

# DFM 36MX415-ML



<b>1. Quick Facts</b>	<b>3</b>
<b>2. Electrical Characteristics</b>	<b>5</b>
2.1 Absolute Maximum Ratings .....	5
2.2 Recommended Operating Conditions .....	5
<b>3. Dimensional Diagrams</b>	<b>6</b>
3.1 DFM 36MX415-ML Board Camera .....	6
<b>4. Spectral Characteristics</b>	<b>7</b>
4.1 Spectral Sensitivity - IMX415-AAQR .....	7
<b>5. Connector Description</b>	<b>8</b>
<b>6. CSI Lane Configurations</b>	<b>11</b>
<b>7. I2C Devices</b>	<b>12</b>
<b>8. Programming the Image Sensor</b>	<b>13</b>
8.1 Input Clock .....	13
8.2 Power-up Sequence .....	13
8.3 Further Assistance .....	13



## 1 Quick Facts

<b>General</b>	
Dynamic Range	12 bit
Resolution	3840x2160
Frame Rate at Full Resolution	90
Pixel Formats	12-Bit Bayer (GB) 10-Bit Bayer (GB)

<b>Optical Interface</b>	
Sensor Type	Sony IMX415-AAQR
Shutter Type	Rolling
Sensor Format	1/2.8 inch
Pixel Size	1.45 $\mu\text{m}$

<b>Electrical Interface</b>	
Interface	The Imaging Source MIPI CSI-2 Sensor Board Connector
Number of active CSI lanes	4
Supply voltage	5V ( $\pm 10\%$ )
Current consumption	approx tbd mA @ 5 VDC

<b>Mechanical Data</b>	
Dimensions	H: 30 mm, W: 30 mm, L: 5.45 mm
Mass	4 g

<b>Adjustments</b>	
Shutter	15 $\mu\text{s}$ to 0.1 s
Gain	0 dB to 72 dB



<b>Environmental</b>	
Temperature (operating)	-5 °C to 45 °C
Temperature (storage)	-20 °C to 60 °C
Humidity (operating)	20 % to 80 % (non-condensing)
Humidity (storage)	20 % to 95 % (non-condensing)



## 2 Electrical Characteristics

### 2.1 Absolute Maximum Ratings

Item	Symbol	Pins	Min	Max	Unit
Supply voltage	V_IN	+5V_VDD	-0.3	+6.0	V
I/O voltage	V_IO	CAM_PWR RESET CLK STROBE TRIGGER	-0.3	+2.1	V
I2C voltage	V_I2C	I2C_SCL I2C_SDA	-0.3	+2.1	V

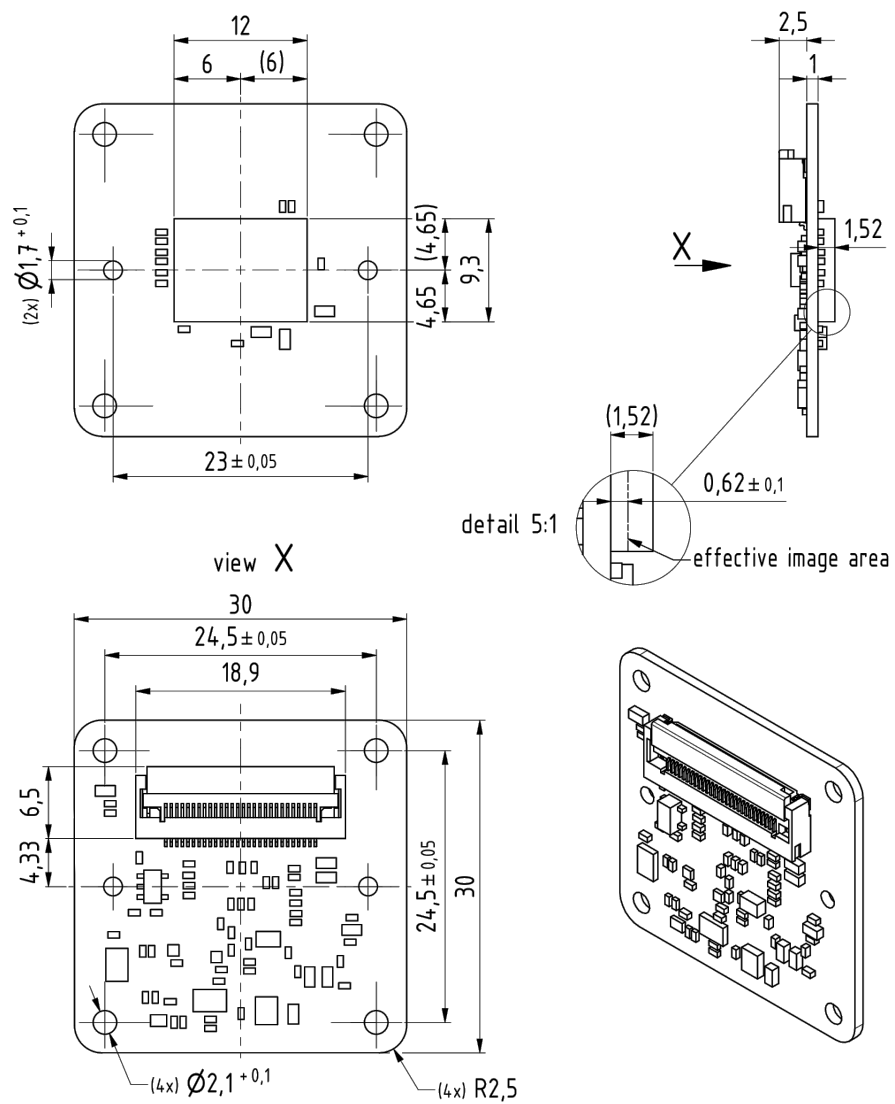
### 2.2 Recommended Operating Conditions

Item	Symbol	Pins	Min	Typ	Max	Unit
Supply voltage	V_IN	+5V_VDD	4.5	5.0	5.5	V
I/O voltage	V_IO	CAM_PWR RESET CLK STROBE TRIGGER	1.7	1.8	1.9	V
I2C voltage	V_I2C	I2C_SCL I2C_SDA	1.7	1.8	1.9	V



## 3 Dimensional Diagrams

### 3.1 DFM 36MX415-ML Board Camera



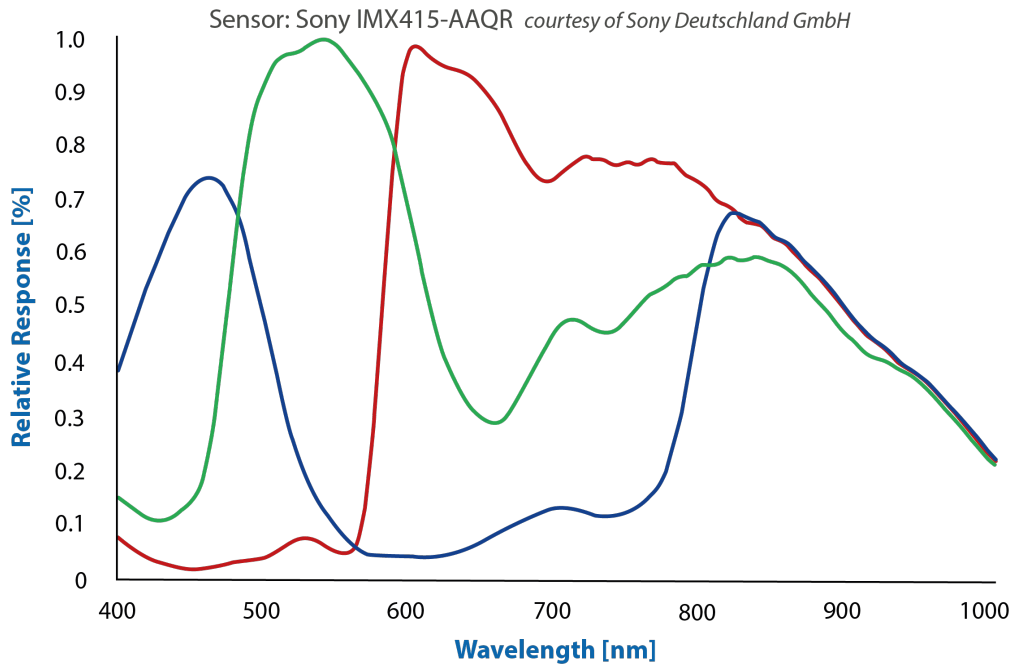
Scale: 2 : 1  
 Dimensions: mm  
 Tolerances: DIN ISO 2768-m  
 289-20-0-06-00





## 4 Spectral Characteristics

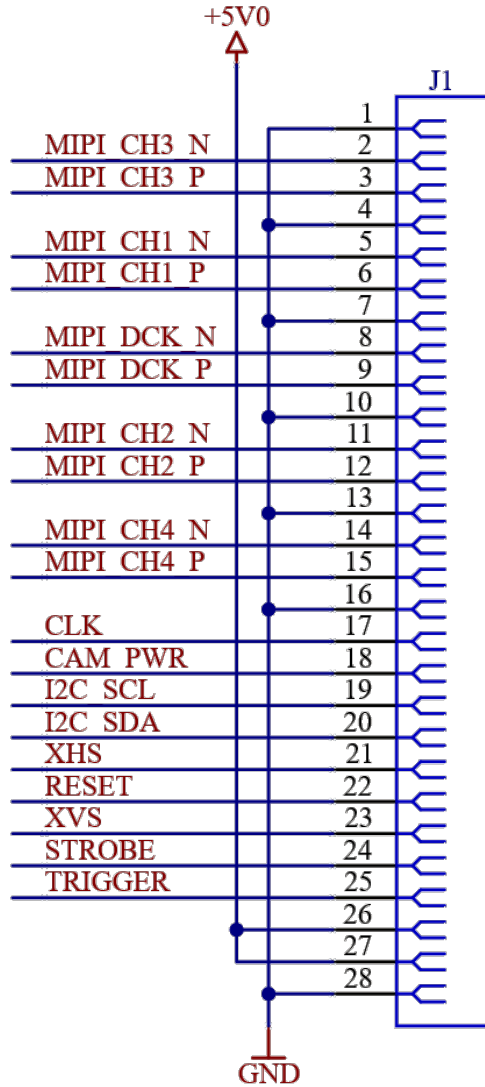
### 4.1 Spectral Sensitivity - IMX415-AAQR





## 5 Connector Description

The DFM 36MX415-ML sensor board is connected to the system via the *The Imaging Source MIPI CSI-2 Sensor Board Connector*.







#	Name	Type	Description
1	GND	GND	Ground
2	MIPI_CH3_N	O	MIPI CSI-2 output
3	MIPI_CH3_P	O	MIPI CSI-2 output
4	GND	GND	Ground
5	MIPI_CH1_N	O	MIPI CSI-2 output
6	MIPI_CH1_P	O	MIPI CSI-2 output
7	GND	GND	Ground
8	MIPI_DCK_N	O	MIPI CSI-2 clock
9	MIPI_DCK_P	O	MIPI CSI-2 clock
10	GND	GND	Ground
11	MIPI_CH2_N	O	MIPI CSI-2 output
12	MIPI_CH2_P	O	MIPI CSI-2 output
13	GND	GND	Ground
14	MIPI_CH4_N	O	MIPI CSI-2 output
15	MIPI_CH4_P	O	MIPI CSI-2 output
16	GND	GND	Ground
17	CLK	I	Reference clock input (with 1k pull-down/termination resistor on sensor board)
18	CAM_PWR	I	High active camera power enable signal (10k pull-down on sensor board)
19	I2C_SCL	I/O	I2C serial clock
20	I2C_SDA	I/O	I2C serial data
21	RESERVED_1	I	Do not use
22	RESET	I	Reset sensor to default state when low (2.2k pull-down on sensor board)
23	RESERVED_2	I	Do not use
24	STROBE	O	Do not use
25	TRIGGER	I	Do not use
26	+5V_VDD	PWR	5V ( $\pm 10\%$ ) power supply
27	+5V_VDD	PWR	5V ( $\pm 10\%$ ) power supply
28	GND	GND	Ground



All I/Os have the same I/O voltage of 1.8V. The manufacturer part number of the Hirose connector is FH28D-28S-0.5SH(98).



## 6 CSI Lane Configurations

The DFM 36MX415-ML sensor board can be operated with 2 or 4 CSI lanes connected.

The following table shows the relationship between used CSI lanes and maximum frame rate:

No of CSI Lanes	Bits Per Pixel	Maximum Frame Rate at Full Resolution
4	10	90
2	10	50



## 7 I2C Devices

There are multiple I2C devices on the DFM 36MX415-ML sensor board. The following table describes the parts and their I2C addresses:

Address (7-bit)	Device	Description
0x1A	IMX415-AAQR	Image Sensor
0x50	AT24C256C	EEPROM
0x57	AT24C02C	EEPROM



## 8 Programming the Image Sensor

The data sheet for the IMX415-AAQR image sensor is not publicly available.

### 8.1 Input Clock

The CLK pin has to be connected to a clock source. The following table lists the ranges of clock frequencies that are supported by the image sensor:

Minimum	Typical	Maximum	Unit
25.92	27	27.54	Hz
35.64	37.125	37.867	Hz
71.28	74.25	75.735	Hz

The driver provided by The Imaging Source assumes a CLK frequency of **37 MHz**. For quick integration with existing software, using this frequency is recommended.

### 8.2 Power-up Sequence

Delay	Action
-	Set RESET to Hi-Z
-	Set CAM_PWR to Hi-Z
-	Supply 5V to 5V_VDD
-	Supply sensor clock to CLK
1 $\mu$ s	Set CAM_PWR to high
20 $\mu$ s	Set RESET to high
11 ms	Write sensor registers

### 8.3 Further Assistance

For more detailed information, register settings and assistance integrating the sensor board into your product, please contact The Imaging Source support.



## DFM 36MX415-ML

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All weights and dimensions are approximate. Unless otherwise specified, the lenses shown in the context of cameras are not shipped with these cameras.

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