VADZO

BOLT-521MRS

5MP NIR Monochrome MIPI Camera based on Onsemi AR0521 Sensor

Vadzo Bolt-521MRS is a 5MP MIPI Camera based on Onsemi AR0521 Sensor coupled with high-performance ISP. The camera delivers max resolution of 5MP and Video streaming of 1080p, 720p and VGA. Applicable in use cases such as pathology camera, digital microscope camera, medical device camera, patient care camera, biometrics camera, surveillance camera, etc. Bolt-521MRS has been integrated with solutions based on platforms such as Raspberry PI, Nvidia Nano, Nvidia XavierNX, etc.

Key Features

- Sensor Model: AR0521 Onsemi Sensor
- Max Resolution: 5 MP
- Pixel Size: 2.2 µm x 2.2 µm
- Shutter: Rolling Shutter
- Lens FOV: 74 DFOV
- Compliance: RoHS 3, REACH

Applications

- **Medical & Life Science Devices:** Ophthalmology Camera, Intraoral Camera, Dermatoscope Camera, Digital Microscope Camera, Pathology Camera.
- **Smart Surveillance:** Iris Recognition, Day/Night Video Recording, Smart Parking, Pedestrian Safety.
- **Warehouse Robotics Camera:** Object Scanning, Document Scanning, OCR, Obstacle Detection.

INDEX

1. Introduction 3
2. Camera Specifications 3
3. Supported Resolutions 4
4. Supported Camera Functions 5
5. MIPI Interface 5
5.1 Pin-Out Adapter Board 5
6. Status LED 6
7. Temperature and Humidity Specifications 6
8. Dimensions 6
Board Top Side – 2D 6
Board Bottom Side - 2D 6
ATR Board 2-Lane Top Side – 2D 7
ATR Board 2-Lane Bottom Side – 2D 7
ATR Board 4-Lane Top Side – 2D 8
ATR Board 4-Lane Bottom Side – 2D 8

Copyright © 2017-2026 Vadzo Imaging

1. Introduction

Bolt-521MRS is a 5MP MIPI Fixed-Focus monochrome camera based on Onsemi AR0521 sensor.

The camera supports image capture and video streaming in Y8 format. The camera supports both 2-Lane as well as 4-Lane MIPI CSI-2 Interface and has been tested with platforms such as Raspberry PI, Nvidia Nano, and Nvidia XavierNX.

This is a two-board camera solution that comprises of the camera module board and the adapter board. There are two variants of the adapter board to 2-Lane MIPI CSI 2 as well as 4-Lane MIPI CSI 2 interfaces.

2. Camera Specifications

General Information	
Product Family	Bolt series
Camera Model	Vadzo Bolt-521MRS
Sensor	
Sensor	AR0521 CMOS sensor from Onsemi
Sensor Format	1/2.5”
Pixel Size	2.2 µm x 2.2 µm
Max Resolution	5MP – 2592(H) x 1944(V)
Shutter	Rolling Shutter
Chroma	Mono
Camera Data	
Interface	2 Lane MIPI CSI-2 & 4 Lane MIPI CSI-2
Pixel Depth	8bit / 12bit
Output Format	Y8 & Y12
Exposure Control	Manual Control via software & Auto-Exposure
GPIO	2 x NC
Camera Hardware	
Lens	S Mount (M12 Standard)

Copyright © 2017-2026 Vadzo Imaging

MIPI connector	XF3M(1)-1515-1B (2 Lane) & 54548-2271 (4 Lane)
Power Requirement	Max: 1.45 W at 3.3VDC Min: 0.80 W at 3.3VDC
Operating Temperature	-30^{o}C to 70^{o}C
Dimension	38mm (L) x 38mm (B) convertible to 32mm (L) x 32mm (B)
Weight	8 Grams (Without Lens)
Camera Software	
Video Resolutions	VGA, HD, Full HD, and 5MP
Video formats	Y8 and Y12
Still Image Resolutions	VGA, HD, Full HD, and 5MP
Image Capture formats	Y8 and Y12
Image Capture Modes	Software trigger
Camera Controls	Brightness, Exposure
Conformity	
Conformity	RoHS 3, REACH

3. Supported Resolutions

Resolution	**Frame Rates (FPS) in 4-Lane MIPI CSI 2**
640 x 480 (VGA)	120
1280 x 720 (HD)	60
1920 x 1080 (FHD)	60
2592 x 1944 (5MP)	30

Copyright © 2017-2026 Vadzo Imaging

4. Supported Camera Functions

The List of functions supported by the Bolt-521MRS camera are:

- Resolution Control
- Image Format Setting
- Video Format Setting – Y8 or Y12
- Image Capture Software Trigger
- Gain – Auto & Manual
- Exposure – Auto & Manual
- Anti Flicker – 50Hz/60Hz

5. MIPI Interface

The camera module supports both 4-Lane MIPI CSI 2 as well as 2-Lane MIPI CSI 2 interface.

Vadzo has designed the camera hardware such that it can be directly integrated with Raspberry PI as well Nvidia Jetson development kit via the 2-Lane MIPI CSI 2 interface. Vadzo has used the XF3M(1)-1515-1B from Omron for this interface.

Vadzo has integrated the capability of functioning in the 4-Lane MIPI CSI 2 bandwidth as well to ensure that you can achieve faster frame rates.

5.1 Pin-Out Adapter Board

The pin-out for the 2-Lane FFC Connector:

15 pin FPC Connector	
Pin No	Pin Name
1	GND
2	MD0_N
3	MD0_P
4	GND
5	MD1_N
6	MD1_P
7	GND
8	MC_N
9	MC_P
10	GND
11	GPIO1
12	GPIO2
13	I2C_SCL
14	I2C_SDA
15	VCC3P3

Copyright © 2017-2026 Vadzo Imaging

6. Status LED

Status LED's indicate the below:

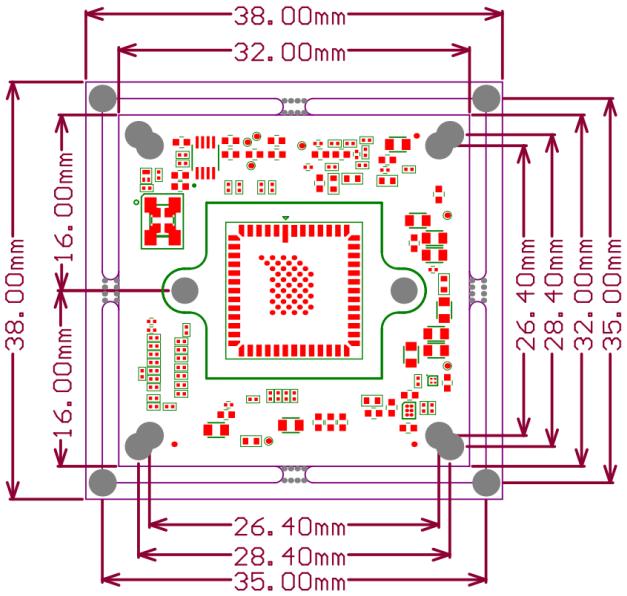
- Red color indicates Device is powered ON with no Streaming.
- Yellow color indicates: Camera is currently Streaming.

7. Temperature and Humidity Specifications

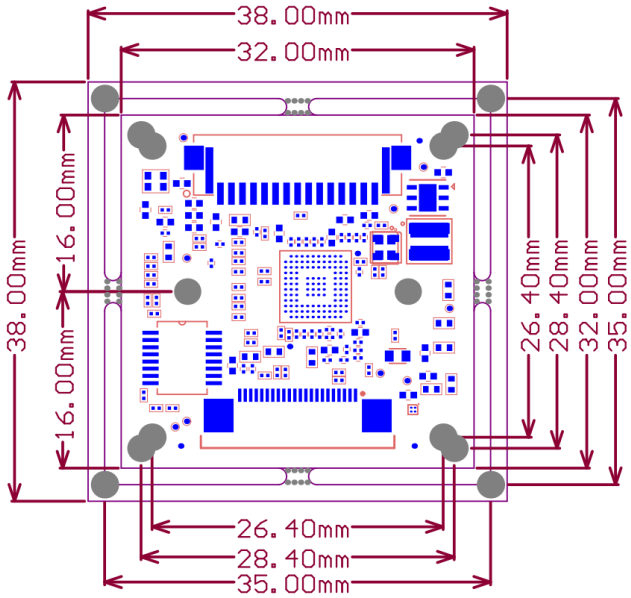
Description	Specification
Operating Temperature	-30°C to 70°C
Storage Temperature	-30°C to 70°C
Humidity	20% to 80%, Relative, non-condensing.

8. Dimensions

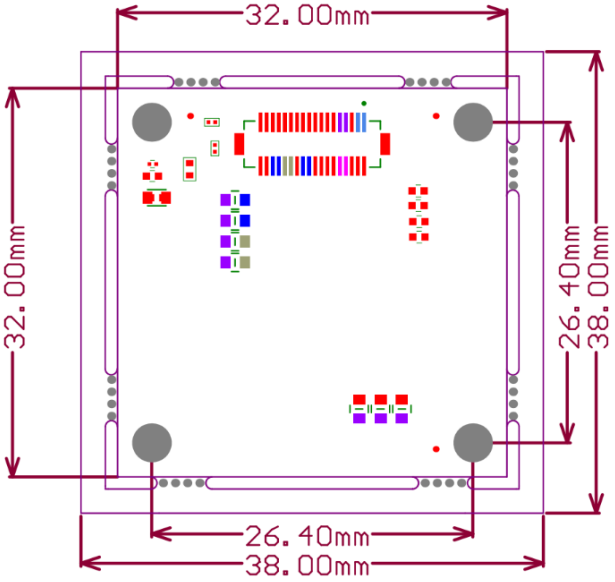
Board Top Side – 2D



Board Bottom Side - 2D

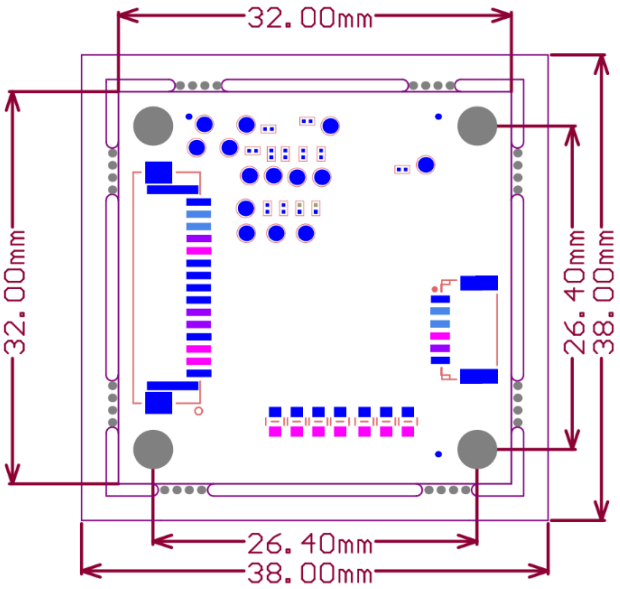


ATR Board 2-Lane Top Side – 2D

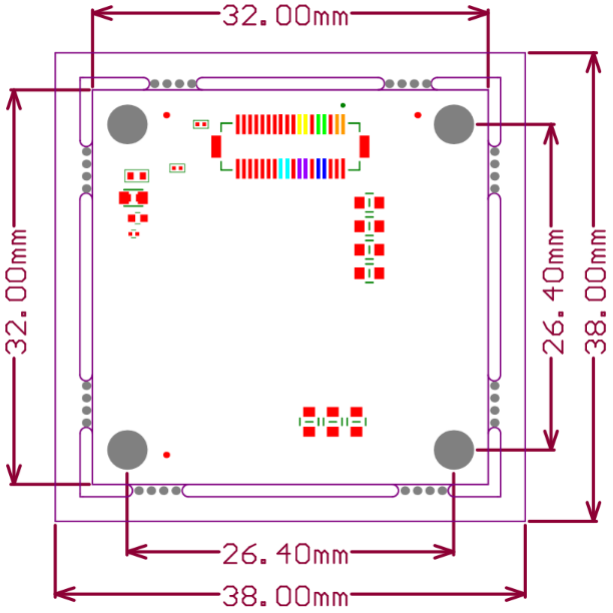


ATR Board 2-Lane Bottom Side – 2D

Copyright © 2017-2026 Vadzo Imaging

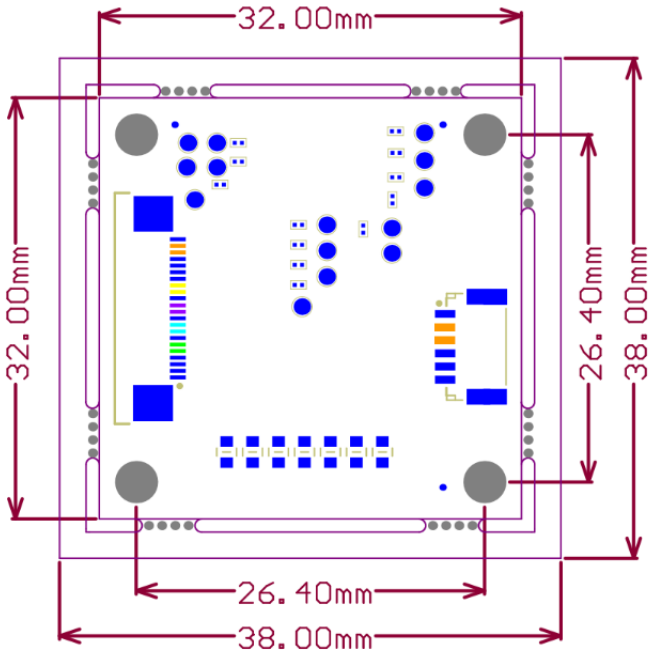


ATR Board 4-Lane Top Side – 2D



ATR Board 4-Lane Bottom Side – 2D

Copyright © 2017-2026 Vadzo Imaging



IMPORTANT NOTICE AND DISCLAIMER

Vadzo Imaging products are sold by description only. Vadzo Imaging reserves the right to change the information in this document, including URL references and/or specifications is subject to change without notice. Customers should obtain the latest relevant information and data sheets before placing orders and should verify that such information is current and complete.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

THIS DOCUMENT IS PROVIDED AS IS WITH NO WARRANTIES WHATSOEVER, INCLUDING ANY WARRANTY OF MERCHANTABILITY, NON-INFRINGEMENT, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY WARRANTY OTHERWISE ARISING OUT OF ANY PROPOSAL, SPECIFICATION, OR SAMPLE.

All liability, including liability for infringement of any proprietary rights, relating to the use of information in this document is disclaimed. No licenses express or implied, by estoppel or otherwise, to any intellectual property rights are granted herein.

All trade names, trademarks, and registered trademarks mentioned in this document are the property of their respective owners and are hereby acknowledged.

Copyright © 2017–2026 Vadzo Imaging. All Rights Reserved.