



SANYO Semiconductors

# DATA SHEET

An ON Semiconductor Company

## LV8416CB — Bi-CMOS LSI For DSC, and Cell Phone Camera Modules H-Bridge × 4-channel Motor Driver

### Overview

The LV8416CB is an H-bridge×4-channel motor driver IC and is able to control 4 modes of forward, reverse, brake and standby.

This IC housed in a wafer level package (WLP) is optimum for use in a stepping motor driving system for DSC or a camera module of cell phones.

### Functions

- Saturation drive H-bridge: 4-channels
- Various protection circuits (thermal protection, low voltage malfunction protection)

### Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Power supply voltage	$V_{CC\ max}$		6.0	V
Output peak current	$I_O\ peak$	Channels 1 to 4, $t \leq 10\text{msec}$ , ON-duty $\leq 20\%$	600	mA
Output continuous current	$I_O\ max$	Channels 1 to 4	400	mA
Allowable power dissipation	$P_d\ max$	Mounted on a circuit board*	1000	mW
Operating temperature	$T_{opr}$		-30 to +85	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$

- Specified circuit board : 60mm × 60mm × 1.7mm, glass epoxy two-layer board.

#### Recommended Operating Conditions at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Power supply voltage range	$V_{CC\ op}$		2.5 to 5.5	V
Logic input voltage range	$V_{IN}$		0 to $V_{CC}+0.3$	V
Input frequency	$f_{IN}$	IN1 to 8	to 100	kHz

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# LV8416CB

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

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Standby mode current drain	Ist	IN1 to IN8 = "L"			1.0	$\mu\text{A}$
$V_{CC}$ current drain	$I_{CC1}$	$V_{CC}=V_{IN1} = 3.3\text{V}$	40	80	160	$\mu\text{A}$
	$I_{CC2}$	$V_{CC}=V_{IN1} = 5.0\text{V}$	50	100	200	$\mu\text{A}$
$V_{CC}$ low-voltage cutoff voltage	$V_{thV_{CC}}$		2.0	2.25	2.5	V
Low-voltage hysteresis voltage	$V_{thHIS}$		100	150	200	mV
Thermal shutdown temperature	TSD	Design guarantee value *	160	180	200	$^\circ\text{C}$
Thermal hysteresis width	$\Delta\text{TSD}$	Design guarantee value *	10	30	50	$^\circ\text{C}$
<b>Input pin</b>						
Logic pin input current	IinL	$V_{IN} = 0\text{V}$ , IN1 to IN8			1.0	$\mu\text{A}$
	IinH	$V_{IN} = 3.3\text{V}$ , IN1 to IN8	8.3	16.5	33	$\mu\text{A}$
Logic input high-level voltage	Vinh	IN1 to IN8	$0.5 \times V_{CC}$			V
Logic input low-level voltage	Vinl	IN1 to IN8	$0.2 \times V_{CC}$			V
Input circuit current consumption	$I_{CCin}$	$V_{IN} = 3.3\text{V}$ , power hit of IN1 to IN8 *1	30	80	250	$\mu\text{A}$
<b>Motor driver</b>						
Output on-resistance	RonU	$I_O = 100\text{mA}$ , upper ON resistance		0.5	0.75	$\Omega$
	RonD	$I_O = 100\text{mA}$ , lower ON resistance		0.3	0.55	$\Omega$
Output leakage current	$I_{Oleak}$				1.0	$\mu\text{A}$
Diode forward voltage	VD	$I_D = -100\text{mA}$	0.4	0.75	1.2	V
Turn-on time	Ton	Time of Input 50% $\rightarrow$ Output 50% *2		0.10	0.50	$\mu\text{sec}$
Turn-off time	Toff	Time of Input 50% $\rightarrow$ Output 50%		0.15	0.55	$\mu\text{sec}$
At the rise time	Tr	Time of Output 10% $\rightarrow$ 90%		0.05	0.20	$\mu\text{sec}$
Standing fall time	Tf	Time of Output 90% $\rightarrow$ 10%		0.05	0.20	$\mu\text{sec}$

\*1: The input circuit current consumption in CMOS circuit composition of the input steps is generated though it is unquestionable for IC operation when impressing it to  $V_{IN}$  voltage that is lower than the  $V_{CC}$  voltage.

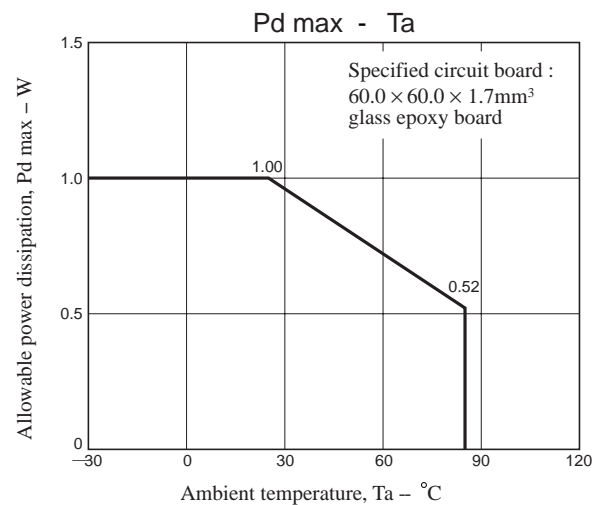
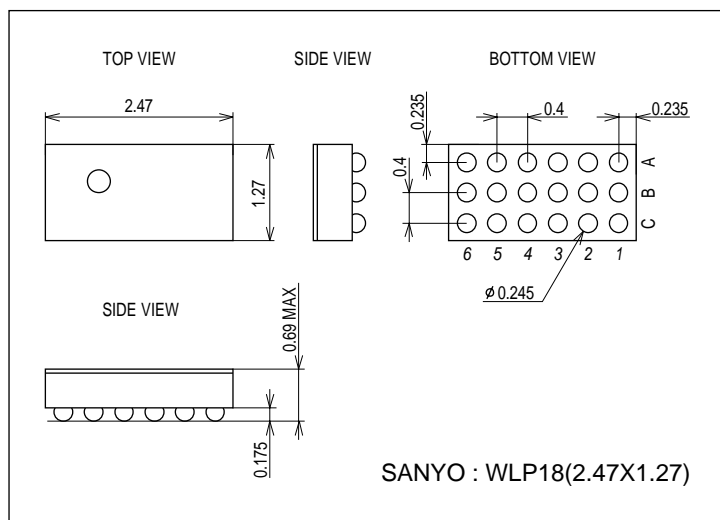
\*2: Time from change edge to change edge ( $0.5 \times V_{CC}$ ) of control input at output level.

It doesn't have an enable pin, and as for this IC, either in the input pin begins and the internal logic begins operation of "High". Therefore, the turn-on time becomes about three microseconds only at the initial motion work of the input terminal "High".

## Package Dimensions

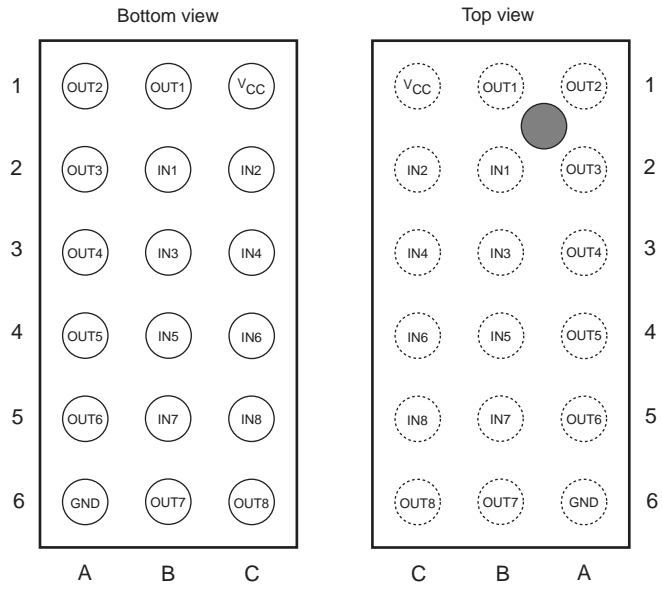
unit : mm (typ)

3401

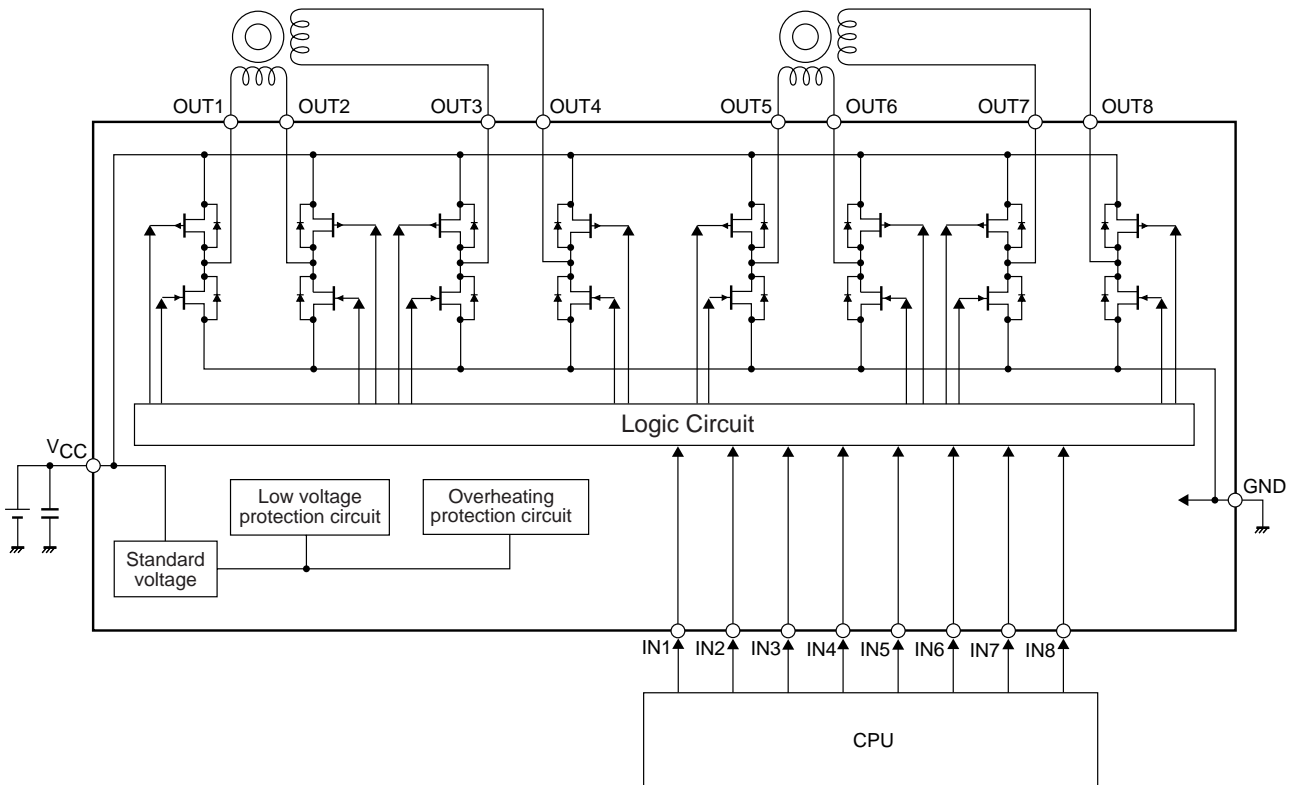


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## Pin Assignment



## Block Diagram



# LV8416CB

## Pin Functions

Pin No.	Pin name	Pin Function	Equivalent Circuit
B2 C2 B3 C3 B4 C4 B5 C5	IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8	Control signal input pin Control signal input pin Control signal input pin Control signal input pin Control signal input pin Control signal input pin Control signal input pin Control signal input pin	
B1 A1 A2 A3 A4 A5 B6 C6	OUT1 OUT2 OUT3 OUT4 OUT5 OUT6 OUT7 OUT8	Motor driver output pin Motor driver output pin Motor driver output pin Motor driver output pin Motor driver output pin Motor driver output pin Motor driver output pin Motor driver output pin	
C1	V <sub>CC</sub>	Logic system power supply connection pin	
A6	GND	Signal ground	

### Logic input specifications

- Common channels 1 to 4

ch1 : IN1 to IN2, OUT1 to OUT2

ch2 : IN3 to IN4, OUT3 to OUT4

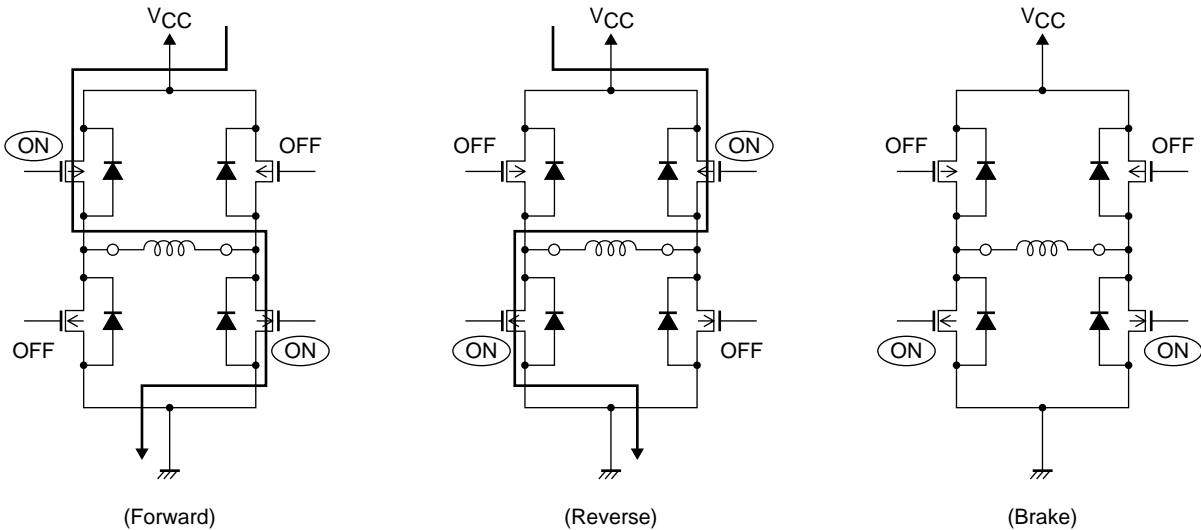
ch3 : IN5 to IN6, OUT5 to OUT6

ch4 : IN7 to IN8, OUT7 to OUT8

Input		Output		Operation mode
IN1	IN2	OUT1	OUT2	
L	L	OFF	OFF	Standby
H	L	H	L	CW (forward)
L	H	L	H	CCW (reverse)
H	H	L	L	Brake

## LV8416CB

### • Output stage transistor function



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