# LB1938FA

## Monolithic Digital IC 1ch, Low-saturation Forward/Reverse Motor Driver



The LB1938FA is an H-bridge motor driver that supports low-voltage drive and features low-saturation outputs in an ultraminiature slim package. The LB1938FA provides forward, reverse, brake, and standby modes controlled by two input signals, and is an optimal DC motor driver for notebook personal computers, digital cameras, cell phones, and other portable equipment.

#### Features

- Ultraminiature Micro8 package
- The low saturation voltage means that the voltage applied to the motor is higher and IC heat generation is reduced. This allows this IC to be used in environments with higher ambient operating temperatures. Output saturation voltage (high side + low side): V<sub>O</sub>sat = 0.15V typical (I<sub>O</sub> = 100mA)
- The wide usable voltage range and the low standby mode current drain of  $0.1 \,\mu\text{A}$  make this IC optimal for battery operated equipment.
- There are no constraints on the relationship between the input signal voltage and the supply voltage. For example, this IC can be use at  $V_{CC} = 3V$  and  $V_{IN} = 5V$ .
- Thermal protection circuit limits the drive current and prevents the IC from causing a fire or being destroyed if the IC chip temperature reaches or exceeds 180°C due to large currents flowing when the outputs are shorted due to, for example, motor layer shorting or other phenomena.

#### **Specifications**

#### Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V <sub>CC</sub> max		10.5	V
Output current	I <sub>OUT</sub> max		800	mA
Output voltage	V <sub>OUT</sub> max		V <sub>CC</sub> +V <sub>SF</sub>	V
Input applied voltage	V <sub>I</sub> H max		10	V
Allowable power dissipation	Pd max	Mounted on a specified board *	400	mW
Operating temperature range	Topr		-30 to +85	°C
Storage temperature range	Tstg		-55 to +150	°C

Note \*: Mounted on a specified board: 114.3mm×76.1mm×1.5mm, glass epoxy resin, wiring density 20%

Caution 1) Absolute maximum ratings represent the value which cannot be exceeded for any length of time.

Caution 2) Even when the device is used within the range of absolute maximum ratings, as a result of continuous usage under high temperature, high current, high voltage, or drastic temperature change, the reliability of the IC may be degraded. Please contact us for the further details.

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.



#### Allowable Operating Range at $Ta = 25^{\circ}C$

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V <sub>CC</sub>		2.2 to 10	V
Input high-level voltage	VIН		2.0 to 9.5	V
Input low-level voltage	VIL		-0.3 to +0.3	V

#### **Electrical Characteristics** at $Ta = 25^{\circ}C$ , $V_{CC} = 3V$

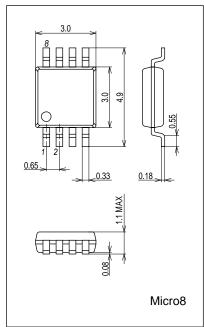
Parameter	Symbol	Conditions	Ratings			L Incit
			min	typ	max	Unit
Circuit current	I <sub>CC</sub> 1	Standby		0.1	5	μΑ
	I <sub>CC</sub> 2	Forward/reverse drive		14	19	mA
	ICC3	Brake		20	29	mA
Output saturation voltage	V <sub>O</sub> sat1	Upper+lower I <sub>O</sub> = 100mA for forward/reverse rotation		0.15	0.2	V
	V <sub>O</sub> sat2	Upper+lower I <sub>O</sub> = 300mA for forward/reverse rotation		0.35	0.5	V
	V <sub>O</sub> sat3	Upper I <sub>O</sub> = 100mA for braking		0.1	0.15	V
Spark killer diode forward voltage	V <sub>SF</sub>	I <sub>O</sub> = 300mA		0.9	1.7	V
Spark killer diode inverse current	I <sub>RS</sub>	V <sub>OUT</sub> = 10V		0.1	5	μA
Input current	I <sub>IN</sub>	V <sub>IN</sub> = 5V		75	98	μA
Thermal protection operating temperature	TSD	Design target value *		180		°C

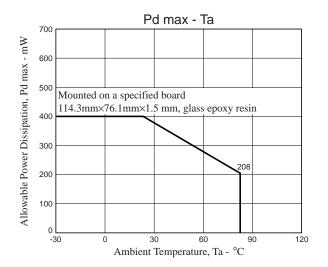
Note \*: Design target value: Measurement with a single unit not made.

#### **Package Dimensions**

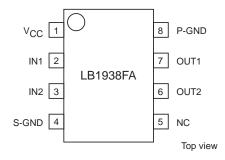
unit : mm (typ)

3427





#### **Pin Assignment**

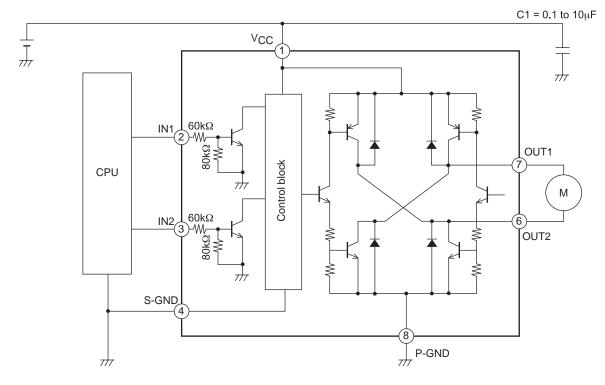


S-GND: GND for the control system P-GND: GND for the power system

#### **Truth Table**

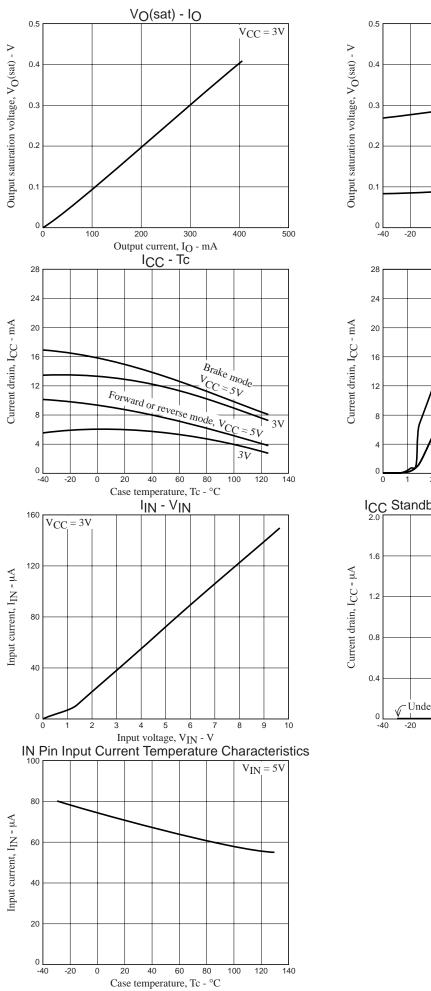
IN1	IN2	OUT1	OUT2	Mode
L	L	OFF	OFF	Standby
Н	L	н	L	Forward rotation
L	Н	L	Н	Reverse rotation
Н	Н	Н	Н	Brake

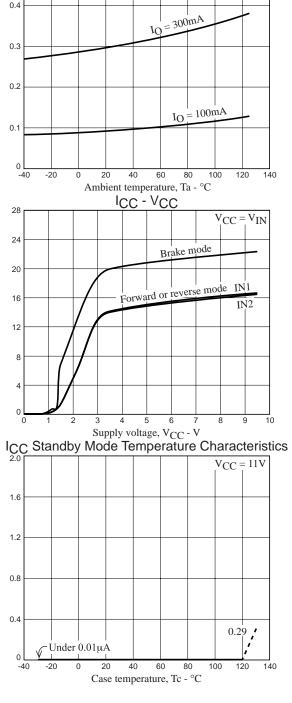
### **Sample Application Circuit**



#### **Cautions:**

- V<sub>CC</sub> and GND lines suffer substantial fluctuation in the current quantity, causing a problem of line oscillation in certain cases. In this case, take following points into account:
  - (1) Use a thick and short wiring to reduce the wiring inductance.
  - (2) Insert a capacitor with satisfactory frequency characteristics near IC.
  - (3) Connect S-GND to the control system GND on the CPU side and P-GND to the power system GND.





Vo(sat) - Ta

 $V_{CC} = 3V$ 

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