LV8417CS

Bi-CMOS IC
Forward/Reverse Motor Driver

ON Semiconductor®

http://onsemi.com

Overview

The LV8417CS is a 1-channel H bridge motor driver IC. The package size is extremely small with wafer level package (WLP). Moreover, the on-resistance is low (upper and lower total 0.27Ω typ.).
The application voltage range is wide (2.0V to 10.5V).
The H bridge of this IC is P-N composition and thereby reduces the external parts without need of charge pump.
Therefore, LV8417CS realizes reduction of mounting area which enables lower cost and smaller application size.

Functions

- H-bridge 1-channel forward/reverse motor driver
- BiCDMOS process
- Output ON resistance (Upper and lower total 0.27Ω; Ts=25°C, I_O=1.0A)
- IO max=1.0A (t≤100ms 2.0A, t≤10ms 3.8A)
- Built-in low voltage reset and thermal shutdown circuit

Specifications

Maximum Ratings at Ta = 25°C, SGND = PGND = 0V

Parameter	Symbol	Conditions	Ratings	Unit
Power supply voltage (for load)	V_M max		-0.5 to 12.6	V
Power supply voltage (for control)	V_{CC} max		-0.5 to 6.0	V
Output current	I_O max		1.0	A
Output peak current	I_O peak1	t ≤ 100ms	2.0	A
	I_O peak2	t ≤ 10ms	3.8	A
Input voltage	V_{IN} max		-0.5 to V_{CC}+0.5	V
Allowable power dissipation	Pd max	Mounted on a specified board *	850	mW
Operating temperature	Topr		-20 to +85	°C
Storage temperature	Tstg		-55 to +150	°C

* Specified board : 57mm × 57mm × 1.6mm, glass epoxy both side board.

Caution 1) Absolute maximum ratings represent the value which cannot be exceeded for any length of time.

Caution 2) Even when the device is used within the range of absolute maximum ratings, as a result of continuous usage under high temperature, high current, high voltage, or drastic temperature change, the reliability of the IC may be degraded. Please contact us for the further details.

LV8417CS

Allowable Operating Conditions at Ta = 25°C, SGND = PGND = 0V

Parameter	Symbol	Conditions	Ratings	Unit
Power supply voltage (V_M pin)	V_M		2.0 to 10.5	V
Power supply voltage (V_{CC} pin)	V_{CC}		2.7 to 5.5	V
Input signal voltage	V_{IN}		0 to V_{CC}	V
Input signal frequency	f max	Duty = 50%	200	kHz

Electrical Characteristics Ta = 25°C, V_{CC} = 3.0V, V_M = 6.0V, SGND = PGND = 0V

Parameter		Symbol	Conditions	Remarks	Ratings			Unit
					min	typ	max	
Standby load current drain		IMO	ENA = 0V	1			1.0	μA
Operating load current drain		IM1	ENA = 3.0V, No load	3		80	120	μA
Standby control current drain		ICO	ENA = IN1 = IN2 = 0V	2			1.0	μA
Operating current consumption 1		IC1	ENA = 3.0V, No load	3		0.5	0.8	mA
High-level input voltage		V_{IH}	$2.7 \leq V_{CC} \leq 5.5V$		$0.6 \times V_{CC}$		V_{CC}	V
Low-level input voltage		V_{IL}	$2.7 \leq V_{CC} \leq 5.5V$		0		$0.2 \times V_{CC}$	V
High-level input current (ENA,IN1, IN2)		$I_{IH}1$	V_{IN} = 3V			20	30	μA
Low-level input current (ENA,IN1, IN2)		$I_{IL}1$	V_{IN} = 0V		-1.0			μA
Pull-down resistance value		R_{DN}	ENA, IN1, IN2	4	100	200	400	kΩ
Output ON resistance		R_{ON}	Sum of top and bottom sides ON resistance.	5		0.27	0.4	Ω
Low-voltage detection operating voltage		VCS1	V_{CC} pin voltage	6	2.1	2.3	2.5	V
Low-voltage detection release voltage		VCS2	V_{CC} pin voltage	6	2.3	2.5	2.7	V
Thermal shutdown temperature		Tth	Design guarantee *	7	150	180	210	°C
Output block	Turn-on time	TPLH	No load	8		0.10	0.15	μs
	Output response time H	TIOH	No load, Design guarantee *	9		0.23	0.35	μs
	Turn-off time	TPHL	No load	8		0.10	0.15	μs
	Output response time L	TIOL	No load, Design guarantee *	9		0.25	0.38	μs

Remarks
1. Current consumption when output at the VM pin is off.
2. Current consumption at the V_{CC} pin when in all function stop.
3. Current consumption at the V_{CC} pin when ENA=3V(IC starting time).
4. ENA, IN1 and IN2 pin have an internal pull-down resistor.
5. The saturation voltage of the bottom above an OUT pin is added, and the value broken by the current value is shown.
6. All output transistors are turned off if a low-voltage is detected for V_{CC}.
7. All output transistors are turned off if the thermal protection circuit is activated. They are turned on again as the temperature goes down.
8. Rising time from 10 to 90% and falling time from 90 to 10% are specified.
9. Time until it changes OUT pin voltage 10% from the time of change of input pin voltage being 50% of V_{CC} is specified.
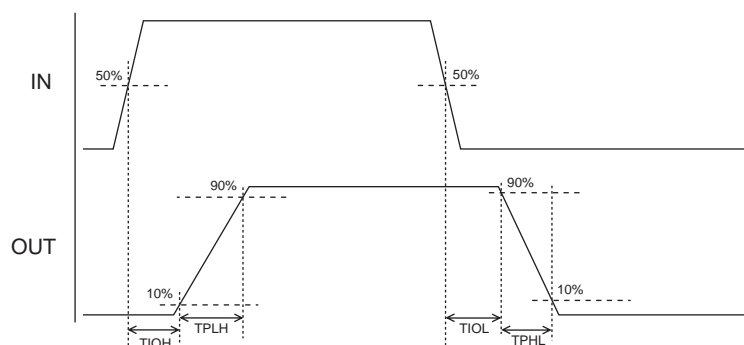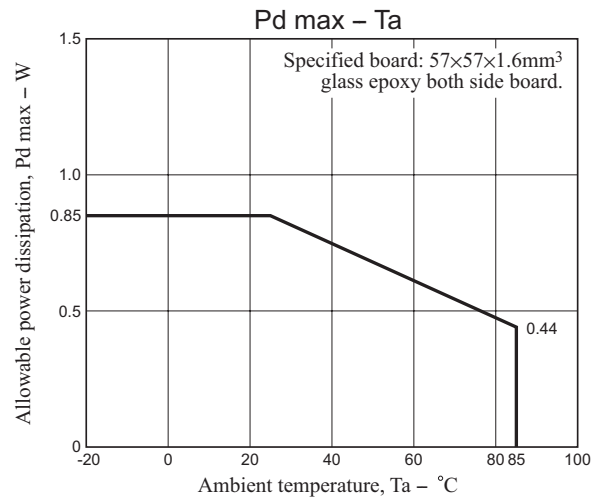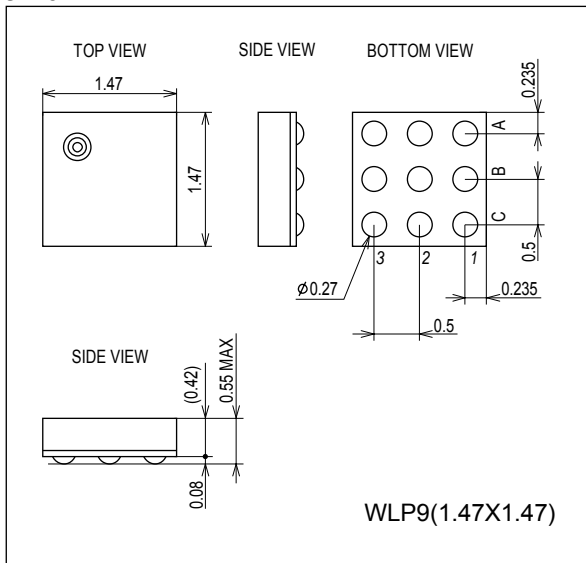
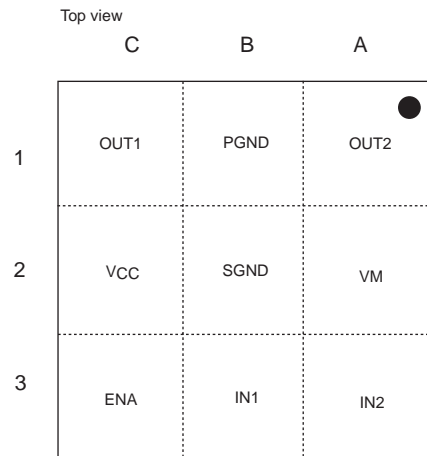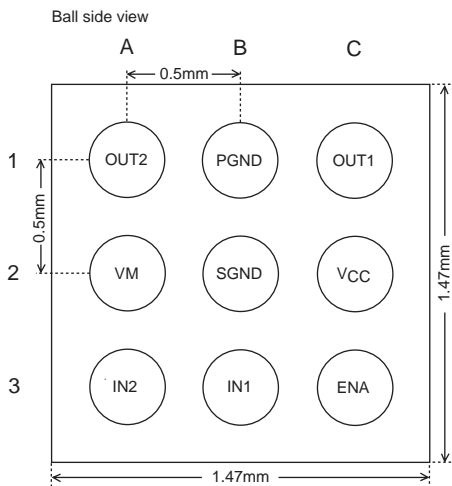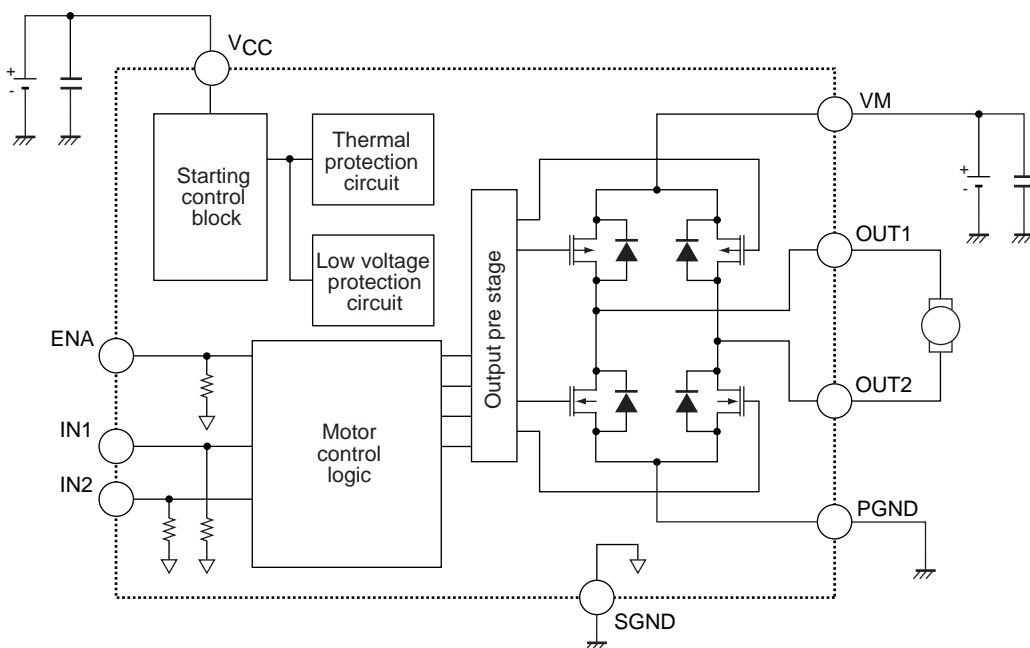# LV8417CS

Package Dimensions

unit : mm (typ)

3418

TOP VIEW
1.47
1.47

SIDE VIEW

BOTTOM VIEW
0.235
A
B
C
0.5
ø0.27
3 2 1
0.235
0.5

SIDE VIEW
(0.42)
0.55 MAX
0.08

WLP9(1.47X1.47)

Pd max – Ta

Specified board: 57×57×1.6mm³ glass epoxy both side board.

0.85

0.44

Allowable power dissipation, Pd max – W

Ambient temperature, Ta – °C

Pin Assignment

Ball side view

	A	B	C
1	OUT2	PGND	OUT1
2	VM	SGND	VCC
3	IN2	IN1	ENA

0.5mm
0.5mm
1.47mm
1.47mm

Top view

	C	B	A
1	OUT1	PGND	OUT2
2	VCC	SGND	VM
3	ENA	IN1	IN2

Block Diagram

VCC

Starting control block

Thermal protection circuit

Low voltage protection circuit

ENA

IN1

IN2

Motor control logic

Output pre stage

VM

OUT1

OUT2

PGND

SGND

Pin Functions

Pin No.	Pin name	Description	Equivalent circuit
C-3	ENA	Logic enable pin	
B-3	IN1	Driver output change pin	
A-3	IN2	Driver output change pin	
C-2	V_CC	Power supply for control	
B-2	SGND	Ground pin for control	
A-2	V_M	Power supply for load	
C-1	OUT1	Driver output pin	
A-1	OUT2	Driver output pin	
B-1	PGND	Ground pin for load	

Truth Table

ENA	IN1	IN2	OUT1	OUT2	Mode
L	-	-	Z	Z	All function stop
H	L	L	Z	Z	Standby
H	H	L	H	L	Forward
H	L	H	L	H	Reverse
H	H	H	L	L	Brake

- : denotes a don't care value. Z : High-impedance

- Current drain is zero in all function stop mode.
- All power transistors turn off and the motor stops driving when the IC is detected in low voltage or thermal protection mode.

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Sample Application Circuit

Motor connect pin
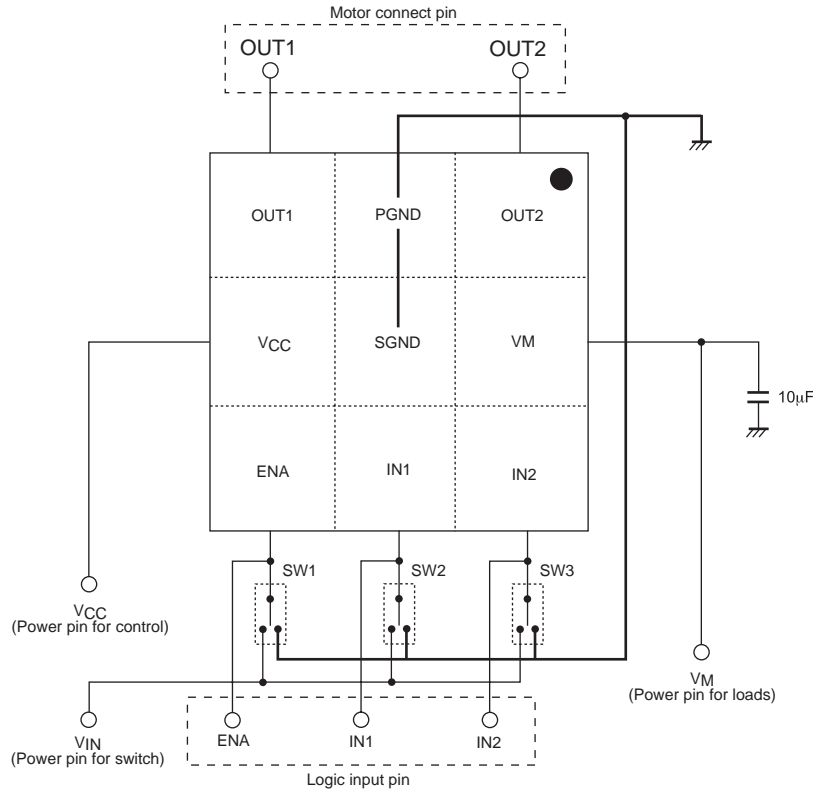
* Connect a kickback absorbing capacitor as close as possible to the IC. Characteristics deterioration of the IC or damage may result if an instantaneous voltage surge exceeding the maximum rated value is applied to the VM line due to coil kickback or other causes.

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