

# Hardware User Manual

**SBC-i.MX51 V1.2**

*...maximum performance at minimum space*

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## Information

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Due to technical requirements components may contain dangerous substances.

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# 1 Overview

## 1.1 Features

The Single Board Computer SBC-i.MX51 is based on Freescale’s high-performance i.MX51x mobile platform, incorporating an ARM Cortex A8 CPU, an Image Processing Unit (IPUv3EX) and a Video Processing Unit (VPU). The IPUv3EX provides comprehensive support for the connectivity to displays and cameras. The VPU supports hardware encoding and decoding of MPEG-4, H.263 and H.264 standards. Its memory capabilities (NAND Flash, DDR2 SDRAM) and numerous interfaces turn the SBC-i.MX51 into the ultimate development board for future high-end embedded devices comparable to netbooks. Other target applications include industrial automation and control systems. Figure 1-1 shows board’s the features.

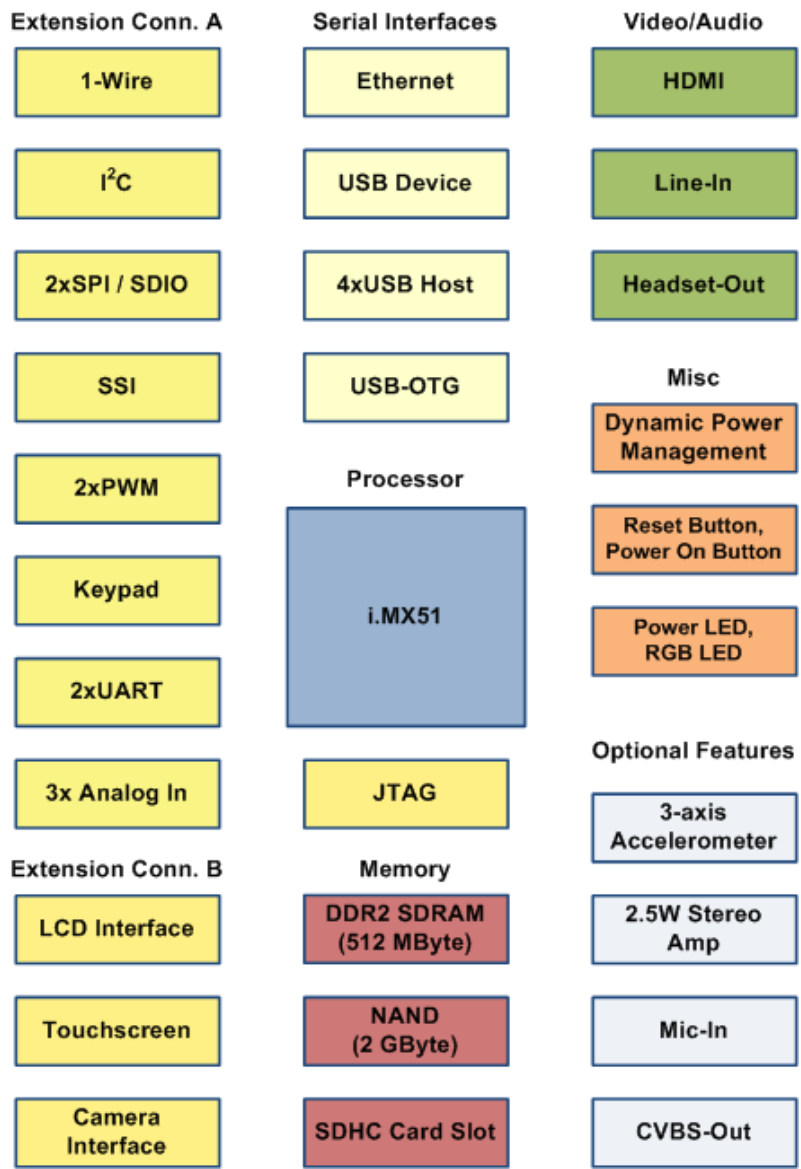


Figure 1-1: SBC-i.MX51 features

## 1.2 Block Diagram

Figure 1-2 shows the main components and connectors on the SBC-i.MX51.

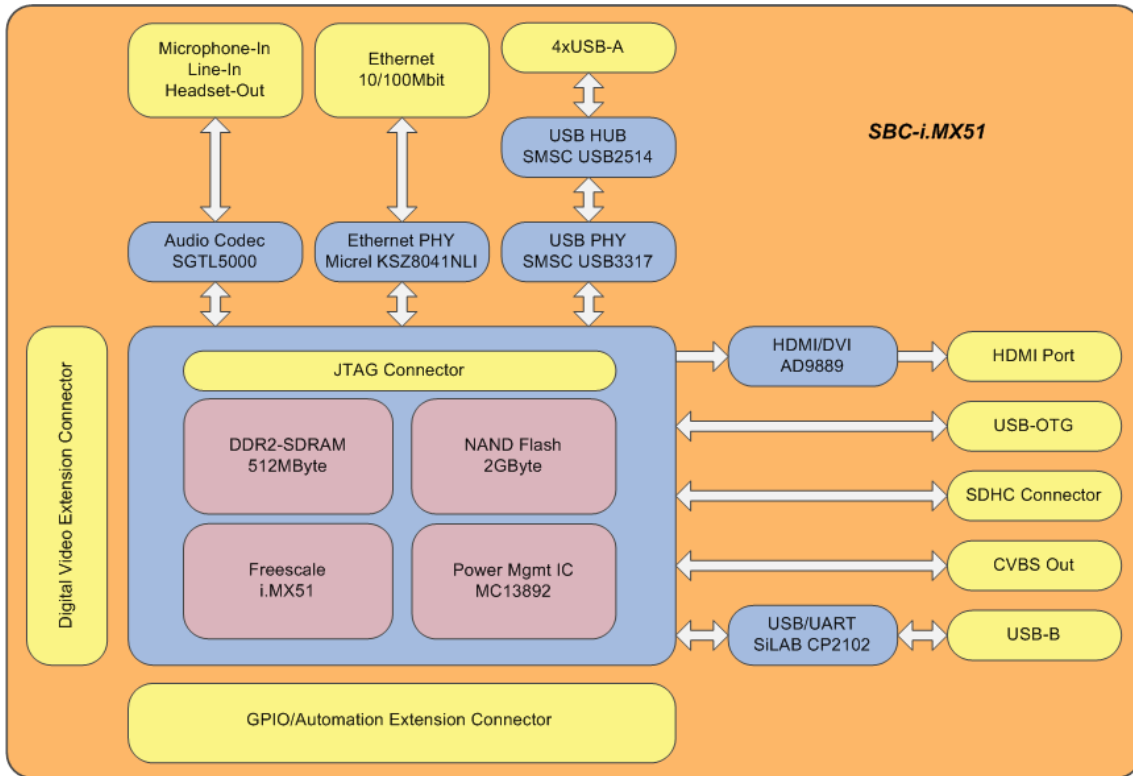


Figure 1-2: SBC-i.MX51 Overview

## 2 Components

The SBC-i.MX51 contains many peripherals to provide a lot of interfacing options. The next paragraphs give you a short overview of each component including a brief feature list. Please refer to the manufacturer's user manuals for more details.

### 2.1 Integrated Components

#### ***i.MX51 processor (Freescale, MCIMX515DJM8C)***

Multimedia processor for mobile and low power application.

- ARM Cortex A8 core
- 800 MHz core clock frequency
- 200 MHz DDR2 SDRAM interface
- Dynamic power management
- Hardware video codec
- Powerful graphics acceleration (OpenGL and OpenVG)

#### ***i.MX Companion IC (Freescale, MC13892JVK)***

The Power Management IC MC13892 is Freescale's companion IC for i.MX series CPUs. It generates all required power supplies, and contains some additional features:

- Dynamic power control system
- Battery charging control logic
- Octal 10-Bit ADC
- Single RGB LED driver
- Backlight LED driver
- Real Time Clock

#### ***DDR2 SDRAM (Micron, MT47H64M16HR-25 IT)***

- 512 MByte
- DDR2-800 (800MB/s)

#### ***NAND Flash (Micron, MT29F16G08CBABAWP)***

- 2GByte
- 8 Bit
- 4k pagesize

#### ***Ethernet Physical Transceiver (Micrel, KSZ8041)***

- Ethernet/IEEE 802.3
- 10BaseT
- 100BaseTX
- MII Interface

### ***USB Physical Transceiver (SMSC, USB3317)***

- USB-IF “High-Speed” compliant (V2.0)
- ULPI interface

### ***USB HUB (SMSC, USB2514I)***

- 4 port HUB
- USB-IF “High-Speed” compliant (V2.0)
- High Speed, Full-Speed and Low-Speed compatible

### ***USB to UART Bridge (SiLabs, CP2102)***

- USB device
- Usable for terminal applications

### ***HDMI Transmitter (Analog Devices, AD9889B)***

- HDMI 1.1 compatible
- I<sup>2</sup>S and SPDIF audio encoding

### ***Audio Codec (Freescale, SGT5000)***

- Stereo Line In
- Stereo Line Out
- Mic In (Electret or Dynamic microphones supported)

## **2.2 Optional Components**

A few components, are not mounted in the current version of the SBC-i.MX51. If you want to use these components contact Bluetechnix for custom assembling.

These optional components are:

- 2.5W Stereo Audio Amp (National Semiconductors, 2x NCP2820)
- PCB Microphone (Knowles Acoustics, SPM0208HD5)
- 3-Axis Acceleration Sensor (Freescale, MMA7660FC)
- CVBS Connector



### 3 Standard I/O Connectors

There are two types of connectors on the SBC-i.MX51: standard I/O Connectors and Extension Connectors. All standard I/O Connectors (except JTAG) are accessible on the front or rear side of the board (see Figure 3-1).

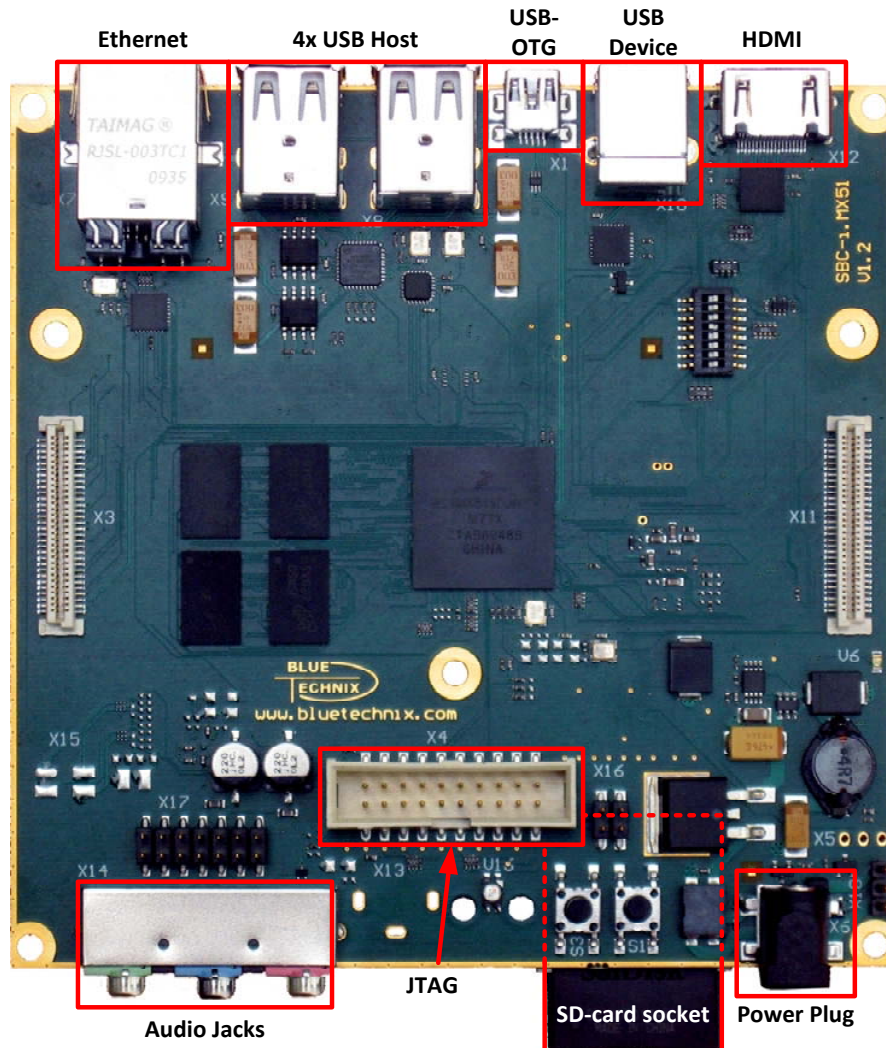


Figure 3-1: Standard Interface positions

#### **Front side Connectors:**

- Triple Audio Jack (Mic-In, Line-In and Headset-Out)
- TV out (not populated on SBC-i.MX51 V1.2)
- SD-card socket
- Power plug

#### **Rear side Connectors:**

- Ethernet
- 4x USB A (host connector)

- Mini USB AB (USB-OTG connector)
- USB-B (device connector for terminal application)
- HDMI Display output

**JTAG Connector:**

A standard ARM JTAG connector with 20 pins is available for debugging.

**LED and Push Buttons:**

There are two push buttons and a single RGB-LED for user interaction. The RGB LED is connected to the MC18392 LED interface.

The push buttons have following functions:

- S1: RESET
- S3: Power On

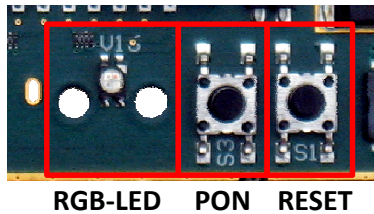


Figure 3-2: LED and button positions

If the SBC is enclosed in a chassis, you can mount a light pipe (515-1011F from DIALIGHT) above the RGB-LED for guiding the light to a front side panel.

## 4 Extension Connectors

The Extension Connectors allow connecting additional hardware to the SBC-i.MX51. Bluetechnix offers additional hardware for the SBC-i.MX51 such as a display extension board. See our website for more information. (<http://www.bluetechnix.com/goto/sbc-i.mx51>)

All connector I/O pins are either connected to the i.MX or to the MC13892 (see pin description). Most of the pins connected to the i.MX have alternate functions; for more details see the Pin Description Tables and consult the i.MX51 datasheet.

The connectors for the GPIO- and Video Extension Connectors are 5177983-2 from Tyco Electronics (mating part is 5179031-2). All other connectors are standard 2.54mm-pitch headers.

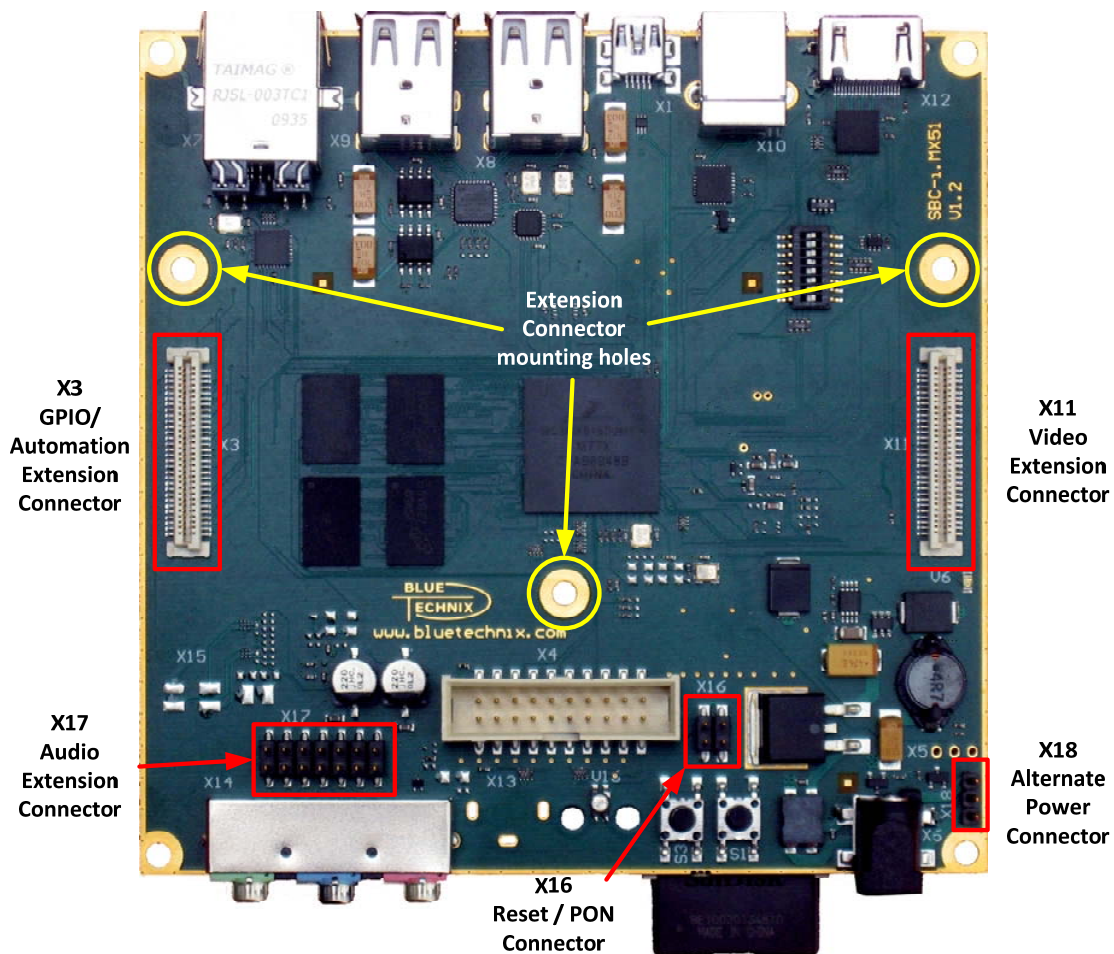


Figure 4-1: Extension Connector positions

### 4.1 GPIO/Automation Connector (X3)

The GPIO/Automation Extension Connector includes several serial interfaces, as well as a keypad, power-LED drivers and three analog inputs. See Figure 4-2 for a feature overview and Table 4-3 for a detailed pin description.

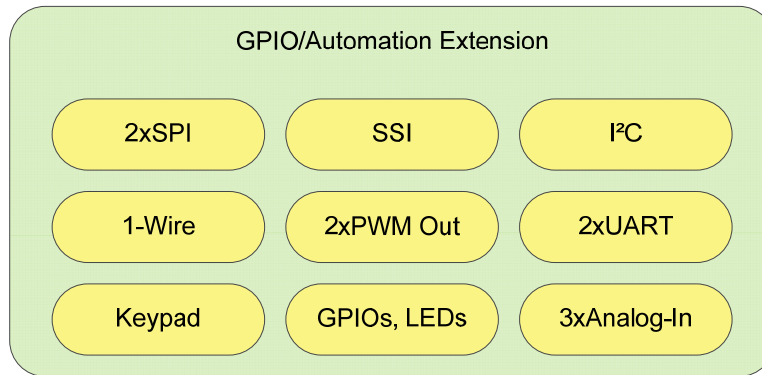


Figure 4-2: GPIO/Automation Extension Connector Interfaces

#### 4.1.1 One-Wire-Interface

The 1-Wire interface is available to communicate with a generic 1-Wire device defined by Maxim-Dallas.

#### 4.1.2 Analog-In

Three 10-Bit analog-digital-converters (ADC) are available for general use. The inputs are connected to ADIN[5..7] on the MC13892 companion chip.

#### 4.1.3 I<sup>2</sup>C

The two I<sup>2</sup>C serial busses allow the attachment of a variety of peripheral components to the GPIO/Automation Connector. Note that the I<sup>2</sup>C1 is shared with the CSPI1 Serial Peripheral Interface.

#### 4.1.4 Keypad

The connector features keypad pins to connect a six-by-four button matrix keyboard to the specially designated interface of the i.MX51.

#### 4.1.5 LEDs

The MC13892 features an auxiliary display LED driver output and a keypad LED driver output. Yet, please refer to the Errata sheet of the MC13892 for problems which may appear when using this interface.

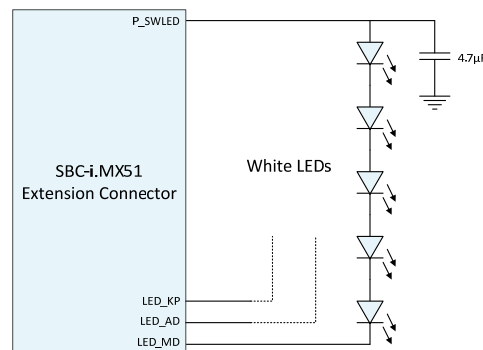


Figure 4-3: LED connection circuit

#### 4.1.6 PWM

Two PWM outputs are available on the GPIO/Automation Extension Connector. Please note that the PWM1 is also present on the Video Extension Connector.

#### 4.1.7 SPI

Two Serial Peripheral Interfaces are available on the connector. The CSPI1 interface is shared with the I<sup>2</sup>C1 and provides two slave select signals, the CSPI is shared with the SD-card interface, and provides only a single slave select signal.

#### 4.1.8 SSI

This interface can be used as alternate digital audio channel and is connected to the AUD4 interface of the i.MX51.

#### 4.1.9 UART

The signals of the UART2 and UART3 are available on the extension connector for the connection of a variety of peripheral devices.

#### 4.1.10 Power Supplies

The GPIO / Automation Extension Connector provides seven different supply voltages. They can be used on a custom extension board. Some supply voltages are generated by the MC13892 and can be set to different values. They must be set and enabled first, by configuring the companion IC. The following table shows the maximum supply current for each voltage domain.

| Signal Name           | Voltage                  | Maximum Supply Current |
|-----------------------|--------------------------|------------------------|
| P_5V0                 | 5.0V                     | 500mA <sup>3)</sup>    |
| P_VIOHI <sup>1)</sup> | 2.775V                   | 50mA <sup>3)</sup>     |
| P_SW4 <sup>1)</sup>   | 1.8V                     | 50mA <sup>3)</sup>     |
| P_GEN2 <sup>1)</sup>  | 3.15V                    | 70mA                   |
| P_AUDIO               | 2.3V, 2.5V, 2.775V, 3.0V | 150mA                  |
| P_VIDEO               | 2.5V, 2.6V, 2.7V, 2.775V | 350mA                  |
| P_SWLED <sup>2)</sup> | 4.3V to 26.5V            | 60mA                   |

Table 4-1: Maximum power consumption for the GPIO / Automation Connector supplies

<sup>1)</sup> It is not advisable to alter these voltages; otherwise the board may get damaged.

<sup>2)</sup> The P\_SWLED voltage drives the LEDs connected to the LED-driver pins. The output voltage will be set automatically by the MC13892. For LED connectivity see Figure 4-3.

<sup>3)</sup> Be aware that this power supply is available on both extension connectors and this is the maximum current that can be drawn altogether.

#### 4.1.11 I/O Power Domains

All digital I/O pins are part of one of three power domains: P\_SW4 (1.8V), P\_VIOHI (2.775V) or P\_GEN2 (3.15V). The following table shows each interface with the corresponding voltage level.

| Interface         | Pins | Power Domain | Description                  |
|-------------------|------|--------------|------------------------------|
| 1-Wire            | 1    | P_VIOHI      | OWIRE                        |
| I <sup>2</sup> C2 | 2    | P_VIOHI      | I2C1.SCL, I2C1.SDA           |
| Keypad            | 10   | P_SW4        | KPP.COL[0..5], KPP.ROW[0..3] |

| Interface | Pins | Power Domain | Description   |
|-----------|------|--------------|---|
| PWM       | 2    | P_VIOHI      | PWM1, PWM2  |
| SD        | 6    | P_GEN2       | SD2.CMD, SD2.CLK, SD2.D0, SD2.D1, SD2.D2, SD2.D3                    |
| SPI       | 6    | P_SW4        | CSPI1.MOSI, CSPI1.MISO, CSPI1.SS0, CSPI1.SS1, CSPI1.RDY, CSPI1.SCLK |
| SSI       | 6    | P_VIOHI      | AUD4.RFS, AUD4.RSCK, AUD4.Tx, AUD4.Rx, AUD4.TSCK, AUD4.TFS          |
| UART      | 4    | P_VIOHI      | UART2.TXD, UART2.RXD, UART3.TXD, UART3.RXD                          |
| PON       | 1    | Open Drain   | A_CTRL.PON1 – Power down Power Mgmt.                                |
| ADIN      | 3    | -            | ADC Input on MC13892  |
| LED       | 2    | P_SWLED      | LED driver outputs  |

Table 4-2: Power Domains for I/Os

#### 4.1.12 Pin Description Table

| Pin No | Signal      | Type | Description  |
|--------|-------------|------|--|
| 1      | P_SWLED     | PWR  | Power Supply                                       |
| 2      | GND         | PWR  | Power Ground                                       |
| 3      | LED_AD      | O    | LED driver output connected to MC18392             |
| 4      | A_CTRL_PON1 | IpU  | Power On Input                                     |
| 5      | LED_KP      | O    | LED driver output connected to MC18392             |
| 6      | GND         | PWR  | Power Ground                                       |
| 7      | GND         | PWR  | Power Ground                                       |
| 8      | EIM_D27     | IO   | usable as I2C2_SCL or GPIO2_9                      |
| 9      | ADIN5       | I    | Analog input connected to MC18392                  |
| 10     | EIM_D24     | IO   | usable as I2C2_SDA or GPIO2_8                      |
| 11     | ADIN6       | I    | Analog input connected to MC18392                  |
| 12     | GND         | PWR  | Power Ground                                       |
| 13     | ADIN7       | I    | Analog input connected to MC18392                  |
| 14     | OWIRE_LINE  | IO   | One-wire interface                                 |
| 15     | GND         | PWR  | Power Ground                                       |
| 16     | UART2_RXD   | I    | UART RxD or GPIO 1_20                              |
| 17     | P_GEN2      | PWR  | Power Supply                                       |
| 18     | UART2_TXD   | O    | UART TxD or GPIO 1_21                              |
| 19     | SD2_CMD     | IO   | SD-card interface or CSPI_MOSI                     |
| 20     | UART3_RXD   | I    | UART RxD or GPIO 1_22                              |
| 21     | SD2_CLK     | O    | SD-card interface or CSPI_SCLK                     |
| 22     | UART3_TXD   | I    | UART TxD or GPIO 1_23                              |
| 23     | SD2_D0      | IO   | SD-card interface                                  |
| 24     | GND         | PWR  | Power Ground                                       |
| 25     | SD2_D1      | IO   | SD-card interface                                  |
| 26     | GPIO1_2     | IO   | GPIO with PWM1 functionality                       |
| 27     | SD2_D2      | IO   | SD-card interface                                  |
| 28     | GPIO1_3     | IO   | GPIO with PWM2 functionality                       |
| 29     | SD2_D3      | IO   | SD-card interface or CSPI_SS2                      |
| 30     | GND         | PWR  | Power Ground                                       |
| 31     | GND         | PWR  | Power Ground                                       |
| 32     | P_SW4       | PWR  | Power Supply                                       |
| 33     | CSPI1_MOSI  | IO   | SPI1 usable also as I2C1_SDA (default) or GPIO4_22 |
| 34     | KPP_ROW0    | I    | Keypad Row   |
| 35     | CSPI1_MISO  | I    | SPI1 usable also as GPIO4_23                       |
| 36     | KPP_ROW1    | I    | Keypad Row   |
| 37     | CSPI1_SS0   | O    | SPI1 usable also as GPIO4_24                       |
| 38     | KPP_ROW2    | I    | Keypad Row   |

|    |            |     |   |
|----|------------|-----|---|
| 39 | CSPI1_SS1  | O   | SPI1 usable also as GPIO4_25                  |
| 40 | KPP_ROW3   | I   | Keypad Row                                    |
| 41 | CSPI1_RDY  | I   | SPI1 usable also as GPIO4_26                  |
| 42 | KPP_COL0   | I   | Keypad Column                                 |
| 43 | CSPI1_SCLK | IO  | SPI1 usable as I2C1_SCL (default) or GPIO4_27 |
| 44 | KPP_COL1   | I   | Keypad Column                                 |
| 45 | AUD4_RFS   | IO  | Audio Port 4 usable also as GPIO2_0           |
| 46 | KPP_COL2   | I   | Keypad Column                                 |
| 47 | AUD4_RSCK  | IO  | Audio Port 4 usable also as GPIO2_3           |
| 48 | KPP_COL3   | I   | Keypad Column                                 |
| 49 | AUD4_TX    | O   | Audio Port 4 usable also as GPIO2_4           |
| 50 | KPP_COL4   | I   | Keypad Column                                 |
| 51 | AUD4_RX    | I   | Audio Port 4 usable also as GPIO2_5           |
| 52 | KPP_COL5   | I   | Keypad Column                                 |
| 53 | AUD4_TSCK  | IO  | Audio Port 4 usable also as GPIO2_6           |
| 54 | P_VIDEO    | PWR | Power Supply                                  |
| 55 | AUD4_TFS   | IO  | Audio Port 4 usable also as GPIO2_7           |
| 56 | P_AUDIO    | PWR | Power Supply                                  |
| 57 | GND        | PWR | Power Ground                                  |
| 58 | P_5V0      | PWR | Power Supply                                  |
| 59 | GND        | PWR | Power Ground                                  |
| 60 | P_5V0      | PWR | Power Supply                                  |

Table 4-3: GPIO / Automation Connector pin description

## 4.2 Digital Video Connector (X11)

The Video Extension Connector is designed to add a custom video extension board with user-defined camera and display components, e.g. a CMOS sensor and a LCD display.

Additionally, some GPIOs are available for configuring the interface and handshaking. Touchscreen functionality can be implemented by connecting four analog lines, which are routed to the MC13892, to an appropriate display.

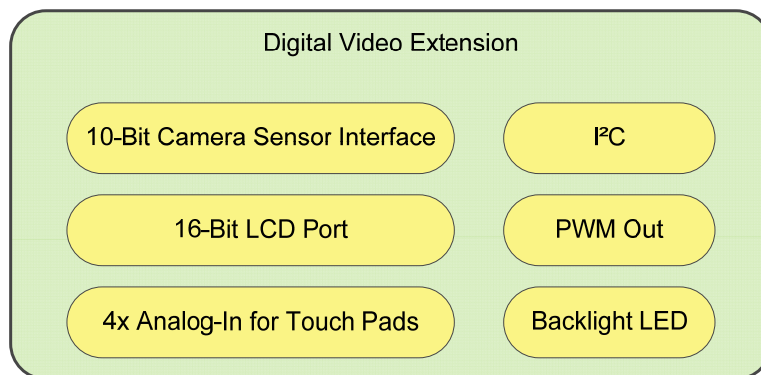


Figure 4-4: Digital Video Connector

### 4.2.1 Camera Sensor Interface Port (CSI1)

A camera (e.g. an OmniVision OV2640 or OV2655) can be connected to the SBC-i.MX51x board using the CMOS Sensor Interface 1 (CSI1).

| Interface         | Pins | Power Domain | Description   |
|-------------------|------|--------------|---|
| CSI1_Data         | 10   | P_SW4        | CSI1.D0 - CSI1.D9   |
| CSI1_Control      | 5    | P_SW4        | CSI1.VSYNC, CSI1.HSYNC, CSI1.PIXCLK, CSI1.MCLK, CSI1.PWDN |
| I <sup>2</sup> C2 | 2    | P_VIOHI      | I2C2.SDA, I2C2.SCL  |

Table 4-4: CSI1 Interface description

### 4.2.2 LCD Port (DISP2)

The DISP2 interface is available to connect an LCD display to the SBC-i.MX51 board. On the secondary display port, the i.MX51 supports resolutions up to 1280X768.

| Interface     | Pins | Power Domain | Description                         |
|---------------|------|--------------|-------------------------------------|
| DISP2_Data    | 16   | P_VIOHI      | DISP2.D0 – DISP2.D15                |
| DISP2_Control | 3    | P_VIOHI      | DISP2.VSYNC, DISP2.HSYNC, DISP2.CLK |
| DISP2_Control | 1    | P_SW4        | DISP2.DE                            |
| PWM           | 2    | P_VIOHI      | PWM1, TFT.PWRCTRL - Contrast        |
| LED           | 2    | P_SWLED      | LED.MD - Display Backlight          |
| ADIN          | 4    | -            | ADIN[1..4] – Touch screen           |

Table 4-5: DISP2 Interface description

### 4.2.3 Power Supplies

The Video Extension Connector provides six different supply voltages. They can be used for a custom extension board. Some supply voltages are generated by the MC13892 and can be set to different values. They must be set and enabled first, by configuring the companion IC. The following table shows the maximum supply current for each voltage.

| Signal Name           | Voltage                   | Maximum Current     |
|-----------------------|---------------------------|---------------------|
| P_5V0                 | 5.0V                      | 500mA <sup>3)</sup> |
| P_SW4 <sup>1)</sup>   | 1.8V                      | 50mA <sup>3)</sup>  |
| P_GEN3                | 1.8V, 2.9V                | 50mA <sup>3)</sup>  |
| P_DIG                 | 1.05V, 1.25V, 1.65V, 1.8V | 50mA                |
| P_CAM                 | 2.5V, 2.6V, 2.75V, 3.0V   | 250mA               |
| P_SWLED <sup>2)</sup> | 4.3V to 26.5V             | 60mA                |

Table 4-6: Maximum power consumption for the Digital Video Connector supplies

<sup>1)</sup> It is not advisable to alter these voltages; otherwise the board may get damaged.

<sup>2)</sup> The P\_SWLED voltage drives the LEDs connected to the LED-Driver Pins. The output voltage will be set automatically by the MC13892. For LED connectivity, see Figure 4-3.

<sup>3)</sup> Be aware that this power supply is available on both extension connectors and this is the maximum current that can be drawn altogether.



#### 4.2.4 Pin Description Table

| Pin No | Signal       | Type | Description   |
|--------|--------------|------|---|
| 1      | GND          | PWR  | Power Ground  |
| 2      | DISP2_DAT0   | O    | Display Port 2 Data                                   |
| 3      | DISP2_DAT1   | O    | Display Port 2 Data                                   |
| 4      | DISP2_DAT2   | O    | Display Port 2 Data                                   |
| 5      | DISP2_DAT3   | O    | Display Port 2 Data                                   |
| 6      | DISP2_DAT4   | O    | Display Port 2 Data                                   |
| 7      | GND          | PWR  | Power Ground  |
| 8      | DISP2_DAT5   | O    | Display Port 2 Data                                   |
| 9      | DISP2_DAT6   | O    | Display Port 2 Data                                   |
| 10     | DISP2_DAT7   | O    | Display Port 2 Data                                   |
| 11     | DISP2_DAT8   | O    | Display Port 2 Data                                   |
| 12     | DISP2_DAT9   | O    | Display Port 2 Data                                   |
| 13     | DISP2_DAT10  | O    | Display Port 2 Data                                   |
| 14     | GND          | PWR  | Power Ground  |
| 15     | DISP2_DAT11  | O    | Display Port 2 Data                                   |
| 16     | DISP2_DAT12  | O    | Display Port 2 Data                                   |
| 17     | DISP2_DAT13  | O    | Display Port 2 Data                                   |
| 18     | DISP2_DAT14  | O    | Display Port 2 Data                                   |
| 19     | DISP2_DAT15  | O    | Display Port 2 Data                                   |
| 20     | GND          | PWR  | Power Ground  |
| 21     | GND          | PWR  | Power Ground  |
| 22     | DI2_DISP_CLK | O    | Display Port 2 Clock                                  |
| 23     | DI2_PIN2     | O    | Display Port 2 HSYNC                                  |
| 24     | DI2_PIN3     | O    | Display Port 2 VSYNC                                  |
| 25     | DI_GP4       | O    | Display Port 2 Data Enable                            |
| 26     | GND          | PWR  | Power Ground  |
| 27     | GPIO1_2      | IO   | GPIO with PWM functionality                           |
| 28     | EIM_A26      | IO   | usable as GPIO2_20                                    |
| 29     | GND          | PWR  | Power Ground  |
| 30     | P_SWLED      | PWR  | LED Power Supply                                      |
| 31     | P_5V0        | PWR  | Power Supply  |
| 32     | LED_MD       | O    | LED driver output connected to MC18392                |
| 33     | ADIN1        | I    | Analog input for touch pad usage connected to MC18392 |
| 34     | ADIN3        | I    | Analog input for touch pad usage connected to MC18392 |
| 35     | ADIN2        | I    | Analog input for touch pad usage connected to MC18392 |
| 36     | ADIN4        | I    | Analog input for touch pad usage connected to MC18392 |
| 37     | P_GEN3       | PWR  | Power Supply  |
| 38     | GND          | PWR  | Power Ground  |
| 39     | CSI1_D10     | I    | CMOS sensor interface 1 Data                          |
| 40     | CSI1_D11     | I    | CMOS sensor interface 1 Data                          |
| 41     | CSI1_D12     | I    | CMOS sensor interface 1 Data                          |
| 42     | CSI1_D13     | I    | CMOS sensor interface 1 Data                          |
| 43     | CSI1_D14     | I    | CMOS sensor interface 1 Data                          |
| 44     | CSI1_D15     | I    | CMOS sensor interface 1 Data                          |
| 45     | CSI1_D16     | I    | CMOS sensor interface 1 Data                          |
| 46     | CSI1_D17     | I    | CMOS sensor interface 1 Data                          |
| 47     | CSI1_D18     | I    | CMOS sensor interface 1 Data                          |
| 48     | CSI1_D19     | I    | CMOS sensor interface 1 Data                          |
| 49     | CSI1_VSYNC   | I    | CMOS sensor interface 1 VSYNC                         |
| 50     | GND          | PWR  | Power Ground  |
| 51     | CSI1_HSYNC   | I    | CMOS sensor interface 1 HSYNC                         |

| Pin No | Signal      | Type | Description  |
|--------|-------------|------|--|
| 52     | CSI1_PIXCLK | I    | CMOS sensor interface 1 Pixel Clock                            |
| 53     | CSI1_D8     | O    | usable as GPIO3_12   |
| 54     | CSI1_MCLK   | O    | CMOS sensor interface 1 Master Clock                           |
| 55     | P_SW4       | PWR  | Power Supply   |
| 56     | CSPI1_MOSI  | IO   | usable as I2C1_SDA (default) for cam configuration or GPIO4_22 |
| 57     | P_DIG       | PWR  | Power Supply   |
| 58     | CSPI1_SCLK  | IO   | usable as I2C1_SCL (default) for cam configuration or GPIO4_27 |
| 59     | P_CAM       | PWR  | Power Supply   |
| 60     | GND         | PWR  | Power Ground   |

Table 4-7: Digital Video Connector pin description

### 4.3 Audio Connector (X17)

This extension connector contains the analog audio signals, as well as an SPDIF interface. This connector is also compatible with some Nano-ITX chassis.

| Pin No | Description     | Pin No | Description    |
|--------|-----------------|--------|----------------|
| 1      | SPDIF           | 2      | P_5V0          |
| 3      | GND             | 4      | n.c.           |
| 5      | Headphone right | 6      | Headphone left |
| 7      | Line in right   | 8      | Line in left   |
| 9      | n.c.            | 10     | Microphone in  |
| 11     | n.c.            | 12     | n.c.           |
| 13     | GND             | 14     | GND            |

Table 4-8: Audio Extension Connector pin description

### 4.4 Reset / Power-On Connector (X16)

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                           | Pin No | Signal | Description   |
|--------|--------|---------------------------------------|--------|--------|---------------|
| 1      | PON1   | Power On (internally pulled up)       | 2      | GND    | Signal ground |
| 3      | POR    | Power On Reset (internally pulled up) | 4      | GND    | Signal ground |

Table 4-9: Reset / Power-On Connector pin description

### 4.5 Power Supply Connector (X18)

The alternate Power Supply Extension Connector provides powering the board via a 3-pin header.

| Pin No | Signal | Description                               |
|--------|--------|---|
| 1      | GND    | Power Ground                              |
| 2      | PDI    | Power Detect Input (leave open if unused) |
| 3      | VIN    | Power Supply                              |

Table 4-10: Power Supply Extension Connector pin description

## 5 Operating Conditions

This section provides the operating conditions for the SBC-i.MX51 Single Board Computer.

### 5.1 Electrical Characteristics

| Parameter                             | Symbol | Min | Typ. | Max  | Unit |
|---------------------------------------|--------|-----|------|------|------|
| Main Power Supply Voltage             | VIN    | 6.0 | 12.0 | 16.0 | V    |
| Board Power Consumption <sup>1)</sup> |        | -   | 2.5  | 5    | W    |
| Operating Temperature                 |        | -30 | -    | 85   | °C   |
| Processor Clock Frequency             | CPUCLK | TBD | 800  | 800  | MHz  |
| USB Supply Voltage                    | VUSBx  | 4.5 | 5.0  | 5.5  | V    |
| USB Supply Current                    | VUSBx  | -   | -    | 500  | mA   |
| Extender Supply Voltage               | P_5V0  | 4.5 | 5.0  | 5.5  | V    |
| Extender Supply Current               | P_5V0  | -   | -    | 500  | mA   |

Table 5-1: Operating Conditions

<sup>1)</sup> The Power consumption refers to a single board, with no Extension Boards or USB-Devices plugged in.

### 5.2 Digital I/O Characteristics

Most IO pins available on the Extension Connectors (X3 and X11) are connected to the i.MX, and are assigned to one of three power domains.

| Parameter                 | Power Domain | Symbol          | Min   | Typ.  | Max   | Unit |
|---------------------------|--------------|-----------------|-------|-------|-------|------|
| High-Level Output Voltage | P_VIOHI      | V <sub>oh</sub> | 2.625 | 2.775 | 3.075 | V    |
| High-Level Output Voltage | PGEN2        | V <sub>oh</sub> | 3.0   | 3.15  | 3.45  | V    |
| High-Level Output Voltage | P_SW4        | V <sub>oh</sub> | 1.65  | 1.8   | 2.1   | V    |
| Low-Level Output Voltage  | all domains  | V <sub>ol</sub> | -     | -     | 0.15  | V    |
| High Level Output Current | all domains  | I <sub>oh</sub> | 1.9   | -     | 6.6   | mA   |
| Low-Level Output Current  | all domains  | I <sub>ol</sub> | 1.9   | -     | 6.6   | mA   |
| High-Level Input Voltage  | P_VIOHI      | V <sub>ih</sub> | 1.95  | -     | 2.775 | V    |
| Low -Level Input Voltage  | P_VIOHI      | V <sub>il</sub> | 0     | -     | 0.83  | V    |
| High-Level Input Voltage  | PGEN2        | V <sub>ih</sub> | 2.21  | -     | 3.15  | V    |
| Low-Level Input Voltage   | PGEN2        | V <sub>il</sub> | 0     | -     | 0.94  | V    |
| High -Level Input Voltage | P_SW4        | V <sub>ih</sub> | 1.26  | -     | 1.8   | V    |
| Low -Level Input Voltage  | P_SW4        | V <sub>il</sub> | 0     | -     | 0.54  | V    |

Table 5-2: Digital IO characteristics

### 5.3 Analog Inputs

The 10-bit ADC, which is integrated in the MC13892, allows measuring analog voltages. These analog inputs are mainly used for touchpad sensing or voltage (battery) monitoring.

| Parameter                     | Symbol          | Min | Typ. | Max | Unit |
|-------------------------------|-----------------|-----|------|-----|------|
| Resolution                    |                 |     | 10   |     | Bit  |
| Conversion Current            | I <sub>c</sub>  |     | 1    |     | mA   |
| Conversion Core Input Voltage | V <sub>in</sub> | 0   | -    | 2.4 | V    |
| Conversion Time Per Channel   | t <sub>c</sub>  |     |      | 10  | µs   |

Table 5-3: ADC characteristics

## 5.4 Boot Mode Settings

The SBC supports three different boot modes. For USB/UART boot mode, the i.MX51 is polling for activity on both USBOTG and UART1.

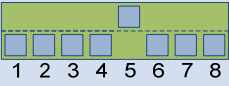
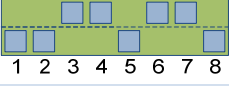
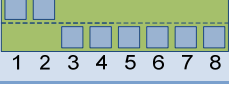
| Mode | Boot Switch Setting  | Boot Media                               |
|------|--|--|
| 1    | <br>On<br>Off | SD Card                                  |
| 2    | <br>On<br>Off | NAND Flash                               |
| 3    | <br>On<br>Off | USBOTG <b>or</b> UART1 (UART-USB-Bridge) |

Table 5-4: Boot Modes

## 6 Mechanical specification

This section shows the position of all connectors and mounting holes.

### 6.1 Connector Locations

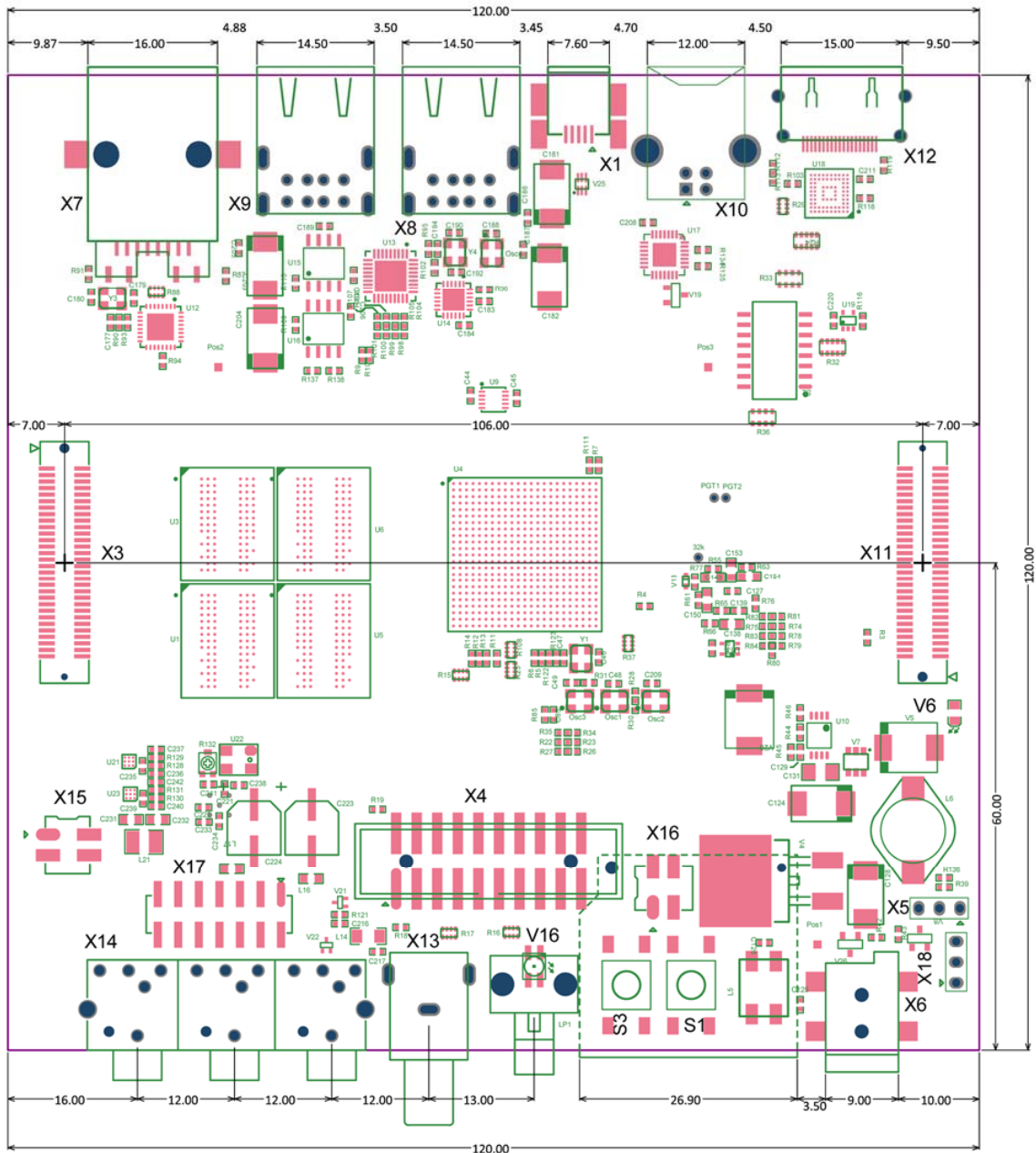


Figure 6-1: Connector Dimensions

## 6.2 Mounting Hole Dimensions

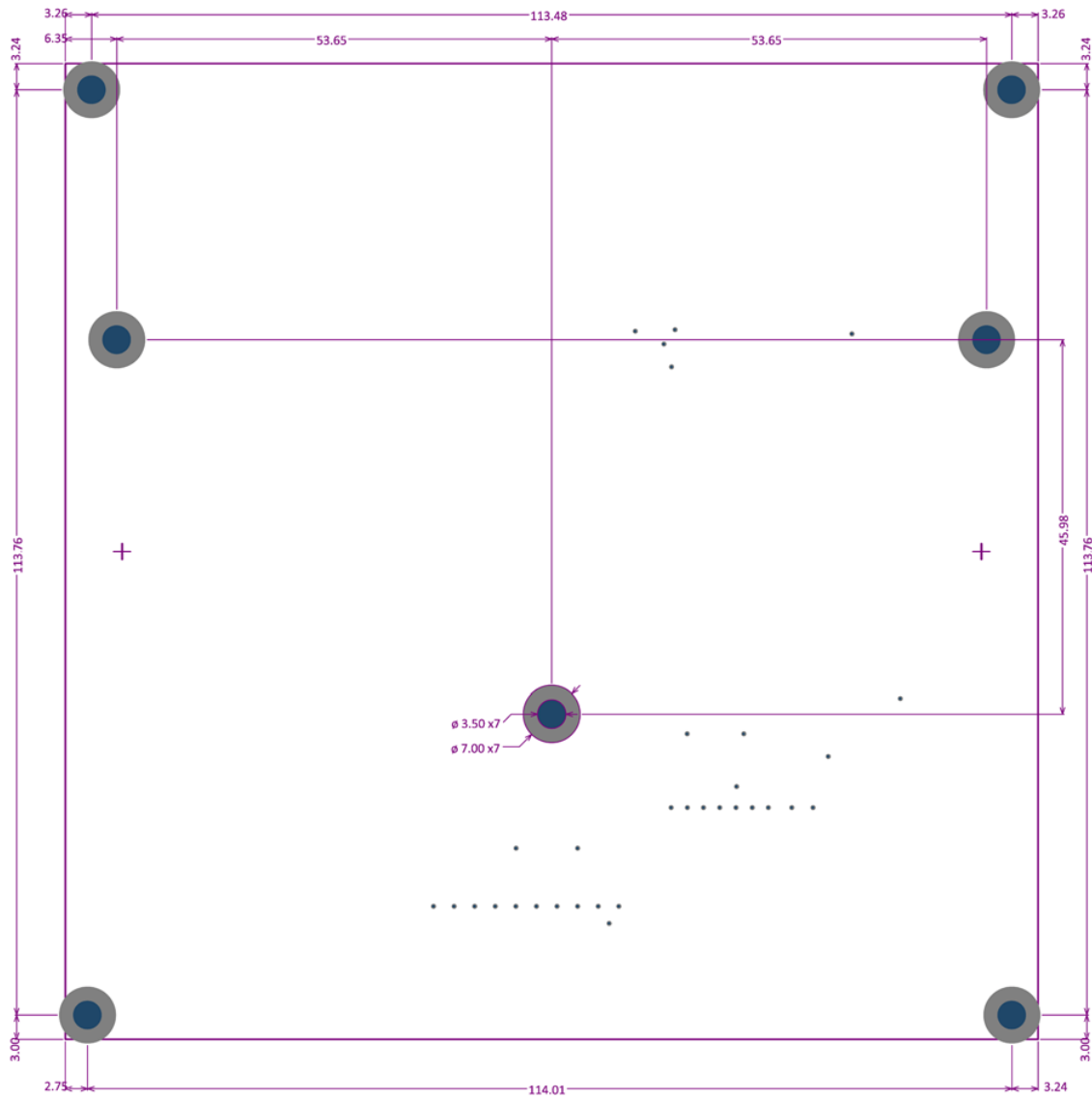


Figure 6-2: Mounting Hole Dimensions

## **7 Anomalies**

For the latest information regarding anomalies for this product, please consult the product website:

<http://www.bluetechnix.com/goto/sbc-i.mx51>

## 8 Product Changes

In the following table, you can find changes and add-ons for different SBC versions.

| Version | Type | Changes           |
|---------|------|-------------------|
| 1.2     |      | First SBC release |

Table 8-1: SBC-i.MX51 Product changes

For the latest product change information, please consult the product web page:

<http://www.bluetechnix.com/goto/sbc-i.mx51>

If you want to know in detail, which components are mounted on your board, please see the production information on our wiki page:

[https://support.bluetechnix.at/wiki/Main\\_Page#SBC-i.MX51\\_documentation](https://support.bluetechnix.at/wiki/Main_Page#SBC-i.MX51_documentation)



## 9 Document Revision History

| Version | Date       | Document Revision    |
|---------|------------|----------------------|
| 1       | 2010-05-11 | First draft release. |

Table 9-1: Revision History

## 10 List of Abbreviations

|     |                                      |
|-----|--------------------------------------|
| PWR | Power                                |
| O   | Output                               |
| I   | Input                                |
| IO  | In-Out (bidirectional)               |
| IpU | Input with internal pull-up resistor |

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