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# LB1930MC

## Monolithic Digital IC

## Low-Voltage, Low-Saturation

## Bidirectional Motor Driver

### Overview

The LB1930MC is single-channel forward/reverse DC brush motor driver. This device is optimal for CD, DVD and Blue Ray Disk player loading motors. And it is possible to use it for others as a general-purpose product.

### 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:  $V_{sat1} = 0.25V$  typical ( $I_O = 0.2A$ )  
(High side + low side):  $V_{sat2} = 0.55V$  typical ( $I_O = 0.5A$ )  
Operating temperature range:  $T_a = -30$  to  $+85^{\circ}C$
- The LB1930MC features the wide operating voltage range of 2.2 to 10.8V and the low standby current drain of  $0.1\mu A$ , and therefore can easily be used in battery operated systems.
- To minimize through currents, the LB1930MC 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 LB1930MC can be used with  $V_{CC} = 3V$ , and  $V_{IN} = 5V$ .
- If the IC chip exceeds  $180^{\circ}C$  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.

### Specifications

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

| Parameter                   | Symbol        | Conditions                     | Ratings           | 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 a specified board * | 750               | mW          |
| Operating temperature       | $T_{opr}$     |                                | $-30$ to $+85$    | $^{\circ}C$ |
| Storage temperature         | $T_{stg}$     |                                | $-55$ to $+150$   | $^{\circ}C$ |

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

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.

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

# LB1930MC

## Allowable Operating Ranges at Ta = 25°C

| Parameter                | Symbol          | Conditions | Ratings      | Unit |
|--------------------------|-----------------|------------|--------------|------|
| Supply voltage           | V <sub>CC</sub> |            | 2.2 to 10.8  | V    |
| High-level input voltage | V <sub>IH</sub> |            | 2.0 to 10    | V    |
| Low-level input voltage  | V <sub>IL</sub> |            | -0.3 to +0.3 | V    |

## Electrical Characteristics at Ta = 25°C, V<sub>CC</sub> = 3V

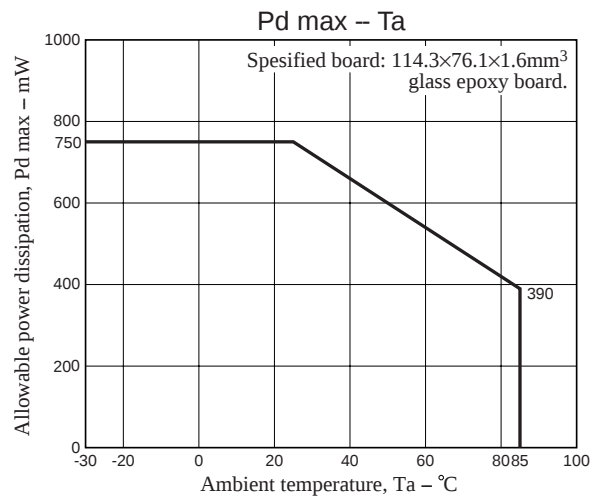
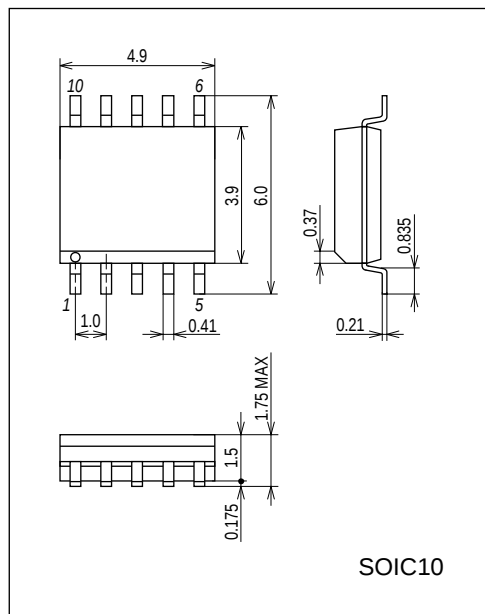
| Parameter                               | Symbol               | Conditions                                                             | Ratings |      |      | Unit |
|-----------------------------------------|----------------------|------------------------------------------------------------------------|---------|------|------|------|
|                                         |                      |                                                                        | min     | typ  | max  |      |
| Current drain                           | I <sub>CC1</sub>     | Standby mode                                                           |         | 0.1  | 5    | μA   |
|                                         | I <sub>CC2</sub>     | Forward or reverse drive operation                                     |         | 15   | 21   | mA   |
|                                         | I <sub>CC3</sub>     | Braking                                                                |         | 22   | 31   | mA   |
| Output saturation voltage               | V <sub>O(sat)1</sub> | Forward or reverse drive: High side + low side, I <sub>O</sub> = 200mA |         | 0.25 | 0.35 | V    |
|                                         | V <sub>O(sat)2</sub> | Forward or reverse drive: High side + low side, I <sub>O</sub> = 500mA |         | 0.55 | 0.75 | V    |
|                                         | V <sub>O(sat)3</sub> | Forward or reverse drive: High side only, I <sub>O</sub> = 200mA       |         | 0.15 | 0.25 | V    |
| Input current                           | I <sub>IN</sub>      | V <sub>IN</sub> = 5V                                                   |         | 70   | 95   | μA   |
| Thermal detection operating temperature | THD                  | Design guarantee value*                                                | 150     | 180  | 200  | °C   |
| <b>Spark Killer diode</b>               |                      |                                                                        |         |      |      |      |
| Forward voltage                         | V <sub>SF</sub>      | I <sub>O</sub> = 200mA                                                 |         | 0.9  | 1.7  | V    |
| Reverse current                         | I <sub>RS</sub>      | V <sub>OUT</sub> = 10V                                                 |         | 0.1  | 5    | μA   |

\* Design guarantee value, Do not measurement.

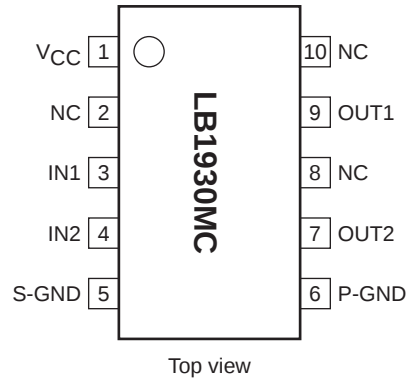
## Package Dimensions

unit : mm (typ)

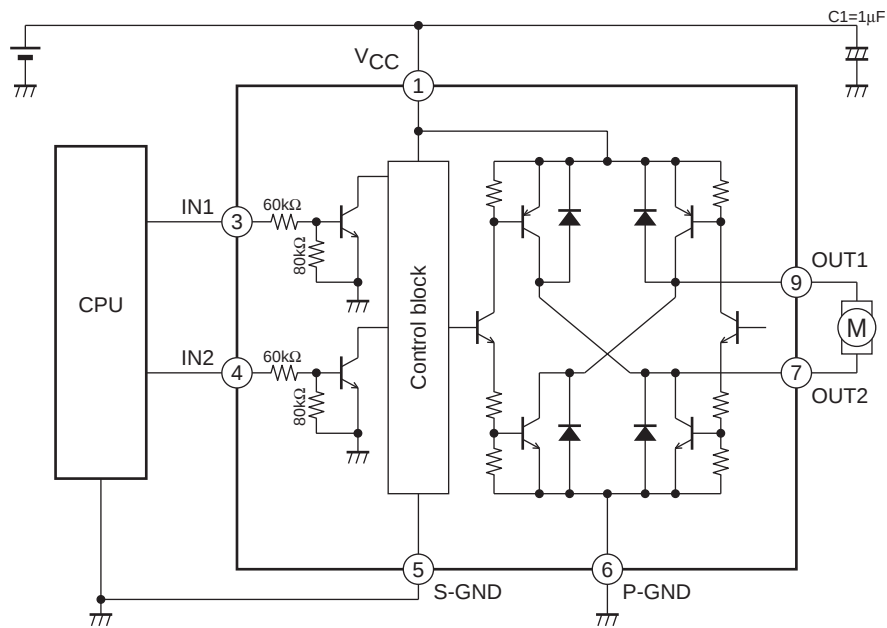
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## Pin Assignment

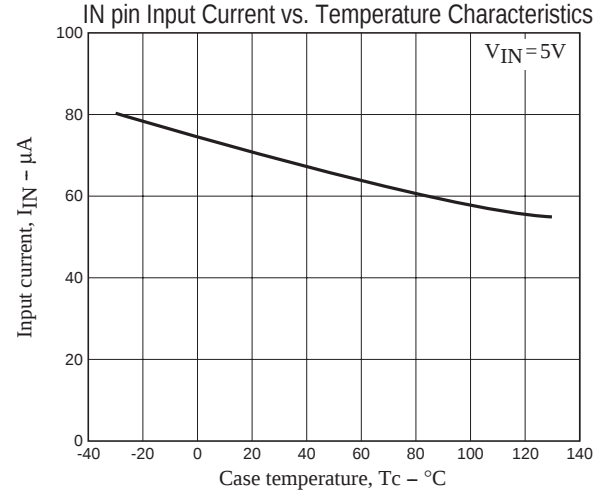
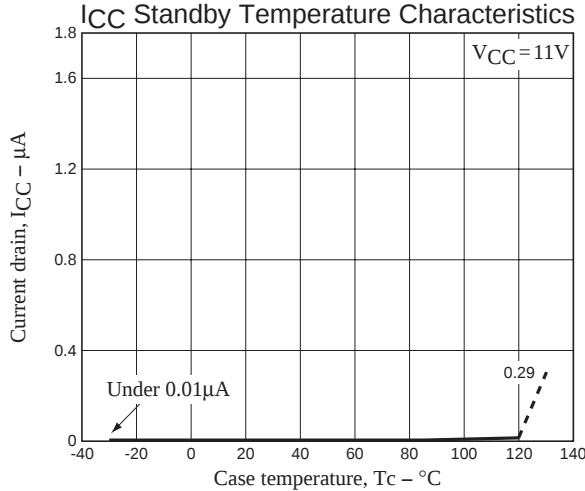
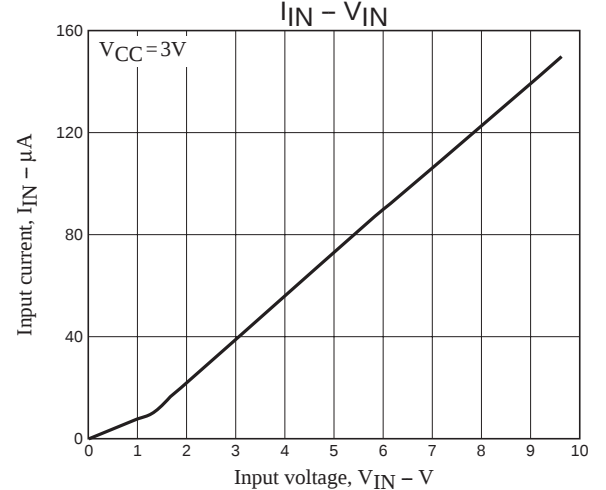
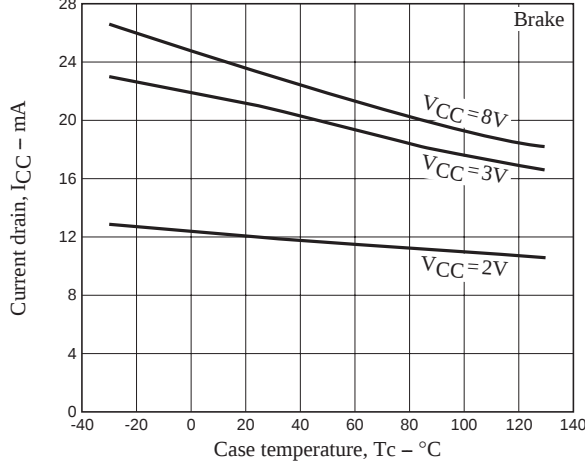
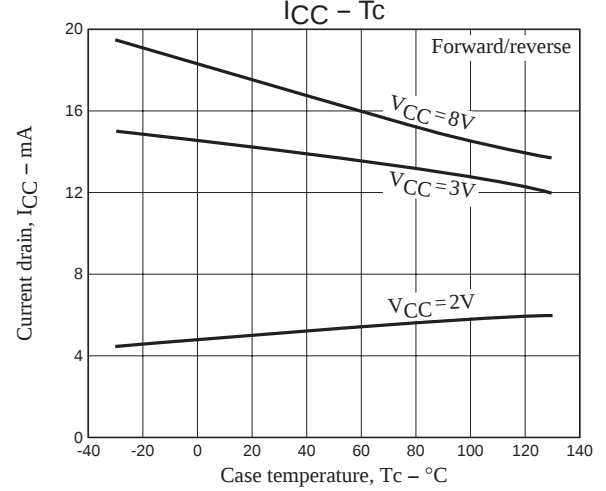
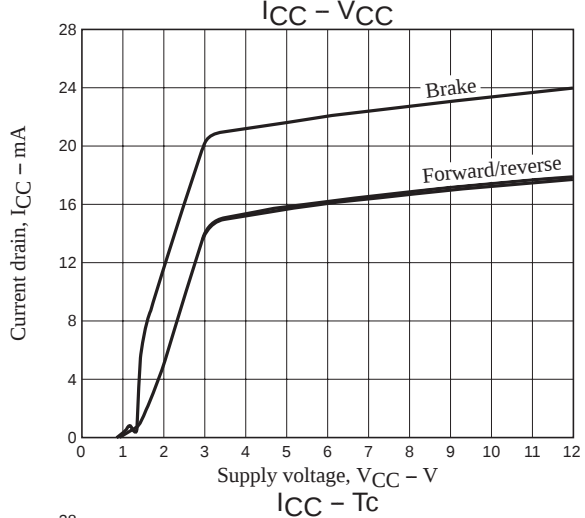
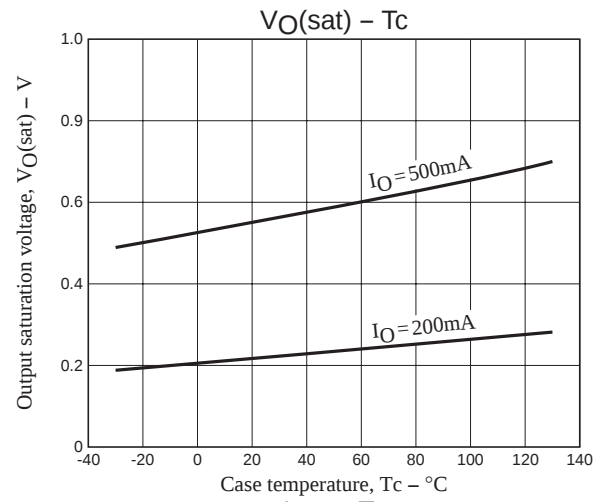
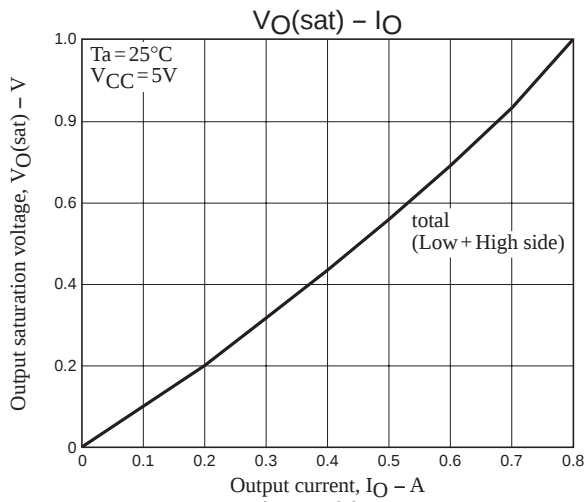


## Block Diagram and Application Circuit Example



## 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   |



## 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.

- (1) Lower the inductance of the wiring by making lines wider and shorter.
- (2) Insert capacitors with good frequency characteristics close to the IC.
- (3) 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 10k $\Omega$  in series between the controller outputs and the inputs on this IC.

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