

**KLT-M3MA-AR1335 PLCC V15****13MP OnSemi AR1335 PLCC MIPI Interface Auto Focus Camera Module**

Front View



Back View

**Specifications**

<b>Camera Module No.</b>	<b>KLT-M3MA-AR1335 PLCC V15</b>
<b>Resolution</b>	13MP
<b>Image Sensor</b>	AR1335 PLCC
<b>Sensor Type</b>	1/3.2"
<b>Pixel Size</b>	1.1 um x 1.1 um
<b>EFL</b>	3.81 mm
<b>F.NO</b>	2.20
<b>Pixel</b>	4208 x 3120
<b>View Angle</b>	74.4°(DFOV) 62.7°(HFOV) 48.7°(VFOV)
<b>Lens Dimensions</b>	8.50 x 8.50 x 5.60 mm
<b>Module Size</b>	55.17 x 8.50 mm
<b>Module Type</b>	Auto Focus
<b>Interface</b>	MIPI
<b>Auto Focus VCM Driver IC</b>	FP5510
<b>Lens Type</b>	650nm IR Cut
<b>Operating Temperature</b>	-30°C to +70°C
<b>Mating Connector</b>	DF30FC-30DS-0.4V

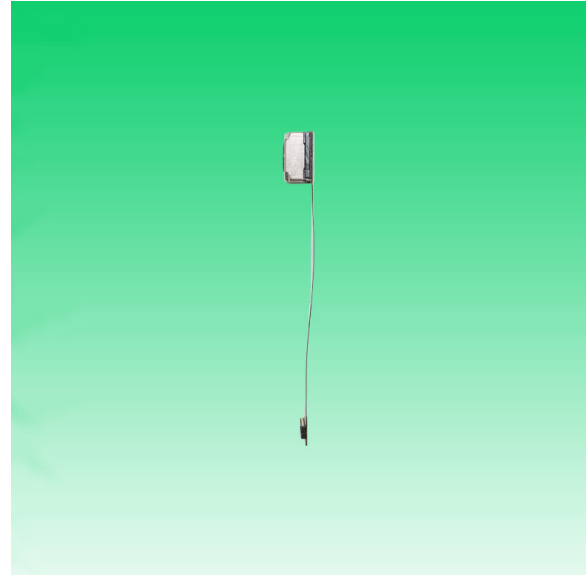


## KLT-M3MA-AR1335 PLCC V15

13MP OnSemi AR1335 PLCC MIPI Interface Auto Focus Camera Module



Top View



Side View



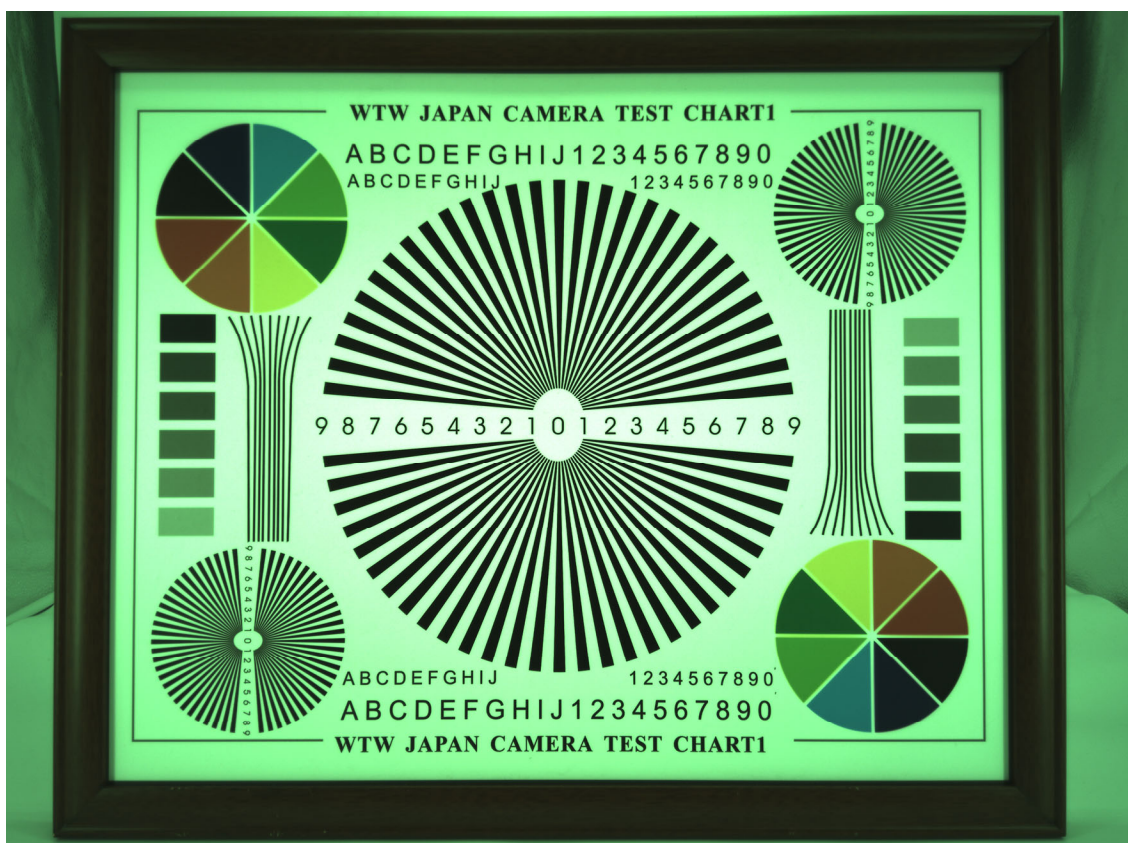
Bottom View



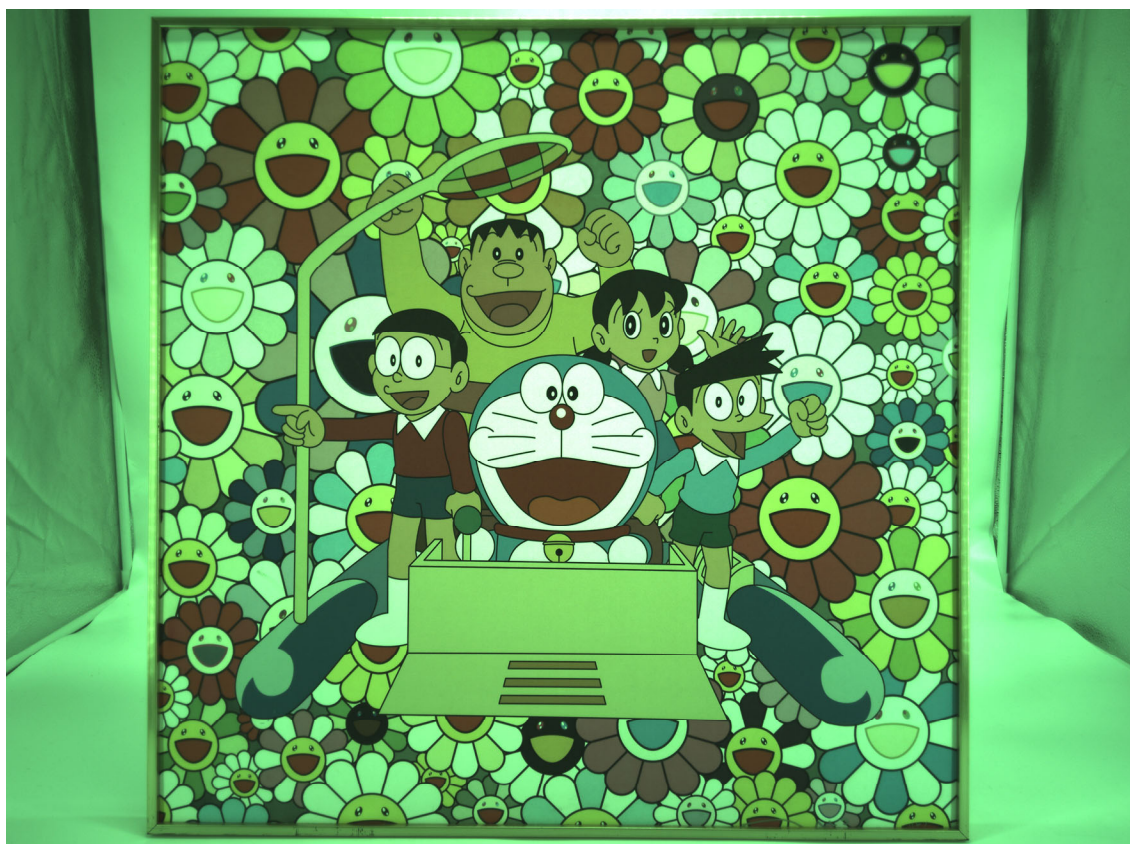
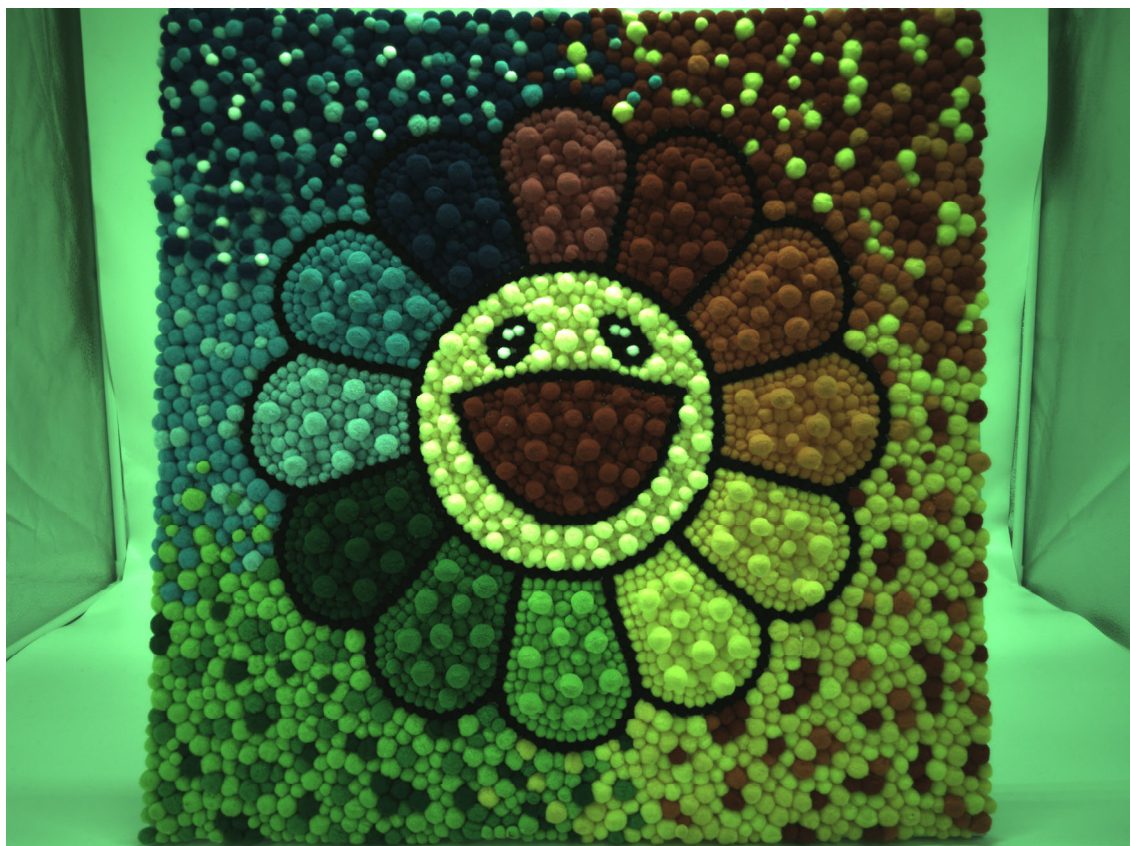
Mating Connector

# Real Test Images

## M3MA-AR1335 PLCC V15

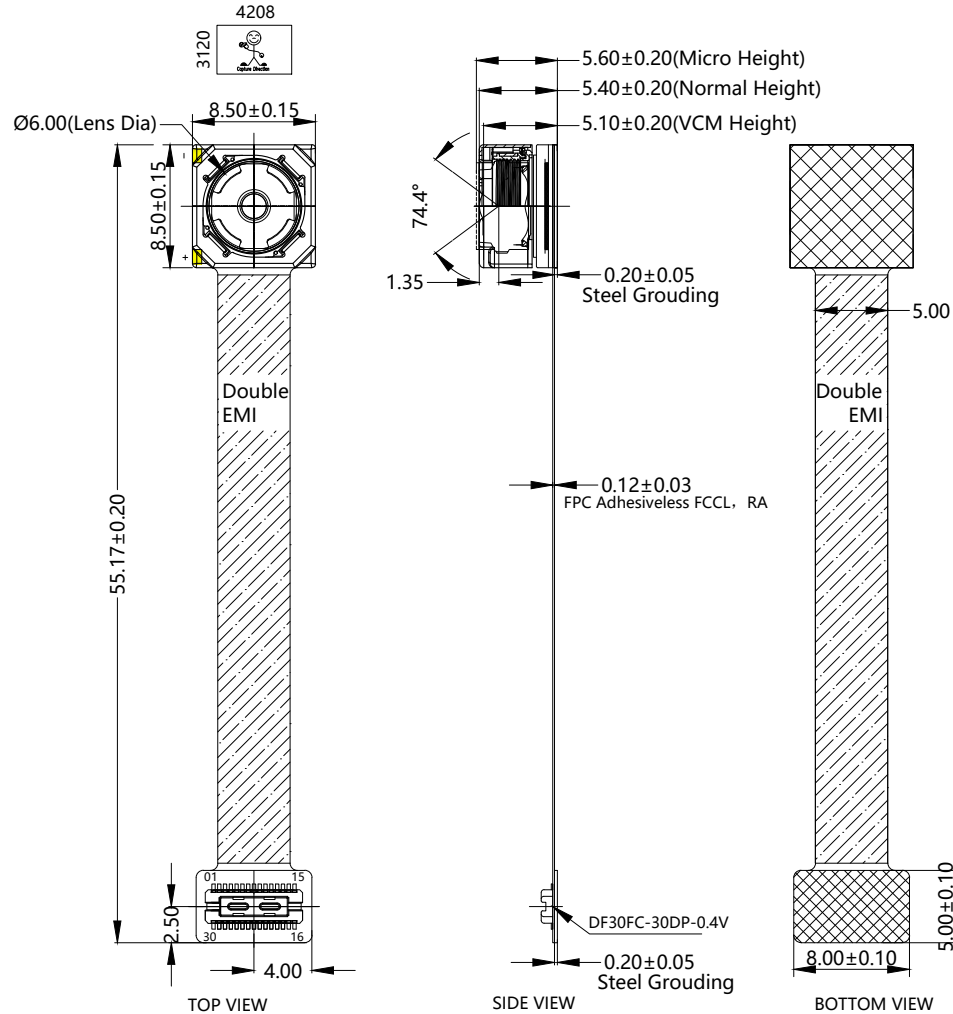


**Real Test Images**  
**M3MA-AR1335 PLCC V15**



PIN	SIGNAL
1	AFVDD 2.8V
2	NC
3	DVDD 1.2V
4	DOVDD 1.8V
5	NC
6	AGND
7	AVDD 2.8V
8	DGND
9	SDA
10	SCL
11	RESET
12	NC
13	DGND
14	MCLK
15	DGND
16	MDP0
17	MDN0
18	DGND
19	MDP1
20	MDN1
21	DGND
22	MCP
23	MCN
24	DGND
25	MDP2
26	MDN2
27	DGND
28	MDP3
29	MDN3
30	DGND

Version	Information
V1.0	First Version
V2.0	Change PIN signal and connector
V5.0	Change PIN signal and connector position
V12.0	Change capture direction
V15	Extend FPC length



NOTE:  
1. The device slave address: 0x6C(w); 0x6D(r)

**Parameter:**

**1、Sensor specification:**

ImageSensor: AR1335C5SC32SMD20  
Pixel: 1.1um\*1.1um  
Lens Type: 1/3.2  
Important Voltage Description:  
DVDD1.2V (external power supply);

**2、Lens specification:**

FOV:  $74.4^\circ$ (D);  $62.7^\circ$ (H);  $48.7^\circ$ (V);  
F/NO.: 2.2  
TV distortion:  $< 1.5\%$   
Focal length: 3.81mm  
Composition: 5P+ +IR FILTER  
IR Cut Coating:  $650\text{nm} \pm 10\text{nm} @ 50\%$

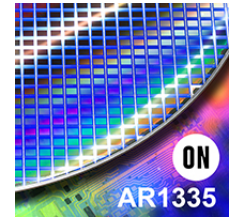
**Kai Lap Technologies Group Ltd**

Designed By	Kevin	Model Name:	KLT-M3MA-AR1335 PLCC V15		
Checked By	Aouly_Yan	Projection Type:	Unit:	Material:	
		Third Angle	mm	-----	
		Scale:	Sheet:	Version:	
		1:1	1 of 1	1/0	

## Product Overview

### AR1335: 13 MP 1/3" CMOS Image Sensor

For complete documentation, see the data sheet.



The AR1335 is a 1/3.2-inch CMOS active-pixel digital image sensor with a pixel array of 4208H x 3120V. The AR1335 digital image sensor, features breakthrough 1.1  $\mu\text{m}$  pixel technology that delivers superior low-light image quality through leading sensitivity, quantum efficiency and linear full well. This allows image quality that rivals digital still cameras. With a sensor architecture focused on low power and a high Chief Ray Angle (CRA) for low Z-heights, the AR1335 is ideal for smartphone and other mobile device applications. It incorporates sophisticated on-chip camera functions such as windowing, mirroring, column and row skip modes, and snapshot mode. It is programmable through a simple two-wire serial interface. The AR1335 sensor can generate full resolution image at up to 30 frames per second (fps) and supports advanced video modes including 4K 30fps, 1080P 60fps and 720P 120fps.

### Features

- 13MP CMOS sensor with advanced 1.1  $\mu\text{m}$  pixel BSI technology
  - Data interfaces: 2,3 and 4 lane MIPI
  - Bit-depth compression available for MIPI: 10-8 and 10-6 to lower bandwidth
  - 3D synchronization controls to enable stereo video capture
  - 6.8 kbits one time programmable memory (OTPM)
  - Programmable controls: gain, horizontal and vertical blanking, auto black level offset correction, frame size/rate, exposure, left-right and top-bottom image reversal, window size, and panning
  - Two on-die phase-locked loop (PLL) oscillators for super low noise performance
  - On-chip temperature sensor
  - Bayer pattern horizontal down-size scaler
  - Simple two-wire fast-mode+ serial interface
- For more features, see the data sheet

### Applications

- Mobile
- 4K video capture
- High resolution still capture

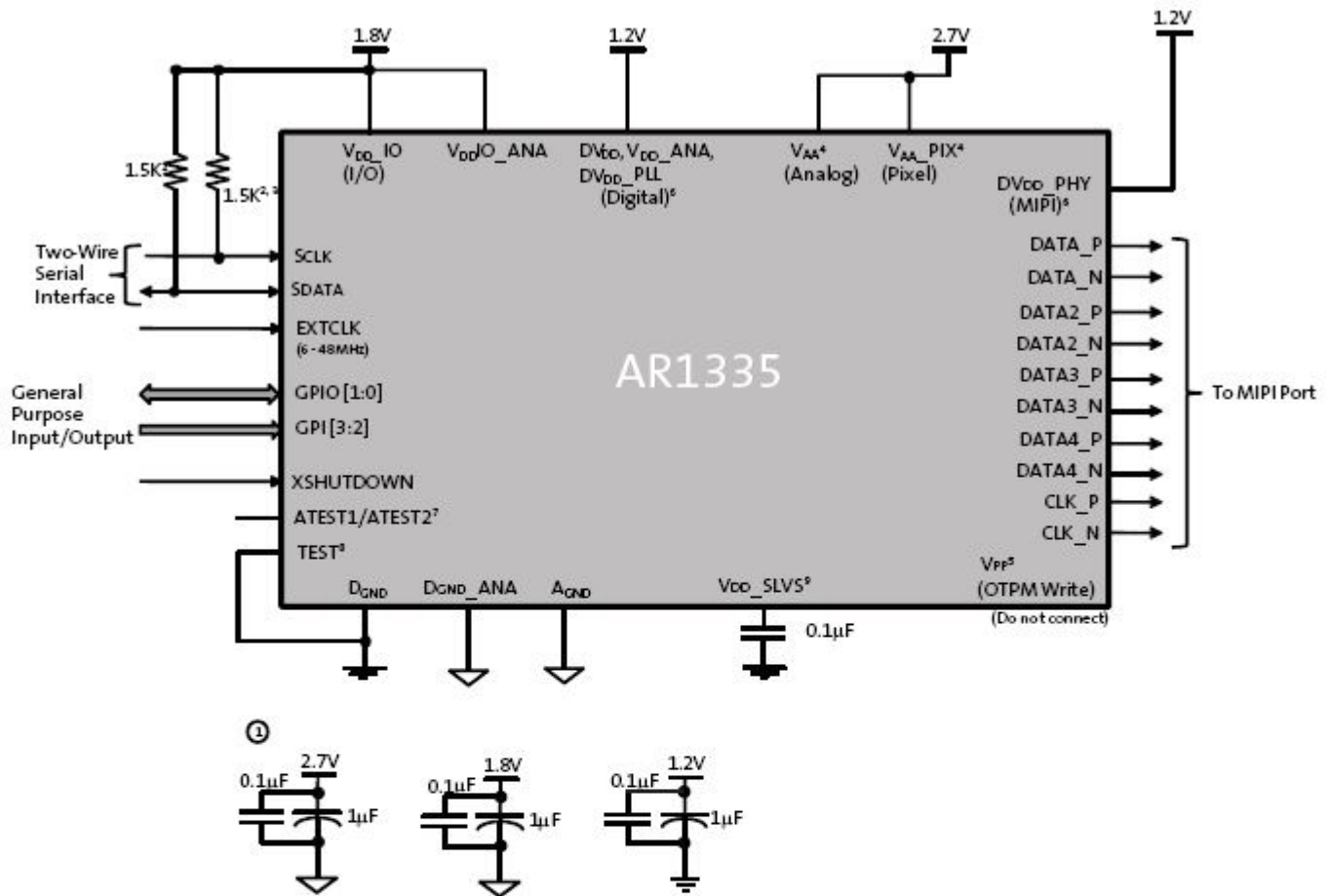
### End Products

- Smart Phone
- Digital Still Camera
- PC Camera
- Consumer devices

### Part Electrical Specifications

Product	Compliance	Status	Type	Megapixels	Frame Rate (fps)	Optical Format	Shutter Type	Pixel Size ( $\mu\text{m}$ )	Output Interface	Color	Package Type
AR1335CSSC11SMD20	Pb-free Halide free	Active	CMOS	13	30	1/3.2 inch	Electronic Rolling	1.1 x 1.1	MIPI	RGB	
AR1335CSSC11SMKA0-CP	Pb-free Halide free	Active	CMOS	13	30	1/3.2 inch	Electronic Rolling	1.1 x 1.1	MIPI	RGB	ODCSP-63
AR1335CSSC11SMKA0-CR	Pb-free Halide free	Active	CMOS	13	30	1/3.2 inch	Electronic Rolling	1.1 x 1.1	MIPI	RGB	ODCSP-63
AR1335CSSC32SMD20	Pb-free Halide free	Active	CMOS	13	30	1/3.2 inch	Electronic Rolling	1.1 x 1.1	MIPI	RGB	
AR1335CSSM11SMD20	Pb-free Halide free	Active	CMOS	13	30	1/3.2 inch	Electronic Rolling	1.1 x 1.1	MIPI	RGB	
AR1335CSSM32SMD20	Pb-free Halide free	Active	CMOS	13	30	1/3.2 inch	Electronic Rolling	1.1 x 1.1	MIPI	RGB	

## Application Diagram



For connectivity above:

- Notes:
- All power supplies should be adequately decoupled; recommended cap values are:
    - 2.7V: 1.0μF and 0.1μF
    - 1.2V: 1.0μF and 0.1μF
    - 1.8V: 1.0μF and 0.1μF
  - Resistor value 1.5kΩ is recommended, but may be greater for slower two-wire speed.
  - This pull-up resistor is not required if the controller drives a valid logic level on SCLK at all times.
  - $V_{AA}$  and  $V_{AA\_PIX}$  must be tied together.
  - Internal charge pump is used for OTPM programming.
  - Digital and MIPI supply can be tied together.
  - ATEST1/ATEST2 must be left floating.
  - TEST pin must be tied to  $D_{GND}$ .
  - $V_{DD\_SLVS}$  must be connected to  $D_{GND}$  through a bypass cap (0.1μF).

For more information please contact your local sales support at [www.onsemi.com](http://www.onsemi.com).

Created on: 9/30/2017



# 1/3.2-Inch 13 Mp CMOS Digital Image Sensor

## AR1335 Datasheet, Rev. A

For the latest datasheet, please visit: [www.aptna.com](http://www.aptna.com)

### Features

- 13 Mp CMOS sensor with advanced 1.1  $\mu\text{m}$  pixel BSI technology
- Data interfaces: two-, three-, and four-lane serial mobile industry processor interface (MIPI)
- Bit-depth compression available for MIPI Interface: 10-8 and 10-6 to enable lower bandwidth receivers for full frame rate applications
- 3D synchronization controls to enable stereo video capture
- 6.8 kbits one-time programmable memory (OTPM) for storing shading correction coefficients and module information
- Programmable controls: gain, horizontal and vertical blanking, auto black level offset correction, frame size/rate, exposure, left-right and top-bottom image reversal, window size, and panning
- Two on-die phase-locked loop (PLL) oscillators for super low noise performance
- On-chip temperature sensor
- Bayer pattern horizontal down-size scaler
- Simple two-wire fast-mode+ serial interface
- Low dark current
- Interlaced multi-exposure readout enabling High Dynamic Range (HDR) still and video applications
- On-chip lens shading correction
- Support for external mechanical shutter
- Support for external LED or Xenon Flash
- Extended Flash duration up to start of frame readout

### Applications

- Cellular phones
- Digital still cameras
- PC cameras
- PDAs

**Table 1: Key Performance Parameters**

Parameter	Value	
Optical format	1/3.2 -inch 13 Mp (4:3)	
Active pixels	4208H x 3120V	
Pixel size	1.1 $\mu\text{m}$ Back Side Illuminated (BSI)	
Chief ray angle (CRA)	32°	
Die size	6.3 mm x 5.7 mm	
Input clock frequency	6 - 48 MHz	
Interface	4-lane MIPI (2- and 3-lane supported); Max data rate: 1.2Gbps/lane	
Subsampling modes (column and row)	skip2 bin2 skip3 bin3 skip4 bin4 skip2bin2	
ADC resolution	10 bits, on-die	
Analog gain	1x – 7.75x	
Digital gain	Up to 7.98x	
Scaler	Adjustable scaling up to 8x	
Temperature sensor	10-bit, controlled by two-wire serial I/F	
Compression	DPCM: 10-8-10, 10-6-10	
3D support	Frame rate and exposure synchronization	
Supply voltage	VAA, VAA_PIX	2.6 - 2.9 V (2.7 V nominal)
	VDD_IO, VDDIO_ANA	1.7 - 1.9 V (1.8 V nominal)
	VDD, VDD_ANA, VDD_PLL, VDD_PHY	1.14 - 1.3 V (1.2 V nominal)
Power consumption	270 mW at 60°C (TYP) at 13 Mp 30 fps	
Responsivity	4700 e <sup>-</sup> /lux-sec	
SNRMAX	37 dB	
Dynamic Range	69 dB	
Operating Temperature Range (at junction) - Tj	-30°C to +70°C	



**Table 2: Mode of Operation and Power**

Mode	Resolution	Readout Configuration	HFOV	FPS	Power Consumption [mW]
<b>4:3 Snapshot Mode</b>					
13 M full resolution	4208x3120	13M full mode	100%	30	270
13 M full resolution	4208x3120	13M full mode	100%	24	250
VGA	640 x 480	Crop+Subsampling+Scaling	61%	120	190
QVGA	320 x 240	Crop+Subsampling+Scaling	30%	240	165
<b>16:9 Video Mode 30 FPS</b>					
4K UHD	3840 x 2160	Cropping	91%	30	230
4K Cinema	4096 x 2160	Cropping	97%	30	235
1080p	1920 x 1080	Crop+Subsampling+Scaling	91%	30	160
1080p LP	1920 x 1080	Crop+Subsampling+Scaling	91%	30	135
720p	1280 x 720	Crop+Subsampling+Scaling	91%	30	140
<b>16:9 Video Mode 60 FPS</b>					
1080p	1920 x 1080	Crop+Subsampling+Scaling	91%	60	210
1080p LP	1920 x 1080	Crop+Subsampling+Scaling	91%	60	180
720p	1280 x 720	Crop+Subsampling+Scaling	91%	60	175
<b>3M 30 FPS</b>					
3M	2000 x 1500	Crop+Subsampling+Scaling	95%	30	195
3M LP	2000 x 1500	Crop+Subsampling+Scaling	95%	30	170
<b>16:9 Video Mode 120 FPS</b>					
720p	1280 x 720	Crop+Subsampling+Scaling	91%	120	260

## Ordering Information

**Table 3: Available Part Numbers**

Part Number	Description
AR1335C5SC32SMD20	Bare die

## 10-Bit DAC 120mA VCM Driver with I<sup>2</sup>C Interface

### Description

The FP5510 is a single 10-bit DAC with 120mA output current voice coil motor (VCM) driver, with an I<sup>2</sup>C-compatible serial interface that operates at clock rates up to 400kHz. Its supply operates from 2.3V to 3.6V.

The FP5510 incorporates with a power-on reset circuit, power-down function. Power-on reset circuit ensure when supply power up, DAC output is to 0V until valid write bit value takes place. In power down mode, the supply current is about 1µA.

The FP5510 is designed for auto focus operation includes digital camera module, optical zoom camera phones and lens auto focus. The I<sup>2</sup>C address of FP5510 is 0x18h.

The FP5510 with WLCSP package which it is suitable for reduced-space mounting in mobile phone and other portable applications.

### Pin Assignments

#### 6-Ball WLCSP

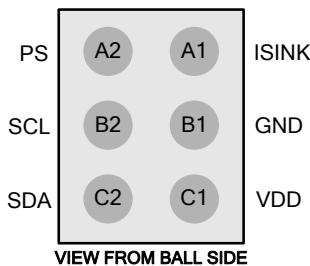


Figure 1. Pin Assignment of FP5510

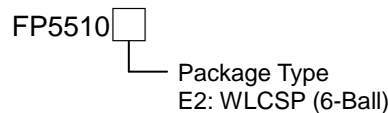
### Features

- Power Supply Voltage Rang: 2.3V to 3.6V
- VCM Driver for Auto-Focus
- 10-Bit Resolution Current Sinking of 120mA for VCM
- 2-Wire I<sup>2</sup>C Interface (1.8V Interface Compatible)
- Internal 4 Slope Control Mechanism
  1. Enhance Slope Control Mode
  2. One Step Mode
  3. Linear Slope Mode
  4. Two Step Slope Mode
- Power-Save Mode Current < 1µA
- Power On Reset (POR)
- Small Size: 0.7mm×1.1mm (6-Balls WLCSP)

### Applications

- Digital Camera Module
- Cell Phone
- Lens Cover
- Web Camera

### Ordering Information

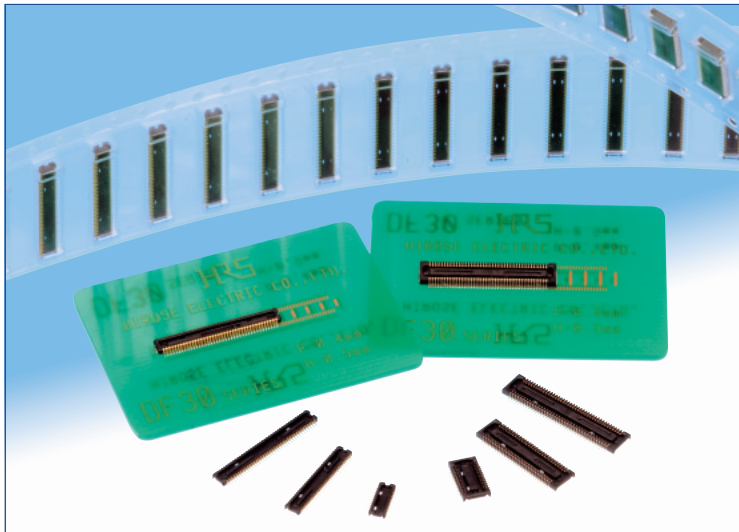


#### WLCSP-6 (0.7mm×1.1mm) Marking

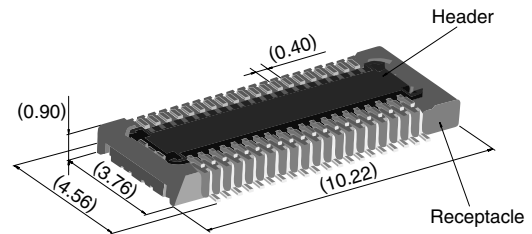
Part Number	Product Code
FP5510E2	2

# 0.4 mm Pitch, 0.9 mm Height, Board-to-Board / Board-to-FPC Connectors

## DF30 Series



### Extremely small size



40 positions shown

### Overview

Continuous miniaturization and increased component density on PCB created demand for extremely low profile connectors. This series is addition of a new extremely low profile connectors to Hirose's wide range of high reliability board-to-board/board-to-FPC connection solutions.

### Features

#### 1. Contact reliability

Concentration of the contact's normal forces at the single point assures good contact wipe and electrical reliability, while confirming the fully mated condition with a definite tactile click.

#### 2. Self alignment

Recognizing the difficulties of mating extremely small connectors in limited spaces the connectors will self align in horizontal axis within 0.3 mm.

#### 3. Automatic board placement

Packaged on tape-and-reel the plug and headers have sufficiently large flat areas to allow pick-up with vacuum nozzles of automatic placement equipment.

#### 4. Variety of contact positions and styles

Available in standard contact positions of: 20, 22, 24, 30, 34, 40, 50, 60, 70 and 80 with and without metal fittings. Addition of metal fittings does not affect external dimensions of the connectors.

Smaller contact positions are also available.

#### 5. Support for continuity test connector

Connectors which have increased insertion and removal durability are available for continuity tests. Contact your Hirose sales representative for details.

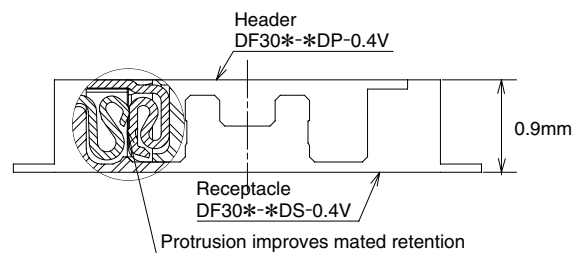
### Applications

Cellular phones, PDA's, mobile computers, digital cameras, digital video cameras, and other devices demanding high reliability connections in extremely limited spaces.

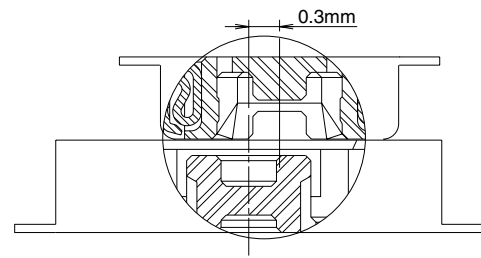
#### Low profile

#### Increased mated retention

#### High contact reliability



### Self alignment



## Product Specifications

Rating	Rated current 0.3A Rated voltage 30V AC	Operating temperature range : -35°C to 85°C (Note 1) Operating humidity range : Relative humidity 20% to 80%	Storage temperature range -10°C to 60°C (Note 2) Storage humidity range Relative humidity 40% to 70% (Note 2)
--------	--------------------------------------------	-----------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------

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 1 μs or more	Frequency: 10 to 55 Hz, single amplitude of 0.75mm, 2 hours, 3 axis
5. Humidity	Contact resistance: 100 mΩ max. Insulation resistance: 25 MΩ min.	96 hours at temperature of 40°C±2°C and RH of 90% to 95%
6. Temperature cycle	Contact resistance: 100 mΩ max. Insulation resistance: 50 MΩ min.	Temperature: -55°C→+5°C to +35°C→+85°C→+5°C to +35°C Duration: 30→10→30→10(Minutes) 5 cycles
7. Durability (insertions/withdrawals)	Contact resistance: 100 mΩ max.	50 cycles(Connector for conductivity tests: 500 cycles)
8. Resistance to soldering heat	No deformation of components affecting performance.	Reflow: At the recommended temperature profile Manual soldering: 300°C for 3 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.

## Materials and Finishes

Connectors	Component	Material	Finish	Remarks
Receptacles and Headers	Insulator	LCP	Color : Black	UL94V-0
	Contacts	Phosphor bronze	Gold plated	————
	Metal fittings	Phosphor bronze	Tin-copper plated	————

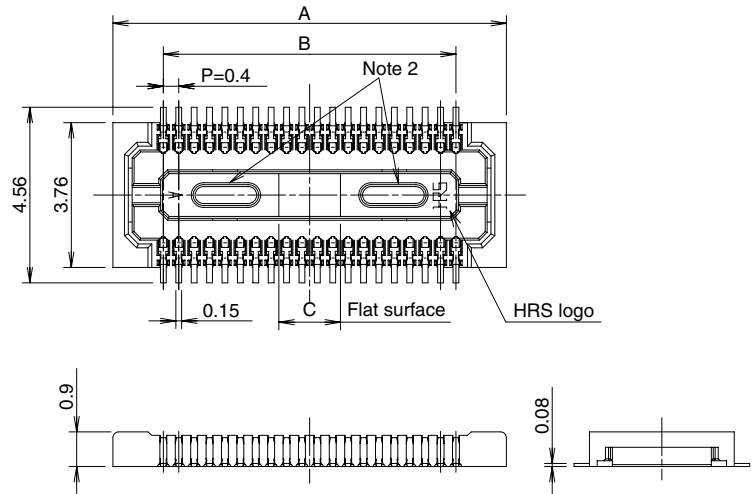
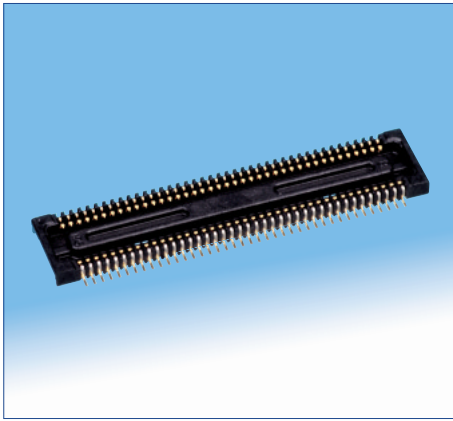
## Ordering information

### Receptacles and Headers

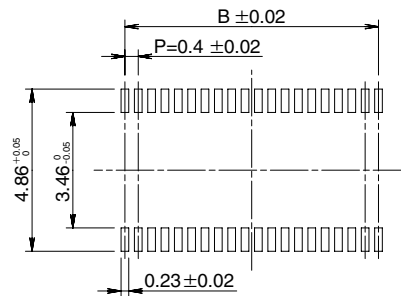
**DF30**   **FC** -   **\***   **DS - 0.4**   **V**   **(\*\*)**  
①   ②   ③   ④   ⑤   ⑥   ⑦

① Series name: DF30	⑤ Contact pitch: 0.4 mm
② Configuration FB: With metal fittings, without bosses FC: Without metal fittings, without bosses CJ: Connector for conductivity tests	⑥ Termination section V: Straight SMT
③ Number of positions: 20, 22, 24, 30, 34, 40, 50, 60, 70, 80	⑦ Packaging (81): Embossed tape packaging (5,000 pieces per reel) (82): Embossed tape packaging (1,000 pieces per reel)
④ Connector type DS: Double row receptacle DP: Double row header	

## ■ Receptacles (without metal fittings)



## ◆ Recommended PCB mounting pattern



Recommended solder paste thickness: 120  $\mu$ m

[Specification number] -\*\*, (\*\*)  
(81): Embossed tape packaging (5,000 pieces per reel)

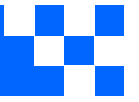
\* Tolerances non- accumulative.

Unit: mm

Part Number	CL No.	Number of contacts	A	B	C
DF30FC-20DS-0.4V(**)	CL684-1109-8-**	20	6.22	3.6	1.2
DF30FC-22DS-0.4V(**)	CL684-1110-7-**	22	6.62	4.0	1.2
DF30FC-24DS-0.4V(**)	CL684-1111-0-**	24	7.02	4.4	1.2
DF30FC-30DS-0.4V(**)	CL684-1112-2-**	30	8.22	5.6	1.2
DF30FC-34DS-0.4V(**)	CL684-1113-5-**	34	9.02	6.4	1.36
DF30FC-40DS-0.4V(**)	CL684-1078-6-**	40	10.22	7.6	1.6
DF30FC-50DS-0.4V(**)	CL684-1114-8-**	50	12.22	9.6	2.0
DF30FC-60DS-0.4V(**)	CL684-1082-3-**	60	14.22	11.6	2.4
DF30FC-70DS-0.4V(**)	CL684-1115-0-**	70	16.22	13.6	2.8
DF30FC-80DS-0.4V(**)	CL684-1116-3-**	80	18.22	15.6	3.2

Note 1: Order by number of reels.

Note 2: Receptacles with 24 or fewer contacts positions will not have recessed areas.



## Cameras Applications



Automotive Driver Pilot



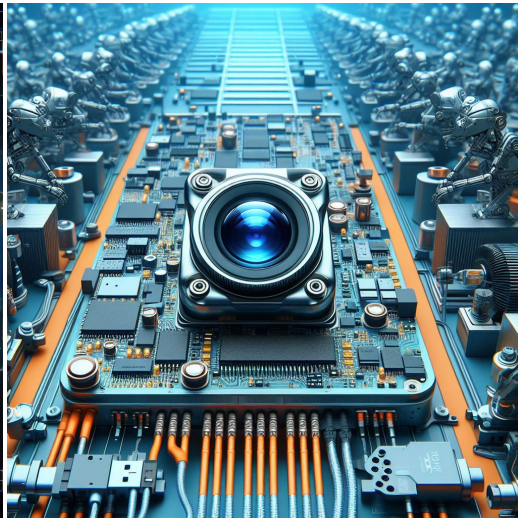
Live Streaming



Video Conference



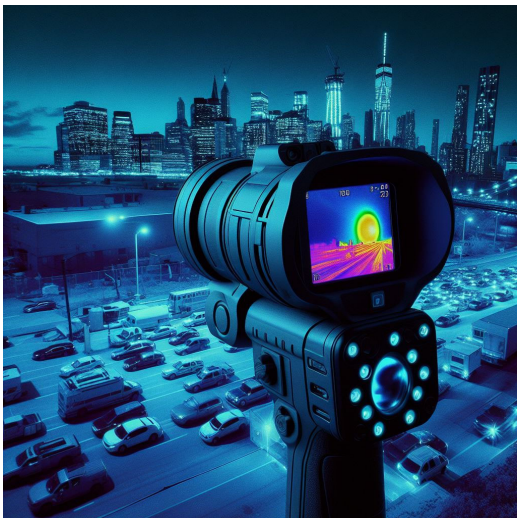
Eye Tracker Biometric Detection



Machine Vision



Agricultural Monitor



Night Vision Security



Drone and Sports Eagle Eyes

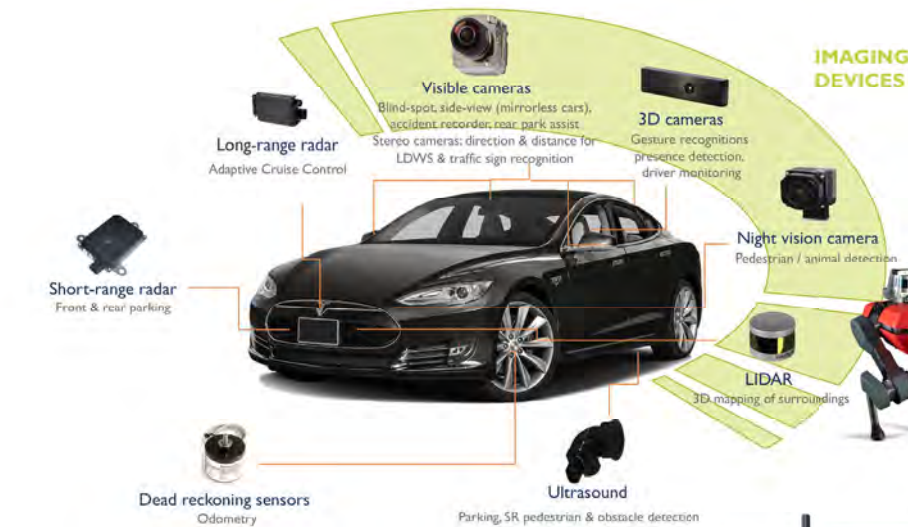


Interactive Pet Camera



your **BEST** camera module partner

## Cameras Applications





## Camera Module Pinout Definition Reference Chart

OmniVision	Sony	Samsung	On-Semi	Aptina	Himax	GalaxyCore	PixArt	SmartSens	Sensors
Pin Signal									
Description									
DGND	GND								
AGND									
PCLK	DCK								
XCLR	PWDN	XSHUTDOWN	STANDBY						
MCLK	XVCLK	XCLK	INCK						
RESET	RST								
NC	NULL								
SDA	SIO_D	SIOD							
SCL	SIO_C	SIOC							
VSYNC	XVS	FSYNC							
HREF	XHS								
DOVDD									
AFVDD									
AVDD									
DVDD									
STROBE	FSTROBE								
FSIN									
SID									
ILPWM									
FREX									
GPIO									
SLASEL									
AFEN									
<b>MIPI Interface</b>									
MDN0	DN0	MD0N	DATA_N	DMO1N					
MDP0	DP0	MD0P	DATA_P	DMO1P					
MDN1	DN1	MD1N	DATA2_N	DMO2N					
MDP1	DP1	MD1P	DATA2_P	DMO2P					
MDN2	DN2	MD2N	DATA3_N	DMO3N					
MDP2	DP2	MD2P	DATA3_P	DMO3P					
MDN3	DN3	MD3N	DATA4_N	DMO4N					
MDP3	DP3	MD3P	DATA4_P	DMO4P					
MCN	CLKN	CLK_N	DCKN						
MCP	CLKP	MCP	CLK_P	DCKN					
<b>DVP Parallel Interface</b>									
D0	DO0	Y0							
D1	DO1	Y1							
D2	DO2	Y2							
D3	DO3	Y3							
D4	DO4	Y4							
D5	DO5	Y5							
D6	DO6	Y6							
D7	DO7	Y7							
D8	DO8	Y8							
D9	DO9	Y9							
D10	DO10	Y10							
D11	DO11	Y11							





## 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



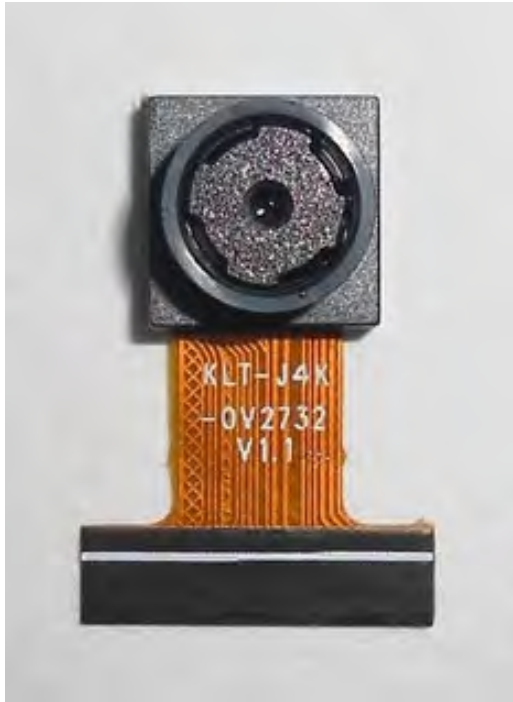


Inspection Item		Inspection Method	Standard of Inspection		
Category	Item				
Appearance	FPC/ PCB	Color	The Naked Eye	Major Difference is Not Allowed.	
		Be Torn/Chopped	The Naked Eye	Copper Crack Exposure is Not Allowed.	
		Marking	The Naked Eye	Clear, Recognizable (Within 30cm Distance)	
	Holder	Scratches	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		



## KLT Package Solutions

KLT Camera Module



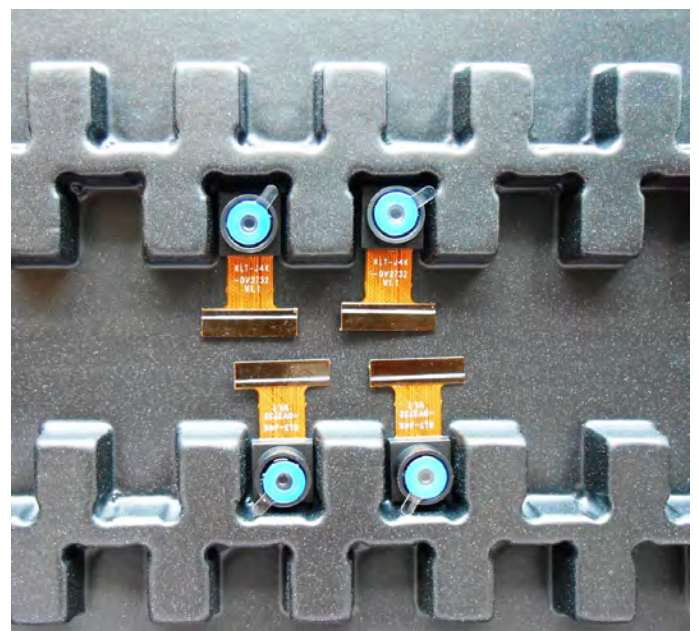
Complete with Lens Protection Film

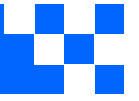


Tray with Grid and Space



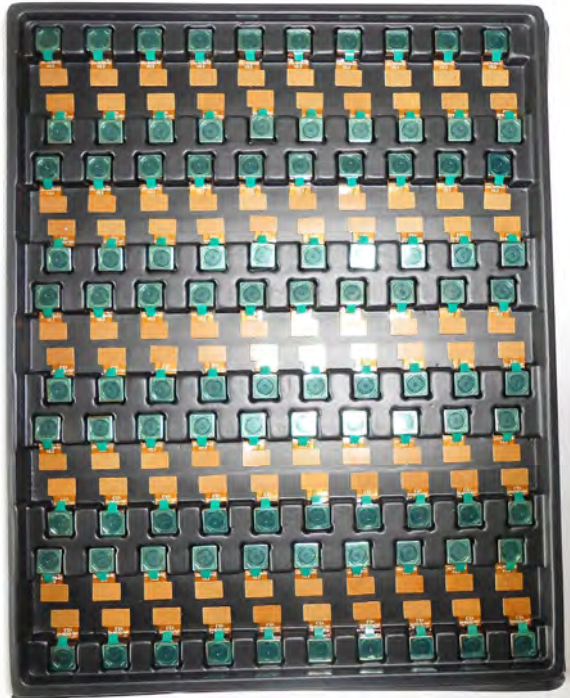
Place Cameras on the Tray





## Camera Modules Package Solution

Full Tray of Cameras



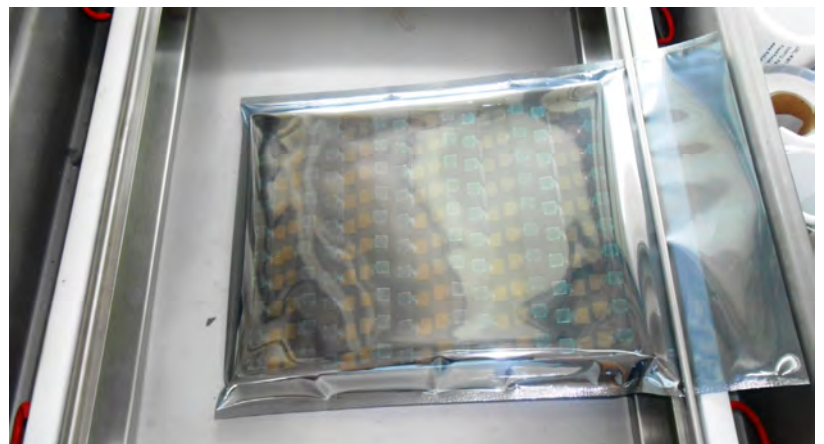
Cover Tray with Lid



Put Tray into Anti-Static Bag



Vacuum the Anti-Static Bag





## Camera Modules Package Solution

Sealed Vacuum Bag with Labels

1. Model and Description 2. Quantity 3. Shipping Date 4. Caution





## 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





## 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





## 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





## 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



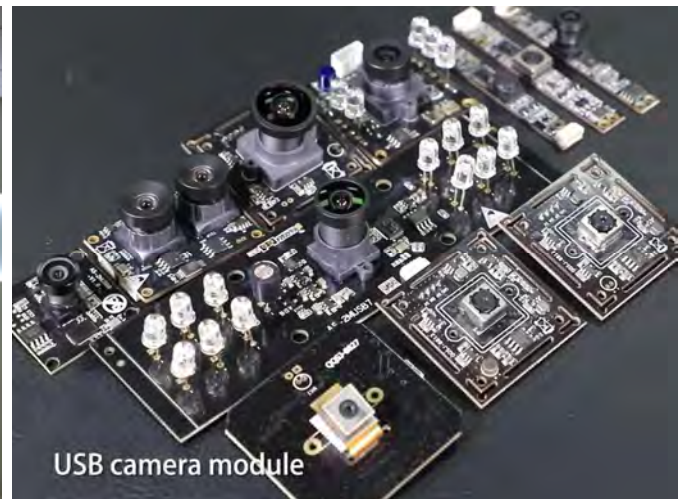


## Company Kai Lap Technologies (KLT)

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](http://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 subsequent events.





# CMOS CAMERA MODULES



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### Professional Service



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