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Driver circuits for CCD image sensor

C11287 C11288

Driver circuit for CCD image sensor (S10420/S11071/S11510 series)

The C11287 and C11288 are driver circuits designed for HAMAMATSU CCD image sensor S10420/S11071/S11510 series. The C11287 and C11288 can be used in spectrometer when combined with the S10420/S11071/S11510 series.
The C11287 and C11288 hold a CCD driver circuit, analog video signal processing circuit (14-bit A/D converter), timing generator, control circuit and power supply. The C11287 and C11288 convert 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 C11287 and C11288 control and data acquisition. The C11287 and C11288 also have a BNC connector for external trigger input and pulse output. The C11287 and C11288 are compact, lightweight and very easy to handle.
Application software (DCam-USB) that comes with the C11287 and C11288 allows easy operation from a PC running on Microsoft® Windows® 7 (32-bit, 64-bit)/10 (32-bit, 64-bit). DLL (DCamUSB.DDL) included with the application software. This software is available with DLL to help you develop your own software programs under various developmental environments.

Features

- **Built-in 14-bit A/D converter**
- **Adjustable offset**
- **Adjustable gain**
- **Interface of computer: USB 2.0**
- **Power supply: USB bus power (C11287)**
  DC+5 V (C11288)

Applications

- **Spectrometer**
- **Control of CCD image sensor (S10420/S11071/S11510 series) and data aquisition**

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 image sensor applicable for the C11287/C11288.
Since the C11287 and C11288 do not include a CCD image sensor, so select the desired sensor and order it separately.

Type no.	CCD area image sensor				
	Type no.	Number of pixels	Number of active pixels	Pixel size (μm)	Active area [mm (H) × mm (V)]
C11287	S10420-1004-01	1044 × 22	1024 × 16	14 × 14	14.336 × 0.224
	S10420-1006-01	1044 × 70	1024 × 64		14.336 × 0.896
	S10420-1104-01	2068 × 22	2048 × 16		28.672 × 0.224
	S10420-1106-01	2068 × 70	2048 × 64		28.672 × 0.896
	S11510-1006	1044 × 70	1024 × 64		14.336 × 0.896
	S11510-1106	2068 × 70	2048 × 64		28.672 × 0.896
C11288	S11071-1004	1044 × 22	1024 × 16	14 × 14	14.336 × 0.224
	S11071-1006	1044 × 70	1024 × 64		14.336 × 0.896
	S11071-1104	2068 × 22	2048 × 16		28.672 × 0.224
	S11071-1106	2068 × 70	2048 × 64		28.672 × 0.896

Structure

Parameter	Specification	Unit
Output type	Digital	-
A/D resolution	14	bit
Interface	USB 2.0	-

Absolute maximum ratings

Parameter	Symbol	Condition	Value	Unit
Supply voltage	Vdd	Ta=25 °C	0 to +6.0	V
Input signal voltage *1	Vi	Ta=25 °C	0 to +Vdd	V
Operating temperature	Topr	No dew condensation*2	0 to +50	°C
Strage temperature	Tstg	No dew condensation*2	-20 to +70	°C

*1: Trigger input
*2: 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.

Recommended driver conditions (Ta=25 °C)

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit
Trigger output voltage	High level	-	Vdd=+5V	3.8	-	Vdd	V
	Low level			-	-	0.6	V
Trigger input voltage	High level	-	Vdd=+5V	+3.5	-	Vdd	V
	Low level			-	-	1.5	V
Operating voltage		-	C11287: 360 mA typ. C11288: 650 mA typ.	+4.5	+5.0	+5.5	V

Electrical characteristics (Ta=25 °C)

Parameter	Symbol	Image sensors	C11287			C11288			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Readout frequency	fop		-	250k	-	-	4M	-	Hz
Conversion gain (Gain=1)	Gc		-	12.2	-	-	12.2	-	e^-/ADU
Frame readout time	-	S10420-1004-01	-	4.8	-	-			ms
	-	S10420-1006-01 S11510-1000	-	5.7	-				
	-	S10420-1104-01	-	8.9	-				
	-	S10420-1106-01 S11510-1106	-	9.8	-				
	-	S11071-1004	-			-	0.62	-	
	-	S11071-1006				-	1.58	-	
	-	S11071-1104				-	0.79	-	
	-	S11071-1106				-	1.75	-	
Data transfer time	-	S10420-1004-01	-	4.3	-	-			
	-	S10420-1006-01 S11510-1000	-	4.3	-				
	-	S10420-1104-01	-	8.4	-				
	-	S10420-1106-01 S11510-1106	-	8.4	-				
	-	S11071-1004	-			-	0.22	-	
	-	S11071-1006				-	0.22	-	
	-	S11071-1104				-	0.44	-	
	-	S11071-1106				-	0.44	-	
Total transfer time	-	S10420-1004-01	-	4.8	-	-			
	-	S10420-1006-01 S11510-1000	-	5.7	-				
	-	S10420-1104-01	-	8.9	-				
	-	S10420-1106-01 S11510-1106	-	9.8	-				
	-	S11071-1004	-			-	0.84	-	
	-	S11071-1006				-	1.80	-	
	-	S11071-1104				-	1.23	-	
	-	S11071-1106				-	2.19	-	
Current consumption	Ic	S10420-1106-01	-	360	400	-			mA
		S11071-1106	-			-	650	700	

Electrical and optical characteristics (Ta=25 °C)

Parameter	Symbol	Condition	C11287			C11288			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Readout noise	Nr		-	3	-	-	7	-	ADU rms
Dynamic range	DR		-	5461	-	-	2730	-	-

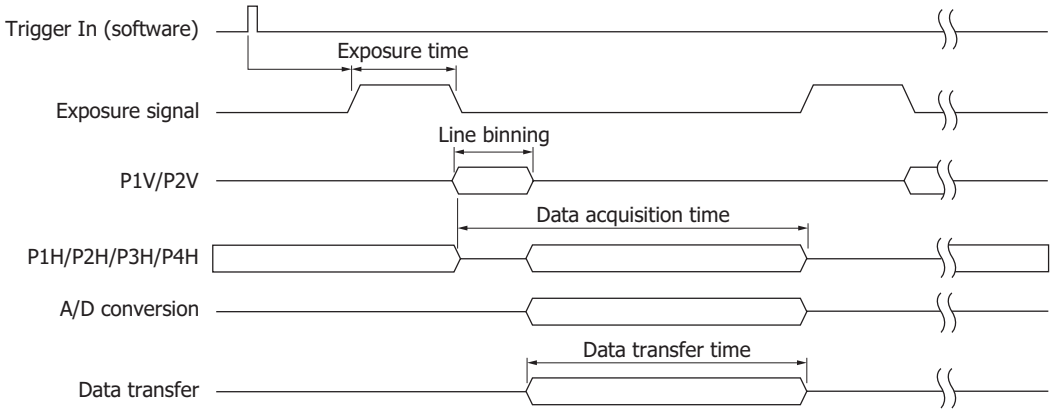
Functions

Parameter		Specification
Operating mode setting	Suspend mode (LED-off)	The power supply is turned off.
	Standby mode (LED-white)	It is 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.
Selectable data acquisition modes	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 10" with the step of 1. Default value is "1".
Offset adjustment		The offset value can be varied in the range of "0 to 1020" with the step of 4. Default value is "40".
Pulse output signal setting		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.

Timing chart

C11287

■ Internal synchronous mode ("INT" mode)



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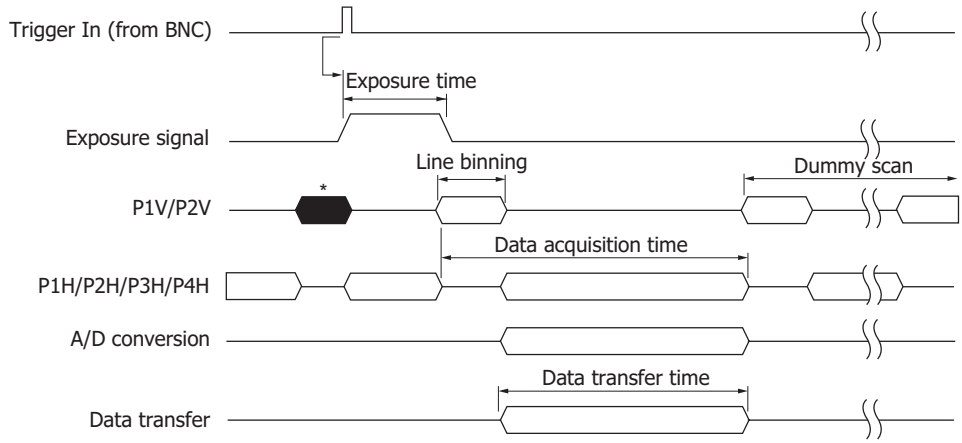
■ External synchronous mode 1 ("EXT.EDGE" mode)



* When an external trigger signal is input, accumulation is started immediately.

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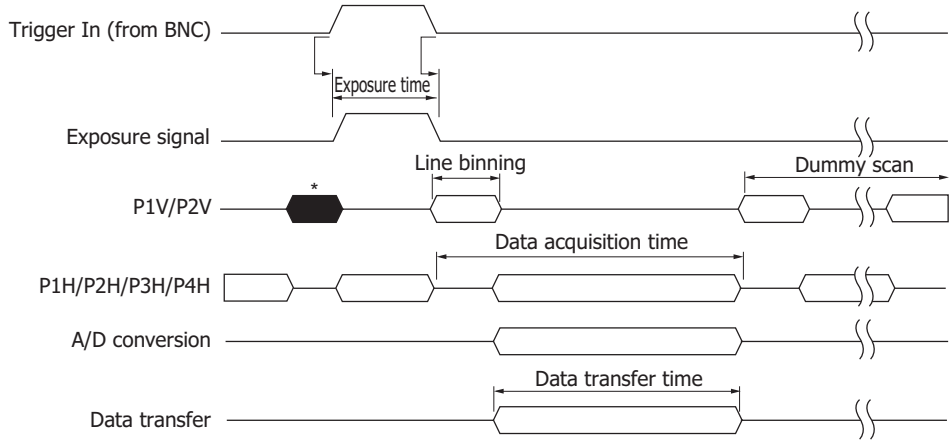
■ External synchronous mode 2 ("EXT.LEVEL" mode)



* When an external trigger signal is input, accumulation is started immediately.

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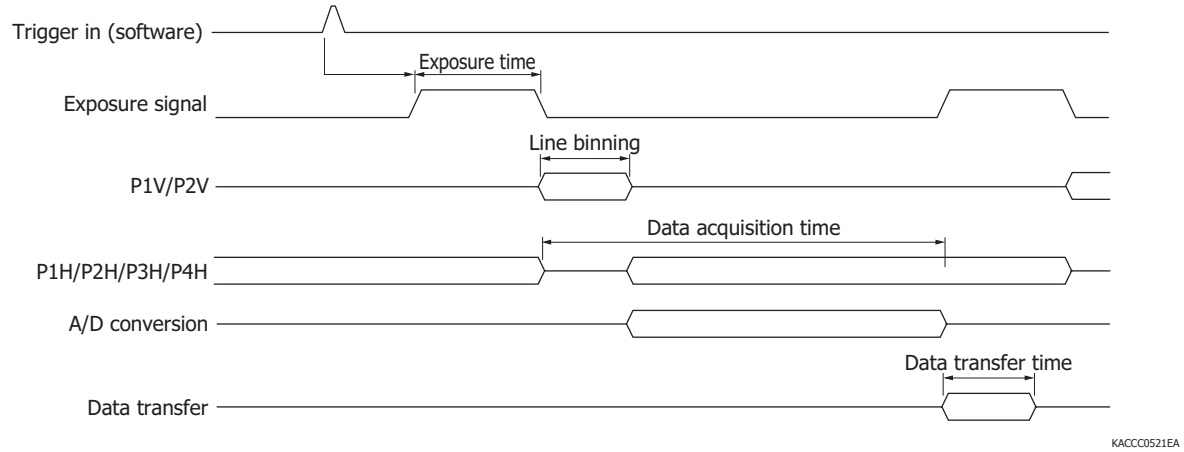
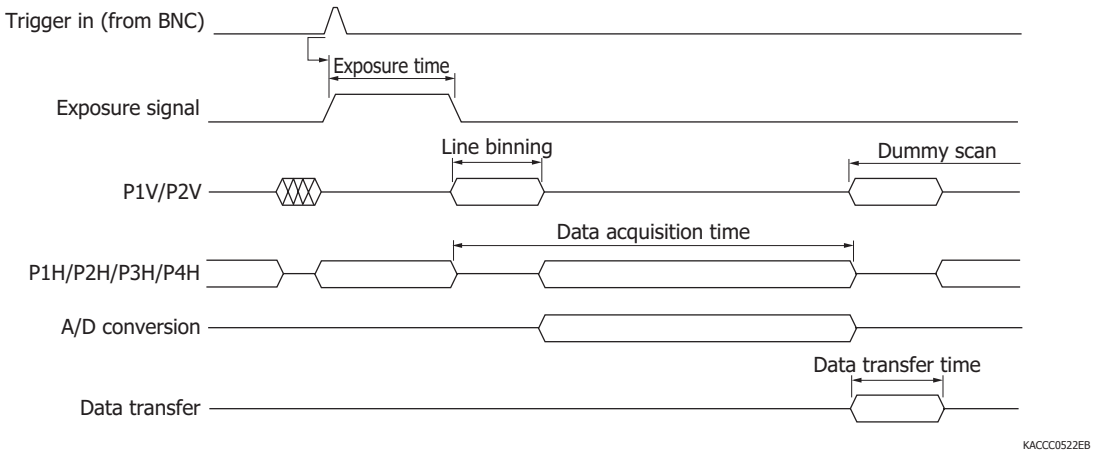
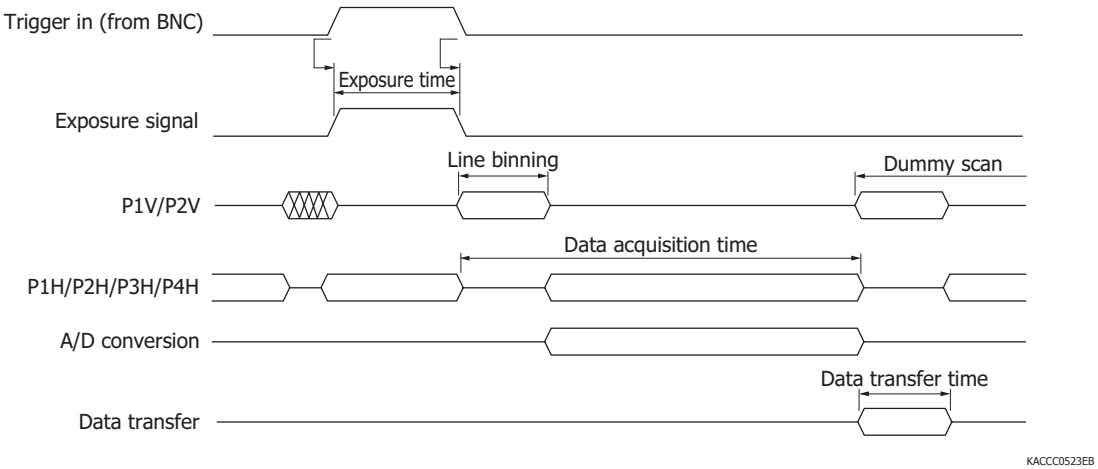
■ Internal synchronous mode ("INT" mode)



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

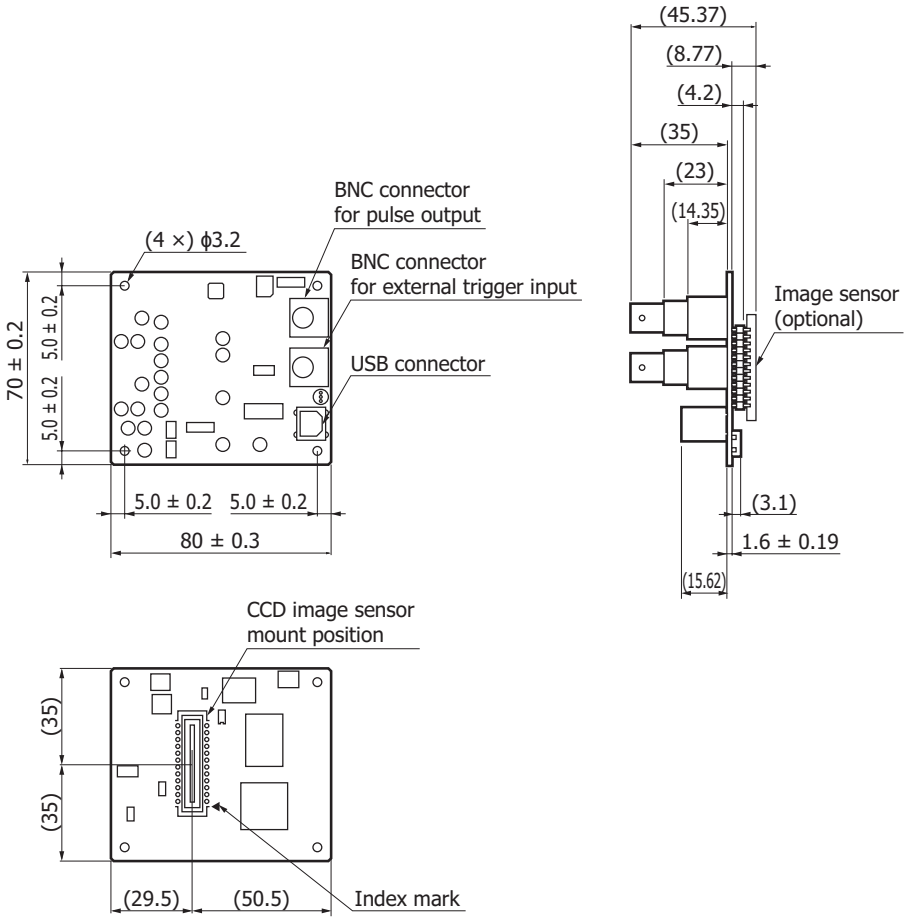


■ External synchronous mode 2 ("EXT.LEVEL" mode)



Dimensional outlines (unit: mm)

C11287



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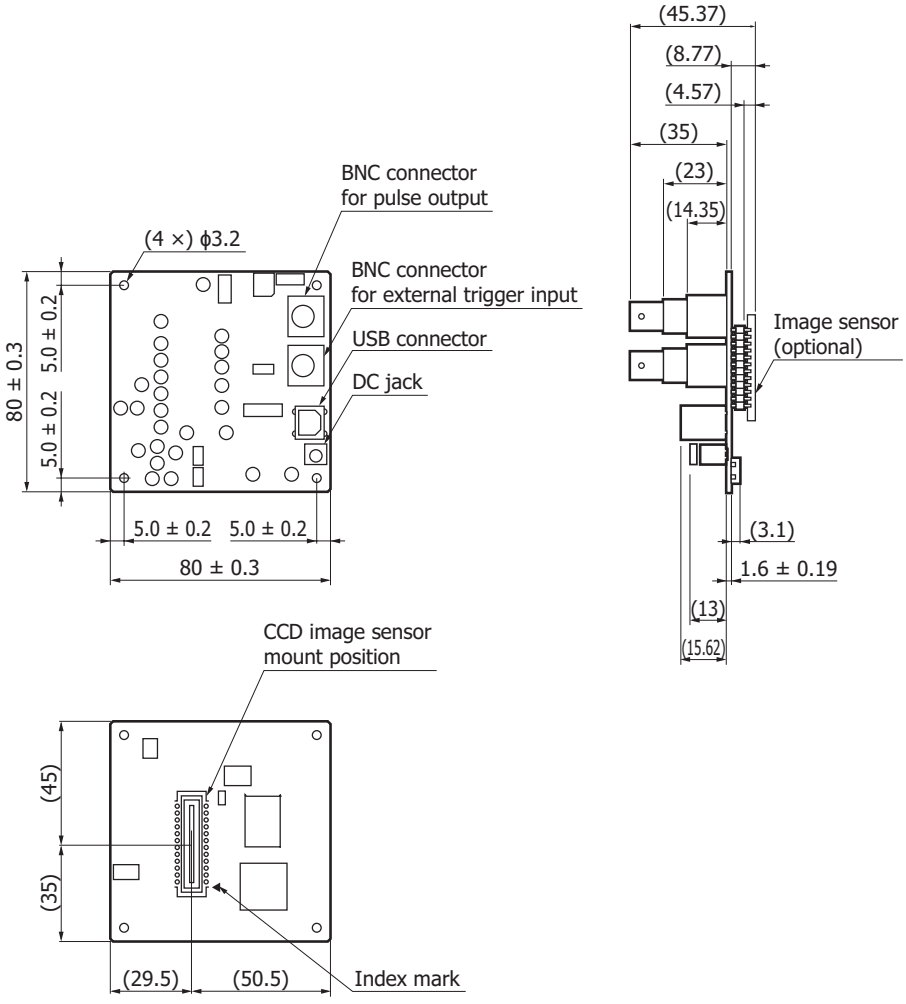

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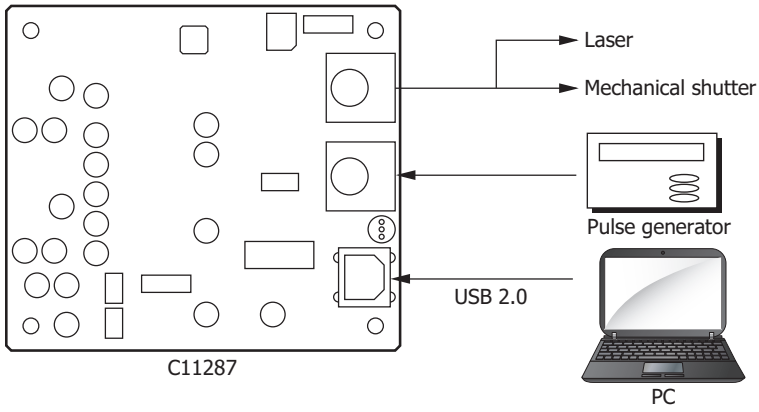
Connection examples

Refer to the following diagram to connect hardware peripherals.

C11287



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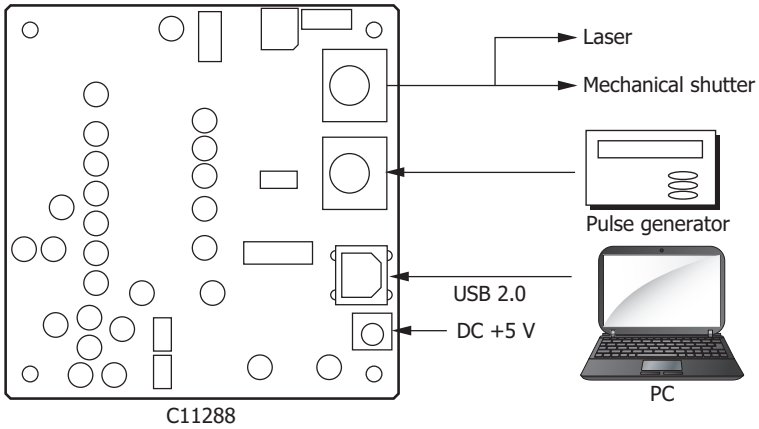

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Accessories

· CD-ROM (instruction manual, application software, SDK)
· USB cable
· AC adapter (C11288)

Related information

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

■ Precautions
· Disclaimer
· Image sensors

Related product datasheet

Available at our website (www.hamamatsu.com)
· CCD image sensor S11071/S10420-01 series
· CCD image sensor S11510 series

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