



ON Semiconductor®

Ordering number : EN3949E

## ON Semiconductor **DATA SHEET**

# LB1838M — Monolithic Digital IC Low-Voltage, Low-Saturation Bidirectional Motor Driver

### Overview

The LB1838M is a low-saturation two-channel bidirectional motor driver IC for use in low-voltage applications.

The LB1838M is a bipolar stepper-motor driver IC that is ideal for use in printers, cameras and other portable devices.

### Functions

- Low voltage operation (2.5V min)
- Low saturation voltage (upper transistor + lower transistor residual voltage: 0.40V at 400mA)
- Built-in through-current prevention circuit
- Separate logic power supply and motor power supply
- Built-in spark killer diodes
- Built-in thermal shutdown circuit
- Compact package: MFP14S

### 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 applied voltage      | $V_{OUT}$     |                                | $V_S + V_{SF}$ | V    |
| Input applied voltage       | $V_{IN}$      |                                | -0.3 to +10    | V    |
| Ground pin flow-out current | $I_{GND}$     | Per channel                    | 1.0            | A    |
| Allowable power dissipation | $P_d\ max$    | Independent IC                 | 550            | mW   |
|                             |               | Mounted on a specified board * | 800            | mW   |
| Operating temperature       | $T_{opr}$     |                                | -20 to +75     | °C   |
| Storage temperature         | $T_{stg}$     |                                | -40 to +125    | °C   |

\* Specified board: 20mm × 30mm × 1.6mm, glass epoxy board.

# LB1838M

## Allowable Operating Ranges at Ta = 25°C

| Parameter                | Symbol          | Conditions | Ratings      | Unit |
|--------------------------|-----------------|------------|--------------|------|
| Supply voltage           | V <sub>CC</sub> |            | 2.5 to 9.0   | V    |
|                          | V <sub>S</sub>  |            | 1.8 to 9.0   | V    |
| Input high-level voltage | V <sub>IH</sub> |            | 1.8 to 9.0   | V    |
| Input Low-level voltage  | V <sub>IL</sub> |            | -0.3 to +0.7 | V    |

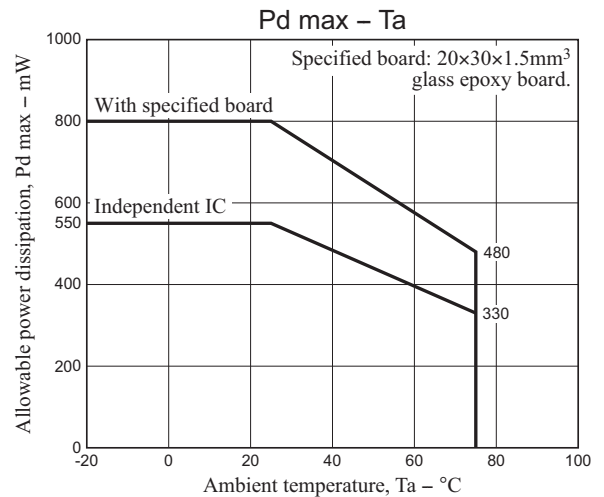
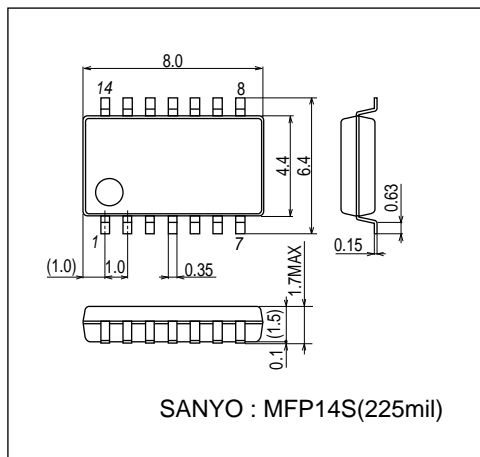
## Electrical Characteristics at Ta = 25°C, V<sub>CC</sub> = 3V

| Parameter                 | Symbol               | Conditions                                                     | Ratings |     |      | Unit |
|---------------------------|----------------------|----------------------------------------------------------------|---------|-----|------|------|
|                           |                      |                                                                | min     | typ | max  |      |
| Current drain             | I <sub>CC0</sub>     | ENA1,2 = 0V, V <sub>IN1</sub> = 3V or 0V                       |         | 0.1 | 10   | μA   |
|                           | I <sub>CC1</sub>     | ENA1 = 3V, V <sub>IN1</sub> = 3V or 0V                         |         | 12  | 18   | mA   |
| Output saturation voltage | V <sub>OUT1</sub>    | ENA = 3V, V <sub>IN</sub> = 3V or 0V, I <sub>OUT</sub> = 200mA |         | 0.2 | 0.28 | V    |
|                           | V <sub>OUT2</sub>    | ENA = 3V, V <sub>IN</sub> = 3V or 0V, I <sub>OUT</sub> = 400mA |         | 0.4 | 0.6  | V    |
| Input current             | I <sub>IN</sub>      | V <sub>CC</sub> = 6V, V <sub>IN</sub> = 6V                     |         |     | 200  | μA   |
|                           | I <sub>ENA</sub>     | V <sub>CC</sub> = 6V, ENA = 6V                                 |         |     | 200  | μA   |
| Output sustaining voltage | V <sub>O(SUS)</sub>  | I <sub>OUT</sub> = 400mA                                       | 9       |     |      | V    |
| <b>Spark killer diode</b> |                      |                                                                |         |     |      |      |
| Reverse current           | I <sub>S(leak)</sub> | V <sub>CC1</sub> , V <sub>S</sub> = 7V                         |         |     | 30   | μA   |
| Forward voltage           | V <sub>SF</sub>      | I <sub>OUT</sub> = 400mA                                       |         |     | 1.7  | V    |

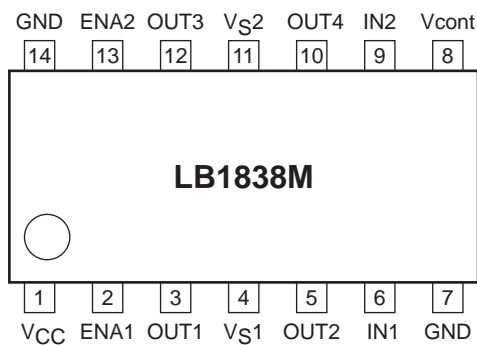
## Package Dimensions

unit : mm (typ)

3111A

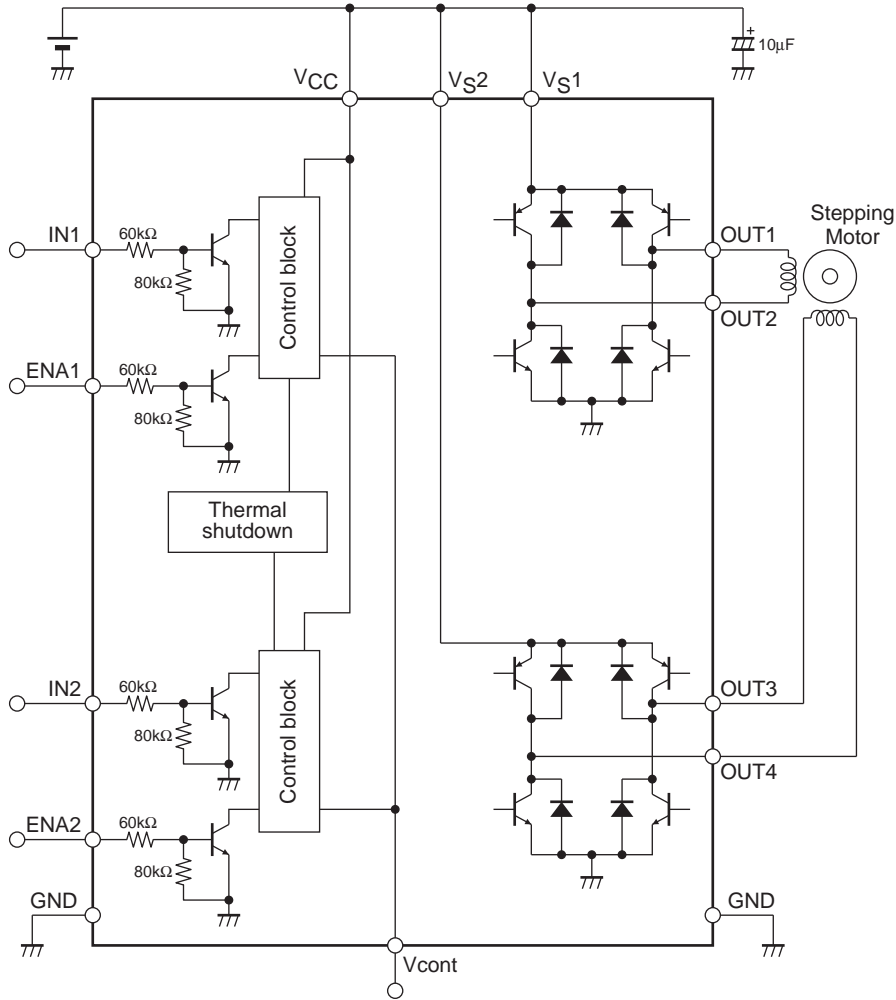


## Pin Assignment



Note: Both GND pins should be connected to ground.

Block Diagram

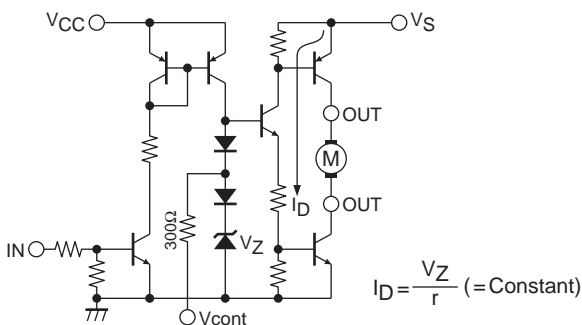


Note: As long as the voltages applied to VCC, VS1, VS2, ENA1, ENA2, IN1, and IN2 are within the limits set by the absolute maximum ratings, there are no restrictions on the relationship of each voltage level in comparison with the others (regarding which is higher or lower). (ex. VCC = 3V, VS1, 2 = 2V, ENA = IN = 5V)

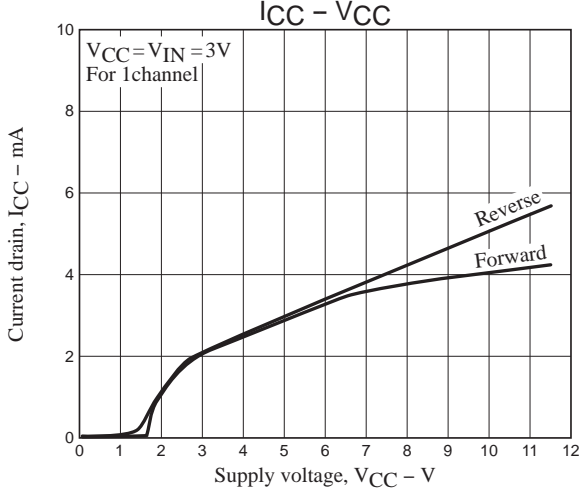
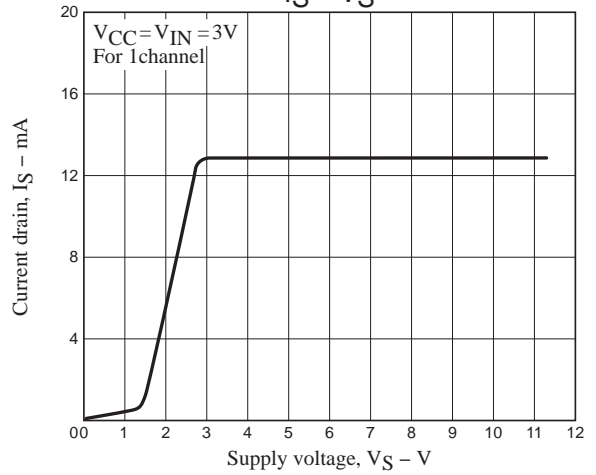
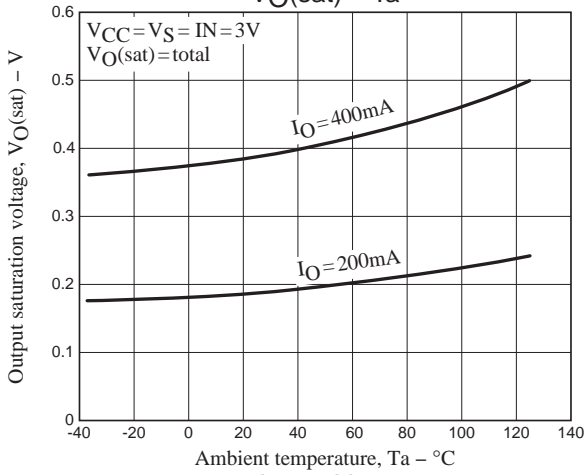
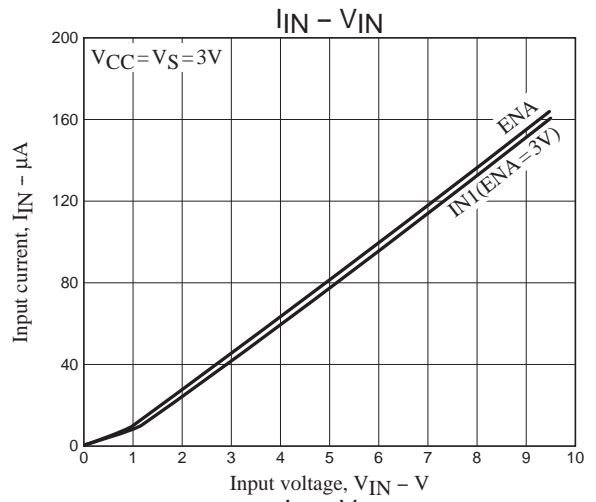
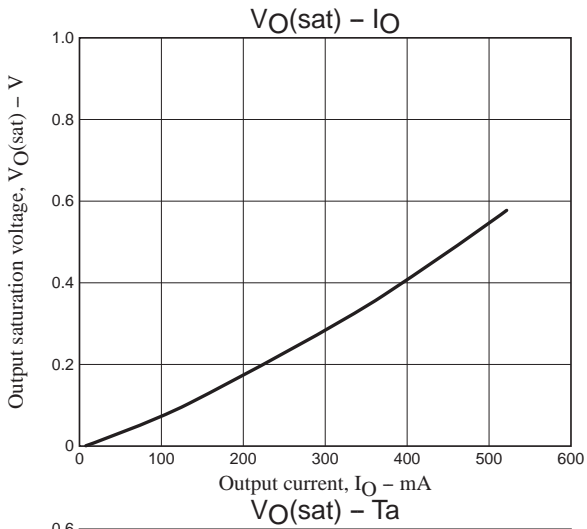
Truth Table

| IN1,2 | ENA1,2 | OUT1,3 | OUT2,4 | Mode    |
|-------|--------|--------|--------|---------|
| L     | H      | H      | L      | Forward |
| H     | H      | L      | H      | Reverse |
| L     | L      | OFF    | OFF    | Standby |
| H     | L      | OFF    | OFF    | Standby |

Vcont pin



As shown in the left 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.



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