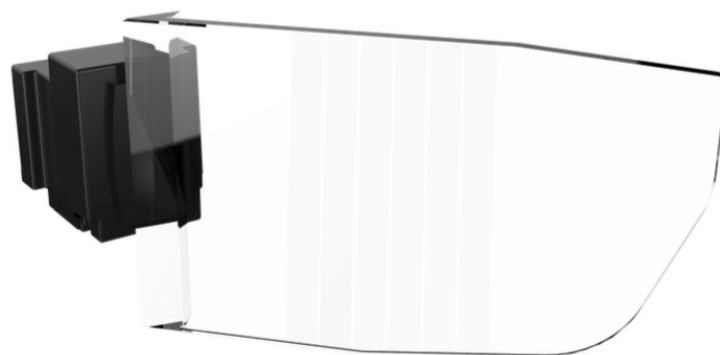
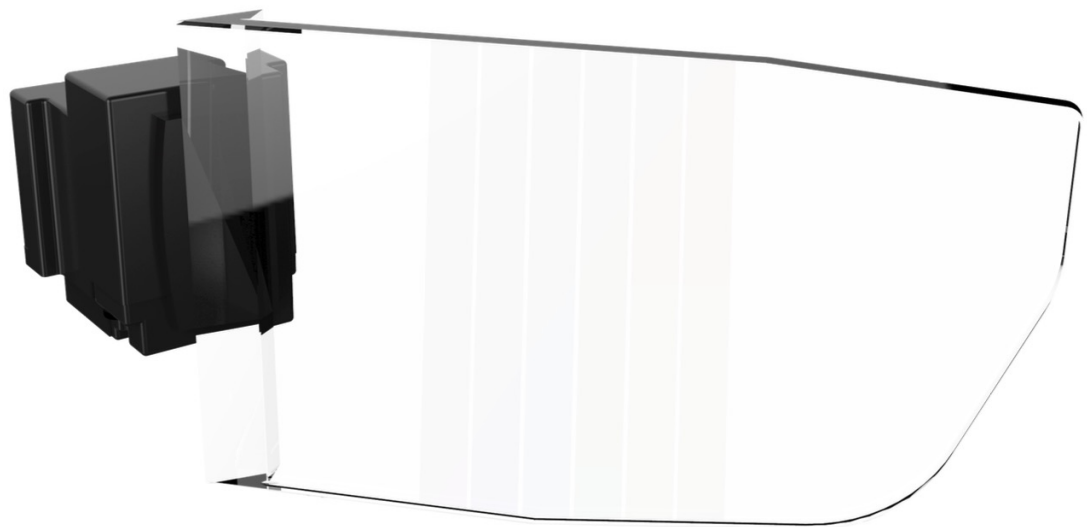


AR Waveguide Optical Module

ARM-101

Product display



Optical Parameters Table

Parameter	Specification
Field of View	30° = 26.16° (H) × 14.71° (V)
Resolution	1280 x 720
Color	RGB full-color
Brightness	800 nits
Contrast Ratio	500:1 (FOFO)
Brightness Uniformity	80% or higher
Gray Level	8 bits
Eye Movement Range	10x10 (mm)
Transmittance	85%
Imaging Distance	Optical infinity

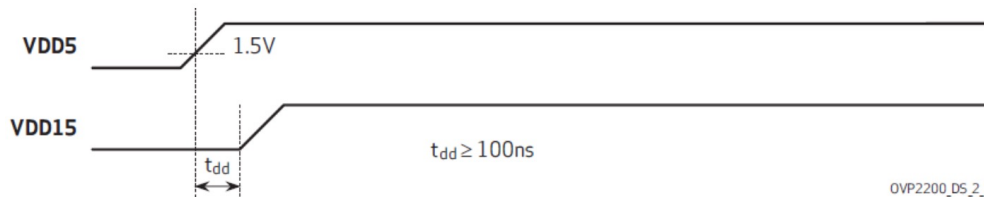
LCOS (Liquid Crystal on Silicon) Specifications

Recommended operating conditions

symbol	parameter	min	typ	max	units
V _{DD5}	supply voltage	5.00	5.50	6.00	V
V _{DD15}	supply voltage	1.35	1.50	1.65	V
V _{IN}	ground		0		V
V _{IH}	high level input voltage	1.2		V _{DD15} + 0.3	V
V _{IL}	low level input voltage	V _{SS} - 0.3		0.4	V

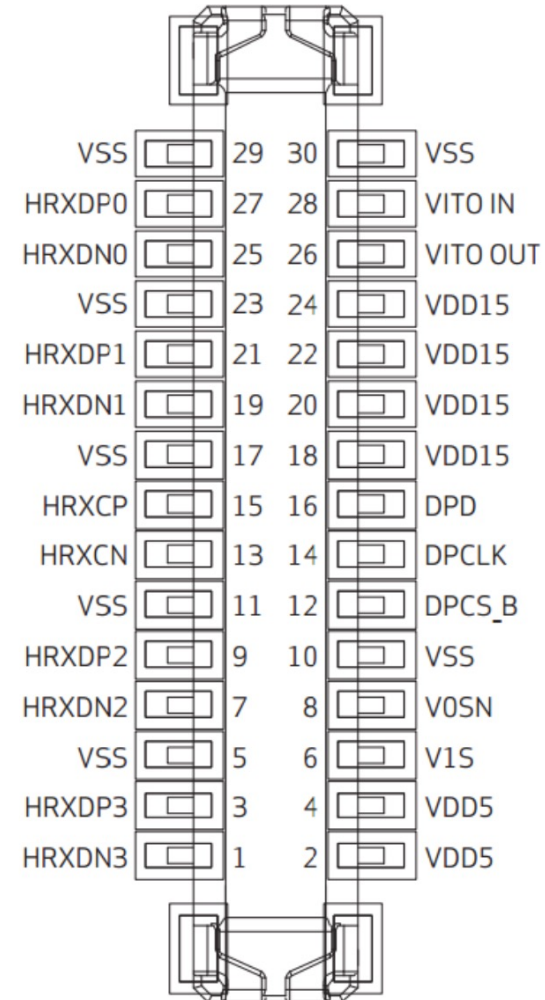
symbol	parameter	min	typ	max	units
I _{IL}	input leakage	-20		20	μA
C _I	input capacitance			5	pF
I _{DD5}	supply current, V _{DD5}		10		mA
I _{DD15}	supply current, V _{DD15}		70		mA
C _{ITO}	ITO capacitance		3.0	5.0	nF

Power-On Timing Sequence



OVP2200_DS_2_1

Pin Map



OVP0921 Specifications

Recommended Operating Conditions operating conditions

symbol	parameter	min	typ	max	unit
V _{DD}	core power supply of 1.2V	1.08	1.2	1.32	V
V _{DD33}	power supply of 3.3V I/O	3.0	3.3	3.6	V
V _{DD33_18} ^a	power supply of 3.3V I/O	3.0	3.3	3.6	V
V _{DD33_18} ^a	power supply of 1.8V I/O	1.62	1.80	1.98	V
V _{33OL}	3.3V I/O output low voltage			0.4	V
V _{33OH}	3.3V I/O output high voltage	2.4			V
V _{33IL}	3.3V I/O input low voltage	-0.3		0.8	V
V _{33IH}	3.3V I/O input high voltage	2.0		V _{DD33} + 0.3V	V
V _{18OL}	1.8V I/O output low voltage			0.45	V
V _{18OH}	1.8V output high voltage	1.35			V
V _{18IL}	1.8V input low voltage	-0.3		0.54	V
V _{18IH}	1.8V input high voltage	1.26		V _{DD33_18} + 0.3V	V

a. this block of I/O pins can be configured as either all 3.3V or all 1.8V

symbol	parameter	min	typ	max	units
I _{DD}	supply current, V _{DD}	92	156	250	mA
I _{DD33}	supply current, V _{DD33}	1	2	5	mA
I _{DD33_18}	supply current, V _{DD33_18}	7	9	15	mA
I _{EVDD}	supply current, analog, 1.2V	15	22	32	mA
I _{PVDD}	supply current, analog, 3.3V	20	25	40	mA

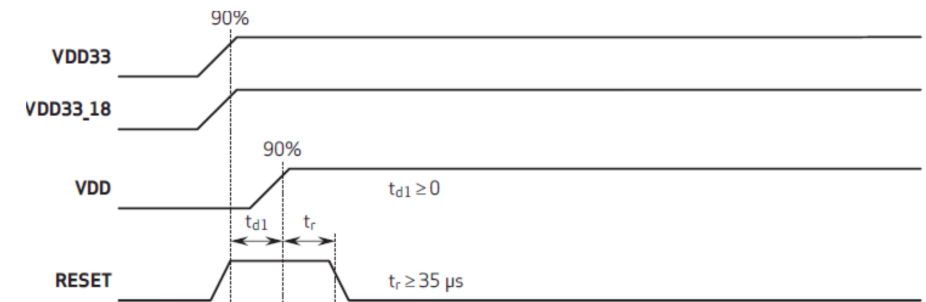
MIPI Video Timing Table

Non-Burst Mode
Sync-pulse
Continuous CLK

Horizontal						Htotal	PClk
HSW	HBP	HAct	HFP				
40	220	1280	110		1650		
Vertical						Vtotal	PClk
VSW	VBP	VAct	VFP				
5	20	720	5		750	74.25	

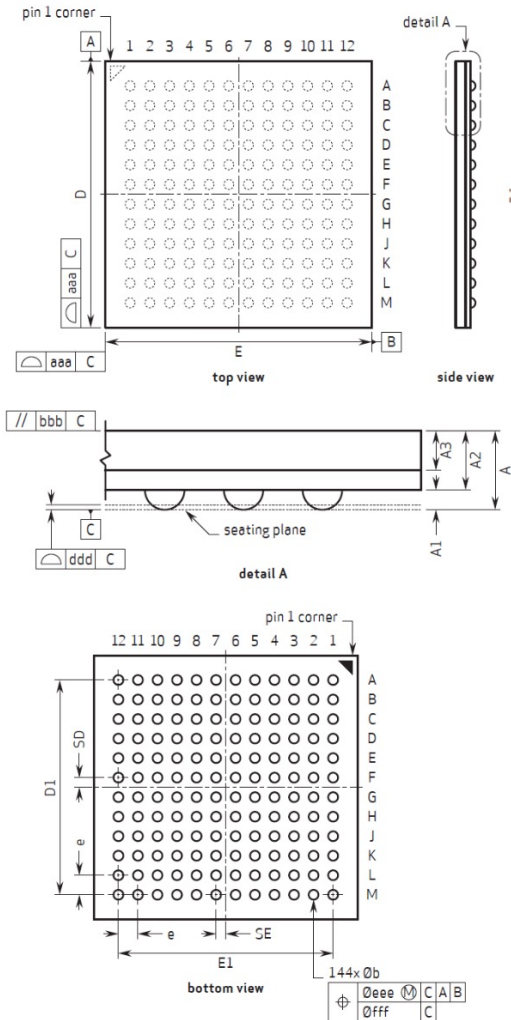
HS_Trail = 64
HS_Zero = 161
HS_PR = 58
LPTX = 50
TA_SURE = 66
TA_GO = 200
CLK_PR = 58
CLK_Trail = 63
CLK_Zero = 308

Power-On Timing Sequence



OVP0921 Specifications

Package Specifications



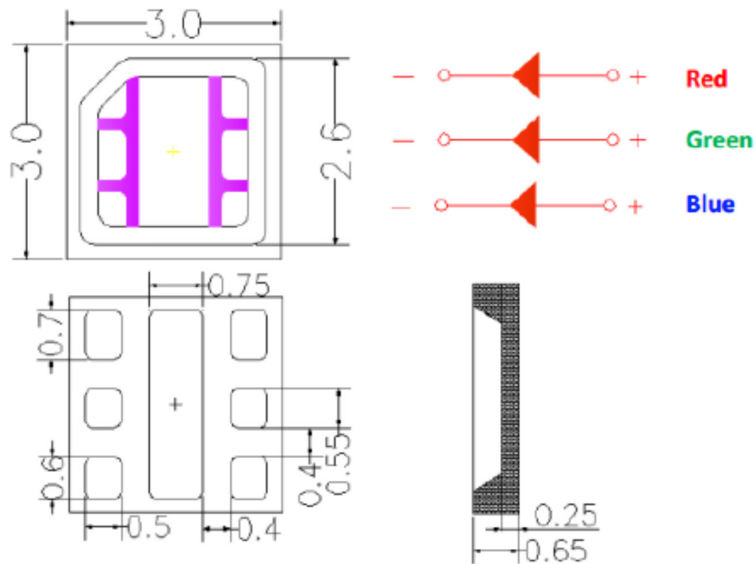
parameter	symbol	min	typ	max	unit
package height	A	-	1.07	1.17	mm
ball height	A1	0.16	0.21	0.26	mm
substrate thickness	A2	0.82	0.86	0.90	mm
ball width (before reflow)	b	0.25	0.30	0.35	mm
package body dimension on x-axis	D	8.90	9.00	9.10	mm
package body dimension on y-axis	E	8.90	9.00	9.10	mm
edge ball center-to-center on x-axis	D1		7.15		mm
edge ball center-to-center on y-axis	E1		7.15		mm
ball pitch	e		0.65		mm
package edge tolerance	aaa		0.10		mm
mold flatness	bbb		0.20		mm
coplanarity	ddd		0.10		mm
ball offset	eee		0.15		mm

LED Specifications

Recommended Operating Current

- ◆ R: 20mA
- ◆ G: 23mA
- ◆ B: 15mA
- ◆ (LED driver register configuration can be adjusted according to brightness requirements)

Product Dimensions



Parameter	Maximum value	Unit
Power dissipation	R:560	mW
	G:680	
	B:680	
Pulse current (1/10 Duty, 0.1ms pulse)	R:300	mA
	G:300	
	B:300	
Forward Current	R:150	mA
	G:150	
	B:150	
Reverse Voltage	5	V
Junction Temperature	100°C	
Operating Temperature	-40°C to +85°C	
Storage Temperature	255°C for 10 Seconds	
ESD (Classification acc. AEC Q101)	ESD HBM	R:2000V
		G:1000V
		B:1000V
	ESD MM	200V

Method for Writing Configuration Parameters to OVP0921

```
Device Addr Instruct
write 0x7ffe, 0x01 // Point to Internal ROM Space
write 0x8000, [Ovp921 code] //send Ovp921 code
write 0x7ffe, 0x00 // Point to regular memory space
write 0x7fc0, 0x03 // Tell internal MCU to reset and execute above code
```

Method for Writing Configuration Parameters to ISL97901 (LED Driver IC)

(Address of the chip device is 0x52) Write the corresponding register configuration parameters in the following memory addresses sequentially:

```
0x00~0x1E: {0x00, 0x00, 0x04, 0x00, 0x82, 0x10, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x22, 0x22, 0x22, 0x00, 0x00, 0x66, 0x9A,
0x9A, 0x9A, 0x9A, 0x50, 0x40}
```

MIPI Video Timing Table

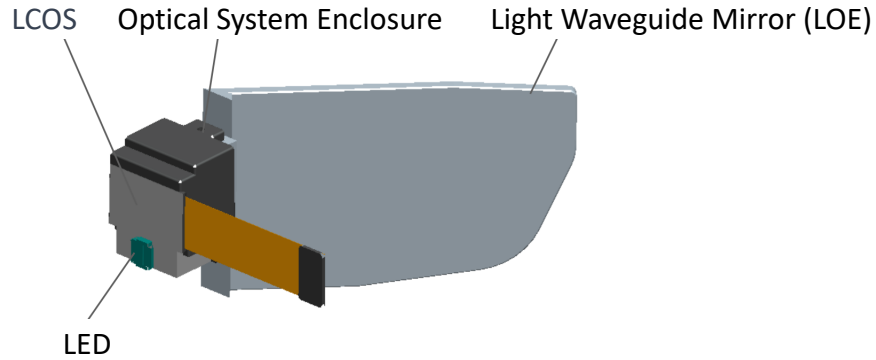
Non-Burst Mode
Sync-pulse
Continuous CLK

Horizontal						
HSW	HBP	HAct	HFP		Htotal	
40	220	1280	110		1650	
Vertical						
VSW	VBP	VAct	VFP		Vtotal	PClk
5	20	720	5		750	74.25

```
HS_Trail = 64
HS_Zero = 161
HS_PR = 58
LPTX = 50
TA_SURE = 66
TA_GO = 200
CLK_PR = 58
CLK_Trail = 63
Clk_Zero = 308
```


Optical System Components

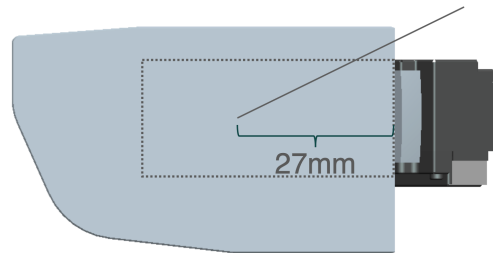
- 1.The LCOS FPC connector is a 30-pin connector that can be connected with HIROSE's BM23FR0.6-30DS-0.35V(51) connector.
- 2.The LED plug-in connector specifications are 1mm high, 0.5mm pitch, and 4 pins (model: AYF530435).



Optical Display Area

Display Area: 38mm x 12mm (Non-cutttable section)

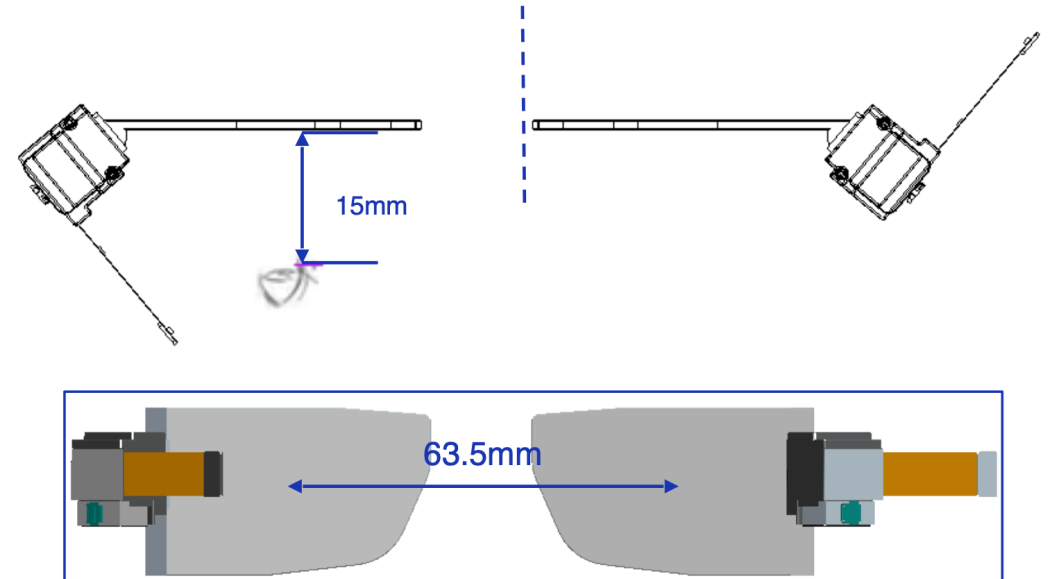
Display Center: Designed to align with the human eye during design



Waveguide Panel Size: 49.93mm x 29.5mm (Default form factor)

Binocular Design Explanation

- 1.The structure of the waveguide mirror (LOE) in the left and right optical module modules is symmetrically designed.
- 2.The optical module housing, LED board, and LCOS board of the left and right optical module modules are designed asymmetrically, with a rotation of 83.7° (each side angled 41.8° relative to the front direction of the eye).
- 3.It is recommended to keep the distance between the eyeball and LOE no greater than 18mm.
- 4.The suggested design value for the distance between the display centers of the left and right eyes is 63.5mm (corresponding to the interpupillary distance of the human eye).



Positioning and Mounting Design

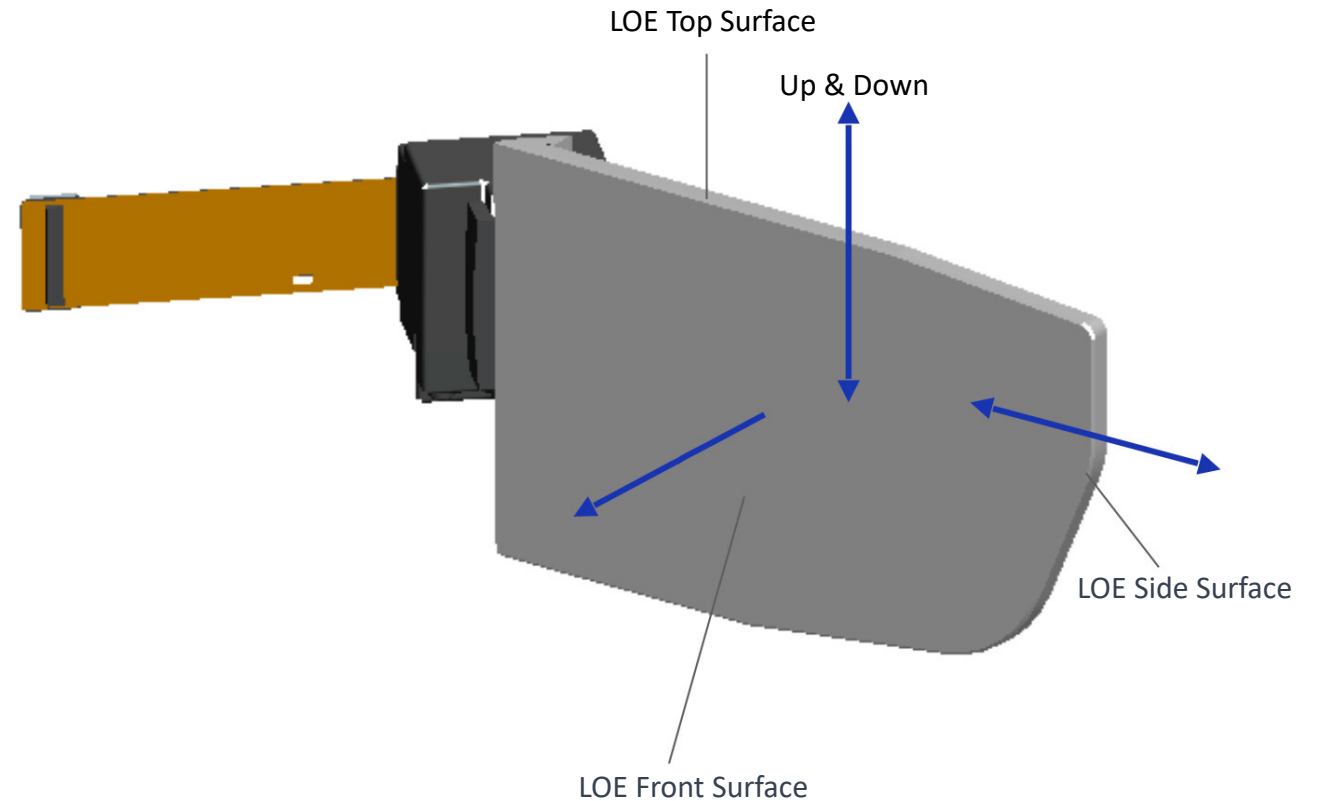
Positioning Surfaces

The waveguide panel serves as the positional reference for the assembly process of various components in the optical module. It has the highest dimensional and positional accuracy and can be used as the primary positioning surface for the assembly of the optical module and eyewear enclosure.

- 1.LOE Front Surface: Positioning in the front-to-back direction.
- 2.LOE Top Surface: Positioning in the vertical direction (up and down).
- 3.LOE Side Surface: Positioning in the horizontal direction (left and right).

Mounting Methods

The internal contour of the waveguide panel on the inside of the eyewear front shell is designed to match the contour of the positioning surfaces mentioned above. According to the positions of the positioning surfaces and the corresponding positions on the optical module, the optical module is securely fixed to the eyewear shell (ensuring the strength of the eyewear front shell).



Avoidance Design for Special Components

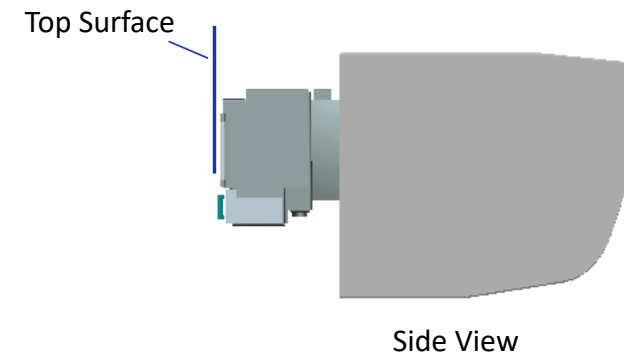
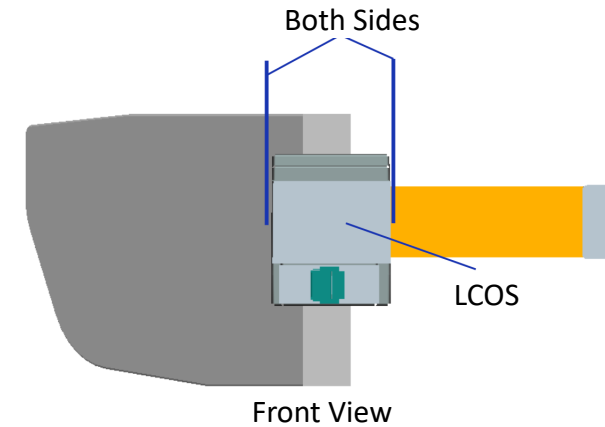
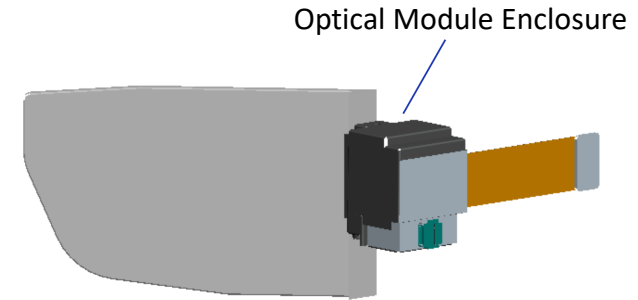
Optical Module Enclosure

To ensure optical display performance, the entire optical module enclosure requires a 1mm clearance.

LCOS Panel

1. To ensure optical display performance, the LCOS panel is assembled with the optical module enclosure in an adapted manner, resulting in positional differences between the LCOS panel and the enclosure (varies with different optical module modules). This necessitates structural clearance (in the frontal view) of the LCOS panel when designing the eyewear, with at least 1mm of clearance on both sides.

2. The top surface of the LCOS panel has a significant adjustment range (in the side view), requiring a gap of no less than 1mm to be designed in the structural components of the eyewear.



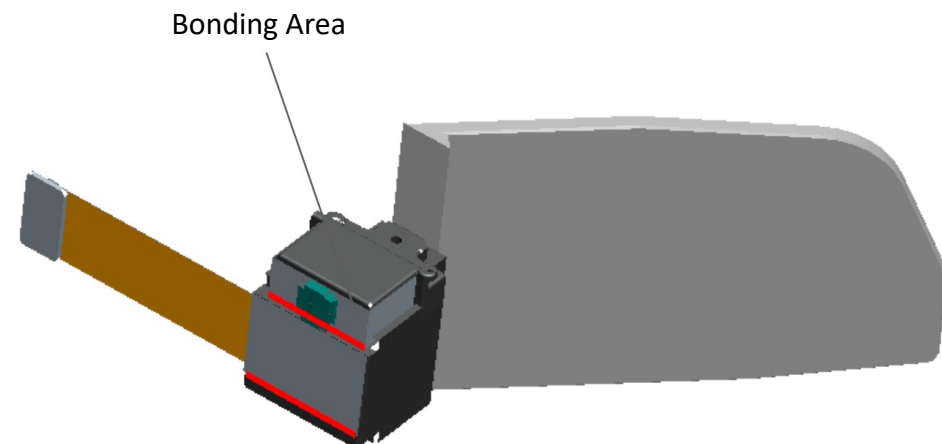
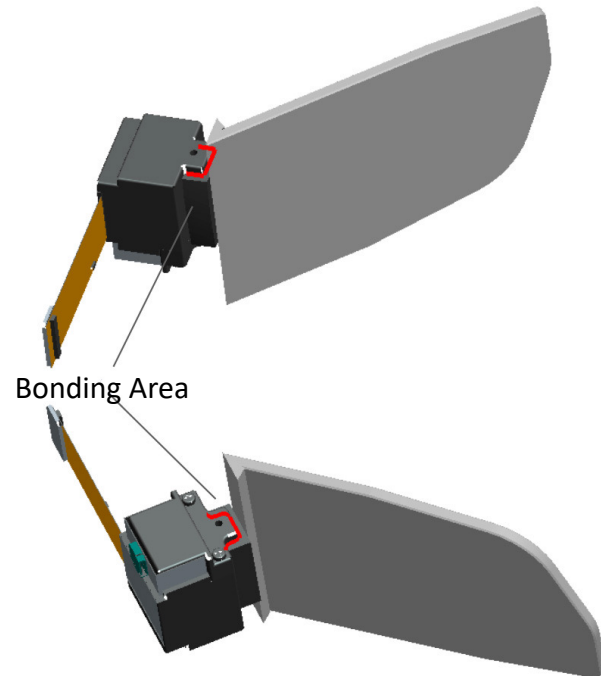
Avoidance Design for Special Components

Contact Area between PBS and Optical Module Enclosure

To ensure optical display performance, the contact area between the PBS and the Optical Module Enclosure needs to be bonded. There should be a 1mm clearance (red area) around the bonding area.

LCOS Panel

Contact Area between the Upper Part of the LCOS Panel and the Optical Module Enclosure.



Operating Temperature/Humidity of the Optical Module

Recommended for use under the conditions of 0°C to 50°C temperature range and 45% to 70% relative humidity (RH).

Service Life

- 1.Theoretical lifespan of the entire device: 12,000 hours or more (Operating conditions: 10 mW/mm²)
- 2.Aging test of the entire device (240 hours of continuous operation): 100% of the sample devices passed.

Extreme Environmental Usage Conditions

Extreme High-Temperature Operating Condition: 70°C -> The screen displays normally without any image anomalies or flickering. The driver board functions properly.

Extreme Low-Temperature Operating Condition: 0°C -> The screen displays normally without any image anomalies or flickering. The driver board functions properly.

Extreme High-Temperature Storage: 100°C -> After returning to normal temperature, the device operates normally without any issues.

Extreme Low-Temperature Storage: -20°C -> After returning to normal temperature, the device operates normally without any issues.

LCOS Related

- 1.The FPC (Flexible Printed Circuit) connector for LCOS is a 30-pin connector and can be connected to the HIROSE BM23FR0.6-30DS-0.35V(51) connector. It can also be connected to the extended_to_bm23_cable FPC, which is compatible with AW60/AW70 driver boards.
- 2.The width of the FPC connector on the cable end needs to strictly adhere to the specifications of the connector. If it is too small, there is a risk of misalignment and short-circuiting.

LED Related

- 1.It is not recommended to set the LED current too high. It is advisable to operate within the recommended current settings to achieve sufficient brightness for most requirements. Excessive current may result in increased power consumption and elevated LED temperature, which can affect the product experience.
- 2.If using different LED driver chips, please ensure that they can perform RGB color mixing. The R/G/B three-channel EN signals need to be connected to the OVP0921 for backlight and image synchronization.