

# Hardware User Manual

**DEV-i.MX53 V1.x**

*...maximum performance at minimum space*

## Contact

Bluetechnix Mechatronische Systeme GmbH

Waidhausenstraße 3/19

A-1140 Vienna

AUSTRIA/EUROPE

[office@bluetechnix.at](mailto:office@bluetechnix.at)

<http://www.bluetechnix.com>

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## Table of Contents

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i.MX Core Modules.....	6
i.MX Development Boards.....	8
1 Introduction .....	9
1.1 Overview.....	9
1.2 Available extensions .....	10
1.3 Key Features .....	10
1.3.1 Core Modules .....	10
1.3.2 Active Components on DEV-i.MX53.....	10
1.3.3 Optional Parts on DEV-i.MX53 .....	10
1.4 Applications.....	10
2 General Description .....	12
2.1 Functional Description.....	12
2.1.1 Interface Interconnection.....	13
2.1.2 Powering.....	13
2.1.3 Audio .....	13
2.1.4 HDMI.....	14
2.1.5 JTAG.....	14
2.1.6 USB/UART Bridge.....	14
2.1.7 USB .....	14
2.1.8 USB-OTG.....	14
2.1.9 SDHC-Card.....	14
2.1.10 SATA .....	14
2.1.11 Ethernet.....	14
2.1.12 ISM Interface.....	14
2.1.13 CAN* .....	15
2.1.14 LED Driver.....	15
2.1.15 ADC .....	15
2.1.16 Acceleration Sensor.....	15
2.2 PCB Placement .....	16
2.3 Mechanical Outline.....	16
3 Specifications.....	19
3.1 Operating Conditions .....	19
3.2 Maximum Ratings .....	19
3.3 Analog Inputs.....	19
3.4 ESD Sensitivity .....	19
4 Connector Description.....	20

4.1	Digital Video Extension Connector (X22).....	20
4.1.1	Camera Sensor Interface Port (CSI0) .....	20
4.1.2	LCD Port (DISP0).....	20
4.1.3	Pin Description Table .....	20
4.2	GPIO/Automation Extension Connector (X23) .....	22
4.2.1	Pin Description Table .....	23
4.3	Image Sensor Connector X21 (BLT-ISM-Connector).....	26
4.4	Reset / Power-On Connector (X10).....	26
4.5	Auxiliary Power Supply Connector (X5).....	27
5	Switches, Jumpers and LEDs .....	28
5.1	RGB LED (V12) .....	28
5.2	Push Buttons (S4, S3) .....	28
5.3	Backup Battery (optional) .....	28
5.4	Board Configuration Switches (S2, S1).....	28
6	Support .....	30
6.1	General Support.....	30
6.2	Board Support Packages .....	30
6.3	i.MX Software Support .....	30
6.3.1	Linux .....	30
6.3.2	Win CE.....	30
6.4	i.MX® Design Services .....	30
6.4.1	Upcoming Products and Software Releases.....	30
7	Ordering Information .....	31
7.1	Predefined mounting options for DEV-i.MX53.....	31
8	Dependability.....	32
8.1	MTBF.....	32
9	Product History .....	33
9.1	Version Information.....	33
9.2	Anomalies.....	33
10	Document Revision History.....	34
11	List of Abbreviations .....	35
A	List of Figures and Tables.....	37

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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.

## **i.MX Core Modules**

### **CM-i.MX27-C-C-Q26S128F32N512**

The Core Module CM-i.MX27 is powered by Freescales' SoC i.MX27 (ARM 926 core, up to 400MHz). It addresses 128MB DDR-RAM, has an onboard NOR-flash of 32MByte and a NAND-flash with 512MByte at a size of 55x45mm.

### **CM-i.MX31-C-C-Q26S128F40N128-E**

The Core Module CM-i.MX31 is powered by Freescales' SoC i.MX31 (ARM1136JF-S core, up to 532MHz). It addresses 128MB DDR-RAM, has an onboard NOR-flash of 40MByte and a NAND-flash with 128MByte at a size of 55x45mm. Core module is available as connector or BGA.

### **CM-i.MX53-C-I-Q24S1024F4N2048**

The Core Module CM-i.MX53 is powered by Freescales' SoC i.MX53 (ARM® Cortex™-A8, up to 1GHz). It addresses 1024MB DDR2-SDRAM, has an onboard NOR-flash of 4MByte and a NAND-flash with 2048MByte at a size of 80x45mm.

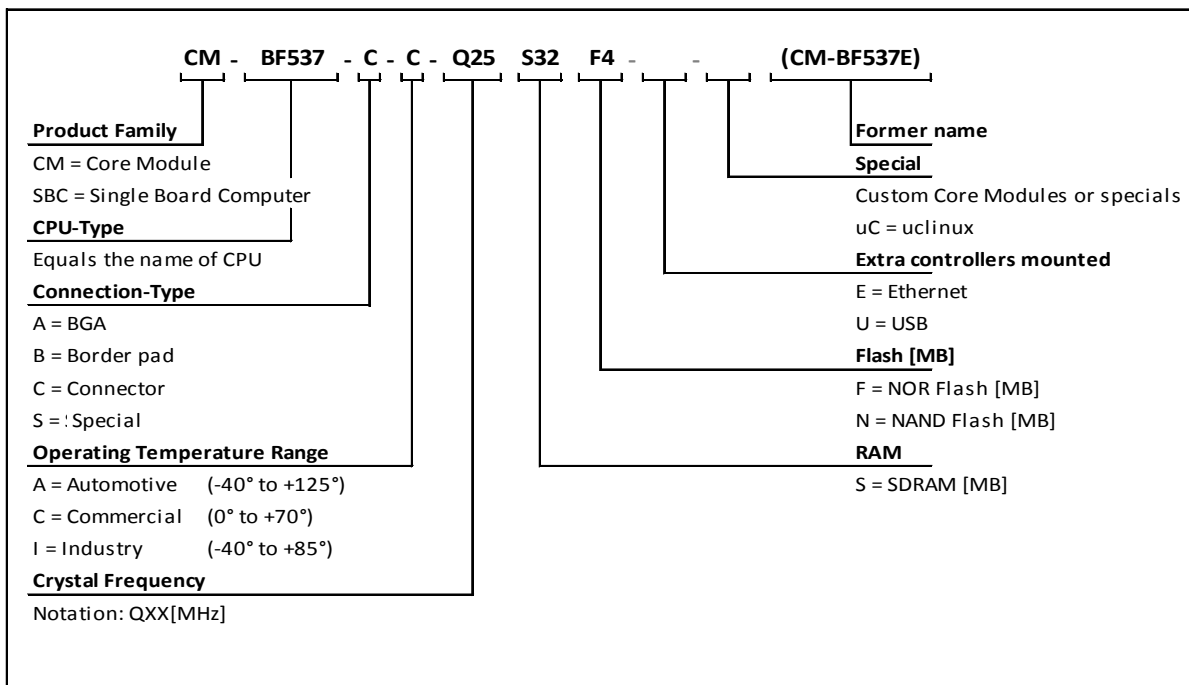
## Core Module naming information

The idea is to put more Core Module specific technical information into the product name. New Core Module names will have following technical information covered in their names.

- Product Family,
- CPU-Type,
- Connection-Type,
- Operating Temperature Range,
- Crystal Frequency [MHz],
- RAM [MB],
- Flash [MB],
- External Controllers
- Optional
  - Special and/or
  - Former name

That expands of course the name but allows the customer to get the most important Core Module specific information at the first sight. Have a look at the example below to get an idea of the new Core Module names.

### Example CM-BF537-C-C-Q25S32F4 (CM-BF537E)



## i.MX Development Boards

### [DEV-i.MX27](#)

The DEV-i.MX27 development board is an extendable development platform for the CM-i.MX27 processor modules. With display connector and keypad it can be used as a reference design for a low power mobile handheld device powered by a single Lithium Ion battery. The development board provides all interfaces of the connector version on dedicated expansion connectors. Extender boards can be plugged on top of the development board in order to enable additional interfaces.

### [DEV-iMX31](#)

The DEV-i.MX31 Development Board is an extendable development platform for the CM-i.MX31 processor module. With display connector and keypad it can be used as a reference design for a low power mobile handheld device powered by a single Lithium Ion battery. The development board provides all interfaces of the connector version on dedicated expansion connectors. Extender boards can be plugged on top of the development board in order to enable additional interfaces.

### [SBC-i.MX51-S-C-Q24S512N2048](#)

The Single-Board Computer SBC-i.MX51 is based on Freescale's high-performance i.MX51 mobile platform, incorporating an ARM Cortex-A8 CPU, an Image Processing Unit (IPUv3EX), a Video Processing Unit (VPU) and a Graphical Processing Unit (GPU). The IPUv3EX provides comprehensive support for connectivity to displays and cameras. The VPU supports hardware encoding and decoding of MPEG-4, H.263, H.264 and many more standards. The GPU serves 3D and 2D acceleration in hardware. The board's memory capabilities (NAND Flash, DDR2) and numerous interfaces like Ethernet, HDMI, 4xUSB and USB-OTG turn the SBC-i.MX51 into the ultimate development board for future high-end embedded devices.

### [DEV-i.MX53](#)

The DEV-i.MX53 development board is an extendable development platform for the CM-i.MX53 processor module. The development board provides all interfaces of the connector version (Ethernet, HDMI, 4xUSB and USB-OTG) on dedicated extender connectors. Extender boards can be plugged on top of the development board in order to enable additional interfaces.

### [Extender boards](#)

Extender boards (EXT-SBC-i.MX51-) are expanding the development board SBC-i.MX51 by several interfaces and functionalities. Targeted application areas are: audio/video processing, security and surveillance, Ethernet access, positioning, automation and control, experimental development and measuring.

Note! Bluetechnix is offering tailored board developments as well.



# 1 Introduction

The DEV-i.MX53 Development Board is a feature rich, low cost rapid development platform designed to decrease time-to-market of customized applications. It supports Bluetechnix' powerful i.MX53 based Core Module. The development board provides all interfaces on dedicated connectors and features the latest extender socket (bottom side) for upcoming extender boards. The form factor of the DEV-i.M5x allows easy integration of the board into OEM products.

In combination with any of Bluetechnix' CM-i.MX53 the DEV-i.MX53 is a future proof embedded development platform for high sophisticated applications in all areas!

Target applications include industrial automation and control systems as well as applications making use of the extensive video features.

## 1.1 Overview

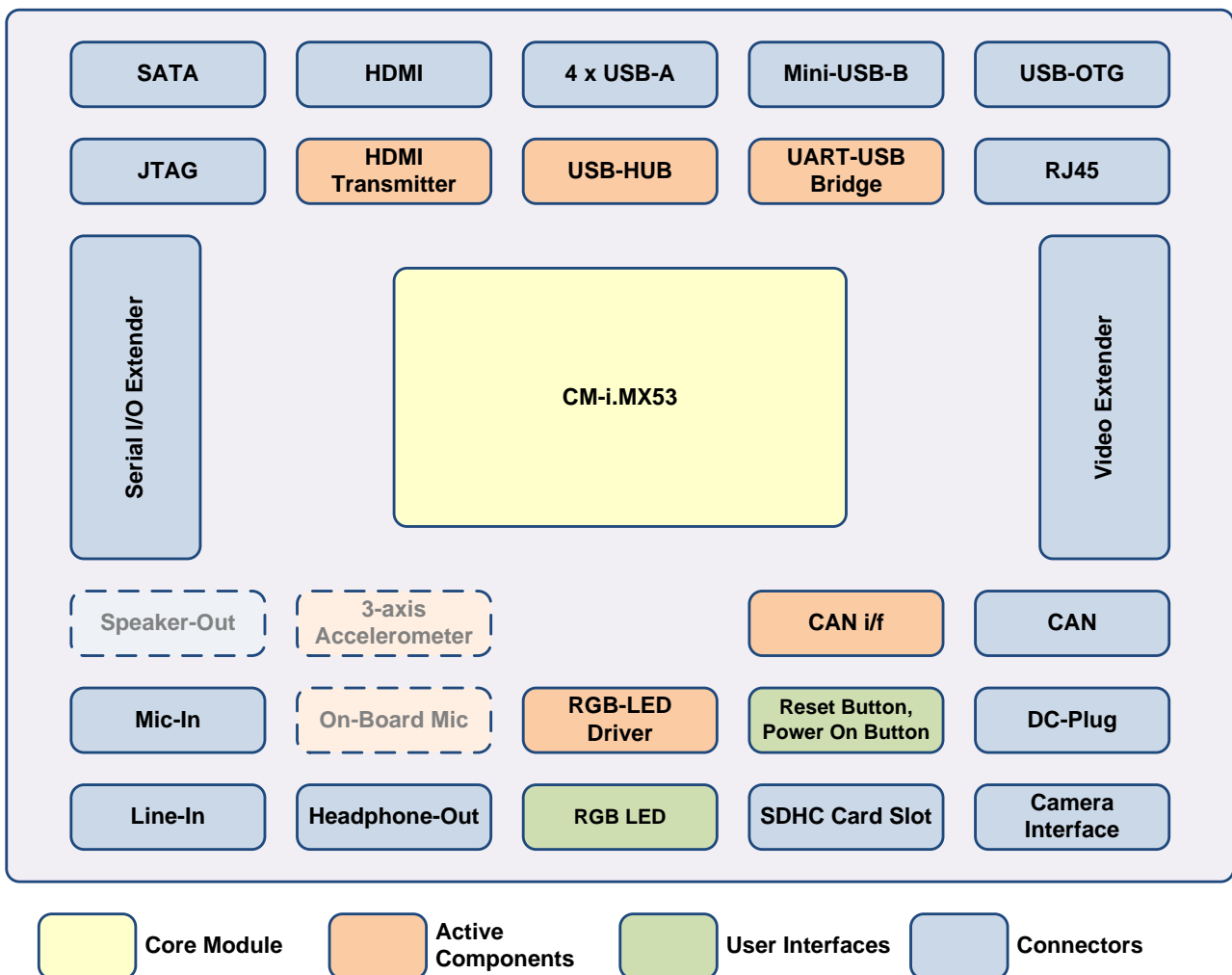


Figure 1-1: Overview of the main components

## 1.2 Available extensions

In addition, different extensions boards from Bluetechnix are available. Further boards are added based on the number of customer demands. All specifications you need to design a custom board of your own are freely available so you can start your design right away. Bluetechnix also offers design support for your custom extensions. The following extensions are currently planned and will be available soon.

- EXT-i.MX53-COMM
  - GPS
  - GSM
  - UMTS
  - Bluetooth/WLAN
  - Display Interface for TFT Displays with RGB interface
  - Two Display Interfaces for TFT Displays with LVDS interface
  - Image Sensor Interface
- EXT-i.MX53-EXP
  - Experimental board making every pin on the extension board available on a test point (allows for rapid prototyping)

## 1.3 Key Features

### 1.3.1 Core Modules

The DEV-i.MX53 allows the use of i.MX Core Modules based on the i.MX53 processor family.

### 1.3.2 Active Components on DEV-i.MX53

- HDMI/DVI Transmitter (Analog Devices **AD9889**)
- 7 Port USB HUB (SMSC **USB2517**)
- DC-DC Converters (5.0V: **LM3485**; 3.3V: **ADP2301**; 1.8V: **ADP2108**)
- USB/UART Bridge (Silicon Labs **CP2104**)
- CAN Transceiver (TI **SN65HVD232D**)
- RGB-LED driver with I<sup>2</sup>C interface (Toshiba **TCA62724FMG**)
- 4 Channel ADC (**AD7993**) for voltage monitoring or resistive touch panels

### 1.3.3 Optional Parts on DEV-i.MX53

- On-board microphone (Knowles Acoustics **SPM0208HD5**)
- Acceleration sensor (Freescale **MMA7660FCR1**)
- 2x 2.5W Audio Amp (ON-Semi **NCP2820FCT2G**)

Please understand that these are only active parts and require additional connectors and passive parts as well. We provide information regarding these parts on request.

## 1.4 Applications

- Automotive infotainment
- Single Board Computer
- Tablets

- Smart Mobile Devices
- Human-Machine-Interface
- Medical Devices
- Video Conference Systems
- Imaging and Consumer Multimedia
- Set Top Boxes
- Video Conference Applications
- Portable Media Players
- Industrial Applications
- High-end Mobile Internet Devices (MID), High-end PDAs
- Netbooks (web tablets)
- Nettops (internet desktop devices)
- High-end portable media players (PMP) with HD video capability
- Portable navigation devices (PND)

## 2 General Description

The DEV-i.MX53 is a development board for i.MX Core Modules based on the ARM Cortex A8™ core (CM-i.MX53). The development board features a broad spread selection of available interfaces from the Core Module, like USB, USBOTG, Ethernet, SATA, SD-Card, HDMI, CAN\*, and analog audio. In addition there is the possibility to access unused interfaces by applying an extension board to the extension connectors located on the bottom side.

\* Available only for Industrial Core Modules (see chapter 7).

### 2.1 Functional Description

Figure 2-1 shows the on-board components and how they are connected to the Core Module. A more precise listing including which interface is routed to which board extension connectors is shown in the interconnection tables below.

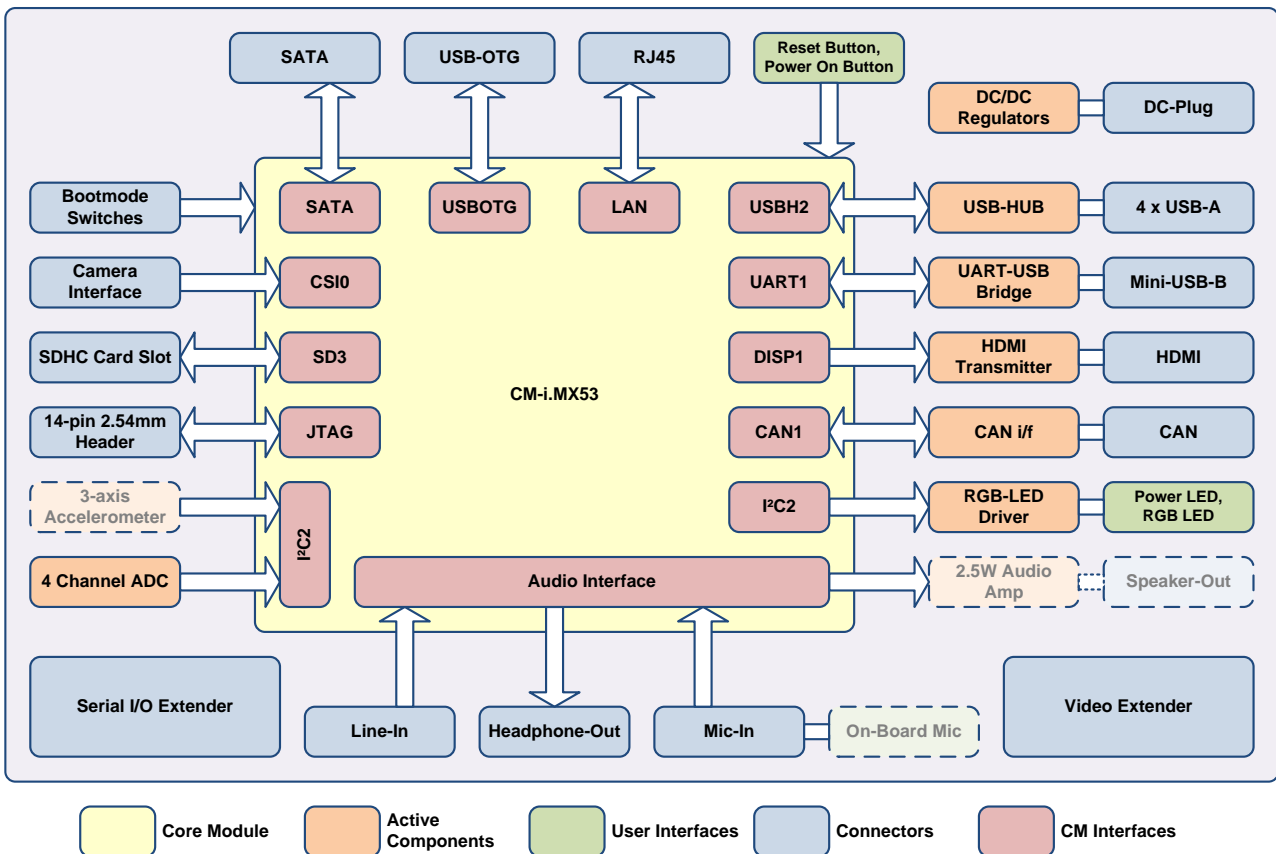


Figure 2-1: DEV-i.MX53 Interconnection Diagram

### 2.1.1 Interface Interconnection

The following table lists all available interfaces from the Core Module and how they are interconnected on the Development Board.

Interface	Category	Pins	Connected to	Comment
<b>AUDIO</b>	Analog Audio	8	Triple 3.5mm Audio Jack	
<b>AUD5</b>	Digital Audio	6	HDMI Transmitter	
<b>CAN1</b>	CAN	2	CAN Transceiver	
<b>eCSPI1</b>	SPI	5	Extension Connector	SS0 + SS1
<b>eCSPI2</b>	SPI	5	Extension Connector	SS0 + SS1
<b>eSDHC2</b>	SD-Card	11	Extension Connector	8-bit
<b>eSDHC3</b>	SD-Card	6	SD-Card	4-bit
<b>FIRI</b>	UART (IrDA)	2	Extension Connector	2-bit
<b>CSI0</b>	IPU	14	BLT-ISM interface; Extension Connector	10-bit
<b>DIO</b>	IPU	21	Extension Connector	18-bit
<b>DI1</b>	IPU	27	HDMI Transceiver	24-bit
<b>LAN</b>	Ethernet	6	RJ45 Socket	
<b>LVDS0</b>	LDB	10	Extension Connector	
<b>LVDS1</b>	LDB	10	Extension Connector	
<b>OWIRE</b>	OWIRE	1	Extension Connector	
<b>PWM</b>	PWM	2	Extension Connector	
<b>I<sup>2</sup>C2</b>	I <sup>2</sup> C	2	RGB-LED Driver, Acceleration Sensor, HDMI Transmitter, Extension Connector	Pull-Ups on Board
<b>I<sup>2</sup>C3</b>	I <sup>2</sup> C	2	Extension Connector	No Pull-Ups
<b>SATA</b>	SATA	4	Serial ATA Connector	Supply for 2.5" HDD
<b>UART1</b>	UART	2	UART-USB Bridge	
<b>UART2</b>	UART	4	Extension Connector	
<b>UART3</b>	UART	4	Extension Connector	
<b>USBOTG</b>	USB	2	Mini USB-AB Connector	
<b>USBH1</b>	USB	2	USB Hub	

Table 2-1: CM-i.MX53 Interface routing

### 2.1.2 Powering

The DEV-i.MX53 works with a single power supply of 12V to 16V. This input voltage is also routed to the extension connectors and can be used there, e.g. for TFT backlight etc.

If stand-alone operation is desired, an auxiliary plug provides the option to connect a Li-Ion battery pack with an external battery charger.

### 2.1.3 Audio

The audio interface is used to deliver a standard PC audio interface with Microphone-In, Line-In and Line-Out. Standard 3,5mm audio jacks are used. A Headset can be connected to the Microphone-In and Line-Out connectors.

On request there is the possibility to mount two 2.5W amps. The speakers can be applied to the screw-less terminal connectors X18 and X19.

On request an on-board microphone can be mounted next to the audio jacks.

#### 2.1.4 HDMI

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.MX53x. The device can be accessed via the I<sup>2</sup>C1 bus with the device address 0x39.

#### 2.1.5 JTAG

A standard ARM JTAG connector (20 pins, 2.54mm pitch) is available for processor debugging.

#### 2.1.6 USB/UART Bridge

The UART1 is connected to a SiLabs CP210x, which implements the USB to UART Bridge. A mini USB-B connector is connected to the device.

#### 2.1.7 USB

The USBH1 port of the DEV-i.MX53 is connected to a seven port USB HUB (SMSC USB2517). Consequently the board features four standard USB-A connectors, three USB lanes are routed to the IO-extension connector.

#### 2.1.8 USB-OTG

The i.MX53' internal USB-OTG PHY is routed to a mini USB-A/B connector.

#### 2.1.9 SDHC-Card

The SDHC-Card signals are directly connected to the SD3 port of the CM-i.MX53. A standard SD-Card connector mounted on the bottom side of the board supports SD and SDHC cards.

#### 2.1.10 SATA

The DEV-i.MX53 allows connecting one SATA HDD or SSD. The 5.0V supply which is needed for most 2.5" HDDs or SSDs is available on the screw-less terminal connector X25. If a 3.5" HDD is needed, the power supply has to be realized externally.

The user has to make sure, that no more than 500mA will be drawn from the 5.0V terminal. A 1A fuse is populated on the DEV-board.

#### 2.1.11 Ethernet

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

#### 2.1.12 ISM Interface

The camera sensor interface signals (CSI0) are routed to a 30 pin ZIF connector. The connector is compatible to the Bluetechnix ISM interface and allows connecting all available [Image Sensor Modules](#) from Bluetechnix.

### 2.1.13 CAN\*

A SN65HVD232D CAN transceiver is present on the Development Board, which allows integrating the board into a CAN bus infrastructure. A termination resistor is designed-in, but not populated. If the termination is needed, a 120Ω 0402 SMD resistor can be soldered.

\* Available only for Industrial Core Modules (see chapter 7).

### 2.1.14 LED Driver

A RGB LED is mounted for status signaling. The LED is connected to a TCA62724FMG I<sup>2</sup>C RGB LED driver. The device can be accessed via the I<sup>2</sup>C1 bus with the device address 0x55.

### 2.1.15 ADC

The AD7993 analog to digital converter has two possible functions. By default it can be used for battery supervisory to measure battery voltage and charging current. If the battery charger won't be used, the four channels are available on the extension connectors and it is possible to connect them to a touch screen panel. The device can be accessed via the I<sup>2</sup>C1 bus with the device address 0x22.

### 2.1.16 Acceleration Sensor

The on-board 3-axis acceleration sensor MMA7660FC is connected to the I<sup>2</sup>C2 bus and is accessible via address 0x4C.

## 2.2 PCB Placement

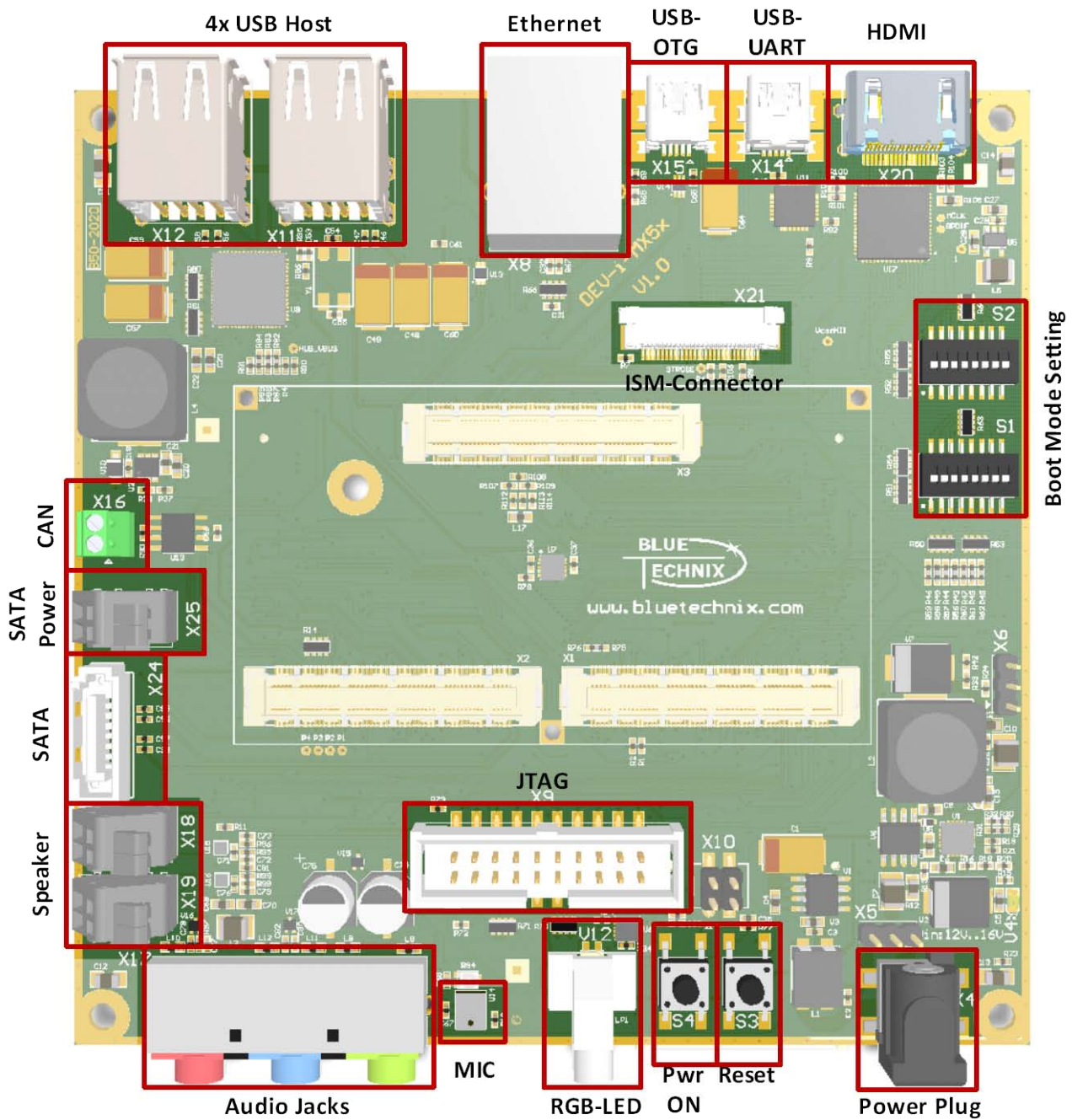


Figure 2-2: Top connectors placement

## 2.3 Mechanical Outline

This section shows the position of all connectors and mounting holes. All dimensions are given in mm.



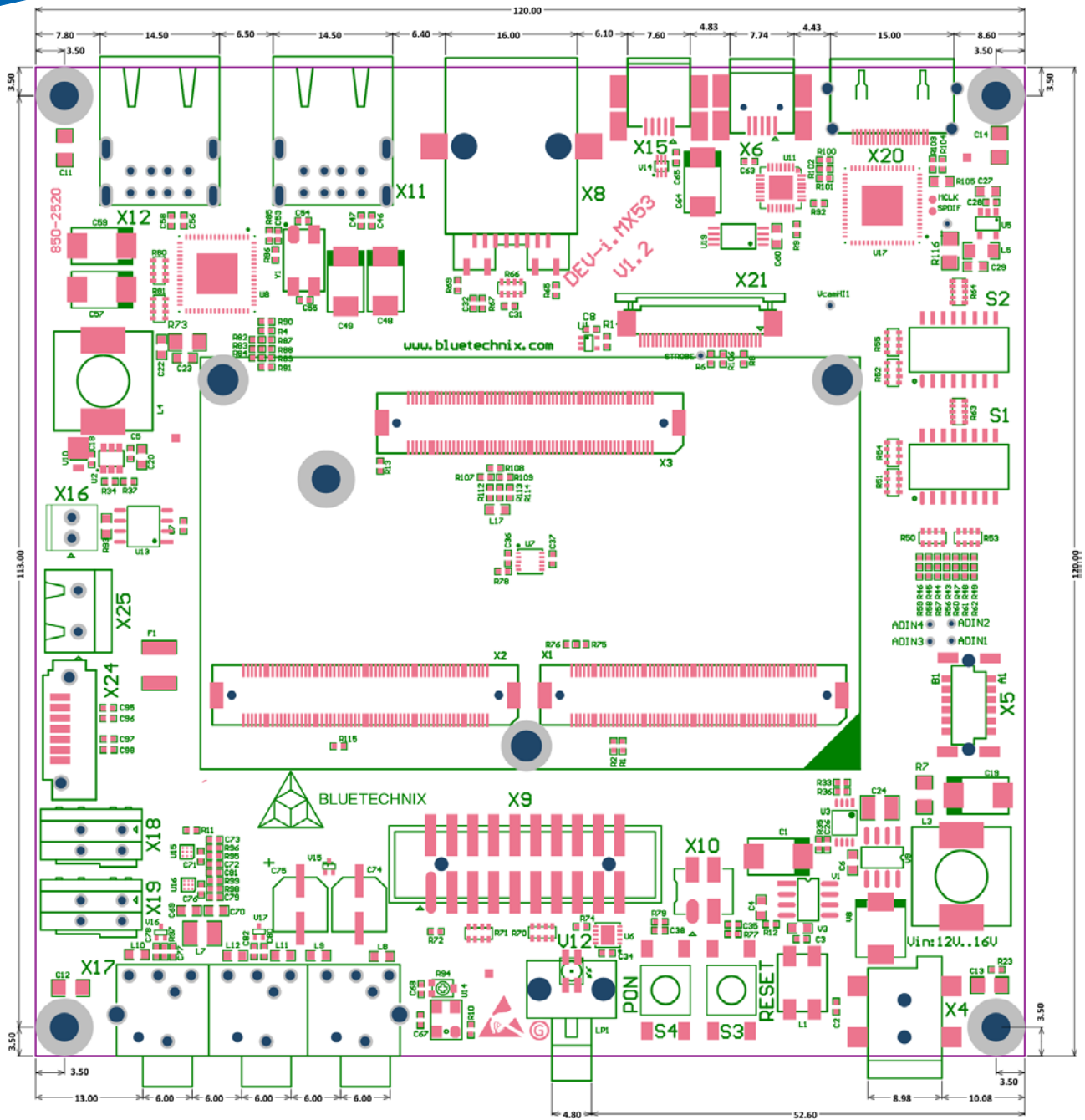


Figure 2-3: DEV-i.MX53 top view

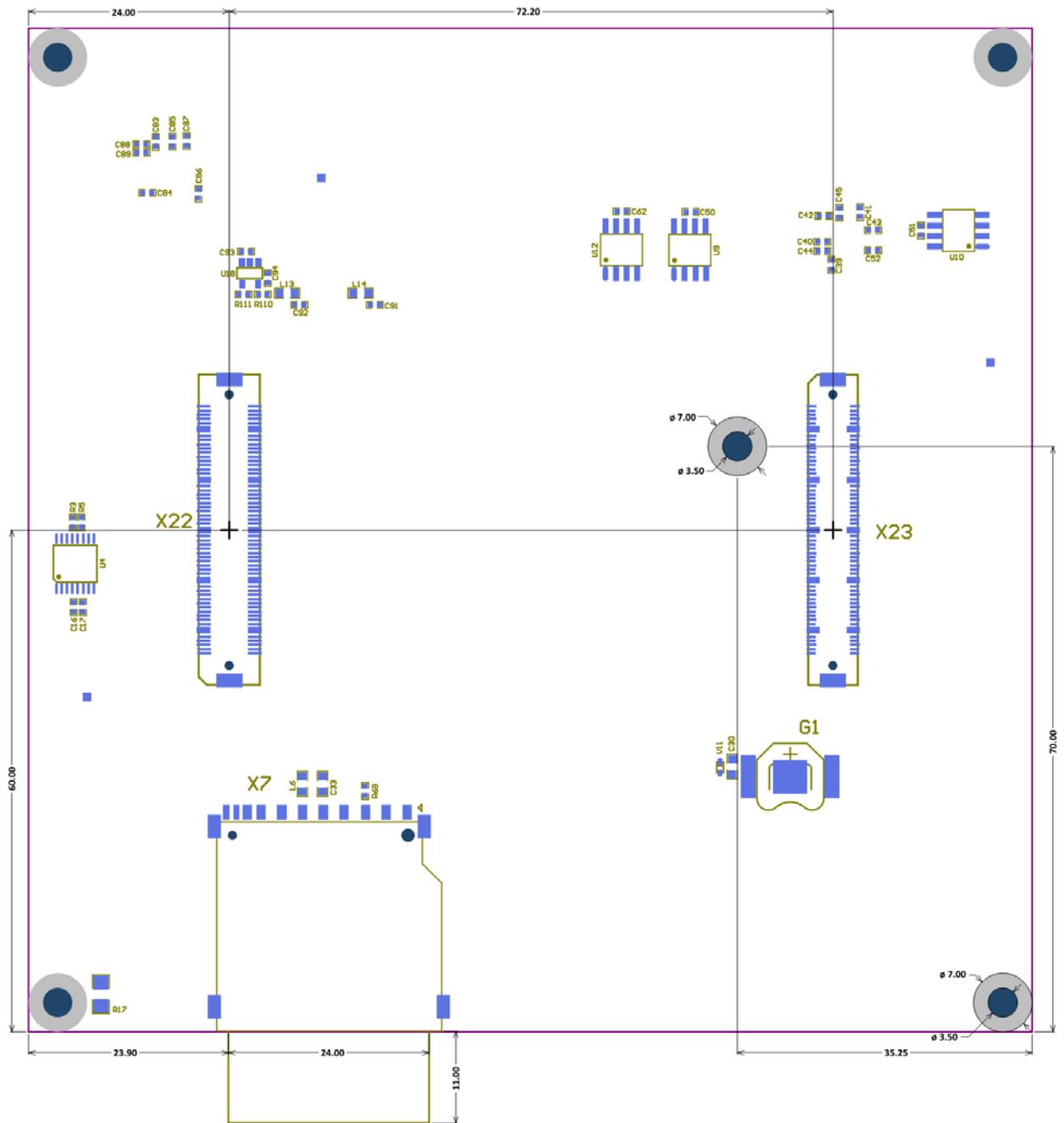


Figure 2-4: DEV-i.MX53 bottom view

### 3 Specifications

#### 3.1 Operating Conditions

Symbol	Parameter	Min	Typical	Max	Unit
$V_{IN}$	Input supply voltage	12	12	16	V
$P$	Board Power Consumption <sup>1)</sup>		TBD	TBD	W
$V_{USBx}$	USB Supply Voltage	4.5	5.0	5.5	V
$I_{USBx}$	USB Supply Current	-	-	500	mA

Table 3-1: Electrical characteristics

<sup>1)</sup> The Power consumption refers to a CM-i.MX53 with Android running in idle state and no Extension Boards or USB-Devices plugged in.

#### 3.2 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
$V_{IO}$	Input or output voltage	-0.5	3.6	V
$V_{IN}$	Input supply voltage	TBD	TBD	V
$I_{OH}/I_{OL}$	Current per pin	0	10	mA
$T_{AMB}$	Ambient temperature	-40	85	°C
$T_{STO}$	Storage temperature	-55	150	°C
$\Phi_{AMB}$	Relative ambient humidity		90	%

Table 3-2: Absolute maximum ratings

#### 3.3 Analog Inputs

The 10-bit ADC, which is integrated in the AD7993BRUZ-0, allows measuring analog voltages. These analog inputs are mainly used for resistive touchpad sensing or voltage (battery) monitoring.

Parameter	Symbol	Min	Typ.	Max	Unit
<b>Resolution</b>			10		Bit
<b>Conversion Core Input Voltage</b>	$V_{in}$	0	-	3.3	V
<b>Conversion Time Per Channel</b>	$t_c$			2	$\mu$ s

Table 3-3: ADC characteristics

#### 3.4 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.

## 4 Connector Description

### 4.1 Digital Video Extension Connector (X22)

The video extension connector allows customers to design their own video extension with user-defined camera and display components. A 100-pin-0.5mm-pitch mezzanine connector FX-10A-100S/10SV\_M from Hirose (*mating part is FX10A-100P/10-SV*) is used.

#### 4.1.1 Camera Sensor Interface Port (CSI0)

A camera or an alternative video device (such as the OV2655 or the ADV7180) can be connected to the DEV-i.MX53 board using the CMOS Sensor Interface 0 (CSI0).

Width (bit)	Interface	Description
10	CSI0	CSI0.D0 – CSI0.D9
5	CSI0	CSI0.VSYNC, CSI0.HSYNC, CSI0.VSYNC, CSI0.PCLK, CSI0.DE
2	I2C1	I2C1.SDA, I2C1.SCL - Camera control interface
14	Power	3V3, P_SW3_2V5, 5V0, VIN, GND

Table 4-1: CSI port overview

#### 4.1.2 LCD Port (DISP0)

The DISP0 interface is available to connect an LCD display and a touch screen to the DEV-i.MX53 board. The i.MX53 supports display resolutions up to 1680X1050 (WSXGA+).

Width (bit)	Interface	Description
16	DISP0	DISP0.D0 – DISP0.D17
4	DISP0	DISP0.VSYNC, DISP0.HSYNC, DISP0.CLK, DISP0.DE
1	PWM	CRTL.PWM2
10	LVDS1	LVDS1 interface
10	LVDS0	LVDS0 interface
15	Power	3V3, P_SW3_2V5, 5V0, VIN, GND

Table 4-2: LCD port overview

#### 4.1.3 Pin Description Table

Pin No	Signal	Type	Description
1	GND	PWR	Power Ground
2	GND	PWR	Power Ground
3	GND	PWR	Power Ground
4	5V0	PWR	Power Supply
5	5V0	PWR	Power Supply
6	DISP0.D1	O	Display Port 0 Data
7	DISP0.D3	O	Display Port 0 Data
8	DISP0.D5	O	Display Port 0 Data
9	DISP0.D7	O	Display Port 0 Data
10	GND	PWR	Power Ground
11	DISP0.D9	O	Power Ground
12	DISP0.D11	O	Display Port 0 Data
13	DISP0.D13	O	Display Port 0 Data

Pin No	Signal	Type	Description
14	DISP0.D15	O	Display Port 0 Data
15	DISP0.D17	O	Display Port 0 Data
16	GND	PWR	Power Ground
17	DISP0.CLK	O	Display Port 0 Clock
18	GND	PWR	Power Ground
19	CSI0_D10	IO	CMOS sensor interface 0 Data
20	CSI0_D10	IO	CMOS sensor interface 0 Data
21	CSI0_D10	IO	CMOS sensor interface 0 Data
22	CSI0_D10	IO	CMOS sensor interface 0 Data
23	CSI0_D10	IO	CMOS sensor interface 0 Data
24	CSI0_D10	IO	CMOS sensor interface 0 Data
25	CSI0_D10	IO	CMOS sensor interface 0 Data
26	CSI0_D10	IO	CMOS sensor interface 0 Data
27	CSI0_D10	IO	CMOS sensor interface 0 Data
28	CSI0_D10	IO	CMOS sensor interface 0 Data
29	GND	PWR	Power Ground
30	CSI0_DE	O	CMOS sensor interface 0 Data Enable
31	GND	PWR	Power Ground
32	CSI0_PCLK	I	CMOS sensor interface 0 Pixel Clock
33	GND	PWR	Power Ground
34	CSI0_HSYNC	I	CMOS sensor interface 0 HSYNC
35	CSI0_VSYNC	I	CMOS sensor interface 0 VSYNC
36	LVDS1.CLK_N	IO	LVDS Clock (-)
37	LVDS1.CLK_P	IO	LVDS Clock (+)
38	LVDS1.TX0_N	O	LVDS Transmit Data0 (-)
39	LVDS1.TX0_P	O	LVDS Transmit Data0 (+)
40	LVDS1.TX1_N	O	LVDS Transmit Data1 (-)
41	LVDS1.TX1_P	O	LVDS Transmit Data1 (+)
42	LVDS1.TX2_N	O	LVDS Transmit Data2 (-)
43	LVDS1.TX2_P	O	LVDS Transmit Data2 (+)
44	LVDS1.TX3_N	O	LVDS Transmit Data3 (-)
45	LVDS1.TX3_P	O	LVDS Transmit Data3 (+)
46	P_SW3_2V5	PWR	Power Supply
47	P_SW3_2V5	PWR	Power Supply
48	GND	PWR	Power Ground
49	GND	PWR	Power Ground
50	GND	PWR	Power Ground
51	GND	PWR	Power Ground
52	GND	PWR	Power Ground
53	GND	PWR	Power Ground
54	3V3	PWR	Power Supply
55	3V3	PWR	Power Supply
56	LVDS0.TX3_P	O	LVDS Transmit Data3 (+)
57	LVDS0.TX3_N	O	LVDS Transmit Data3 (-)
58	LVDS0.TX2_P	O	LVDS Transmit Data2 (+)
59	LVDS0.TX2_N	O	LVDS Transmit Data2 (-)
60	LVDS0.TX1_P	O	LVDS Transmit Data1 (+)
61	LVDS0.TX1_N	O	LVDS Transmit Data1 (-)
62	LVDS0.TX0_P	O	LVDS Transmit Data0 (+)
63	LVDS0.TX0_N	O	LVDS Transmit Data0 (-)
64	LVDS0.CLK_P	IO	LVDS Clock (+)
65	LVDS0.CLK_N	IO	LVDS Clock (-)
66	GPIO4_1	IO	Camera Output Enable

Pin No	Signal	Type	Description
67	GPIO4_0	O	Camera Trigger
68	GPIO4_2	O	Global Camera Reset
69	VGAGND	PWR	Power Ground
70	RGB.R	O	AV Out Red
71	VGAGND	PWR	Power Ground
72	RGB.G	O	AV Out Green
73	VGAGND	PWR	Power Ground
74	RGB.B	O	AV Out Black
75	VGAGND	PWR	Power Ground
76	NC	NC	Not Connected
77	I2C1.SCL	IO	I2C Clock
78	I2C1.SDA	IO	I2C Data
79	NC	NC	Not Connected
80	CTRL.PWM2	O	PWM
81	GND	PWR	Power Ground
82	DISP0.DE	O	Display Port 0 Data Enable
83	DISP0.VSYNC	I	Display Port 0 Data VSYNC
84	DISP0.HSYNC	I	Display Port 0 Data HSYNC
85	GND	PWR	Power Ground
86	DISP0.D16	O	Display Port 0 Data
87	DISP0.D14	O	Display Port 0 Data
88	DISP0.D12	O	Display Port 0 Data
89	DISP0.D10	O	Display Port 0 Data
90	DISP0.D8	O	Display Port 0 Data
91	GND	PWR	Power Ground
92	DISP0.D6	O	Display Port 0 Data
93	DISP0.D4	O	Display Port 0 Data
94	DISP0.D2	O	Display Port 0 Data
95	DISP0.D0	O	Display Port 0 Data
96	VIN	PWR	Power Supply
97	VIN	PWR	Power Supply
98	GND	PWR	Power Ground
99	GND	PWR	Power Ground
100	GND	PWR	Power Ground

Table 4-3: Digital video extension connector (X22) pin description

## 4.2 GPIO/Automation Extension Connector (X23)

The GPIO / automation extension connector allow customers to design their own GPIO extension with user-defined components. A 100-pin-0.5-pitch mezzanine connector (FX-10A-100S/10SV\_M from Hirose (*mating part is FX10A-100P/10-SV*)) is used. Many interfaces have alternate functions and can also be used as GPIOs.

Interface	Width (bit)	Interface	Description
1-Wire	1	OWIRE	OWIRE
Analog-In	4	ADIN	ADIN[1..4]
I2C	2	I2C3	I2C3.SCL, I2C3.SDA
PWM	2	PWM1, PWM2	PWM1, PWM2
SD	12	SD2	SD2.CMD, SD2.CLK, SD2.WP, SD2.CD. SD2.D0 – SD2.D7
SPI	10	ECSPI1, ECSPI2	ECSPI1.MOSI, ECSPI1.MISO, ECSPI1.SS0, ECSPI1.SS1, ECSPI1.SCLK ECSPI2.MOSI, ECSPI2.MISO, ECSPI2.SS0, ECSPI2.SS1, ECSPI2.SCLK

Interface	Width (bit)	Interface	Description
<b>UART</b>	8	UART2, UART3	UART2.TXD, UART2.RXD, UART2.RTS, UART2.CTS UART3.TXD, UART3.RXD, , UART3.RTS, UART3.CTS
<b>CAN</b>	2	CAN1	CAN1.RXD, CAN1.TXD
<b>USB</b>	12	USBH5, USBH6, USBH7	USBH5.D_P, USBH5.D_N, USBH5.PWR, USBH5.OC USBH6.D_P, USBH6.D_N, USBH6.PWR, USBH6.OC USBH7.D_P, USBH7.D_N, USBH7.PWR, USBH7.OC
<b>FIRI</b>	2	FIRI	FIRI.RXD, FIRI.TXD
<b>Power</b>	35		5V0, VIN, VUSB5, P_SW3_2V5, 3V3, P_LDO4_2V8, GND

Table 4-4: GPIO / automation extension connector (X23) port overview

#### 4.2.1 Pin Description Table

Pin No	Signal	Type	Description
1	GND	PWR	Power Ground
2	GND	PWR	Power Ground
3	GND	PWR	Power Ground
4	5V0	PWR	Power Supply
5	5V0	PWR	Power Supply
6	USBH7.D_P	IO	USB Data+
7	USBH7.D_N	IO	USB Data-
8	USBH7.PWR	O	USB Power Enable
9	USBH7.OC	I	USB Over Current
10	GND	PWR	Power Ground
11	I2C3.SCL	O	I2C Clock
12	I2C3.SDA	IO	I2C Data
13	OWIRE	IO	One Wire Interface
14	VUSB5	PWR	500mA Current Limited 5V Power Supply for USB Host 5
15	VUSB5	PWR	500mA Current Limited 5V Power Supply for USB Host 5
16	CAN1.RXD	I	CAN Receive Data / GPIO4_11
17	CAN1.TXD	O	CAN Transmit Data / GPIO4_10
18	P_LDO4_2V8	PWR	Power Supply
19	GPIO.(2V8)_3	IO	GPIO4_3
20	GPIO.(2V8)_4	IO	GPIO4_4
21	GND	PWR	Power Ground
22	UART2.RXD	I	UART Receive Data
23	UART2.TXD	O	UART Transmit Data
24	UART2.RTS	O	UART Request To Send
25	UART2.CTS	I	UART Clear To Send
26	GND	PWR	Power Ground
27	UART3.RXD	I	UART Receive Data
28	UART3.TXD	O	UART Transmit Data
29	UART3.RTS	O	UART Request To Send
30	UART3.CTS	I	UART Clear To Send
31	FIRI.RXD	O	Fast Infrared Interface Receive Data
32	FIRI.TXD	I	Fast Infrared Interface Transmit Data
33	GND	PWR	Power Ground
34	NC	NC	Not Connected
35	CTRL.PWM1	O	Pulse Width Modulation Output / GPIO1_9
36	CTRL.PWM2	O	Pulse Width Modulation Output / GPIO1_19

Pin No	Signal	Type	Description
37	P_SW3_2V5	PWR	Power Supply
38	NC	NC	Not Connected
39	GND	PWR	Power Ground
40	ECSPI2.MOSI	O	SPI MOSI
41	ECSPI2.MISO	I	SPI MISO
42	ECSPI2.SS1	O	SPI Select1
43	ECSPI2.SS2	O	SPI Select2
44	NC	NC	Not Connected
45	ECSPI2.SCLK	O	SPI CLK
46	3V3	PWR	Power Supply
47	3V3	PWR	Power Supply
48	GND	PWR	Power Ground
49	GND	PWR	Power Ground
50	GND	PWR	Power Ground
51	GND	PWR	Power Ground
52	GND	PWR	Power Ground
53	GND	PWR	Power Ground
54	VIN	PWR	Power Supply
55	VIN	PWR	Power Supply
56	ECSPI1.SCLK	O	SPI CLK
57	NC	NC	Not Connected
58	ECSPI1.SS1	O	SPI Select1
59	ECSPI1.SS0	O	SPI Select0
60	ECSPI1.MISO	I	SPI MISO
61	ECSPI1.MOSI	O	SPI MOSI
62	GND	PWR	Power Ground
63	ADIN4	I	Vin4 (AD7993)
64	ADIN3	I	Vin3 (AD7993)
65	ADIN2	I	Vin2 (AD7993)
66	ADIN1	I	Vin1 (AD7993)
67	SD2.D7	IO	SD Data7 / GPIO2_15
68	SD2.D6	IO	SD Data6 / GPIO2_14
69	SD2.D5	IO	SD Data5 / GPIO2_13
70	SD2.D4	IO	SD Data4 / GPIO2_12
71	SD2.D3	IO	SD Data3 / GPIO1_12
72	SD2.D2	IO	SD Data2 / GPIO1_13
73	SD2.D1	IO	SD Data1 / GPIO1_14
74	SD2.D0	IO	SD Data0 / GPIO1_15
75	GND	PWR	Power Ground
76	SD2.CLK	O	SD Clock / GPIO1_10
77	SD2.CMD	O	SD Command / GPIO1_11
78	GND	PWR	Power Ground
79	SD2.WP	I	SD Card Detect / GPIO2_31
80	SD2.CD	I	SD Write Protect / GPIO1_2
81	P_SW3_2V5	PWR	Power Supply
82	GPIO.(2V5)_3	IO	GPIO5_13
83	GPIO.(2V5)_2	IO	GPIO1_18
84	GPIO.(2V5)_1	IO	GPIO1_17
85	GPIO.(2V5)_0	IO	GPIO1_16



Pin No	Signal	Type	Description
86	GND	PWR	Power Ground
87	USBH5_OC	I	USB Over Current
88	USBH5_PWR	O	USB Power Enable
89	USBH5_D_N	IO	USB Data-
90	USBH5_D_P	IO	USB Data+
91	GND	PWR	Power Ground
92	USBH6_OC	I	USB Over Current
93	USBH6_PWR	O	USB Power Enable
94	USBH6_D_N	IO	USB Data-
95	USBH6_D_P	IO	USB Data+
96	5V0	PWR	Power Supply
97	5V0	PWR	Power Supply
98	GND	PWR	Power Ground
99	GND	PWR	Power Ground
100	GND	PWR	Power Ground

Table 4-5: GPIO / automation extension connector (X23) pin description

### 4.3 Image Sensor Connector X21 (BLT-ISM-Connector)

Pin	Name	Type	Description
1	VCAMA	PWR	Camera Analog Voltage Supply
2	GND	PWR	Power Ground
3	SADDR	NC	Not Connected
4	NC	NC	Not Connected
5	GPIO4_2	O	Global Camera Reset
6	I2C1.SCL	O	Configuration Bus Clock Line
7	I2C1.SDA	I/O	Configuration Bus Data Line
8	VCAMC	PWR	Camera Core Voltage Supply
9	GND	PWR	Power Ground
10	CSI0.PCLK	I	Pixel Clock
11	CSI0.VSYNC	I	VSYNC
12	CSI0.HSYNC	I	HSYNC
13	GPIO4_0	O	Camera Trigger
14	STROBE	I	Strobe Signal from Camera (available only on solder pad)
15	NC	NC	Not Connected
16	NC	NC	Not Connected
17	CSI0.D0	I	Pixel Data
18	CSI0.D1	I	Pixel Data
19	VCAMIO	PWR	Camera IO Power Supply
20	GND	PWR	Power Ground
21	CSI0.D2	I	Pixel Data
22	CSI0.D3	I	Pixel Data
23	CSI0.D4	I	Pixel Data
24	CSI0.D5	I	Pixel Data
25	GND	PWR	Power Ground
26	CSI0.D6	I	Pixel Data
27	CSI0.D7	I	Pixel Data
28	CSI0.D8	I	Pixel Data
29	CSI0.D9	I	Pixel Data
30	CSI0.DE	O	Output Enable (Active Low)

Table 4-6: BLT-ISM-Connector interface description (X21)

### 4.4 Reset / Power-On Connector (X10)

The two signals Power-On and Reset are accessible via this connector. These signals are the same as the ones routed to the two push buttons.

Pin No	Signal	Description
1	CTRL.ON	Power On (internally pulled up)
2	GND	Signal ground
3	CTRL.NRESET_IN	Power On Reset (internally pulled up)
4	GND	Signal ground

Table 4-7: Reset / power-on connector pin description

## 4.5 Auxiliary Power Supply Connector (X5)

The auxiliary Power Supply Extension Connector provides the possibility to power the board via a 12-pin Connector (ERNI 063179). It is possible to connect a supply voltage to the Vin Pins, or to connect an external battery charger.

Pin No	Signal	Description	Pin No	Signal	Description
1A	I <sup>2</sup> C1.SCL	I <sup>2</sup> C1 Serial Clock	1B	GPIO5_13	Free Configurable Control IO
2A	I <sup>2</sup> C1.SDA	I <sup>2</sup> C1 Serial Data	2B	GPIO1_18	Free Configurable Control IO
3A	PWR_GT	Power Gate (for DC Connector)	3B	GPIO1_17	Free Configurable Control IO
4A	GND	Power Ground	4B	GND	Power Ground
5A	CHRG_IN	Power Supply for External Charger	5B	Vin	Dev-Board Power Supply
6A	CHRG_IN	Power Supply for External Charger	6B	Vin	Dev-Board Power Supply

Table 4-8: Auxiliary power supply extension connector pin description

## **5 Switches, Jumpers and LEDs**

### **5.1 RGB LED (V12)**

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

### **5.2 Push Buttons (S4, S3)**

The push buttons have the following functions:

- S3: RESET
- S4: Power On/Off

### **5.3 Backup Battery (optional)**

There is also a possibility to add a 6.8mm non-rechargeable lithium coin cell to keep the RTC running and the RAM self-refreshing. The DEV/i.MX53 is delivered only on request with a 6.8mm coin cell holder. Bluetechnix does not provide any batteries due to legal restrictions.

### **5.4 Board Configuration Switches (S2, S1)**

The DEV-i.MX53 supports five different boot modes. For USB/UART boot mode, the i.MX53 is polling for activity on both USBOTG and UART1. For a more detailed explanation please see the software documentation on <http://support.bluetechnix.at/wiki>.

Mode	Switch	Boot Switch Setting	Boot Media
1	S2	 On Off	SPI NOR Flash
	S1	 On Off	
2	S2	 On Off	NAND Flash (Consumer Core Module Version)
	S1	 On Off	
3	S2	 On Off	NAND Flash (Industrial Core Module Version)
	S1	 On Off	
4	S2	 On Off	SD card
	S1	 On Off	
5	S2	 On Off	SATA hard disk
	S1	 On Off	
6	S2	 On Off	USB/UART boot mode
	S1	 On Off	

Table 5-1: Supported Boot Modes

## **6 Support**

### **6.1 General Support**

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

### **6.2 Board Support Packages**

Board support packages, boot loaders and further software downloads can be downloaded at the products wiki page at <https://support.bluetechnix.at/wiki>

### **6.3 i.MX Software Support**

#### 6.3.1 Linux

Linux BSP and images of derivatives can be found at Bluetechnix' support site <https://support.bluetechnix.at/wiki> at the software section of the related product.

#### 6.3.2 Win CE

WinCE is only supported on ARM platforms. Please contact Bluetechnix for support information.

### **6.4 i.MX® Design Services**

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

#### 6.4.1 Upcoming Products and Software Releases

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

## 7 Ordering Information

### 7.1 Predefined mounting options for DEV-i.MX53

Article Number	Name	Description
<b>100-4120-1</b>	i.MX53 Development Starter Package	DEV-i.MX5x + CM-i.MX53-C-C-Q24S1024F4N2048
<b>100-1470-2</b>	CM-i.MX53-C-I-Q24S1024F4N2048	Industrial version
<b>100-1471-2</b>	CM-i.MX53-C-C-Q24S1024F4N2048	Commercial version
<b>100-1472-2-TR</b>	CM-i.MX53-C-C-Q24S512F4N256	Tape Reel (Commercial version, 50 pcs per reel)

Table 7-1: Ordering information

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**NOTE:** Custom hard and software developments are available on request! Please contact Bluetechnix ([office@bluetechnix.com](mailto:office@bluetechnix.com)) if you are interested in custom hard- and software development.

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## 8 Dependability

### 8.1 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 development board 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 development board components. 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](mailto:office@bluetechnix.com)) if you are interested in the MTBF result.



## 9 Product History

### 9.1 Version Information

Version	Date	Changes
1.2	2011 11 24	Battery charger removed. Coin cell Holder not mounted. Core Module mounting holes adapted for new modules (Version V2.0 or higher). Two different extension connectors to prevent reverse connecting of extension boards. Optional plug to connect an external Li-Ion battery pack with charger. Pin out of extension connector X22 changed (Pin 66 from NC to Cam_OE).
1.1	2011 08 23	First DEV-i.MX53 release

Table 9-1: Overview product changes

### 9.2 Anomalies

Version	Date	Description
1.2	2011 11 24	No anomalies reported yet.
1.1	2011 10 02	Power Supplies for USB Lane 1 and Lane 2 interchanged. Over-current detection will not work.

Table 9-2: Overview product anomalies

## 10 Document Revision History

Version	Date	Document Revision
2	2011 11 24	Updates for HWR V1.2
1	2011 09 05	First draft release

Table 10-1: Revision history

## 11 List of Abbreviations

Abbreviation	Description
<b>ADC</b>	Analog Digital Converter
<b>ADIN</b>	Analog Data Input
<b>AI</b>	Analog Input
<b>CAN</b>	Controller Area Network
<b>CM</b>	Core Module
<b>COMM</b>	Communication
<b>CSI</b>	Camera Sensor Interface
<b>DC</b>	Direct Current
<b>DDR</b>	Double Data Rate
<b>DEV</b>	Development Board
<b>DI</b>	Display Interface
<b>DISP</b>	Display
<b>EBI</b>	External Bus Interface
<b>ESD</b>	Electrostatic Discharge
<b>EXP</b>	Experimental
<b>FIRI</b>	Fast Infrared Interface
<b>GPIO</b>	General Purpose Input Output
<b>GPS</b>	Global Positioning System
<b>GSM</b>	Global System for Mobile Communications
<b>HD</b>	High Definition
<b>HDD</b>	Hard Disk Drive
<b>HDMI</b>	High-Definition Multimedia Interface
<b>I</b>	Input
<b>I/O</b>	Input/Output
<b>I<sup>2</sup>C</b>	Inter-Integrated Circuit
<b>ISM</b>	Image Sensor Module
<b>JTAG</b>	Joint Test Action Group
<b>LAN</b>	Local Area Network
<b>LiPol</b>	Lithium-Polymer
<b>LVDS</b>	Low Voltage Differential Signaling
<b>MIC</b>	Microphone
<b>MTBF</b>	Mean Time Between Failure
<b>NC</b>	Not Connected
<b>O</b>	Output
<b>OEM</b>	Original Equipment Manufacturer
<b>OWIRE</b>	One-Wire
<b>PCB</b>	Printed Circuit Board
<b>PDA</b>	Personal Digital Assistant
<b>PWM</b>	Pulse Width Modulation
<b>PWR</b>	Power
<b>SATA</b>	Serial Advanced Technology Attachment
<b>SD</b>	Secure Digital
<b>SDHC</b>	Secure Digital High Capacity
<b>SDRAM</b>	Synchronous Dynamic Random Access Memory
<b>SoC</b>	System on Chip
<b>SPI</b>	Serial Peripheral Interface
<b>SSD</b>	Solid State Disk
<b>TFT</b>	Thin-Film Transistor
<b>TISM</b>	Tiny Image Sensor Module
<b>TSC</b>	Touch Screen Controller

<b>UART</b>	Universal Asynchronous Receiver Transmitter
<b>UMTS</b>	Universal Mobile Telecommunications System
<b>USB</b>	Universal Serial Bus
<b>USBH</b>	Universal Serial Bus Host
<b>USBOTG</b>	USB On The Go
<b>WLAN</b>	Wireless Local Area Network
<b>ZIF</b>	Zero Insertion Force

Table 11-1: List of abbreviations

## A List of Figures and Tables

### Figures

Figure 1-1: Overview of the main components .....	9
Figure 2-1: DEV-i.MX53 Interconnection Diagram .....	12
Figure 2-2: Top connectors placement .....	16
Figure 2-3: DEV-i.MX53 top view.....	17
Figure 2-4: DEV-i.MX53 bottom view .....	18

### Tables

Table 2-1: CM-i.MX53 Interface routing .....	13
Table 3-1: Electrical characteristics .....	19
Table 3-2: Absolute maximum ratings.....	19
Table 3-3: ADC characteristics.....	19
Table 4-1: CSI port overview .....	20
Table 4-2: LCD port overview .....	20
Table 4-3: Digital video extension connector (X22) pin description.....	22
Table 4-4: GPIO / automation extension connector (X23) port overview.....	23
Table 4-5: GPIO / automation extension connector (X23) pin description .....	25
Table 4-6: BLT-ISM-Connector interface description (X21).....	26
Table 4-7: Reset / power-on connector pin description .....	26
Table 4-8: Auxiliary power supply extension connector pin description .....	27
Table 5-1: Supported Boot Modes.....	29
Table 7-1: Ordering information .....	31
Table 9-1: Overview product changes.....	33
Table 9-2: Overview product anomalies .....	33
Table 10-1: Revision history .....	34
Table 11-1: List of abbreviations .....	36



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#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.