



SANYO Semiconductors

# DATA SHEET

An ON Semiconductor Company

## LB1638

## LB1638M

Monolithic Digital IC

Low-Voltage, Low-Saturation

### Bidirectional Motor Driver

### Overview

The LB1638, LB1638M are low-saturation bidirectional motor driver ICs for use in low-voltage applications. At an  $I_O$  of 500mA, they have a low saturation output of  $V_O(\text{sat}) = 0.75\text{V}$ . They are especially suited for use in compact motor of portable equipment.

### Features

- Low voltage operation (2.5V min.)
- Low saturation voltage (upper transistor + lower transistor residual voltage; at  $I_O = 500\text{mA}$ ,  $V_O(\text{sat}) = 0.75\text{V}$  typ.)
- Low current drain at standby mode ( $I_{CCO} = 0.1\mu\text{A}$  typ. or less)
- Separate logic power supply and motor power supply
- Brake function
- Built-in spark killer diodes

### 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      | $V_{OUT}$    |                                       | -0.3 to $V_S + V_F$ | V                |
| Input applied voltage       | $V_{IN}$     |                                       | -0.3 to +10.0       | V                |
| Ground pin flow-out current | $I_{GND}$    |                                       | 1.0                 | A                |
| Allowable power dissipation | $P_d$ max    | LB1638                                | 1.0                 | W                |
|                             |              | LB1638M: Independent IC               | 440                 | mW               |
|                             |              | LB1638M: Mounted on a specified board | 550                 | mW               |
| Operating temperature       | $T_{opr}$    |                                       | -20 to +75          | $^\circ\text{C}$ |
| Storage temperature         | $T_{stg}$    |                                       | -40 to +125         | $^\circ\text{C}$ |

\* Specified board: 30mm × 30mm × 1.5mm, glass epoxy board.

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# LB1638,1638M

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

| Parameter                | Symbol   | Conditions | Ratings      | Unit |
|--------------------------|----------|------------|--------------|------|
| Supply voltage range     | $V_{CC}$ |            | 2.5 to 9.0   | V    |
|                          | $V_S$    |            | 2.2 to 9.0   | V    |
| Input high-level voltage | $V_{IH}$ |            | 2.0 to 9.0   | V    |
| Input low-level          | $V_{IL}$ |            | -0.3 to +0.7 | V    |

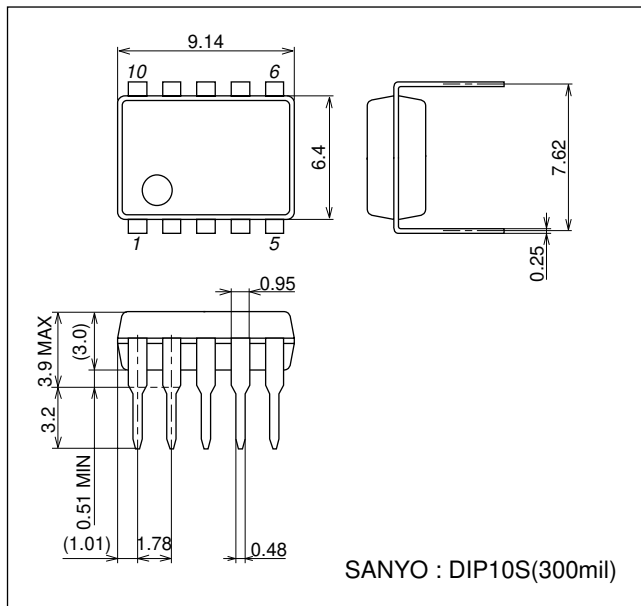
## Electrical Characteristics at $T_a = 25^\circ\text{C}$ , $V_{CC} = 5\text{V}$

| Parameter                                    | Symbol             | Conditions   | Ratings |      |     | Unit          |
|--|--------------------|--|---------|------|-----|---------------|
|  |                    |  | min     | typ  | max |               |
| Current drain                                | $I_{CC0}$          | $V_{IN1,2}$ $I_{CC} + I_S$                                   |         |      | 10  | $\mu\text{A}$ |
|  | $I_{CC1}$          | $V_{IN1} = 3\text{V}$ , $V_{IN2} = 0\text{V}$ $I_{CC} + I_S$ |         |      | 20  | mA            |
|  | $I_{CC2}$          | $V_{IN1,2} = 3\text{V}$ $I_{CC} + I_S$                       |         |      | 40  | mA            |
| Output saturation voltage<br>(upper + lower) | $V_{OUT1}$         | $I_{OUT} = 200\text{mA}$                                     |         | 0.25 | 0.5 | V             |
|  | $V_{OUT2}$         | $I_{OUT} = 500\text{mA}$                                     |         | 0.70 | 1.3 | V             |
| Output pin voltage difference                |                    | $I_O = 200\text{mA}$   |         |      | 0.1 | V             |
| Output sustain voltage                       | $V_O(\text{sus})$  | $I_{OUT} = 500\text{mA}$                                     | 9       |      |     | V             |
| Input current                                | $I_{IN}$           | $V_{IN} = 7\text{V}$ , $V_{CC} = 7\text{V}$                  |         |      | 0.5 | mA            |
| <b>Spark killer diode</b>                    |                    |  |         |      |     |               |
| Reverse current                              | $I_S(\text{leak})$ | $V_{CC}$ , $V_S = 7\text{V}$                                 |         |      | 10  | $\mu\text{A}$ |
| Forward voltage                              | $V_{SF}$           | $I_{OUT} = 200\text{mA}$                                     |         |      | 1.7 | V             |

## Package Dimensions

unit : mm (typ)

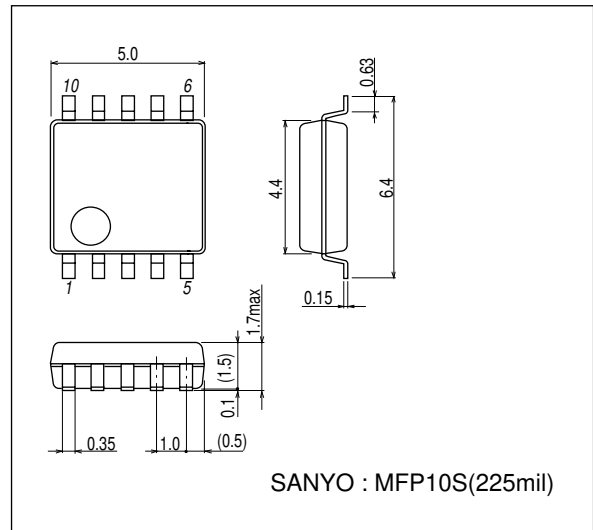
3098D



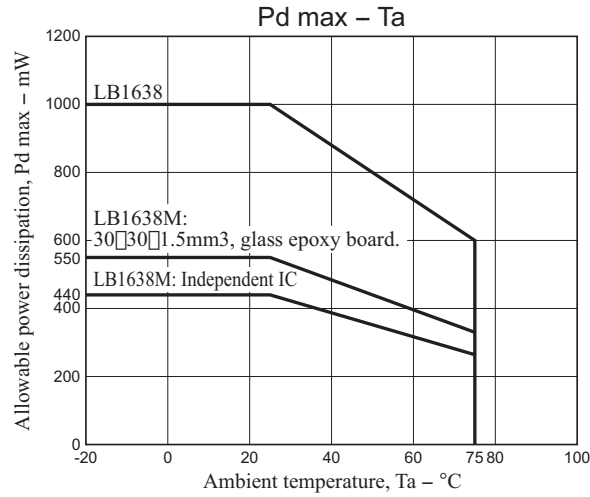
## Package Dimensions

unit : mm (typ)

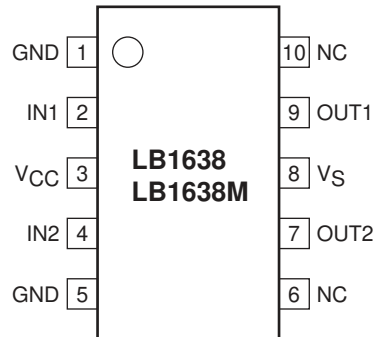
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# LB1638,1638M



## Pin Assignment

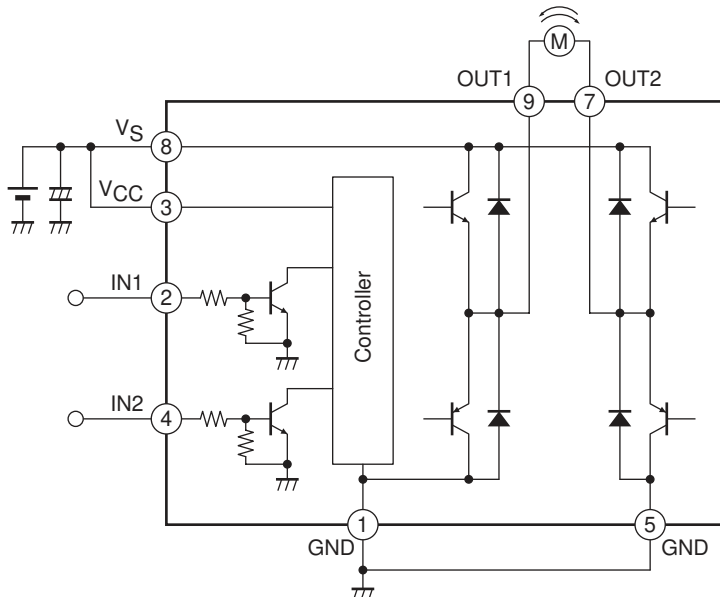


Note: both ground pins must be grounded.

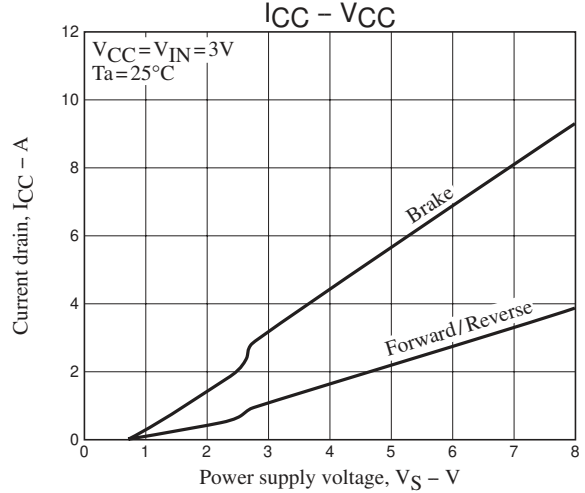
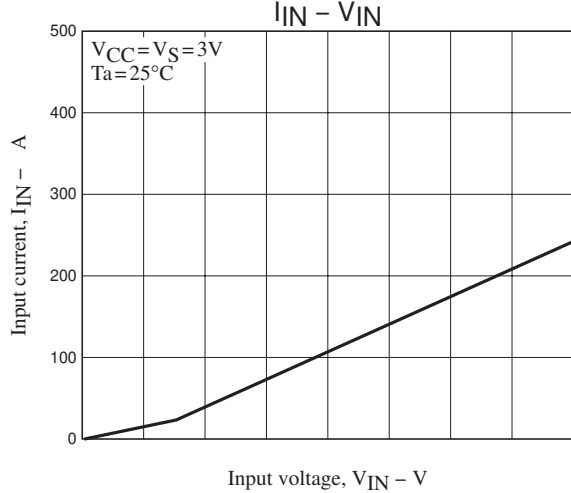
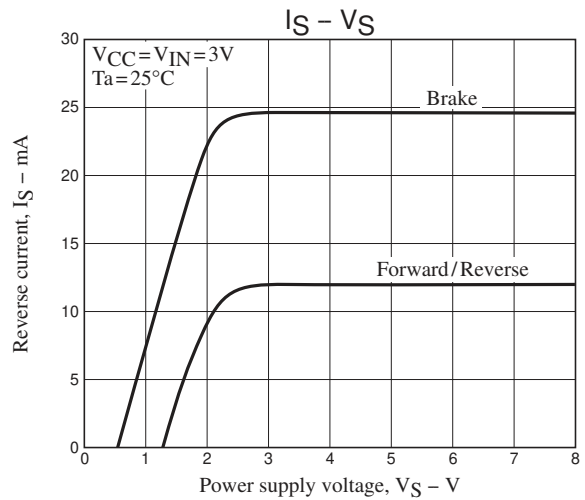
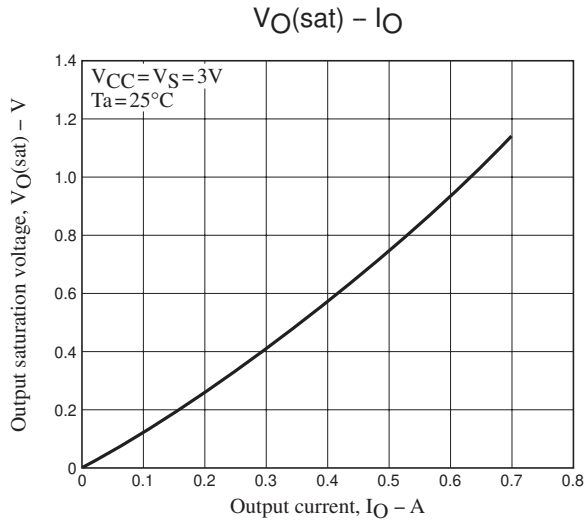
## Truth Table

| IN1 | IN2 | OUT1 | OUT2 | M Ode   |
|-----|-----|------|------|---------|
| H   | L   | H    | L    | Forward |
| L   | H   | L    | H    | Reverse |
| H   | H   | L    | L    | Brake   |
| L   | L   | OFF  | OFF  | Standby |

## Block Diagram and Sample Application Circuit



Note: When using the same power supply for VS and VCC, short the VCC and VS pins to each other or insert a capacitor in the VCC line.



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