


**SANYO Semiconductors**

# DATA SHEET

An ON Semiconductor Company

Monolithic Digital IC

## LB1909M — Stepping Motor Driver IC

### Overview

The LB1909M is a 2-channel low saturation voltage forward/reverse motor driver that can operate on a wide supply voltage range (2.5V to 16V). The IC is ideal for use in 2-phase excitation drive of general-purpose 2-phase bipolar stepping motors including dampers for refrigerators.

### Features

- Wide supply voltage range : 2.5V to 16V
- Low saturation voltage :  $V_{O(sat)} = 0.25V$  typ at  $I_O = 200mA$ .
- Built-in shoot-through current protection circuit.
- No standby current consumption (or zero).
- Built-in thermal shutdown circuit.
- Small package : MFP10S (225mil)

### Specifications

**Absolute Maximum Ratings** at  $T_a = 25^\circ C$ 

| Parameter                    | Symbol                | Conditions                       | Ratings     | Unit       |
|------------------------------|-----------------------|----------------------------------|-------------|------------|
| Maximum power source voltage | $V_{CC \text{ max}}$  |                                  | -0.3 to +20 | V          |
| Applied output voltage       | $V_{OUT \text{ max}}$ |                                  | -0.3 to +20 | V          |
| Applied input voltage        | $V_{IN \text{ max}}$  |                                  | -0.3 to +18 | V          |
| GND pin outflow current      | $I_{GND}$             |                                  | 800         | mA         |
| Allowable power consumption  | $P_d \text{ max}$     | Independent IC                   | 350         | mW         |
|                              |                       | Mounted on the specified board * | 870         | mW         |
| Operating temperature        | $T_{opr}$             |                                  | -30 to +85  | $^\circ C$ |
| Storage temperature          | $T_{stg}$             |                                  | -40 to +150 | $^\circ C$ |

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

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# LB1909M

## Allowable Operating Range at Ta = 25°C

| Parameter                | Symbol          | Conditions         | Ratings      | Unit |
|--------------------------|-----------------|--------------------|--------------|------|
| Supply voltage           | V <sub>CC</sub> |                    | 2.5 to 16    | V    |
| Input high level voltage | V <sub>IH</sub> | Pins ENA, IN1, IN2 | 1.8 to 10    | V    |
| Input low level voltage  | V <sub>IL</sub> |                    | -0.3 to +0.7 | V    |

## Electrical Characteristics at Ta = 25°C, V<sub>CC</sub> = 12V

| Parameter                              | Symbol                | Conditions               | Ratings |      |      | Unit |
|----------------------------------------|-----------------------|--------------------------|---------|------|------|------|
|                                        |                       |                          | min     | typ  | max  |      |
| Power source current                   | I <sub>CC0</sub>      | ENA = L                  |         | 0.1  | 10   | μA   |
|                                        | I <sub>CC1</sub>      | ENA = H                  |         | 25   | 35   | mA   |
| Output saturation voltage              | V <sub>OUT1</sub>     | I <sub>OUT</sub> = 200mA |         | 0.25 | 0.35 | V    |
|                                        | V <sub>OUT2</sub>     | I <sub>OUT</sub> = 400mA |         | 0.50 | 0.75 | V    |
| Input current                          | I <sub>IN</sub>       | V <sub>IN</sub> = 5V     |         | 120  | 160  | μA   |
| Thermal protection block *1            |                       |                          |         |      |      |      |
| Thermal shutdown operation temperature | T <sub>t</sub> sd     | Design guarantee *2      |         | 180  |      | °C   |
| Temperature hysteresis width           | ΔT <sub>t</sub> sd    |                          |         | 60   |      | °C   |
| Spark killer diode                     |                       |                          |         |      |      |      |
| Reverse current                        | I <sub>S</sub> (leak) |                          |         |      | 30   | μA   |
| Forward voltage                        | V <sub>SF</sub>       | I <sub>OUT</sub> = 400mA |         |      | 1.7  | V    |

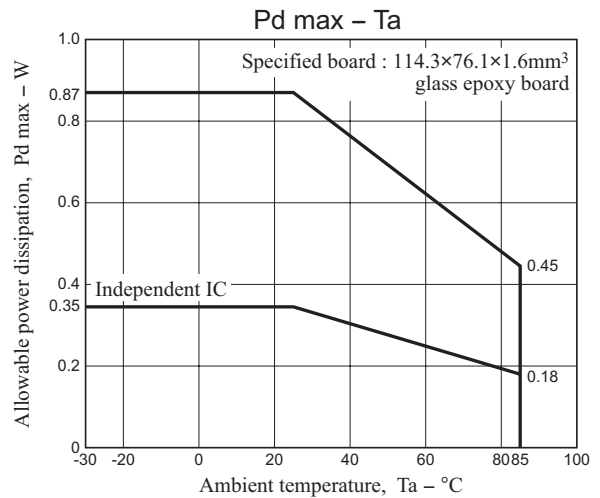
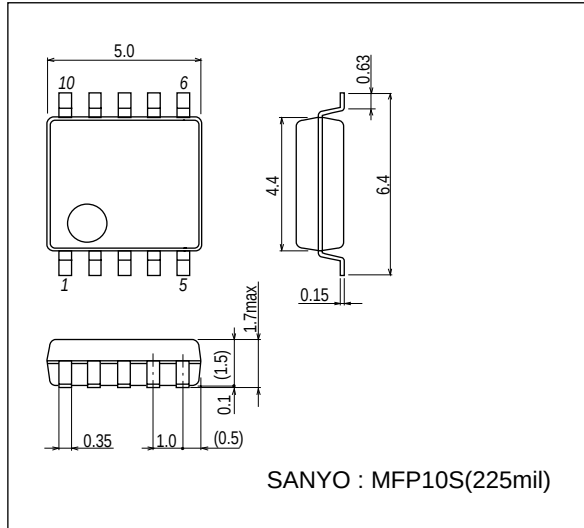
\*1 The thermal protection function is a feature to prevent the product from smoking and firing under unusual conditions. It is not intended to guarantee operation of the product under an ambient temperature exceeding the operating temperature range.

\*2 Design guarantee is not tested in individual units.

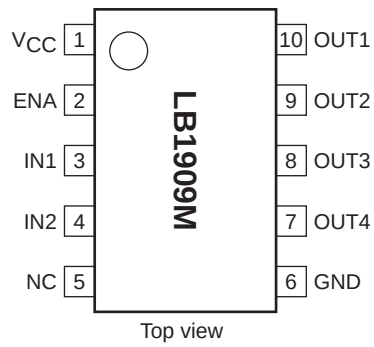
## Package Dimensions

unit : mm (typ)

3086B



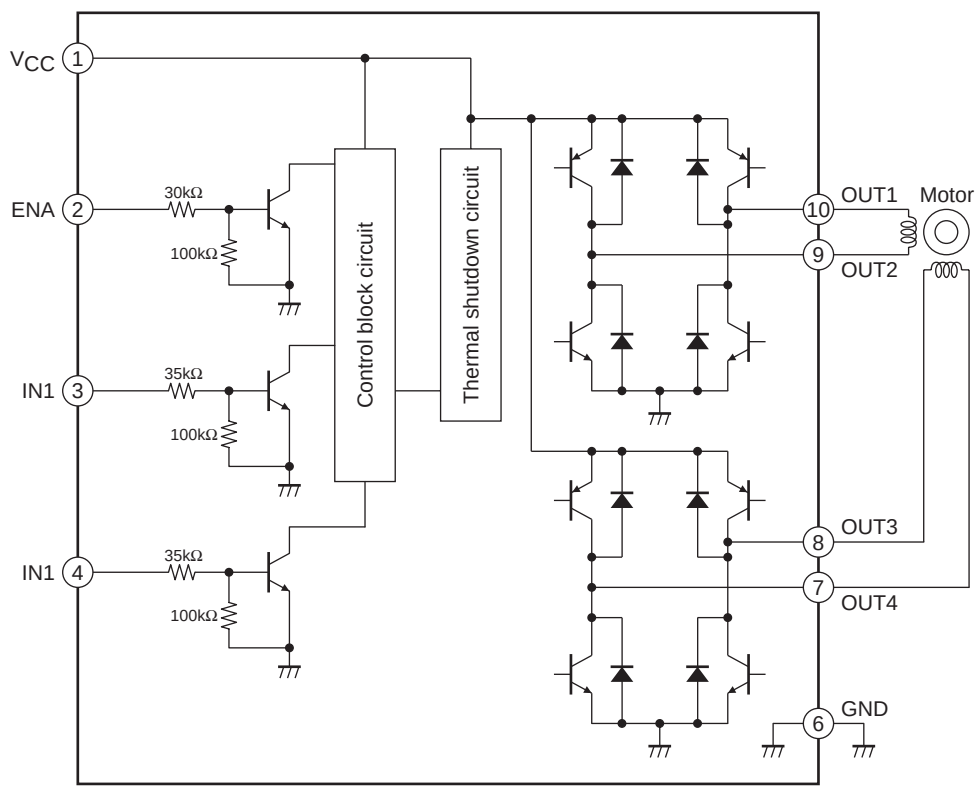
Pin Assignment



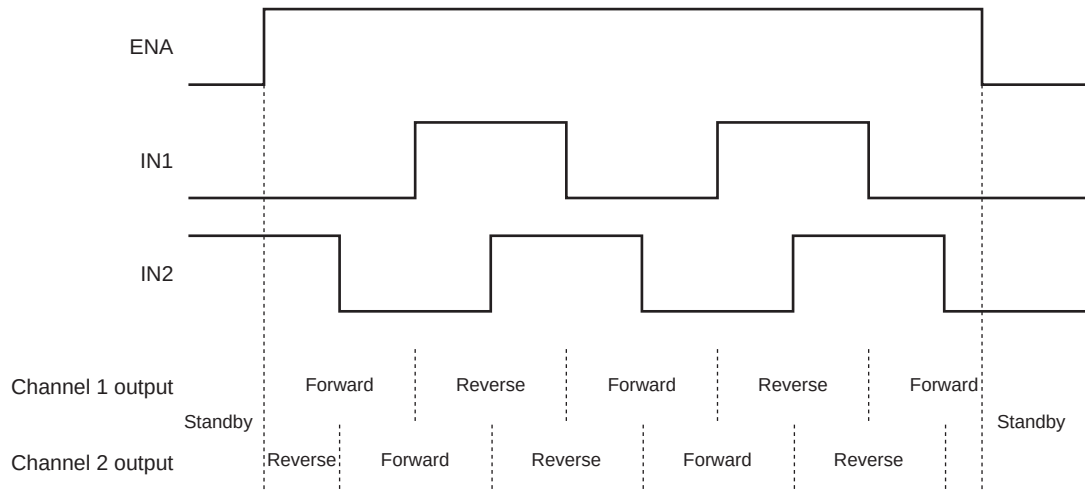
Truth table

| Input |     |     | Output |      |      |      | Remarks      |         |
|-------|-----|-----|--------|------|------|------|--------------|---------|
| ENA   | IN1 | IN2 | OUT1   | OUT2 | OUT3 | OUT4 |              |         |
| L     | x   | x   | OFF    | OFF  | OFF  | OFF  | Standby mode |         |
| H     | L   |     | H      | L    |      |      | Channel 1    | Forward |
|       | H   |     | L      | H    |      |      |              | Reverse |
|       |     |     |        |      | H    | L    | Channel 2    | Forward |
|       |     |     |        |      | L    | H    |              | Reverse |

Block Diagram



## Timing Chart (2 phase excitation drive)



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