

HD309D1-C1
MEMS Scanning Projection Module
<User manual>
Preliminary version



Jan 04, 2023
Version 1.0

Contents

1. Specifications.....	4
2. Contents	5
3. Assembly	6
4. Mechanical drawing	8
5. Troubleshooting.....	15
6. Thermal requirement	18
7. OSD Manual	19
8. Precautions of use	25
9. Eye safety precautions.....	27
10. Recommend resolution setting of Raspberry Pi.....	28

Ultimems, Inc.



1. Specifications

MEMS Mirror / Drive Force	2D single mirror / Electrostatics
Resolution	720P / 60 frames per second (Input Source)
Projected FOV	X axis:39°; Y axis:23° (ref.)
Contrast	10,000: 1 <FOFO test>
Focus	Free Focus
Brightness (Lumen)	34 ± 3lm (measured at 400mm from MEMS Mirror)
Color Gamut	>150%
Throw Ratio	<1.3
Cable requirement	a. USB Full-Featured Type-C to Type-C cable b. Digital video interface cable
Power Input	DC 4.75V ~ 5.5V via USB Type-C (Note: Exceeding this value may result in damage to critical components.)
Video input interface	a. USB Type-C receptacle; DisplayPort Alternate Mode (DP. Alt. Mode) b. Digital video interface receptacle
Power Consumption	Peak 6.5W; Normal operation<5.5W
Safety of Laser product	Class 1 (IEC 60825-1:2014 + IEC62471-5)
Size	Please refer to "Mechanical drawing"
Module Weight	35± 3 grams
Operation environment	0°~35°C ; 40~60%
Storage environment	0°~60°C

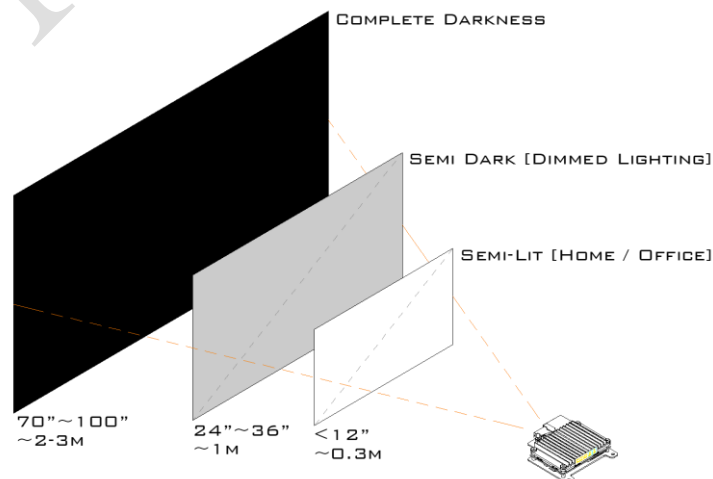
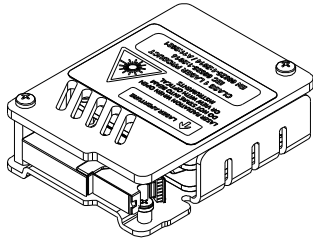


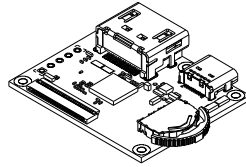
Fig.1 HD309D1-C1 projection area size

2. Contents

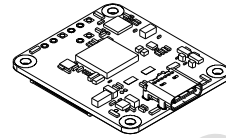
2.1 Components inside the package



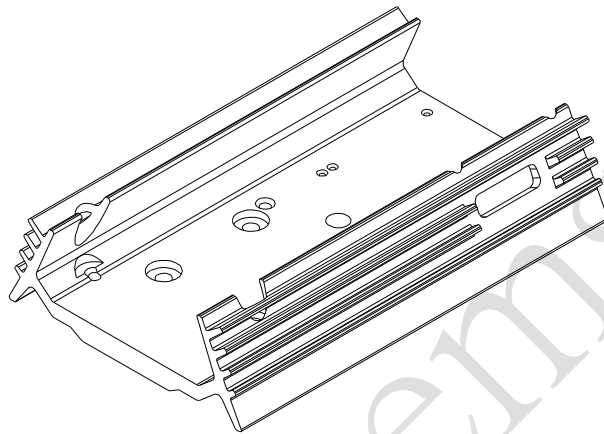
LSP Module
(HD309U2)



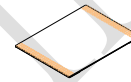
Digital Video Interface
Converter Board



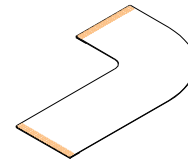
Type-C Converter Board



Metal Base



FPC
(Type A)



FPC
(Type B)



Machine Screw
M3.0x6.0L
[3 pcs]



Spacer
M1.6x6.0L
[6 pcs]



Machine Screw
M1.60x3.5L
[6 pcs]

2.2 Others

OSD SW tool QR code when converter board is Type C version

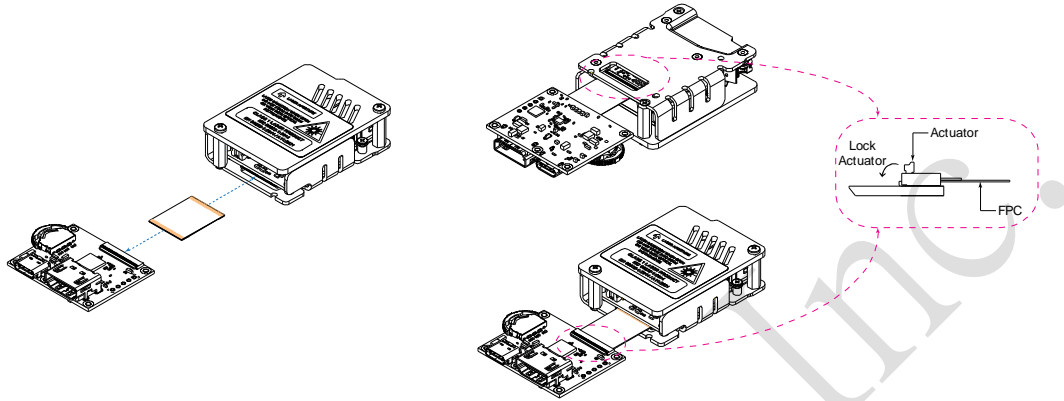


3. Assembly

3.1 When converter board is Digital video interface version

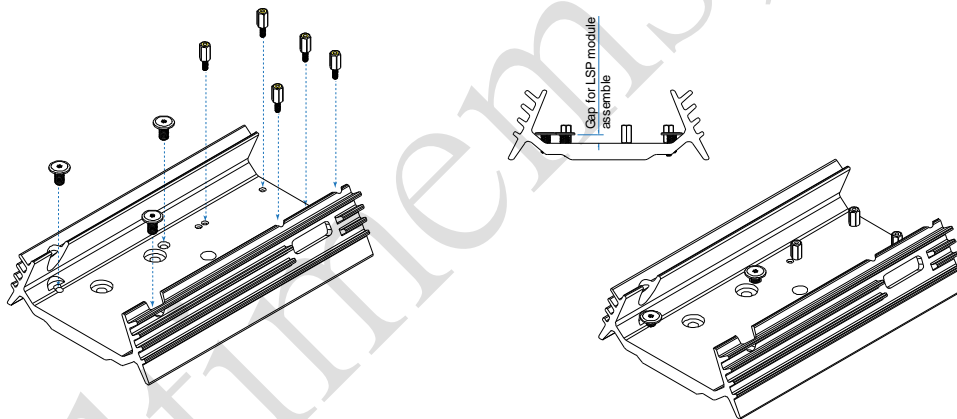
Step 1:

Insert FPC to LSP module and converter board connector, then lock the actuator respectively.



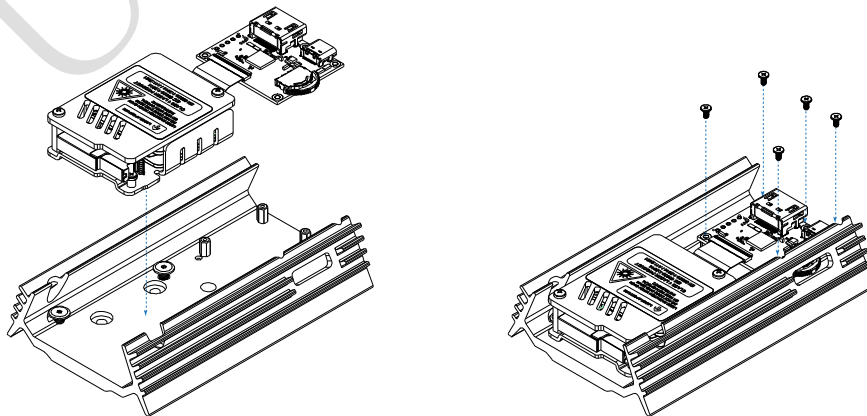
Step 2:

Pre-assemble M3.0 machine screw and spacer to metal base.



Step 3:

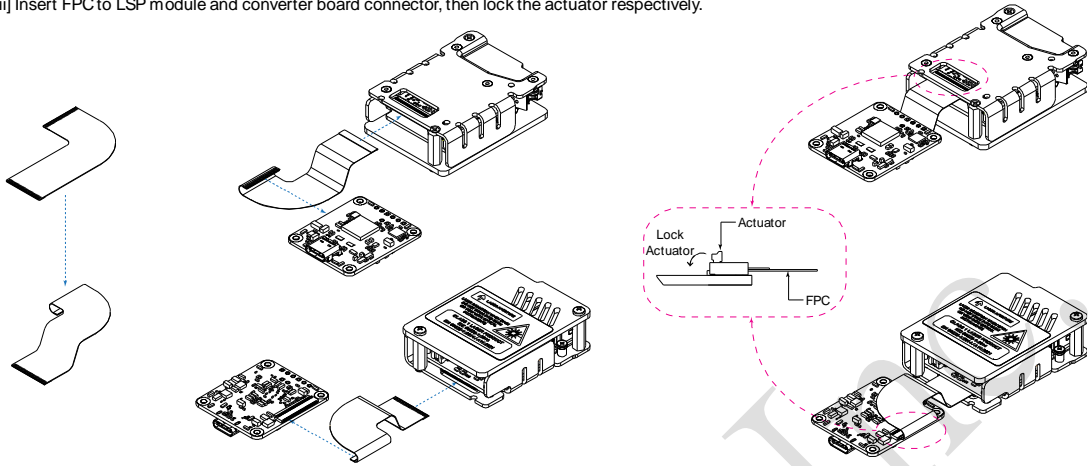
- [i] Fixed LSP module to metal base, fasten M3.0 machine screw.
- [ii] Fixed converter board by using M1.6 machine screw.



3.2 When converter board is Type C version

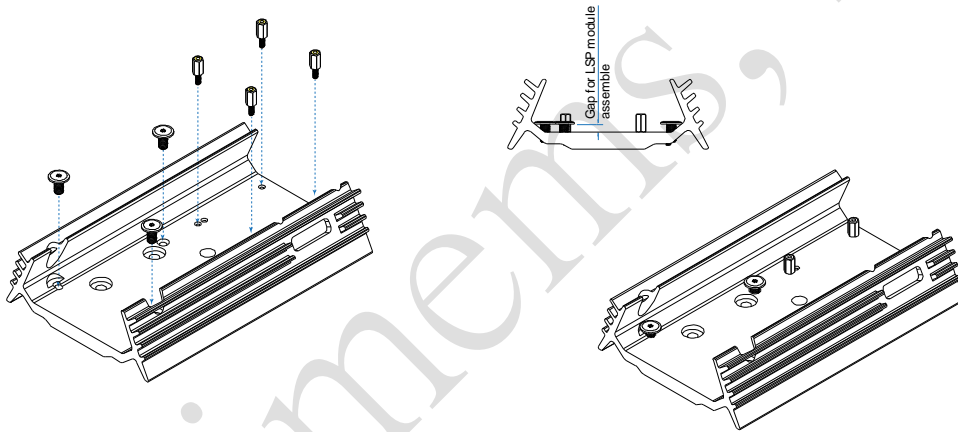
Step 1:

- (i) Pre-bending FPC (Type-B).
- (ii) Insert FPC to LSP module and converter board connector, then lock the actuator respectively.



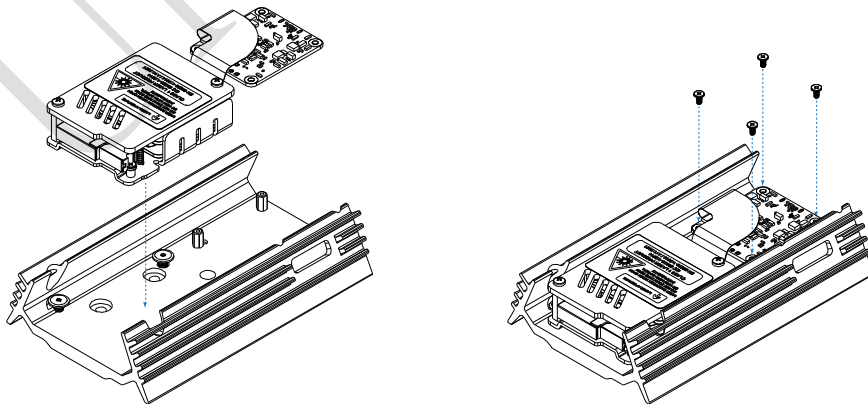
Step 2:

- Pre-assemble M3.0 machine screw and spacer to metal base.

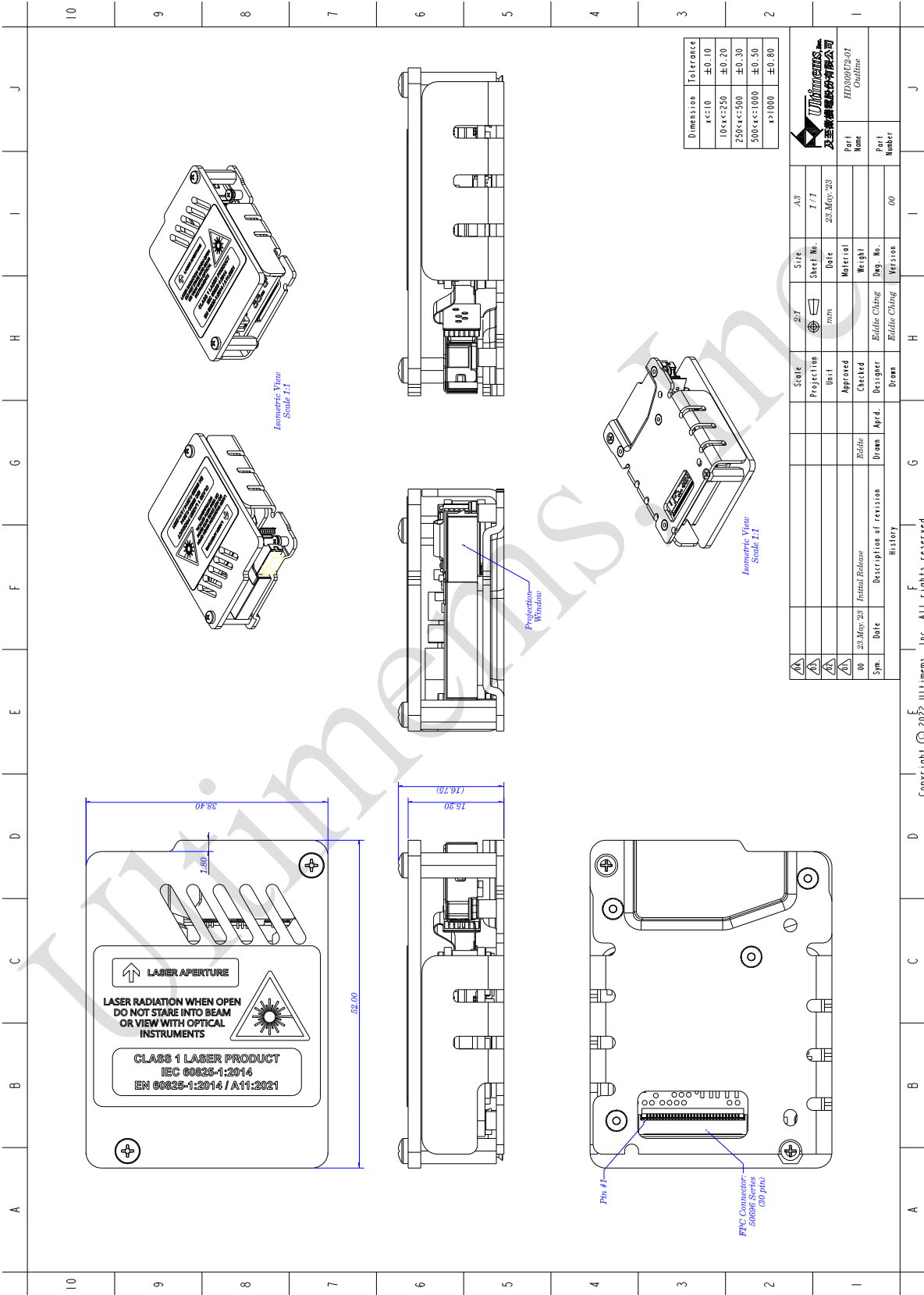


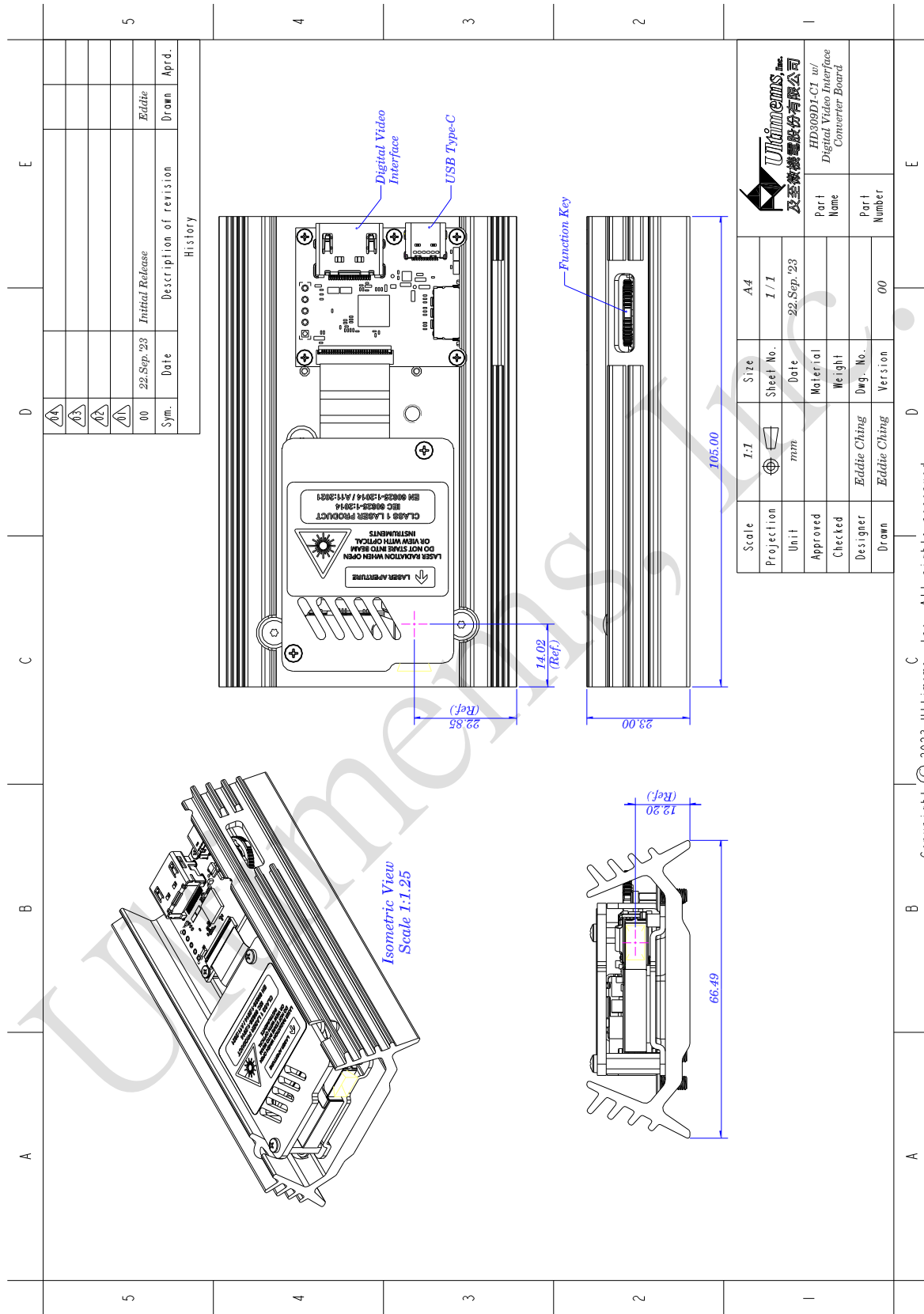
Step 3:

- (i) Fixed LSP module to metal base, fasten M3.0 machine screw.
- (ii) Fixed converter board by using M1.6 machine screw.

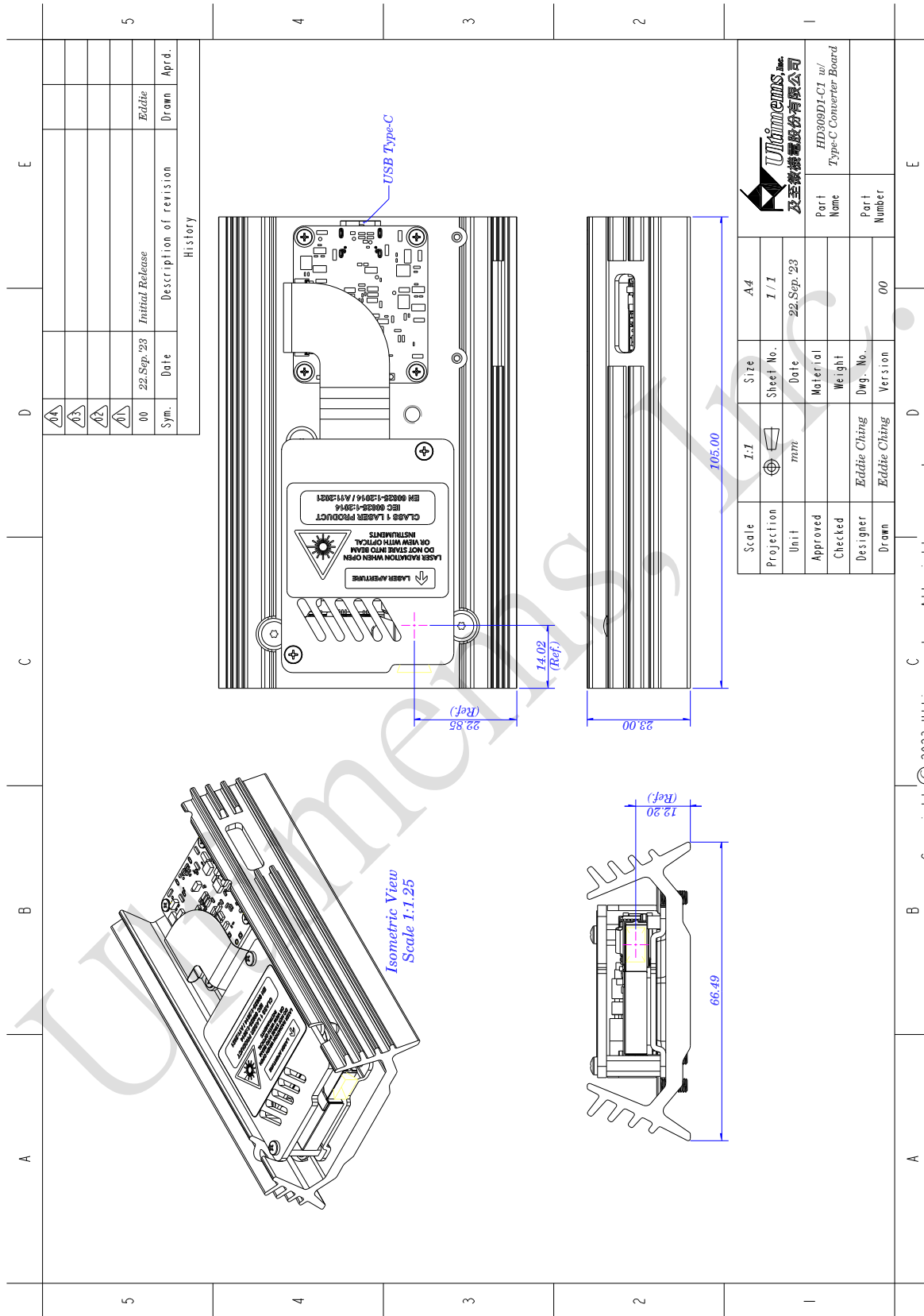


4. Mechanical drawing

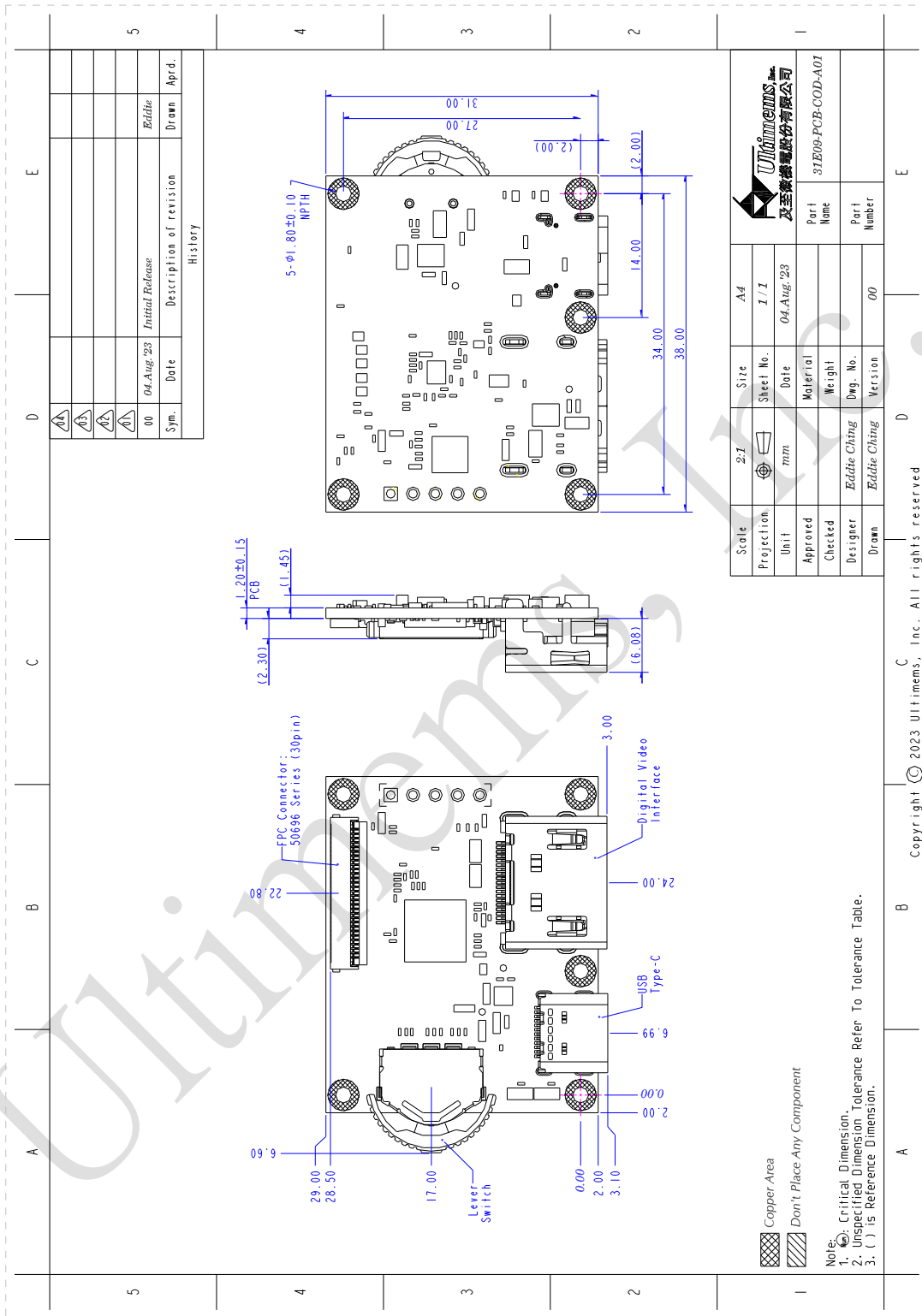


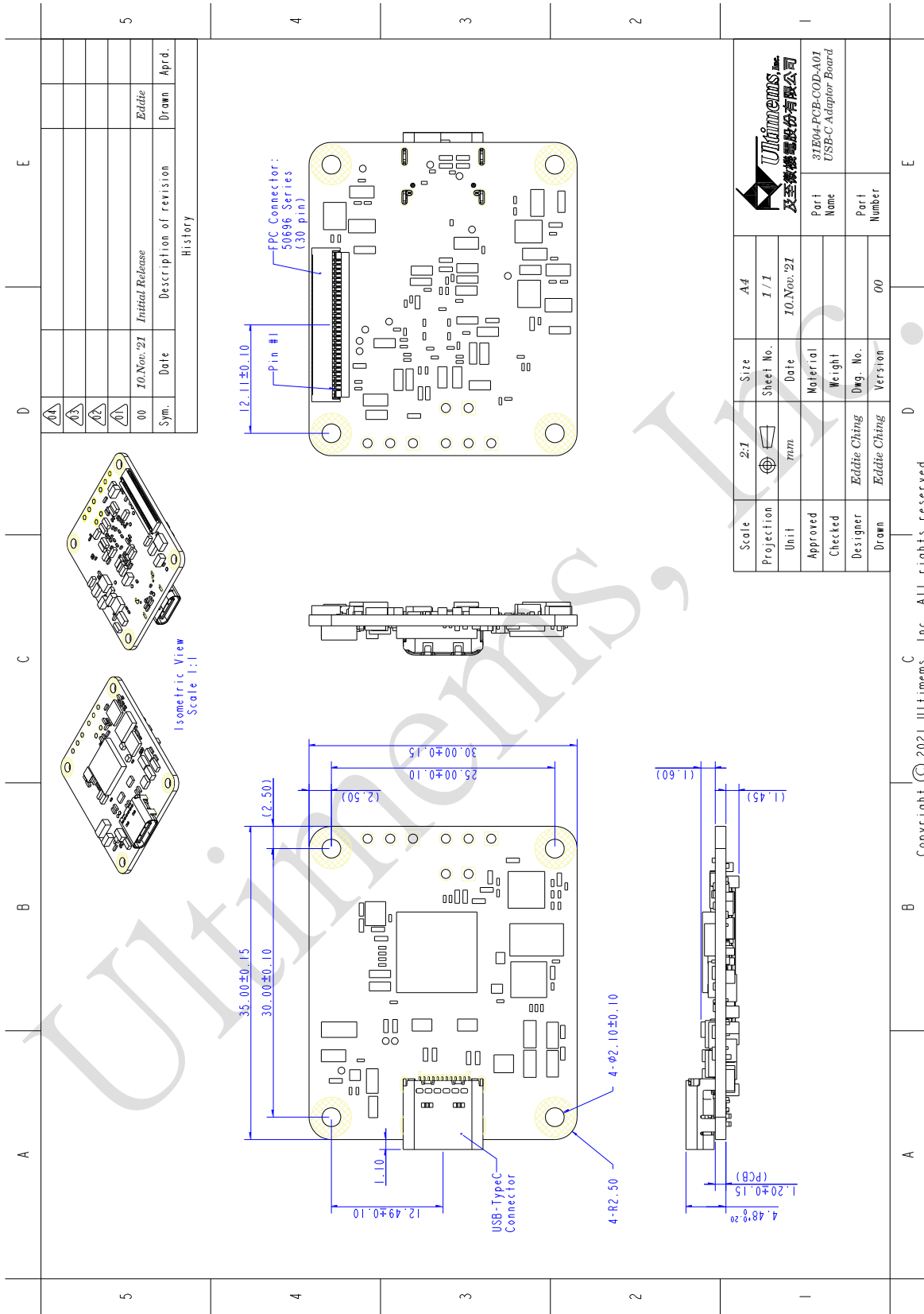


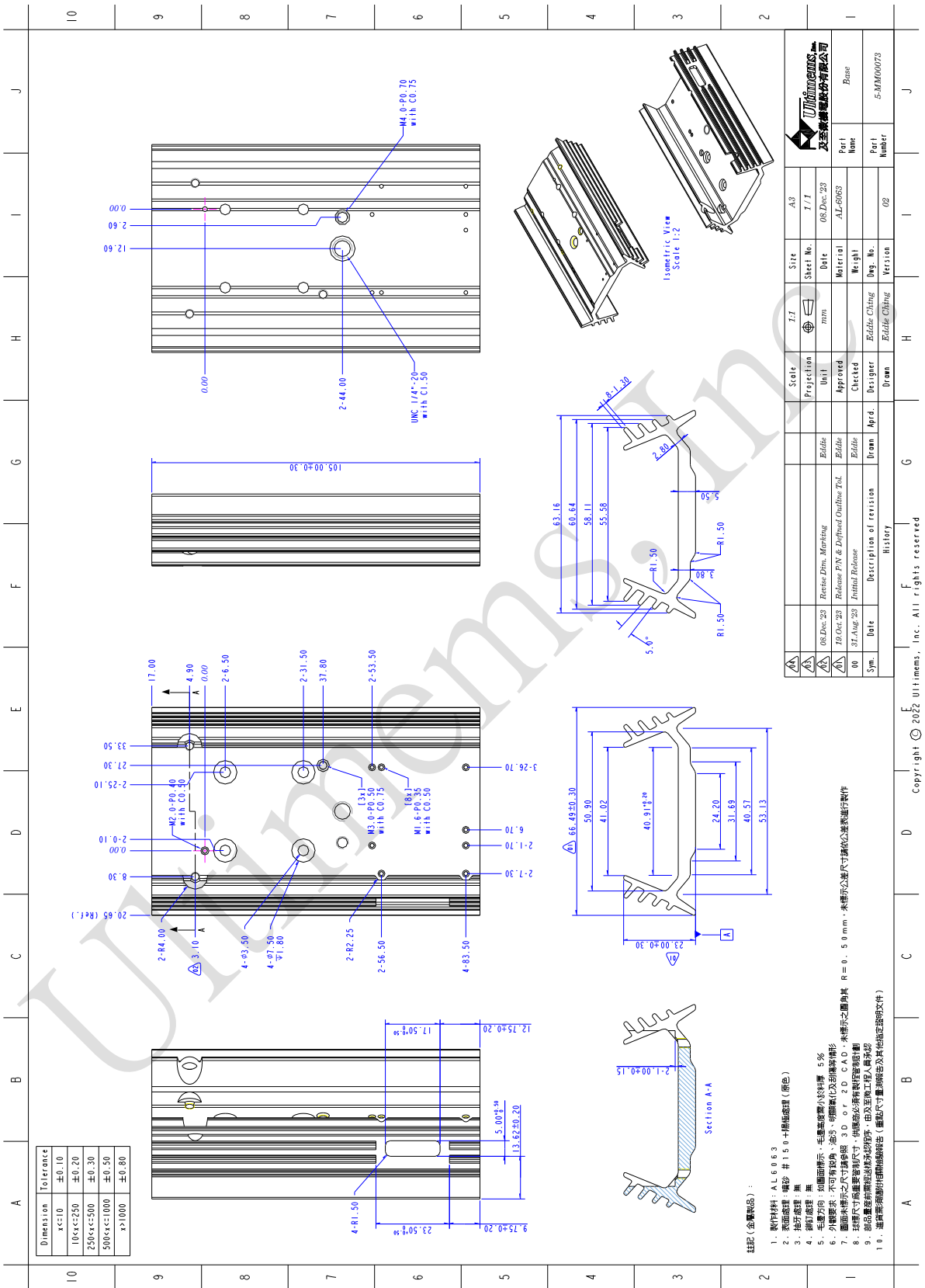
Copyright © 2023 Ultimems, Inc. All rights reserved

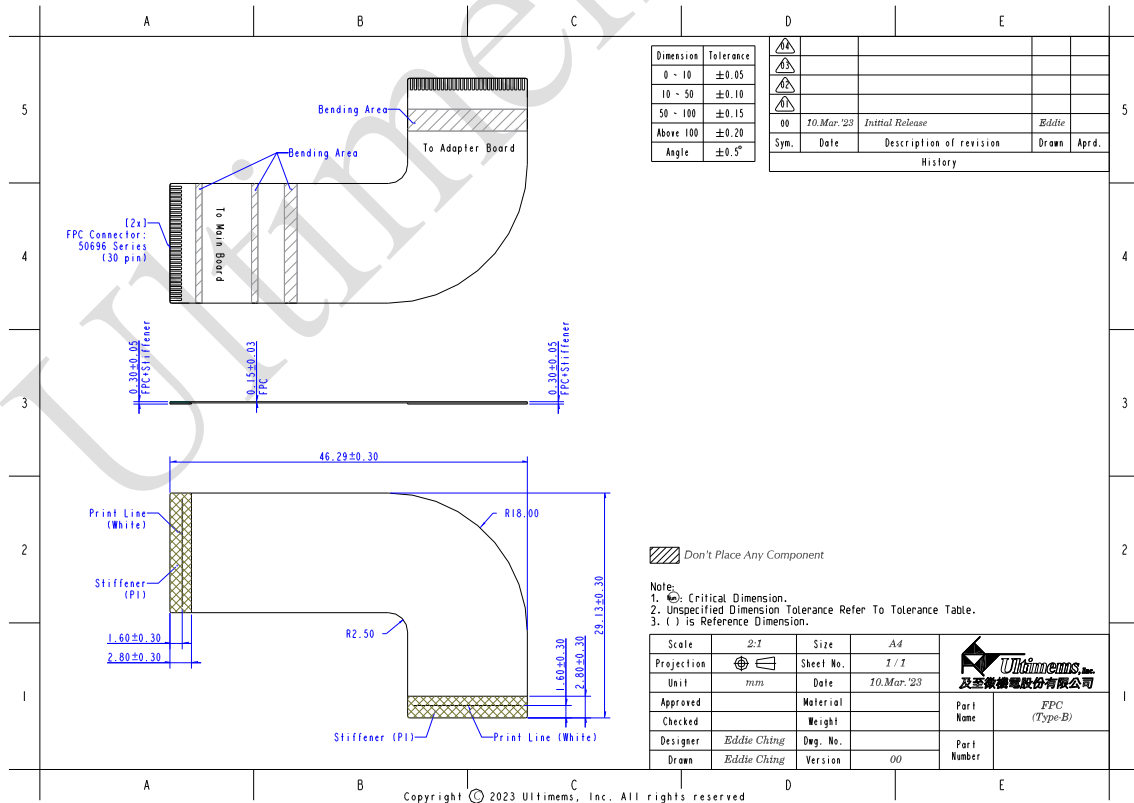
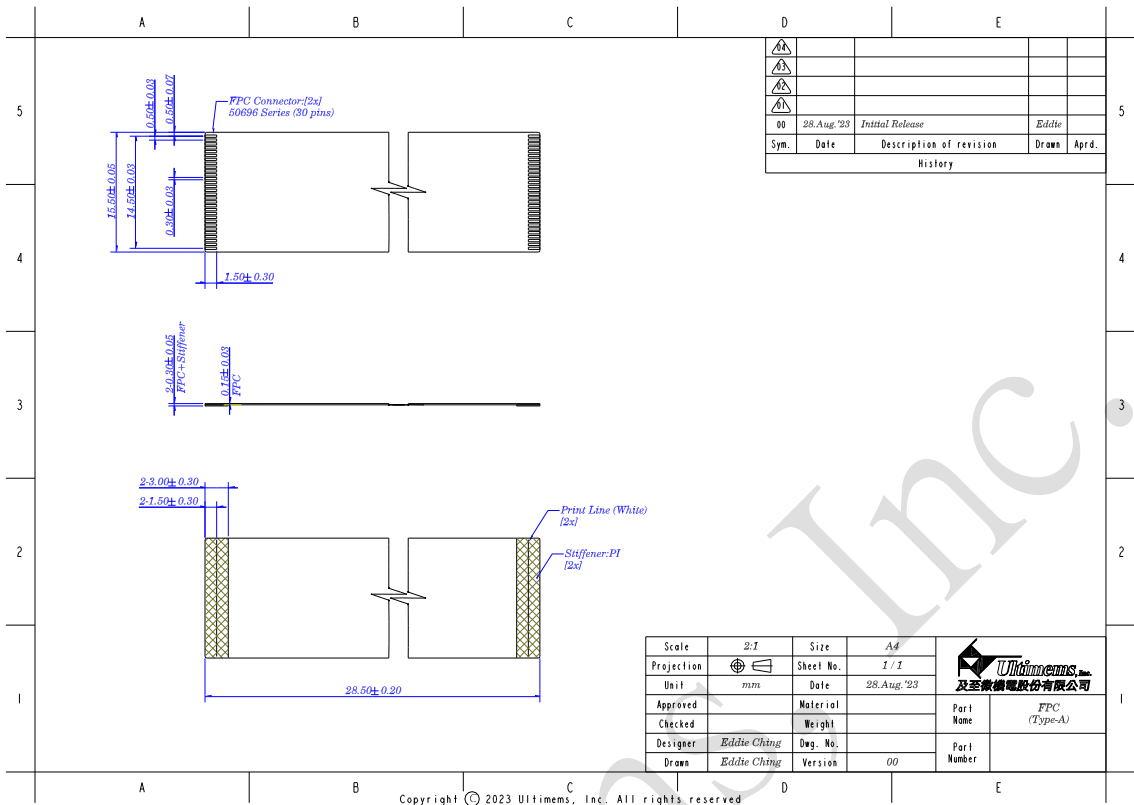


Copyright © 2023 Ultimems, Inc. All rights reserved





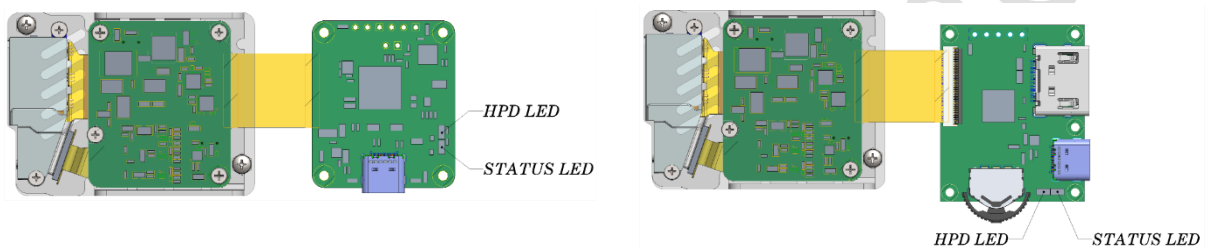




5. Troubleshooting

5.1 STATUS and/or HPD LEDs do not light up or fast-blinking.

- Step 1:** Make sure your DRP/DRD* (e.g. PCs, smartphones, etc.) and cable support Type-C DP* Alt.* mode when using the Type-C converter board.
- Step 2:** Make sure cable, FPC, Digital video interface source or DRP/DRD, and the HD309D1-C1 are securely connected.
- Step 3:** Make sure that the HD309D1-C1 operates over a specified temperature range.
- Step 4:** Unplug the cable from the HD309D1-C1 and plug it back in.



5.2 No image from the projector.

- Step 1:** Make sure your DRP/DRD (e.g. PCs, smartphones, etc.) and cable support Type-C DP Alt. mode when using the Type-C converter board.
- Step 2:** Make sure cable, FPC, Digital video interface source or DRP/DRD, and the HD309D1-C1 are securely connected.
- Step 3:** Make sure that the HD309D1-C1 operates over a specified temperature range.
- Step 4:** Unplug the cable from the HD309D1-C1 and plug it back in

No Signal Detected!

Check the cable connection and the settings of the source device.

- 5.3 The projected image color is not correct (e.g. reddish) or distorted.**
- Step 1:** Take a cleanroom wiper to wipe away any particles from the lens.
 - Step 2:** Make sure your DRP/DRD (e.g. PCs, smartphones, etc.) and cable support Type-C DP Alt. mode when using the Type-C converter board.
 - Step 3:** Make sure cable, FPC, Digital video interface source or DRP/DRD, and the HD309D1-C1 are securely connected.
 - Step 4:** Make sure that the HD309D1-C1 operates over a specified temperature range.
 - Step 5:** Unplug the cable from the HD309D1-C1 and plug it back in.
 - Step 6:** Check the projection surface/screen color.
- 5.4 The projected image is jumping or shaking.**
- Step 1:** Make sure your DRP/DRD (e.g. PCs, smartphones, etc.) and cable support Type-C DP Alt. mode when using the Type-C converter board.
 - Step 2:** Make sure cable, FPC, Digital video interface source or DRP/DRD, and the HD309D1-C1 are securely connected.
 - Step 3:** Make sure that the HD309D1-C1 operates over a specified temperature range.
 - Step 4:** Check whether there are any sources of vibration (e.g. speaker.) close to the HD309D1-C1.
 - Step 5:** Check whether there are any sources of magnetic field (e.g. magnet.) close to the HD309D1-C1.
 - Step 6:** Unplug the cable from the HD309D1-C1 and plug it back in.
 - Step 7:** Keep the magnetic field away from the projection module.
- 5.5 The projected images flicker, or blurry is displayed.**
- Step 1:** Make sure the HD309D1-C1 isn't projected onto a non-planar screen. It is recommended that you project onto a smooth and flat surface.
 - Step 2:** Entering OSD* menu via OSD SW tool or the function key.
 - Step 3:** Select [Sharpness] to adjust.
- 5.6 Color convergence problem (the alignment of the green and blue colors)**
- Step 1:** Make sure the projection surface should not be colored or textured.
 - Step 2:** Entering OSD menu via OSD SW tool or the function key.
 - Step 3:** Select [Green/ Blue Alignment] to adjust.

5.7 The projected image is distorted.

Step 1: Make sure the HD309D1-C1 isn't projected onto a non-planar screen.

It is recommended that you project onto a smooth and flat surface.

Step 2: Make sure your DRP/DRD (e.g. PCs, smartphones, etc.) and cable support Type-C DP Alt. mode when using the Type-C converter board.

Step 3: Make sure cable, FPC, Digital video interface source or DRP/DRD, and the HD309D1-C1 are securely connected.

Step 4: Make sure that the HD309D1-C1 operates over a specified temperature range.

Step 5: Unplug the cable from the HD309D1-C1 and plug it back in.

*Abbreviate

HDP: Hot plug detect

DRP: Dual-role power

DRD: Dual-role data

Alt: Alternate

DP: DisplayPort

OSD: On-screen display

Note:

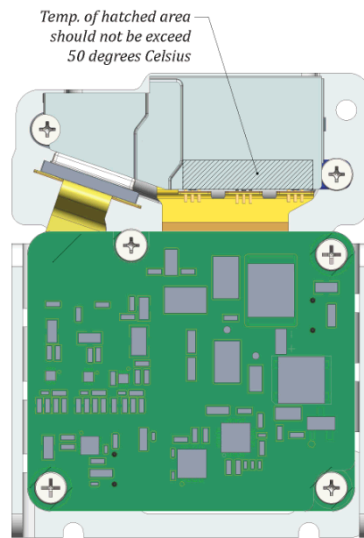
Some DRP/DRD is designed to enter protection mode when an over-current event is occurring. In protection mode, the DRP/DRD may turn off DP Alt. mode function to protect itself for system stability. This may lead to abnormal behavior of the HD309D1-C1.

Please contact your local reseller for technical support if you still cannot solve your problems with the suggested methods.

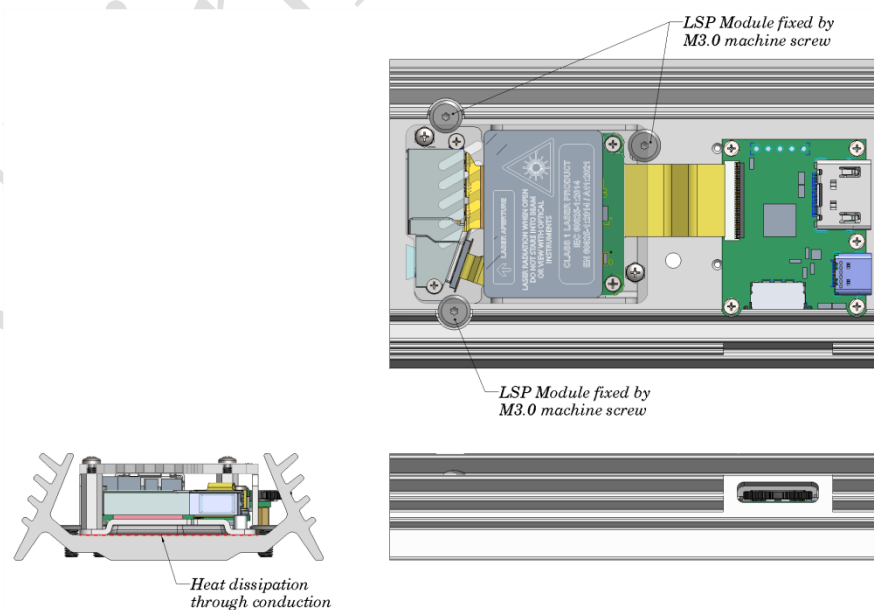


6. Thermal requirement

The thermal design is expected to make the temperatures of the specified top cover area never exceed 50°C as shown in attached figure. If the specified area temperature over 50°C, the laser diodes could be damaged or degraded due to the high temperature, the liability for damages will be excluded.



The recommended thermal solution is as shown in attached figure, a metal base is needed to place under the MEMS scanning projection module. The minimum metal base size is 105.0 x 66.5 x 23.0 mm, and the drawing of reference design is as page 14.



7. OSD Manual

7.1 (1) Operation Method if converted board is “Type C type”

Step 1: Create a directory named “OSD-BUTTON” in the personal computer (PC).

Step 2: Scanning the QR code card inside the box (please refer to page 5). And download compressed app zip file into the “OSD-BUTTON”.

Step 3: Un-compress app zip file in “OSD-BUTTON”

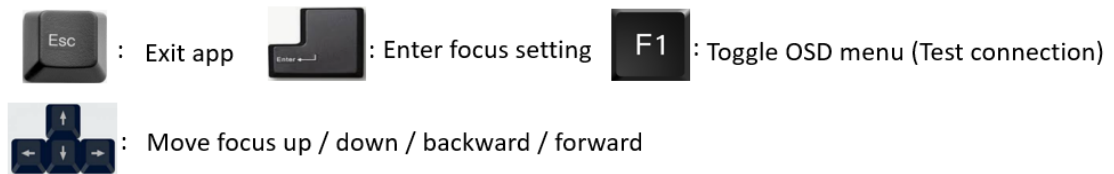
Step 4: Connect HD309D1-C1 and PC and wait for desktop of PC display projecting through HD309D1-C1.

Step5: Double click icon as right side to launch OSD SW tool  app

Step6: OSD SW tool and the image of main screen / button function description as below in the PC display



Step7: There are two ways to tap the icon of OSD SW tool as above. If you use the keyboard, the keystroke function is as below.



(2) Operation Method if converted board is “Digital video interface type”

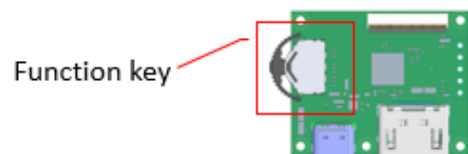
Step 1: Press and hold Function key [Enter] for 3 to 5 seconds, you will see a “On-Screen Display” (OSD) menu.

Step 2: When the OSD menu is activated, these keys are used as directional arrows to select the desired menu items and to make adjustments. Select the operation menu and select an item (press Function key)

Step 3: Adjust the parameters according to the displayed adjustment items

Step 4: Select "Save" and save the setting.

Step5: Press and hold Function key [Enter] for 3 to 5 seconds to return display mode

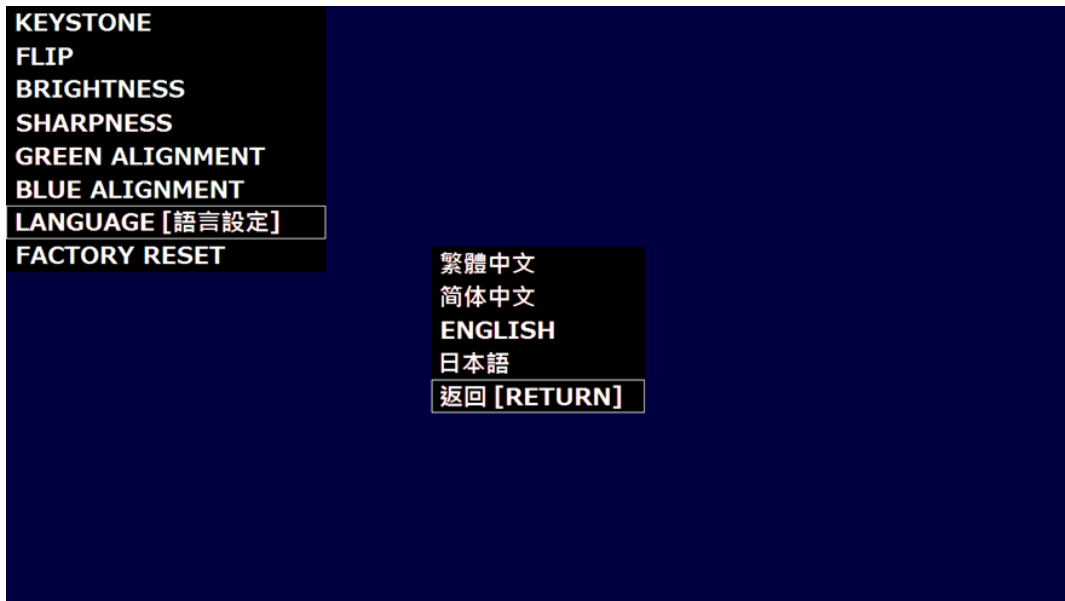


7.2 OSD menu and setting

Note: It also can enter this menu via the function key when using the Digital video interface converter board)

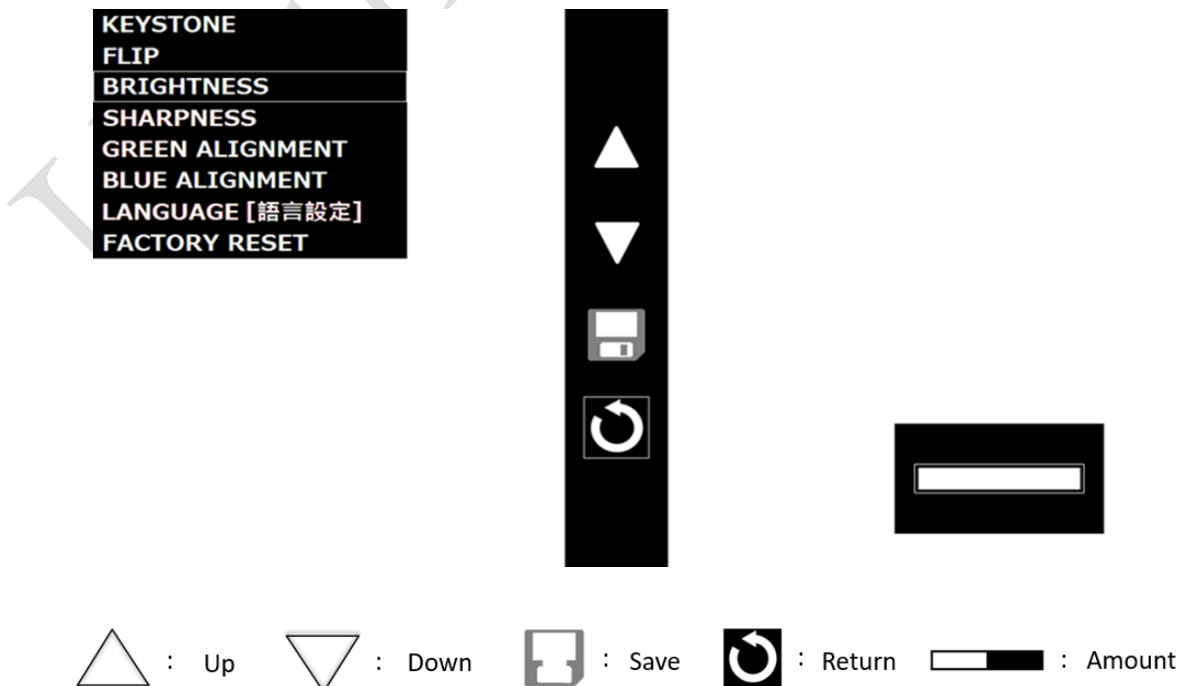
7.2.1 Language

There are four languages for your selection. 繁體中文(Traditional Chinese)、簡體中文(Simplified Chinese)、English、日本語(Japanese)



7.2.2 BRIGHTNESS

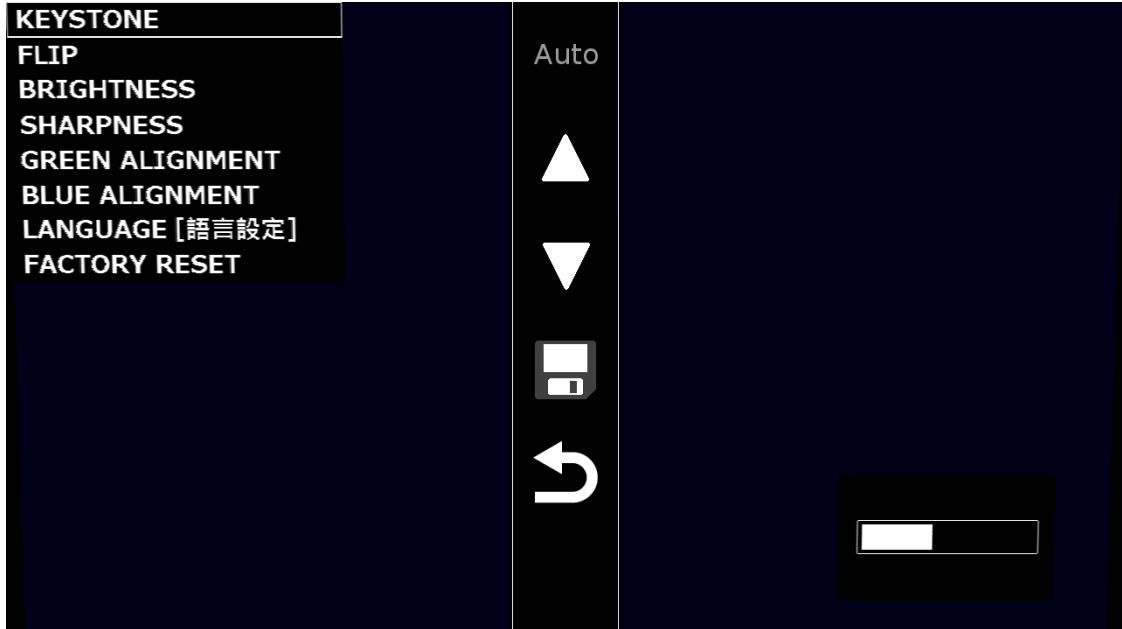
Adjust the screen brightness



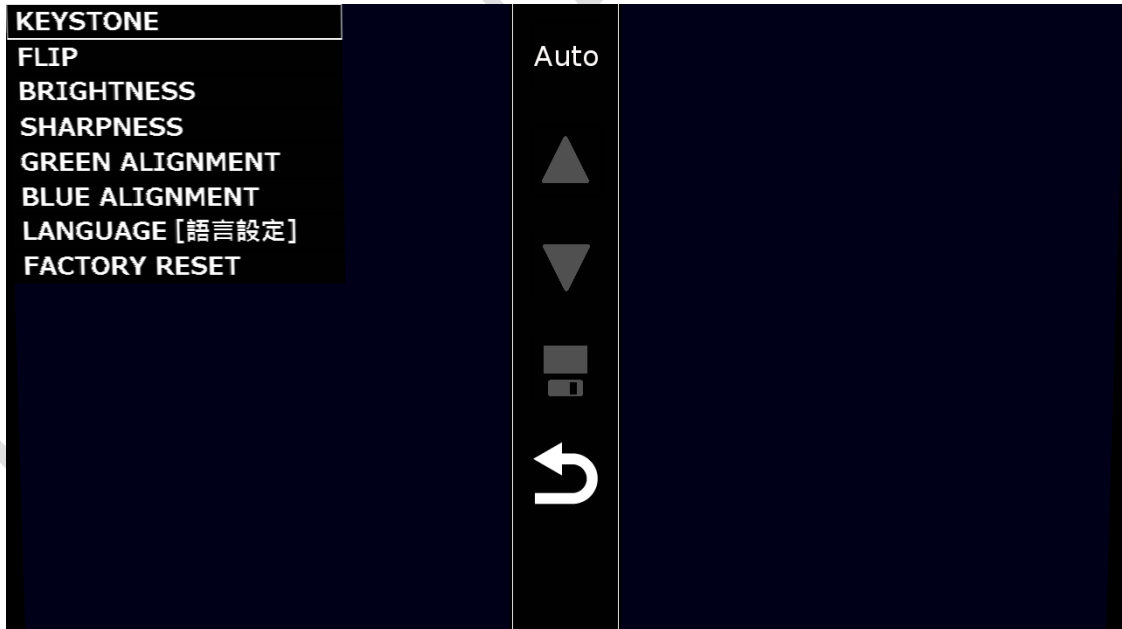
7.2.3 KEYSTONE: Vertical directional distortion correction

Corrects trapezoidal distortion that occurs when the projector is tilted up and down.

<Auto keystone off>

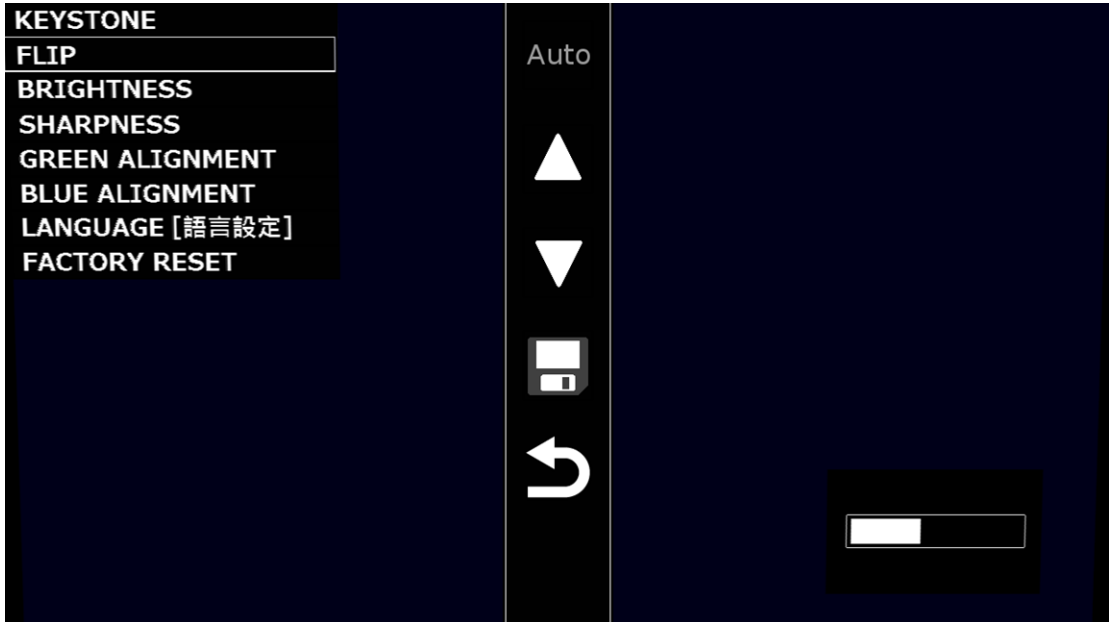


<Auto keystone on>

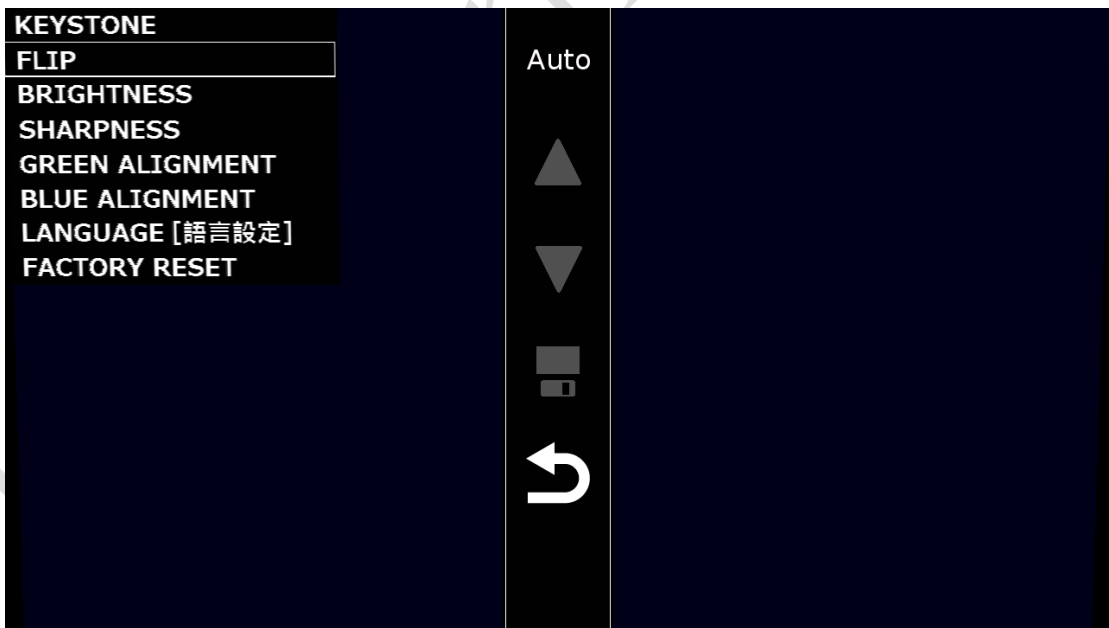



7.2.4 FLIP: Image flip


You can flip the display image vertically and horizontally
 <Auto flip off>



<Auto flip on>



 : Upper left -> Upper right -> Lower left -> Lower right -> Return

 : Lower right -> Lower left -> Upper right -> Upper left -> Return

 : Flip is adjusted automatically
  : Save
  : Return
  : Amount

7.2.5 SHARPNESS: Fine adjustment for misalignment

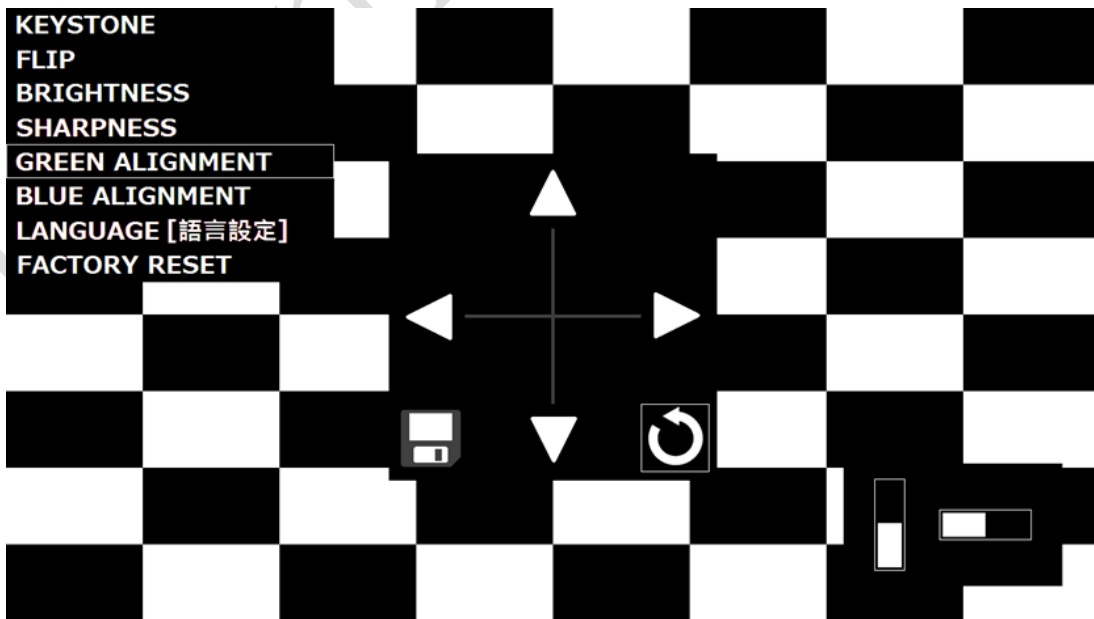
Adjust the vertical double line at the center of the screen to one.



 : Up
  : Down
  : Save
  : Return
  : Amount

7.2.6 GREEN/BLUE ALIGNMENT: Color shift adjustment

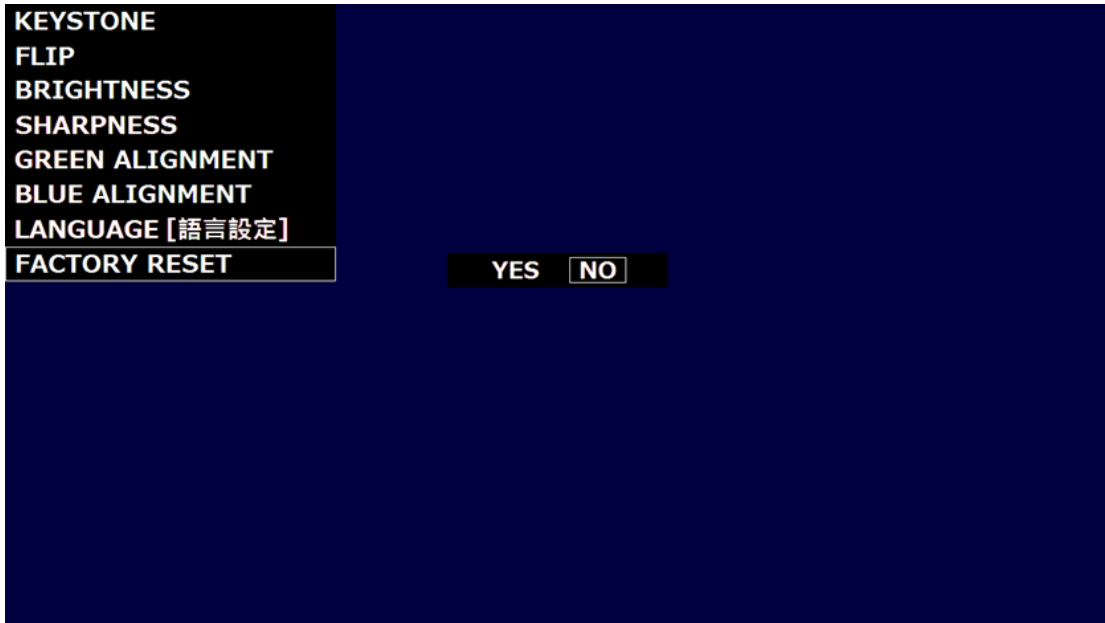
The color shift (RGB) adjustment of this machine is adjusted by finely adjusting the positions of green and blue colors.



 : Save
  : Return
  : Amount
  : Adjustment direction

7.2.7 FACTORY RESET: Reset (return to initial settings)

Reset all settings items to default value



Yes : Restore default settings No : Keep settings

Ultimems, Inc.

8. Precautions of use

- ◆ Do not point the laser light at a mirror, etc. as the reflected laser light may be harmful to eyes.
- ◆ Don't remove the black tape on the module
- ◆ Magnetic or electric noise may cause HD309D1-C1 abnormal or the noise from HD309D1-C1
- ◆ Children should only use HD309D1-C1 under adult supervision. Keep the HD309D1-C1 out of reach of infants.
- ◆ Do not short-circuit HD309D1-C1. Do not allow metal objects such as hairpins to come into contact with HD309D1-C1 or its terminals.
- ◆ Do not disassemble or modify HD309D1-C1
- ◆ Do not place HD309D1-C1 in fire nor heat it in a microwave oven or oven.
- ◆ Do not allow HD309D1-C1 to get wet with fresh water, sea water, milk, soft drinks or soap water. Do not use HD309D1-C1 while wet.
- ◆ Do not use or store HD309D1-C1 in a place where temperature is extremely high, such as near a fire, under direct sunlight, near a heater or in a car parked in the sun. Do not use HD309D1-C1 in a place with poor ventilation, such as while wrapped in a quilt/ blanket or in a bag.
- ◆ Do not apply a strong impact to HD309D1-C1. Avoid hitting it with a hammer, putting any heavy object on top, stepping on it or dropping it.
- ◆ Avoid continuous contact between your skin and HD309D1-C1 while in use. Doing so may cause low-temperature burns. Be careful of heat transmitted through clothes as it may also cause low-temperature burns.
- ◆ Do not touch or stick your finger into the connection parts.
- ◆ Ultimems, Inc. is not liable for damage or loss resulting from the use of HD309D1-C1, or for any claim from a third party.
- ◆ Ultimems, Inc. is not liable for problems with your PC, cell phone or other hardware arising from the use of HD309D1-C1; the suitability of the product for specific hardware, software, or peripherals; operating conflicts with other installed software; data loss; or other accidental or unavoidable damages.
- ◆ If a malfunction occurs, stop use and contact KSY.
- ◆ Use HD309D1-C1 in a place where there is no dust or cigarette smoke because HD309D1-C1 is a precision apparatus.
- ◆ Use on a stable or flat surface when using HD309D1-C1
- ◆ Do not place HD309D1-C1 close to credit and other cards. Doing so may result in the loss of recorded data.
- ◆ Ultimems, Inc. is not responsible for, and the Limited Warranty does not cover, any damage arising from a failure to operate the product within its intended uses, or otherwise follow the user's manual and safety instructions relating to the product's use and installation



- ◆ The Limited Warranty does not cover products purchased from sources other than Ultimems, Inc. or a Ultimems, Inc. authorized dealer (including non-authorized online auctions), or issues due to: (i) outdoor exposure and other acts of nature; (ii) power surges; (iii) accidental damage; (iv) abuse; (v) limitations of technology; (vi) cosmetic damage; (vii) contact with liquid, heat, humidity or perspiration, sand, smoke, or foreign materials; (viii) use of parts or supplies not sold or authorized by Ultimems, Inc. ; (ix) servicing not authorized or performed by Ultimems, Inc. or a Ultimems, Inc. authorized service center; (x) computer or internet viruses, bugs, worms, or Trojan Horses; (xi) malfunctions due to peripherals/accessories; (xii) modifications of or to any part of the product, including “rooting” or other modifications to control the behavior of the product or any factory installed operating system; (xiii) consumable parts such as batteries, cable; or (xiv) any product where the factory-applied serial number has been altered or removed from the product.

Ultimems, Inc.



9. Eye safety precautions

- 9.1 The HD309 is a certified Class 1 Laser Product (IEC 60825-1:2014 + IEC62471-5)
- 9.2 Beware the eyes injured that caused by laser beam, so please do not look at laser beam directly.

Laser Color	Green	Red	Blue
Part No.	OSRAM PLT3 520D	USHIO HL63653TG	OSRAM PLT3 450GB
Wavelength(min/max)	515nm/530nm	635nm/645nm	440nm/460nm

Ultimems, Inc.

10. Recommend resolution setting of Raspberry Pi

When using “Digital video interface converter board” connecting to Raspberry Pi, recommend resolution setting:

Setting the values of “hdmi_group” and “hdmi_mode” in the config file and steps/example are showed as below

- (1) Uncomment (remove # symbol) “hdmi_group” and “hdmi_mode”.
- (2) Change the value of “hdmi_group” to “2” and “hdmi_mode” to “85”.
- (3) Force the Raspberry Pi to use HDMI mode.

Edit /boot/config.txt and uncomment hdmi_force_hotplug as shown below

```
hdmi_force_hotplug=1
```

- (4) Reboot Raspberry Pi: `sudo reboot`

Example as below

```
# uncomment if you get no picture on HDMI for a default "safe" mode
#hdmi_safe=1

# uncomment this if your display has a black border of unused pixels visible
# and your display can output without overscan
#disable_overscan=1

# uncomment the following to adjust overscan. Use positive numbers if console
# goes off screen, and negative if there is too much border
#overscan_left=16
#overscan_right=16
#overscan_top=16
#overscan_bottom=16

# uncomment to force a console size. By default it will be display's size minus
# overscan.
#framebuffer_width=1280
#framebuffer_height=720

# uncomment if hdmi display is not detected and composite is being output
#hdmi_force_hotplug=1

# uncomment to force a specific HDMI mode (this will force VGA)
hdmi_group=2
hdmi_mode=85
```

```
# uncomment to force a HDMI mode rather than DVI. This can make audio work in
# DMT (computer monitor) modes
#hdmi_drive=2

# uncomment to increase signal to HDMI, if you have interference, blanking, or
# no display
#config_hdmi_boost=4

# uncomment for composite PAL
#sdtv_mode=2

#uncomment to overclock the arm. 700 MHz is the default.
arm_freq=900

# for more options see http://elinux.org/RPi\_config.txt
core_freq=250
sdram_freq=450
over_voltage=2
```

Ultimems,

