Ordering number: EN4996

Monolithic Digital IC

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.

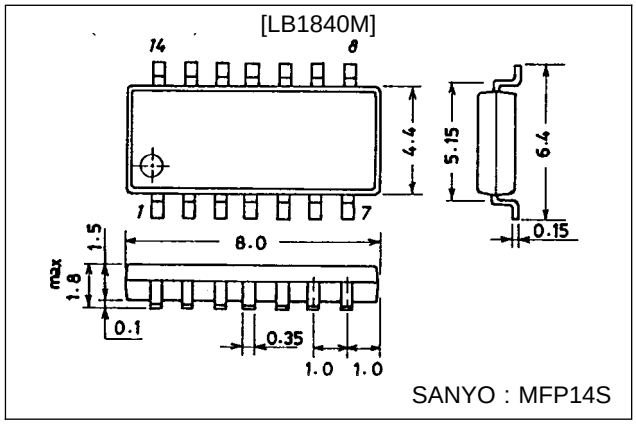
Features

- Wide operating voltage range (3.0 to 9.0 V).
- Low saturation voltage
  $V_{O(sat)}$ = 0.40 V at I_O = 200 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 Ta = 25 °C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		10.5	V
Output current	Im max		250	mA
Applied input voltage	V_{IN}		–0.3 to +10	V
Allowable power dissipation	Pd max	With board (30 × 30 × 1.5 mm^3)	800	mW
Operating temperature	Topr		–20 to +80	°C
Storage temperature	Tstg		–40 to +150	°C

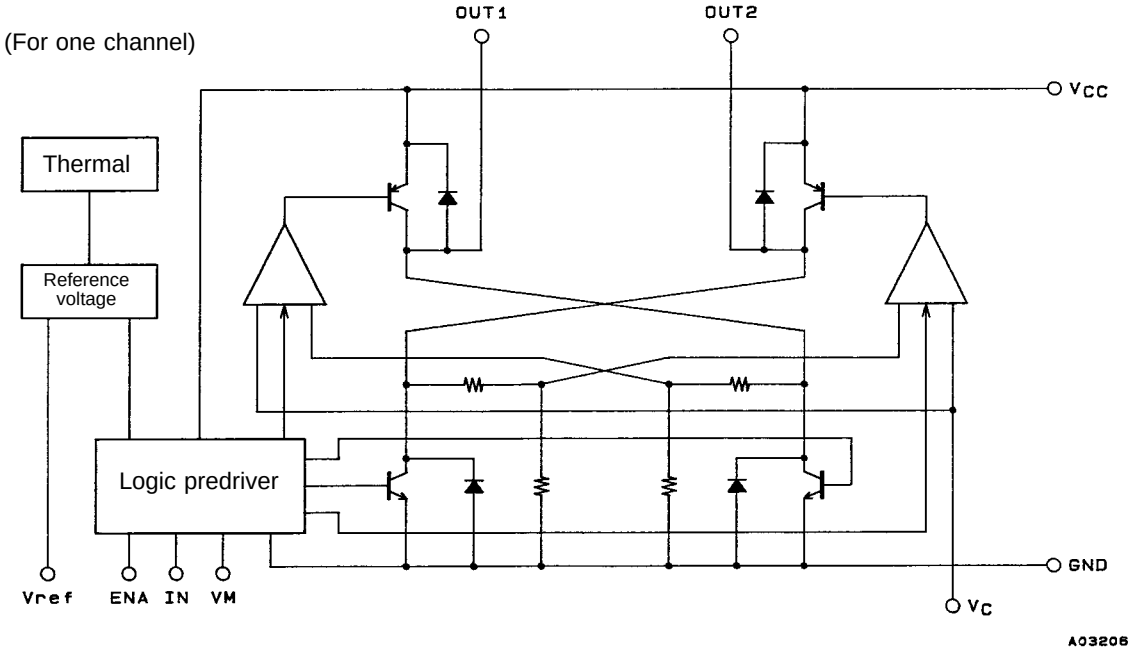
Allowable Operating Ranges at Ta = 25 °C

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	VM_H		V_{CC} – 0.3 to V_{CC}	V
VM pin low level voltage	VM_L		–0.3 to V_{CC}–2.5	V

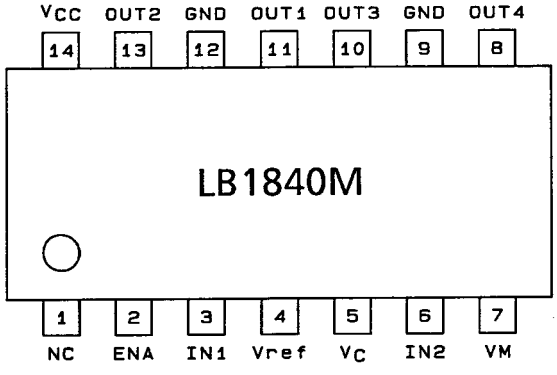
Electrical Characteristics at Ta = 25 °C, V_{CC} = 6 V

Parameter	Symbol	Conditions	min	typ	max	Unit
Supply current	$I_{CC}0$	During standby		0.1	10	µA
	$I_{CC}1$	During bidirectional operation (for two channels): during control, load open		3.5	5.0	mA
	$I_{CC}2$	during saturation, load open		4.5	6.5	mA
Output saturation voltage	V_{sat1}	I_O = 100 mA (upper side + lower side)		0.30	0.40	V
	V_{sat2}	I_O = 200 mA (upper side + lower side)		0.40	0.55	V
	V_{Osat3}	I_O = 200 mA (lower side)	0.07	0.10	0.15	V
Reference voltage	V_{ref}	I_{Vref} = 1 mA	1.85	2.0	2.15	V
Output voltage voltage characteristics	$\frac{\Delta V_O}{\Delta V_{CC}}$	V_O = 5 V, V_{CC} = 5.5 to 9 V, I_O = 100 mA			20	mV
Output voltage current characteristics	$\frac{\Delta V_O}{\Delta I_O}$	V_O = 5 V, V_{CC} = 6 V, I_O = 10 to 100 mA			50	mV
Input current	I_{IN}	V_{IN} = 5 V		90	150	µA
	I_{VM}	V_M = GND		210	300	µA
Output voltage	V_O	Between OUT and GND	2.45 x V_C		2.65 x V_C	V

Equivalent Circuit Block Diagram



Pin Assignment



Note: Both GND pins must be grounded.

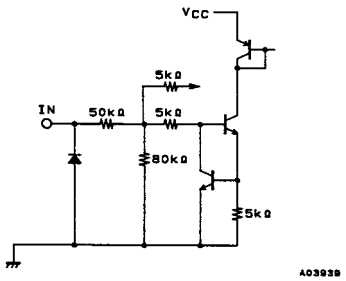
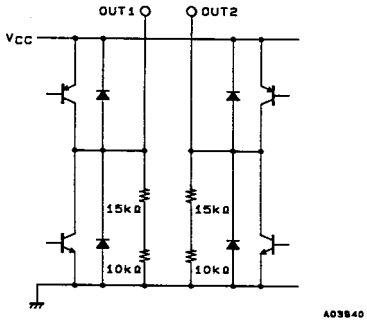
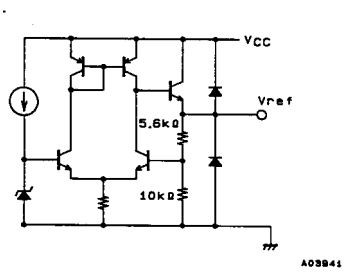
Top view A03207

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 $V_O \geqq V_{CC}$.

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		Input pins that determine the excitation of the outputs. IN1 control outputs OUT1 and OUT2; IN2 control outputs OUT3 and OUT4. L: –0.3 to +0.7 V or open H: 3.0 to 9.0 V There are no limitations on the magnitude relationships between the V_{CC} and V_{IN} supply voltages.
8 10 11 13	OUT4 OUT3 OUT1 OUT2		Output pins. Have built-in spark killer diodes.
4	Vref		Reference voltage (= 2.0 V).

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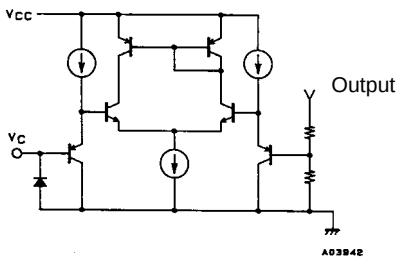
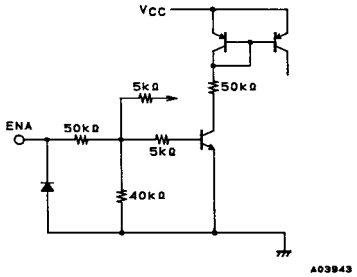
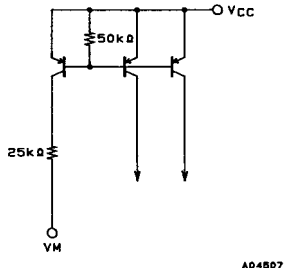
Pin No.	Symbol	Equivalent Circuit Diagram	Pin Function
5	V_C		Input pins that determine the constant-voltage regulated output level. The constant-voltage regulated output V_O (= voltage between H side output and GND) is controlled by $V_O = 2.5 \times V_C$. There are no limitations on the magnitude relationships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

Sample Application Circuit