



# LB1960M

## Fan Motor 2-Phase Half-Wave Driver

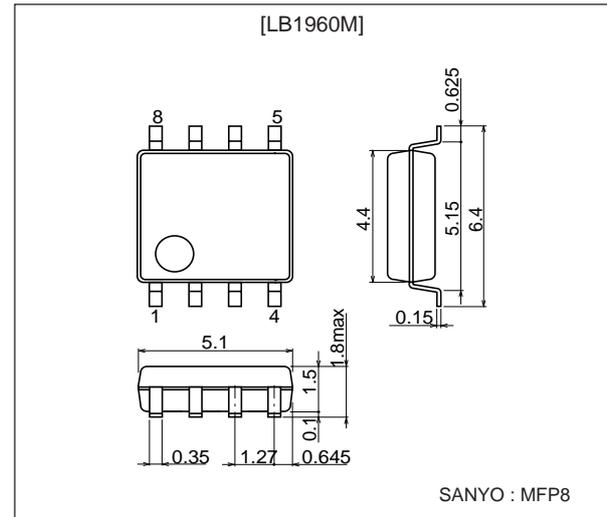
### Features

- 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-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 0.1  $\mu$ F, allowing compact, cost-saving design)
- Built-in output transistor with output withstand voltage 24Vmax/output current 500 mA (average), 1A (peak)
- Built-in thermal protection circuit
- Compact MFP-8 package. Low external parts count, easy wiring, and small PCB area allow use also with miniature fan motors.

### Package Dimensions

unit: mm

#### 3032B-MFP8



### Specification

#### Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC}$ max		18	V
Allowable power dissipation	$P_d$ max	With specified substrate *	600	mW
Maximum output current	$I_{OUTave}$		500	mA
	$I_{OUTpeak}$	$t \leq 1$ ms	1000	mA
Maximum output voltage	$V_{OUT}$ max		Internal	V
Maximum HB output current	$I_H$ max		10	mA
Operating temperature	$T_{opr}$		-30 to +85	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$

\* Specified substrate (114.3  $\times$  76.1  $\times$  1.5 mm<sup>3</sup>, glass epoxy)

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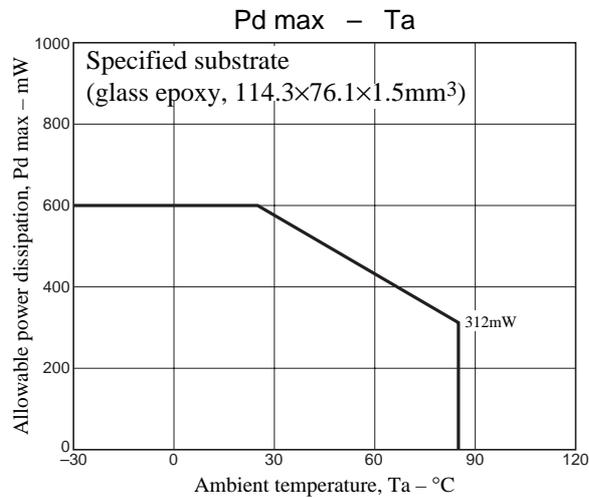
## Allowable Operating Ranges at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V <sub>CC</sub> 1		3.6 to 17	V
Common mode input voltage range	V <sub>COM</sub>		0.2 to HB	V

## Electrical Characteristics at Ta = 25°C, VCC = 12V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Circuit current	I <sub>CC</sub>	In drive mode (CT = L)		2.3	4	mA
		In lockup protection mode (CT = H)		3	5	mA
CT capacitor charge current	I <sub>CT1</sub>	V <sub>CT</sub> = 0.2V	0.8	1.2	2.0	μA
Capacitor discharge current	I <sub>CT2</sub>	V <sub>CT</sub> = 8V	0.16	0.24	0.4	μA
Capacitor charge/discharge current ratio	R <sub>CT</sub>	R <sub>CT</sub> = I <sub>CT1</sub> /I <sub>CT2</sub>	4.0	5.0	7.0	–
CT charge voltage	V <sub>CT1</sub>		6.8	7.2	7.6	V
CT discharge voltage	V <sub>CT2</sub>		1.4	1.6	1.8	V
Output limiter withstand voltage	V <sub>OLM</sub>	I <sub>o</sub> = 1 mA	22.5	23.5	24.5	V
Output saturation voltage	V <sub>OSat</sub>	I <sub>o</sub> = 500 mA		1.0	1.3	V
Hall input sensitivity	V <sub>HN</sub>	Including offset and hysteresis		6	12	mV
HB output H voltage	V <sub>HBH</sub>	R <sub>H</sub> = 350Ω	1.1	1.3	1.5	V
Thermal protection trigger temperature	T <sub>TSD</sub>	Assured design target*	150	180	210	°C

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

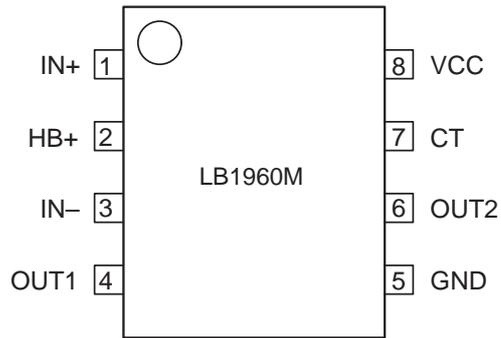


## Truth Table

IN–	IN+	CT	OUT1	OUT2	Mode
H	L	L	L	H	Rotating
L	H		H	L	
–	–	H	off	off	Lock-up protection activated

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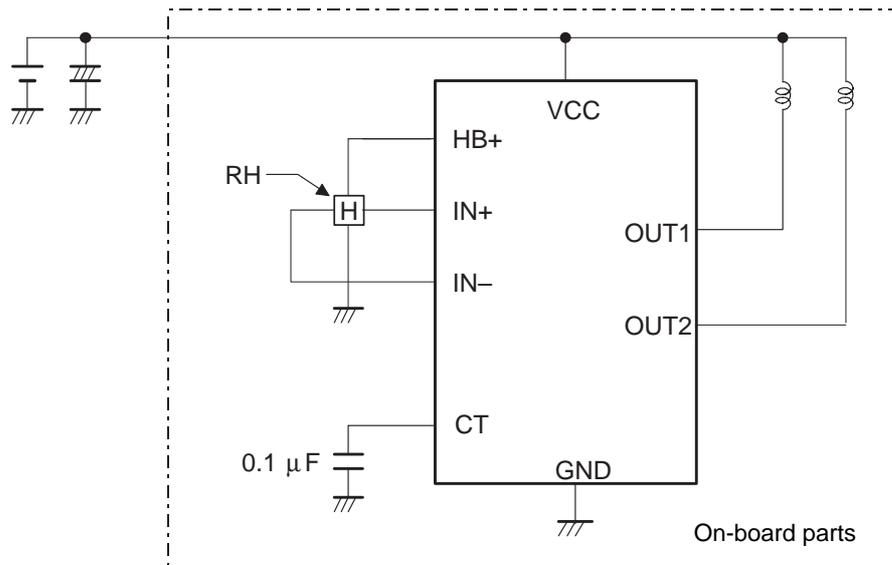
## Pin Assignment



Top view

## Sample Application Circuit

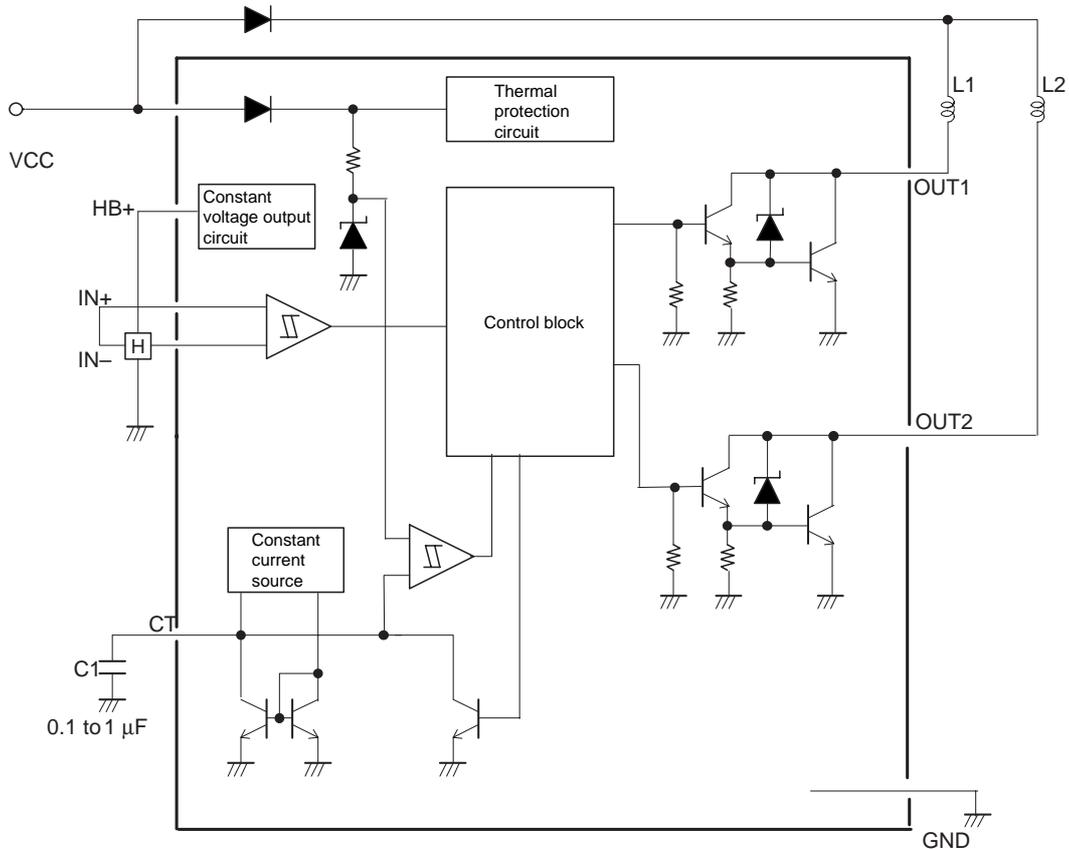
5/12V power supply (3.8 to 18V)



## 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 500 mA, the IC will not be destroyed. If required, insert a diode between  $V_{CC}$  and the coil.

Block Diagram and Sample Application Circuit



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