

**LB1837M****Low-voltage/Low-saturation Bidirectional Constant-Voltage Regulated Motor Driver**

An ON Semiconductor Company

**Overview**

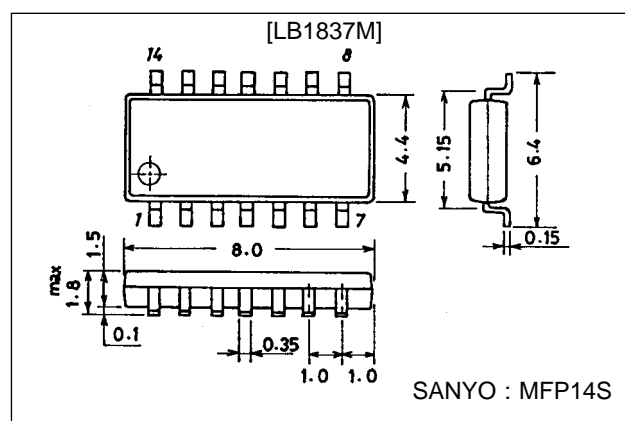
The LB1837M is a low-voltage, low-saturation, two-channel motor driver with a bidirectional braking function that provides constant-voltage regulated output for bidirectional operation. The design of the LB1837M is ideal for video equipment, cameras, and other portable equipment.

**Features**

- Wide operating voltage range (3.0 to 9.0 V).
- Low saturation voltage  
 $V_O(\text{sat}) = 0.40 \text{ V}$  at  $I_O = 200 \text{ mA}$ .
- Consumes almost no current in standby mode (0.1  $\mu\text{A}$  or less).
- Permits setting of bidirectional constant-voltage regulated value.
- Built-in reference voltage coupled to input.
- Brake function built in.
- Compact MFP14S package.

**Package Dimensions**

unit: mm

**3111-MFP14S****Specifications****Absolute Maximum Ratings at  $T_a = 25 \text{ }^\circ\text{C}$** 

| Parameter                   | Symbol               | Conditions                                   | Ratings     | Unit             |
|-----------------------------|----------------------|--|-------------|------------------|
| Maximum supply voltage      | $V_{CC \text{ max}}$ |  | 10.5        | V                |
| Output current              | $I_m \text{ max}$    |  | 250         | mA               |
| Applied input voltage       | $V_{IN}$             |  | -0.3 to +10 | V                |
| Allowable power dissipation | $P_d \text{ max}$    | With board ( 30 x 30 x 1.5 mm <sup>3</sup> ) | 800         | mW               |
| Operating temperature       | $T_{opr}$            |  | -20 to +80  | $^\circ\text{C}$ |
| Storage temperature         | $T_{stg}$            |  | -40 to +125 | $^\circ\text{C}$ |

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

| Parameter         | Symbol   | Conditions | Ratings      | Unit |
|-------------------|----------|------------|--------------|------|
| Supply voltage    | $V_{CC}$ |            | 3.0 to 9.0   | V    |
| Input [H] voltage | $V_{IH}$ |            | 3.0 to 9.0   | V    |
| Input [L] voltage | $V_{IL}$ |            | -0.3 to +0.7 | V    |
| Control voltage   | $V_C$    |            | 0.2 to 6.0   | V    |

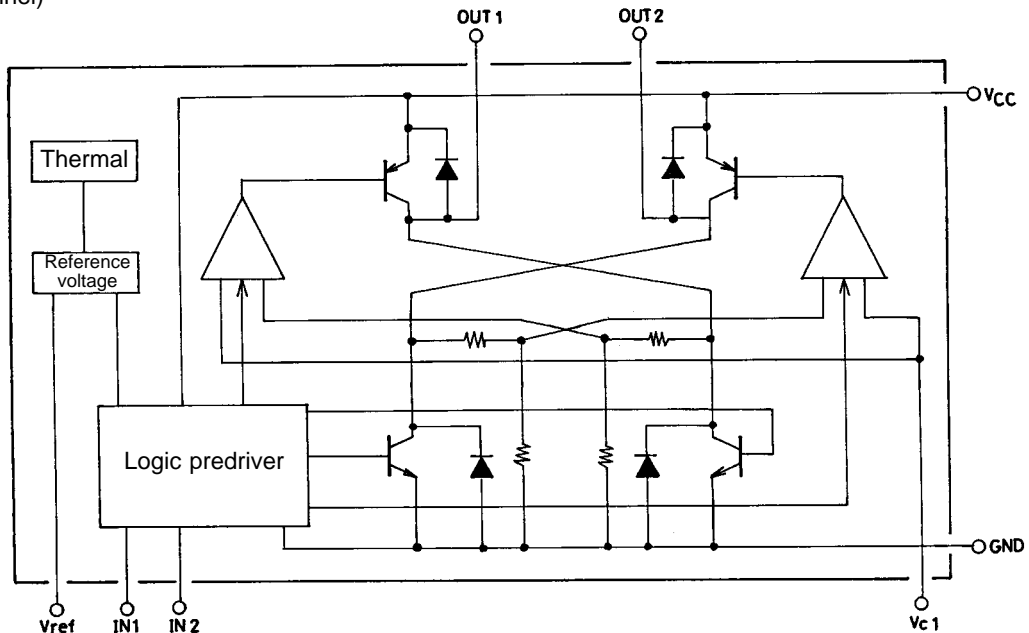
# LB1837M

## Electrical Characteristics at $T_a = 25\text{ }^\circ\text{C}$ , $V_{CC} = 6\text{ V}$

| Parameter                              | Symbol                             | Conditions  | min              | typ  | max              | Unit          |
|--|------------------------------------|---|------------------|------|------------------|---------------|
| Supply current                         | $I_{CC0}$                          | During standby  |                  | 0.1  | 10               | $\mu\text{A}$ |
|  | $I_{CC1}$                          | (For one channel) During bidirectional operation during control, load open          |                  | 2    | 3                | $\text{mA}$   |
|  | $I_{CC2}$                          | (For one channel) During bidirectional operation during saturation, load open       |                  | 3    | 5                | $\text{mA}$   |
|  | $I_{CC3}$                          | During braking (for one channel)  |                  | 6.5  | 9                | $\text{mA}$   |
| Output saturation voltage              | $V_{sat1}$                         | $I_O = 100\text{ mA}$ (upper side + lower side)                                     |                  | 0.3  | 0.4              | V             |
|  | $V_{sat2}$                         | $I_O = 200\text{ mA}$ (upper side + lower side)                                     |                  | 0.4  | 0.55             | V             |
|  | $V_{sat3}$                         | $I_O = 200\text{ mA}$ (lower side)  | 0.07             | 0.10 | 0.15             | V             |
| Reference voltage                      | $V_{ref}$                          | $I_{vref} = 1\text{ mA}$  | 1.85             | 2.0  | 2.15             | V             |
| Output voltage voltage characteristics | $\frac{\Delta V_O}{\Delta V_{CC}}$ | $V_O = 5\text{ V}$ , $V_{CC} = 5.5\text{ to }9\text{ V}$ ,<br>$I_O = 100\text{ mA}$ |                  |      | 20               | $\text{mV}$   |
| Output voltage current characteristics | $\frac{\Delta V_O}{\Delta I_{CC}}$ | $V_O = 5\text{ V}$ , $V_{CC} = 6\text{ V}$ ,<br>$I_O = 10\text{ to }100\text{ mA}$  |                  |      | 50               | $\text{mV}$   |
| Input current                          | $I_{IN}$                           | $V_{IN} = 5\text{ V}$   |                  | 90   | 150              | $\mu\text{A}$ |
| Output voltage                         | $V_O$                              | Between OUT and GND   | $2.5 \times V_C$ |      | $2.7 \times V_C$ | V             |

### Equivalent Circuit Block Diagram

(For one channel)

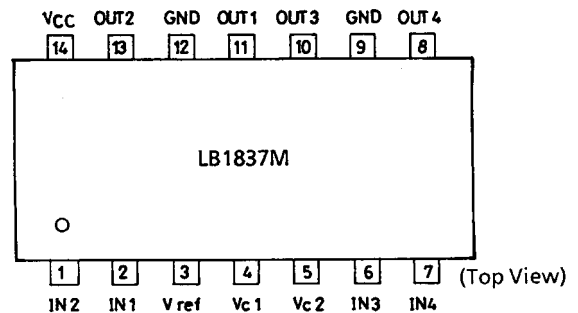


### Truth Table

| Input  |        | Output  |         | Mode   |
|--------|--------|---------|---------|--|
| IN 1/3 | IN 2/4 | OUT 1/3 | OUT 2/4 |  |
| L      | L      | OFF     | OFF     | Standby                                      |
| H      | L      | H       | L       | Constant-voltage regulated forward operation |
| L      | H      | L       | H       | Constant-voltage regulated reverse operation |
| H      | H      | L       | L       | Brake  |

The constant-voltage regulated output  $V_O$  (= voltage between H side output and GND) is controlled by  $2.5 \times V_C$ . The output is in the saturated state when the  $V_C$  input range is 0.2 to 6 V and  $V_O \cong V_{CC}$ .

### Pin Assignment



Note: Both GND pins must be grounded.

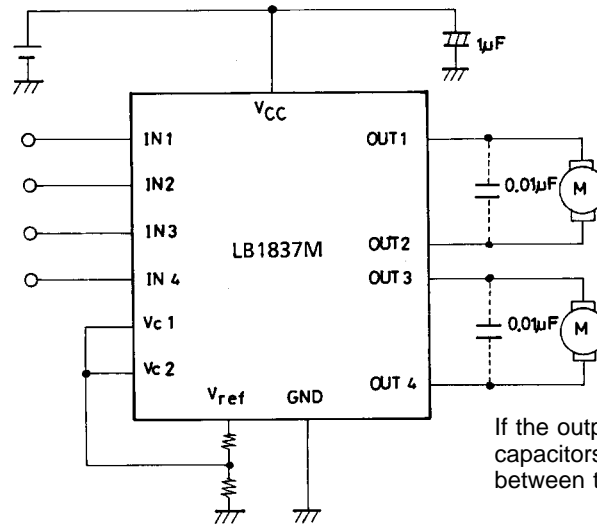
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## Pin Functions

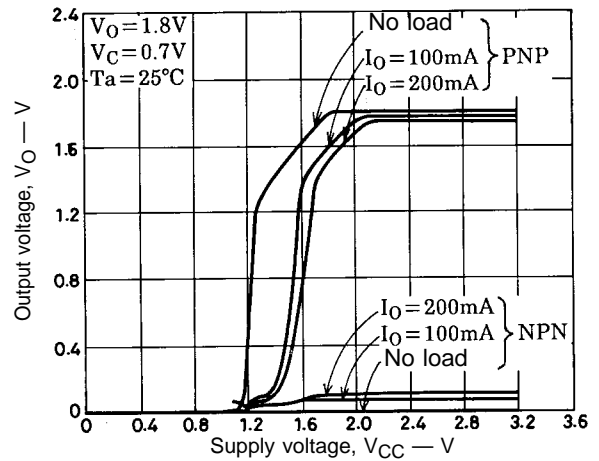
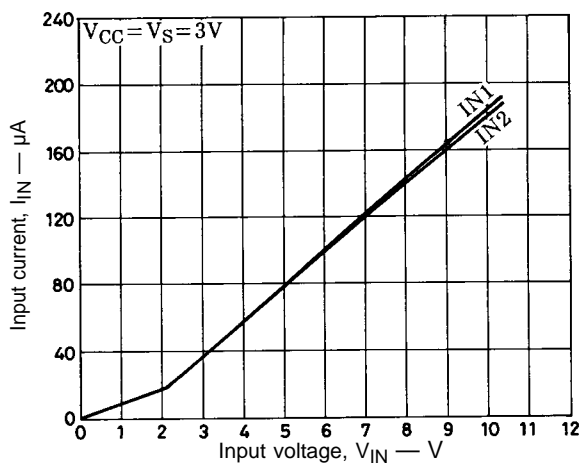
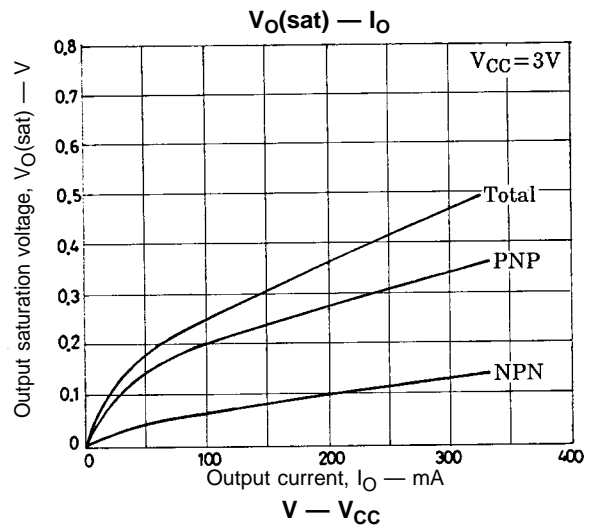
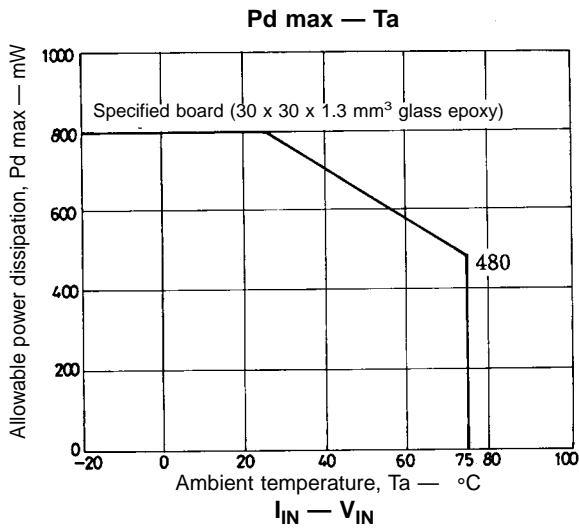
| Pin No.             | Symbol                             | Equivalent Circuit Diagram               | Pin Function   |
|---------------------|------------------------------------|--|--|
| 14                  | V <sub>CC</sub>                    |  | Power supply pin for output and controller.  |
| 9<br>12             | GND                                |  | GND pins for output and controller. Both must be grounded.   |
| 1<br>2<br>6<br>7    | IN2<br>IN1<br>IN3<br>IN4           | <p style="text-align: right;">A03935</p> | <p>Input pins that determine the excitation of the outputs.</p> <p>IN1 and IN2 control outputs OUT1 and OUT2; IN3 and IN4 control outputs OUT3 and OUT4.</p> <p>When inputs IN1 through IN4 are all low or open, the device goes into standby mode and current consumption drops to 10 μA or less.</p> <p style="margin-left: 40px;">L: -0.3 to +0.7 V<br/>H: 3.0 to 9.0 V</p> <p>There are no limitations on the magnitude relationships between the V<sub>CC</sub> and V<sub>IN</sub> supply voltages.</p> |
| 8<br>10<br>11<br>13 | OUT4<br>OUT3<br>OUT1<br>OUT2       | <p style="text-align: right;">A03936</p> | <p>Output pins.</p> <p>Have built-in spark killer diodes. Braking provides short braking that turns on the lower transistor.</p>   |
| 3                   | V <sub>ref</sub>                   | <p style="text-align: right;">A03937</p> | Reference voltage (= 2.0 V).   |
| 4<br>5              | V <sub>C1</sub><br>V <sub>C2</sub> | <p style="text-align: right;">A03938</p> | <p>Input pins that determine the constant-voltage regulated output level.</p> <p>The constant-voltage regulated output V<sub>O</sub> (= voltage between H side output and GND) is controlled by V<sub>O</sub> = 2.5 × V<sub>C</sub>. There are no limitations on the magnitude relationships between the V<sub>CC</sub>, V<sub>C1</sub> and V<sub>C2</sub> supply voltages.</p>  |

# LB1837M

## Sample Application Circuit



If the outputs oscillate, insert capacitors of 0.001 to 0.1  $\mu\text{F}$  between the outputs.



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