



# SANYO Semiconductors DATA SHEET

## LB1935T LB1935CL

Monolithic Digital IC  
Stepping Motor Driver IC

### Overview

LB1935T/LB1935CL is IC with forward/reverse motor drive 2-channel in which low saturation voltage and low voltage operation possible. Its small sized package is optimal for 2 phase excitation drive of 2 phase bipolar stepping motors for various portable devices such as digital still cameras.

### Features

- Low saturation voltage,  $V_{O(sat)} = 0.3V$  typ at  $I_O = 150mA$
- Built-in shoot-through current protection circuit
- No standby current consumption (or zero)
- Built-in thermal shutdown circuit
- MSOP10 small-sized package (3.0mm×4.9mm×1.1mm typ) [LB1935T]
- ECSP2828-10 ultraminiature leadless package (2.8mm×2.8mm×0.8mm typ) [LB1935CL]

### Absolute Maximum Ratings at $T_a = 25^\circ C$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum Power Source Voltage	$V_{CC}$ max		-0.3 to +8.0	V
Applied Output Voltage	$V_{OUT}$ max	OUT1, OUT2, OUT3, OUT4 pin	$V_{CC}+VSF$	V
Applied Input Voltage	$V_{IN}$ max	ENA, IN1, IN2 pin	-0.3 to +8.0	V
GND Pin Outflow Current	I GND	Per channel	400	mA
Allowable Power Consumption	$P_d$ max	With substrate* [LB1935T]	400	mW
	$P_d$ max	With substrate* [LB1935CL]	450	
Operating Temperature	$T_{opr}$		-20 to +75	$^\circ C$
Storage Temperature	$T_{stg}$		-40 to +150	$^\circ C$

\* Specified substrate : 20.0mm×10.0mm×0.8mm paper phenol

### Allowable Operating Range at $T_a = 25^\circ C$

Parameter	Symbol	Conditions	Ratings	Unit
Source Voltage	$V_{CC}$		2.2 to 7.5	V
Input High Level Voltage	$V_{IH}$	ENA, IN1, IN2 pin	1.8 to 7.5	V
Input Low Level Voltage	$V_{IL}$	ENA, IN1, IN2 pin	-0.3 to +0.7	V

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# LB1935T, LB1935CL

**Electric Characteristics** at  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 3.3\text{V}$

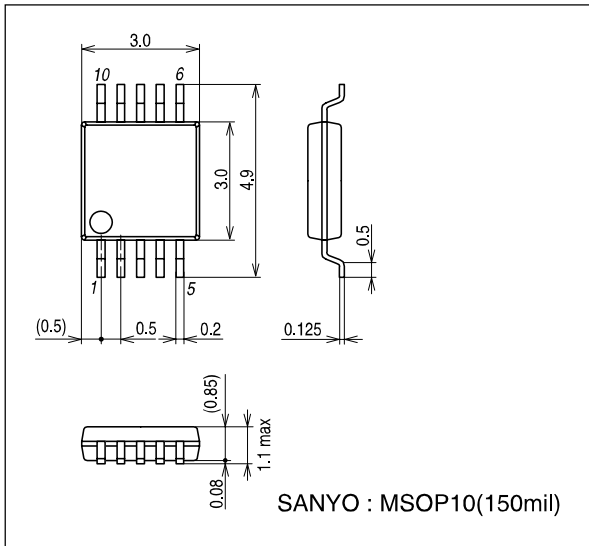
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Power Source Current	$I_{CC0}$	$EN_A = 0\text{V}$ , $V_{IN} = 3\text{V}$ or $0\text{V}$		0.1	1	$\mu\text{A}$
	$I_{CC1}$	$EN_A = 3\text{V}$ , $V_{IN} = 3\text{V}$ or $0\text{V}$		13	19	$\text{mA}$
Output Saturation Voltage	$V_{OUT1}$	$EN_A = 3\text{V}$ , $V_{IN} = 3\text{V}$ or $0\text{V}$ , $I_{OUT} = 100\text{mA}$		0.2	0.3	$\text{V}$
	$V_{OUT2}^*$	$EN_A = 3\text{V}$ , $V_{IN} = 3\text{V}$ or $0\text{V}$ , $I_{OUT} = 200\text{mA}$ [LB1935T only]		0.4	0.6	$\text{V}$
Input Current	$I_{IN}$	$V_{IN} = 3\text{V}$		40	60	$\mu\text{A}$
	$I_{ENA}$	$V_{ENA} = 3\text{V}$		40	60	$\mu\text{A}$
Spark killer diode						
Reverse Current	$I_S(\text{leak})$				1	$\mu\text{A}$
Forward Voltage	$V_{SF}^*$	$I_{OUT} = 200\text{mA}$ [LB1935T only]			1.7	$\text{V}$

Note : \*For LB1935CL, it is a design assured value.

## Package Dimensions

unit : mm

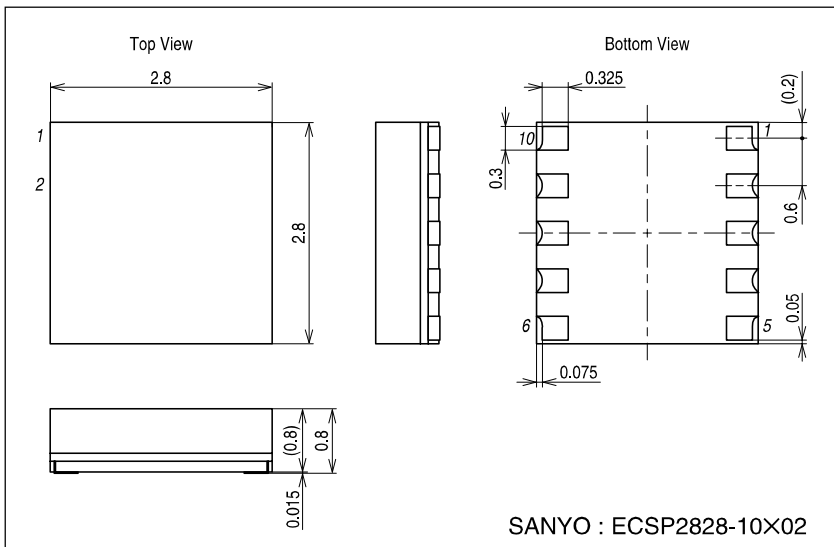
3297 [LB1935T]



## Package Dimensions

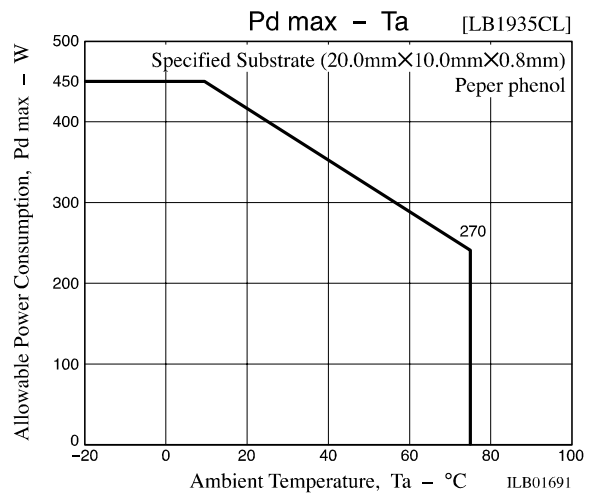
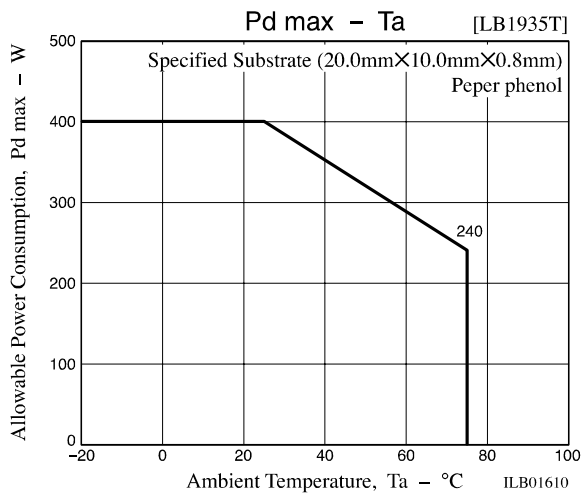
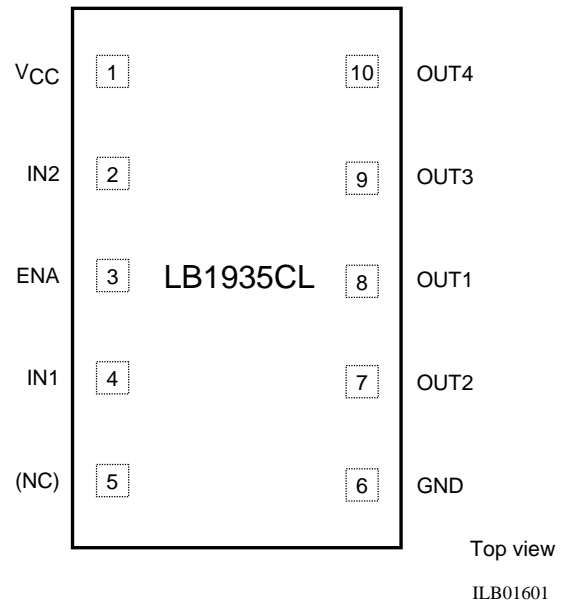
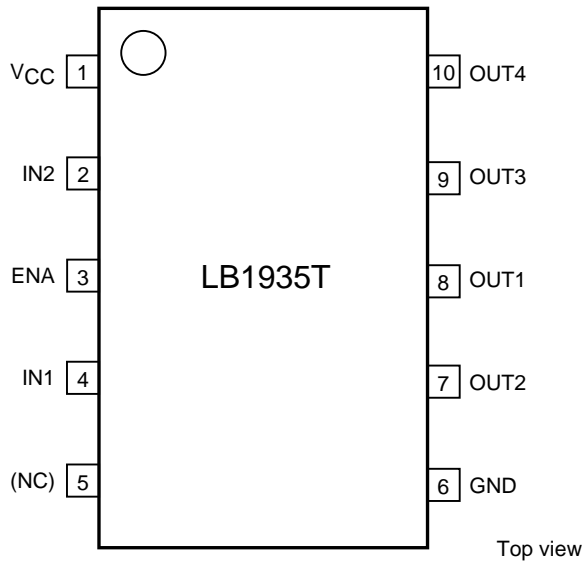
unit : mm

3301 [LB1935CL]



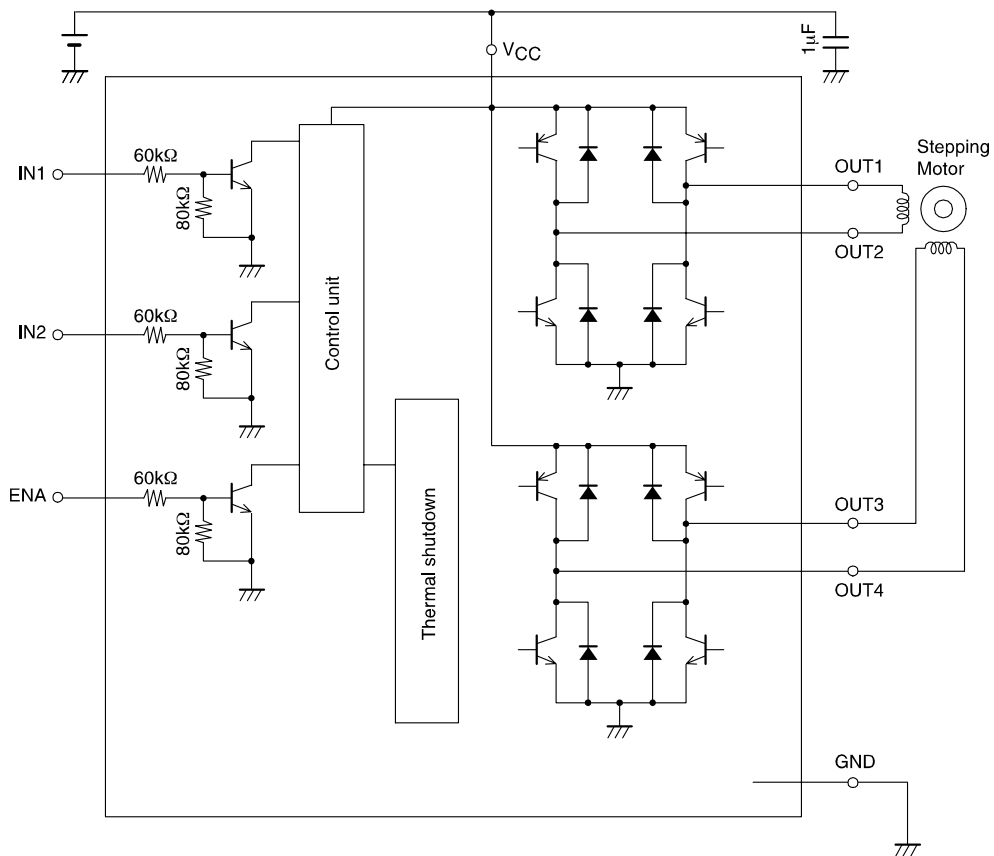
# LB1935T, LB1935CL

## Pin Assignments



# LB1935T, LB1935CL

## Block Diagram



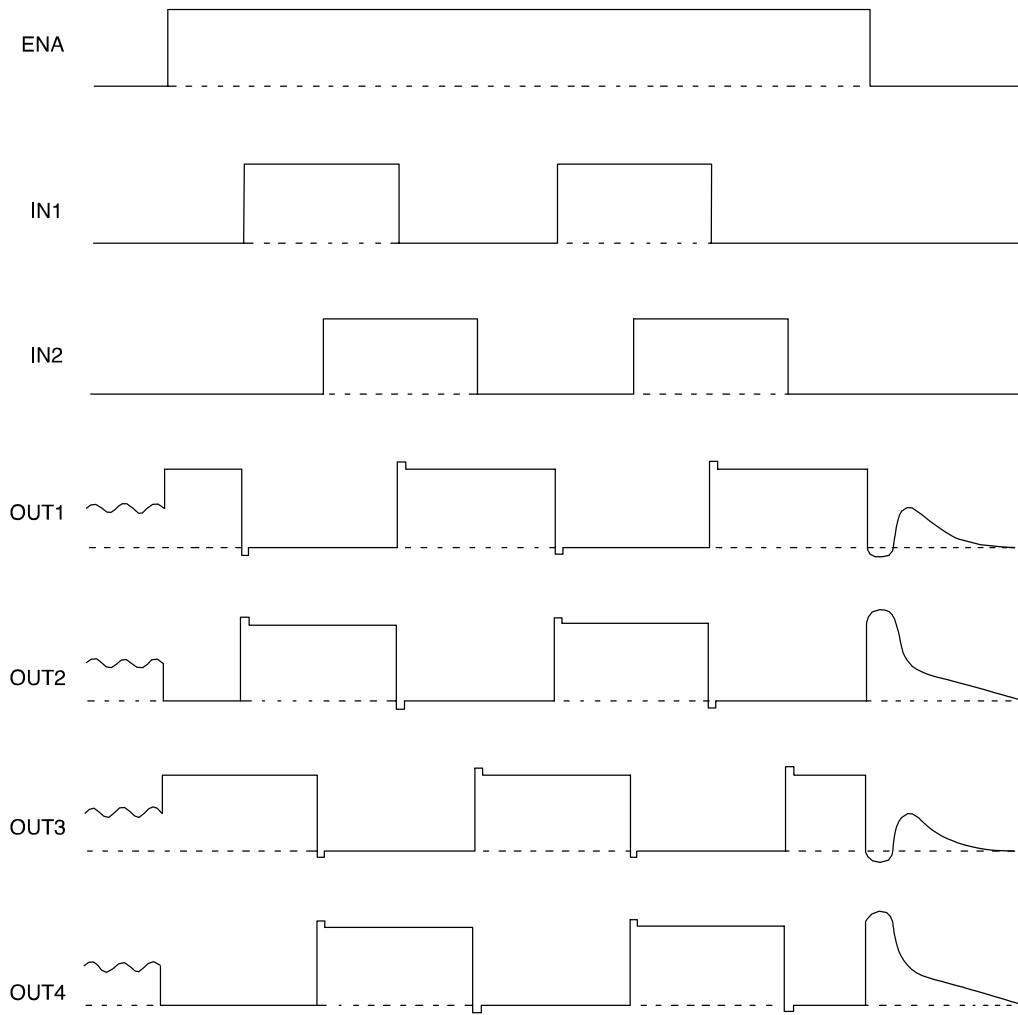
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## Truth Table

Input			Output				Remarks
ENA	IN1	IN2	OUT1	OUT2	OUT3	OUT4	
L	-	-	OFF	OFF	OFF	OFF	Stdby
H	L	L	H	L	H	L	2-phase excitation
	L	H	H	L	L	H	
	H	H	L	H	L	H	
	H	L	L	H	H	L	

**Timing Chart**

Timing chart below shows the 2 phase excitation stepping motor.



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