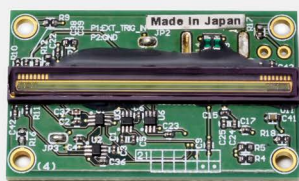


# Image sensor modules



C15774 series

**Compact circuit suitable for incorporation into spectrometers, etc.**

The C15774 series is an image sensor module with a built-in CMOS linear image sensor. By connecting the C15774 series to a PC through the USB 2.0 interface, you can control the circuit and capture 12-bit digital output data, converted from the sensor's analog video signal. The circuit is compact, making it easy to be installed in optical systems. Also main unit is provided with through holes for external trigger input, allowing it to work synchronously with external devices.

## Features

- **Compact: Easy to install in optical systems**
- **Built-in 12-bit A/D converter**
- **USB 2.0 interface (Full Speed)**
- **Single power supply: USB bus powered (DC +5 V)**
- **Parallel bus output can be performed by using the flexible flat cable**
- **External synchronization operation capable**

## Applications

- **Spectrophotometry**
- **Laser spot position detection**
- **Encoder**

## Built-in sensor

CMOS linear image sensors				
Type no.	Spectral response range (nm)	Number of effective pixels	Pixel size (μm)	Photosensitive area length (mm)
C15774-01	200 to 1000	2048	14 × 200	28.672
C15774-02		4096	7 × 200	

## Structure (Typ. Ta=25 °C, unless otherwise noted)

Parameter	Specification	Unit
Output type	Digital	-
A/D resolution	12	bit
Weight	Approx. 6	g

## Absolute maximum ratings (Typ. Ta=25 °C, unless otherwise noted)

Parameter	Symbol	Condition	Value	Unit
Supply voltage	Vdd	Ta=25 °C	+6.0	V
Operating temperature	Topt	No dew condensation*1	0 to +50	°C
Storage temperature	Tstg	No dew condensation*1	-20 to +70	°C

\*1: When there is a temperature difference between a product and the surrounding area in high humidity environments, 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 operating conditions (Typ. Ta=25 °C, unless otherwise noted)

Parameter	Symbol	Condition	Value	Unit
Supply voltage	Vdd		+5.0	V
Operating temperature	Topr	No dew condensation	0 to +40	°C

### ■ Electrical characteristics (Ta=25 °C, unless otherwise noted)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating voltage	Vop		+4.75	+5.0	+5.25	V
Readout frequency*2	fop		-	500	-	kHz
Conversion gain	Gc	Gain=1	-	0.98	-	mV/ADU
Current consumption*3	Ic		-	80	120	mA
Trigger input voltage	VH		+3.5	+5.0	+5.5	V
	VL		-0.8	0	+1.5	V
Start pulse period*4	tpi(ST)		Refer to the table below*5	-	2,147,483,648	CLK*6
High start pulse period	thp(ST)		-	-	tpi(ST)-200	CLK*5

\*2: Fixed value

\*3: Value when driven with USB bus power

\*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 rate (system rate) of acquiring data from the circuit into the PC via the USB 2.0 port. Incidentally, this system rate depends on the PC environment.

\*5: The value differs depending on the settings on readout pixels numbers.

\*6: 1CLK = 1/fop = 1/500 kHz = 2 μs

### ■ Electrical and optical characteristics (Ta=25 °C, unless otherwise noted)

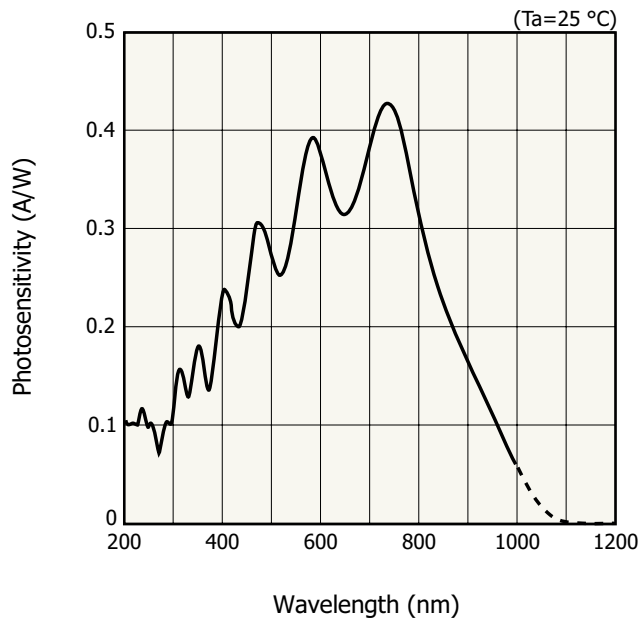
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Readout noise	Nr	Gain=1	-	0.9	-	ADU rms
Saturation output	Dsat	Gain=1	3,480	-	4,095	ADU
Dynamic range*7	DR	Gain=1	-	4,550	-	-

\*7: DR = Dsat/Nread

### ■ Line rate and start pulse period

Readout pixels	Line rate Max. (Hz)		Start pulse period Min. (CLK)	
	Real-time transfer	Memory transfer	Real-time transfer	Memory transfer
256	800	1400	625	357
512	400	800	1250	625
1024	200	400	2500	125
2048	100	200	5000	2500
4096	50	100	10000	5000

Note: Refer to "Data transfer mode" in "Function" (P4) for the transfer method.

**▣ Spectral response (typical example)**

KMPDB0467EB

## Function

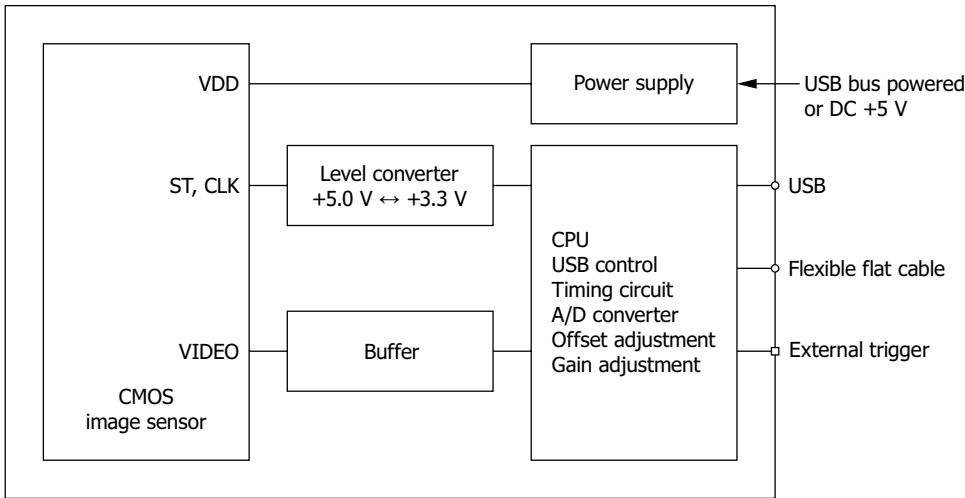
Parameter	Specification	
Operation mode*8 *9	Internal synchronization mode	Data is acquired according to the trigger timing from the application software.
	External edge mode	
	External level mode	Data is acquired according to the trigger timing from the application software and the external trigger input timing from the external trigger terminal.
	External gate mode	
	External edge one-shot mode	
Gain adjustment	The gain can be set in the range of 1 to 10. The default gain is 1.	
Offset adjustment		The gain can be set in the range of -30 to 75, and the default value is 10. The offset increment per step is different depending on the gain.
		G=1 8.19 ADU/step
		G=2 16.38 ADU/step
		G=3 24.58 ADU/step
		G=4 32.76 ADU/step
		G=5 40.95 ADU/step
		G=6 49.14 ADU/step
		G=7 57.33 ADU/step
		G=8 65.52 ADU/step
		G=9 73.71 ADU/step
		G=10 81.90 ADU/step
Integration time	The integration time is determined by the high period +48 CLK of the start pulse.	
Line rate	The line rate is determined by the start pulse period.	
Number of readout pixels*10	Readout pixel number setting is among the following five patterns. However, pixel readout is always started from the first pixel. <ul style="list-style-type: none"> <li>· 1 to 256 pixels</li> <li>· 1 to 512 pixels</li> <li>· 1 to 1024 pixels</li> <li>· 1 to 2048 pixels</li> <li>· 1 to 4096 pixels</li> </ul>	
Data transfer mode*10	The following 2 data transfer modes are available. <ul style="list-style-type: none"> <li>· Real-time transfer Data is transferred without using a memory. When using the included software, 20,000 lines of data can be acquired at the maximum.</li> <li>· Memory transfer Specified number of lines of continuous data is stored in a memory, and then collectively transferred. The maximum number of lines that can be acquired is as follows. Number of readout pixels 256 pixels: 16,384 lines Number of readout pixels 512 pixels: 8,192 lines Number of readout pixels 1024 pixels: 4,096 lines Number of readout pixels 2048 pixels: 2,048 lines Number of readout pixels 4096 pixels: 1,024 lines</li> </ul>	
Interface selection	The following two interfaces can be switched for use. <ul style="list-style-type: none"> <li>· USB 2.0 interface Command communication control and data acquisition are done using a USB cable.</li> <li>· Parallel output interface Command communication control (UART) and data acquisition (12-bit parallel output) are done using a flexible flat cable.</li> </ul>	

\*8: The readout frequency is fixed

\*9: Value when driven with USB bus power

\*10: It is limited to 2048 pixels for C15774-01

**Block diagram**



Note: Do not supply power to the USB and the DC +5 V terminals at the same time.

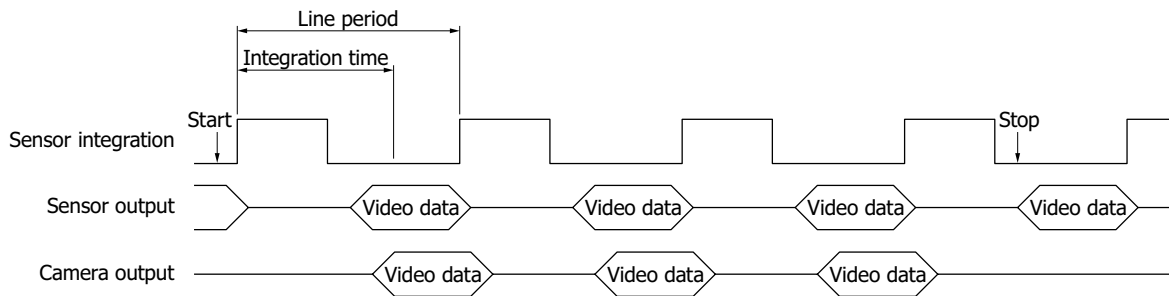
KACCC1198EA

**Timing chart**

Trigger mode

■ Internal mode

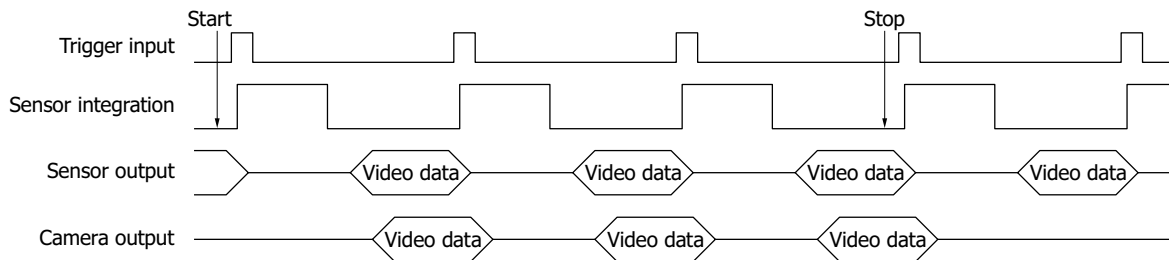
When a Start command is received from the PC, the sensor integration operation control is started and acquired image data is output to PC.



KACCC1200EA

■ External edge mode

The sensor integration control is performed in synchronization with the edges of an external input trigger signal. When the circuit receives an external trigger after having received a Start command from the PC, the image data output from the sensor is sent to the host.



KACCC1201EA

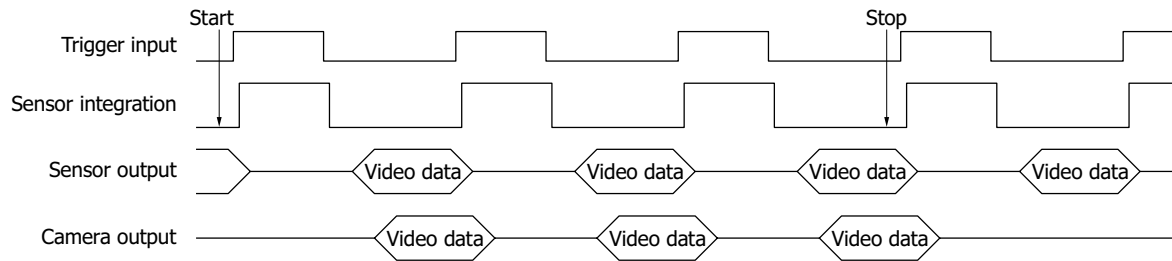
#### External level mode

Integration time and line transmission period are controlled using an external trigger signal.

When the circuit receives an external trigger after having received a Start command from the PC, the image data output from the sensor is sent to the host.

High start pulse period = High trigger input period

Transmission period = Trigger input period

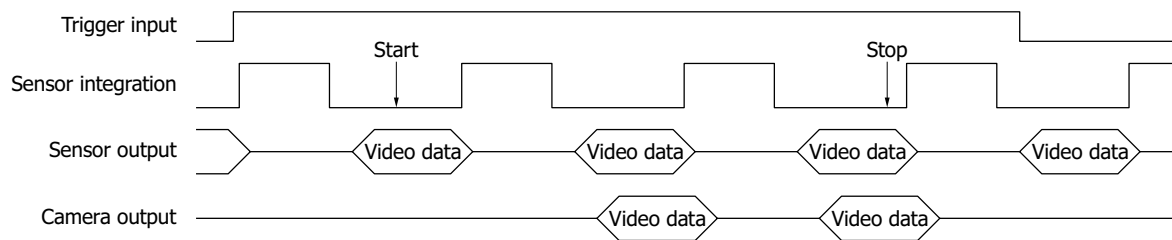


KACCC1202EA

#### External gate mode

Integration is performed only while the external trigger level is high.

When the circuit receives a Start command from the PC while the external trigger level is high, the image data output from the sensor is sent to the host.

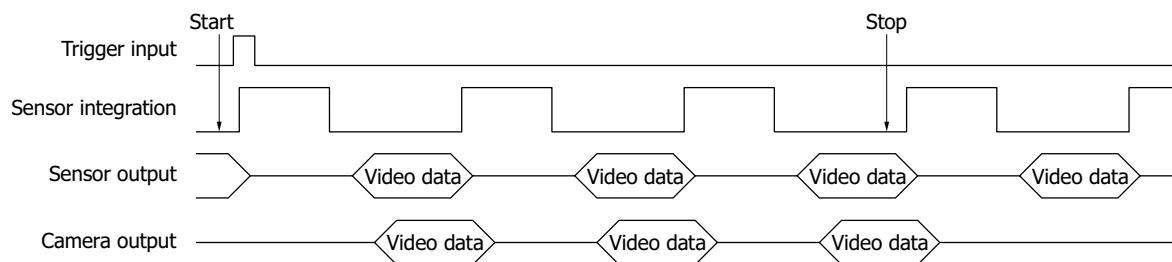


KACCC1203EA

#### External edge one shot mode

The sensor integration is performed in synchronization with the edges of an external input trigger.

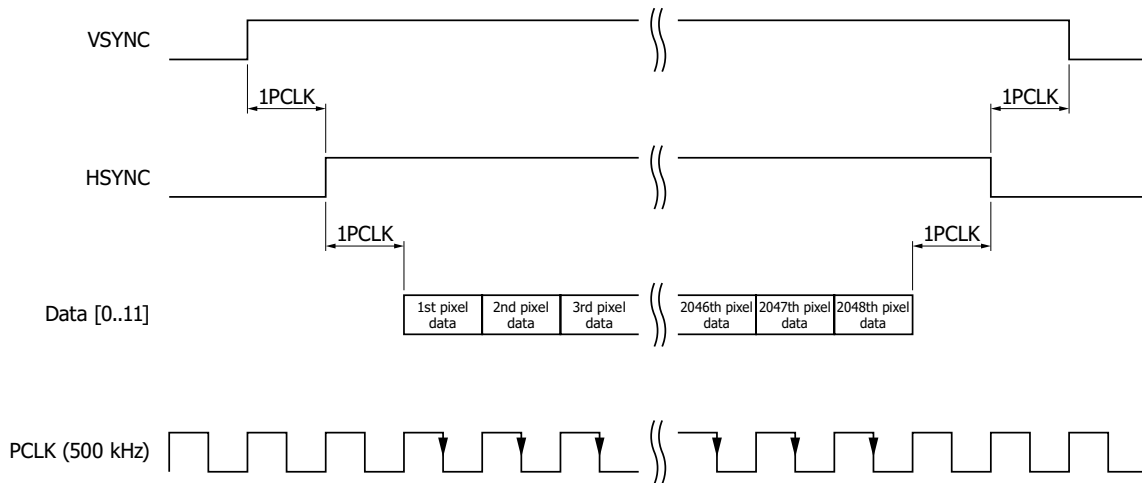
When the circuit receives one shot of external trigger after having received a Start command from the PC, the specified number of lines of image data output from the sensor is sent to the host.



KACCC1204EA

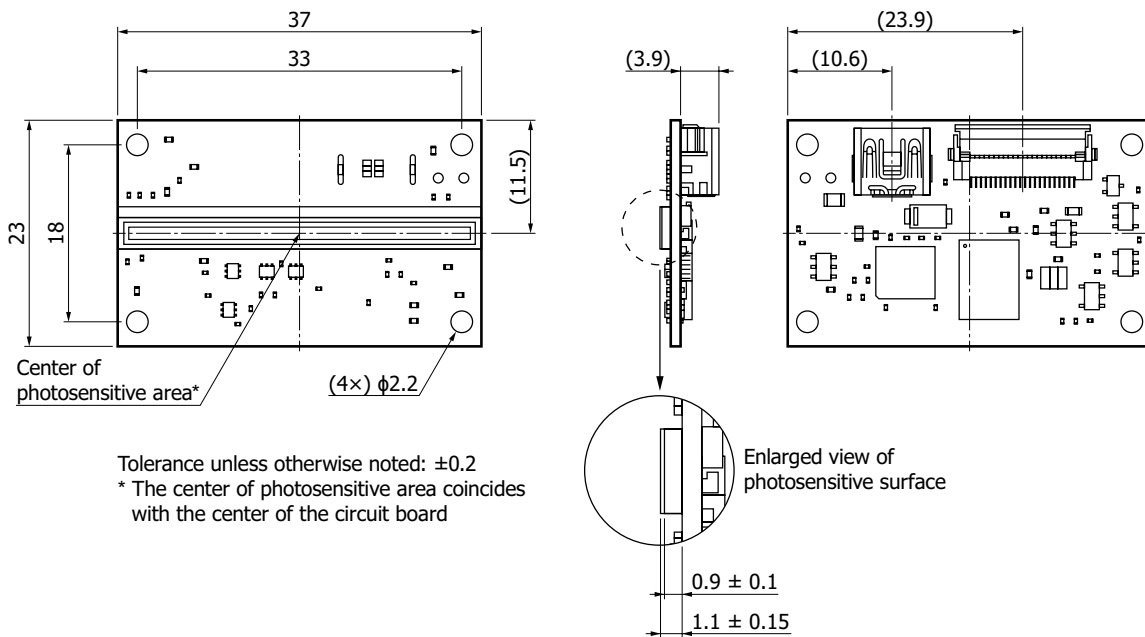
Parallel output interface

12-bit parallel digital data is output from the flexible flat cable connector.  
External devices latch Data [0..11] at the falling edge of PCLK.



KACCC1205EA

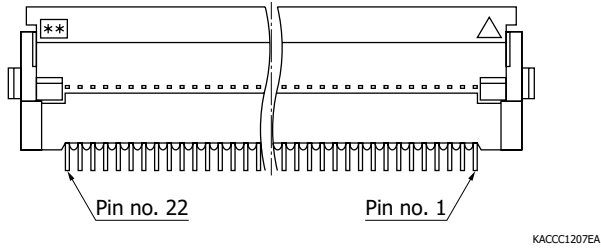
Dimensional outline (unit: mm)



KACCA0495EA

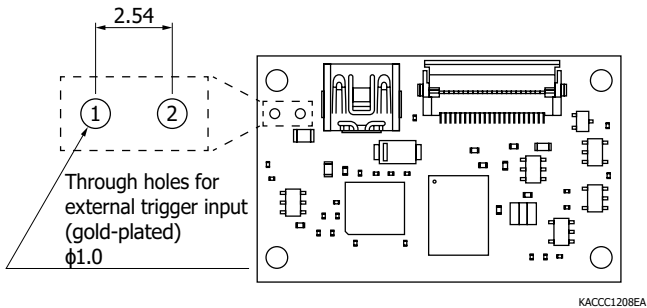
**Pin layout (unit: mm)**

Flexible flat cable connector Hirose FH12-22S-0.5SH (55)



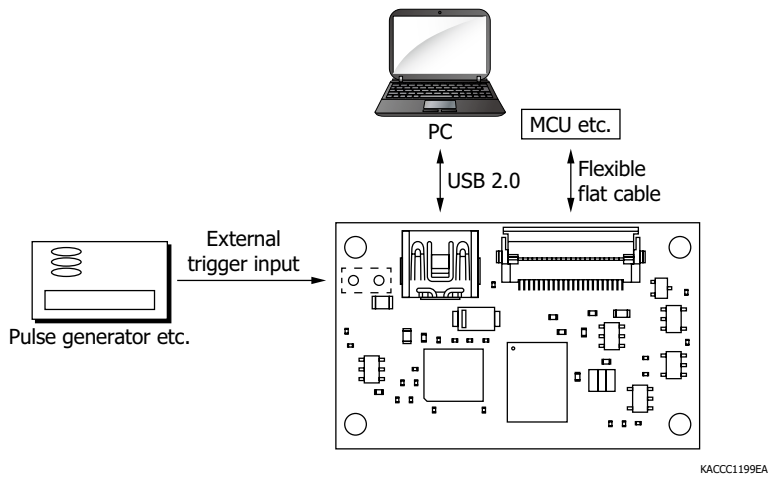
Pin no.	Symbol	Pin no.	Symbol
1	+5 V	12	DO7
2	NC	13	DO6
3	UART TX	14	DO5
4	UART RX	15	DO4
5	HSYNC	16	DO3
6	VSYNC	17	DO2
7	PCLK	18	DO1
8	DO11	19	DO0
9	DO10	20	GND
10	DO9	21	External trigger
11	DO8	22	GND

Through holes for external trigger input



Pin no.	Symbol
1	GND
2	External trigger

**Connection example**





### ❏ Soldering to through-holes for external trigger input/output

Pins and cables are required to be soldered to the through-holes for external trigger input/output in order to synchronize with external devices. Before soldering, make sure to read the following "Image sensors precautions | 3. Soldering."

[https://www.hamamatsu.com/resources/pdf/ssd/image\\_sensor\\_KXX-A12018-ENG.pdf](https://www.hamamatsu.com/resources/pdf/ssd/image_sensor_KXX-A12018-ENG.pdf)

### ❏ Accessories

- Application software (Dcam-CL) [compatible OS: Windows 10® (64-bit)]
- Function library (SSDic.dll)

Note: Windows is a registered trademark of Microsoft Corporation in the United States and/or other countries.

The content of this document is current as of October 2023.

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