# BLUE TECHNIX

Hardware User Manual

DEV-BF5xxDA-Lite Board V1.0 and V1.1

PRELIMINARY

www.tinyboards.com
Maximum Power at Minimum Size

Contact

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Information
For further information on technology, delivery terms and conditions and prices please contact Bluetechnix (http://www.bluetechnix.com).

Warnings
Due to technical requirements components may contain dangerous substances.

The Core Boards and Development systems contain ESD (electrostatic discharge) sensitive devices. Electro-static charges readily accumulate on the human body and equipment and can discharge without detection. Permanent damage may occur on devices subjected to high-energy discharges. Proper ESD precautions are recommended to avoid performance degradation or loss of functionality. Unused core boards and development boards should be stored in the protective shipping package.

BLACKFIN Products

Core Modules:

CM-BF533: Blackfin Processor Module powered by Analog Devices single core ADSP-BF533 processor; up to 600MHz, 32MB RAM, 2MB Flash, 120 pin expansion connector and a size of 36.5x31.5mm

CM-BF537E: Blackfin Processor Module powered by Analog Devices single core ADSP-BF537 processor; up to 600MHz, 32MB RAM, 4MB Flash, integrated TP10/100 Ethernet physical transceiver, 120 pin expansion connector and a size of 36.5x31.5mm

CM-BF537U: Blackfin Processor Module powered by Analog Devices single core ADSP-BF537 processor; up to 600MHz, 32MB RAM, 4MB Flash, integrated USB 2.0 Device, 120 pin expansion connector and a size of 36.5x31.5mm

TCM-BF537: Blackfin Processor Module powered by Analog Devices single core ADSP-BF537 processor; up to 500MHz, 32MB RAM, 8MB Flash, 28x28mm, 120 pin expansion connector, Ball Grid Array or Border Pads for reflow soldering, industrial temperature range -40°C to +85°C.

CM-BF561: Blackfin Processor Module powered by Analog Devices dual core ADSP-BF561 processor; up to 2x 600MHz, 64MB RAM, 8MB Flash, 120 pin expansion connector and a size of 36.5x31.5mm

CM-BF527: From Q3 '07 a new Blackfin Processor Module powered by Analog Devices single core ADSP-BF527 processor will be available; key features are USB OTG 2.0 and Ethernet. 2x120pin expansion connectors are backwards compatible to other Core Modules.

CM-BF548: From Q3 '07 a new Blackfin Processor Module powered by Analog Devices single core ADSP-BF548 processor will be available; key features are 64MB DDR SD-RAM 2x100pin expansion connectors.

Development Boards:

EVAL-BF5xx: Low cost Blackfin processor Evaluation Board with one socket for any Bluetechnix Blackfin Core Module. Additional periphery is available, such as a SD-Card.

DEV-BF5xxDA-Lite: Get ready to program and debug Bluetechnix Core Modules with this tiny development platform including a USB Based Debug Agent. The DEV-BF5xxDA-Lite is a low cost starter development system including VDSP++ Evaluation Software License.

DEV-BF5xx-FPGA:	Backfin Development Board with two sockets for any combination of Blackfin Core Modules. Additional periphery is available, such as SD-Card, Ethernet, USB host, multi-port JTAG including a USB based Debug Agent, connector for a LCD-TFT Display and connector for a digital camera system. A large on-board SPARTAN-3 FPGA and Soft IPs make this board the most flexible Blackfin development platforms ever developed. Available Q2 2007
EXT-Boards:	The following Extender Boards are available: EXT-BF5xx-Audio, EXT-BF5xx-Video, EXT-BF5xx-Camera, EXT-BF5xx-Exp, *EXT-BF5xx-LVDS, *EXT-BF5xx-ETH-USB, *EXT-BF5xx-AD/DA. Additional boards based on customer request *Available Q2 2007

Software Support:

BLACKSheep:	The BLACKSheep VDK is a multithreaded framework for the Analog Devices Blackfin processor family that includes driver support for a variety of hardware extensions. It is based on the real-time VDK kernel included within the VDSP++ development environment.
LabVIEW:	LabVIEW embedded support for the CM-BF537E, CM-BF537U and TCM-BF537 Core Modules based on the BLACKSheep VDK driver Framework.
uClinux:	All the Core Modules are supported by uClinux. The required boot loader and uClinux can be downloaded at http://blackfin.uClinux.org.

BLACKFIN Design Service

Based on over three years Blackfin experience Bluetechnix offers development assistance as well as custom design services and software development.

1 Introduction

The DEV-BF5xxDA-Lite Board is a lightweight development platform for all current and future Bluetechnix Core Modules (CM-BF533, CM-BF561, CM-BF537U, CM-BF537E, TCM-BF537, future CM-BF52x). A bottom mounted tiny high performance Debug Agent fully compatible with Visual DSP++ allows for programming and debugging any of the Blackfin Processors. The small baseboard has all hardware necessary to test the performance of the Core Modules including a high-speed serial port directly connectable to a computers USB port, a CAN Interface and a SD-Card mass storage device socket.

1.1 Overview

The DEV-BF5xxDA-Lite Board includes the following components:
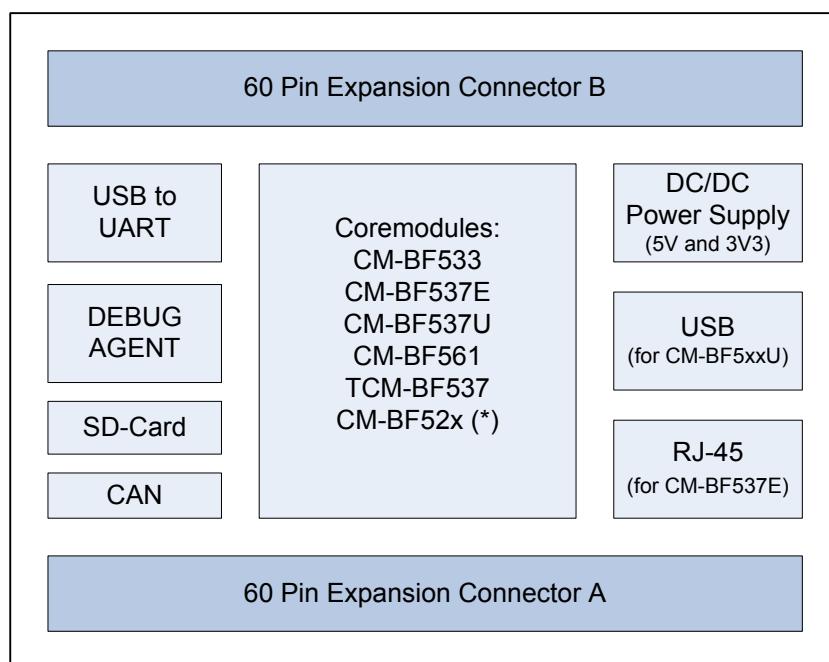
Figure 1-1: Overview of the Dev-BF5xxDA-Lite Board

(*) available Q4 2007

- **DC/DC Converters**

    o 5V@2A + 3V3@1.5A (draws its power from the 5V output of the DC/DC)

- **1 Core Module Slot**

    o Supports all current Bluetechnix Blackfin based Core Modules

- **USB**

    o Supports up to 915kbps UART-USB conversion.

    o Emulates a standard COM port on the computer.

- o Drivers for Windows and Linux available

- ▪ **JTAG**

  - o JTAG-Plug that supports all analog Devices JTAG Emulators.

- ▪ **Expansion Connector 1**

  - o SPORT 0

  - o JTAG

  - o UART

  - o SPI

  - o PPI1 (Parallel Port Interface 1)

  - o PFs (Programmable Flags)

- ▪ **Expansion Connector 2**

  - o Data Bus

  - o Address Bus

  - o Memory Control Signals

  - o PPI2[1] (Parallel Port Interface 2)

  - o Power Supply

- ▪ **2nd USB Connector (optional)**

  - o Can only be used together with the CM-BF537U Core Module which has an on-board NETPLX 2272 USB2.0 Device Chip

  - o Future versions of the CM-BF52x may also make use of this USB connector.

- ▪ **RJ-45 Ethernet Plug**

  - o Only in combination with the CM-BF537E module

  - o Standard 10BaseT/100BaseT Ethernet connection

- ▪ **External Power Supply**

  - o The board is shipped with a 12V, 2A external DC/DC Power Supply

  (Please insert the 12V jumper in the power supply)

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[1] Only available when using the CM-BF561 Core Module

2 Functional Specification
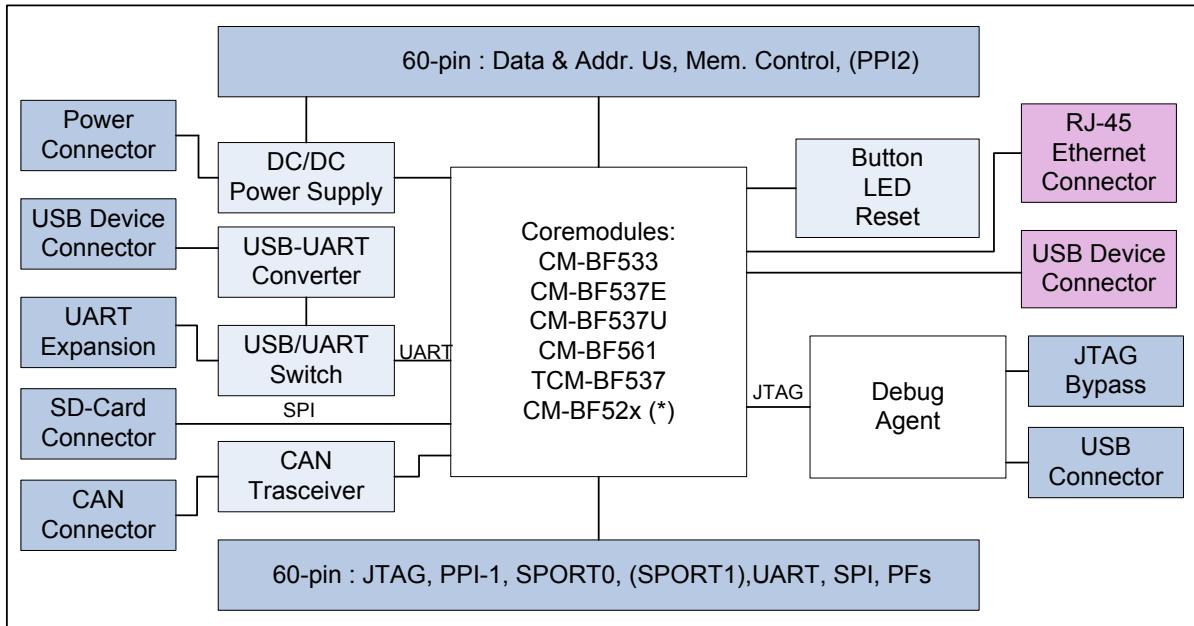
Figure 2-1: Block Diagram

(*) available Q4 2007

Figure 2-1 shows a detailed block diagram of the Dev-BF5xxDA-Lite Board.

Power connector and Power supply:
The supplied power supply should be used. It can deliver up to 2A at 12V.
The input voltage range of an alternative power supply must be within 6-16V!
The on-board DC/DC power supply generates 5V and 3.3V which are made available at the expansion connectors. The maximum current that can be drawn from the 5V is 2A, but take care this includes the current going into the 3.3V regulator as well as this regulator is powered by the 5V. The maximum current that can be drawn from the 3.3V is 1.5A but note that this means at least 1A additional load on the 5V connector.

The serial port of the Core Module can be routed directly to the *USB Port* (USB/UART Switch (S4) Position 0 or to the *UART Expansion Pads* (USB/UART Switch S4 Position 1.

An *SD-Card connector* mounted at the bottom of the board allows making use of file IO Functions delivered with the BLACKSheep Software. BLACKSheep supports SD-Cards and includes a FAT files system as well as the most relevant File IO Functions. The complete BLACKSheep software package can be purchased from Bluetechnix.

The 2nd USB Device connector (colored in purple) can only be used with the CM-BF537U Core Module which has an on-board USB V2.0 Device (NET2272 by PLX-technology). Future Core Modules may make use of this connector as well.

The RJ-45 Ethernet connector (colored in purple) can only be used in combination with the CM-BF537E Core Module which has an on-board Ethernet physical chip.

3 PCB Placement and Mechanical Outline

3.1 PCB Placement
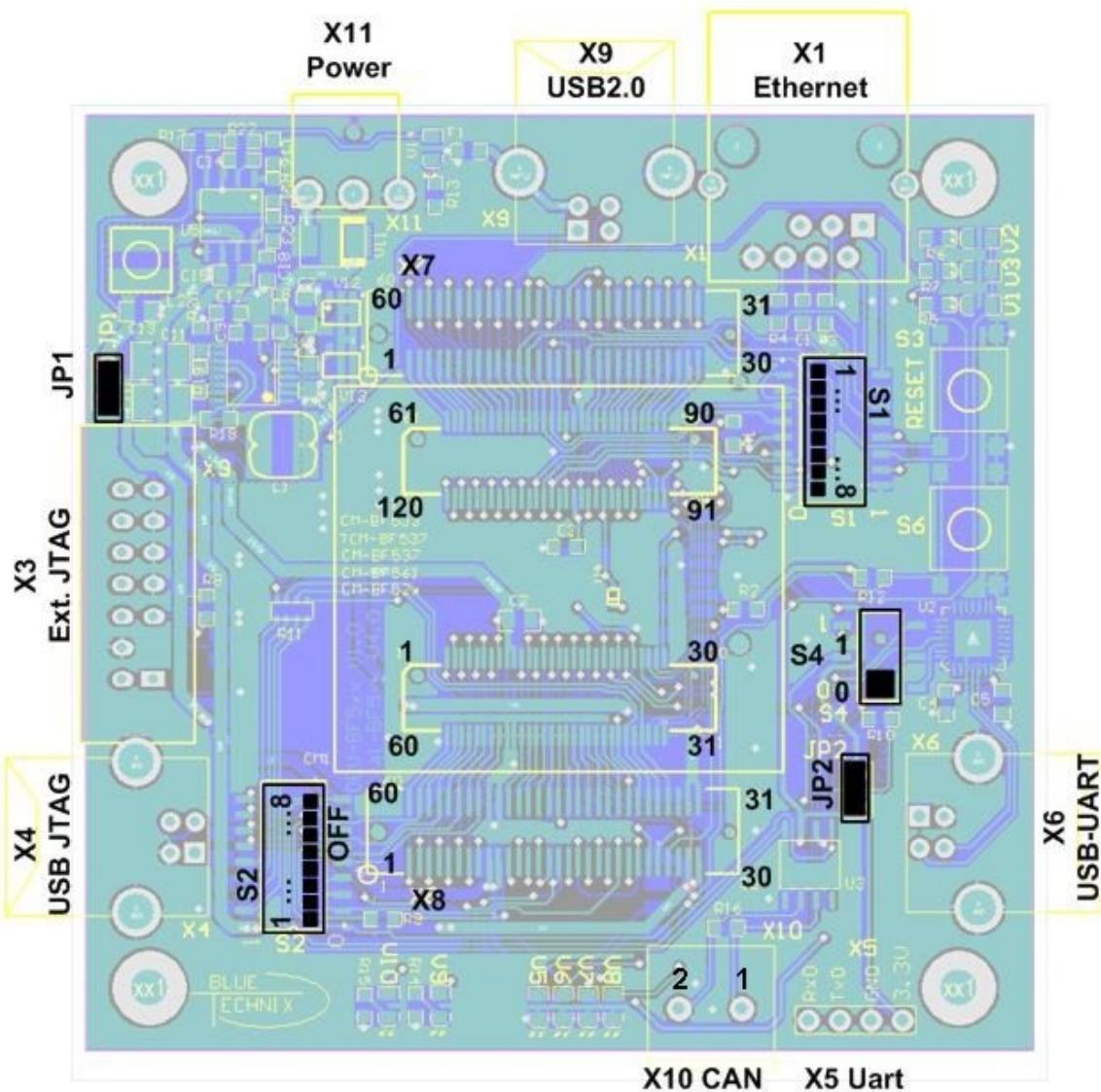
Figure 3-1: Connector PCB Placement

3.2 Mechanical Outline
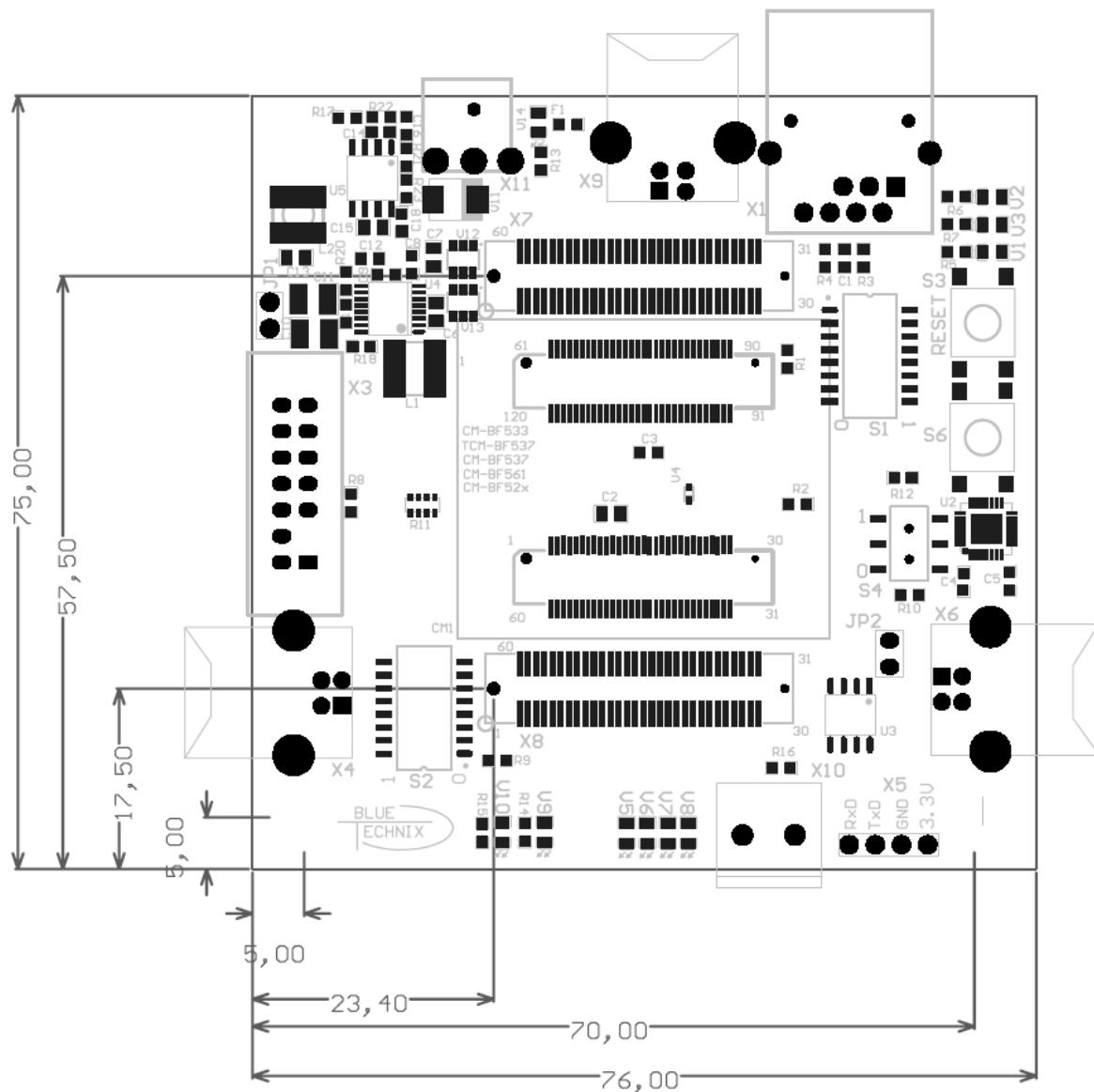
Figure 3-2: Mechanical Outline – Expansion Connector Placement

4 Connector Description

In the following the connectors shown in section 3.1 are described.

4.1 X1 –RJ45 Ethernet Connector

Pin No.	Signal (Core Module)	Description
1	TX+	O
2	TX-	O
3	RX+	I
4	NC	-
5	NC	-
6	RX-	I
7	NC	-
8	NC	-

Table 4-1: Ethernet Connector

4.2 X2 –SD-Card Connector (bottom Mount)

Pin No.	Signal (Core Module)	Description (SD Card)
0	-	DAT2
1	nCS	CD/DAT3
2	MOSI	CMD
3	GND	VSS1
4	3,3V	VDD
5	SPICLK	CLK
6	GND	VSS2
7	MISO	DAT0
8	-	DAT1
9	-	CD
10	-	WP

Table 4-2: SD-Card Connector

4.3 X3 – JTAG Bypass Connector

The JTAG connector is compliant to any Blackfin JTAG Emulator from Analog Devices. When an external JTAG emulator is attached the on-board JTAG is bypassed and the external one is automatically used.

4.4 X4, X6, X9 – USB Connectors

X4 is a standard USB-B Device Connector for the DEBUG AGENT PC Interface

X6 is a standard USB-B Device Connector for the USB to UART converter

X9 is a standard USB-B 2.0 Device Connector for the USB versions of the Core Modules

4.5 X5 UART Expansion Pads

When S4 is on position 1 the UART0 (TX, RX) is brought on the expansion pins and disconnected from the USB-UART Chip.

Pin No.	Signal	Signal Type
1	RxD Blackfin	Input Core Module
2	TxD Blackfin	Output Core Module
3	GND	
4	3V3	Regulated Power

Table 4-3: UART Connector

4.6 X7, X8 Expansion Connectors

The Expansion Connectors on the Dev-BF5xxDA-Lite for a Stacked Height of 16mm are of the following type:

Part	Manufacturer	Manufacturer Part Nr.
X7, X8	AMP (Stacked Height = 16mm)	5-5179010-2
Matching connector	AMP	5179031-2

Table 4-4: DEV-board connector types

The matching connector, which is used for building an extender board, can be ordered from Bluetechnix.

4.7 X10 – CAN Connector

Pin No.	Signal (Core Module)	Signal Type
1	CAN+	I/O
2	CAN-	I/O

Table 4-5: CAN Connector

4.8 X11 – Power Connector

The board is shipped with a 12V, 2A external DC/DC Power Supply which should be used.

Pin No.	Signal	Description
1	Vin (+6V to +16V DC) Input Supply	Preferable 12V DC (2A)
2	NC	
3	GND	

Table 4-6: Power Supply
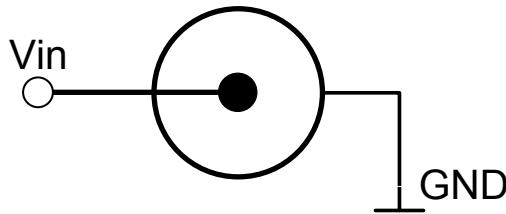
Figure 4-1: Power connector

4.9 X8 – Expansion Connector 1

Pin 31 and 32 of the X7 are Vin of the external power supply minus the input protection diode voltage. These pins can be used for custom add-on board power supplies.

Pin 29 and 30 of the X8 connector are +5V stabilized from the DC/DC that can be used for custom add-on boards or the extender boards.

CM-BF533 (inserted):

PIN No	Signal	Signal type	Pin No	Signal	Signal type
1	RSCLK0	I/O	2	DR0PRI	I
3	TSCLK0	I/O	4	DT0PRI	O
5	RSCLK1	I/O	6	DR1PRI	I
7	TSCLK1	I/O	8	DT1PRI	O
9	3.3V	PWR	10	3.3V	PWR
11	PPI0	I/O	12	PPI2	I/O
13	PF15 / PPI4	I/O	14	PF13 / PPI6	I/O
15	PF11 / PPI8	I/O	16	PF9 / PPI10	I/O
17	PF7/SPISEL7/PPI12	I/O	18	PF5/SPISEL5/PPI14	I/O
19	PF3/SPISEL3/PPI_FS3	I/O	20	TMR1 / PPI_FS1	I/O
21	TMR0	I/O	22	PF1 / SPISEL1	I/O
23	RX	I	24	MOSI	I/O
25	SCK	I	26	BMODE0	I
27	GND	PWR	28	n.c.	-
29	5.0V	PWR	30	5.0V	PWR
31	Vin of X11	PWR	32	Vin of X11	PWR
33	n.c.	-	34	n.c.	-
35	n.c.	-	36	BMODE1	I
37	MISO	I/O	38	TX	O
39	PF0 / nSPISS	I/O	40	PF2 / SPISEL2	I/O
41	PPI_CLK	I/O	42	TMR2 / PPI_FS2	I/O
43	PF4/SPISEL4/PPI15	I/O	44	PF6/SPISEL6/PPI13	I/O
45	PF8 / PPI11	I/O	46	PF10 / PPI9	I/O
47	PF12 / PPI7	I/O	48	PF14 / PPI5	I/O
49	PPI3	I/O	50	PPI1	I/O
51	GND	PWR	52	GND	PWR
53	DT1SEC	O	54	TFS1	I/O
55	DR1SEC	I	56	RFS1	I/O
57	DT0SEC	O	58	TFS0	I/O

59	DR0SEC	I	60	RFS0	I/O

Table 4-7: Connector X8 pin assignment for CM-BF533

CM-BF537E (inserted):

Pin No	Signal	Signal type	Pin No	Signal	Signal type
1	RSCLK0/TACLK2	I/O	2	DR0PRI/ TACLK4	I
3	TSCLK0/TACLK1	I/O	4	DT0PRI/SPI_CS2	O
5	CLK_out	O	6	SDA	I/O
7	PF4/TMR5/SPI_CS6	I/O	8	PF5/TMR4/SPI_CS5	I/O
9	3.3V	PWR	10	3.3V	PWR
11	PG0/PPI1D0	I/O	12	PG2/PPI1D2	I/O
13	PG4/PPI1D4	I/O	14	PG6/PPI1D6	I/O
15	PG8/PPI1D8/DR1SEC	I/O	16	PG10/PPI1D10/RSCLK1	I/O
17	PG12/PPI1D12/RE1PRI	I/O	18	PG14/PPI1D14/TFS1	I/O
19	PPI1SY3/PF7/TMR2	I/O	20	PPI1SY1/PF8/TMR0	I/O
21	PPI1SY1/PF8/TMR0	I/O	22	PF3/Tx1/TMR6/TACI6	I/O
23	PF1/DMAR1/TACI1/Rx0	I/O	24	PF11/MOSI	I/O
25	PF13/SCK	I/O	26	BMODE0	I
27	GND	PWR	28	n.c.	-
29	5.0V	PWR	30	5.0V	PWR
31	Vin of X11	PWR	32	Vin of X11	PWR
33	n.c.	-	34	BMODE2	I
35	n.c.	-	36	BMODE1	I
37	PF12/MISO	I/O	38	PF0/DMAR0/Tx0	O
39	PF14/SPI_SS	I/O	40	PF2/Rx1/TMR7	I/O
41	PPI1Clk/PF15/TMRCLK	I/O	42	PPI1Sy2/PF8/TMR1	I/O
43	PG15/PPI1D15/DT1PRI	I/O	44	PG13/PPI1D13/TSCLK1	I/O
45	PG11/PPI1D11/RFS1	I/O	46	PG9/PPI1D9/TD1SEC	I/O
47	PG7/PPI1D7	I/O	48	PG5/PPI1D5	I/O
49	PG3/PPI1D3	I/O	50	PG1/PPI1D1	I/O
51	GND	PWR	52	GND	PWR
53	PF5/TMR4/SPI_CS5	O	54	PF6/TMR3/SPI_CS4	I/O
55	PF10/SPI_SC1	I	56	SCL	I/O
57	DT0SEC/CANTX/SPICS7	O	58	TFS0	I/O
59	DR0SEC/TACI0/CANRX	I	60	RFS0/TACLK3	I/O

Table 4-8: Connector X8 pin assignment for CM-BF537E

CM-BF537U (inserted):

Pin No	Signal	Signal type	Pin No	Signal	Signal type
1	RSCLK0/TACLK2	I/O	2	DR0PRI/ TACLK4	I
3	TSCLK0/TACLK1	I/O	4	DT0PRI/SPI_CS2	O
5	CLK_out	O	6	SDA	I/O
7	PF4/TMR5/SPI_CS6	I/O	8	PF5/TMR4/SPI_CS5	I/O
9	3.3V	PWR	10	3.3V	PWR

11	PG0/PPI1D0	I/O	12	PG2/PPI1D2	I/O
13	PG4/PPI1D4	I/O	14	PG6/PPI1D6	I/O
15	PG8/PPI1D8/DR1SEC	I/O	16	PG10/PPI1D10/RSCLK1	I/O
17	PG12/PPI1D12/RE1PRI	I/O	18	PG14/PPI1D14/TFS1	I/O
19	PPI1SY3/PF7/TMR2	I/O	20	PPI1SY1/PF8/TMR0	I/O
21	PPI1SY1/PF8/TMR0	I/O	22	PF3/Tx1/TMR6/TACI6	I/O
23	PF1/DMAR1/TACI1/Rx0	I/O	24	PF11/MOSI	I/O
25	PF13/SCK	I/O	26	BMODE0	I
27	GND	PWR	28	n.c.	-
29	5.0V	PWR	30	5.0V	PWR
31	Vin of X11	PWR	32	Vin of X11	PWR
33	n.c.	-	34	BMODE2	I
35	n.c.	-	36	BMODE1	I
37	PF12/MISO	I/O	38	PF0/DMAR0/Tx0	O
39	PF14/SPI_SS	I/O	40	PF2/Rx1/TMR7	I/O
41	PPI1Clk/PF15/TMRCLK	I/O	42	PPI1Sy2/PF8/TMR1	I/O
43	PG15/PPI1D15/DT1PRI	I/O	44	PG13/PPI1D13/TSCLK1	I/O
45	PG11/PPI1D11/RFS1	I/O	46	PG9/PPI1D9/TD1SEC	I/O
47	PG7/PPI1D7	I/O	48	PG5/PPI1D5	I/O
49	PG3/PPI1D3	I/O	50	PG1/PPI1D1	I/O
51	GND	PWR	52	GND	PWR
53	PF5/TMR4/SPI_CS5	O	54	PF6/TMR3/SPI_CS4	I/O
55	PF10/SPI_SC1	I	56	SCL	I/O
57	DT0SEC/CANTX/SPICS7	O	58	TFS0	I/O
59	DR0SEC/TACI0/CANRX	I	60	RFS0/TACLK3	I/O

Table 4-9: Connector X8 pin assignment for CM-BF537U

TCM-BF537 (inserted)

Pin No.	Signal	Signal type	Pin No.	Signal	Signal type
1	RSCLK0/TACLK2	I/O	2	DR0PRI/ TACLK4	I
3	TSCLK0/TACLK1	I/O	4	DT0PRI/SPI_SSEL2	O
5	PH15 / MIICRS	I/O	6	SDA	I/O
7	PH7 / COL	I/O	8	PH6/MIIPHYINT	I/O
9	3.3V	PWR	10	3.3V	PWR
11	PG0/PPI1D0	I/O	12	PG2/PPI1D2	I/O
13	PG4/PPI1D4	I/O	14	PG6/PPI1D6	I/O
15	PG8/PPI1D8/DR1SEC	I/O	16	PG10/PPI1D10/RSCLK1	I/O
17	PG12/PPI1D12/RE1PRI	I/O	18	PG14/PPI1D14/TFS1	I/O
19	PPI1SY3/PF7/TMR2	I/O	20	PPI1SY1/PF8/TMR0	I/O
21	MDC	I/O	22	PF3/Rx1/TMR6/TACI6	I/O
23	PF1/DMAR1/TACI1/Rx0	I/O	24	PF11/SPI_MOSI	I/O
25	PF13/SPI_SCK	I/O	26	BMODE0	I
27	GND	PWR	28	n.c	-
29	5.0V	PWR	30	5.0V	PWR
31	Vin of X11	PWR	32	Vin of X11	PWR

33	n.c.	-	34	BMODE2	-
35	MDIO	-	36	BMODE1	I
37	PF12/SPI_MISO	I/O	38	PF0/DMAR0/Tx0	I/O
39	PF14/SPI_SS	I/O	40	PF2/Tx1/TMR7	I/O
41	PPI1Clk/PF15/TMRCLK	I/O	42	PPI1Sy2/PF8/TMR1	I/O
43	PG15/PPI1D15/DT1PRI	I/O	44	PG13/PPI1D13/TSCLK1	I/O
45	PG11/PPI1D11/RFS1	I/O	46	PG9/PPI1D9/TD1SEC	I/O
47	PG7/PPI1D7	I/O	48	PG5/PPI1D5	I/O
49	PG3/PPI1D3	I/O	50	PG1/PPI1D1	I/O
51	GND	PWR	52	GND	PWR
53	PH5/MIITxCLK	I/O	54	PF6/TMR3/SPI_SSEL4	I/O
55	PF10/SPI_SSEL1	I	56	SCL	I/O
57	DT0SEC/CANTX/SPI_SSEL7	O	58	TFS0	I/O
59	DR0SEC/TACI0/CANRX	I	60	RFS0/TACLK3	I/O

Table 4-10: Connector X8 pin assignment for TCM-BF537

CM-BF561 (inserted):

Pin No	Signal	Signal type	Pin No	Signal	Signal type
1	RSCLK0 / PF28	I/O	2	DR0PRI	I
3	TSCLK0 / PF29	I/O	4	DT0PRI / PF18	I/O
5	PF11(Clk_out optional)	I/O	6	PF9	I/O
7	PF7/SPISEL7/TMR7	I/O	8	PF5/SPISEL5/TMR5	I/O
9	3.3V	PWR	10	3.3V	PWR
11	PPI1D0	I/O	12	PPI1D2	I/O
13	PPI1D4	I/O	14	PPI1D6	I/O
15	PPI1D8 / PF40	I/O	16	PPI1D10 / PF42	I/O
17	PPI1D12 / PF44	I/O	18	PPI1D14 / PF46	I/O
19	PPI1SYNC3	I/O	20	PPI1SYNC1 / TMR8	I/O
21	PF3 / SPICS2	I/O	22	PF1/SPISEL1/TMR1	I/O
23	RX / PF27	I/O	24	MOSI	I/O
25	SCK	I/O	26	nABE2	O
27	ARDY	I	28	n.c.	-
29	5.0V	PWR	30	5.0V	PWR
31	Vin of X11	PWR	32	Vin of X11	PWR
33	n.c.	-	34	nAMS3	O
35	nABE1	O	36	nABE0	O
37	MISO	I/O	38	TX / PF26	I/O
39	PF0/SPISS/TMR0	I/O	40	PF2/SPISEL2/TMR2	I/O
41	PPI1CLK	I	42	PPI1SYNC2 / TMR9	I/O
43	PPI1D15 / PF47	I/O	44	PPI1D13 / PF45	I/O
45	PPI1D11 / PF43	I/O	46	PPI1D9 / PF41	I/O
47	PPI1D7	I/O	48	PPI1D5	I/O
49	PPI1D3	I/O	50	PPI1D1	I/O
51	GND	PWR	52	GND	PWR

53	PF4/SPISEL4/TMR4	I/O	54	PF6/SPISEL6/TMR6	I/O
55	PF8	I/O	56	PF10	I/O
57	DT0SEC / PF17	O	58	TFS0 / PF16	I/O
59	DR0SEC / PF20	I	60	RFS0 / PF19	I/O

Table 4-11: Connector X8 pin assignment for CM-BF561

4.10 X7 – Expansion Connector 2

Attention: Pin 77 and pin 104 of the inserted Core Module are only available on the expansion connector X7. Pin 17 and pin 44 are only available if the 0 Ohm resistors R24 and R25 are mounted on the bottom of the PCB. The signals are routed to the USB connector X9 to support Core Modules with on board USB support. The Figure 4-2 shows the position of R24 and R25. Refer to the tables below to see witch signals corresponds to pin 17 and pin 44 depending on the Core Module inserted. R24 connects pin 17 and R25 connects pin 44.
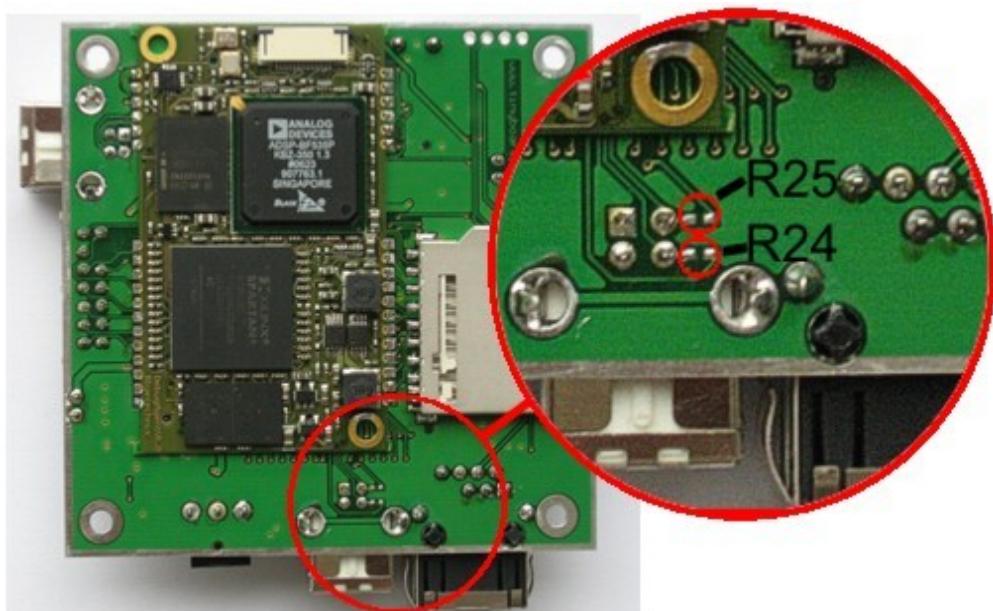

Figure 4-1: Position of 0 Ohm resistors R24 and R25

CM-BF533 (inserted):

Pin No	Signal	Signal type	Pin No	Signal	Signal type
1	A1	O	2	A3	O
3	A5	O	4	A7	O
5	A9	O	6	A11	O
7	A13	O	8	A15	O
9	A17	O	10	A19	O
11	ABE1	O	12	n.c.	-

13	n.c.	-	14	n.c.	-
15	n.c.	O	16	ADRY	I
17	nBG [1]	O	18	CLK_Out 25MHz	O
19	GND	PWR	20	nAMS3	O
21	nAWE	O	22	NMI	I
23	D0	I/O	24	D2	I/O
25	D4	I/O	26	D6	I/O
27	D8	I/O	28	D10	I/O
29	D12	I/O	30	D14	I/O
31	D15	I/O	32	D13	I/O
33	D11	I/O	34	D9	I/O
35	D7	I/O	36	D5	I/O
37	D3	I/O	38	D1	I/O
39	nRESET	I	40	nAOE	O
41	nARE	O	42	nAMS2	O
43	VDD-RTC	PWR	44	nBGH [2]	O
45	nBR	I	46	n.c.	-
47	n.c.	-	48	n.c.	-
49	n.c.	-	50	n.c.	-
51	ABE0	O	52	A18	O
53	A16	O	54	A14	O
55	A12	O	56	A10	O
57	A8	O	58	A6	O
59	A4	O	60	A2	O

Table 4-12: Connector X7 pin assignment for CM-BF533

[1]   The signal nBG is only available if the 0 Ohm resistor R24 is mounted on the bottom of the PCB.
[2]   The signal nBGH is only available if the 0 Ohm resistor R25 is mounted on the bottom of the PCB

CM-BF537E (inserted):

Pin No	Signal	Signal type	Pin No	Signal	Signal type
1	A1	O	2	A3	O
3	A5	O	4	A7	O
5	A9	O	6	A11	O
7	A13	O	8	A15	O
9	A17	O	10	A19	O
11	nABE1	O	12	LED_ACT	O
13	GND	-	14	RX+	I
15	RX-	I	16	ADRY	I
17	nBG [1]	O	18	CLK_out	O
19	GND	PWR	20	nAMS3	O
21	nAWE	O	22	NMI	I
23	D0	I/O	24	D2	I/O
25	D4	I/O	26	D6	I/O

27	D8	I/O	28	D10	I/O
29	D12	I/O	30	D14	I/O
31	D15	I/O	32	D13	I/O
33	D11	I/O	34	D9	I/O
35	D7	I/O	36	D5	I/O
37	D3	I/O	38	D1	I/O
39	nReset	I	40	nAOE	O
41	nARE	O	42	nAMS2	O
43	VDD-RTC	PWR	44	nBGH [2]	O
45	nBR	I	46	VA25	PWR
47	TX-	O	48	TX+	O
49	LED_FD	O	50	LED_SPEED	O
51	nABE0	O	52	A18	O
53	A16	O	54	A14	O
55	A12	O	56	A10	O
57	A8	O	58	A6	O
59	A4	O	60	A2	O

Table 4-13: Connector X7 pin assignment for CM-BF537E

[1] The signal nBG is only available if the 0 Ohm resistor R24 is mounted on the bottom of the PCB.

[2] The signal nBGH is only available if the 0 Ohm resistor R25 is mounted on the bottom of the PCB

CM-BF537U (inserted):

Pin No	Signal	Signal type	Pin No	Signal	Signal type
1	A1	O	2	A3	O
3	A5	O	4	A7	O
5	A9	O	6	A11	O
7	A13	O	8	A15	O
9	A17	O	10	A19	O
11	nABE1	O	12	LED_ACT	O
13	GND	-	14	RX+	I
15	RX-	I	16	ADRY	I
17	USBD+ [1]	O	18	CLK_out	O
19	GND	PWR	20	nAMS3	O
21	nAWE	O	22	NMI	I
23	D0	I/O	24	D2	I/O
25	D4	I/O	26	D6	I/O
27	D8	I/O	28	D10	I/O
29	D12	I/O	30	D14	I/O
31	D15	I/O	32	D13	I/O
33	D11	I/O	34	D9	I/O
35	D7	I/O	36	D5	I/O
37	D3	I/O	38	D1	I/O
39	nReset	I	40	nAOE	O
41	nARE	O	42	nAMS2	O

43	VDD-RTC	PWR	44	USBD- [1]	O
45	nBR	I	46	VA25	PWR
47	TX-	O	48	TX+	O
49	LED_FD	O	50	LED_SPEED	O
51	nABE0	O	52	A18	O
53	A16	O	54	A14	O
55	A12	O	56	A10	O
57	A8	O	58	A6	O
59	A4	O	60	A2	O

Table 4-14: Connector X7 pin assignment for CM-BF537U

[1] This pins are only available on the expansion connector if the 0 Ohm resistors R24 and R25 are mounted on the bottom of the board. The signals are routed to the USB connector X9.

TCM-BF537 (inserted)

Pin No.	Signal	Signal type	Pin No.	Signal	Signal type
1	A1	O	2	A3	O
3	A5	O	4	A7	O
5	A9	O	6	A11	O
7	A13	O	8	A15	O
9	A17	O	10	A19	O
11	nABE1 / SDQM1	O	12	PH1 / ETxD1	I/O
13	PH3 / ETxD3	I/O	14	PH8 / ERxD0	I/O
15	PH10 / ERxD2	I/O	16	ADRY	I
17	PH13 / ERxCLK [1]	I/O	18	CLKBUF	O
19	GND	PWR	20	nAMS3	O
21	nAWE	O	22	CLKOUT (SCLK)	I
23	D0	I/O	24	D2	I/O
25	D4	I/O	26	D6	I/O
27	D8	I/O	28	D10	I/O
29	D12	I/O	30	D14	I/O
31	D15	I/O	32	D13	I/O
33	D11	I/O	34	D9	I/O
35	D7	I/O	36	D5	I/O
37	D3	I/O	38	D1	I/O
39	nReset	I	40	nAOE	O
41	nARE	O	42	nAMS2	O
43	VDD-RTC	PWR	44	PH14 / ErxER [2]	I/O
45	PH12 / ERxDV	I/O	46	PH11 / ERxD3	PWR
47	PH9 / ERxD1	I/O	48	PH4 / ETxEN	I/O
49	PH2 / ETxD2	I/O	50	PH0 / ETxD0	I/O
51	nABE0/SDQM0	O	52	A18	O
53	A16	O	54	A14	O
55	A12	O	56	A10	O
57	A8	O	58	A6	O
59	A4	O	60	A2	O

Table 4-15: Connector X7 pin assignment for TCM-BF537

[1] The signal PH13 / ERxCLK is only available if the 0 Ohm resistor R24 is mounted on the bottom of the PCB.
[2] The signal PH14 / ErxER is only available if the 0 Ohm resistor R25 is mounted on the bottom of the PCB

CM-BF561 (inserted):

Pin No	Signal	Signal type	Pin No	Signal	Signal type
1	nABE3	O	2	A3	O
3	A5	O	4	A7	O
5	A9	O	6	A11	O
7	A13	O	8	A15	O
9	PPI2SYNC1	I/O	10	PPI2SYNC2	I/O
11	PPI2D1	I/O	12	PPI2D3	I/O
13	PPI2D5	I/O	14	PPI2D7	I/O
15	PPI2D9 / PF33	I/O	16	PPI2D11 / PF35	I/O
17	PPI2D13 / PF37	I/O	18	PPI2D15 / PF39	I/O
19	GND	PWR	20	nAMS1	O
21	nAWE	O	22	NMI0	I
23	D0	I/O	24	D2	I/O
25	D4	I/O	26	D6	I/O
27	D8	I/O	28	D10	I/O
29	D12	I/O	30	D14	I/O
31	D15	I/O	32	D13	I/O
33	D11	I/O	34	D9	I/O
35	D7	I/O	36	D5	I/O
37	D3	I/O	38	D1	I/O
39	nRESET	I	40	nAOE	O
41	nARE	O	42	nAMS2	O
43	n.c.	-	44	PPI2D14 / PF38	I/O
45	PPI2D12 / PF36	I/O	46	PPI2D10 / PF34	I/O
47	PPI2D8 / PF32	I/O	48	PPI2D6	I/O
49	PPI2D4	I/O	50	PPI2D2	I/O
51	PPI2D0	I/O	52	PPI2SYNC3	I/O
53	PPI2CLK	I	54	A14	O
55	A12	O	56	A10	O
57	A8	O	58	A6	O
59	A4	O	60	A2	O

Table 4-16: Connector X7 pin assignment for CM-BF561

5 Switches, Jumper and LED Description

5.1 S1 Ethernet Switch for CM-BF537E

This 8 pin DIP switch enables the Ethernet connector. It is necessary to switch them on for the Core Module CM-BF537E.

Switch Settings	Description
On / Off 1 2 3 4 5 6 7 8	CM-BF537E
On / Off 1 2 3 4 5 6 7 8	CM-BF533, CM-BF537U, TCM-BF537, CM-BF561

Table 5-1: Ethernet Switch

5.2 S2 Core Module Configuration

Switch Settings S2 (only 5-8 shown)	Core Module inserted
CM-BF533 and CM-BF561	On / Off 1 2 3 4 5 6 7 8
CM-BF537E, CM-BF537U and TCM-BF537	On / Off 1 2 3 4 5 6 7 8
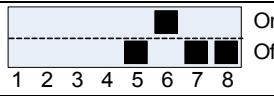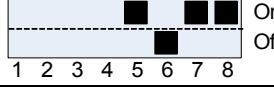
Table 5-2: Core Module Configuration (1-3 are for Boot Mode only)

For switch settings 1-4 please refer to chapter 6 "Boot Mode Description".

5.3 S4 – UART Switch

Move S4 to position 0 to route the Core Modules RX and TX signals to USB

Move S4 to position 1 to route the Core Modules RX and TX signals to X5

5.4 JP1 - Power Supply Jumper

This jumper can be removed in order to insert an AMPERE METER for current measurement of the entire Core Module.

5.5 JP2 – RTC Power Jumper

This jumper is used to connect the VddRTC pin of the Core Module to 3.3V. You can also use this jumper to connect a battery to the internal RTC of the Blackfin.

5.6 Buttons

The Button S3 is the main Reset Button of the Core Module.
The Button S6 is a general-purpose input button on pin 18 of the Core Module.

Core Module	Button S6
CM-BF533	PF5
CM-BF537U	PG14
CM-BF537E	PG14
TCM-BF537	PG14
CM-BF561	PF46
CM-BF52x	-

Table 5-3: Pin assignment of button S6

5.7 General Purpose LEDs

The LED V14 indicates that the board is powered.
The LED's V9 and V10 are connected to general-purpose IO pins 45 and 16 respectively.

Core Module	LED V9	LED V10
CM-BF533	PF8	PF9
CM-BF537U	PG11	PG10
CM-BF537E	PG11	PG10
TCM-BF537	PG11	PG10
CM-BF561	PF43	PF42
CM-BF52x	-	-

Table 5-4: Core Module LEDs

5.8 Ethernet LEDs

V1	Yellow	Fullduplex
V2	Green	Activity
V3	Green	100MB Speed LED

Table 5-5: Ethernet LEDs

5.9 LEDs of the Debug Agent

V5	Green	Flag0
V6	Green	Flag1
V7	Green	Monitor
V8	Green	Pr. done

Table 5-6: LEDs for the Debug Agent

6 Boot Mode Description

Boot-settings for CM-BF561 (S2) only Switches 1 – 4 are shown

Attention: Switch 4 is not used for boot mode settings. Please refer to section 7 to see the settings for switch 4.

If you are using a CM-BF561 set switches 1-4 of S2 OFF!

Due to the limited number of pins on the two connectors, the CM-BF561 can only set its boot mode on the core module itself by changing the resistor settings. See the CM-BF561 Manual for further details.

Boot-settings for CM-BF533 (S2) only Switches 1 – 4 are shown

Attention: Switch 4 is not used for boot mode settings. Please refer to section 7 to see the settings for switch 4.

Switch Settings BMODE0,BMODE1	Boot Mode	Description
	0	Execute from16Bit ext. mem. Bypass ROM (Standard boot mode for uBoot)
	1	Boot from 8Bit or 16Bit EEPROM/Flash (Standard boot mode for BLACKSheep)
	2	Boot from SPI 8Bit
	3	Boot from SPI 16Bit

Table 6-1: Boot Mode CM-BF533

Boot-settings for CM-BF537E, CM-BF537U and TCM-BF537 (S2) only Switches 1 – 4 are shown

Attention: Switch 4 is not used for boot mode settings. Please refer to section 7 to see the settings for switch 4.

Switch Settings BMODE0,BMODE1,BMODE2	Boot Mode	Description
	0	Execute from16Bit ext. mem. Bypass ROM (Standard boot mode for uBoot)
	1	Boot from 8Bit or 16Bit EEPROM/Flash (Standard boot mode for BLACKSheep)

On Off 1 2 3 4	2	Reserved	
On Off 1 2 3 4	3	Boot from serial SPI Memory	
On Off 1 2 3 4	4	Boot from SPI Host (slave mode)	
On Off 1 2 3 4	5	Boot from serial TWI memory	
On Off 1 2 3 4	6	Boot from TWI host (slave mode)	
On Off 1 2 3 4	7	Boot from UART host (slave mode)	
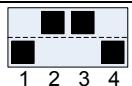
Table 6-2: Boot Mode CM-BF537 Types

7 Using an Core Module with on board USB support

If you use a Core Module with USB on board, for example the CM-BF537U set switch 4 of S2 to "on". This connects the 5,0V pin of the USB connector X9 to pin 53 of the Core Module.

If you don't use a Core Module with on board USB support the switch 4 of S2 should always remain "off".

8 Installation

8.1 What is included in the package?

1. DEV-BF5xxDA-Lite Board

2. Support CD

3. 2x USB Device Cable

4. 1x Multiple output Voltages, 2A, 24VA DC/DC power supply.

Note: The Core Modules are not shipped with the Dev-BF5xxDA-Lite board, so you must order them separately.

8.2 Initial Board Setup

The installation guide is written for Windows (Windows 2000 and WinXP). However for connecting the USB device the driver for MAC and LINUX are available on the CD.

In order to set up und test your EVAL-board the following steps can be done:

1. Make sure the Jumper JP1 is set and the Switch S4 is in Position 0 as shown in Figure 8-1 .
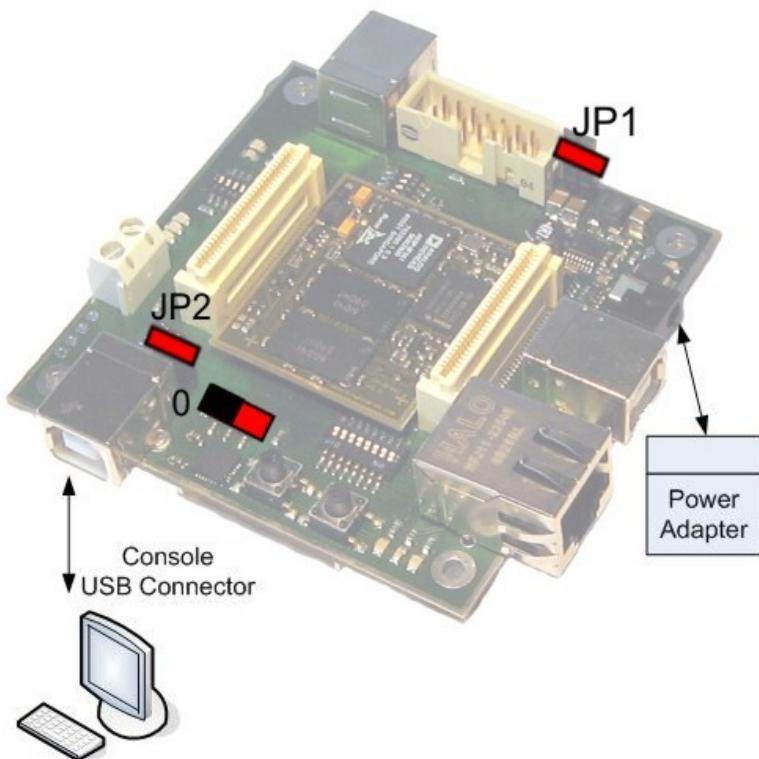
Figure 8-1: Setup of the Dev-BF5xxDA-Lite Board

2. If you want to use an SD-Card, insert the SD-Card in the appropriate slot at the bottom side of the board.

3. Connect the power supply to the power connector off the DEV-BF5xxDA-Lite board.

4. Connect the DEV-BF5xxDA-Lite Board via USB to the PC. The pre-flashed BLACKSheep starts and the LED mounted on the EVAL board starts blinking. On the PC usually the 'Found New Hardware Wizard' opens.

If the wizard is asking you to look at the windows update site, select "No, not this time"
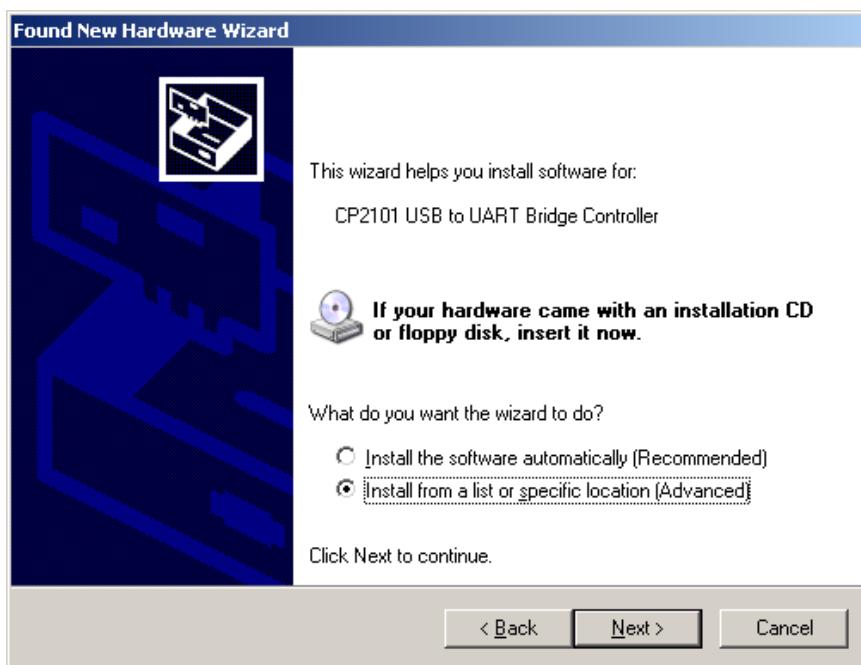
Choose: "Install from a list or specific location". The driver is located on your support CD.
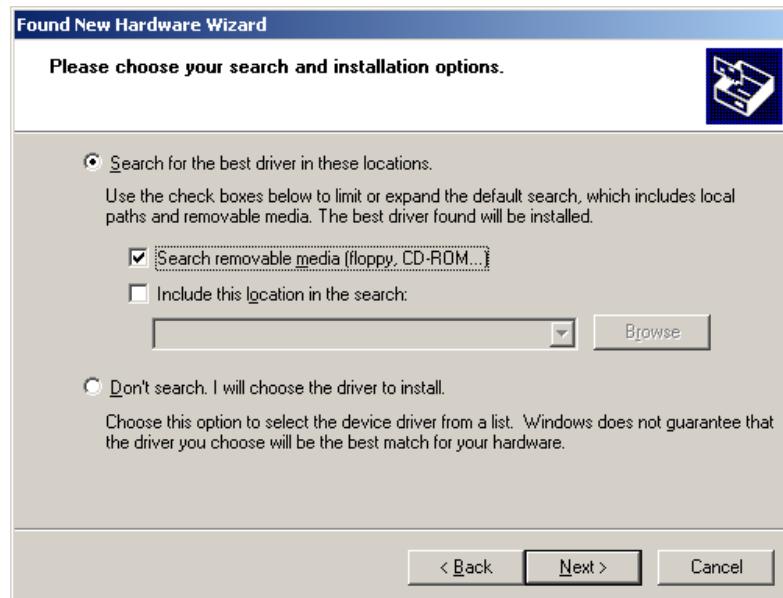
This procedure has to be done twice, because at first the USB driver will be installed. Then the Hardware Wizard opens again, because the UART bridge driver has to be installed in addition using the same driver file. Please do the same again as described in this point.

5. Open the Windows device manager (Control Panel → System → Hardware) to see which COM port number has been assigned to the CP2101 UART-to-USB Chip. This number differs from computer to computer based on the already installed COM ports. (e.g. COM4)

6. Open a Terminal program like the HyperTerminal included in Windows operating systems and open the respective COM port with **115200 Baud, 8 Data-bits, No Parity and 1 Stop bit**, **disable the Hardware flow control**.

7. Reset the DEV-BF5xxDA-Lite Board (Press the main reset button). After this you will see the BLACKSheep boot-screen showing up. If you disconnect the device, you have to reconnect.
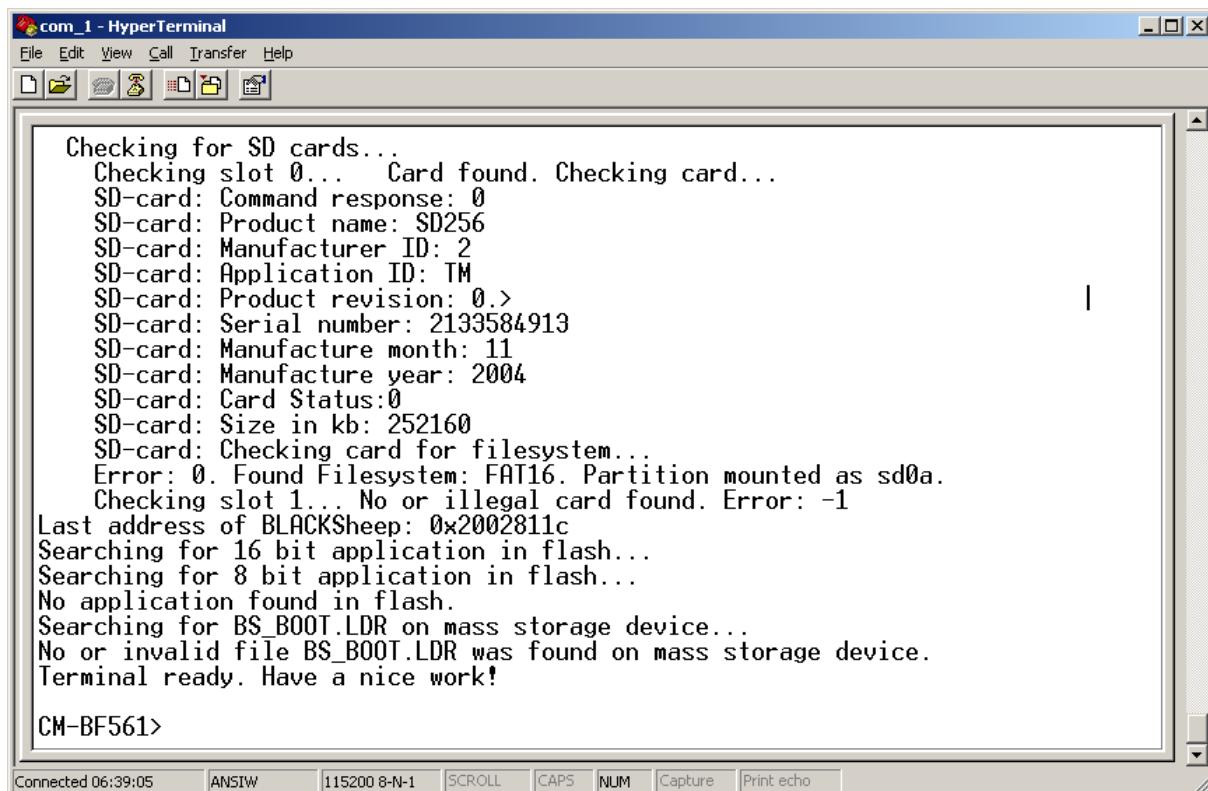
This shows a sample boot screen. Depending on the current software version, you might get different boot messages.

8. You can find a simple hello world program on your support CD or at the download section of the product homepage. To start the sample program, type "*xmr UART*" on your terminal program, then (Transfer → Send file) select the appropriate file "*UART.ldr*" depending on your Core Module, choose protocol "Xmodem" and send. After the download has finished type "*exec UART*" for executing the sample program.

9. Press reset to return to the BLACKSheep command line.

8.3 Debug Agent Setup

If you have purchased a DEV-BF5xxDA-Lite board with the Debug Agent mounted on the bottom side of the board you can use it to download and debug your software with the VDSP++ development environment from Analog Devices. An evaluation version is included in the support CD or you can download it from our website or the website from Analog Devices. Currently the Debug Agent works only with version 4.5 of the VDSP++ IDE.

Note: The Core Module will get warm while in use.

Please follow the instructions for installing and configuring VDSP++ to work with the Debug Agent.

1. Install VDSP++4.5

2. If available install the latest update for VDSP++4.5. You can download updates from the Analog Devices website.

3. Configure VDSP++4.5 to support the DEV-BF5xxDA-Lite by starting the Installer from your support CD. Once started you should see the following dialog.

   Note: To run the installer the .net framework is required!

4. Select the Core Module that you have inserted in the socket of your DEV-BF5xxDA-Lite.

5. Press the "Install" button.

6. You should get the following message:

7. Be sure that the board is powered on!

8. Connect X4 (USB JTAG) with an USB cable to a free USB port on your PC.

9. The following dialog or a similar one should appear:

10. Choose "Install the software automatically", press "Next" and follow the instructions on the screen.

After the install process you have to create a Platform using the Platform Wizard of the VDSP++. Please follow the instructions to create a valid Platform for the Bluetechnix USB Debug Agent.

1. Open the VisualDSP++ Configurator from the start menu entry of VisualDSP++ 4.5.

2. Select "New…"

3. In the "Type" box select the Bluetechnix entry corresponding to the Core Module on your DEV-BF5xxDA-Lite board.

4. Enter a Name for the Platform for example "Bluetechnix CM-BF537".
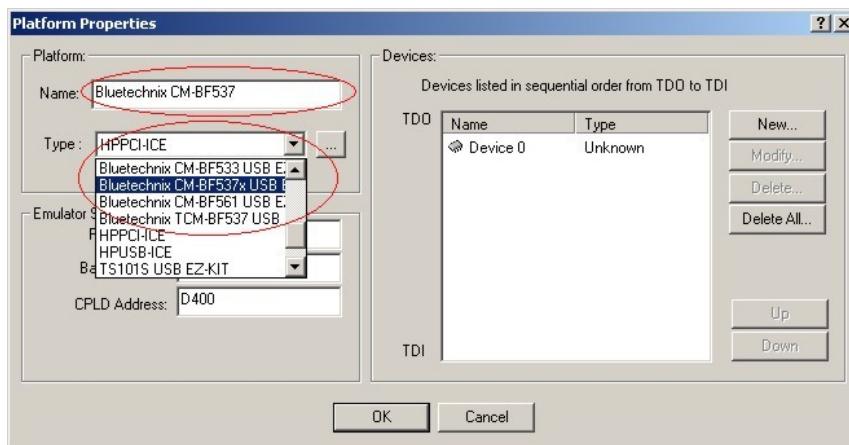
5. Select "Ok". The created platform should appear in the "Platforms" section of the "configurator" window.
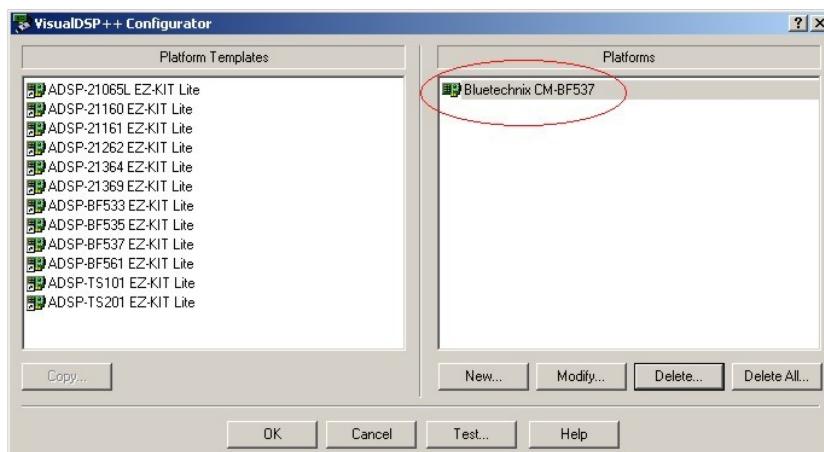
6. Press "Ok" to close the VisualDSP++ Configurator.

The last step is the creation of a VDSP++ debug session. Please follow the instructions below.

1. Open the "New Session Wizard" from the pulldown menu of the VDSP++ (Session→New Session) or press the "New Session" button on the "Sesson List" window that appears on startup of VDSP++.

2. Select the processor corresponding to your Core Module and press "Next".
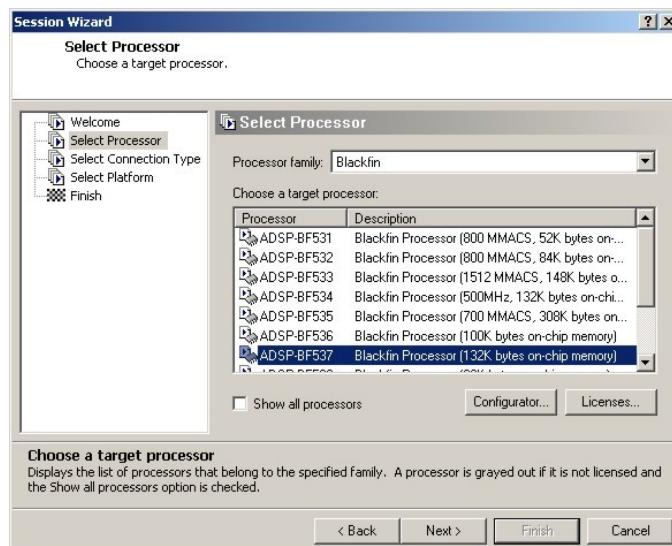
3. Select "EZ-KIT Lite" and press "Next".
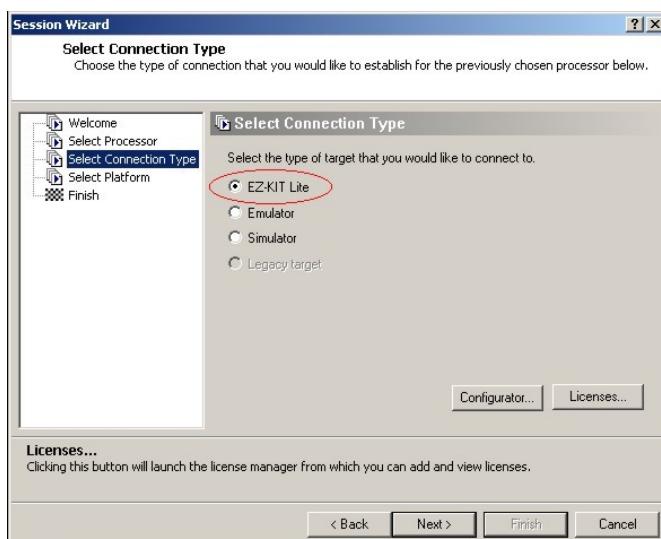
4. Select the platform that you have created with the VisualDSP++ Configurator and press "Finish".
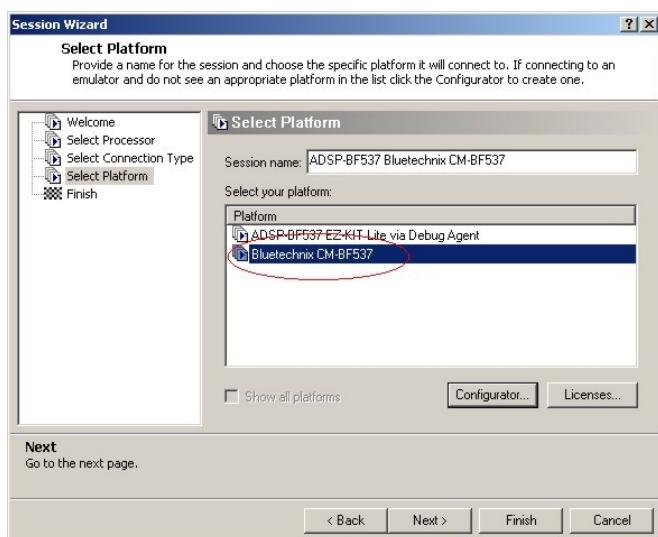
Now the session is ready and VDSP++ should start with this settings. The Core Module on the DEV-BF5xxDA-Lite is now ready for debugging.

For further information about the session wizard and the VDSP++ tools please refer to the VDSP++ manuals downloadable from the Analog Devices website.

If you change your Core Module on the DEV-BF5xxDA-Lite you have to reconfigure VDSP++ starting with the install tool as described above.

9 Using the VDSP Flash Programming Tool

9.1 Developing an Application

If you are developing your own projects with the VDSP++ development tools including the JTAG provided by Analog Devices you can use the flash programming tool included in the VDSP++ environment in order to flash your program on the Core Module. As flash driver you have to load the flash driver located on your EVAL board support CD corresponding to the inserted Core Module.

9.2 Overwriting BLACKSheep Code

If you overwrite intentionally or unintended the section in the flash containing the BLACKSheep code, you need a JTAG device and the VDSP++ flash tool to reprogram the flash. Flashing the appropriate BLACKSheep loader file (*.ldr) located on the CD, reinstalls the BLACKSheep code.

The examples, drivers and the BLACKSheep software are under permanent development. Please refer to the download section of www.bluetechnix.com to get the latest version or updates.

10 Known Bugs

	NONE

Table 10-1: Known Bugs

11 Product Changes

Version	Changes

Table 11-1: Product Changes

12 Document Revision History

Date	Document Revision
2007-03-01	Initial release of the document

Table 12-1: Revision History

A   List of Figures and Tables

Figures:

Tables: