

**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

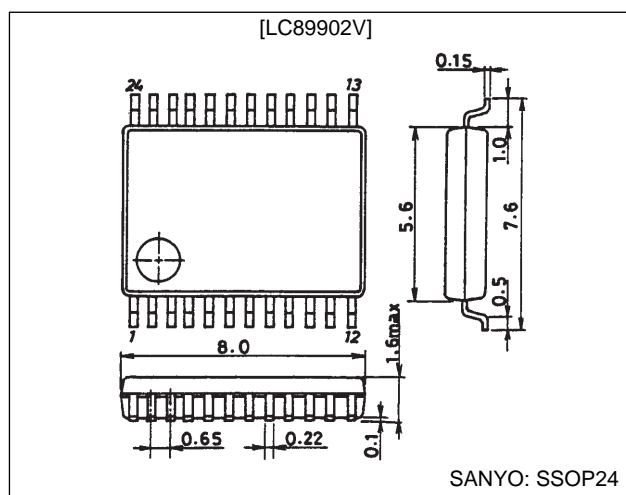
- CMOS structure supporting low power dissipation.
- Level shifter circuits provided on chip to minimize the number of external components required.
- Miniature package (24-pin SSOP)

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

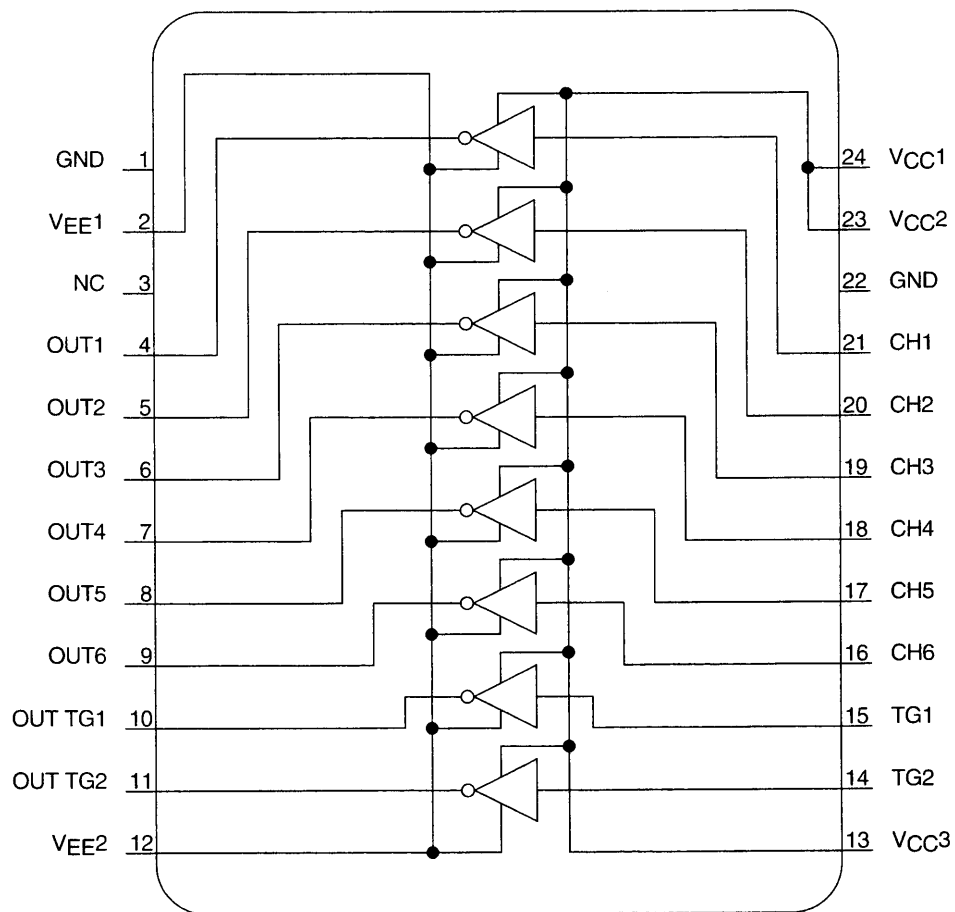
3175A-SSOP24**Specifications****Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$**

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

Block Diagram



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LC89902V

Pin Functions

Pin No.	Pin name	Function
1	GND	Ground
2	V _{EE1}	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 _{EE2}	Negative power supply used to set the low output level
13	V _{CC3}	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 _{CC2}	Positive power supply used to set the high output level
24	V _{CC1}	Positive power supply used to set the high output level

Electrical Characteristics at Ta = 25°C, V_{CC1}, V_{CC2}, and V_{CC3} = 5.0 V, V_{EE1} and V_{EE2} = –10.0 V

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

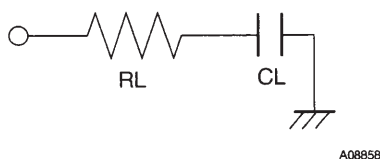
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Switching Characteristics at $T_a = 25^\circ\text{C}$, V_{CC1} , V_{CC2} , and $V_{CC3} = 5.0\text{ V}$, V_{EE1} and $V_{EE2} = -10.0\text{ V}$, $f_{IN} = 3.58\text{ MHz}$

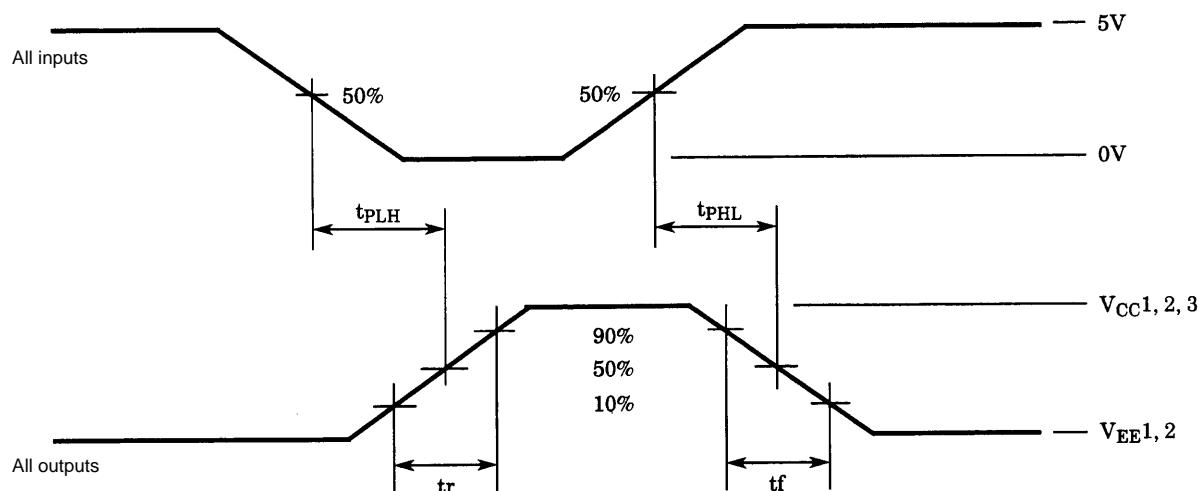
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Propagation delay time	t_{PLH}	All output pins		23		ns
Low level \rightarrow high level						
Propagation delay time	t_{PHL}	All output pins		31		ns
High level \rightarrow low level						
Rise time	t_r	All output pins		47		ns
Fall time	t_f	All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

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

Load Circuit



Switching Waveforms



Truth Table

		Output
Input	H	V_{OL}
	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 μF .

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