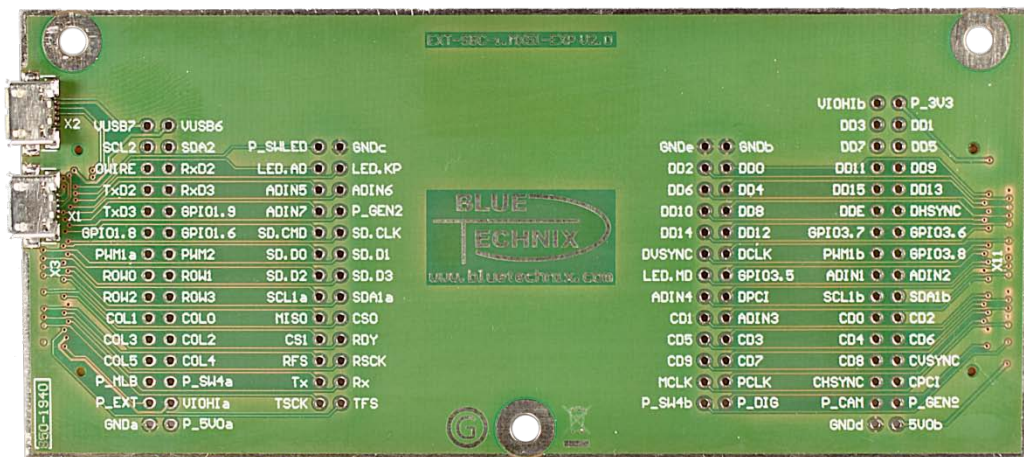
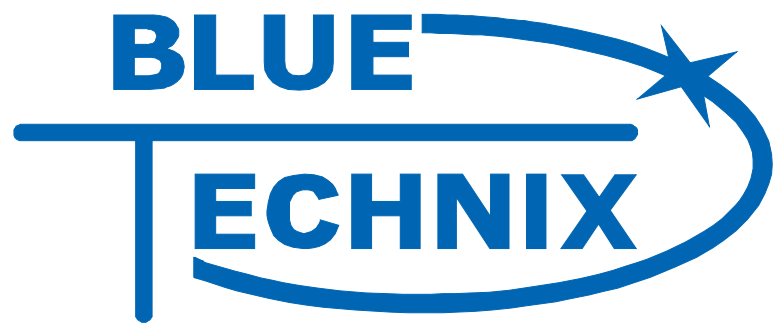




# Hardware User Manual

**EXT-SBC-i.MX51-EXP V2.0**

*...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>

Document No.: 100-2520-2.4

Date: 2011-08-04

## Table of Contents

---

|                                                              |    |
|--------------------------------------------------------------|----|
| i.MX Core Modules.....                                       | 5  |
| Core Module naming information .....                         | 6  |
| i.MX Development Boards.....                                 | 7  |
| 1 Introduction .....                                         | 8  |
| 1.1 Overview .....                                           | 8  |
| 2 PIN Description .....                                      | 9  |
| 2.1 I/O Power Domain Overview .....                          | 9  |
| 2.2 Pin Location .....                                       | 9  |
| 3 Operating Conditions.....                                  | 13 |
| 3.1 Power Supplies.....                                      | 13 |
| 3.2 Digital I/O Characteristics.....                         | 13 |
| 3.3 Analog Inputs.....                                       | 14 |
| 3.3.1 ESD Sensitivity .....                                  | 14 |
| 4 Mechanical Outline .....                                   | 15 |
| 5 Support .....                                              | 16 |
| 5.1 General Support.....                                     | 16 |
| 5.2 Board Support Packages .....                             | 16 |
| 5.3 i.MX Software Support .....                              | 16 |
| 5.3.1 Linux .....                                            | 16 |
| 5.3.2 Win CE .....                                           | 16 |
| 5.4 i.MX® Design Services .....                              | 16 |
| 5.4.1 Upcoming Products and Software Releases .....          | 16 |
| 6 Ordering Information .....                                 | 17 |
| 6.1 Predefined mounting options for EXT-SBC-i.MX51-EXP ..... | 17 |
| 7 Dependability .....                                        | 18 |
| 7.1 MTBF .....                                               | 18 |
| 8 Product History .....                                      | 19 |
| 8.1 Version Information.....                                 | 19 |
| 8.2 Anomalies.....                                           | 19 |
| 9 Document Revision History .....                            | 20 |
| 10 List of Abbreviations .....                               | 21 |
| A List of Figures and Tables.....                            | 22 |

© Bluetechnix Mechatronische Systeme GmbH 2011

All Rights Reserved.

The information herein is given to describe certain components and shall not be considered as a guarantee of characteristics.

Terms of delivery and rights of technical change reserved.

We hereby disclaim any warranties, including but not limited to warranties of non-infringement, regarding circuits, descriptions and charts stated herein.

Bluetechnix makes and you receive no warranties or conditions, express, implied, statutory or in any communication with you. Bluetechnix specifically disclaims any implied warranty of merchantability or fitness for a particular purpose.

Bluetechnix takes no liability for any damages and errors causing of the usage of this board. The user of this board is responsible by himself for the functionality of his application. He is allowed to use the board only if he has the qualification. More information is found in the General Terms and Conditions (AGB).

#### **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.

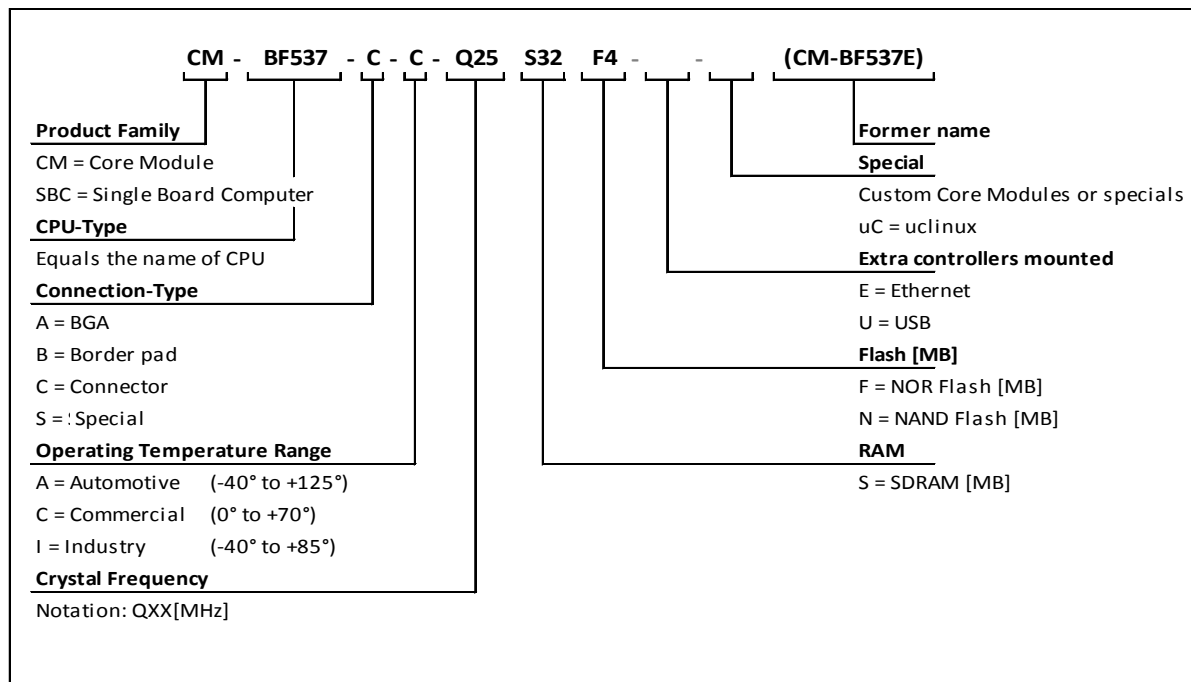
## Core Module naming information

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
  - o Special and/or
  - o 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

## 1.1 Overview

The primary goal of the EXT-SBC-i.MX51-EXP is to ensure easy connection of separate hardware with the SBC-i.MX51. Each extender connector pin is routed to a solder pad on the EXT-SBC-i.MX51-EXP. The USB-Hosts can be accessed via micro USB- connectors. The Pads are ordered in a 2.54mm pitch spacing to ensure that standard thru-hole headers or sockets can be easily soldered.

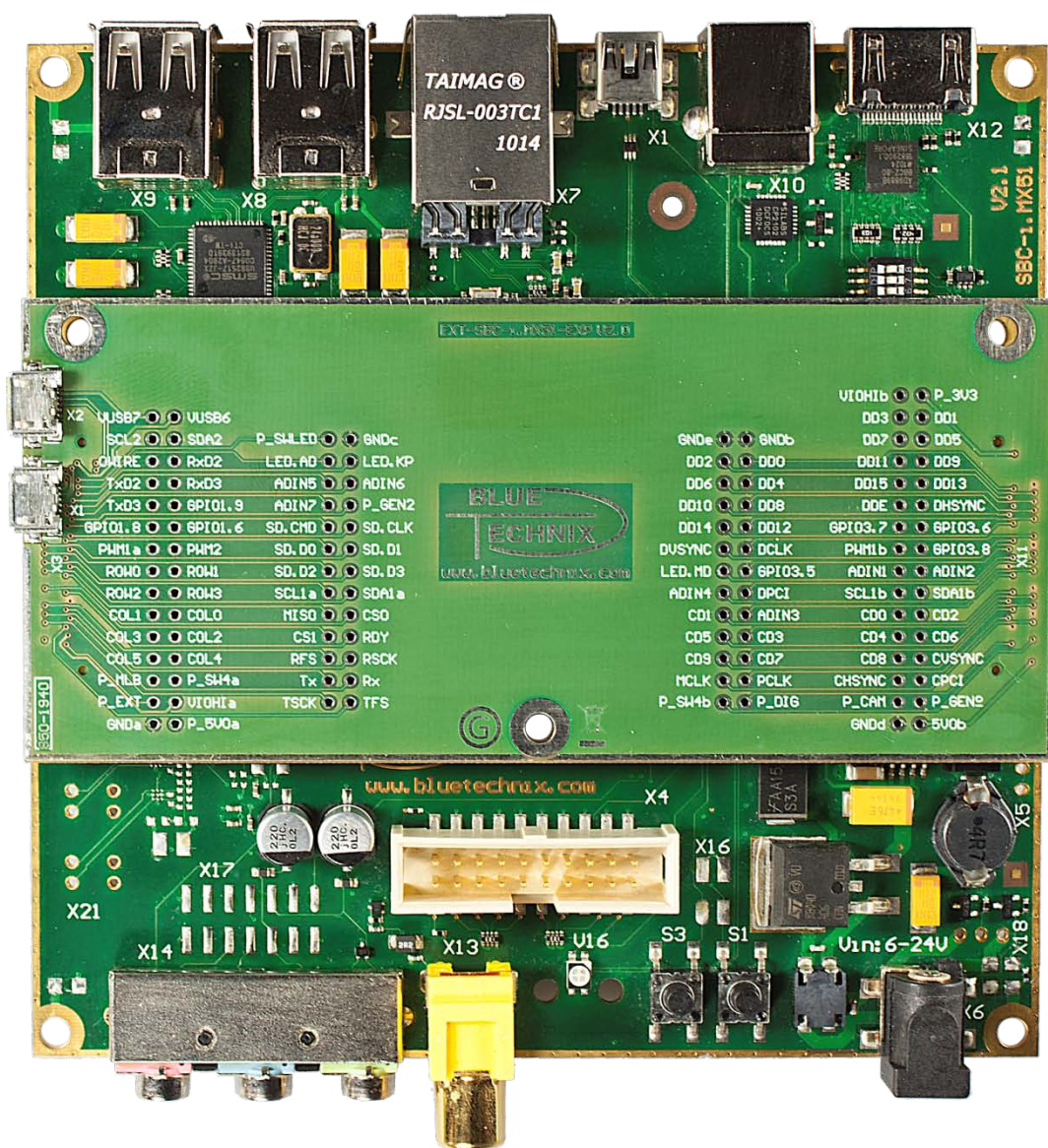


Figure 1-1: Connected EXT-SBC-i.MX51-EXP on SBC-i.MX51



## 2 PIN Description

### 2.1 I/O Power Domain Overview

All digital I/O pins belong to one of three available 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]                                        |
| 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 2-1: Power Domains for I/Os

### 2.2 Pin Location



Figure 2-1: Pin location

| Pin No | Signal   | Type | Power Domain | Description                              |
|--------|----------|------|--------------|------------------------------------------|
| 1      | VUSB7    | PWR  | P_5V0        | Power Supply                             |
| 2      | VUSB6    | PWR  | P_5V0        | Power Supply                             |
| 3      | I2C2_SCL | O    | P_VIOHI      | usable as I2C2_SCL or GPIO2_9            |
| 4      | I2C2_SDA | IO   | P_VIOHI      | usable as I2C2_SDA or GPIO2_8            |
| 5      | OWIRE    | IO   | P_VIOHI      | One-Wire Interface                       |
| 6      | RxD2     | I    | P_VIOHI      | UART2 Rx or GPIO 1_20                    |
| 7      | TxD2     | O    | P_VIOHI      | UART2 Tx or GPIO 1_21                    |
| 8      | RxD3     | I    | P_VIOHI      | UART3 Rx or GPIO 1_22                    |
| 9      | TxD3     | O    | P_VIOHI      | UART3 Tx or GPIO 1_23                    |
| 10     | GPIO1.9  | IO   | P_VIOHI      | General Purpose Input or Output          |
| 11     | GPIO1.8  | IO   | P_VIOHI      | General Purpose Input or Output          |
| 12     | GPIO1.6  | IO   | P_VIOHI      | General Purpose Input or Output          |
| 13     | PWM1     | IO   | P_VIOHI      | GPIO1_2 with PWM1 functionality          |
| 14     | PWM2     | IO   | P_VIOHI      | GPIO1_3 with PWM2 functionality          |
| 15     | ROW0     | I    | P_SW4        | Keypad Row                               |
| 16     | ROW1     | I    | P_SW4        | Keypad Row                               |
| 17     | ROW2     | I    | P_SW4        | Keypad Row                               |
| 18     | ROW3     | I    | P_SW4        | Keypad Row                               |
| 19     | COL0     | I    | P_SW4        | Keypad Column                            |
| 20     | COL1     | I    | P_SW4        | Keypad Column                            |
| 21     | COL2     | I    | P_SW4        | Keypad Column                            |
| 22     | COL3     | I    | P_SW4        | Keypad Column                            |
| 23     | COL4     | I    | P_SW4        | Keypad Column                            |
| 24     | COL5     | I    | P_SW4        | Keypad Column                            |
| 25     | P_MLB    | PWR  | P_MLB        | Power Supply                             |
| 26     | P_SW4    | PWR  | P_SW4        | Power Supply                             |
| 27     | P_EXT    | PWR  | P_EXT        | Power Supply                             |
| 28     | P_VIOHI  | PWR  | P_VIOHI      | Power Supply                             |
| 29     | GND      | PWR  | GND          | Power Ground                             |
| 30     | P_5V0    | PWR  | P_5V0        | Power Supply                             |
| 31     | P_SWLED  | PWR  | P_SWLED      | Power Supply                             |
| 32     | GND      | PWR  | GND          | Power Ground                             |
| 33     | LED.AD   | O    | P_SWLED      | LED driver output connected to MC18392   |
| 34     | LED.KP   | O    | P_SWLED      | LED driver output connected to MC18392   |
| 35     | ADIN5    | I    |              | Analog input connected to MC18392        |
| 36     | ADIN6    | I    |              | Analog input connected to MC18392        |
| 37     | ADIN7    | I    |              | Analog input connected to MC18392        |
| 38     | P_GEN2   | PWR  | P_GEN2       | Power Supply                             |
| 39     | SD2.CMD  | IO   | P_GEN2       | SD-card interface or CSPI_MOSI           |
| 40     | SD2.CLK  | O    | P_GEN2       | SD-card interface or CSPI_SCLK           |
| 41     | SD2.D0   | IO   | P_GEN2       | SD-Card Interface                        |
| 42     | SD2.D1   | IO   | P_GEN2       | SD- Card Interface                       |
| 43     | SD2.D2   | IO   | P_GEN2       | SD- Card Interface                       |
| 44     | SD2.D3   | IO   | P_GEN2       | SD- Card Interface or CSPI_SS2           |
| 45     | SCLK     | IO   | P_SW4        | SPI1 usable as I2C1_SCL or GPIO4_27      |
| 46     | MOSI     | IO   | P_SW4        | SPI1 usable also as I2C1_SDA or GPIO4_22 |
| 47     | MISO     | I    | P_SW4        | SPI1 usable also as GPIO4_23             |
| 48     | CS0      | O    | P_SW4        | SPI1 usable also as GPIO4_24             |
| 49     | CS1      | O    | P_SW4        | SPI1 usable also as GPIO4_25             |
| 50     | RDY      | I    | P_SW4        | SPI1 usable also as GPIO4_26             |
| 51     | RFS      | IO   | P_VIOHI      | Audio Port 4 usable also as GPIO2_0      |
| 52     | RSCK     | IO   | P_VIOHI      | Audio Port 4 usable also as GPIO2_3      |

| Pin No | Signal  | Type | Power Domain | Description                                                |
|--------|---------|------|--------------|------------------------------------------------------------|
| 53     | TX      | O    | P_VIOHI      | Audio Port 4 usable also as GPIO2_4                        |
| 54     | RX      | I    | P_VIOHI      | Audio Port 4 usable also as GPIO2_5                        |
| 55     | TSCK    | IO   | P_VIOHI      | Audio Port 4 usable also as GPIO2_6                        |
| 56     | TFS     | IO   | P_VIOHI      | Audio Port 4 usable also as GPIO2_7                        |
| 57     | GND     | PWR  | GND          | Power Ground                                               |
| 58     | GND     | PWR  | GND          | Power Ground                                               |
| 59     | DD2     | O    | P_VIOHI      | Display Port 2 Data                                        |
| 60     | DD0     | O    | P_VIOHI      | Display Port 2 Data                                        |
| 61     | DD6     | O    | P_VIOHI      | Display Port 2 Data                                        |
| 62     | DD4     | O    | P_VIOHI      | Display Port 2 Data                                        |
| 63     | DD10    | O    | P_VIOHI      | Display Port 2 Data                                        |
| 64     | DD8     | O    | P_VIOHI      | Display Port 2 Data                                        |
| 65     | DD14    | O    | P_VIOHI      | Display Port 2 Data                                        |
| 66     | DD12    | O    | P_VIOHI      | Display Port 2 Data                                        |
| 67     | DVSYNC  | O    | P_VIOHI      | Display Port 3 VSYNC                                       |
| 68     | DCLK    | O    | P_VIOHI      | Display Port 2 Clock                                       |
| 69     | LED.MD  | O    | P_SWLED      | LED driver output connected to MC18392                     |
| 70     | GPIO3.5 | IO   | P_SW4        | General Purpose Input or Output                            |
| 71     | ADIN4   | I    |              | Analog input for touch pad usage connected to MC18392      |
| 73     | CD1     | I    | P_SW4        | CMOS Sensor Interface 1 Data                               |
| 72     | DPCI    | IO   | P_VIOHI      | Usable as GPIO2_20                                         |
| 74     | ADIN3   | I    |              | Analog input for touch pad usage connected to MC18392      |
| 75     | CD5     | I    | P_SW4        | CMOS Sensor Interface 1 Data                               |
| 76     | CD3     | I    | P_SW4        | CMOS Sensor Interface 1 Data                               |
| 77     | CD9     | I    | P_SW4        | CMOS Sensor Interface 1 Data                               |
| 78     | CD7     | I    | P_SW4        | CMOS Sensor Interface 1 Data                               |
| 79     | MCLK    | O    | P_SW4        | CMOS Sensor Interface 1 Master Clock                       |
| 80     | PCLK    | I    | P_SW4        | CMOS Sensor Interface 1 Pixel Clock                        |
| 81     | P_SW4   | PWR  | P_SW4        | Power Supply                                               |
| 82     | P_DIG   | PWR  | P_DIG        | Power Supply                                               |
| 83     | P_VIOHI | PWR  | P_VIOHI      | Power Supply                                               |
| 84     | P_3V3   | PWR  | P_3V3        | Only available if 3V3 regulator is populated on SBC i.MX51 |
| 85     | DD3     | O    | P_VIOHI      | Display Port 2 Data                                        |
| 86     | DD1     | O    | P_VIOHI      | Display Port 2 Data                                        |
| 87     | DD7     | O    | P_VIOHI      | Display Port 2 Data                                        |
| 88     | DD5     | O    | P_VIOHI      | Display Port 2 Data                                        |
| 89     | DD11    | O    | P_VIOHI      | Display Port 2 Data                                        |
| 90     | DD9     | O    | P_VIOHI      | Display Port 2 Data                                        |
| 91     | DD15    | O    | P_VIOHI      | Display Port 2 Data                                        |
| 92     | DD13    | O    | P_VIOHI      | Display Port 2 Data                                        |
| 93     | DDE     | O    | P_SW4        | Display Port 4 Data Enable                                 |
| 94     | DHSYNC  | O    | P_VIOHI      | Display Port 2 HSYNC                                       |
| 95     | GPIO3.7 | IO   | P_SW4        | Usable as GPIO3_7                                          |
| 96     | GPIO3.6 | IO   | P_SW4        | Usable as GPIO3_6                                          |
| 97     | PWM1    | IO   | P_VIOHI      | GPIO1.2 with PWM functionality                             |
| 98     | GPIO3.8 | IO   | P_SW4        | Usable as GPIO3_8                                          |
| 99     | ADIN1   | I    |              | Analog input for touch pad usage connected to MC18392      |
| 100    | ADIN2   | I    |              | Analog input for touch pad usage connected to MC18392      |
| 101    | SCL1    | IO   | P_SW4        | usable as I2C1_SCL for cam configuration or GPIO4_27       |
| 102    | SDA1    | IO   | P_SW4        | usable as I2C1_SDA for cam configuration or GPIO4_22       |
| 103    | CD0     | I    | P_SW4        | CMOS Sensor Interface 1 Data                               |
| 104    | CD2     | I    | P_SW4        | CMOS Sensor Interface 1 Data                               |

| Pin No     | Signal | Type | Power Domain | Description                          |
|------------|--------|------|--------------|--------------------------------------|
| <b>105</b> | CD4    | I    | P_SW4        | CMOS Sensor Interface 1 Data         |
| <b>106</b> | CD6    | I    | P_SW4        | CMOS Sensor Interface 1 Data         |
| <b>107</b> | CD8    | I    | P_SW4        | CMOS Sensor Interface 1 Data         |
| <b>108</b> | CVSYNC | I    | P_SW4        | CMOS Sensor Interface 1 VSYNC        |
| <b>109</b> | CHSYNC | I    | P_SW4        | CMOS Sensor Interface 1 HSYNC        |
| <b>110</b> | CPCI   | O    | P_SW4        | usable as GPIO3_12 (e.g. Power Down) |
| <b>111</b> | P_CAM  | PWR  | P_CAM        | Power Supply                         |
| <b>112</b> | P_GEN3 | PWR  | P_GEN3       | Power Supply                         |
| <b>113</b> | GND    | PWR  | GND          | Power Ground                         |
| <b>114</b> | P_5V0  | PWR  | P_5V0        | Power Supply                         |

Table 2-2: Pin description

### 3 Operating Conditions

This section provides the operating conditions for the EXT-SBC-i.MX51-EXP Extender Board.

#### 3.1 Power Supplies

The EXT-SBC-i.MX51-EXP provides different supply voltages. They can be used to supply custom electronics. Some supply voltages are generated by the MC13892 PMIC 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                  |
| P_3V3                 | 3.3V                      | 500mA                  |
| P_VIOHI <sup>1)</sup> | 2.775V                    | 50mA                   |
| P_SW4 <sup>1)</sup>   | 1.8V                      | 50mA                   |
| P_GEN2 <sup>1)</sup>  | 3.15V                     | 70mA                   |
| P_GEN3                | 1.8V, 2.9V                | 50mA                   |
| P_DIG                 | 1.05V, 1.25V, 1.65V, 1.8V | 50mA                   |
| P_CAM                 | 2.5V, 2.6V, 2.75V, 3.0V   | 250mA                  |
| P_EXT <sup>3)</sup>   | 2.3V, 2.5V, 2.775V, 3.0V  | 150mA                  |
| P_MLB <sup>3)</sup>   | 2.5V, 2.6V, 2.7V, 2.775V  | 350mA                  |
| P_SWLED <sup>2)</sup> | 4.3V to 26.5V             | 60mA                   |

Table 3-1: 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. Please also refer to the MC13892 errata sheet available from the Freescale website.

<sup>3)</sup> P\_EXT is called VAUDIO and P\_MLB is called VVIDEO on the MC13892 Users Guide.

#### 3.2 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 3-2: Digital IO characteristics

### 3.3 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            | $I_c$    |     | 1    |     | mA      |
| Conversion Core Input Voltage | $V_{in}$ | 0   | -    | 2.4 | V       |
| Conversion Time Per Channel   | $t_c$    |     |      | 10  | $\mu s$ |

Table 3-3: ADC characteristics

#### 3.3.1 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 Mechanical Outline

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

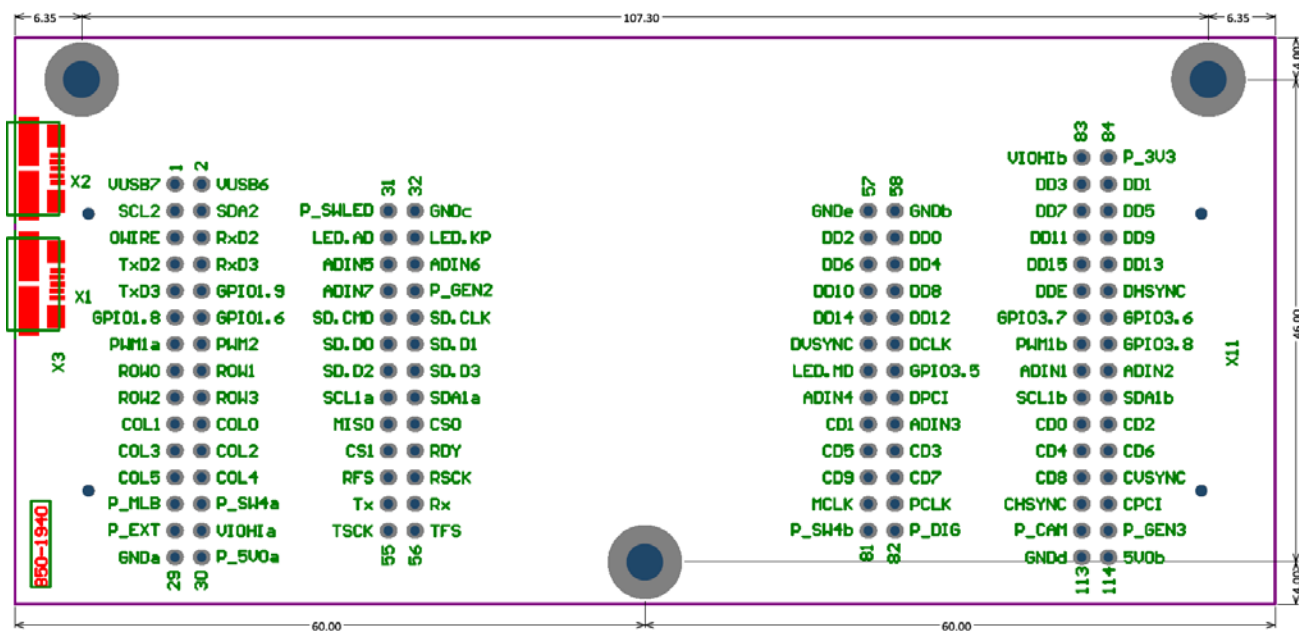


Figure 4-1: EXT-SBC-i.MX51-EXP top view



## **5 Support**

### **5.1 General Support**

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

### **5.2 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>

### **5.3 i.MX Software Support**

#### **5.3.1 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.

#### **5.3.2 Win CE**

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

### **5.4 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.

#### **5.4.1 Upcoming Products and Software Releases**

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

## 6 Ordering Information

### 6.1 Predefined mounting options for EXT-SBC-i.MX51-EXP

| Article Number | Name                                        | Description                                          |
|----------------|---------------------------------------------|------------------------------------------------------|
| 100-2520-2     | EXT-SBC-i.MX51-EXP                          | Experimental Extender Board for SBC-i.MX51           |
| 100-4110-2     | SBC-i.MX51-S-C-Q24S512N2048<br>(SBC-i.MX51) | Single-Board Computer SBC-I.MX51 based on i.MX51 SoC |

Table 6-1: Ordering information

---

**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 developments.

---

## **7 Dependability**

### **7.1 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.

## 8 Product History

### 8.1 Version Information

| Version | Date       | Changes                                                                                                                   |
|---------|------------|---------------------------------------------------------------------------------------------------------------------------|
| 2.0     | 2011-04-20 | The two expansion connectors have been changed to a FX10-80S from Hirose for better signal integrity and more flexibility |
| 1.0     | 2010-12-22 | First extender board release.                                                                                             |

Table 8-1: Overview product changes

### 8.2 Anomalies

| Version | Date       | Description                |
|---------|------------|----------------------------|
| 1.0     | 2011-04-20 | No anomalies reported yet. |

Table 8-2: Overview product anomalies

## 9 Document Revision History

| Version | Date       | Document Revision               |
|---------|------------|---------------------------------|
| 4       | 2011 08 04 | Changed product photos.         |
| 3       | 2011 04 20 | Changed description of Pin 84   |
| 2       | 2011 03 17 | Update for Board Revision V2.0. |
| 1       | 2010 12 22 | First draft release.            |

Table 9-1: Revision history

## 10 List of Abbreviations

| Abbreviation          | Description                                 |
|-----------------------|---------------------------------------------|
| <b>ADI</b>            | Analog Devices Inc.                         |
| <b>AI</b>             | Analog Input                                |
| <b>AMS</b>            | Asynchronous Memory Select                  |
| <b>AO</b>             | Analog Output                               |
| <b>CM</b>             | Core Module                                 |
| <b>DC</b>             | Direct Current                              |
| <b>DSP</b>            | Digital Signal Processor                    |
| <b>eCM</b>            | Enhanced Core Module                        |
| <b>EBI</b>            | External Bus Interface                      |
| <b>ESD</b>            | Electrostatic Discharge                     |
| <b>GPIO</b>           | General Purpose Input Output                |
| <b>I</b>              | Input                                       |
| <b>I<sup>2</sup>C</b> | Inter-Integrated Circuit                    |
| <b>I/O</b>            | Input/Output                                |
| <b>ISM</b>            | Image Sensor Module                         |
| <b>LDO</b>            | Low Drop-Out regulator                      |
| <b>MTBF</b>           | Mean Time Between Failure                   |
| <b>NC</b>             | Not Connected                               |
| <b>NFC</b>            | NAND Flash Controller                       |
| <b>O</b>              | Output                                      |
| <b>OS</b>             | Operating System                            |
| <b>PPI</b>            | Parallel Peripheral Interface               |
| <b>PWR</b>            | Power                                       |
| <b>RTOS</b>           | Real-Time Operating System                  |
| <b>SADA</b>           | Stand Alone Debug Agent                     |
| <b>SD</b>             | Secure Digital                              |
| <b>SoC</b>            | System on Chip                              |
| <b>SPI</b>            | Serial Peripheral Interface                 |
| <b>SPM</b>            | Speech Processing Module                    |
| <b>SPORT</b>          | Serial Port                                 |
| <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>USB</b>            | Universal Serial Bus                        |
| <b>USBOTG</b>         | USB On The Go                               |
| <b>ZIF</b>            | Zero Insertion Force                        |

Table 10-1: List of abbreviations

## A List of Figures and Tables

### Figures

|                                                              |    |
|--------------------------------------------------------------|----|
| Figure 1-1: Connected EXT-SBC-i.MX51-EXP on SBC-i.MX51 ..... | 8  |
| Figure 2-1: Pin location .....                               | 9  |
| Figure 4-1: EXT-SBC-i.MX51-EXP top view .....                | 15 |

### Tables

|                                                                                         |    |
|-----------------------------------------------------------------------------------------|----|
| Table 2-1: Power Domains for I/Os .....                                                 | 9  |
| Table 2-2: Pin description .....                                                        | 12 |
| Table 3-1: Maximum power consumption for the GPIO / Automation Connector supplies ..... | 13 |
| Table 3-2: Digital IO characteristics .....                                             | 13 |
| Table 3-3: ADC characteristics .....                                                    | 14 |
| Table 6-1: Ordering information .....                                                   | 17 |
| Table 8-1: Overview product changes .....                                               | 19 |
| Table 8-2: Overview product anomalies .....                                             | 19 |
| Table 9-1: Revision history .....                                                       | 20 |
| Table 10-1: List of abbreviations .....                                                 | 21 |





Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### 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.