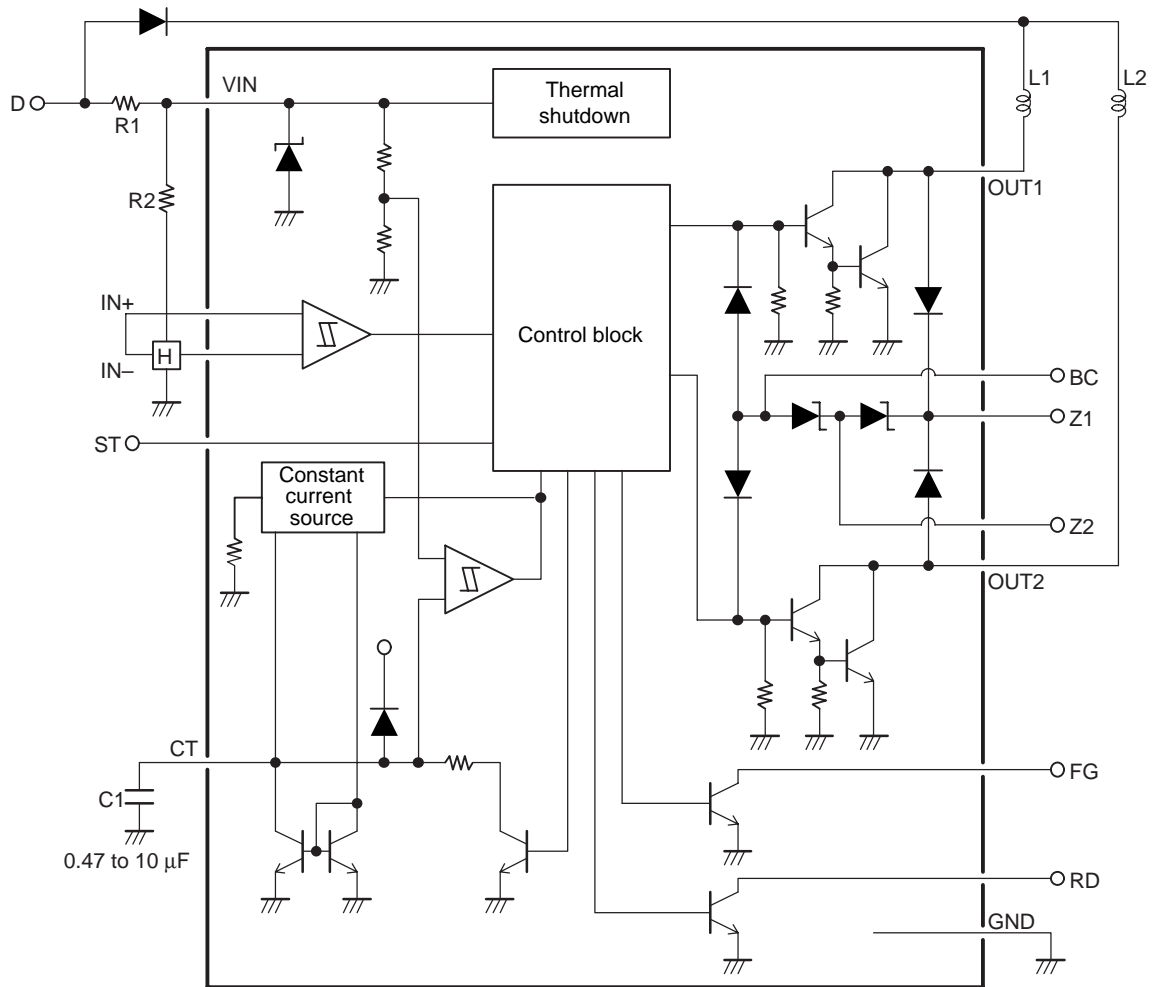
Parameter	Symbol	Conditions	Ratings	Unit
Input voltage range	I <sub>CC</sub>		6.0 to 50	mA
Common mode input voltage range	V <sub>ICM</sub>		0.2 to V <sub>IN</sub> -1.5	V
ST High voltage	V <sub>STH</sub>		4.5 to 7.0	V
ST Low voltage	V <sub>STL</sub>		0 to 0.5	V

Electrical Characteristics at Ta = 25°C, Icc = 10 mA

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output limiter withstand voltage	V <sub>OLM1</sub>	Z1, Z2 open	54	57	60	V
	V <sub>OLM2</sub>	Z1, Z2 short	31	33	35	V
Output saturation voltage	V <sub>osat</sub> 1 2	I <sub>o</sub> = 0.5A		0.95	1.2	V
		I <sub>o</sub> = 1.0A		0.15	1.5	V
V <sub>IN</sub> voltage	V <sub>IN</sub>	I <sub>CC</sub> = 7.0 mA	6.4	6.7	7.0	V
Hall input sensitivity (at zero peak)	V <sub>HN</sub>	Including offset and hysteresis			20	mV
RD, FG output saturation voltage	V <sub>RDsat</sub>	IRD = 5 mA		0.1	0.3	V
CT drain current	I <sub>C1</sub>	C = GND	2.7	3.8	4.9	μA
CT discharge current	I <sub>C2</sub>	C = V <sub>IN</sub>	0.19	0.30	0.41	μA
Comp input threshold voltage	V <sub>TH1</sub>		0.77	0.8V <sub>IN</sub>	0.83	V
	V <sub>TH2</sub>		0.42	0.45V <sub>IN</sub>	0.48	V
ST input current	I <sub>ST</sub>	V <sub>ST</sub> = 5V		80	120	μA
Thermal protection circuit operating temperature	TSD	Design target value*		180		°C
Thermal protection circuit hysteresis	ΔTSD	Design target value*		40		°C

\* Design target values are not measured.

Block Diagram and Sample Application Circuit



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

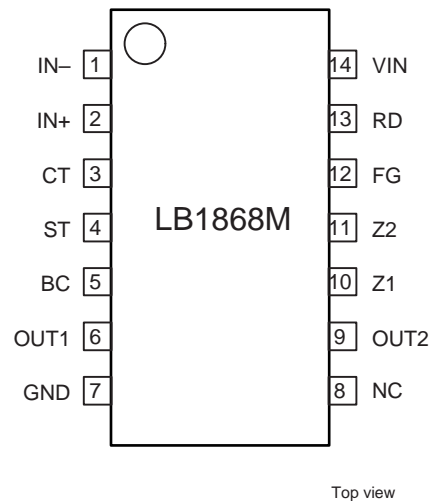
\*RD is a latch type output.

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## Pin Description

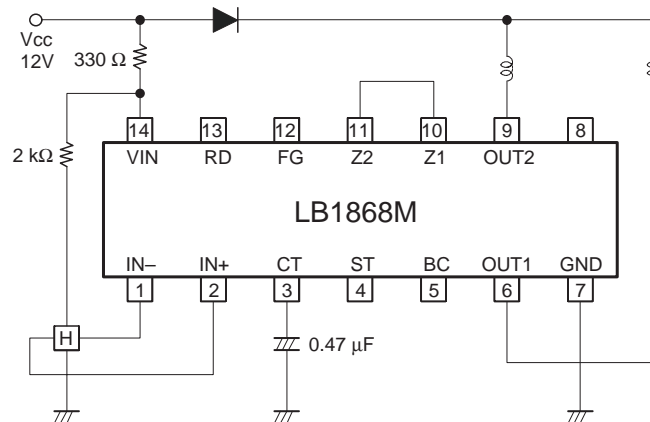
Pin name	Function
IN-	Hall input + pin Hysteresis amplifier
IN+	Hall input – pin Hysteresis amplifier
CT	Lockup protection time setting capacitor pin (0.47 to 4.7 $\mu$ F)
Z1	External Zener diode pin (external Zener diode to be connected between power supply and Z1)
Z2	Kickback absorption voltage alteration pin (shorted to Z1: 12V operation)
OUT1	Output 1 pin
OUT2	Output 2 pin
VIN	Regulated power supply input pin (limiting resistor to be inserted between power supply and VIN)
GND	GND pin
RD	Lockup detection pin (latch type)
FG	Rotation frequency detector pin
ST	Start/stop pin
BC	Output transistor common base pin

## Pin Assignment



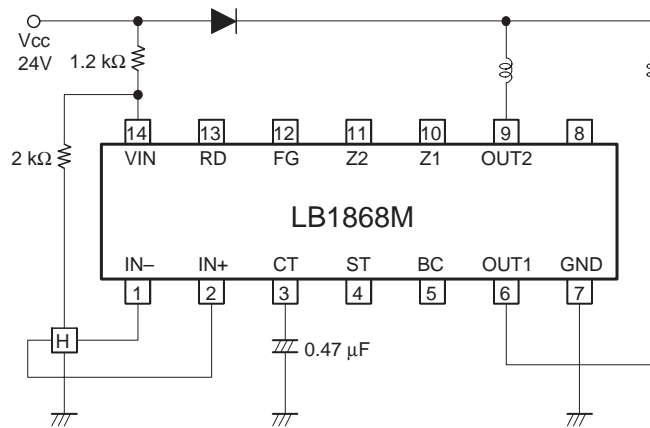
## Sample Application Circuits

(1) 12V supply voltage

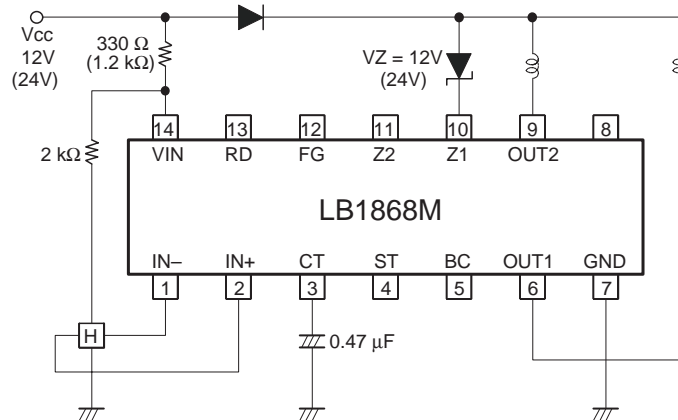


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### (2) 24V supply voltage



### (3) High-Power Fan (120 mm-HH-speed)



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