

# Hardware User Manual

**CM-BF548 V1.x**

*...maximum performance at minimum space*

## Contact

Bluetechnix Mechatronische Systeme GmbH

Lainzerstraße 162/3

A-1130 Vienna

AUSTRIA/EUROPE

[office@bluetechnix.at](mailto:office@bluetechnix.at)

<http://www.bluetechnix.com>

Document No.: 100-1241-1.0

Document Revision 13

Date: 2010-02-02

## Table of Contents

1	Introduction.....	8
1.1	Overview.....	8
1.2	Key Features .....	9
1.3	Target Applications.....	9
1.4	Further Information .....	9
2	Specification .....	10
2.1	Functional Specification.....	10
2.2	Boot Mode.....	10
2.3	Memory Map.....	11
2.3.1	Core Module Memory.....	11
2.3.2	Externally Addressable Memory Space (on connector) .....	11
2.4	Electrical Specification .....	11
2.4.1	Supply Voltage.....	11
2.4.2	Supply Voltage Ripple .....	11
2.4.3	Oscillator Frequency .....	11
2.4.4	Supply Current .....	11
2.5	Environmental Specification.....	12
2.5.1	Temperature .....	12
2.5.2	Humidity.....	12
3	CM-BF548.....	12
3.1	Mechanical Outline .....	12
3.1.1	Footprint .....	13
3.2	Schematic Symbols (Signals of X1a and X1b) .....	15
3.3	Connector X1a – (1-100).....	16
3.4	Connector X1b – (101-200).....	18
3.5	Reset circuit.....	20
4	Software Support .....	20
4.1	BLACKSheep.....	20
4.2	uClinux .....	21
5	Application Examples .....	21
5.1	Sample Schematic .....	21
6	Anomalies.....	23
7	Production Report.....	23
7.1	CM-BF548 (100-1241).....	23

8	Product Changes.....	23
9	Document Revision History.....	24
A	List of Figures and Tables.....	25

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:

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.
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.
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-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.
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-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.
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.

### 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>.

**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

The CM-BF548 is a high performance and low power processor module incorporating Analog Devices Blackfin family of processors. Special feature is the fast DDR SDRAM memory bus and the many IO Interfaces available on two 100 pin connectors. The module allows easy integration into high demanding very space and power limited applications.

### 1.1 Overview

The Core Module CM-BF548 consists of the following components:

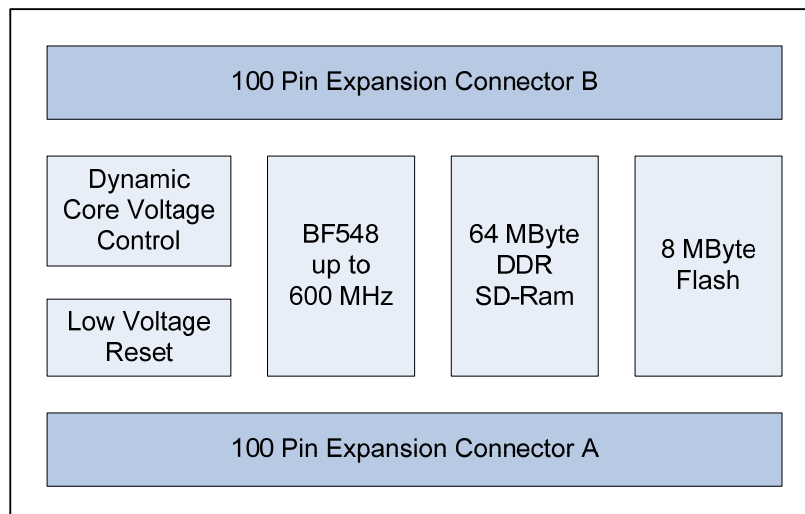


Figure 1-1: Main components of the CM-BF548 module

- **Analog Devices Blackfin Processor ADSP-BF548**
  - ADSP-BF548BBCZ-5X with 533MHz\*  
(\* please see chapter 7.1 for the correct part number)
  - **Note: ADSP BF54x Variants can be mounted upon request for higher volumes**
- **64 MB DDR SDRAM**
  - DDR SDRAM MT46V32M16BN-6IT (32Mx16, 512Mbit @ 2.5V)
- **8 MB of Byte Addressable Flash**
  - PF48F2000P0XBQ0 (4Mx16, 64Mbit @ 3.3 V; all 8MByte addressable)
  - Additional flash memory can be connected through the expansion board as parallel Flash using asynchronous chip select lines or the NAND Flash interface, or as SPI flash.

- **Low Voltage Reset Circuit**
  - Resets module if power supply goes below 2.93V for at least 140ms
  
- **Dynamic Core Voltage Control**
  - Core voltage can be adjusted by setting software registers on the Blackfin processor
  - Core voltage range: 0.8 – TBD
  
- **Expansion Connector A – 100pins**
  - Data Bus
  - Address Bus
  - Control Signals (Memory Control, Reset, Interrupt, Timer)
  - PC (0..13) SD-IO Signals, SPORT, GPIO
  - PJ (1..13) Atapi Signals, GPIO
  - PH (0..7)
  - ClkOUT, CLKBUF
  - USB-OTG
  - JTAG
  - Boot Mode Pins
  - Power Supply
  
- **Expansion Connector B – 100pins**
  - PA (0..15) Main functions: SPORT, GPIO, Timer
  - PB (0..14) Main functions: SPI, UART, I2C, GPIO, Timer
  - PD (0..15) Main functions: Host Port, SPORT, PPI0, PPI1, PPI2
  - PE (0..15) Main functions: SPI, UART, I2C, PPI1, GPIO
  - PF(0..15) Main functions: PPI0, GPIO
  - PG(0..15) Main functions: CAN1,2 , PPI0, SPI, Host Port, GPIO

## 1.2 Key Features

- Allows quick prototyping of product that comes very close to the final design
- Reduces development costs, faster time to market
- Very cost effective for small and medium volumes

## 1.3 Target Applications

- Generic high performance signal processor module
- Automotive Applications
- GUI Based Web Appliances
- Robotics: Tiny processor module for mobile robots

## 1.4 Further Information

Further information, and document updates are available on the product homepage:  
<http://www.bluetechnix.com/goto/cm-bf548>

## 2 Specification

**ATTENTION:** Please check the orientation of the Core Module. Insertion in the wrong orientation will cause damage!

### 2.1 Functional Specification

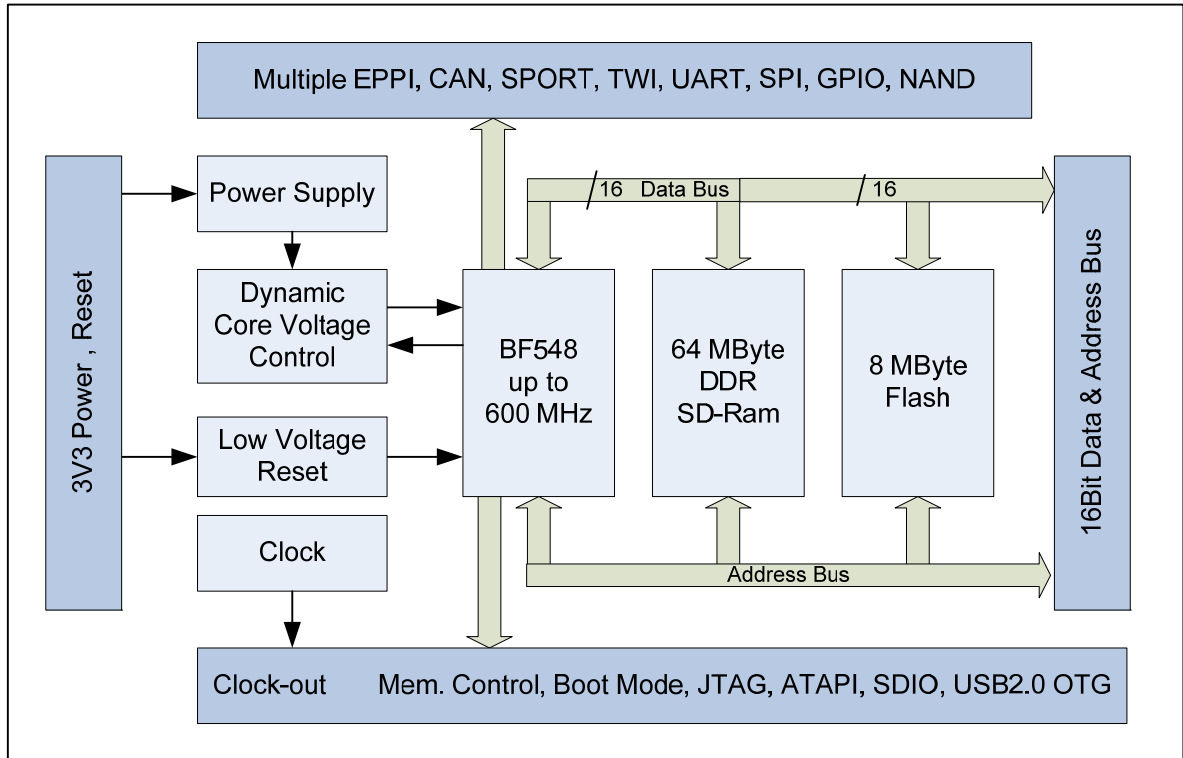


Figure 2-1: CM-BF548 Detailed Block Diagram

Figure 2-1 shows a detailed block diagram of the CM-BF548 module. Beside the DDR SD-RAM control pins the CM-BF548 has all other pins of the Blackfin processor at its two main 100 pin connectors.

Dynamic voltage control allows reducing power consumption to a minimum adjusting the core voltage and the clock frequency dynamically in accordance to the required processing power. A low voltage reset circuit guarantees a power on reset and resets the system when the input voltage drops below 2.93V.

### 2.2 Boot Mode

BMODE3-0	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 2-1: Available Boot Modes for the CM-BF548

By default the Boot Mode is set to 0000 (BMODE0 = LOW, BMODE1 = LOW; BMODE2 = LOW, BMODE3 = LOW). Push BMODE PINS to high in order to change the boot mode.

## 2.3 Memory Map

### 2.3.1 Core Module Memory

Memory Type	Start Address	End Address	Size	Comment
FLASH	0x20000000	0x207FFFFFFF	8MB	PF48F2000P0XBQ0
DDR SDRAM	0x00000000	0x03FFFFFFF	64MB	MT46V32M16BN-6IT

Table 2-2: Memory Map

### 2.3.2 Externally Addressable Memory Space (on connector)

The core module has 3 banks of the Asynchronous Memory interface of the Blackfin processor available, this can be addressed via the following addresses.

Async Bank	Memory	Start Address	End Address	Size	Comment
1		0x24000000	0x2400FFFF	64K	Use nAMS 1
2		0x28000000	0x2800FFFF	64K	Use nAMS 2
3		0x2C000000	0x2C00FFFF	64K	Use nAMS 3

Table 2-3: External Asynchronous Memory Mapping

These memory banks can be used to access various memory mapped devices or peripherals.

## 2.4 Electrical Specification

### 2.4.1 Supply Voltage

- 3.3V DC +/-10%

### 2.4.2 Supply Voltage Ripple

- 100mV peak to peak 0-20 MHz

### 2.4.3 Oscillator Frequency

- 25MHz

### 2.4.4 Supply Current

- Maximum supply current: ca. 450mA
- Operating conditions:

- CPU running at 533MHz, Core Voltage 1.25V, DDR RAM 20% bandwidth utilization @ 130MHz: ca. 230mA
- CPU running at 300MHz, Core Voltage 0.9V DDR RAM 20% bandwidth utilization @ 1xxMHz: ca. 155mA

## 2.5 Environmental Specification

### 2.5.1 Temperature

- Operating at full 533 MHz: -40 to + 85°C (\* see chapter 7.1)

### 2.5.2 Humidity

- Operating: 10% to 90% (non condensing)

## 3 CM-BF548

### 3.1 Mechanical Outline

All dimensions are given in millimeters!

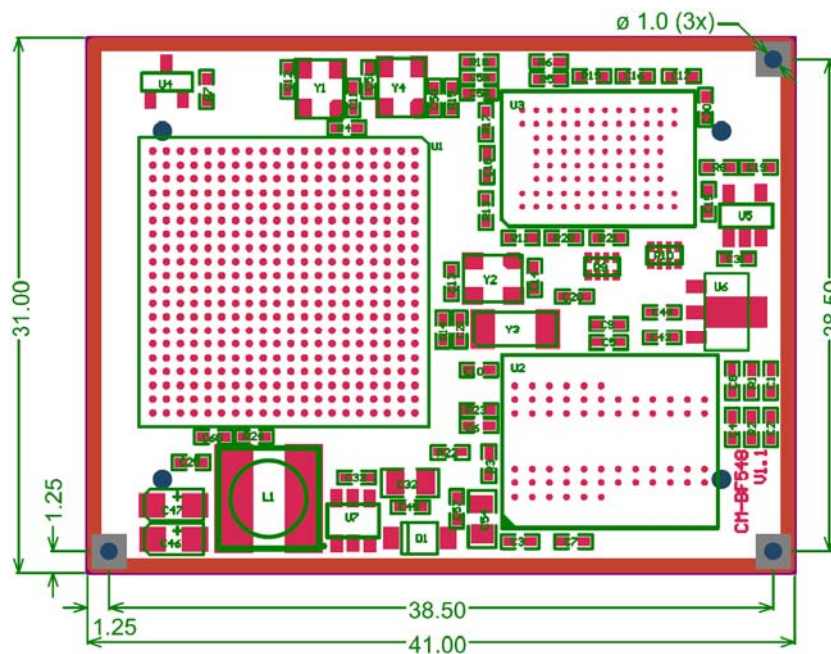


Figure 3-1: Mechanical outline (top view)

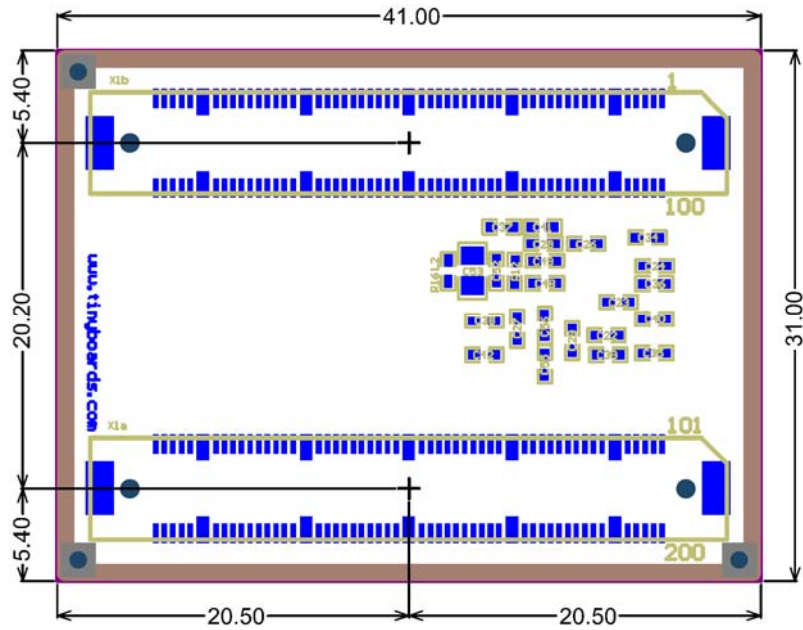


Figure 3-2: Mechanical outline (bottom view)

Take 0.5mm as a tolerance for the border of the board since it is braked out from a multiboard panel and some additional rest may remain.

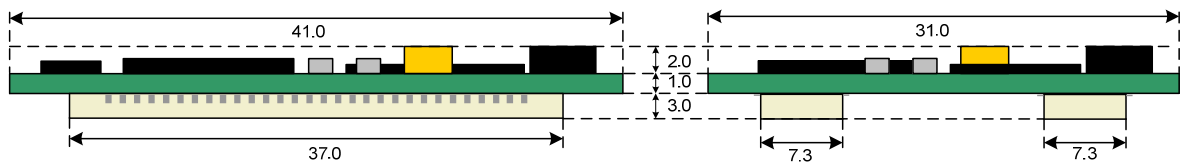


Figure 3-3: Side View with Connectors Mounted

The total minimum mounting height including receptacle at the motherboard is 7.5mm.

### 3.1.1 Footprint

For the baseboard the following connectors have to be used.

Part Baseboard	Manufacturer	Manufacturer Part No.
X1a,X1b	Hirose	FX10A-100S/10-SV Receptacle

Table 3-1: Baseboard connector types

The Connectors on the CM-BF548 are of the following type:

Part Core Module	Manufacturer	Manufacturer Part No.
X1a,X1b	Hirose	FX10A-100P/10-SV Header

Table 3-2: Module connector types

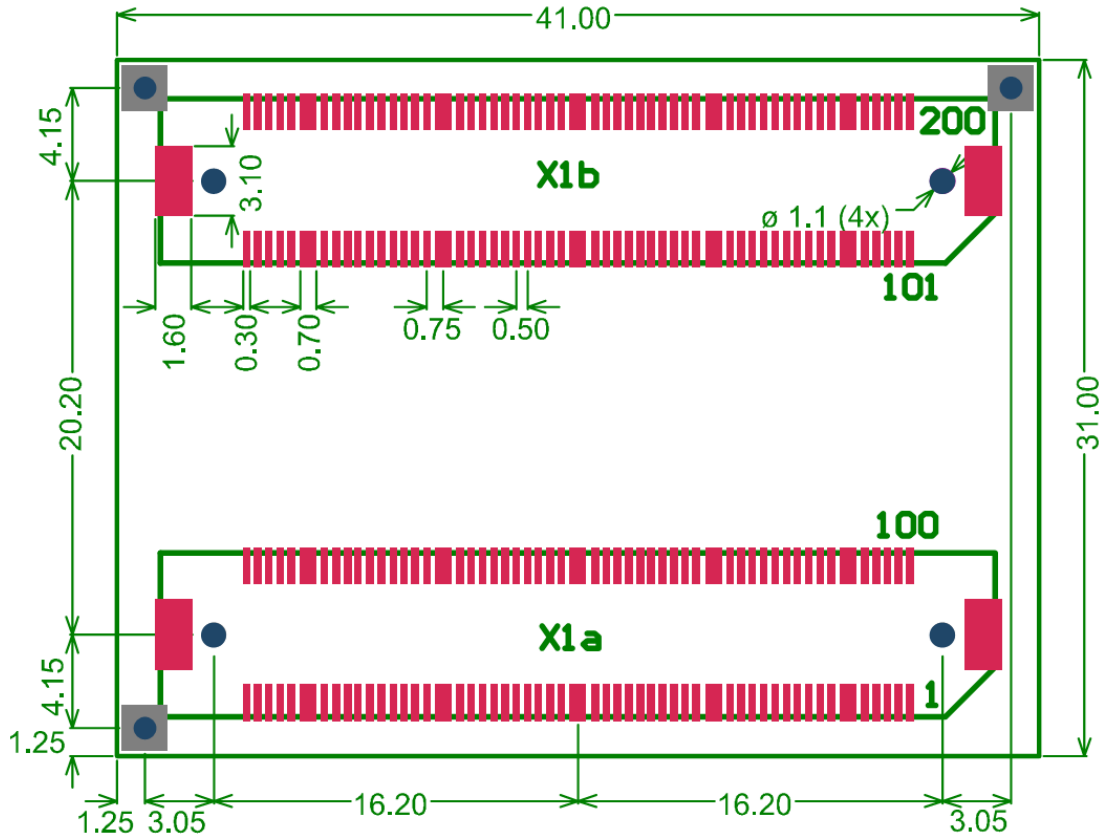


Figure 3-4: Recommended Footprint for Baseboard Design (top view)

Figure 3-4 shows the footprint of the connector looking through the board. The RED Pads of the connectors are shown in top view as placed on the top layer of an application Board. The fixing holes on top-right and bottom-left can be omitted, if no shock lock is required. For the exact connector footprints please refer to the manufacturer homepage.

Info: A Library of the Baseboard module for the Altium Designer 6.x can be obtained from Bluetechnix upon request.

### 3.2 Schematic Symbols (Signals of X1a and X1b)

1	A1	ATAP1_PDIAG	134	101	PA0/TFS2	PG15/CANIRX/TACI5	151
2	A2	PJ13/BGH or A25	74	102	PA1/DT2SEC/TMR4	PG14/CANITX	152
3	A3	PJ12/BG	75	103	PA2/DT2PRI	PG13/CANORX/TACI4	153
4	A4	PJ11/BR	76	104	PA3/TSCCLK2	PG12/CANOTX	154
5	A5	PJ10/ATAP1_JORDY	77	105	PA4/RFS2	PG11/SPI1SS/MTXON	155
6	A6	PJ9/ATAP1_INTRQ	78	106	PA5/DR2SEC/TMR5	PG10/SPI1_MOSI	156
7	A7	PJ8/ATAP1_DMARQ	79	107	PA6/DR2PRI	PG9/SPI1_MISO	157
8	A8	PJ7/ATAP1_DMACKB	80	108	PA7/RSCLK2/TACLK0	PG8/SPI1_SCLK	158
9	A9	PJ6/ATAP1_CS1B	81	109	PA8/TFS3/TACLK1	PG7/SPI1SEL3/HOST_WR/PP12_CLK	159
10	A10	PJ5/ATAP1_CS0B	82	110	PA9/DT3SEC/TMR6	PG6/SPI1SEL2/HOST_RD/PP12_FS1	160
11	A11	PJ4/ATAP1_DIOBW	83	111	PA10/DT3PRI/TACLK2	PG5/SPI1SEL1/HOST_CE/PP12_FS2/CZM	161
12	A12	PJ3/ATAP1_DIORB	84	112	PA11/TSCCLK3/TACLK3	PG4/PP10_D17	162
13	A13	PJ2/ND_RB	85	113	PA12/RFS3/TACLK4	PG3/PP10_D16	163
14	A14	PJ1/ND_CE	86	114	PA13/DR3SEC/TMR7/TACLK5	PG2/PP10_FS2	164
15	A15			115	PA14/DR3PRI/TACLK6	PG1/PP10_FS1	165
				116	PA15/RSCLK3/TACLK7/TACI7	PG0/PP10_CLK/TMRCLK	166
		PC13/SD_CMD	87				
30	AMSI	PC12/SD_CLK	88	119	PB0/SCL1	PF15/PP10_D15	167
31	AMS2	PC11/SD_D3	89	120	PB1/SDA1	PF14/PP10_D14	168
32	AMS3	PC10/SD_D2	90	121	PB2/RTS3	PF13/PP10_D13	169
		PC9/SD_D1	91	122	PB3/CTS3	PF12/PP10_D12	170
16	ABE0	PC8/SD_D0	92	123	PB4/TX2	PF11/PP10_D11	171
17	ABE1	PC7/RSCLK0	93	124	PB5/RX2/TACI2	PF10/PP10_D10	172
18	AOE	PC6/DR0PRI	94	125	PB6/TX3	PF9/PP10_D9	173
19	ARE	PC5/DR0SEC/MBCLK	95	126	PB7/RX3/TACI3	PF8/PP10_D8	174
20	AWE	PC4/RFS0	96	127	PB8/SPI2SS/TMR0	PF7/PP10_D7	175
21	ARDY	PC3/TSCCLK0	97	128	PB9/SPI2SEL1/TMR1	PF6/PP10_D6	176
		PC2/DT0PRI	98	129	PB10/SPI2SEL2/TMR2	PF5/PP10_D5	177
		PC1/DT0SEC/MMCLK	99	130	PB11/SPI2SEL3/HWAIT	PF4/PP10_D4	178
35	D0	PC0/TFS0	100	131	PB12/SPI2_SCLK	PF3/PP10_D3	179
36	D1			132	PB13/SPI2_MOSI	PF2/PP10_D2	180
37	D2			133	PB14/SPI2_MISO	PF1/PP10_D1	181
38	D3	PH0/TX1/PP11_FS3	22			PF0/PP10_D0	182
39	D4	PH1/RX1/PP10_FS3/TACI1	23	135	PD0/PP11_D0/HOST_D8/TFS1/PP10D18	PE15/SDA0	185
40	D5	PH2/ATAP1_RST/TMR8/PP12_FS3	24	136	PD1/PP11_D1/HOST_D9/DT1SEC/PP10_D19	PE14/SCL0	186
41	D6	PH3/HOST_ADDR/TMR9/CUD	25	137	PD2/PP11_D2/HOST_D10/DT1PRI/PP10_D20	PE13/PP11_FS2	187
42	D7	PH4/HOST_ACK/TMR10/CDG	26	138	PD3/PP11_D3/HOST_D11/TSCCLK1/PP10_D21	PE12/PP11_FS1	188
43	D8	PH5/MTX/DMAR0/TACI8/TACLK8	27	139	PD4/PP11_D4/HOST_D12/RFS1/PP10_D22	PE11/PP11_CLK	189
44	D9	PH6/MRX/DMAR1/TACI9/TACLK9	28	140	PD5/PP11_D5/HOST_D13/DR1SEC/PP10_D23	PE10/CTS1	190
45	D10	PH7/MRXON/HWAIT/TACI10/TACLK10	29	141	PD6/PP11_D6/HOST_D14/DR1PRI	PE9/RX0	191
46	D11			142	PD7/PP11_D7/HOST_D15/RSCLK1	PE8/RX0/TACI0	192
47	D12	USB_D+	62	143	PD8/PP11_D8/HOST_D0/PP12_D0/K_R0	PE7/TX0/K_R7	193
48	D13	USB_D-	63	144	PD9/PP11_D9/HOST_D1/PP12_D1/K_R1	PE6/SPI0SEL3/K_C4	194
49	D14	USB_VBus	65	145	PD10/PP11_D10/HOST_D2/PP12_D2/K_R2	PE5/SPI0SEL2/K_R4	195
50	D15	USB_ID	66	146	PD11/PP11_D11/HOST_D3/PP12_D3/K_R3	PE4/SPI0SEL1/K_C5	196
				147	PD12/PP11_D12/HOST_D4/PP12_D4/K_C0	PE3/SPI0SS/K_R5	197
				148	PD13/PP11_D13/HOST_D5/PP12_D5/K_C1	PE2/SPI0_MOSI/K_C6	198
				149	PD14/PP11_D14/HOST_D6/PP12_D6/K_C2	PE1/SPI0_MISO/K_R6	199
				150	PD15/PP11_D15/HOST_D7/PP12_D7/K_C3	PE0/SPI0_SCLK/K_C7	200
71	3V3	GND	184				
117	3V3	GND	183				
118	3V3	GND	61				
		GND	64				
		GND	68				
72	VccRTC	GND					
73	2V5						
		GND_Shield	201				
51	EMU	GND_Shield	202				
52	TRST	GND_Shield	203				
53	TMS	GND_Shield	204				
54	TDO	GND_Shield	205				
55	TDI	GND_Shield	206				
56	TCK	GND_Shield	207				
		GND_Shield	208				
		GND_Shield	209				
57	BMODE3	GND_Shield	210				
58	BMODE2	GND_Shield	213				
59	BMODE1	GND_Shield	214				
60	BMODE0	GND_Shield	215				
		GND_Shield	216				
		GND_Shield	217				
67	RESET	GND_Shield	218				
34	NMI	GND_Shield	219				
33	EXT_WAKEUP	GND_Shield	220				
		GND_Shield	221				
69	CLKBUF	GND_Shield	222				
70	CLKOUT	GND_Shield					

Figure 3-5: Schematic Symbol of the CM-BF548 Module

Important Hardware NOTICE: Besides VCC and GND, you need a 10k pull up resistor on BR (pin76) in all cases, so that the Core Module can boot and for the correct Boot Mode setting.

This pin should always be enabled as BR in software and pulled high to enable asynchronous access.



### 3.3 Connector X1a – (1-100)

Pin No.	Signal Name	IO type
1	A1	O
2	A2	O
3	A3	O
4	A4	O
5	A5	O
6	A6	O
7	A7	O
8	A8	O
9	A9	O
10	A10	O
11	A11	O
12	A12	O
13	A13	O
14	A14	O
15	A15	O
16	$\overline{\text{ABE0}} / \text{ND\_CLE}$	O
17	$\overline{\text{ABE1}} / \text{ND\_ALE}$	O
18	$\overline{\text{AOE}}$	O
19	$\overline{\text{ARE}}$	O
20	$\overline{\text{AWE}}$	O
21	ARDY	I
22	PH0 / TX1 / PPI1_FS3	IO
23	PH1 / RX1 / PPI0_FS3 / TACI1	IO
24	PH2 / ATAPI_RST / TMR8 / PPI2_FS3	IO
25	PH3 / HOST_ADDR / TMR9 / CUD	IO
26	PH4 / HOST_ACK / TMR10 / CDG	IO
27	PH5 / MTX / DMAR0 / TACI8 / TACLK8	IO
28	PH6 / MRX / DMAR1 / TACI9 / TACLK9	IO
29	PH7 / $\overline{\text{MRXON}}$ / HWAIT / TACI10 / TACLK10	IO – 33R serial
30	$\overline{\text{AMS1}}$	O
31	$\overline{\text{AMS2}}$	O
32	$\overline{\text{AMS3}}$	O
33	EXT_WAKEUP	O
34	$\overline{\text{NMI}}$	I – 10k pull up
35	D0	IO
36	D1	IO
37	D2	IO
38	D3	IO
39	D4	IO
40	D5	IO
41	D6	IO
42	D7	IO
43	D8	IO
44	D9	IO
45	D10	IO

46	D11	IO
47	D12	IO
48	D13	IO
49	D14	IO
50	D15	IO
51	$\overline{\text{EMU}}$	O
52	$\overline{\text{TRST}}$	I – 10k pull down
53	TMS	I – 10k pull up
54	TDO	O
55	TDI	I – 10k pull up
56	TCK	I – 10k pull up
57	BMODE3	I – 10k pull down
58	BMODE2	I – 10k pull down
59	BMODE1	I – 10k pull down
60	BMODE0	I – 10k pull down
61	GND	Power
62	USB_D+	IO
63	USB_D-	IO
64	GND	Power
65	USB_VBus	I
66	USB_ID	I
67	$\overline{\text{RESET}}$	I/O
68	GND	Power
69	CLKBUF	O – 33R serial
70	CLKOUT	O
71	3V3	Power
72	VccRTC	Power
73	2V5 (do not connect (output))	Power
74	PJ13 / $\overline{\text{BGH}}$ or A25	IO
75	PJ12 / $\overline{\text{BG}}$	IO
76	PJ11 / $\overline{\text{BR}}$ (use 10k Pull-Up on Base Board !)	IO
77	PJ10 / ATAPI_IORDY	IO
78	PJ9 / ATAPI_INTRQ	IO
79	PJ8 / ATAPI_DMARQ	IO
80	PJ7 / ATAPI_DMACKB	IO
81	PJ6 / ATAPI_CS1B	IO
82	PJ5 / ATAPI_CS0B	IO
83	PJ4 / ATAPI_DIOBW	IO
84	PJ3 / ATAPI_DIORB	IO
85	PJ2 / $\overline{\text{ND\_RB}}$	IO
86	PJ1 / $\overline{\text{ND\_CE}}$	IO
87	PC13 / SD_CMD	IO
88	PC12 / SD_CLK	IO
89	PC11 / SD_D3	IO
90	PC10 / SD_D2	IO
91	PC9 / SD_D1	IO
92	PC8 / SD_D0	IO
93	PC7 / RSCLK0	IO

94	PC6 / DROPRI	IO
95	PC5 / DROSEC / MBCLK	IO
96	PC4 / RFS0	IO
97	PC3 / TSCLK0	IO
98	PC2 / DTOPRI	IO
99	PC1 / DT0SEC / MMCLK	IO
100	PC0 / TFS0	IO

Table 3-3: Connector X1a Pin Assignment

**Note:** Please mind the mounted pull up and pull down resistors on the Core Module. See the third column of Table 3-3.

### 3.4 Connector X1b – (101-200)

Pin No.	Signal Name	IO type
101	PA0 / TFS2	IO
102	PA1 / DT2SEC / TMR4	IO
103	PA2 / DT2PRI	IO
104	PA3 / TSCLK2	IO
105	PA4 / RFS2	IO
106	PA5 / DR2SEC / TMR5	IO
107	PA6 / DR2PRI	IO
108	PA7 / RSCLK2 / TACLK0	IO
109	PA8 / TFS3 / TACLK1	IO
110	PA9 / DT3SEC / TMR6	IO
111	PA10 / DT3PRI / TACLK2	IO
112	PA11 / TSCLK3 / TACLK3	IO
113	PA12 / RFS3 / TACLK4	IO
114	PA13 / DR3SEC / TMR7 / TACLK5	IO
115	PA14 / DR3PRI / TACLK6	IO
116	PA15 / RSCLK3 / TACLK7 / TACI7	IO
117	3V3	Power
118	3V3	Power
119	PB0 / SCL1	IO
120	PB1 / SDA1	IO
121	PB2 / RTS3	IO
122	PB3 / CTS3	IO
123	PB4 / TX2	IO
124	PB5 / RX2 / TACI2	IO
125	PB6 / TX3	IO
126	PB7 / RX3 / TACI3	IO
127	PB8 / $\overline{\text{SPI2SS}}$ / TMR0	IO
128	PB9 / SPI2SEL1 / TMR1	IO
129	PB10 / SPI2SEL2 / TMR2	IO
130	PB11 / SPI2SEL3 / HWAIT	IO
131	PB12 / SPI2SCLK	IO
132	PB13 / SPI2MOSI	IO

133	PB14 / SPI2MISO	IO
134	ATAPI_PDIAG	I
135	PD0 / PPI1_D0 / HOST_D8 / TFS1 / PPIO_D18	IO
136	PD1 / PPI1_D1 / HOST_D9 / DT1SEC / PPIO_D19	IO
137	PD2 / PPI1_D2 / HOST_D10 / DT1PRI / PPIO_D20	IO
138	PD3 / PPI1_D3 / HOST_D11 / TSCLK1 / PPIO_D21	IO
139	PD4 / PPI1_D4 / HOST_D12 / RFS1 / PPIO_D22	IO
140	PD5 / PPI1_D5 / HOST_D13 / DR1SEC / PPIO_D23	IO
141	PD6 / PPI1_D6 / HOST_D14 / DR1PRI	IO
142	PD7 / PPI1_D7 / HOST_D15 / RSCLK1	IO
143	PD8 / PPI1_D8 / HOST_D0 / PPI2_D0 / K_R0	IO
144	PD9 / PPI1_D9 / HOST_D1 / PPI2_D1 / K_R1	IO
145	PD10 / PPI1_D10 / HOST_D2 / PPI2_D2 / K_R2	IO
146	PD11 / PPI1_D11 / HOST_D3 / PPI2_D3 / K_R3	IO
147	PD12 / PPI1_D12 / HOST_D4 / PPI2_D4 / K_C0	IO
148	PD13 / PPI1_D13 / HOST_D5 / PPI2_D5 / K_C1	IO
149	PD14 / PPI1_D14 / HOST_D6 / PPI2_D6 / K_C2	IO
150	PD15 / PPI1_D15 / HOST_D7 / PPI2_D7 / K_C3	IO
151	PG15 / CAN1RX / TACI5	IO
152	PG14 / CAN1TX	IO
153	PG13 / CAN0RX / TACI4	IO
154	PG12 / CAN0TX	IO
155	PG11 / $\overline{\text{SPI1SS}}$ / $\overline{\text{MTXON}}$	IO
156	PG10 / SPI1MOSI	IO
157	PG9 / SPI1MISO	IO
158	PG8 / SPI1SCLK	IO
159	PG7 / SPI1SEL3 / $\overline{\text{HOST_WR}}$ / PPI2_CLK	IO
160	PG6 / SPI1SEL2 / $\overline{\text{HOST_RD}}$ / PPI2_FS1	IO
161	PG5 / SPI1SEL1 / $\overline{\text{HOST_CE}}$ / PPI2_FS2 / CZM	IO
162	PG4 / PPIO_D17	IO
163	PG3 / PPIO_D16	IO
164	PG2 / PPIO_FS2	IO
165	PG1 / PPIO_FS1	IO
166	PG0 / PPIO_CLK / TMRCLK	IO
167	PF15 / PPIO_D15	IO
168	PF14 / PPIO_D14	IO
169	PF13 / PPIO_D13	IO
170	PF12 / PPIO_D12	IO
171	PF11 / PPIO_D11	IO
172	PF10 / PPIO_D10	IO
173	PF9 / PPIO_D9	IO
174	PF8 / PPIO_D8	IO
175	PF7 / PPIO_D7	IO
176	PF6 / PPIO_D6	IO
177	PF5 / PPIO_D5	IO
178	PF4 / PPIO_D4	IO
179	PF3 / PPIO_D3	IO
180	PF2 / PPIO_D2	IO

181	PF1 / PPIO_D1	IO
182	PF0 / PPIO_D0	IO
183	GND	Power
184	GND	Power
185	PE15 / SDA0	IO
186	PE14 / SCL0	IO
187	PE13 / PPI1_FS2	IO
188	PE12 / PPI1_FS1	IO
189	PE11 / PPI1_CLK	IO
190	PE10 / CTS1	IO
191	PE9 / RTS1	IO
192	PE8 / RX0 / TACIO	IO
193	PE7 / TX0 / K_R7	IO
194	PE6 / SPIOSEL3 / K_C4	IO
195	PE5 / SPIOSEL2 / K_R4	IO
196	PE4 / SPIOSEL1 / K_C5	IO
197	PE3 / nSPIOSS / K_R5	IO
198	PE2 / SPIO MOSI / K_C6	IO
199	PE1 / SPIO MISO / K_R6	IO
200	PE0 / SPIO SCLK / K_C7	IO

Table 3-4: Connector X1b Pin Assignment

### 3.5 Reset circuit

The reset of the flash and the processor are connected to a power monitoring IC. The output can be used as power on reset for external devices, see Figure 3-6.

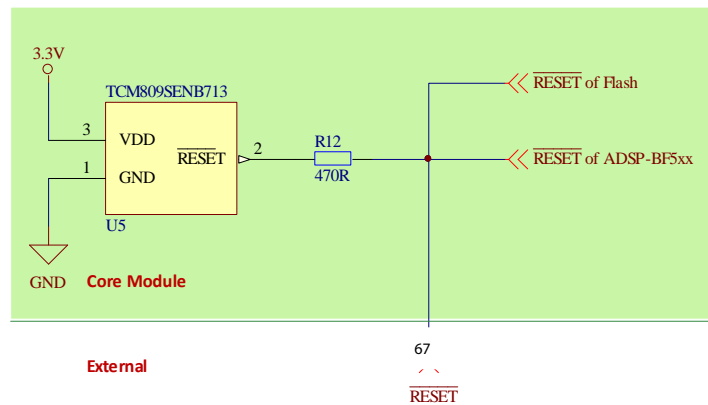


Figure 3-6: Schematic of reset circuit on the Core Module

## 4 Software Support

### 4.1 BLACKSheep

The Core Module is delivered with a pre-flashed basic version of the BLACKSheep VDK multithreaded framework. Please consult the software development documents.

## 4.2 uClinux

The Core Module is fully supported by the open source platform at <http://blackfin.uclinux.org>. Since the Core Modules are pre-flashed with BLACKSheep you have to flash uBoot first. To flash uBoot you can use the BLACKSheep boot-loader.

# 5 Application Examples

## 5.1 Sample Schematic

In this minimum configuration the CM-BF548 is used (see Figure 5-1).

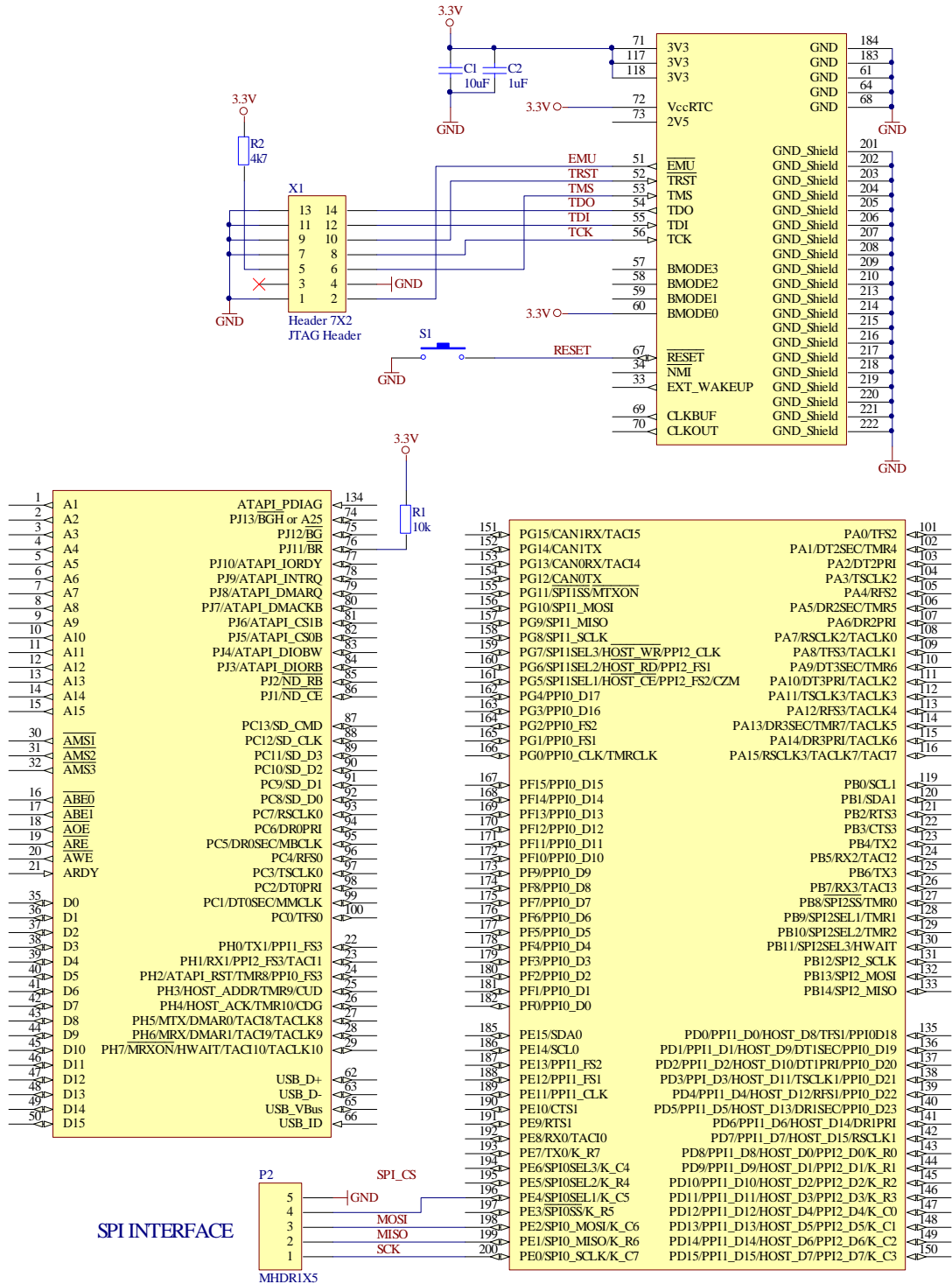


Figure 5-1: Schematic

## 6 Anomalies

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

<http://www.bluetechnix.com/goto/cm-bf548>

## 7 Production Report

### 7.1 CM-BF548 (100-1241)

Version	Component	Type
V1.1.2	Processor	ADSP-BF548BBCZ-5A V 0.1
	RAM	MT46V32M16BN-6IT
	FLASH	PF48F2000P0XBQ0
V1.1.1	Processor	ADSP-BF548BBCZ-5X V 0.1 *)
	RAM	MT46V32M16BN-6IT
	FLASH	PF48F2000P0XBQ0
V1.0	Processor	ADSP-BF549BBCZ-ENG V0.1
	RAM	MT46V32M16BN-6IT
	FLASH	PF48F2000P0XBQ0

Table 7-1: Production Report CM-BF548

\*) As long as X-Grade status is active, take notice of the Analog Devices X-Grade information.

## 8 Product Changes

For the latest product change information please consult the product web-page at:

<http://www.bluetechnix.com/goto/cm-bf548>



## 9 Document Revision History

Version	Date	Document Revision
14	2010-02-02	Redesign of Manual
13	2009-07-14	production report updated
12	2009-07-01	chapter 3.5: reset pin 67
11	2009-03-11	pin description of pin 23, 24 changed
10	2008-12-02	Chapter 5.1 added
9	2008-11-06	Chapter 3.5 added Pull up/down added on table 3.3
8	2008-09-15	Footprint and mechanical drawings updated
7	2008-08-14	English checked for grammar, spelling, and clarity
6	2008-06-04	Correction of Schematics
5	2008-05-26	Power Consumption
4	2008-05-23	formatting
3	2008-04-16	Production Report and incorporation of revision changes for V1.1
2	2007-10-07	Release of preliminary document version
1	2007-08-30	First preliminary V1.0 of the Document

Table 9-1: Revision History