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Driver circuits for CCD image sensor

C11287-01 C11288-01

For CCD area image sensors (S10420/S14650/S16010/S11071/S14660 series)

The C11287-01 and C11288-01 are driver circuits developed for Hamamatsu CCD area image sensors S10420/S14650/S16010/S11071/S14660 series. They consist of a CCD driver circuit, an analog video signal processing circuit (16-bit A/D converter), timing generator, control circuit, and power supply, and convert analog video signals received from a CCD into digital signals and output them. They can be controlled from a PC by connecting them to a PC with the USB connector (USB 2.0) attached to the main unit. The main unit has a BNC connector for external trigger input and a BNC connector for pulse output. In addition, the C11287-01 and C11288-01 are compact, lightweight, and easy to handle.
These products come with application software (DCam-USB) that runs on Microsoft® Windows® 10 (64-bit).It can be used to easily operate the C11287-01/C11288-01 from the PC. These products also include DLLs that the user can use to create original control programs.

Features

- **Built-in 16-bit A/D converter**
- **Offset adjustment function**
- **Gain adjustment function**
- **Interface: USB 2.0**
- **Power supply: USB bus powered (C11287-01)**
  DC +5 V (C11288-01)

Applications

- **Spectrometers**
- **CCD area image sensor (S10420/S14650/S16010/S11071/S14660 series) control and data acquisition**

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

The C11287-01 and C11288-01 are each compatible with the following CCD image sensors. Note that sensors are not included. Please purchase it separately.

Type no.	CCD area image sensors				
	Type no.	Number of pixels	Number of effective pixels	Pixel size (µm)	Photosensitive area [mm (H) × mm (V)]
C11287-01	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
	S16010-1006	1044 × 70	1024 × 64		14.336 × 0.896
	S16010-1106	2068 × 70	2048 × 64		28.672 × 0.896
	S14650-1024	1044 × 198	1024 × 192		14.336 × 2.688
	S14650-2048	2068 × 198	2048 × 192		28.672 × 2.688
C11288-01	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
	S14660-1024	1044 × 198	1024 × 192		14.336 × 2.688
	S14660-2048	2068 × 198	2048 × 192		28.672 × 2.688

Structure

Parameter	Specification	Unit
Output type	Digital	-
A/D resolution	16	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*2	Topr		0 to +50	°C
Storage temperature*2	Tstg		-20 to +70	°C

*1: Trigger input
*2: No dew condensation
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 drive conditions (Ta=25 °C)

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit
Trigger output voltage	High level	-	Vdd=+5 V	+3.8	-	Vdd	V
	Low level			-	-	+0.6	V
Trigger input voltage	High level	-	Vdd=+5 V	+3.5	-	Vdd	V
	Low level			-	-	+1.5	V
Operating voltage		-	C11287-01: 370 mA typ. C11288-01: 650 mA typ.	+4.75	+5.0	+5.25	V

Electrical characteristics (Ta=25 °C)

Parameter	Symbol	Image sensor	C11287-01			C11288-01			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Readout frequency*3	fop		-	0.25	-	-	4	-	MHz
Line rate*4	-	S10420-1004-01	-	-	0.21	-			kHz
	-	S10420-1006-01, S16010-1006	-	-	0.18				
	-	S10420-1104-01	-	-	0.11				
	-	S10420-1106-01, S16010-1106	-	-	0.1				
	-	S14650-1024	-	-	0.09				
	-	S14650-2048	-	-	0.07				
	-	S11071-1004	-			-	-	1.42	
	-	S11071-1006				-	-	0.6	
	-	S11071-1104				-	-	1.04	
	-	S11071-1106				-	-	0.52	
	-	S14660-1024				-	-	0.29	
	-	S14660-2048				-	-	0.15	
Conversion gain (gain=1)	Gc		-	4.5	-	-	3	-	e^-/ADU
Current consumption	Ic		-	370	420	-	650	700	mA

*3: The readout frequency is fixed.
*4: Theoretical line rate value determined by the internal operation timing of the driver circuit. This is different from the line rate defined in the sensor specifications. This value is also different from the overall processing line rate of acquiring data from the driver circuit into a PC via USB.

Electrical and optical characteristics (Ta=25 °C)

Parameter	Symbol	Condition	C11287-01			C11288-01			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Readout noise	Nread		-	8	-	-	17	-	ADU rms
Dynamic range	Drange		-	8100	-	-	3800	-	-

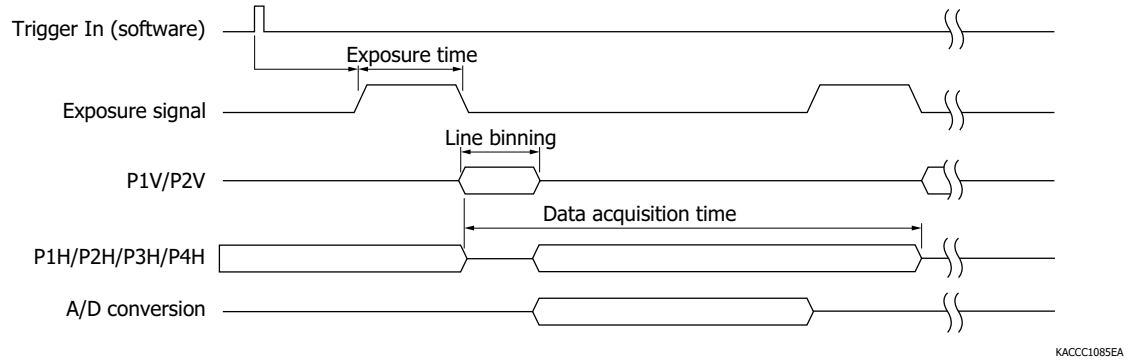
Function

Parameter		Specification
Data acquisition mode	Internal synchronization mode ("INT" mode)	Data is acquired according to the trigger timing from the application software.
	External synchronization mode 1 ("EXT.EDGE" mode)	Data is acquired in synchronous with the external trigger signal input from Trigger In. Integration starts in synchronous with the edge of the external trigger signal. Integration is done at the integration time set with the application software, then data is output.
	External synchronization mode 2 ("EXT.LEVEL" mode)	Data is acquired in synchronous with the external trigger signal input from the Trigger In connector. Integration is done for the same period of time as the pulse width of the external trigger signal, then data is output.
Gain adjustment		It can be set to whole numbers in the ranges "1 to 6" (C11287-01) and "1 to 5" (C11288-01). The default value is "1".
Offset adjustment		It can be set to whole numbers in the range "-255 to +255". The default value is "10".
Pulse output setting		It sets the pulse signal output from the BNC connector for pulse output. (Output ON/OFF, signal polarity, delay time, pulse width) This signal is output in synchronous with the starting point of integration time of the CCD image sensor. The signal output level is H-CMOS compatible.
Saving settings		Settings for data acquisition (gain, offset, etc.) can be saved in the circuit's internal memory.

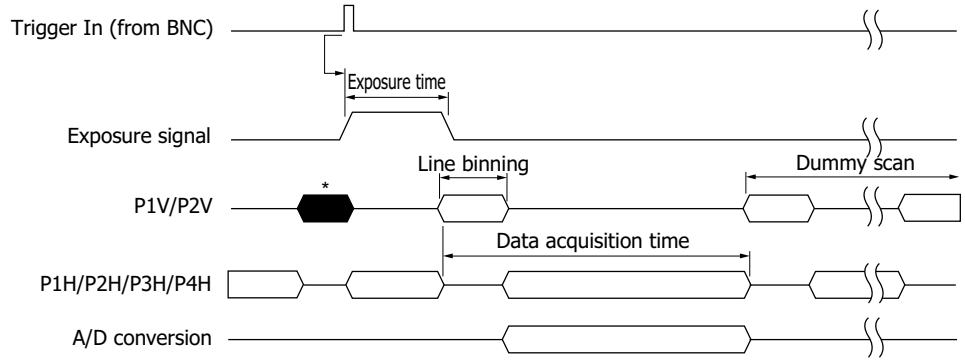
Note: For details on each function, refer to the instruction manual that comes with the product.

Timing chart

■ Internal synchronization mode ("INT" mode)

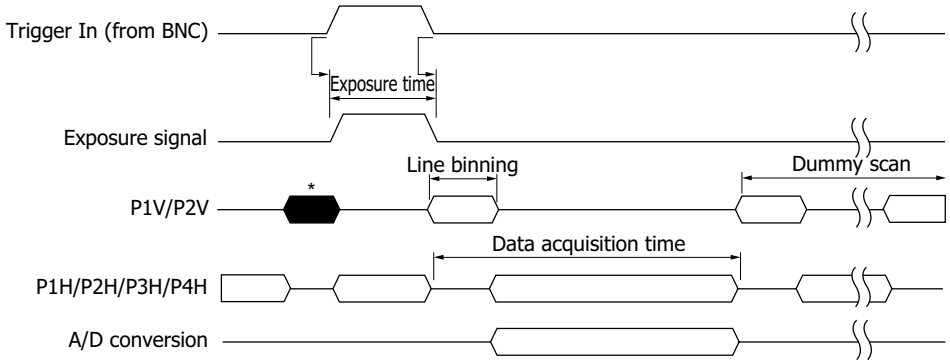


■ External synchronization mode 1 ("EXT.EDGE" mode)



* Integration starts immediately when an external trigger signal is input.

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



* Integration starts immediately when an external trigger signal is input.

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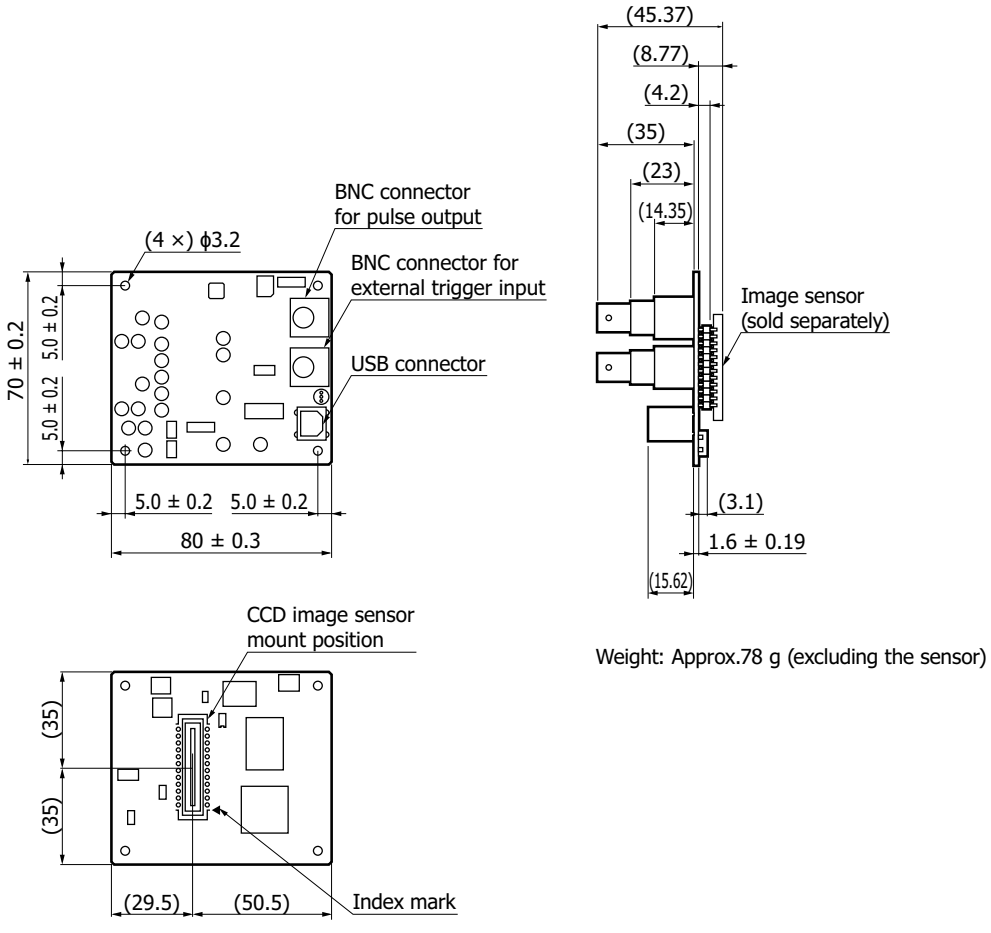
Dimensional outline (unit: mm)

C11287-01



Weight: Approx.78 g (excluding the sensor)

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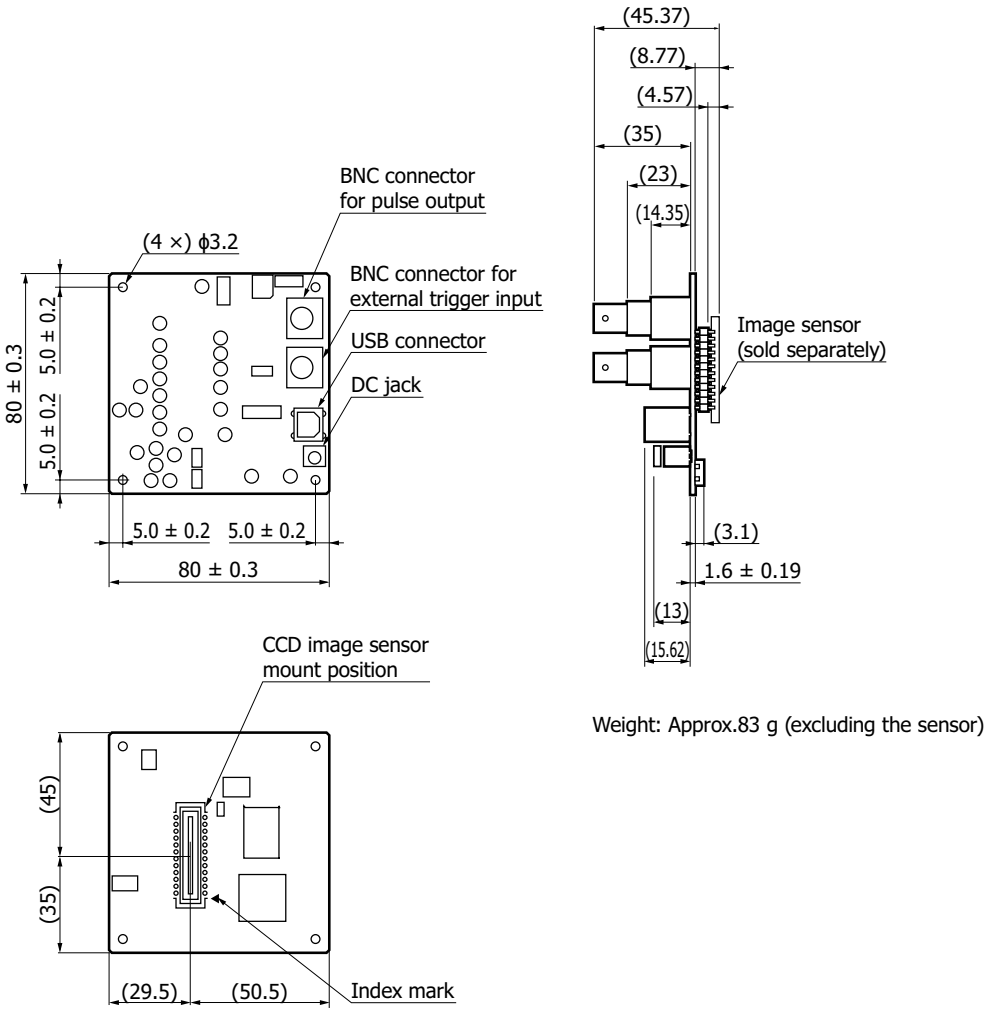
C11288-01



Weight: Approx.83 g (excluding the sensor)

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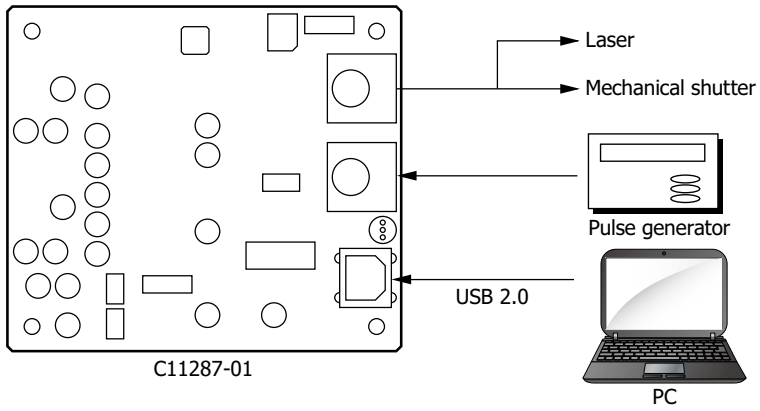
Connection examples

See the figures below for connection with peripheral devices.

C11287-01



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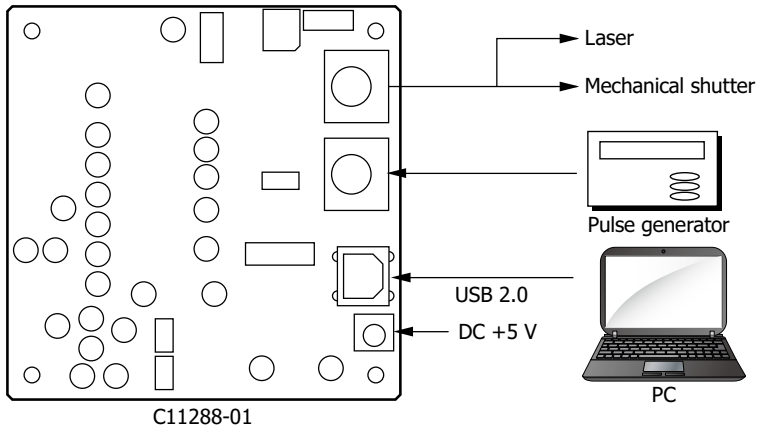
C11288-01



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Accessories

· CD-ROM (includes the instruction manual, application software, and SDK)
· USB cable
· Power cable: 1800 mm in length (C11288-01)

Related information

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

■ Precautions
· Disclaimer
· Image sensors

HAMAMATSU www.hamamatsu.com

HAMAMATSU PHOTONICS K.K., Solid State Division
1126-1 Ichino-cho, Chuo-ku, Hamamatsu City, 435-8558 Japan, Telephone: (81)53-434-3311, Fax: (81)53-434-5184
U.S.A.: HAMAMATSU CORPORATION: 360 Foothill Road, Bridgewater, NJ 08807, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218
Germany: HAMAMATSU PHOTONICS DEUTSCHLAND GMBH: Arzbergerstr. 10, 82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-375-0, Fax: (49)8152-265-8 E-mail: info@hamamatsu.de
France: HAMAMATSU PHOTONICS FRANCE S.A.R.L.: 19 Rue du Saule Trapu, Parc du Moulin de Massy, 91882 Massy Cedex, France, Telephone: (33)1 69 53 71 00, Fax: (33)1 69 53 71 10 E-mail: infos@hamamatsu.fr
United Kingdom: HAMAMATSU PHOTONICS UK LIMITED: 2 Howard Court,10 Tewin Road, Welwyn Garden City, Hertfordshire, AL7 1BW, UK, Telephone: (44)1707-294888, Fax: (44)1707-325777 E-mail: info@hamamatsu.co.uk
North Europe: HAMAMATSU PHOTONICS NORDEN AB: Torshamnsgatan 35, 16440 Kista, Sweden, Telephone: (46)8-509-031-00, Fax: (46)8-509-031-01 E-mail: info@hamamatsu.se
Italy: HAMAMATSU PHOTONICS ITALIA S.R.L.: Strada della Moia, 1 int. 6 20044 Arese (Milano), Italy, Telephone: (39)02-93 58 17 33, Fax: (39)02-93 58 17 41 E-mail: info@hamamatsu.it
China: HAMAMATSU PHOTONICS (CHINA) CO., LTD.: 1201, Tower B, Jiaming Center, 27 Dongsanhuan Beilu, Chaoyang District, 100020 Beijing, P.R. China, Telephone: (86)10-6586-6006, Fax: (86)10-6586-2866 E-mail: hpc@hamamatsu.com.cn
Taiwan: HAMAMATSU PHOTONICS TAIWAN CO., LTD.: 13F-1, No.101, Section 2, Gongdao 5th Road, East Dist., Hsinchu City, 300046, Taiwan(R.O.C) Telephone: (886)3-659-0080, Fax: (886)3-659-0081 E-mail: info@hamamatsu.com.tw

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