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SANYO Semiconductors

# DATA SHEET

An ON Semiconductor Company

Monolithic Digital IC

## LB1836M — Low-Saturation Bidirectional Motor Driver for Low-Voltage Drive

### Overview

The LB1836M is a low-saturation two-channel bidirectional motor driver IC for use in low-voltage applications. The LB1836M is a bipolar stepper-motor driver IC that is ideal for use in printers, FDDs, cameras and other portable devices.

### Features

- Low voltage operation (2.5V min)
- Low saturation voltage (upper transistor + lower transistor residual voltage ; 0.40V typ at 400mA).
- Parallel connection (Upper transistor + lower transistor residual voltage ; 0.5V typ at 800mA).
- Separate logic power supply and motor power supply
- Brake function
- Spark killer diodes built in
- Thermal shutdown circuit built in
- Compact package (14-pin MFP)

### Specifications

**Absolute Maximum Ratings** at  $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC\ max}$		-0.3 to +10.5	V
	$V_S\ max$		-0.3 to +10.5	V
Output supply voltage	$V_{OUT}$		$V_S + V_{SF}$	V
Input supply voltage	$V_{IN}$		-0.3 to +10	V
GND pin flow-out current	IGND	Per channel	1.0	A
Allowable power dissipation	$P_d\ max$	* Mounted on a board.	800	mW
Operating temperature	$T_{opr}$		-40 to +85	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$

\* Mounted on a substrate:  $30 \times 30 \times 1.5\text{mm}^3$ , glass epoxy board.

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# LB1836M

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

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	$V_{CC}$		2.5 to 9.0	V
	$V_S$		1.8 to 9.0	V
Input "H"-level voltage	$V_{IH}$		1.8 to 9.0	V
Input "L"-level voltage	$V_{IL}$		-0.3 to +0.7	V

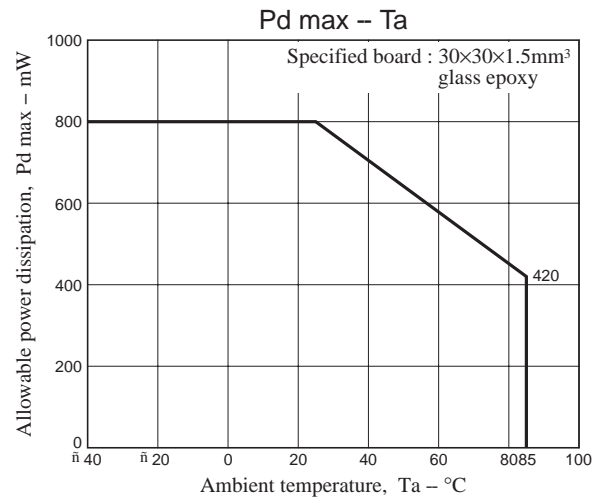
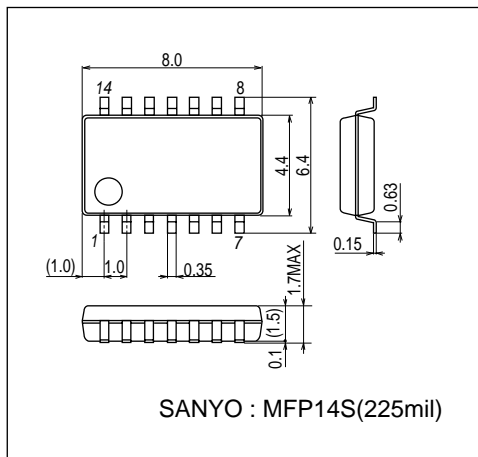
## Electrical Characteristics at $T_a = 25^\circ\text{C}$ , $V_{CC} = V_S = 3\text{V}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Supply current	$I_{CC0}$	$V_{IN1, 2, 3, 4} = 0\text{V}$ , $I_{CC} + I_S$		0.1	10	$\mu\text{A}$
	$I_{CC1}$	$V_{IN1} = 3\text{V}$ , $V_{IN2, 3, 4} = 0\text{V}$ , $I_{CC} + I_S$		14	20	mA
	$I_{CC2}$	$V_{IN1, 2} = 3\text{V}$ , $V_{IN3, 4} = 0\text{V}$ , $I_{CC} + I_S$		22	35	mA
Output saturation voltage (upper + lower)	$V_{OUT1}$	$I_{OUT} = 200\text{mA}$		0.20	0.28	V
	$V_{OUT2}$	$I_{OUT} = 400\text{mA}$		0.40	0.60	V
	$V_{OUT3}$	$I_{OUT} = 400\text{mA}$ , Parallel connection		0.25	0.35	V
	$V_{OUT4}$	$I_{OUT} = 800\text{mA}$ , Parallel connection		0.50	0.70	V
Output sustain voltage	$V_O$ (SUS)	$I_{OUT} = 400\text{mA}$	9			V
Input current	$I_{IN}$	$V_{IN} = 2\text{V}$ , $V_{CC} = 6\text{V}$			80	$\mu\text{A}$
<b>Spark killer diode</b>						
Reverse current	$I_S$ (leak)	$V_{CC1, 2} = 9\text{V}$			30	$\mu\text{A}$
Forward voltage	$V_{SF}$	$I_{OUT} = 400\text{mA}$			1.7	V

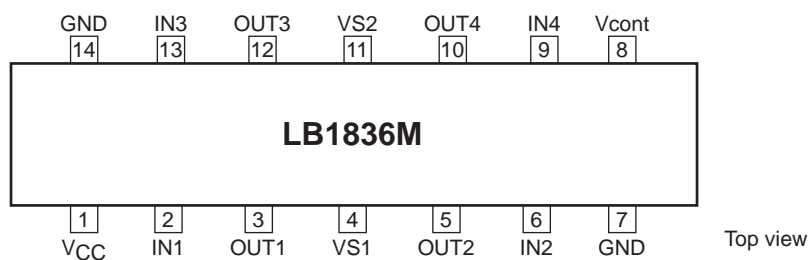
## Package Dimensions

unit : mm (typ)

3111A

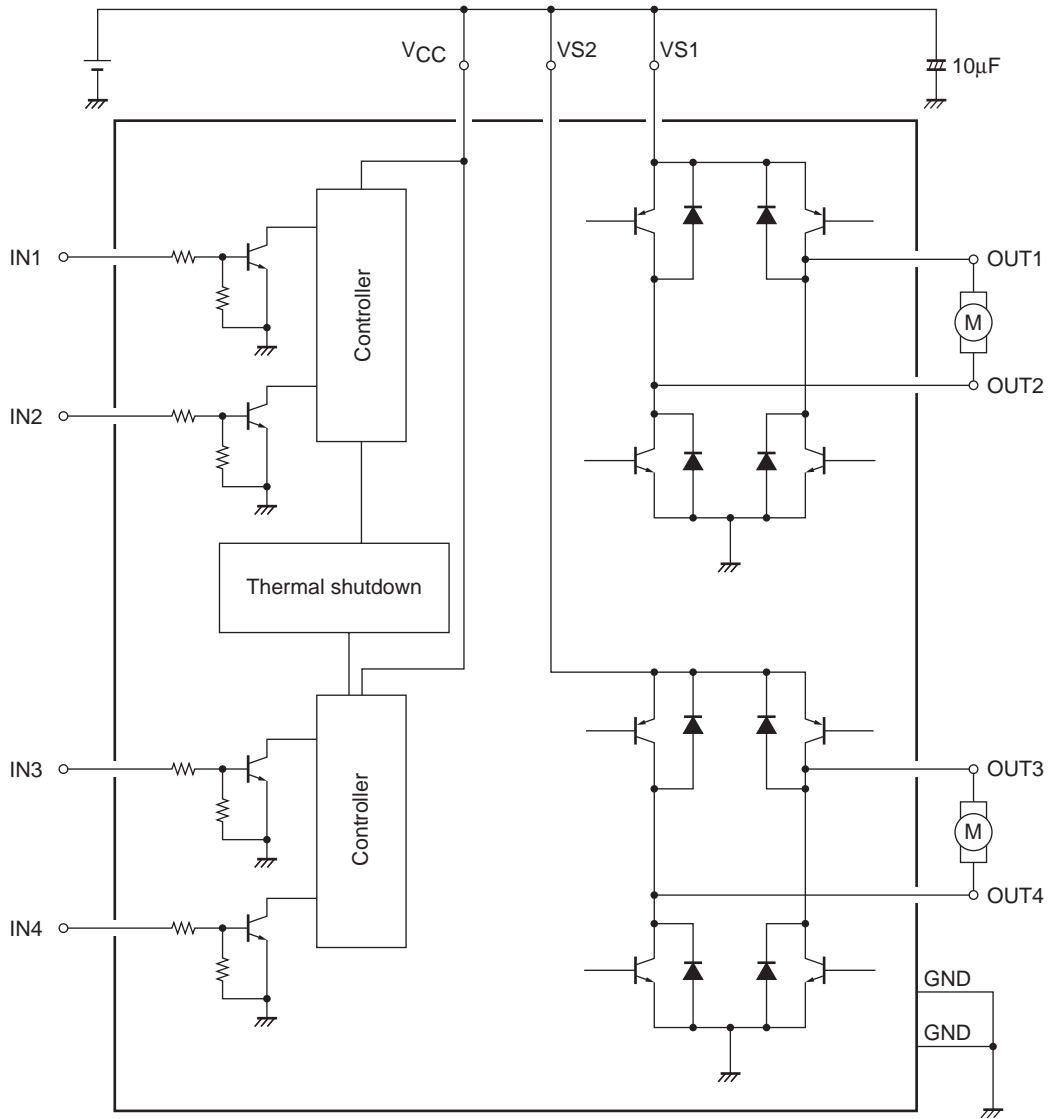


## Pin Assignment



Note) Ground both GND pins.

Block Diagram



Truth Table

IN1/3	IN2/4	OUT1/3	OUT2/4	Mode
H	L	H	L	Forward
L	H	L	H	Reverse
H	H	L	L	Brake
L	L	OFF	OFF	Standby

## Design Notes

If large current flows on the power supply ( $V_S$ ) line and the GND line, then in some applications and layouts, misoperation due to line oscillation may result.

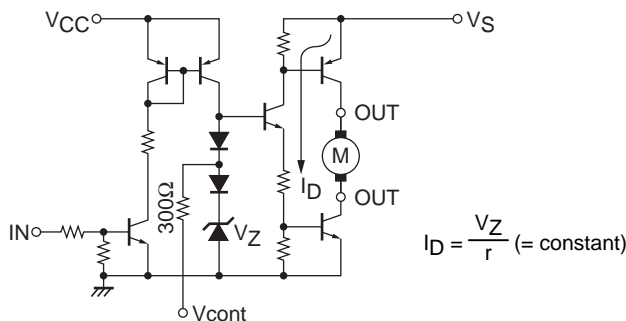
The modes during which large current flows are as follows :

- Motor surge current when the DC motor starts up or when it shifts rotation directions (forward  $\leftrightarrow$  reverse).
- Passthrough current generated within the IC when shifting rotation directions (forward  $\leftrightarrow$  reverse) or when shifting from forward/reverse rotation to braking, or vice versa.

The following points should be kept in mind regarding the pattern layout :

- Keep the wiring lines thick and short in order to reduce wiring inductance between the power supply ( $V_S$ ) and GND.
- Insert a passthrough capacitor near the IC. (Maximum effect is obtained by inserting the passthrough capacitor between  $V_S$  and the pin 7 GND at the closest distance possible).
- If the CPU and the LB1836M are mounted on separate boards and the difference between the ground potential of each board is large, install resistors of about  $10k\Omega$  in series between the CPU and the LB1836M inputs.

## Vcont pin

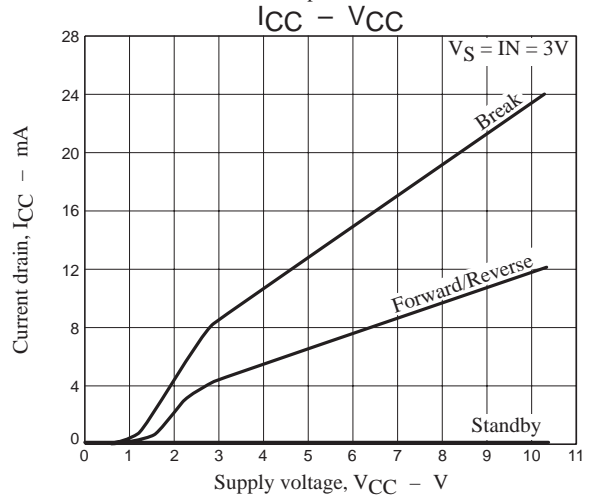
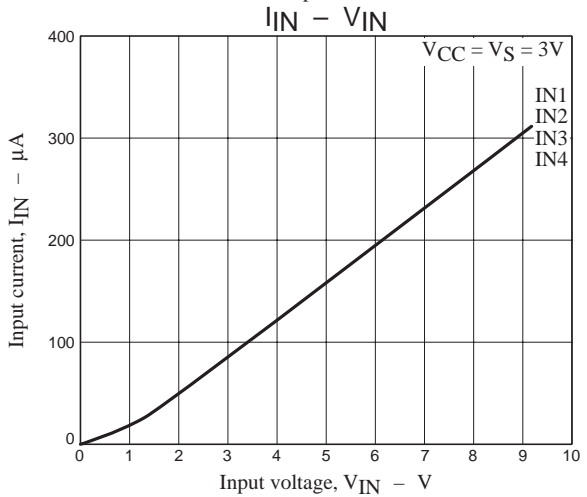
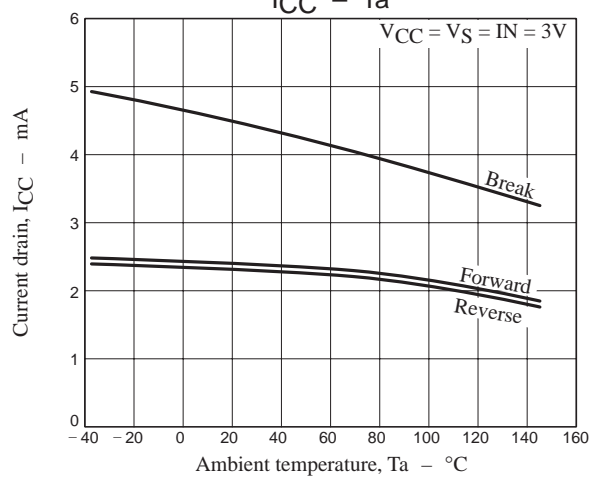
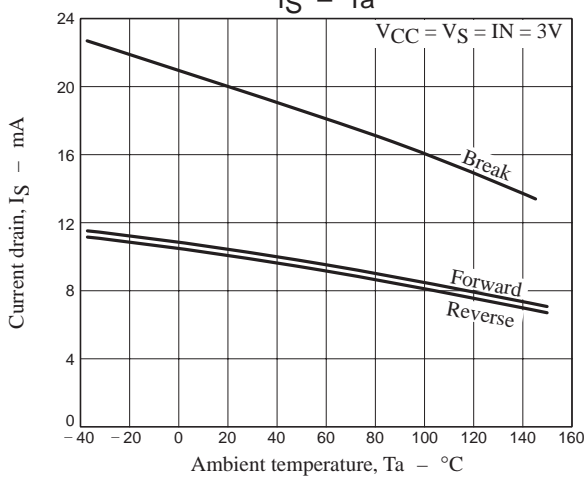
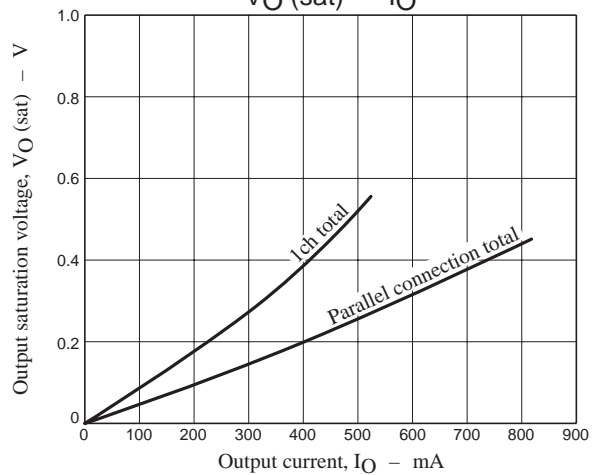
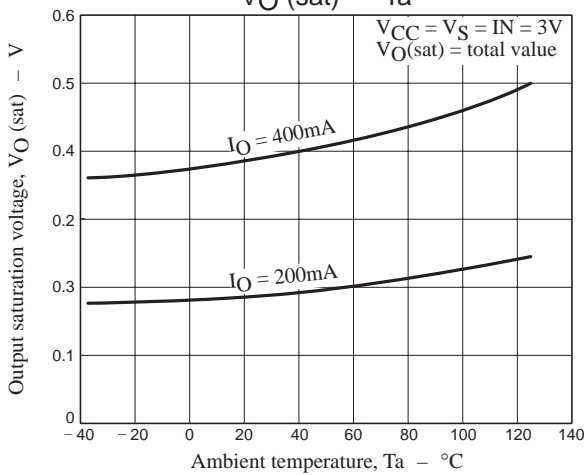
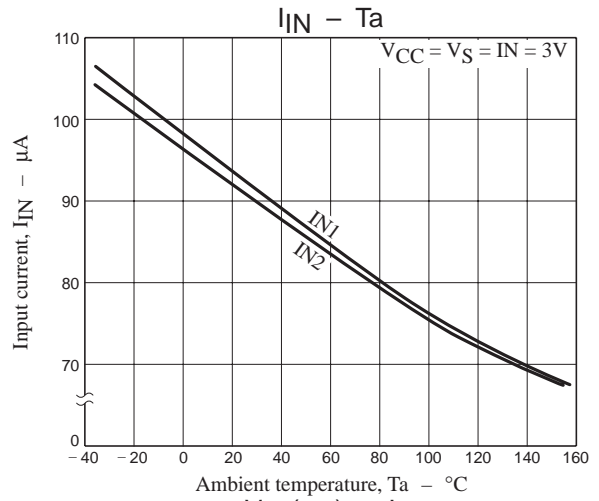
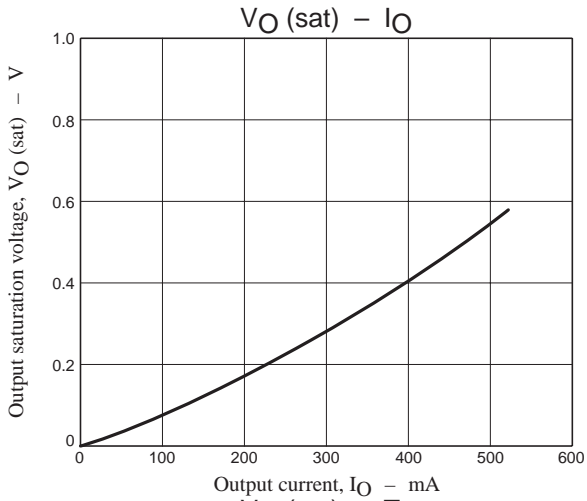


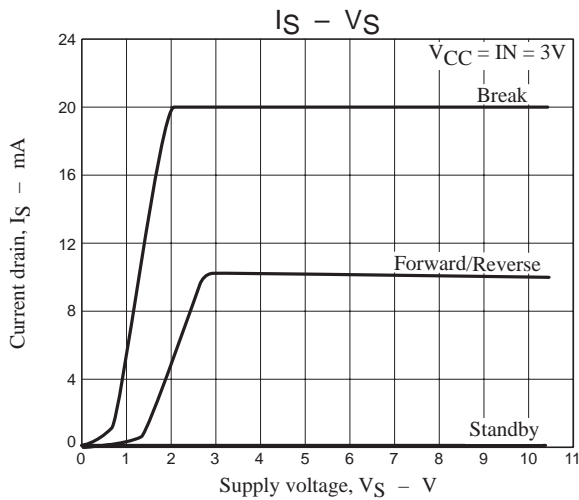
As shown in the above diagram, the Vcont pin outputs the voltage of the band gap Zener  $V_Z + V_F (=1.93V)$ .

In normal use, this pin is left open.

The drive current  $I_D$  is varied by the Vcont voltage. However, because the band gap Zener is shared, it functions as a bridge.

# LB1836M





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