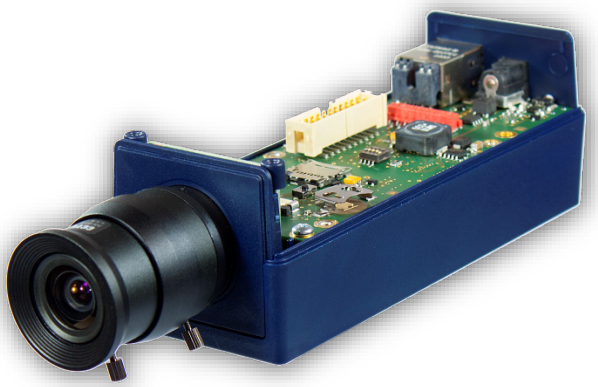
BLUETECHNIX
Embedding Ideas

Argos2D - D12x



User Manual

Version 1.1

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Argos®[2D] – D12x – User Manual

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Subject to change without notice. Errors excepted.

Table of Contents

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Information

For further information on technology, delivery terms and conditions and prices please contact Bluetechnix (http://www.bluetechnix.com).

Warning

Due to technical requirements components may contain dangerous substances.

1 General Information

This guide applies to all smart cameras based on the Argos® smart camera platform from Bluetechnix GmbH. Follow this guide chapter by chapter to set up and understand your product. If a section of this document only applies to certain camera models, this is indicated at the beginning of the respective section.

1.1 Symbols Used

This guide makes use of a few symbols and conventions:

Warning

Indicates a situation which, if not avoided, could result in minor or moderate injury and/or property damage or damage to the device.

Caution

Indicates a situation which, if not avoided, may result in minor damage to the device, in malfunction of the device or in data loss.

Note

Notes provide information on special issues related to the device or provide information that will make operation of the device easier.

Procedures

A procedure always starts with an headline

1. The number indicates the step number of a certain procedure you are expected to follow. Steps are numbered sequentially.

This sign ➤ indicates an expected result of your action.

References

This symbol indicates a cross reference to a different chapter of this manual or to an external document.

2 Overview

2.1 System Architecture

The Argos2D – D12x is designed to cover the needs for an intelligent image sensor with a high flexibility in data transmission. The typical workflow can be divided in three actions:

- Data capturing
- Video/Image processing
- Data transmission

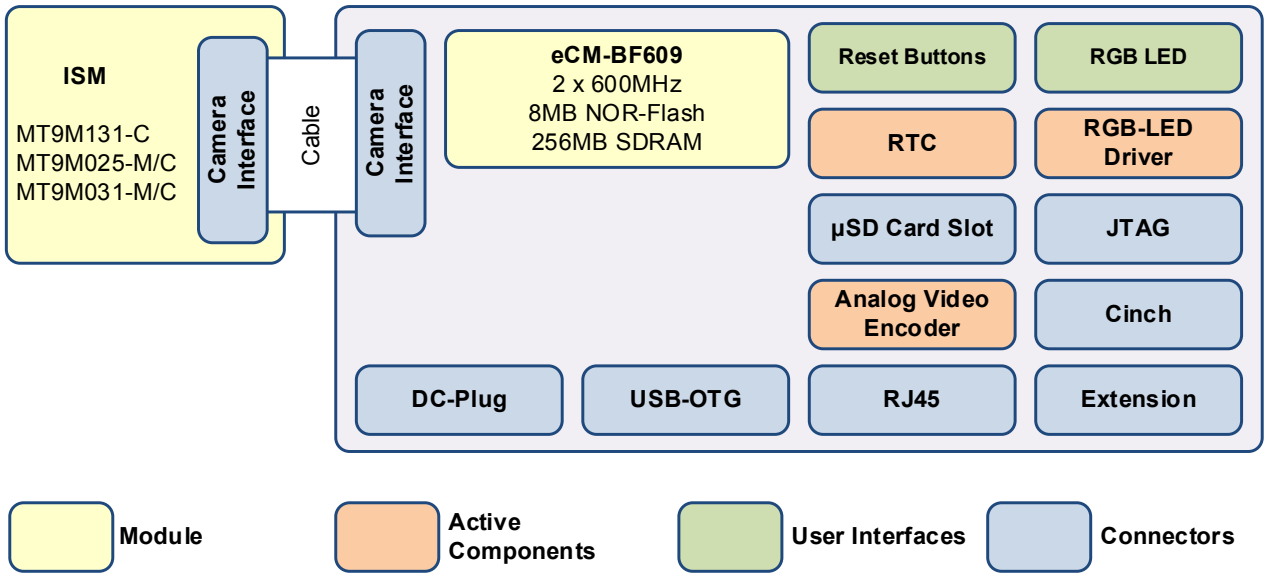


Figure 2.1: System Architecture

The Bluetechnix standard Image Sensor Interface (BLT-ISM-Connector) allows connecting various image sensors to the Argos2D – D12x (i.e. ISM-AR0132AT, ISM-MT9M131 or ISM-MT9P031).

To transmit the captured and processed data there are various interfaces on the Argos2D – D12x. Depending on the needed transmission rate you can select between USB, Ethernet, CAN (optional) or just store the data on a micro-SD-card.

If there is the need to visualize the processed data or simply for visual debugging, an HDMI output is available on the Argos2D – D12x.

2.2 Models

All Argos2D – D12x cameras are equipped with the i.MX carrier board, which contains all peripherals, the core module mount and interfaces including the ISM-connector, the eCM-BF609 SoM as CPU board, the housing and the selected ISM.

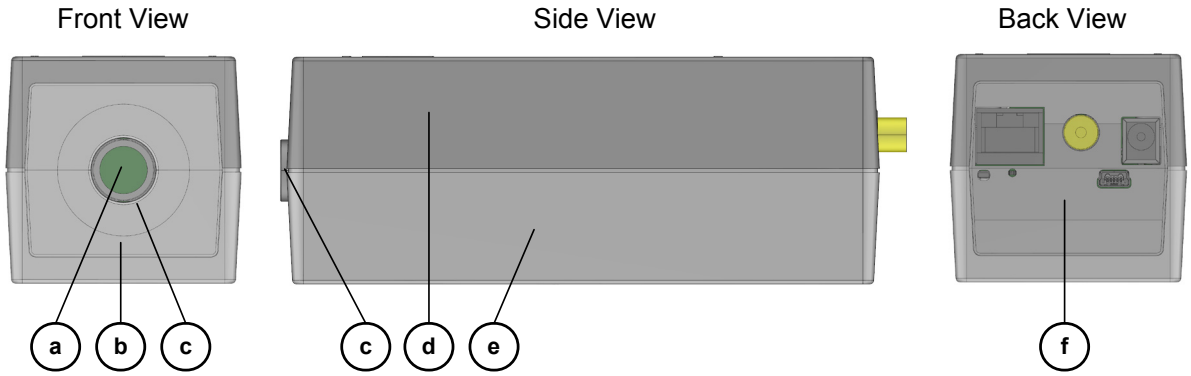


Figure 2.2: Argos2D – D12x views

a. ISM (Images Sensor Module) changeable
b. Front panel
c. Lense holder
d. Housing cover
e. Housing base
f. Rear panel with user interface and peripherals connectors

2.2.1 Argos2D – D120 (150-1020-1)

The D120 comes with the MT9M131 color, image sensor form Aptina, module. The sensor has a 1/3-inch (5:4) format with 1280 x 1024 pixels.

2.2.2 Argos2D – D121 (150-1021-1)

The D121 comes with the MT9M025 monochrome, image sensor form Aptina, module. The sensor has a 1/3-inch (4:3) format with 1280 x 960 pixels.

2.2.3 Argos2D – D122 (150-1022-1)

The D122 comes with the MT9M025 color, image sensor form Aptina, module. The sensor has a 1/3-inch (4:3) format with 1280 x 960 pixels.

2.2.4 Argos2D – D123 (150-1023-1)

The D123 comes with the MT9P031 monochrome, image sensor form Aptina, module. The sensor has a 1/2.5-inch (4:3) format with 2592 x 1944 pixels.

2.2.5 Argos2D – D124 (150-1024-1)

The D124 comes with the MT9P031 color, image sensor form Aptina, module. The sensor has a 1/2.5-inch (4:3) format with 2592 x 1944 pixels.

2.3 Interfaces & Connectors

All Argos2D – D12x cameras are equipped with the same connectors and interfaces.

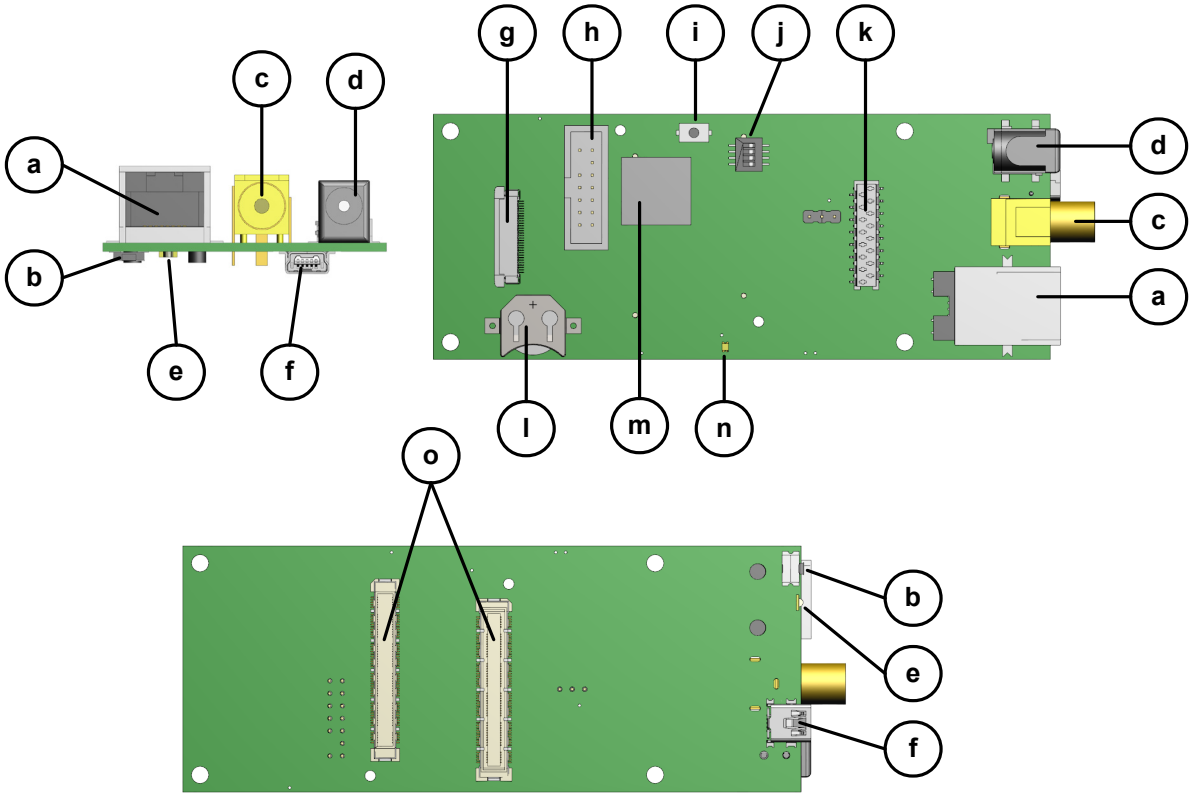


Figure 2.3: Argos2D – D12x connectors and interfaces

a. RJ45 Ethernet connector
b. Reset button
c. Analog video connector
d. Power connector
e. Status LED
f. USB-OTG connector
g. ISM connector
h. JTAG connector
i. Reset button
j. Boot mode switch
k. I/O extender connector
l. RTC-battery holder
m. µSD-Card holder
n. Power supply LED
o. Core Module connectors

3 Software Installation

3.1 Software-Development-Kit SDK

Bluetechnix offers a Board Support Package that is based on BlackSheep. This BSP will need Visual DSP++ Version 5.0 Update 8.

3.2 Drivers

If your Operating system does not install the drivers for a virtual comport, a USB-UART driver installation guide can be found here.

3.3 Console

An installation guide for a serial console can be found here.

4 Hardware Installation

Caution

Only assemble and dissemble electronic in an ESD-protected environment.

4.1 Connecting the Core Module and the Carrier Board

1. Put the carrier board with the bottom side up on a base.
2. Take the core module and align in on the connectors of the carrier board.

   ⚠ Be aware that the CM and the CB is parallel
3. Connect the CM with appropriate force on the marked spots to the CB.

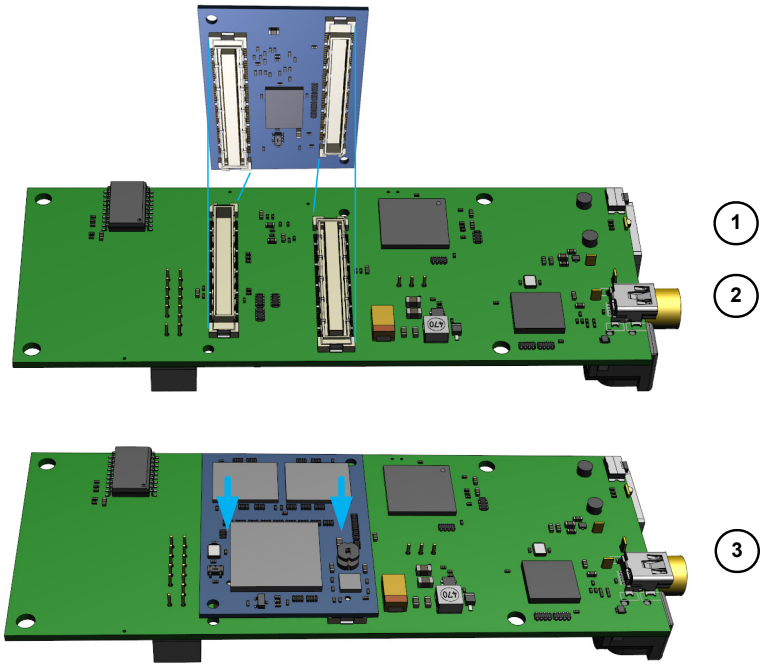


Figure 4.1: Connecting the Core Module and the Carrier Board

4.2 Connecting CM and CB with housing base

1. Take the rear plane and the housing base.
2. Take two M2.9 x 5mm self-tapping screws and mount it.
3. Take the eCM-CB compound with the CM looking down. First insert the connectors into the rear plane and then push the CB down to the housing base.
4. Take two M2.9 x 5mm self-tapping screws and mount it on the front.

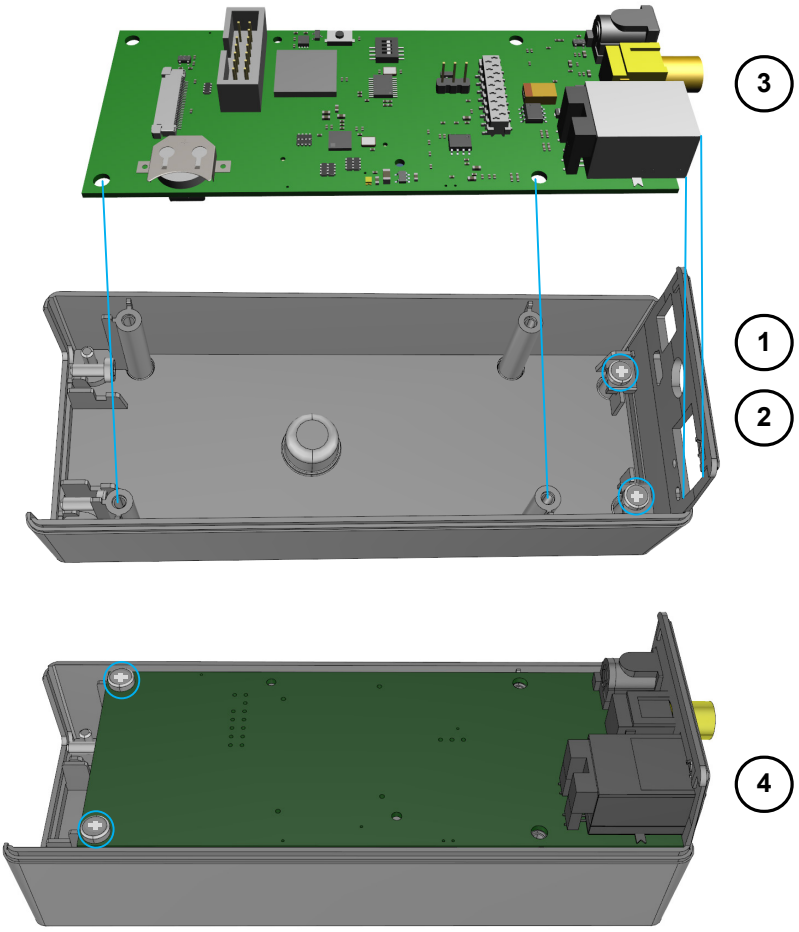


Figure 4.2: Connecting CM and CB with housing base

4.3 Connecting the ISM with front plane

1. Usually the ISM comes mounted with a CS mount holder. This is fixed with two M2 x 5mm screws
2. Take the ISM and align it on the front plane, by using the locating pins.
3. Take four M2.9 x 8mm self-tapping screws and mount them together.

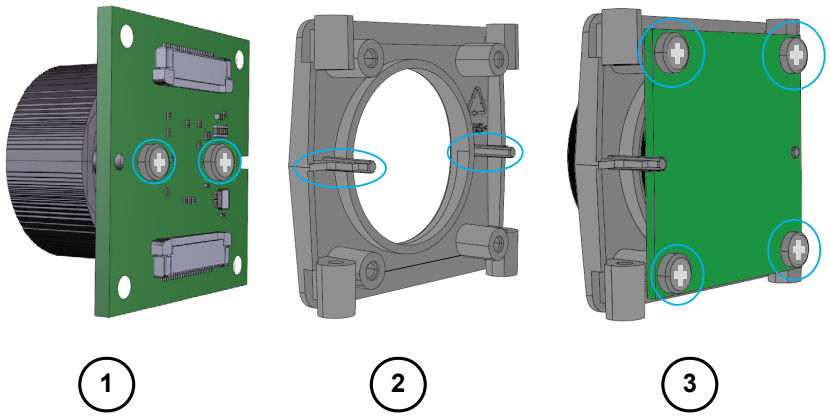


Figure 4.3: Connecting the ISM with front plane

4.4 Connecting the 30pin flex-foil cable to the ISM

1. Take a look on the ISM. There is the possibility that more than one ISM connector is populated, if that's the case you must use that one with an i.MX mark besides. The flex foil cable must have the contacts on the same side.
2. Pull out the lock of the connector with appropriate force simultaneously on both sides.
3. Insert the flex-foil cable with the visible contacts showing away from the ISM.
4. Secure the cable by pushing the lock back in.

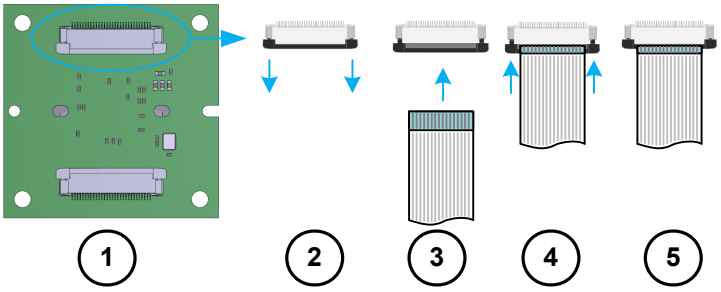


Figure 4.4: Connecting flex-foil cable with ISM

4.5 Connecting ISM to housing base

1. Take the housing base including the CB and also take the ISM with connected front plane and flex-foil cable.
2. Pull out the lock of the connector with appropriate force simultaneously on both sides.
3. Pull out the lock of the connector with appropriate force simultaneously on both sides.
4. Insert the flex-foil cable with the visible contacts showing away from the ISM.
5. Secure the cable by pushing the lock back in.
6. Insert the ISM into the housing base
7. Turn the whole camera around and mount two M2.9 x 8mm self-tapping screws on the bottom.

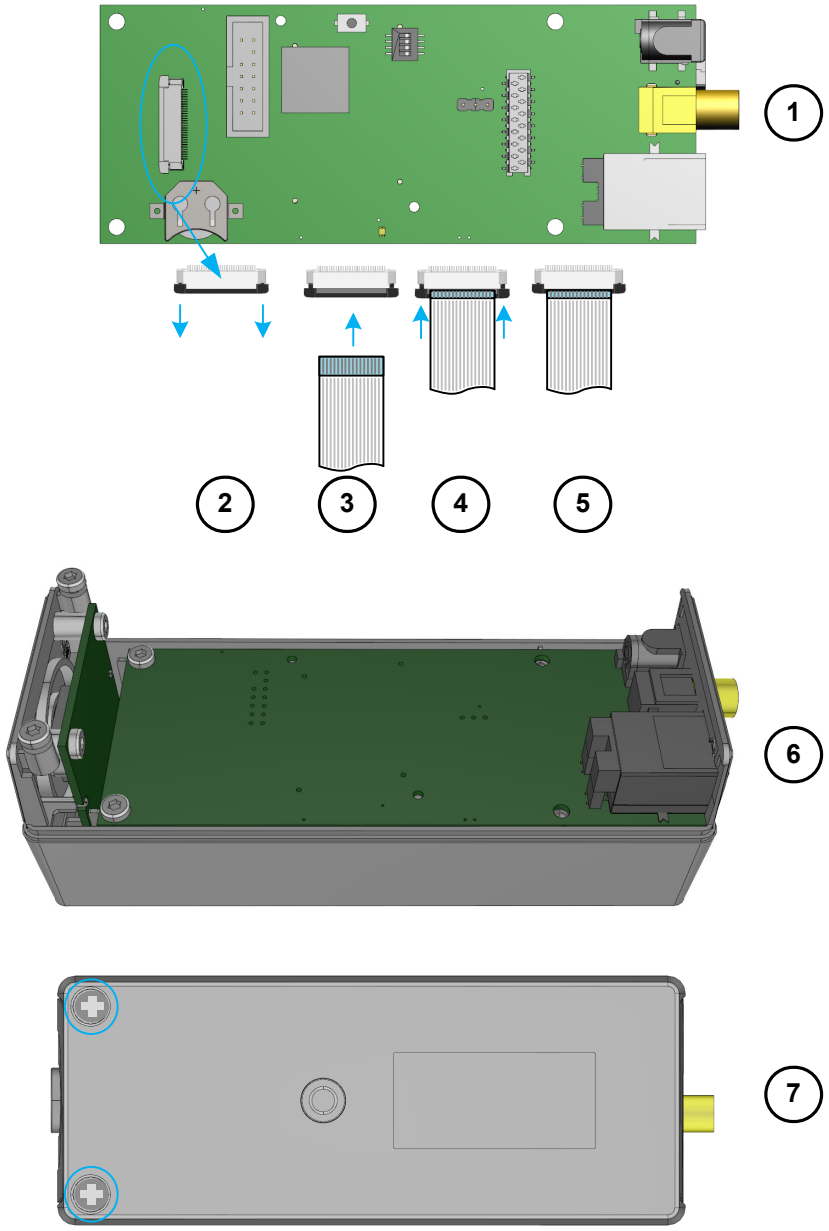


Figure 4.5: Connecting ISM and front plane to housing base

4.6 Inserting the µSD-Card and the coin cell

1. Open the µSD-Card slot by pushing the slot with appropriate force to the right and then up.
2. Insert the µSD-Card.
3. Close the slot by pushing them town and to the left.
4. Push the 12mm coin cell with the positive side up and appropriate force into the holder.

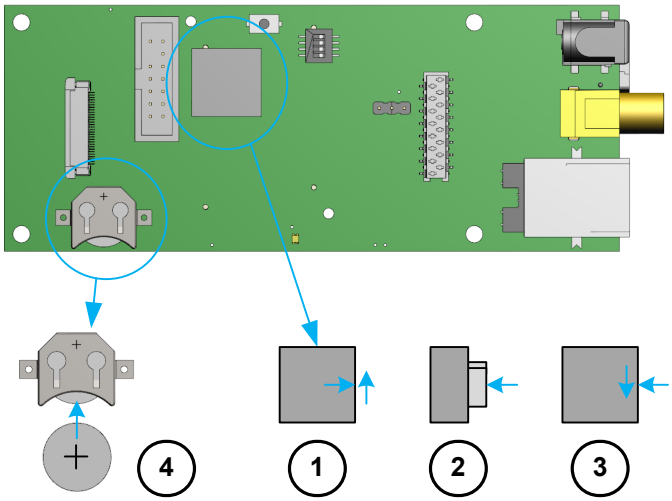


Figure 4.6: Inserting the µSD-Card and the coin cell

4.7 Connecting the housing cover with the base

1. Put the housing cover over the base
2. Take two M2.9 x 8mm self-tapping screws and mount them in front of the cover.
3. Take two M2.9 x 18mm self-tapping screws and mount them in back of the cover.

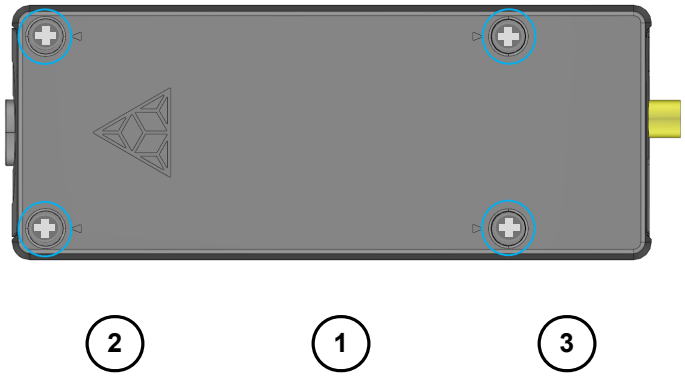


Figure 4.7: Connecting the housing cover with the base

5 Getting Started

A Guide how to start with your Argos®^{2D} D120 Camera based on the eCM-BF609 SoM can be found here.

6 Programming Environment

Use Visual DSP++ Version 5.0 Update 8.

6.1 Setting up the tool chain

The tool chain gets installed with the Software-Development-Kit SDK.

7 Appendix

7.1 Electrical Specifications

7.1.1 Operating Conditions

Symbol	Parameter	Min	Typical	Max[1]	Unit
V_{IN}	Input supply voltage	7	12	20	V
I_{IN}	Input current @ 12V	-	TBD	TBD	mA
V_{3V3}	Extender Voltage Supply	3.0	3.3	3.6	V
I_{3V3}	Extender Current Supply	-	-	TBD	mA
V_{OH}	High level output voltage	2.31	-	-	V
V_{OL}	Low level output voltage	-	-	0.99	V

Table 7.1: Electrical characteristics

[1] An overstepping of these maximums may cause permanent damage of the CM.

7.1.2 Maximum Ratings

Stressing the device above the rating listed in the absolute maximum ratings table may cause permanent damage to the device. These are stress ratings only. Operation of the device at these or any other conditions greater than those indicated in the operating sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Symbol	Parameter	Min	Max	Unit
V_{IN}	Input supply voltage	-0.5	22	V
V_{IO}	Input or output voltage	-0.5	3.6	V
$_{OH}/I_{OL}$	Current per pin	0	10	mA
T_{AMB}	Ambient temperature	0	70	°C
T_{STO}	Storage temperature	-55	150	°C
φ_{AMB}	Relative ambient humidity	-	90	%

Table 7.2: Absolute maximum ratings

7.1.3 ESD Sensitivity

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

7.2 Connector and Interface Description

7.2.1 Reset button b (S2)

The push button performs a factory reset. This function is not implemented in Software.

7.2.2 Analog video connector c (X9)

The cinch connector provides a standard interface for analog video signals. The video encoder ADV7391 is preprocessing the video signal from the IPU.

7.2.3 Power connector d (X4)

The Argos2D-D12x works with a single power supply of 7V to 20V.

7.2.4 RJ45 Ethernet connector a (X3)

The RJ45 Ethernet connector is routed directly to the on-board physical transceiver of the eCM-BF609.

7.2.5 Status LED e (V3)

The RGB LEDs are connected to GPIOs of the Core Module.

LED	Signal	Type
Green	PF23	Active low
Blue	PF24	Active low
Red	PF22	Active low

Table 7.3: Status LEDs e (V3)

7.2.6 Micro USB connector f (X7)

The USB signals are routed to a micro USB-A connector.

7.2.7 ISM connector g (X1)

Pin No.	Pin Name	Signal Name	Type	Description
1	VCAMA	VCAMIO	PWR	Camera Analog Voltage Supply
2	GND	GND	PWR	Power Ground
3	SADDR	-	NC	Not Connected
4	CAMCLK	CLKBUF	O	Camera Master Clock
5	NRESET	PF16	O	Global Reset
6	SIO.C	PPI0.D15	O	Configuration Bus Clock Line
7	SIO.D	PPI0.D15	I/O	Configuration Bus Data Line
8	VCAMC	-	NC	Not Connected
9	GND	GND	PWR	Power Ground
10	PCLK	PPI0.CLK	I	Pixel Clock
11	VSYNC	PPI0.SY2	I	VSYNC
12	HSYNC	PPI0.SY1	I	HSYNC
13	TRIGGER	PPI0.D12	O	Camera Trigger
14	STROBE	PPI0.D13	I	Strobe Signal from Camera
15	D0	PPI0.D0	I	Pixel Data
16	D1	PPI0.D1	I	Pixel Data
17	D2	PPI0.D2	I	Pixel Data
18	D3	PPI0.D3	I	Pixel Data
19	VCAMIO	VCAMIO	PWR	Camera IO Power Supply
20	GND	GND	PWR	Power Ground
21	D4	PPI0.D4	I	Pixel Data
22	D5	PPI0.D5	I	Pixel Data

Pin No.	Pin Name	Signal Name	Type	Description
23	D6	PPI0.D6	I	Pixel Data
24	D7	PPI0.D7	I	Pixel Data
25	GND	GND	PWR	Power Ground
26	D8	PPI0.D8	I	Pixel Data
27	D9	PPI0.D9	I	Pixel Data
28	D10	PPI0.D10	I	Pixel Data
29	D11	PPI0.D11	I	Pixel Data
30	OE	PF18	O	Output Enable (Active Low)

Table 7.4: ISM connector **g** (X1)

7.2.8 µSD-Card holder m (X5)

The µSD-Card is connected to the Core Module by SPI interface. The signal PF3 is used as CS. A µSD-Card connector mounted on the top side of the board supports µSD cards.

7.2.9 JTAG connector h (X2)

A JTAG connector provides a debug interface to the Core Module.

Pin No.	Signal Name	Type	Description
1	GND	PWR	Power Ground
2	JTAG.nEMU	O	Emulation (active low)
3	-	-	-
4	GND	PWR	Power Ground
5	Vref	Passive	IO Reference Voltage (10kΩ resistor to 3.3V)
6	JTAG.TMS	I	Test Mode Selection
7	GND	PWR	Power Ground
8	JTAG.TCK	I	Test Clock
9	GND	PWR	Power Ground
10	JTAG.nTRST	I	Test Reset (active low)
11	GND	PWR	Power Ground
12	JTAG.TDI	I	Test Data Input
13	GND	PWR	Power Ground
14	JTAG.TDO	O	Test Data Output

Table 7.5: JTAG connector h (X2)

7.2.10 I/O extender connector k (X6)

Pin No.	Signal Name	Type	Description
1	UART.RXD	I	UART Receive Data
2	I2C.D	I/O 3k PU	I2C Data
3	UART.TXD	O	UART Transmit Data
4	I2C.C	O 3k PU	I2C Clock
5	GND	PWR	Power Ground
6	GND	PWR	Power Ground
7	3V3	PWR	3.3V
8	3V3	PWR	3.3V
9	PF1	I/O	GPIO
10	CAN.RXD	I	CAN Receive Data
11	PF2	I/O	GPIO
12	CAN.TXD	O	CAN Transmit Data

Pin No.	Signal Name	Type	Description
13	SPI.SCLK	O	SPI CLK
14	SPI.MISO	I	SPI MISO
15	PF4	I/O	GPIO
16	SPI.MOSI	O	SPI MOSI

Table 7.6: I/O extender connector **k** (X6)

7.2.11 RTC-battery holder l (G1)

There is also a possibility to add a 12mm coin cell to keep the RTC (PCF2129) running. The Argos2D – D12x is delivered only with a coin cell holder but without a battery.

7.2.12 Reset button i (S1)

The push buttons perform a hardware reset.

7.2.13 Boot mode switch j (S6)

To set the right boot mode for the eCM-BF609, only the switches 1 and 2 are used; switches 3 and 4 are used for extended boot mode features when using other Core Modules with an eADP adapter.

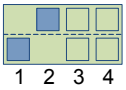
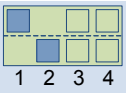
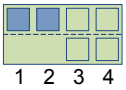
Switch Setting	Boot Description
	Execute from16Bit external memory bypass ROM
	Reserved
	Boot from 8Bit Flash
	Boot from SPI 16Bit

Table 7-7: Boot mode settings

7.2.14 Core Module connectors o (U1)

The two connectors are used to mount an eCM-BF609 Core Module on the Argos2D-D12x. For more information take a look into the eCM-BF609 Hardware User Manual.

7.3 Mechanical Outline

All dimensions are given in mm.

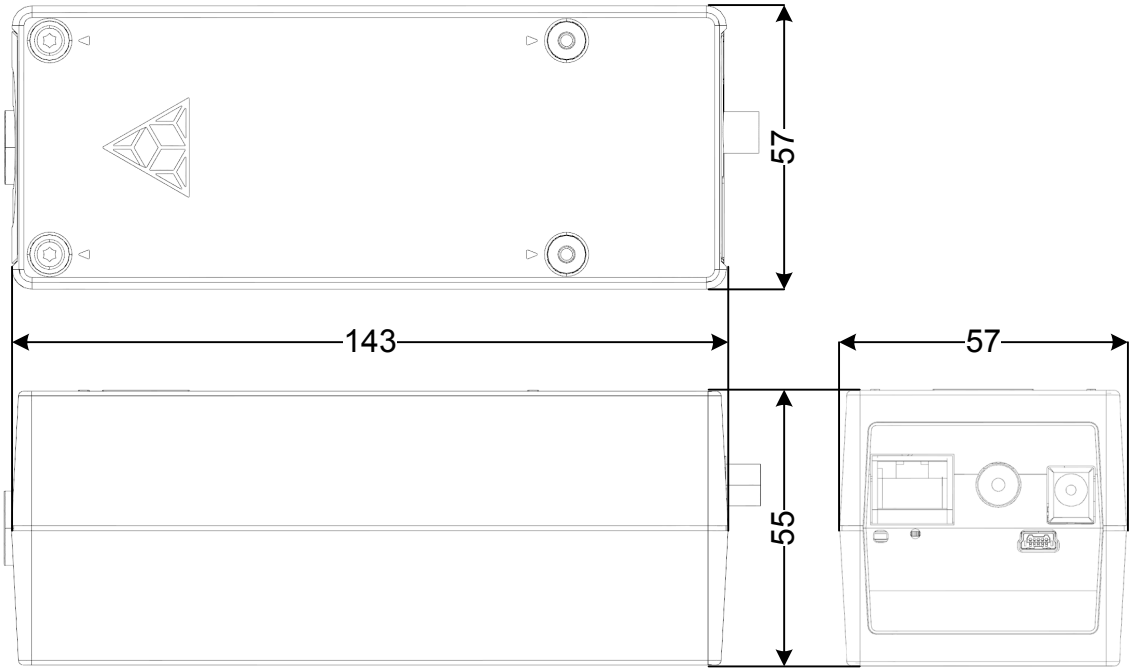


Figure 7.1: Mechanical outline

7.4 Support

7.4.1 General Support

General support for products can be found at Bluetechnix' support site https://support.bluetechnix.at/wiki

7.4.2 Board Support Packages

Board support packages and software downloads are for registered customers only
https://support.bluetechnix.at/software/

7.4.3 Blackfin® Software Support

7.4.3.1 BLACKSheep® OS

BLACKSheep® OS stands for a powerfully and multithreaded real-time operating system (RTOS) originally designed for digital signal processing application development on Analog Devices Blackfin® embedded processors. This high-performance OS is based on the reliable and stable real-time VDK kernel from Analog Devices that comes with VDSP++ IDE. Of course BLACKSheep® OS is fully supported by all Bluetechnix Core-Modules and development hardware.

7.4.3.2 LabVIEW

You can get LabVIEW embedded support for Bluetechnix Core Modules by Schmid-Engineering AG http://www.schmid-engineering.ch.

7.4.3.3 uClinux

You can get uClinux support (boot loader and uClinux) for Bluetechnix Core Modules at http://blackfin.uClinux.org.

7.4.4 Blackfin® Design Services

Based on more than seven years of experience with Blackfin, Bluetechnix offers development assistance as well as custom design services and software development.

7.4.4.1 Upcoming Products and Software Releases

Keep up to date with all product changes, releases and software updates of Bluetechnix at http://www.bluetechnix.com.

7.5 Dependability

7.5.1 MTBF

Please keep in mind that a part stress analysis would be the only way to obtain significant failure rate results, because MTBF numbers just represent a statistical approximation of how long a set of devices should last before failure. Nevertheless, we can calculate an MTBF of the Core Module using the bill of material. We take all the components into account. The PCB and solder connections are excluded from this estimation. For test conditions we assume an ambient temperature of 30°C of all Core Module components except the Blackfin® processor (80°C) and the memories (70°C). We use the MTBF Calculator from ALD (http://www.aldservice.com/) and use the reliability prediction MIL-217F2 Part Stress standard. Please get in touch with Bluetechnix (office@bluetechnix.com) if you are interested in the MTBF result.

8 Product History

8.1 Version Information

8.1.1 Argos2D – D120 (150-1020-1)

Version	Component	Type
1.0.0	ISM	ISM-MT9M131-Color (100-3202-2)
	CM	eCM-BF609-C-C-Q25S256F8 (100-1217-1)
	CB	eCAM-eCM-BF Carrier Board (100-2280-1)

Table 8.1: Overview Argos2D – D120 product changes

8.1.2 Argos2D – D121 (150-1021-1)

Version	Component	Type
1.0.0	ISM	ISM-AR0132AT-Mono (100-3200-2)
	CM	eCM-BF609-C-C-Q25S256F8 (100-1217-1)
	CB	eCAM-eCM-BF Carrier Board (100-2280-1)

Table 8.2: Overview Argos2D – D121 product changes

8.1.3 Argos2D – D122 (150-1022-1)

Version	Component	Type
1.0.0	ISM	ISM-AR0132AT-Color (100-3206-2)
	CM	eCM-BF609-C-C-Q25S256F8 (100-1217-1)
	CB	eCAM-eCM-BF Carrier Board (100-2280-1)

Table 8.3: Overview Argos2D – D122 product changes

8.1.4 Argos2D – D123 (150-1023-1)

Version	Component	Type
1.0.0	ISM	ISM-MT9P031-Mono (100-3210-2)
	CM	eCM-BF609-C-C-Q25S256F8 (100-1217-1)
	CB	eCAM-eCM-BF Carrier Board (100-2280-1)

Table 8.4: Overview Argos2D – D123 product changes

8.1.5 Argos2D – D124 (150-1024-1)

Version	Component	Type
1.0.0	ISM	ISM-MT9P031-Color (100-3204-2)
	CM	eCM-BF609-C-C-Q25S256F8 (100-1217-1)
	CB	eCAM-eCM-BF Carrier Board (100-2280-1)

Table 8.5: Overview Argos2D – D124 product changes

8.2 Anomalies

Version	Date	Description
V1.0.0	2013 02 11	No anomalies reported yet.

Table 8.6 – Product anomalies

8.3 Document Revision History

Version	Date	Document Revision
1	2013 02 11	First release V1.0 of the Document

Table 8.7: Revision history

9 Index