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 V (24 V Specification)
  - Z1, Z2 pins shorted: V_{OLM} = 32 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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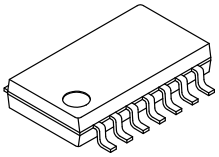
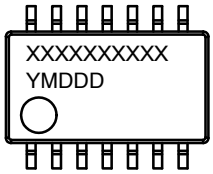


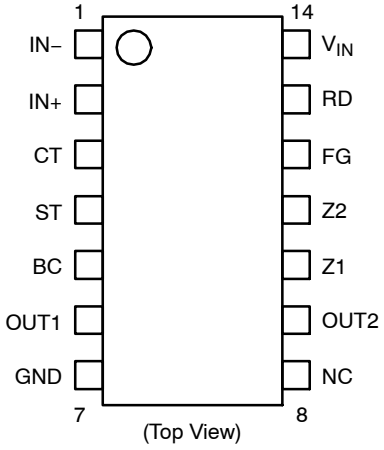
MFP14S
CASE 751CB

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.

SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Symbol	Parameter	Conditions	Ratings	Unit
I_{CC} max	Maximum Input Current	t ≤ 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	°C
T_{stg}	Storage Temperature		−55 to +150	°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 × 15 mm × 1.5 mm, glass epoxy board.

ALLOWABLE OPERATING RANGES (T_A = 25°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
$V_{ST}H$	ST High Voltage		4.5 to 7.0	V
$V_{ST}L$	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°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
$V_O$sat1	Output Saturation Voltage	I_O = 0.5 A	–	0.95	1.2	V
$V_O$sat2		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_{RD}sat	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	μA
IC2	CT Discharge Current	C = V_{IN}	0.19	0.30	0.41	μA
V_{TH}1	Comp Input Threshold Voltage		0.77	0.8V_{IN}	0.83	V
V_{TH}2			0.42	0.45V_{IN}	0.48	V
I_{ST}	ST Input Current	V_{ST} = 5 V	–	80	120	μA
TSD	Thermal Protection Operating Temperature	Design target value (Note 2)	–	180	–	°C
ΔTSD	Thermal Protection Circuit Hysteresis	Design target value (Note 2)	–	40	–	°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.

2. Design target value, Do not measurement.

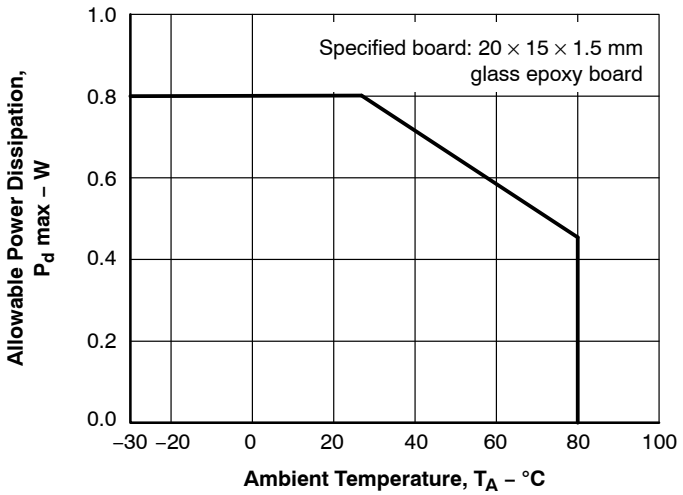


Figure 1. P_d max – T_A

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_{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

NOTE: RD is a latch type output.

BLOCK DIAGRAM

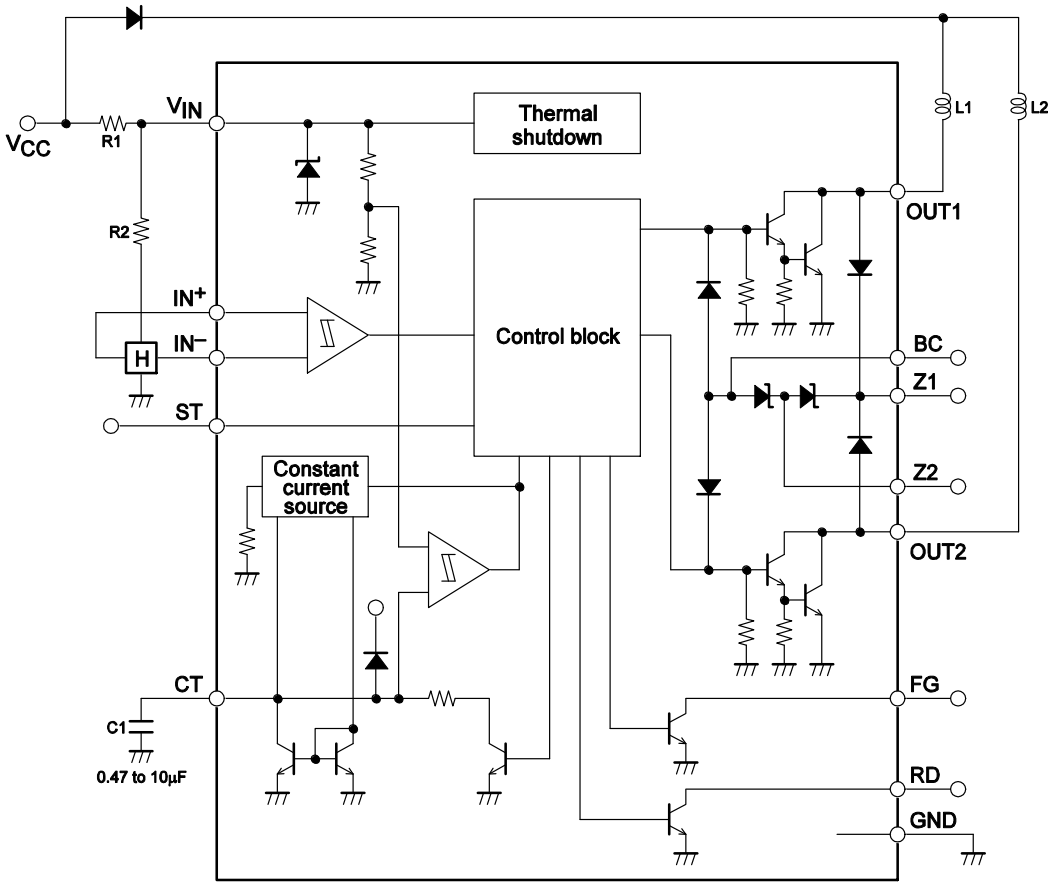


Figure 2. Block Diagram

APPLICATION CIRCUIT

1. 12 V Supply Voltage

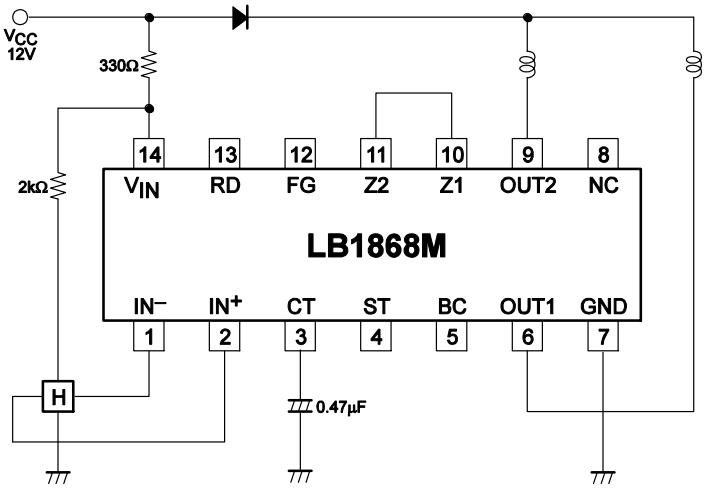


Figure 3. 12 V Supply Voltage

2. 24 V Supply Voltage

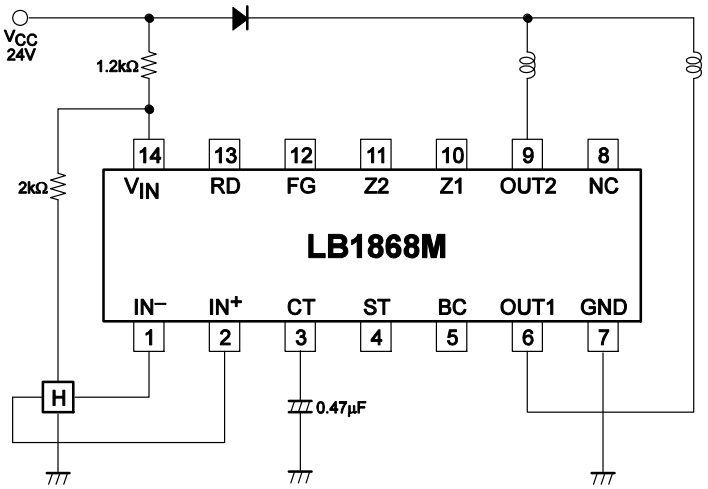


Figure 4. 24 V Supply Voltage

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

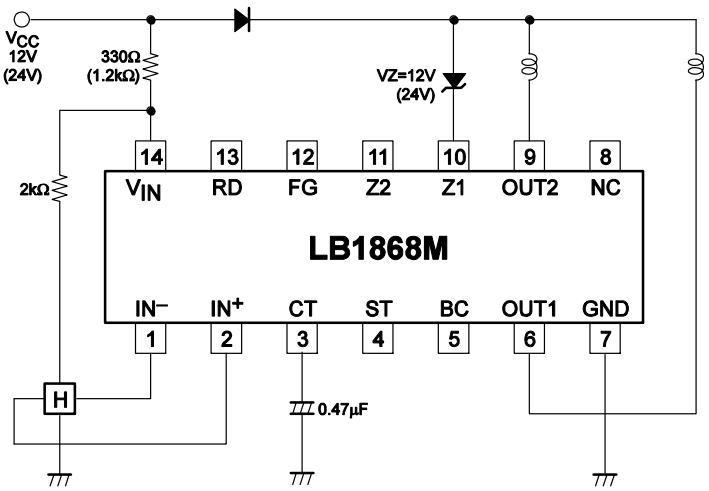


Figure 5. High-power Fan (120 mm-HH-Speed)

ORDERING INFORMATION

Device	Package	Wire Bond	Shipping† (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

†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
PACKAGE DIMENSIONS

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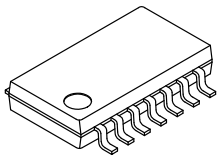
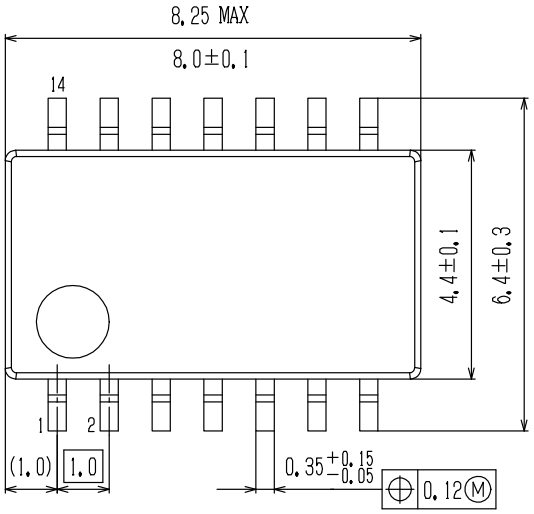
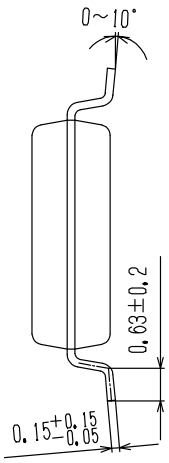
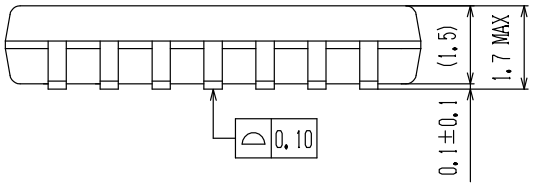
SOIC14 W / MFP14S (225 mil)
CASE 751CB
ISSUE A

DATE 25 OCT 2013

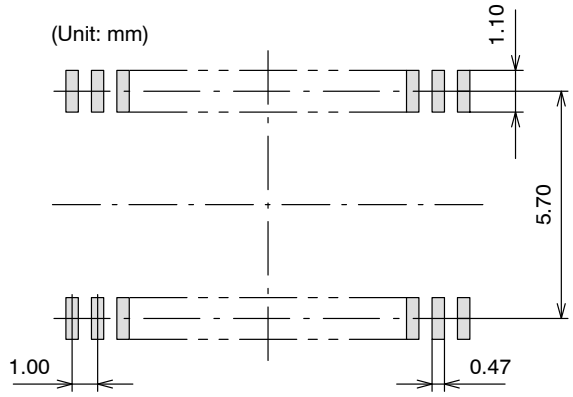








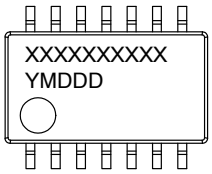
SOLDERING FOOTPRINT*



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.

GENERIC MARKING DIAGRAM*



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*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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ISSUE	REVISION	DATE
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A	ADDED MARKING AND SOLDER FOOTPRINT INFORMATION. REQ. BY D. TRUHITTE	25 OCT 2013

PUBLICATION ORDERING INFORMATION

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