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Ver1.04

USB3.0 InGaAs NIR CAMERA

ARTCAM-131TNIR

INSTRUCTION BOOKLET

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ARTRAY CO., LTD.

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1. Attention

■ About this manual

1. Before using the camera, please read this manual thoroughly.
2. Please keep this manual reachable and always refer to the contents when needed.
3. Please contact us if the manual is lost or damaged. We will provide a replacement.
4. We cannot guarantee the safety of improper uses of the camera.
5. For your safety, please follow the directions of this manual.
6. All contents are subject to change.
7. Images in this manual may have been simplified to be easier comprehended.
8. Please contact us if you find any unclear points or mistakes in this manual.
9. Quoting, copying or altering some or all parts of the manual without our permission is prohibited.
10. We are not responsible for any lost or damages on your profits due to the use of our products.
11. Please understand that our oversea branches do not provide maintenance or repair services.

■ About the Icons

To keep the safety of the user, other people and their properties, please pay attention to the following icons.



Warning

If the user fails to follow the instruction, serious injury or death may occur.



Caution

If the user fails to follow the instruction, physical injury on human or damages on hardware may occur.

■ For Safe Use



Warning

● In following circumstances, please stop using the product and turn off the power immediately to prevent the risks of fires and electric shocks. If the product is defective, please contact us for repair or exchange. For your safety, please do not disassemble, modify or repair the camera on your own.

Please stop using the product and turn off the power immediately when:

- The product becomes smoky or gets extremely hot on the surface, or makes unusual smells or sounds.
 - Foreign material or water gets into the product.
 - The product falls and becomes damaged.
- Do not place the product on unstable surfaces. The product may be fallen and people may get hurt.



Caution

- Do not expose the product to steam or fumes to avoid electric shocks and fires.
- Do not leave the product in high temperature places such as inside of vehicles or under direct sunlight. High temperature may cause damages to the camera, or even cause fires.
- Do not cover the product with cloth or other materials. The product may get extremely hot and the heat may cause deformations on the parts or even cause fires.
- Please avoid dropping or shocking the product as the product may be damaged.
- Do not touch the cable with a wet hand. Such action may cause electric shocks.
- Please avoid continuously contacting the surface of the camera to your skin when the camera is being used. The surface temperature of the camera may cause burns.

■ Other Notices

- Please do not use the camera under strong lights such as sun light for a long period. Also, please do not expose the camera under strong lights even when the product is not being used because the sensor might be damaged.

Maintenance

- Wipe the dirt on surface with soft cloth or tissue paper. Do not use alcohol, thinner or benzene to avoid damaging the surface paints.

■ Export Control

This product is a List Control item subject to the Foreign Exchange and Foreign Trade Act and its relevant legislations No.1 10 (2) and (4). To export this product from Japan, obtaining export licenses from the Ministry of Economy, Trade and Industry is required. It is also necessary for our company to manage the information of users and the purposes of use. If the end users or purposes of use change after the purchase and thus cause the need to apply export licenses from Ministry of Economy, Trade and Industry, please contact the sales representative in advance.

■ CE marking

This camera complies with CE marking certification.

This camera meets the criteria listed below.

EMC Directive, 2014/30/EU	EN55032:2012	Class A (industrial)
	EN55035:2017	
RoHS Directive, 2011/65/EU	EN50581:2012	
Category 9 (industrial monitoring and control instruments)		

■ Guarantee

To save the environment, we do not issue warranty in printed format. Instead, all records of the warranty periods, delivery dates and the customer information are well kept in our system.

For more details, please refer to the sites below:

Hardware Warranty: http://www.artray.us/download/artray_warranty.pdf

2. Introduction

ARTCAM-131TNIR is an InGaAs camera which adopted in InGaAs (Indium Gallium Arsenide) image sensor in the near-infrared region from 900 nm to 1700 nm.

The resolution is 640 x 512 pixel of the high definition for InGaAs sensor.

The camera adopts USB3.0 interface superior in the affinity with a PC, and the image data to a PC is delivered directly without a capture card.

ARTCAM-TNIR series adopts USB3.0 interface, so image data can be delivered to PC directly without a capture board. Also, this camera is equipped with an on-board memory which avoid data missing during transfer.

3. Main Features

●NIR Detection with High Sensitivity

The InGaAs sensor can detect radiation invisible to human eyes and CCD/CMOS cameras in the wavelength range between 900 nm to 1700 nm bond.

●High Resolution, High Frame Rate

ARTCAM-131TNIR uses a higher resolution sensor of 640 x 512 pixel and delivers image at 263 frame per second.

●USB3.0 Interface

This camera adopts USB3.0 interface, so the data can be delivered to PC directly. No capture card is needed.

●InGaAs Camera Viewer Software

The camera comes with a bonded viewer software ArtMeasure (Windows 8/10/11). With this software, users can easily preview images, save images and change camera settings.

●Software Development Kit

For customer who prefers to create their own image processing software or use our camera with other applications, we provide SDK upon requests.

4. The Product

- 1) Camera
- 2) USB3.0 Cable Type A-micro B connector cable, 3m approx.
- 3) AC adapter (DC12V)
- 4) Introduction Booklet
- 5) Special viewer software/Device Driver CD
- 6) Software Development Kit, ARTCCM-SDK

<Options>

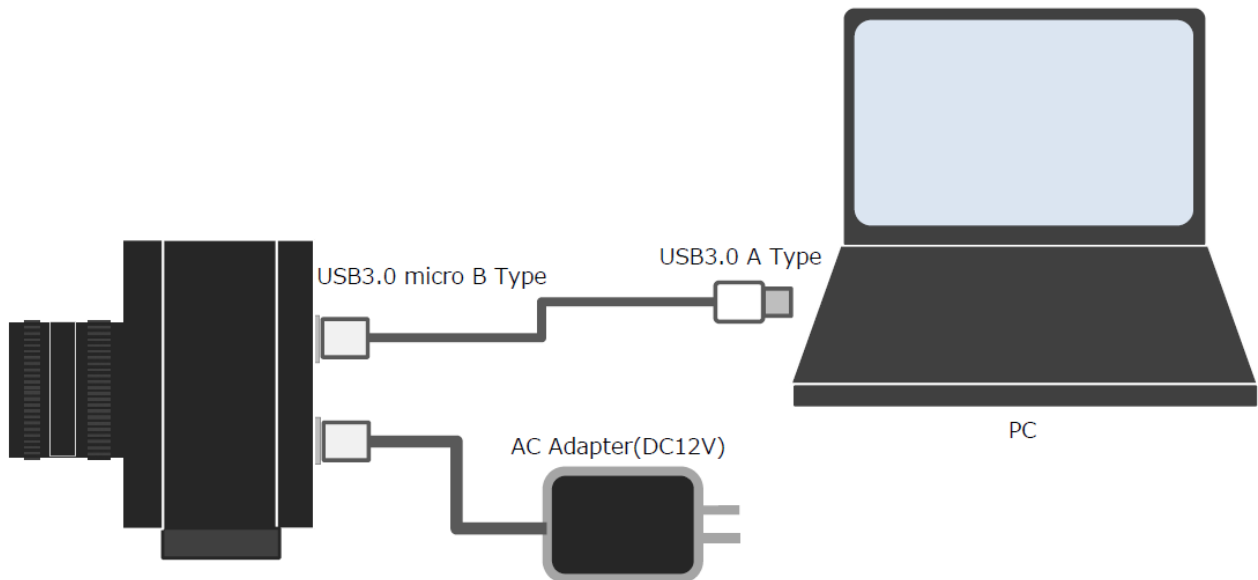
- 1) NIR Lenses (C Mount Lens)

5. Connect the Camera

5.1. How to Connect a Camera

Please connect the camera and the PC by using the attached USB3.0 cable.

Camera's power is supplied from USB Bus Power.



6. Specifications

6.1. Sensor Specification

MODEL	ARTCAM-131TNIR
Sensor Type	InGaAs Image Sensor
Sensor Model	FPA0640P15F-17-C
Effective Pixel Array	640(H) × 512(V)
Image Size	9.6 (H) × 7.68 (V) mm
Scan Mode	Progressive Scan
Pixel Pitch	15(H) × 15(V) μ m
Spectral Range	900nm~1700nm
Pixel Operability	$\geq 99.5\%$
Shutter Type	Rolling Shutter / Global shutter (This setting can be changed when placing an order. Default: Rolling shutter)
Frame Rate	263fps
Shutter Speed	1/136.3698 ~ 480msec.
Sensitivity	$\geq 5 \times 10^{12}$ Jones
Full Well Capacity	High Gain:41Ke- Mid Gain:118Ke- Low Gain:1.38Me-
A/D Resolution	14bit
Synchronization System	Internal Synchronization/ External Trigger Synchronization

6.2. Camera Specification

Interface	USB3.0 Bulk Transfer
Lens Mount	C Mount
External I/O terminal	HR10A-7R-6S(73) (HIROSE)
Power	DC12V
Power Consumption	5W Approx.
Ambient Conditions	Operating Temperature/Humidity : 0~35° C/10~80%(Non-condensing) Storage Temperature / Humidity : 0~60° C / 10~95%(Non-condensing)
External Dimensions	71.6(W) × 61.5(H) × 43.5(D)mm ※Lens, Tripod mount and cables not included
Weight	220g Approx.

6.3. Camera Function

6.3.1. Shutter Speed Setting

The exposure time (electronic shutter speed) of the camera can be set in one line time resolution.

The exposure time can be calculated by the following formula:

$$\text{Exposure Time} = \text{Shutter Value} * \text{One Line Time} / 1000 [\mu\text{sec}] \text{ (Setting Range 1~65533)}$$

The calculation formula for the one line time is different for every single mode.

Full Resolution Output (640x512)

$$1 \text{ Line Time} = (640 / 16 + 26) * 1000 / 9 / 1000 [\mu\text{sec.}]$$

$$\text{Exposure Time (min)} = 1 * (640 / 16 + 26) * 1000 / 9 / 1000 = 7.333 [\mu\text{sec.}]$$

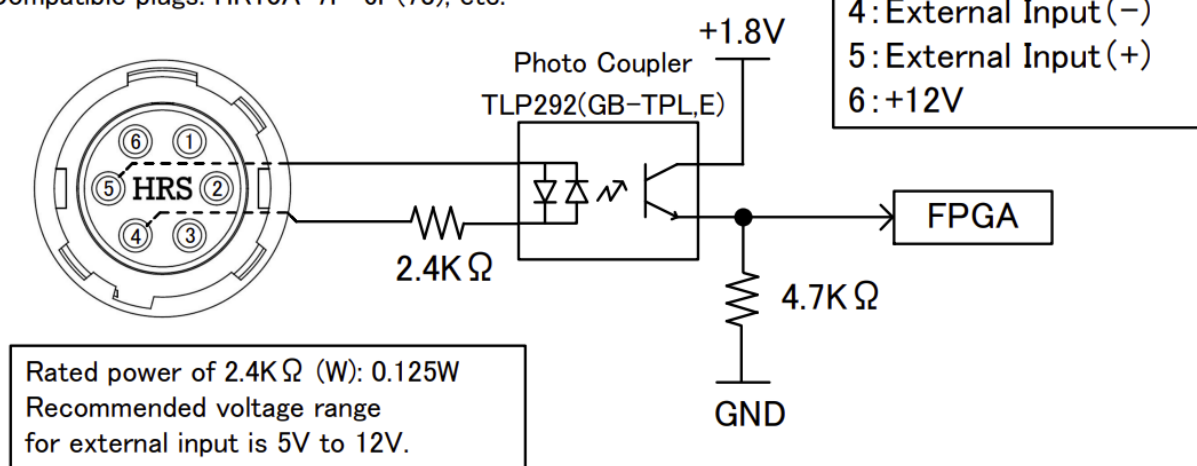
$$\begin{aligned} \text{Exposure Time (max)} &= 65533 * (640 / 16 + 26) * 1000 / 9 / 1000 = 480,553.48 [\mu\text{sec.}] \\ &\div 480 [\text{msec.}] \end{aligned}$$

6.3.2. Eternal Trigger Function

This camera has an external trigger electronic circuit, which is insulated by a photocoupler, and thus enables synchronized shooting by the input signal received from the external circuit.

Connector on the camera side:HR10A-7R-6S(73)

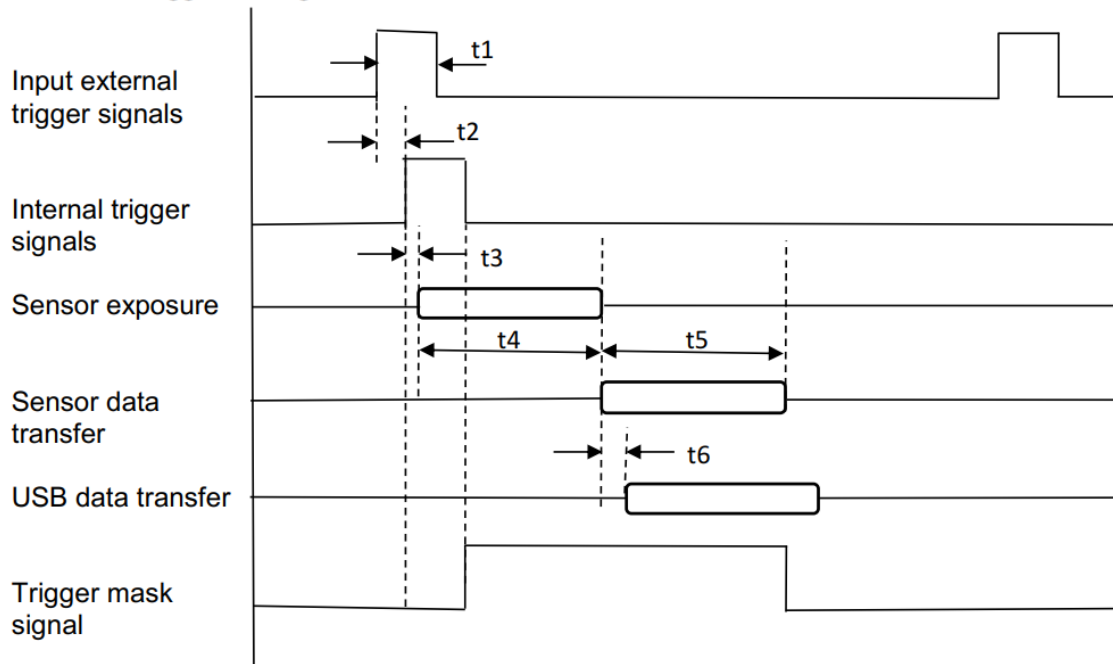
*Compatible plugs: HR10A-7P-6P(73), etc.



※It is possible to change the pin connector and pin assignment.

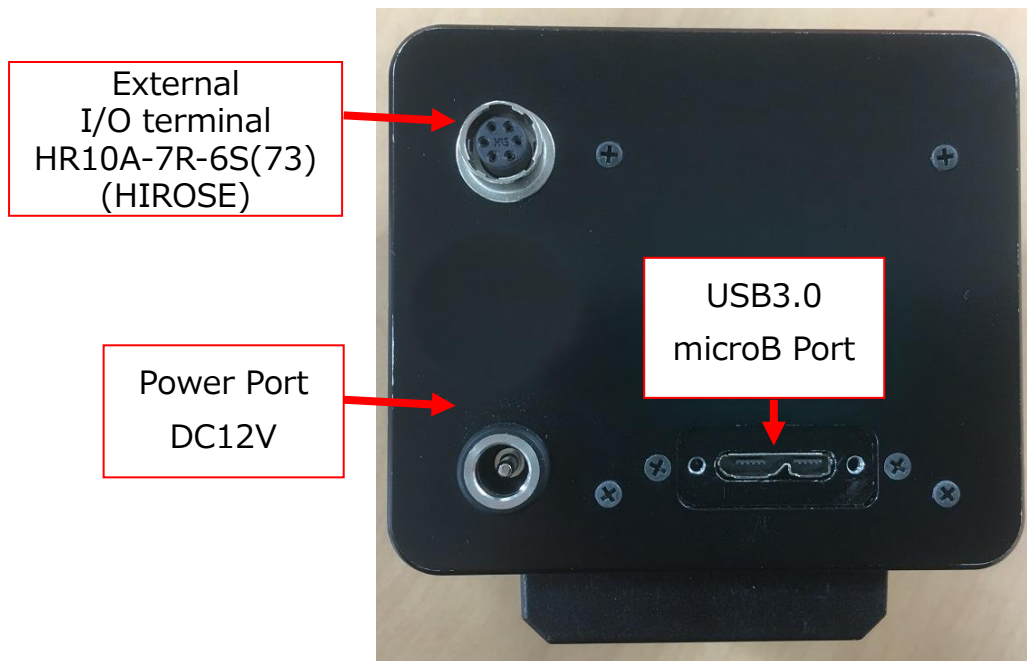
6.3.3. Trigger Timing

Details of Trigger Timing



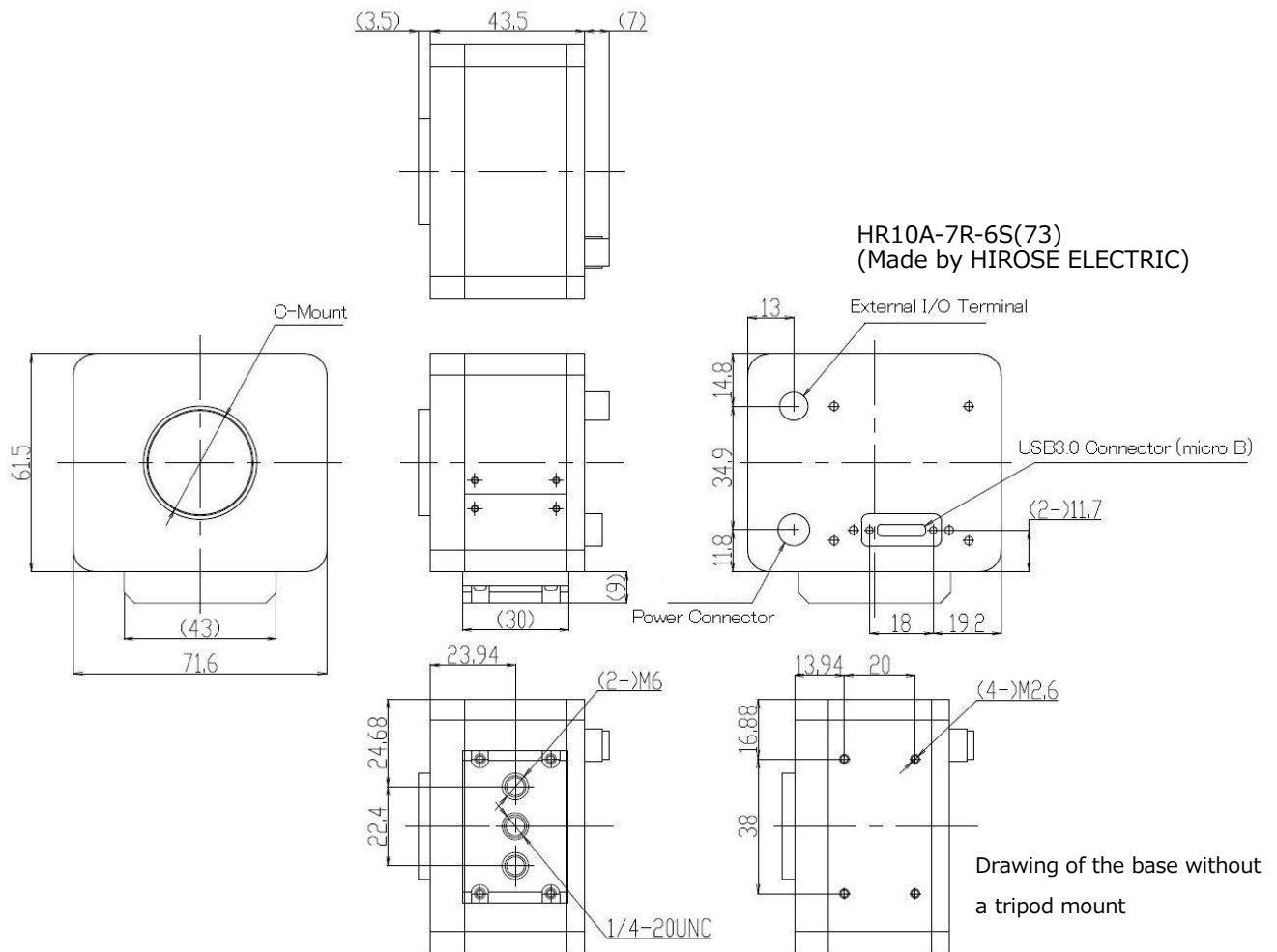
Item No.	Items	Required Time
t1	Effective Trigger Input Pulse	$>10 \mu \text{sec.}$
t2	Time required from the starting of the External Trigger to the starting of the Internal Trigger Signals (may be delay caused the photocoupler)	$<1 \mu \text{sec.}$
t3	Time required from the starting of the Internal Trigger Input to the Exposure Time	3CLK
t4	Exposure Time	Exposure Time = The setting value of the Shutter Speed * 1H period
t5	Time required for data transfer (from the sensor to the FPGA)	$(\text{Effective Vertical Pixels} + 2) * 1\text{H period}$
t6	Time required for the transfer (from the FPGA to USB)	Depending on the PC specification and software

6.4. Each Terminal Information on the Back of the Camera

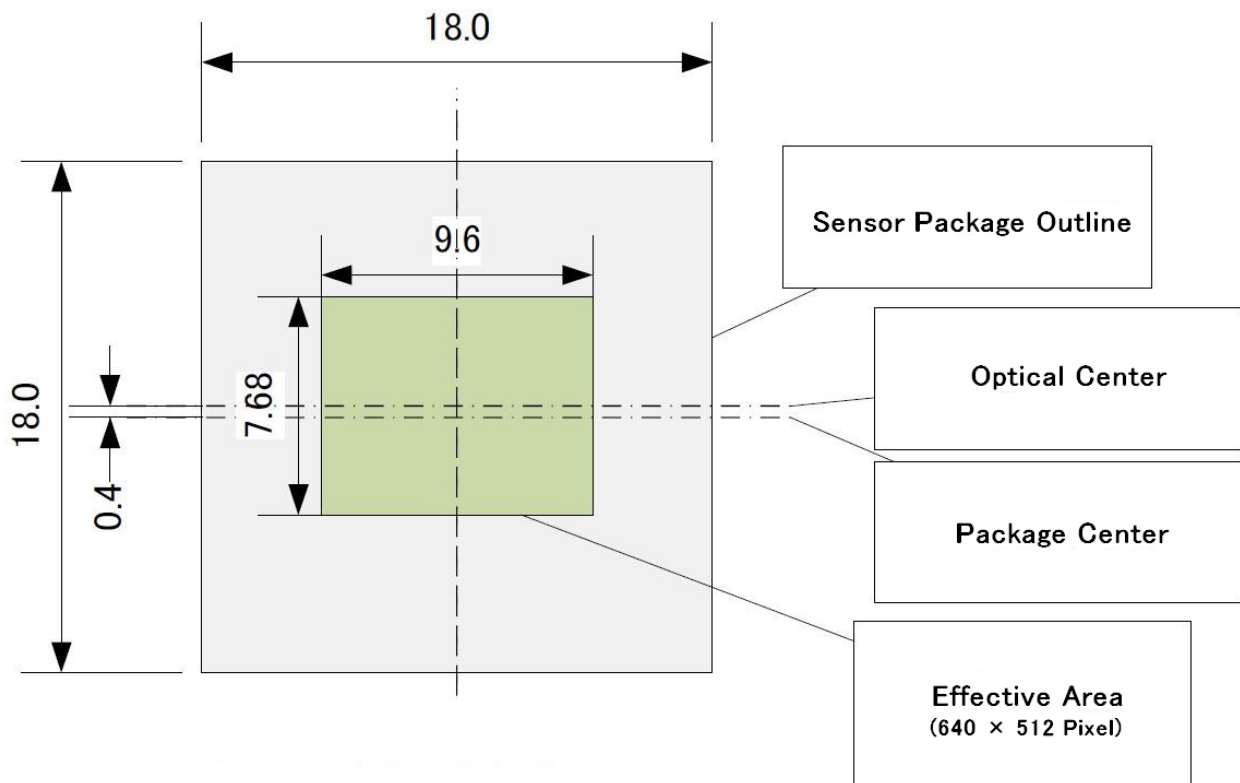


7. Dimensional Outline

7.1. ARTCAM-131TNIR



7.2. Position Relationship Diagram between the Sensor Package and the Light Receiving Surface

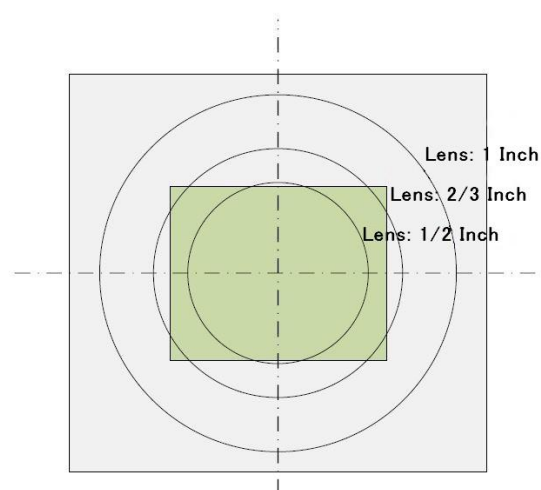


- The distance between package center and optical center is 0.4mm.
- Diag: 12.294mm

$$H = 15[\mu\text{m}] * 640 = 9600 [\mu\text{m}]$$

$$V = 15[\mu\text{m}] * 512 = 7680 [\mu\text{m}]$$

7.3. Field of Vision: Lens versus Sensor (Reference Value)



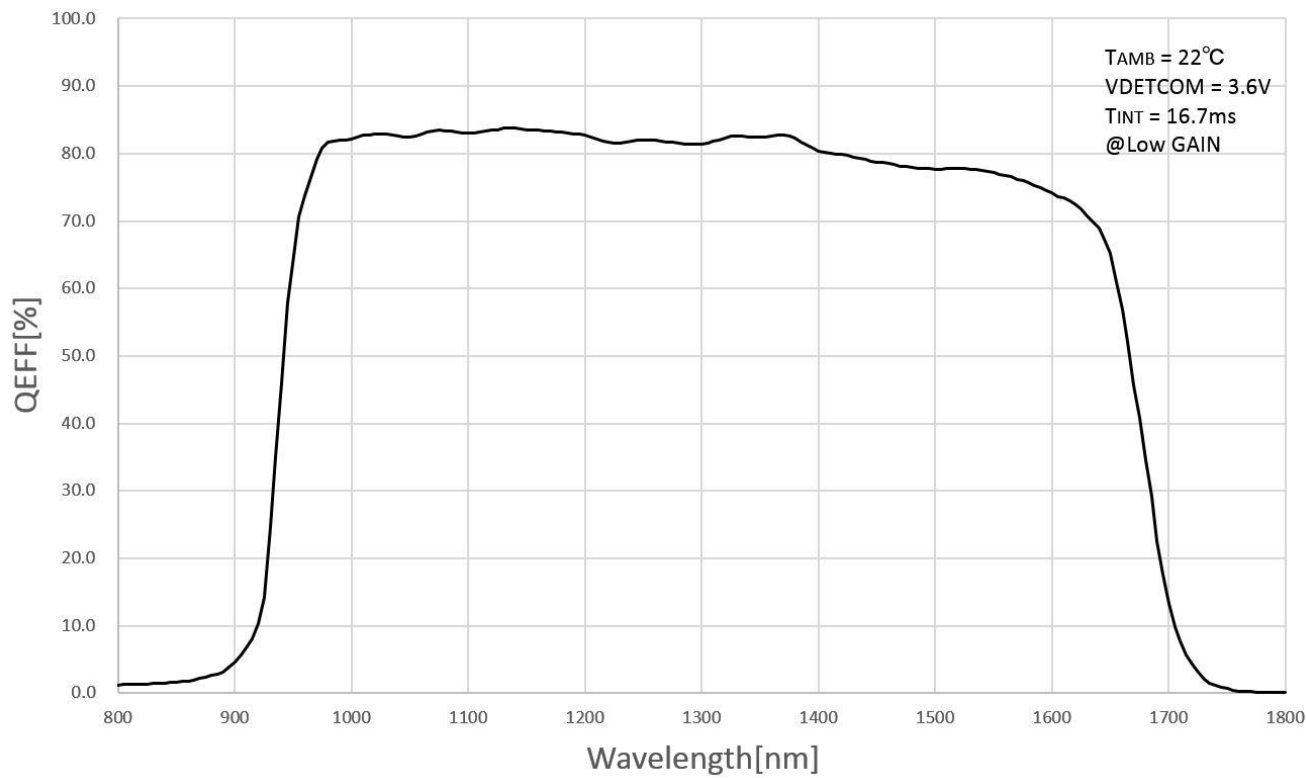
※The ratios of sensor size (diagonal) to lens size in the above illustrations are as follows:

1/2 inch = ϕ 8mm, 2/3 inch = ϕ 11mm, 1 inch = 15.8mm.

Please note that the actual field of view varies depending on different lens.

8. Spectral Sensitivity Characteristics (Reference Value)

8.1. ARTCAM-131TNIR



9. System Requirements

9.1. Recommended System Requirements

- Host Controller

This camera is applicable to USB 3.0.

Connecting to USB 2.0 host controller may cause low-speed or failure to function properly.

- CPU

The driver of this camera is applicable to computer architecture “x86” or “amd64”.

The specification of CPU effects directly the imaging process speed, therefore it is highly recommended to utilize a high-end CPU if possible.

- Memory

In the viewer software, there is a data buffer which can store 4 to 8 frames.

Therefore, it is necessary to keep spare space at least for 8 frames in the memory.

(For example, when using 1.3MP color camera, $1280 \times 1024 \times 3 \times 8$ [byte] = 30[MB] is necessary.)

It is highly recommended to keep enough memory space especially when using high resolution camera.

- OS

This camera is applicable only to the architecture of Windows NT (32bit/64bit).

Standard functions are confirmed with OS after Windows 10.

In addition, it is recommended to use Windows 11.



Caution

■ Please refer the restrictions below when you use ARTCAM series.

(1) Recommended System Requirements

If the system specifications do not meet the requirements recommended above, it may be difficult to run at the maximum frame rate.

(2) Use of other USB3.0 Hardware

The data on our camera/converter is transferred in bulk mode. For this reason, when using our camera/converter, please avoid using other bulk transferred USB3.0 hardware such as Memory stick, External HDD, External DVD, CDROM etc.

As a solution, we recommend installing a PCI USB host card to the PC and connect external USB hardware to this port only.

(3) USB3.0 Cable Extension

We cannot guarantee the functionality of the USB3.0 camera if the user adopts USB3.0 extension cables or repeaters which are not confirmed by us. With the extension cables or repeaters, the bandwidth of transfer may differ, and thus caused malfunctions such as a low frame rate or recognition failure on the camera.

What may cause the problem is that the regulation of the power lines becomes not enough, and so causes impedance mismatch on data signals.

*For the recommended extension cable, please contact our sales department.

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