



SANYO Semiconductors

## DATA SHEET

# 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  $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC}$ max		-0.3 to +8.0	V
Output voltage	$V_{OUT}$ max		-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	$P_d$ max1	For Unit	350	mW
	$P_d$ max2	Mounted on a circuit board.*	870	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

**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	$V_{IH}$		1.3 to 7.5	V
Low-level input voltage	$V_{IL}$		-0.3 to +0.5	V

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# LB1973M

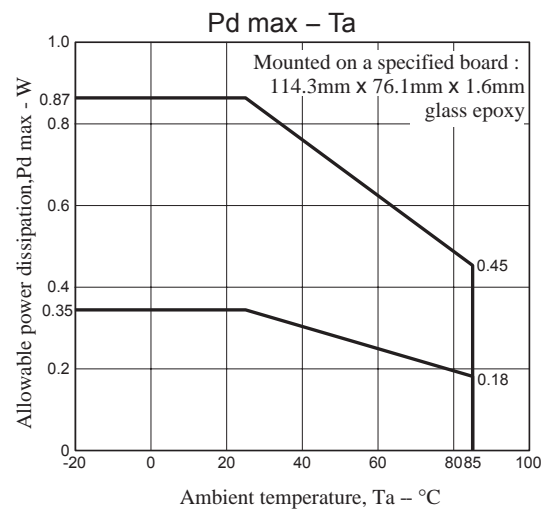
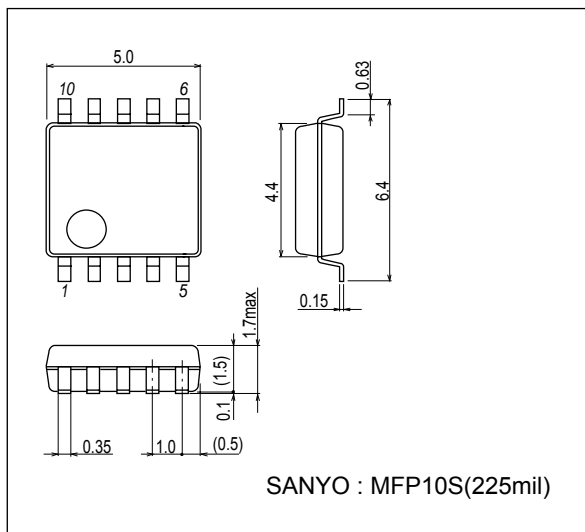
**Electrical Characteristics** at  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 1.9\text{V}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Source current	$I_{CCO1}$	$V_{CC} = 1.9\text{V}, IN1 \text{ to } IN4 = 0\text{V}$		0.01	1	$\mu\text{A}$
	$I_{CCO2}$	$V_{CC} = 3\text{V}, IN1 \text{ to } IN4 = 0\text{V}$		0.01	1	$\mu\text{A}$
	$I_{CC1}$	$IN1 = 1.9\text{V}, IN2 \text{ to } IN4 = 0\text{V}$		18	25	$\text{mA}$
	$I_{CC2}$	$IN1 = 3\text{V}, IN2 \text{ to } IN4 = 0\text{V}, V_{CC} = 3\text{V}$		19	26	$\text{mA}$
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	$\mu\text{A}$
Thermal shutdown operation temperature	$T_{tsd}$			140		$^\circ\text{C}$
Temperature hysteresis width	$\Delta T$			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	$\mu\text{A}$
Forward voltage	$V_{SF}$	$I_{OUT} = 400\text{mA}, V_{IN} = 0\text{V}$			1.7	V

## Package Dimensions

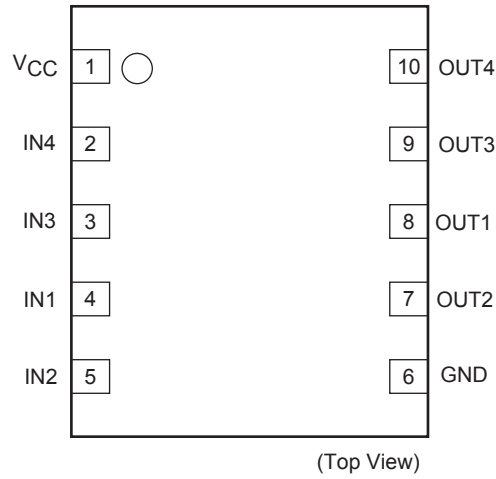
unit : mm (typ)

3086B



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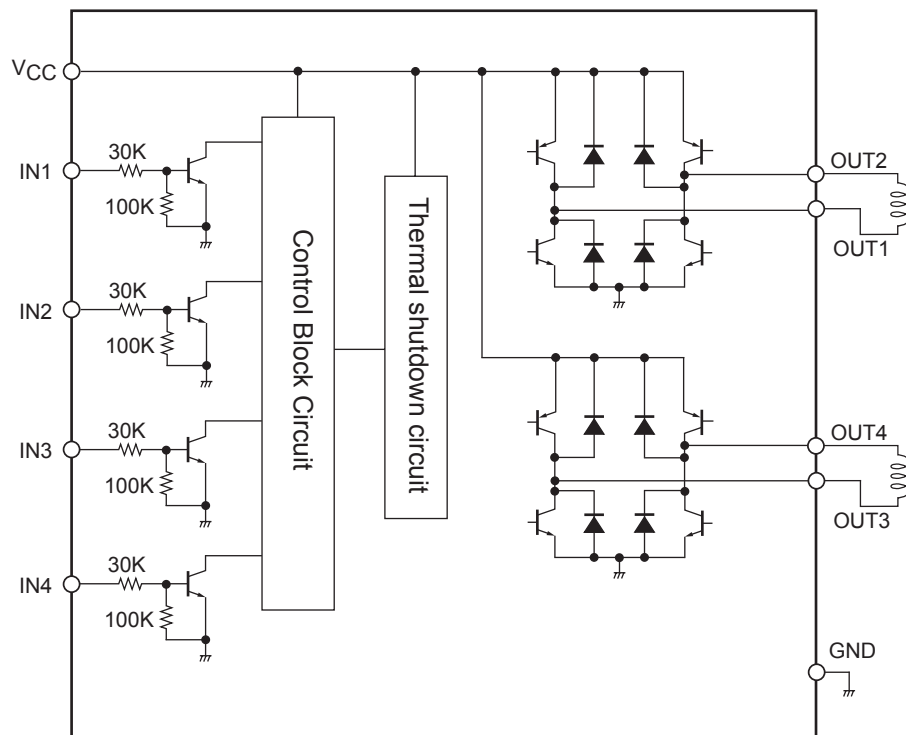
## Pin Assignment



## Truth Table

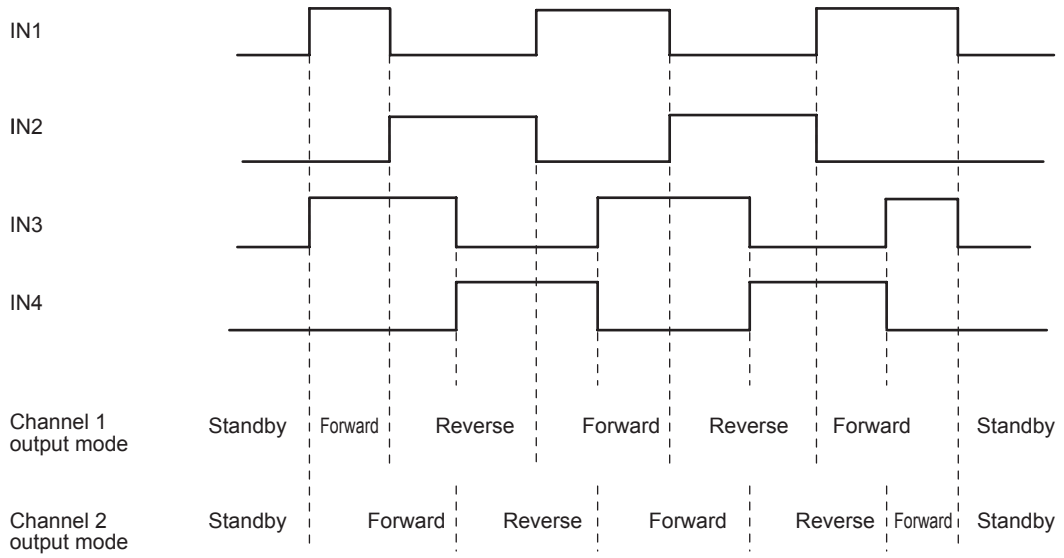
Input				Output				Mode
IN1	IN2	IN3	IN4	OUT1	OUT2	OUT3	OUT4	
Low	Low	Low	Low	Off	Off	Off	Off	Standby mode
High	Low	-	-	High	Low	-	-	Channel 1, forward
Low	High			Low	High			Channel 1, reverse
-	-	High	Low	-	-	High	Low	Channel 2, forward
		Low	High			Low	High	Channel 2, reverse
High	High	-	-	The logic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

## Block Diagram

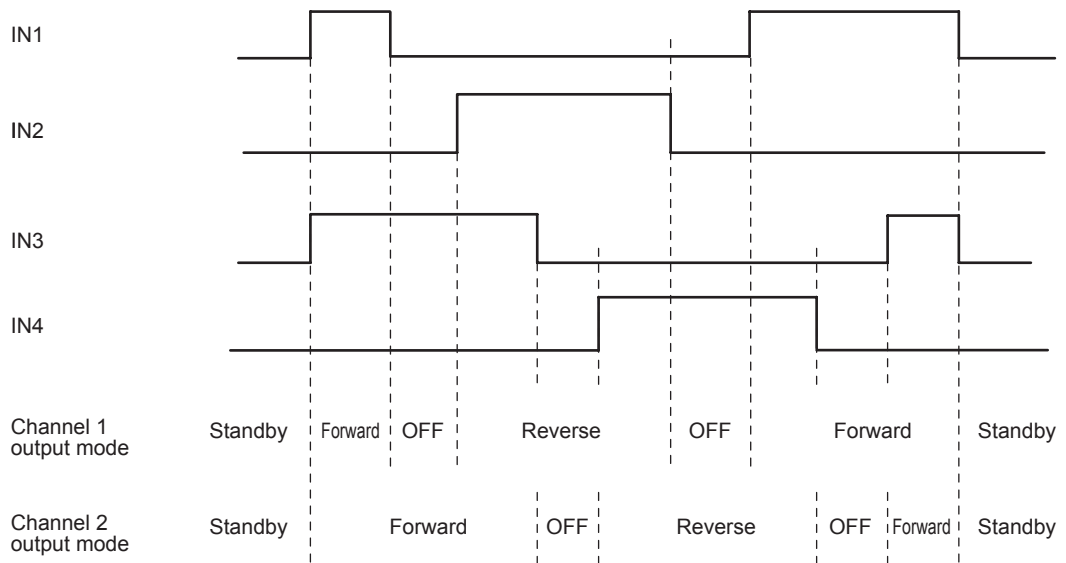


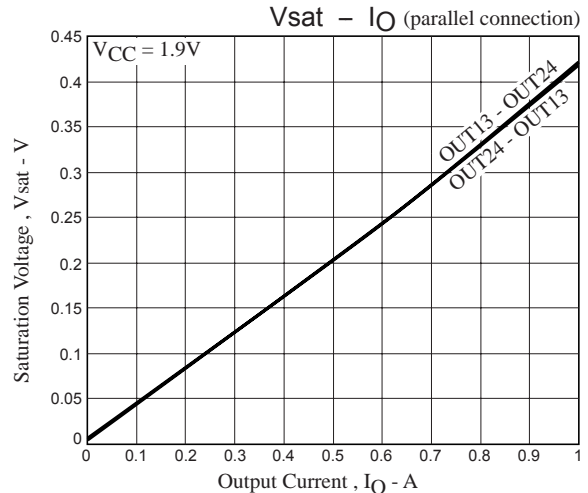
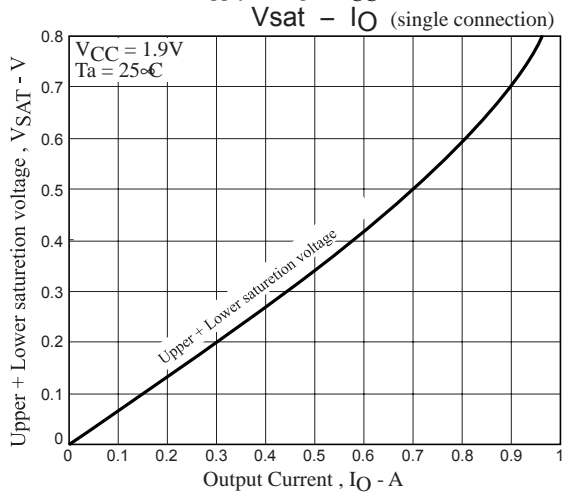
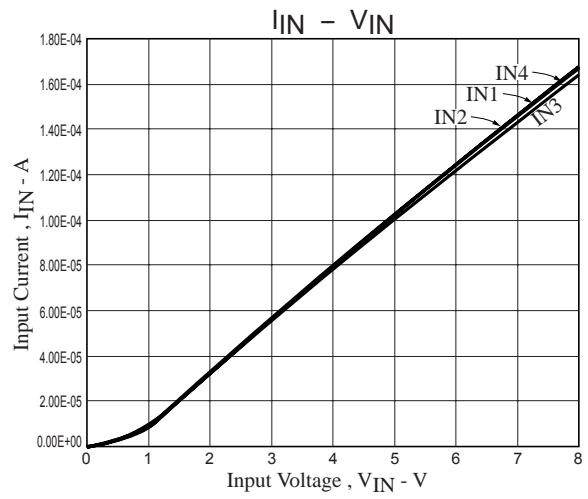
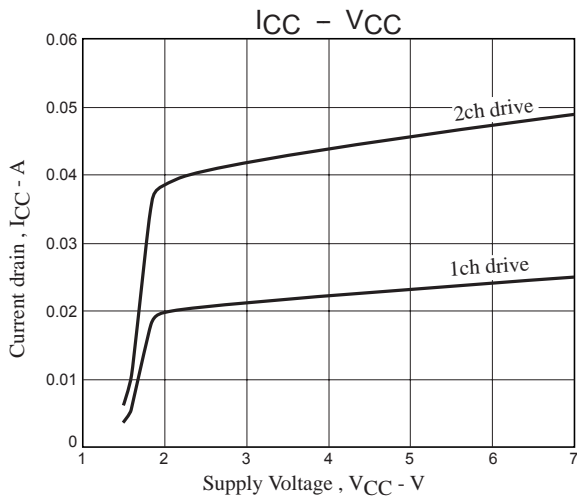
Timing Chart

(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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