



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)

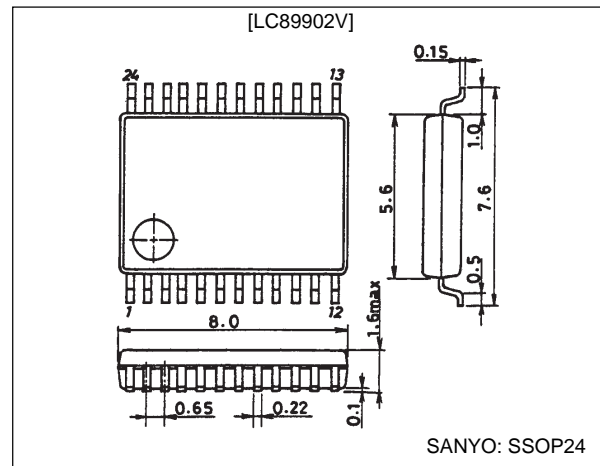
Functions

- 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 |

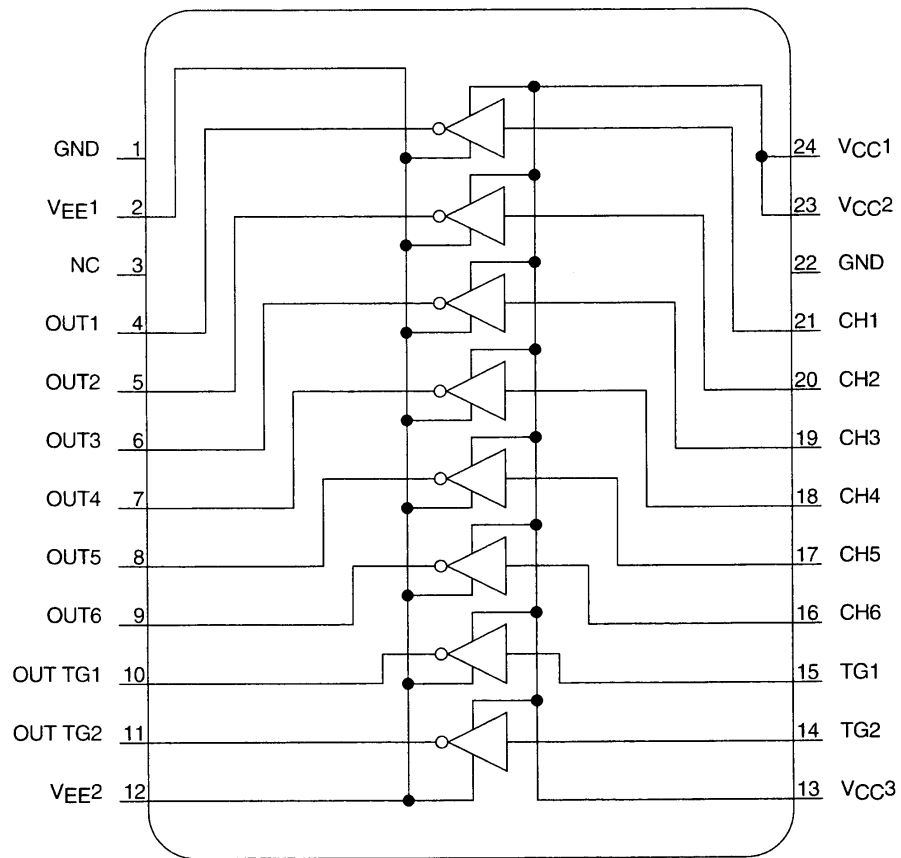
SANYO Electric Co., Ltd. Semiconductor Business Headquarters

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110 JAPAN

93097HA (OT) No. 5741-1/5

LC89902V

Block Diagram



A08857

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 _{CCH} ⁺ | V _{CC1} , V _{CC2} , and V _{CC3} , all input pins, V _{IN} = 5.0 V | | 1 | | μA |
| | I _{CCH} [–] | V _{EE1} and V _{EE2} , all input pins, V _{IN} = 5.0 V | | –10 | | μA |
| | I _{CCL} ⁺ | V _{CC1} , V _{CC2} , and V _{CC3} , all input pins, V _{IN} = 0 V | | 7 | | μA |
| | I _{CCL} [–] | 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.

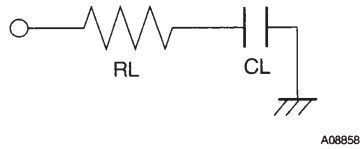
LC89902V

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

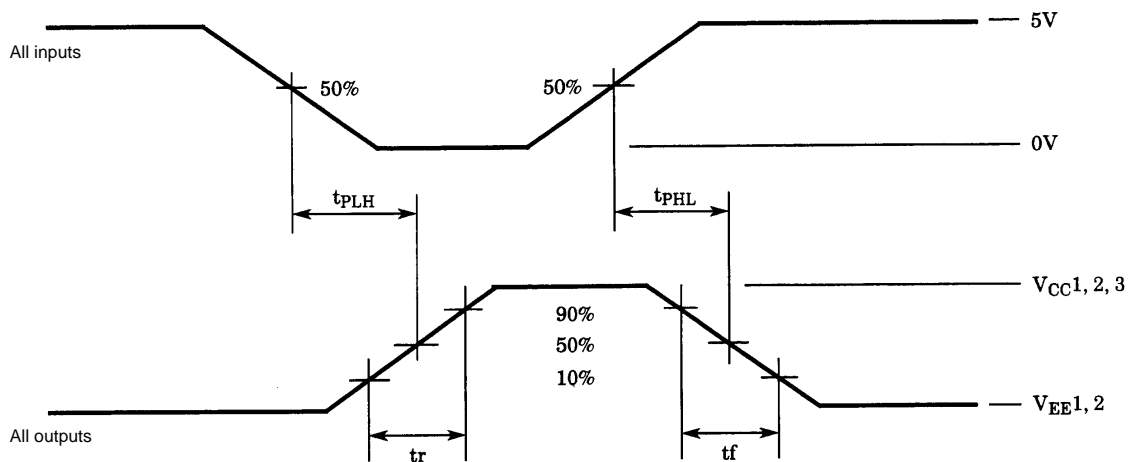
| Parameter | Symbol | Conditions | Ratings | | | Unit |
|------------------------------------|-----------|-----------------|---------|-----|-----|------|
| | | | min | typ | max | |
| Propagation delay time | t_{PLH} | All output pins | | 23 | | ns |
| Low level \rightarrow high level | | | | | | |
| 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 | |
|-------|---|--------|----------|
| | | H | V_{OL} |
| Input | H | | V_{OH} |
| | 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 .

- No products described or contained herein are intended for use in surgical implants, life-support systems, aerospace equipment, nuclear power control systems, vehicles, disaster/crime-prevention equipment and the like, the failure of which may directly or indirectly cause injury, death or property loss.
- Anyone purchasing any products described or contained herein for an above-mentioned use shall:
 - ① Accept full responsibility and indemnify and defend SANYO ELECTRIC CO., LTD., its affiliates, subsidiaries and distributors and all their officers and employees, jointly and severally, against any and all claims and litigation and all damages, cost and expenses associated with such use:
 - ② Not impose any responsibility for any fault or negligence which may be cited in any such claim or litigation on SANYO ELECTRIC CO., LTD., its affiliates, subsidiaries and distributors or any of their officers and employees jointly or severally.
- Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production. SANYO believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

This catalog provides information as of September, 1997. Specifications and information herein are subject to change without notice.