



SANYO Semiconductors

## DATA SHEET

An ON Semiconductor Company

**LV8548M**

Bi-CMOS integrated circuit

**12V Low Saturation Voltage Drive****Forward/Reverse Motor Driver****Overview**

The LV8548M is a 2-channel low saturation voltage forward/reverse motor driver IC. It is optimal for motor drive in 12V system products and can drive either two DC motors, one DC motor using parallel connection, or a 2-phase bipolar stepping motor with 1-2 phase excitation mode drive.

**Functions**

- DMOS output transistor adoption (Upper and lower total  $R_{ON}=1\Omega$  typ)
- For one power supply (The control system power supply is unnecessary.)
- Our motor driver IC, LB1948M, and compatible pin
- It is possible to connect it in parallel (parallel, connected operation of drive ch).
- The compact package (MFP-10S) is adopted.
- $V_{CC\ max}=20V$ ,  $I_O\ max=1A$
- Current consumption 0 when standing by
- Built-in brake function

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

| Parameter                    | Symbol        | Conditions | Ratings     | Unit       |
|------------------------------|---------------|------------|-------------|------------|
| Maximum power supply voltage | $V_{CC\ max}$ |            | -0.3 to +20 | V          |
| Output impression voltage    | $V_{OUT}$     |            | -0.3 to +20 | V          |
| Input impression voltage     | $V_{IN}$      |            | -0.3 to +6  | V          |
| GND pin outflow current      | $I_{GND}$     | For ch     | 1.0         | A          |
| Allowable Power dissipation  | $P_d\ max$    | *          | 1.05        | W          |
| Operating temperature        | $T_{opr}$     |            | -30 to +85  | $^\circ C$ |
| Storage temperature          | $T_{stg}$     |            | -40 to +150 | $^\circ C$ |

\*: When mounted on the specified printed circuit board (57.0mm × 57.0mm × 1.6mm), glass epoxy, both sides

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.

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# LV8548M

## Recommended Operating Range at Ta = 25°C

| Parameter               | Symbol           | Conditions | Ratings      | Unit |
|-------------------------|------------------|------------|--------------|------|
| Power supply voltage    | V <sub>CC</sub>  |            | 4.0 to 16    | V    |
| Input "H" level voltage | V <sub>INH</sub> |            | +1.8 to +5.5 | V    |
| Input "L" level voltage | V <sub>INL</sub> |            | -0.3 to +0.7 | V    |

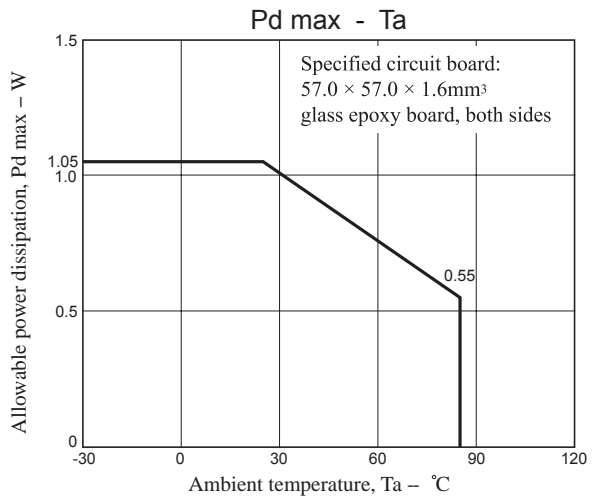
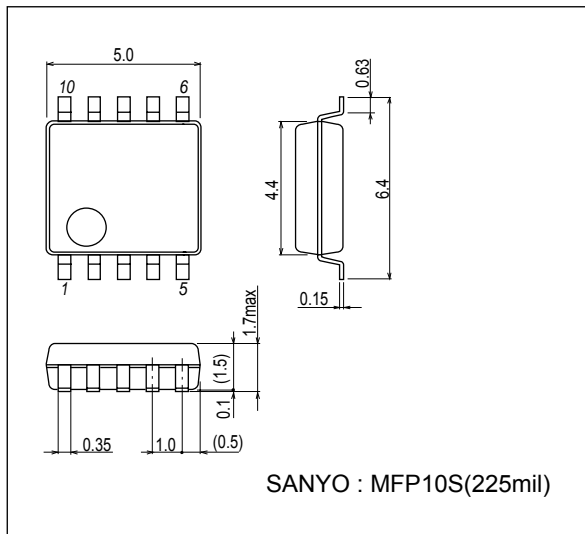
## Electrical Characteristics at Ta = 25°C, V<sub>CC</sub> = 12V

| Parameter   | Symbol                          | Conditions  | Ratings |     |      | Unit |
|---|---------------------------------|---|---------|-----|------|------|
|   |                                 |   | min     | typ | max  |      |
| Power supply voltage                              | I <sub>CC0</sub>                | Standby mode<br>IN1=IN2=IN3=IN4="LOW"                       |         |     | 1    | μA   |
|   | I <sub>CC1</sub>                | It is "High" from IN1 as for either of IN4.<br>Load opening |         | 1.7 | 2.3  | mA   |
| Input current                                     | I <sub>IN</sub>                 | V <sub>IN</sub> =5V   | 35      | 50  | 65   | μA   |
| Thermal shutdown operating temperature            | T <sub>tsd</sub>                | Design certification  | 150     | 180 | 210  | °C   |
| Width of temperature hysteria                     | ΔT <sub>tsd</sub>               | Design certification  |         | 40  |      | °C   |
| Low voltage protection function operation voltage | V <sub>th</sub> V <sub>CC</sub> |   | 3.3     | 3.5 | 3.65 | V    |
| Release voltage                                   | V <sub>thret</sub>              |   | 3.55    | 3.8 | 3.95 | V    |
| Output ON resistance (Upper and lower total)      | R <sub>ON</sub>                 | I <sub>OUT</sub> =1.0A                                      | 0.7     | 1   | 1.25 | Ω    |
| Output leak current                               | I <sub>O</sub> leak             | V <sub>O</sub> =16V   |         |     | 10   | μA   |
| Diode forward voltage                             | V <sub>D</sub>                  | I <sub>D</sub> =1.0A  |         | 1.0 | 1.2  | V    |

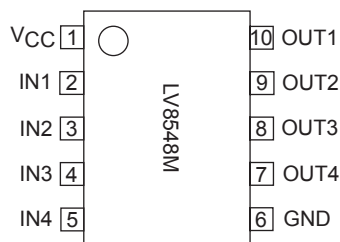
## Package Dimensions

unit : mm (typ)

3086B

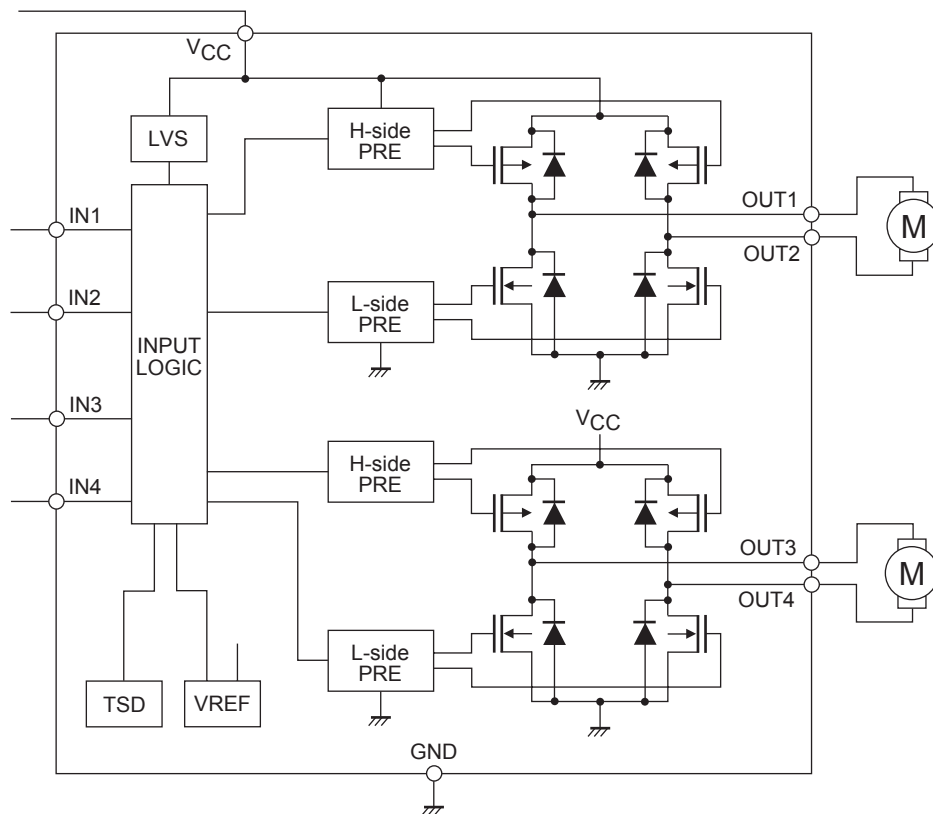


## Pin Assignment

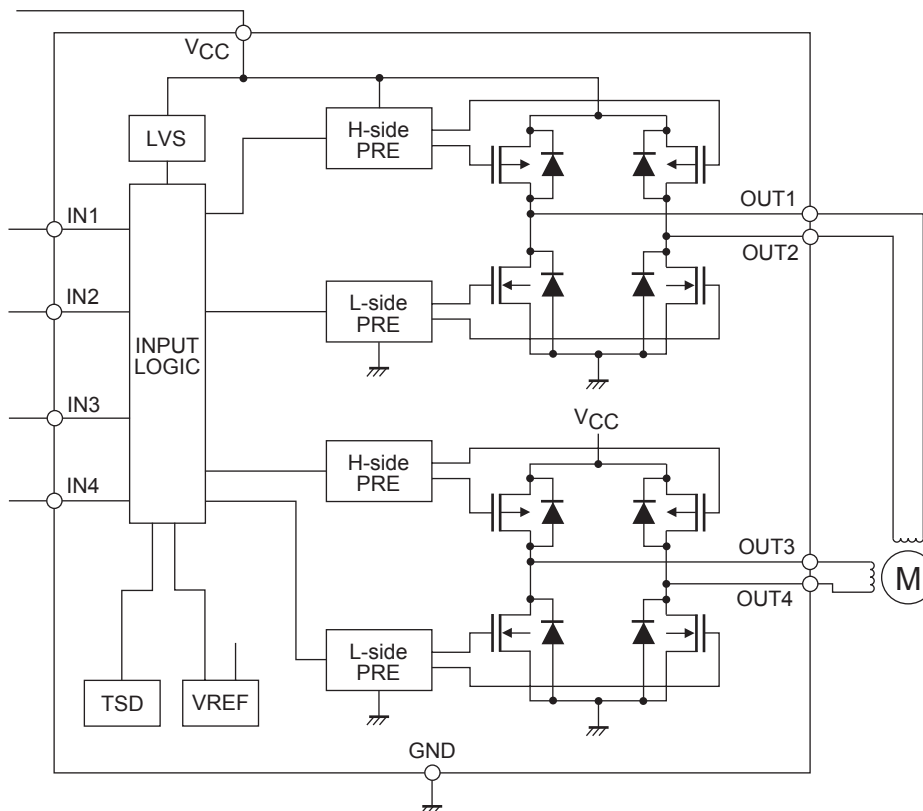


## Block Diagram

### 1. At two DC motor drive



### 2. At one stepping motor drive



## Pin function

| Pin No. | Pin name        | Pin function  | Equivalent Circuit |
|---------|-----------------|---|--------------------|
| 1       | V <sub>CC</sub> | Power-supply voltage pin.<br>V <sub>CC</sub> voltage is impressed. The permissible operation voltage is from 4.0 to 16.0(V). The capacitor is connected for stabilization for GND pin (6pin).   |                    |
| 2       | IN1             | Motor drive control input pin.<br>Driving control input pin of OUT1 (10pin) and OUT2 (9pin). It combines with IN2 pin (3pin) and it fights desperately. The digital input it, range of the "L" level input is 0 to 0.7(V), range of the "H" level input is from 1.8 to 5.5(V). PWM can be input. Pull-down resistance 100(kΩ) is built into in the pin. It becomes a standby mode because all IN1, IN2, IN3, and IN4 pins are made "L", and the circuit current can be adjusted to 0. |                    |
| 3       | IN2             | Motor drive control input pin.<br>Driving control input pin of OUT1 (10pin) and OUT2 (9pin). It combines with IN1 pin (2pin) and it uses it. PWM can be input. With built-in pull-down resistance.  |                    |
| 4       | IN3             | Motor drive control input pin.<br>Driving control input pin of OUT3 (8pin) and OUT4 (7pin). It combines with IN4 pin (5pin) and it uses it. PWM can be input. With built-in pull-down resistance.   |                    |
| 5       | IN4             | Motor drive control input pin.<br>Driving control input pin of OUT3 (8pin) and OUT4 (7pin). It combines with IN3 pin (4pin) and it uses it. PWM can be input. With built-in pull-down resistance.   |                    |
| 6       | GND             | Ground pin.   |                    |
| 7       | OUT4            | Driving output pin.<br>The motor coil is connected between terminal OUT3 (8pin).  |                    |
| 8       | OUT3            | Driving output pin.<br>The motor coil is connected between terminal OUT4 (7pin).  |                    |
| 9       | OUT2            | Driving output pin.<br>The motor coil is connected between terminal OUT1 (10pin).   |                    |
| 10      | OUT1            | Driving output pin.<br>The motor coil is connected between terminal OUT2 (9pin).  |                    |

## Operation explanation

### 1. DCM output control logic

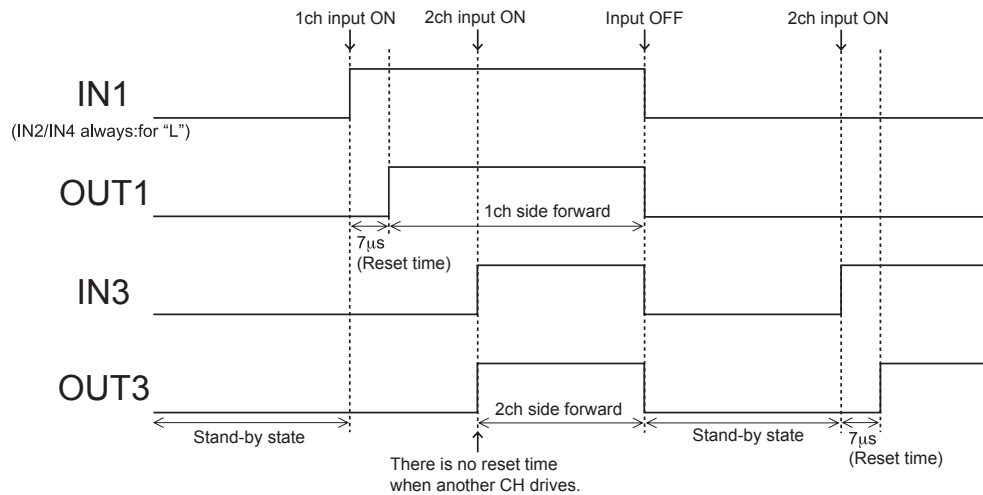
| Input |     |     |     | Output |      |      |      | Remarks  |
|-------|-----|-----|-----|--------|------|------|------|----------|
| IN1   | IN2 | IN3 | IN4 | OUT1   | OUT2 | OUT3 | OUT4 |          |
| L     | L   | L   | L   | OFF    | OFF  | OFF  | OFF  | Stand-by |
| L     | L   |     |     | OFF    | OFF  |      |      | Stand-by |
| H     | L   |     |     | H      | L    |      |      | Forward  |
| L     | H   |     |     | L      | H    |      |      | Reverse  |
| H     | H   |     |     | L      | L    |      |      | Brake    |
|       |     | L   | L   |        |      | OFF  | OFF  | Stand-by |
|       |     | H   | L   |        |      | H    | L    | Forward  |
|       |     | L   | H   |        |      | L    | H    | Reverse  |
|       |     | H   | H   |        |      | L    | L    | Brake    |

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### 2. About the switch time from the stand-by state to the state of operation

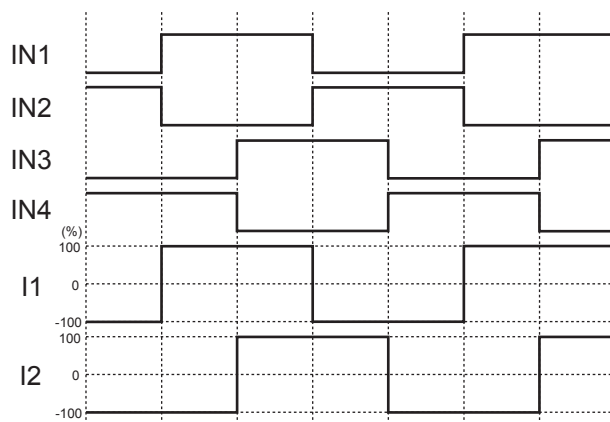
When IN1, IN2, IN3, IN4 are "L", this IC has completely stopped operating. After the time of reset of about  $7\mu\text{s}$  of an internal setting, it shifts to a prescribed output status corresponding to the state of the input when the signal enters the input terminal.

Reset of about  $7\mu\text{s}$  doesn't hang even if the motor is driven from the stand-by state when either CH drives and the output becomes an output status corresponding to the state of the input. As for full power TR between the reset time, turning off is maintained.

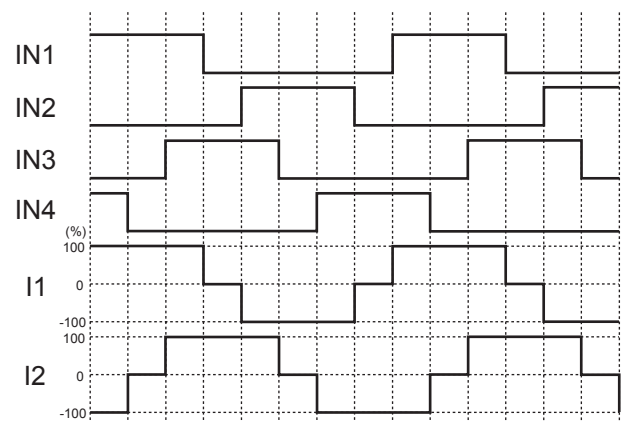


### 3. Example of current wave type in each excitation mode when stepping motor parallel input is controlled.

#### • 2 phase excitation

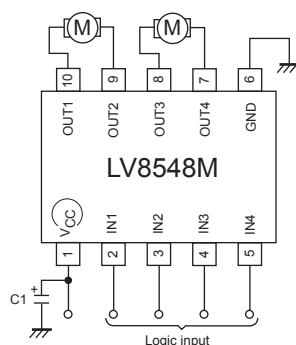


#### • 1-2 phase excitation

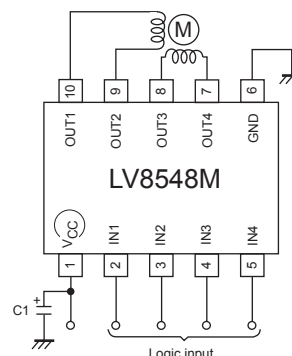


## Application Circuit Example

### 1. Example of applied circuit when two DC motor driving



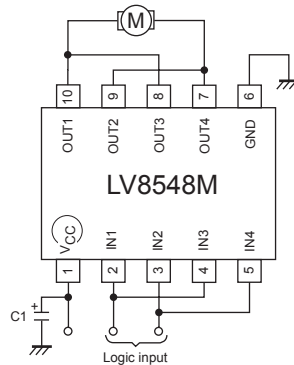
### 2. Example of applied circuit when one stepping motor driving



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### 3. Example of applied circuit when connecting it in parallel

The use likened to H bridge 1ch is shown possible in the figure below by connecting IN1 with IN3, IN2 with IN4, OUT1 with OUT3, OUT2, and OUT4. ( $I_O$  max=2.0A, Upper and lower total  $R_{ON}$ =0.5 $\Omega$ )



\* Bypass capacitor (C1) connected between  $V_{CC}$ -GND of all examples of applied circuit recommends the electric field capacitor of 0.1 $\mu$ A to 10 $\mu$ A.

Confirm there is no problem in operation in the state of the motor load including the temperature property about the value of the capacitor.

Mount the position where the capacitor is mounted on nearest IC.

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