



SANYO Semiconductors

# DATA SHEET

Monolithic Digital IC

## LB1948M — Low saturation voltage drive forward/reverse 12 V motor driver

### Overview

The LB1948M is a two-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 two-phase bipolar stepping motor with 1-2 phase excitation mode drive.

### Applications

12V low saturation voltage forward/reverse motor drive

### Features

- Supports 12V power supply systems
- Low saturation voltage:  $V_O(\text{sat})=0.5\text{V}$  (typical) at  $I_O=400\text{mA}$
- Zero current drawn in standby mode
- Braking function
- Supports parallel connection:  $I_{O\text{max}}=1.6\text{A}$ ,  $V_O(\text{sat})=0.6\text{V}$  (typical) at  $I_O=800\text{mA}$
- Built-in spark killer diode
- Thermal shutdown circuit
- Miniature package: MFP-10S (6.5 × 5.1mm)

### Specifications

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

| Parameter                   | Symbol              | Conditions                  | Ratings     | Unit |
|-----------------------------|---------------------|-----------------------------|-------------|------|
| Maximum supply voltage      | $V_{CC\text{ max}}$ |                             | -0.3 to +20 | V    |
| Output voltage              | $V_{OUT}$           |                             | -0.3 to +20 | V    |
| Input voltage               | $V_{IN}$            |                             | -0.3 to +18 | V    |
| Ground pin source current   | $I_{GND}$           | Per channel                 | 800         | mA   |
| Allowable power dissipation | $P_d\text{ max1}$   | Independent IC              | 350         | mW   |
|                             | $P_d\text{ max2}$   | Mounted on a circuit board* | 870         | mW   |
| Operating temperature       | $T_{opr}$           |                             | -20 to +85  | °C   |
| Storage temperature         | $T_{stg}$           |                             | -40 to +150 | °C   |

\*: On the stipulated circuit board (114.3 × 76.1 × 1.6mm, glass epoxy)

- Any and all SANYO products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your SANYO representative nearest you before using any SANYO products described or contained herein in such applications.
- SANYO assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO products described or contained herein.

**SANYO Electric Co., Ltd. Semiconductor Company**

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

# LB1948M

## Allowable Operating Ranges at $T_a=25^\circ\text{C}$

| Parameter                | Symbol   | Conditions | Ratings      | Unit |
|--------------------------|----------|------------|--------------|------|
| Supply voltage           | $V_{CC}$ |            | 2.5 to 16    | V    |
| Input high-level voltage | $V_{IH}$ |            | 1.8 to 10    | V    |
| Input low-level voltage  | $V_{IL}$ |            | -0.3 to +0.7 | V    |

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

| Parameter                 | Symbol        | Conditions                                      | Ratings |      |      | Unit          |
|---------------------------|---------------|---|---------|------|------|---------------|
|                           |               |   | min     | typ  | max  |               |
| Current drain             | $I_{CC0}$     | IN1, 2, 3, 4=0V (Standby mode)                  |         | 0.1  | 10   | $\mu\text{A}$ |
|                           | $I_{CC1}$     | *1 (Forward or reverse mode)                    |         | 15   | 21   | mA            |
|                           | $I_{CC2}$     | *2 (Brake mode)                                 |         | 30   | 40   | mA            |
| Output saturation voltage | $V_{O(sat)1}$ | $I_{OUT}=200\text{mA}$ (High Side and Low Side) | —       | 0.25 | 0.35 | V             |
|                           | $V_{O(sat)2}$ | $I_{OUT}=400\text{mA}$ (High Side and Low Side) | —       | 0.50 | 0.75 | V             |
| Input current             | $I_{IN}$      | $V_{IN}=5\text{V}$                              |         | 85   | 110  | $\mu\text{A}$ |
| [Spark Killer Diode]      |               |   |         |      |      |               |
| Reverse current           | $I_S$ (leak)  |   |         |      | 30   | $\mu\text{A}$ |
| Forward voltage           | $V_{SF}$      | $I_{OUT}=400\text{mA}$                          |         |      | 1.7  | V             |

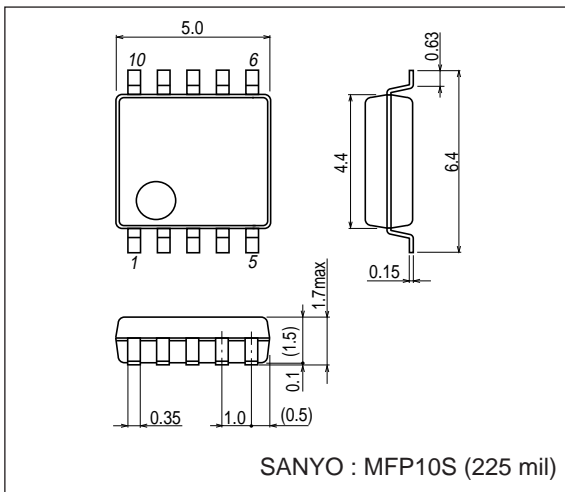
\*1: IN1/IN2/IN3/IN4=H/L/L/L or L/H/L/L or L/L/H/L or L/L/L/H

\*2: IN1/IN2/IN3/IN4=H/H/L/L or L/L/H/H

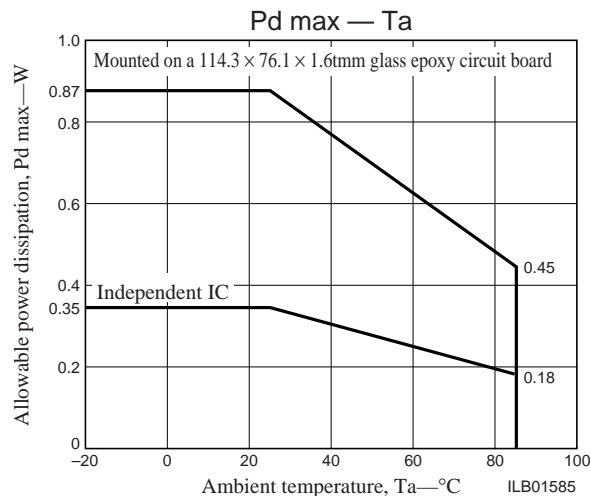
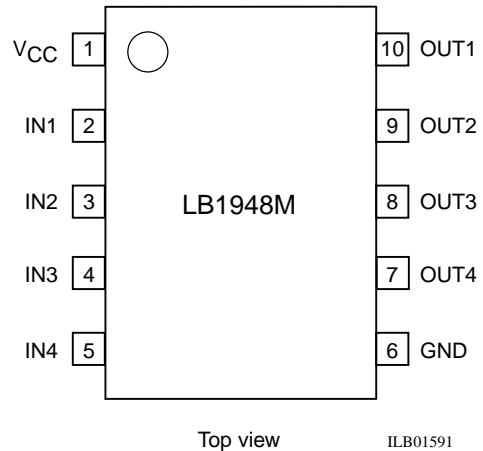
## Package Dimensions

unit : mm

3086B



## Pin Assignment

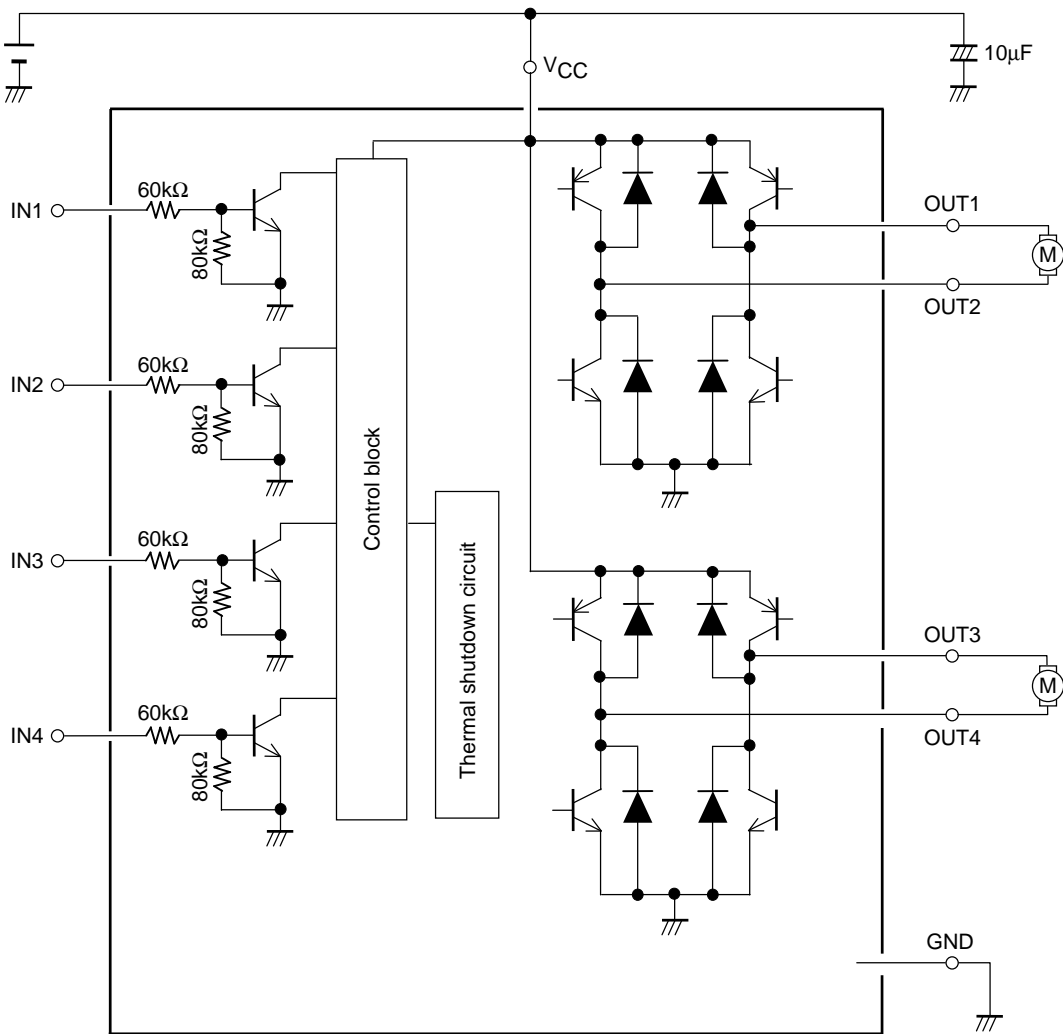


# LB1948M

## Truth Table

| Input |     |     |     | Output |      |      |      | Notes        |              |
|-------|-----|-----|-----|--------|------|------|------|--------------|--------------|
| IN1   | IN2 | IN3 | IN4 | OUT1   | OUT2 | OUT3 | OUT4 |              |              |
| L     | L   | L   | L   | OFF    | OFF  | OFF  | OFF  | Standby mode |              |
| L     | L   |     |     | OFF    | OFF  |      |      | 1CH          | Standby mode |
| H     | L   |     |     | H      | L    |      |      |              | Forward      |
| L     | H   |     |     | L      | H    |      |      |              | Reverse      |
| H     | H   |     |     | L      | L    |      |      |              | Brake        |
|       |     | L   | L   |        |      | OFF  | OFF  | 2CH          | Standby mode |
|       |     | H   | L   |        |      | H    | L    |              | Forward      |
|       |     | L   | H   |        |      | L    | H    |              | Reverse      |
|       |     | H   | H   |        |      | L    | L    |              | Brake        |

## Block Diagram



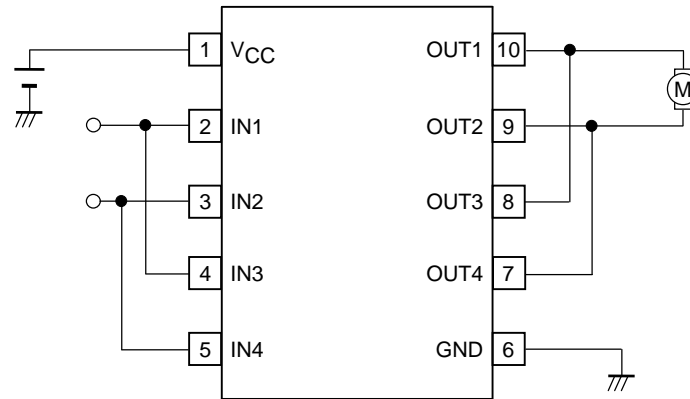
## Design Documentation

- Voltage magnitude relationship

There are no restrictions on the magnitude relationships between the voltages applied to  $V_{CC}$  and IN1 to IN4.

- Parallel connection

The LB1948M can be used as a single-channel H-bridge power supply by connecting IN1 to IN3, IN2 to IN4, OUT1 to OUT3, and OUT2 to OUT4 as shown in the figure. ( $I_{Omax}=1.6A$ ,  $V_{O(sat)}=0.6V$  (typical) at  $I_O=800mA$ )

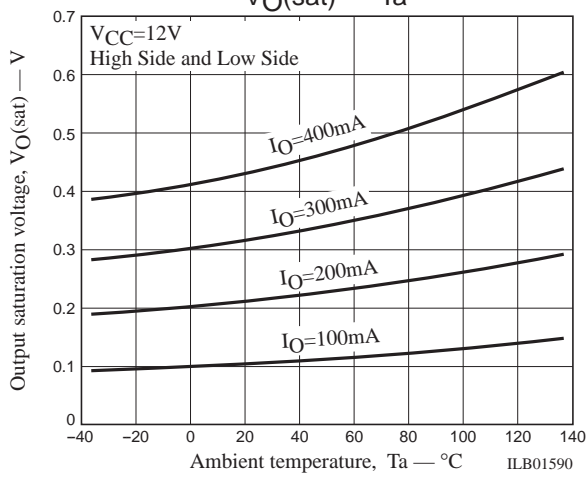
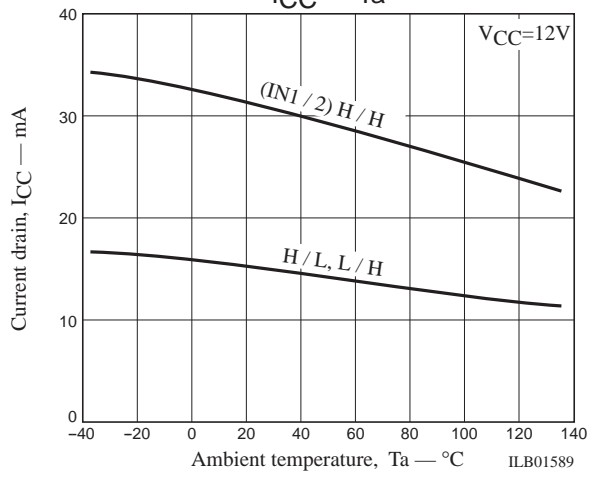
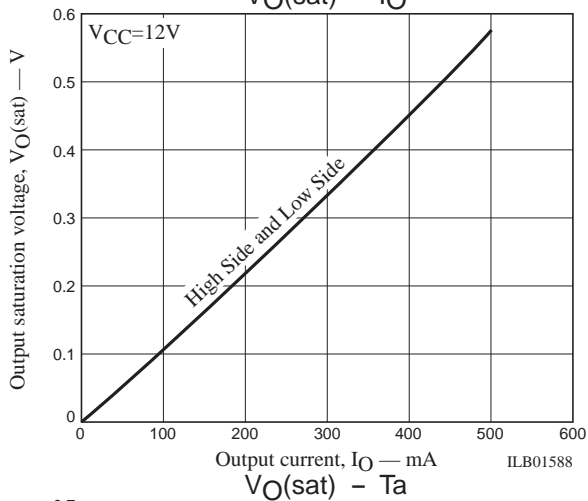
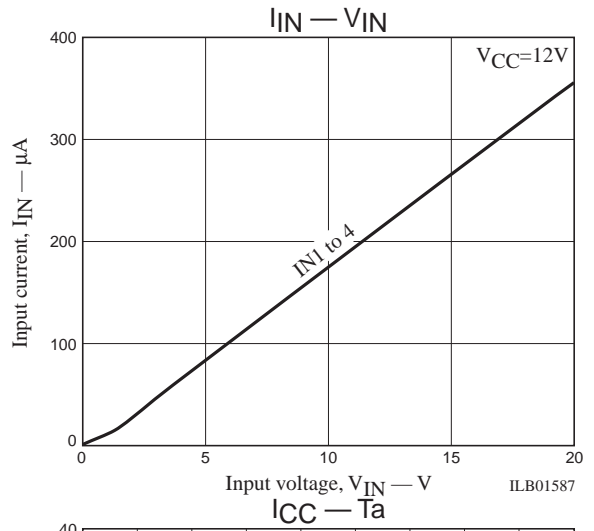
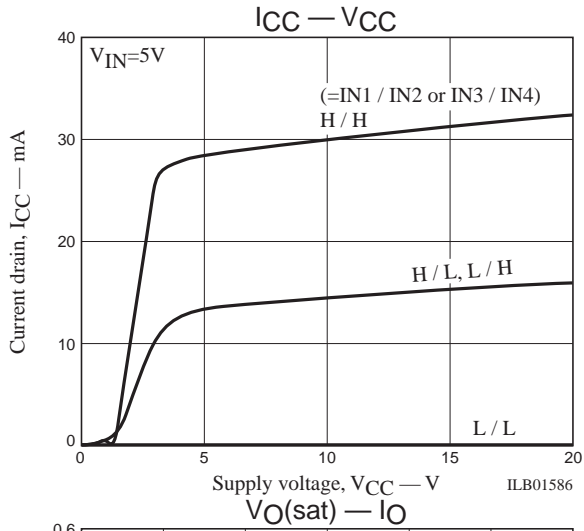


- Observe the following points when designing the printed circuit board pattern layout.

- Make the  $V_{CC}$  and ground lines as wide and as short as possible to lower the wiring inductance.

- Insert bypass capacitors between  $V_{CC}$  and ground mounted as close as possible to the IC.

- Resistors of about  $10K\Omega$  must be inserted between the CPU output ports and the IN1 to IN4 pins if the microcontroller and the LB1948M are mounted on different printed circuit boards and the ground potentials differ significantly.



- Specifications of any and all SANYO products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- SANYO Electric Co., Ltd. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO products(including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of SANYO Electric Co., Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO product that you intend to use.
- Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. SANYO believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

This catalog provides information as of March, 2004. Specifications and information herein are subject to change without notice.

This datasheet has been download from:

[www.datasheetcatalog.com](http://www.datasheetcatalog.com)

Datasheets for electronics components.