



LB1973JA

Monolithic Digital IC

Two-channel H-Bridge Driver

ON Semiconductor®

<http://onsemi.com>

Overview

The LB1973JA is a two-channel H-bridge driver that supports for low saturation drive operation. It is optimal for H-bridge drive of stepping motors (AF and zoom) in portable equipment such as camera cell phones.

Features

- Two-channel H-bridge driver
- 2ch simultaneous connection is possible
- Parallel input interface
- 2 phase excitation, 1-2 phase excitation drive are possible
- The range of the operation voltage is wide.(1.8V to 7.5V)
- Built-in thermal protection

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 +8.0 | V |
| Output voltage | $V_{OUT\ max}$ | | - V_{SF} to $V_{CC}+V_{SF}$ | V |
| Input voltage | $V_{IN\ max}$ | | -0.3 to +8.0 | V |
| Spark killer Di order direction electric | $I_{SF\ max}$ | | 1000 | mA |
| Ground pin source current | I_{GND} | Per channel | 1000 | mA |
| Allowable power dissipation | $P_d\ max$ | *Mounted on a board | 800 | mW |
| Operating temperature | T_{opr} | | -20 to +85 | $^\circ\text{C}$ |
| Storage temperature | T_{stg} | | -40 to +150 | $^\circ\text{C}$ |

* Mounted on a Specified board : 114.3mm×76.1mm×1.6mm, glass epoxy

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

| Parameter | Symbol | Conditions | Ratings | Unit |
|--------------------------|----------|----------------------------|--------------|------|
| Supply voltage | V_{CC} | | 1.8 to 7.5 | V |
| High-level input voltage | V_{IH} | $R_{IN} = 1\text{k}\Omega$ | 1.3 to 7.5 | V |
| Low-level input voltage | V_{IL} | $R_{IN} = 1\text{k}\Omega$ | -0.3 to +0.5 | V |

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Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = 1.9\text{V}$

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|--------------------|---|---------|------|------|------------------|
| | | | min | typ | max | |
| Source current | I_{CCO1} | $V_{CC} = 1.9\text{V}, \text{IN1 to IN4} = \text{Low level}$ | | 0.01 | 1 | μA |
| | I_{CCO2} | $V_{CC} = 3\text{V}, \text{IN1 to IN4} = \text{Low level}$ | | 0.01 | 1 | μA |
| | I_{CC1} | $\text{IN1} = \text{High level}, \text{IN2 to IN4} = \text{Low level}$ | | 18 | 25 | mA |
| | I_{CC2} | $\text{IN1} = \text{High level}, \text{IN2 to IN4} = \text{Low level}, V_{CC} = 3\text{V}$ | | 19 | 27.5 | mA |
| Output saturation voltage1 (single connection) | V_{OUT11} | $I_{OUT} = 270\text{mA}, V_{CC} = 1.9\text{V to } 3.6\text{V}, T_a = -20 \text{ to } 85^\circ\text{C}$ $V_{OUT} = \text{Upper Tr and Under Tr}$ $\text{IN1} = \text{High level}, \text{IN2 to IN4} = \text{Low level}$ Supplementation: Standard similar as for IN2 to IN4 = High level | | 0.2 | 0.3 | V |
| | V_{OUT12} | $I_{OUT} = 350\text{mA}, V_{CC} = 1.9\text{V to } 3.6\text{V}, T_a = -20 \text{ to } 85^\circ\text{C}$ $V_{OUT} = \text{Upper Tr and Under Tr}$ $\text{IN1} = \text{High level}, \text{IN2 to IN4} = \text{Low level}$ Supplementation: Standard similar as for IN2 to IN4 = High level | | 0.25 | 0.4 | V |
| Output saturation voltage2 (parallel connection) | V_{OUT21} | $I_{OUT} = 270\text{mA}, V_{CC} = 1.9\text{V to } 3.6\text{V}, T_a = -20 \text{ to } 85^\circ\text{C}$ $V_{OUT} = \text{Upper Tr and Under Tr}$ $\text{OUT1-3}, \text{OUT2-4 short. IN1 and IN3} = \text{High level}, \text{IN2 and IN4} = \text{Low level}$ Supplementation: Standard similar as for IN2 and IN4 = High level | | 0.12 | 0.2 | V |
| | V_{OUT22} | $I_{OUT} = 500\text{mA}, V_{CC} = 1.9\text{V to } 3.6\text{V}, T_a = -20 \text{ to } 85^\circ\text{C}$ $V_{OUT} = \text{Upper Tr and Under Tr}$ $\text{OUT1-3}, \text{OUT2-4 short. IN1 and IN3} = \text{High level}, \text{IN2 and IN4} = \text{Low level}$ Supplementation: Standard similar as for IN2 and IN4 = High level | | 0.2 | 0.35 | V |
| Output electric current with the parasitic element | I_{PA} | $V_{IN} = 1.9 \text{ to } 3.6\text{V}, T_a = -20 \text{ to } 85^\circ\text{C} \quad *1$ | | | 9 | mA |
| Input current | I_{IN} | $V_{IN} = 1.9\text{V}$ | | 32 | 70 | μA |
| Thermal shutdown operation temperature | T_{sd} | *2: Design guarantee | | 140 | | $^\circ\text{C}$ |
| Temperature hysteresis width | ΔT | *2: Design guarantee | | 20 | | $^\circ\text{C}$ |
| Spark killer Diode | | | | | | |
| Reverse current | $I_S(\text{leak})$ | $V_{CC-OUT} = 8\text{V}, V_{IN} = \text{Low level}$ | | | 10 | μA |
| Forward voltage | V_{SF} | $I_{SF} = 400\text{mA}, V_{IN} = \text{Low level}$ | | | 1.7 | V |

*1: Output electric current with the parasitic element I_{PA} : The current value that the off ch(-free) output is pulled at the time of one side ch drive by a parasitic element

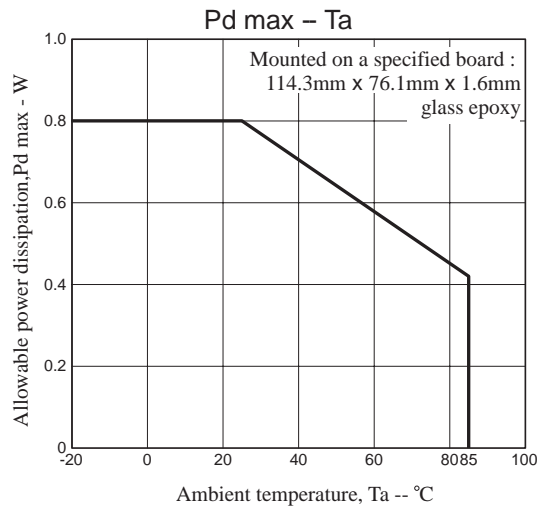
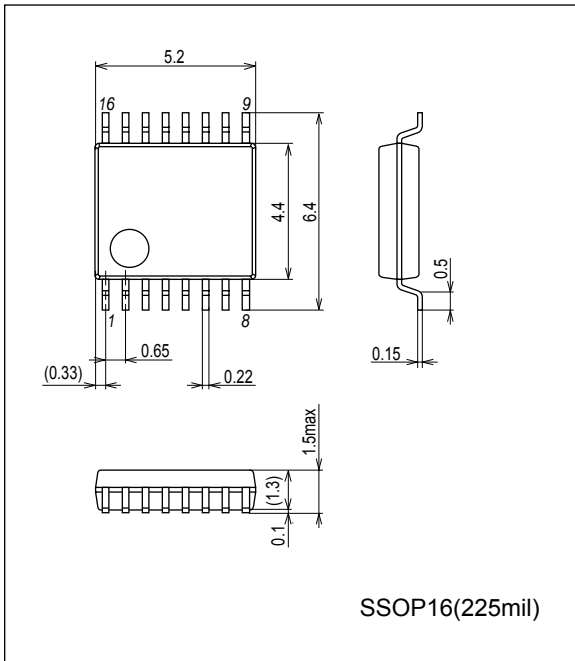
*2: Design guarantee value and does not measure

* VSF: The current order direction voltage true in a time

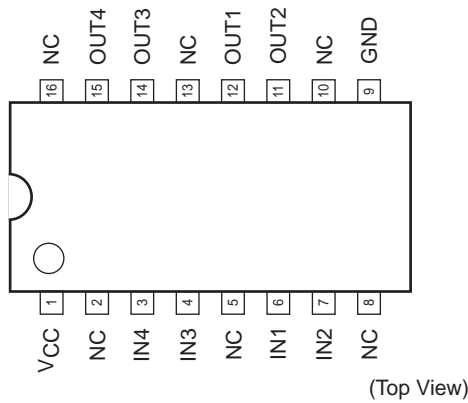
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Package Dimensions

unit : mm (typ)
3178B



Pin Assignment

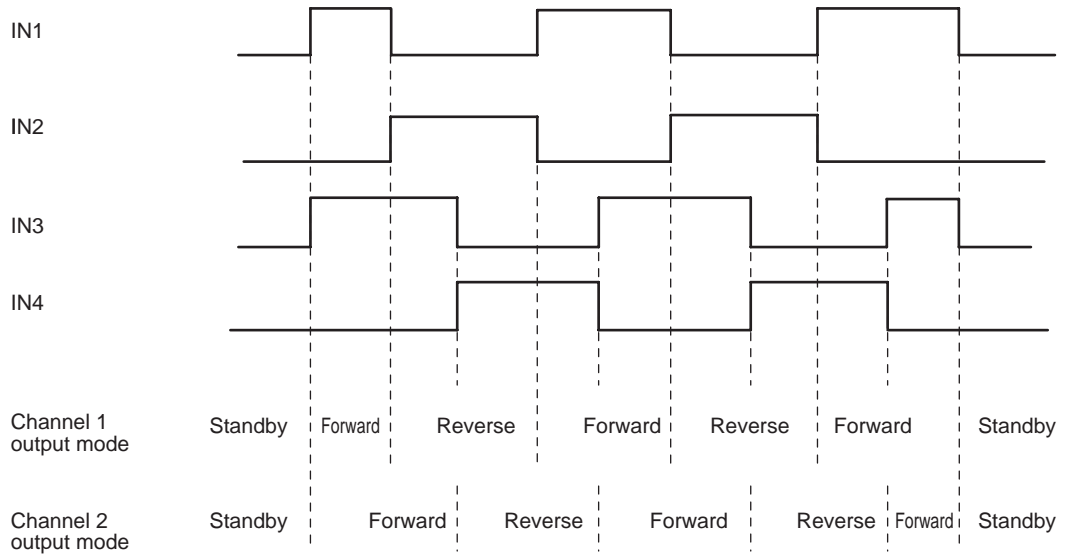


Truth Table

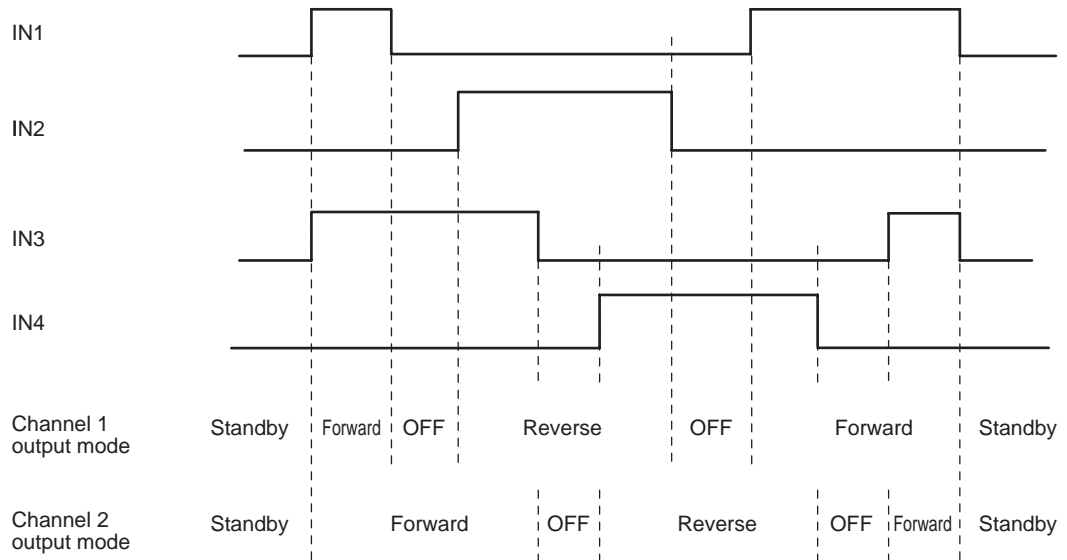
| Input | | | | Output | | | | Mode |
|-------|------|------|------|--|------|------|------|--------------------|
| IN1 | IN2 | IN3 | IN4 | OUT1 | OUT2 | OUT3 | OUT4 | |
| Low | Low | Low | Low | Off | Off | Off | Off | Standby mode |
| High | Low | - | - | High | Low | - | - | Channel 1, forward |
| Low | High | | | Low | High | | | Channel 1, reverse |
| - | - | High | Low | - | - | High | Low | Channel 2, forward |
| | | Low | High | | | Low | High | Channel 2, reverse |
| High | High | - | - | The logic output for the first high-level input is produced. | | | | |
| - | - | | | | | | | High |

Stepping motor control example

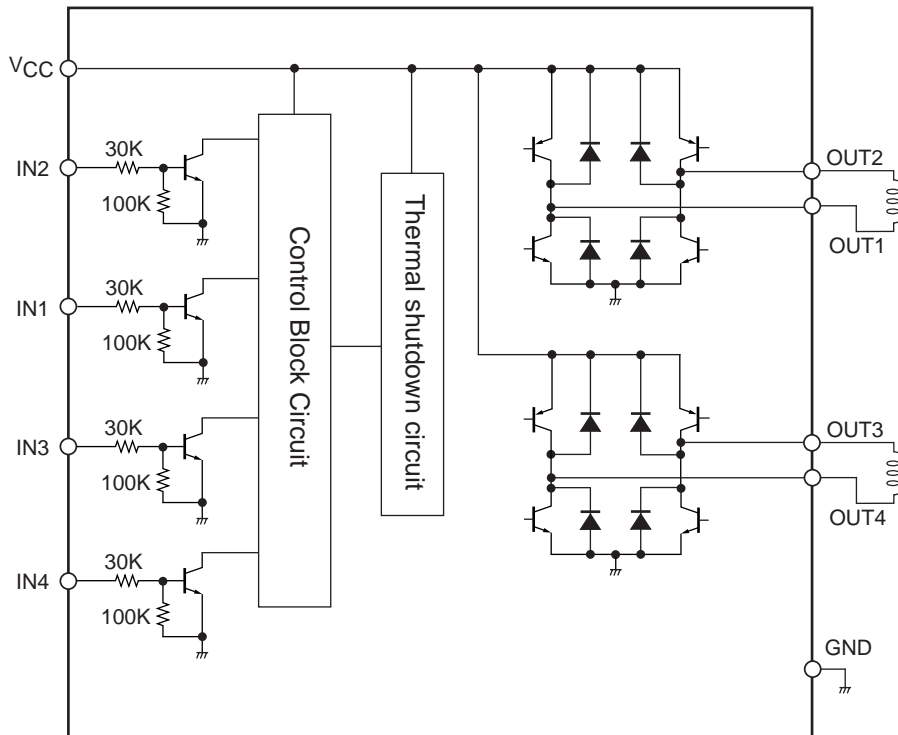
(1) Timing chart for 2-phase drive



(2) Timing chart for 1-2 phase drive



Block Diagram



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