Product Specification

Product: InnoCAM_DCM_AR0330PDFF

Part Number: INV-AR0330FF-3MP

Revision: Rev 1.1

Document No: INV0101

REVISION HISTORY

Revision	Description of change	Changed by	Date
1.0	Initial Draft	Jamie Lynn	02/18/2023
1.1	Updated with lens drawing	Jamie Lynn	04/26/2023
1.2			
1.3			

APPROVAL

Company	Name	Signature	Date
InnoWave Design LLC	Tony Reed		04/19/2023
InnoWave Design LLC	Jamie Lyn		04/20/2023

Contents

1. General

The INV-AR0330FF-3MP camera module has the On-Semi AR0330 1/3-inch CMOS digital image sensor with an active-pixel array of 2304Hx1536V. It can support 3.15 megapixel (2048H x 1536V) digital still image capture and a 1080p60+20%EIS (2304H x 1296V)digital video mode. It incorporates sophisticated on-chip camera functions such as windowing, mirroring, column and row subsampling modes, and snapshot modes.

The AR0330 can be operated in its default mode or programmed for frame size, expo- sure, gain, and other parameters. The default mode output is a 2304 x 1296 image at 60frames per second (fps). The sensor outputs 10- or 12-bit raw data, using either the parallel or serial (HiSPi, MIPI) output ports.

1.1. Specifications

Sensor Make and Model		On Semi AR0330
Optical format		1/3-inch (6.0 mm) Entire Array: 6.09mm
		Still Image: 5.63mm (4:3)
		HD Image: 5.82mm (16:9)
Active pixels		2304(H) x 1536(V): (entire array): 5.07mm(H) x 3.38mm(V)
		2048(H) x 1536(V) (4:3, still mode) 2304(H) x 1296(V) (16:9, sHD mode)
Pixel size		2.2um x 2.2um
Color filter array		RGB Bayer
Shutter type		ERS and GRR
Input clock range		6 – 64 MHz
Output clock maximum		196 Mp/s (4-lane HiSPi or MIPI)
Output Video	4-lane HiSPi	2304x1296 at 60 fps
		< 450 mW (Vcm 0.2V, 198MP/s)
		2304x1296 at 30 fps
		< 300 mW (VCM 0.2V, 98MP/s)
Responsivity		2.0 V/lux-sec
SNRMAX		39 dB
Dynamic range		69.5 dB
Supply voltage	I/O/Digital	1.7–1.9V (1.8V nominal) or 2.4–3.1V (2.8V nominal)
	Digital	1.7–1.9V (1.8 V nominal)
	Analog	2.7–2.9V
	HiSPi PHY	1.7–1.9V (1.8V nominal)
	HiSPi I/O (SLVS)	0.3–0.9V (0.4 or 0.8V nominal)
	HiSPi I/O (HiVCM)	1.7–1.9V (1.8V nominal)

Operating temperature (junction) -TJ	–30°C to + 70° C
Module Dimensions	9x9x17mm
Lens Model	30281
Construction	5P
Lens Type	Fixed Focus
Field of View (FOV) degrees	Vertical 57
	Horizontal 90
	Diagonal 110
Aperture (F#)	2.35
EFL	2.4mm
Relative illumination	34%
Distortion (TV)	<14%
Lens CRA	12°
Focus Range	40cm to 300cm
IR Filter Thickness	0.21mm
IR Filter Cutoff	650nm
Thread	M7* P0.35

Table 1: Specifications

1.2. Sensor Features

- 2.2µm pixel with On-Semi A-Pix™ technology
- Full HD support at 60 fps (2304H x 1296V) formaximum video performance
- Superior low-light performance
- 3.4Mp (3:2) and 3.15Mp (4:3)still images
- Support for external mechanical shutter
- Support for external LED or Xenon flash
- Data interfaces: four-lane serial high-speed pixelinterface (HiSPi™) differential signaling (SLVS), four-lane serial MIPI interface, or parallel.
- On-chip phase-locked loop (PLL) oscillator
- Integrated position-based color and lens shadingcorrection
- Simple two-wire serial interface
- Auto black level calibration
- 12-to-10 bit output A-Law compression
- Slave mode for precise frame-rate control and forsynchronizing two sensors

1.3. Applications

- 1080p high-definition digital video camcorder
- Web cameras and video conferencing cameras
- Security

1.4. Layout

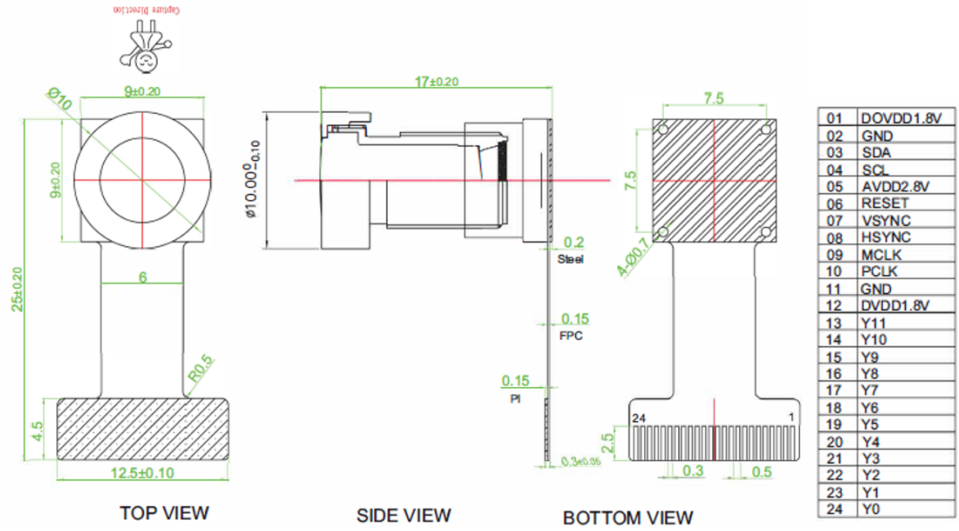

Figure 1: camera module assembly layout

2. Electrical Characteristics

2.1. Sensor DC Electrical Definitions and Characteristics (MIPI Mode)

Definition	Symbol	Min	Typ	Max	Unit
Core digital voltage	VDD	1.7	1.8	1.9	V
I/O digital voltage	VDD_IO	1.7	1.8	1.9	V
		2.4	2.8	3.1	V
Analog voltage	VAA	2.7	2.8	2.9	V
Pixel supply voltage	VAA_PIX	2.7	2.8	2.9	V
PLL supply voltage	VDD_PLL	2.7	2.8	2.9	V
MIPI supply voltage	VDD_MIPI	2.7	2.8	2.9	V
Digital operating current		-	114	-	mA
I/O digital operating current		-	0	-	mA
Analog operating current		-	41	-	mA
Pixel supply current		-	9.9	-	mA
PLL supply current		-	15	-	mA
MIPI digital operating current		-	35	-	mA

Table 2: DC Electrical (MIPI Mode)

2.2. Sensor DC Electrical Definitions and Characteristics (HiSPi Mode)

Definition	Symbol	Min	Typ	Max	Unit
Core digital voltage	VDD	1.7	1.8	1.9	V
I/O digital voltage	VDD_IO	1.7	1.8	1.9	V
		2.4	2.8	3.1	V
Analog voltage	VAA	2.7	2.8	2.9	V
Pixel supply voltage	VAA_PIX	2.7	2.8	2.9	V
PLL supply voltage	VDD_PLL	2.7	2.8	2.9	V
HiSPi digital voltage	VDD_HiSPi	1.7	1.8	1.9	V
HiSPi I/O digital voltage	VDD_HiSPi_TX	0.3	0.4	0.9	V
		1.7	1.8	1.9	V
Digital operating current			96.3		mA
I/O digital operating current			0		mA
Analog operating current			45.1		mA
Pixel supply current			10.5		mA
PLL supply current			6.4		mA
HiSPi digital operating current			21.8		mA
HiSPi I/O digital operating current			22.3		mA

Table 3: DC Electrical (MIPI Mode)

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.

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, humidly 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.

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 4: 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 5: 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 6: 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.

9 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.

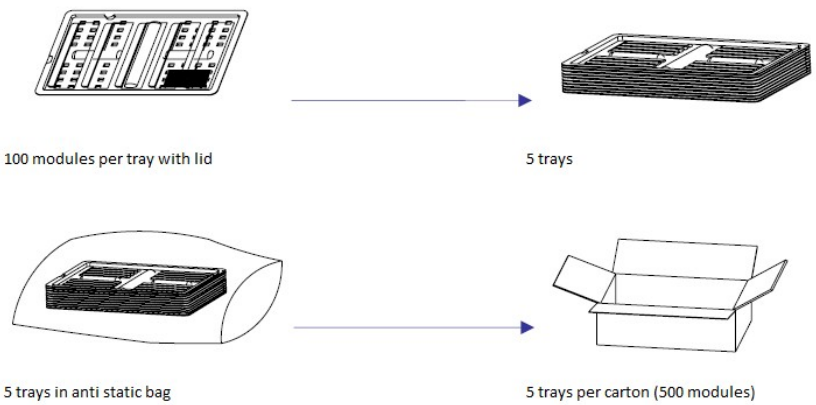

Figure 2: Packaging Example