



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.

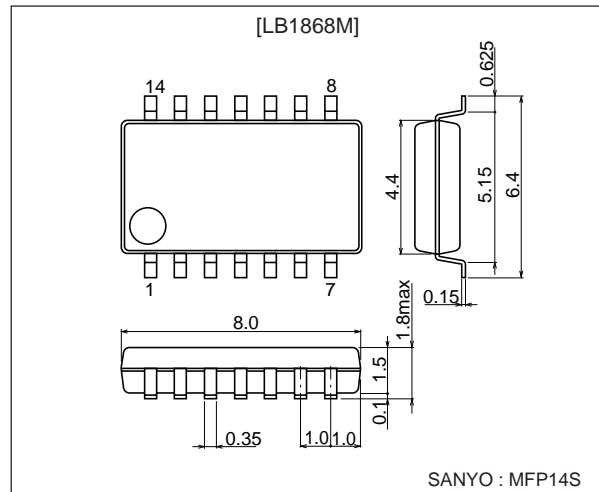
Functions and Features

- 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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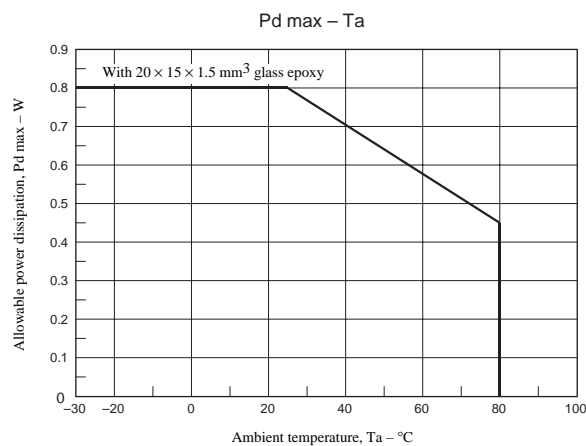
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Specifications

Absolute Maximum Ratings at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|--------------------------------|----------------------|---------------------------|-------------|------|
| Maximum input current | I _{CC} max | t ≤ 20 ms | 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 | IRD max | | 10 | mA |
| RD, FG applied voltage | V _{RD} max | | 30 | V |
| ST applied voltage | V _{ST} 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 mm³ glass epoxy



Allowable Operating Ranges at Ta = 25°C

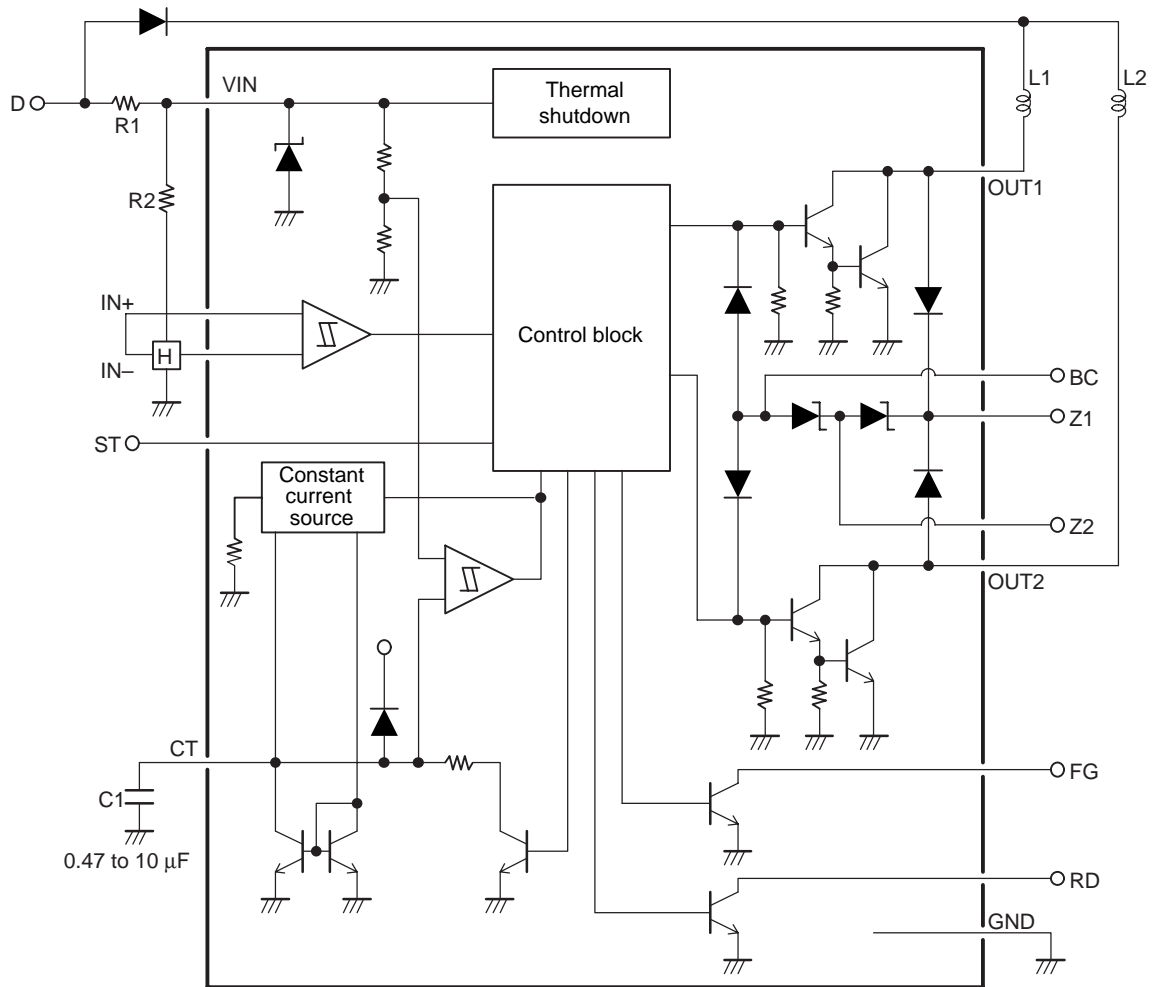
| Parameter | Symbol | Conditions | Ratings | Unit |
|---------------------------------|------------------|------------|-----------------------------|------|
| Input voltage range | I _{CC} | | 6.0 to 50 | mA |
| Common mode input voltage range | V _{ICM} | | 0.2 to V _{IN} -1.5 | V |
| ST High voltage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

Electrical Characteristics at Ta = 25°C, Icc = 10 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 _{osat} 1 2 | I _o = 0.5A | | 0.95 | 1.2 | V |
| | | I _o = 1.0A | | 0.15 | 1.5 | V |
| V _{IN} voltage | V _{IN} | I _{CC} = 7.0 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} | IRD = 5 mA | | 0.1 | 0.3 | V |
| CT drain current | I _{C1} | C = GND | 2.7 | 3.8 | 4.9 | μA |
| CT discharge current | I _{C2} | 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} = 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 |

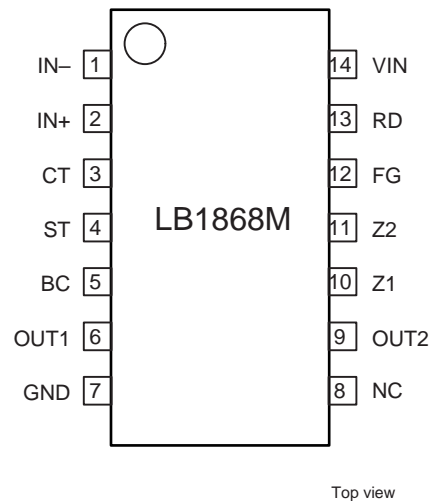
*RD is a latch type output.

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Pin Description

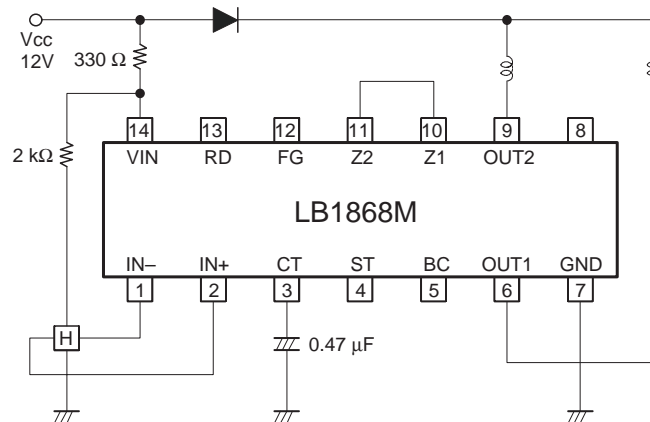
| Pin name | Function |
|----------|--|
| IN- | Hall input + pin Hysteresis amplifier |
| IN+ | Hall input – pin Hysteresis amplifier |
| CT | Lockup protection time setting capacitor pin (0.47 to 4.7 μ F) |
| Z1 | External Zener diode pin (external Zener diode to be connected between power supply and 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



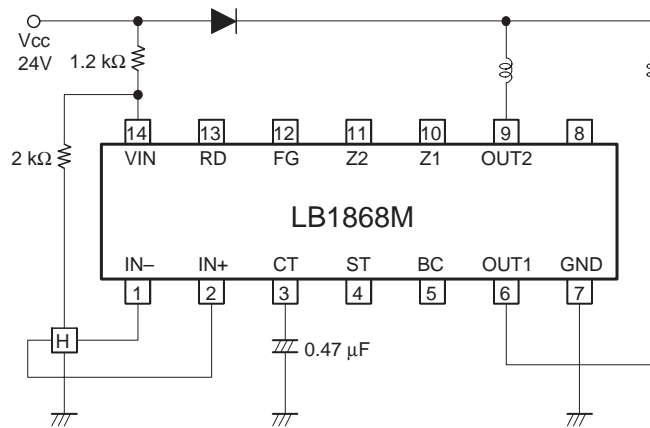
Sample Application Circuits

(1) 12V supply voltage

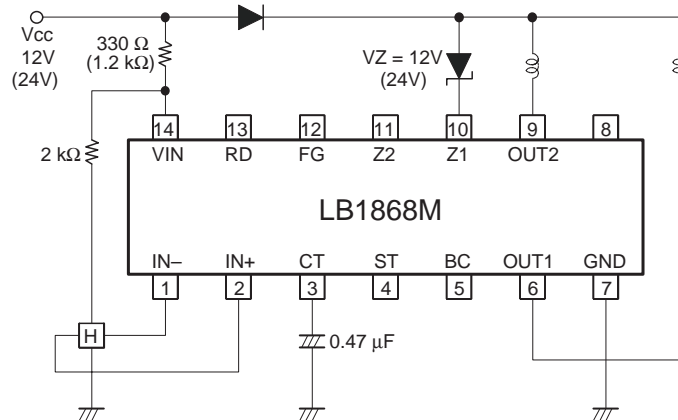


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(2) 24V supply voltage



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



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