



SANYO Semiconductors

## DATA SHEET

# LV5710V

Bi-CMOS LSI  
For camera sensor  
Power supply for charge pump

## Overview

The LV5710V is power supply for charge pump for camera sensor.

## Functions

- Regulating the 5V input by boosting it three-fold with the charge pump to the specified voltage.
- Output voltage variable with external resistor.
- Soft start function incorporated, which reduces the rush current at start of charge pump.
- Timer-latch type short-circuit protective function incorporated.

## Specifications

### Absolute Maximum Ratings at Ta = 25°C

| Parameter                   | Symbol              | Conditions                 | Ratings     | Unit |
|-----------------------------|---------------------|----------------------------|-------------|------|
| Maximum supply voltage      | V <sub>DD</sub> max |                            | 6.0         | V    |
| Allowable power dissipation | Pd max              | with specified substrate * | 0.55        | W    |
| Operating temperature       | Topr                |                            | -20 to +80  | °C   |
| Storage temperature         | Tstg                |                            | -40 to +125 | °C   |

\* : Specified substrate : 114.3mm×76.1mm×1.6mm, glass epoxy board

### Allowable Operating Ratings at Ta = 25°C

| Parameter         | Symbol           | Conditions | Ratings |     |                 | Unit |
|-------------------|------------------|------------|---------|-----|-----------------|------|
|                   |                  |            | min     | typ | max             |      |
| Supply voltage    | V <sub>DD</sub>  |            | 4.5     |     | 5.5             | V    |
| Input "H" voltage | V <sub>INH</sub> | EN pin     | 1.5     |     | V <sub>DD</sub> | V    |
| Input "L" voltage | V <sub>INL</sub> | EN pin     | -0.1    |     | 0.4             | V    |

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**SANYO Semiconductor Co., Ltd.**

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# LV5710V

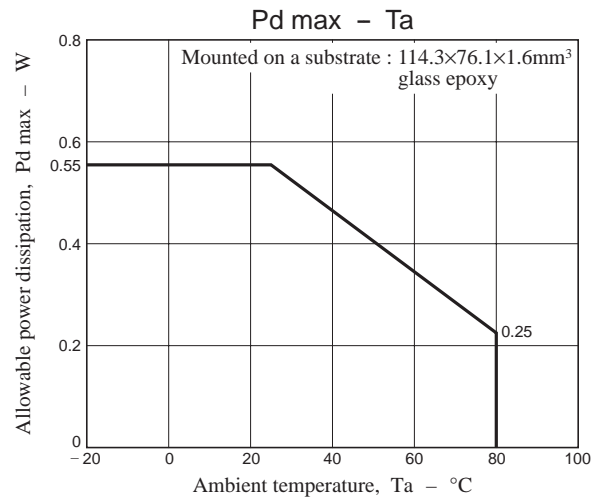
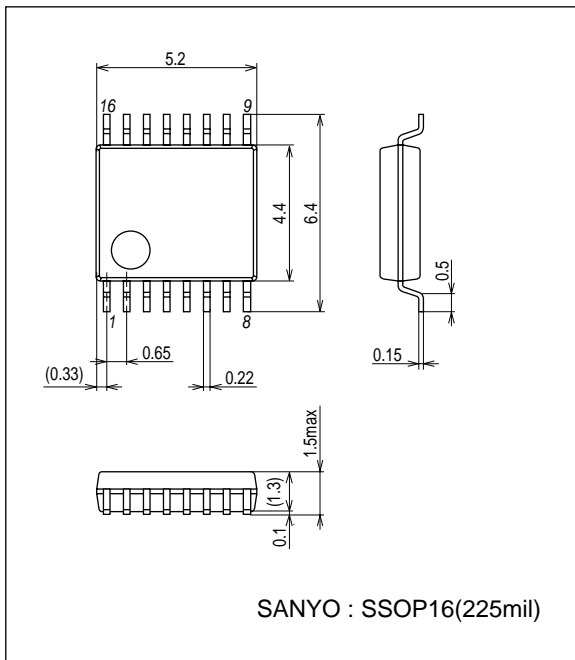
**Electrical Characteristics** at  $T_a = 25^\circ\text{C}$ ,  $V_{DD} = 5\text{V}$ ,  $I_{OUT} = 30\text{mA}$ ,  $S0 = L$ ,  $S1 = L$ , Unless otherwise specified

| Parameter                        | Symbol            | Conditions   | Ratings |       |       | Unit          |
|----------------------------------|-------------------|--|---------|-------|-------|---------------|
|                                  |                   |  | min     | typ   | max   |               |
| Circuit current drain            | $I_{DD1}$         | EN = L   |         |       | 1     | $\mu\text{A}$ |
|                                  | $I_{DD2}$         | EN = H No load   |         | 12    | 18    | mA            |
| Output load current              | $I_O \text{ ave}$ | At $V_{OUT} = 12\text{V}$ setting  |         |       | 30    | mA            |
| Reference voltage                | $V_{REF}$         | $V_{DD} = 4.5 \text{ to } 5.5\text{V}$   | 1.285   | 1.305 | 1.325 | V             |
|                                  |                   | $T_a = -20^\circ\text{C} \text{ to } +80^\circ\text{C}$ , Design value                                       | 1.279   |       | 1.331 | V             |
| Output voltage at OFF            | $V_{OFF}$         | After capacitive discharge   | -50     | 0     | 50    | mV            |
| Protective circuit masking time  | $T_{mask}$        | Masking time from detection of short-circuit to IC OFF   |         | 18    | 33    | ms            |
| Short-circuit protective current | $I_{lim}$         |  | 35      | 50    | 65    | mA            |
| Short-circuit protective voltage | $V_{lim}$         |  | 82.5    | 87.5  | 92.5  | %             |
| SS end time                      | $T_{SSEND}$       | Time from EN = H to regulator SS OFF<br>$T_a = -20^\circ\text{C} \text{ to } +80^\circ\text{C}$ Design value |         |       | 10    | ms            |
| RO load regulation               | $\Delta RO$       | Load $1\text{mA} \rightarrow 30\text{mA}$  |         | 30    | 40    | mV            |
| Input pin current                | $I_{in}$          | Pins EN  | 30      | 40    | 50    | $\mu\text{A}$ |
|                                  |                   | S0 and S1 pins   |         |       | 1     | $\mu\text{A}$ |
| Power efficiency                 | $P_{eff}$         | CP+regulator   |         | 70    |       | %             |
| Rush current                     | $I_{rush}$        | No load  |         |       | 300   | mA            |
| Oscillation frequency            | $f_{clk}$         |  | 1.4     | 1.8   | 2.3   | MHz           |

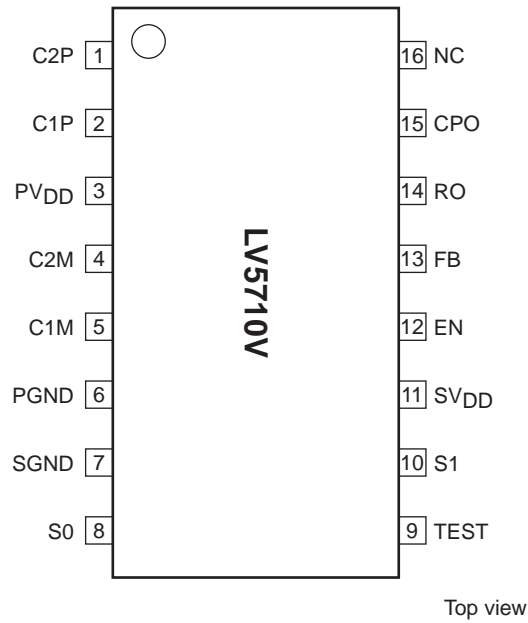
## Package Dimensions

unit : mm (typ)

3178B



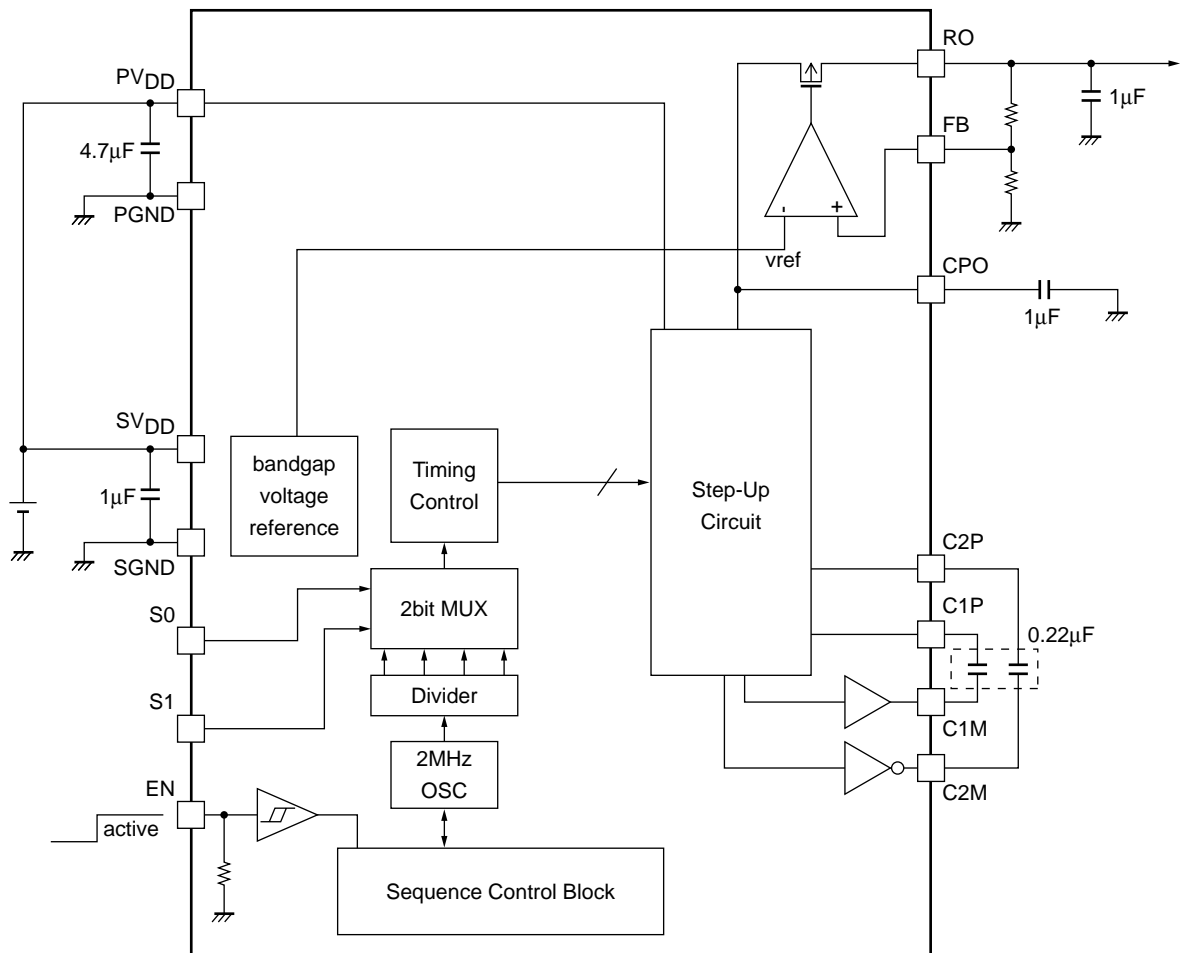
## Pin Assignment



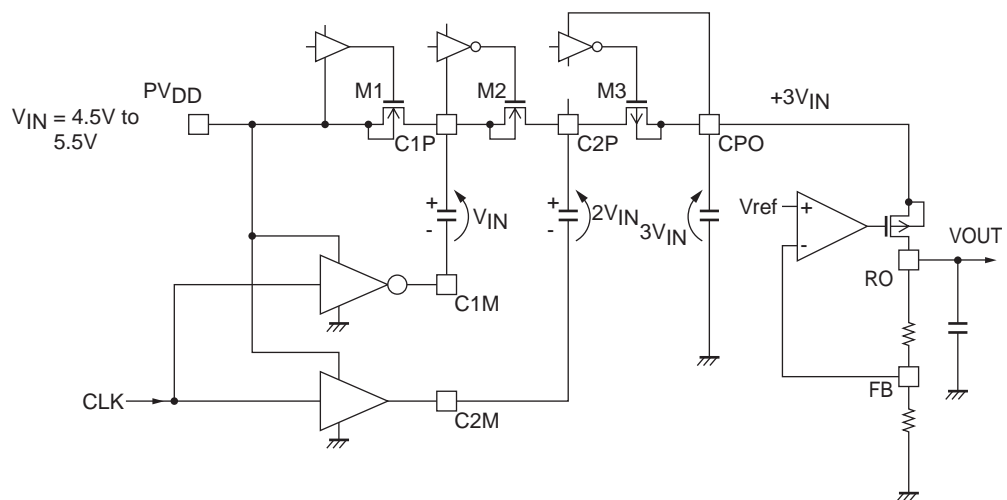
## Pin Function

| Pin No. | Name             | Function  |
|---------|------------------|---|
| 1       | C2P              | Boost capacitor connection pin (charge transfer side) |
| 2       | C1P              | Boost capacitor connection pin (charge transfer side) |
| 3       | PV <sub>DD</sub> | Power system V <sub>DD</sub> pin                      |
| 4       | C2M              | Boost capacitor connection pin (driver side)          |
| 5       | C1M              | Boost capacitor connection pin (driver side)          |
| 6       | PGND             | Power GND pin for the charge pump                     |
| 7       | SGND             | Small signal system GND pin                           |
| 8       | S0               | Charge pump frequency changeover pin                  |
| 9       | TEST             | Test pin (open or short-circuited to GND)             |
| 10      | S1               | Charge pump frequency changeover pin                  |
| 11      | SV <sub>DD</sub> | Small signal system V <sub>DD</sub> pin               |
| 12      | EN               | System enable pin (Hi active)                         |
| 13      | FB               | Regulator FB pin                                      |
| 14      | RO               | Regulator output pin                                  |
| 15      | CPO              | Boost voltage output (3V <sub>DD</sub> )              |
| 16      | NC               |   |

## Block Diagram



## Equivalent Circuit Diagram

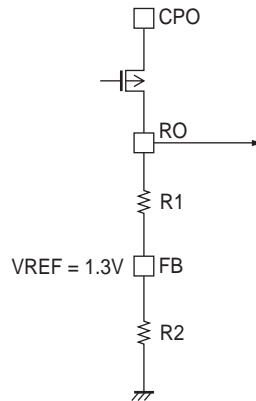


## Output Voltage Setting Method

The output voltage of IC-incorporated LDO can be determined as follows :

$$V_H = \frac{R1+R2}{R2} \times V_{REF}$$

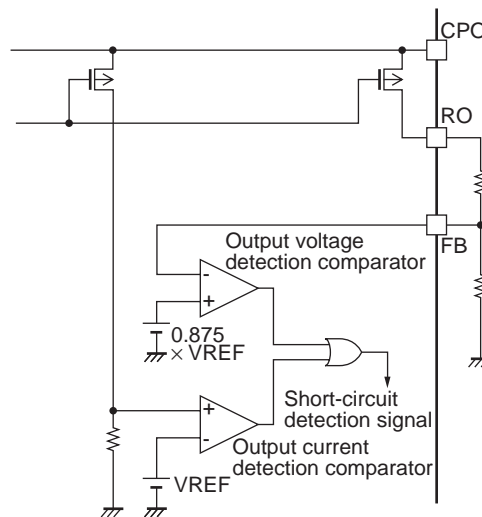
For example, to set the output voltage to 12V, set the resistance Value to  $R1 = 1070k\Omega / R2 = 130k\Omega$ .



## Short-circuit Protective Operation

The RO output pin has the short-circuit protective function.

The over-current detector circuit outputs the detection signal when the output current of 50mA (typ) or more flows or when the output voltage drops below 87.5% (typ). When this detection signal is output continuously for 18ms (typ) or more, IC determines that there is over-current and stops the output. To reset from the stop state, set the EN pin to “L”, then set the EN pin to “H” again.



Equivalent circuit of the over-current detection circuit

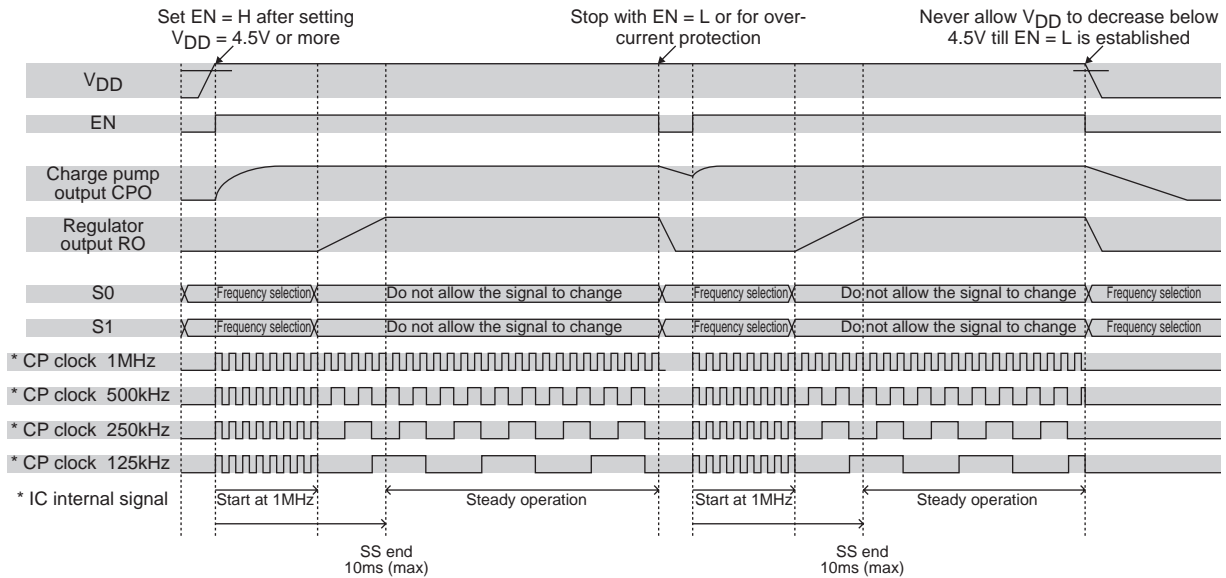
## Selecting the Frequency

According to the logic of S0 and S1, the charge pump operation frequency can be changed.

In the case of light load, the reactive power can be reduced by decreasing the operating frequency.

| S0 | S1 | CP operating frequency |
|----|----|------------------------|
| L  | L  | 1MHz                   |
| H  | L  | 500kHz                 |
| L  | H  | 250kHz                 |
| H  | H  | 125kHz                 |

## Startup sequence



## EN Pin and $V_{DD}$

The sequence operation is made at startup. However, startup is not made when the internal circuit has not been reset. To reset the internal circuit, keep the EN pin to "L" till  $V_{DD}$  becomes 4.5V or more. Note that  $V_{DD}$  and EN pin cannot be short-circuited for this purpose.

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