

**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**

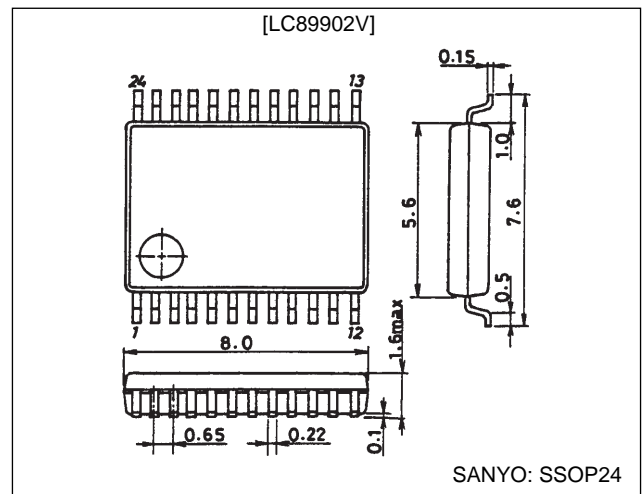
- CMOS structure supporting low power dissipation.
- Level shifter circuits provided on chip to minimize the number of external components required.
- Miniature package (24-pin SSOP)

**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	$V_{CC \text{ max}}$	$V_{CC1}, V_{CC2}, V_{CC3}$	-0.3 to +6.0	V
	$V_{EE \text{ max}}$	$V_{EE1}, V_{EE2}$	-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	$P_d \text{ max}$		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  $T_a = 25^\circ\text{C}$** 

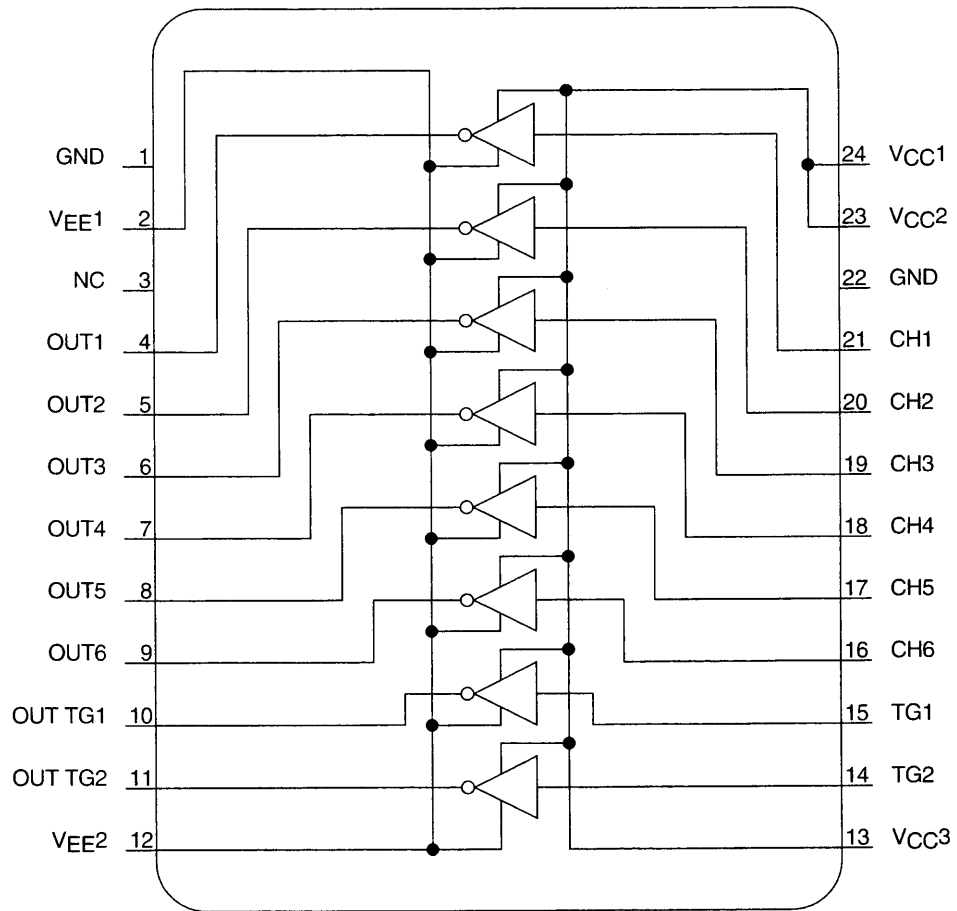
Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	$V_{CC}$	$V_{CC1}, V_{CC2}, V_{CC3}$	4.5 to 5.5	V
	$V_{EE}$	$V_{EE1}, V_{EE2}$	-10.5 to 0	V
Input voltage range	$V_{IN}$	All input pins	0 to $V_{CC}$	V

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# 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>CCCH</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>CCCH</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.

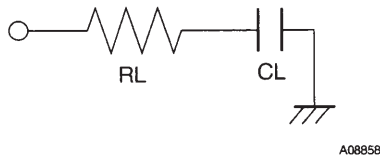
## LC89902V

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

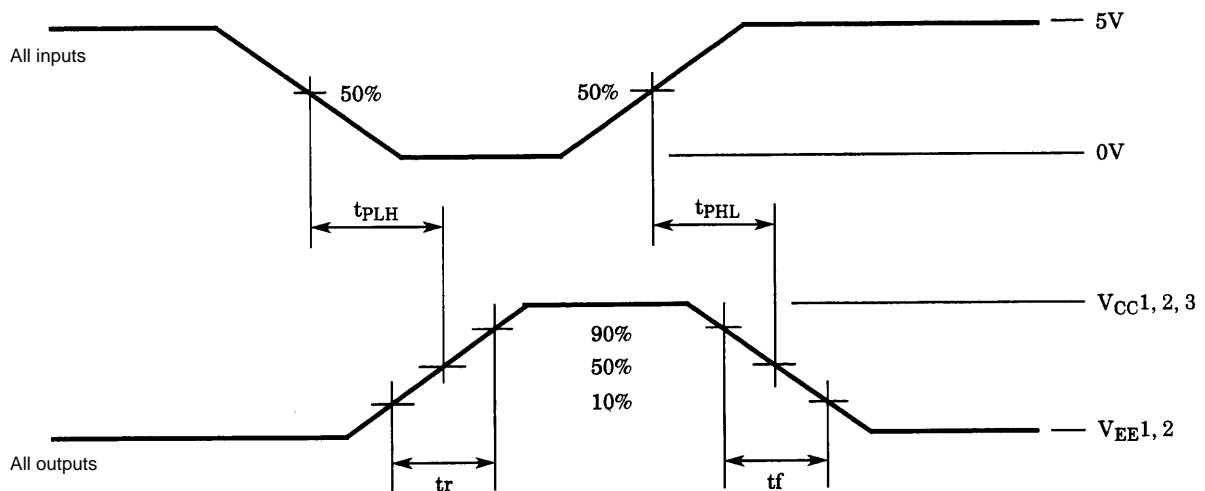
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Propagation delay time	$t_{PLH}$	All output pins		23		ns
Low level → high level						
Propagation delay time	$t_{PHL}$	All output pins		31		ns
High level → low level						
Rise time	$t_r$	All output pins		47		ns
Fall time	$t_f$	All output pins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