


**SANYO Semiconductors**

# DATA SHEET

## LV8019LP — Bi-CMOS IC Forward/Reverse Motor Driver

### Overview

The LV8019LP is a forward/reverse motor driver.

### Features

- One H-bridge driver channel
- Provides a constant current output
- Built-in thermal shutdown circuit

### Specifications

**Maximum Ratings** at  $T_a = 25^\circ\text{C}$  and  $\text{SGND} = \text{PGND} = 0\text{V}$

| Parameter                                    | Symbol               | Conditions                            | Ratings              | Unit             |
|----------------------------------------------|----------------------|---------------------------------------|----------------------|------------------|
| Output block supply voltage                  | $V_M \text{ max}$    |                                       | -0.5 to 8.4          | V                |
| Control block supply voltage                 | $V_{CC} \text{ max}$ |                                       | -0.5 to 7.0          | V                |
| Constant current output block supply voltage | $V_{RG} \text{ max}$ |                                       | -0.5 to 6.0          | V                |
| Maximum output current                       | $I_O \text{ max}$    |                                       | 1.0                  | A                |
|                                              | $I_O \text{ peak1}$  | $t \leq 200\text{ms}, f = 2\text{Hz}$ | 3                    | A                |
|                                              | $I_O \text{ peak2}$  | $t \leq 10\text{ms}, f = 2\text{Hz}$  | 5                    | A                |
| Input signal voltage                         | $V_{IN} \text{ max}$ |                                       | -0.5 to $V_{CC}+0.5$ | V                |
| Allowable power dissipation                  | $P_d \text{ max1}$   | Independent IC                        | 0.2                  | W                |
|                                              | $P_d \text{ max2}$   | When mounted on a circuit board *1    | 1.05                 | W                |
| Operating temperature                        | $T_{opr}$            |                                       | -30 to +85           | $^\circ\text{C}$ |
| Storage temperature                          | $T_{stg}$            |                                       | -55 to +150          | $^\circ\text{C}$ |

\* : Specified substrate :  $40 \times 50 \times 0.8\text{mm}^3$ , glass epoxy four-layer (2S2P) board

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**Recommended Operating Conditions** at  $T_a = 25^\circ\text{C}$  and  $\text{SGND} = \text{PGND} = 0\text{V}$ 

| Parameter                                    | Symbol     | Conditions | Ratings         | Unit |
|----------------------------------------------|------------|------------|-----------------|------|
| Output block supply voltage                  | $V_M$      |            | 3.0 to 7.4      | V    |
| Control block supply voltage                 | $V_{CC}$   |            | 2.7 to 6.0      | V    |
| Constant current output block supply voltage | $V_{RGIN}$ |            | 1.5 to $V_{CC}$ | V    |
| Input signal voltage                         | $V_{IN}$   |            | 0 to $V_{CC}$   | V    |
| Maximum input signal frequency               | $f_{max}$  | Duty = 50% | 100             | kHz  |

**Electrical Characteristics**  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = V_M = 5\text{V}$ , and  $\text{SGND} = \text{PGND} = 0\text{V}$  unless otherwise specified.

| Parameter                                     |                | Symbol             | Conditions                                                                     | Ratings |      |          | Unit             |
|-----------------------------------------------|----------------|--------------------|--------------------------------------------------------------------------------|---------|------|----------|------------------|
|                                               |                |                    |                                                                                | min     | typ  | max      |                  |
| Standby mode output block current consumption |                | $I_{MO}$           | $\text{EN} = 0\text{V}$ , $\text{IN1} = \text{IN2} = \text{ICTRL} = 0\text{V}$ |         |      | 1.0      | $\mu\text{A}$    |
| Control block current consumption             | Standby mode   | $I_{CCO}$          | $\text{EN} = 0\text{V}$ , $\text{IN1} = \text{IN2} = \text{ICTRL} = 0\text{V}$ |         | 0    | 1.0      | $\mu\text{A}$    |
|                                               | Operation mode | $I_{CC}$           | $\text{EN} = 5\text{V}$                                                        |         | 0.8  | 1.3      | mA               |
| High-level input voltage                      |                | $V_{INH}$          | $\text{IN}^*$                                                                  | 2.5     |      | $V_{CC}$ | V                |
| Low-level input voltage                       |                | $V_{INL}$          | $\text{IN}^*$                                                                  | 0       |      | 0.8      | V                |
| High-level input current                      |                | $I_{INH}$          | $\text{IN}^*$                                                                  |         |      | 1.0      | $\mu\text{A}$    |
| Low-level input current                       |                | $I_{INL}$          | $\text{IN}^*$                                                                  | -1.0    |      |          | $\mu\text{A}$    |
| High-level EN pin current                     |                | $I_{ENH}$          | EN                                                                             | 15      | 25   | 35       | $\mu\text{A}$    |
| Low-level EN pin current                      |                | $I_{ENL}$          | EN                                                                             |         |      | 1.0      | $\mu\text{A}$    |
| Output on resistance                          | 1              | $R_{ON1}$          | $V_M = 5\text{V}$ , sink + source                                              |         | 0.30 | 0.40     | $\Omega$         |
|                                               | 2              | $R_{ON2}$          | $V_M = 3\text{V}$ , sink + source                                              |         | 0.45 | 0.60     | $\Omega$         |
| ISET setting resistance                       |                | RSET               | Between ISET pin and SGND                                                      | 80      |      |          | $\Omega$         |
| ISET pin voltage                              |                | $V_{ISET}$         | $R_{SET} > 80\Omega$                                                           | 0.90    | 1.05 | 1.20     | V                |
| CC pin output saturation voltage              |                | $V_{CSAT}$         | $R_{SET} = 150\Omega$ *1                                                       |         |      | 1.5      | V                |
| CC pin output leakage current                 |                | $I_{CONL}$         | $\text{CTRL} = 0\text{V}$                                                      |         |      | 1.0      | $\mu\text{A}$    |
| Low voltage shutdown operation voltage        |                | $V_{LVD}$          | $V_{CC}$ pin voltage detection                                                 | 2.10    | 2.35 | 2.60     | V                |
| High-level output turn-on time                |                | TOH                | The transition from 10% to 90% of the output amplitude *2                      |         | 0.1  | 1.0      | $\mu\text{s}$    |
| Low-level output turn-on time                 |                | TOL                | The transition from 90% to 10% of the output amplitude *2                      |         | 0.2  | 2.0      | $\mu\text{s}$    |
| Thermal shutdown temperature                  |                | TSD                | *2                                                                             | 150     | 180  |          | $^\circ\text{C}$ |
| Thermal shutdown hysteresis                   |                | $\Delta\text{TSD}$ | *2                                                                             |         | 40   |          | $^\circ\text{C}$ |

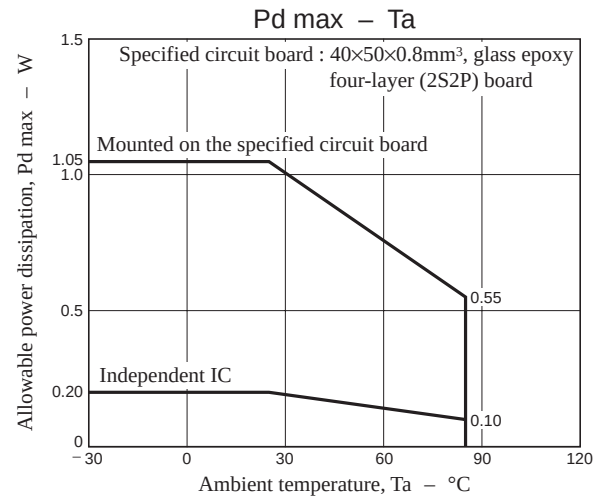
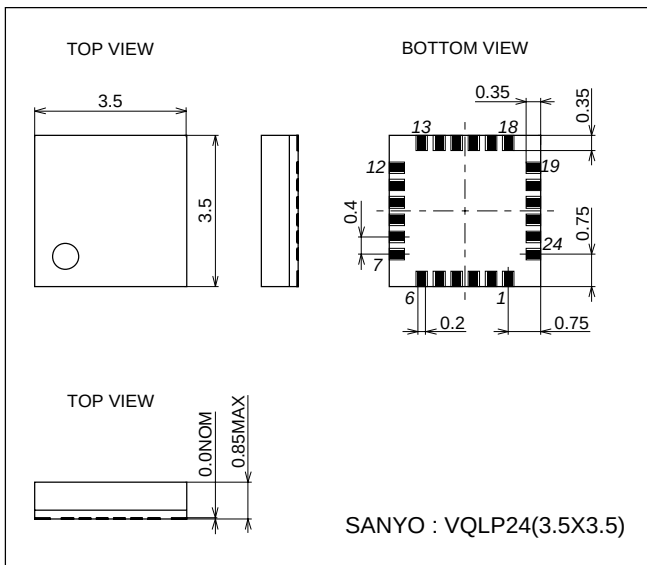
\*1 : Voltage between CC pin and ISET pin

\*2 : Design guarantee: These characteristics are not measured.

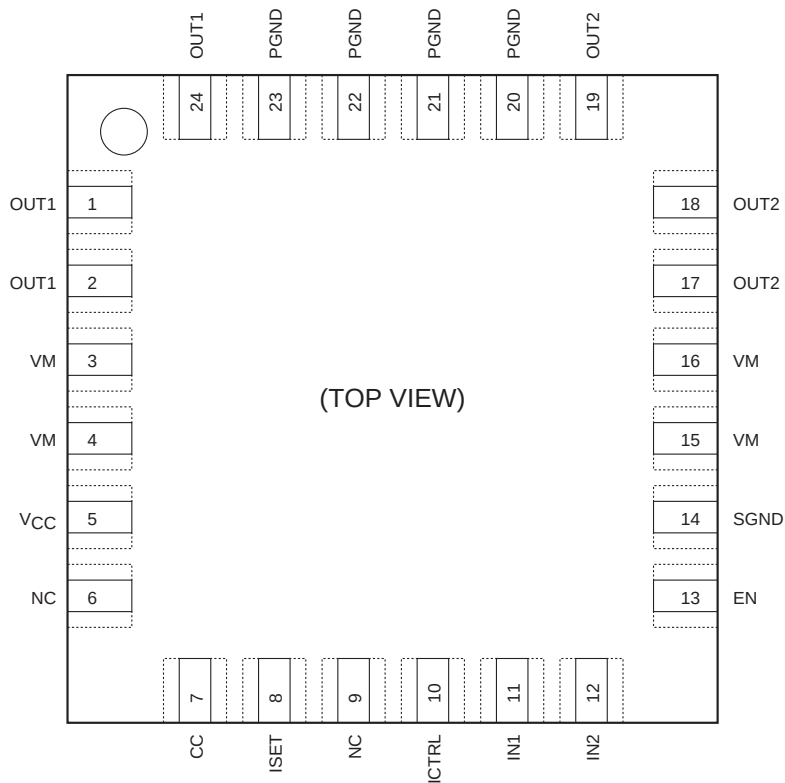
## Package Dimensions

unit : mm (typ)

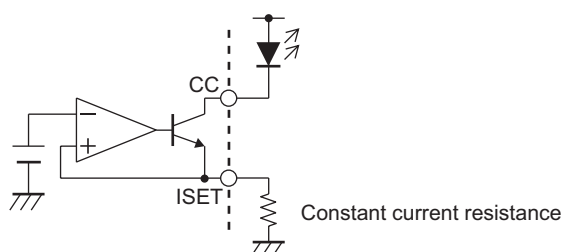
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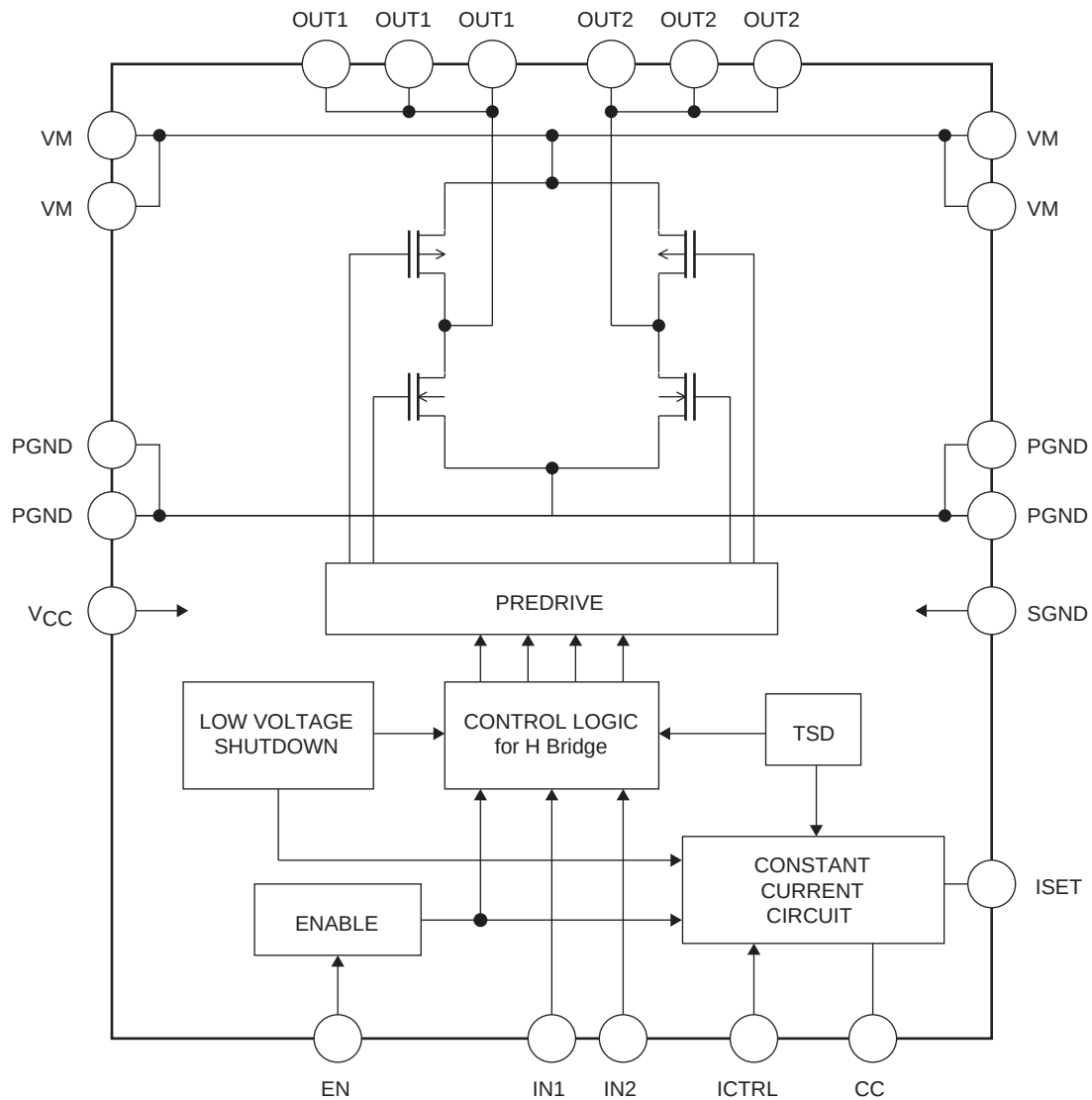
## Pin Assignment



## Constant current output



## Block Diagram



## Truth Table

| EN | IN1 | IN2 | CTRL | OUT1 | OUT2 | CC | Mode                        |
|----|-----|-----|------|------|------|----|-----------------------------|
| H  | H   | H   | X    | L    | L    | X  | Break                       |
| H  | H   | L   | X    | H    | L    | X  | Forward                     |
| H  | L   | H   | X    | L    | H    | X  | Reverse                     |
| H  | L   | L   | X    | Z    | Z    | X  | Standby                     |
| L  | X   | X   | X    | L    | L    | L  | Standby                     |
| H  | X   | X   | L    | X    | X    | Z  | Constant current output off |
| H  | X   | X   | H    | X    | X    | ON | Constant current output on  |

H : High level

L : Low level

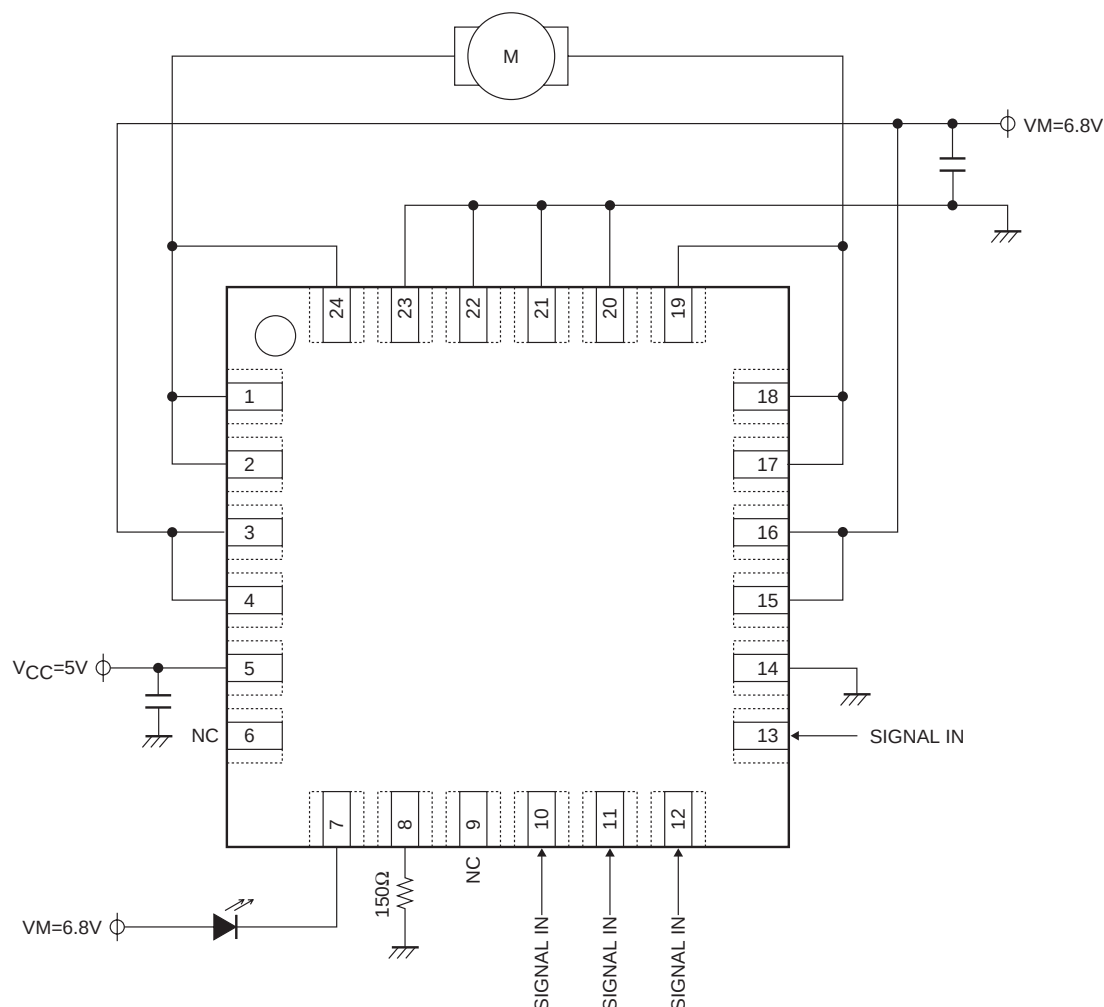
Z : Hi-impedance

X : Don't care

## Pin Functions

| Pin No.                 | Pin          | Description                                                                                                                                     | Equivalent circuit |
|-------------------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| 11<br>12                | IN1<br>IN2   | Logic input 1<br>Logic input 2<br>The output is set by the combination of the input 1 and 2 states. See the truth table for details.            |                    |
| 10                      | ICTRL        | Controls the output on/off state of the constant current block.                                                                                 |                    |
| 13                      | EN           | EN pin<br>Controls the on/off state of the H-bridge output (OUT1 and OUT2) and the constant current output. See the truth table for details.    |                    |
| 1, 2, 24,<br>17, 18, 19 | OUT1<br>OUT2 | Output 1<br>Output 2<br>The source side is a p-channel transistor and sink side is an n-channel transistor.                                     |                    |
| 7<br>8                  | CC<br>ISET   | Constant current output<br>Constant current setting<br>The output current (CC) is set by connecting a resistor between the ISET pin and ground. |                    |
| 5                       | VCC          | Signal system power supply                                                                                                                      |                    |
| 3, 4, 15, 16            | VM           | Power system power supply                                                                                                                       |                    |
| 14                      | SGND         | Signal system ground                                                                                                                            |                    |
| 21, 22, 23              | PGND         | Power system ground                                                                                                                             |                    |

## Application Example



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