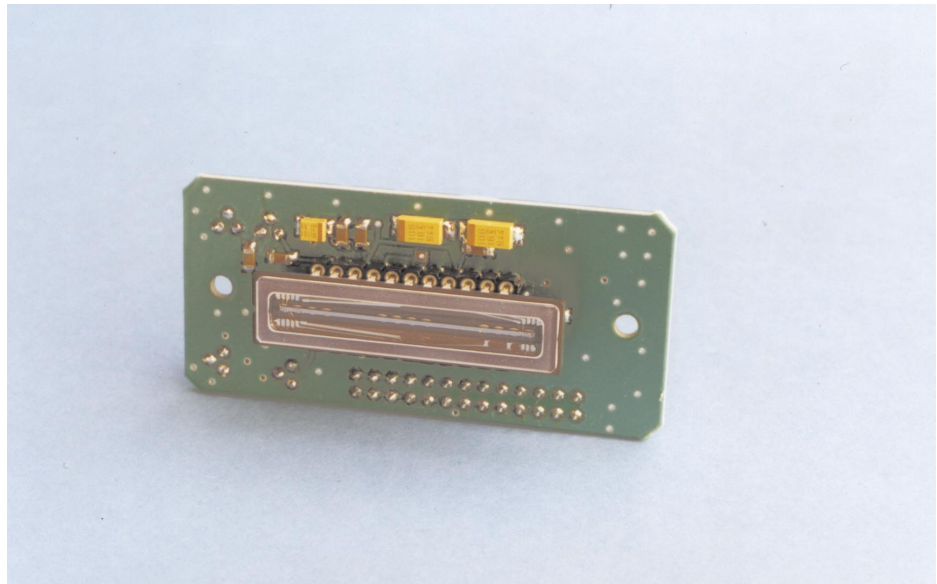


# LCCD 2048A - 14

Complete low cost  
ccd linescan  
camera



## Key Features:

- Stand alone CCD-line scan camera.
- All clock signals included.
- Analog output with pixel clock.
- Start of frame output.
- Selectable exposure time.
- Low cost

## Applications:

- Spectroscopy.
- Industrial imaging.
- Bar code reader.
- Position detector.
- Prototyping.

## Overview:

The LCCD 2048 is an easy to use, complete ccd linescan camera on a single 67.5 mm x 31.5 mm sized printed circuit board.

For operation the LCCD requires power 5 and + 12V only, additional logic is not required.

To provide more flexibility the LCCD has an interface to control exposure time and pixel clock. All inputs are connected to internal pull up resistors, so they can left unconnected if not required.

## Hardware:

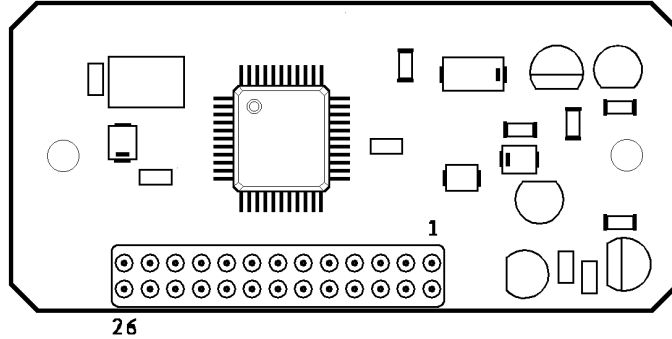
The LCCD linescan camera includes the CCD-linescan sensor with all required CCD-timing signals including pixel clock and exposure control.

The digital interface provides user selectable pixel clock and exposure time. An output for pixel clock and start of frame facilitates the operation with an additional frame grabber.

With an additional oscilloscope the LCCD-2048 converts to a complete very low cost CCD-linescan camera with display. (See the application on the last page).

khs instruments

## Camera Interface



### Connections:

| Signal | Pin | Pin | Signal       |
|--------|-----|-----|--------------|
| GND    | 1   | 2   | CCD          |
| GND    | 3   | 4   | GND          |
| GND    | 5   | 6   | GND          |
| GND    | 7   | 8   | VDD (+ 12 V) |
| VCC    | 9   | 10  | GND          |
| SOS    | 11  | 12  | nc           |
| PCLK   | 13  | 14  | nc           |
| nc     | 15  | 16  | Reset        |
| ts2    | 17  | 18  | ps2          |
| ts1    | 19  | 20  | ps1          |
| ts0    | 21  | 22  | ps0          |
| te     | 23  | 24  | pe           |
| nc     | 25  | 26  | SH           |

### Pinout description:

| Pin Name | Pin Type | Pin Description                   |
|----------|----------|-----------------------------------|
| GND      | Power    | Power Ground.                     |
| VCC      | Power    | Power + 5 V.                      |
| VDD      | Power    | Power +12 V.                      |
| CCD      | Out      | Analog output, open npn emitter.  |
| SOS      | Out      | Start of scan output, low active. |
| PCLK     | Out      | Pixelclock output, low active.    |
| ts0..ts1 | In       | Exposure control.                 |
| te       | In       | Exposure control external.        |
| ps0..ps1 | In       | Pixelclock control.               |
| pe       | In       | Pixelclock external.              |
| Reset    | In       | CCD asynchron reset low active    |
| SH       | In       | Sample/Hold enable hi active      |
| nc       | nc       | Do not connect!                   |

All inputs: 50 K pull up to VCC.

### Exposure timer control:

| ts2 | ts1 | ts0 | exposure time |
|-----|-----|-----|---------------|
| 1   | 1   | 1   | 520 $\mu$ s   |
| 1   | 1   | 0   | 1.0 ms        |
| 1   | 0   | 1   | 2.0 ms        |
| 1   | 0   | 0   | 4.1 ms        |
| 0   | 1   | 1   | 8.2 ms        |
| 0   | 1   | 0   | 6.4 ms        |
| 0   | 0   | 1   | -             |
| 0   | 0   | 0   | external      |

### Pixelclock control\*:

| ps2 | ps1 | ps0 | pixel clock |
|-----|-----|-----|-------------|
| 1   | 1   | 1   | 4 MHz       |
| 1   | 1   | 0   | 2 MHz       |
| 1   | 0   | 1   | 1 MHz       |
| 1   | 0   | 0   | 500 kHz     |
| 0   | 1   | 1   | 250 kHz     |
| 0   | 1   | 0   | 125 kHz     |
| 0   | 0   | 1   | 62.5 kHz    |
| 0   | 0   | 0   | external/2  |

### DC characteristics:

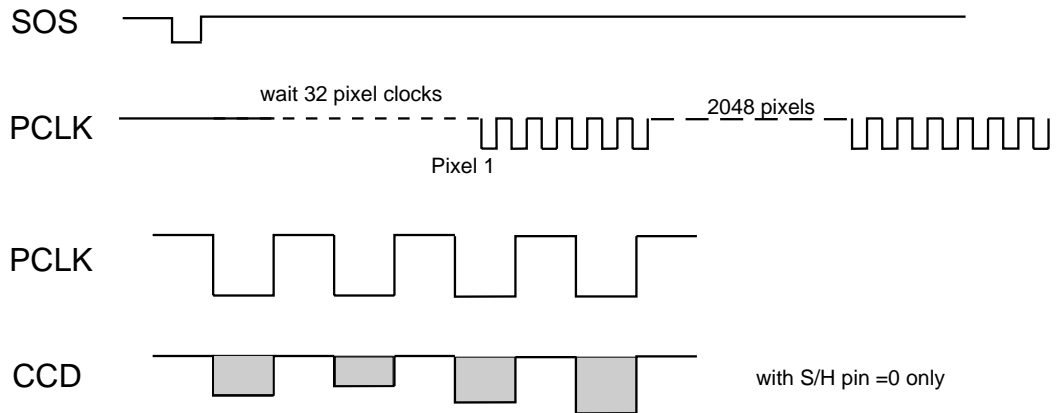
|                             |          |
|-----------------------------|----------|
| Output low voltage (8 mA)   | 0.4V     |
| Output high voltage (-4 mA) | 2.4V     |
| Input pullup current        | -0.15 mA |
| Input low Voltage (max)     | 0.8 V    |
| Input high voltage (min)    | 2.0V     |

\* Pixelclock up to 5 MHz upon request.

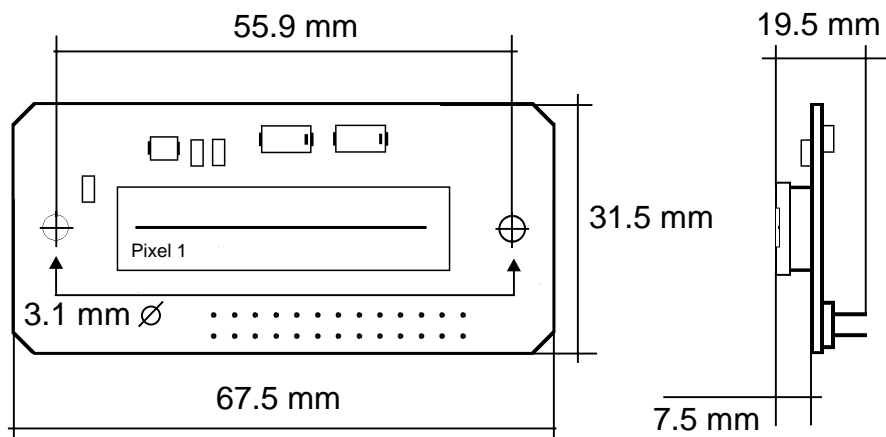
### Power requirements:

+ 5 V 200 mA, + 12 V 100 mA

## Camera Timing Overview



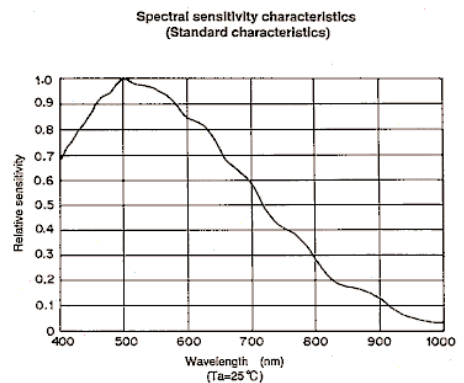
## Mechanical Dimension



## Sensor

### Detector Array:

|                            |                                     |
|----------------------------|-------------------------------------|
| Number of pixels:          | 2048                                |
| Pixel size:                | 14 $\mu\text{m}$ x 14 $\mu\text{m}$ |
| Spectral range:            | < 400nm..1000nm                     |
| Sensitivity nonuniformity: | < 8% (typ. 2%) ss                   |
| Sensitivity (660 nm):      | 500V / (lx sec)                     |
| Saturation exposure:       | 0.060 lx sec                        |
| Analog output:             | -0.7 to 9 V                         |



## Absolute Maximum Ratings

|                        |                      |
|------------------------|----------------------|
| VCC Supply voltage     | - 0.5 V to + 6 V     |
| VDD supply voltage     | - 0.5 V to + 25 V    |
| Input voltage applied  | - 0.5 to Vcc + 0.5 V |
| Digital output current | 0 to 5 mA            |
| Storage temperature    | - 20 to 150 °C       |
| Operating temperature  | 0 to 50 °C           |

## Application

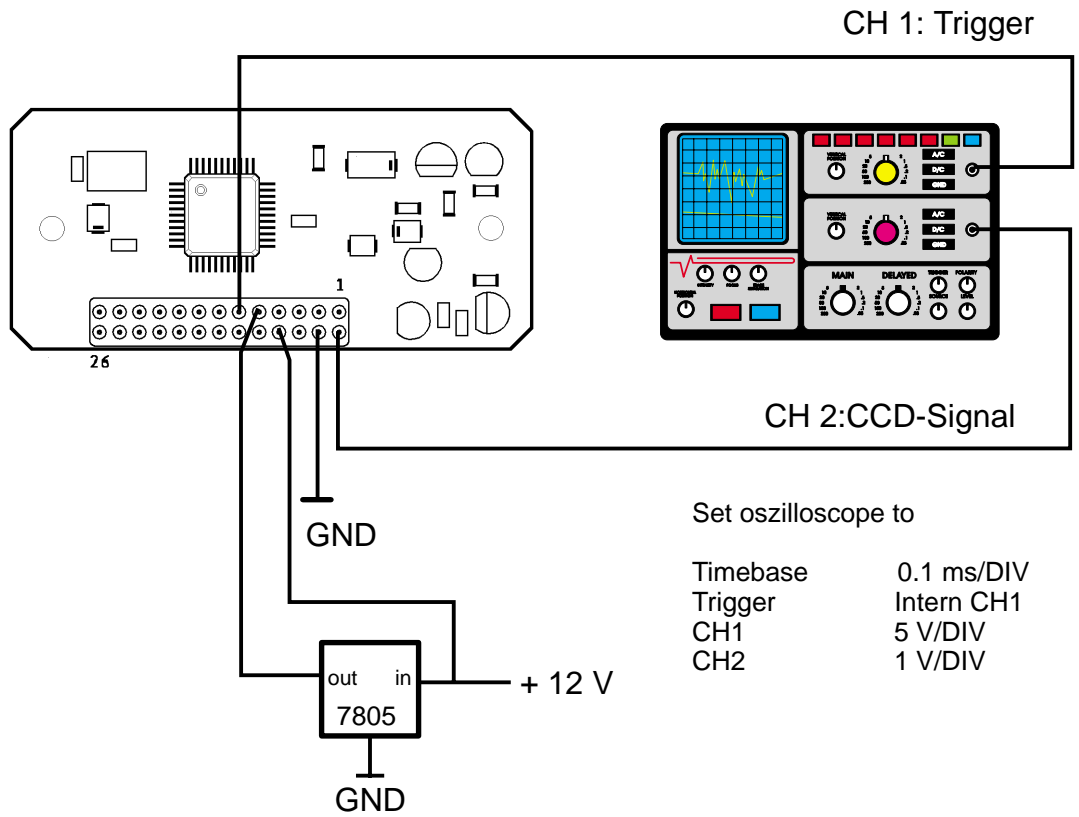


Fig. 1 Test circuit