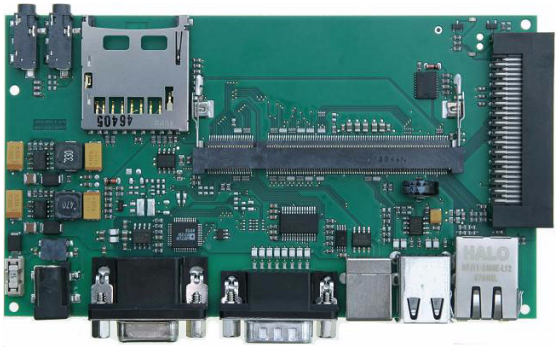
uConXS

Documentation Ver 1.1



1.0 Introduction

The uConXS board is a multipurpose baseboard for the SODIMM 200 series of Keith & Koep Trizeps modules. It has been verified with Trizeps-III, Trizeps-IV and Trizeps-V

The board offers the following features:

- Ethernet: 10 / 100 MBit RJ45
- SD/MMC Card connector
- USB: 2 x USB host or 1 x USB host and 1 x Slave
- RS232 via DB9 (DTE, full HS Support)
- GoldCap buffered Real Time Clock (RTC)
- 2 x UART (3.3V) via Extension Connector
- External Power Supply interface (via Extension Connector)
- Audio: Stereo Headphone , Microphone-In (Mono)
- Single power supply (12V)
- VGA output connector for computer monitor
- Universal LCD connector from sub 1/4 VGA to 16bpp TFT SVGA (opt)
- LED backlight source (opt)

2.0 Preface

2.1 Getting started

The uConXS board is designed as a motherboard for Trizeps III/IV/V based on XScale / Marvell PXA255/270/320 prozessors. The first part of this chapter gives a physical description of the board and the second part describes:

1. How to unpack the board and how to make a visual inspection.
2. How to power up the board for the first time.
3. How to connect the board to a host system

2.1.1 Physical description

The dimension of the board is 141 x 80 mm (LxW). The physical layout is shown in figure 3 on page 11 and you can find all measures at figure 6 on page 20.

There is a number of assembly options. For more information please contact Keith&Koep sales department: sales@keith-koep.com

The uConXS is equipped with multiple display options:

- Direct display connector
  this connector fits to EDT 4.3“ TFT Display including touch and LED backlight or BOE Hydis 4.3“ 800x480 Display (different mounting option)
- VGA converter option 640x480 or 800x600
  You can connect to a standard VGA monitor.

A serial connection to a host system is possible by using one of the RS232 interfaces. The serial port is used to connect to the internal bootloader. For more information about the bootloader read:

ftp://www.keith-koep.com/bootloader/Doc/bootloader3.pdf

2.1.2 Unpacking the board

The uConXS contains electronic components that are susceptible to electrostatic discharge (static electricity). To avoid electrostatic damage the board is supplied in an antistatic bag. When handling the card, risk of damage can be diminished by taking a few simple precautions:

1. Do not remove the card from the bag unless you are working on an antistatic, grounded surface and wearing an grounded antistatic wrist strap.
2. Keep the antistatic bag the card was supplied in; if you remove the card from a system, store it in the bag.

Normally uConXS is supplied with a Trizeps IV or Trizeps V in the SODIMM-socket. If the SODIMM is not fitted with a Trizeps module when you receive your board, follow the next instructions:

1. Slide the Trizeps into the socket taking account of the polarity mark. Do not touch the gold contacts. You can see that there is a polarization mark cut in the Trizeps ; this ensures that the module is adjusted correctly. Put the Trizeps module carefully at an angle of about 30 degrees into the socket.
2. Support the underside of the board and push the Trizeps down into the socket. It should click into its place with a gentle click.

Before you install and power up your uConXS, you should perform a short visual inspection for physical damage.

2.1.3 How to connect the board to host system

Use an RS232 null-modem cable to attach the serial interface (J5) on the board to an RS232 port on a terminal or terminal emulator. For example, you could connect it to a PC running Windows and use the Windows Terminal or Hyperterminal application. Configure the terminal to operate at 38 kbaud, 8-bit data, 1 stop bit, no parity, no flow control. If you need more details on choosing an appropriate cable, refer to appendix A.

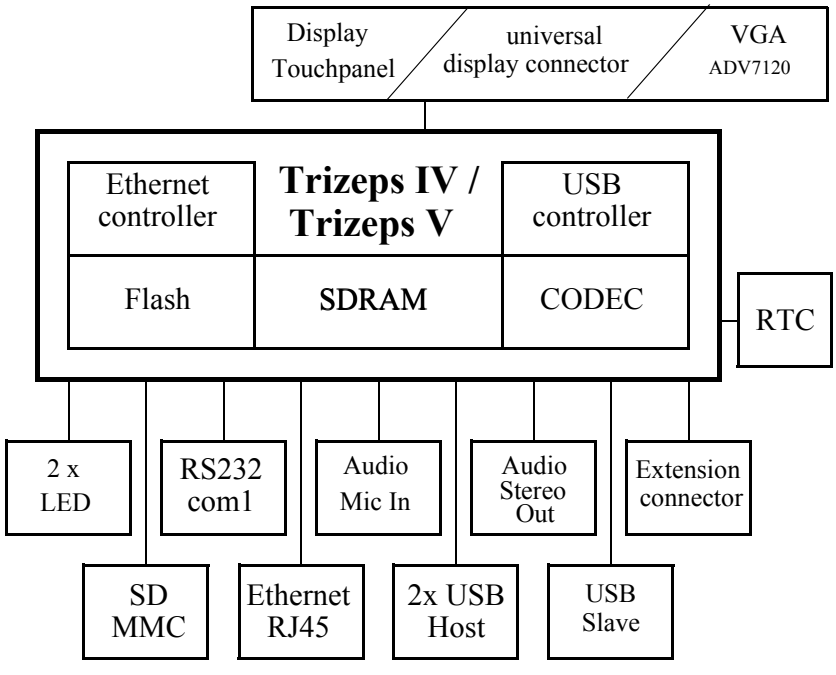
3.0 Functional specification

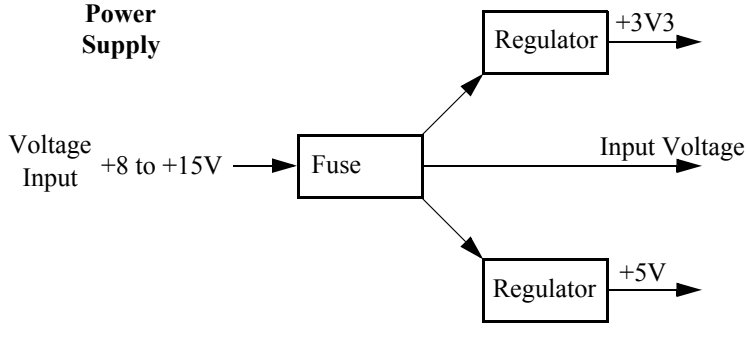
This chapter describes each functional element on the uConXS board. In the next chapters you can find more detailed information about the board and some important hints for programming it. The block diagram on figure 1 on page 5 shows the interconnections of the major elements.

Components of uConXS:

1. Trizeps CPU module
2. Real Time Clock PCF 8563 (EPSON RTC8564)
3. Power Supply
4. Power generation on board
5. VGA connector
6. Ethernet
7. UART serial ports
8. Audio in/out
9. Display connector, 4 wire Touch Panel, backlight switch
10. SD / MMC connector
11. Powerfail - Interrupt
12. USB host
13. Extension connector

FIGURE 1. uConXS block diagram





3.1 Trizeps CPU module

The uConXS can operate with all SODIMM 200 modules as Trizeps III, IV, IV-WL and Trizeps V. Please refer to our website to get more informations about the CPU modules.

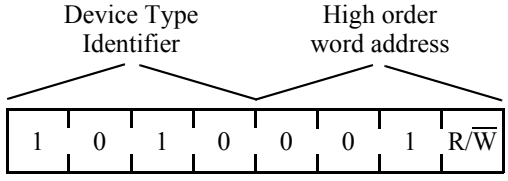
http://www.keith-koep.com/produkte/xscale-arm-embedded/trizepsmodule.html

3.2 RTC via i2C

uConXS provides a Gold-Cap buffered RTC based on the NXP PCF8563 RTC chip functionality. The board contains the EPSON RTC8564 which is a RTC subsystem, built with a precalibrated XTAL circuit and the NXP chip inside. The clock is supported by the uConXS BSP and can be read by using the Embedded Windows CE (TM) standard APIs. The I^2C baseadress is 0xA2 (8Bit Address, see below).

FIGURE 2.

The slave address of the RTC:



- Read address: Hex A3
- Write address: Hex A2

3.3 Power Supply

The +12V power supply is connected usually through a power jack (J4) or optionally using a 2-pin connector by Phoenix. The input voltage range can vary from +8V to +15V. Applying more than +15V can destroy the hardware ! The polarity of J4 is shown below in figure 4 on page 14.

3.4 Power generation on board

The power supplies +5V and +3V3 are generated from the input voltage by two DC-DC converters. The +5V are used for USB. The +3V3 are used for the CPU module, SD-Cards, serial interfaces and other components.

3.5 LEDs

The uCONXS Board has two SMD-LEDs which can be equipped with a light-pipe. D12 is usually wired to be active with power input. There is a mounting option to be active with GPIO13 (TR-IV) = SODIMM Pin 45. The second LED (D13) can be activated with GPIO85 (TR-IV) = SODIMM Pin 69.

3.6 VGA

The uConXS offers an analog video output. It's possible to connect a common desktop PC monitor to the connector J19. The resolution is 640x480 or 800x600. Most PC monitors have an auto config option which should be used to adjust the analog ouput.

3.7 Ethernet

The Ethernet Controller on Trizeps III/IV/V (DM9000 by Davicom) provides 10 / 100MBit interface

3.8 UART serial ports

The uConXS provides four kinds of serial ports:

- USB
- RS232 Standard Full Function COM1 on DB9 (J5) :
- Bluetooth UART on Extension Connector J1
- Standard UART/IrDA on Extension Connector J1

3.8.1 USB Device Controller

The universal serial bus device controller (UDC) can operate half-duplex at a baud rate of 12 Mbps (slave only, not a host or hub controller).The UDC is USB-compliant and supports all standard device requests is issued by the host. The external pins dedicated to this interface are UDC+ and UDC-. The USB protocol uses differential signalling between the two pins for half-duplex data transmission. A 1.5 KOhm resistor is connected between a Trizeps GPIO and the USB cable's D+ signal to pull the UDC+ pin high when not driven. This signifies the UDC is a full-speed, 12 Mbps device and provides the correct polarity for data transmission.

The UDC is accessible by an USB-B connector. However, the user should refer to the Universal Serial Bus Specification, Revision 1.0[1] for a full description of the USB protocol and its operation.

3.8.2 Bluetooth - UART

The Bluetooth UART is available on the extension connector J1. The level of these signals are 3.3V and must be adapted to the levels requested by the user application.

3.8.3 Standard UART

The STUART can be used as an IrDA interface. The infrared communications port (ICP) operates at half-duplex and provides direct connection to commercially available Infrared Data Association (IrDA) compliant LED transceivers. The ICP supports both the original IrDA standard with speeds up to 115.2 Kbps as well as the newer 4-Mbps standard. Both standards use different bit encoding techniques and serial packet formats. Low-speed IrDA transmission uses the Hewlett-Packard Serial Infrared standard (HP-SIR) for bit encoding and an UART as the serial engine; high-speed uses Four-Position Pulse Modulation (4PPM) and a specialized serial packet protocol developed expressly for IrDA transmission. Standard UART is accessible by connector J1. IrDA Mode and IrDA SD signals are not supported on uConXS and might be emulated via GPIOs if needed.

Alternately you can use serial port 2 as an UART.

3.8.4 Full Function UART

A Maxim MAX3243 RS232 transceiver is used to manage the level conversion and line interface. The device has a power saving automatic shutdown that powers down the chip if no valid RS232 levels are detected. Full Function UART is accessible by the male serial port connector J5 (DSUB9M). This port provides RTS, CTS, DSR,

1. The latest revision of the Universal Serial Bus Specification Revision 1.0 can be accessed via the World Wide Web Internet side at: http://www.teleport.com/~usb/

DTR, DCD and RI modem signals to support a serial IO port PC synchronous application.

3.8.5 Network SSP Serial Port

The NSSP is a synchronous serial interface that connects to a variety of external analog-to-digital (A/D) converters, telecommunication CODECs, and many other devices that use serial protocols for data transfer. The NSSP provides support for the following protocols:

- Texas Instruments (TI) Synchronous Serial Protocol
- Motorola Serial Peripheral Interface (SPI) protocol
- National Semiconductor Microwire
- Programmable Serial Protocol (PSP)

The NSSP operates as full-duplex devices for the TI Synchronous Serial Protocol, SPI, and PSP protocols and as a half-duplex devices for the Microwire devices.The external pins dedicated to this interface are NSSPTXD, NSSPRXD, NSSPCLK and NSSPFRM. The NSSP is accessible by the extension connector J1.

Note due to an assembly option these pins might be unavailable. It is possible that SSP2 is mounted instead. (schematics)

3.9 Audio In/Out

The Trizeps modules include a single chip, intergrated mixed signal audio and telecom codec (Philips UCB 1400).

The uConXS is usually equipped with two 3.5mm jack chassis sockets for stereo headphones (J9) and for microphone (J10).

Note: The Headphone-GND signal has a +1.75V DC Level and shall not be connected to GND !

3.10 Display connector, 4 wire touch panel and backlight switch

The XScale PXA255/PXA270/PXA320 on Trizeps III/IV/V offer a 16 bit LCD-controller. The audio and telecom codec (see chapter 3.9, "Audio In/Out" on page 8) provides also a 4 wire touch screen interface. The relevant signals are accessible at J12 see table 7 on page 16.

Using a directly connected display, the LED backlight is sourced by a LED-driver on the uConXS. The backlight intensity can be set with a PWM via the BL_PWM signal.

3.11 SD / MMC connector

A common SD/MMC card socket is integrated on the uConXS, compatible with SDHC (high capacity).

3.12 Powerfail - Interrupt

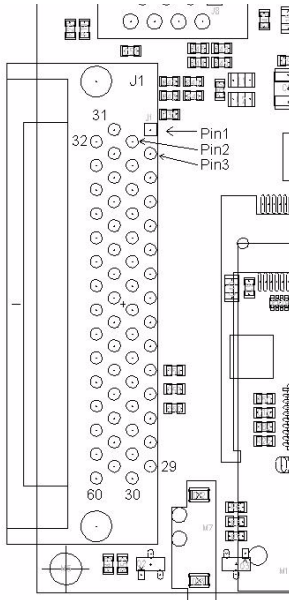
Falling down power supply under ~8V generates an interrupt (Powerfail-IRQ).

3.13 USB Host connector

The uConXS has a double USB A connector (J7) to connect mouse, keyboard, memory cards or others.

3.14 Extension connector J1

uConXS offers a 60-pin high density connector as extension bus. A pin description is given below in table 2 on page 12.



Appendix A

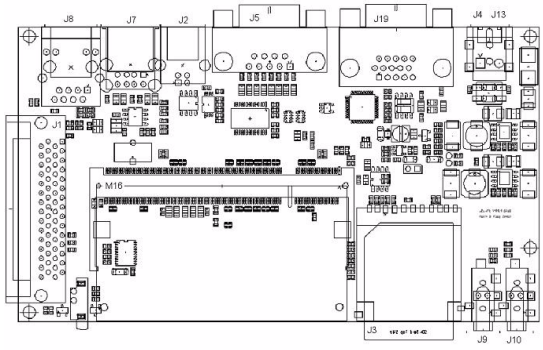
In this chapter you can find detailed description about all headers and connectors on ConXS.

A.1 Overview of all connectors

TABLE 1. Overview of all connectors

Name	Function	Type
M16	Trizeps connector	SODIMM 200
J1	Extension connector matching part type	JAE TX25-60P-LT-H1E JAE TX24-60R-LT-H1E
J2	USB-B connector	Reichelt USB PCB BW
J3	SD / MMC card connector	ALPS SCDA2A0201
J4	Power Jack	Lumberg
J5	RS232 connector (FFUART)	DSUB9 male
J6	Internal display connector (bottom side)	JST 40FLZ-RSM1-R-TB
J7	USB-A connector	AMP 787617-x
J8	Ethernet connector	HFJ11-2450E-L12
J9	Audio in	ST-3500-4N
J10	Audio out	ST-3500-4N
J11	LED Backlight connector (bottom side)	Kyocera-6277
J12	external Display connector (bottom side) matching part type	DF15(x.x)-50DP-0.65V DF15(x.x)-50DS-0.65V
J13	alt. Power supply	MSTBA2,5/2-G-5.08
J14	alt. Audio out	Header SL1-3
J15	alt. Audio in	Header SL1-3
J19	VGA connector	D-SUB15

FIGURE 3. Connector locations (top side)



A.2 Extension bus connector

TABLE 2. J1 - Extension connector

Pin	Signal	Description	Trizeps IV GPIO No.	Trizeps V GPIO No.
1	CIF_D0	camera data signal 0	27	49
2	CIF_D2	camera data signal 2	116	51
3	CIF_D4	camera data signal 4	90	53
4	CIF_D6	camera data signal 6	17	55
5	CIF_FV__SPI1_FRM	camera frame valid / SPI 1 frame	24	62
6	CIF_LV__SPI1_TXD	camera line valid / SPI 1 transceive	25	61
7	GND	ground		
8	SPI2_FRM	Trizeps IV: CIF_FV__SPI1_FRM (same as pin 5) Trizeps V: SPI 2 frame signal	24	90
9	SPI2_CLK	Trizeps IV: CIF_MCLK__SPI1_CLK (same as pin 35) Trizeps V: SPI 2 clock	23	89
10	GND	ground	-	-
11	I2C_CLK	I2C clock	117	32
12	I2C_DATA	I2C data	118	33
13	GPIO_POWERFAIL	powerfail GPIO	81	14
14	TXD_2	standard UART	47	31
15	RXD_2	standard UART	46	30
16	GND	ground	-	-
17	BT_TXD	bluetooth UART	43	111
18	BT_RXD	bluetooth UART	42	110
19	BT_RTS	bluetooth UART	45	109
20	BT_CTS	bluetooth UART	44	112
21	AD0	analog digital converter 0	-	-
22	AD1	analog digital converter 1	-	-
23	+3V3	+3V3 from DC converter	-	-
24	+3V3	+3V3 from DC converter	-	-
25	+5V	+5V from DC converter	-	-
26	+5V	+5V from DC converter	-	-
27	EXT_VIN	external power connection	-	-
28	EXT_VIN	external power connection	-	-
29	VIN_FUSED	fused +12V supply input	-	-
30	VIN_FUSED	fused +12V supply input	-	-
31	CIF_D1	camera data signal 1	114	50
32	CIF_D3	camera data signal 3	103	52
33	CIF_D5	camera data signal 5	91	54

TABLE 2. J1 - Extension connector

Pin	Signal	Description	Trizeps IV GPIO No.	Trizeps V GPIO No.
34	CIF_D7	camera data signal 7	108	56
35	CIF_MCLK__SPI1_CLK	camera masterclock / SPI 1clock	23	59 (93)
36	CIF_PCLK__SPI1_RXD	camera pixelclock / SPI 1 receive	26	60 (96)
37	GND			
38	SPI2_RXD	Trizeps IV: CIF_PCLK__SPI1_RXD (same as pin 36) Trizeps V: SPI 2 receive	26	92
39	SPI2_TXD	Trizeps IV: CIF_LV__SPI1_TXD (same as pin 6) Trizeps V : SPI 2 transceive	25	91
40	GND	ground	-	-
41	reserved for future use		-	-
42	reserved for future use		-	-
43	reserved for future use		-	-
44	\RESET_OUT	Trizeps reset output	-	-
45	GP00	GPIO 0	0	9
46	GND	ground	-	-
47	GP13	GPIO 13	13	16
48	GP85	GPIO 85	85	13
49	GP106	GPIO 106	106	58
50	GP107	GPIO 107	107	57
51	\RESET_IN	reset input	-	-
52	AD3	analog digital converter 3	-	-
53	reserved for future use		-	-
54	reserved for future use		-	-
55	reserved for future use		-	-
56	reserved for future use		-	-
57	reserved for future use		-	-
58	GND	ground	-	-
59	GND	ground	-	-
60	GND	ground	-	-

A.3 RS232 connector COM1

The connector J5 is a male DB9 connector with the following pin description.

TABLE 3. J5 - Serial Interface connector (COM 1)

Pin	Signal	Description
1	FF_DCD_V24X	Data Carrier Detect
2	FF_RXD_V24X	Receive Data
3	FF_TXD_V24X	Transmit Data
4	FF_DTR_V24X	Data Terminal Ready
5	GND	Ground
6	FF_DSR_V24X	Data Set Ready
7	FF_RTS_V24X	Request to Send
8	FF_CTS_V24X	Clear to Send
9	FF_RI_V24X	Ring Indicator

A.4 Power Supply

A Power Jack (J4) is usually equipped on the uConXS. The polarity is shown below Alternatively the board can be equipped with a 2 pin connector (J13). Nominal power supply value is 12V.

FIGURE 4. Polarity of J4

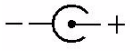


TABLE 4. J13 - Power Supply

Pin	Signal	Description
1 (pin next to VGA)	GND	Ground
2 (pin next to fuse)	VIN (12V)	Power Supply

A.5 Ethernet connector

The Ethernet connector is an usually RJ45 connector with integrated traffic LEDs with the following pin description.

TABLE 5. J8 - Ethernet connector

Pin	Signal	Description
1	TD+	Transmit differential output
2	TD-	Transmit differential output
3	RD+	Receive differential output
4	CT_T	Center point transmit
5	CT_R	Center point receive
6	RD-	Receive differential output
7	nc	not connected
8	CHGND	Chassis ground
9	+3V3	pullup 1K
10	$\overline{\text{ETH\_SPEED\_100}}$	Status: Ethernet speed
11	+3V3	pullup 1K
12	$\overline{\text{ETH\_LINK\_AKT}}$	Status: Ethernet link

A.6 USB-A connector

TABLE 6. J7 - USB-A connector

Pin	Signal	Description
1	VCCB+	Power Supply
2	OTG_DM2	Differential signal
3	OTG_DP2	Differential signal
4	GNDB	Ground
5	VCCT+	Power Supply
6	OTG_DM1	Differential signal
7	OTG_DP1	Differential signal
8	GNDT	Ground
9	CHGND	Chassis Ground
10	CHGND	Chassis Ground
11	CHGND	Chassis Ground
12	CHGND	Chassis Ground

A.7 Display connector J12

This is an universal LCD connector to connect displays from sub 1/4 VGA to 16bpp TFT SVGA. The signals are described in table 7 on page 16.

FIGURE 5. Display connector (assembly on the bottom side)

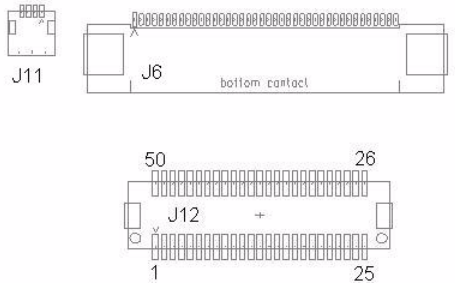


TABLE 7. J12 - Display connector (50-pin Header)

Pin	Signal	Description
1	GND	ground
2	VIN_FUSED	fused +12V supply input
3	VIN_FUSED	fused +12V supply input
4	+5V	+5V from DC converter
5	+5V	+5V from DC converter
6	+3V3	+3V3 from DC converter
7	+3V3	+3V3 from DC converter
8	\RESET_OUT	reset output from Trizeps
9	GND	ground
10	TSMX	touch screen negative x-plate input
11	TSPX	touch screen positive x-plate input
12	TSMY	touch screen negative y-plate input
13	TSPY	touch screen positive y-plate input
14	I2C_CLK	I2C clock
15	I2C_DATA	I2C data
16	GND	ground
17	SPI2_FRM	SPI 2 frame
18	SPI2_CLK	SPI 2 clock
19	SPI2_TXD	SPI 2 transceive
20	SPI2_RXD	SPI 2 receive
21	GND	ground

TABLE 7. J12 - Display connector (50-pin Header)

Pin	Signal	Description
22	BL_PWM	PWM for Backlight brightness
23	USB_PWR	USB +5V (usually not connected)
24	USB+	USB data signal
25	USB-	USB data signal
26	GND	ground
27	L_FCLK	display frame clock
28	L_LCLK	display line clock
29	DISP_EN	display enable GPIO Trizeps IV: GPIO104, Trizeps V: GPIO 124
30	L_PCLK	display pixelclock
31	GND	ground
32	LDD04	display data 04
33	LDD03	display data 03
34	LDD02	display data 02
35	LDD01	display data 01
36	LDD00	display data 00
37	GND	ground
38	LDD10	display data 10
39	LDD09	display data 09
40	LDD08	display data 08
41	LDD07	display data 07
42	LDD06	display data 06
43	LDD05	display data 05
44	GND	ground
45	LDD15	display data 15
46	LDD14	display data 14
47	LDD13	display data 13
48	LDD12	display data 12
49	LDD11	display data 11
50	L_BIAS	display enable data signal

A.8 USB-B connector

TABLE 8. J2 - USB-B connector

Pin	Signal	Description
1	VCC+	Power Supply
2	TUDC-	differential signal
3	TUDC+	differential signal
4	GND	Ground

A.9 MultiMediaCard connector

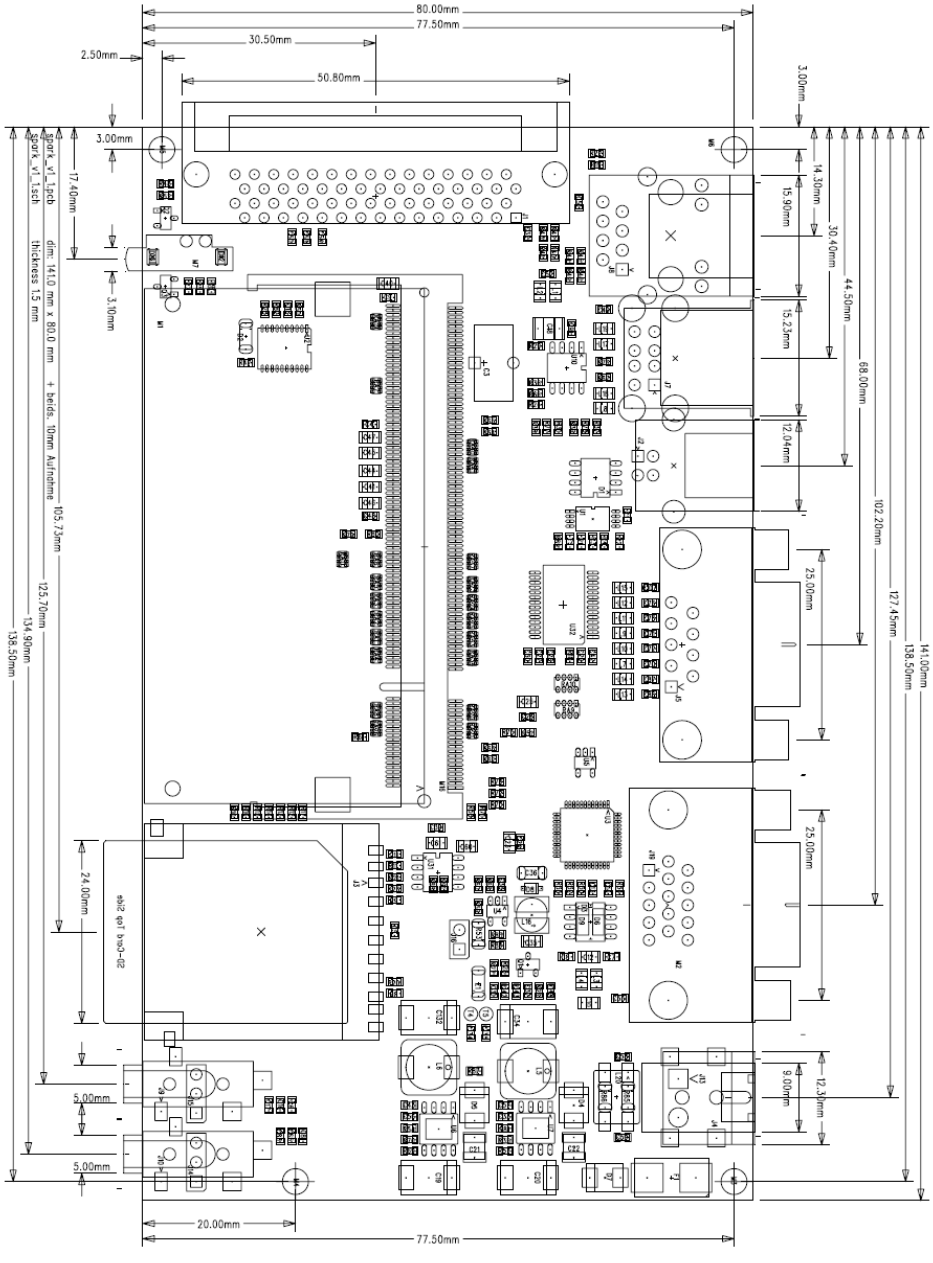
TABLE 9. The MultiMediaCard connector J3 has the following pinout:

Pin	Signal PXA255 (Trizeps III)	Description	Signal PXA270 (Trizeps IV)	Description
1	GPIO08_MMC_CS0	MMC chip select	MMCDAT3	MMC data 3
2	MMC_CMD	MMC command	MMCCMD	MMC command
3	GND	Ground	GND	Ground
4	+3V3	Power supply	+3V3	Power supply
5	GPIO06_MMC_CLK	MMC clock	MMCCLK	MMC clock
6	GND	Ground	GND	Ground
7	MMC_DAT	MMC data	MMCDAT0	MMC data 0
8	nc	not connected	MMCDAT1	MMC data 1
9	nc	not connected	MMCDAT2	MMC data 2
10	GPIO12_MMC_DET	MMC card detect (100K pulldown)	MMCDET	MMC card detect (100K pulldown)
11	+3V3	Power supply	+3V3	Power supply
12	GND	100k pulldown	GND	100k pulldown
13	nc	not connected	nc	not connected

TABLE 10. J19 VGA connector

Pin	Signal	Description
1	IOR	analog output red
2	IOG	analog output green
3	IOB	analog output blue
4	n.c.	
5	GND	digital ground
6	GNDA	analog ground
7	GNDA	analog ground
8	GNDA	analog ground
9	n.c.	
10	GND	digital ground
11	n.c.	
12	n.c.	
13	L_LCLK	line synchronisation
14	L_FCLK	frame synchronisation
15	n.c.	

FIGURE 6. Dimensions of ConXS board (top side)



Revision

Board: uConXS

TABLE 11. Revision history

Revision	PCB number	Date	Changes
1.0		15.04.2008	initial version
1.1		30.07.2008	describe on-board LEDs

Please contact Keith & Koep for further information at: contact@keith-koep.com.