Document Version 1.11

# IRISHIELD™ – MO 2120

# HARDWARE DEVELOPER'S MANUAL

**Iritech, Inc.**

# Document Change Record

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

| Doc ver. | Date | Change Description |
|---|---|---|
| 1.0 | 16th Nov 2012 | Beta version released to customers |
| 1.1 | 19th Nov 2012 | Minor update |
| 1.2 | 21st Nov 2012 | Grammar correction |
| 1.3 | 12th Feb 2013 | Minor update |
| 1.4 | 01st Apr 2013 | Minor update |
| 1.5 | 03rd Sep 2013 | Minor update |
| 1.6 | 26th Nov 2013 | Adding parts description |
| 1.7 | 07th Jan 2014 | Update power management |
| 1.8 | 28th Jul 2014 | Update indicator LED |
| 1.9 | 13th Aug 2014 | Update Memory Warranty |
| 1.10 | 03rd Dec 2014 | Update FPCB Connector |
| 1.11 | 08th Oct 2015 | Update Product Inventory |

**Note**

# Table of Contents

# 1. Preface

### 1.1 Purpose of this Document

This Hardware Developer's Manual provides detailed information useful for integrating the IriShield™ - USB MO 210 into customer's solutions. The manual describes 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™ - USB 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

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™-USB 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™-USB 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™-USB 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 USB interface, compact design, and sophisticated, easy-to-integrate accompanying software, IriShield™-USB 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
- Single USB cable connection to host PC (both Power supply and Data)
- 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
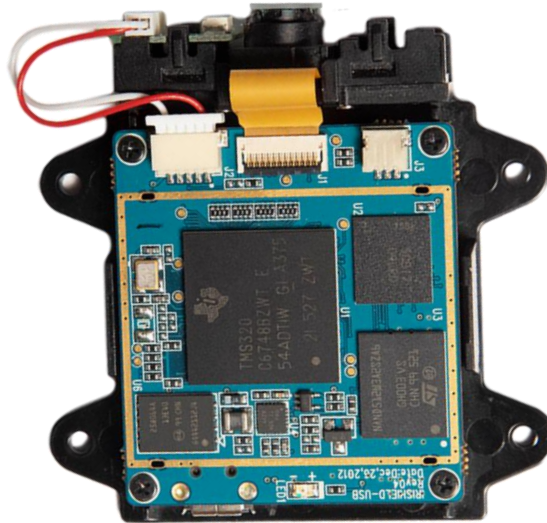
# 4. Warnings and Precautions

IriShield™-USB includes sensitive electronics and optics.  It is possible for IriShield™-USB 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**

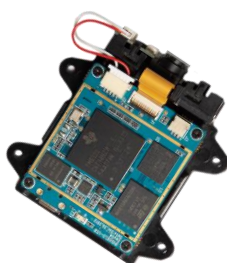| Item | | Quantity |
|---|---|---|
| Standard | IriShield™-USB MO Board | 1 |
| | Camera Module | 1 |
| | IriShield™-USB MO Module Frame | 1 |
| | IR-LED Board | 1 |
| | Software Package | 1 |
| | 40mm Ass'y Cable | 1 |
| | 9Φ IR-Filter | 1 |
| Option 1 | Micro USB Cable | 1 |
| Option 2 | IriShield™-UART MO 2120 Evaluation kit | 1 |

## STANDARD



IR-Filter    Ass'y Cable

## OPTION



Micro USB Cable

## OPTION 2



IriShield™-USB MO 2120 Evaluation Kit

* Software Package can be downloaded from IriTech's Website.
* Additional cost applies for parts offered as option.

# 6. Hardware Specifications

- **Parts description and Mechanical Size**
  - IriShield™-USB MO 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 10)
    30 x 15.4 x 7.1 mm (1.2 x 0.6 x 0.3 in)

  - IriShield™-USB MO 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 13)
    10 x 12.5 x 3 mm (0.4 x 0.5 x0.1 in)

  - 40mm Ass'y Cable: Communication cable with host (details from page 10)
    50 x 5.4 x 2.8 mm (2 x 0.2 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 15)

- **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 250mA | Fully operating |
| Standby | Max 80mA | Standby Mode |
| Sleep | Max 60mA | Sleep Mode |
| DeepSleep | Max 20mA | Deepsleep Mode |

- **Environmental**
  - −20ºC to +60ºC Storage
  - 0ºC to +50ºC 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**

1 USB Connection (supports USB 2.0)

- **Compliance**
  - Eye safety (IEC 62471:2006-07)
  - 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**

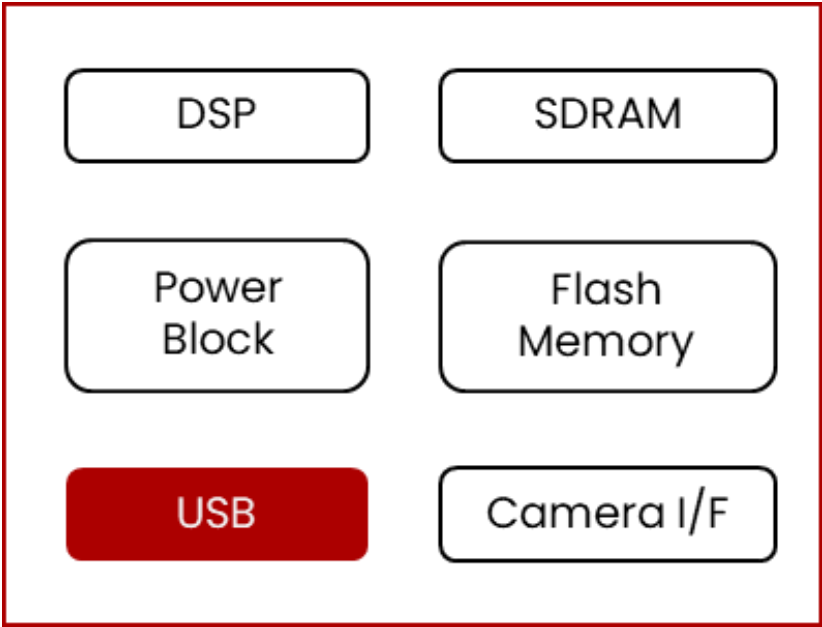| Parameters | Min | Unit |
|---|---|---|
| Program/erase cycles per block | 100,000 | Cycles |

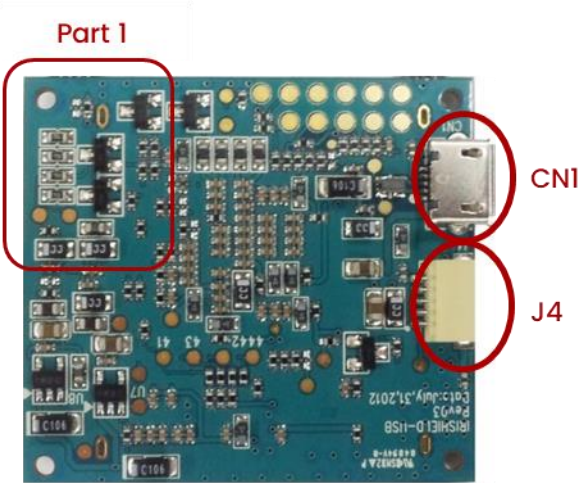# 7. Irishield™–USB MO BOARD

## 7.1 Mechanical Drawing
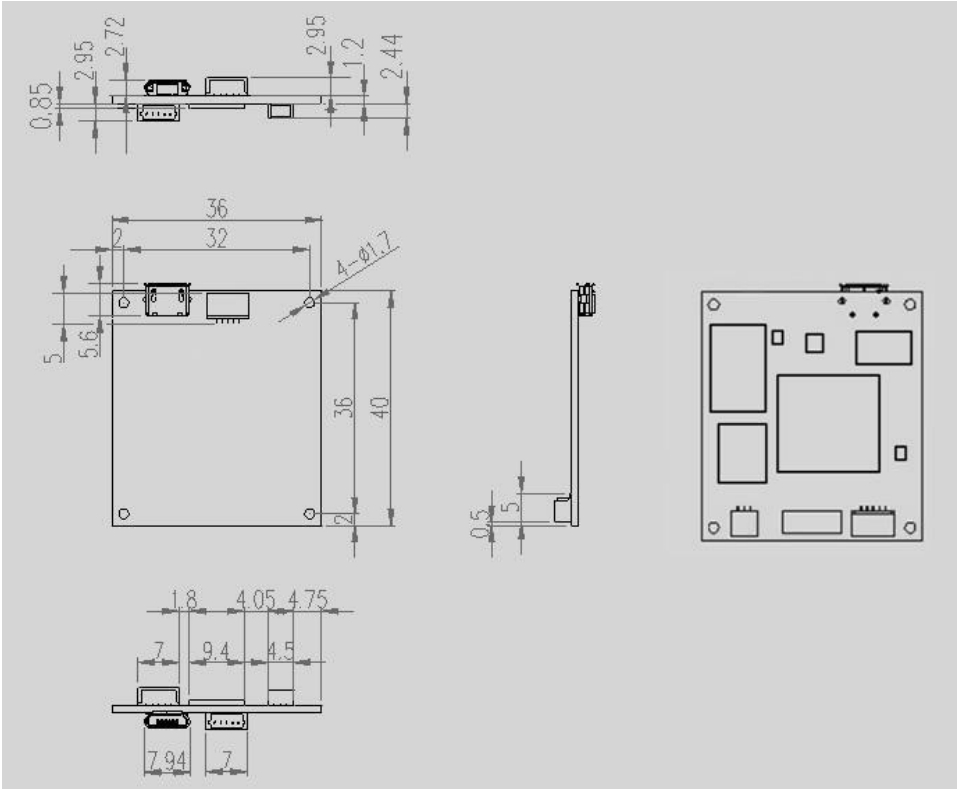


Note: All dimensions are in millimeters.

## 7.2 Functional Block Diagram

## 7.3 Connector and Ass'y Cable Interfaces



- **USB Connector**

Location:  CN1

0.65mm pitch, 5 pin connector

Manufacturer: MAIN SUPER ENTERPRISES CO. LTD.

Part Number: 000010801-00012

| Pin number | Signal |
|:---:|:---:|
| 1 | VUSB+ |
| 2 | D- |
| 3 | D+ |
| 4 | No Signal |
| 5 | GND |

- **FPCB Connector**

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

25 pin connector

Manufacturer: KYOCERA ELCO CORPORATION

Part Number: 04-6293-625-005-829
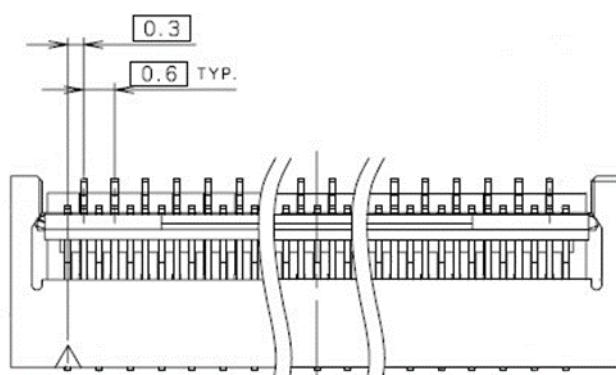
* 0.6mm Pitch (SMT Pitch)
* 0.3mm Pitch (Cable Connection Pitch)
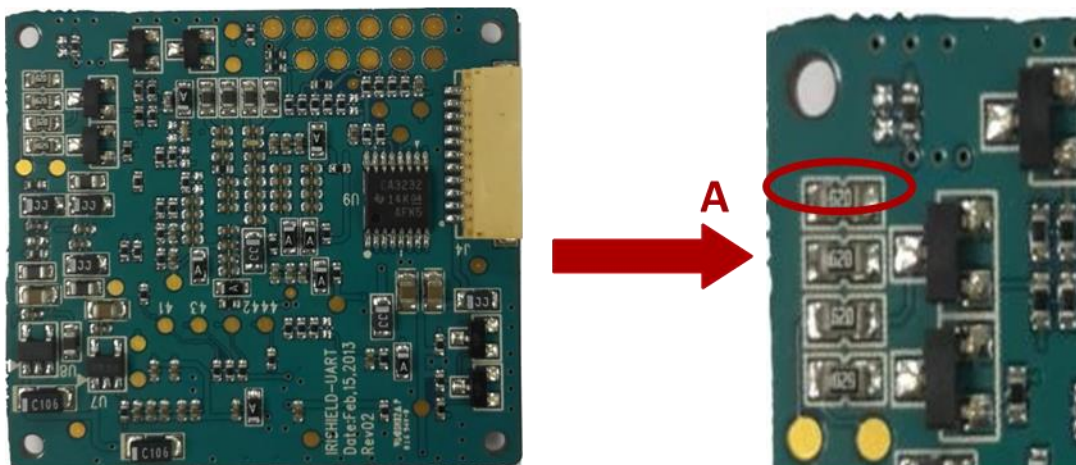
- **IR-LED Connector**

Location: J2
1.0mm pitch, 5 pin connector
Manufacturer: CVILUX CORPORATION
Part Number: CI1105M1HR0-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".

- **LED Connector**

Location:  J3

1.0mm pitch, 3 pin connector
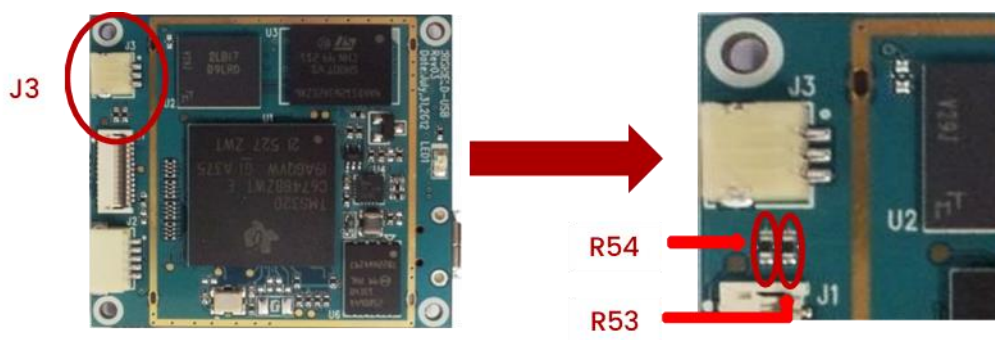
Manufacturer: CVILUX CORPORATION

Part Number: CI1403M1HR0-NH

| Pin number | Signal | Description |
|---|---|---|
| 1 | LED5 | Control pin for indicating |
| 2 | LED6 | Control pin for indicating |
| 3 | GND | |

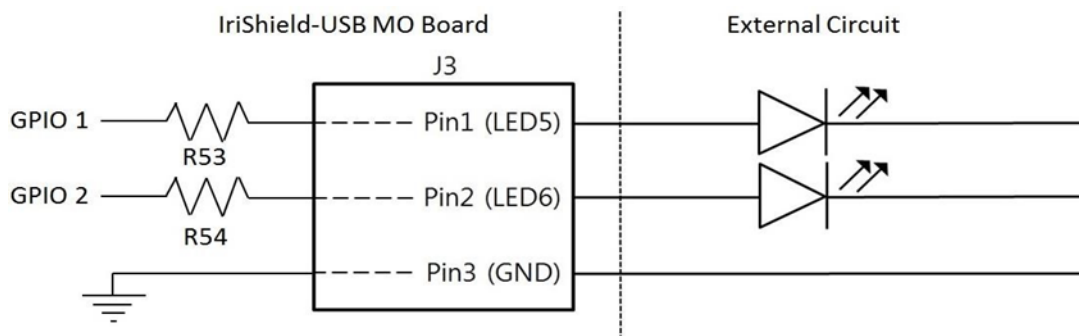- A user can control LED5 or LED6 signal of J3.

▷ LED drawing current can be changed by the value of "R53" and "R54" resistor.

**\*R53 and R54 default ValuE: 270ohm.**



- **Maximum current of LED5 and LED6 is 6mA.**

▷ Please refer to the picture below for right way of LED connection.

- **USB Connector**

Location: J4 (on bottom of IriShield™-USB MO Board)

1.0mm pitch, 5 pin connector

Manufacturer: CVILUX CORPORATION

Part Number: CI1105M1HR0-LF

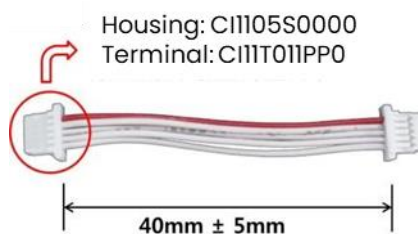| Pin number | Signal |
|---|---|
| 1 | VUSB+ |
| 2 | D- |
| 3 | D+ |
| 4 | No Signal |
| 5 | GND |

- **40mm Ass'y Cable**

Location:  From J4 to Host

1.0mm pitch, 5 pin cable

Housing and Terminal Manufacturer: CVILUX CORPORATION

Part Number: Housing (CI1105S0000), Terminal (CI11T011PP0)



Housing: CI1105S0000
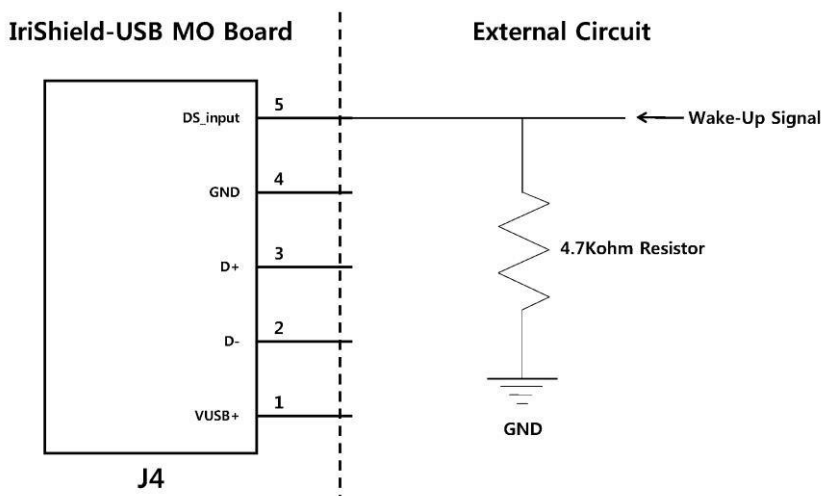Terminal: CI11T011PP0

40mm ± 5mm

## 7.4 Deepsleep Mode

- **Deepsleep Mode**

  ※ Device can be put into Deepsleep Mode due to one of the following conditions

  - ➢ Firmware version: at least Ver4.0 or above.
  - ➢ An exterior switch: A board that has serial over F0011000005500 only requires an exterior switch to utilize Deepsleep Mode. But the board that has serial No. F0011000005500 or below requires a pull-down resistance of 4.7Kohm connected to the GND pin (Pin4 of J4) together with an exterior switch as the figure below.

  **NOTE**



  ※ **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".
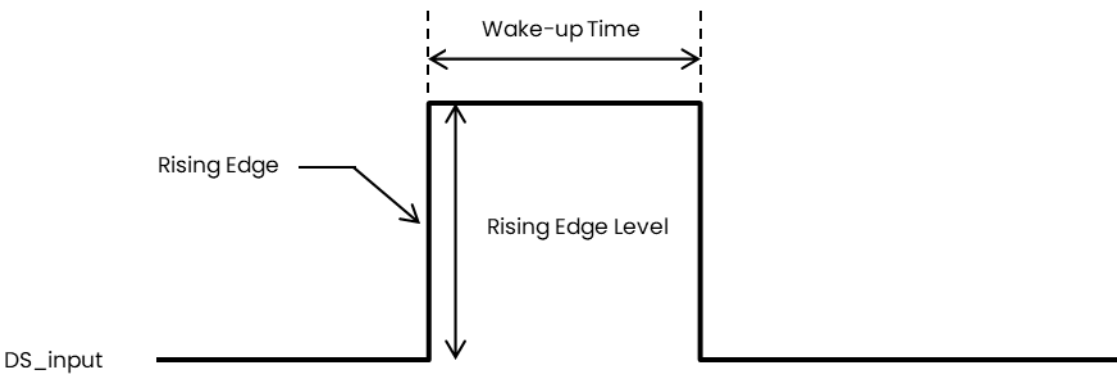
- **Wake-up**
  Wake-Up Mode is controlled by Pin5 of J4
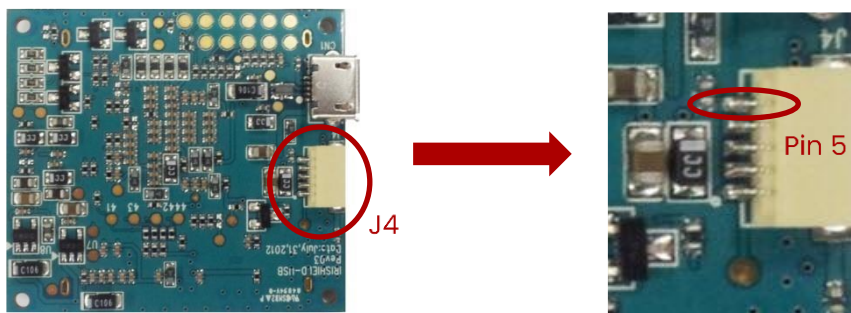
- **UART Connector J4 pin map**

| Pin number | Signal |
|:---:|:---:|
| 1 | VUSB+ |
| 2 | D- |
| 3 | D+ |
| 4 | GND |
| 5 | DS_input |

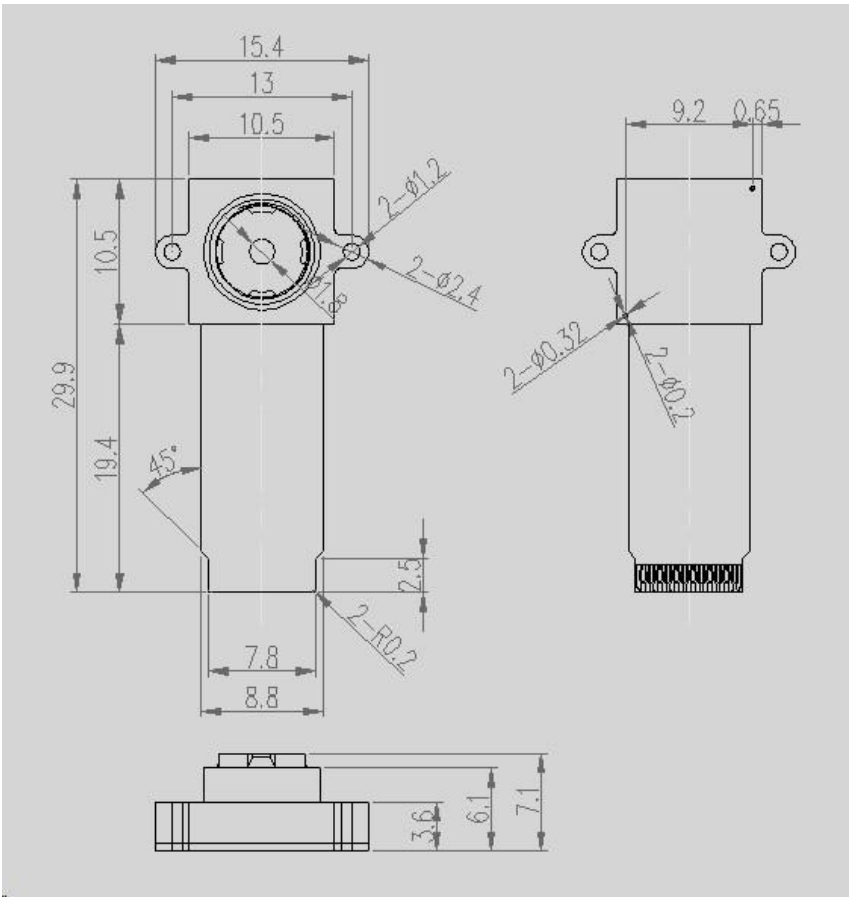Wake-Up Mode is executed when rising edge is entered into pin 5 of J4



- o  Rising Edge Level: 2.5V(Min) ~ 3.3V(Max)
- o  Wake-Up Time: ≥ 100uS

# 8. Camera Module

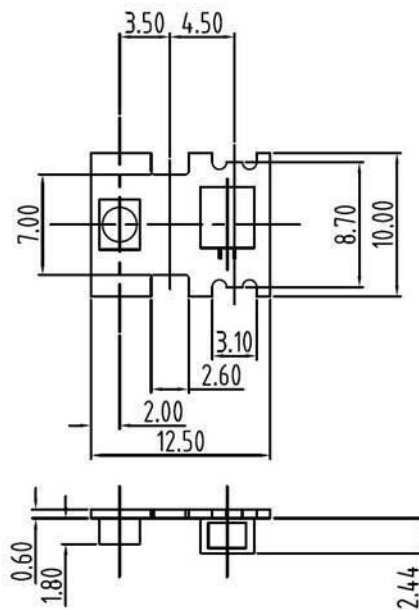## 8.1 Camera Interface



## 8.2 Camera Mechanical Drawing
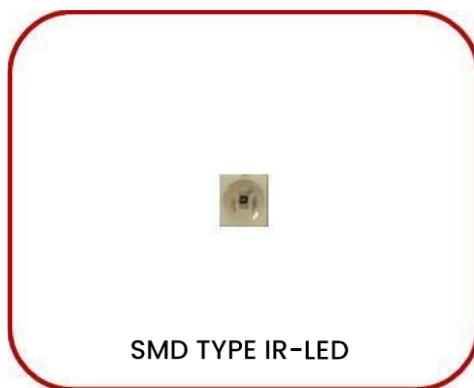


Note: All dimensions are in millimeters.
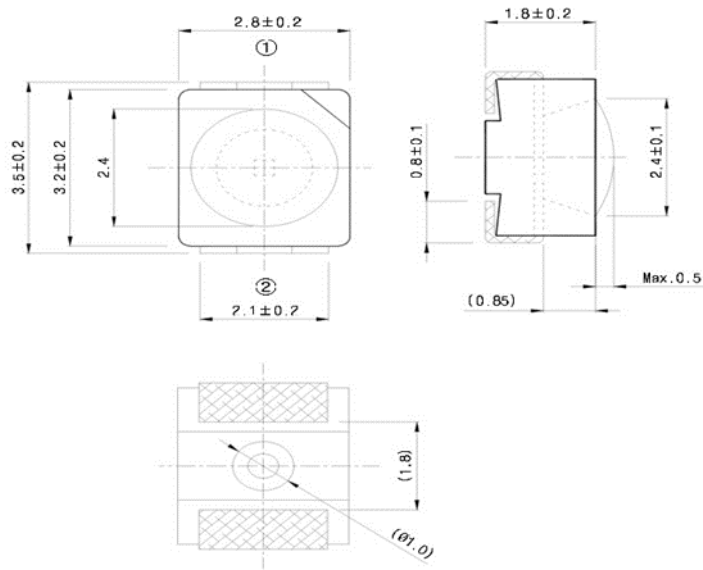
# 9. IR-LED Ass'y Cable

## 9.1 Interface



## 9.2 IR-LED Interface



SMD TYPE IR-LED

- SMD TYPE IR-LED
  Peak wavelength: λp = 810 nm
  Angle of half intensity: φ = ± 60°
  Manufacturer: KODENSHI AUK
  Part Number: KP3528I81(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 (CI1105S0000), Terminal (CI11T011PP0)

- Mechanical Drawing



DIM. A = 1.00 x NO. OF SPACES
DIM. B = DIM. A + 4.0
DIM. C = DIM. A + 2.0
* AVAILABLE IN 2 THROUGH 15 CIRCUITS
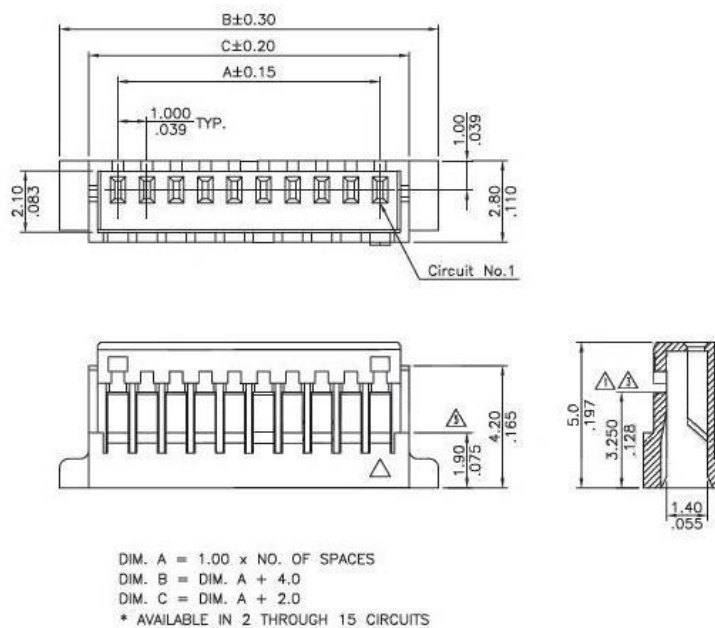
Note: All dimensions are in millimeters.

# 10. Camera and LED Boards Installation

## 10.1 Interface and Mechanical Drawing
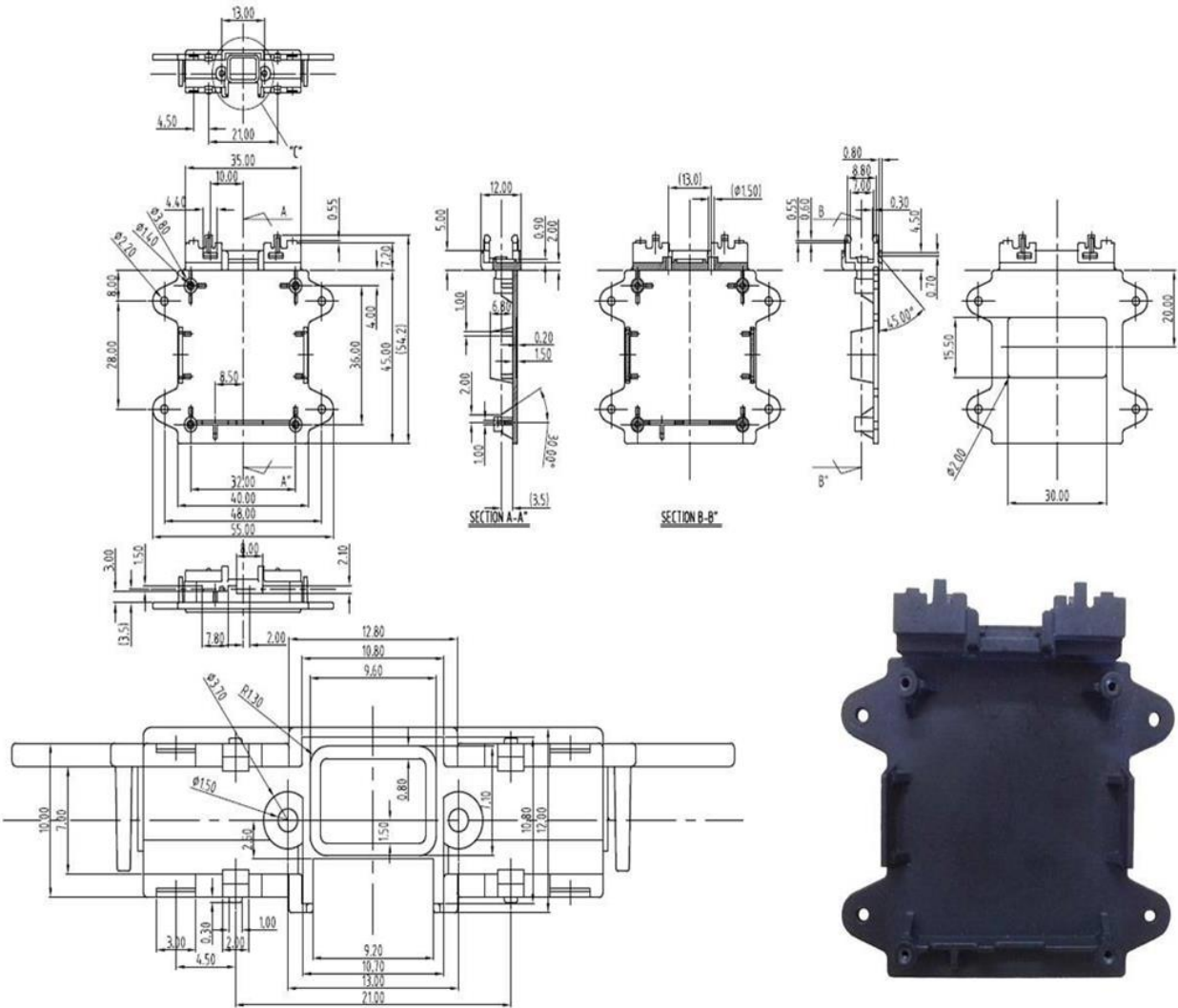


Note: All dimensions are in millimeters

# 11. IR Filter

IR Filter enables only infrared light to penetrate into the camera by filtering out visible light.
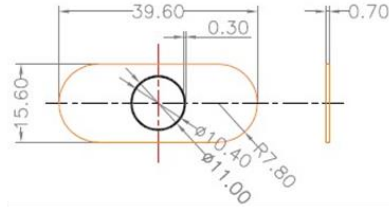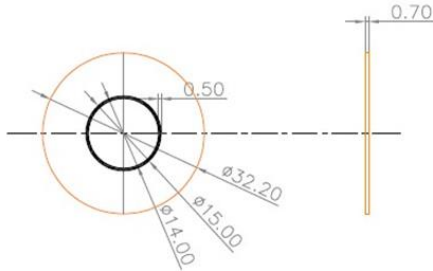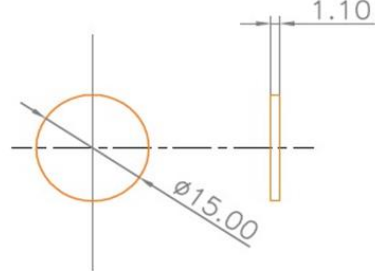
- *Note:  Camera should be in a dark space. Make sure visible lights do not penetrate into the camera when you attach the IR filter on your case.*
- Location (Example)

Place rhe IR Filter on the camera as shown below.

- **Avaibility**

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

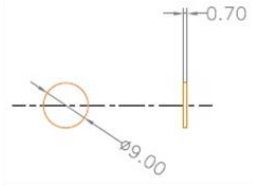| Part Code | Size | Thickness | Drawing |
|---|---|---|---|
| 0F02-000001 | 9Φ | 0.7mm |  |
| 0F02-000002 | 39.60*15.60 | 0.7mm |  |
| 0F02-000003 | 32.20Φ | 0.7mm |  |
| 0F02-000005 | 15.00Φ | 1.1mm |  |

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:  ~ 300Φ (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



Wavelength
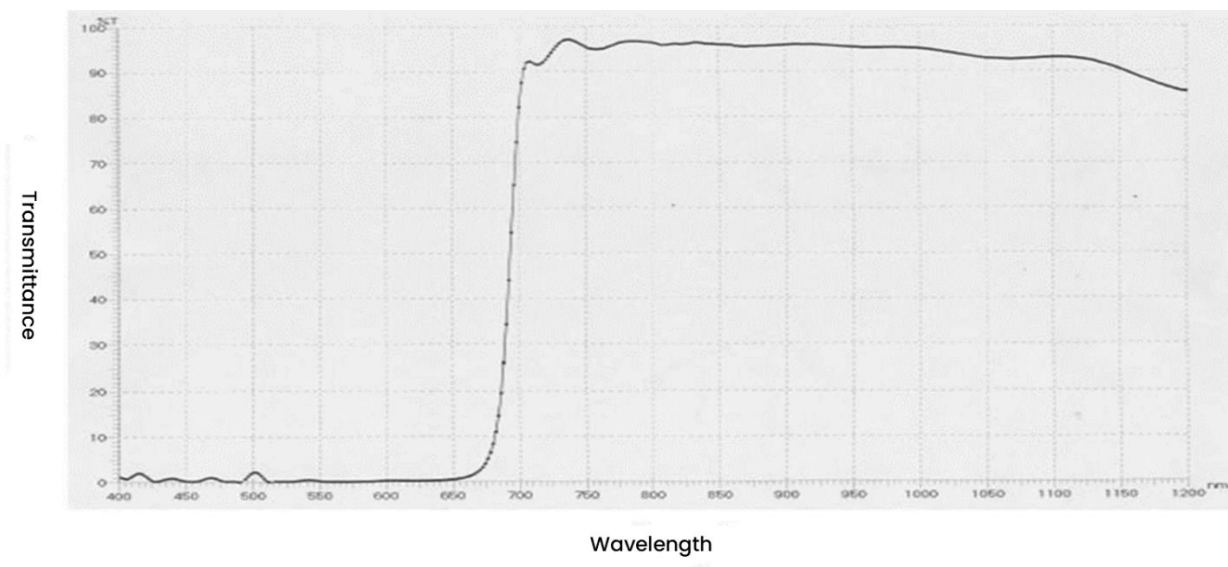
# 12. Capture Volume

| 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 cm³ at 13.5 ~ 14.5 cm range
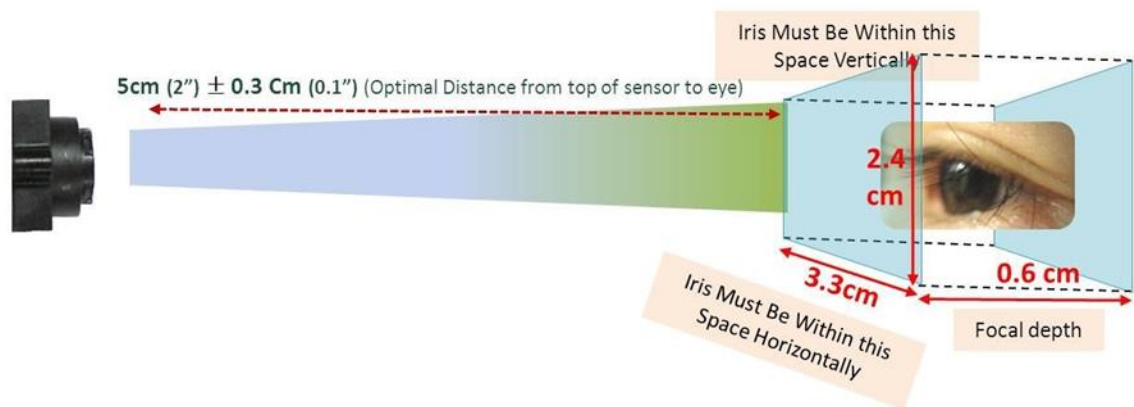


❖ The optimal distance for the best image is 5cm (2 in) from the top of the camera module.

# 13. Mount Cautions and Mount Guide

## 13.1 Mount Cautions



Image 1

Image 2
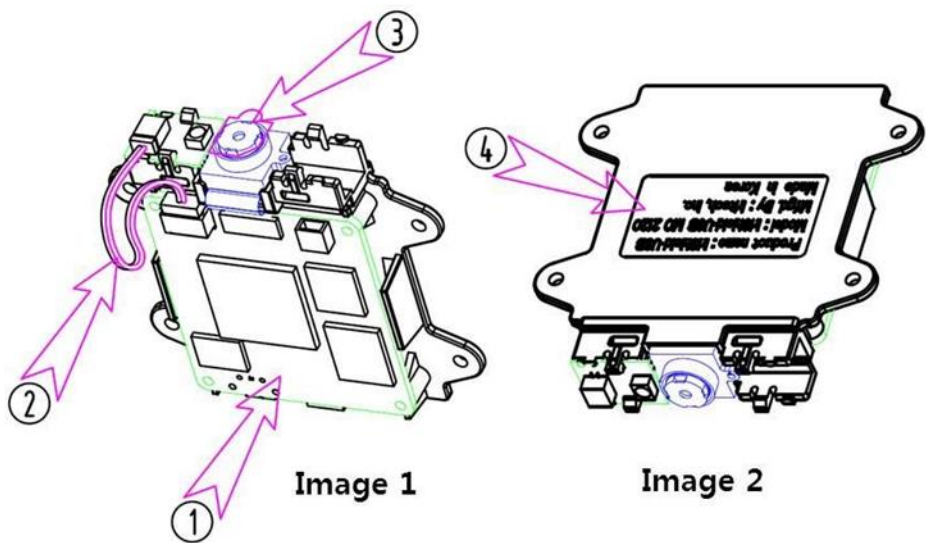
1. Be cautious not to directly touch the PCB Panel with hands, liquid, or rigid objects for it may lead to malfunction.
2. When mounting the module with the case, allow enough space to avoid any unnecessary shock to the wire.
3. The lens protector film must be removed before starting to mount.
4. The 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
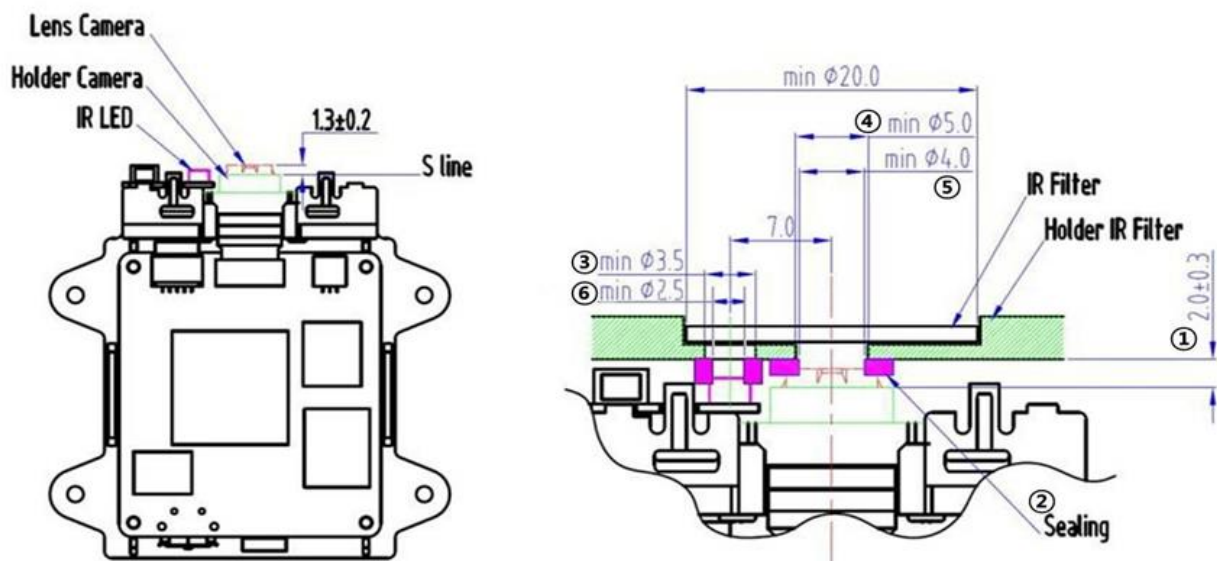


Note: All dimensions are in millimeters.

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. Conditions for Using USB

## 14.1 Using USB 2.0

- The IriShield™-USB camera should be used with the accompanied USB cable supplied by IriTech.
- The PC must be equipped with a USB 2.0 Host Adapter and a USB 2.0 port.
- You can verify the above conditions in the Device Manager provided by MS Windows. If there is "Standard Extension PCI2 USB", "Enhanced", or "USB 2.0" listed in the Universal Serial Bus controllers, it means the PC supports USB 2.0.
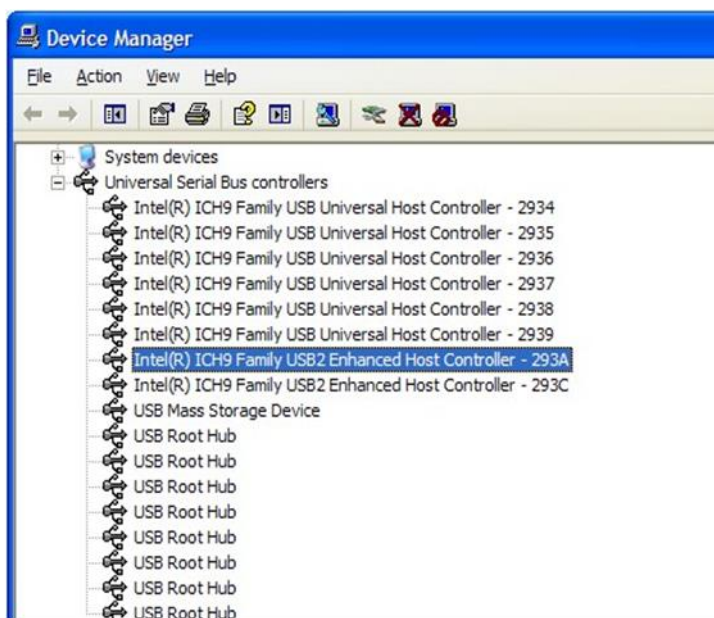
To access the *Device Manager*

(MS Windows XP)

    ① Click "**Start**" button on the taskbar.

    ② Right-click on "**My Computer**" and choose "**Properties**" at the bottom.

    ③ Click "**Hardware**" tab.

    ④ Click "**Device Manager**" button.

(MS Windows 7)

    ① Click "**Start**" button on the taskbar.

    ② Right-click on "**My Computer**" and choose "**Properties**" at the bottom.

    ③ Click "**Device Manager**" on the left pane.

- Operating systems that support USB 2.0 include MS Windows Server 2003, MS Windows XP, MS Windows7, MS Windows 8, MS Windows 10. You can verify whether your operation system has the correct service pack by checking System Properties. For Windows XP, the Service Pack version should read Service Pack 2 or later versions. Please contact IriTech if other operating systems need be supported.
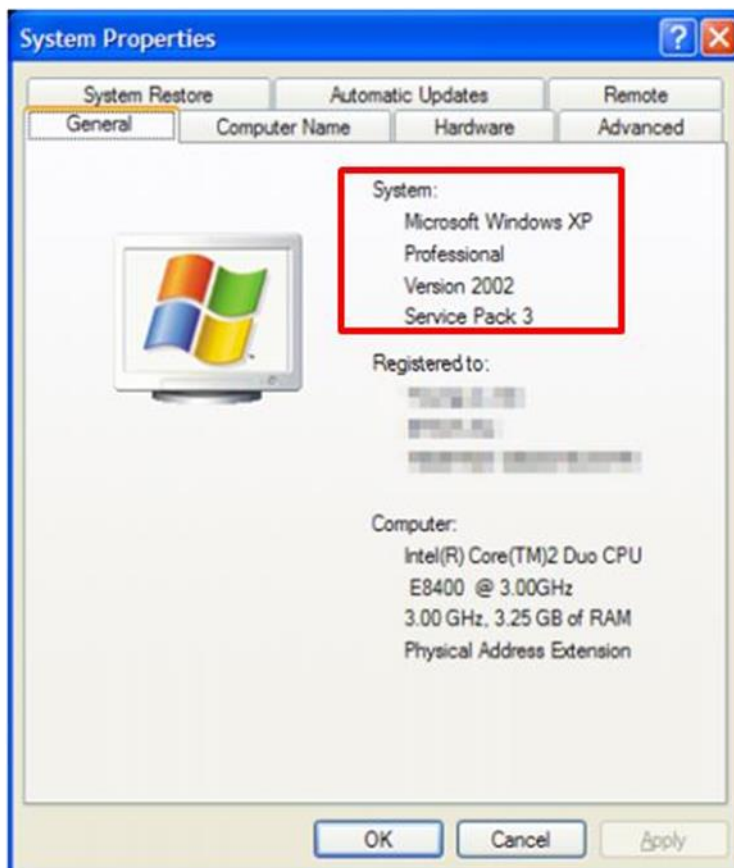
# 15. Legal Notice

## 15.1 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 | http://www.iritech.com |
| Service Phone Number | +1 703 877 2135 (United States)<br>+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 DEFACED.

**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).

1. **Implied Warranties. EXCEPT TO THE EXTENT PROHIBITED BY APPLICABLE LAW, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE IS LIMITED IN DURATION TO THE DURATION OF THIS WARRANTY.**

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