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Driver circuit for CCD linear image sensor

C11160

For CCD image sensor (S11151-2048)

The C11160 is a driver circuit designed for Hamamatsu CCD image sensor S11151-2048. The C11160 can be used in spectrometers when combined with the S11151-2048.

The C11160 holds a CCD driver circuit, analog video signal processing circuit (16-bit A/D converter), timing generator, control circuit and power supply. The C11160 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 C11160 control and data acquisition. The C11160 also has a BNC connector for external trigger input and pulse output. The C11160 is compact, lightweight and very easy to handle.

Application software (DCam-USB) that comes with the C11160 allows easy operation from a PC running on Windows 7 (32-bit, 64-bit). A function library (DCamUSB.DLL) included with the application software helps you to develop your own software under various developmental environments.

Features

→ **Built-in 16-bit A/D converter**

→ **Adjustable offset**

→ **Adjustable gain**

→ **Interface of computer: USB 2.0**

→ **Power supply: USB bus power**

Applications

→ **Spectrometer**

→ **Control and data aquisition of CCD image sensor (S11151-2048)**

The table below shows CCD linear image sensors applicable for the C11160.
Since the C11160 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)]
S11151-2048	2056 × 1	2048 × 1	14 × 200	28.672 × 0.200

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	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
    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		-	1	-	MHz
Line rate[*4]		-		-	-	483	Hz
Conversion gain		Gc	Gain 1	-	3	-	e⁻/ADU
Trigger output voltage	High level	-		3.8	-	-	V
	Low level			-	-	0.6	
Trigger input voltage	High level	-		-	3.5	5	V
	Low level			-	-	1.5	
Current consumption		Ic	fop=1 MHz	-	360	500	mA
Integration time[*5]		Tinteg		2071	-	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 = 1/1 MHz ≈ 1 μs

Electrical and optical characteristics (Ta=25 °C)

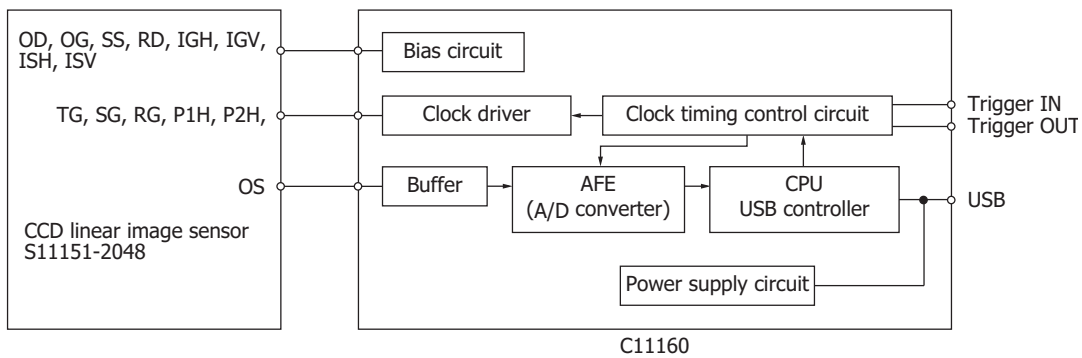| Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Readout noise	Nr	Gain 1	-	15	-	ADU
Dynamic range	DR	Gain 1	-	4000	-	-
Operating voltage[*6]	-		4.5	5	5.5	V

[*6]: USB bus powered

Functions

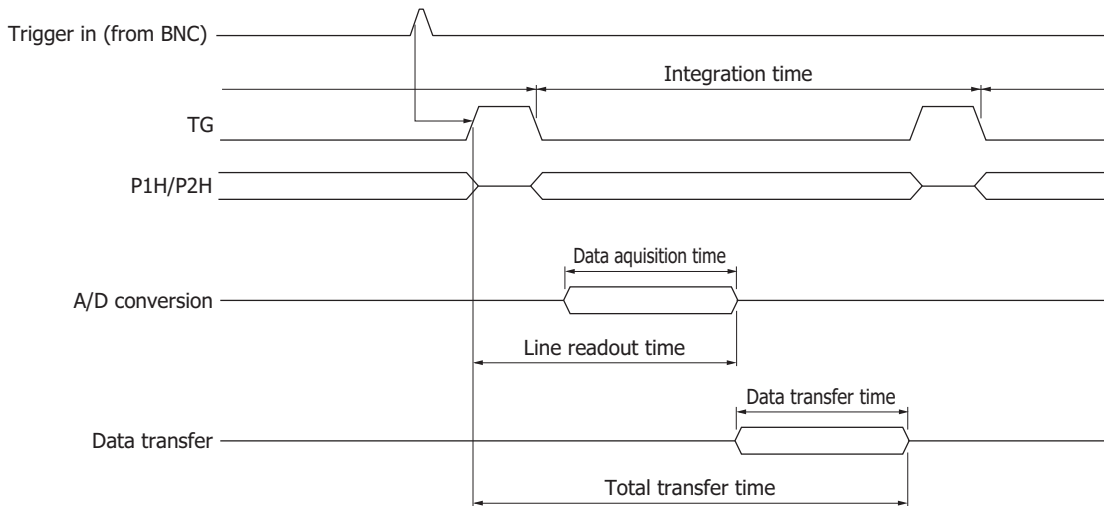| Parameter		Specification
Operation mode display	"Suspend" mode (LED-off)	The power supply is turned off.
	"Standby" mode (LED-white)	It is a standby state, in which the data acquisition is possible.
	"Data transfer" mode (LED-green, aqua, blue)	In this mode, the driver circuit sends the data to PC.
Synchronous 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.
Gain adjustment		The gain value can be varied in the range of "1 to 3" with the step of 1.
Offset adjustment		The offset value can be varied in the range of "-255 to 255" with the step of 1.
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

Block diagram

KACCC0756EA

Timing chart

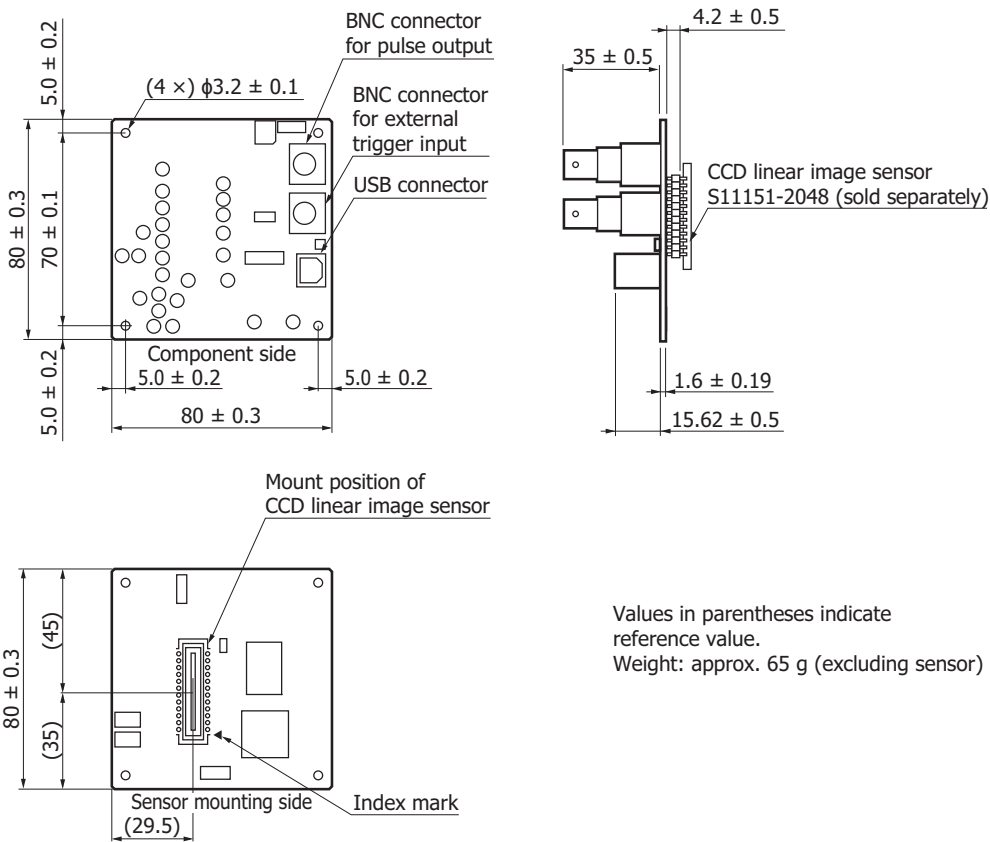### Internal synchronous mode ("INT" mode)

Trigger in (software)

Integration time

TG

P1H/P2H

Data aquisition time

A/D conversion

Line readout time

Data transfer time

Data transfer

Total transfer time
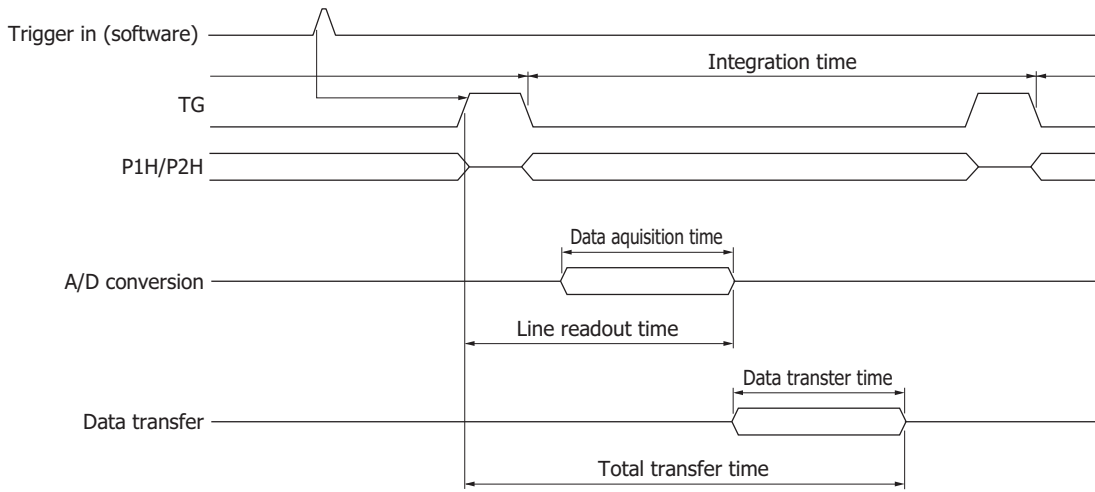
KACCC0670EA

External synchronous mode ("EXT.EDGE" mode)

Trigger in (from BNC)

Integration time

TG

P1H/P2H

Data aquisition time

A/D conversion

Line readout time

Data transfer time

Data transfer

Total transfer time

KACCC0671EA

Dimensional outline (unit: mm)

BNC connector for pulse output

BNC connector for external trigger input

USB connector

(4 ×) φ3.2 ± 0.1

5.0 ± 0.2

80 ± 0.3

70 ± 0.1

5.0 ± 0.2

5.0 ± 0.2

Component side

5.0 ± 0.2

5.0 ± 0.2

80 ± 0.3

4.2 ± 0.5

35 ± 0.5

CCD linear image sensor
S11151-2048 (sold separately)

1.6 ± 0.19

15.62 ± 0.5

Mount position of
CCD linear image sensor

80 ± 0.3

(45)

(35)

Sensor mounting side

Index mark

(29.5)

Values in parentheses indicate
reference value.
Weight: approx. 65 g (excluding sensor)

KACCA0318EA

Connection examples

Refer to the following diagram to connect hardware peripherals.

Laser

Mechanical shutter

External trigger
output

External trigger
input

Pulse generator

USB 2.0

PC
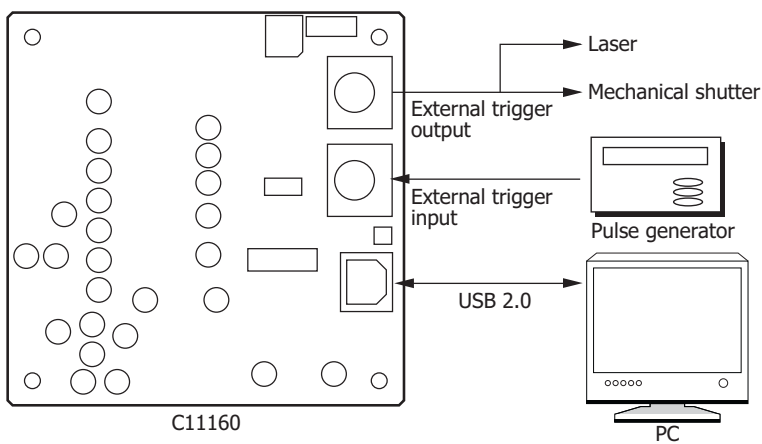
C11160

KACCC0669EA

Accessories

· CD-ROM (includes C11160 instruction manual, application software, SDK)
· USB cable

Related information

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

Precautions

· Disclaimer
· Image sensors

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