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Driver circuit for CCD linear image sensor

C11165-02

For CCD image sensor (S11155/S11156-2048-02)

The C11165-02 is a driver circuit designed for Hamamatsu CCD image sensor S11155/S11156-2048-02. The C11165-02 can be used in spectrometers when combined with the S11155/S11156-2048-02.
The C11165-02 holds a CCD driver circuit, analog video signal processing circuit (16-bit A/D converter), timing generator, control circuit and power supply. The C11165-02 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 C11165-02 control and data acquisition. The C11165-02 also has a BNC connector for external trigger input and pulse output. The C11165-02 is compact, lightweight and very easy to handle.
This product comes with application software (DCam-USB) that runs on Microsoft® Windows® 10 (64-bit). It can be used to easily operate the C11165-02 from the PC. This product also includes DLLs that the user can use to create original control programs.

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 aquisition of CCD image sensor (S11155/S11156-2048-02)**

Note) Microsoft and Windows are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

The table below shows CCD linear image sensors applicable for the C11165-02.
Since the C11165-02 does not include CCD image sensors, so select the desired sensor and order it separately.

Type no.	Number of pixels	Number of effective pixels	Pixel size (µm)	Image size [mm (H) × mm (V)]
S11155-2048-02	2128 × 1	2048 × 1	14 × 500	28.672 × 0.500
S11156-2048-02			14 × 1000	28.672 × 1.000

Structure

Parameter	Specification	Unit
Output type	Digital	-
A/D conversion resolution	16	bit
Interface	USB 2.0	-

Absolute maximum ratings

Parameter	Symbol	Condition	Value	Unit
Supply voltage	-	Ta=25 °C	0 to +6.0	V
Input signal voltage	Vi	Ta=25 °C	0 to Vdd	V
Operating temperature*2	Topr		0 to +50	°C
Storage temperature*2	Tstg		-20 to +70	°C

*1: Trigger input
*2: No condensation
When there is a temperature difference between a product and the surrounding area in high humidity environment, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.
Note: Exceeding the absolute maximum ratings even momentarily may cause a drop in product quality. Always be sure to use the product within the absolute maximum ratings.

Electrical characteristics (Ta=25 °C)

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit
Readout frequency*3		fop		-	6	-	MHz
Line rate*4		-		-	-	2.78	kHz
Conversion gain		Gc	Gain 1	-	3	-	e^-/ADU
Trigger output voltage	High level	-	Vp=+5 V	3.8	-	-	V
	Low level			-	-	0.6	
Trigger input voltage	High level	-	Vp=+5 V	-	3.5	5	V
	Low level			-	-	1.5	
Current consumption		Ic	fop=6 MHz	-	940	1110	mA
Integration time*5		Tinteg		12	-	16 777 215	clock

*3: Fixed
*4: This is the theoretical value of the line rate that is determined by the internal operation timing of the driver circuit and is different from the line rate defined by the sensor specifications. This value differs from the line rate in a series of processes that acquire data from the circuit to a PC via the USB 2.0 port on the PC.
*5: 1 clock = 1/6 MHz ≈ 0.167 µs

Electrical and optical characteristics (Ta=25 °C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Readout noise	Nr	-	12	-	ADU
Dynamic range	DR	-	4000	-	-
Operating voltage*6	-	4.75	5	5.25	V

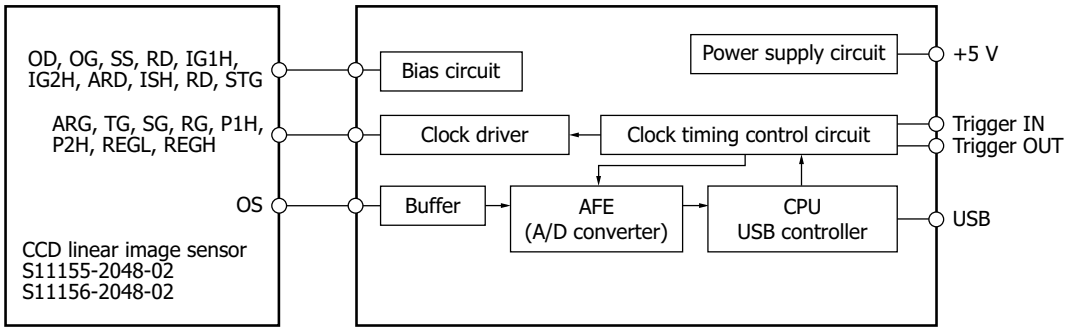
*6: Accessory DC cable for external power supply

Functions

Parameter		Specification
Operation mode display	Suspend mode (LED-off)	The power supply is turned off.
	Standby mode (LED-white)	It is a standby state, in which the data acquisition is possible.
	Data transfer mode (LED-green, aqua, blue)	In this mode, the driver circuit sends the data to PC.
Synchronous*7 mode	Internal synchronous mode ("INT" mode)	Data is acquired on the basis of the trigger timing generated by application software.
	External synchronous mode 1 ("EXT.EDGE" mode)	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.
	External synchronous mode 2 ("EXT.LEVEL" mode)	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.
Gain adjustment		The gain value can be varied in the range of "1 to 3" with the step of 1. Default value is "1".
Offset adjustment		The offset value can be varied in the range of "-255 to 255" with the step of 1. Default value is "10".
External signal	Input	Acquires data in synchronization with trigger pulse input to the BNC connector
	Output	Sets the timing for the pulse signal output from the pulse output BNC connector of the driver circuit
MPP operation	MPP mode	The REGH/REGL signal goes Low during integration.
	Non-MPP mode	The REGH/REGL signal is constantly fixed to High.
Electronic shutter ON/ OFF function	ON mode	Performs integration only during the set period in one line period
	OFF mode	Constantly performs integration in one line period

*7: External synchronous mode 2 ("EXT. LEVEL" mode) cannot be used when the electronic shutter is OFF.

Block diagram



C11165-02

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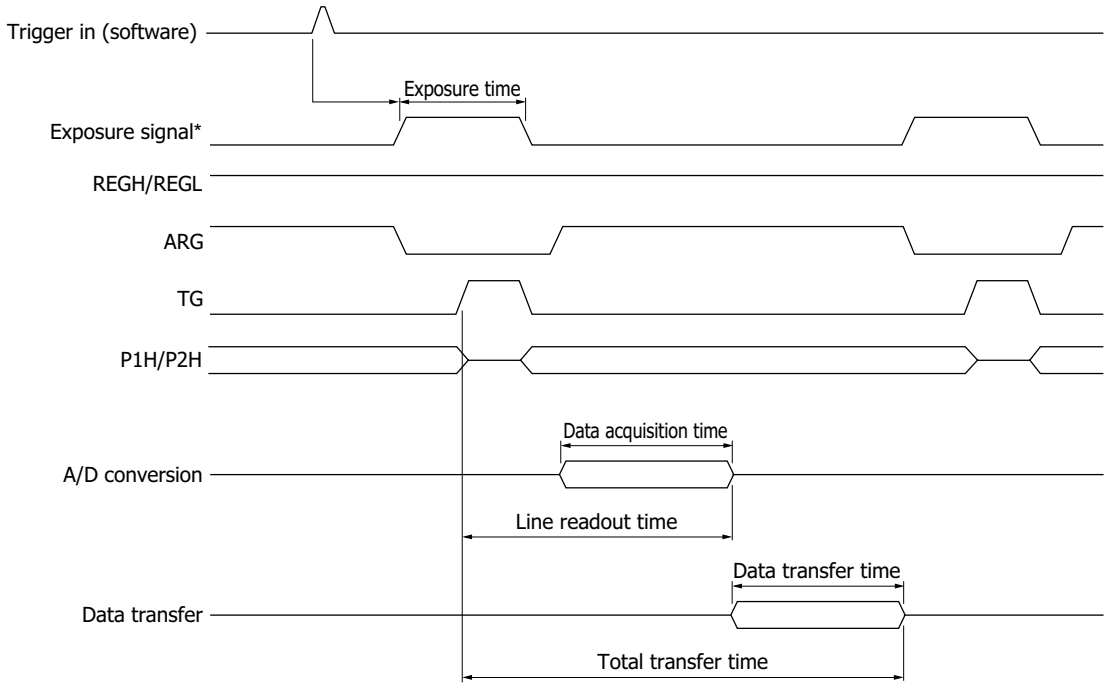
Timing chart

Internal synchronous mode ("INT" mode)

■ Non-MPP operation



* Internal signal

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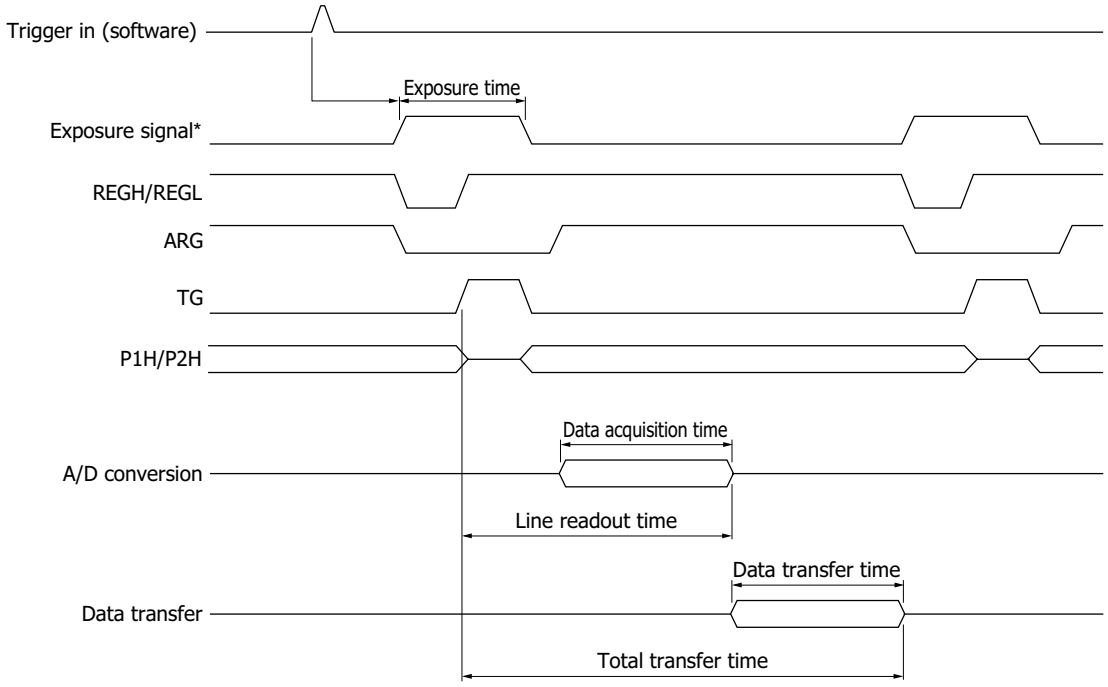
■ MPP operation

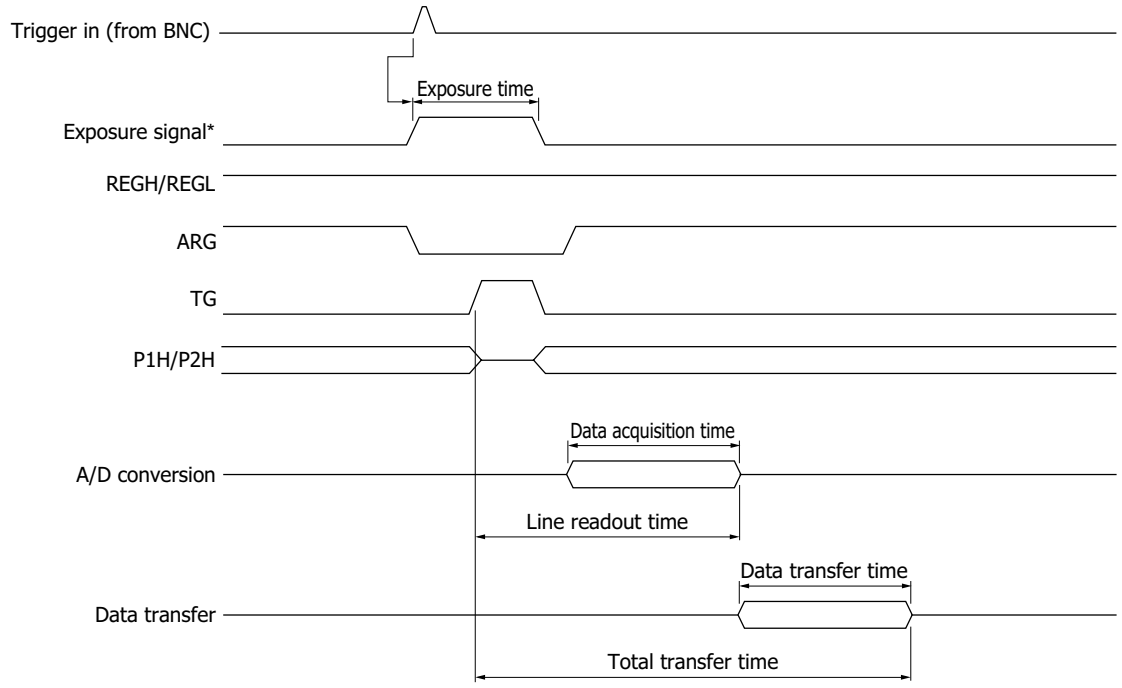


* Internal signal

KACCC0529EB

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

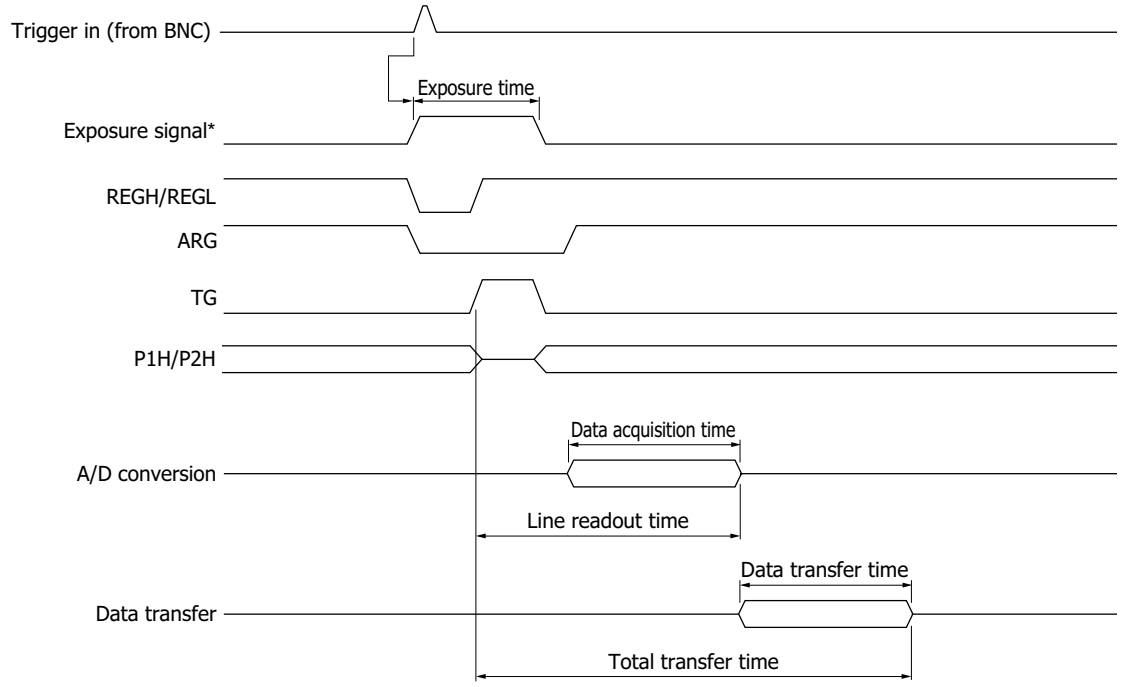
■ Non-MPP operation



* Internal signal

KACCC0530EB

■ MPP operation



* Internal signal

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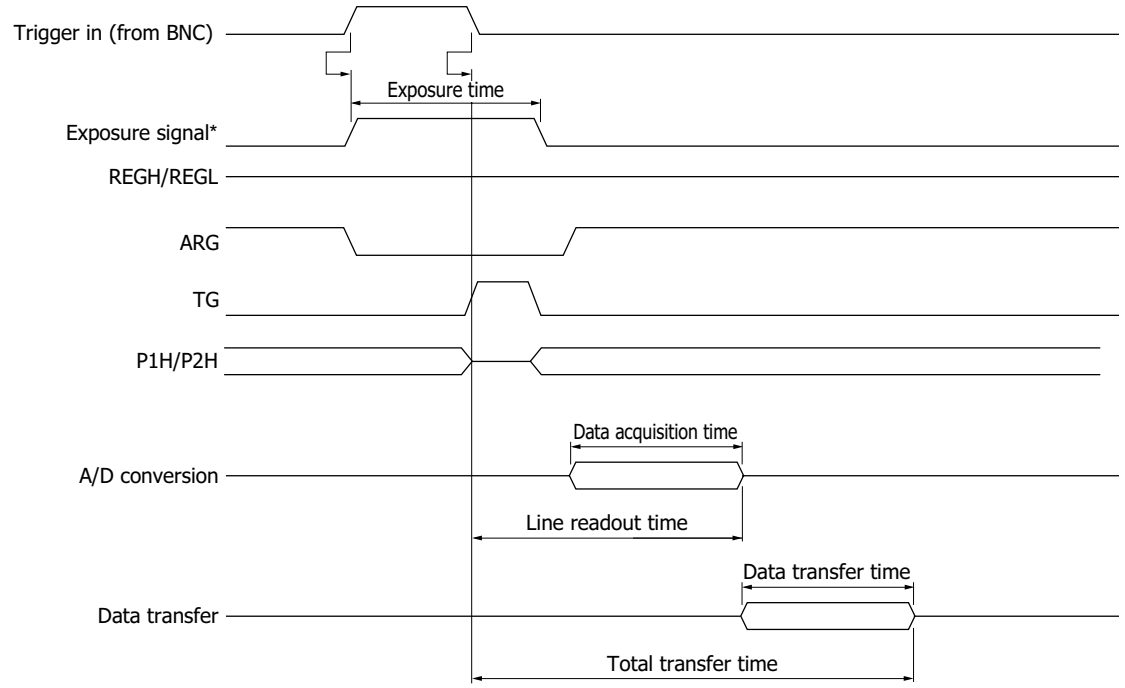
External synchronous mode 2 ("EXT.LEVEL" mode)

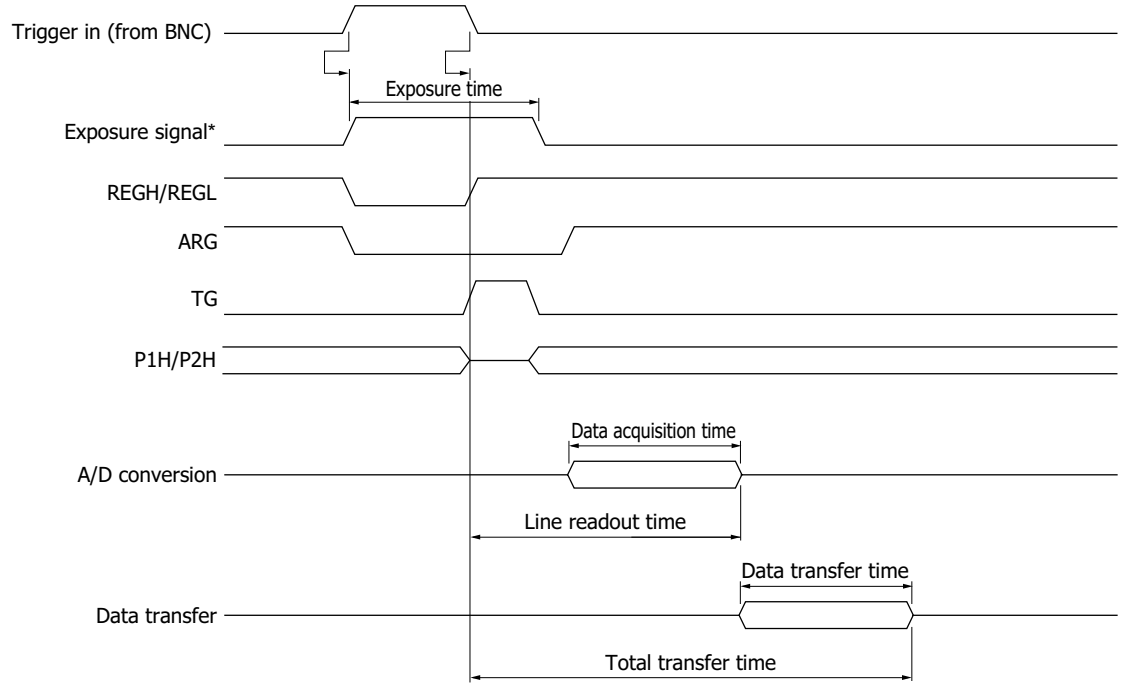
■ Non-MPP operation



* Internal signal

KACCC0532EB

■ MPP operation



* Internal signal

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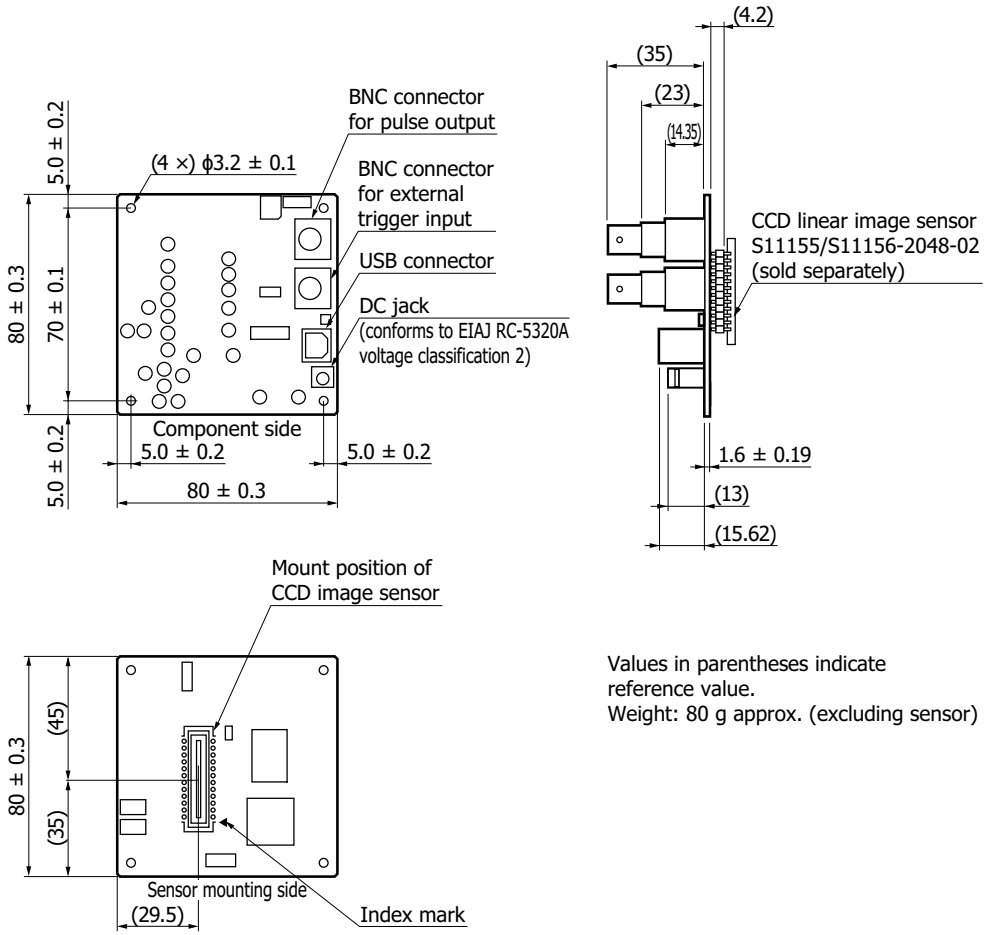
Dimensional outline (unit: mm)



Values in parentheses indicate reference value.
Weight: 80 g approx. (excluding sensor)

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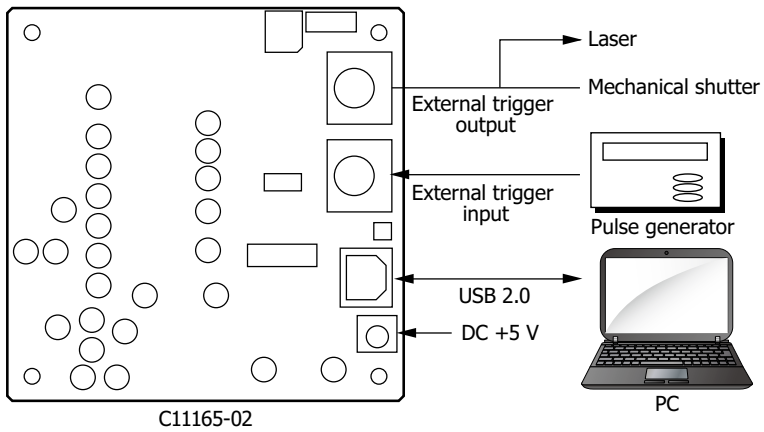
Connection examples

Refer to the following diagram to connect hardware peripherals.



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Accessories

· CD-ROM (includes C11165-02 instruction manual, application software, SDK)
· USB cable
· DC cable

Related information

www.hamamatsu.com/sp/ssd/doc_en.html

■ Precautions
· Disclaimer

■ Technical information
· Resistive gate type CCD linear image sensors with electronic shutter

Information described in this material is current as of March 2022.
Product specifications are subject to change without prior notice due to improvements or other reasons. This document has been carefully prepared and the information contained is believed to be accurate. In rare cases, however, there may be inaccuracies such as text errors. Before using these products, always contact us for the delivery specification sheet to check the latest specifications.
The product warranty is valid for one year after delivery and is limited to product repair or replacement for defects discovered and reported to us within that one year period. However, even if within the warranty period we accept absolutely no liability for any loss caused by natural disasters or improper product use.
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