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

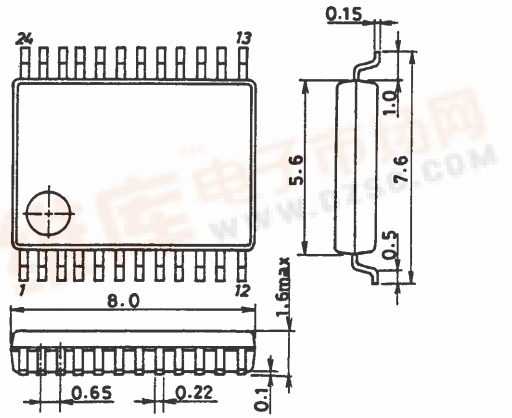
- Inverting drivers: 6 channels
  - — Converts input pulses to $V_{CC}1$, $V_{CC}2$, and $V_{CC}3$, as well as $V_{EE}1$ and $V_{EE}2$ levels (inverting).
  - — Generates the drive levels required for the image sensor imaging and storage sections.
- Inverting drivers: 2 channels
  - — These drivers convert input pulses to $V_{CC}1$, $V_{CC}2$, and $V_{CC}3$, as well as $V_{EE}1$ and $V_{EE}2$ levels (inverting).
  - — These drivers generate the drive levels required for the image sensor transfer gate.

Package Dimensions

unit: mm

3175A-SSOP24

[LC89902V]



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Specifications

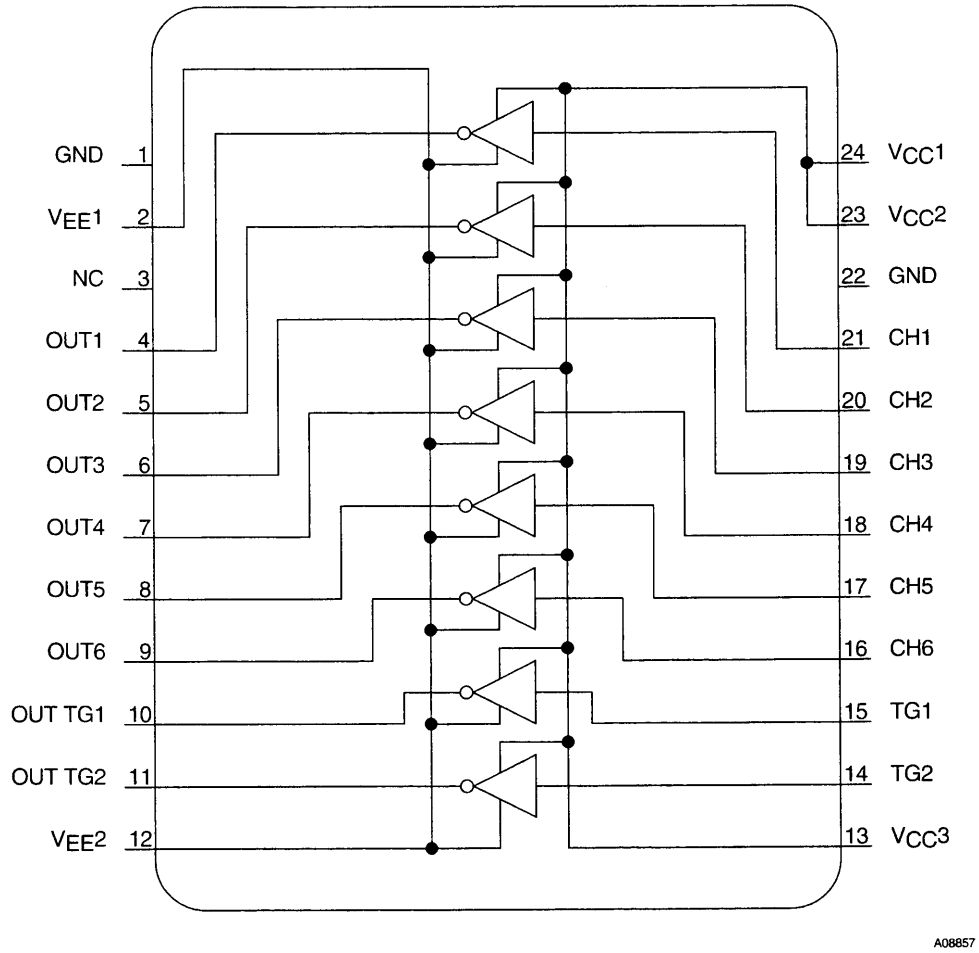
Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Condition	Ratings	Unit
Maximum supply voltage	V_{CC} max	$V_{CC}1$, $V_{CC}2$, $V_{CC}3$	–0.3 to +6.0	V
	V_{EE} max	$V_{EE}1$, $V_{EE}2$	–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	Pd max		350	mA
Operating temperature	Topr		–10 to +70	°C
Storage temperature	Tstg		–40 to +125	°C

Allowable Operating Ranges at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{CC}	$V_{CC}1$, $V_{CC}2$, $V_{CC}3$	4.5 to 5.5	V
	V_{EE}	$V_{EE}1$, $V_{EE}2$	–10.5 to 0	V
Input voltage range	V_{IN}	All input pins	0 to V_{CC}	V

Block Diagram



Pin Functions

Pin No.	Pin name	Function
1	GND	Ground
2	$V_{EE}1$	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	$V_{EE}2$	Negative power supply used to set the low output level
13	$V_{CC}3$	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	$V_{CC}2$	Positive power supply used to set the high output level
24	$V_{CC}1$	Positive power supply used to set the high output level

Electrical Characteristics at Ta = 25°C, $V_{CC}1$, $V_{CC}2$, and $V_{CC}3$ = 5.0 V, $V_{EE}1$ and $V_{EE}2$ = –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_{CCH}^{+}	$V_{CC}1$, $V_{CC}2$, and $V_{CC}3$, all input pins, V_{IN} = 5.0 V		1		µA
	I_{CCH}^{-}	$V_{EE}1$ and $V_{EE}2$, all input pins, V_{IN} = 5.0 V		–10		µA
	I_{CCL}^{+}	$V_{CC}1$, $V_{CC}2$, and $V_{CC}3$, all input pins, V_{IN} = 0 V		7		µA
	I_{CCL}^{-}	$V_{EE}1$ and $V_{EE}2$, 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	$V_{OH}2$	Load = LC99152, input = LC99055 *		5.0		V
	$V_{OL}2$	Load = LC99152, input = LC99055 *		–10		V
Output current under actual operating conditions	$I_{CC}2^{+}$	Load = LC99152, input = LC99055 *		1.62		mA
	$I_{CC}2^{-}$	Load = LC99152, input = LC99055 *		1.61		mA

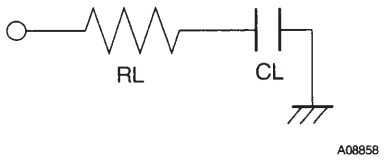
Note: * Values for when the LC99055 timing IC provides the input pulses and the LC99152 image sensor is driven. These values are provided for reference purposes only.

Switching Characteristics at Ta = 25°C, $V_{CC}1$, $V_{CC}2$, and $V_{CC}3$ = 5.0 V, $V_{EE}1$ and $V_{EE}2$ = –10.0 V, f_{IN} = 3.58 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	tr	All output pins		47		ns
Fall time	tf	All output pins		42		ns

Note: Load conditions
RL = 18 Ω, CL = 780 pF

Load Circuit



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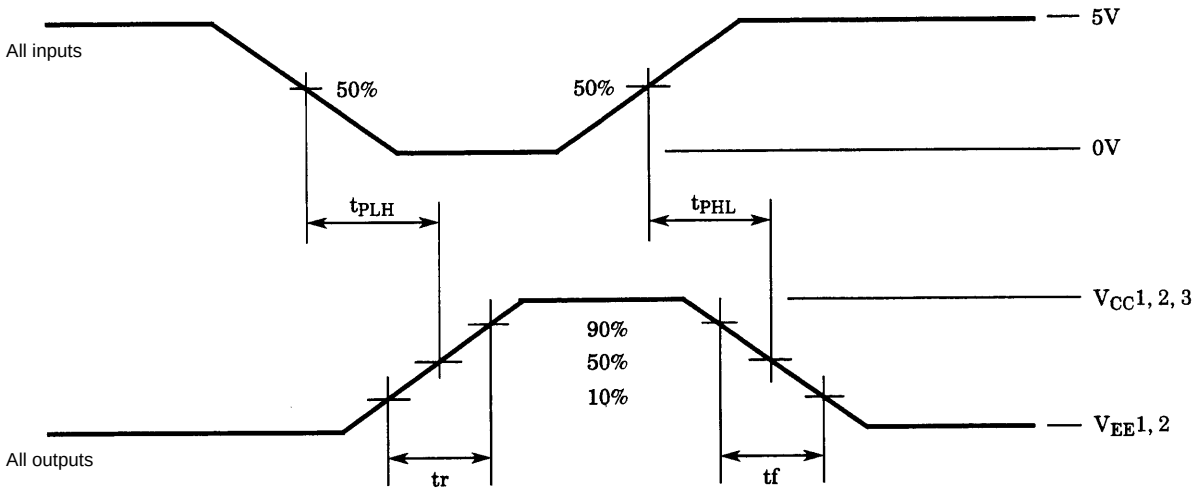
Switching Waveforms



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.