

**LB1840M**

## Low-voltage/Low-saturation Bidirectional Variable Constant-voltage Motor Driver

### Overview

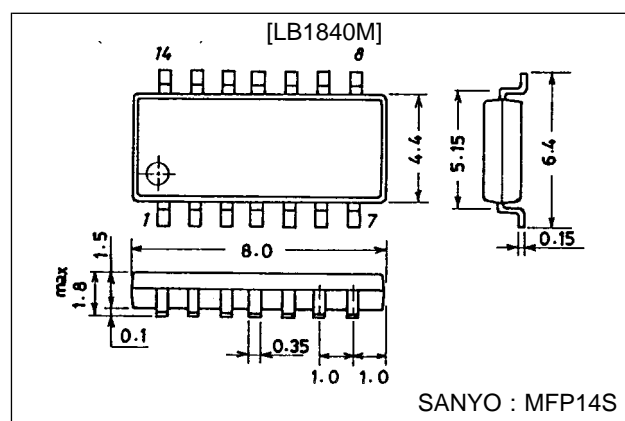
The LB1840M is a low-voltage, low-saturation, three-input type two-channel bidirectional motor driver that permits switching between constant-voltage regulated output and saturated output. The design is ideal for a two-phase bipolar driver for stepping motors.

### Features

- Wide operating voltage range (3.0 to 9.0 V).
- Low saturation voltage  
 $V_{O(sat)} = 0.40 \text{ V}$  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.
- Three-input type that is ideal for a two-phase bipolar driver.
- Permits switching between constant-voltage regulated output and saturated output.
- Built in reference voltage coupled to input.
- Compact MFP-14S 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 ( $30 \times 30 \times 1.5 \text{ mm}^3$ )	800	mW
Operating temperature	$T_{opr}$		-20 to +80	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-40 to +150	$^\circ\text{C}$

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

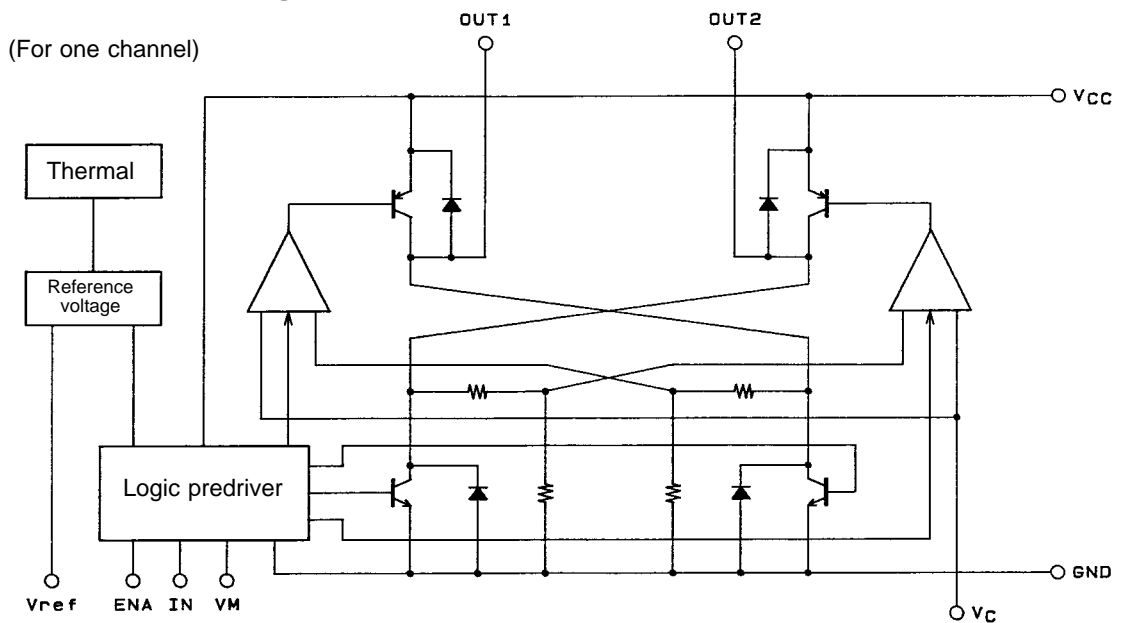
Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	$V_{CC}$		3.0 to 9.0	V
IN pin high level voltage	$V_{INH}$		3.0 to 9.0	V
IN pin low level voltage	$V_{INL}$		-0.3 to +0.7	V
Control voltage	$V_C$		0.2 to 6.0	V
VM pin high level voltage	$V_{MH}$		$V_{CC} - 0.3$ to $V_{CC}$	V
VM pin low level voltage	$V_{ML}$		-0.3 to $V_{CC} - 2.5$	V

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

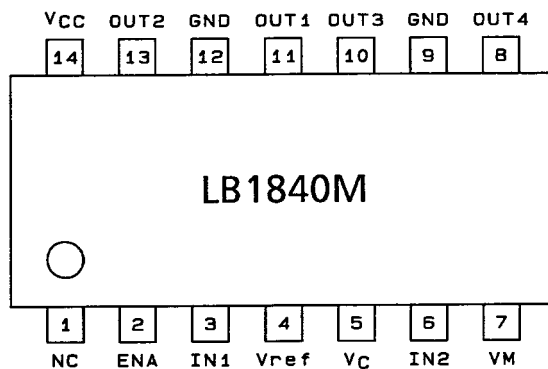
Parameter	Symbol	Conditions	min	typ	max	Unit
Supply current	$I_{CC0}$	During standby		0.1	10	$\mu\text{A}$
	$I_{CC1}$	During bidirectional operation (for two channels): during control, load open		3.5	5.0	$\text{mA}$
	$I_{CC2}$		during saturation, load open		4.5	6.5
Output saturation voltage	$V_{sat1}$	$I_O = 100\text{ mA}$ (upper side + lower side)		0.30	0.40	$\text{V}$
	$V_{sat2}$	$I_O = 200\text{ mA}$ (upper side + lower side)		0.40	0.55	$\text{V}$
	$V_{Osat3}$	$I_O = 200\text{ mA}$ (lower side)	0.07	0.10	0.15	$\text{V}$
Reference voltage	$V_{ref}$	$I_{Vref} = 1\text{ mA}$	1.85	2.0	2.15	$\text{V}$
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	$\frac{\Delta V_O}{\Delta I_O}$	$V_O = 5\text{ V}$ , $V_{CC} = 6\text{ V}$ , $I_O = 10\text{ to }100\text{ mA}$			50	$\text{mV}$
Input current	$I_{IN}$	$V_{IN} = 5\text{ V}$		90	150	$\mu\text{A}$
	$I_{VM}$	$V_M = \text{GND}$		210	300	$\mu\text{A}$
Output voltage	$V_O$	Between OUT and GND	$2.45 \times V_C$		$2.65 \times V_C$	$\text{V}$

## Equivalent Circuit Block Diagram



A03206

## Pin Assignment



Note: Both GND pins must be grounded.

Top view

A03207

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## Truth Table

Input			Output		Mode
ENA	IN 1/2	VM	OUT 1/3	OUT 2/4	
L	—	—	OFF	OFF	Standby
H	L	H	H	L	Constant-voltage regulated forward operation
H	L	L	H	L	Saturated forward operation
H	H	H	L	H	Constant-voltage regulated reverse operation
H	H	L	L	H	Saturated reverse operation

The constant-voltage regulated output  $V_O$  (= voltage between H side output and GND) is controlled by  $V_O = 2.5 \times V_C$ . 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 Functions

Pin No.	Symbol	Equivalent Circuit Diagram	Pin Function
14	$V_{CC}$		Power supply pin for output and controller.
9 12	GND		GND pins for output and controller. Both must be grounded.
3 6	IN2 IN1		<p>Input pins that determine the excitation of the outputs. IN1 control outputs OUT1 and OUT2; IN2 control outputs OUT3 and OUT4.</p> <p>L: -0.3 to +0.7 V or open H: 3.0 to 9.0 V</p> <p>There are no limitations on the magnitude relationships between the <math>V_{CC}</math> and <math>V_{IN}</math> supply voltages.</p>
8 10 11 13	OUT4 OUT3 OUT1 OUT2		Output pins. Have built-in spark killer diodes.
4	$V_{ref}$		Reference voltage (= 2.0 V).

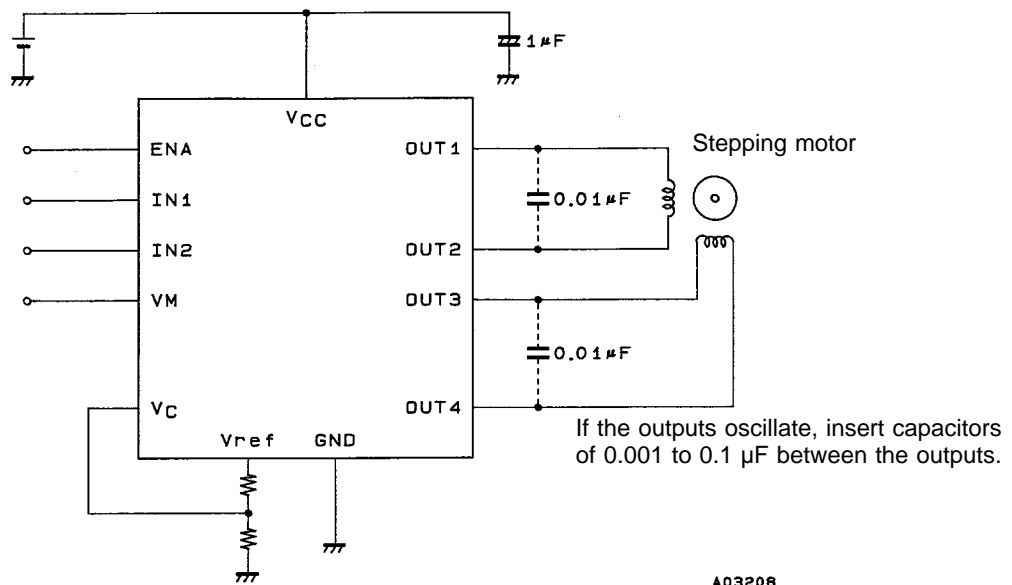
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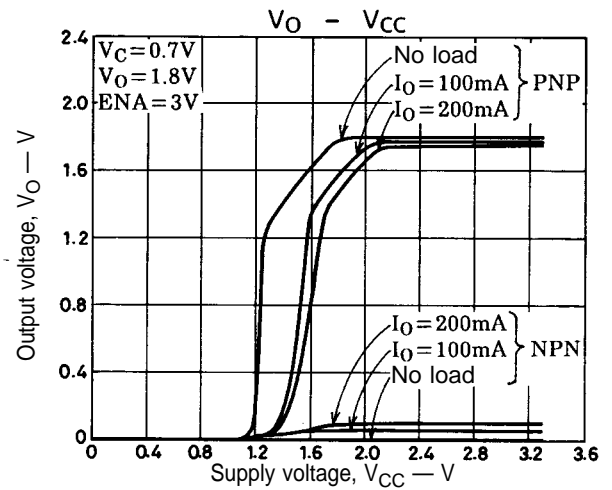
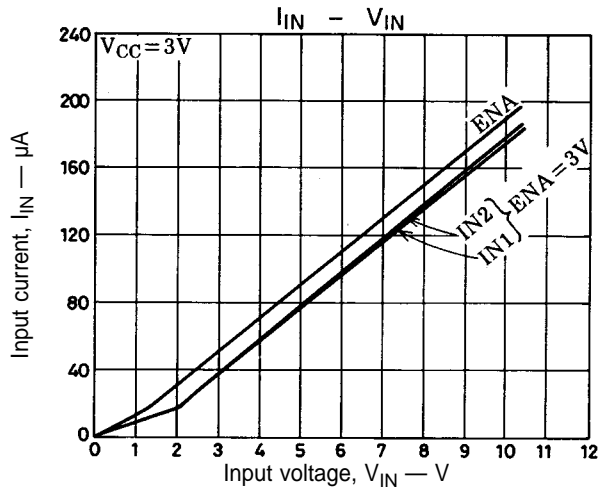
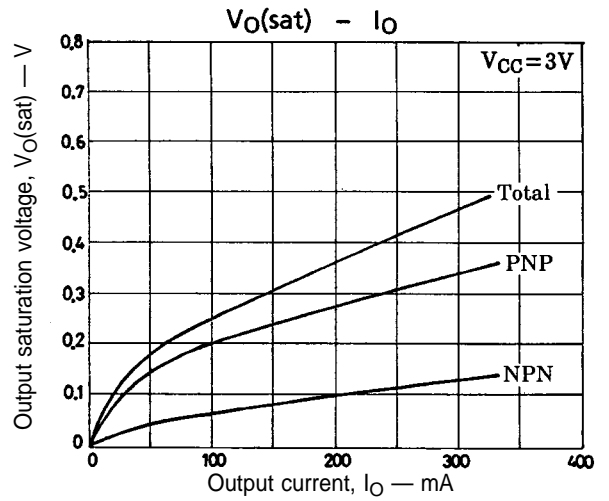
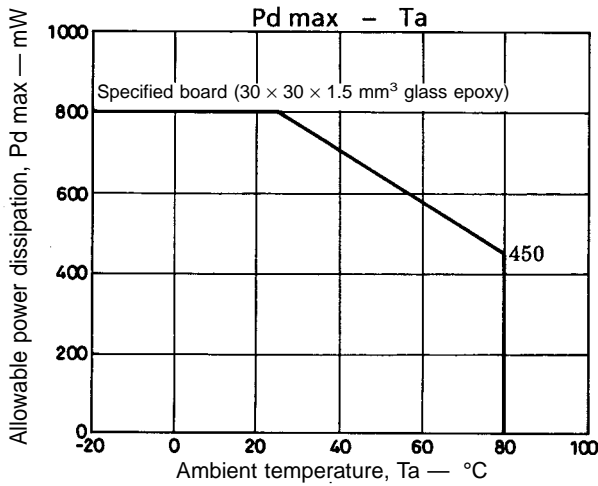
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Pin No.	Symbol	Equivalent Circuit Diagram	Pin Function
5	$V_C$		<p>Input pins that determine the constant-voltage regulated output level. The constant-voltage regulated output <math>V_O</math> (= voltage between H side output and GND) is controlled by <math>V_O = 2.5 \times V_C</math>. There are no limitations on the magnitude relationships between the <math>V_{CC}</math> and <math>V_C</math> supply voltages.</p>
2	ENA		<p>Standby/drive control input pin. Current drain in standby mode is 10 <math>\mu</math>A or less.</p> <p>L: <math>-0.3</math> to <math>+0.7</math> V or open H: 3.0 to 9.0 V</p> <p>There are no limitation on the magnitude relationships between <math>V_{CC}</math> and <math>V_{ENA}</math> supply voltage.</p>
7	VM		<p>Control input pin for switching between constant voltage output and saturated output.</p> <p>L: <math>-0.3</math> to <math>V_{CC} - 2.5</math> V (saturated output) H: <math>V_{CC} - 0.3</math> to <math>V_{CC}</math> or open (constant-voltage regulated output)</p>

## Sample Application Circuit





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