



SANYO Semiconductors

## DATA SHEET

An ON Semiconductor Company

# LV8417CS — Bi-CMOS IC Forward/Reverse Motor Driver

## 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, IO=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 <sub>M</sub> max   |                                | -0.5 to 12.6                 | V    |
| Power supply voltage (for control) | V <sub>CC</sub> max  |                                | -0.5 to 6.0                  | V    |
| Output current                     | I <sub>O</sub> max   |                                | 1.0                          | A    |
| Output peak current                | I <sub>O</sub> peak1 | t ≤ 100ms                      | 2.0                          | A    |
|                                    | I <sub>O</sub> peak2 | t ≤ 10ms                       | 3.8                          | A    |
| Input voltage                      | V <sub>IN</sub> max  |                                | -0.5 to V <sub>CC</sub> +0.5 | V    |
| Allowable power dissipation        | P <sub>d</sub> max   | Mounted on a specified board * | 850                          | mW   |
| Operating temperature              | T <sub>opr</sub>     |                                | -20 to +85                   | °C   |
| Storage temperature                | T <sub>stg</sub>     |                                | -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.

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<http://semicon.sanyo.com/en/network>

# LV8417CS

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

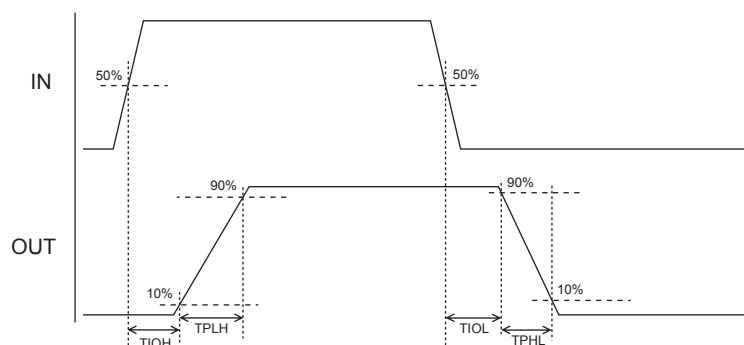
| Parameter                                  | Symbol          | Conditions | Ratings              | Unit |
|--------------------------------------------|-----------------|------------|----------------------|------|
| Power supply voltage (V <sub>M</sub> pin)  | V <sub>M</sub>  |            | 2.0 to 10.5          | V    |
| Power supply voltage (V <sub>CC</sub> pin) | V <sub>CC</sub> |            | 2.7 to 5.5           | V    |
| Input signal voltage                       | V <sub>IN</sub> |            | 0 to V <sub>CC</sub> | V    |
| Input signal frequency                     | f max           | Duty = 50% | 200                  | kHz  |

## Electrical Characteristics Ta = 25°C, V<sub>CC</sub> = 3.0V, V<sub>M</sub> = 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 <sub>IH</sub>  | 2.7 ≤ V <sub>CC</sub> ≤ 5.5V               |         | 0.6×V <sub>CC</sub> |      | V <sub>CC</sub>     | V    |
| Low-level input voltage                    |                        | V <sub>IL</sub>  | 2.7 ≤ V <sub>CC</sub> ≤ 5.5V               |         | 0                   |      | 0.2×V <sub>CC</sub> | V    |
| High-level input current<br>(ENA,IN1, IN2) |                        | I <sub>IH1</sub> | V <sub>IN</sub> = 3V                       |         |                     | 20   | 30                  | μA   |
| Low-level input current<br>(ENA,IN1, IN2)  |                        | I <sub>IL1</sub> | V <sub>IN</sub> = 0V                       |         | -1.0                |      |                     | μA   |
| Pull-down resistance value                 |                        | R <sub>DN</sub>  | ENA, IN1, IN2                              | 4       | 100                 | 200  | 400                 | kΩ   |
| Output ON resistance                       |                        | R <sub>ON</sub>  | Sum of top and bottom sides ON resistance. | 5       |                     | 0.27 | 0.4                 | Ω    |
| Low-voltage detection operating voltage    |                        | VCS1             | V <sub>CC</sub> pin voltage                | 6       | 2.1                 | 2.3  | 2.5                 | V    |
| Low-voltage detection release voltage      |                        | VCS2             | V <sub>CC</sub> pin voltage                | 6       | 2.3                 | 2.5  | 2.7                 | V    |
| Thermal shutdown temperature               |                        | T <sub>th</sub>  | 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

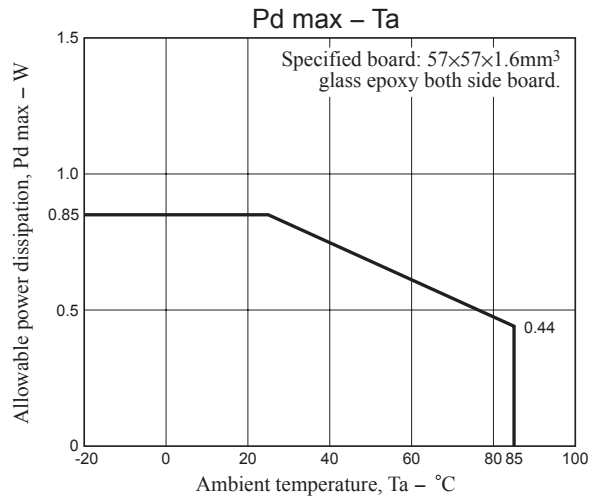
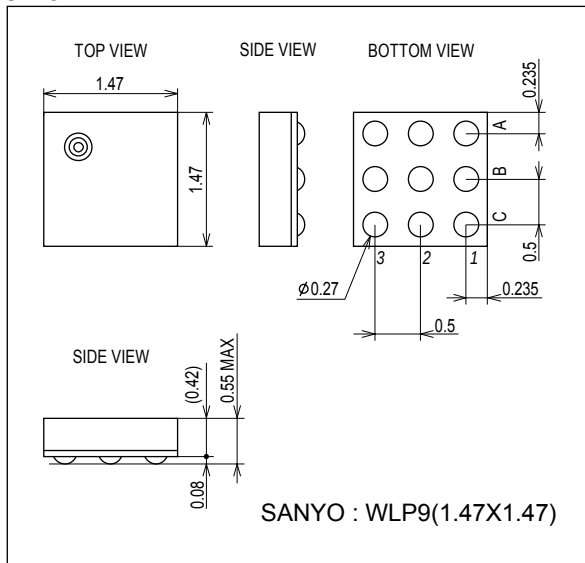
1. Current consumption when output at the V<sub>M</sub> pin is off.
2. Current consumption at the V<sub>CC</sub> pin when in all function stop.
3. Current consumption at the V<sub>CC</sub> pin when ENA=3V(IC starting time).
4. ENA, IN1 and IN2 pin have an internal pull-down resistor.
5. The saturation 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<sub>CC</sub>.
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<sub>CC</sub> is specified.



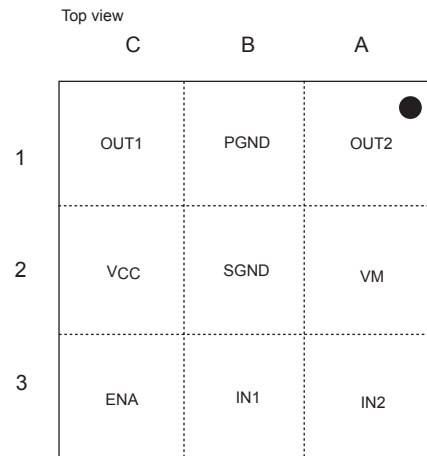
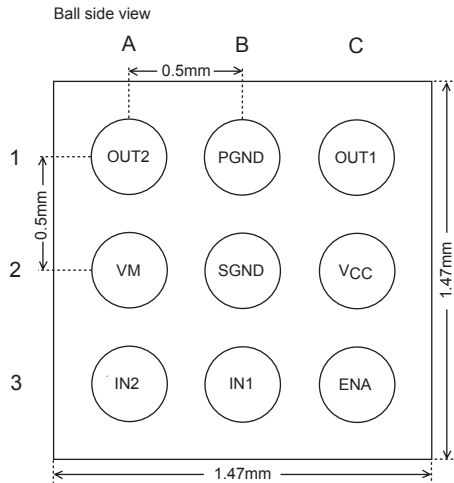
## Package Dimensions

unit : mm (typ)

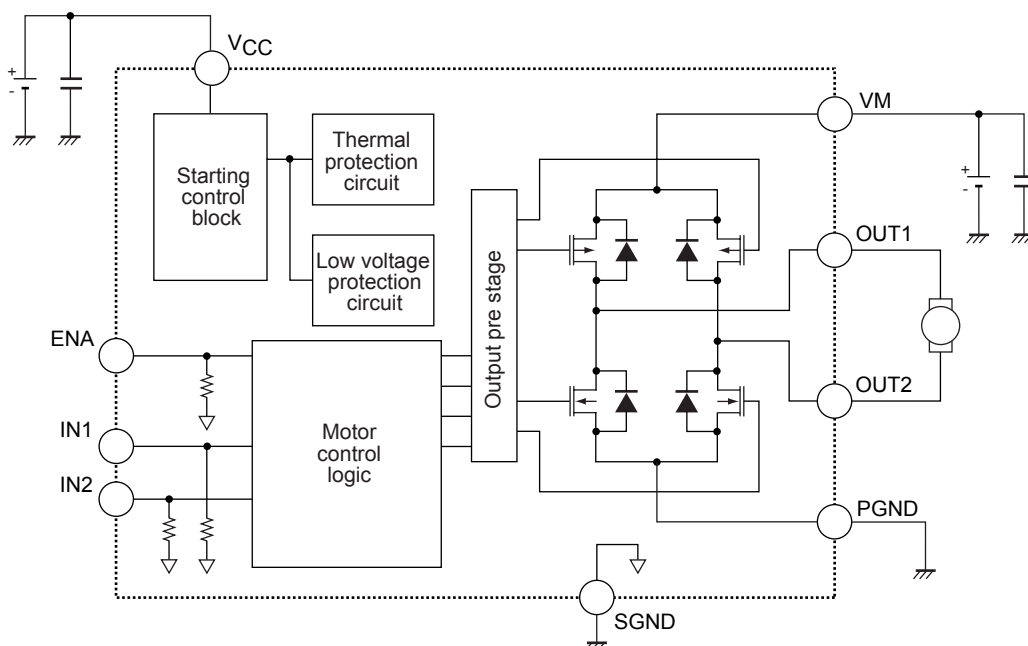
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## Pin Assignment



## Block Diagram



# LV8417CS

## Pin Functions

| Pin No.                         | Pin name                                     | Description                                                                                                                    | Equivalent circuit |
|---------------------------------|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------|
| C-3<br>B-3<br>A-3<br>C-2<br>B-2 | ENA<br>IN1<br>IN2<br>V <sub>CC</sub><br>SGND | Logic enable pin<br>Driver output change pin<br>Driver output change pin<br>Power supply for control<br>Ground pin for control |                    |
| A-2<br>C-1<br>A-1<br>B-1        | V <sub>M</sub><br>OUT1<br>OUT2<br>PGND       | Power supply for load<br>Driver output pin<br>Driver output pin<br>Ground pin for load                                         |                    |

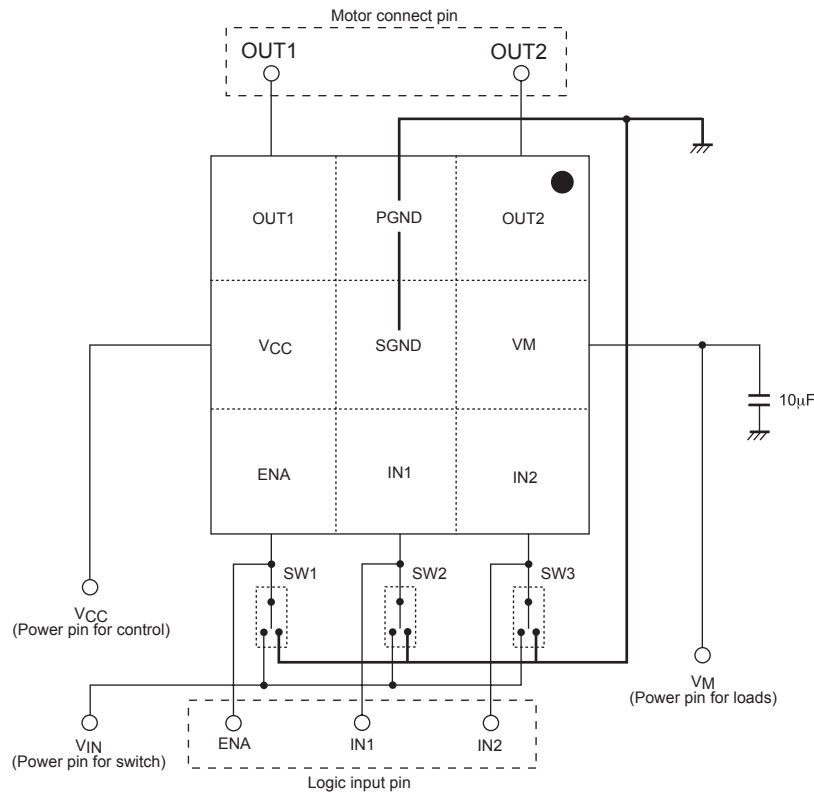
## Truth Table

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

## Sample Application Circuit



\* 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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