

# LB1868M

## 2-phase Brushless Fan Motor Driver

### Monolithic Digital IC

#### 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 12 V or 24 V 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.

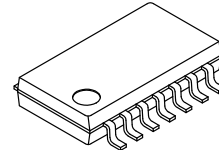
#### Features

- Output Protection Zener Diode with Variable Withstand Voltage
  - ◆ Z1, Z2 Pins Open:  $V_{OLM} = 57\text{ V}$  (24 V Specification)
  - ◆ Z1, Z2 pins shorted:  $V_{OLM} = 32\text{ V}$  (12 V Specification)
  - ◆ External Zener Diode Connected across Z1 –  $V_{CC}$  Pins:  
Support for Fans with Large Drive Current
- External Resistor Allows Configuration for 12 V or 24 V
- Direct Hall Element Connection Possible (Built-in Hall Amplifier with Hysteresis Supports Core without Auxiliary Electrode)
- Built-in Output Transistor with 1.0 A 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



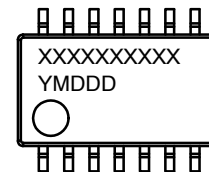
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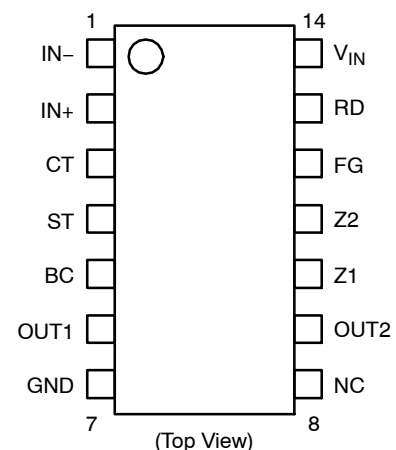
MFP14S  
CASE 751CB

#### MARKING DIAGRAM



XXXXX = Specific Device Code  
Y = Year  
M = Month  
DDD = Additional Traceability Data

#### PIN ASSIGNMENT



#### ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

# LB1868M

## SPECIFICATIONS

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

Symbol	Parameter	Conditions	Ratings	Unit
$I_{CC}$ max	Maximum Input Current	$t \leq 20$ ms	200	mA
$V_{OUT}$ max	Maximum Applied Output Voltage		Internal	V
$I_{OUT}$ max	Maximum Output Current		1.0	A
$I_{RD}$ max	Current Flowing into RD, FG		10	mA
$V_{RD}$ max	RD, FG Applied Voltage		30	V
$V_{ST}$ max	ST Applied Voltage		7.5	V
$P_d$ max	Allowable Power Dissipation	Mounted on a specified board (Note 1)	800	mW
$T_{opr}$	Operating Temperature		-30 to +80	$^\circ\text{C}$
$T_{stg}$	Storage Temperature		-55 to +150	$^\circ\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. .Specified board: 20 mm  $\times$  15 mm  $\times$  1.5 mm, glass epoxy board.

### ALLOWABLE OPERATING RANGES ( $T_A = 25^\circ\text{C}$ )

Symbol	Parameter	Conditions	Ratings	Unit
$I_{CC}$	Input Current Range		6.0 to 50	mA
$V_{ICM}$	Common Mode Input Voltage Range		0.2 to $V_{IN}-1.5$	V
$V_{STH}$	ST High Voltage		4.5 to 7.0	V
$V_{STL}$	ST Low Voltage		0 to 0.5	V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , $I_{CC} = 10$ mA)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{OLM1}$	Output Limiter Withstand Voltage	Z1, Z2 open	54	57	60	V
$V_{OLM2}$		Z1, Z2 short	31	33	35	V
$V_{Osat1}$	Output Saturation Voltage	$I_O = 0.5$ A	-	0.95	1.2	V
$V_{Osat2}$		$I_O = 1.0$ A	-	1.15	1.5	V
$V_{IN}$	$V_{IN}$ Voltage	$I_{CC} = 7.0$ mA	6.4	6.7	7.0	V
$V_{HN}$	Hall Input Sensitivity (at Zero Peak)	Including offset and hysteresis	-	-	20	mV
$V_{RDsat}$	RD, FG Output Saturation Voltage	$I_{RD} = 5$ mA	-	0.1	0.3	V
IC1	CT Drain Current	C = GND	2.7	3.8	4.9	$\mu\text{A}$
IC2	CT Discharge Current	C = $V_{IN}$	0.19	0.30	0.41	$\mu\text{A}$
$V_{TH1}$	Comp Input Threshold Voltage		0.77	$0.8V_{IN}$	0.83	V
$V_{TH2}$			0.42	$0.45V_{IN}$	0.48	V
$I_{ST}$	ST Input Current	$V_{ST} = 5$ V	-	80	120	$\mu\text{A}$
TSD	Thermal Protection Operating Temperature	Design target value (Note 2)	-	180	-	$^\circ\text{C}$
$\Delta\text{TSD}$	Thermal Protection Circuit Hysteresis	Design target value (Note 2)	-	40	-	$^\circ\text{C}$

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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2. Design target value, Do not measurement.

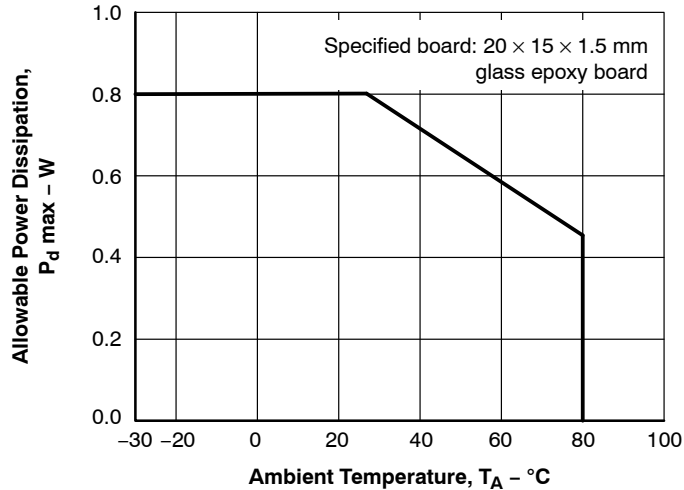


Figure 1. P<sub>d</sub> max - T<sub>A</sub>

## 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 μF)
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: 12 V operation)
12	FG	Rotation frequency detector pin
13	RD	Lockup detection pin (latch type)
14	V <sub>IN</sub>	Regulated power supply input pin (limiting resistor to be inserted between power supply and V <sub>IN</sub> )

## 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

NOTE: RD is a latch type output.

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## BLOCK DIAGRAM

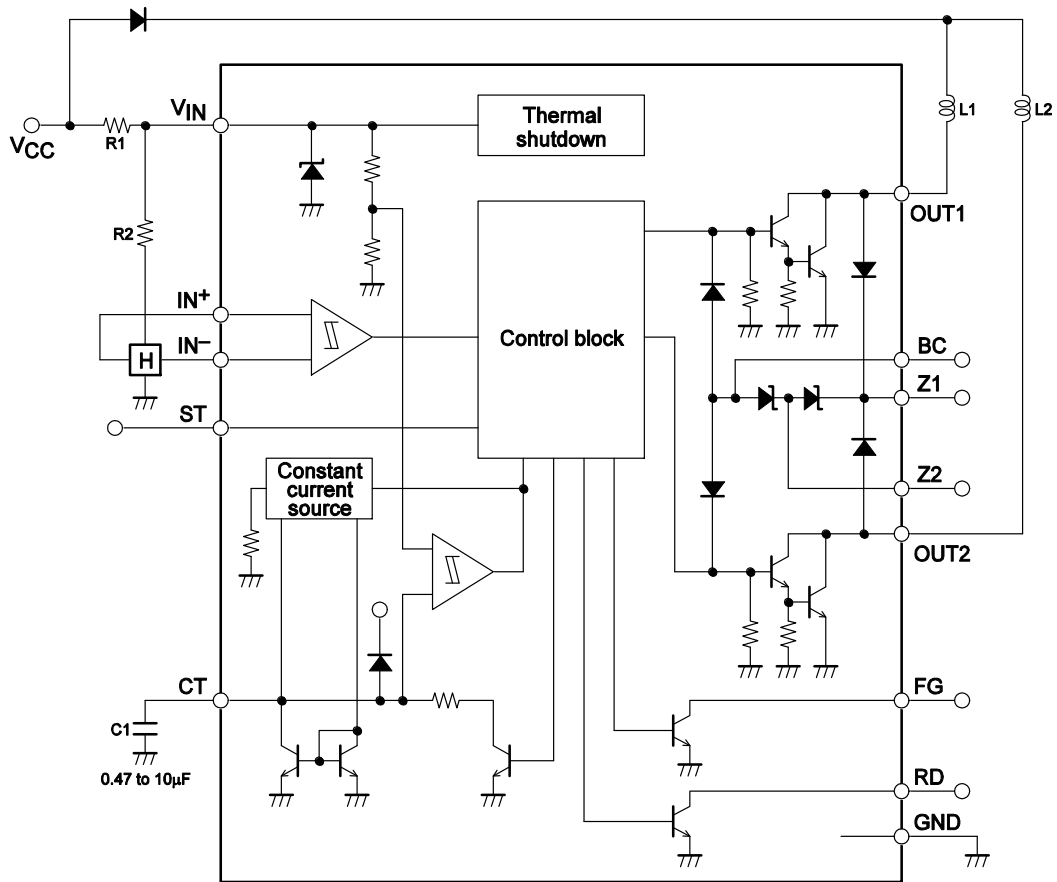


Figure 2. Block Diagram

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## APPLICATION CIRCUIT

### 1. 12 V Supply Voltage

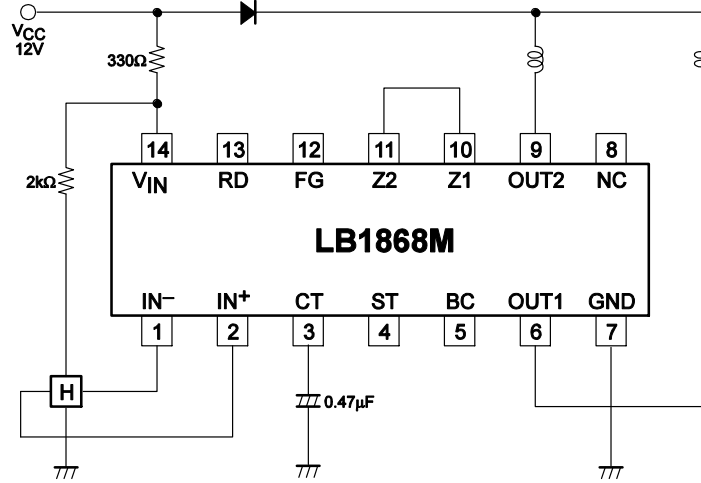


Figure 3. 12 V Supply Voltage

### 2. 24 V Supply Voltage

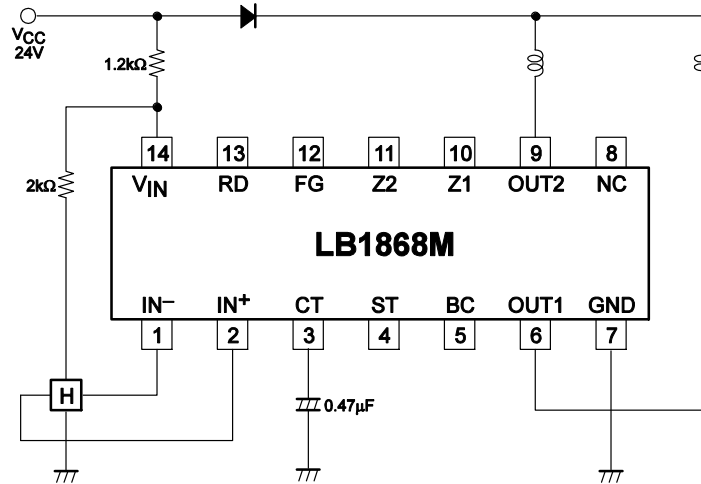


Figure 4. 24 V Supply Voltage

## LB1868M

### 3. High-power Fan (120 mm-HH-Speed)

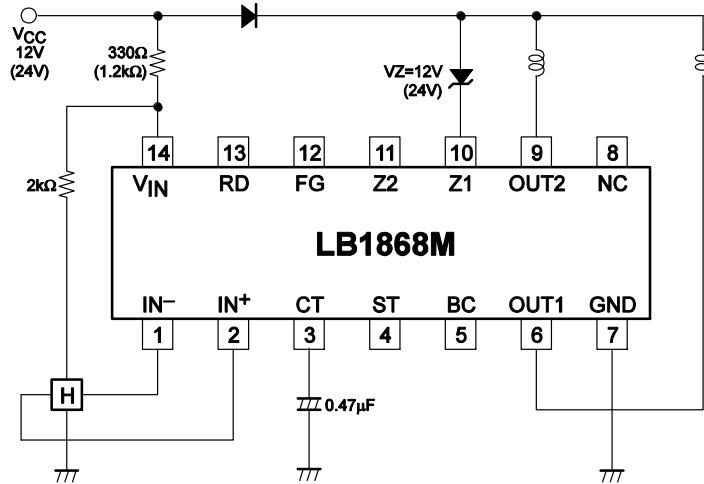


Figure 5. High-power Fan (120 mm-HH-Speed)

#### ORDERING INFORMATION

Device	Package	Wire Bond	Shipping <sup>†</sup> (Qty / Packing)
LB1868M-TLM-E	MFP14S (225 mil) (Pb-Free)	Au wire	1,000 / Tape & Reel
LB1868M-TLM-H	MFP14S (225 mil) (Pb-Free / Halogen Free)	Au wire	1,000 / Tape & Reel
LB1868M-W-AH	MFP14S (225 mil) (Pb-Free / Halogen Free)	Cu wire	1,000 / Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

# MECHANICAL CASE OUTLINE

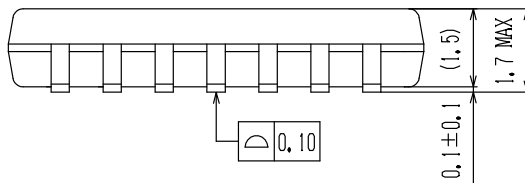
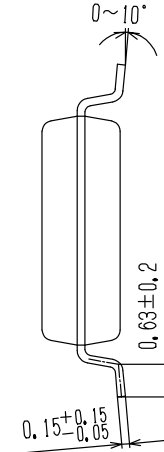
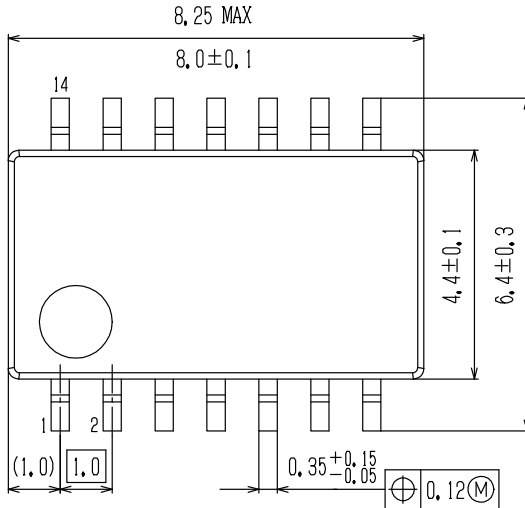
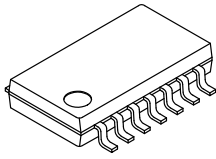
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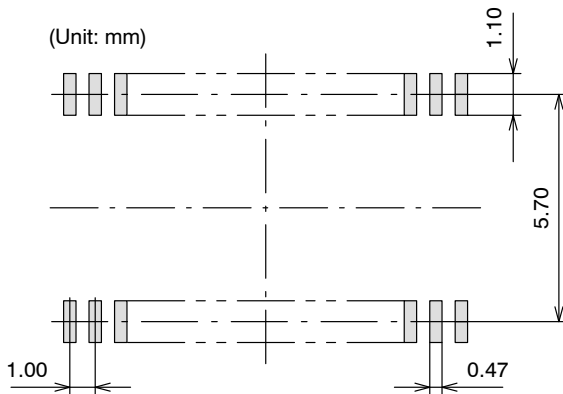


SOIC14 W / MFP14S (225 mil)  
CASE 751CB  
ISSUE A

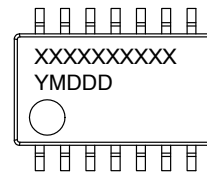
DATE 25 OCT 2013



### SOLDERING FOOTPRINT\*



### GENERIC MARKING DIAGRAM\*



XXXXX = Specific Device Code  
Y = Year  
M = Month  
DDD = Additional Traceability Data

NOTE: The measurements are not to guarantee but for reference only.

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

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