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# LV5609LP

Bi-CMOS LSI

## Vertical Clock Driver for CCD

### Overview

The LV5609LP is vertical clock driver for CCD.

### Functions

- Ternary output ×2ch
- Binary output ×2ch
- SHT output ×1ch
- Output ON resistance : 30Ω typ

### Specifications

**Absolute Maximum Ratings** at  $T_a = 25^\circ\text{C}$ ,  $V_{SS} = V_M = 0\text{V}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{DD}$ max		6	V
	VH max		20	V
	VL max		-10	V
	VH-VL max		24	V
Allowable power dissipation	$P_d$ max	with specified substrate *	0.8	W
Operating temperature	$T_{opr}$		-20 to +80	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-40 to +125	$^\circ\text{C}$

\* : Specified substrate : 40×50×0.8mm<sup>3</sup>, glass epoxy four-layer (2S2P) board

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

**Allowable Operating Ratings** at  $T_a = 25^\circ\text{C}$ ,  $V_{SS} = V_M = 0\text{V}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Supply voltage	$V_{DD}$		2.0	3.3	5.5	V
	VH			15	17	V
	VL		-8.5	-7.5	-4	V
	VH-VL				23.5	V
CMOS input High voltage	$V_{INH}$		$0.8V_{DD}$		$V_{DD}$	V
CMOS input Low voltage	$V_{INL}$		-0.1		0.4	V

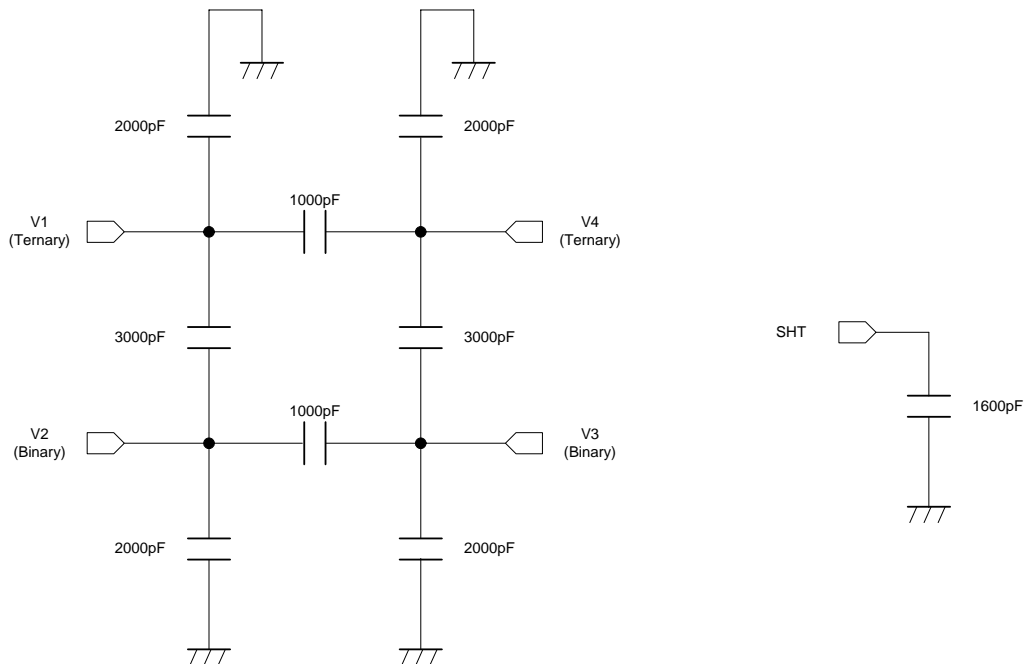
# LV5609LP

**Electrical Characteristics** at  $T_a = 25^\circ\text{C}$ ,  $V_{DD} = 3.3\text{V}$ ,  $V_{SS} = 0\text{V}$ ,  $V_H = 15\text{V}$ ,  $V_L = -7.5\text{V}$ ,  $V_M = 0\text{V}$ ,  
Unless otherwise specified

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Static current drain	$I_{DD}$	$V_{DD}$ pin			1	$\mu\text{A}$
	$I_H$	$V_H$ pin			10	$\mu\text{A}$
	$I_L$	$V_L$ pin			1	$\mu\text{A}$
Dynamic current drain	$I_{DD}$	$V_{DD}$ pin See *1 and *2.			1	$\text{mA}$
	$I_H$	$V_H$ pin See *1 and *2.		2.4	4.5	$\text{mA}$
	$I_L$	$V_L$ pin See *1 and *2.		3	5	$\text{mA}$
Output ON resistance	$R_L$	$I_O = +10\text{mA}$		20	30	$\Omega$
	$R_M$	$I_O = \pm 10\text{mA}$		30	45	$\Omega$
	$R_H$	$I_O = -10\text{mA}$		30	40	$\Omega$
	$R_{SHT}$	$I_O = -10\text{mA}$		30	40	$\Omega$
Propagation delay time	$T_{PLM}$	No load			200	$\text{ns}$
	$T_{PMH}$	No load			200	$\text{ns}$
	$T_{PLH}$	No load			200	$\text{ns}$
	$T_{PML}$	No load			200	$\text{ns}$
	$T_{PHM}$	No load			200	$\text{ns}$
	$T_{PHL}$	No load			200	$\text{ns}$
Rise time	$T_{TLM}$	$V_L \rightarrow V_M$ $V_1, V_3$ See *1.			800	$\text{ns}$
		$V_L \rightarrow V_M$ $V_2, V_4$ See *1.			800	$\text{ns}$
	$T_{TMH}$	$V_M \rightarrow V_L$ $V_1, V_3$ See *1.			800	$\text{ns}$
	$T_{TLH}$	$V_L \rightarrow V_H$ SHT See *1.			200	$\text{ns}$
Fall time	$T_{TML}$	$V_M \rightarrow V_L$ $V_1, V_3$ See *1.			800	$\text{ns}$
		$V_M \rightarrow V_L$ $V_2, V_4$ See *1.			800	$\text{ns}$
	$T_{THM}$	$V_H \rightarrow V_M$ $V_1, V_3$ See *1.			800	$\text{ns}$
	$T_{THL}$	$V_H \rightarrow V_L$ SHT See *1.			200	$\text{ns}$

\*1 : Refer to the CCD equivalent load shown below.

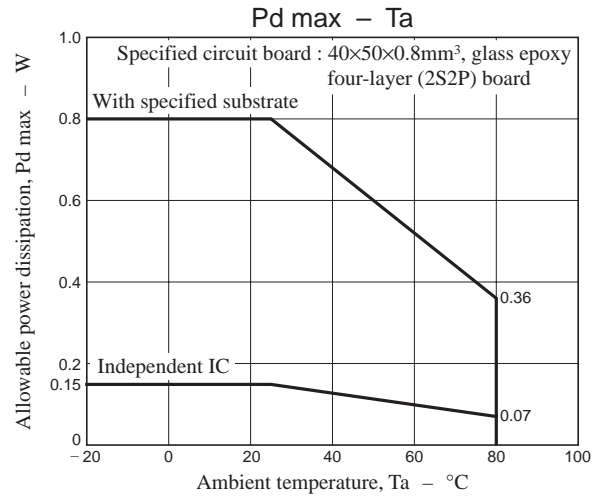
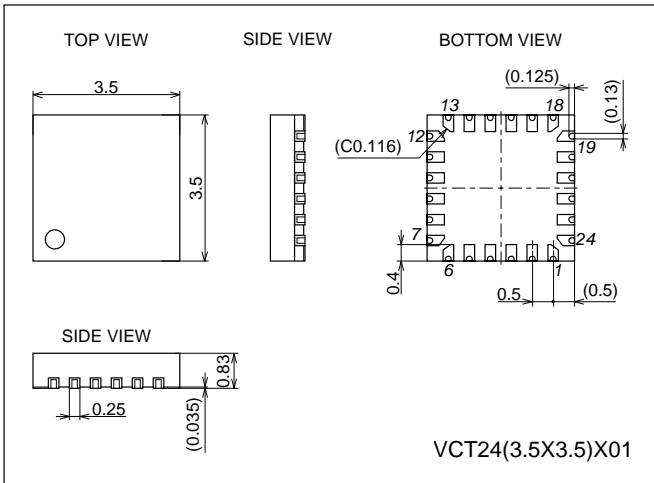
\*2 : Refer to the timing waveform on Page 7.



# LV5609LP

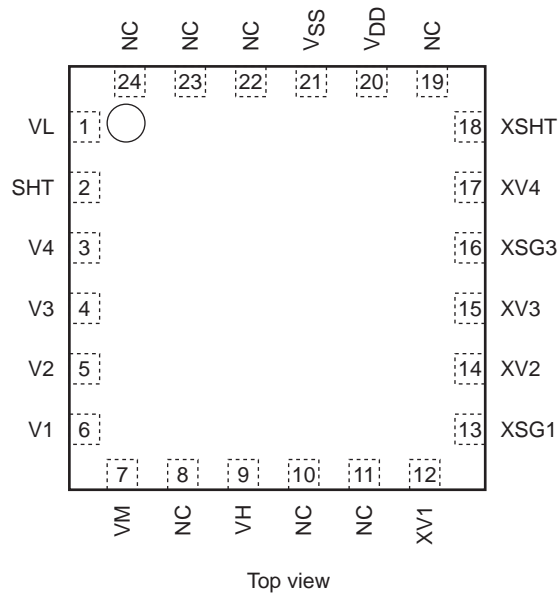
## Package Dimensions

unit : mm (typ)  
3322



# LV5609LP

## Pin Assignment

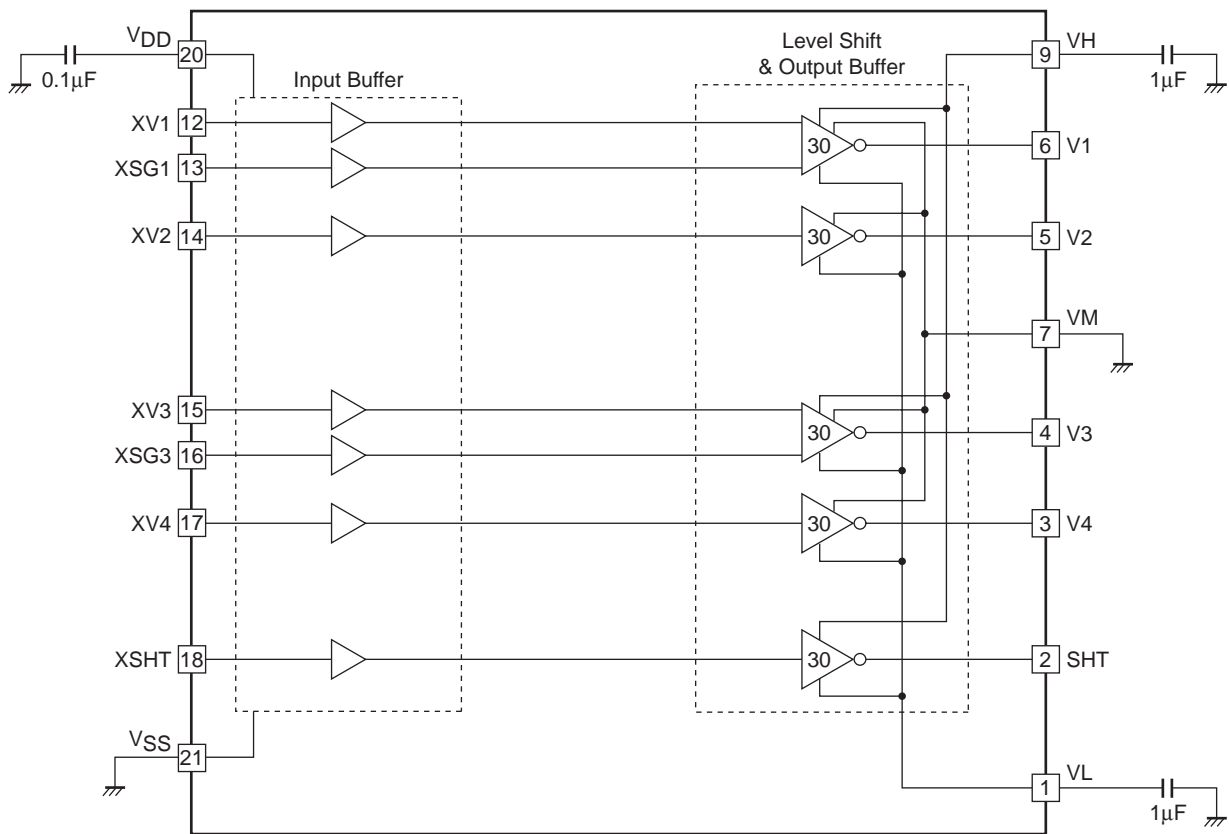


## Pin Function

Pin No.	Name	Mode
1	VL	Lo power for output (-7.5V system)
2	SHT	Level shift output (binary VH, VL)
3	V4	Level shift output (binary VM, VL)
4	V3	Level shift output (ternary VH, VM, VL)
5	V2	Level shift output (binary VM, VL)
6	V1	Level shift output (ternary VH, VM, VL)
7	VM	GND for output
8	NC	
9	VH	Hi power supply for output (15V system)
10	NC	
11	NC	
12	XV1	V1 transfer pulse input
13	XSG1	V1 read pulse input
14	XV2	V2 transfer pulse input
15	XV3	V3 transfer pulse input
16	XSG3	V3 read pulse input
17	XV4	V4 transfer pulse input
18	XSHT	SHT pulse input
19	NC	
20	V <sub>DD</sub>	Power supply for input buffer (3.3V system)
21	V <sub>SS</sub>	GND for input buffer
22	NC	
23	NC	
24	NC	

# LV5609LP

## Block Diagram

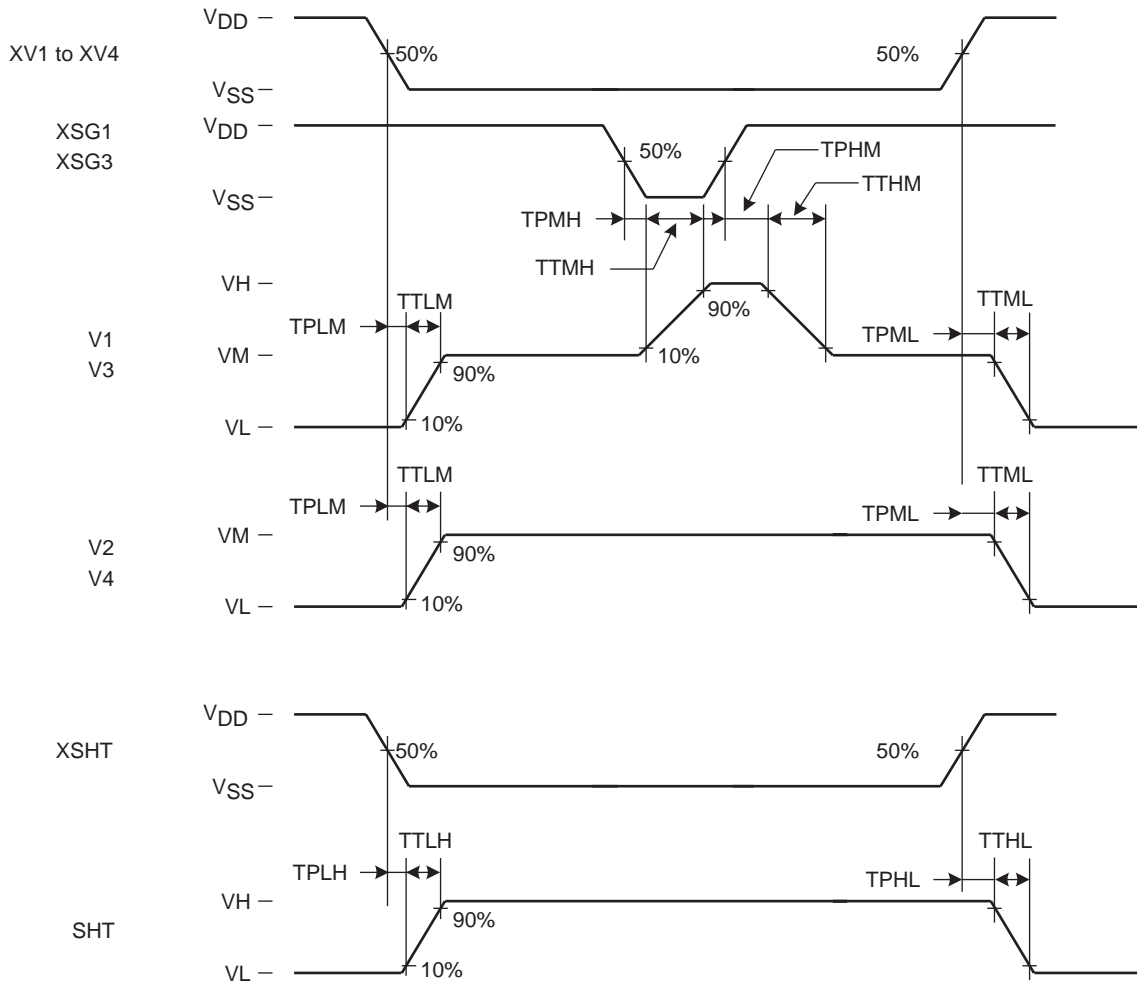


## Logical Function Table

Input				Output		
XV1 XV3	XSG1 XSG3	XV2 XV4	XSHT	V1 V3	V2 V4	SHT
L	L	X	X	VH	X	X
L	H	X	X	VM	X	X
H	L	X	X	VL	X	X
H	H	X	X	VL	X	X
X	X	L	X	X	VM	X
X	X	H	X	X	VL	X
X	X	X	L	X	X	VH
X	X	X	H	X	X	VL

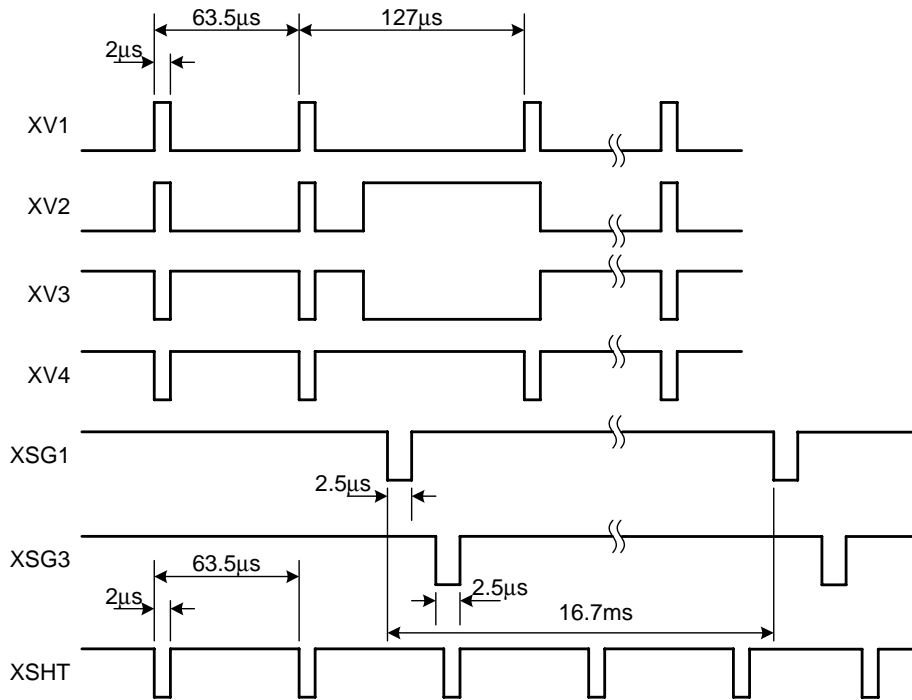
# LV5609LP

## Timing Chart

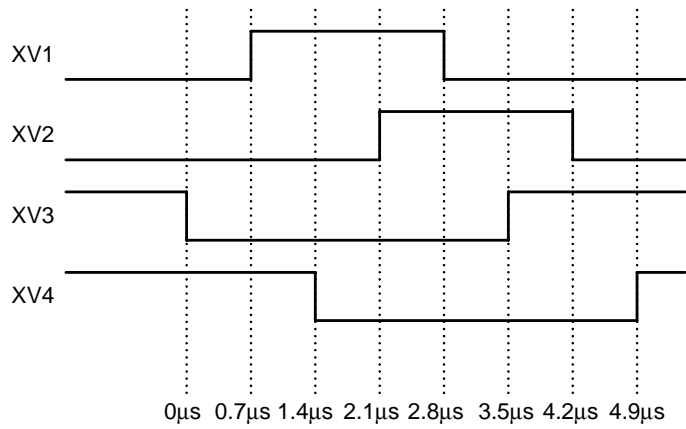


# LV5609LP

## CCD Equivalent Load Measurement Timing Waveform



## Enlarged View of overlapped portion



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