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Image sensor modules

C16795 series

High dynamic range module including a built-in InGaAs area image sensor and capable of operating at a high frame rate

C16795 series is a sensor module equipped with a high-speed and high-sensitivity InGaAs area image sensor, and is capable of high-speed operation at 503 frames/s at maximum. This product consists of an analog front end, A/D converter, digital controller, temperature controller, and high-speed communication controller. It converts analog signals received from an InGaAs image sensor into digital signals and outputs them to the external devices. Various controls of the module and data acquisition can be done from a PC connected with a USB connector (conforms to USB3.1 Gen.1). The SMA connector for external trigger input is attached to the main body, making it possible to synchronize operation with external devices. Also, a C-mount compatible lens can be used for the optical interface, so no special optical design is necessary, and image acquisition can be done easily.

Features

- 20 µm pitch, 320 × 256 ch (QVGA format)
- High S/N
- Operation of simultaneous integration readout function and post-integration readout function is possible
- Multi-line readout function

Applications

- Near infrared non-destructive inspection (farm product inspection, semiconductor inspection, etc.)
- Hyperspectral imaging (food sorting, etc.)
- Traffic monitoring

Selection guide

Type no.	InGaAs area image sensor (built-in)							
	Type no.	Spectral response range (µm)	Number of pixels (ch)	Pixel size (µm)	Pixel pitch (µm)	Image size (mm)	Cooling	Sensor cooling temperature*1 (°C)
C16795-01	G16561-0808T	0.95 to 1.69	320 × 256	20 × 20	20	6.4 × 5.12	Three-stage TE-cooled	+15
C16795-02	G16562-0808T	1.12 to 1.85						-20
C16795-03	G16563-0808T	1.3 to 2.15						
C16795-04	G16564-0808T	1.7 to 2.55						

*1: Factory settings prior to shipping (can be changed with driver software)

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

Parameter	Specification	Unit
A/D resolution	16	bit
Interface	USB 3.1 Gen 1 (data transfer speed: 5 Gbps)	-
Trigger mode	Internal trigger mode/external trigger mode*2	-
Port switching	4 ports	-

*2: Input signal polarity (rising/falling edge) can be selected

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

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	Vs		DC	-	12	V
Input signal voltage (external trigger)	Vix		-0.5	-	6.5	V
Operating temperature	Topr	No dew condensation*3	0	-	40	°C
Storage temperature	Tstg	No dew condensation*3	-20	-	70	°C

*3: 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.

▶ Electrical characteristics (Typ. Ta=25 °C, unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating frequency	fop		-	50	-	MHz
Frame rate	FR	Tint=1.97 ms	-	-	503	frames/s
Integration time	Tint	Step value=0.1 µs	1.1	-	5000000	µs
Output offset	Ooffset	Tint=8.8 µs	5000	10000	15000	ADU
Readout noise	Nread	Tint=8.8 µs	-	17.13	34.25	ADU
Dynamic range	Drange	Tint=8.8 µs	1200	3500	-	-
Conversion gain	Gc		-	40.872	-	µV/ADU
Input signal voltage (external trigger signal)	Vih		2	3.3	5.5	V
	Vil		-	0	0.8	V
Supply voltage	Vs		11.4	12.0	12.6	V
Current consumption	Ic	Tint=1.1 µs*4	-	1.5	3	A
USB bus power current consumption	Ic_USB	Tint=1.1 µs*4	-	550	700	mA
A/D resolution	-		16			bit
Number of readout ports	-		4 ports			-
Interface	-		USB 3.1 Gen 1 (data transfer speed: 5 Gbps)			-
Trigger mode	-		internal/external			-
Image readout mode	-		All-image readout/multi-line readout			-

*4: During continuous operation at internal trigger mode/all-image readout mode

▶ Temperature controller (Ta=25 °C, unless otherwise specified)

| Parameter	Min.	Typ.	Max.	Unit
Sensor cooling temperature*5	-30	-	+20	°C
Temperature setting	Can be set in 1 °C steps			-
Sensor cooling temperature difference*6	50	60	-	°C
Temperature accuracy*7	-1	-	+1	°C
Temperature stability*8	-0.1	-	+0.1	°C
Setting temperature achievement time	-	2	5	min

*5: Be sure to use the product within the setting range of sensor cooling temperature difference. The sensor temperature may not reach the setting value although there is no problem for operation of the devices.

*6: Sensor photosensitive area and environmental temperature difference

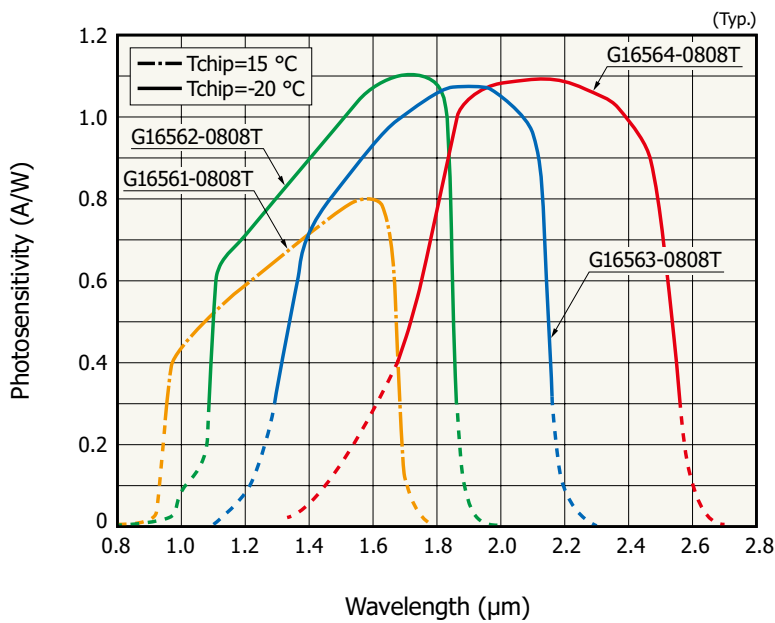*7: Deviation of the actual temperature from the setting temperature

*8: Temperature fluctuation after temperature stabilization

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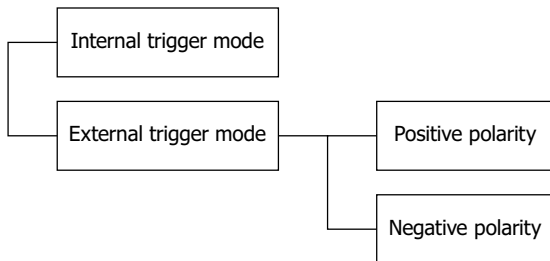## Block diagram
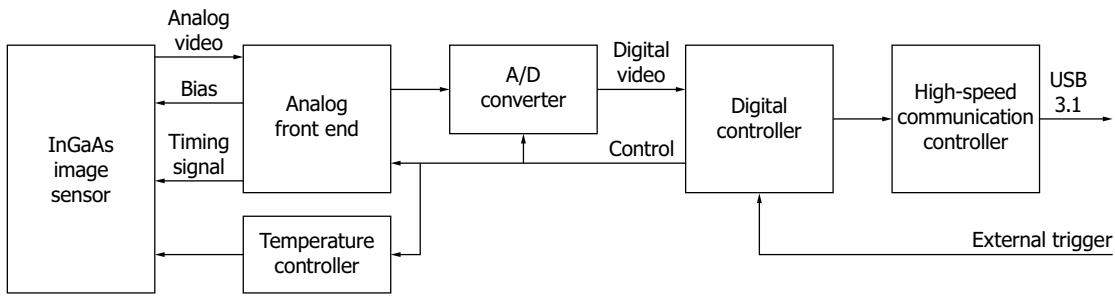
KACCC0936EA

Spectral response

KMIRB0142EA

Imaging mode

There are two imaging modes: internal trigger mode in which the image sensor module operates by itself and external trigger mode in which the exposure timing can be set using an external trigger.
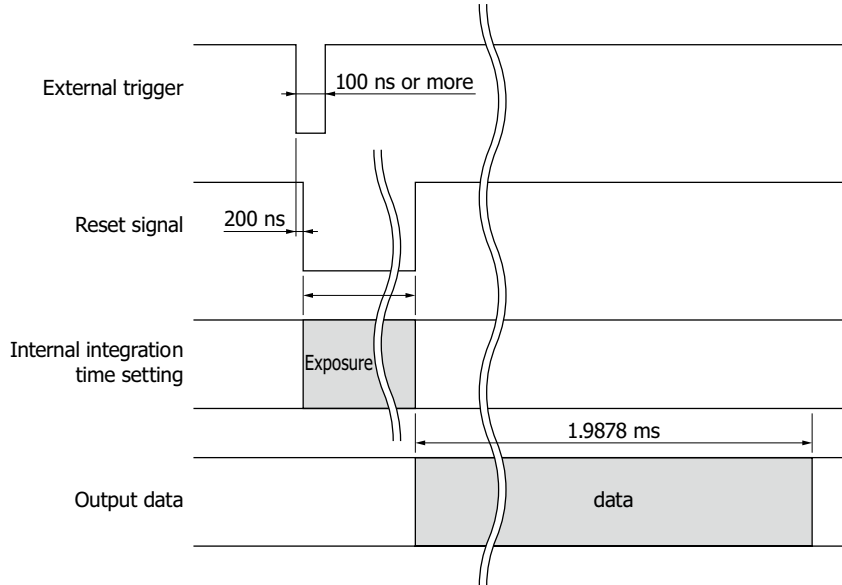

KACCC0944EA

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Timing chart (external trigger mode)

In external trigger mode, the image sensor module is controlled via signals from external devices, and images are captured at certain timing. Exposure starts at the edge (rising/falling) of the external trigger.

The timing chart in external trigger mode is shown below.

External trigger

100 ns or more

Reset signal

200 ns

Internal integration time setting

Exposure

1.9878 ms

Output data

data

KACCC1233EA

Connection example

See the figure below for connection method. Ports and cables that meet USB 3.1 Gen 1 standard are required to connect this module with a PC. An AC adapter is required to supply power to those devices. Use the supplied AC adapter.

To use in external trigger mode, connect this module with an external trigger signal generator via an SMA coaxial cable.

TRIG. IN

SMA coaxial cable

Trigger signal generator

USB 3.1 Gen1

USB 3.1 cable

PC

AC adapter (included)

DC +12 V

12 V⎓3A
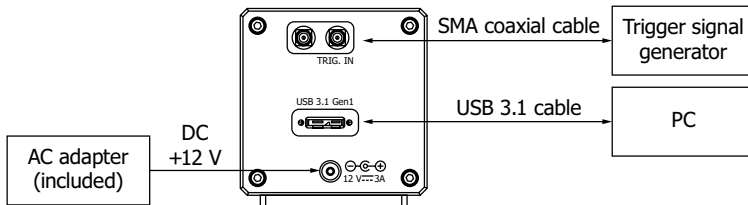
KACCC0943EA

Dimensional outline (unit: mm)

1-32UN C mount

1/4-20UNC depth 6

Tolerance: ±1
Weight: 930 g
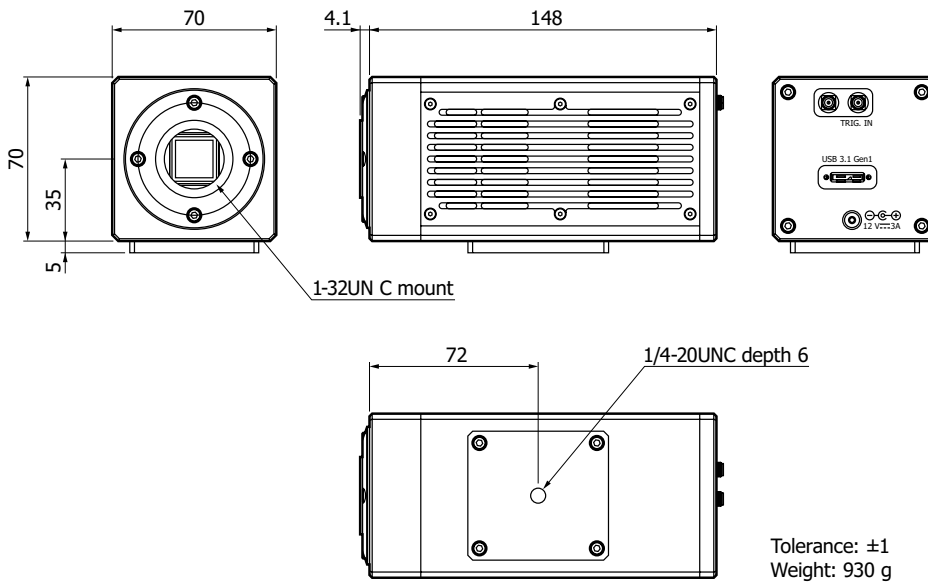
KACCA0501EA

USB cable

Parameter	Specification
Plug	Type A/Micro-B
Cable length	1 m
Interface standard	USB3.1 Gen.1
Transfer speed	5 Gbps max.

AC adapter

Parameter		Specification
Input voltage, input frequency		100 to 240 V AC, 50 Hz/60 Hz
Output voltage, output current		DC 12 V, 3.8 A
Cable length	Image sensor module to adapter	1800 ± 100 mm
	Adapter to electrical outlet	1200 ± 100 mm
Dimensions (adapter)		47 × 98 × 32 mm (W × D × H)
Weight		200 ± 10 g

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▐ Software

· Compatible OS: Windows 10, Windows 11
· DCAM-API (Digital Camera Application Programming Interface): Download from https://dcam-api.com. Hamamatsu driver software,
  DLL, and image capture software are included. DCAM-SDK, which includes the function manual and sample software, is available.

Note: The image processing library is not provided.

▐ Accessories

· AC adapter
· USB cable
· CD-ROM

▐ Related information

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

◼ Precautions
· Disclaimer