



SANYO Semiconductors

# DATA SHEET

## LB1960M — Monolithic Digital IC For Fan Motor 2-phase Half-Wave Driver

### Overview

The LB1960M is a 2-phase half-wave driver for fan motor. The LB1960M is a compact package (MFP8). Low external parts count, easy wiring, and small PCB area allow use also with miniature fan motors.

### Functions

- Dual power supply voltage design (5/12V) and wide voltage handling range. (3V also supported for rotation functions only)
- Constant-voltage Hall bias power supply (1.3V across HB to GND) assures stable Hall output over entire temperature and power supply voltage range. External limiting resistor not required.
- Built-in Hall amplifier with hysteresis (supports core without commutating pole).
- Built-in lockup protection and automatic recovery circuits (External capacitor for rotation detection need only be 0.1μF, allowing compact, cost-saving design).
- Built-in output transistor with output withstand voltage 24V (max)/output current 500mA (average), 1A (peak).
- Built-in thermal protection circuit.

### Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V <sub>CC</sub> max		18	V
Maximum output current	I <sub>OUT</sub> ave		500	mA
	I <sub>OUT</sub> peak	t ≤ 1ms	1000	mA
Maximum output voltage	V <sub>OUT</sub> max		Internal	V
Maximum HB output current	I <sub>H</sub> max		10	mA
Allowable power dissipation	P <sub>d</sub> max	Mounted on a specified board *	600	mW
Operating temperature	Topr		-30 to +85	°C
Storage temperature	Tstg		-55 to +150	°C

\* Specified board: 114.3mm × 76.1mm × 1.5mm, glass epoxy board.

■ Any and all SANYO Semiconductor Co.,Ltd. products described or contained herein are, with regard to "standard application", intended for the use as general electronics equipment (home appliances, AV equipment, communication device, office equipment, industrial equipment etc.). The products mentioned herein shall not be intended for use for any "special application" (medical equipment whose purpose is to sustain life, aerospace instrument, nuclear control device, burning appliances, transportation machine, traffic signal system, safety equipment etc.) that shall require extremely high level of reliability and can directly threaten human lives in case of failure or malfunction of the product or may cause harm to human bodies, nor shall they grant any guarantee thereof. If you should intend to use our products for applications outside the standard applications of our customer who is considering such use and/or outside the scope of our intended standard applications, please consult with us prior to the intended use. If there is no consultation or inquiry before the intended use, our customer shall be solely responsible for the use.

■ Specifications of any and all SANYO Semiconductor Co.,Ltd. products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.

SANYO Semiconductor Co., Ltd.

[www.semiconductor-sanyo.com/network](http://www.semiconductor-sanyo.com/network)

# LB1960M

## Allowable Operating Conditions at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	$V_{CC}$		3.6 to 17	V
Common mode input voltage range	$V_{COM}$		0.2 to HB	V

## Electrical Characteristics at $T_a = 25^\circ\text{C}$ , $V_{CC} = 12\text{V}$

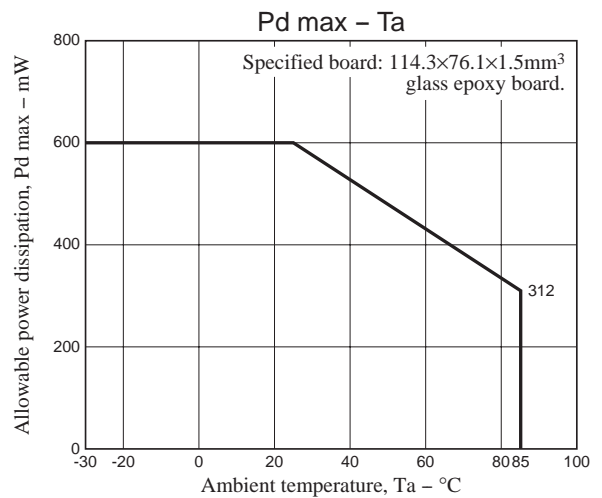
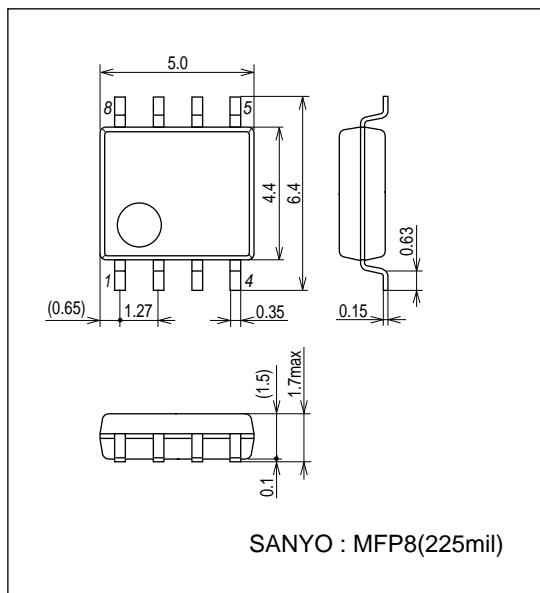
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Circuit current	$I_{CC}$	In drive mode (CT = L)		2.3	4	mA
		In lockup protection mode (CT = H)		3	5	mA
CT capacitor charge current	$I_{CT1}$	$V_{CT} = 0.2\text{V}$	0.8	1.2	2.0	$\mu\text{A}$
Capacitor discharge current	$I_{CT2}$	$V_{CT} = 8\text{V}$	0.16	0.24	0.4	$\mu\text{A}$
Capacitor charge/discharge current ratio	$R_{CT}$	$R_{CT} = I_{CT1}/I_{CT2}$	4.0	5.0	7.0	
CT charge voltage	$V_{CT1}$		6.8	7.2	7.6	V
CT discharge voltage	$V_{CT2}$		1.4	1.6	1.8	V
Output limiter withstand voltage	$V_{OLM}$	$I_O = 1\text{mA}$	22.5	23.5	24.5	V
Output saturation voltage	$V_{OSat}$	$I_O = 500\text{mA}$		1.0	1.3	V
Hall input sensitivity	$V_{HN}$	Including offset and hysteresis		6	12	mV
HB output H voltage	$V_{HBH}$	$R_H = 350\Omega$	1.1	1.3	1.5	V
Thermal protection trigger temperature	TSD	Assured design target *	150	180	210	$^\circ\text{C}$

\* Assured design target: Target value, not measured individually.

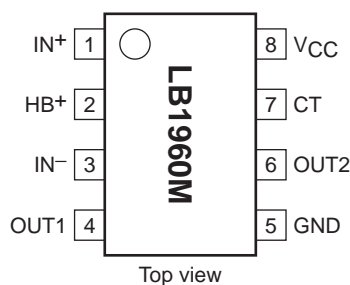
## Package Dimensions

unit : mm (typ)

3032B

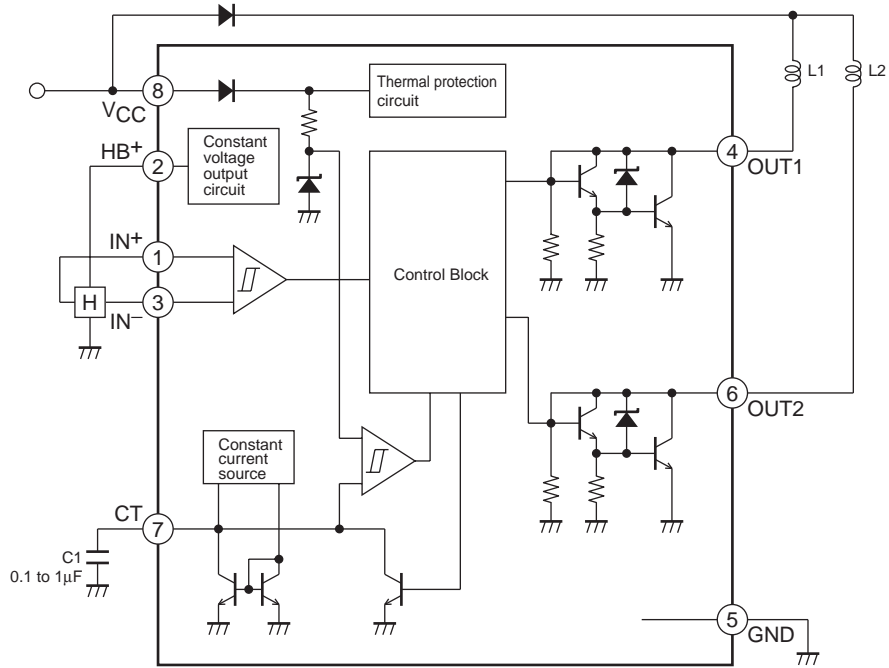


## Pin Assignment



# LB1960M

## Block Diagram

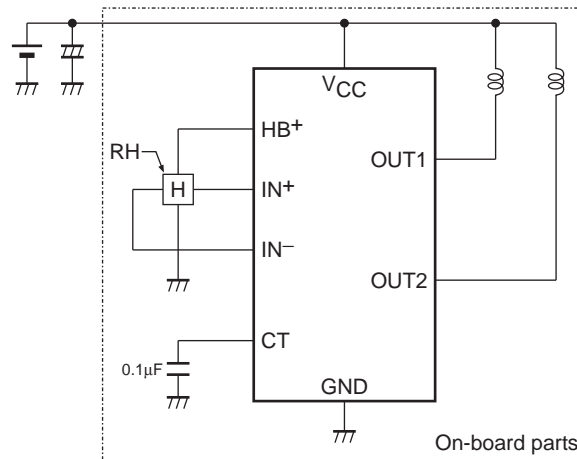


## Truth Table

IN <sup>-</sup>	IN <sup>+</sup>	CT	OUT1	OUT2	Mode
H	L	L	L	H	Rotating
L	H		H	L	
-	-	H	OFF	OFF	Lock-up protection activated

# LB1960M

## Application Circuit Example 5/12V power supply (3.8 to 18V)



### Precautions

- If CT pin is connected to GND, the lockup protection and restart functions are disabled.
- In a circuit configuration as shown above, a power supply/GND reverse connection will cause a current to flow as follows: GND → OUT → coil → power supply. The value of this current is limited by the coil resistance. If it is less than 500mA, the IC will not be destroyed. If required, insert a diode between VCC and the coil.

- SANYO Semiconductor Co.,Ltd. assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO Semiconductor Co.,Ltd. products described or contained herein.
- SANYO Semiconductor Co.,Ltd. strives to supply high-quality high-reliability products, however, any and all semiconductor products fail or malfunction with some probability. It is possible that these probabilistic failures or malfunction could give rise to accidents or events that could endanger human lives, trouble that could give rise to smoke or fire, or accidents that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO Semiconductor Co.,Ltd. products described or contained herein are controlled under any of applicable local export control laws and regulations, such products may require the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written consent of SANYO Semiconductor Co.,Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO Semiconductor Co.,Ltd. product that you intend to use.
- Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production.
- Upon using the technical information or products described herein, neither warranty nor license shall be granted with regard to intellectual property rights or any other rights of SANYO Semiconductor Co.,Ltd. or any third party. SANYO Semiconductor Co.,Ltd. shall not be liable for any claim or suits with regard to a third party's intellectual property rights which has resulted from the use of the technical information and products mentioned above.

This catalog provides information as of December, 2008. Specifications and information herein are subject to change without notice.