AmμLED™ Hummingbird Mini II

Ultra-Compact | Ultra-High Brightness | Monochrome Projector

AmμLED™ Hummingbird Mini II is only 0.15cc in volume, has a FOV of 30° & weighs nominally <0.3 grams.

KEY FEATURES

World's smallest monochrome Micro LED projector 0.15cc in Volume

Nominal weight <0.3 grams

Ultra-high brightness projector designed for Waveguides

Industry standard QSPI Interface

VGA Resolution

4-bit Greyscale Colour depth

APPLICATIONS

Smart Glasses

AR Glasses

Head-up Displays

Pico Projection

PART NUMBERS	DESCRIPTION
J013G01VGA30E1N	AMμLED™ VGA monochrome Projector with 4010 QSPI Interface
J013AA0201	3 channel control board for 4010 MOC

JBD PART NUMBERING INFORMATION

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
J	0	1	3	G	0	1	V	G	A	3	0	E	1	N

Digits	Description
1	Company Initial (J for JBD)
2, 3, 4	Display Active Area Diagonal – 013 for 0.13" Diagonal
5	Color. G for green
6, 7	01: Panel Type. 01 (JBD Internal Panel reference)
8, 9, 10	Resolution Code: VGA
11, 12	FOV value: 30°
13, 14	Projector Type: E1 (JBD Internal Projector reference)
15	Waveguide type: N for No Waveguide included

Absolute Maximum Ratings:

PARAMETER	RATING	UNIT	CONDITION
Operating temperature	-20~ +60	℃	Please note that the Tsensor temperature of the optical machine **should not exceed 80 ℃**
Storage temperature	-30~ +80	℃	Ambient temperature
VCC2.5	1.8 or 2.5	V	
VCC1.2	1.2	V	
VCOM	-2.0	V	
ESD (HBM)	2	KV	

Display Specifications:

PARAMETER	VALUE	UNIT	NOTES
Display Type	AMμLED™	-	
Display Active Area	0.13	Inch	Diagonal
Resolution	640 x 480	-	VGA
Pixel pitch	4	μm	
Gray Level	4	Bits	
Display Interface	QSPI/SPI	-	
Max clock frequency	32	MHz	
Display Refresh Rate	30~480	Hz	
Gamma	1.0	-	

Optical Specifications:

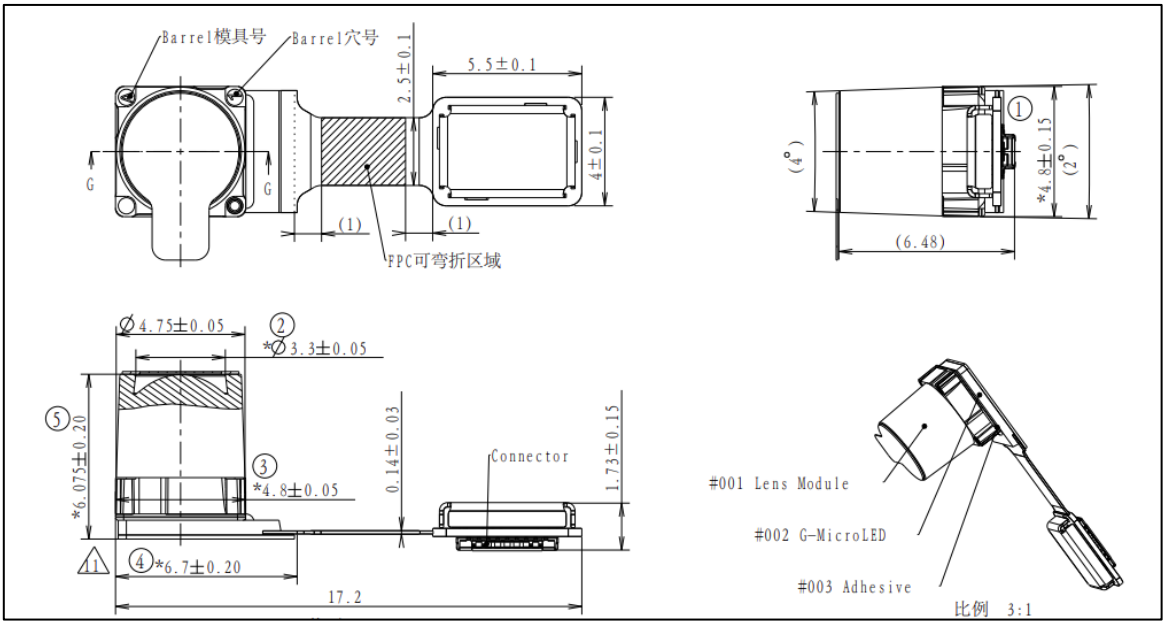
PARAMETER	VALUE			UNIT	NOTES
	Min	Typical	Max		
FOV	29.5	30	30.5	°	Diagonal
Aspect ratio	-	4:3	-	-	
MTF	0.65	-	-	-	@62.5lp/mm 0 field
	0.5	-	-	-	@62.5lp/mm 0.8 field
Exit pupil	3.25	3.3	3.35	mm	
Position of exit pupil	-	0	-	mm	Front of projector
Flux output	0.9	1.2	-	lm	APL 25%, Lreg 7109,Creg 63, demura off
Power Consumption	-	450	-	mW	APL 25%, Lreg 7109,Creg 63
Contrast	80:1	150	-	-	4 x 4 Checkboard
Distortion	-	-	1.0%	-	TV Distortion
Brightness uniformity	80%	-	-	-	3*3, min/max
Peak wavelength (Green)	520	527.5	535	nm	
Focus	6m	-	-	-	
Boresight	-	-	0.5	°	
Clocking	-	-	0.5	°	
Image blemish	-	-	2	pixel	

Mechanical Specifications:

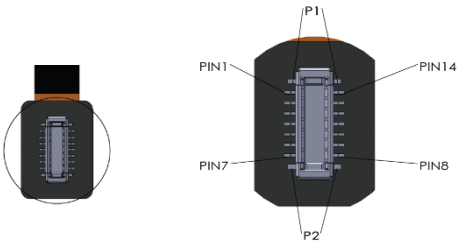
PARAMETER	VALUE	UNIT	NOTES
Volume	0.15	cc	Displacement volume
Dimensions	6.1*4.8*6.7	mm	L x W x H (not including FPC)
Weight (without heat sink foil)	<0.3	g	
IP rating	JBD	-	Not IP rated

Outline Drawing & Dimensions:

Units: mm



Pin definition:

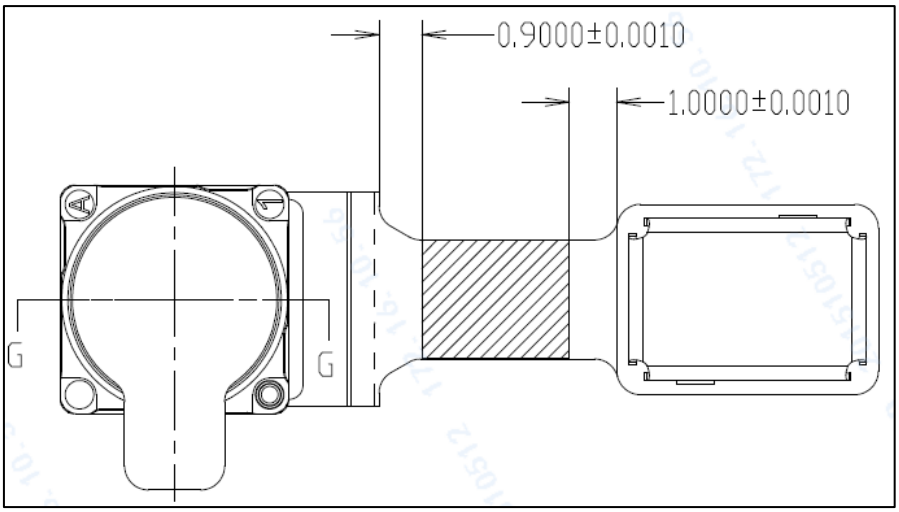


Connector type: Molex 5050701422

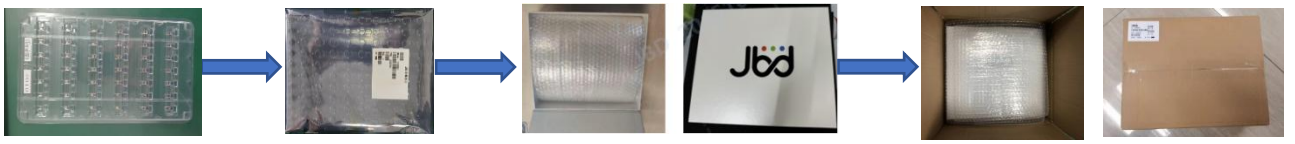
Pin NO.	IO	Description
Pin1	XIN	External clock input, if using the panel's own internal clock, it can be left unconnected
Pin2	CS_FLASH	Flash select input
Pin3	VCC2.5V	IO Power supply, 1.8V, max current <100mA
Pin4	WP_FLASH	GND
Pin5	GND	Power
Pin6	GND	Power
Pin7	GND	Power
Pin8	DIO1	When selecting chips: SPI mode data output; QSPI mode data input/output 1 When selecting flash: SPI data output
Pin9	PGMDB	Floating
Pin10	DIO0	When selecting chips: SPI mode data input; QSPI mode data input/output 0 When selecting flash: SPI data input
Pin11	CS_CHIP	Chip select input
Pin12	DIO3	Quad SPI Data input output 3
Pin13	SCLK	Serial clock input
Pin14	DIO2	Quad SPI data input output 2
P1	VCC1.2V	Power supply ,1.2V, max current < 0.5A
P2	VCOM	Power supply, -2.0V, max current < 0.5A

FPC Bending:

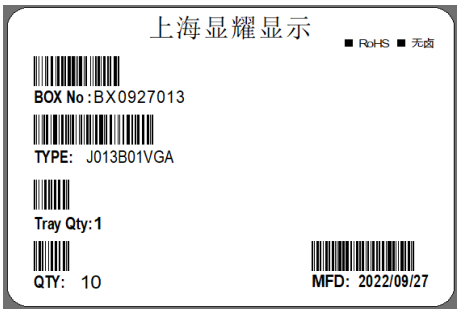
The shaded area is a bendable zone, while other areas are prohibited from bending, Bending radius R≥0.5mm, Bend Angle≤180°, bending times≤20 times, Bending speed 2s /cycle.



Package：



Putting in the tray	Vacuumize with an electrostatic bag	Wrap the Tray box with bubble cotton and place it in a white gift box	White gift box packed in cardboard box



Label（white box）

label（cardboard box）

Precautions & Handling:

- Please guarantee the **heat dissipation** when using projector. The T-sensor temperature of the optical machine **should not exceed 80 ℃.**
- Please don't use APL 100% image, if you have to do it, the **heat dissipation must be satisfied**
- Please avoid the **violent collisions** which could lead to the IC crack and display abnormal when using projector.
- Please contact us to get **latest version firmware and GUI** when you receive the projector.
- Please don't **bend and pull FPC overly**, which could lead to FPC circuit crack and display abnormal.
- Please avoid the **hot plug**, which could generate large current to cause damage
- The product is **ESD-sensitive**, so avoid discharging static electricity to the connector when handling or touching the product. It is necessary to pick up the product in an antistatic environment, and ensure that personnel wear electrostatic clothing and electrostatic bracelets.
- Please avoid the **scratches** on lens, which will influence the display quality.
- When connecting to the projector, please make sure that the connector is connected **in right direction** and whether it is **clamped properly** to avoid damage to the connector.
- Bending is only allowed in the bendable area of FPC, and bending is prohibited in the prohibited bending area.
- Suggest warehouse storage conditions: temperature 10-30 ℃, humidity30%~75%, avoid sunlight exposure.
- Ensure that the power supply voltage is within the required range.
- It is recommended to use anti-static tweezers to clamp the FPC soft board for operation.
- Please work in a cleanroom with a high dust-free level (recommended to be a Class 100 workshop) to prevent dirt and foreign objects.