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## Product Specification

**Product:** InnoCAM\_DCM\_OV5645FF

**Product Part Number:** INV-OV5645FF-5MP

**Revision:** Rev 1.0

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INV-OV5645FF-5MP

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**REVISION HISTORY**

Revision	Description of change	Changed by	Date
1.0	Initial Specification	Jamie Lynn	09/06/2022

**APPROVAL**

Company	Name	Signature	Date
InnoWave Design LLC	Jamie Lynn		21/06/2022
InnoWave Design LLC	Tony Reed		22/06/2022



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## INV-OV5645FF-5MP

### 1. General

The INV-OV5645FF-5MP is a fixed focus camera module with a OV5645 color CMOS 5-megapixel 2592 x 1944 image sensor with system-on-chip (SOC) Omni BSI-2 HDR technology with automatic image control functions. The camera module has a fixed focus lens, lens holder and FPC.

#### 1.1. Specifications

Sensor Make and Model	Omni Vision OV5645-G04A
Sensor Type	COB
Resolution	5 MP
Active array size	2592 x 1944
Pixel Size	1.4 $\mu\text{m}$ x 1.4 $\mu\text{m}$ with OmniBSI-2 HDR
Module Size	8.5 x 8.5 x 3.95 mm
Image Sensor Format	1/4"
Output Format	8/10 bit RGB RAW, RGB565/555/444, YUV, CbCr
Output interface	Dual lane MIPI output interface Digital Video Port (DVP) parallel output interface
Chroma	Color
Image Area	3673.6 x 2738.4 $\mu\text{m}$
Sensor CRA	29.1 degrees
Power Requirements	Active: 130mA Standby: 20uA
Power Supply	Core: 1.5V+/- 5% (with embedded 1.5V regulator) Analog: 2.6~3.0V (2.8V typical) I/O: 1.8V/2.8V
Input Clock Frequency	6~27 MHz
Temperature Range	Operating -30C to+70C junction temperature Stable Image 0C to +50C junction temperature
Maximum Image Transfer Rates	OSXGA (2592 x1944):15 fps 1080p: 30 fps 1280x960: 45 fps 720p: 60 fps
Shutter	Rolling/Frame Exposure
Image area	3673.6um x 2738.4 um
Dark Current	0.72mV/Sec@50C junction temperature
Sensor Package Dimensions	6190 x 4850 um
Lens Manufacturer	Largan
Lens Model	40103A
Max. Image Circle	4.9 mm
Construction	4P
Field of View (FOV) at 2592x1944 pixels	Vertical 59.8 degrees Horizontal 75.3 degrees

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Diagonal	88 degrees
Aperture (F#)	2.4
Image Sensor Format	2592 * 1944 Pixels
EFL	2.34
Flange Back Length (FB)	3.4+0.1/-0.1 From top barrel to image plane at infinity, including 0.21mm IRF
Relative illumination at sensor corner	30.00%
TV Distortion	<1.5%
Lens CRA	< 31.9 deg
Hyper Focus Distance	80 cm
Focus Range	40cm to infinity
Thread	M5.5 * P0.25

**Table 1: Specifications**

## 1.2. Sensor Features

Automatic image control functions:
- Automatic exposure control (AEC)
- Automatic gain control (AGC)
- Automatic white balance (AWB)
- Automatic black level calibration (ABLC)
Image Quality Controls:
- Color Saturation
- Hue
- Gamma
- Sharpness (Edge Enhancement)
- Lens Correction (shading correction)
- Defective Pixel Canceling
-Noise Canceling
Programmable controls for:
- Frame rate
- AEC/AGC 16-zone size/position/weight control
- Mirror and flip
- Cropping
- Windowing
- Panning
Defective pixel canceling
Support for output formats:
- RAW RGB
- RGB565/555/444
- YUV422/420
YCbCr422 and compression
Support for video or snapshot operations

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Support for LED and flash strobe mode
Support for internal and external frame synchronization for frame exposure mode
Support for horizontal and vertical sub-sampling
Support for minimizing artifacts on binned image
Support for data compression output
support for anti-shake
standard serial SCCB interface
Dual lane MIPI output interface
Digital Video Port (DVP) parallel output interface
Embedded 1.5V regulator for core power
Programmable I/O drive capacity, I/O tri-state configurability
Support for black sun cancellation
Support for image sizes: 5MP and arbitrary size scaling down from 5MP
Support for auto focus control (AFC) with embedded AF VCM driver
Embedded Microcontroller

**Table 2: Sensor Features**

### 1.3. Applications

- Smart Phones
- Tablets
- Wearables
- PC multimedia

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1.4. Layout

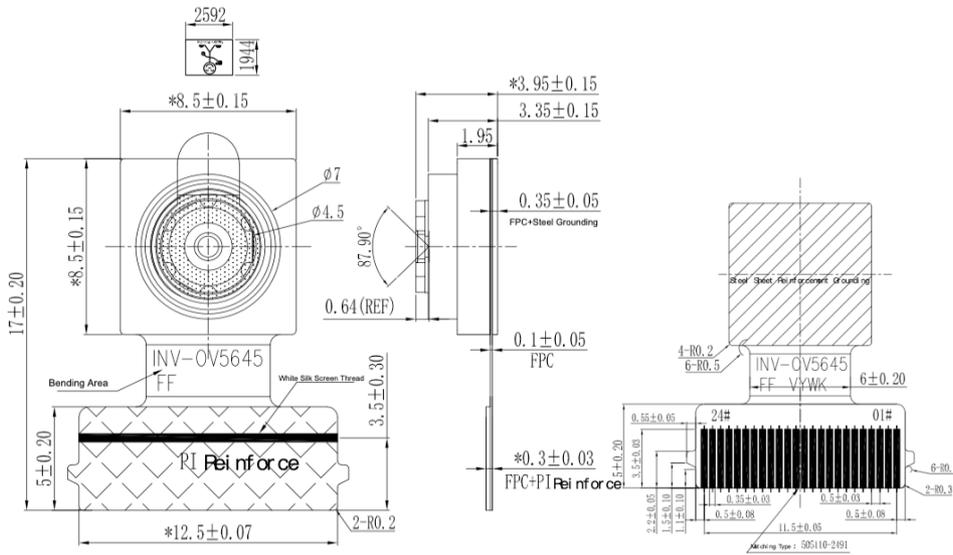


Figure 1: Camera module assembly layout

Pin Assignment	
1	AVDD-2.8V
2	DVDD-1.5V
3	AGND
4	GND
5	RESET
6	PWDN
7	STROBE
8	GND
9	MC_P
10	MC_N
11	GND
12	MD_P1
13	MD_N1
14	GND
15	MD_P0
16	MD_N0
17	GND
18	XCLK
19	GND
20	DOVDD-1.8
21	GND
22	SCL
23	GND
24	SDA

## 2. Electrical

### 2.1. Absolute Maximum Ratings

Parameter	Absolute maximum rating	
Ambient storage temperature		-40°C to +125°C
	VDD-A	4.5V
Supply voltage (with respect to ground)	VDD-D	3V
	VDD-IO	4.5V
	Human body model	2000V
Electro-static discharge (ESD)	Machine model	200V
All input/output voltages (with respect to ground)		-0.3V to VDD-IO + 1V
I/O current on any input or output pin		± 200 mA

Table 3: Absolute Maximum Ratings

### 2.2. DC Characteristics

Supply	Parameter	Min	Typ	Max	Unit
VDD-A	supply voltage (analog)	2.6	2.8	3.0	V
VDD-D	supply voltage (digital core)	1.425	1.5	1.575	V
VDD-IO	supply voltage (digital I/O)	1.71	1.8	3.0	V

Table 4: DC Characteristics

## 3. Environment Requirements

### 3.1. Operating Temperature

The camera module shall be fully functional when ambient temperature is between -20°C to 60°C but 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.

### 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 85% RH under non-condensing conditions for 24 hours.

### 3.4. Thermal Shock

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

-40°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



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### 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 5: Electrical parameter measurements

### 5.2. Mechanical Parameters

Parameter	Test Frequency
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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**

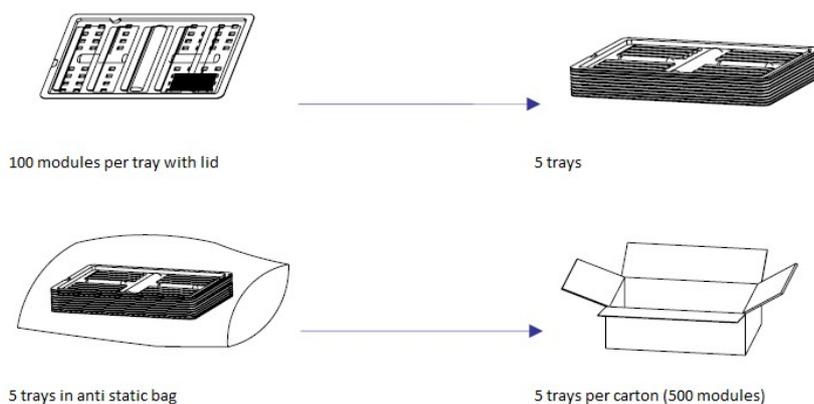
## 6. Product Identification TBD

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

## 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 4: Packaging Example**