

**LB1837M**

## Low-voltage/Low-saturation Bidirectional Constant-Voltage Regulated Motor Driver

### Overview

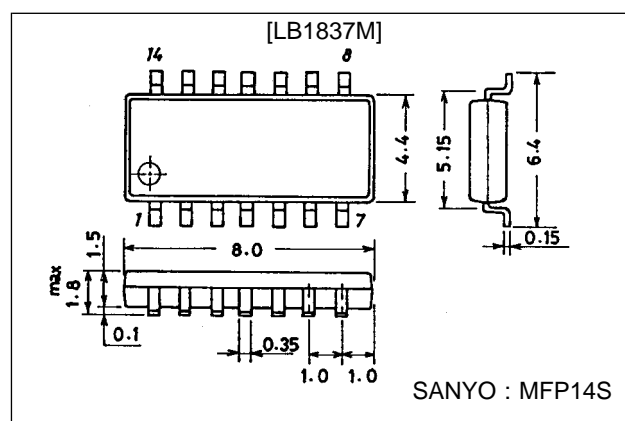
The LB1837M is a low-voltage, low-saturation, two-channel motor driver with a bidirectional braking function that provides constant-voltage regulated output for bidirectional operation. The design of the LB1837M is ideal for video equipment, cameras, and other portable equipment.

### 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

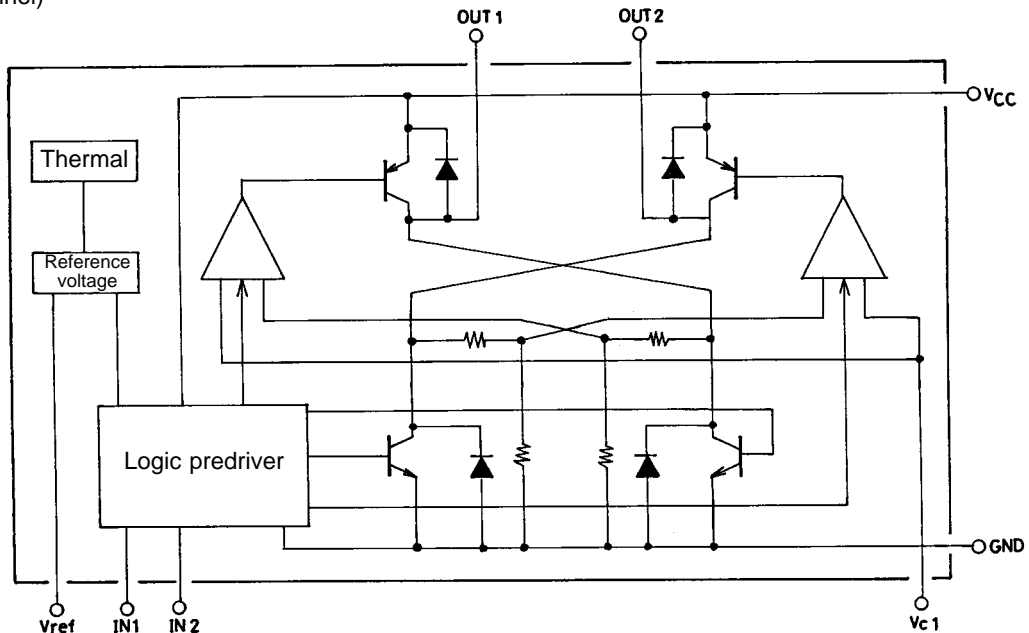
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## Electrical Characteristics at $T_a = 25\text{ }^\circ\text{C}$ , $V_{CC} = 6\text{ V}$

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	$\frac{\Delta V_O}{\Delta V_{CC}}$	$V_O = 5\text{ V}$ , $V_{CC} = 5.5\text{ to }9\text{ V}$ , $I_O = 100\text{ mA}$			20	$\text{mV}$
Output voltage current characteristics	$\frac{\Delta V_O}{\Delta I_{CC}}$	$V_O = 5\text{ V}$ , $V_{CC} = 6\text{ V}$ , $I_O = 10\text{ to }100\text{ mA}$			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)

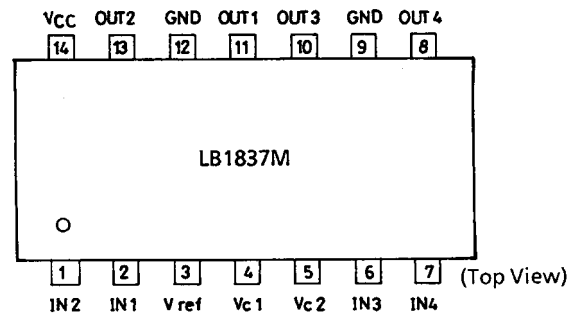


## Truth Table

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  $0.2\text{ to }6\text{ V}$  and  $V_O \cong V_{CC}$ .

## Pin Assignment



Note: Both GND pins must be grounded.

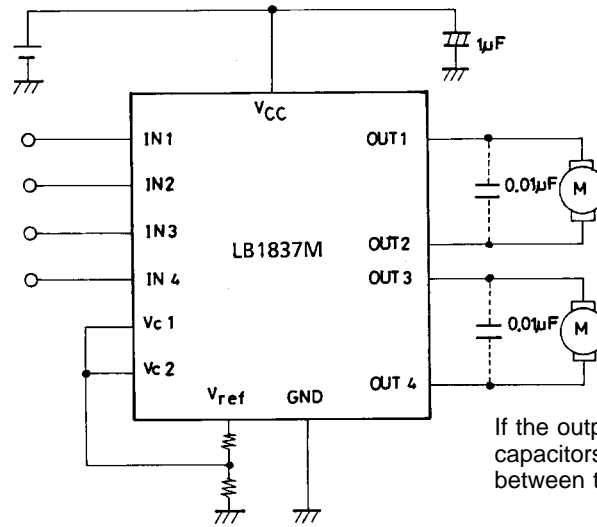
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## Pin Functions

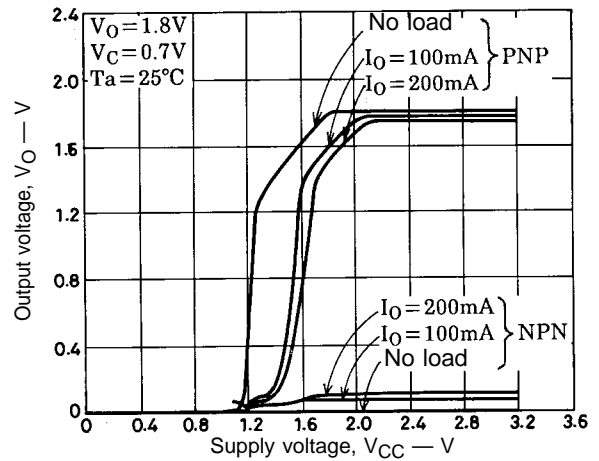
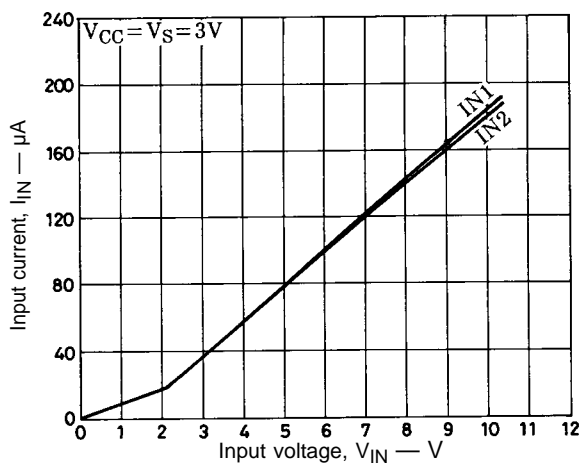
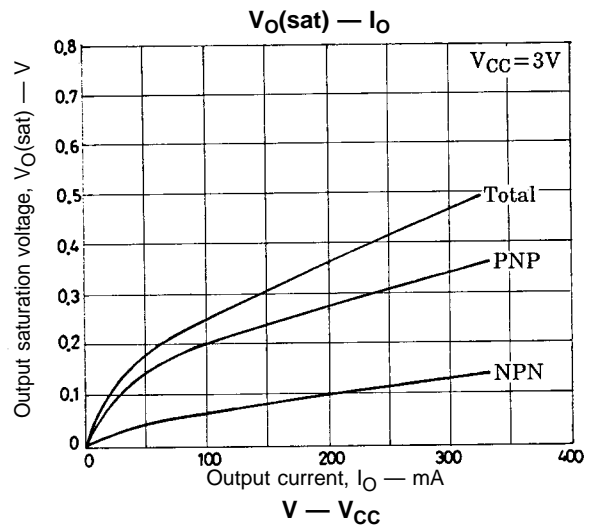
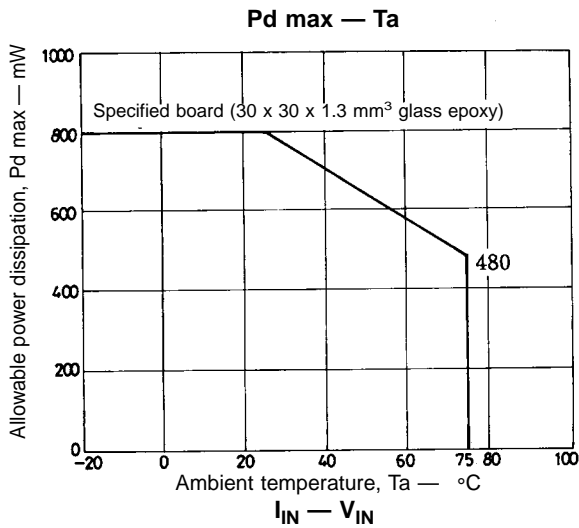
Pin No.	Symbol	Equivalent Circuit Diagram	Pin Function
14	V <sub>CC</sub>		Power supply pin for output and controller.
9 12	GND		GND pins for output and controller. Both must be grounded.
1 2 6 7	IN2 IN1 IN3 IN4	<p style="text-align: right;">A03935</p>	<p>Input pins that determine the excitation of the 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: 20px;">L: -0.3 to +0.7 V 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 10 11 13	OUT4 OUT3 OUT1 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 5	V <sub>C1</sub> 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>

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## 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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