



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 $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{DD\ max}$		6.0	V
Allowable power dissipation	$P_d\ max$	with specified substrate *	0.55	W
Operating temperature	$T_{opr}$		-20 to +80	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-40 to +125	$^\circ\text{C}$

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

#### Allowable Operating Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Supply voltage	$V_{DD}$		4.5		5.5	V
Input "H" voltage	$V_{INH}$	EN pin	1.5		$V_{DD}$	V
Input "L" voltage	$V_{INL}$	EN pin	-0.1		0.4	V

■ Any and all SANYO Semiconductor products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your SANYO Semiconductor representative nearest you before using any SANYO Semiconductor products described or contained herein in such applications.

■ SANYO Semiconductor assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO Semiconductor products described or contained herein.

**SANYO Semiconductor Co., Ltd.**

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

# LV5710V

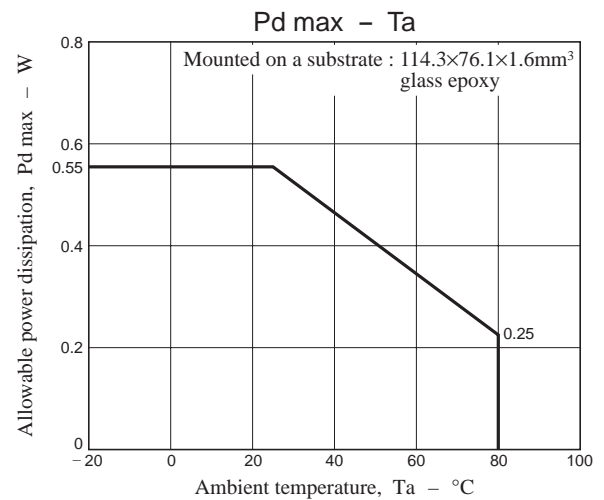
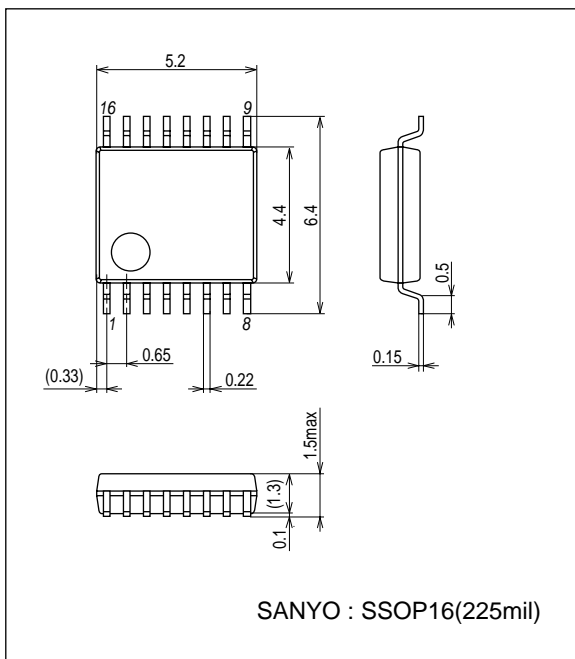
**Electrical Characteristics** at  $T_a = 25^\circ\text{C}$ ,  $V_{DD} = 5\text{V}$ ,  $I_{OUT} = 30\text{mA}$ ,  $S0 = L$ ,  $S1 = L$ , Unless otherwise specified

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

## Package Dimensions

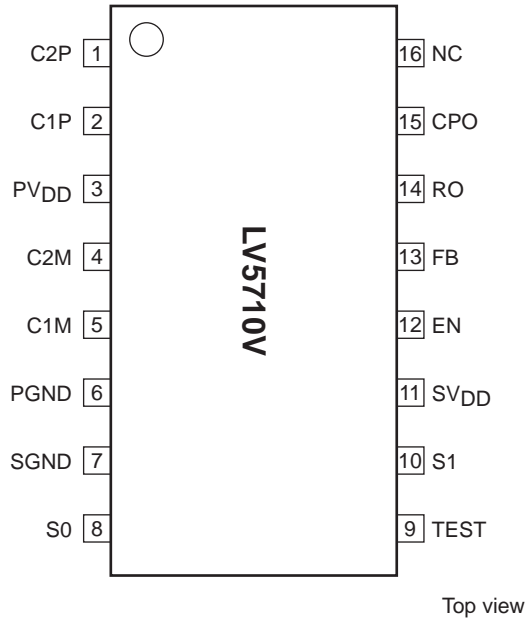
unit : mm (typ)

3178B



# LV5710V

## Pin Assignment

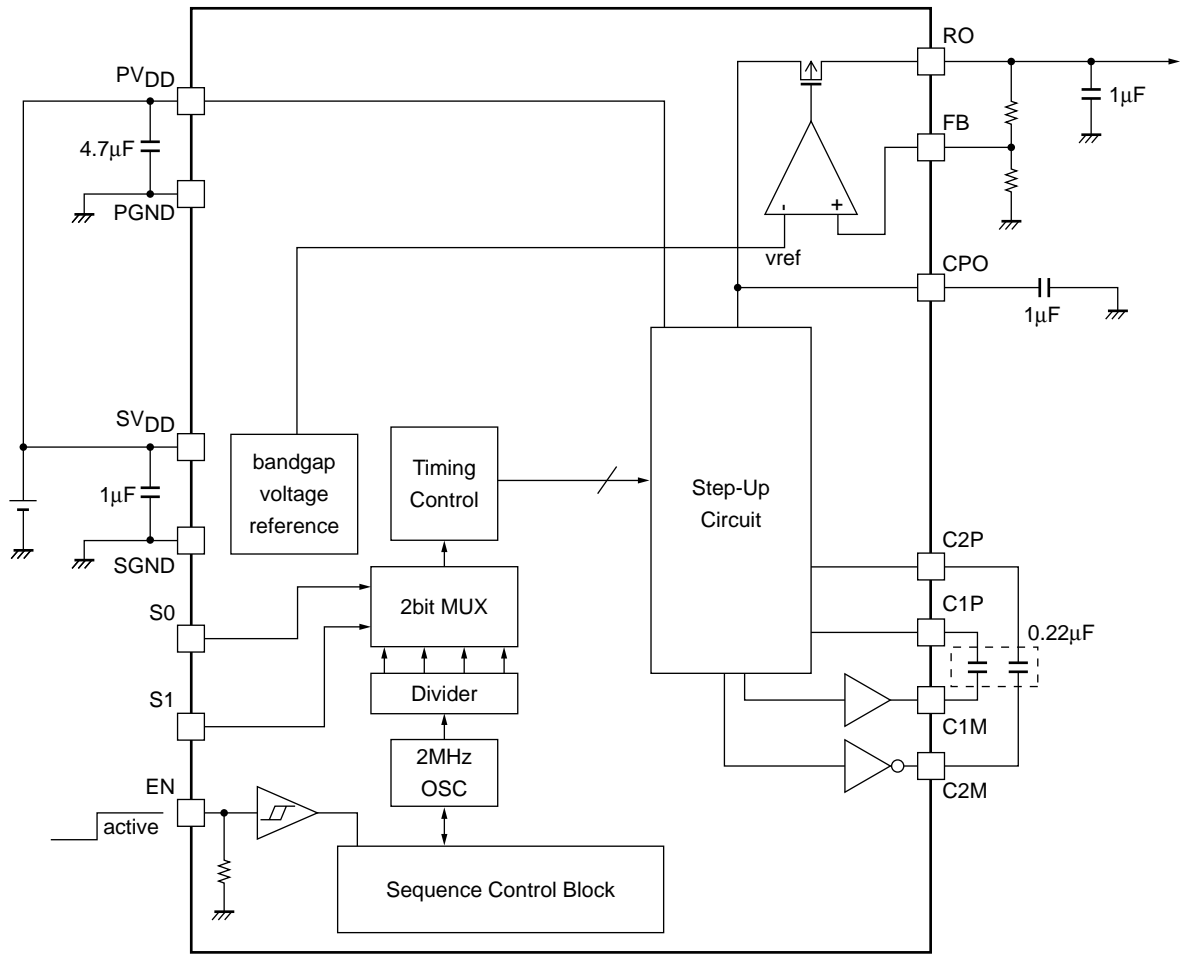


## Pin Function

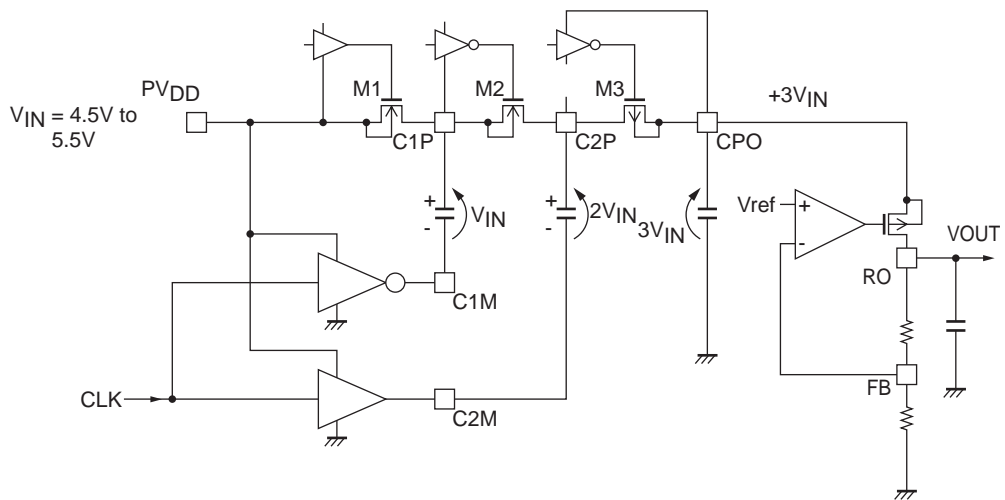
Pin No.	Name	Function
1	C2P	Boost capacitor connection pin (charge transfer side)
2	C1P	Boost capacitor connection pin (charge transfer side)
3	PV <sub>DD</sub>	Power system V <sub>DD</sub> pin
4	C2M	Boost capacitor connection pin (driver side)
5	C1M	Boost capacitor connection pin (driver side)
6	PGND	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	

# LV5710V

## Block Diagram



## Equivalent Circuit Diagram

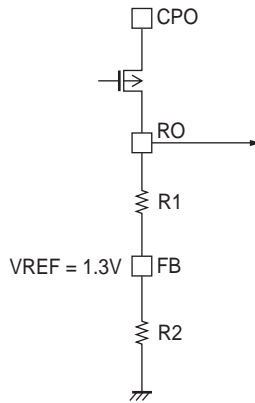


## Output Voltage Setting Method

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

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

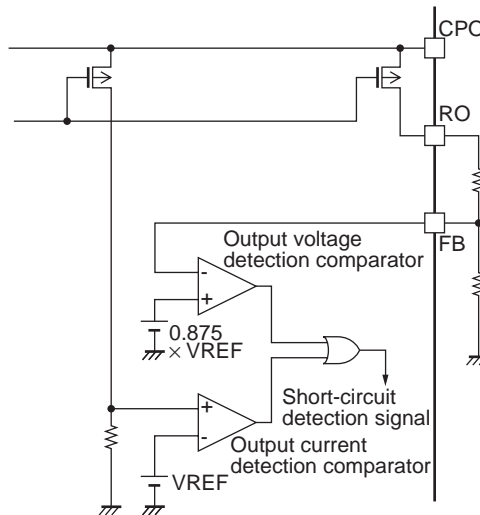
For example, to set the output voltage to 12V, set the resistance Value to  $R1 = 1070k\Omega/R2 = 130k\Omega$ .



## 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

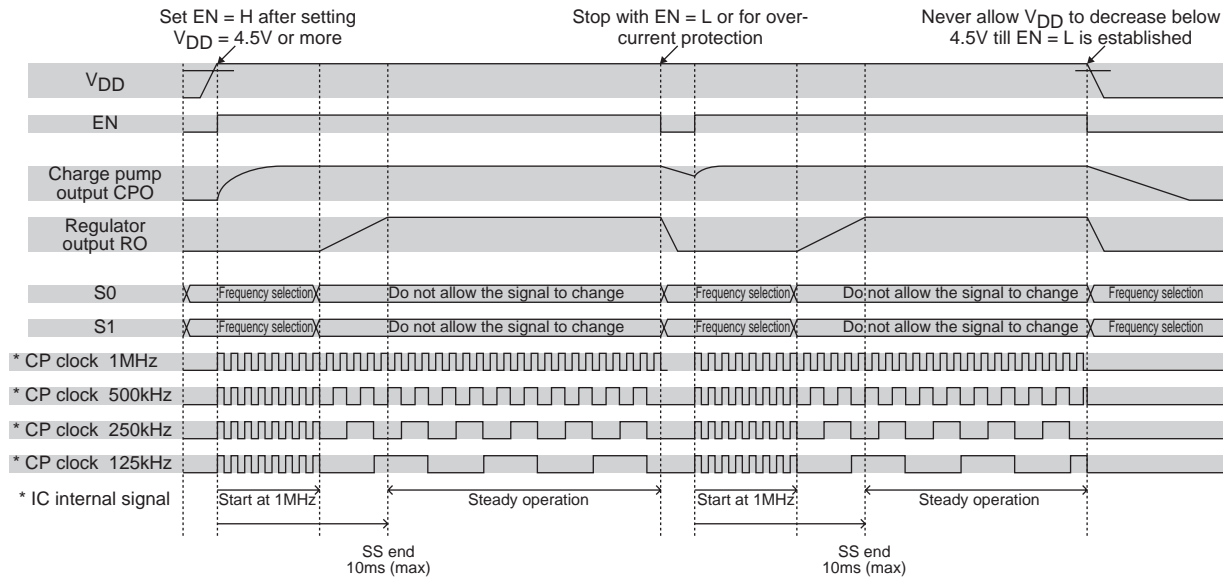
## Selecting the Frequency

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.

- Specifications of any and all SANYO Semiconductor products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- SANYO Semiconductor Co., Ltd. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO Semiconductor products (including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of SANYO Semiconductor Co., Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO Semiconductor product that you intend to use.
- Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production. SANYO Semiconductor believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

This catalog provides information as of March, 2008. Specifications and information herein are subject to change without notice.