Ordering number : ENN6204

Monolithic Digital IC

# LB1867M

## Two-Phase Brushless Fan Motor Driver

## Overview

The LB1867M 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.

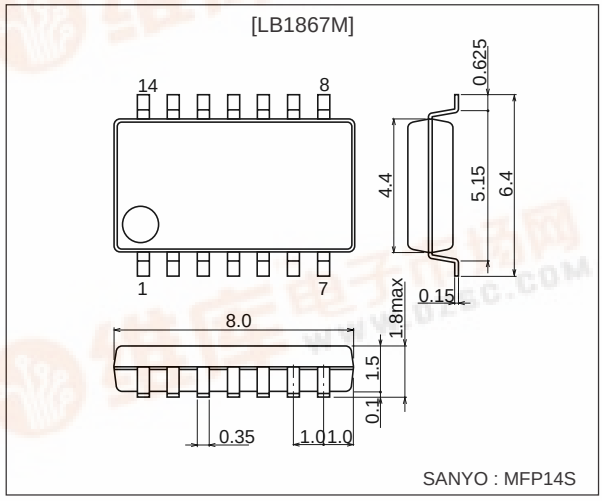
## Functions and Features

- Output protection Zener diode with variable withstand voltage
  Z1, Z2 pins open: VOLM = 57V (24V specification)
  Z1, Z2 pins shorted: VOLM = 32V (12V specification)
  External Zener diode connected across Z1 - VCC 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
- Built-in thermal shutdown

## Package Dimensions

unit: mm

**3111-MFP14S**

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# Specifications

## Absolute Maximum Ratings at Ta = 25˚C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Maximum input current | ICC max | t ≤ 20 ms | 200 | mA |
| Maximum applied output voltage | VOUT max | | Internal | V |
| Maximum output current | IOUT max | | 1.0 | A |
| Maximum current flowing into RD pin | IRD max | | 10 | mA |
| Maximum RD applied voltage | VRD max | | 30 | 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$^3$ glass epoxy)

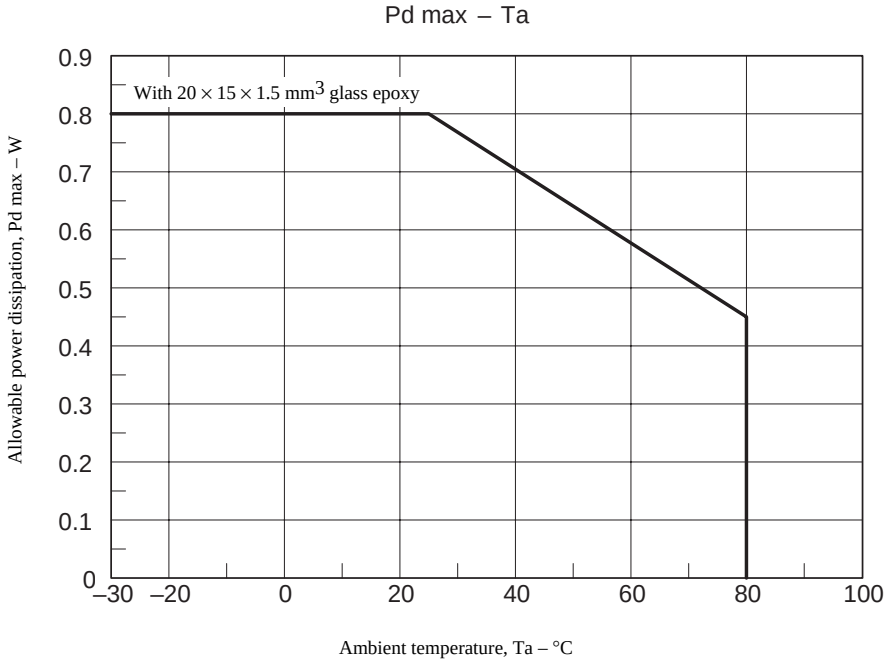
## Allowable Operating Ranges at Ta = 25˚C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Input voltage range | ICC | | 6.0 to 50 | mA |
| Common mode input voltage range | VICM | | 0.2 to VIN–1.5 | V |

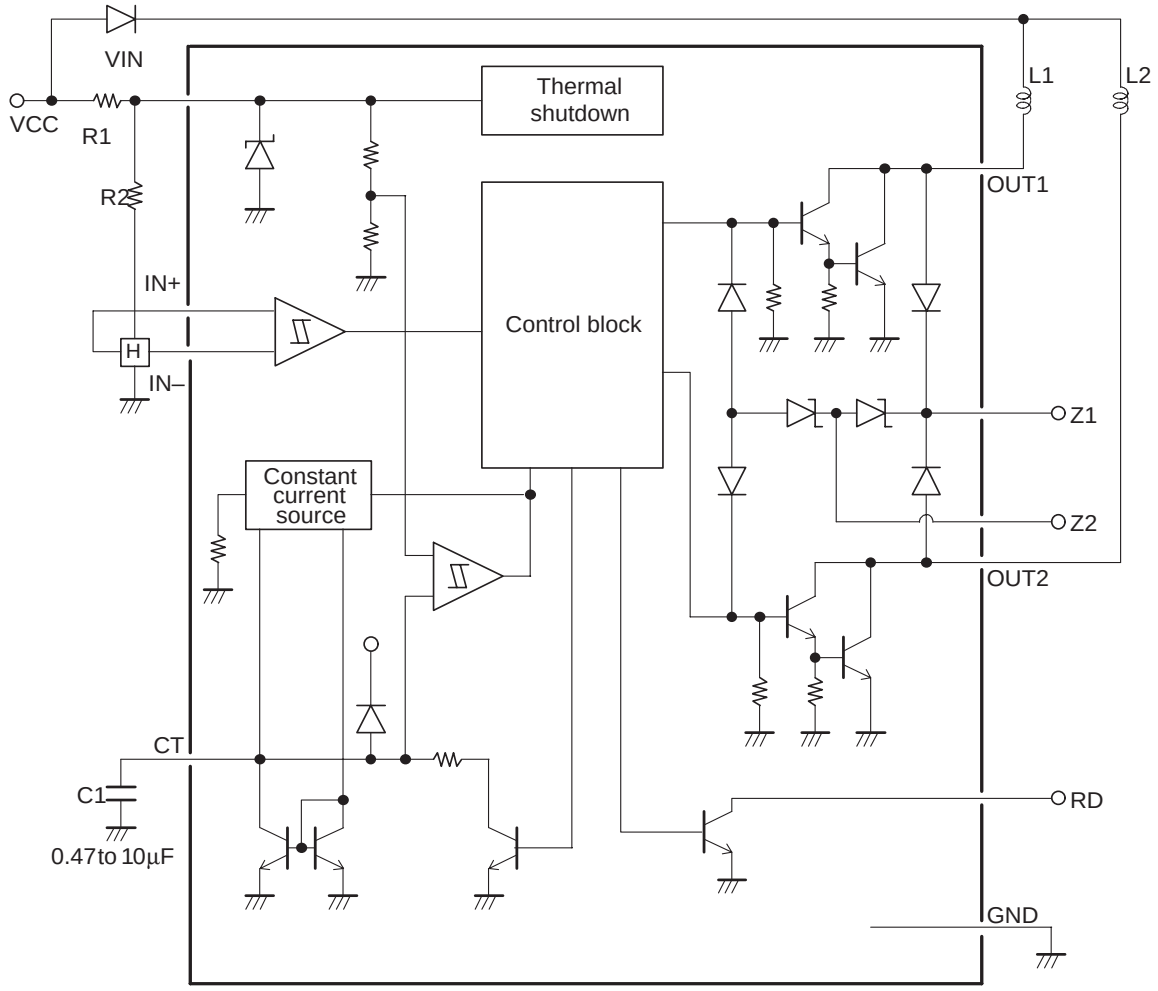
## Electrical Characteristics at Ta = 25˚C, Icc = 10 mA

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Output limiter withstand voltage | VOLM1 | Z1, Z2 open | 54 | 57 | 60 | V |
| | VOLM2 | Z1, Z2 short | 31 | 33 | 35 | V |
| Output saturation voltage | Vosat 1 | Io = 0.5A | | 0.95 | 1.2 | V |
| | 2 | Io = 1.0A | | 0.15 | 1.5 | V |
| VIN voltage | VIN | ICC = 7.0 mA | 6.4 | 6.7 | 7.0 | V |
| Hall input sensitivity (at zero peak) | VHN | Including offset and hysteresis | | | 20 | mV |
| RD output saturation voltage | VRDsat | IRD = 5 mA | | 0.1 | 0.3 | V |
| CT drain current | IC1 | C = GND | 2.7 | 3.8 | 4.9 | µA |
| CT discharge current | IC2 | C = VIN | 0.19 | 0.30 | 0.41 | µA |
| Comp input threshold voltage | VTH1 | | 0.77 | 0.8VIN | 0.83 | V |
| | VTH2 | | 0.42 | 0.45VIN | 0.48 | V |
| Thermal protection 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

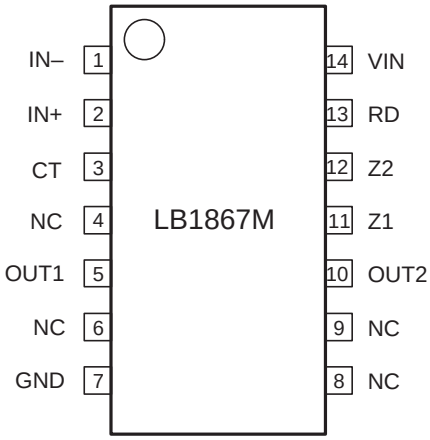
| IN+ | IN– | CT | OUT1 | OUT2 | RD |
|---|---|---|---|---|---|
| H | L | L | H | L | L |
| L | H | L | L | H | L |
| H | L | H | H | H | H |
| L | H | H | H | H | H |

*RD is a latch type output

## 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 µF) |
| 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) |

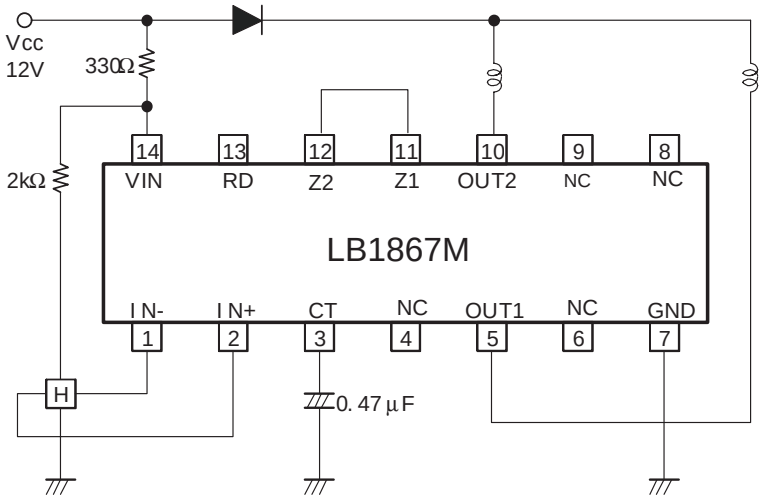
## Pin Assignment



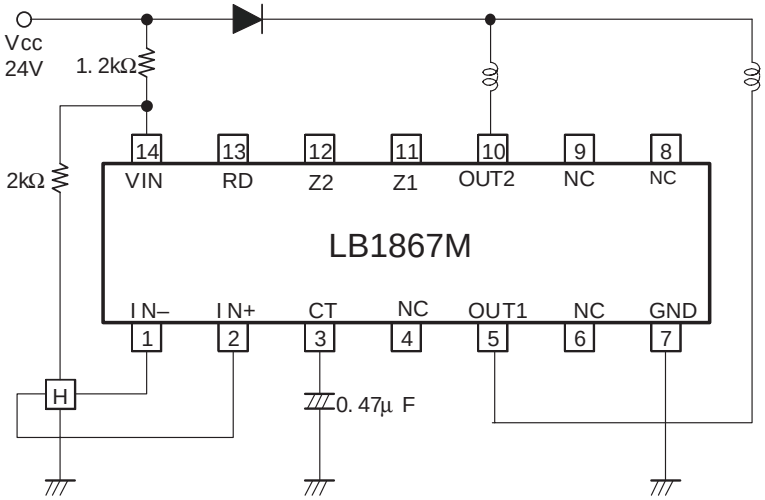

Top view

## LB1867M Sample Application Circuits

(1) 12V supply voltage




(2) 24V supply voltage



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