

Monolithic digital IC

# LB1930M

## Single-Channel Low Saturation Voltage Forward/Reverse Motor Driver

### Overview

The LB1930M is a low saturation voltage H-bridge forward/reverse motor driver that supports low-voltage drive. This device is optimal for CD, MD, and cassette player loading motors.

### Functions and Features

- The low saturation voltage reduces IC internal heating and allows a high voltage to be applied to the motor. Thus this device can be used even in environments with a high operating ambient temperature.

Output saturation voltage:

$$V_{sat1} = 0.25 \text{ V typical (} I_O = 0.2 \text{ A)}$$

(High side + low side):

$$V_{sat2} = 0.55 \text{ V typical (} I_O = 0.5 \text{ A)}$$

Operating temperature range:

$$T_a = -30 \text{ to } +85^\circ\text{C}$$

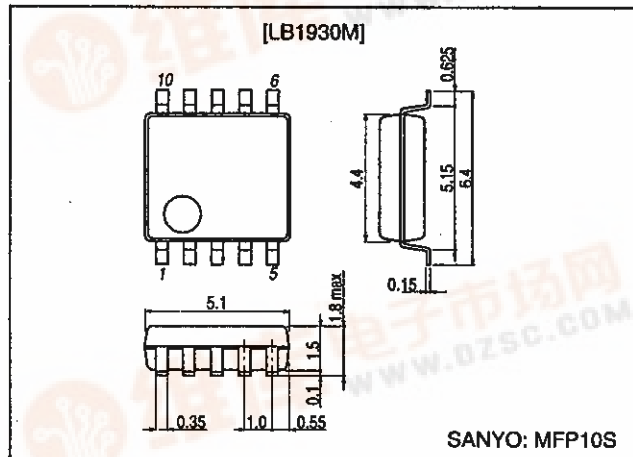
- The LB1930M features the wide operating voltage range of 2.2 to 10.8 V and the low standby current drain of 0.1  $\mu\text{A}$ , and therefore can easily be used in battery operated systems.
- To minimize through currents, the LB1930M internal logic passes through an internal standby state when switched by the input signals between forward/reverse and brake, or between forward and reverse.
- There are no constraints on the relationship between the input voltage and the supply voltage. For example, the LB1930M can be used with  $V_{CC} = 3 \text{ V}$ , and  $V_{IN} = 5 \text{ V}$ .

- If the IC chip exceeds 180°C due to an output short causing a large current flow, the built-in thermal protection circuit suppresses the drive current to prevent fires or destruction of the IC.
- MFP-10S miniature package. Also, the LB1930M features the high allowable power dissipation of  $P_d = 800 \text{ mW}$ .

### Package Dimensions

unit: mm

3148-MFP10S



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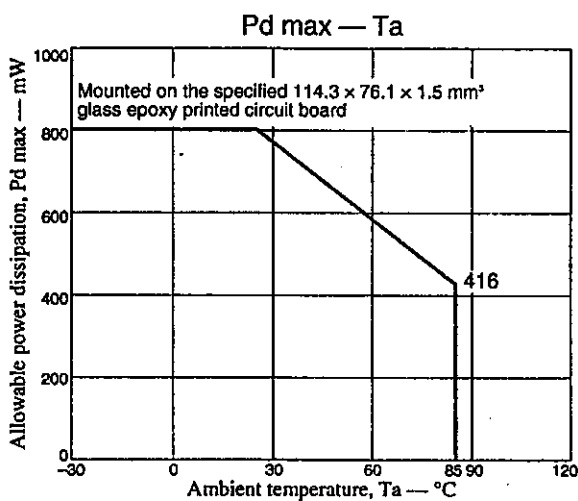
## LB1930M

### Specifications

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

| Parameter                   | Symbol        | Conditions                                      | Rating            | Unit             |
|-----------------------------|---------------|---|-------------------|------------------|
| Supply voltage              | $V_{CC}$ max  |   | 11                | V                |
| Output current              | $I_{OUT}$ max |   | 1000              | mA               |
| Output voltage handling     | $V_{OUT}$ max |   | $V_{CC} + V_{SF}$ | V                |
| Applied input voltage       | $I_H$ max     |   | 10.5              | V                |
| Allowable power dissipation | $P_d$ max     | Mounted on the specified printed circuit board* | 800               | mW               |
| Operating temperature       | $T_{opr}$     |   | -30 to +85        | $^\circ\text{C}$ |
| Storage temperature         | $T_{stg}$     |   | -55 to +150       | $^\circ\text{C}$ |

Note \*:  $114.3 \times 76.1 \times 1.5 \text{ mm}^3$  glass epoxy printed circuit board



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

| Parameter                | Symbol   | Conditions | Rating       | Unit |
|--------------------------|----------|------------|--------------|------|
| Supply voltage           | $V_{CC}$ |            | 2.2 to 10.8  | V    |
| High-level input voltage | $V_{IH}$ |            | 2.0 to 10    | V    |
| Low-level input voltage  | $V_{IL}$ |            | -0.3 to +0.3 | V    |

#### Electrical Characteristics at $T_a = 25^\circ\text{C}$ , $V_{CC} = 3 \text{ V}$

| Parameter                               | Symbol       | Conditions   | Rating |      |      | Unit             |
|---|--------------|--|--------|------|------|------------------|
|   |              |  | min    | typ  | max  |                  |
| Supply current                          | $I_{CC1}$    | Standby mode   |        | 0.1  | 5    | $\mu\text{A}$    |
|   | $I_{CC2}$    | Forward or reverse drive operation                                     |        | 15   | 21   | mA               |
|   | $I_{CC3}$    | Braking  |        | 22   | 31   | mA               |
| Output saturation voltage               | $V_O$ (sat)1 | Forward or reverse drive: High side + low side, $I_O = 200 \text{ mA}$ |        | 0.25 | 0.35 | V                |
|   | $V_O$ (sat)2 | Forward or reverse drive: High side + low side, $I_O = 500 \text{ mA}$ |        | 0.55 | 0.75 | V                |
|   | $V_O$ (sat)3 | Forward or reverse drive: High side only, $I_O = 200 \text{ mA}$       |        | 0.15 | 0.25 | V                |
| Spark killer diode forward voltage      | $V_{SF}$     | $I_O = 200 \text{ mA}$   |        | 0.9  | 1.7  | V                |
| Spark killer diode reverse current      | $I_{RS}$     | $V_{OUT} = 10 \text{ V}$   |        | 0.1  | 5    | $\mu\text{A}$    |
| Input current                           | $I_{IN}$     | $V_{IN} = 5 \text{ V}$   |        | 70   | 95   | $\mu\text{A}$    |
| Thermal detection operating temperature | THD          | Design target value*   | 150    | 180  | 200  | $^\circ\text{C}$ |

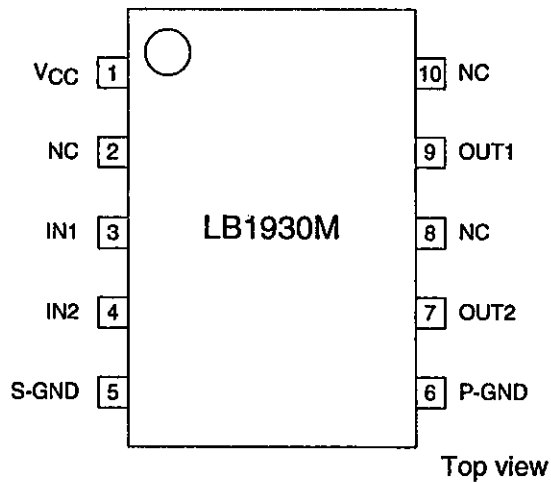
Note \*: This value is a design guarantee and is not measured.

# LB1930M

## Truth Table

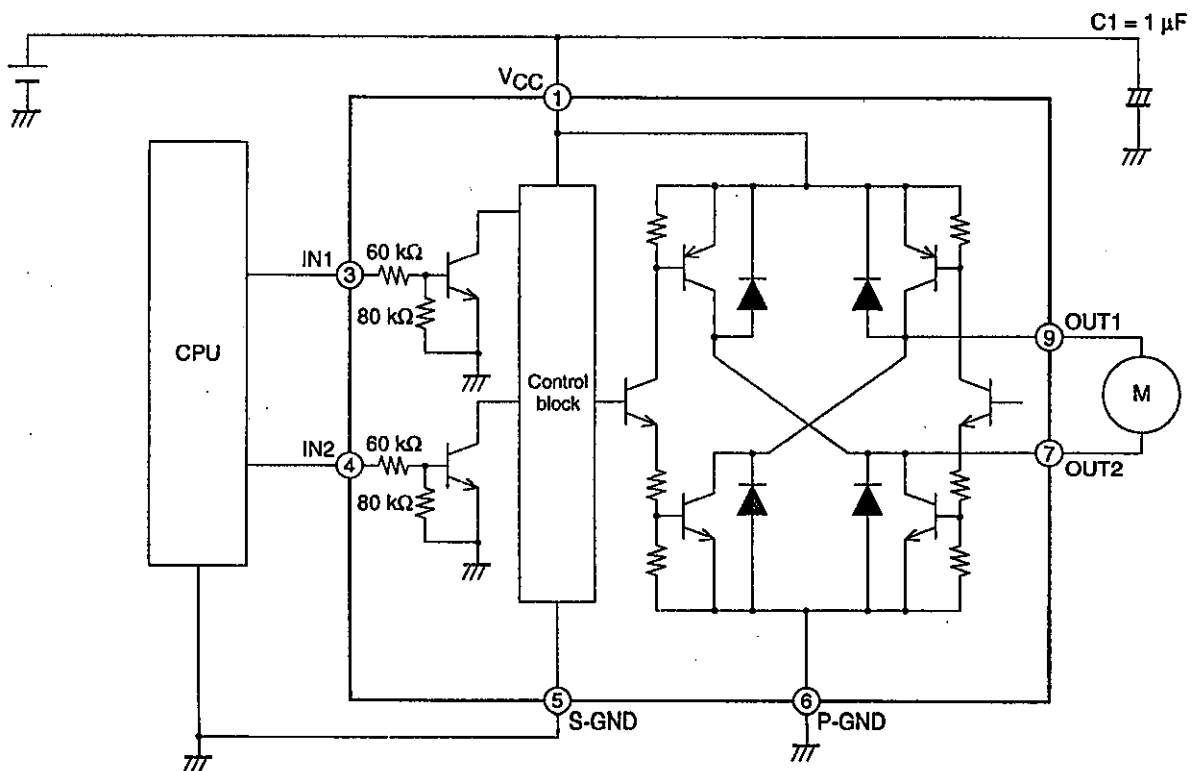
| IN1 | IN2 | OUT1 | OUT2 | Mode    |
|-----|-----|------|------|---------|
| L   | L   | OFF  | OFF  | Standby |
| H   | L   | H    | L    | Forward |
| L   | H   | L    | H    | Reverse |
| H   | H   | H    | H    | Brake   |

## Pin Assignment



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## Block Diagram and Sample Application Circuit



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# LB1930M

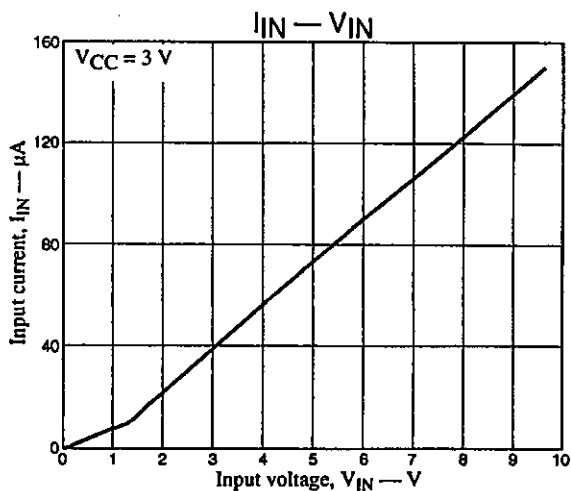
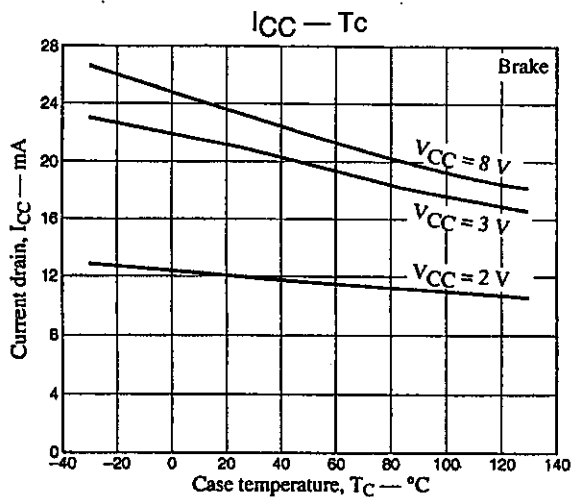
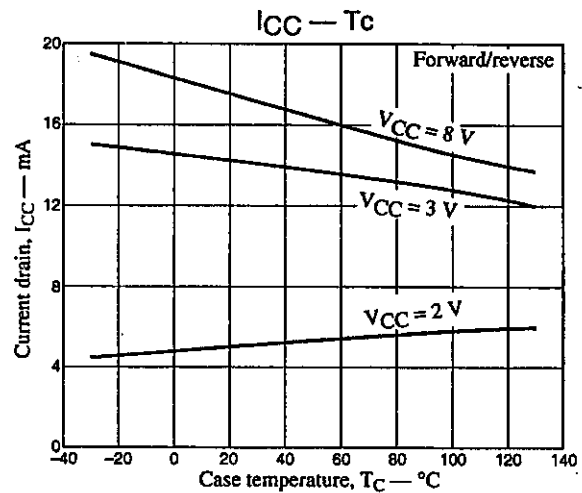
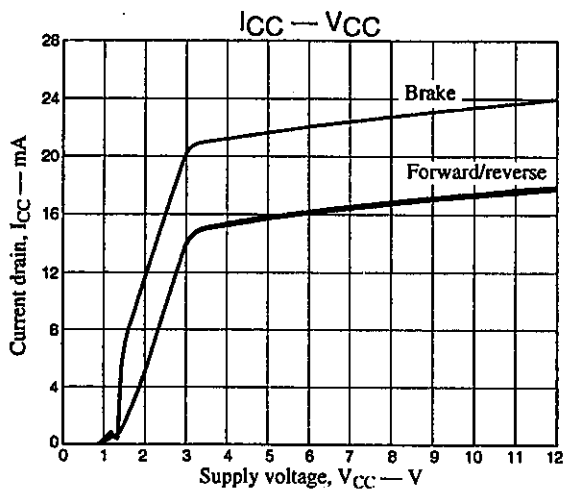
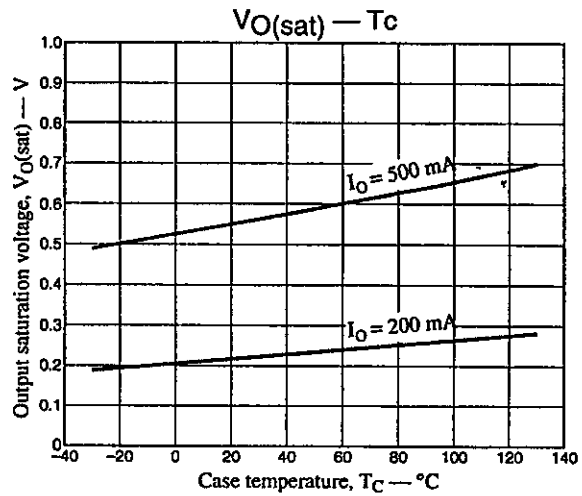
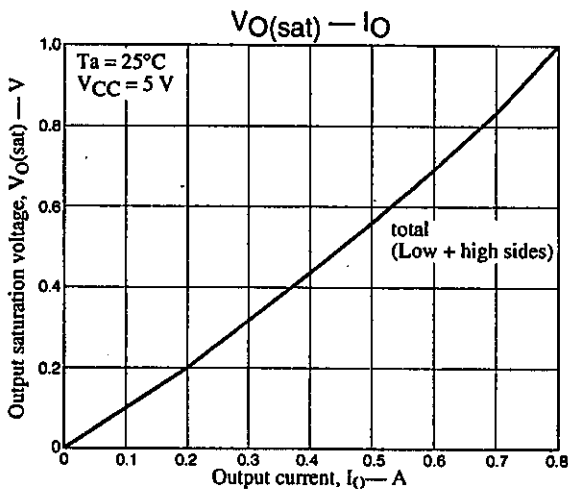
## Usage Notes

Oscillation may occur in the  $V_{CC}$  and P-GND lines, since these lines carry a wide range of currents. The following may help if this is a problem.

- Lower the inductance of the wiring by making lines wider and shorter.
- Insert capacitors with good frequency characteristics close to the IC.
- Consider adopting the following methods if the CPU and this IC are mounted on different printed circuit boards that could easily have different ground potentials.

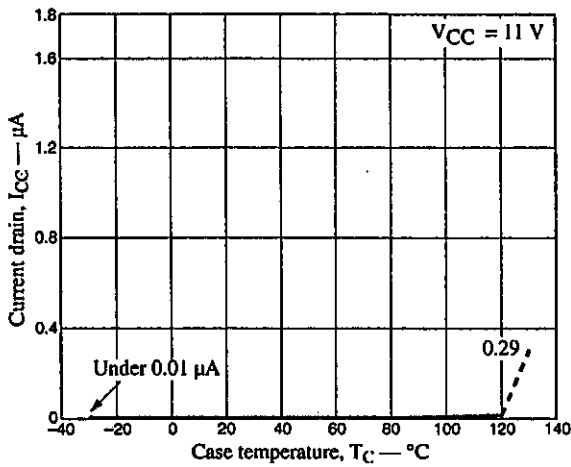
Connect S-GND to the CPU ground and connect P-GND to the power system ground.

Insert resistors of about 10 k $\Omega$  in series between the controller outputs and the inputs on this IC.

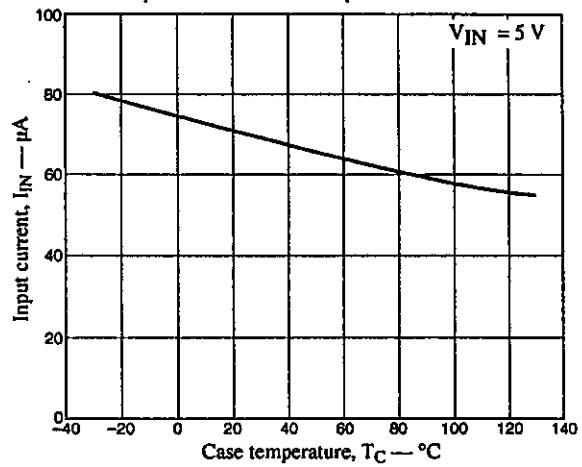


## LB1930M

**I<sub>CC</sub> Standby Temperature Characteristics**



**I<sub>N</sub> Pin Input Current vs. Temperature Characteristics**



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