

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.

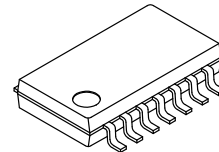
Features

- 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



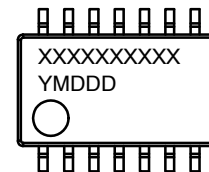
ON Semiconductor®

www.onsemi.com



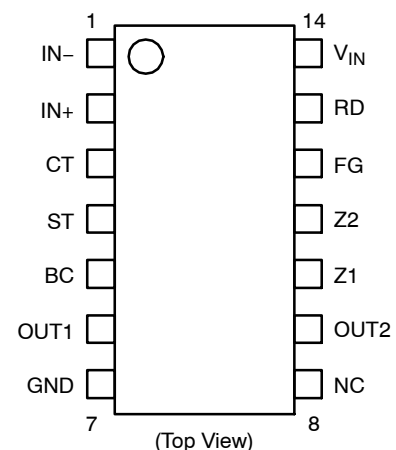
MFP14S
CASE 751CB

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	μA
IC2	CT Discharge Current	C = V_{IN}	0.19	0.30	0.41	μA
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	μA
TSD	Thermal Protection Operating Temperature	Design target value (Note 2)	-	180	-	$^\circ\text{C}$
ΔTSD	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.

LB1868M

2. Design target value, Do not measurement.

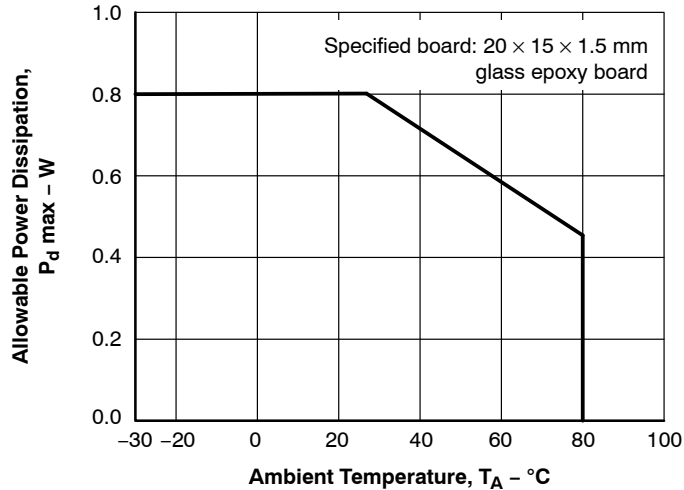


Figure 1. P_d max - T_A

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.

LB1868M

BLOCK DIAGRAM

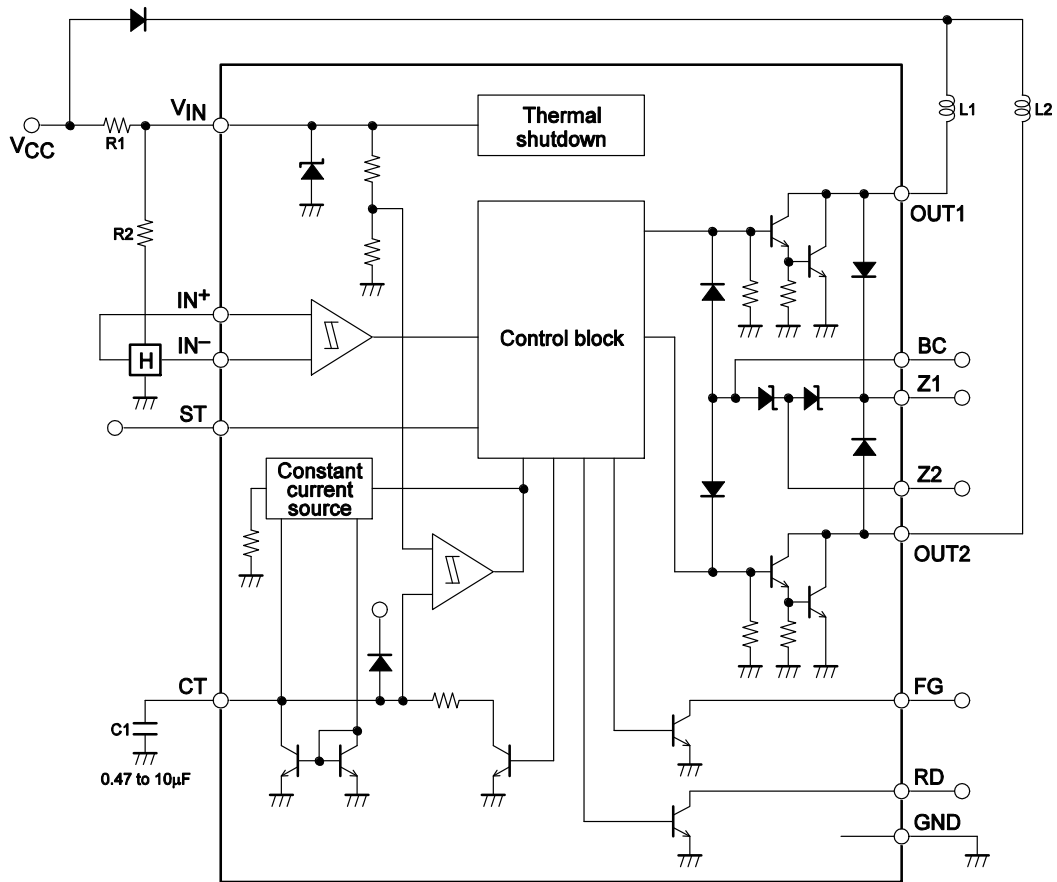


Figure 2. Block Diagram

LB1868M

APPLICATION CIRCUIT

1. 12 V Supply Voltage

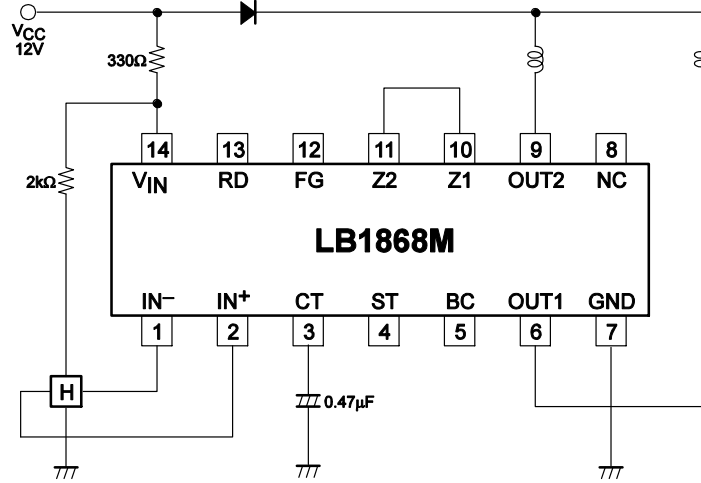


Figure 3. 12 V Supply Voltage

2. 24 V Supply Voltage

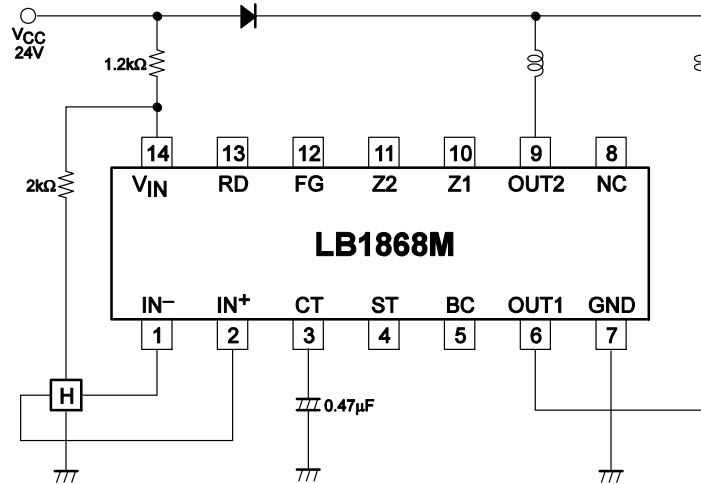


Figure 4. 24 V Supply Voltage

LB1868M

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

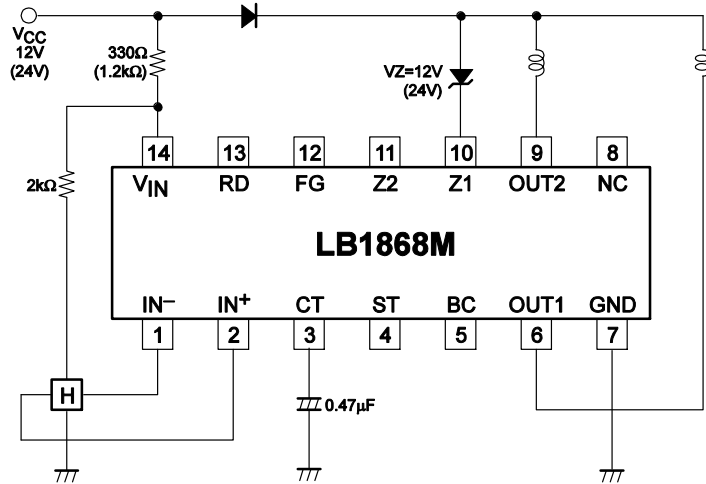


Figure 5. High-power Fan (120 mm-HH-Speed)

ORDERING INFORMATION

Device	Package	Wire Bond	Shipping [†] (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

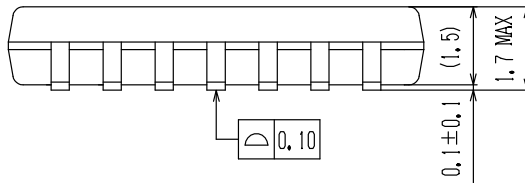
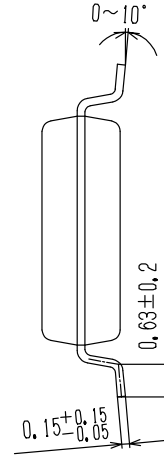
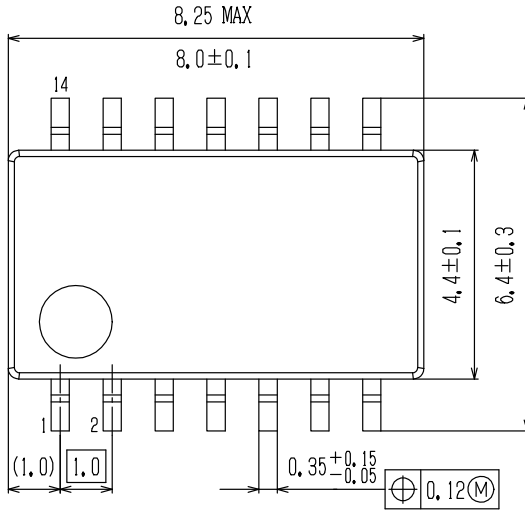
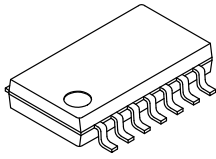
PACKAGE DIMENSIONS

ON Semiconductor®

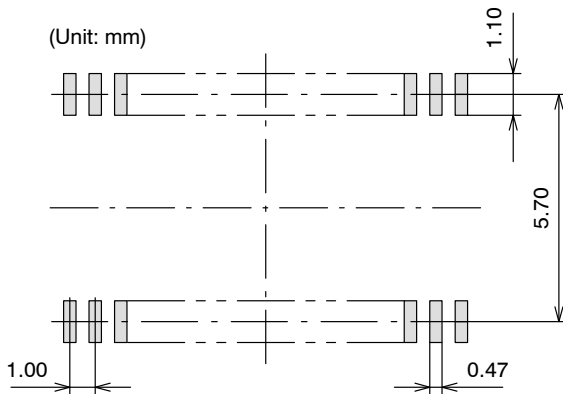


SOIC14 W / MFP14S (225 mil) CASE 751CB ISSUE A

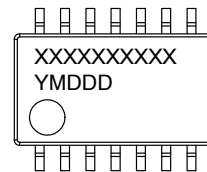
DATE 25 OCT 2013



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.

DOCUMENT NUMBER:	98AON67224E	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	SOIC14 W / MFP14S (225 MIL)	PAGE 1 OF 1

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Email Requests to: orderlit@onsemi.com

ON Semiconductor Website: www.onsemi.com

TECHNICAL SUPPORT

North American Technical Support:
Voice Mail: 1 800-282-9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative