

Hardware User Manual

DEV-BF548-Lite v1.x
DEV-BF548DA-Lite v1.x

...maximum performance at minimum space

Contact

Bluetechnix Mechatronische Systeme GmbH

Lainzerstraße 162/3

A-1130 Vienna

AUSTRIA/EUROPE

office@bluetechnix.at

<http://www.bluetechnix.com>

Document No.: 100-2246-1.0

Document Revision 13

2010-07-13

Table of Contents

1	Introduction	8
1.1	Overview	8
2	Functional Specification	10
3	PCB Placement and Mechanical Outline	11
3.1	PCB Placement	11
3.2	Mechanical Outline	12
3.3	Extension Board Footprint	13
4	Connector Description	14
4.1	X4 –RJ45 Ethernet Connector	14
4.2	X9 –SD-Card Connector (bottom Mount)	14
4.3	X6 – JTAG Bypass Connector	14
4.4	X11 – USB-UART Connectors	14
4.5	X12 UART Expansion Pads	14
4.6	X1, X2, X3 Expansion Connectors	15
4.7	X8, X10 – CAN1, CAN0 Connector	15
4.8	X5 – Power Connector	15
4.9	Expansion Connectors	16
4.9.1	X2 – Expansion Connector 2	16
4.9.2	X1 – Expansion Connector 1	18
4.9.3	X3 – Expansion Connector 3	19
5	Switches, Jumper and LED Description	21
5.1	S1 – Reset switch	21
5.2	S2 – Ethernet Control Signals / SDCARD CS	21
5.3	S3 – UART Switch	21
5.4	S4 – Boot Configuration	21
5.5	JP1 – Ethernet Speed Selection	21
5.6	JP2 – Power Supply Jumper	21
5.7	JP3 – RTC Power Jumper	21
5.8	JP4 – USB ID	22
5.9	S5 - Button	22
5.10	General Purpose LEDs	22
5.11	Ethernet LEDs	22
5.12	LEDs of the Debug Agent	22

6	Boot Mode Description	22
7	Installation	23
7.1	Initial Board Setup	23
7.2	Debug Agent Setup (DEV-BF548DA-Lite only)	26
8	Using the VDSP Flash Programming Tool.....	30
8.1	Developing an Application.....	30
8.2	Overwriting BLACKSheep Code.....	30
9	Extender Board Compatibility List.....	31
9.1	Without Extender Board.....	31
9.2	EXT-BF5xx-EXP	31
9.3	EXT-BF5xx-Video	31
9.4	Audio Extender Board	32
9.5	Camera Extender Board.....	32
9.6	Analog-Digital / Digital-Analog Converter Extender Board	32
9.7	USB-ETH Extender Board.....	32
9.8	Video and Audio Extender Board	32
9.9	Camera and Audio Extender Board	33
10	Anomalies	33
11	Product Changes	33
	Document Revision History.....	34
A	List of Figures and Tables	35

Packing List

The DEV-BF548DA-Lite and the DEV-BF548-Lite Board Package contain the following items:

1. DEV-BF548DA-Lite or DEV-BF548-Lite Board
2. 1x USB Cable (USB A/B)
3. 1x USB Cable (USB A/B) (DEV-BF548DA-Lite only)
4. 1x USB Cable (USB A/Mini USB)
5. 1x Ethernet Cable
6. 1x Power Supply.
7. Support CD

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

Edition 2008-09

© Bluetechnix Mechatronische Systeme GmbH 2008

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.

The Core Modules 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 Modules and Development Boards should be stored in the protective shipping



BLACKFIN Products

Core Modules:

- TCM-BF518: The new Core Module CM-BF518 is powered by Analog Devices' single core ADSP-BF518 processor; up to 400MHz, 32MB SDRAM, up to 8MB flash. The 2x60 pin expansion connectors are backwards compatible with other Core Modules.
- CM-BF527: The new Blackfin Processor Module is powered by Analog Devices' single core ADSP-BF527 processor; key features are USB OTG 2.0 and Ethernet. The 2x60 pin expansion connectors are backwards compatible with other Core Modules.
- CM-BF533: Blackfin Processor Module powered by Analog Devices' single core ADSP-BF533 processor; up to 600MHz, 32MB SDRAM, 2MB flash, 2x60 pin expansion connectors 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 SDRAM, 8MB flash, a size of 28x28mm, 2x60 pin expansion connectors, Ball Grid Array or Border Pads for reflow soldering, industrial temperature range -40°C to +85°C.
- CM-BF537E: Blackfin Processor Module powered by Analog Devices' single core ADSP-BF537 processor; up to 600MHz, 32MB SDRAM, 4MB flash, integrated TP10/100 Ethernet physical transceiver, 2x60 pin expansion connectors 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 SDRAM, 4MB flash, integrated USB 2.0 Device, 2x60 pin expansion connectors and a size of 36.5x31.5mm.
- CM-BF548: The new Blackfin Processor Module is powered by Analog Devices' single core ADSP-BF548 processor; key features are 64MB DDR SD-RAM 2x100 pin expansion connectors.
- CM-BF561: Blackfin Processor Module powered by Analog Devices' dual core ADSP-BF561 processor; up to 2x 600MHz, 64MB SDRAM, 8MB flash, 2x60 pin expansion connectors and a size of 36.5x31.5mm.
- eCM-BF561: Blackfin Processor Module powered by Analog Devices' dual core ADSP-BF561 processor; up to 2x 600MHz, 128MB SDRAM, 8MB flash, 2x100 pin expansion connectors and a size of 44x33mm.

Development Boards:

- EVAL-BF5xx:** Low cost Blackfin processor Evaluation Board with one socket for any Bluetechnix Blackfin Core Module. Additional interfaces are available, e.g. an SD-Card.
- DEV-BF5xxDA-Lite:** Get ready to program and debug Bluetechnix Core Modules with this tiny development platform including an USB-Based Debug Agent. The DEV-BF5xxDA-Lite is a low cost starter development system including a VDSP++ Evaluation Software License.
- DEV-BF548-Lite:** Low-cost development board with one socket for Bluetechnix CM-BF548 Core Module. Additional interfaces are available, e.g. an SD-Card, USB and Ethernet.
- DEV-BF548DA-Lite:** Get ready to program and debug Bluetechnix CM-BF548 Core Module with this tiny development platform including an USB-Based Debug Agent. The DEV-BF548DA-Lite is a low-cost starter development system including a VDSP++ Evaluation Software License.
- EXT-Boards:** The following Extender Boards are available: EXT-BF5xx-AUDIO, EXT-BF5xx-VIDEO, EXT-BF5xx-CAM, EXT-BF5xx-EXP-TR, EXT-BF5xx-USB-ETH2, EXT-BF5xx-AD/DA, EXT-BF548-EXP and EXT-BF518-ETH. Furthermore, we offer the development of customized extender boards for our customers.

Software Support:

- BLACKSheep:** The BLACKSheep VDK is a multithreaded framework for the Blackfin processor family from Analog Devices 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 Bluetechnix Core Modules is done by Schmid-Engineering AG: <http://www.schmid-engineering.ch>
- uClinux:** All the Core Modules are fully supported by uClinux. The required boot loader and uClinux can be downloaded from: <http://blackfin.uClinux.org>.

Upcoming Products and Software Releases:

Keep up-to-date with all the changes to the Bluetechnix product line and software updates at: <http://www.bluetechnix.com>.

BLACKFIN Design Service

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

1 Introduction

NOTE: The DEV-BF548DA-Lite has an on-board Debug Agent, which is not available on the DEV-BF548-Lite Board. All other features are identical! In this document, when describing both boards, the name DEV-BF548-Lite is used.

The DEV-BF548-Lite Development Board with integrated Debug Agent is designed as a development and application board for the high performance ADSP-BF548 based CM-BF548 Core Module. Special feature of the board is the 10/100Mbit industrial Ethernet controller. The integrated Debug Agent is a USB based debug interface which enables programming and debugging of the Blackfin Core Modules. It is fully compatible with the Visual DSP++ development environment. The development board provides all interfaces on dedicated connectors or expansion connectors. Extender boards can be plugged on top of the Development Board in order to enable additional interfaces.

1.1 Overview

The DEV-BF548-Lite Board includes the following components:

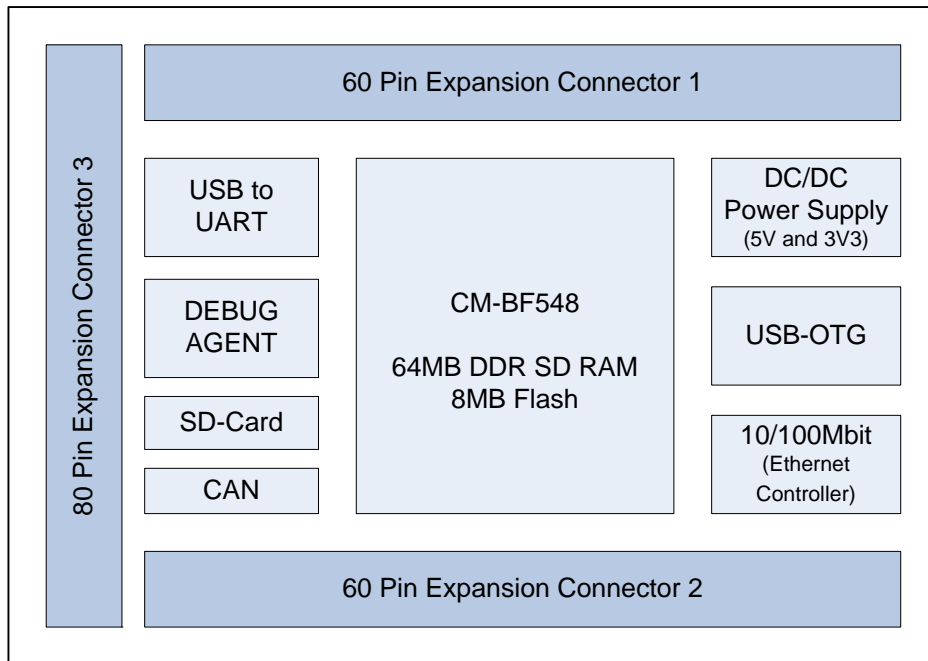


Figure 1-1: Overview of the DEV-BF548-Lite Board

- **DC/DC Converters**
 - 5V@2A
 - 3V3@1.5A (draws its power from the 5V output of the DC/DC)
- **1 Core Module Slot**
 - Supports the CM-BF548 Core Module
- **USB-to-UART Port**
 - Supports up to 915kbps UART-USB conversion.
 - Emulates a standard COM port on the computer.
 - Drivers for Windows and Linux available

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

- **Expansion Connector 1 (X1)**
 - Data Bus
 - Address Bus
 - Memory Control
 - RESET
 - PPIO (Parallel Port Interface 0)
 - GPIO (Programmable)
 - Power Supply

- **Expansion Connector 2 (X2)**
 - PPI1 (Parallel Port Interface 1), SPORT1
 - Power Supply (Main Supply Connector)
 - GPIO (Programmable)
 - UART0
 - SPI2

- **Expansion Connector 3 (X3)**
 - ATAPI Interface
 - SPI0, SPI1
 - SPORT2, SPORT3
 - CAN 0, CAN1
 - UART2, UART3
 - PPIO (Sync, D16,D17))
 - SDIO Interface
 - GPIO (Programmable)

- **USB2.0 OTG Connector**
 - Uses the On-Board USB-OTG transceiver

- **RJ-45 Ethernet Plug**
 - Connected to the On-Board SMSC LAN9218 Ethernet Controller

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

2 Functional Specification

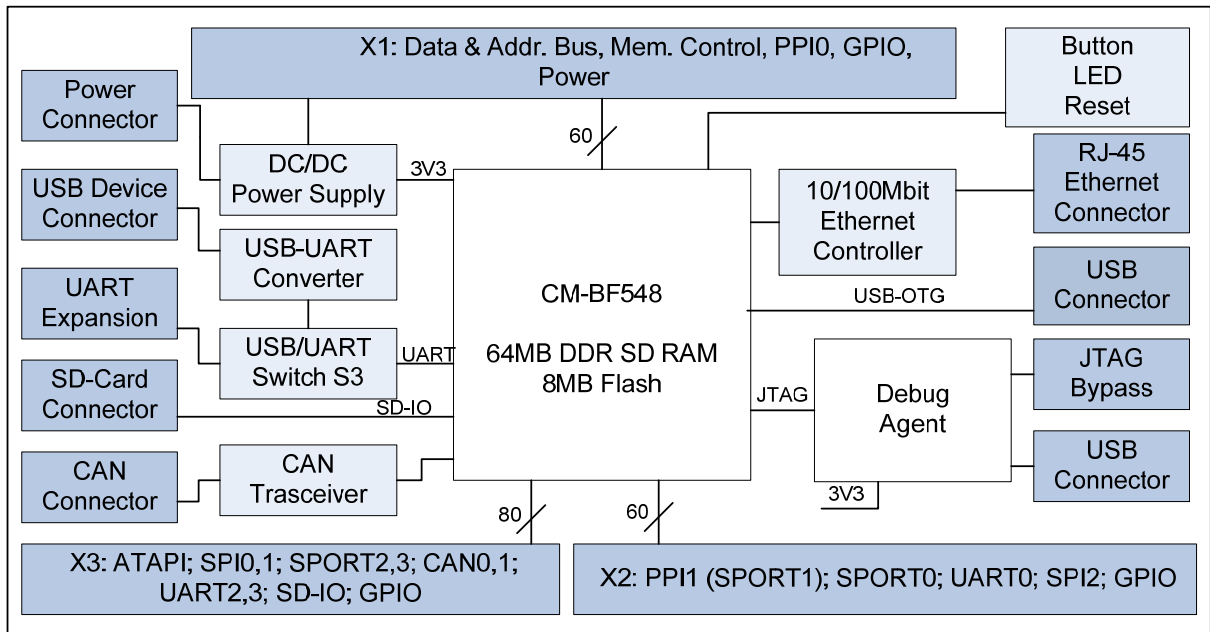


Figure 2-1: Functional Block Diagram

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 between 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 also, because 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 0 (UART0, default Console IO) or Port1 (UART1) of the Core Module can be routed directly to the *USB Port* (USB/UART Switch (S3)).

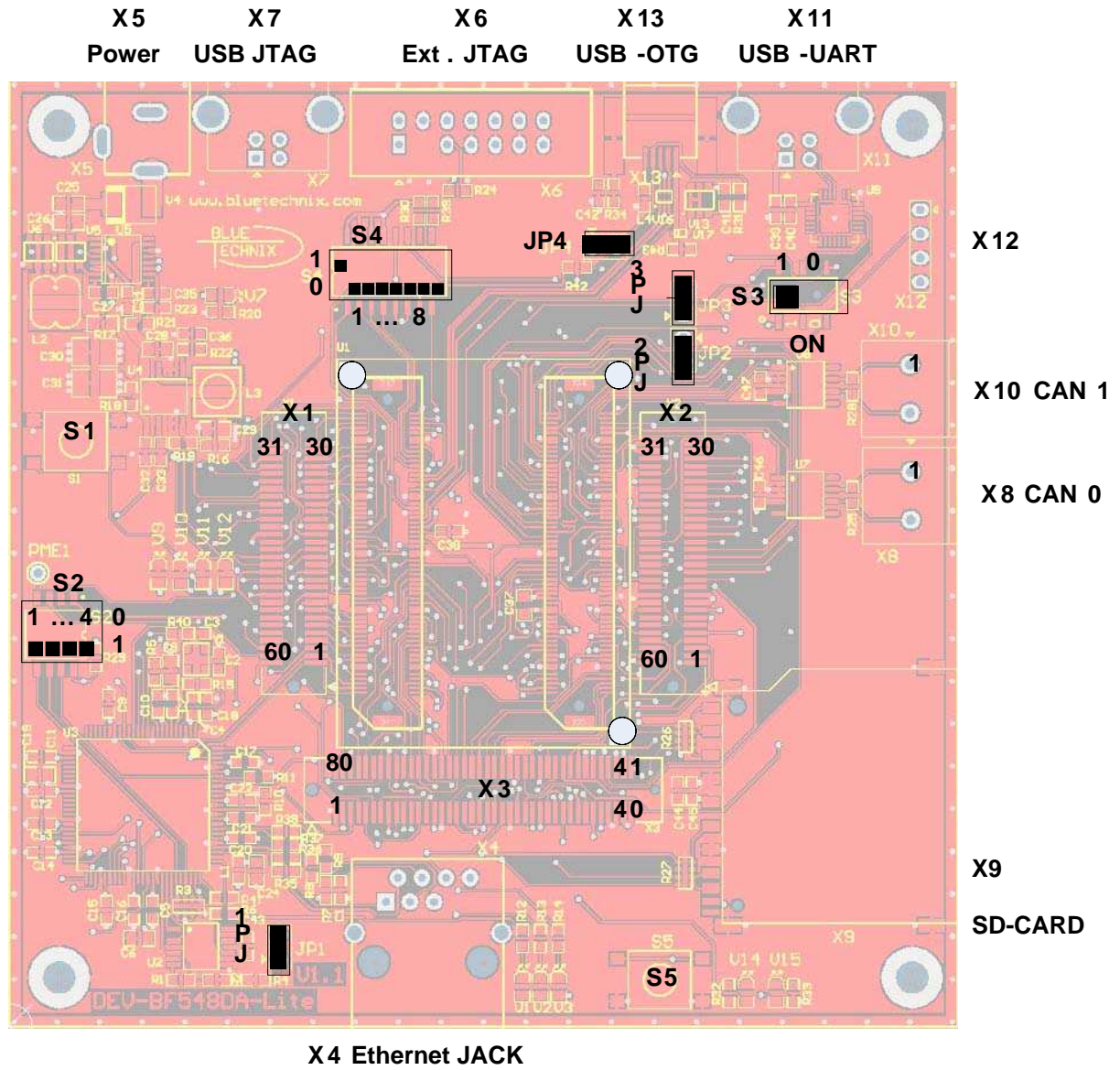
An *Ethernet controller (SMSC LAN9218)* is connected to the data and address bus on the baseboard providing a high speed 10/100MBit LAN Interface

An *SD-Card connector* is mounted on the board and is connected to the processors SD-IO Interface. With the SD-Card one can make use of file IO Functions delivered with the BLACKSheep Software. BLACKSheep supports SD-Cards and includes a FAT file system as well as the most relevant File IO Functions. The complete BLACKSheep software package can be purchased from Bluetechnix.

The *USB2.0 OTG connector* interfaces with the processors on-chip (ADSP-BF548) USB Transceiver.

3 PCB Placement and Mechanical Outline

3.1 PCB Placement



○ Corner holes on Core Module indicating insertion Rotation

Figure 3-1: Connector PCB Placement

ATTENTION: Please mind the direction while inserting the Core Module!

3.2 Mechanical Outline

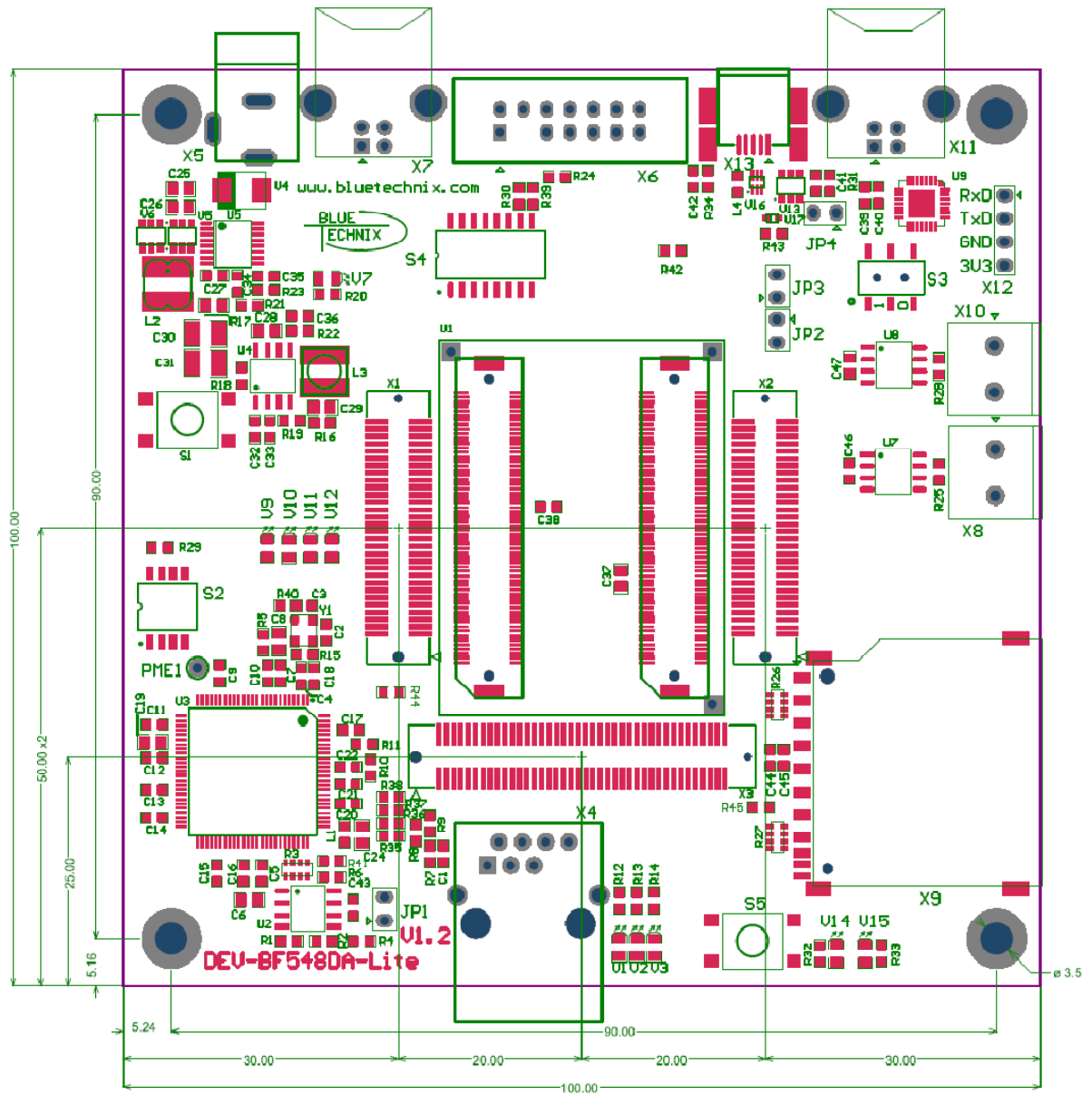


Figure 3-2: Mechanical Outline – Expansion Connector Placement

3.3 Extension Board Footprint

If you want to design your own Extension Board for the DEV-BF548, you can use the following Board dimensions. The mating Connectors in Figure 3-3 are mounted on top.

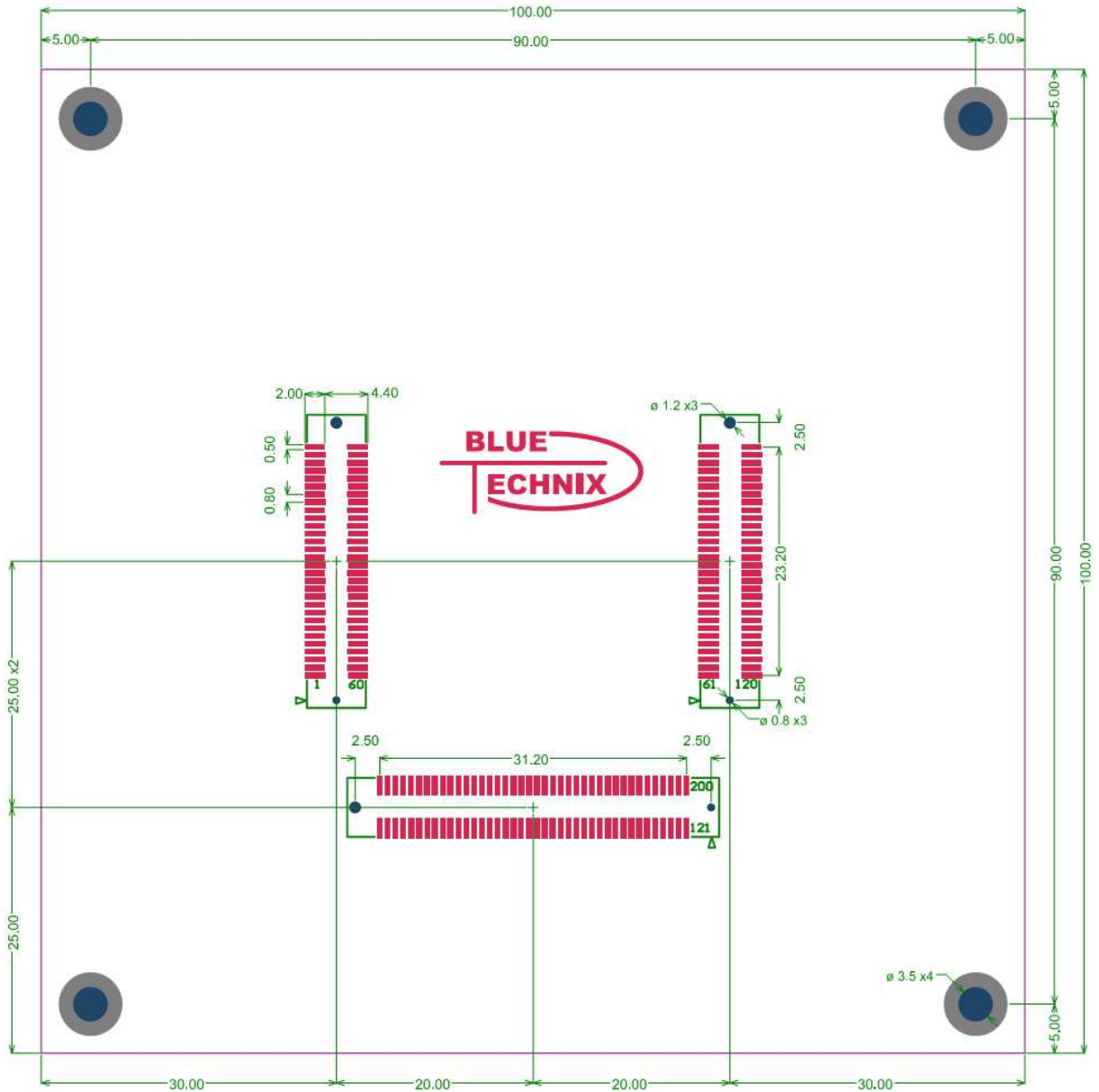


Figure 3-3: Recommended Footprint for Extension Boards – top view

4 Connector Description

4.1 X4 –RJ45 Ethernet Connector

Pin No.	Signal (Core Module)	IO-Type
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 X9 –SD-Card Connector (bottom Mount)

Pin No.	Signal (Core Module)	Description (SD Card)
0	SD_D2	DAT2
1	SD_D3	CD/DAT3
2	SD_CMD	CMD
3	GND	VSS1
4	3,3V	VDD
5	SD_CLK	CLK
6	GND	VSS2
7	SD_D0	DAT0
8	SD_D1	DAT1
9	-	CD
10	-	WP

Table 4-2: SD-Card Connector

4.3 X6 – JTAG Bypass Connector

The JTAG connector is compliant with 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 X11 – USB-UART Connectors

Connects either UART0 (when S3 is in Pos 1) or UART1 (when S3 is in Pos 0) to the USB Interface enabling a COM Port on the PC. UART0 is standard console IO for the BLACKSheep Software.

4.5 X12 UART Expansion Pads

When S3 is in position 1 the UART1 on PortH (TX, RX) is available on the expansion pins and disconnected from the USB-UART Chip.

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

Table 4-3: UART1 additional Header

4.6 X1, X2, X3 Expansion Connectors

The Expansion Connectors on the DEV-BF548-Lite for a Stacked Height of 16mm are of the following type:

Part	Manufacturer	Manufacturer Part Nr.
X1, X2	AMP (Stacked Height = 16mm)	5-5179010-2
Matching connector	AMP	5179031-2
X3	AMP (Stacked Height = 16mm)	5-5179010-3
Matching connector	AMP	5179031-3

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 X8, X10 – CAN1, CAN0 Connector

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

Table 4-5: CAN Connector

4.8 X5 – 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

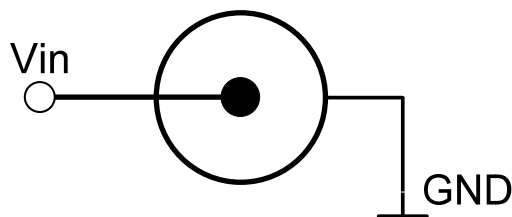


Figure 4-1: Power connector

To connect to X141 use a “DCPP1” e.g. from Cliff Electronic Components (2.1mm * 5.5mm * 9.5mm) plug to the power supply. Outer contact is GND, inner contact is VCC.

4.9 Expansion Connectors

The interface to the extender boards is grouped into three different connectors (X1, X2, X3). The three tables below shows the pin out of these connectors. The column “Pin No. (Connector)” shows the pin number of each connector, while the column “Pin No. (Symbol)” shows the pin number of the extension connector schematic symbol, where the pins are numbered from 1 to 200. The column “Pin No. CM” represents the pin number of the corresponding signal on the Core Module.

4.9.1 X2 – Expansion Connector 2

Pin (Symbol)	No.	Pin (Connector)	No.	Signal	Signal type	Pin No CM
1		1		PC7	I/O	93
2		2		PC6	I/O	94
3		3		PC3	I/O	97
4		4		PC2	I/O	98
5		5		CLKOUT	O	70
6		6		PE15	I/O	185
7		7		PA13	I/O	114
8		8		PA5	I/O	106
9		9		3.3V	PWR	
10		10		3.3V	PWR	
11		11		PD0	I/O	135
12		12		PD2	I/O	137
13		13		PD4	I/O	139
14		14		PD6	I/O	141
15		15		PD8	I/O	143
16		16		PD10	I/O	145
17		17		PD12	I/O	147
18		18		PD14	I/O	149
19		19		PH0	I/O	22
20		20		PE12	I/O	188
21		21		PB11	I/O	130
22		22		PB9	I/O	128
23		23		PE8	I/O	192
24		24		PB13	I/O	132
25		25		PB12	I/O	131
26		26		PH1	I/O	23
27		27		nARDY	I	21
28		28		PH4	I/O	26
29		29		5.0V *)	PWR	
30		30		5.0V ²)	PWR	
31		31		Vin ³)	PWR	
32		32		Vin ³)	PWR	
33		33		PH7	I/O	29
34		34		nAMS3	O	32
35		35		nABE1	O	17
36		36		nABE0	O	16
37		37		PB14	I/O	133
38		38		PE7	I/O	193
39		39		PB8	I/O	127

40	40	PB10	I/O	129
41	41	PE11	I/O	189
42	42	PE13	I/O	187
43	43	PD15	I/O	150
44	44	PD13	I/O	148
45	45	PD11	I/O	146
46	46	PD9	I/O	144
47	47	PD7	I/O	142
48	48	PD5	I/O	140
49	49	PD3	I/O	138
50	50	PD1	I/O	136
51	51	GND	PWR	
52	52	GND	PWR	
53	53	PA1	I/O	102
54	54	PA9	I/O	110
55	55	PH3	I/O	25
56	56	PE14	I/O	186
57	57	PC1	I/O	99
58	58	PC0	I/O	100
59	59	PC5	I/O	95
60	60	PC4	I/O	96

4-7 Expansion Connector X2

- 1) Maximum current carrying capacity: **1A**.
- 2) 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. Maximum current carrying capacity: **900mA**. **(Attention:** If Core Modules with USB in host mode are used, the current must be shared with the connected USB device.
- 3) 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. Maximum current carrying capacity: **1A**.

4.9.2 X1 – Expansion Connector 1

Pin (Symbol)	No.	Pin (Connector)	No.	Signal	Signal type	Pin No CM
61	1			A1	O	1
62	2			A3	O	3
63	3			A5	O	5
64	4			A7	O	7
65	5			A9	O	9
66	6			A11	O	11
67	7			A13	O	13
68	8			A15	O	15
69	9			PG1	I/O	165
70	10			PG2	I/O	164
71	11			PF1	I/O	181
72	12			PF3	I/O	179
73	13			PF5	I/O	177
74	14			PF7	I/O	175
75	15			PF9	I/O	173
76	16			PF11	I/O	171
77	17			PF13	I/O	169
78	18			PF15	I/O	167
79	19			GND	PWR	
80	20			nAMS1	O	30
81	21			nAWE	O	20
82	22			nNMI	I	34
83	23			D0	I/O	35
84	24			D2	I/O	37
85	25			D4	I/O	39
86	26			D6	I/O	41
87	27			D8	I/O	43
88	28			D10	I/O	45
89	29			D12	I/O	47
90	30			D14	I/O	49
91	31			D15	I/O	50
92	32			D13	I/O	48
93	33			D11	I/O	46
94	34			D9	I/O	44
95	35			D7	I/O	42
96	36			D5	I/O	40
97	37			D3	I/O	38
98	38			D1	I/O	36
99	39			nRESET	I/O	67
100	40			nAOE	O	18
101	41			nARE	O	19
102	42			nAMS2	O	31
103	43			3.3V	PWR	
104	44			PF14	I/O	168
105	45			PF12	I/O	170
106	46			PF10	I/O	172
107	47			PF8	I/O	174

108	48	PF6	I/O	176
109	49	PF4	I/O	178
110	50	PF2	I/O	180
111	51	PF0	I/O	182
112	52	PH2	I/O	24
113	53	PG0	I/O	166
114	54	A14	O	14
115	55	A12	O	12
116	56	A10	O	10
117	57	A8	O	8
118	58	A6	O	6
119	59	A4	O	4
120	60	A2	O	2

4-8 Expansion Connector X1

4.9.3 X3 – Expansion Connector 3

Pin No. (Symbol)	Pin (Connector)	No. Signal	Signal type	Pin No CM
121	1	GND	PWR	
122	2	PJ13	I/O	74
123	3	PJ12	I/O	75
124	4	PJ11	I/O	76
125	5	PJ10	I/O	77
126	6	PJ9	I/O	78
127	7	PJ8	I/O	79
128	8	PJ7	I/O	80
129	9	PJ6	I/O	81
130	10	PJ5	I/O	82
131	11	PJ4	I/O	83
132	12	PJ3	I/O	84
133	13	PJ2	I/O	85
134	14	PJ1	I/O	86
135	15	GND	PWR	
136	16	PB0	I/O	119
137	17	PB1	I/O	120
138	18	PB2	I/O	121
139	19	PB3	I/O	122
140	20	PB4	I/O	123
141	21	PB5	I/O	124
142	22	PB6	I/O	125
143	23	PB7	I/O	126
144	24	GND	PWR	
145	25	PA0	I/O	101
146	26	PA2	I/O	103
147	27	PA3	I/O	104
148	28	PA4	I/O	105
149	29	PA6	I/O	107
150	30	PA7	I/O	108
151	31	PA8	I/O	109
152	32	PA10	I/O	111

153	33	PA11	I/O	112
154	34	PA12	I/O	113
155	35	PA14	I/O	115
156	36	PA15	I/O	116
157	37	GND	PWR	
158	38	GND	PWR	
159	39	3.3V	PWR	
160	40	3.3V	PWR	
161	41	5.0V	PWR	
162	42	Vin	PWR	
163	43	GND	PWR	
164	44	PG3	I/O	163
165	45	PG4	I/O	162
166	46	PG5	I/O	161
167	47	PG6	I/O	160
168	48	PG7	I/O	159
169	49	PG8	I/O	158
170	50	PG9	I/O	157
171	51	PG10	I/O	156
172	52	PG11	I/O	155
173	53	PG12	I/O	154
174	54	PG13	I/O	153
175	55	PG14	I/O	152
176	56	PG15	I/O	151
177	57	GND	PWR	
178	58	PE0	I/O	200
179	59	PE1	I/O	199
180	60	PE2	I/O	198
181	61	PE3	I/O	197
182	62	PE4	I/O	196
183	63	PE5	I/O	195
184	64	PE6	I/O	194
185	65	PE9	I/O	191
186	66	PE10	I/O	190
187	67	GND	PWR	
188	68	PC8	I/O	92
189	69	PC9	I/O	91
190	70	PC10	I/O	90
191	71	PC11	I/O	89
192	72	PC12	I/O	88
193	73	PC13	I/O	87
194	74	PH6	I/O	28
195	75	PH5	I/O	27
196	76	ATAPI_PDIAG	I	134
197	77	EXT_WAKEUP	O	33
198	78	GND	PWR	
199	79	CLKBUF	O	69
200	80	GND	PWR	

4-9 Expansion Connector X3

5 Switches, Jumper and LED Description

5.1 S1 – Reset switch

Performs system reset.

5.2 S2 – Ethernet Control Signals / SDCARD CS



Default Settings

Dipswitch	Function
S2.1	Connect SDCARD CS to PC5
S2.2	Connect nAMS1 from Core Module to Ethernet chip
S2.3	Connect PE6 from Core Module to Ethernet chip IRQ
S2.4	Connect PME of Ethernet chip to test point PME1

5-1 DIP switch S2

5.3 S3 – UART Switch

Move S3 to position 1 to route the Core Modules RX0 and TX0 signals to USB

Move S3 to position 0 to route the Core Modules RX1 and TX1 signals to USB

5.4 S4 – Boot Configuration

S4.1 to S4.4 Control the boot mode and are described in chapter 6 Boot Mode Description.

Dipswitch	Function
S4.1	Bootmode 0
S4.2	Bootmode 1
S4.3	Bootmode 2
S4.4	Bootmode 3
S4.5	Power Supply for CAN0 Driver IC
S4.6	Power Supply for CAN1 Driver IC
S4.7	Connect TXD-USB to VCC
S4.8	Connect S5 to VCC

5-2 DIP switch S4

5.5 JP1 – Ethernet Speed Selection

Set jumper JP1 to select Ethernet Speed 10MBit/s and unset JP1 for 100Mbit/s.

5.6 JP2 -- Power Supply Jumper

This jumper can be removed in order to insert an AMPERE METER for current measurement:

5.7 JP3 – 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.

5.8 JP4 – USB ID

Short jumper JP4 to tie USB ID to GND on the USB-OTG Connector X13.

5.9 S5 - Button

The button S5 is a GPIO Button and connects to PH7.

5.10 General Purpose LEDs

Designator	Function	Blackfin GPIO
V14	GPIO LED	PH6
V15	GPIO LED	PH5

Table 5-3: Core Module LEDs

5.11 Ethernet LEDs

Designator	Color	Description
V1	Yellow	Full duplex
V2	Green	Activity
V3	Green	100MB Speed LED

Table 5-4: Ethernet LEDs

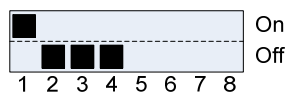
5.12 LEDs of the Debug Agent

Designator	Color	Description
V9	Green	Flag0
V10	Green	Flag1
V11	Green	Monitor
V12	Green	Pr. done

Table 5-5: LEDs for the Debug Agent

6 Boot Mode Description

Boot-settings for CM-BF548 (S4) only Switches 1 – 4 of 8 are shown



The default Boot Mode option for the BLACKSheep Software is 0001 !

The default Boot Mode option for the uClinux / uBoot is 0001 !

BMODE3-0 (S4.4-S4.1)	Description
0000	Idle-no boot
0001	Boot from 8- or 16-bit external flash memory
0010	Boot from 16-bit asynchronous FIFO
0011	Boot from serial SPI memory (EEPROM or flash)
0100	Boot from SPI host device
0101	Boot from serial TWI memory (EEPROM/flash)
0110	Boot from TWI host
0111	Boot from UART host

1000	Reserved
1001	Reserved
1010	Boot from (DDR) SDRAM
1011	Boot from OTP memory
1100	Reserved
1101	Boot from 8- or 16-bit NAND flash memory via NFC
1110	Boot from 16-Bit Host DMA
1111	Boot from 8-Bit Host DMA

Table 6-1: Boot modes

7 Installation

7.1 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 and test your DEV-BF548-Lite board the following steps can be done:

1. Make sure jumpers JP2 and JP3 are set and the Switch S3 is in Position 1. as shown in Figure 7-1 (JP1 unset).

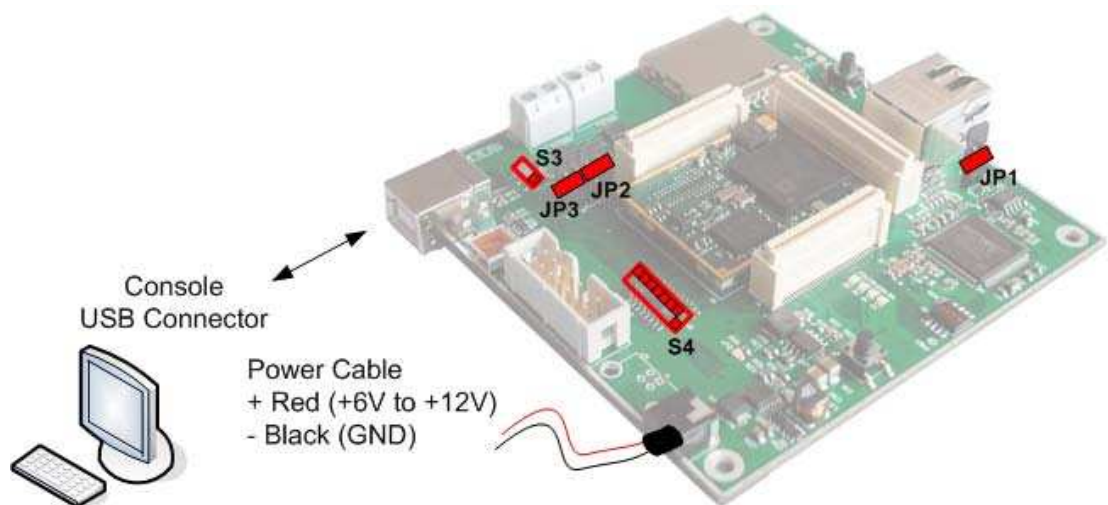
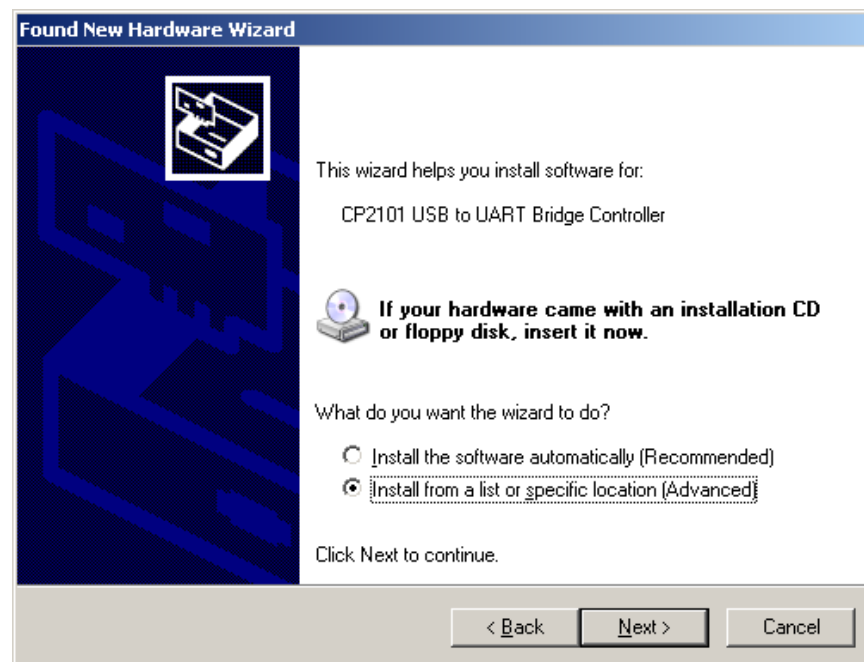


Figure 7-1: Setup of the DEV-BF548-Lite Board

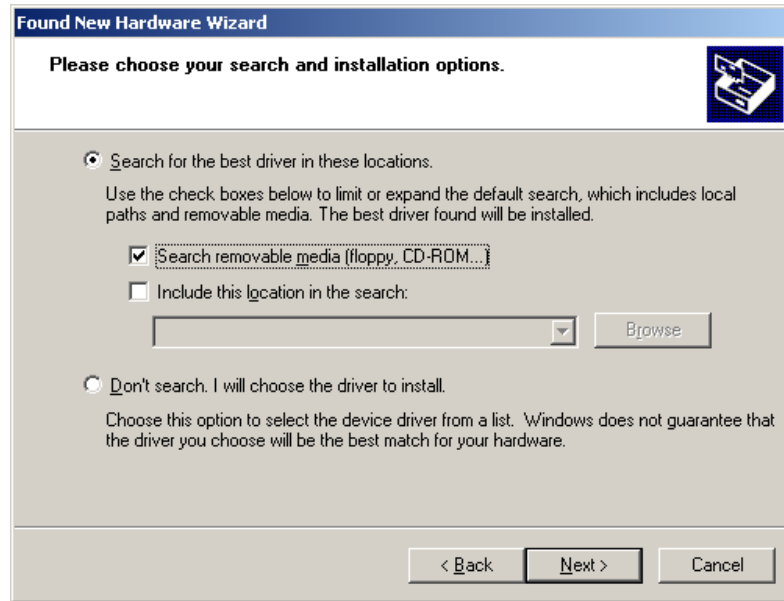
2. If you want to use an SD-Card, insert the SD-Card in the appropriate slot at the bottom side of the board.
3. Connect the power supply to the power connector off the DEV-BF548-Lite board.
4. Connect the DEV-BF548-Lite Board via USB to the PC. The pre-flashed BLACKSheep starts and the LED mounted on the DEV-BF548-Lite board starts blinking. On the PC usually the 'Found New Hardware Wizard' opens.



If the wizard asks you to connect to 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. Simply repeat this step.

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-BF548-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.

```

com_1 - HyperTerminal
File Edit View Call Transfer Help
[Icons]
Checking for SD cards...
Checking slot 0... Card found. Checking card...
SD-card: Command response: 0
SD-card: Product name: SD256
SD-card: Manufacturer ID: 2
SD-card: Application ID: TM
SD-card: Product revision: 0.>
SD-card: Serial number: 2133584913
SD-card: Manufacture month: 11
SD-card: Manufacture year: 2004
SD-card: Card Status:0
SD-card: Size in kb: 252160
SD-card: Checking card for filesystem...
Error: 0. Found Filesystem: FAT16. Partition mounted as sd0a.
Checking slot 1... No or illegal card found. Error: -1
Last address of BLACKSheep: 0x2002811c
Searching for 16 bit application in flash...
Searching for 8 bit application in flash...
No application found in flash.
Searching for BS_BOOT.LDR on mass storage device...
No or invalid file BS_BOOT.LDR was found on mass storage device.
Terminal ready. Have a nice work!

CM-BF561>
Connected 06:39:05 ANSIW 115200 8-N-1 SCROLL CAPS NUM Capture Print echo

```

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.

7.2 Debug Agent Setup (DEV-BF548DA-Lite only)

If you have purchased a DEV-BF548DA-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.

- Configure VDSP++4.5 to support the DEV-BF548DA-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!



- Select the Core Module that you have inserted in the socket of your DEV-BF548DA-Lite.
- Press the "Install" button.
- You should get the following message:



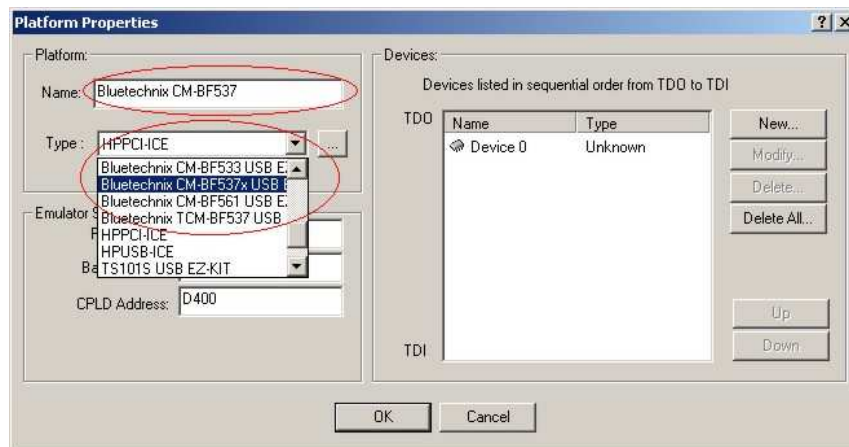
- Be sure that the board is powered on!
- Connect X4 (USB JTAG) with an USB cable to a free USB port on your PC.
- The following dialog or a similar one should appear:



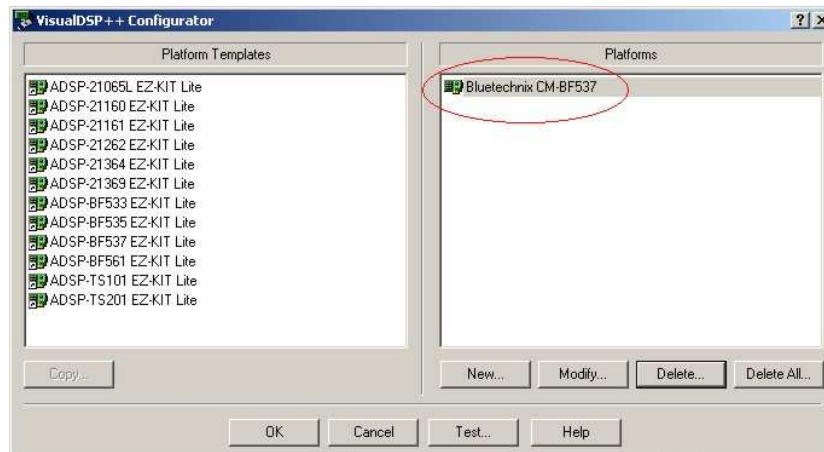
- Choose "Install the software automatically", press "Next" and follow the instructions on the screen.

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-BF548DA-Lite board.
4. Enter a Name for the Platform for example "Bluetechnix CM-BF537".



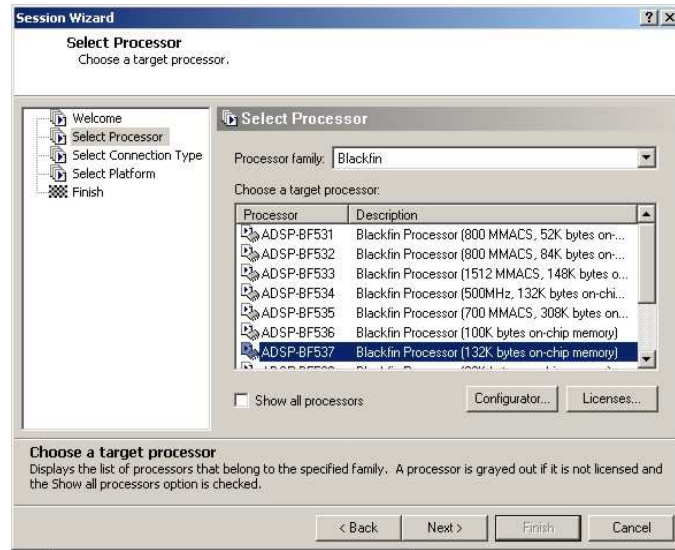
5. Select "Ok". The created platform should appear in the "Platforms" section of the "configurator" window.



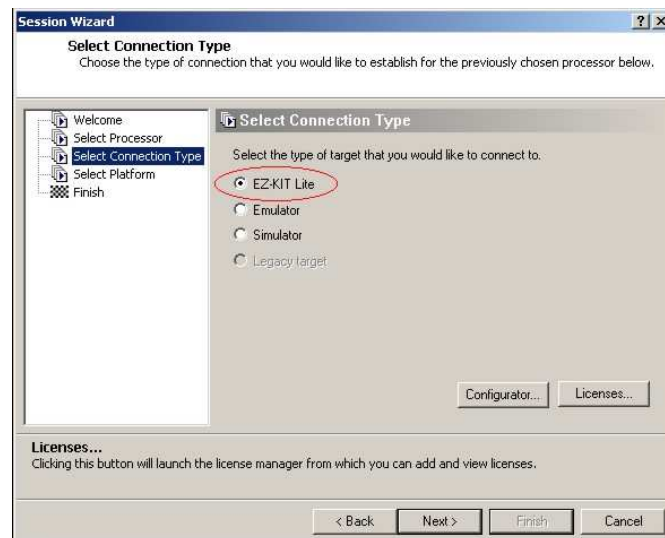
6. Press "Ok" to close the VisualDSP++ Configurator.

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

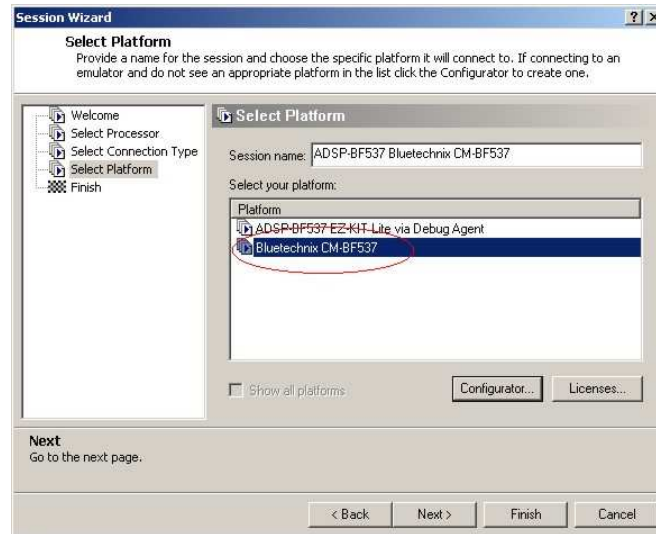
1. Open the "New Session Wizard" from the pulldown menu of the VDSP++ (Session→New Session) or press the "New Session" button on the "Session List" window that appears on startup of VDSP++.
2. Select the processor corresponding to your Core Module and press "Next".



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 these settings. The Core Module on the DEV-BF548DA-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-BF548DA-Lite you have to reconfigure VDSP++ starting with the install tool as described above.

8 Using the VDSP Flash Programming Tool

8.1 Developing an Application

If you are developing your own projects with the VDSP++ development tools using 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. You have to load the flash driver located on your EVAL board support CD corresponding to the inserted Core Module.

8.2 Overwriting BLACKSheep Code

If you overwrite intentionally or unintentionally 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 versions or updates.

9 Extender Board Compatibility List

This chapter points out the compatibility of the DEV-BF548-Lite and DEV-BF548DA-Lite with Core Module and Extension Boards. Please refer to the Extender board and Core Module Hardware Manuals for further information.

Legend:

OK	Full functional
(OK)	Functional but not all features are available
NO	Not functional
NG	Functionality not guaranteed
NT	Not tested yet
Limited	Limited

The following tables show possible board combinations:

9.1 Without Extender Board

Core Module	CM-BF548	
No Extender	OK	

Table 9-1: Used without Extender Board

9.2 EXT-BF5xx-EXP

Core Module	CM-BF548	
EXT-BF5xx-EXP	NT	

Table 9-2: Used with the Experimental Extender Board

All boards can be used in combination with the Experimental Extender Board

9.3 EXT-BF5xx-Video

Core Module	CM-BF548	
EXT-BF5xx-Video	NT	

Table 9-3: Used with the Video Extender Board

9.4 Audio Extender Board

Core Module	CM-BF548	
EXT-BF5xx-Audio	NT	

Table 9-4: Used with the Audio Extender Board

9.5 Camera Extender Board

Core Module	CM-BF548	
EXT-BF5xx-Camera	NT	

Table 9-5: Used with the Camera Extender Board

9.6 Analog-Digital / Digital-Analog Converter Extender Board

Core Module	CM-BF548	
EXT-BF5xx-AD/DA	NT	

Table 9-6: Used with the Analog-Digital / Digital-Analog Converter Extender Board

9.7 USB-ETH Extender Board

Core Module	CM-BF548	
EXT-BF5xx-USB-ETH	NT	

Table 9-7: Used with the USB-ETH Extender Board

9.8 Video and Audio Extender Board

Core Module	CM-BF548	
EXT-BF5xx-Video	NT	
EXT-BF5xx-Audio	NT	

Table 9-8: Used with the Video and the Audio Extender Board

9.9 Camera and Audio Extender Board

Core Module	CM-BF548	
EXT-BF5xx-Camera	NT	
EXT-BF5xx-Audio	NT	

Table 9-9: Used with the Camera and the Audio Extender Board

10 Anomalies

2	Missing pull up resistor on nBR -> workaround done
1	Missing pull up resistor on CMD_OD -> workaround done

Table 10-1: Anomalies on V1.0 boards

11 Product Changes

Version	Changes
V1.1	Bug Fix and Connector Replacement
V1.0	Initial Board Version

Table 11-1: Product Changes

Document Revision History

Version	Date	Document Revision
13	2010-06-23	Layout changes
12	2010-02-09	Redesign of Manual
11	2009-02-04	Caption for some tables added Table 5-1 corrected Table 6-1 S4.4-S4.1 added
10	2008-10-15	Chapter 4.9: column Pin No. (Symbol) added
9	2008-09-23	Extension Footprint added, Layout changed
8	2008-08-18	English checked for grammar, spelling and clarity.
7	2008-07-01	Change matching connector
6	2008-06-26	Fixed naming of dipwitches and added missing ones
5	2008-05-29	VDSP++ Version
4	2008-05-23	Several changes
3	2008-04-01	Extender Board Compatibility List
2	2007-12-10	Minor Changes
1	2007-12-09	Initial release of the document

Table 0-1: Revision History

A List of Figures and Tables

Figures:

Figure 1-1: Overview of the DEV-BF548-Lite Board	8
Figure 2-1: Functional Block Diagram	10
Figure 3-1: Connector PCB Placement	11
Figure 3-2: Mechanical Outline – Expansion Connector Placement	12
Figure 3-3: Recommended Footprint for Extension Boards – top view	13
Figure 7-1: Setup of the DEV-BF548-Lite Board.....	23

Tables:

Table 4-1: Ethernet Connector	14
Table 4-2: SD-Card Connector	14
Table 4-3: UART1 additional Header	14
Table 4-4: DEV-board connector types	15
Table 4-5: CAN Connector	15
Table 4-6: Power Supply	15
4-7 Expansion Connector X2	17
4-8 Expansion Connector X1	19
4-9 Expansion Connector X3	20
5-1 DIP switch S2	21
5-2 DIP switch S4	21
Table 5-3: Core Module LEDs.....	22
Table 5-4: Ethernet LEDs	22
Table 5-5: LEDs for the Debug Agent	22
Table 6-1: Boot modes	23
Table 9-1: Used without Extender Board.....	31
Table 9-2: Used with the Experimental Extender Board	31
Table 9-3: Used with the Video Extender Board	31
Table 9-4: Used with the Audio Extender Board.....	32
Table 9-5: Used with the Camera Extender Board	32
Table 9-6: Used with the Analog-Digital / Digital-Analog Converter Extender Board ...	32
Table 9-7: Used with the USB-ETH Extender Board.....	32
Table 9-8: Used with the Video and the Audio Extender Board	32
Table 9-9: Used with the Camera and the Audio Extender Board.....	33
Table 10-1: Anomalies on V1.0 boards	33
Table 11-1: Product Changes	33
Table 0-1: Revision History	34