



C15853 series

Built-in high-speed InGaAs linear image sensor, USB 3.1 Gen1 interface

This image sensor module is equipped with an InGaAs linear image sensor (G14714-512DE/-1024DK). This product has sensitivity in the near infrared region of 0.95 to 1.7 μm , and is capable of readout at a high-speed line rate of 40 klines/s. It transfers the acquired image signal to a PC via a USB 3.1 Gen1 interface. Various functions can be controlled with USB communication and an external trigger signal. 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

- High-speed line rate: 40 klines/s max.
- High-speed data rate: 15 MHz max.
- Room temperature operation
- Output data: 16-bit
- Interface: USB 3.1 Gen1

Applications

- Near infrared non-destructive inspection (farm product inspection, semiconductor inspection, etc.)
- Sorting machines

Specifications of built-in sensor

Parameter	C15853-01	C15853-02	Unit
Built-in InGaAs linear image sensor	G14714-512DE	G14714-1024DK	-
Spectral response range	0.95 to 1.7		μm
Number of effective pixels	512	1024	pixels
Pixel size*1 (H \times V)	25 \times 25	12.5 \times 12.5	μm
Pixel pitch	25	12.5	μm
Image size*2	12.8 \times 0.025	12.8 \times 0.0125	mm
Cooling	Non-cooled type		-

*1: Region with actual sensitivity G14714-512DE: 25 \times 45 μm , G14714-1024DK: 12.5 \times 32.5 μm

*2: Region with actual sensitivity G14714-512DE: 12.8 \times 0.045 mm, G14714-1024DK: 12.8 \times 0.0325 mm

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

Parameter	C15853-01	C15853-02	Unit
A/D resolution	16		bit
Interface	USB 3.1 Gen1		-
Internal/external trigger mode	Internal trigger mode: Runs without external triggers External trigger mode: Runs in sync with external triggers. Rising or falling edge selectable. Trigger level LVTTTL (0/3.3 V)		-
Gain switching	Can be switched to fit the sensor		-
Integration time	21 to 5000000		μs
Optical interface	C mount		-
Dimensions (W \times H \times D)*3	60 \times 60 \times 54		mm
Weight	340		g

*3: Excluding protrusions

➤ Absolute maximum ratings (Ta=25 °C, unless otherwise noted)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	Vs		-0.3	-	15	V
Input signal voltage (external trigger)	Vix	LVTTL (0/3.3 V)	-0.5	-	6.5	V
Operating temperature	Topr	No dew condensation*4	0	-	40	°C
Storage temperature	Tstg	No dew condensation*4	-20	-	70	°C

*4: 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.

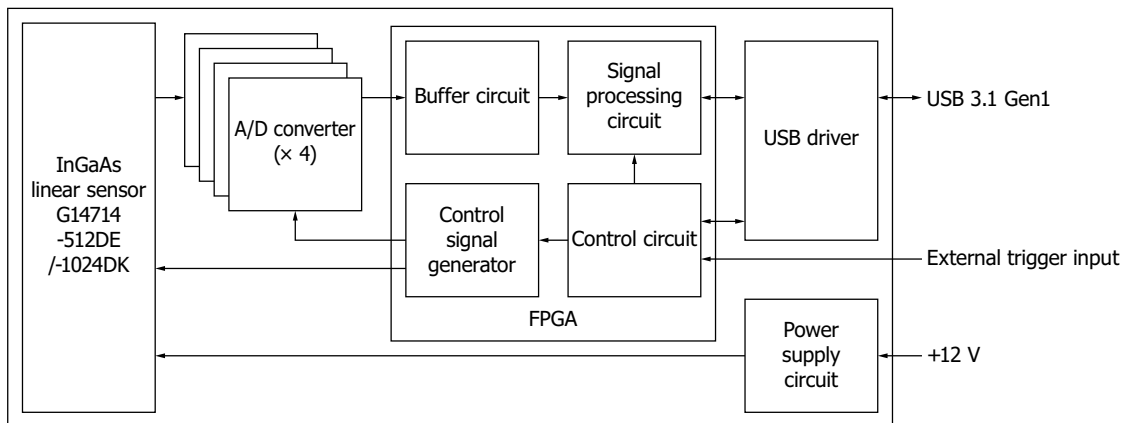
➤ Recommended operating conditions (Ta=25 °C, unless otherwise noted)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	Vs	11.4	12.0	12.6	V
Input signal voltage	Vih	2.0	3.3	5.5	V
(external trigger signal)	Vil	-	0	0.8	V

➤ Electrical characteristics (Typ. Ta=25 °C, unless otherwise noted)

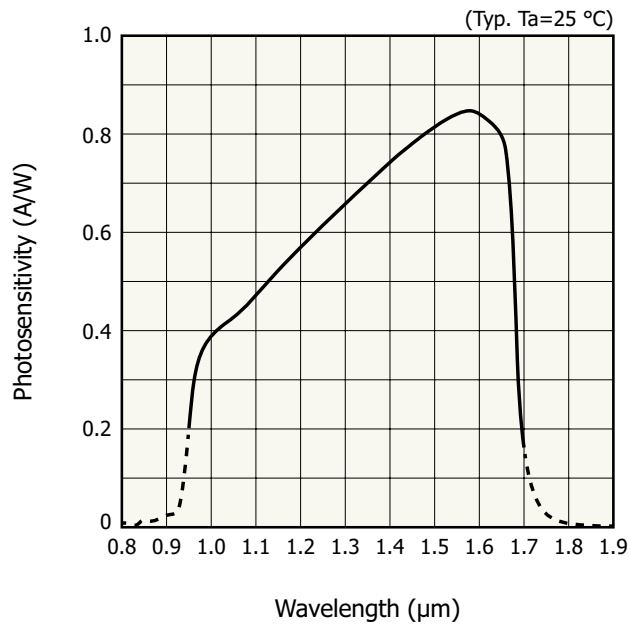
Parameter	Symbol	Condition	C15853-01			C15853-02			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Operating frequency	fop		-	-	15	-	-	15	MHz
Frame rate	-		-	-	40	-	-	40	klines/s
Dark current	Id	CE=1.23 μV/e ⁻	-	0.5	-	-	0.5	-	pA
Readout noise	Nread	CE=1.23 μV/e ⁻	-	1.5	-	-	1.2	-	mV rms
Dynamic range	Drange	CE=1.23 μV/e ⁻	-	1167	-	-	1417	-	-
Conversion efficiency	CE	Low	-	0.128	-	-	0.128	-	μV/e ⁻
		Middle low	-	1.23	-	-	1.23	-	
		Middle high	-	4.0	-	-	4.0	-	
		High	-	8.0	-	-	8.0	-	
Current consumption	Ic		-	0.2	0.3	-	0.2	0.3	A
USB bus power current consumption	Ic_USB		-	560	700	-	560	700	mA

➤ Block diagram



KACCC1090EA

Spectral response

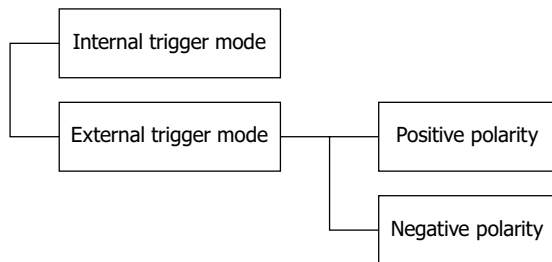


C mount

C mount lens can be attached using the C mount holder included with the product.

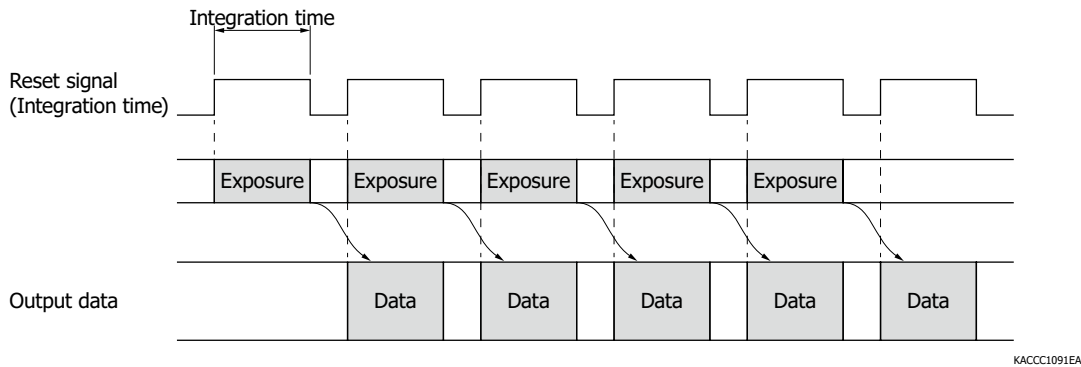
Imaging mode

There are two imaging modes: internal trigger mode, which operates with only the image sensor module, and external trigger mode, which determines exposure timing using an external trigger.



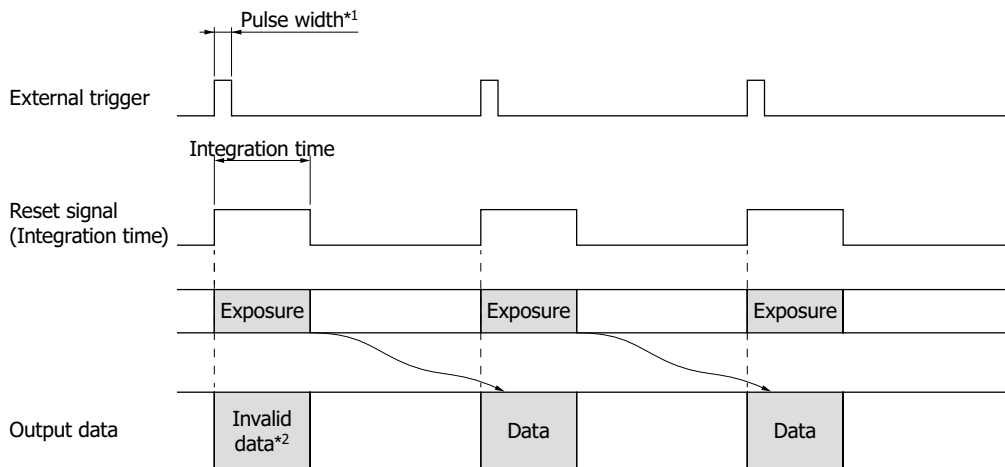
Internal trigger mode

In internal trigger mode, exposure time is set with a software command. Shown below is the timing chart in internal trigger mode. The maximum line rate is 40 kline/s (exposure time: 21 μ s) When it is dark, higher S/N data can be collected, by setting longer exposure time and increasing the signal level. Line rate depends on exposure time.



External trigger mode

External trigger mode makes it possible to synchronize with external devices. In this mode, an external trigger signal is used to start exposure. Exposure starts at the edge (rising/falling) of the external trigger. Line rate depends on exposure time. Exposure time is set with a software command. Shown below is the timing chart when the rising edge is set in external trigger mode.

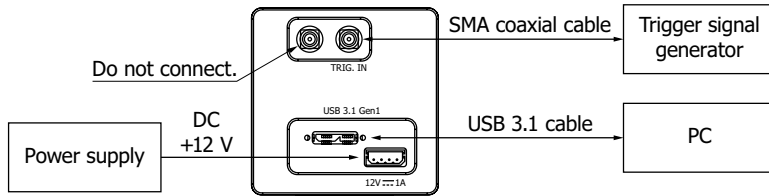


- *1: The minimum pulse width of trigger signal is 1 μ s.
To get X number of frames, X + 1 trigger signals are required.
- *2: This is data exposed in the previous frame.

Connection example

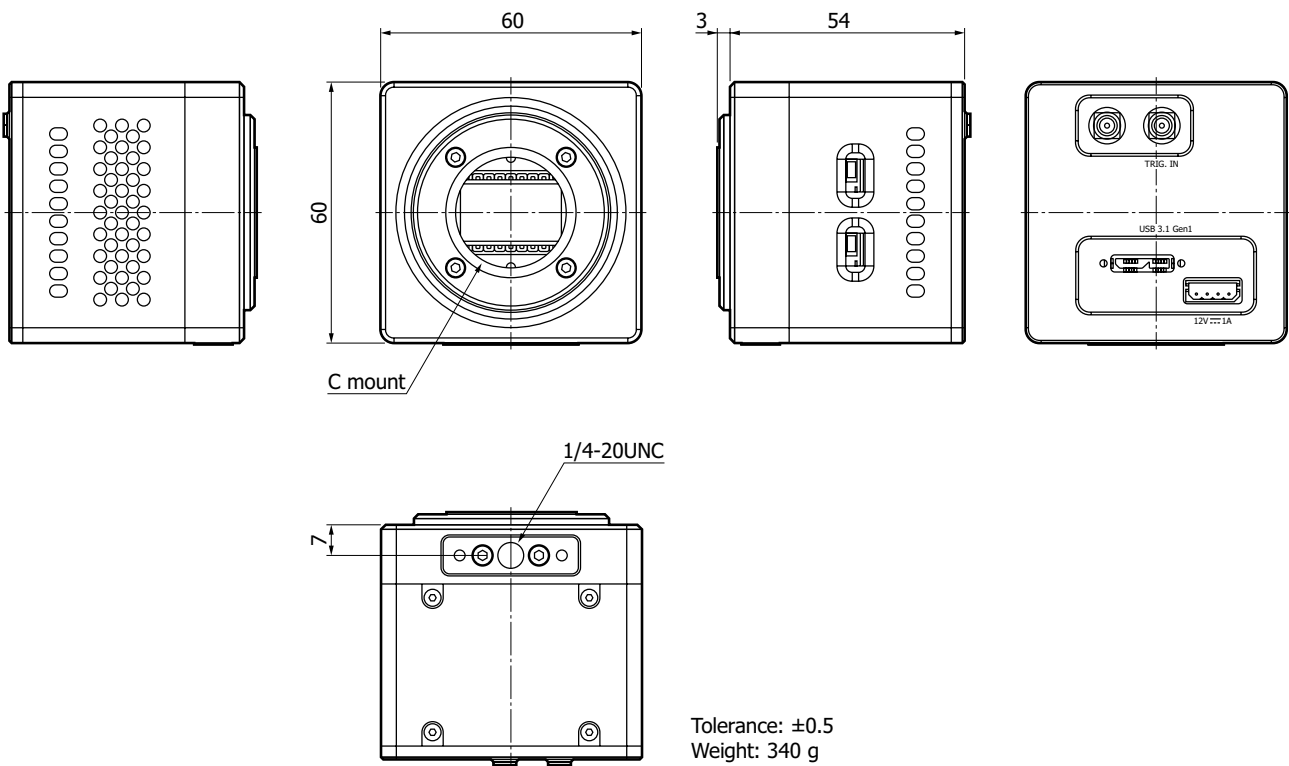
A USB 3.1 Gen1 interface is required on the PC. Connect to the PC using the USB 3.1 cable, and install the driver software in the PC. The digital controller runs on the bus power through the USB 3.1 cable.

When operating in external trigger mode, use an SMA cable to connect the trigger generator externally. The input level is 3.3 V LVTTTL and the input impedance is 1 kΩ.



KACCC1093EA

Dimensional outline (unit: mm)



KACCA0461EB

Software

- Compatible OS: Windows 10
- DCAM-API (digital camera application programming interface): Download from <https://dcam-api.com>. It includes Hamamatsu driver software, DLL, and image capture software. DCAM-SDK, which includes the function manual and sample software, is available.

Note: The image processing library is not provided.

Accessories

- Power cable (one end unterminated)
- USB cable

Related information

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

- Precautions
- Disclaimer

Image sensor modules C16091 series

It is an image sensor module incorporating a TE-cooled InGaAs linear image sensor.

Type no.	InGaAs image sensors (built-in)					
	Type no.	Spectral response range (μm)	Number of pixels (ch)	Pixel size (μm)	Pixel pitch (μm)	Image size (mm)
C16091-01	G11475-256WB	0.9 to 1.85	256	50 × 250	50	12.8 × 0.25
C16091-02	G11475-512WB		512	25 × 250	25	
C16091-03	G11476-256WB	0.9 to 2.05	256	50 × 250	50	
C16091-04	G11477-256WB		256	50 × 250	50	
C16091-05	G11477-512WB	0.9 to 2.15	512	25 × 250	25	
C16091-06	G11478-256WB		256	50 × 250	50	
C16091-07	G11478-512WB	0.9 to 2.55	512	25 × 250	25	
C16091-08	G11508-256SA		256	50 × 500	50	
C16091-09	G11508-512SA	0.9 to 1.67	512	25 × 500	25	12.8 × 0.5
C16091-10	G14237-512WA		0.85 to 1.4	512	25 × 500	
C16091-11	G11620-256SA	0.95 to 1.67	256	50 × 500	50	
C16091-12	G11620-512SA		512	25 × 500	25	
C16091-13	G12230-512WB*5	0.95 to 1.65 1.4 to 2.15	512	25 × 250	25	12.8 × 0.25

*5: Built-in two InGaAs chips (cutoff wavelength: 1.65 μm, 2.15 μm)



The content of this document is current as of September 2022.

Product specifications are subject to change without prior notice due to improvements or other reasons. This document has been carefully prepared and the information contained is believed to be accurate. In rare cases, however, there may be inaccuracies such as text errors. Before using these products, always contact us for the delivery specification sheet to check the latest specifications.

The product warranty is valid for one year after delivery and is limited to product repair or replacement for defects discovered and reported to us within that one year period. However, even if within the warranty period we accept absolutely no liability for any loss caused by natural disasters or improper product use. Copying or reprinting the contents described in this material in whole or in part is prohibited without our prior permission.

HAMAMATSU

www.hamamatsu.com

HAMAMATSU PHOTONICS K.K., Solid State Division

1126-1 Ichino-cho, Higashi-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 E-mail: usa@hamamatsu.com

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, Jianning 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.: 8F-3, No.158, Section 2, Gongdao 5th Road, East District, Hsinchu, 300, Taiwan R.O.C. Telephone: (886)3-659-0080, Fax: (886)3-659-0081 E-mail: info@hamamatsu.com.tw