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# LB1960MC

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

### Overview

The LB1960MC is a 2-phase half-wave driver for fan motor. The LB1960MC is a compact package. 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 *	750	mW
Operating temperature	T <sub>opr</sub>		-30 to +85	°C
Storage temperature	T <sub>stg</sub>		-55 to +150	°C

\* Specified board: 114.3mm × 76.1mm × 1.6mm, glass epoxy board.

Caution 1) Absolute maximum ratings represent the value which cannot be exceeded for any length of time.

Caution 2) Even when the device is used within the range of absolute maximum ratings, as a result of continuous usage under high temperature, high current, high voltage, or drastic temperature change, the reliability of the IC may be degraded. Please contact us for the further details.

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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

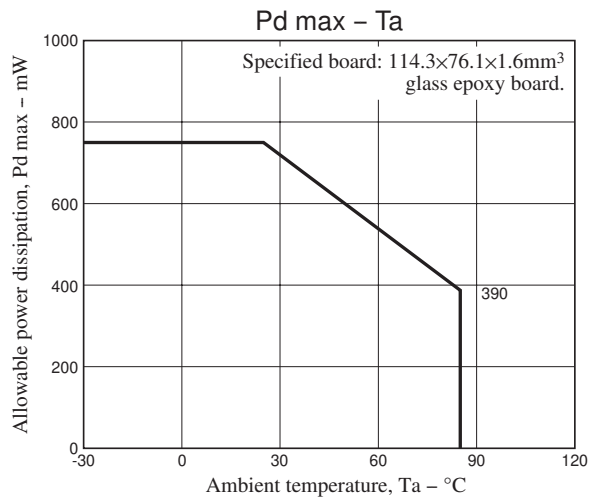
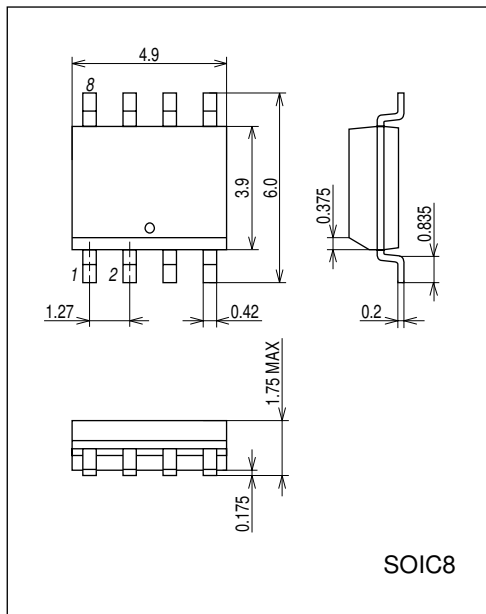
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Circuit current	$I_{CC}$	In drive mode (CT = L)		2.3	4	mA
		In lockup protection mode (CT = H)		3	5	mA
CT capacitor charge current	$I_{CT1}$	$V_{CT} = 0.2\text{V}$	0.8	1.2	2.0	$\mu\text{A}$
Capacitor discharge current	$I_{CT2}$	$V_{CT} = 8\text{V}$	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	$V_{O\text{sat}}$	$I_O = 50\text{mA}$		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 *	180	180	210	$^\circ\text{C}$

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

## Package Dimensions

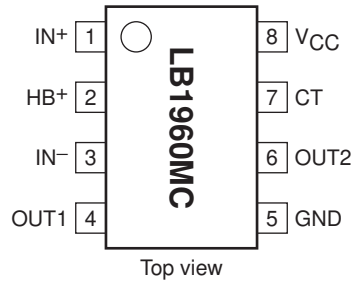
unit : mm (typ)

3424

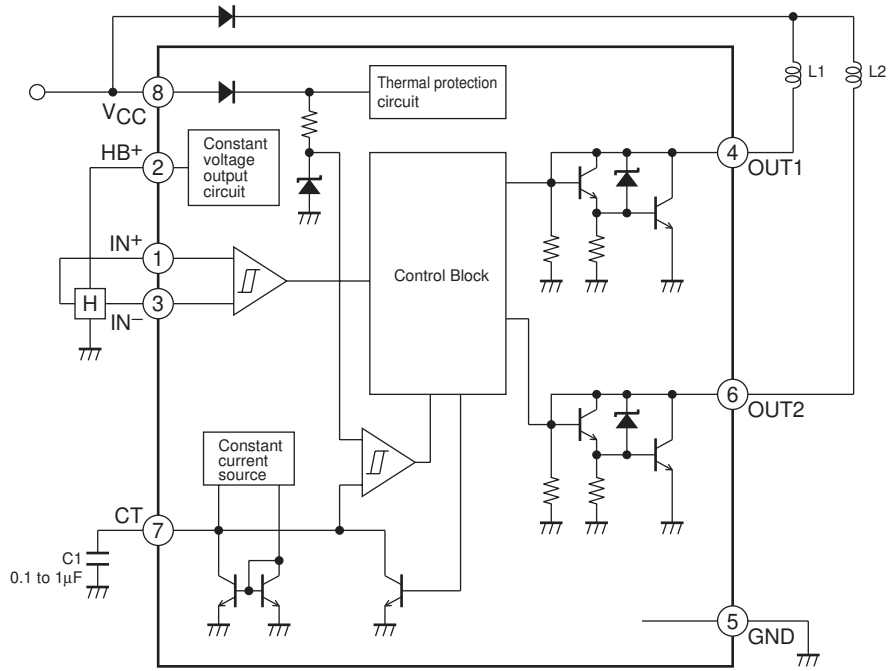


# LB1960MC

## Pin Assignment



## Block Diagram

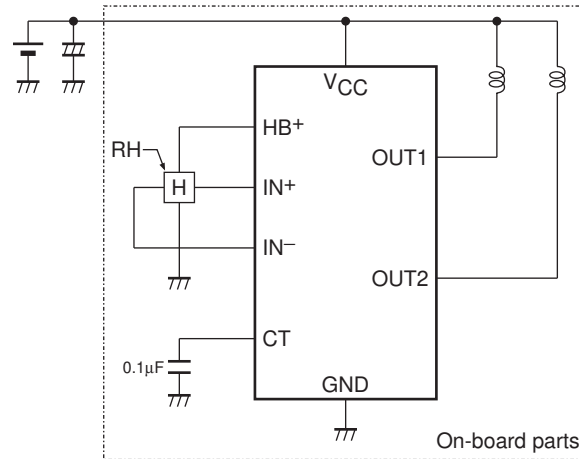


## Truth Table

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

## LB1960MC

### 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 V<sub>CC</sub> and the coil.

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