

MA5D4EVK Evaluationkit

Users and Hardware Manual

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1 About this Manual

1.1 Imprint

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2 MA5D4EVK Evaluationkit

The MA5D4EVK features the main functionality of the MA5D4 System on Module. The board can be used for developing software or evaluating the SAMA5D4 architecture.

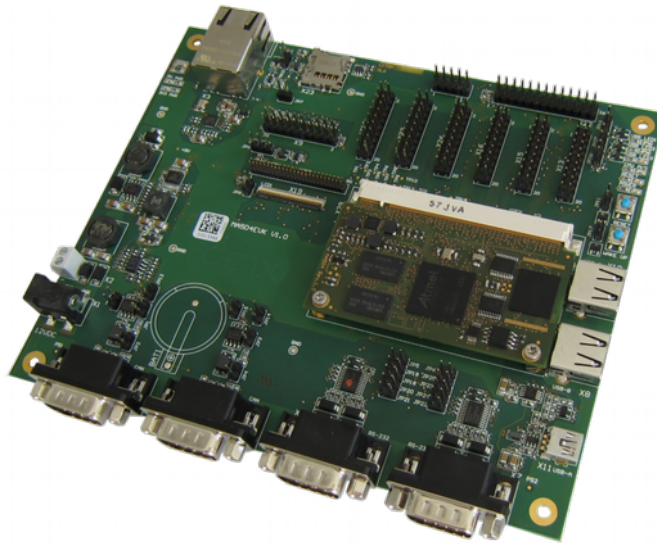


Figure 1: MA5D4EVK

2.1 Feature Set

The SAMA5D4EVK supports

- Ethernet 10/100MBit on RJ45
- Camera Port
- LCD Interface
- Dual UART on DSUB9
- Dual CAN on DSUB9
- USB Host
- USB Host/OTG
- microSD card slot
- JTAG
- size 165mm x 135mm

2.2 Block Diagram

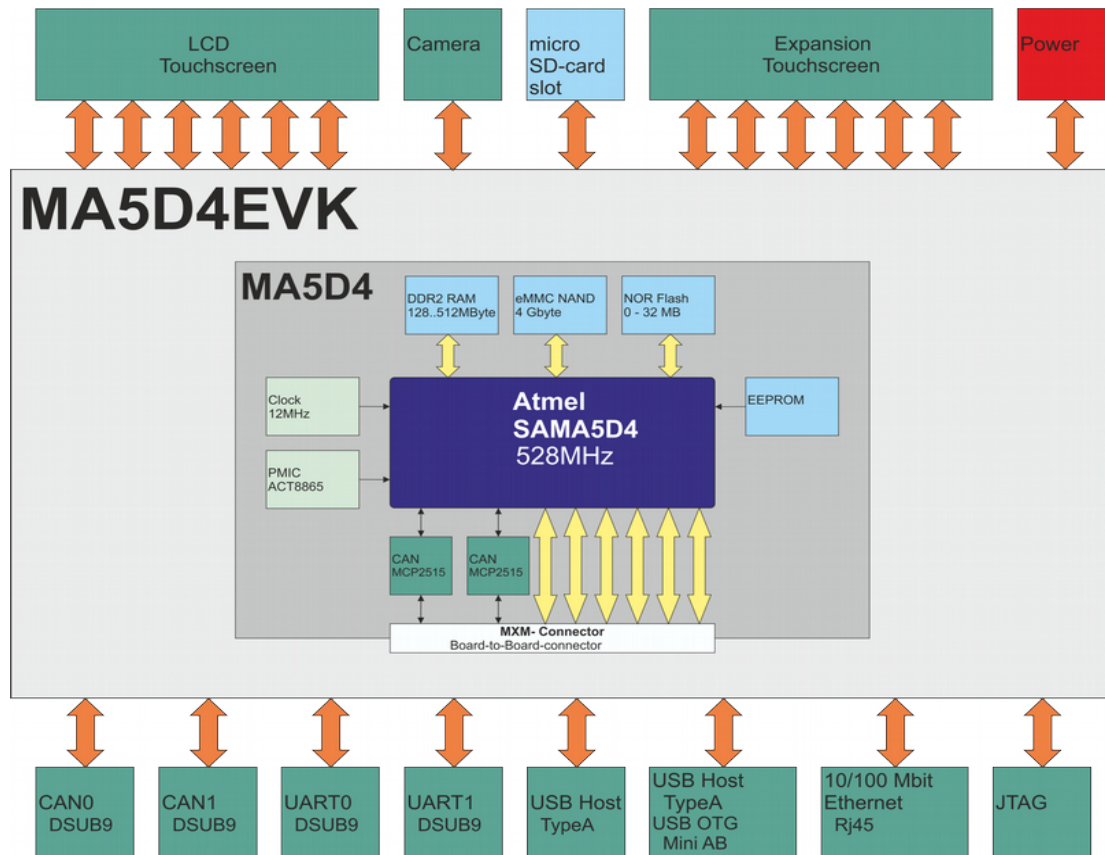


Figure 2: MA5D4 Block Diagram

2.3 Assembly Plan

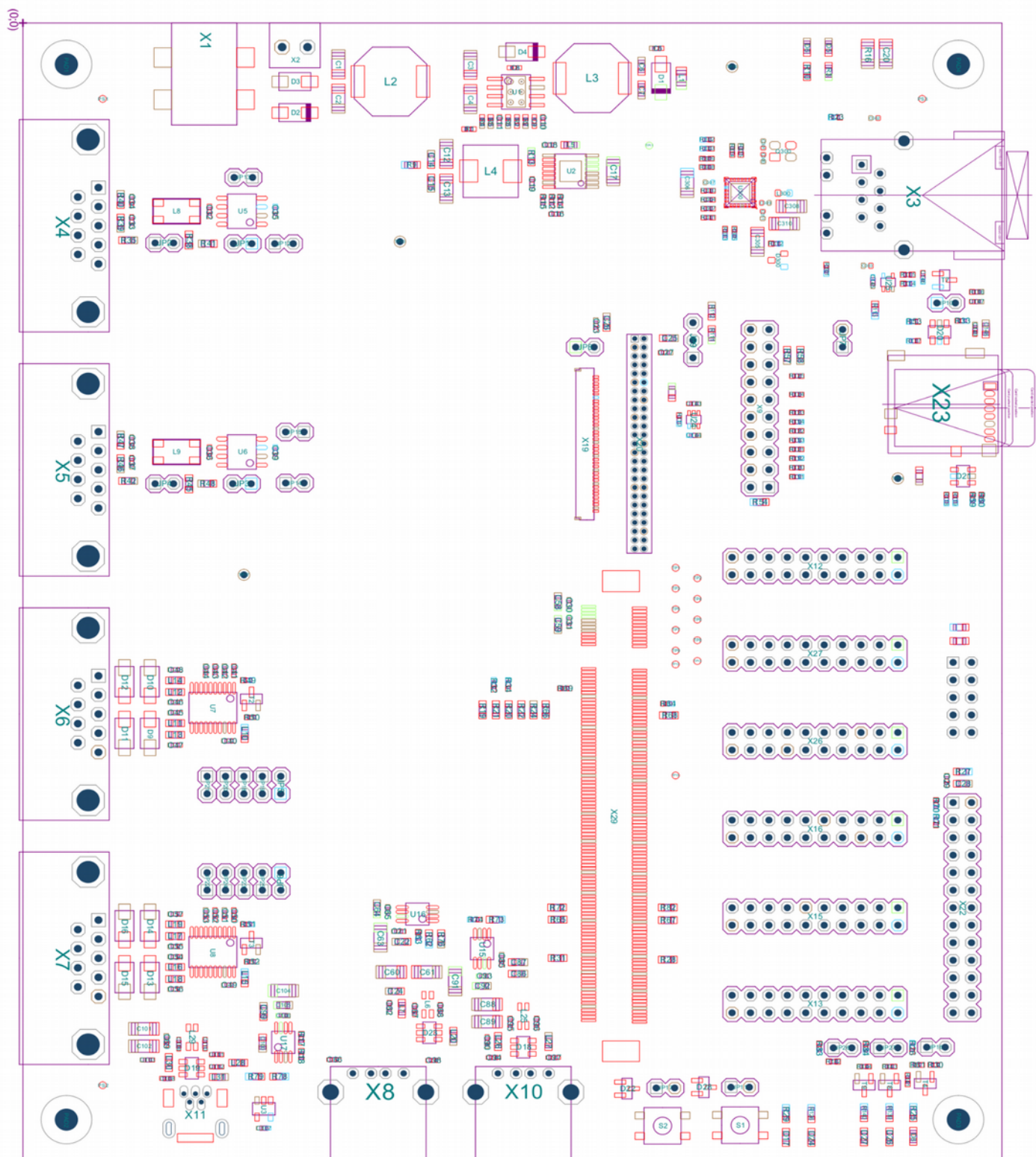


Figure 3: MA5D4EVK Assembly Plan

2.4 Overview: Connectors and Jumpers

Component	Resource	Component	Resource
X1	Power Connector	X2	Power Connector
X3	Ethernet		
X4	CAN1	JP1	CAN1 slope control
JP2	CAN1 termination	JP12/JP13	CAN1 enable
X5	CAN2	JP3	CAN2 slope control
JP4	CAN2 termination	JP14/JP15	CAN2 enable
X6	UART0	JP5	UART0 Transceiver enable
JP18/JP19/ JP20/JP21	UART0 signals enable		
X7	UART1	JP6	UART1 Transceiver enable
JP22/JP23/ JP24/JP25	UART1 signals enable		
X9	JTAG		
S1/JP11	Reset	S2/JP17	Wakeup
D8	User LED1	JP16	Enable User LED1
D27	User LED2	JP26	Enable User LED2
D26	User LED3	JP27	Enable User LED3
X10	USB1: USB–Host	X8	USB2: USB–Host
X11	USB OTG		
X19/X20	LCD Interface	JP8	Enable Backlight
JP9	Backlight dimming		
X22	Image Sensor Interface		
X23	MicroSD–card	JP10	Enable micro SD–card power
X26/X27/ X12/X13	GPIO, external bus interface	X15	Security box module
X16	GPIO/ANIN2–I/Os	X14	ADC signals
X29A/X29B	Edge connector for MA5D4		

Table 1: Connectors and jumpers

2.4.1 Power Supply

The MA5D4EVK can be fed with a DC power supply in the range of 5V....15V on connector X1 or X2. All needed voltages will be built on the board.



Connector X1

Vendor: CUI Inc.
Manufacturer part number: PJ-002A-SMT



Connector X2

Vendor: Lumberg
Manufacturer part number: KRMC 02

2.4.2 Ethernet

With FEC0 MA5D4EVK provides a 10/100 MBit Ethernet channel on connector X3



Connector X3

Vendor: Würth Elektronik
Manufacturer part number: 74990112116A

For best flexibility the Ethernet-PHY KSZ8081 (Micrel) is populated on the MA5D4EVK baseboard.

2.4.3 CAN

Please note that the CAN interface can only be functional in case one or two of the optional CAN interfaces on the MA5D4 System on Module are populated.

The CAN interfaces 1 and 2 are available on connectors X4 and X5.



Connector X4, X5

Vendor: TE connectivity
Manufacturer part number: 1734351-1

Termination

To apply 120R termination to the interface

- jumper JP2 has to be closed for CAN interface 1
- jumper JP4 has to be closed for CAN interface 2

Signal enable

To connect the CAN signals of the CAN controller to the SN65HVD320 CAN transceiver jumper

- JP12, JP13 for CAN interface 1
- JP14, JP15 for CAN interface 2

have to be closed accordingly

Slope control

To enable slope control

- jumper JP1 has to be closed for CAN interface 1
- jumper JP3 has to be closed for CAN interface 2

2.4.4 UART

The UART interfaces 0 and 1 are available on connectors X6 and X7.



Connector X6, X7

Vendor: TE connectivity
Manufacturer part number: 1734351-1

The SP3222 RS232 line driver has to be activated by closing

- jumper JP5 for UART0
- jumper JP6 for UART1

To connect the UART signals to the SP3222 RS232 line driver

- JP18, JP19, JP20, JP21 for UART0
- JP22, JP23, JP24, JP25 for UART1

have to be closed accordingly

2.4.5 JTAG

JTAG is available on a 20 pin header X9



Connector X9

Vendor: mpe GARRY
 Manufacturer part number: 087-2-020-0-F-XS0-1260

The JTAG interface provides the following signals:

Pin	Signal/ Value	Comment
1	3V3	
2	3V3	
3	#TRST	3V3 Pull up 100k
4	GND	
5	TDI	3V3 Pull up 100k
6	GND	
7	TMS	3V3 Pull up 100k
8	GND	
9	TCK	3V3 Pull up 100k
10	GND	
11	n.c.	
12	GND	
13	TDO	
14	GND	
15	#SRST	
16	GND	
17	GND	
18	GND	
19	GND	
20	GND	

Table 2: JTAG

2.4.6 Reset Button

MA5D4EVK provides a reset button. It is connected to the signal PMIC_RESET#. Pressing the reset-button will cause a reset of the ACT8865 PMIC on the MA5D4 SoM. An active PMIC_RESET# will be indicated by lighting the LED D24.

By closing jumper JP11 the PMIC_RESET# can be asserted permanently to a low-level.

2.4.7 Wake Up Button

The wake-up button is connected to the signal WAKEUP#. Pressing the wake-up-button will cause a push-button behavior of the system. More details are available in the ACT8865 datasheet.

By closing jumper JP17 WAKEUP# can be asserted permanently to a low-level.

2.4.8 User LED

MA5D4EVK offers three user LEDs. They can be activated by either using a port-signal of the SAMA5D4 CPU or permanently activated by closing a jumper.

LED	Port Pin	Jumper
D8	PD28	JP16
D27	PD29	JP26
D26	PD30	JP27

Table 3: User LED

2.4.9 USB Host

MA5D4EVK offers two USB 2.0 Host-interfaces.

USB-Host Interface	SAMA5D4 signal
1	USBC_D_N
	USBC_D_P
	PE12/USBC_EN/EBI_A12
	PE14/USB_C_OC/EBI_A14
2	USBB_D_N
	USBB_D_P
	PE11/USBB_EN/EBI_A11
	PE13/USB_B_OC/EBI_A13

Table 4: USB-Host signals



Connector X8, X10

Vendor: TE Connectivity
Manufacturer part number: 292303-1

2.4.10 USB OTG

MA5D4EVK offers one USB-OTG interface.

SAMA5D4 signal

PE10/USBA_EN/EBI_A10

PE9/unused/EBI_A9

PE31/ADTRG/USB-VBUS

PE8/unused/EBI_A8

USBA_D_N

USBA_D_P

Table 5: USB-OTG signals



Connector X11

Vendor: Molex
Manufacturer part number: 0565790519

2.4.11 LCD with Touchscreen

The LCD interface of MA5D4EVK is available on connectors X19 and X20.

Pin-No.	X19 Signal
1	n.c.
2	n.c.
3	n.c.
4	VLED
5	VLED
6	VLED
7	3V3
8	n.c.
9	LCD_D0_CS
10	TOUCH_XP1
11	TOUCH_YP1
12	LCD_DIM
13	LCD_DAT7
14	LCD_DAT6
15	LCD_DAT5
16	GND
17	LCD_DAT4
18	LCD_DAT3
19	LCD_DAT2
20	GND
21	LCD_DAT15
22	LCD_DAT14
23	LCD_DAT13
24	GND
25	LCD_DAT12
26	LCD_DAT11
27	LCD_DAT10
28	GND
29	LCD_DAT23
30	LCD_DAT22
31	LCD_DAT21
32	GND
33	LCD_DAT20
34	LCD_DAT19
35	LCD_DAT18
36	TOUCH_XMi
37	TOUCH_YMi

Pin-No.	X19 Signal
38	LCD_CLK
39	GND
40	n.c.
M1	GND
M2	GND

Table 6: X19 LCD signals

Pin-No.	X20 Signal	Pin-No.	X20 Signal
1	LCD_D0_CS	2	TOUCH_XP1
3	GND	4	TOUCH_YP1
5	LCD_DAT5	6	VLED
7	LCD_DAT4	8	VLED
9	LCD_DAT3	10	VLED
11	GND	12	3V3
13	LCD_DAT2	14	LCD_DAT18
15	LCD_DAT1	16	GND
17	LCD_DAT0	18	LCD_DAT19
19	GND	20	LCD_DAT20
21	LCD_DAT11	22	LCD_DAT21
23	LCD_DAT10	24	LCD_DAT22
25	LCD_DAT9	26	GND
27	GND	28	LCD_DAT23
29	LCD_DAT8	30	LCD_PIN15
31	LCD_DAT7	32	LCD_D1_CS
33	LCD_DAT6	34	LCD_PIN2
35	GND	36	GND
37	LCD_DAT17	38	LCD_PIN12
39	LCD_DAT16	40	LCD_PIN1
41	LCD_DAT15	42	LCD_PIN3
43	LCD_DAT14	44	LCD_DIM
45	LCD_DAT13	46	GND
47	LCD_DAT12	48	TOUCH_XMi
49	LCD_CLK	50	TOUCH_YMi

Table 7: X20 LCD signals

Closing Jumper J8 will connect the LCD vbacklight to +5V.

2.4.12 Image Sensor Interface

MA5D4EVK offers a Image Sensor Interface on connector X22

Pin- No.	X22 Signal	Comment
1	3V3	
2	GND	
3	PA31/I2C0_SCL	pull up 4k7 to 3V3
4	PA30/I2C0_SDA	pull up 4k7 to 3V3
5	PB3/ISI_VSYNC	
6	PB4/ISI_HSYNC	
7	ePB1/EN_PMIC_I2C	
8	PD31/SPI_NPCS2	
9	PC26/ISI_D7	
10	PC25/ISI_D6	
11	PC24/ISI_D5	
12	PC23/ISI_D4	
13	PC22/ISI_D3	
14	PC21/ISI_D2	
15	PC20/ISI_D1	
16	PC19/ISI_D0	
17	PB11/ISI_RST	
18	PB5/ISI_PWD	
19	PC1/SPI0_MOSI/ISI_D9	
20	PC0/SPI0_MISO/ISI_D8	
21	PC3/SPI0_NPCS0	
22	PC2/SPI0_SPCK/ISI_D10	
23	n.c.	
24	n.c.	
25	n.c.	
26	n.c.	

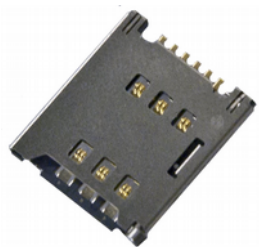
Table 8: X22 Image Sensor Interface signals

2.4.13 SD-card

MA5D4EVK offers a microSD-card interface on connector X23. The SD-card interface can be enabled by triggering the CPU pin PE17/SD_MMC1_PWR/EBI_A17 or closing jumper KP10.

Pin- No.	X23 Signal	Comment
1	PE22/SD_MMC1_DA2/EBI_A24	MMC1_DATA2
2	PE23/SD_MMC1_DA3/EBI_A25	MMC1_DATA3
3	PE19/SD_MMC1_CDA/EBI_A19	MMC1_CMD
4	PE17/SD_MMC1_PWR/EBI_A17	SD-card power
5	PE18/SD_MMC1_CK/EBI_A18	MMC1_CLK
6	GND	
7	PE20/SD_MMC1_DA0/EBI_A20	MMC1_DATA0
8	PE21/SD_MMC1_DA1/EBI_A23	MMC1_DATA1
9	GND	
10	PE16/EBI_A16	MMC1_WP#
11	PE5/SD_MMC1_CD/EBI_A5	MMC1_CD#
12	GND	
13	GND	
14	GND	

Table 9: X23 micro SD-card signals



Connector X23

Vendor: Yamaichi
 Manufacturer part number: PJS008-2130-0

2.4.14 GPIO / EBI

The GPIO and pins of the External Bus Interface are available on the following pin headers:

Pin-No.	X26 Signal
1	5V
2	3V3
3	PC4/SPI0_NPCS1/ISI_MCK/MMC0_CK
4	PC5/EBI_D0/MMC0_CDA
5	GND
6	PC6/EBI_D1/MMC0_DA0
7	PC7/EBI_D2/MMC0_DA1
8	PC8/EBI_D3/MMC0_DA2
9	PC9/EBI_D4/MMC0_DA3
10	PC10/EBI_D5/MMC0_DA4
11	PC11/EBI_D6/MMC0_DA5
12	PC12/EBI_D7/MMC0_DA6
13	PC13/EBI_RD#/MMC0_DA7
14	GND
15	PC14/EBI_WE#
16	PC15/EBI_NCS3#
17	PC16/EBI_RDY#
18	PC17/EBI_ALE
19	PC18/EBI_CLE
20	GND

Table 10: X26 signals

Pin-No.	X27 Signal
1	5V
2	3V3
3	PE0/PMIC_IRQ/EBI_A0
4	PE1/FEC0_IRQ/EBI_A1
5	PE2/SD_MMC0_CD/EBI_A2
6	PE3/HDMI_IRQ/EBI_A3
7	PE4/AUDIO_IRQ/EBI_A4
8	PE5/SD_MMC1_CD/EBI_A5
9	ePE6/CAN2_RX/EBI_A6
10	ePE7/CAN2_TX/EBI_A7
11	PE8/unused/EBI_A8
12	PE9/unused/EBI_A9
13	PE10/USBA_EN/EBI_A10
14	PE11/USBB_EN/EBI_A11
15	PE12/USBC_EN/EBI_A12
16	PE13/USB_B_OC/EBI_A13
17	PE14/USB_C_OC/EBI_A14
18	ePE15/may_DNU/EBI_A15
19	GND
20	GND

Table 11: X27 signals

Pin-No.	X12 Signal
1	5V
2	3V3
3	PE16/unused/EBI_A16
4	PE17/SD_MMC1_PWR/EBI_A17
5	PE18/SD_MMC1_CK/EBI_A18
6	PE19/SD_MMC1_CDA/EBI_A19
7	PE20/SD_MMC1_DA0/EBI_A20
8	PE21/SD_MMC1_DA1/EBI_A23
9	PE22/SD_MMC1_DA2/EBI_A24
10	PE23/SD_MMC1_DA3/EBI_A25
11	PE24/unused/EBI_NCS0#
12	PE25/unused/EBI_NCS1#
13	PE26/unused/EBI_NCS2#
14	PE27/unused/EBI_WR1-BS1#
15	PE28/unused/EBI_WAIT#
16	PE29/Softmodem-P
17	PE30/Softmodem-N
18	PE31/ADTRG/USB-VBUS
19	GND
20	GND

Table 12: X12 signals

Pin-No.	X13 Signal
1	5V
2	3V3
3	PB10/AUDIO_MCLK
4	PB14/unused
5	PB15/HDMI_RST
6	PB18/SPI1_MISO/CAN_DNU/EBI_D8
7	PB19/SPI1_MOSI/CAN_DNU/EBI_D9
8	PB20/SPI1_SPCK/CAN_DNU/EBI_D10
9	PB21/SPI1_NCS0/CAN_DEN/EBI_D11
10	ePB22/SPI1_NCS1/CAN1_RX/EBI_D12
11	ePB23/SPI1_NCS2/CAN1_TX/EBI_D13
12	PB24/JTAG_TDI/EBI_D14
13	PB25/JTAG_TDO/EBI_D15
14	PB26/AUDIO_BCLK
15	PB27/AUDIO_BCLK/HDMI_TK0
16	PB28/AUDIO_DACDAT/HDMI_TD0
17	PB29/AUDIO_ADCDAT
18	PB30/AUDIO_LRCLK
19	PB30/AUDIO_LRCLK
20	GND

Table 13: X13 signals

2.4.15 Security Box Module

The signals of the Security Box Module are available on a pin header as follows:

Pin-No.	X15 Signal
1	5V
2	3V3
3	PIOBU15
4	PIOBU14
5	PIOBU13
6	PIOBU12
7	PIOBU11
8	PIOBU10
9	PIOBU9
10	PIOBU8
11	GND
12	PIOBU7
13	PIOBU6
14	PIOBU5
15	PIOBU4
16	PIOBU3
17	PIOBU2
18	PIOBU1
19	PIOBU0
20	GND

Table 14: X15 Security Box Module signals

2.4.16 GPIO

Pin-No.	X16 Signal
1	5V
2	3V3
3	PD30
4	PD29
5	PD28
6	GND
7	PD9
8	PD8
9	GND
10	PD27/SENSE9
11	PD26/SENSE8
12	PD25/SENSE7
13	PD24/SENSE6
14	PD23/SENSE5
15	PD22/SENSE4
16	PD21/SENSE3
17	PD20/SENSE2
18	PD19/SENSE1
19	PD18/SENSE0
20	GND

Table 15: X16 signals

2.4.17 ADC

Pin-No.	X14 Signal
1	AGND
2	AGND
3	ADCVREF / 3V3
4	ADC4
5	ADC3
6	ADC2
7	ADC1
8	ADC0
9	AGND
10	AGND

Table 16: X14 signals