



**ON Semiconductor®**

<http://onsemi.com>

# LB1937T

---

Monolithic Digital IC

## 1-2 Phase Excitation Stepping Motor Driver

### Overview

The LB1937T is a 2-phase bipolar drive stepping motor driver IC that supports low-voltage drive and can drive two stepping motors at the same time. The LB1937T's miniature package and minimal number of external components reduces the required mounting area. It also provides high-efficiency motor drive and can reduce circuit current consumption. Since it provides a current detection pin and supports PWM control input, it can be used to implement current chopper control at the system level. The LB1937T is optimal for the stepping motors used for lens drive in digital cameras, printers, and movie cameras.

### Functions and Features

- Low saturation voltage forward/reverse motor driver ( $V_{O\ sat} = 0.3V$  at  $I_O = 200mA$ )
- Four H-bridge channels
- Wide usable voltage range (Allowable voltage range: 2.5V to 9.5V, absolute maximum rating: 10.5V)
- Supports PWM input (Low power consumption can be achieved in slow delay mode that uses IN1/IN2 = H/H logic.)
- Motor (coil) current detection pin
- Built-in thermal shutdown circuit
- Thin form factor miniature package (TSSOP24)

# LB1937T

## 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
Maximum output voltage	$V_{OUT}$ max		$V_S + V_{SF}$	V
Input voltage	$V_{IN}$ max		-0.3 to +8.0	V
Ground pin source current	$I_{GND}$ max	Per channel	800	mA
Allowable power dissipation	$P_d$ max	When mounted on a circuit board *	1100	mW
Operating temperature	$T_{opr}$		-30 to +85	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-40 to +150	$^\circ\text{C}$

\* Specified circuit board :  $114.3 \times 76.1 \times 1.6\text{mm}^3$ , glass epoxy

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

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	$V_{CC}$		2.5 to 9.5	V
	$V_S$		2.5 to 9.5	V
High-level input voltage	$V_{IH}$		2.0 to 7.5	V
Low-level input voltage	$V_{IL}$		-0.3 to 0.7	V

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

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
$V_{CC}$ system power supply current	$I_{CC0}$	$IN1$ to $IN8 = 0\text{V}$		0.1	5	$\mu\text{A}$
	$I_{CC1}$	$IN1 = IN3 = 3\text{V}$		10	16	mA
VS system power supply current	$I_{S0}$	$IN1$ to $IN8 = 0\text{V}$		0.1	5	$\mu\text{A}$
	$I_{S1}$	$IN1 = IN3 = 3\text{V}$		13	19	mA
Output saturation voltage	$V_{OUT1}$	$V_{CC} = V_S = 3\text{V}$ to $7.5\text{V}$ , $V_{IN} = 3\text{V}$ or $0\text{V}$ , $I_{OUT} = 200\text{mA}$ (High and low side)		0.3	0.4	V
	$V_{OUT2}$	$V_{CC} = V_S = 4\text{V}$ to $7.5\text{V}$ , $V_{IN} = 3\text{V}$ or $0\text{V}$ , $I_{OUT} = 400\text{mA}$ (High and low side)		0.6	0.8	V
Input current	$I_{IN}$	$V_{IN} = 5\text{V}$		150	200	$\mu\text{A}$
<b>Spark killer diode</b>						
Reverse current	$I_S(\text{leak})$				30	$\mu\text{A}$
Forward voltage	$V_{SF}$	$I_{OUT} = 400\text{mA}$			1.7	V





# LB1937T

## Truth Table

Input								Output								Output mode		
IN1	IN2	IN3	IN4	IN5	IN6	IN7	IN8	OUT1	OUT2	OUT3	OUT4	OUT5	OUT6	OUT7	OUT8			
L	L							off	off							(1)		
L	H							L	H							(2)		
H	L							H	L							(3)		
H	H							off	H							(4)		
(*)	(*)							H	off							(4)'		
		L	L					off	off							(5)		
		L	H					L	H							(6)		
		H	L					H	L							(7)		
		H	H					off	H							(8)		
		(*)	(*)					H	off							(8)'		
				L	L					off	off					(11)		
				L	H					L	H					(12)		
				H	L					H	L					(13)		
				H	H					off	H					(14)		
				(*)	(*)					H	off					(14)'		
				L	L											(15)		
				L	H											L	H	(16)
				H	L											H	L	(17)
				H	H											off	H	(18)
				(*)	(*)											H	off	(18)'

L : low, H : high

\*: The output logic mode when IN1/IN2 = H/H is determined by the immediately preceding IN1/IN2 mode.

The post-switching output modes will be as follows.

When switching from (2): (4)

When switching from (3): (4)'

When switching from (1): Undefined (Either (4) or (4)')

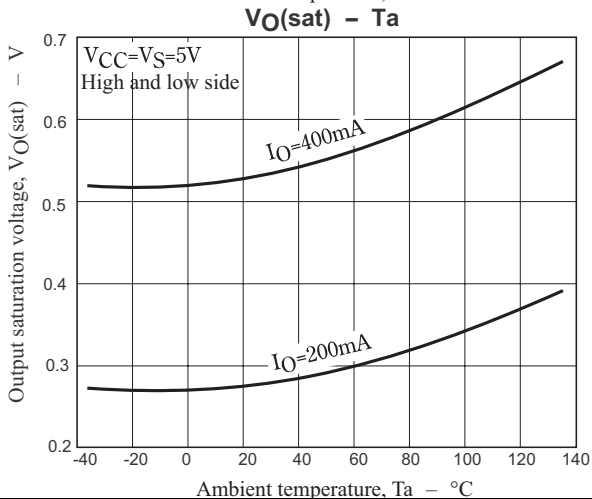
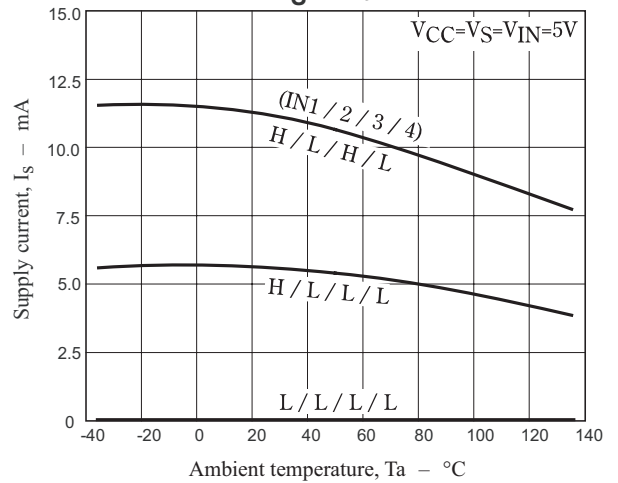
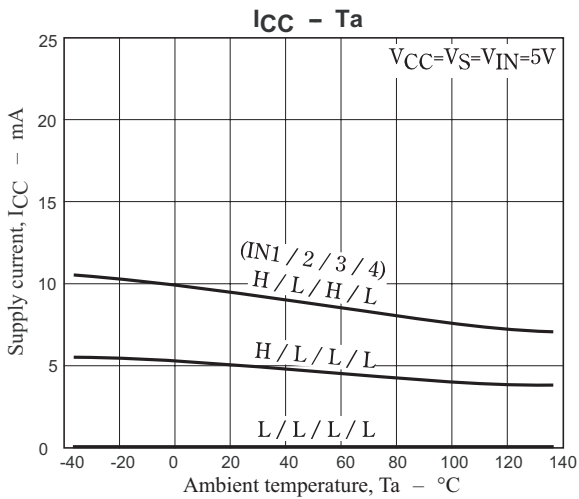
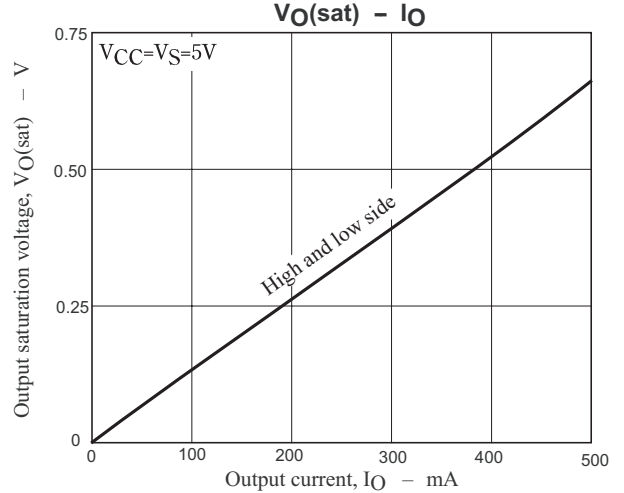
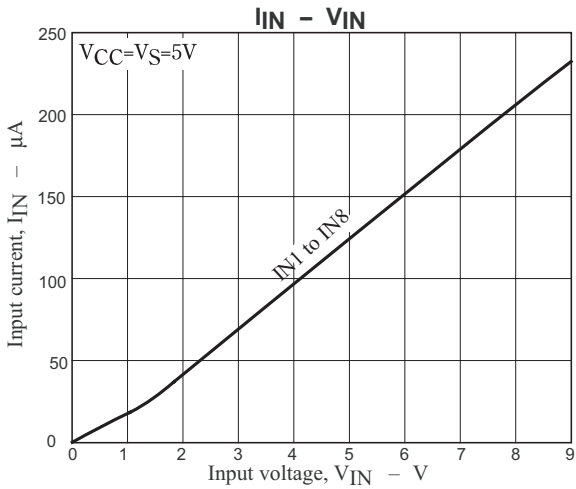
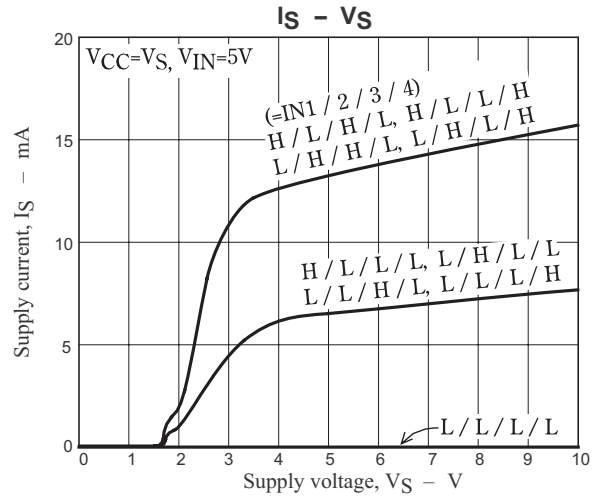
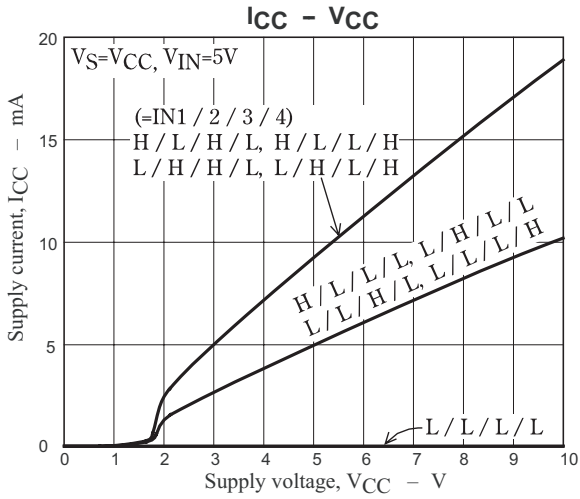
The modes when IN3/IN4 = H/H operate similarly as described below.

When switching from (6): (8)

When switching from (7): (8)'

When switching from (5): Undefined (Either (8) or (8)')

# LB1937T



ON Semiconductor and the ON logo are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.