



LB1973M — Bi-CMOS LSI Two-channel H-Bridge Driver

Overview

The LB1973M 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
- The range of the operation voltage is wide.(1.8V to 7.5V)
- Small package : MFP10S(225mil)
- Built-in thermal protection

Specifications

Absolute Maximum Ratings at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|-----------------------------|----------------------|------------------------------|--|------|
| Maximum supply voltage | V _{CC} max | | -0.3 to +8.0 | V |
| Output voltage | V _{OUT} max | | -0.3 to V _{CC} +V _{SF} | V |
| Input voltage | V _{IN} max | CONT, IN | -0.3 to +8.0 | V |
| Ground pin source current | I _{GND} | Per channel | 1000 | mA |
| Allowable power dissipation | Pd max1 | For Unit | 350 | mW |
| | Pd max2 | Mounted on a circuit board.* | 870 | mW |
| Operating temperature | Topr | | -20 to +85 | °C |
| Storage temperature | Tstg | | -40 to +150 | °C |

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

Allowable Operating Ratings at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|--------------------------|-----------------|------------|--------------|------|
| Supply voltage | V _{CC} | | 1.8 to 7.5 | V |
| High-level input voltage | V _{IH} | | 1.3 to 7.5 | V |
| Low-level input voltage | V _{IL} | | -0.3 to +0.5 | V |

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

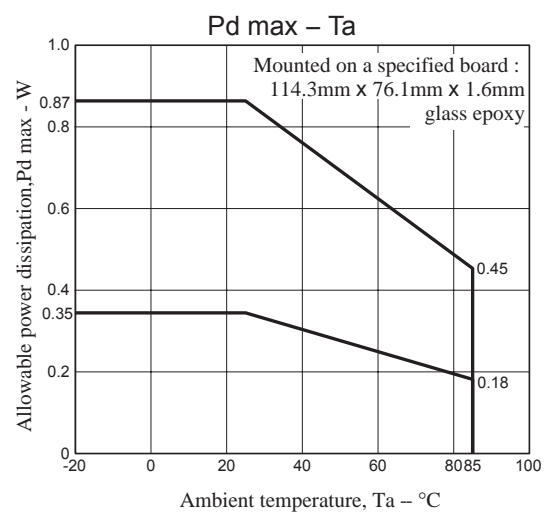
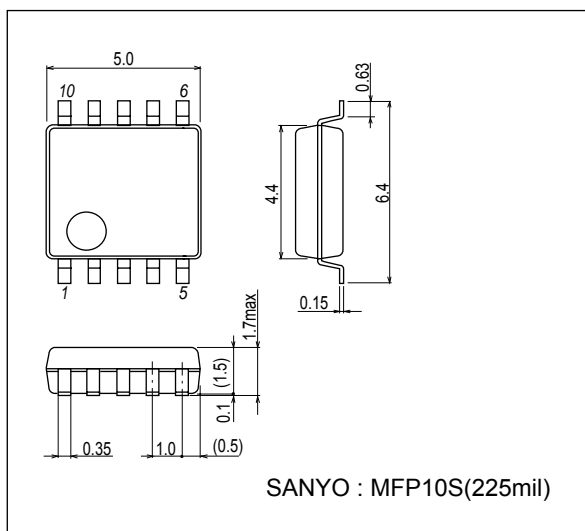
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| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|--------------------|---|---------|------|------|------------------|
| | | | min | typ | max | |
| Source current | I_{CCO1} | $V_{CC} = 1.9\text{V}, IN1 \text{ to } IN4 = 0\text{V}$ | | 0.01 | 1 | μA |
| | I_{CCO2} | $V_{CC} = 3\text{V}, IN1 \text{ to } IN4 = 0\text{V}$ | | 0.01 | 1 | μA |
| | I_{CC1} | $IN1 = 1.9\text{V}, IN2 \text{ to } IN4 = 0\text{V}$ | | 18 | 25 | mA |
| | I_{CC2} | $IN1 = 3\text{V}, IN2 \text{ to } IN4 = 0\text{V}, V_{CC} = 3\text{V}$ | | 19 | 26 | mA |
| Output saturation voltage1 (single connection) | V_{OUT11} | $I_{OUT} = 270\text{mA}, V_{CC} = 1.9\text{V to } 3.6\text{V}, V_{OUT} =$ Upper Tr and Under Tr $IN1 = 1.3\text{V}, IN2 \text{ to } IN4 = 0\text{V}$ Supplementation: Standard similar as for IN2 to IN4 = 1.3V | | 0.2 | 0.3 | V |
| | V_{OUT12} | $I_{OUT} = 350\text{mA}, V_{CC} = 1.9\text{V to } 3.6\text{V}, V_{OUT} =$ Upper Tr and Under Tr $IN1 = 1.3\text{V}, IN2 \text{ to } IN4 = 0\text{V}$ Supplementation: Standard similar as for IN2 to IN4 = 1.3V | | 0.25 | 0.4 | V |
| Output saturation voltage2 (parallel connection) | V_{OUT21} | $I_{OUT} = 270\text{mA}, V_{CC} = 1.9\text{V to } 3.6\text{V}, V_{OUT} =$ Upper Tr and Under Tr OUT1-3, OUT2-4 short. $IN1 \text{ and } IN3 =$ $1.3\text{V}, IN2 \text{ and } IN4 = 0\text{V}$ Supplementation: Standard similar as for IN2 and IN4 = 1.3V | | 0.12 | 0.2 | V |
| | V_{OUT22} | $I_{OUT} = 500\text{mA}, V_{CC} = 1.9\text{V to } 3.6\text{V}, V_{OUT} =$ Upper Tr and Under Tr OUT1-3, OUT2-4 short. $IN1 \text{ and } IN3 =$ $1.3\text{V}, IN2 \text{ and } IN4 = 0\text{V}$ Supplementation: Standard similar as for IN2 and IN4 = 1.3V | | 0.2 | 0.35 | V |
| Input current | I_{IN} | $V_{IN} = 1.9\text{V}$ | | 32 | 70 | μA |
| Thermal shutdown operation temperature | T_{tsd} | | | 140 | | $^\circ\text{C}$ |
| Temperature hysteresis width | ΔT | | | 20 | | $^\circ\text{C}$ |
| Spark killer Diode | | | | | | |
| Reverse current | $I_S(\text{leak})$ | $V_{CC-OUT} = 8\text{V}, V_{IN} = 0\text{V}$ | | | 10 | μA |
| Forward voltage | V_{SF} | $I_{OUT} = 400\text{mA}, V_{IN} = 0\text{V}$ | | | 1.7 | V |

Package Dimensions

unit : mm (typ)

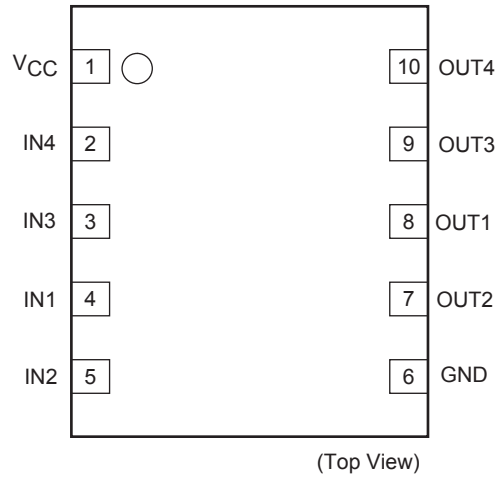
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Pin Assignment

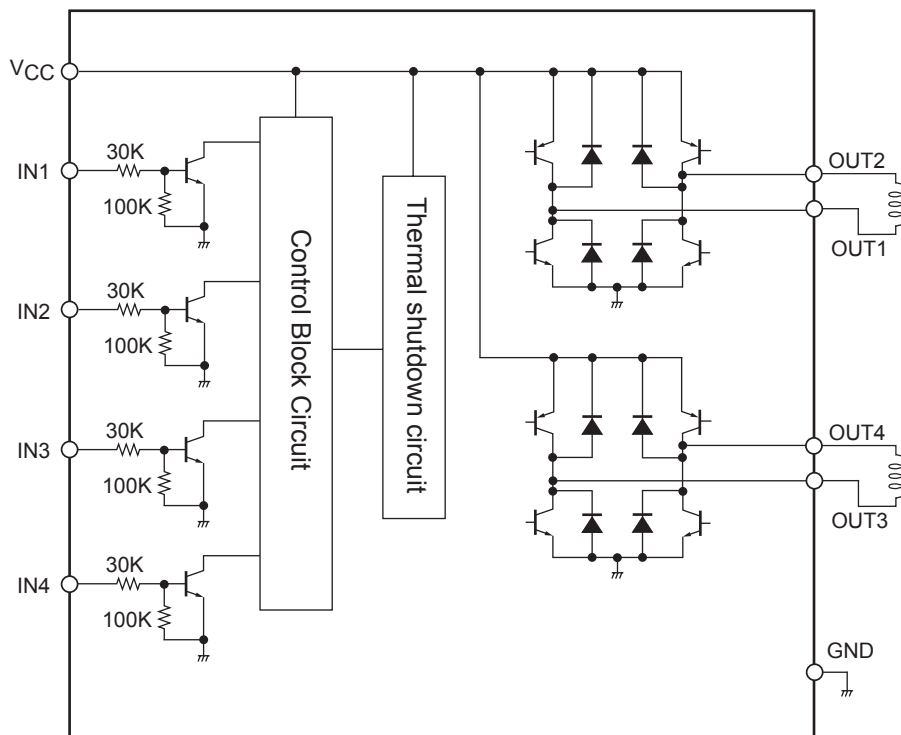
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Truth Table

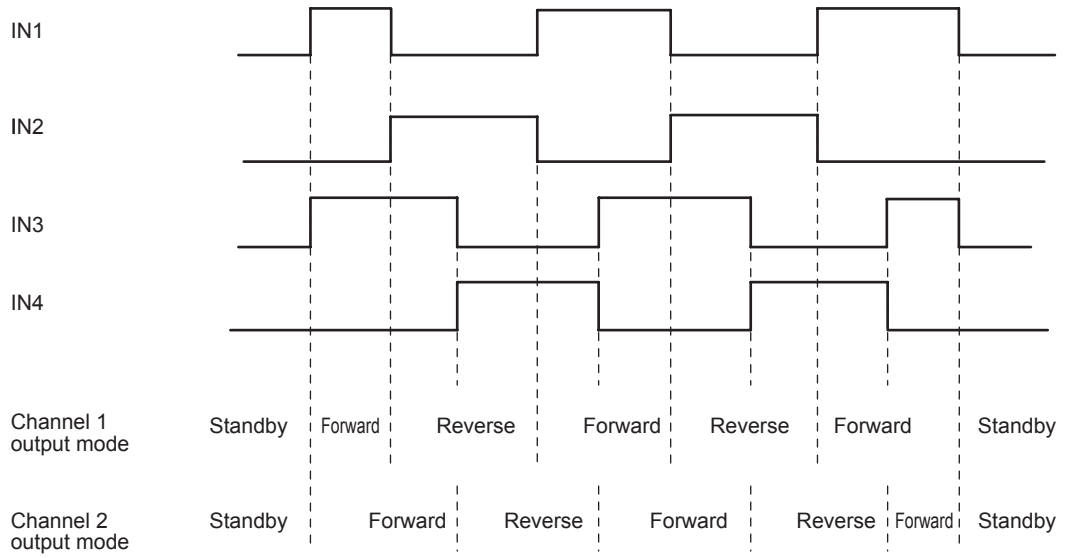
| Input | | | | Output | | | | Mode |
|-------|------|------|------|--|------|------|------|--------------------|
| IN1 | IN2 | IN3 | IN4 | OUT1 | OUT2 | OUT3 | OUT4 | |
| Low | Low | Low | Low | Off | Off | Off | Off | Standby mode |
| High | Low | - | - | High | Low | - | - | Channel 1, forward |
| 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 | High | | | | | |

Block Diagram

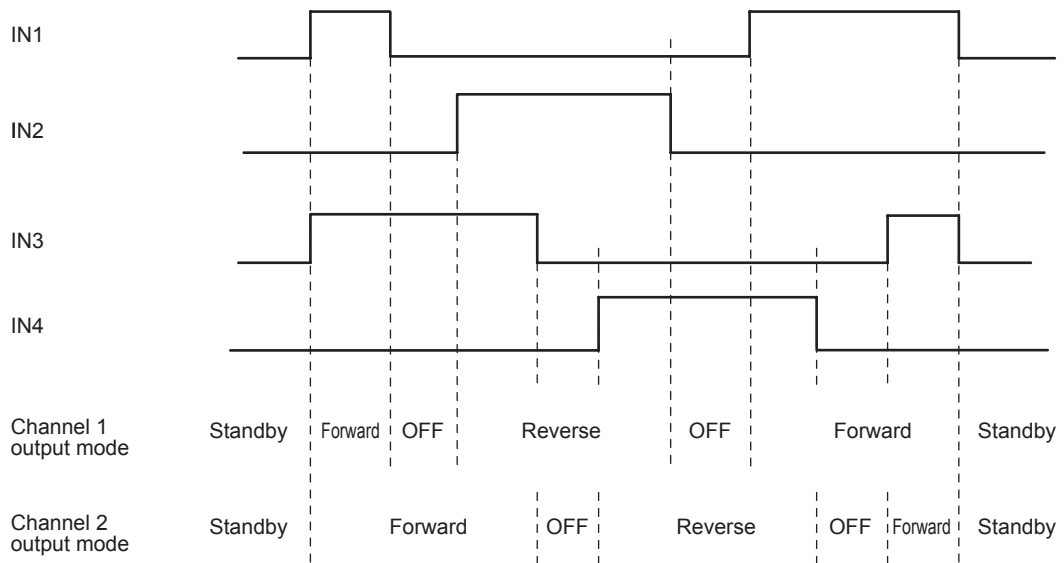


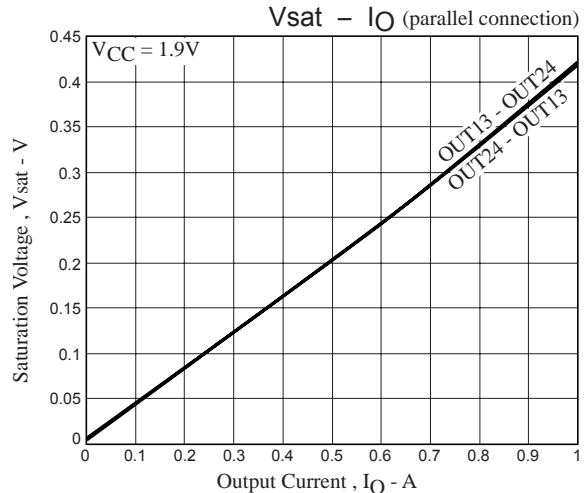
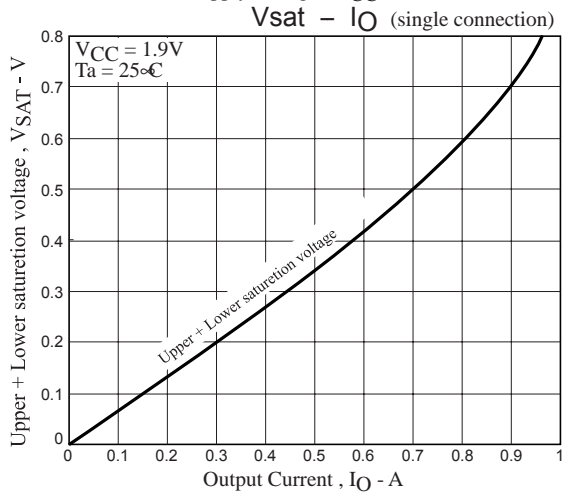
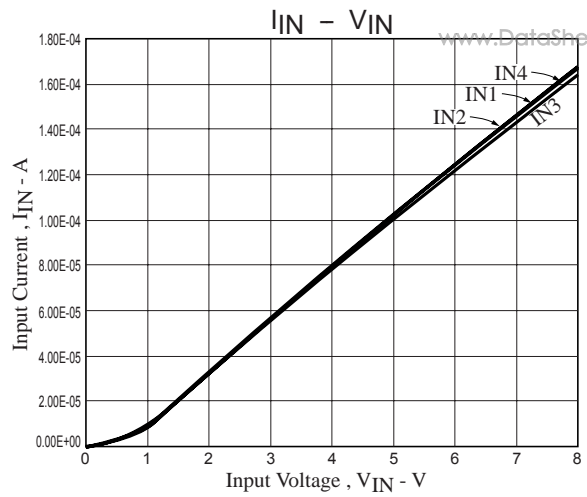
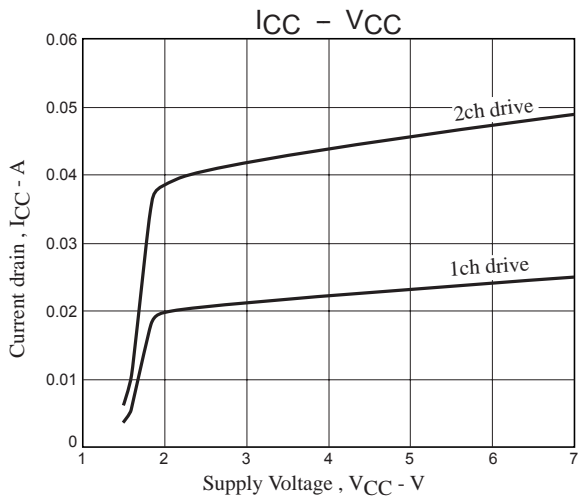
Timing Chart

(1) Stepper motor timing chart
Timing chart for 2-phase drive



(2) Timing chart for 1-2 phase drive (Fastdecay mode)





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