

**LB1839M**

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

### Overview

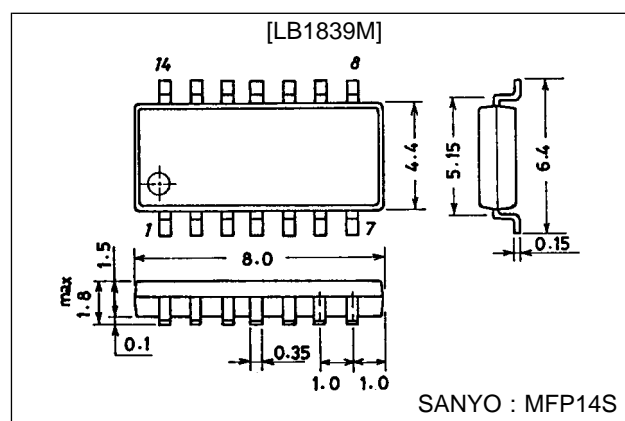
The LB1839M is a low-voltage, low-saturation, three-input type two-channel bidirectional motor driver that permits switching between constant-voltage regulated output and saturated output. The design of the LB1839M is ideal for a two-phase bipolar driver for stepping motors.

### Features

- Wide operating voltage range (3.0 to 9.0 V).
- Low saturation voltage  
 $V_O(\text{sat}) = 0.40 \text{ V}$  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.
- 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 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

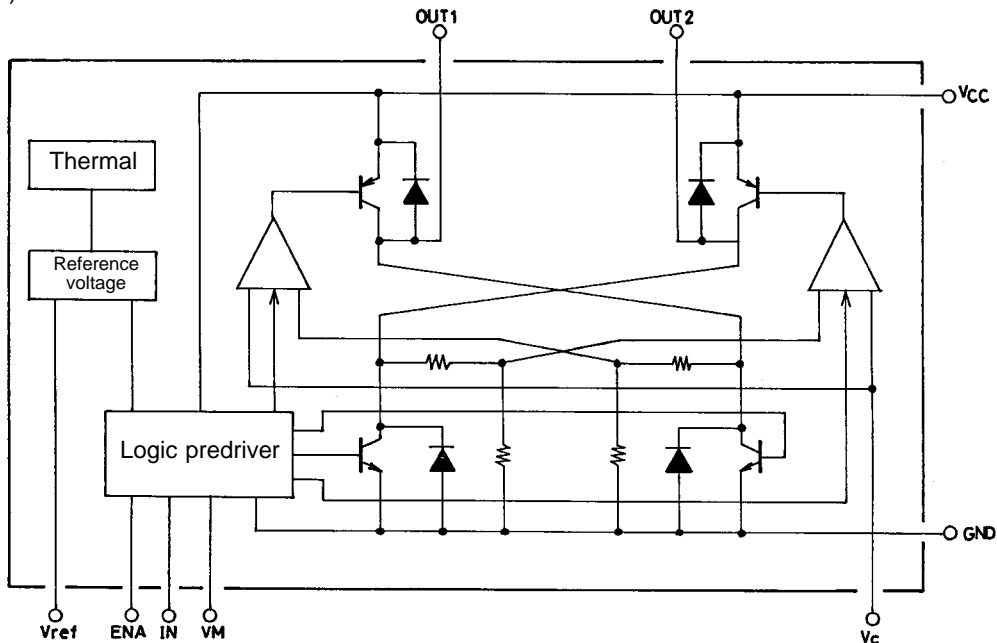
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## Electrical Characteristics at $T_a = 25\text{ }^\circ\text{C}$ , $V_{CC} = 6\text{ V}$

Parameter	Symbol	Conditions	min	typ	max	Unit
Supply current	$I_{CC0}$	During standby		0.1	10	$\mu\text{A}$
	$I_{CC1}$	(For two channel) During bidirectional operation, during control, load open		3.5	5.0	$\text{mA}$
	$I_{CC2}$	(For two channel) During bidirectional operation, during saturation, load open		4.0	6.0	$\text{mA}$
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
	$V_{sat3}$	$I_O = 200\text{ mA}$ (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

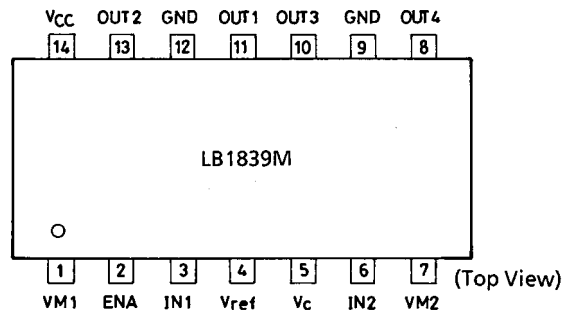
(For one channel)



### Truth Table

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

### Pin Assignment



Note: Both GND pins must be grounded.

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  $V_O \cong V_{CC}$ .

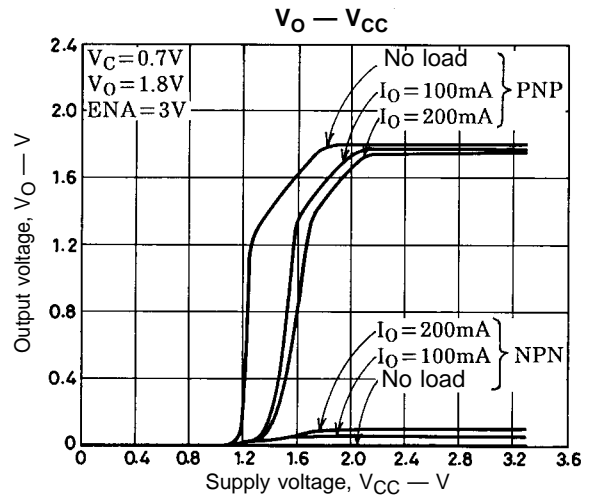
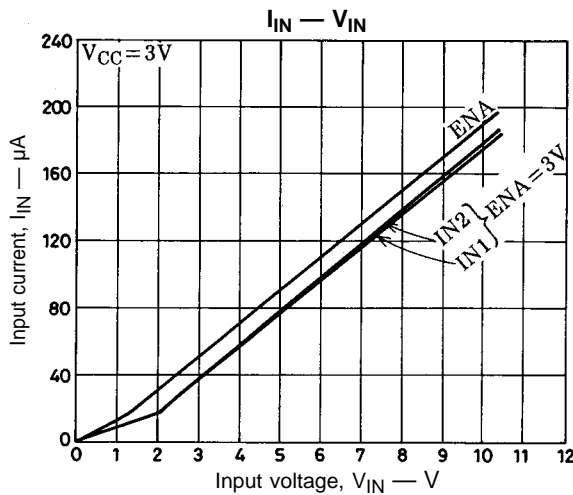
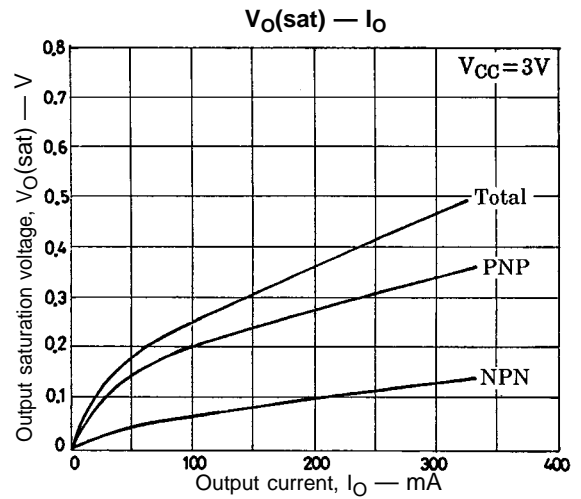
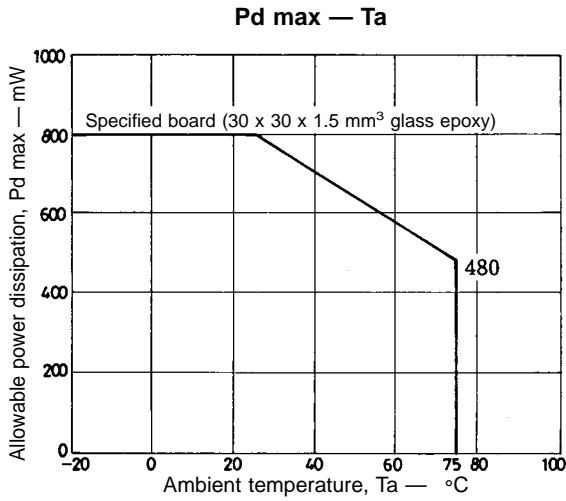
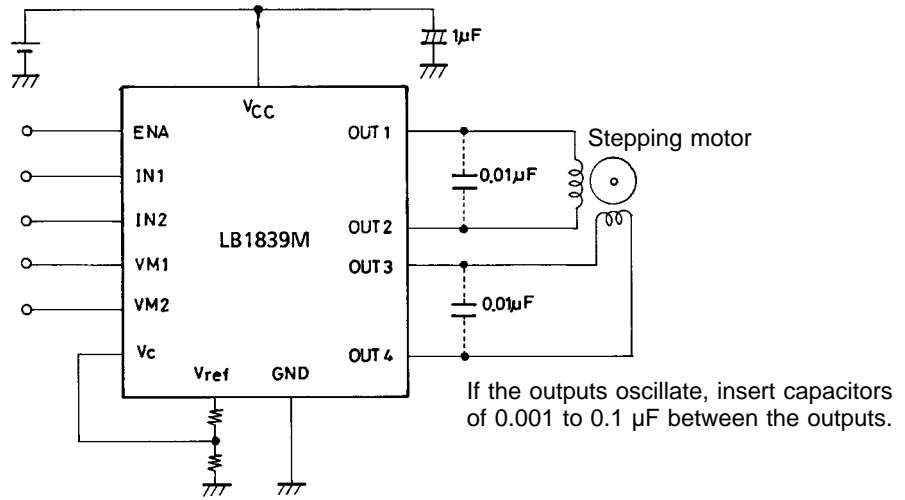
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## Pin Functions

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.
3 6	IN2 IN1		<p>Input pins that determine the excitation of the outputs.</p> <p>IN1 control outputs OUT1 and OUT2; IN2 control outputs OUT3 and OUT4.</p> <p>L: -0.3 to +0.7 V</p> <p>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>Output pins.</p> <p>Have built-in spark killer diodes.</p>
4	V <sub>ref</sub>		Reference voltage (= 2.0 V).
5	V <sub>C</sub>		<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> and V<sub>C</sub> supply voltages.</p>
2	ENA		<p>Standby/drive control input pin</p> <p>Current consumption in standby mode is 10 μA or less.</p> <p>L: -0.3 to + 0.7 V</p> <p>H: 3.0 to 9.0 V</p>
1 7	VM1 VM2		<p>Output voltage setting</p> <p>Control input pin for switching between constant voltage output and saturated output. There are no limitations on the magnitude relationships between the V<sub>CC</sub>, V<sub>M1</sub> and V<sub>M2</sub> supply voltages.</p> <p>L: -0.3 to + 0.7 V</p> <p>(constant-voltage regulated output)</p> <p>H: 3.0 to 9.0 V (saturated output)</p>

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## Sample Application Circuit



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