

**INNOWAVE**
INSPIRE THE NEXT**INNOCAM**
BEYOND EXPECTATIONS
BY INNOWAVE

Product Specification

Product: InnoCAM_DCM_IMX376PDAF

Part Number: INV-IMX376FF-13MP

Revision: Rev 1.0

Document No: INV412

INV-IMX376FF-20M

REVISION HISTORY

Revision	Description of change	Changed by	Date
1.0	Initial Draft	Jamie Lynn	05/26/2022
1.1			
1.2			
1.3			

APPROVAL

Company	Name	Signature	Date
InnoWave Design LLC	Tony Reed		10/18/2022
InnoWave Design LLC	Jamie Lynn		11/20/2022



INV-IMX376FF-20M

Contents

Product Specification	1
1. General	4
1.1. Specifications	4
1.2. Sensor Features	5
1.3. Applications	5
1.4. Layout	6
2. Electrical	7
2.1. Absolute Maximum Ratings	7
2.2. Recommended Operation Voltage	7
3. Environment Requirements	7
3.1. Operating Temperature	7
3.2. Storage Temperature	7
3.3. Humidity	8
3.4. Thermal Shock	8
3.5. High Temperature Test	8
3.6. Low Temperature Test	8
4. Reliability Requirements	8
4.1. Drop Test	8
4.2. Random Vibration	8
4.3. Salt Fog Test	8
4.4. ESD (Electronic Discharge)	8
5. Product Performance Verification	8
5.1. Electrical Parameters	9
5.2. Mechanical Parameters	9
5.3. Environmental and Reliability Test Parameters	9
6. Product Identification TBD	9
7 Packaging	10

INV-IMX376FF-20M

1. General

The IC-IMX376FF-20M is a fixed focus camera module with a diagonal 6.475 mm (Type 1/2.78) 20 Mega-pixel IMX376 CMOS active pixel type stacked image sensor with a square pixel array. It adopts Exmor RS™ technology to achieve high speed image capturing by column parallel A/D converter circuits and high sensitivity and low noise image (comparing with conventional CMOS image sensor) through the backside illuminated imaging pixel structure. R, G, and B pigment primary color mosaic filter is employed. It operates with four power supply: analog 2.8 V, 1.8V, digital 1.05 V and 1.8 V for input/output interface and achieves low power consumption. It is optionally operational with conventional three power supplies by using an analog power supply voltage of 2.8V.

1.1. Specifications

Sensor Make and Model	Sony IMX376-AAJH5-C
Sensor Type	CMOS
Resolution	20MP
Active array size	5216x4032
Pixel Size	1.00um x 1.00um
Module Size	8.8x8.8x6.96mm
Optical size	1/2.78"
Output Format	10-bit RAW RGB data
Chroma	Color
Image Size	Diagonal 6.475 mm (Type 1/2.78)
Total number of pixels	5216 (H) × 4032 (V) approx. 21.03 M pixels
Number of effective pixels	5216 (H) × 3896 (V) approx. 20.32 M pixels
Number of active pixels	5184 (H) × 3880 (V) approx. 20.11 M pixels
Chip Size	6.415 mm (H) × 4.759 mm (V)
Substrate material	Silicon
Frame Rate	Rate 30fps@Full resolution
	120fps@2x2 Adjacent Pixel Binning (4:3)
	150fps@2x2 Adjacent Pixel Binning (16:9)
Sensor CRA	34 degrees @ 80% field
Guaranteed Temperature Ranges	Operating -20C to +70C
	Storage -30 to +80C
	Performance -20C to +60C
Lens Model	D7631A
Construction	6P
Lens Type	Fixed focus
Field of View (FOV) degrees	Diagonal 117.2

INV-IMX376FF-20M

Aperture (F#)	2.2
Focal Length	2.35mm
Distortion (TV)	<9.7%
Focus Range	62.8cm - inf

Table 1: Specifications

1.2. Sensor Features

Back-illuminated and stacked CMOS image sensor Exmor RS
High Frame Rate 30fps@Full resolution / 120fps@2x2 Adjacent Pixel Binning (4:3) / 150fps@2x2 Adjacent Pixel Binning (16:9)
Electronic Image Stabilization (EIS)
High signal to noise ratio(SNR)
Dual sensor synchronization operation
Built-in 2D Dynamic Defect Pixel Correction
Lens Shading Correction (LSC)
Built-in temperature sensor
Output video format of RAW10/8, COMP8
Pixel binning readout function
Two PLLs for independent clock generation for pixel control and data output interface
CSI-2 serial data output (MIPI 2lane/4lane, Max. 2.3Gbps/lane, D-PHY spec. ver. 1.2 compliant)
2-wire serial communication
Advanced Noise Reduction (Chroma noise reduction and RAW noise reduction)
12K bit of OTP ROM for users
Quad Bayer Coding color filter arrangement

Table 2: Sensor Features

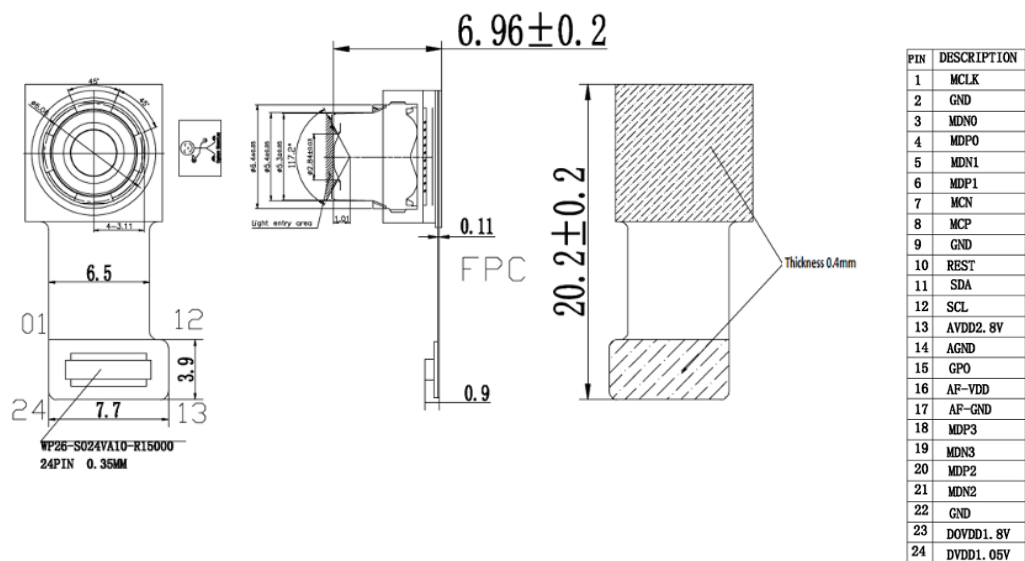
1.3. Applications

- Cellular Phones
- Tablet PCs

INV-IMX376FF-20M

1.4. Layout

Figure 1: camera module assembly layout



INV-IMX376FF-20M

1.5. Lens

Lens drawing is available upon request

2. Electrical

2.1. Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Supply voltage (analog)	VANA1	-0.3 to +4.2	V
Supply voltage (digital)	VDIG	-0.3 to +1.54	V
Supply voltage (interface)	VIF	-0.3 to +2.52	V
Input voltage (digital)	VI	-0.3 to +2.52	V
Output voltage (digital)	VO	-0.3 to +2.52	V
Supply voltage (analog)	VANA2	-0.3 to +4.2	V
Guaranteed Operating temperature	TOPR	-20 to +70	°C
Guaranteed storage temperature	TSTG	-30 to +80	°C
Guaranteed performance temperature	TSPEC	-20 to +60	°C

Table 3: Absolute Maximum Ratings

2.2. Recommended Operation Voltage

Item	Symbol	Ratings	Unit
Supply voltage (analog)	VANA1	2.8 ± 0.1	V
Supply voltage (digital)	VDIG	1.05 ± 0.1	V
Supply voltage (interface)	VIF	1.8 ± 0.1	V
Supply voltage (analog)	VANA2(*)	2.8 ± 0.1 or 1.8 ± 0.1	V

Table 4: Recommended operation voltage

3. Environment Requirements

3.1. Operating Temperature

The camera module shall be fully functional when ambient temperature is between -20°C to 60°C with image quality remaining stable. Test duration is 24 hours.

3.2. Storage Temperature

The camera module shall withstand storage temperatures between -30°C to 70°C. Test duration is 48 hours.



INV-IMX376FF-20M

3.3. Humidity

The camera module shall withstand humidity at or below 90% RH under non-condensing conditions for 24 hours.

3.4. Thermal Shock

The camera module shall withstand the following temperatures (with humidity off)

-30°C to 70°C

20 min cycles (10 min dwell, 5 min ramp, 10 min dwell)

3.5. High Temperature Test

60C, humidity off, 24 hours

3.6. Low Temperature Test

-20C, humidity off, 24 hours

Stable image is -30°C to 70°C junction temperature. The sensor functions but image quality may be noticeably different at temperatures outside of stable image range. Image quality remains stable between 0°C to 50°C.

4. Reliability Requirements

4.1. Drop Test

The camera module shall withstand a 1.2m Drop in packaging onto Concrete (12 drops) Random Positions

4.2. Random Vibration

The camera module shall withstand vibration of the following conditions

Frequency range: 50Hz

Amplitude: 2mm Duration 10 minutes for each position

Test all 3 axes (X, Y, Z)

4.3. Salt Fog Test

Condition: 5%nacl solvent Test duration: 24H

4.4. ESD (Electronic Discharge)

The camera module shall withstand Electrostatic Discharge of

8KV Contact Discharge

12KV Air Discharge

10 Times for a Second

5. Product Performance Verification

To verify the camera module performance, the following tests will be conducted at either the factory during production or as an initial qualification characterization in either the factory laboratory or at the InnoWave laboratory.

INV-IMX376FF-20M

5.1. Electrical Parameters

Parameter	Test Frequency
Current consumption – Standby	Initial Qualification
Current consumption – Idle	Initial Qualification
Current consumption – Viewfinder	Initial Qualification
Current consumption – Capture	Initial Qualification

Table 5: Electrical parameter measurements

5.2. Mechanical Parameters

Parameter	Test Frequency
X Dimension (mm)	Initial Qualification
Y dimension (mm)	Initial Qualification
Z Dimension (mm)	Initial Qualification

Table 6: Mechanical parameter measurements

5.3. Environmental and Reliability Test Parameters

Parameter	Test Frequency
Thermal Shock	Initial Qualification
Humidly	Initial Qualification
High Temperature Test	Initial Qualification
Low Temperature Test	Initial Qualification
Drop Test	Initial Qualification
Random Vibration Test	Initial Qualification
Salt Fog Test	Initial Qualification
ESD Test	Initial Qualification

Table 7: Environmental and Reliability parameter measurements

6. Product Identification TBD

All modules will be marked with an identification number using laser marking or bar code label.

INV-IMX376FF-20M

7 Packaging

The package will prevent damage to the components during transport and will be suitable for electrostatic-sensitive devices. The single camera modules shall be delivered in a reusable tray of anti-static plastic material. Several cameras shall be packed in one tray. The tray has separate holders for each camera module.

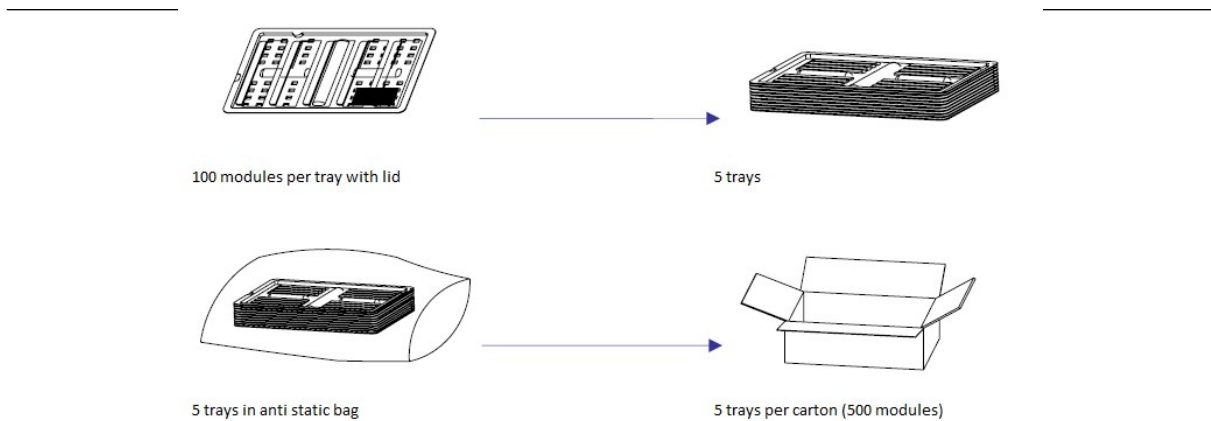


Figure 2: Packaging Example