

**LB1840M**

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

Overview

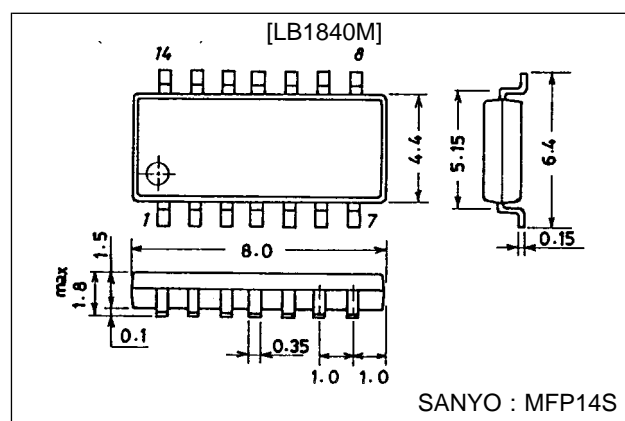
The LB1840M is a low-voltage, low-saturation, three-input type two-channel bidirectional motor driver that permits switching between constant-voltage regulated output and saturated output. The design is ideal for a two-phase bipolar driver for stepping motors.

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 μA 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 $T_a = 25^\circ\text{C}$

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 $T_a = 25^\circ\text{C}$

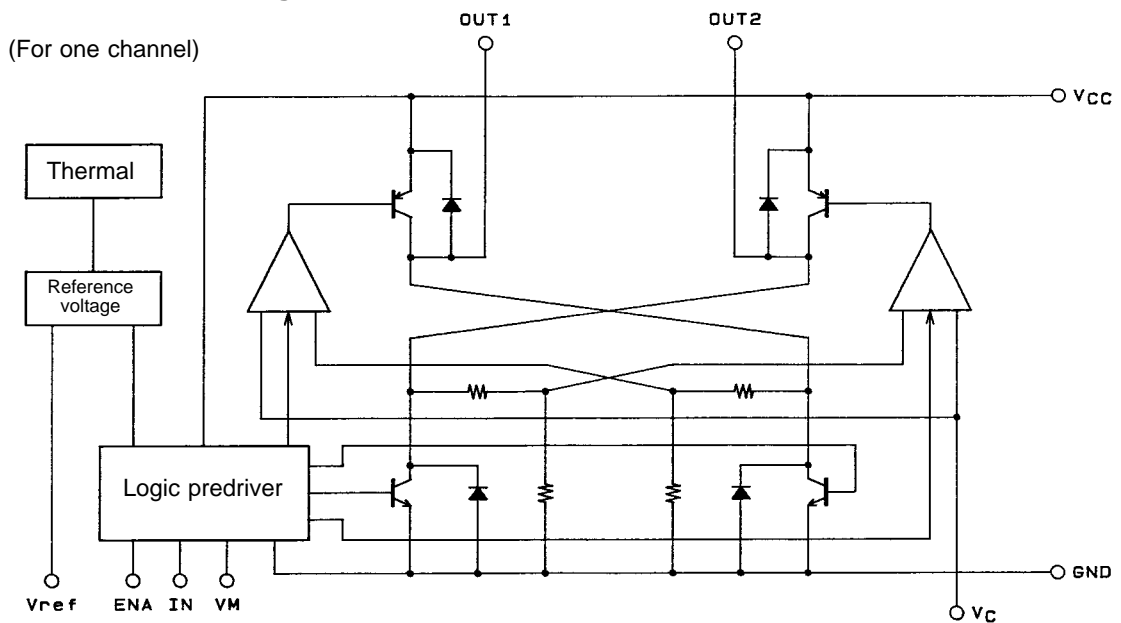
Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{CC}		3.0 to 9.0	V
IN pin high level voltage	V_{INH}		3.0 to 9.0	V
IN pin low level voltage	V_{INL}		-0.3 to +0.7	V
Control voltage	V_C		0.2 to 6.0	V
VM pin high level voltage	V_{MH}		$V_{CC} - 0.3$ to V_{CC}	V
VM pin low level voltage	V_{ML}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

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

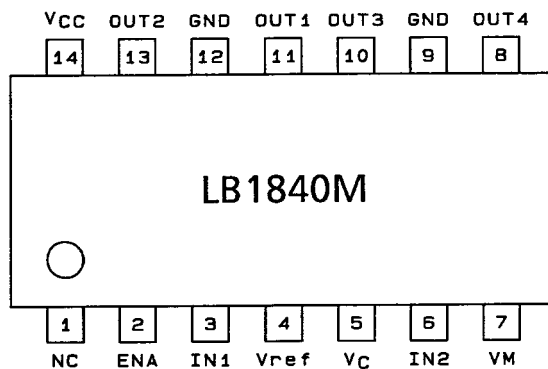
Parameter	Symbol	Conditions	min	typ	max	Unit
Supply current	I_{CC0}	During standby		0.1	10	μA
	I_{CC1}	During bidirectional operation (for two channels): during control, load open		3.5	5.0	mA
	I_{CC2}		during saturation, load open		4.5	6.5
Output saturation voltage	V_{sat1}	$I_O = 100\text{ mA}$ (upper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

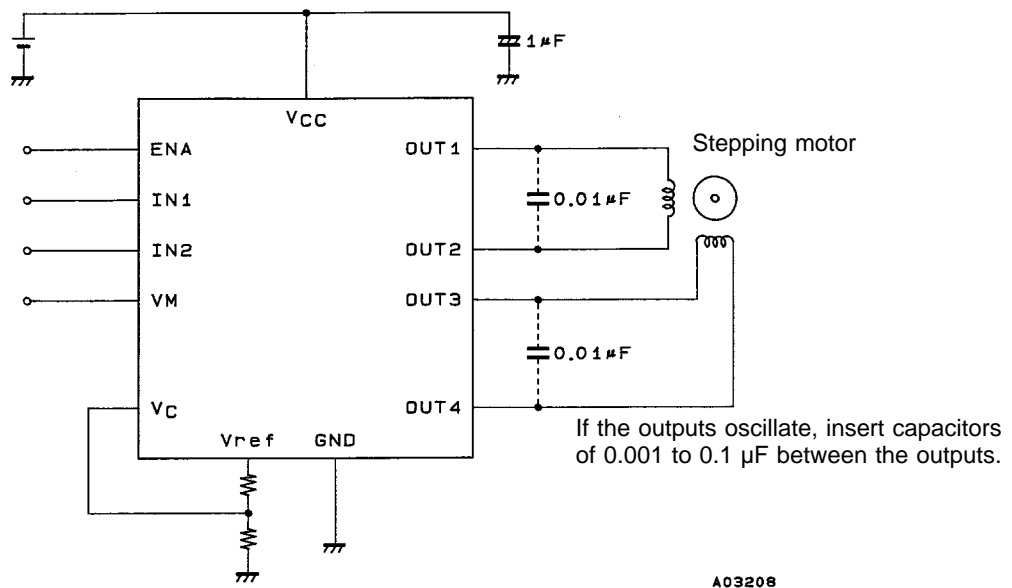
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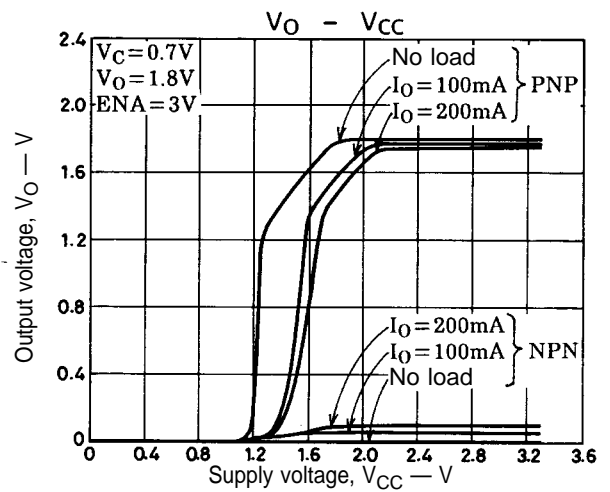
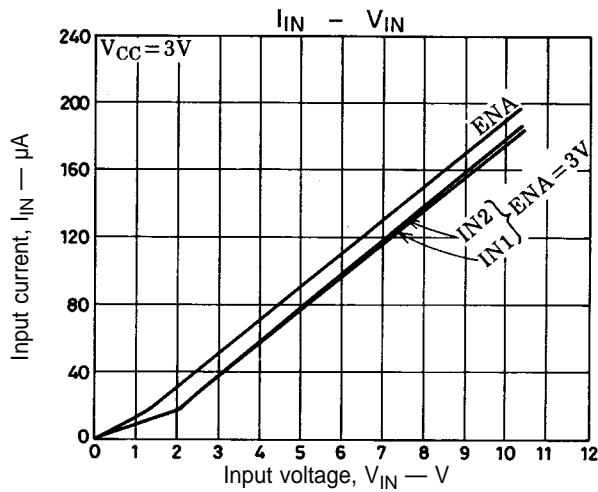
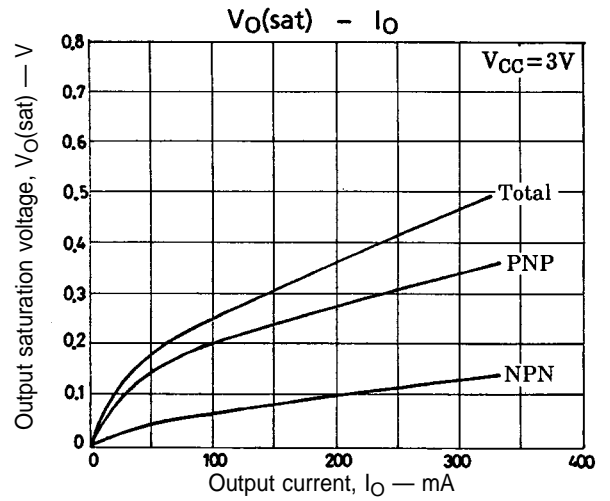
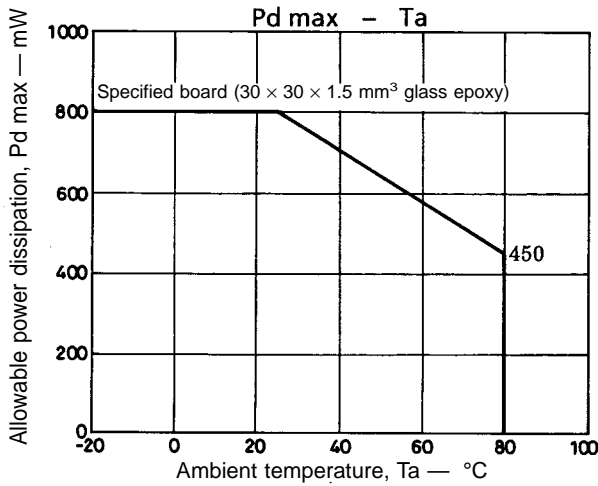
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Pin No.	Symbol	Equivalent Circuit Diagram	Pin Function
5	V_C		<p>Input pins that determine the constant-voltage regulated output level. The constant-voltage regulated output V_O (= voltage between H side output and GND) is controlled by $V_O = 2.5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

Sample Application Circuit



LB1840M



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