

SANYO**LC89901V****CMOS Driver IC for 1/5 and 1/6 Inch Image Sensors****Overview**

The LC89901V is a high breakdown voltage CMOS vertical driver IC for 1/5 and 1/6 inch image sensors. Provision of a built-in level shifter means that an external clamp circuit is no longer required.

Applications

Surveillance cameras and image input equipment

Functions

CMOS driver IC for 1/5 and 1/6 inch image sensors

Features

- CMOS process fabrication for low power dissipation
- Built-in level shifter circuits to reduce the number of required peripheral circuits.
- Miniature package (SSOP-24)

Structure

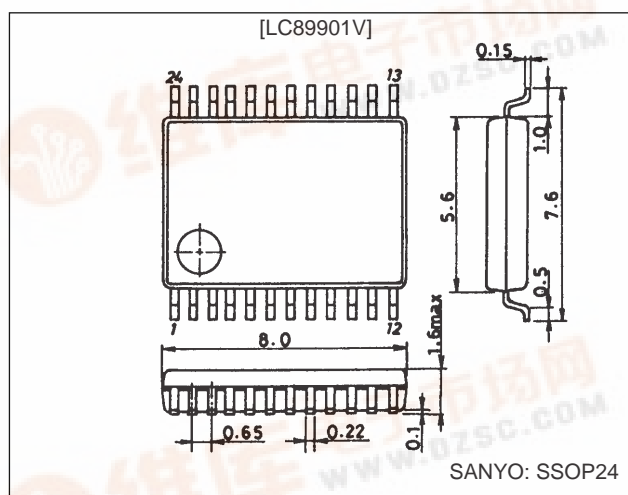
- Inverter type drivers: 8 channels
Input pulses are converted to V_{CC1} , V_{CC2} and V_{EE1} , V_{EE2} levels (inversion).
These are drivers for image sensor imaging and storage sections.

- Inverter type driver: 1 channel
Input pulses are converted to V_{CCN} and V_{EE1} , V_{EE2} levels (inversion).
This circuit is an image sensor NSUB driver.

Package Dimensions

unit: mm

3175A-SSOP24

**Specifications****Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$**

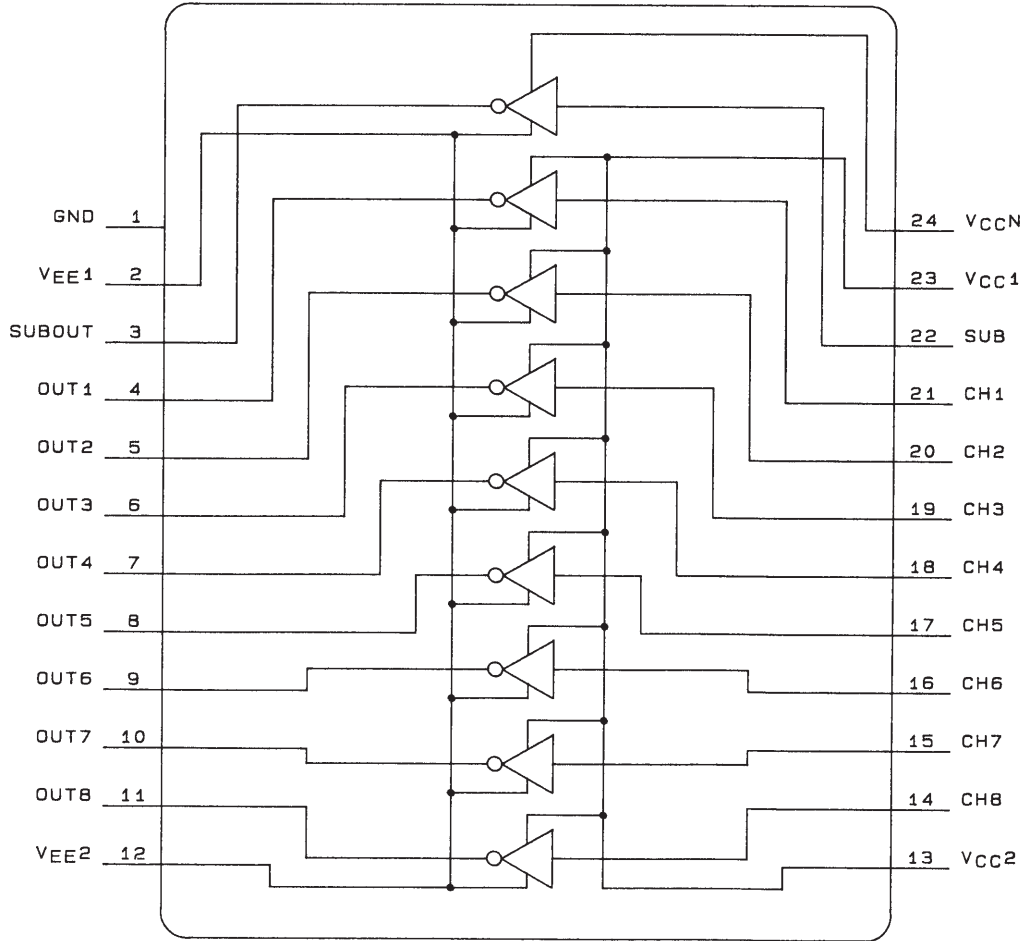
Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC \text{ max}}$	$V_{CC1}, V_{CC2}, V_{CCN}$	-0.3 to +6.0	V
	$V_{EE \text{ max}}$	V_{EE1}, V_{EE2}	+0.3 to -11.0	V
Input voltage	V_{IN}	All input pins	-0.3 to $V_{CC} + 0.3$	V
Allowable power dissipation	$P_d \text{ max}$		350	mW
Operating temperature	T_{opr}		-10 to +70	$^\circ\text{C}$
Storage temperature	T_{stg}		-40 to +125	$^\circ\text{C}$

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

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{CC}	$V_{CC1}, V_{CC2}, V_{CCN} : *V_{CCN} \leq V_{CC1}, V_{CC2}$	4.5 to 5.5	V
	V_{EE}	V_{EE1}, V_{EE2}	0 to -10.5	V
Input voltage range	V_{IN}	All input pins	0 to V_{CC}	V

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Block Diagram



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Electrical Characteristics at $T_a = 25^\circ\text{C}$, V_{CC1} , V_{CC2} , $V_{CCN} = 5.0\text{ V}$, V_{EE1} , $V_{EE2} = -10.0\text{ V}$

Parameter	Symbol	Conditions	min	typ	max	Unit
Input high level current	I_{IH}	All input pins, $V_{IN} = 5.0\text{ V}$		10		μA
Input low level current	I_{IL}	All input pins, $V_{IN} = 0\text{ V}$		5		nA
Current drain	I_{CCH+}	V_{CC1} , V_{CC2} , V_{CCN} , all input pins, $V_{IN} = 5.0\text{ V}$		1		μA
	I_{CCH-}	V_{EE1} , V_{EE2} , all input pins, $V_{IN} = 5.0\text{ V}$		-10		μA
	I_{CCL+}	V_{CC1} , V_{CC2} , V_{CCN} , all input pins, $V_{IN} = 0\text{ V}$		7		μA
	I_{CCH-}	V_{EE1} , V_{EE2} , all input pins, $V_{IN} = 0\text{ V}$		-2		μA
Output voltage	V_{OH}	All inputs, $V_{IN} = 0\text{ V}$		5.0		V
	V_{OL}	All inputs, $V_{IN} = 5.0\text{ V}$		-10.0		V
Operating output voltage*	V_{OH2}	Load = LC9997, input = LC99052		5.0		V
	V_{OL2}	Load = LC9997, input = LC99052		-10.0		V
Operating current drain*	I_{CC2+}	Load = LC9997, input = LC99052		1.62		mA
	I_{CC2-}	Load = LC9997, input = LC99052		1.61		mA

Note: Load conditions
Load circuit

$$R_L = 18\ \Omega, C_L = 780\text{ pF}$$

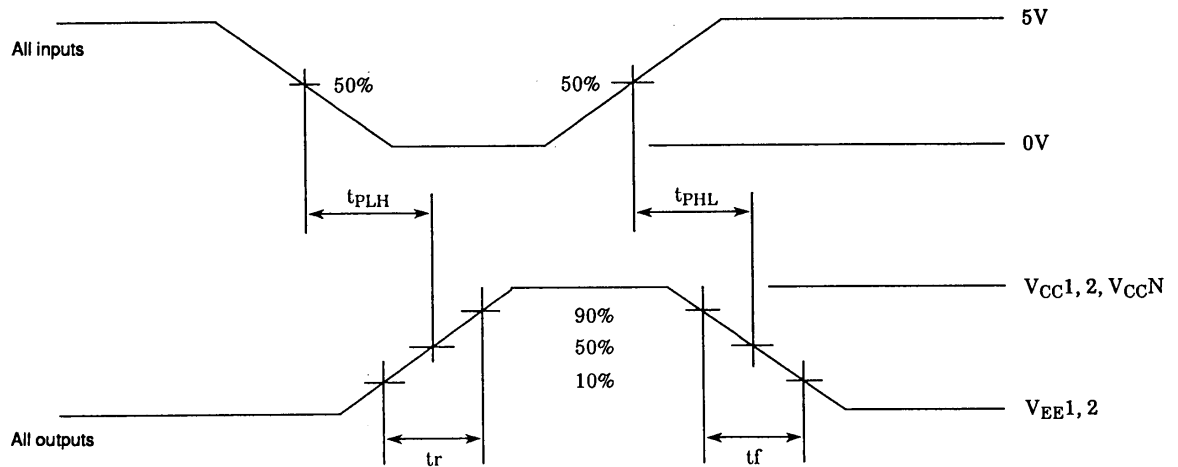
* Reference values for driving an LC9997 image sensor with pulses input from an LC99052 timing LSI.

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Switching Characteristics at $T_a = 25^\circ\text{C}$, V_{CC1} , V_{CC2} , $V_{CCN} = 5.0\text{ V}$, V_{EE1} , $V_{EE2} = -10.0\text{ V}$, $f_{IN} = 3.58\text{ MHz}$

Parameter	Symbol	Conditions	min	typ	max	Unit
Propagation delay Low level \rightarrow high level t_{PLH}	t_{PLH}	All output pins		23		ns
Propagation delay High level \rightarrow low level t_{PHL}	t_{PHL}	All output pins		31		ns
Rise time	t_r	All output pins		47		ns
Fall time	t_f	All output pins		42		ns

Switching Waveforms



Truth table

Input	Output	
	H	V_{OL}
	L	V_{OH}

Pin Functions

Pin No.	Pin	Function
1	GND	Ground
2	V_{EE1}	Negative power supply for setting the low level
3	SUBOUT	NSUB driver output
4	OUT1	Channel 1 driver output
5	OUT2	Channel 2 driver output
6	OUT3	Channel 3 driver output
7	OUT4	Channel 4 driver output
8	OUT5	Channel 5 driver output
9	OUT6	Channel 6 driver output
10	OUT7	Channel 7 driver output
11	OUT8	Channel 8 driver output
12	V_{EE2}	Negative power supply for setting the low level
13	V_{CC2}	Positive power supply for setting the high level
14	CH8	Channel 8 driver input
15	CH7	Channel 7 driver input
16	CH6	Channel 6 driver input
17	CH5	Channel 5 driver input
18	CH4	Channel 4 driver input
19	CH3	Channel 3 driver input
20	CH2	Channel 2 driver input
21	CH1	Channel 1 driver input
22	SUB	NSUB driver input
23	V_{CC1}	Positive power supply for setting the high level
24	V_{CCN}	NSUB driver positive power supply

Sample Application Circuit

The diagram illustrates the internal architecture of two video processing chips, LC99052-V64 and LC99062-W50, connected to an image sensor (LC9997G/98G) and a serial bus.

LC99052-V64 (Left Section):

- Image Sensor (LC9997G/98G):** Receives a **Vertical driver LC89901V** and a **Horizontal driver**. It outputs an **Image output** signal.
- Timing and Control:** The **Timing generator** provides signals to the **SSG** (Signal Synchronizing Gate) and **Iris control**. The **Gain control** also receives input from the **Iris control**.
- Analog Signal Processing (CMOS):** The **Image output** signal passes through a **CDS** (Correlated Double Sampling) block and an **AGC** (Automatic Gain Control) block.
- Digital Conversion:** The output of the **AGC** is converted by an **8bit ADC** (Analog-to-Digital Converter). The **DAC** (Digital-to-Analog Converter) receives input from the **Gain control** and outputs to the **AGC**.
- Line Memory:** The output of the **8bit ADC** is stored in the **Line memory**.
- Serial Bus:** The **Serial bus** provides control signals to the **Timing generator**, **SSG**, **Iris control**, **Gain control**, **8bit DAC**, and **NTSC/PAL encoder**.

LC99062-W50 (Right Section):

- White Balance Control:** Receives input from the **White balance control** block and outputs to the **White balance** block.
- Color Separator:** Receives input from the **White balance** block and outputs to the **White balance** block.
- White balance:** Receives input from the **Color separator** and outputs to the **RGB processing** block.
- RGB processing:** Receives input from the **White balance** block and outputs to the **Y processing** block.
- Clamp:** Receives input from the **Line memory** and outputs to the **Y matrix** block.
- Y matrix:** Receives input from the **Clamp** block and outputs to the **Y processing** block.
- Y processing:** Receives input from the **Y matrix** block and outputs to the **Matrix** block.
- Sampling frequency conversion:** Receives input from the **Y processing** block and outputs to the **Matrix** block.
- Matrix:** Receives input from the **Y processing** block and the **Sampling frequency conversion** block. It outputs to the **NTSC/PAL encoder** and the **8bit DAC**.
- NTSC/PAL encoder:** Receives input from the **Matrix** block and outputs to the **8bit DAC**.
- 8bit DAC:** Receives input from the **NTSC/PAL encoder** and outputs to the **Serial bus**.
- Serial Bus Output:** The **Serial bus** outputs **VIDEO (VBS) OUT** and other signals: **Y, C/ R, G, B/ Y, R-Y, B-Y** and **R, G, B**.

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