

August 2021

Document Version 0.7

# **IRISHIELD™-UART MO 2120**

## **HARDWARE DEVELOPER'S**

## **MANUAL**



# Document

## Change Record

This page records any updates and revisions made to the IriShield™-UART MO 2120 Hardware Developer's Manual.

Doc ver.	Date	Change Description
0.2	05 <sup>th</sup> Sep 2013	Draft version
0.3	10 <sup>th</sup> Sep 2013	Format correction
0.4	26 <sup>th</sup> Nov 2013	Adding parts description
0.5	07 <sup>th</sup> Jan 2014	Update power management
0.6	13 <sup>th</sup> Aug 2014	Update Memory Warranty
0.7	03 <sup>rd</sup> Dec 2014	Update FPCB Connector

### Note

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The information contained herein is provided solely for the purpose of assisting customers to understand how to operate and integrate IriTech's hardware and software and is not to be released, reproduced, or used for any other purpose without written permission of IriTech, Inc.

IriTech reserves the right to make changes on this hardware and software with the intent to improve its functionalities. Information and specifications contained in this document are subject to change without prior notice and do not represent a commitment on part of IriTech.

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# 1. Preface

## 1.1 Purpose of this Document

This Hardware Developer's Manual provides detailed information useful for integrating the IriShield™- UART MO 2120 into customer solutions, including hardware specifications, component technology and component assembly.

## 1.2 Intended Reader

This document is written for hardware engineers and systems architects responsible for designing and building complete biometrics solutions. Readers of this manual are assumed to be familiar with basic engineering, electronics and biometrics concepts. There is no presumed knowledge about any aspect of the IriShield™-UART MO 2120.

## 1.3 Other Documentation

For additional information about this product, refer to the following documents:

- IriShield™-USB and IriShield™-UART SW Developer's Manual – useful tips for IriShield™USB and IriShield™-UART SDK
- IDDK 2000 API Reference Manual for C\_C++ – a detailed listing of the Application Programming Interface (API)

## 1.4 Contact Information

If you have any questions or experience any problems using this hardware, please contact:

Phone: +1.703.877.2135 (USA)  
+82.2.872.3812 (South Korea)

Email: [collaboration@iritech.com](mailto:collaboration@iritech.com)

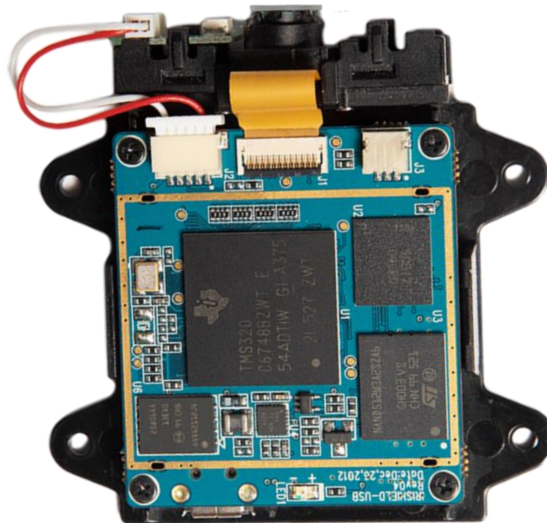
Your feedback is important for us to help and provide you with the most accurate and highest quality information. If you have any comments about this documentation, please email us. Include the version of this document and the section that pertains to your comments.

# 2. Introduction

IriShield™-UART MO 2120 is a revolutionary, monocular design that delivers the highest quality autocapturing iris acquisition with an ease of use never achieved by older camera systems. The system offers contactless, fast, standards-compliant iris acquisition in a small form factor that is easy to house in a variety of packages. IriShield™-UART includes an embedded CPU that enables on-board computing for automated quality-based iris image capturing, verification, and identification without taxing the computing power of the host PC. IriShield™-UART provides a PKI-based security infrastructure which creates a self-generated RSA-2048bit key and generates a random one-time AES-256bit key for each session. As a result, this camera can operate with nearly any host PC or mobile computing device. With its UART interface, compact design, and sophisticated, easy-to-integrate accompanying software, IriShield™-UART represents unprecedented value for iris biometrics identification.

### 3. Key Features

- All-in-one Iris Identification camera in an ultra-compact size
- Top quality, fast, auto-capture and cost-effective iris recognition camera
- Automatic, easy-to-use, and light-weight
- Built-in Real-time Quality Evaluator and Automated Iris Acquisition
- Proven leading algorithms for template generation and comparison
- Powerful SDK for easy software development
- Safest for eyes: Safe infrared illumination at less than 2% of the LED Eye Safety Standard Regulation
- Ready to be integrated with IriTech's enterprise software environment
- Easy hardware integration



## 4. Warnings and Precautions

IriShield™-UART includes sensitive electronics and optics. It is possible for IriShield™-UART device to get these electronics damaged if you do not follow proper precautions:

- Clean regularly to remove dust, but do not use any cleaning solutions. Only wipe the device with a smooth cloth or towel. Keep the lens free of dust and dirt, and use a special cloth for optics in order to avoid scratching the optics.
- Do not allow water to leak into the device or operate the device in humid conditions where water might condense upon the electronics.
- Do not operate device in places where temperate reach extremes beyond the stated range.
- Do not place the device next to heating equipment.
- Do not place magnets near the device.
- Do not apply voltage or current beyond the stated range.
- Do not use the device for any purposes beyond those specified.
- Do not disassemble components from the boards or alter wiring or board design.
- Do not drop the device or submit to sudden impact or mechanical stresses.
- Handle the electronics with proper anti-static protection and techniques to prevent shorting any microchips.

**Any damage to the device caused by these activities will void the warranty.**

# 5. Product Inventory

Item		Quantity
Standard	IriShield™-UART MO 2120 Board	1
	Camera Module	1
	IriShield™-UART MO 2120 Module Frame	1
	IR-LED Ass'y Cable	1
	90mm Ass'y Cable (UART)	1
	9Φ IR-Filter	1
	Software Package	1

## STANDARD



Camera Module



IriShield-UART MO 2120



IriShield-UART MO 2120  
Module Frame



IR-LED Ass'y Cable



Software Package

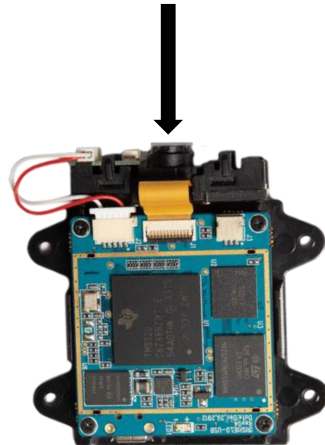
## STANDARD



IR-Filter



Ass'y Cable (UART)



\* Software Package can be downloaded from IriTech's Website.

## 6. Hardware Specifications

- **Parts description and Mechanical Size**
  - IriShield™-UART MO 2120 Board: Main board (details from page 7)  
36 x 40 x 6.9 mm (1.4 x 1.6 x 0.3 in)
  - Camera Module: Specialized iris camera module (details in page 14)  
30 x 15.4 x 7.1 mm (1.2 x 0.6 x 0.3 in)
  - IriShield™-UART MO 2120 Module Frame: Frame for assembly  
54.2 x 55 x 12 mm (2.1 x 2.2 x 0.5 in)
  - IR-LED Board: IR LED board for infrared emission light (details from page 15)  
10 x 12.5 x 3 mm (0.4 x 0.5 x 0.1 in)
  - 90mm Ass'y Cable: Communication cable with host (details in page 8, 11)  
93 x 14 x 2.8 mm (3.67 x 0.55 x 0.1 in)
  - 9 Φ IR-Filter: High pass filter to remove visible light reflection in iris image  
9 x 9 x 0.7 mm (0.36 x 0.36 x 0.28 in)  
※ Should be assembled in front of camera module (details from page 17)

- **Power Requirements**

Required Voltage	Vin	
	Min	Max
Recommend	External Power (DC +5V ± 5%)	
Absolute	3.4V	6V

- Infinite loops are one of the most common problem that plagues developers. They can occur in any programming language, in any application and in any coding style. If infinite loop occurs, it can be solved by turning off/on the power switch. We strongly recommend installing a switching circuit or power control switch to fix the problem.

- **Power Management**

Mode	Current	Description
Active	MAX 220mA	Fully operating
Standby	MAX 70mA	Standby Mode
Sleep	MAX 40mA	Sleep Mode
Deepsleep	MAX 25mA	Deep Sleep Mode



- **Environmental**

- -20°C to +60°C Storage
- 0°C to +50°C Operating

- **Camera Description**

Image Resolution:	Output is ISO Standard of 640 x 480 pixels (Optional: Higher Resolution output is available)
Sensor Resolution:	VGA
Pixel Density:	Normally greater than 210 pixels across iris diameter
Focal Distance:	4.7 cm ~ 5.3 cm (1.8 ~ 2.1 in) from the front of the top of camera module (Focal Depth: 0.6 cm).
Optimal Distance:	5 cm (2 in) from the front of the top of camera module
Field of View (FOV):	About 3.3 x 2.4 cm at 5 cm (1.3 x 0.9 in at 2 in)

- **Memory**

- 64 MB NAND Flash Memory
- 128 MB Mobile DDR SDRAM

- **External Connection**

- UART, RS-232

- **Compliance**

- Eye safety (IEC 62471:2006-07) (TBD)
- RoHS (TBD)

- **Memory Warranty**

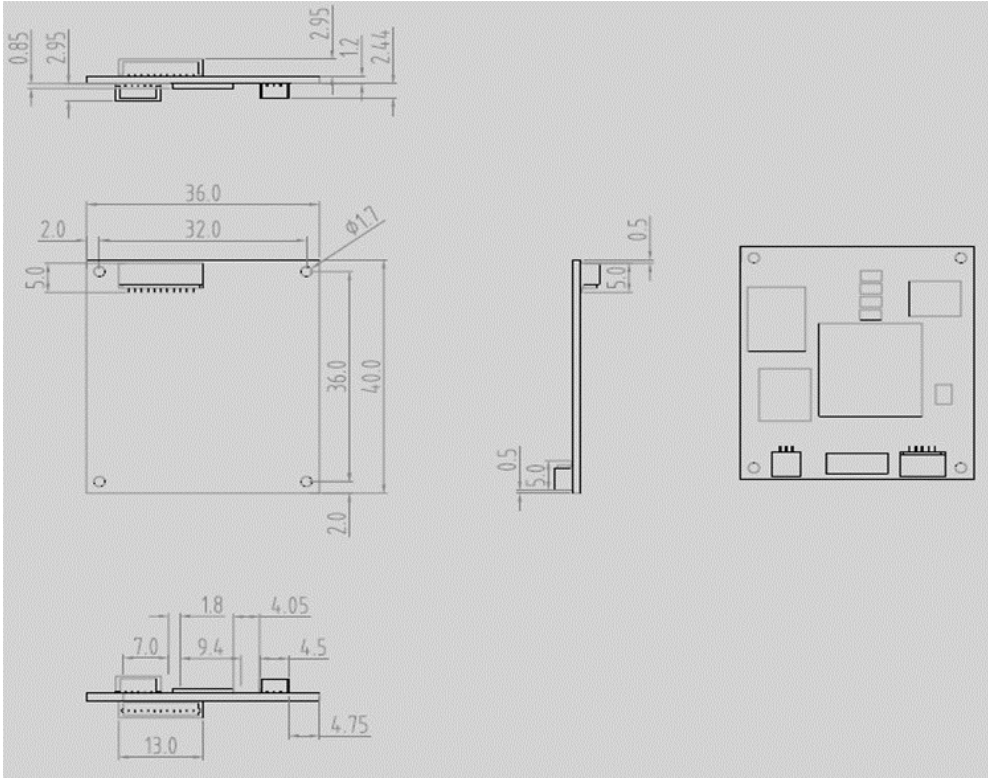
Iris images will be stored inside the memory of device. This memory is warranted for storing and deleting up to 100,000 cycles. Therefore, if the count of stored/deleted images exceed 100,000 cycles, the device will be out of warranty.

**Program, erase endurance cycles**

Parameters	Min	Unit
Program/erase cycles per block	100,000	Cycles

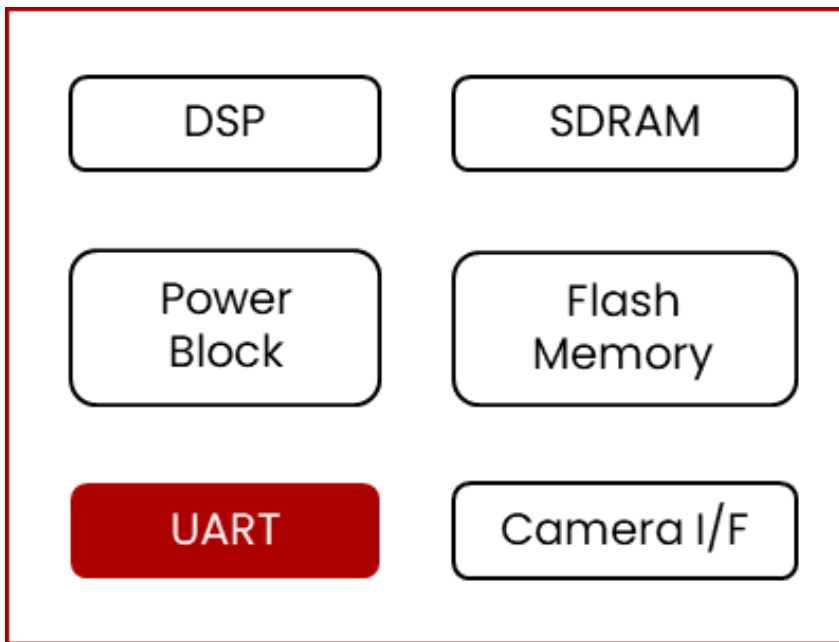
# 7. Irishield™-UART MO 2120 BOARD

## 7.1 Mechanical Drawing

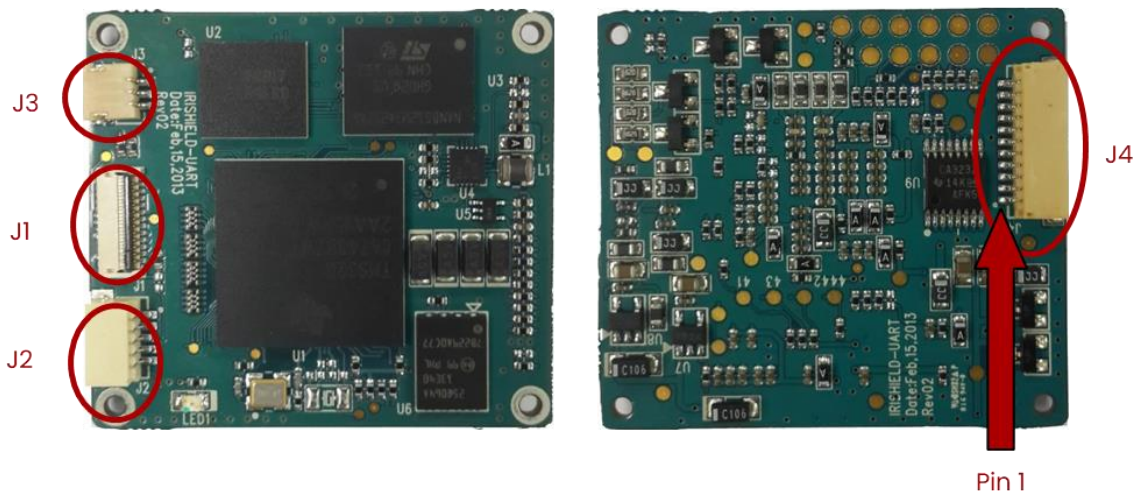


Note: All dimensions are in millimeters.

## 7.2 Functional Block Diagram



### 7.3 Connector and Ass'y Cable Interfaces



- **UART Connector**

Location: J4

1.0mm pitch, 11 pin connector

Manufacturer: CVILUX CORPORATION

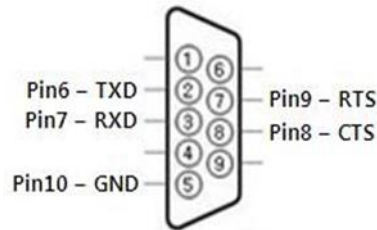
Part Number: C11111MIHR0-LF

- **UART Connector pin map**

Pin number	Signal	Remark
1	POWER(+5V)	
2	TXD1	The Pin Level is 0 ~ 3.3V
3	RXD1	The Pin Level is 0 ~ 3.3V
4	RTSN1	
5	CTSN1	
6	TXD (RS-232)	The Pin Level is 0 ~ 5V
7	RXD (RS-232)	The Pin Level is 0 ~ 5V
8	CTS (RS-232)	

9	RTS (RS-232)	
10	GND	
11	DS_input	

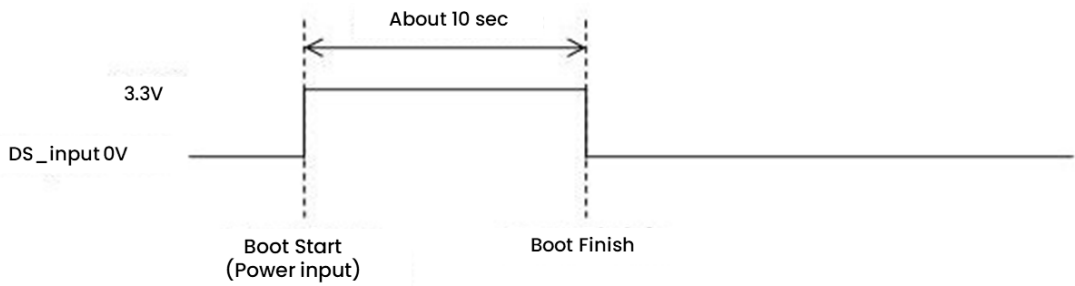
DB-9 RS232 CONNECTOR



- UART flow control on RS-232

Signal	Hardware flow Control	No flow Control
TXD	Pin Connection	Pin Connection
RXD	Pin Connection	Pin Connection
CTS	Pin Connection	Pin Non connection
RTS	Pin Connection	Pin Non connection

- UART flow control reset



When the voltage of DS\_input pin is maintained more than 10 seconds at 3.3V (high) during system boot, UART flow control settings are reset to default values. The exact booting time can be known by checking Ready Status of DS\_ouput.

UART Flow control could be changed to no flow control after UART flow control settings are reset. For more information, please refer to "IriShield™-USB and IriShield™-UART SW Developer's Manual".

**Note:**

If "enableDeepsleepInterrupt" is set ON in device's configuration, device automatically goes to Deepsleep Mode when it detects a falling edged on DS\_input after booting time. Please refer to section 7.4 to know how to wake it up.

Item	Default Value
Flow Control	No Flow Control
Baud Rate	115200(b/s)

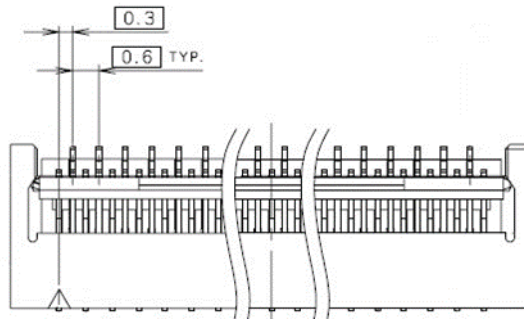
- **FPCB Connector**

Location: J1 (on top of IriShield™-UART MO 2120 Board)

25 pin connector

Manufacturer: KYOCERA ELCO CORPORATION

Part Number: 04-6293-625-005-829+



\* 0.6mm Pitch (SMT Pitch)

\* 0.3mm Pitch (Cable Connection Pitch)

- **IR-LED Connector**

Location: J2

1.0mm pitch, 5 pin connector

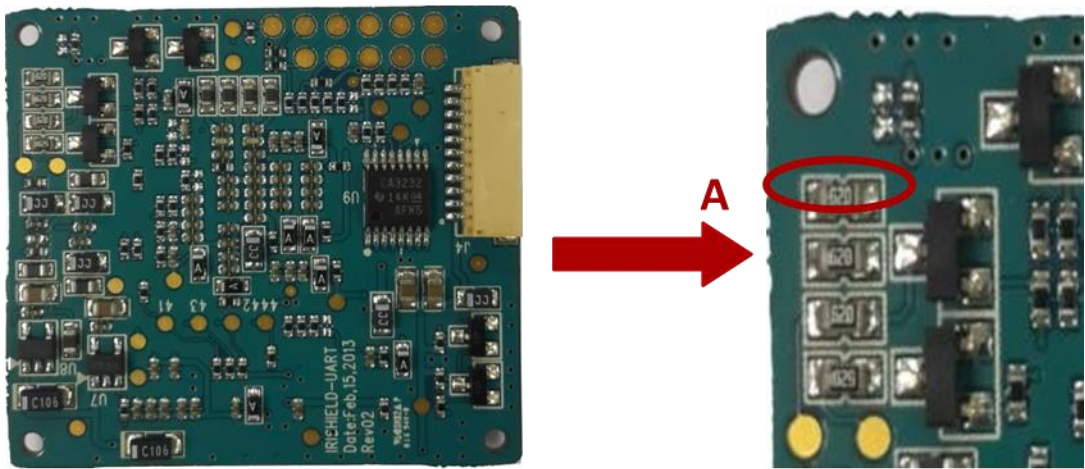
Manufacturer: CVILUX CORPORATION

Part Number: C11105MIHR0-LF

Pin number	Signal
1	LED1
2	LED2
3	LED3

4	LED4
5	POWER (3.3V)

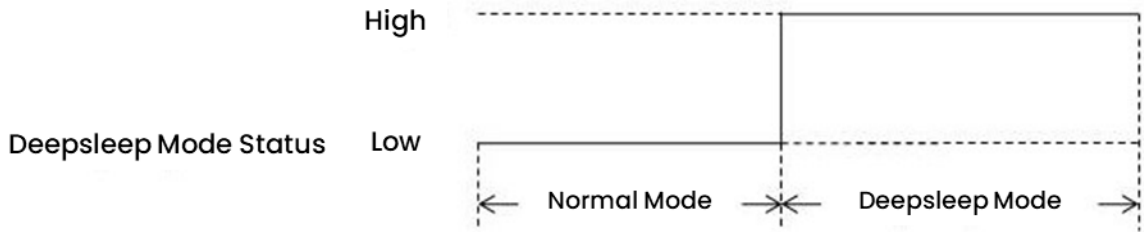
- GPIOs of LED1~LED3 are controlled at the same time not independently.
  - ▷ IR-LED is connected to the LED1 on this module.
- A user can control LED4 signal of J2.
  - ▷ LED drawing current can be changed by the value of "A" resistor.
    - \* "A" resistor default value: 62ohm
  - ▷ For more information about LED control, refer to "IDDK 2000 API Reference Manual".



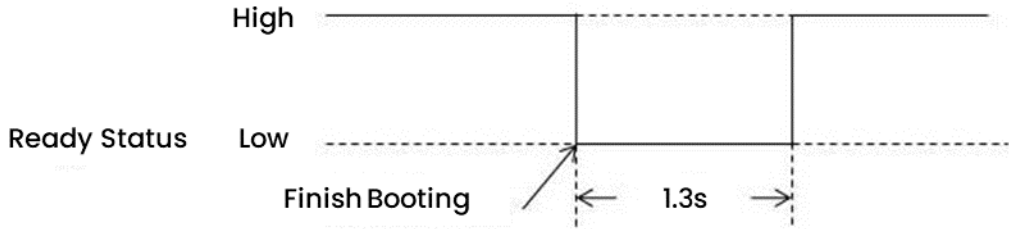
- **DS\_output Connector**  
 Location: J3  
 1.0mm pitch, 3 pin connector  
 Manufacturer: CVILUX CORPORATION  
 Part Number: CII403MIHR0-NH

Pin number	Signal	Description
1	Deepsleep Mode Status	Alert pin of Deepsleep Mode status
2	Ready Status	Alert pin for the Ready Status of device
3	GND	

## Deepsleep Mode Status Timing Diagram



## Ready Status Timing Diagram



※ High voltage value: 3.3V (Max)

- 90mm Ass'y Cable

Location: From J4 to Host

1.0mm pitch, 11 pin cable

Housing and Terminal Manufacturer: CVILUX CORPORATION

Part Number: Housing (C1111S0000), Terminal (C111T011PP0)

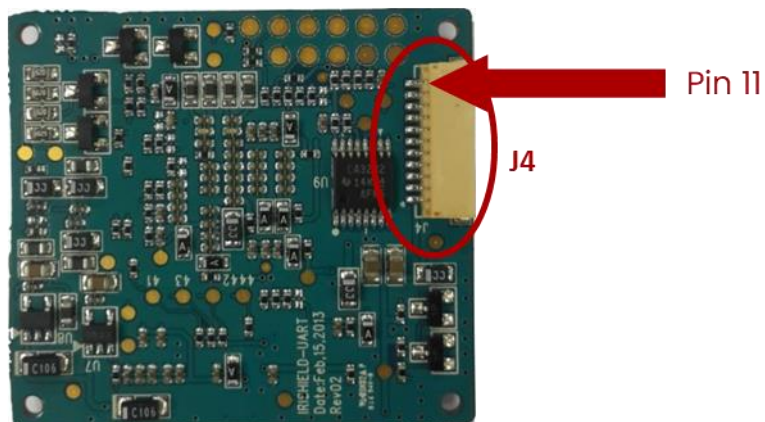


## 7.4 Deepsleep Mode

- Deepsleep Mode
  - It requires a Firmware of at least Ver4.0 or above to utilize its Deepsleep Mode.
  - It requires an exterior switch to utilize its Deepsleep Mode.
  - ※ Device can be put into Deepsleep Mode due to one of the following conditions
    - “Iddk\_SleepDevice” function of IriShield’s SDK is called when the DS\_input pin is being kept in low-level.
    - Device is configured to automatically go into Deepsleep Mode after some idling time during DS\_input pin is being kept in low-level.
    - A falling edge is detected on DS\_input pin when device has been configured to automatically go into Deepsleep Mode (“enableDeepsleepInterrupt” is set ON).

For detailed information, please refer to “IriShield™-USB and IriShield™-UART SW Developer’s Manual”.

- Wake-up  
Wake-Up Mode is controlled by Pin11 of J4 as in figure below



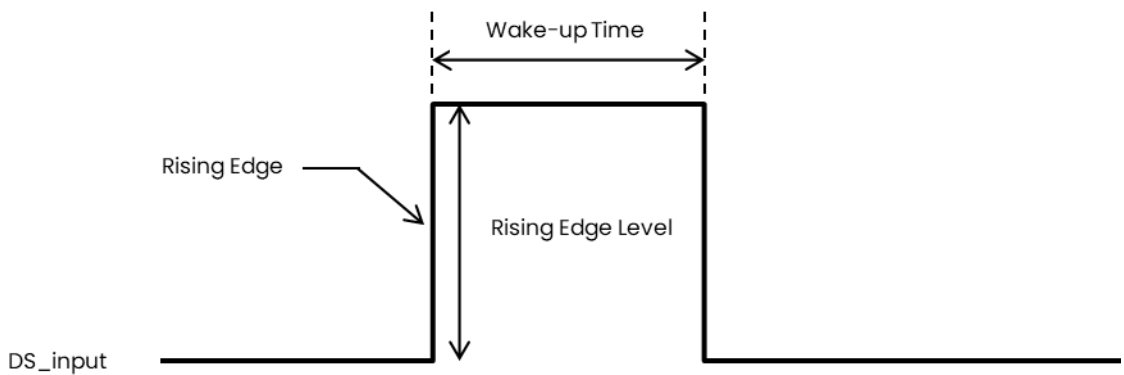
- UART Connector J4 pin map

Pin number	Signal	Remark
1	POWER(+5V)	
2	TXD1	The Pin Level is 0 ~ 3.3V
3	RXD1	The Pin Level is 0 ~ 3.3V
4	RTSN1	



5	CTSNI	
6	TXD (RS-232)	The Pin Level is 0 ~ 5V
7	RXD (RS-232)	The Pin Level is 0 ~ 5V
8	CTS (RS-232)	
9	RTS (RS-232)	
10	GND	
11	DS_input	

Wake-Up Mode is executed when rising edge is entered into pin 11 of J4



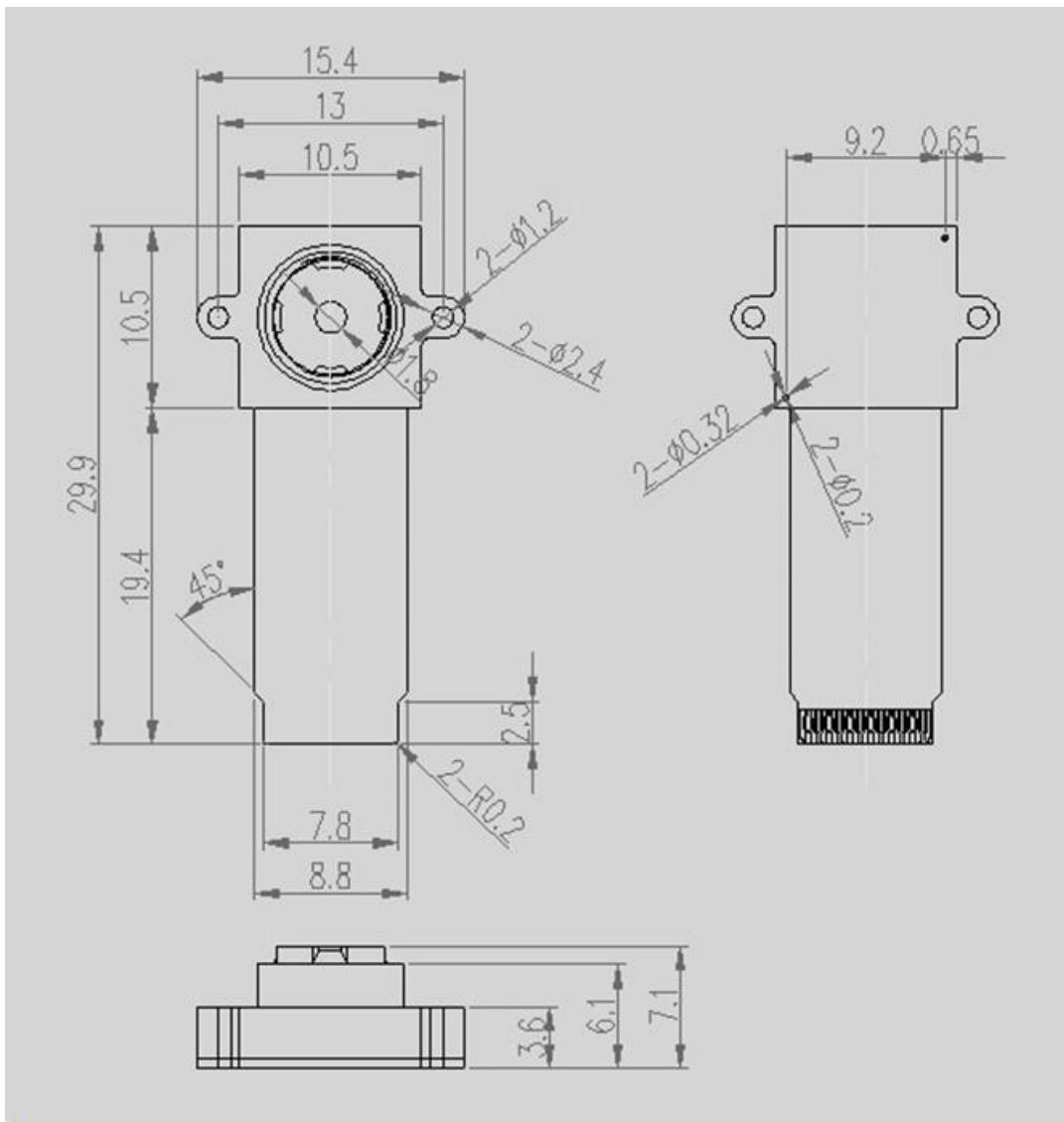
- Rising Edge Level: 2.5V(Min) ~ 3.3V(Max)
- Wake-Up Time:  $\geq 100\mu\text{s}$

# 8. Camera Module

## 8.1 Camera Interface



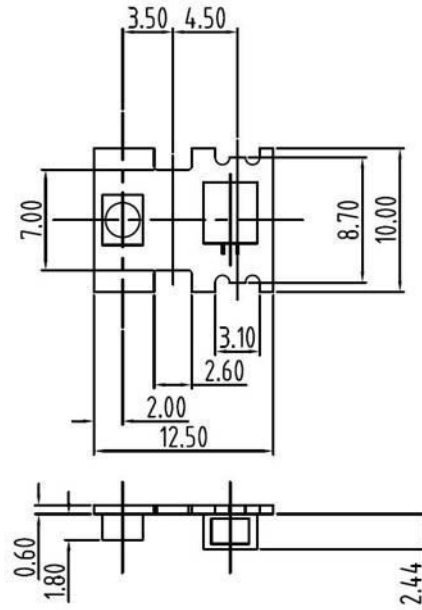
## 8.2 Mechanical Drawing



Note: All dimensions are in millimeters.

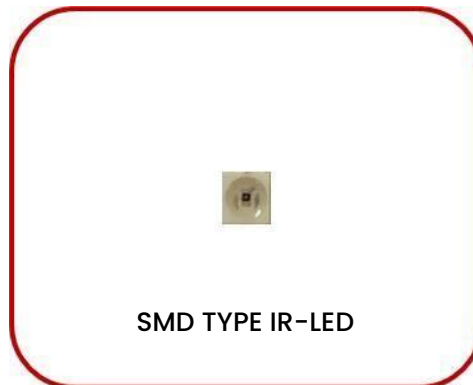
## 9. IR-LED Ass'y Cable

### 9.1 Interface and Mechanical Drawing



Note: All dimensions are in millimeters.

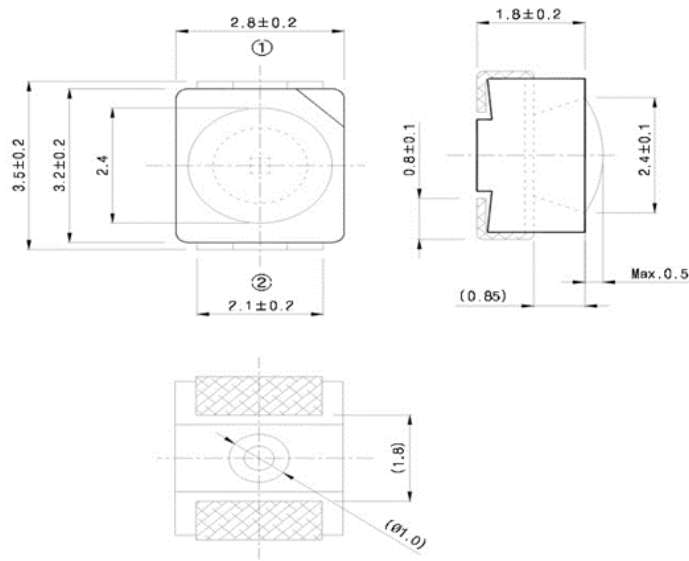
### 9.2 IR-LED Interface



- SMD TYPE IR-LED
  - Peak wavelength:  $\lambda_p = 810 \text{ nm}$
  - Angle of half intensity:  $\varphi = \pm 60^\circ$
  - Manufacturer: KODENSHI AUK
  - Part Number: KP3528181 (KLP-32I-81)

### 9.3 IR-LED Mechanical Drawing

➤ SMD TYPE IR-LED



Note: All dimensions are in millimeters.

### 9.4 5 Pin Housing Interface and Mechanical Drawing

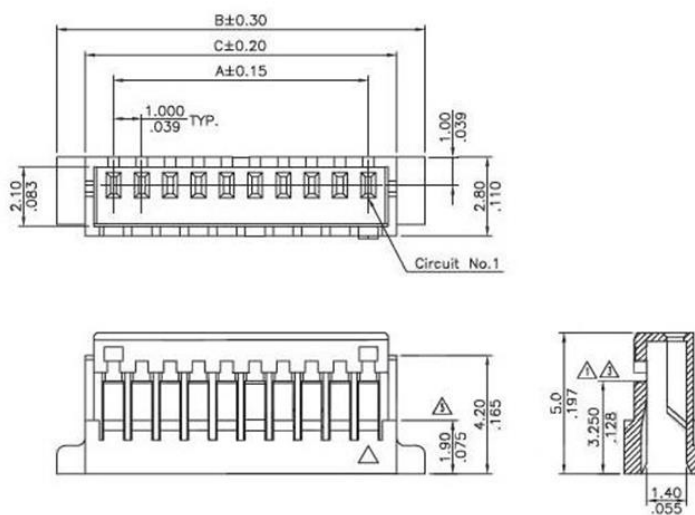
- 5 Pin Housing Interface

1.0 mm pitch, 5 pin

Housing and Terminal Manufacturer: CVILUX CORPORATION

Part Number: Housing (C11105S0000), Terminal (C111T011PP0)

- Mechanical Drawing

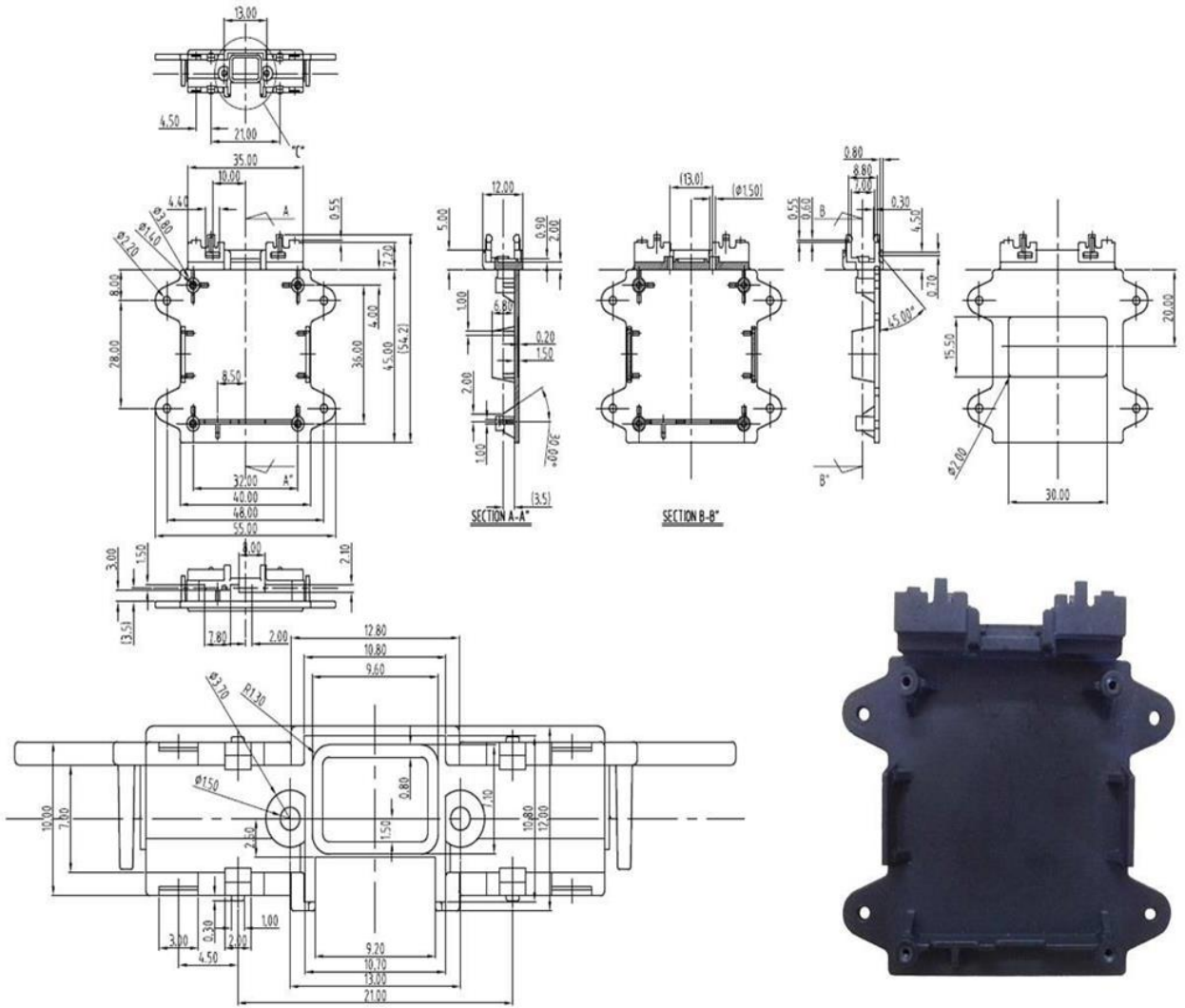


DIM. A =  $1.00 \times \text{NO. OF SPACES}$   
 DIM. B = DIM. A + 4.0  
 DIM. C = DIM. A + 2.0  
 \* AVAILABLE IN 2 THROUGH 15 CIRCUITS

Note: All dimensions are in millimeters.

# 10. IriShield™-UART MO 2120 Module Frame

## 10.1 Interface and Mechanical Drawing



Note: All dimensions are in millimeters

## 11. IR Filter

IR Filter enables only infrared light to penetrate into the camera by filtering out visible light.

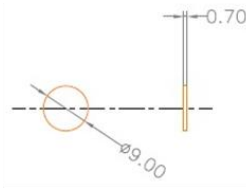
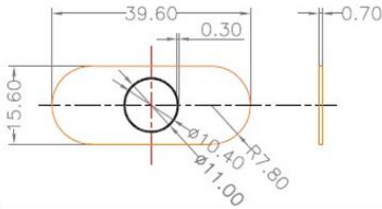
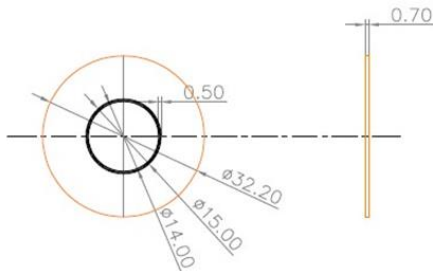
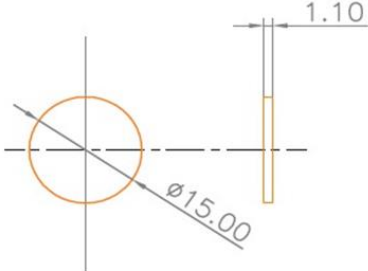
- *Note: Camera should be in a dark space. Make sure visible lights do not penetrate into the camera when you attach the IR filter on your case.*
- **Location (Example)**

Place the IR Filter on the camera as shown below.



- **Availability**

The following types of IR Filter have been used in other products.

Part Code	Size	Thickness	Drawing
0F02-000001	9 $\phi$	0.7mm	
0F02-000002	39.60*15.60	0.7mm	
0F02-000003	32.20 $\phi$	0.7mm	
0F02-000005	15.00 $\phi$	1.1mm	

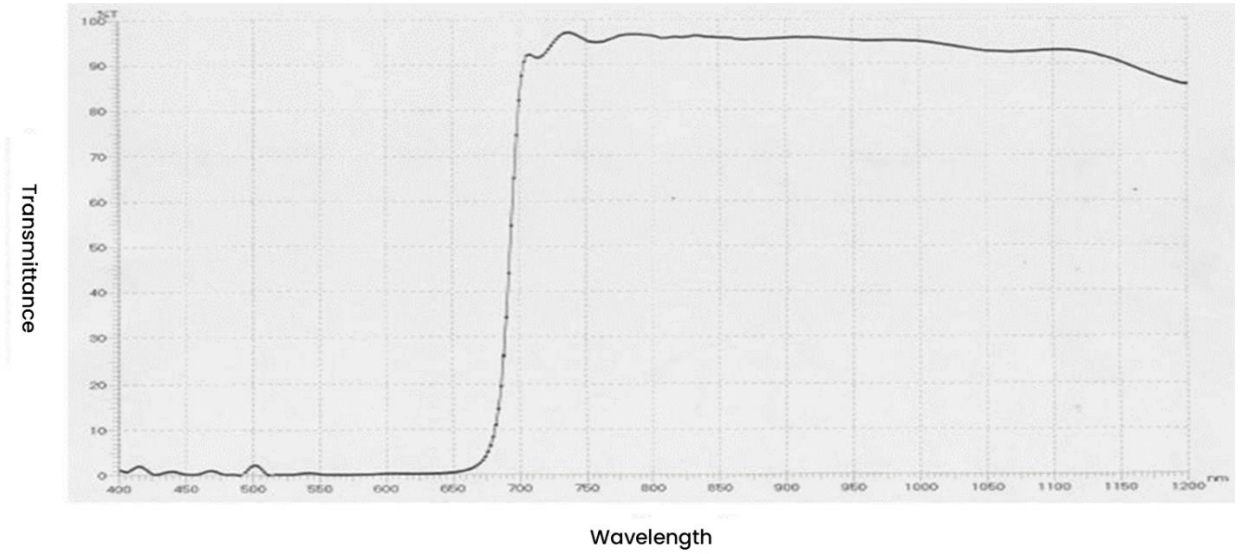
Specifications of IR Filter that can be modified are as follows. Additional cost applies for this tooling.

- Thickness: 0.55mm, 0.7mm, 1.1mm
- Shape: Circle, Quadrangle, etc.
- Size: ~ 300 $\phi$  (Circle), ~ 340\*290mm (Quadrangle)

- **Recommend Band Pass Filter Specifications**

- Tavg < 5% @ 400~680nm
- Tavg > 90% @ 720~880nm

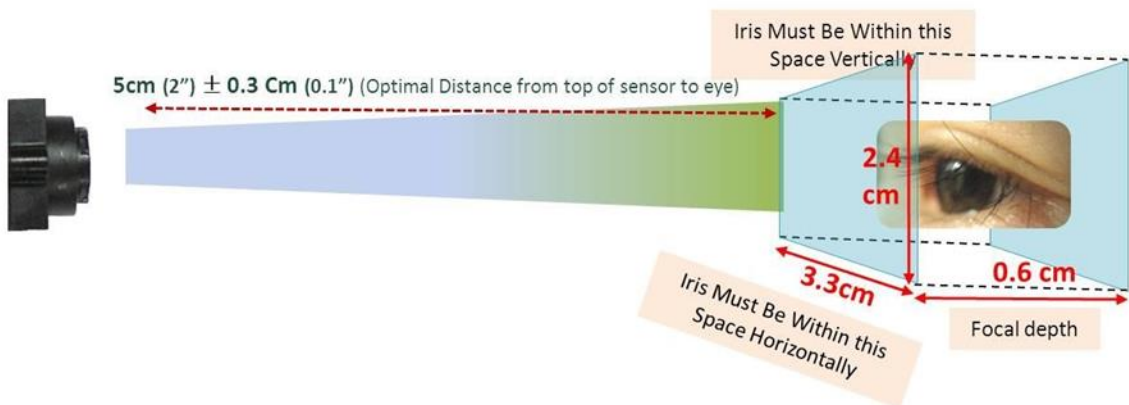
- Tabs > 90% @ 810~850nm (Tabs > 87% @ 720~810nm and 850~880nm)
- Spectral Spectral Characteristics Graph



## 12. Capture Volume

Parameter	Focal Depth	Horizontal	Vertical
Range	0.6 cm (0.2 in)	3.3 ± 0.1 cm (1.3 in)	2.4 ± 0.1 cm (0.9 in)

Volume: 7.9 cm<sup>3</sup> at 13.5 ~ 14.5 cm range

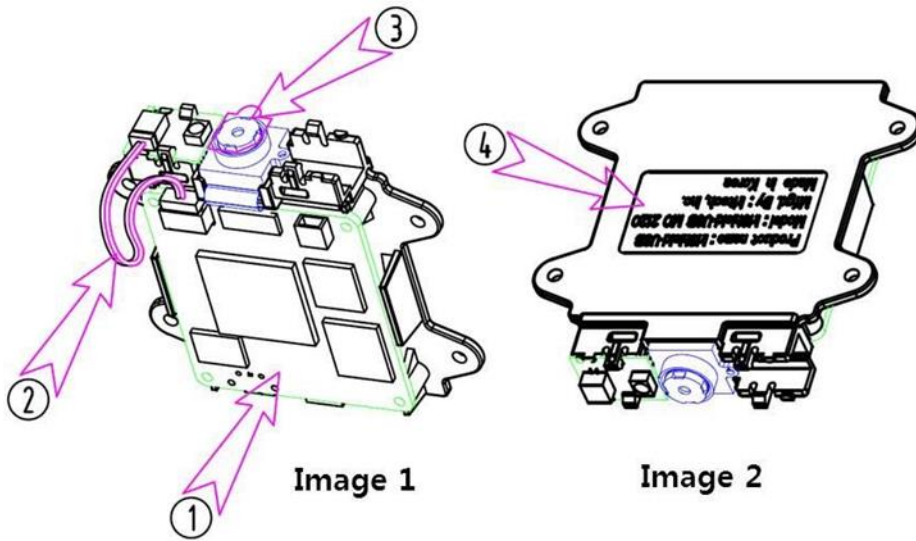


- ❖ The optimal distance for the best image is 5cm (2 in) from the top of the camera module.



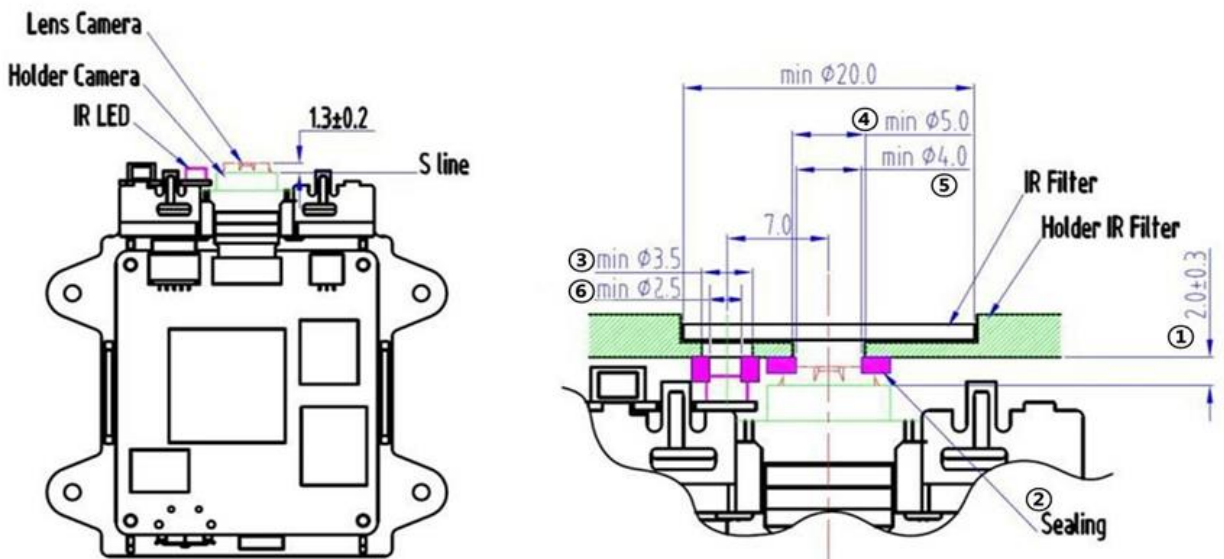
# 13. Mount Cautions and Mount Guide

## 13.1 Mount Cautions



1. Be cautious not to directly touch the PCB Panel with hands, liquid, or rigid objects for it may lead to malfunction.
2. When mounting the module with the case, allow enough space to avoid any unnecessary shock to the wire.
3. The lens protector film must be removed before starting to mount.
4. The module must be mounted with the labeled side facing up as shown in Image 2. If mounting orientation is upside down, an error will occur with flipped captured image.

## 13.2 Mount Guides



Note: All dimensions are in millimeters.

The following installation guidelines are recommended to prevent degradation in captured image quality.

1. Maintain 2 mm distance between Holder Camera and Holder IR Filter.
2. Use a ring-shaped elastic material such as Poron as a sealing sponge and have it compressed between Holder IR Filter and Camera Lens to prevent the interference of IR LED light. When doing so, the camera hole and the center of a sphere need to be matched to avoid interference in capture view angle.  
Use the same or similar sealing material and have it compressed between Holder IR Filter and IR LED to prevent the IR LED light from leaking in different directions.
3. Maintain the minimum of 3.5 mm as the IR LED light transmission hole diameter; otherwise, the images will turn out dim.
4. Maintain the minimum of 5.0 mm as the camera light transmission hole diameter; otherwise, the capture errors may occur.
5. Maintain the minimum of 4.0 mm as the Camera Sealing; otherwise, the capture errors may occur.
6. Maintain the minimum of 2.5 mm as the IR LED Sealing hole diameter; otherwise, the images will turn out dim.

# 14. Legal Notice

## 14.1 Warranty Terms

Commonly applied to entire Iris Cameras & Modules supplied by IriTech	
Warranty Length	1 Year Limited: Parts & Labor, Mail in or Carry in
Hardware Technical Support	1 Year
Software Support	90 days
Website	<a href="http://www.irittech.com">http://www.irittech.com</a>
Service Phone Number	+1 703 877 2135 (United States) +82 2 872 3812 (Korea)

THIS LIMITED WARRANTY DOES NOT COVER MISUSE OR MINOR IMPERFECTIONS IN UNITS THAT MEET DESIGN SPECIFICATIONS OR IMPERFECTIONS THAT DO NOT MATERIALLY ALTER FUNCTIONALITY.

THIS LIMITED WARRANTY DOES NOT COVER AND IRITECH IS NOT RESPONSIBLE FOR:

- DAMAGES CAUSED BY MISUSE, ABUSE, ACCIDENTS, FIRE, THEFT, DISAPPEARANCE, MISPLACEMENT, POWER SURGES, VIRUSES, RECKLESS, WILLFUL, OR INTENTIONAL CONDUCT.
- DAMAGES CAUSED BY SERVICING NOT AUTHORIZED BY IRITECH.
- DAMAGES CAUSED BY USAGE THAT IS NOT IN ACCORDANCE WITH PRODUCT INSTRUCTIONS.
- DAMAGES CAUSED BY FAILURE TO FOLLOW THE PRODUCT INSTRUCTIONS OR FAILURE TO PERFORM PREVENTIVE MAINTENANCE.
- DAMAGES CAUSED BY THE COMBINATION OF IRITECH PRODUCTS WITH OTHER NON-IRITECH BRANDED PRODUCTS, ACCESSORIES, PARTS OR COMPONENTS.
- SOFTWARE, INCLUDING THE OPERATING SYSTEM AND SOFTWARE ADDED TO YOUR PRODUCT THROUGH OUR FACTORY-INTEGRATION SYSTEM, THIRD-PARTY SOFTWARE, OR THE RELOADING OF SOFTWARE.
- ANY EQUIPMENT OR COMPONENTS THAT WERE NOT INCLUDED IN YOUR PRODUCT AS ORIGINALLY SOLD TO YOU.
- NORMAL WEAR AND TEAR.
- COSMETIC DAMAGE THAT DOES NOT AFFECT FUNCTIONALITY.
- PRODUCTS WHERE THE IRITECH SERIAL NUMBER IS MISSING, ALTERED OR DEFACTED.

To obtain warranty service:

- You must assist IRITECH in diagnosing issues with your product and follow IRITECH's warranty processes.
- You must obtain warranty service from IRITECH or an authorized service center specified by IRITECH. IRIECH will not reimburse you for service performed by others.
- You may be required to deliver and retrieve your product to and from IRITECH or an authorized service facility specified by IRITECH at your expense. When sending a product to IRITECH or the authorized service facility specified by IRITECH, you must deliver the

product, freight prepaid, in either its original packaging or packaging affording an equal degree of protection. You are responsible for properly packaging your product, paying all shipping costs, loss or damage to the product during shipping, and any other taxes, fees or charges associated with transporting the product to an authorized IRITECH service facility. **YOU ARE RESPONSIBLE FOR ANY DAMAGE TO YOUR IRITECH PRODUCT DURING SHIPMENT TO US.**

- Before providing your product to IRITECH for service, remove any confidential, proprietary or personal information.
- If IRITECH asks you to return defective parts or products, you must do so within 7 days after you receive the replacement parts or products. IRITECH will charge you for replacement parts or products if you fail to do so.

IT IS YOUR RESPONSIBILITY TO BACK UP THE CONTENTS OR DATA RECORDED ON THE DEVICE BEFORE SERVICES ARE PERFORMED AND REMOVE ANY DATA FROM PARTS OR PRODUCTS RETURNED TO IRITECH. It is possible that the contents recorded will be lost or reformatted in the course of service and IRITECH will not be responsible for any damage to or loss of any programs, data, or other information stored on any media or any part of any product serviced. IF DURING THE REPAIR OF THE PRODUCT THE CONTENTS OF THE DEVICE ARE ALTERED, DELETED, OR IN ANY WAY MODIFIED, IRITECH IS NOT RESPONSIBLE FOR ANY LOSS OF YOUR DATA WHATSOEVER. YOUR PRODUCT WILL BE RETURNED TO YOU CONFIGURED AS ORIGINALLY PURCHASED (SUBJECT TO AVAILABILITY OF SOFTWARE).

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