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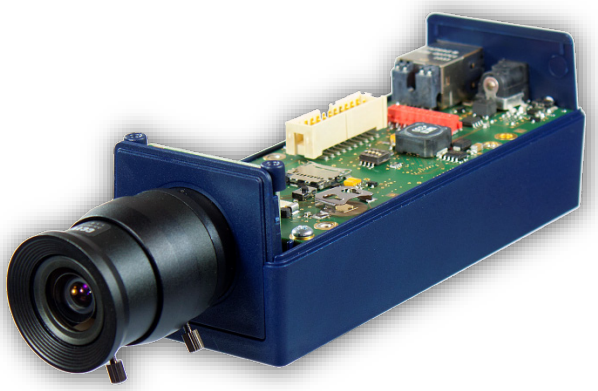
Embedding Ideas

Argos2D - A12x



User Manual

Version 1.1

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Argos®[2D] – A120 – User Manual

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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 – A12x 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

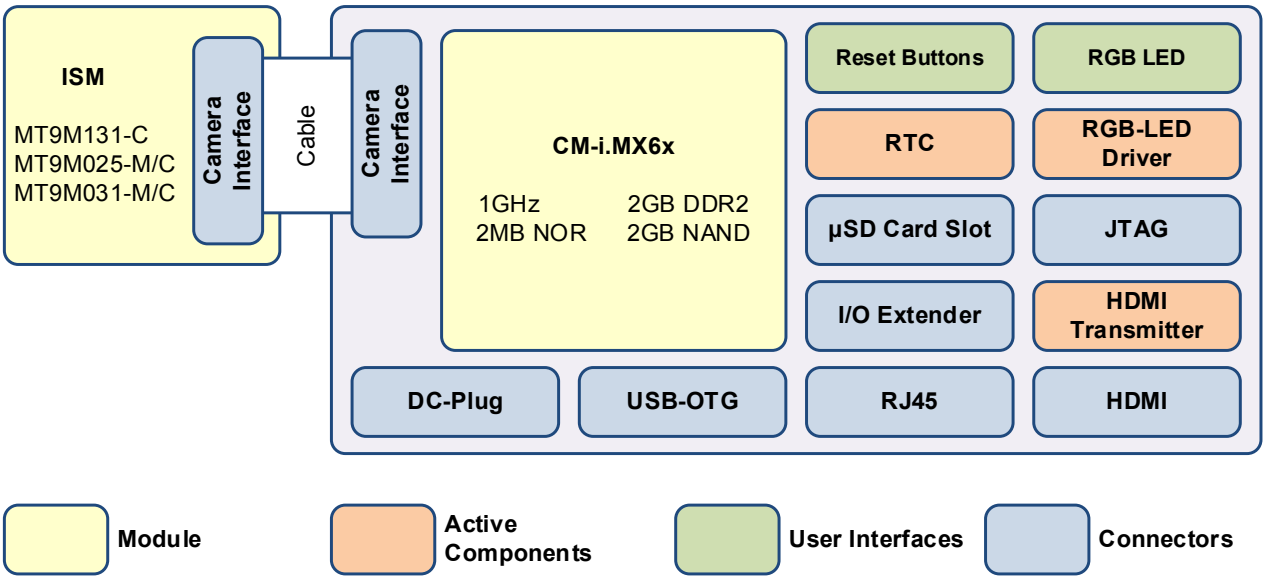

Figure 2.1: System Architecture

The Bluetechnix standard Image Sensor Interface (BLT-ISM-Connector) allows connecting various image sensors to the Argos2D – A12x (i.e. ISM-AR0132AT, ISM-MT9M131 or ISM-MT9P031).

To transmit the captured and processed data there are various interfaces on the Argos2D – A12x. 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 – A12x.

2.2 Models

All Argos2D A12x cameras are equipped with the i.MX carrier board, which contains all peripherals, the core module mount and interfaces including the ISM-connector, the CM-i.MX6x SoM as CPU board, the housing and the selected ISM.

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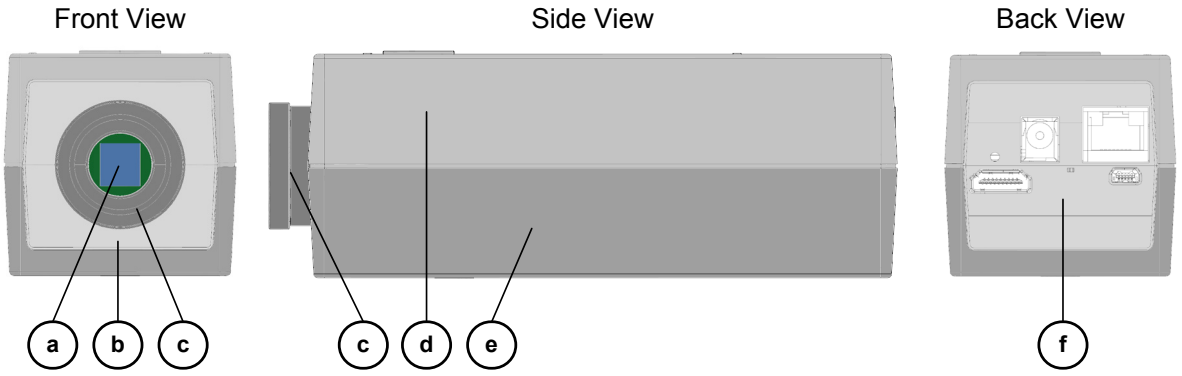

Figure 2.2: Argos2D – A12x views

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

2.2.1 Argos2D – A120 (150-1020-1)

The A120 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 – A121 (150-1021-1)

The A121 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 – A122 (150-1022-1)

The A122 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 – A123 (150-1023-1)

The A123 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 – A124 (150-1024-1)

The A124 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.

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2.3 Interfaces & Connectors

All Argos2D – A12x cameras are equipped with the same connectors and interfaces.

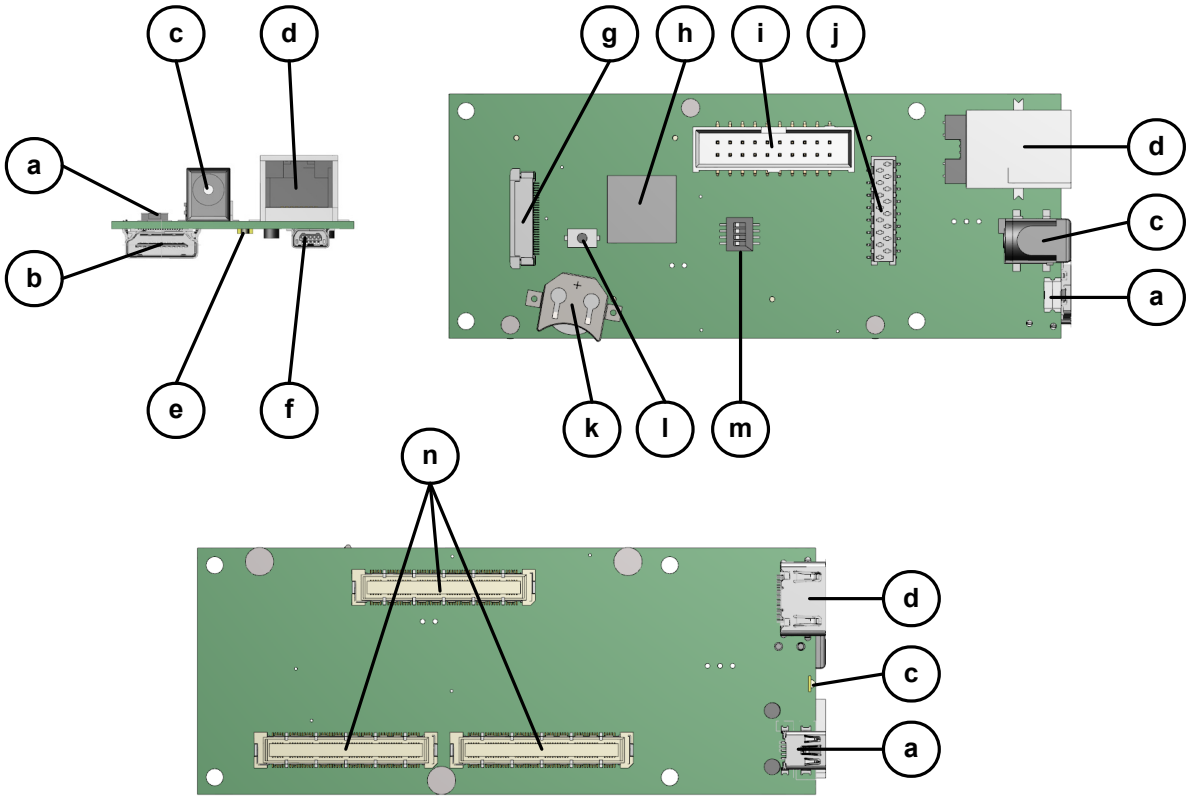

Figure 2.3: Argos2D – A12x connectors and interfaces

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

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3 Software Installation

3.1 Software-Development-Kit SDK

The SDK is build up on Linux. Bluetechnix offers a Board Support Package that is based on the U-Boot boot loader and the Linux kernel. The build environment is LTIB, the Linux Target Image Builder, which is Freescale's preferred way to offer Linux board support packages. Bluetechnix provides a patch set that is installed on top of Freescale's i.MX6x LTIB BSP. A guide for downloading and installing the SDK can be found in the CM-i.MX6x Software User Manual.

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.

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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.
4. Check if the CM is fully aligned on the CB
5. Take three M2 x 5mm screws and mount it.

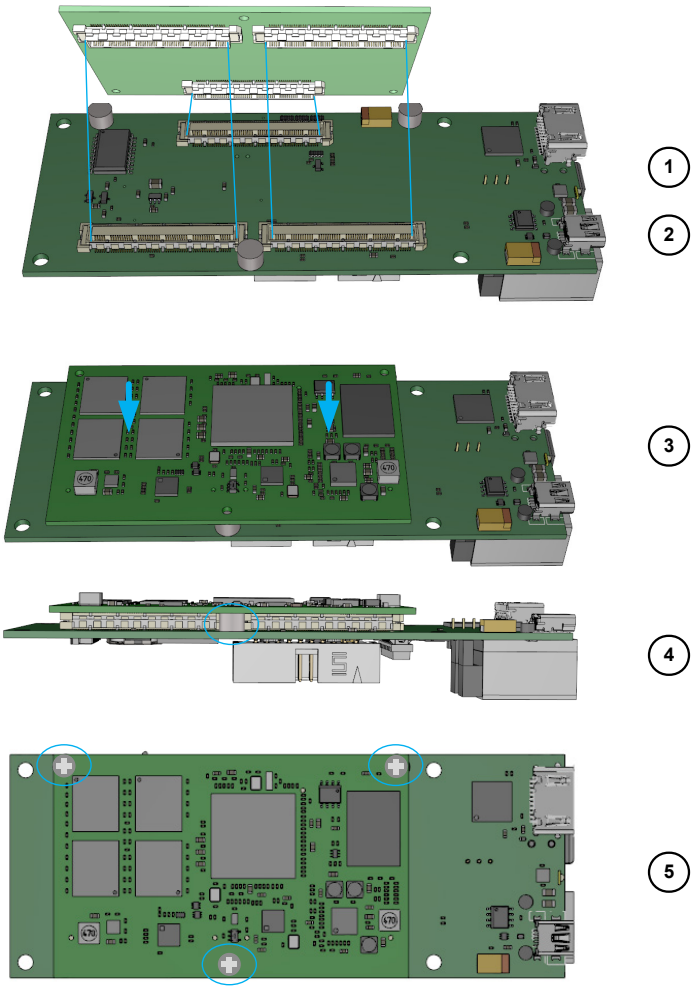

Figure 4.1: Connecting the Core Module and the Carrier Board

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 CM-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.

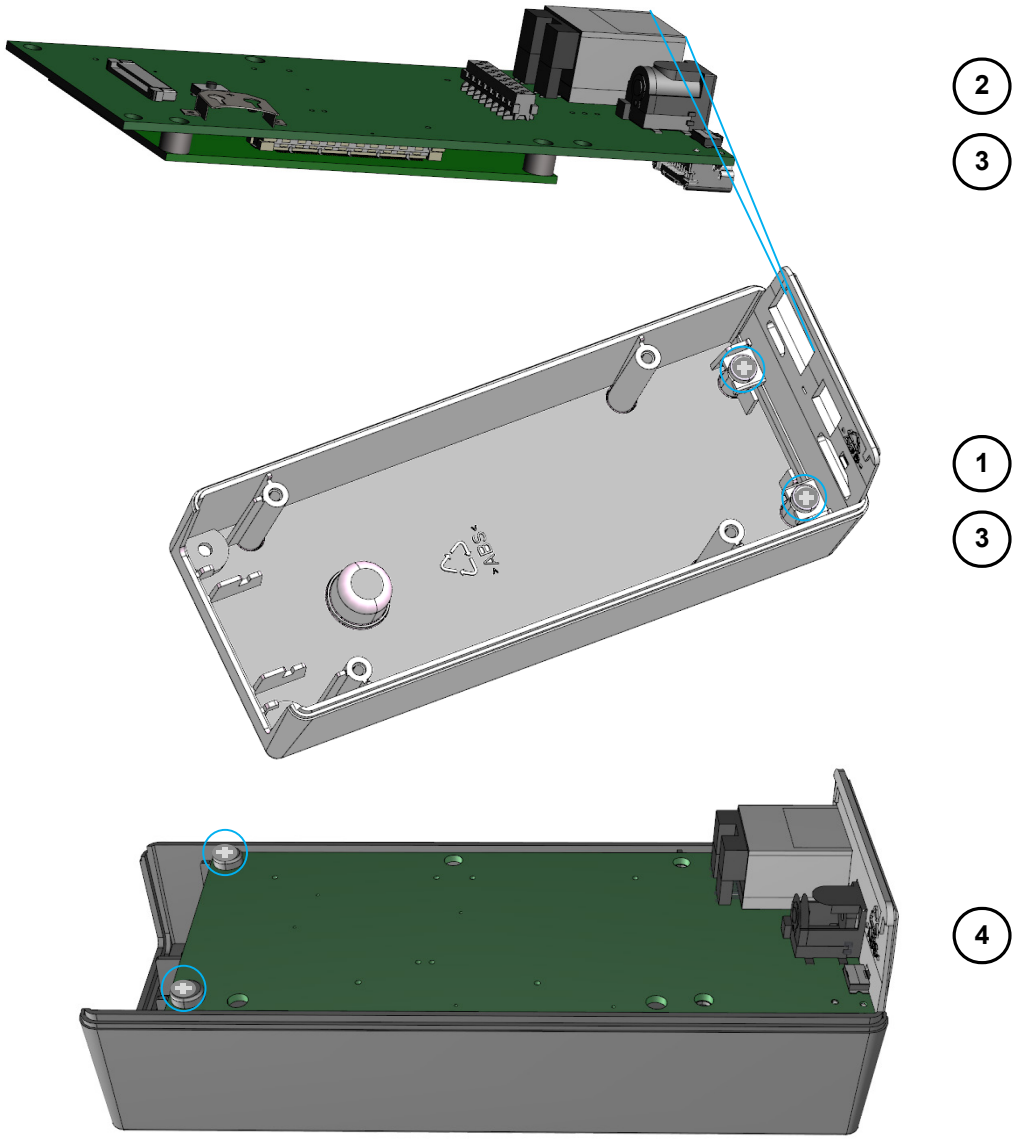

Figure 4.2: Connecting CM and CB with housing base

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 srews
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.

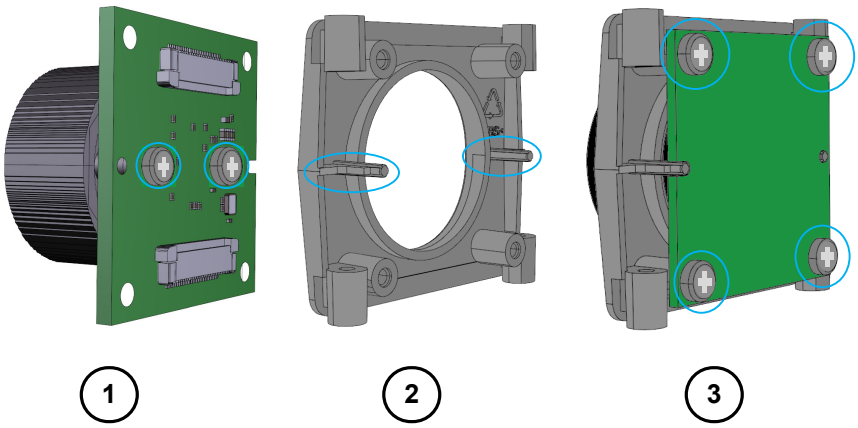

Figure 4.3: Connecting the ISM with front plane

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.

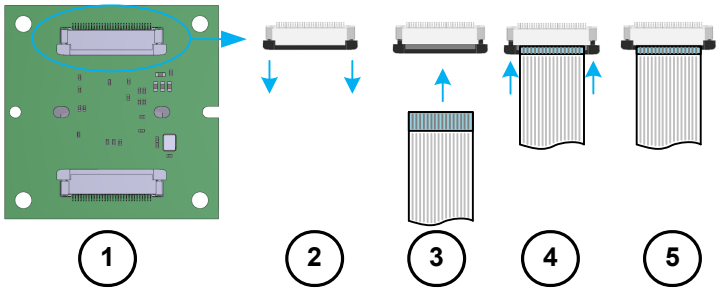

Figure 4.4: Connecting flex-foil cable with ISM

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.

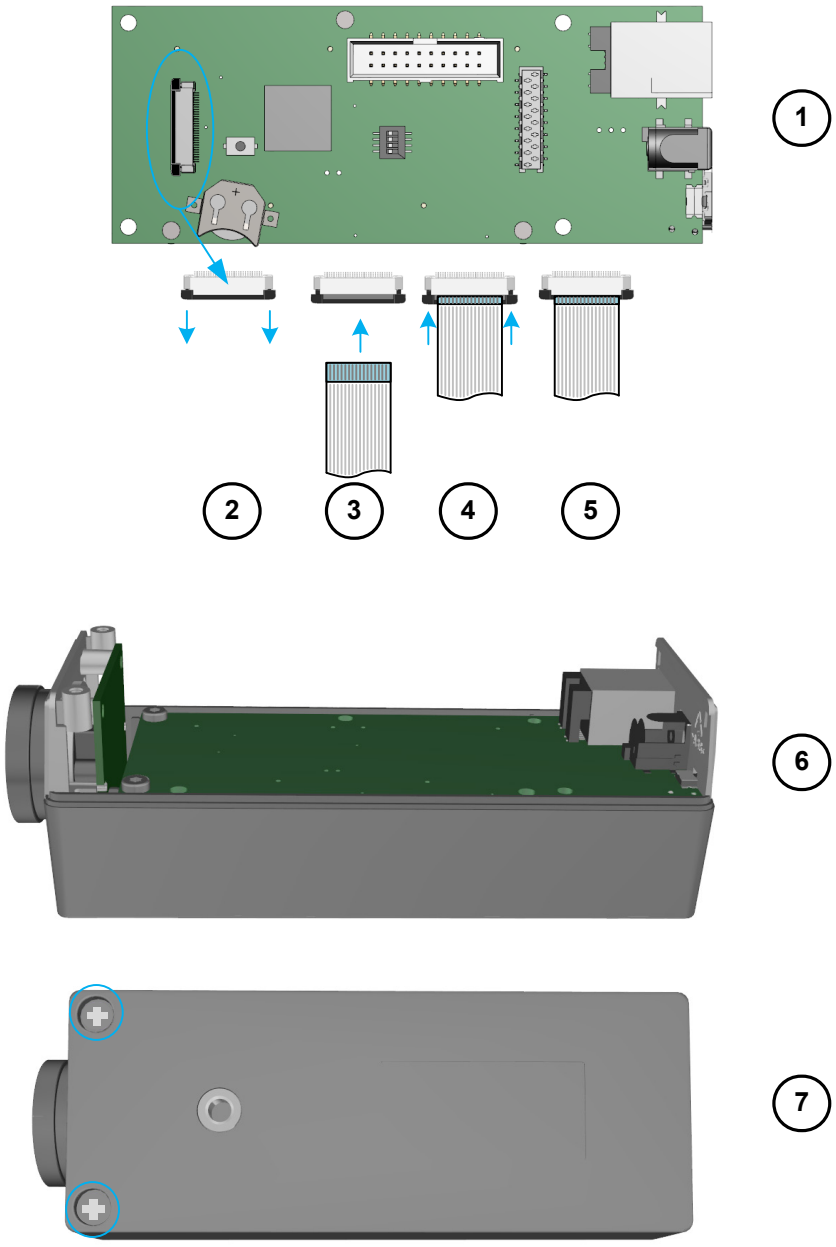

Figure 4.5: Connecting ISM and front plane to housing base

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.

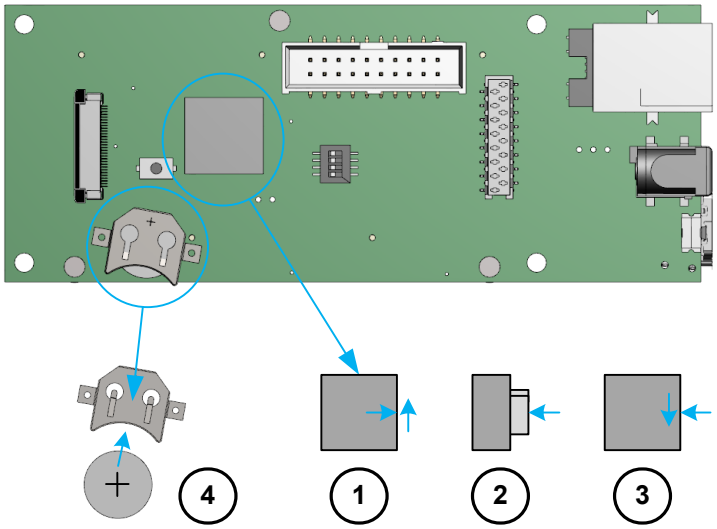

Figure 4.6: Inserting the µSD-Card and the coin cell

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.

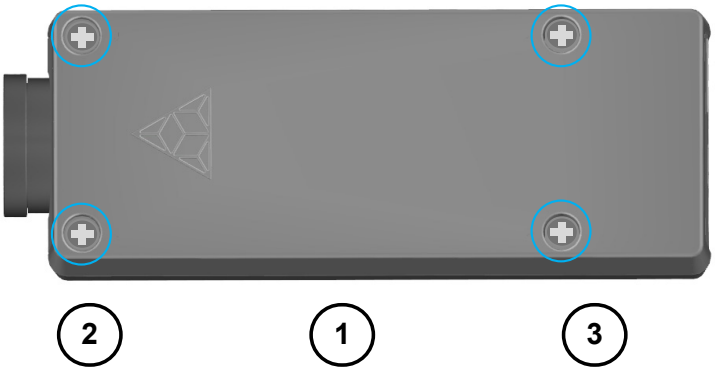

Figure 4.7: Connecting the housing cover with the base

5 Getting Started

A Guide how to start with your Argos®[2D] A120 Camera based on the CM-i.MX6x SoM can be found here.

6 Programming Environment

Use Eclipse IDE for C/C++ developers or an editor of your choice.

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	12	12	16	V
I_{IN}	Input current @ 12V	-	300	500	mA
V_{3V3}	Extender Voltage Supply	3.0	3.3	3.6	V
I_{3V3}	Extender Current Supply	-	-	300	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

The voltage levels and currents are only correct with the Bluetechnix default PMIC settings.

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	16	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[1]	°C
T_{STO}	Storage temperature	-55	150	°C
φ_{AMB}	Relative ambient humidity	-	90	%

Table 7.2: Absolute maximum ratings

[1] If extreme high ambient temperatures are expected (75°C in industrial environments or 60°C for commercial products), the user has to apply a heat spreader on CPU and DDR-RAM (avoid heat accumulation!). In addition the die temperature should be monitored regularly, so that the CPU and RAM clock can be throttled if necessary.

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.

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7.2 Connector and Interface Description

7.2.1 Reset button a(S4)

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

7.2.2 HDMI connector b(X10)

The HDMI connector provides a standard interface for digital video and audio signals. The HDMI/DVI transmitter is preprocessing the video signal from the IPU. The audio stream comes from the AUD5 interface of the i.MX6x.

7.2.3 Power connector c(X10)

The Argos2D - A12x works with a single power supply of 12V to 16V.

7.2.4 RJ45 Ethernet connector d(X8)

As the Ethernet PHY is already integrated on the Core Module, the LAN signals are routed directly to a RJ45 LAN connector.

7.2.5 Status LED e(V7)

The RGB LED is connected to the TCA62724FMG RGB-LED driver and can be used for status signaling.

7.2.6 USB-OTG connector f(X6)

The i.MX6x USB-OTG internal USB-OTG PHY is routed to a mini USB-A/B connector.

7.2.7 ISM connector g(X9)

Pin No.	Signal Name	Type	Description
1	VCAMA	PWR	Camera Analog Voltage Supply
2	GND	PWR	Power Ground
3	SADDR	NC	Not Connected
4	CAMCLK	O	Camera Master Clock
5	NRESET	O	Global Reset
6	SIO.C	O	Configuration Bus Clock Line
7	SIO.D	I/O	Configuration Bus Data Line
8	VCAMC	PWR	Camera Core Voltage Supply
9	GND	PWR	Power Ground
10	PPI0.CLK	I	Pixel Clock
11	PPI0.SY2	I	VSYNC
12	PPI0.SY1	I	HSYNC
13	PF45	O	Camera Trigger
14	STROBE	I	Strobe Signal from Camera (available only on solder pad)
15	PPI0.D0	I	Pixel Data
16	PPI0.D1	I	Pixel Data
17	PPI0.D2	I	Pixel Data
18	PPI0.D3	I	Pixel Data
19	VCAMIO	PWR	Camera IO Power Supply

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Pin No.	Signal Name	Type	Description
20	GND	PWR	Power Ground
21	PPI0.D4	I	Pixel Data
22	PPI0.D5	I	Pixel Data
23	PPI0.D6	I	Pixel Data
24	PPI0.D7	I	Pixel Data
25	GND	PWR	Power Ground
26	PPI0.D8	I	Pixel Data
27	PPI0.D9	I	Pixel Data
28	PPI0.D10	I	Pixel Data
29	PPI0.D11	I	Pixel Data
30	PF44	O	Output Enable (Active Low)

Table 7.3: ISM connector **g**(X9)

7.2.8 µSD-Card holder h(X7)

The SDHC-Card signals are directly connected to the SD Port of the CM-i.MX6x. A Micro SD-Card connector mounted on the top side of the board supports µSD cards.

7.2.9 JTAG connector i(X12)

Pin No.	Signal Name	Type	Description
1	JTAG.REF	PWR	2V8 Reference Voltage
2	JTAG.PWR	PWR	3V3 Supply if S1.4 is on
3	JTAG.nTRST	I 10k PU	JTAG Test Reset
4	GND	PWR	Power Ground
5	JTAG.TDI	I 10k PU	JTAG Test Data Input
6	GND	PWR	Power Ground
7	JTAG.TMS	I 10k PU	JTAG Test Mode Select
8	GND	PWR	Power Ground
9	JTAG.TCK	I 10k PD	JTAG Test Clock
10	GND	PWR	Power Ground
11	10k PD	-	10k Pull Down
12	GND	PWR	Power Ground
13	JTAG.TDO	O 10k PU	JTAG Test Data Output
14	GND	PWR	Power Ground
15	CTRL.nRESET	I	Global Reset
16	GND	PWR	Power Ground
17	JTAG.nDE	I 10k PU	JTAG Debug
18	GND	PWR	Power Ground
19	10k PD	-	10k Pull Down
20	GND	PWR	Power Ground

Table 7.4: JTAG connector **i**(X12)

7.2.10 I/O extender connector j(X11)

Pin No.	Signal Name	Type	Description
1	UART1.RXD	I	UART1 Receive Data
2	I2C3.SDA	I/O 3k PU	I2C Data
3	UART1.TXD	O	UART1 Transmit Data
4	I2C3.SCL	O 3k PU	I2C Clock
5	GND	PWR	Power Ground
6	GND	PWR	Power Ground

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Pin No.	Signal Name	Type	Description
7	P_SW4_3V3	PWR	3.3V
8	P_SW4_3V3	PWR	3.3V
9	UART2.RXD	I 10k PU	UART2 Receive Data
10	CAN1.RXD	I	CAN Receive Data
11	UART2.TXD	O	UART2 Transmit Data
12	CAN1.TXD	O	CAN Transmit Data
13	ECSPI2.SCLK	O	SPI CLK
14	ECSPI2.MISO	I	SPI MISO
15	ECSPI2.SS0	O	SPI Select0
16	ECSPI2.MOSI	O	SPI MOSI

Table 7.5: I/O extender connector **j**(X11)

7.2.11 RTC-battery holder k(G1)

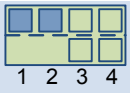
There is also a possibility to add a 12mm coin cell to keep the RTC running. The Argos2D – A12x is delivered only with a coin cell holder but without a battery.

7.2.12 Reset button l(S2)

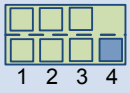
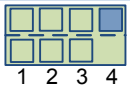
The push buttons perform a reset.

7.2.13 Boot mode switch m(S1)

To set the right boot mode for the CM-i.MX6x, only the switches 1, 2 and 3 are used.

Switch Setting	Boot Description
	Boot from SPI NOR flash
	Boot from SD card
	USB/UART boot mode

Some JTAG debuggers, like the PEEDI JTAG, short pins #1 and #2 (VREF and VSUPPLY) of the 20-pin ARM JTAG header (X12). On the Argos®^{2D} A120, these pins are connected to different voltages (2V8 vs. 3V3) and must not be shortened. If your JTAG device/connector shorts pins #1 and #2, the following switch setting must be done on Argos®^{2}. It disconnects 3V3 from JTAG pin #2 (VSUPPLY).

Switch Setting	Description
	Disconnect 3V3 from JTAG pin #2 (VSUPPLY)
	Connect 3V3 to VSUPPLY

7.2.14 Core Module connectors n(X1, X2, X3)

The three connectors connecting the CM-i.MX6x Module, for more information take a look into the CM-i.MX6x Hardware User Manual.

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7.3 Mechanical Outline

All dimensions are given in mm.

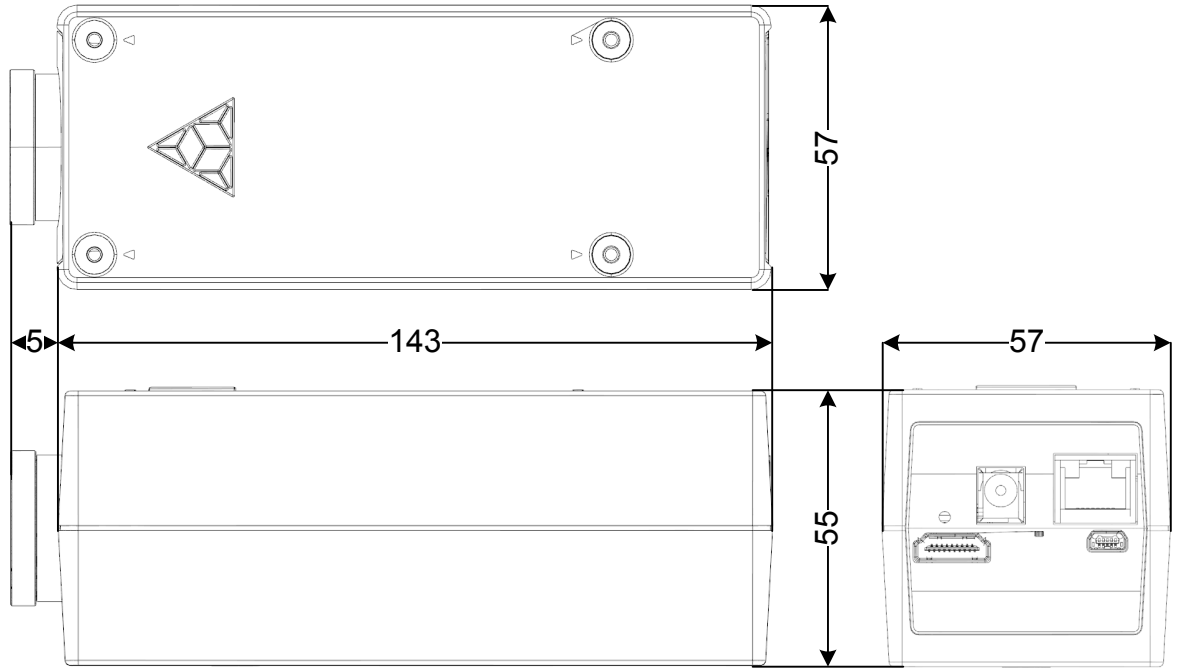

Figure 7.1: Mechanical outline

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/wiki/Argos%C2%AE2D_A120_Camera.

7.4.3 i.MX Freescale Software Support

https://community.freescale.com/community/imx

7.4.3.1 Upcoming Products and Software Releases

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

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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.

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8 Product History

8.1 Version Information

8.1.1 Argos2D – A120 (150-1020-1)

Version	Component	Type
1.0.0	ISM	ISM-MT9M131-Color (100-3202-2)
	CM	CM-i.MX6Q-C-C-Q24S2048F2N2048 (100-1481-1)
	CB	eCAM-CM-i.MX6x Carrier Board (100-4122-1)

Table 8.1: Overview Argos2D – A120 product changes

8.1.2 Argos2D – A121 (150-1021-1)

Version	Component	Type
1.0.0	ISM	ISM-AR0132AT-Mono (100-3200-2)
	CM	CM-i.MX6Q-C-C-Q24S2048F2N2048 (100-1481-1)
	CB	eCAM-CM-i.MX6x Carrier Board (100-????-1)

Table 8.2: Overview Argos2D – A121 product changes

8.1.3 Argos2D – A122 (150-1022-1)

Version	Component	Type
1.0.0	ISM	ISM-AR0132AT-Color (100-3206-2)
	CM	CM-i.MX6Q-C-C-Q24S2048F2N2048 (100-1481-1)
	CB	eCAM-CM-i.MX6x Carrier Board (100-????-1)

Table 8.3: Overview Argos2D – A122 product changes

8.1.4 Argos2D – A123 (150-1023-1)

Version	Component	Type
1.0.0	ISM	ISM-MT9P031-Mono (100-3210-2)
	CM	CM-i.MX6Q-C-C-Q24S2048F2N2048 (100-1481-1)
	CB	eCAM-CM-i.MX6x Carrier Board (100-????-1)

Table 8.4: Overview Argos2D – A123 product changes

8.1.5 Argos2D – A124 (150-1024-1)

Version	Component	Type
1.0.0	ISM	ISM-MT9P031-Color (100-3204-2)
	CM	CM-i.MX6Q-C-C-Q24S2048F2N2048 (100-1481-1)
	CB	eCAM-CM-i.MX6x Carrier Board (100-????-1)

Table 8.5: Overview Argos2D – A124 product changes

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8.2 Anomalies

Version	Date	Description
V1.0.0	2013 02 06	No anomalies reported yet.

Table 8.6 – Product anomalies

8.3 Document Revision History

Version	Date	Document Revision
1	2013 02 06	First release V1.0 of the Document

Table 8.7: Revision history

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