BLUE TECHNIX

Hardware User Manual

EXT-SBC-i.MX51-COMM V1.2

...maximum performance at minimum space

Contact

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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)

CM - BF537 - C - C - Q25 S32 F4 - - (CM-BF537E)

Product Family
CM = Core Module
SBC = Single Board Computer

CPU-Type
Equals the name of CPU

Connection-Type
A = BGA
B = Border pad
C = Connector
S = : Special

Operating Temperature Range
A = Automotive   (-40° to +125°)
C = Commercial   (0° to +70°)
I = Industry   (-40° to +85°)

Crystal Frequency
Notation: QXX[MHz]

Former name

Special
Custom Core Modules or specials
uC = uclinux

Extra controllers mounted
E = Ethernet
U = USB

Flash [MB]
F = NOR Flash [MB]
N = NAND Flash [MB]

RAM
S = SDRAM [MB]

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 2Dacceleration 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 EXT-SBC-i.MX51-COMM is the best equipped extender board for the SBC-i.MX51. It offers GPS, GSM/GPRS, a camera (BLT-ISM-CONNECTOR) as well as a display interface. Antenna connectors for GSM and GPS are available for external antennas. Possible applications are wireless communication, mobile Navigation, surveillance, locating and industrial applications.

Antenna connectors are provided to connect to the GPS and GSM module.
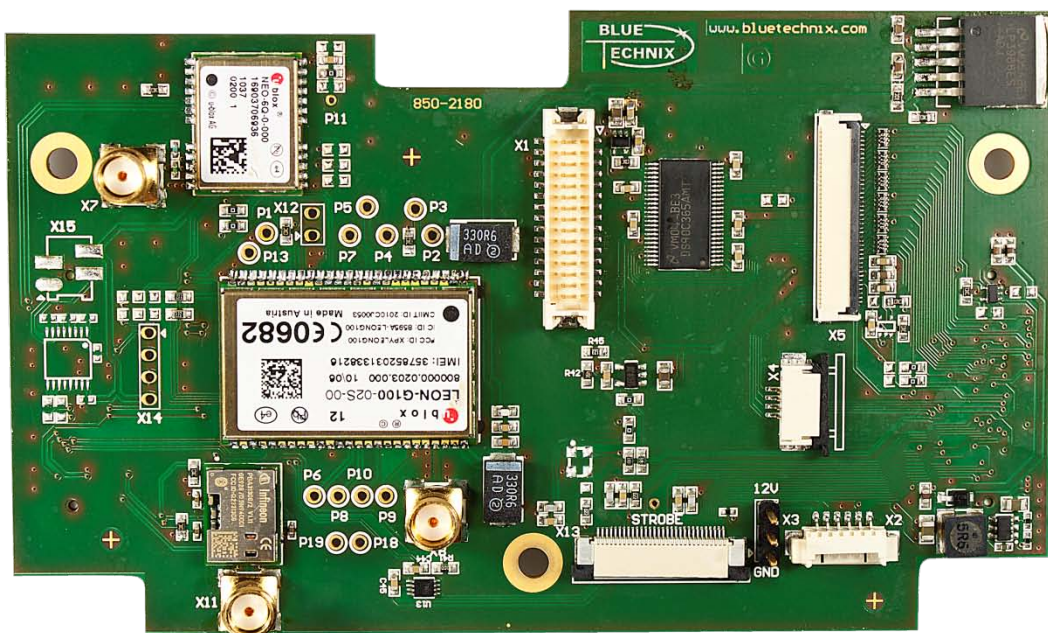
Figure 1-1: EXT-SBC-i.MX51-COMM

1.1 Overview
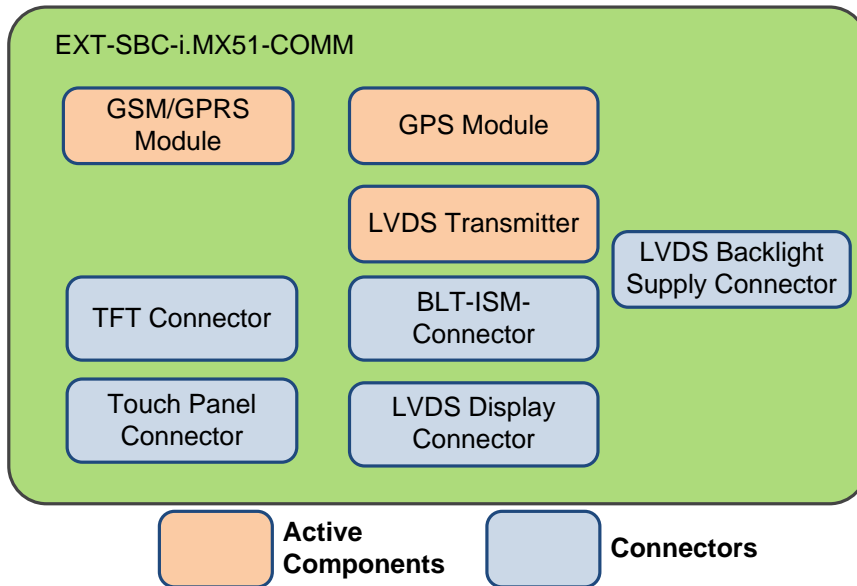
Figure 1-2: Main components of EXT-SBC-i.MX51-COMM

1.2 Key Features

- **GPS Module**
  - U-Blox NEO-6Q
    - Onboard RTC crystal for faster warm and hot starts
    - Up to 5Hz navigation rate
    - Anti-jamming technology
  - Onboard antenna connector

- **GSM/GPRS Module**
  - U-Blox LEON G100 incl. SIM Card Holder
    - Full feature quad-band GSM/GPRS, class 10
    - Embedded TCP/IP stack
  - Onboard antenna connector

- **TFT Connector**
  - 40 pin ZIF connector
  - Various EDT displays available (3,5" to 7"; 320x240 to 800x480)

- **LVDS Connector**
  - 30 pin connector
  - Supports Toshiba LT084AC3711 LVDS display

- **LVDS Transmitter**
  - National Semiconductor DS90C365

- **Touch Panel Connector**

  o 4 pin Connector for connection of a resistive Touch Panel

- **Power Supply**

  o LVDS Backlight supplied via separate external power supply (not included)

  o EXT-SBC-i.MX51-COMM is powered via SBC-i.MX51

- **Camera Connector (BLT-ISM-Connector)**

  o 30 pin ZIF connector

  o Compatible with all Bluetechnix Image Sensor Modules

1.3 Applications

- Rapid prototyping

- POS terminals

- Onboard units

- Multimedia products

- Wireless applications

- Automation and control systems

- Graphical User Interfaces

2 General Description

2.1 Functional Description

2.1.1 Powering

The EXT-SBC-i.MX51-COMM is supplied by the SBC-i.MX51. Please consider the chapter *Electrical Specifications*. If an LVDS display is used (e.g. LT084AC3711) an external 12V power supply must be connected to the connector X3.

2.2 PCB Placement

Figure 2-1: Connector positions

2.3 Mechanical Outline

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

Figure 2-2: EXT-SBC-i.MX51-COMM top view
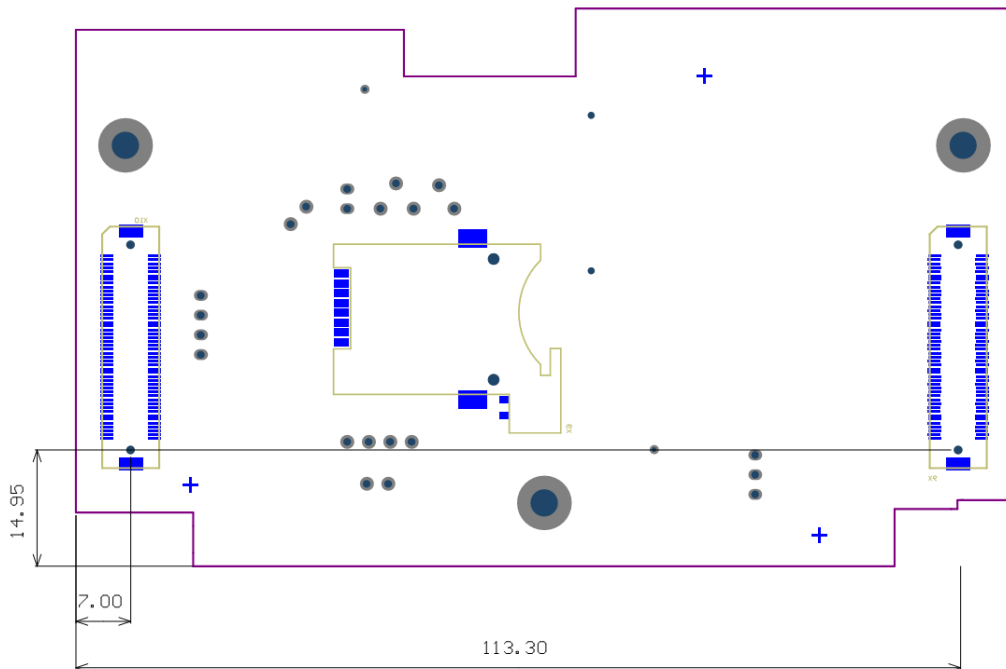
Figure 2-3: EXT-SBC-i.MX51-COMM bottom view

3 Specifications

3.1 Electrical Specifications

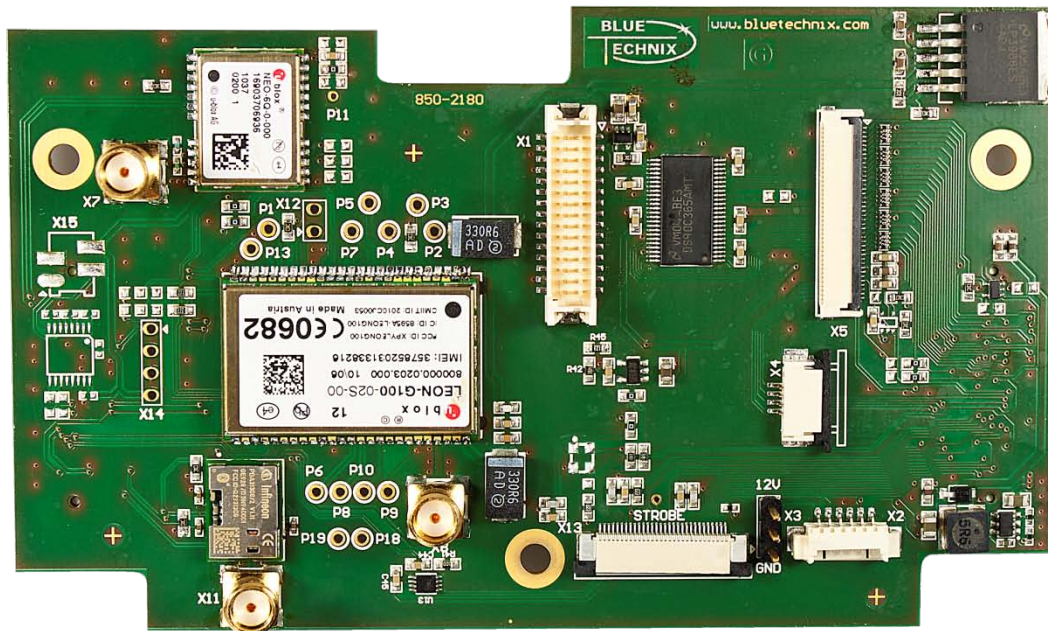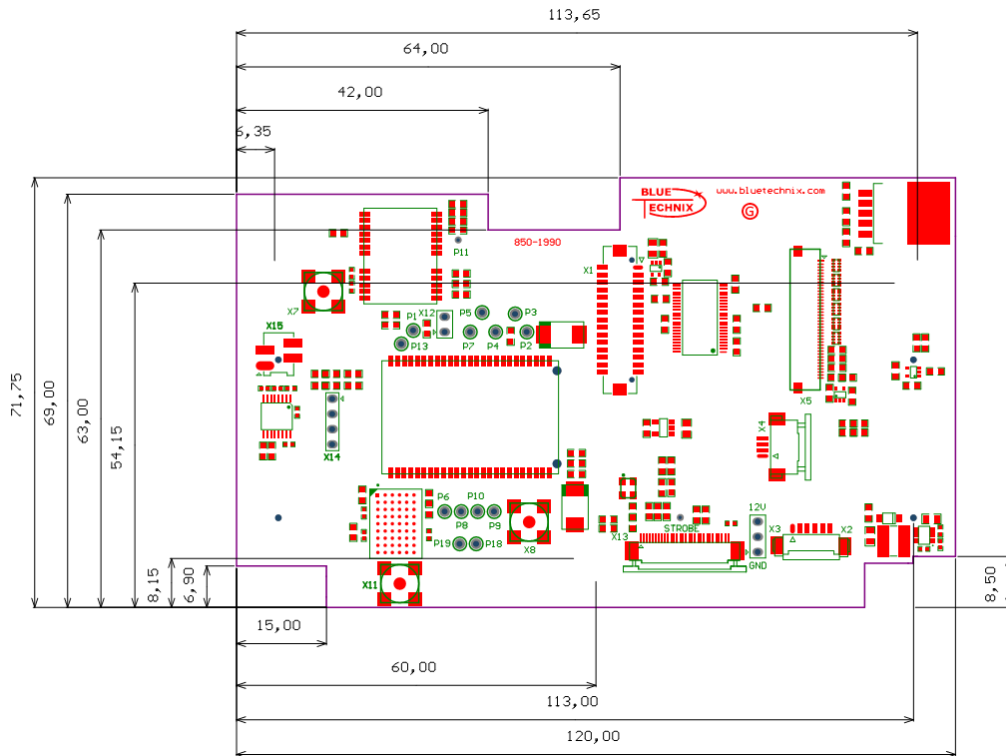### 3.1.1 Digital I/O Characteristics

Parameter	Power Domain	Symbol	Min	Typ.	Max	Unit
High-Level Output Voltage	P_VIOHI	V_{oh}	2.625	2.775	3.075	V
High-Level Output Voltage	P_SW4	V_{oh}	1.65	1.8	2.1	V
Low-Level Output Voltage	all domains	V_{ol}	-	-	0.15	V
High Level Output Current	all domains	I_{oh}	1.9	-	6.6	mA
Low-Level Output Current	all domains	I_{ol}	1.9	-	6.6	mA
High-Level Input Voltage	P_VIOHI	V_{ih}	1.95	-	2.775	V
Low -Level Input Voltage	P_VIOHI	V_{il}	0	-	0.83	V
High -Level Input Voltage	P_SW4	V_{ih}	1.26	-	1.8	V
Low -Level Input Voltage	P_SW4	V_{il}	0	-	0.54	V

Table 3-1: Digital IO characteristics

3.1.2 Analog Inputs

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	µs

Table 3-2: ADC characteristics

3.1.3 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_{LED}	Backlight supply voltage	0	20	V
I_{OH} /I_{OL}	Current per pin	0	10	mA
T_{AMB}	Ambient temperature	-20	70	°C
T_{STO}	Storage temperature	-55	100	°C
T_{SLD}	Solder temperature for 10 seconds		260	°C
φ_{AMB}	Relative ambient humidity		90	%

Table 3-3: Absolute maximum ratings

3.1.4   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 Display Data Connector X1 (Toshiba LT084AC3711)

Pin No.	Signal Name	Type	Power Domain	Description
1	NC	NC		Not Connected
2	NC	NC		Not Connected
3	P_3V3	PWR	P_3V3	Display Power Supply
4	GND	PWR	GND	Power Ground
5	TxCLK_N	O	P_3V3	LVDS clock
6	TxCLK_P	O	P_3V3	LVDS clock
7	P_3V3	PWR	P_3V3	Display Power Supply
8	GND	PWR	GND	Power Ground
9	Tx0_N	O	P_3V3	LVDS Channel 0
10	Tx0_P	O	P_3V3	LVDS Channel 0
11	Tx1_N	O	P_3V3	LVDS Channel 1
12	Tx1_P	O	P_3V3	LVDS Channel 1
13	Tx2_N	O	P_3V3	LVDS Channel 2
14	Tx2_P	O	P_3V3	LVDS Channel 2
15	NC	NC		Not Connected
16	NC	NC		Not Connected
17	NC	NC		Not Connected
18	NC	NC		Not Connected
19	NC	NC		Not Connected
20	NC	NC		Not Connected
21	NC	NC		Not Connected
22	NC	NC		Not Connected
23	NC	NC		Not Connected
24	NC	NC		Not Connected
25	NC	NC		Not Connected
26	NC	NC		Not Connected
27	P_3V3	PWR	P_3V3	Display Power Supply
28	GND	PWR	GND	Power Ground
29	NC	NC		Not Connected
30	NC	NC		Not Connected

Table 4-1: Display Data Connector description (X1)

4.2 LVDS Backlight Supply Connector X2 (Toshiba LT084AC3711)

Pin No.	Signal Name	Type	Power Domain	Description
1	12V	PWR	12V	Display Power Supply
2	12V	PWR	12V	Display Power Supply
3	GND	PWR	GND	Power Ground
4	GND	PWR	GND	Power Ground
5	LVDS-nRESET	O	P_3V3	Display ON/OFF
6	PWM1	O	P_VIOHI	PWM1 Output

Table 4-2: Display Power Connector description (X2)

4.3 Display Power Supply Connector X3

Pin No.	Signal Name	Type	Power Domain	Description
1	12V	PWR	V_LED	External Backlight Power Supply
2	NC	NC		Not Connected
3	GND	PWR	GND	External Power Ground

Figure 4-1: Display Power Supply Connector description (X3)

4.4 Touch Panel Connector X4 (Toshiba LT084AC3711)

Pin No.	Signal Name	Type	Description
1	ADIN1	AI	Touch Panel XR Terminal
2	ADIN2	AI	Touch Panel YU Terminal
3	ADIN3	AI	Touch Panel XL Terminal
4	ADIN4	AI	Touch Panel YD Terminal

Figure 4-2: Touch Panel Connector description (X4)

4.5 Display Connector X5 (ET0500G0DH6)

Pin No.	Signal Name	Type	Power Domain	Description
1	DISP.nRESET	O	P_3V3	Display Reset
2	GND	PWR	GND	Power Ground
3	DISP2.D4	O	P_VIOHI	Blue Data Bit 5
4	DISP2.D3	O	P_VIOHI	Blue Data Bit 4
5	DISP2.D2	O	P_VIOHI	Blue Data Bit 3
6	DISP2.D1	O	P_VIOHI	Blue Data Bit 2
7	DISP2.D0	O	P_VIOHI	Blue Data Bit 1
8	DISP2.D4	O	P_VIOHI	Blue Data Bit 0
9	GND	PWR	GND	Power Ground
10	DISP2.D10	O	P_VIOHI	Green Data Bit 5
11	DISP2.D9	O	P_VIOHI	Green Data Bit 4
12	DISP2.D8	O	P_VIOHI	Green Data Bit 3
13	DISP2.D7	O	P_VIOHI	Green Data Bit 2
14	DISP2.D6	O	P_VIOHI	Green Data Bit 1
15	DISP2.D5	O	P_VIOHI	Green Data Bit 0
16	GND	PWR	GND	Power Ground
17	DISP2.D15	O	P_VIOHI	Green Data Bit 5
18	DISP2.D14	O	P_VIOHI	Green Data Bit 4
19	DISP2.D13	O	P_VIOHI	Green Data Bit 3
20	DISP2.D12	O	P_VIOHI	Green Data Bit 2
21	DISP2.D11	O	P_VIOHI	Green Data Bit 1
22	DISP2.D15	O	P_VIOHI	Green Data Bit 0
23	GND	PWR	GND	Power Ground
24	TFT.CLK	O	P_VIOHI	Dot Data Clock
25	GND	PWR	GND	Power Ground
26	TFT.HSYNC	O	P_VIOHI	Horizontal Sync
27	TFT.VSYNC	O	P_VIOHI	Vertical Sync
28	TFT.DE	O	P_3V3	Data Enable
29	TFT.PWRCTRL	O	P_VIOHI	Power Control
30	P_3V3	PWR	P_3V3	Power Supply

Pin No.	Signal Name	Type	Power Domain	Description
31	GND	PWR	GND	Power Ground
32	GND	PWR	GND	Power Ground
33	P_3V3	PWR	P_3V3	Power Supply
34	P_3V3	PWR	P_3V3	Power Supply
35	NC	NC		Not Connected
36	PWM1	O	P_VIOHI	Backlight Brightness Control
37	ADIN1	AI		Touch Panel YU Terminal
38	ADIN3	AI		Touch Panel XL Terminal
39	ADIN2	AI		Touch Panel YD Terminal
40	ADIN4	AI		Touch Panel XR Terminal

Figure 4-3: Display Connector description (X5)

4.6 GSM/GPRS Antenna Connector X7 (SMA Jack)

SMA coaxial antenna connector for GSM/GPRS module.

4.7 GPS Antenna Connector X8 (SMA Jack)

SMA coaxial antenna connector for GPS module.

4.8 SIM Connector X9

Pin No.	Signal Name	Type	Description
1	VCC	PWR	SIM Voltage Supply
2	NRESET	I	SIM Reset
3	CLK	I	SIM Clock
4	NC	NC	Not Connected
5	GND	PWR	Power Ground
6	NC	NC	Not Connected
7	DIO	I/O	Data In/Out
8	NC	NC	Not Connected
9	NC	NC	Not Connected
10	NC	NC	Not Connected

Figure 4-4: Touch Panel Connector description (X4)

4.9 Image Sensor Connector X13 (BLT-ISM-Connector)

Pin No.	SignalName	Type	Power Domain	Description
1	VCAMA	PWR	P_CAM_2V75	Camera Analog Voltage Supply
2	GND	PWR	GND	Power Ground
3	NC	NC		Not Connected
4	CAMCLK	O	P_SW4	Camera Master Clock
5	NRESET	O	P_SW4	Global Reset
6	SIO.C	O	P_SW4	Configuration Bus Clock Line
7	SIO.D	I/O	P_SW4	Configuration Bus Data Line
8	VCAMC	PWR	1V8	Camera Core Voltage Supply
9	GND	PWR	GND	Power Ground

Pin No.	SignalName	Type	Power Domain	Description
10	CSI1.PCLK	I	P_SW4	Pixel Clock
11	CSI1.VSYNC	I	P_SW4	VSYNC
12	CSI1.HSYNC	I	P_SW4	HSYNC
13	GPIO3.5	O	P_SW4	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	CSI1.DO	I	P_SW4	Pixel Data
18	CSI1.D1	I	P_SW4	Pixel Data
19	VCAMIO	PWR	1V8	Camera IO Power Supply
20	GND	PWR	GND	Power Ground
21	CSI1.D2	I	P_SW4	Pixel Data
22	CSI1.D3	I	P_SW4	Pixel Data
23	CSI1.D4	I	P_SW4	Pixel Data
24	CSI1.D5	I	P_SW4	Pixel Data
25	GND	PWR	GND	Power Ground
26	CSI1.D6	I	P_SW4	Pixel Data
27	CSI1.D7	I	P_SW4	Pixel Data
28	CSI1.D8	I	P_SW4	Pixel Data
29	CSI1.D9	I	P_SW4	Pixel Data
30	CSI1.PWDN	O	P_SW4	Output Enable (Active Low)

Table 4-3: BLT-ISM-Connector interface description (X13)

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 derivates 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 Related products for EXT-SBC-i.MX51-COMM

Article Number	Name	Description
100-2524-1	EXT-SBC-i.MX51-COMM	Communication extender board for SBC-i.MX51
100-9910-1	EDT-TFT-5.0"-WVGA-G-ET0500G0DH6	EDT Display TFT 5.0" WVGA, 300cd/m² LED, TTL, touch
100-4110-2	SBC-i.MX51-S-C-Q24S512N2048 (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) 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) if you are interested in the MTBF result.

8 Product History

8.1 Version Information

Version	Date	Changes
1.2	2011-05-30	Changed layout of Image Sensor Connector X13
1.1	2011-04-20	First release V1.1 of the Hardware.

Table 8-1: Overview product changes

8.2 Anomalies

Version	Date	Description
1.1	2011-04- 20	No anomalies reported yet.

Table 8-2: Overview product anomalies

9 Document Revision History

Version	Date	Document Revision
4	2011-12-06	Removed Bluetooth support since BT module is not available any more.
3	2011-09-06	Changed product photo.
2	2011-08-03	Update for Board Revision 1.2
1	2011-04- 20	First release V1.0 of the Document

Table 9-1: Revision History

10 List of Abbreviations

Abbreviation	Description
ADI	Analog Devices Inc.
AI	Analog Input
AMS	Asynchronous Memory Select
AO	Analog Output
CM	Core Module
DC	Direct Current
DSP	Digital Signal Processor
eCM	Enhanced Core Module
EBI	External Bus Interface
ESD	Electrostatic Discharge
GPIO	General Purpose Input Output
I	Input
I²C	Inter-Integrated Circuit
I/O	Input/Output
ISM	Image Sensor Module
LDO	Low Drop-Out regulator
MTBF	Mean Time Between Failure
NC	Not Connected
NFC	NAND Flash Controller
O	Output
OS	Operating System
PPI	Parallel Peripheral Interface
PWR	Power
RTOS	Real-Time Operating System
SADA	Stand Alone Debug Agent
SD	Secure Digital
SoC	System on Chip
SPI	Serial Peripheral Interface
SPM	Speech Processing Module
SPORT	Serial Port
TFT	Thin-Film Transistor
TISM	Tiny Image Sensor Module
TSC	Touch Screen Controller
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus
USBOTG	USB On The Go
ZIF	Zero Insertion Force

Table 10-1: List of abbreviations

A   List of Figures and Tables

Figures

Tables