KLT-X9MF-OV5640-1B V2.2 NIR

5MP OmniVision OV5640-1B MIPI and DVP Parallel Interface
M12 No IR Fixed Focus Camera Module

Front View

Back View

Specifications

Camera Module No.	KLT-X9MF-OV5640-1B V2.2 NIR
Resolution	5MP
Image Sensor	OV5640-1B
Sensor Type	1/4"
Pixel Size	1.4 um x 1.4 um
EFL	0.90 mm
F.NO	2.00
Pixel	2592 x 1944
View Angle	220.0°(DFOV) 187.0°(HFOV) 144.0°(VFOV)
Lens Dimensions	13.00 x 13.00 x 13.56 mm
Module Size	70.00 x 22.00 mm
Module Type	Fixed Focus
Interface	MIPI and DVP Parallel
Auto Focus VCM Driver IC	Embedded
Lens Type	No IR Filter Lens
Operating Temperature	-30°C to +70°C
Mating Connector	FX12B-40P-0.4SV

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KLT-X9MF-OV5640-1B V2.2 NIR

5MP OmniVision OV5640-1B MIPI and DVP Parallel Interface
M12 No IR Fixed Focus Camera Module

Top View

Side View

Bottom View

Mating Connector

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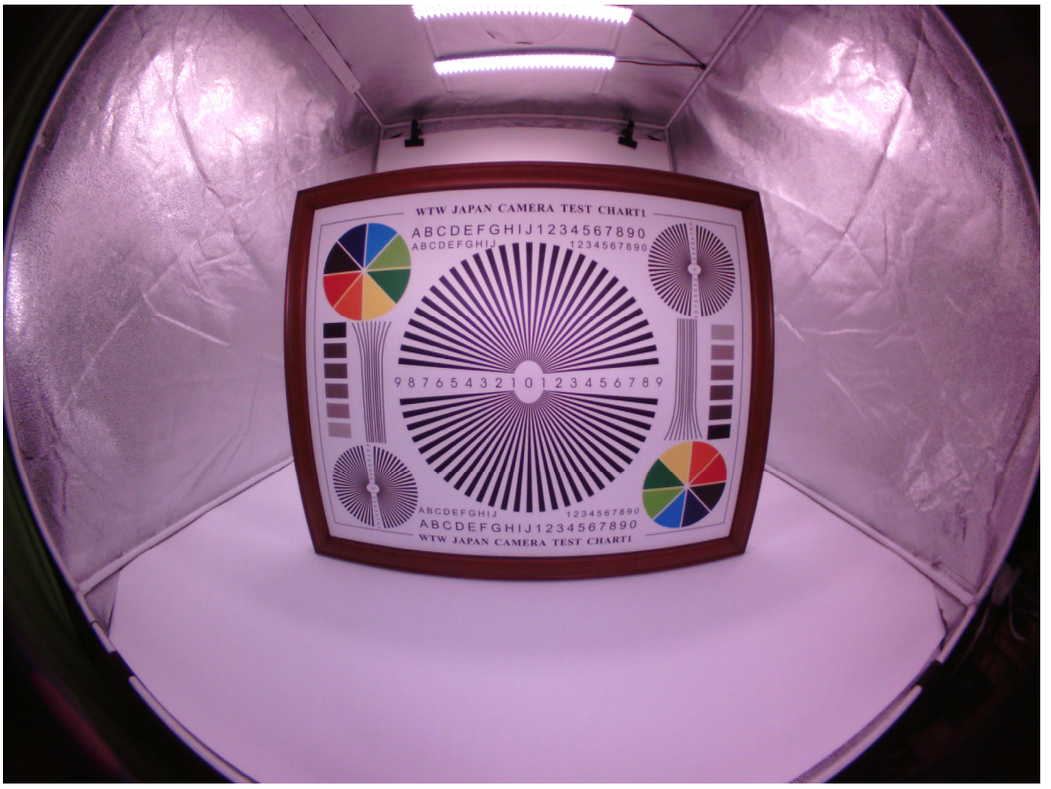

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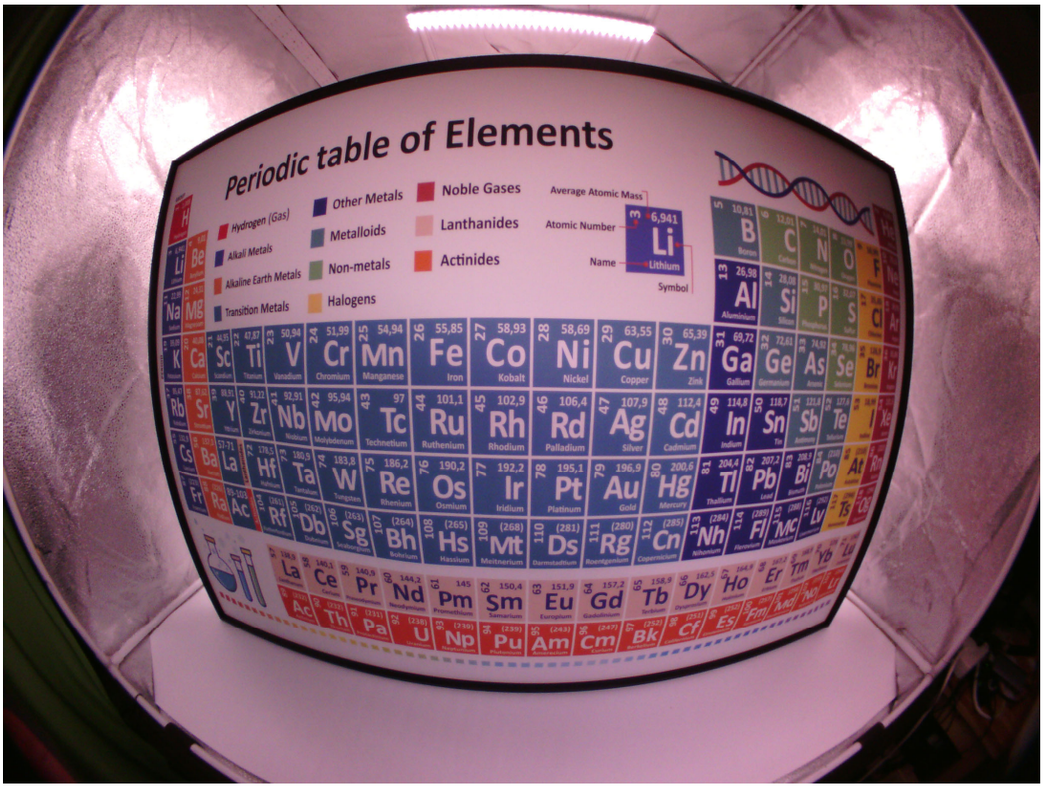

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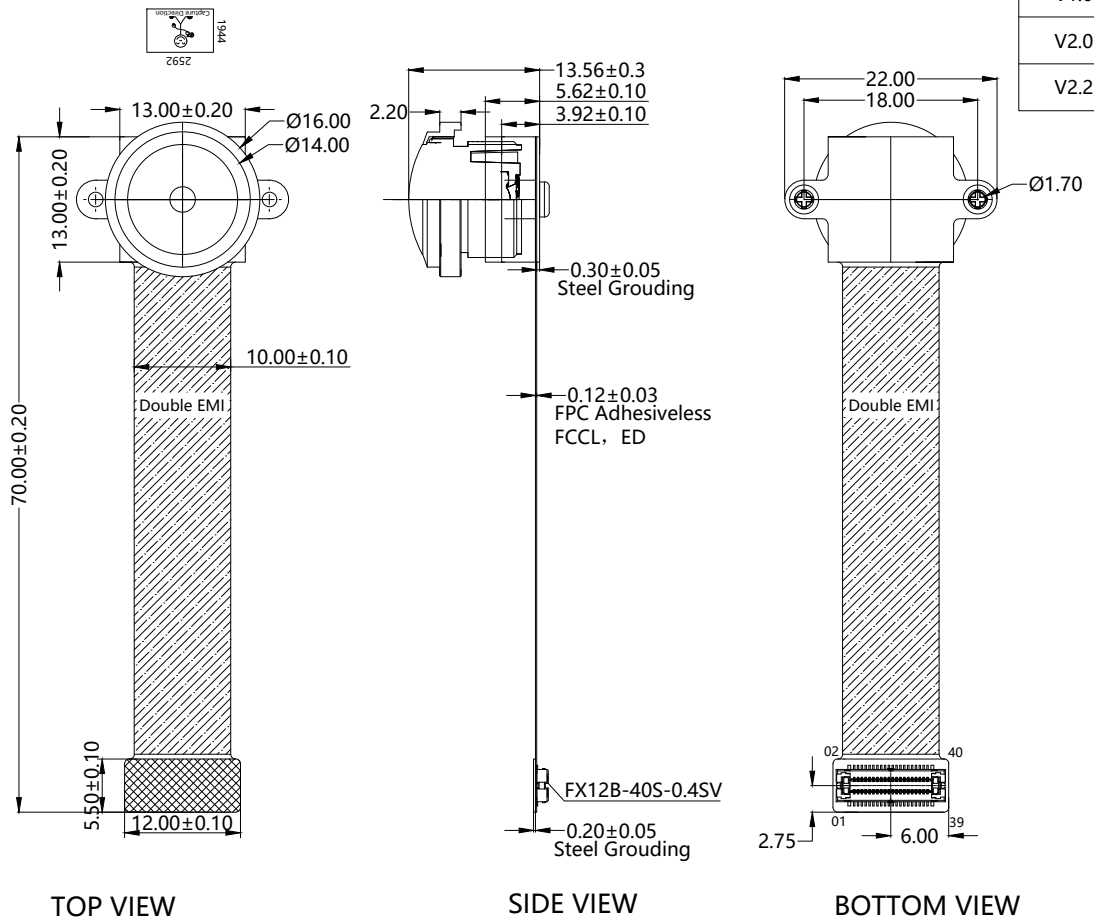
PIN	SIGNAL
1	AGND
2	NC
3	STROBE
4	NC
5	SIOD
6	NC
7	SIOC
8	AVDD2.8V
9	RESET
10	GPIO1
11	PCLK
12	GPIO0
13	VSYNC
14	FREX
15	HREF
16	D9/MDP1
17	PWDN
18	D8/MDN1
19	D9/MDP1
20	DGND
21	D8/MDN1
22	D7/MCP
23	D7/MCP
24	D6/MCN
25	D6/MCN
26	DGND
27	D5/MDP0
28	D5/MDP0
29	D4/MDN0
30	D4/MDN0
31	D3
32	DGND
33	D2
34	XCLK
35	D1
36	DVDD1.5V
37	D0
38	DOVDD1.8V
39	DGND
40	DGND

Version	Information
V1.0	First Version
V2.0	Change capture direction and FPC length
V2.2	Change lens holder



TOP VIEW　　SIDE VIEW　　BOTTOM VIEW

Parameter:

1、Sensor specification:

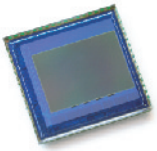
Image Sensor：OV5640-1B
Pixel：1.4um*1.4um
Lens Type：1/4
Important Voltage Description:
DVDD1.5V (external power supply);

2、Lens specification:

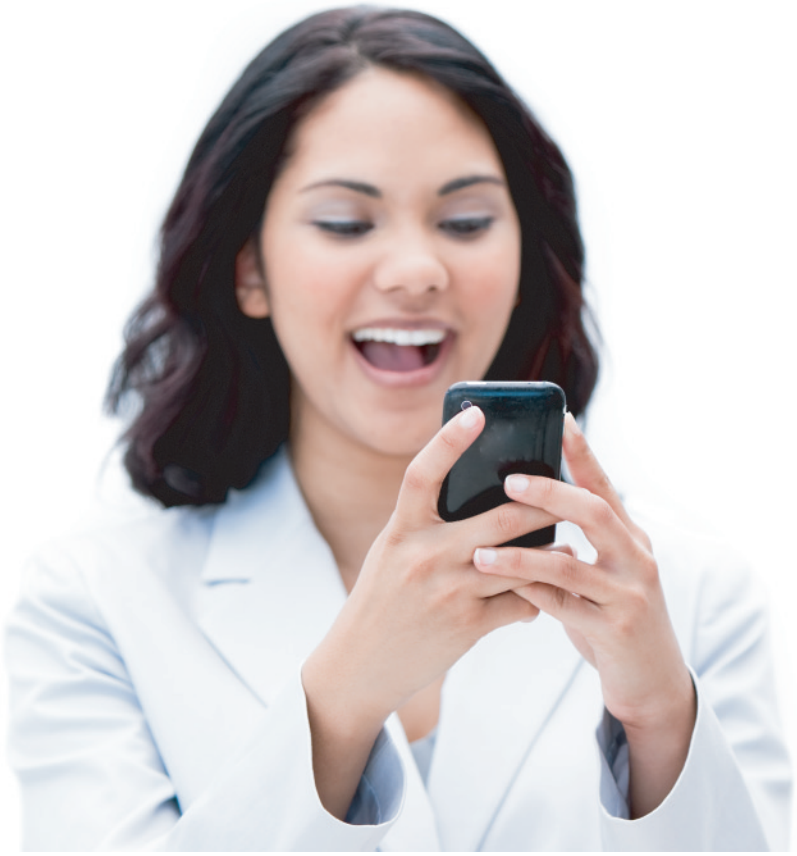
FOV：220°(D);187°(H);144°(V)
F/NO.：2.0
TV distortion：<-16%
Focal length：0.9mm
Composition：1G4P (NO IR FILTER)

Kai Lap Technologies Group Ltd

Designed By	Kevin	Model Name:	KLT-X9MF-OV5640-1B V2.2 NIR
Checked By	Jacky	Projection Type: Third Angle	Unit: mm / Date: 3/23/2024 / Scale: 1:1 / Sheet: 1 of 1 / Version: 1/0



OV5640 5-megapixel product brief



lead free

available in a lead-free package

1/4-inch, 5-Megapixel SOC Image Sensor Optimized for High-Volume Mobile Markets

The OV5640 delivers a complete 5-megapixel camera solution on a single chip, aimed at offering cost efficiencies that serve the high-volume autofocus (AF) camera phone market. The system-on-a-chip (SOC) sensor features OmniVision's 1.4 micron OmniBSI™ backside illumination architecture to deliver excellent pixel performance and best-in-class low-light sensitivity, while enabling ultra compact camera module designs of 8.5 mm x 8.5 mm with <6 mm z-height. The OV5640 provides the full functionality of a complete camera, including anti-shake technology, AF control, and MIPI while being easier to tune then two-chip solutions, making it an ideal choice in terms of cost, time-to-market and ease of platform integration.

The OV5640 enables 720p HD video at 60 frames per second (fps) and 1080p HD video at 30 fps with complete user control over formatting and output data transfer. The 720p/60 HD video is captured in full field of view (FOV) with 2 x 2 binning, which doubles the sensitivity and improves the signal-to-noise ratio (SNR). Additionally, a unique post-binning re-sampling filter function removes zigzag artifacts around slant edges and minimizes spatial artifacts to deliver even sharper, crisper color images. To further improve camera performance and user experience, the OV5640 features an internal anti-shake engine for image stabilization, and it supports Scalado™ tagging for faster image preview and zoom.

The OV5640 offers a digital video port (DVP) parallel interface and a high-speed dual lane MIPI interface, supporting multiple output formats. An integrated JPEG compression engine simplifies data transfer for bandwidth-limited interfaces. The sensor's automatic image control functions include automatic exposure control (AEC), automatic white balance (AWB), automatic band filter (ABF), 50/60 Hz automatic luminance detection, and automatic black level calibration (ABLC). The OV5640 delivers programmable controls for frame rate, AEC/AGC 16-zone size/position/weight control, mirror and flip, cropping, windowing, and panning. It also offers color saturation, hue, gamma, sharpness (edge enhancement), lens correction, defective pixel canceling, and noise canceling to improve image quality.

Find out more at www.ovt.com.

OmniVision

applications

- cellular phones
- toys
- PC multimedia
- digital still cameras

ordering information

- **OV05640-A71A-1B** (color, lead-free)
  71-pin CSP

features

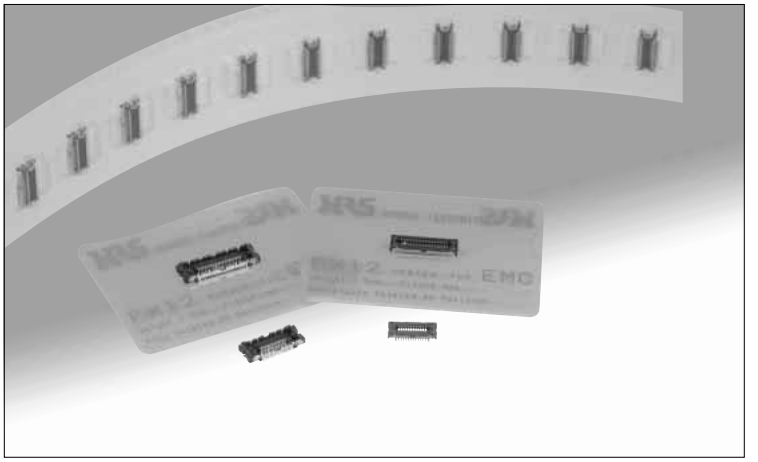
- 1.4 µm x 1.4 µm pixel with OmniBSI technology for high performance (high sensitivity, low crosstalk, low noise, improved quantum efficiency)
- optical size of 1/4"
- automatic image control functions: automatic exposure control (AEC), automatic white balance (AWB), automatic band filter (ABF), automatic 50/60 Hz luminance detection, and automatic black level calibration (ABLC)
- programmable controls for frame rate, AEC/AGC 16-zone size/position/weight control, mirror and flip, cropping, windowing, and panning
- image quality controls: color saturation, hue, gamma, sharpness (edge enhancement), lens correction, defective pixel canceling, and noise canceling
- support for output formats: RAW RGB, RGB565/555/444, CCIR656, YUV422/420, YCbCr422, and compression
- support for video or snapshot operations
- support for internal and external frame synchronization for frame exposure mode
- support for LED and flash strobe mode
- support for horizontal and vertical sub-sampling, binning
- support for minimizing artifacts on binned image
- support for data compression output
- support for anti-shake
- standard serial SCCB interface
- digital video port (DVP) parallel output interface and dual lane MIPI output interface
- embedded 1.5V regulator for core power
- programmable I/O drive capability, I/O tri-state configurability
- support for black sun cancellation
- support for images sizes: 5 megapixel, and any arbitrary size scaling down from 5 megapixel
- support for auto focus control (AFC) with embedded AF VCM driver
- embedded microcontroller
- suitable for module size of 8.5 x 8.5 x <6mm with both CSP and RW packaging

key specifications (typical)

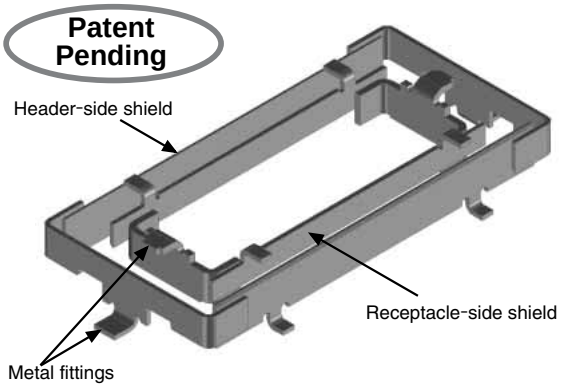
- **active array size:** 2592 x 1944
- **power supply:**
  core: 1.425 ~ 1.675V (with embedded 1.5V regulator)
  analog: 2.6 ~ 3.0V (2.8V typical)
  I/O: 1.8V / 2.8V
- **power requirements:**
  active: 140 mA
  standby: 20 µA
- **temperature range:**
  operating: -30°C to 70°C junction temperature (see **table 8-2**)
  stable image: 0°C to 50°C junction temperature (see **table 8-2**)
- **output formats:** 8-/10-bit RGB RAW output
- **lens size:** 1/4"
- **lens chief ray angle:** 24° (see **figure 10-2**)
- **input clock frequency:** 6~27 MHz
- **max S/N ratio:** 36 dB
- **dynamic range:** 68 dB @ 8x gain
- **maximum image transfer rate:**
  QSXGA (2592x1944): 15 fps
  1080p: 30 fps
  1280x960: 45 fps
  720p: 60 fps
  VGA (640x480): 90 fps
- **sensitivity:** 600 mV/Lux-sec
- **shutter:** rolling shutter / frame exposure
- **maximum exposure interval:** 1964 x t_{ROW}
- **pixel size:** 1.4 µm x 1.4 µm
- **dark current:** 8 mV/s @ 60°C junction temperature
- **image area:** 3673.6 µm x 2738.4 µm
- **package dimensions:** 5985 µm x 5835 µm

0.4 mm Pitch, 1.5 mm Board-to-Board Connectors with Dual Shields

FX12 Series



Dual Shields (when mated)



■Features

1. Dual shields

Built-in shield plates and metal fittings in the plugs and receptacles prevent electromagnetic emission and external interference on the entire 360° periphery of mated connectors.

2. Low-Profile

Board-to-Board distance of 1.5 mm and reduced PCB mounting pattern allows use in applications where space is limited.

3. Self alignment

Built-in self-alignment feature in the plug and receptacle allows mating / un-mating in limited spaces.

4. Consistent mated retention force

Indents in the shield plates and contact configuration assure consistency of the mated retention forces irrespective of the contact numbers. Positive “click” sensation confirms fully mated condition.

5. Solder wicking prevention

Nickel plating barrier on the contacts prevents solder compound intrusion (wicking) into the contact engagement areas.

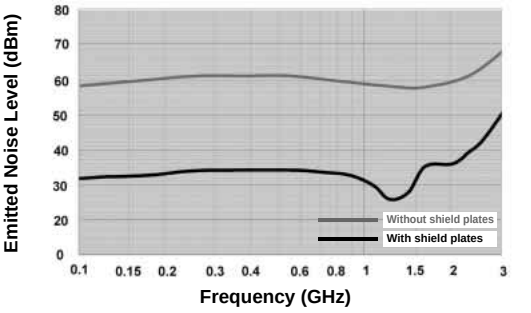
6. Board placement with automatic equipment

Packaged on tape-and-reel, the connectors have flat areas (0.8mm) to allow use of vacuum nozzles.

7. RoHS Compliant

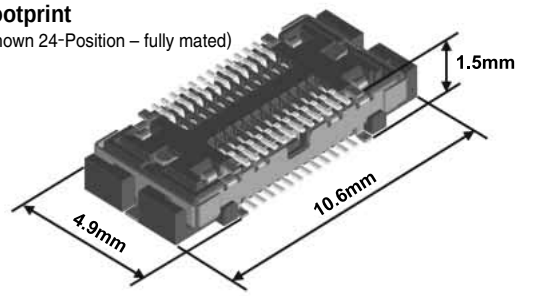
All components and materials comply with the requirements of the EU Directive 2002/95/EC.

High Shielding Effectiveness

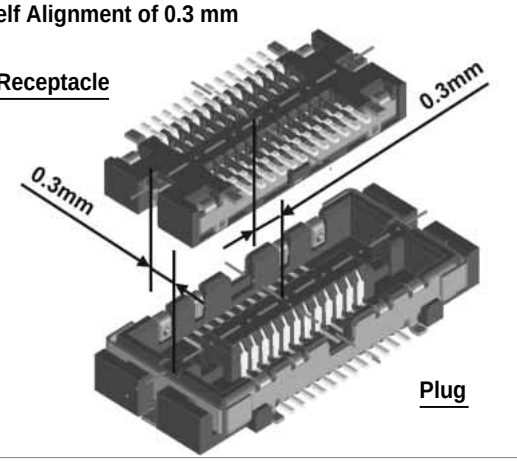


Low-Profile, Space-Saving with Reduced Connector Footprint

(Shown 24-Position – fully mated)



Self Alignment of 0.3 mm



■Specifications

Rating	Current rating 0.3A Voltage rating 30V AC	Operating temperature range -55℃ to +85℃ (Note 1)	Storage temperature range -10℃ to +60℃ (Note 2) Storage humidity range Relative humidity 95% max. (No condensation)

Item	Specification	Conditions
1.Insulation resistance	50 MΩ min.	100V DC
2.Withstanding voltage	No flashover or insulation breakdown.	100V AC/one minute
3.Contact resistance	100 mΩ max.	100 mA
4.Vibration	No electrical discontinuity of 1μs or more. No damage, cracks or parts dislocation.	Frequency: 10 to 55 Hz, single amplitude of 0.75mm, 3 axis, 10 cycles
5.Shock	No electrical discontinuity of 1μs or more. No damage, cracks or parts dislocation.	Acceleration of 490 m/s², 11 ms duration, sine half-wave waveform, 3 cycles / each of 3 axis
6.Humidity	Contact resistance: 120 mΩ max. Insulation resistance: 25 MΩ min. No damage, cracks or parts dislocation.	96 hours at 40℃, 90% to 95% R.H.
7.Temperature cycle	Contact resistance: 120 mΩ max. Insulation resistance: 50 MΩ min. No damage, cracks or parts dislocation.	Temperature: -55℃ → +15℃ to 35℃ → +85℃ → +15℃ to +35℃ Time: 30 → 2 to 3 → 30 → 2 to 3 (Minutes) 5 cycles
8.Durability (mating / un-mating)	Contact resistance: 120 mΩ max. No damage, cracks or parts dislocation.	30 cycles
9.Resistance to soldering heat	No deformation of components affecting performance.	Reflow: At the recommended temperature profile Manual soldering: 360℃ for 5 seconds

Note 1: Includes temperature rise caused by current flow.
Note 2: The term “storage” refers to products stored for long period of time prior to mounting and use. Operating temperature range and humidity range covers non-conducting condition of installed connectors in storage, shipment or during transportation.
Note 3: Information contained in this catalog represents general requirements for this Series. Contact us for the drawings and specifications for a specific part number shown.

■Materials

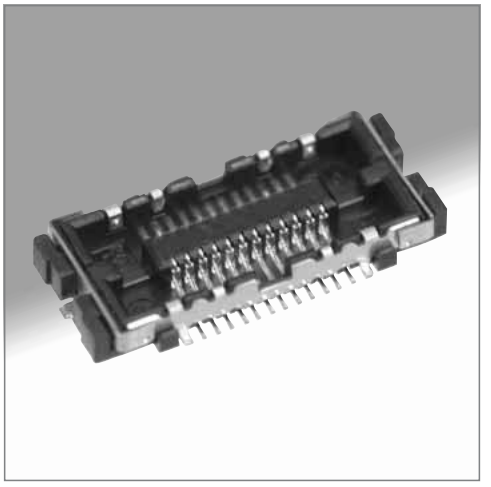
Part	Material	Finish		Remarks
Insulator	Polyamide	Color: Black		UL94V-0
Contacts	Phosphor bronze	Plug Receptacle	Selective gold plated	——
Ground plates		Gold plated		——
Metal fittings		Tin plated		——

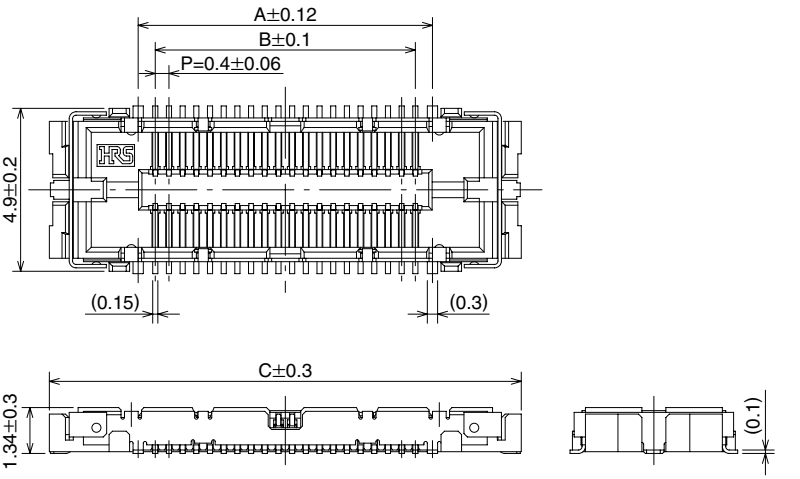
■Ordering information

FX12 B - 24 P - 0.4 SV
❶ ❷ ❸ ❹ ❺ ❻

❶ Series name: FX12	❹ Connector type P: Plug S: Receptacle
❷ Configuration B: Without guide post	
❸ Number of positions: 24, 40, 60	❺ Contact pitch: 0.4 mm
	❻ Termination configuration SV: SMT

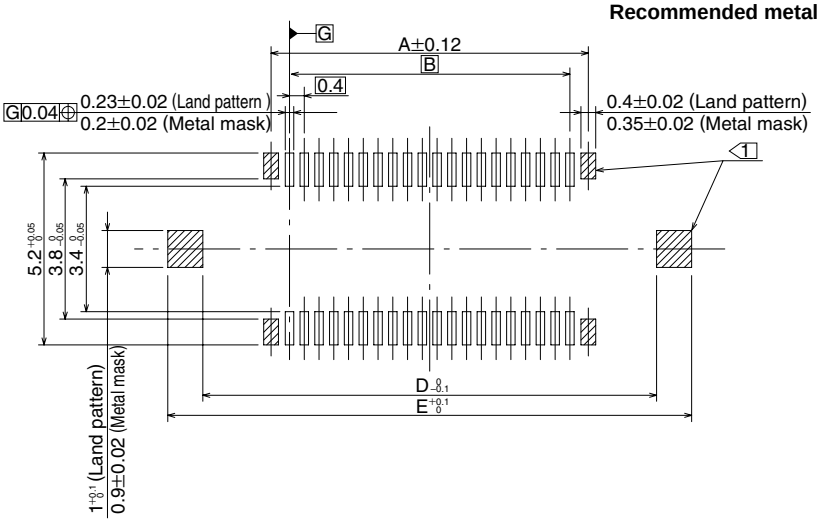
■Plugs





◆Recommended PCB Mounting Pattern and Metal Mask Dimensions

Recommended metal mask thickness: 0.12 mm



Notes:

1 Positions marked ▨ indicate a ground circuit connections.
2 The co-planarity of SMT terminations is 0.1 maximum.
3 No polarity orientation for board mounting.
4 Dimensions in parentheses ( ) are reference dimensions.
5 All dimensions in mm.

Part number	CL No.	Number of positions	A	B	C	D	E	RoHS
FX12B-24P-0.4SV	573-1005-0	24	5.4	4.4	10.6	9.1	11.0	
FX12B-40P-0.4SV	573-1001-0	40	8.6	7.6	13.8	12.3	14.2	YES
FX12B-60P-0.4SV	573-1007-6	60	12.6	11.6	17.79	16.3	18.2	

Packaging : 3,000 pieces per reel

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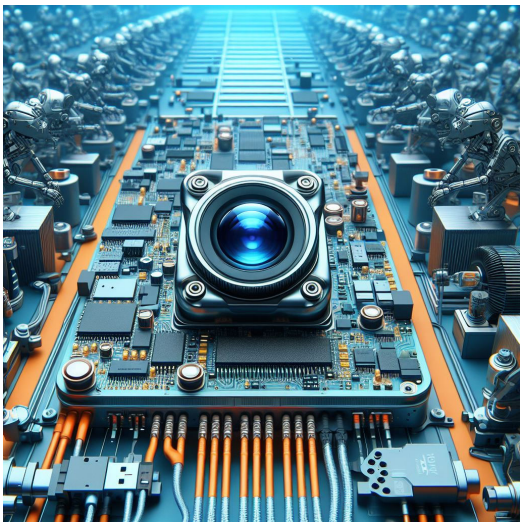
Cameras Applications

Automotive Driver Pilot

Live Streaming

Video Conference

Eye Tracker Biometric Detection



Machine Vision

Agricultural Monitor

Night Vision Security

Drone and Sports Eagle Eyes

Interactive Pet Camera

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Cameras Applications

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Camera Module Pinout Definition Reference Chart

OmniVision Sony Samsung On-Semi Aptina Himax GalaxyCore PixArt SmartSens Sensors	
Pin Signal	**Description**
DGND GND	ground for digital circuit
AGND	ground for analog circuit
PCLK DCK	DVP PCLK output
XCLR PWDN XSHUTDOWN STANDBY	power down active high with internal pull-down resistor
MCLK XVCLK XCLK INCK	system input clock
RESET RST	reset active low with internal pull-up resistor
NC NULL	no connect
SDA SIO_D SIOD	SCCB data
SCL SIO_C SIOC	SCCB input clock
VSYNC XVS FSYNC	DVP VSYNC output
HREF XHS	DVP HREF output
DOVDD	power for I/O circuit
AFVDD	power for VCM circuit
AVDD	power for analog circuit
DVDD	power for digital circuit
STROBE FSTROBE	strobe output
FSIN	synchronize the VSYNC signal from the other sensor
SID	SCCB last bit ID input
ILPWM	mechanical shutter output indicator
FREX	frame exposure / mechanical shutter
GPIO	general purpose inputs
SLASEL	I2C slave address select
AFEN	CEN chip enable active high on VCM driver IC
MIPI Interface	
MDN0 DN0 MD0N DATA_N DMO1N	MIPI 1st data lane negative output
MDP0 DP0 MD0P DATA_P DMO1P	MIPI 1st data lane positive output
MDN1 DN1 MD1N DATA2_N DMO2N	MIPI 2nd data lane negative output
MDP1 DP1 MD1P DATA2_P DMO2P	MIPI 2nd data lane positive output
MDN2 DN2 MD2N DATA3_N DMO3N	MIPI 3rd data lane negative output
MDP2 DP2 MD2P DATA3_P DMO3P	MIPI 3rd data lane positive output
MDN3 DN3 MD3N DATA4_N DMO4N	MIPI 4th data lane negative output
MDP3 DP3 MD3P DATA4_P DMO4P	MIPI 4th data lane positive output
MCN CLKN CLK_N DCKN	MIPI clock negative output
MCP CLKP MCP CLK_P DCKN	MIPI clock positive output
DVP Parallel Interface	
D0 DO0 Y0	DVP data output port 0
D1 DO1 Y1	DVP data output port 1
D2 DO2 Y2	DVP data output port 2
D3 DO3 Y3	DVP data output port 3
D4 DO4 Y4	DVP data output port 4
D5 DO5 Y5	DVP data output port 5
D6 DO6 Y6	DVP data output port 6
D7 DO7 Y7	DVP data output port 7
D8 DO8 Y8	DVP data output port 8
D9 DO9 Y9	DVP data output port 9
D10 DO10 Y10	DVP data output port 10
D11 DO11 Y11	DVP data output port 11

Camera Reliability Test

Reliability Inspection Item			Testing Method	Acceptance Criteria
Category		Item		
Environmental	Storage Temperature	High 60°C 96 Hours	Temperature Chamber	No Abnormal Situation
		Low -20°C 96 Hours	Temperature Chamber	No Abnormal Situation
	Operation Temperature	High 60°C 24 Hours	Temperature Chamber	No Abnormal Situation
		Low -20°C 24 Hours	Temperature Chamber	No Abnormal Situation
	Humidity	60°C 80% 24 Hours	Temperature Chamber	No Abnormal Situation
	Thermal Shock	High 60°C 0.5 Hours Low -20°C 0.5 Hours Cycling in 24 Hours	Temperature Chamber	No Abnormal Situation
Physical	Drop Test (Free Falling)	Without Package 60cm	10 Times on Wood Floor	Electrically Functional
		With Package 60cm	10 Times on Wood Floor	Electrically Functional
	Vibration Test	50Hz X-Axis 2mm 30min	Vibration Table	Electrically Functional
		50Hz Y-Axis 2mm 30min	Vibration Table	Electrically Functional
		50Hz Z-Axis 2mm 30min	Vibration Table	Electrically Functional
	Cable Tensile Strength Test	Loading Weight 4 kg 60 Seconds Cycling in 24 Hours	Tensile Testing Machine	Electrically Functional
Electrical	ESD Test	Contact Discharge 2 KV	ESD Testing Machine	Electrically Functional
		Air Discharge 4 KV	ESD Testing Machine	Electrically Functional
	Aging Test	On/Off 30 Seconds Cycling in 24 Hours	Power Switch	Electrically Functional
	USB Connector	On/Off 250 Times	Plug and Unplug	Electrically Functional




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Camera Inspection Standard

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Inspection Item			Inspection Method	Standard of Inspection
Category		Item		
Appearance	FPC/ PCB	Color	The Naked Eye	Major Difference is Not Allowed.
		Be Torn/Chopped	The Naked Eye	Copper Crack Exposure is Not Allowed.
		Marking	The Naked Eye	Clear, Recognizable (Within 30cm Distance)
	Holder	Scratches	The Naked Eye	The Inside Crack Exposure is Not Allowed
		Gap	The Naked Eye	Meet the Height Standard
		Screw	The Naked Eye	Make Sure Screws Are Presented (If Any)
		Damage	The Naked Eye	The Inside Crack Exposure is Not Allowed
	Lens	Scratch	The Naked Eye	No Effect On Resolution Standard
		Contamination	The Naked Eye	No Effect On Resolution Standard
		Oil Film	The Naked Eye	No Effect On Resolution Standard
		Cover Tape	The Naked Eye	No Issue On Appearance.
Function	Image	No Communication	Test Board	Not Allowed
		Bright Pixel	Black Board	Not Allowed In the Image Center
		Dark Pixel	White board	Not Allowed In the Image Center
		Blurry	The Naked Eye	Not Allowed
		No Image	The Naked Eye	Not Allowed
		Vertical Line	The Naked Eye	Not Allowed
		Horizontal Line	The Naked Eye	Not Allowed
		Light Leakage	The Naked Eye	Not Allowed
		Blinking Image	The Naked Eye	Not Allowed
		Bruise	Inspection Jig	Not Allowed
		Resolution	Chart	Follows Outgoing Inspection Chart Standard
		Color	The Naked Eye	No Issue
		Noise	The Naked Eye	Not Allowed
		Corner Dark	The Naked Eye	Less Than 100px By 100px
		Color Resolution	The Naked Eye	No Issue
Dimension		Height	The Naked Eye	Follows Approval Data Sheet
		Width	The Naked Eye	Follows Approval Data Sheet
		Length	The Naked Eye	Follows Approval Data Sheet
		Overall	The Naked Eye	Follows Approval Data Sheet

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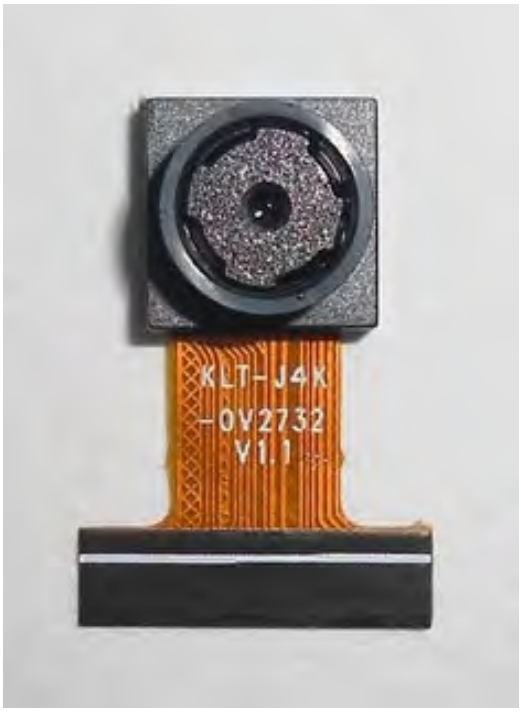
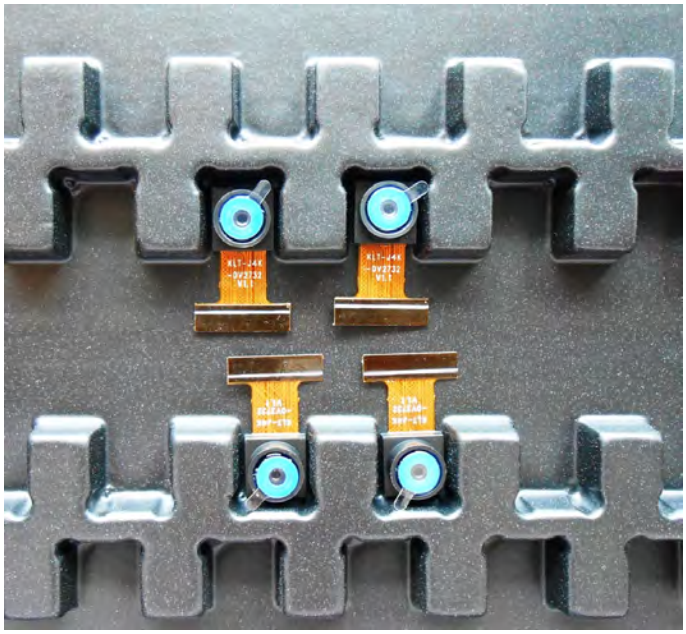


Complete with Lens Protection Film

Tray with Grid and Space

Place Cameras on the Tray



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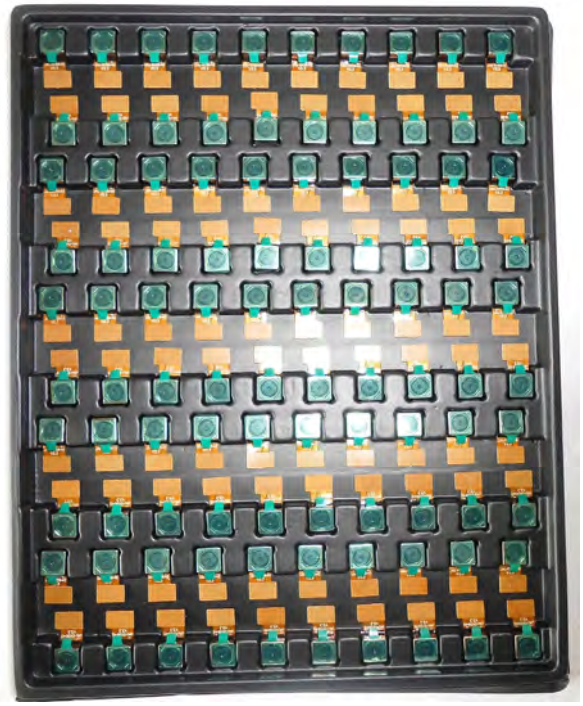
Camera Modules Package Solution

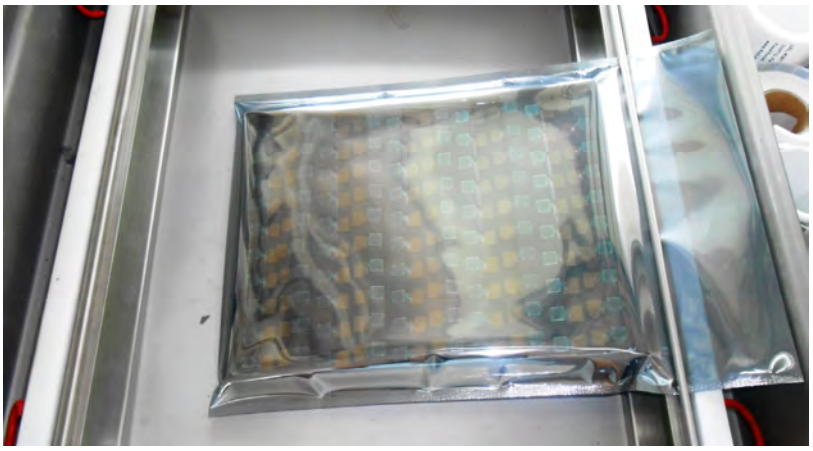
Full Tray of Cameras



Cover Tray with Lid

Put Tray into Anti-Static Bag

Vacuum the Anti-Static Bag



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Camera Modules Package Solution

Sealed Vacuum Bag with Labels
1. Model and Description 2. Quantity 3. Shipping Date 4. Caution

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Large Order Package Solution

Place Foam Sheets Between Trays

Foam Sheets are Slightly Larger than Trays

Place Foam Sheets and Trays into Box

Foam Sheets are Tightly Fitting Box

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Small Order Package Solution

Place Foam Sheets and Trays into Small Box

Foam Sheets are Nicely Fitting the Small Box

Package in Small Box for Shipment

Place Small Boxes into Larger Box

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Carbon Box Package Solution

Seal the Carbon Box

Final Package Labelled Box

Carbon Box Ready for Shipment
1. Delivery Address and Phone No. 2. Box No. and Ship Date 3. Fragile Caution

Sample Order Package Solution

Place Sample into Small Anti-Static Bag

Place Connectors into Small Ant-Static Bag

Sample Labels on the Small Bag
1. Camera Module or Connector Model 2. Shipping Date and Quantity 3. Caution

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Connectors Large Order Package Solution

Connectors in a Wheel

Label Connectors in the Wheel

The Wheel is Perfectly Fitting the Box

Connectors Box Ready for Shipment

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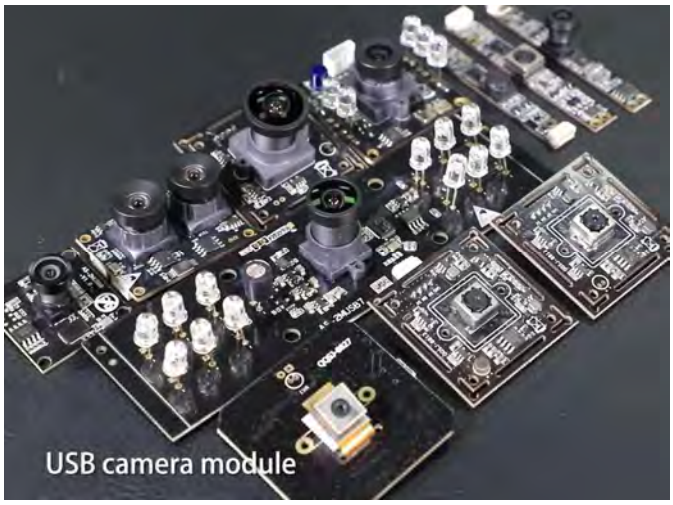
Company Kai Lap Technologies (KLT)

Kai Lap Technologies Group Limited. (KLT) was established in 2009, a next-generation technology driven manufacturer specialized in research, design, and produce of audio and video products. KLT is occupying 20,000 square feet automated plants with 100 employees of annual throughput 30,000,000 units cameras.

KLT provides OEM, ODM design, contract manufacturing, and builds the camera products. You may provide the requirements to us, even with a hand draft, our sales and engineering work together to meet your needs. We consider ourselves your last-term partner in developing practical and innovative solutions.

Our team covers everything from initial concept development to mass produced product. KLT specializes in customized camera design, raw material, electronic engineering, firmware/software development, product testing, and packing design. Our experienced strategic supply systems offer a robust and dependable manufacturing capacity for orders of various sizes.



Limited Warranty

KLT provides the following limited warranty if you purchased the Product(s) directly from KLT company or from KLT's website, www.KaiLapTech.com. Product(s) purchased from other sellers or sources are not covered by this Limited Warranty. KLT guarantees that the Product(s) will be free from defects in materials and workmanship under normal use for a period of one (1) year from the date you receive the product ("Warranty Period").

For all Product(s) that contain or develop material defects in materials or workmanship during the Warranty Period, KLT will, at its sole option, either: (i) repair the Product(s); (ii) replace the Product(s) with a new or refurbished Product(s) (replacement Product(s) being of identical model or functional equivalent); or (iii) provide you a refund of the price you paid for the Product(s).

This Limited Warranty of KLT is solely limited to repair and/or replacement on the terms set forth above. KLT is not reliable or responsible for any subsequential events.

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KLT Strength

Powerful Factory

Professional Service

Promised Delivery

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