

Ordering number : EN5741

CMOS LSI



**LC89902V**

**CMOS Driver for VGA-Format Image Sensors**

**Overview**

The LC89902V is a vertical driver CMOS IC specifically designed for use with VGA-format CCD image sensors.

**Applications**

- Image input units and similar products

**Features**

- CMOS structure supporting low power dissipation.
- Level shifter circuits provided on chip to minimize the number of external components required.
- Miniature package (24-pin SSOP)

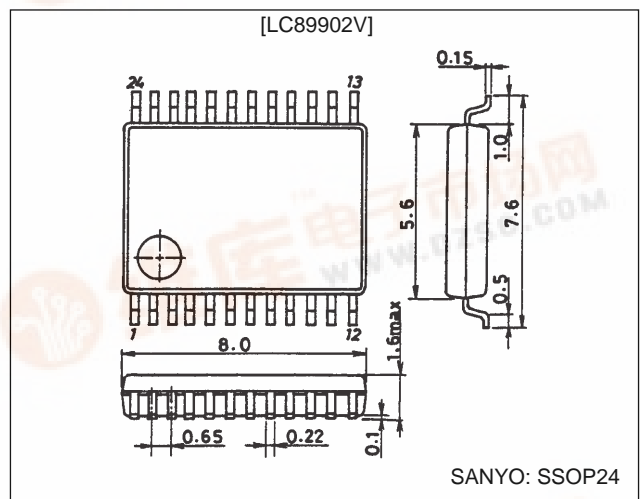
**Functions**

- Inverting drivers: 6 channels
  - Converts input pulses to  $V_{CC1}$ ,  $V_{CC2}$ , and  $V_{CC3}$ , as well as  $V_{EE1}$  and  $V_{EE2}$  levels (inverting).
  - Generates the drive levels required for the image sensor imaging and storage sections.
- Inverting drivers: 2 channels
  - These drivers convert input pulses to  $V_{CC1}$ ,  $V_{CC2}$ , and  $V_{CC3}$ , as well as  $V_{EE1}$  and  $V_{EE2}$  levels (inverting).
  - These drivers generate the drive levels required for the image sensor transfer gate.

**Package Dimensions**

unit: mm

**3175A-SSOP24**



**Specifications**

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

Parameter	Symbol	Condition	Ratings	Unit
Maximum supply voltage	$V_{CC}$ max	$V_{CC1}, V_{CC2}, V_{CC3}$	-0.3 to +6.0	V
	$V_{EE}$ max	$V_{EE1}, V_{EE2}$	-11.0 to +0.3	V
Input and voltages	$V_{IN}$	All input pins	-0.3 to $V_{CC} + 0.3$	V
Allowable power dissipation	$P_d$ max		350	mA
Operating temperature	$T_{opr}$		-10 to +70	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-40 to +125	$^\circ\text{C}$

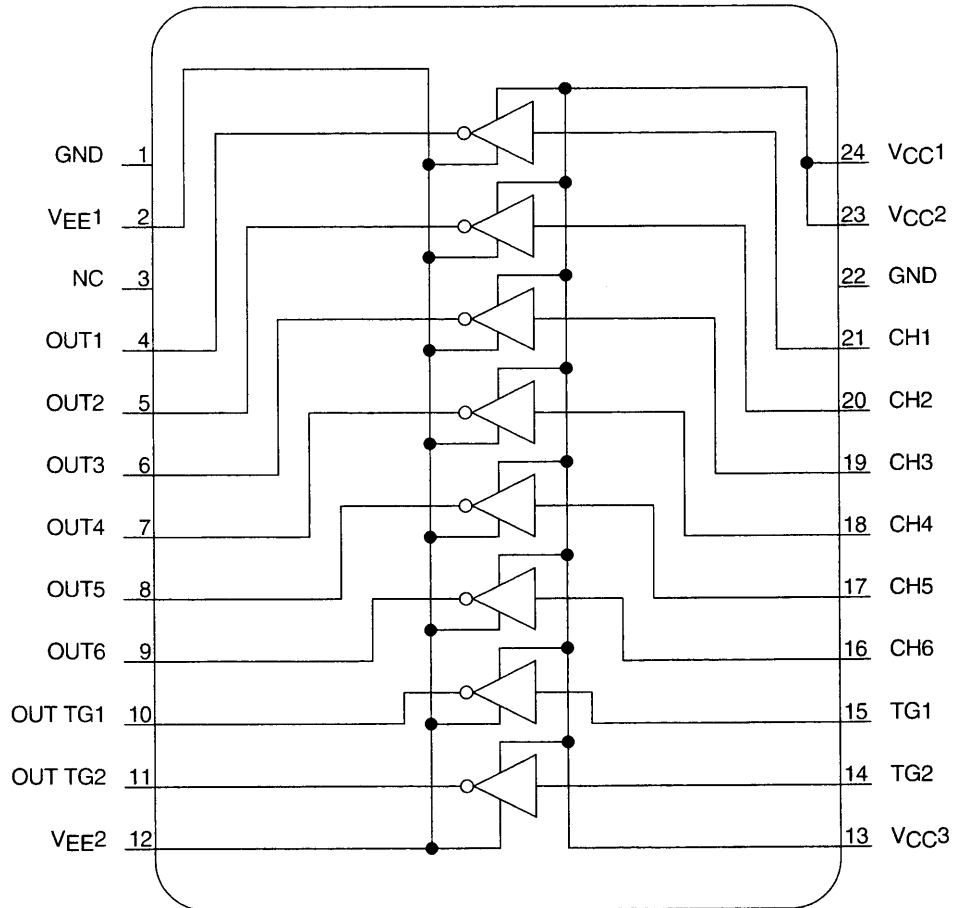
**Allowable Operating Ranges at  $T_a = 25^\circ\text{C}$**

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	$V_{CC}$	$V_{CC1}, V_{CC2}, V_{CC3}$	4.5 to 5.5	V
	$V_{EE}$	$V_{EE1}, V_{EE2}$	-10.5 to 0	V
Input voltage range	$V_{IN}$	All input pins	0 to $V_{CC}$	V



# LC89902V

## Block Diagram



A08857

## LC89902V

### Pin Functions

Pin No.	Pin name	Function
1	GND	Ground
2	V <sub>EE1</sub>	Negative power supply used to set the low output level
3	NC	–
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	OUT TG1	Transfer gate 1 driver output
11	OUT YG2	Transfer gate 2 driver output
12	V <sub>EE2</sub>	Negative power supply used to set the low output level
13	V <sub>CC3</sub>	Positive power supply used to set the high output level
14	TG2	Transfer gate 2 driver input
15	TG1	Transfer gate 1 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	GND	Ground
23	V <sub>CC2</sub>	Positive power supply used to set the high output level
24	V <sub>CC1</sub>	Positive power supply used to set the high output level

### Electrical Characteristics at Ta = 25°C, V<sub>CC1</sub>, V<sub>CC2</sub>, and V<sub>CC3</sub> = 5.0 V, V<sub>EE1</sub> and V<sub>EE2</sub> = –10.0 V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Input high-level current	I <sub>IH</sub>	All input pins, V <sub>IN</sub> = 5.0 V		10		μA
	I <sub>IL</sub>	All input pins, V <sub>IN</sub> = 0 V		5		nA
Supply current	I <sub>CCH</sub> <sup>+</sup>	V <sub>CC1</sub> , V <sub>CC2</sub> , and V <sub>CC3</sub> , all input pins, V <sub>IN</sub> = 5.0 V		1		μA
	I <sub>CCH</sub> <sup>–</sup>	V <sub>EE1</sub> and V <sub>EE2</sub> , all input pins, V <sub>IN</sub> = 5.0 V		–10		μA
	I <sub>CCCL</sub> <sup>+</sup>	V <sub>CC1</sub> , V <sub>CC2</sub> , and V <sub>CC3</sub> , all input pins, V <sub>IN</sub> = 0 V		7		μA
	I <sub>CCCL</sub> <sup>–</sup>	V <sub>EE1</sub> and V <sub>EE2</sub> , all input pins, V <sub>IN</sub> = 0 V		–2		μA
Output voltage	V <sub>OH</sub>	All input pins, V <sub>IN</sub> = 0 V		5.0		V
	V <sub>OL</sub>	All input pins, V <sub>IN</sub> = 5.0 V		–10		V
Output voltage under actual operating conditions	V <sub>OH2</sub>	Load = LC99152, input = LC99055 *		5.0		V
	V <sub>OL2</sub>	Load = LC99152, input = LC99055 *		–10		V
Output current under actual operating conditions	I <sub>CC2</sub> <sup>+</sup>	Load = LC99152, input = LC99055 *		1.62		mA
	I <sub>CC2</sub> <sup>–</sup>	Load = LC99152, input = LC99055 *		1.61		mA

Note: \* Values for when the LC99055 timing IC provides the input pulses and the LC99152 image sensor is driven. These values are provided for reference purposes only.

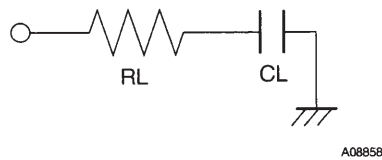
## LC89902V

**Switching Characteristics at  $T_a = 25^\circ\text{C}$ ,  $V_{CC1}$ ,  $V_{CC2}$ , and  $V_{CC3} = 5.0\text{ V}$ ,  $V_{EE1}$  and  $V_{EE2} = -10.0\text{ V}$ ,  $f_{IN} = 3.58\text{ MHz}$**

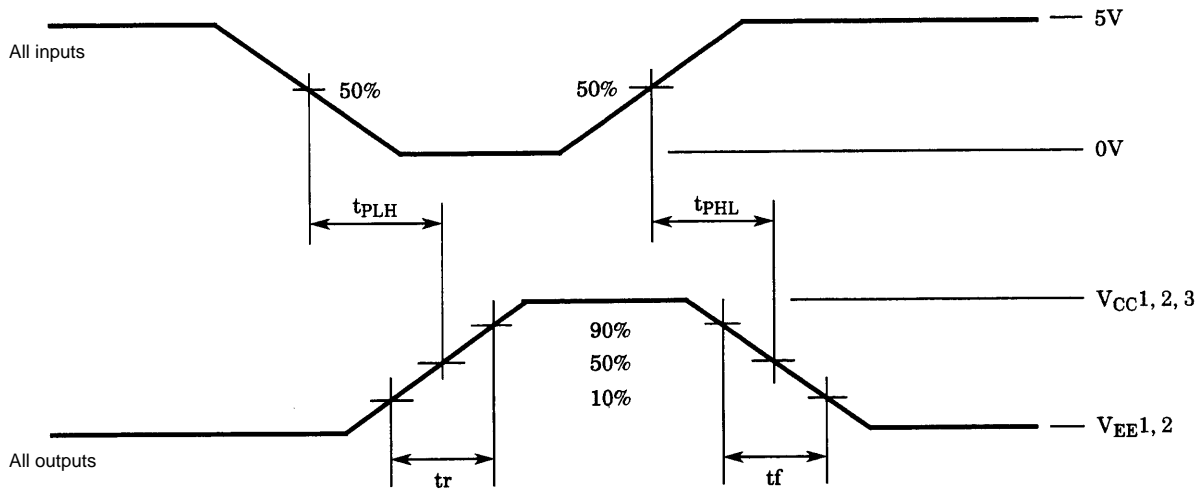
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Propagation delay time	$t_{PLH}$	All output pins		23		ns
Low level → high level						
Propagation delay time	$t_{PHL}$	All output pins		31		ns
High level → low level						
Rise time	$t_r$	All output pins		47		ns
Fall time	$t_f$	All output pins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

Note: Load conditions  
 $R_L = 18\ \Omega$ ,  $C_L = 780\text{ pF}$

### Load Circuit



### Switching Waveforms



### Truth Table

		Output
		Input
L	$V_{OH}$	

### Usage Notes

- Power supply application timing**  
 When applying power to the LC89902V, either both power-supply voltages must be turned on at the same time or  $V_{CC}$  (+5 V) must be turned on before  $V_{EE}$  (-10 V) is turned on. The IC may be destroyed if  $V_{EE}$  is turned on first.
- Power supply noise elimination**  
 Clock frequency noise may occur on the power supply lines due to the charge and discharge currents required to drive the CCD. Capacitors must be inserted both between  $V_{CC}$  and ground and between  $V_{EE}$  and ground to eliminate noise from the power supply lines. These capacitors must have values of at least 47  $\mu\text{F}$ .

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