Hardware User Manual

eADP-AV-Out V1.1

...maximum performance at minimum space

Contact

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Document No.: 100-7010-1.1

Date: 2011-08-05

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Information

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

Warning

Due to technical requirements components may contain dangerous substances.

Blackfin® Core Modules

TCM-BF518-C-C-Q25S32F2 (TCM-BF518)

The Tiny Core Module TCM-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.

ACM-BF525C-C-C-Q25S64F4N1024

The Core Module ACM-BF525C is optimized for audio applications and performance. It is based on the high performance ADSPBF525Cfrom Analog Devices. It addresses 64MByte SDRAM via its 16bit wide SDRAM bus, has an onboard NOR-flash of 4MByte and a NAND-flash with 1024MByte.

CM-BF527-C-C-Q50S32F8 (CM-BF527)

The Core Module CM-BF527 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-C-C-Q25S32F2 (CM-BF533)

The Core Module CM-BF533 is powered by Analog Devices' single core ADSP-BF533 processor; up to 600MHz, 32MB SDRAM, 2MB flash, 2x60 pin expansion connectors at a size of 36.5x31.5mm.

TCM-BF537-C-I-Q25S32F8 (TCM-BF537)

The Tiny Core Module TCM-BF537 is 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-BF537-C-C-Q25S32F4 (CM-BF537E)

The Core Module CM-BF537 is 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 at a size of 36.5x31.5mm.

CM-BF537-C-C-Q30S32F4-U (CM-BF537U)

The Core Module CM-BF537 is 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 at a size of 36.5x31.5mm.

CM-BF548-C-C-Q25S64F8 (CM-BF548)

The Core Module CM-BF548 is characterized by its numerous peripheral interfaces, its performance in combination with its high speed memory interface (DDR). Key features are 533MHz, 64MB DDR SD-RAM (266MHz), and 8MB flash.

CM-BF561-C-C-Q25S64F8 (CM-BF561)

The Core Module CM-BF561 is powered by Analog Devices' dual core ADSP-BF561 processor; up to 2x 600MHz, 64MB SDRAM, 8MB flash, 2x60 pin expansion connectors at a size of 36.5x31.5mm.

eCM-BF561-C-C-Q25S128F32 (eCM-BF561)

The Core Module CM-BF561 is 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.

Core Module naming information

The idea is to put more Core Module specific technical information into the product name. New Core Module names will have following technical information covered in their names.

- Product Family,
- CPU-Type,
- Connection-Type,
- Operating Temperature Range,
- Crystal Frequency [MHz],
- RAM [MB],
- Flash [MB],
- External Controllers
- Optional
    - Special and/or
    - Former name

That expands of course the name but allows the customer to get the most important Core Module specific information at the first sight. Have a look at the example below to get an idea of the new Core Module names.

Example CM-BF537-C-C-Q25S32F4 (CM-BF537E)

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

Product Family
CM = Core Module
SBC = Single Board Computer
CPU-Type
Equals the name of CPU
Connection-Type
A = BGA
B = Border pad
C = Connector
S = Special
Operating Temperature Range
A = Automotive   (-40° to +125°)
C = Commercial   (0° to +70°)
I = Industry   (-40° to +85°)
Crystal Frequency
Notation: QXX[MHz]

Former name
Special
Custom Core Modules or specials
uC = uclinux
Extra controllers mounted
E = Ethernet
U = USB
Flash [MB]
F = NOR Flash [MB]
N = NAND Flash [MB]
RAM
S = SDRAM [MB]

Blackfin® Development Boards

ADEV-BF52xC

Feature rich, low cost embedded audio development platform which supports Audio Core Modules (ACM). The form factor of the ADEV-BF52xC allows easy integration of the board into OEM products. Dedicated interfaces such as USB2.0, Line In/Out, headphone out and an onboard silicon microphone turn the ADEV-BF52xC into a full-featured development platform for most embedded audio applications in commercial areas.

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 a 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.

eDEV-BF5xx

Feature rich, low cost rapid development platform which provides all interfaces on dedicated connectors and has all Core Module pins routed to solder pads which easily can be accessed by the developers. The eDEV-BF5xx supports the latest debugging interface from Analog Devices - ADI-SADA (Analog Devices Stand Alone Debug Agent).

EVAL-BF5xx

Tiny, low cost embedded platform which supports Bluetechnix powerful Blackfin® based Core Modules. The form factor (75x75mm) of the EVAL-BF5xx allows easy integration of the board into OEM products. Dedicated interfaces such as USB2.0, SD-card slot, CAN interface connectors and of course Ethernet, turn the EVAL-BF5xx into a full-featured evaluation platform for most embedded applications.

Extender boards

Extender boards (EXT-BF5xx) are expanding the development and evaluation boards by several interfaces and functionalities. Targeted application areas are: audio/video processing, security and surveillance, Ethernet access, positioning, automation and control, experimental development and measuring.

Note! Bluetechnix is offering tailored board developments as well.

1   Introduction

The eADP-AV-Out adapter board features the analog video encoder ADV7391 from Analog Devices. The board is designed to be stacked between the Core Module eCM-BF561 and the base board (e.g. CDEV-BF5xx or eDEV-BF5xx).
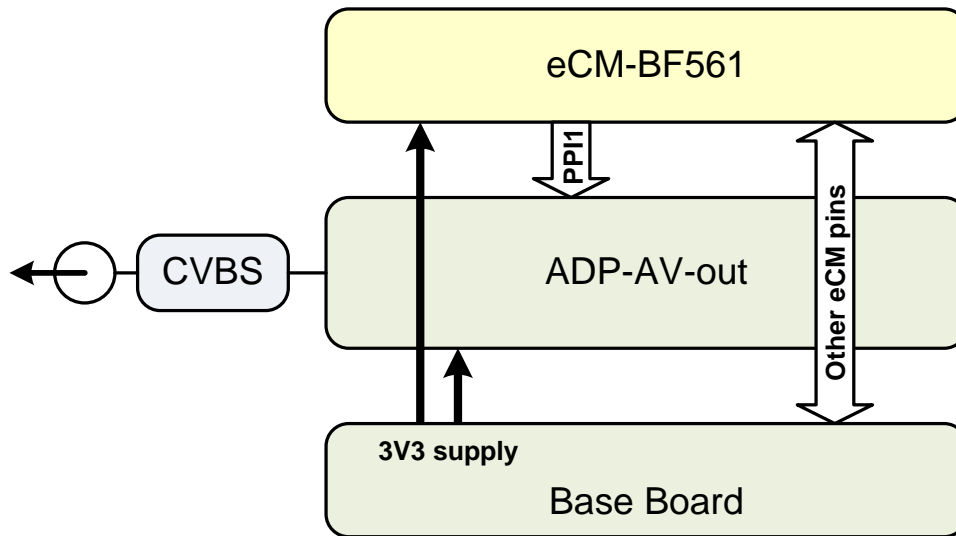
1.1   Overview
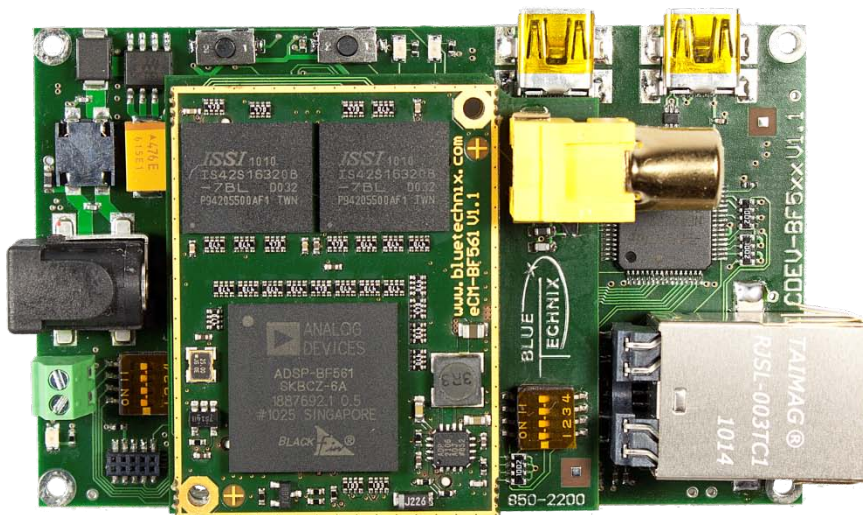

Figure 1-1: eADP-AV-Out

Figure 2 - CDK - eCM-Bf561 connected on eADP-AV-Out connected on CDEV-BF5xx

1.2 Applications

- Machine Vision

- Environment Observation

- Home Automation

- Video Streaming

- Image Recognition

- Video Surveillance

- Object Counting

- Scientific Imaging

- Industrial and commercial applications

2   General Description

The eADP-AV-Out allows connecting an analog video sink to an eCM Core Module. The board contains the ADV7391, a 27MHz oscillator as clock source and a 1.8V linear voltage regulator to generate the core supply for the encoder.

The ADV7391 has three analog outputs, but only the first channel is used. Channels 2 and 3 are terminated with 75Ω. Channel 1 is ESD protected, and the video signal is filtered by a passive 3rd order low-cut Π-filter.

2.1   Functional Description
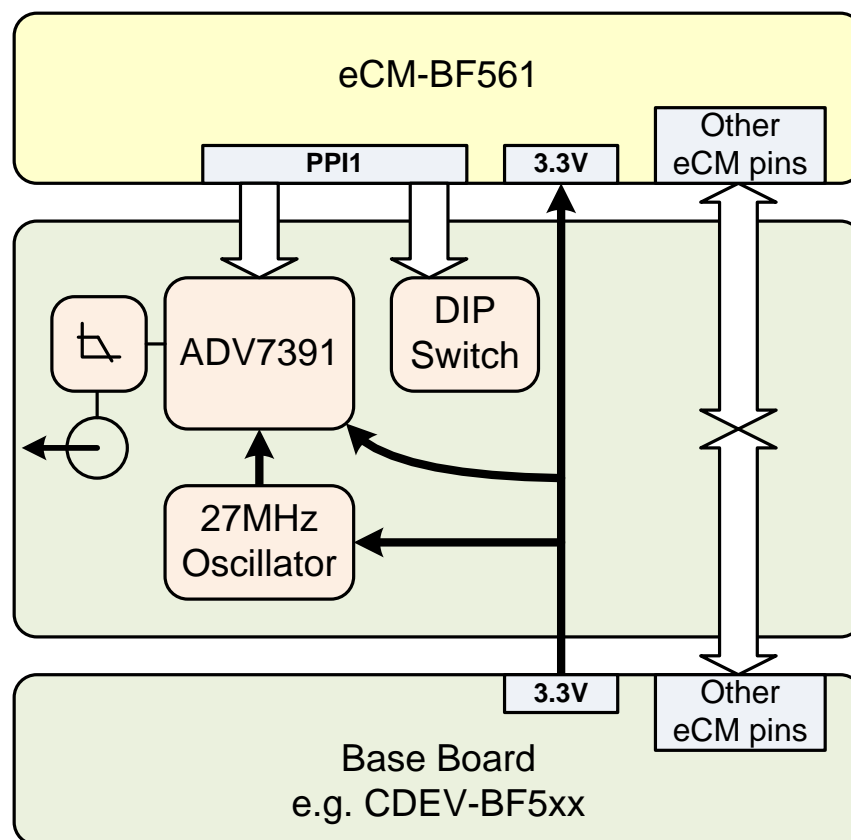
Figure 2-1: Functional Overview

The lowest 8 bits (0 - 7) of the PPI1 interface are connected to the ADV7391's digital interface. The PPI1 Data Bits 8 to 11 (=PF32 to PF35) are pulled up with 10kΩ and can be shorted to GND with the 4 -way DIP switch and might be used as GPIOs to set some user configurations.

The encoder can be configured via an I^{2}C compatible interface. As the ADSP-BF561 has no TWI (Two Wire Interface) the I^{2}C protocol has to be emulated by using GPIO pins. On the eADP-AV-out the PF39 pin is used as SCL signal, the PF36 pin is used as SDA. The I^{2}C emulation driver is included in at BLACKSheep® OS.

The remaining PPI1 signals as well as all other Core Module pins are routed to the bottom side connectors, and can be used on the base board. The connector pin out is compatible to the eCM-BF561.

2.2   PCB Placement

CVBS OUT

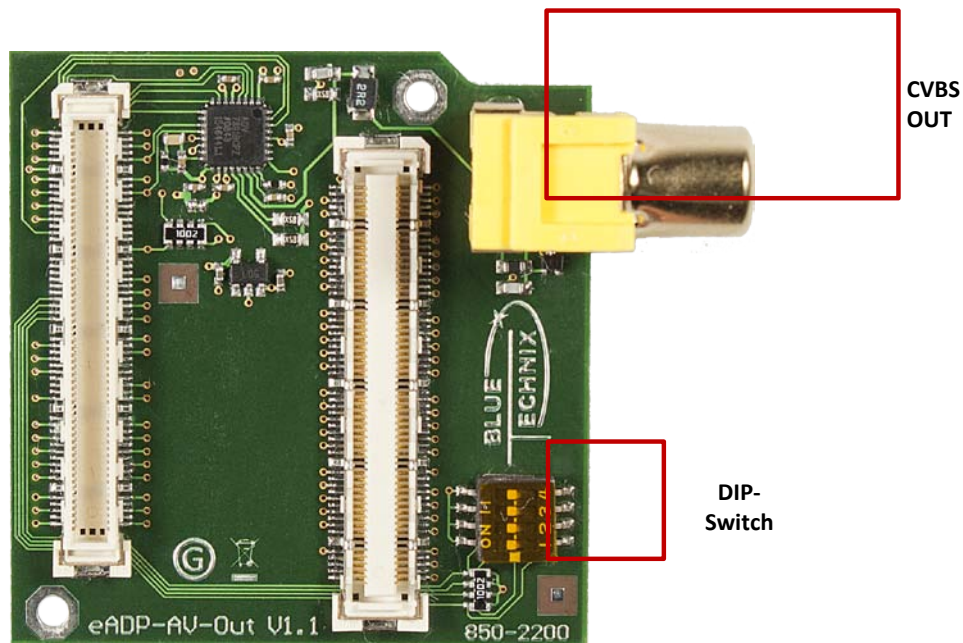DIP-Switch

Figure 2-2: Top component placement

2.3   Mechanical Outline
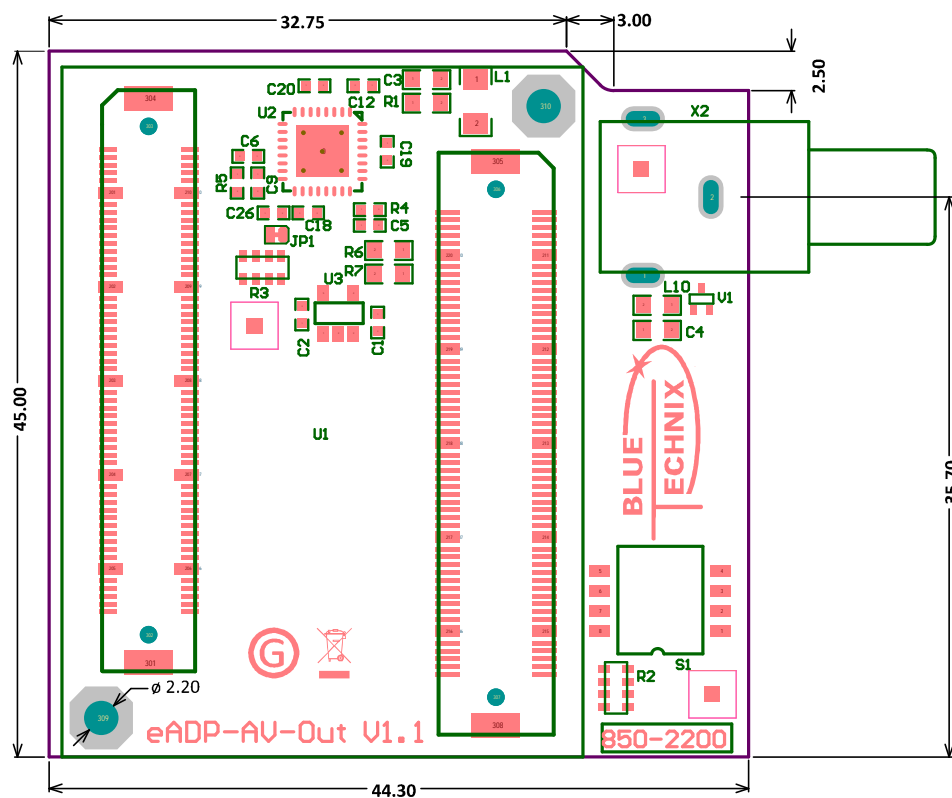
Figure 2-3: Board layout – Top layer

3 Specifications

3.1 Operating Conditions

Symbol	Parameter	Min	Typical	Max	Unit
V_{IN}	Input supply voltage	3.0		3.465	V
P_{ADP}	Power consumption (without Core Module)	TBD	TBD	TBD	mW
I_{OUT}	Full Drive Output Current (R_L=37.5Ω)	33	33.5	37	mA
V_{OC}	Output Compliance	0		1.4	V

Table 3-1: Electrical characteristics

For a detailed specification of the Video DAC please refer to ADV7391 datasheet available for download on the manufacturer's website (www.analog.com).

3.2 Maximum Ratings

Stressing the device above the rating listed in the absolute maximum ratings table may cause permanent damage to the device. These are stress ratings only. Operation of the device at these or any other conditions greater than those indicated in the operating sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Symbol	Parameter	Min	Max	Unit
V_{IO}	Input or output voltage	-0.3	$V_{DD} + 0.3V$	V
V_{DD}	Supply voltage	-0.3	3.6	V
I_{OH} /I_{OL}	Current per pin	0	10	mA
T_{AMB}	Ambient temperature	-40	85	°C
T_{STO}	Storage temperature	-60	100	°C
T_{SLD}	Solder temperature for 10 seconds		260	°C
φ_{AMB}	Relative ambient humidity		90	%

Table 3-2: Absolute maximum ratings

3.3 ESD Sensitivity

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

4 Connector Description

The connectors are identically to the eCM connector definition, except the PPI1 pins routed to the ADV7391 and the 4-way DIP-switch are not connected:

PPI1 Pin	Alternate function	Connected to	Description
D0		ADV7391	Pixel Data 0
D1	-	ADV7391	Pixel Data 1
D2	-	ADV7391	Pixel Data 2
D3	-	ADV7391	Pixel Data 3
D4	-	ADV7391	Pixel Data 4
D5	-	ADV7391	Pixel Data 5
D6	-	ADV7391	Pixel Data 6
D7	-	ADV7391	Pixel Data 7
D8	PF32	DIP-switch	User Setting
D9	PF33	DIP-switch	User Setting
D10	PF34	DIP-switch	User Setting
D11	PF35	DIP-switch	User Setting
D12	PF36	ADV7391 / Connector	I^2C SDA
D13	PF37	Connector	
D14	PF38	Connector	
D15	PF39	ADV7391	I^2C SCL
FS1	TMR10	Connector	
FS2	TMR11	Connector	
FS3	-	Connector	
CLK		ADV7391	Pixel Clock

Table 4-1: PPI1 interconnection

5 Support

5.1 General Support

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

5.2 Board Support Packages

Board support packages and software downloads are for registered customers only https://support.bluetechnix.at/software/

5.3 Blackfin® Software Support

5.3.1 BLACKSheep® OS

BLACKSheep® OS stands for a powerfully and multithreaded real-time operating system (RTOS) originally designed for digital signal processing application development on Analog Devices Blackfin® embedded processors. This high-performance OS is based on the reliable and stable real-time VDK kernel from Analog Devices that comes with VDSP++ IDE. Of course BLACKSheep® OS is fully supported by all Bluetechnix Core-Modules and development hardware.

5.3.2 LabVIEW

You can get LabVIEW embedded support for Bluetechnix Core Modules by Schmid-Engineering AG http://www.schmid-engineering.ch.

5.3.3 uClinux

You can get uClinux support (boot loader and uClinux) for Bluetechnix Core Modules at http://blackfin.uClinux.org.

5.4 Blackfin® Design Services

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

5.4.1 Upcoming Products and Software Releases

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

6   Ordering Information

The following table shows the ordering information for the eADP-AV-Out and other related products.

Article Number	Name	Description
100-7010-1	eADP-AV-out	Analog Video Out Adapter
100-2342-2	eDEV-BF5xx	Development Board for eCM Core Modules
100-2350-1	CDEV-BF5xx	Camera development board for especially for the eCM-BF561
100-3106	CDK - Camera Development Kit	Including eCM-BF561, CDEV-BF5xx and ISM-MT9M024-Mono
100-1214-1	eCM-BF561-C-C-Q25S128F32 (eCM-BF561)	Commercial eCM-BF561 Core Module Connector Version (extended Memory)
100-1215-1	eCM-BF561-C-I-Q25S128F32 (eCM-BF561)	Industrial eCM-BF561 Core Module Connector Version (extended Memory)
100-3200-1	ISM-MT9M024-Mono	Image Sensor Module ISM-MT9M024 Monochrome
100-3206-1	ISM-MT9M024-Color	Image Sensor Module ISM-MT9M024 Color
100-3208-1	ISM-MT9M024-RCCC	Image Sensor Module ISM-MT9M024 RCCC
100-3202-1	ISM-MT9M131-Color	Image Sensor Module ISM-MT9M131Color
100-3204-1	ISM-MT9P031-Color	Image Sensor Module ISM-MT9P031Color
100-3210-1	ISM-MT9P031-Mono	Image Sensor Module ISM-MT9P031Color

Table 6-1: Ordering information

NOTE: Custom hard and software developments are available on request! Please contact Bluetechnix (office@bluetechnix.com) if you are interested in custom hard- and software developments.

7 Dependability

7.1 MTBF

Please keep in mind that a part stress analysis would be the only way to obtain significant failure rate results, because MTBF numbers just represent a statistical approximation of how long a set of devices should last before failure. Nevertheless, we can calculate an MTBF of the development board using the bill of material. We take all the components into account. The PCB and solder connections are excluded from this estimation. For test conditions we assume an ambient temperature of 30°C of all development board components. We use the MTBF Calculator from ALD (http://www.aldservice.com/) and use the reliability prediction MIL-217F2 Part Stress standard. Please get in touch with Bluetechnix (office@bluetechnix.com) if you are interested in the MTBF result.

8 Product History

8.1 Version Information

Version	Date	Changes
1.1	2011 06 09	New board outline to fit into the CDEV-BF5xx
1.0	2010 12 03	First release V1.0 of the Hardware.

Table 8-1: Overview product changes

8.2 Anomalies

Version	Date	Description
1.1	2011 06 09	The I^{2}C SCL signal is not routed to the connector. I^{2}C devises on the baseboard has to be connected to other GPIO pins.
1.0	2010 12 03	No anomalies reported yet.

Table 8-2: Overview product anomalies

9 Document Revision History

Version	Date	Document Revision
1	2011 08 05	First release V1.0 of the Document

Table 9-1: Revision history

10 List of Abbreviations

Abbreviation	Description
ADI	Analog Devices Inc.
AO	Analog Output
AV	Analog Video
CM	Core Module
CVBS	Color Video Baseband Signal
DAC	Digital to Analog Converter
DIP	Dual In-line Package
DSP	Digital Signal Processor
eADP	Extended Adapter
eCM	Enhanced Core Module
ESD	Electrostatic Discharge
FS	Frame Synchronization
GPIO	General Purpose Input Output
I	Input
I²C	Inter-Integrated Circuit
I/O	Input/Output
ISM	Image Sensor Module
LDO	Low Drop-Out regulator
MTBF	Mean Time Between Failure
NC	Not Connected
O	Output
OS	Operating System
PPI	Parallel Peripheral Interface
PWR	Power
RTOS	Real-Time Operating System
SADA	Stand Alone Debug Agent
SCL	Serial Clock
SDA	Serial Data
TBD	To Be Defined
TISM	Tiny Image Sensor Module
TWI	Two Wire Interface

Table 10-1: List of abbreviations

A List of Figures and Tables

Figures

Tables