The C11165-01 is a driver circuit designed for HAMAMATSU CCD image sensor S11155/S11156-2048-01. The C11165-01 can be used in spectrometers when combined with the S11155/S11156-2048-01. The C11165-01 holds a CCD driver circuit, analog video signal processing circuit (16-bit A/D converter), timing generator, control circuit and power supply. The C11165-01 converts analog video signals from a CCD into digital signals and outputs them. The USB connector (USB 2.0) provided as a standard feature easily connects to a PC for the C11165-01 control and data acquisition. The C11165-01 also has a BNC connector for external trigger input and pulse output. The C11165-01 is compact, lightweight and very easy to handle. Application software (DCam-USB) that comes with the C11165-01 allows easy operation from a PC running on Windows 2000/XP/7. A function library (DCamUSB.DLL) included with the application software helps you to develop your own software. This software is available with DLL to help you develop your own software programs under various developmental environments.

**Features**

- Built-in 16-bit A/D converter
- Adjustable offset
- Adjustable gain
- Interface of computer: USB 2.0
- Power supply: DC+5 V

**Applications**

- Spectrometer
- Control and data acquisition of CCD image sensor (S11155/S11156-2048-01)

The table below shows CCD linear image sensors applicable for the C11165-01. Since the C11165-01 does not include CCD image sensors, so select the desired sensor and order it separately.

<table>
<thead>
<tr>
<th>Type no.</th>
<th>Type no.</th>
<th>Number of pixels</th>
<th>Number of active pixels</th>
<th>Pixel size (μm)</th>
<th>Active area [mm (H) × mm (V)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>C11165-01</td>
<td>S11155-2048-01</td>
<td>2068 × 1</td>
<td>2048 × 1</td>
<td>14 × 500</td>
<td>28.672 × 0.500</td>
</tr>
<tr>
<td></td>
<td>S11156-2048-01</td>
<td>14 × 1000</td>
<td>14 × 1000</td>
<td>28.672 × 1.000</td>
<td></td>
</tr>
</tbody>
</table>

**Absolute maximum ratings**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Condition</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td></td>
<td>Ta=25 °C</td>
<td>+7</td>
<td>V</td>
</tr>
<tr>
<td>Operating temperature*1</td>
<td>Topp</td>
<td>0 to +50</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Storage temperature*1</td>
<td>Tstg</td>
<td>-20 to +70</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Operating humidity*1</td>
<td></td>
<td>70 max.</td>
<td>%</td>
<td></td>
</tr>
</tbody>
</table>

*1: No condensation
Specifications (Typ. Ta=25 °C, unless otherwise noted)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Condition</th>
<th>Specification</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scanning</td>
<td>6 MHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line readout time</td>
<td></td>
<td>349.5 μs</td>
<td></td>
</tr>
<tr>
<td>Data transfer time</td>
<td></td>
<td>344.67 μs</td>
<td></td>
</tr>
<tr>
<td>Total transfer time</td>
<td></td>
<td>694.17 μs</td>
<td></td>
</tr>
<tr>
<td>A/D conversion resolution</td>
<td>65535 ADU</td>
<td>16</td>
<td>bit</td>
</tr>
<tr>
<td>Conversion gain</td>
<td></td>
<td>3.6×2 e−/ADU</td>
<td></td>
</tr>
<tr>
<td>Readout noise</td>
<td>Gain=1</td>
<td>12 (TBD)</td>
<td>ADU</td>
</tr>
<tr>
<td>Dynamic range</td>
<td></td>
<td>5461 (TBD)</td>
<td></td>
</tr>
<tr>
<td>Interface</td>
<td></td>
<td>USB 2.0</td>
<td></td>
</tr>
<tr>
<td>Supply voltage</td>
<td>950 mA typ. (TBD)</td>
<td>DC + 4.5 to 5.5</td>
<td>V</td>
</tr>
<tr>
<td>Dimension</td>
<td></td>
<td>80 (H) × 80 (W)</td>
<td>mm</td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td>Approx. 65</td>
<td>g</td>
</tr>
</tbody>
</table>

*2: Theoretical value including sensor conversion efficiency

Functions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating mode Suspend mode (LED-off)</td>
<td>The power supply is turned off.</td>
</tr>
<tr>
<td>Standby mode (LED-white)</td>
<td>It is a standby state, in which the data acquisition is possible.</td>
</tr>
<tr>
<td>Data transfer mode (LED-green, aqua, blue)</td>
<td>In this mode, the driver circuit sends the data to PC.</td>
</tr>
<tr>
<td>Data acquisition mode Internal synchronous mode (&quot;INT&quot; mode)</td>
<td>Data is acquired on the basis of the trigger timing generated by application software.</td>
</tr>
<tr>
<td>External synchronous mode 1 (&quot;EXT.EDGE&quot; mode)</td>
<td>Data is acquired in synchronization with the external trigger signal input from the BNC connector. In synchronization with an edge of the external trigger signal, data is accumulated for the set integration time and is then output.</td>
</tr>
<tr>
<td>External synchronous mode 2 (&quot;EXT.LEVEL&quot; mode)</td>
<td>Data is acquired in synchronization with the external trigger signal input from the BNC connector. Data is accumulated for a period equal to the pulse width of the external trigger signal and is then output.</td>
</tr>
<tr>
<td>Gain adjustment</td>
<td>The gain value can be varied in the range of “1 to 3” with the step of 1. Default value is “1”.</td>
</tr>
<tr>
<td>Offset adjustment</td>
<td>The offset value can be varied in the range of “-255 to 255” with the step of 1. Default value is “10”.</td>
</tr>
<tr>
<td>Pulse output setting</td>
<td>It is possible to set the timing of the pulse output signal that is output from the “BNC connector for pulse output” of the driver circuit.</td>
</tr>
</tbody>
</table>
Timing chart

Internal synchronous mode ("INT" mode)

Non-MPP operation

Trigger in (software)

Exposure signal*

REGH/REGL

ARG

TG

P1H/P2H

A/D conversion

Data acquisition time

Line readout time

Data transfer

Data transfer time

Total transfer time

* Internal signal

MPP operation

Trigger in (software)

Exposure signal*

REGH/REGL

ARG

TG

P1H/P2H

A/D conversion

Data acquisition time

Line readout time

Data transfer

Data transfer time

Total transfer time

* Internal signal
Driver circuit for CCD linear image sensor

External synchronous mode 1 ("EXT.EDGE" mode)

- Non-MPP operation

Trigger in (from BNC)

Exposure signal*

REGH/REGL

ARG

TG

P1H/P2H

A/D conversion

Data acquisition time

Line readout time

Data transfer

Data transfer time

Total transfer time

* Internal signal

- MPP operation

Trigger in (from BNC)

Exposure signal*

REGH/REGL

ARG

TG

P1H/P2H

A/D conversion

Data acquisition time

Line readout time

Data transfer

Data transfer time

Total transfer time

* Internal signal
Driver circuit for CCD linear image sensor

External synchronous mode 2 ("EXT.LEVEL" mode)

Non-MPP operation

- Trigger in (from BNC)
- Exposure signal
- REGH/REGL
- ARG
- TG
- P1H/P2H
- A/D conversion
- Data transfer

MPP operation

- Trigger in (from BNC)
- Exposure signal
- REGH/REGL
- ARG
- TG
- P1H/P2H
- A/D conversion
- Data transfer

* Internal signal
Driver circuit for CCD linear image sensor

Dimensional outline (unit: mm)

- BNC connector for pulse output
- BNC connector for external trigger input
- USB connector
- DC jack
- CCD linear image sensor S11155/S11156-2048-01 (optional)
- CCD image sensor mount position
- Index mark

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**Connection examples**

Refer to the following diagram to connect hardware peripherals.

![Diagram showing connections between laser, mechanical shutter, pulse generator, USB 2.0, DC +5 V, and PC](KACCC0527EB)

**Accessories**

- CD-ROM (includes C11165-01 instruction manual, application software, SDK)
- USB cable
- AC adapter

**Related information**

- Datasheet
- CCD linear image sensors S11155-2048-01, S11156-2048-01
- Technical information
  - [http://jp.hamamatsu.com/sp/ssd/CCD_e.html](http://jp.hamamatsu.com/sp/ssd/CCD_e.html)
- Resistive gate type CCD linear image sensors with electronic shutter