Specification Developers Kit A9M2410

ModARM9 with Samsung S3C2410A/S3C2440A

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1. History

Date	Version	Responsible	Description
18.08.2004	0.1	J. Jaeger	Initial Version
07.10.2004	0.2	J. Jaeger	Chapter SD card interface modified
12.11.2004	0.3	J. Jaeger	Connectors updated
16.11.2004	1.0	J. Jaeger	Application specific items added to system connectors
22.12.2004	1.1	J. Jaeger	Chapter Touch screen updated

2. Overview

The A9M2410 Developer's Kit consists of the module together with a base board, cabling, documentation and software. Two A9M2410 Developer's Kits are available: one for Linux (LxNETES v3.0) and one for Windows CE .NET 4.2.

3. Market Requirements

The various ARM-based SoCs that are now available typically address specific market segments. It is now relatively easy for companies who are silicon market leaders in a niche segment to add an ARM core to their silicon and so provide a single chip solution reducing cost and complexity to their end customers. A typical example of this is the Micrel KS8695 which has been designed as a residential gateway for SOHO applications.

Although the ARM-based SoCs have been designed for a particular market, it does not mean that a module with this SoC on it should address the same market. So the markets we want to address with ModARM9 modules are still the ones where we have been successful in the past. The Samsung module will target applications requiring a GUI but not an Ethernet connection (the optional 10Mbps Ethernet interface is intended for debugging purposes only) and be able to do this competitively. This means that the following markets can be addressed:

- Industrial automation

- Retail point-of-sale

- Medical equipment

- Mobile applications (battery-powered)

The emphasis on the GUI will probably mean that Windows CE .NET will be more popular on the A9M2410 than Linux, which has it strength in networking applications.

4. Features of the Base Board

The base board will contain the following components and interfaces:

- 5.7" TFT display (SHARP) with Touch screen

- RJ45 connector and transformer for 10/100MBit/s, with integrated LEDs

- 2 serial interfaces using DB-9P connectors

- USB connectors for host and device

- CompactFlash type-II slot

- SD Interface with normal type connector

- Audio codec (UDA1341TS) with speaker jack and connector for microphone

- CAN driver with 10pin header

- Connector for 5V power supply

- Connector (2-pin) for external Li-Ion battery will be realized on a 2nd base board, which is specialized for Li-Ion battery, and has an own Li-Ion charger on board

- JTAG 20-pin connector and 8-pin JTAG Booster connector

- Connectors for the module signals (like on the A9Mvali), but realized as PC/104 press fit contacts with pin on top and acceptable on the bottom.

- Connector for TFT LCD, this will be a 2row, 40pin connector.

- Reset button

- Power LED

- Debug LED

- Two user buttons

- DIP switches for configuration

- Support of A9M2440 module

5. Components of the Developer's Kit

The parts list for the A9M2410 Developer's Kit for LxNETES is as follows:

Article No.	Description	Quantity	Info1
362	A9M2410 module, 32MB SDRAM, 32MB NAND Flash, 10MbEthernet	1	
369	A9M2410 Developer Board	1	
370	A9M2410 LCD Board	1	
9041	A9M2410 Documentation CD	1	
9043	LxNETES v3.x for ARM9 CD	1	
285	JTAG Booster for Samsung	1	
TN01051	Power Supply	1	
TK02491	Power adapter cable	1	
TK00053	Null Modem cable	1	

6. Detailed Specification

6.1. Module Signals

All module signals from A9M2410 and A9M2440 are routed either to extension connectors with 2.54mm spacing allowing direct connection of measuring cables with 0.4mm connectors or to the appropriate drivers or interface connectors. Speed critical signals do not have additional connections at the extension connectors (Ethernet, USB) to allow impedance controlled wiring between module and interface.

6.2. Power Supply

Input voltage for the developer board is 5VDC. The LCD board will be supplied by 12VDC from the same power supply (UMEC, 5V3A, 12V1A). The 3.3V is generated by the regulator LT1086CM-3.3, (3.3V@1.5A).
The Power LED indicates power input and 3.3V voltage at the developer board.

As an alternative the board can be powered from a 4.2V Li-Ion battery pack. The 2 pin connector J6 allows connection of an external voltage (VEXT, GND). To use the external power supply for VLIO, the jumper J3 has to be configured.

USB needs +5V. This voltage is taken directly by the external power supply via X5.

6.3. Debug LED

A green debug LED is connected with its cathode to ground. The anode has a 1K serial resistor and is wired to GPF6 to allow universal usage on the board.

6.4. RESET Control

A push button S1 allows manual RESET by connecting RSTIN# to ground. Signals RSTIN#, PWRGOOD and RSTOUT# are available on the 2.54mm extension connectors.

6.5. JTAG Interfaces

The developer board provides a 20-pin JTAG interface and an 8-pin JTAG-Booster connector, to access the CPU. A separate 8pin connector is provided to program the Lattice CPLD, which contains the logic to access the CompactFlash card.

6.6. Configuration Switches

S2 provides 8 configuration switches, which allow remote configuration of 4 hardware and 4 software configuration pins. Closing the switch tears the signal to Low.

Switch	Function	Comment
1	Open: TRST# and PWRGOOD are connected Closed: TRST# and PWRGOOD are disconnected	DEBUGEN#
2	Open: No write protection Closed: Write protection active	NAND Flash write protect
3	Not used	
4	Not used	
5	Not used	
6	Not used	
7	Not used	
8	Not used	

6.7. Configuration Jumpers

Jumper	Function	Comment
J1	Open: VRTC not buffered Closed: VRTC battery buffered with G1	Battery buffering RTC
J2	Open: Transmitter U4 MAX3320 disabled Closed: Transmitter U4 MAX3320 enabled	RS232 driver control COMA
J3	1-2: VLIO = +3.3V 2-3: VLIO = VEXT	Selection of VLIO
J4	1-2: Handshake line ERTS1# 2-3: Data line ETXD2	COMC selection
J5	1-2: Handshake line ECTS1# 2-3: Data line ERXD2	COMC selection
J6	1: VEXT, max. +4.2V 2: GND	Connector for VEXT, **NO JUMPER**
J9	Open: Transmitter U15 MAX3320 disabled Closed: Transmitter U15 MAX3320 enabled	RS232 driver control COMB
J10	Closed: CAN Termination active	CAN termination 120R

6.8. RS232 Interface

Two RS232 Interfaces are realized with two MAX3320 drivers. The signals are routed to the DB9 connectors. RXD, TXD, RTS# and CTS# lines are routed to the module. The handshake signals of UART1 could also be used as data signals for a 3rd UART2. Both signals are additional connected to a 10pin connector, which is provided to connect to the 3rd RS232 interface. Via jumpers J4 and J5, the 3rd UART can be selected.

6.9. USB Interfaces

USB connectors for USB host and USB device are provided. The 22R series resistor are placed near the connectors. The signal USB_DT/PW switches a 1k5 pull-up resistor to the USBP line. This is the necessary pull-up resistor for the recognition of a USB device.

MAX890 supervises the current limit of a connected USB device. The FAULT# output is connected to the signal USBH0PEN.

6.10. Ethernet Interface

On the developer board an Ethernet connector for 100MHz mode, with integrated transformer and LEDs, is provided.

6.11. CompactFlash Interface

A 50 pin CompactFlash Card header Type 2 with ejector is provided. It is placed at the bottom side of the PCB. A logic device enables the access of the Compact Flash in 16bit mode.

Only 3.3V CompactFlash cards can be used.

The Lattice device ispMACH 4128 CPLD is used to realize the logic, which is necessary to access the CompactFlash cards. Following control and address lines are used:

CS4#, OE#, WE#, WAIT#, A0 – A9.

6.12. LCD Interface

The Sharp LQ57Q3DC02 TFT display is supported. It has a colour resolution of 18bpp. Only 16bpp are supported. An additional pcb (LCDMODARM) is used, which includes the power connector, Backlight module, LCD connector and Touch interface connector. The signal lines from the LCD to the developer board are connected by a 40pin flat ribbon cable. 22R series resistors are provided at the CLK lines.

6.13. Touch Screen

The internal touch screen controller of the A9M24xx module is used. Therefore only a connector (for the A9M2410 additional 4 FETs) is necessary on the developer board. The signal lines from the touch screen to the developer board are connected by a 10pin flat ribbon cable.

The analog signals from the touch screen are connected to the analog inputs AIN5 and AIN7 for the A9M2410 module and to AIN4, AIN5, AIN6, AIN7 for the A9M2440 module. The A9M2440 module doesn't need the external FETs at the developer board. Therefor pull-up or pull-down resistors are placed at the gate of each FET to disable it, in case of using an A9M2440 module.

At the board following patch is necessary to get the touch interface running for the S3C2410:

- Remove resistors R69, R70.
- Remove C63 and connect it between R65 (AIN7) and AGND.
- Remove C64 and connect it between R68 (AIN5) and AGND.

6.14. Audio Codec

The UDA1341TS is used as audio codec. It is connected to the IIS-interface of the S3C2410. A speaker, a microphone and a line-in jack is provided at the developer board.

6.15. SD Interface

A SD card holder from Molex is used to realize the SD interface. The card holder is normal type, which means it is mounted at the top side.

6.16. Camera Interface

The camera specific signals (A9M2440 only), are routed together to a 20pin dual row connector. These signals are not buffered and may used only in 3.3V environment.

6.17. CAN interface

A CAN driver is provided on the board with a 10pin header to connect to a 9pin SubD connector via flat cable. If a customer wants to use the CAN interface, the CAN4MODARM9 board has to be plugged between the A9M2410 module and the base board. If CAN4MODARM is used, CS3# will be used to access the CAN controller.

6.18. Extension Connectors

Extension connectors are provided to support also the extended version of the A9M2410 module. The signals are connected to the corresponding expansion connectors. The signals have to be defined.

6.19. Expansion Connectors

The board provides expansion connectors, which can be used to plug onto a customized board. Most of the signals from the module are connected to these expansion connectors.

7. Mechanics

The size of the board is selected, to support also the extended version of the module, with its additional connectors X3 and X4.

- board size 140x190mm.

- PCB ML4, SMD on both sides.

- All parts mounted on TOP but the CF connector.

- Standard Module fits on 2 connectors X1,X2 with 120 pins each. Pitch 0.8mm.

- Additional connectors X3,X4 for extended Module with 60 pins each. Pitch 0.8mm

7.1. Standard Module

The module size is defined to 60 x 44mm. Two holes, for M2 screws, catercornered, are provided to enable fixing of the module at the base board.

Two board to board connectors are used on the module. Depending on the counterpart at the base board, different distances between module and base board can be realized. The least possible distance is 5mm.

Therefore the height of the parts mounted at the bottom side of the module should not exceed 2.5mm. The height of the parts mounted at the top side should not exceed 4.1mm.

Board-to-Board Distance h	Module Connector X1, X2				Base Board Connector X1, X2		
	No. of Pins	Qty	Supplier	Order No.	No. Of Pins	Supplier	Order No.
8 mm	120	2	AMP Berg	177983-5 61082-121000	120	AMP Berg	179031-5 61083-124000

7.2. Extended Module

For further modules it might be necessary to have some additional hardware placed on the module, which will need more signal lines connected between module and base board, than actual available. To meet these future requirements, an extended board is defined, which has two additional board to board connectors with 60 pins each.

The size of the extended module is defined to 92 x 44mm. Two holes, for M2 screws, catercornered, are provided to enable fixing of the module at the base board.

Board-to-Board Distance h	Module Connector X3, X4				Base Board Connector X3, X4		
	No. of Pins	Qty	Supplier	Order No.	No. Of Pins	Supplier	Order No.
8 mm	60	2	AMP Berg	177983-2 61082-061009	60	AMP Berg	179031-2 61083-064009

8. General Connectors

8.1. Connector JTAG Booster CPU, X7

8pin, 2.54mm, single row, Signals have 3.3V TTL levels

Pin	Function	Comment
1	TCK	
2	GND	
3	TMS	
4	TRST#	
5	NC	
6	TDI	
7	TDO	
8	+3.3V	

8.2. Connector JTAG Booster CPLD, X25

8pin, 2.54mm, single row, Signals have 3.3V TTL levels

Pin	Function	Comment
1	ISP_TCK	
2	GND	
3	ISP_TMS	
4	NC	
5	NC	
6	ISP_TDI	
7	ISP_TDO	
8	+3.3V	

8.3. Connector JTAG Multi-ICE, X6

20pin, 2.54mm, dual row, signals have 3.3V TTL levels

Pin	Function	Comment	Pin	Function	Comment
1	NC		2	+3.3V	
3	TRST#		4	GND	
5	TDI		6	GND	
7	TMS		8	GND	
9	TCK		10	GND	
11	RTCK		12	GND	
13	TDO		14	GND	
15	SRST#		16	GND	
17	NC		18	GND	
19	NC		20	GND	

8.4. Connector COMA, X12

D-SUB 9 pin male, signals have RS232 levels

Pin	Function	Comment
1	NC	
2	ERXD0	
3	ETXD0	
4	NC	
5	GND	
6	NC	
7	ERTS0#	
8	ECTS0#	
9	NC	

8.5. Connector COMB, X13

D-SUB 9 pin male, signals have RS232 levels

Pin	Function	Comment
1	NC	
2	ERXD1	
3	ETXD1	
4	NC	
5	GND	
6	NC	
7	ERTS1#	
8	ECTS1#	
9	NC	

8.6. Connector COMC, X8

10pin, 2.54mm, dual row

Pin	Function	Comment	Pin	Function	Comment
1	NC		2	NC	
3	ERXD2		4	NC	
5	ETXD2		6	NC	
7	NC		8	NC	
9	GND		10	GND	

8.7. Ethernet Connector 10/100Mbit/s, X16

RJ45 8 pin, with integrated LED and magnetics

Pin	Function	Comment
1	TX+	
2	TX-	
3	RX+	
4	VGND1	
5	VGND1	
6	RX-	
7	VGND2	
8	VGND2	

8.8. Connector USB Host, X14

4pin Type A

Pin	Function	Comment
1	+5V	
2	USBN	
3	USBP	
4	GND	

8.9. Connector USB Device, X15

4pin Type B

Pin	Function	Comment
1	NC	
2	USBN	
3	USBP	
4	GND	

8.10. Connector CAN, X9

10pin, 2.54mm, dual row

Pin	Function	Comment	Pin	Function	Comment
1	NC		2	GND	
3	CANL		4	CANH	
5	GND		6	NC	
7	NC		8	NC	
9	NC		10	NC	

8.11. Connector Camera, X28

20pin, 2.54mm, dual row

Pin	Function	Comment	Pin	Function	Comment
1	+3.3V		2	GND	
3	CAMDATA0		4	CAMDATA1	
5	CAMDATA2		6	CAMDATA3	
7	CAMDATA4		8	CAMDATA5	
9	CAMDATA6		10	CAMDATA7	
11	CAMCLKOUT		12	CAMPCLK	
13	CAM_HREF		14	CAMVSYNC	
15	IICSCL		16	IICSDA	
17	XDACK0#		18	CAMRESET	
19	GND		20	+5V	

8.12. Connector LCD, X26

40pin, 2.54mm, dual row

Pin	Function	Comment	Pin	Function	Comment
1	GND		2	LCD_HCLK	
3	HSYNC		4	VSYNC	
5	GND		6	VD18	
7	VD19		8	VD20	
9	VD21		10	VD22	
11	VD23		12	GND	
13	VD10		14	VD11	
15	VD12		16	VD13	
17	VD14		18	VD15	
19	GND		20	VD2	
21	VD3		22	VD4	
23	VD5		24	VD6	
25	VD7		26	GND	
27	VDEN		28	+3.3V	
29	+3.3V		30	LCDVF0	
31	LCDVF1		32	LCDVF2	
33	GND		34	nc	
35	nc		36	nc	
37	nc		38	nc	
39	LCD_PWREN#		40	GND	

8.13. Connector Touch Screen, X27

10pin, 2.54mm, dual row

Pin	Function	Comment	Pin	Function	Comment
1	TSYP		2	NC	A9M9750
3	TSXM		4	NC	A9M9750
5	TSYM		6	NC	A9M9750
7	TSXP		8	NC	A9M9750
9	AGND		10	NC	A9M9750

8.14. Compact Flash Socket, X18

Compact Flash Connector Type II, 50 pole

Pin	Function	Comment	Pin	Function	Comment
1	GND		2	CF_CD1#	
3	CF_D3		4	CF_D11	
5	CF_D4		6	CF_D12	
7	CF_D5		8	CF_D13	
9	CF_D6		10	CF_D14	
11	CF_D7		12	CF_D15	
13	CF_CE1#		14	CF_CE2#	
15	CF_A10		16	NC	VS1
17	CF_OE#		18	CF_IORD#	
19	CF_A9		20	CF_IOWR#	
21	CF_A8		22	CF_WE#	
23	CF_A7		24	CF_RDY/IRQ#	
25	+3.3V		26	+3.3V	
27	CF_A6		28	GND	MSTR#/SLAVE
29	CF_A5		30	NC	VS2
31	CF_A4		32	CF_RESET	
33	CF_A3		34	CF_WAIT#	
35	CF_A2		36	NC	INPACK#
37	CF_A1		38	CF_REG#	
39	CF_A0		40	NC	BVD2
41	CF_D0		42	NC	BVD1
43	CF_D1		44	CF_D8	
45	CF_D2		46	CF_D9	
47	CF_WP/IOCS16#		48	CF_D10	
49	NC	CF_CD2#	50	GND	

8.15. Connector SD Card, X29

9pin SD card connector normal type, with card detect switch and write protect switch

Pin	Function	Comment
1	SDDATA3	
2	SDCMD	
3	GND	
4	+3.3V	
5	SDCLK	
6	GND	
7	SDDATA0	
8	SDDATA1	
9	SDDATA2	
DT	SD_CD#	Card detect switch
DTWP	GND	common root for DT and WP switch
WP	SD_WP#	Write protect switch

8.16. External 5V Power, X5

4pin

Pin	Function	Comment
1	+5V	
2	GND	
3	GND	
4	+12V	not used

9. Board to Board Connectors

Following table shows the configuration of the module pins and the usage at the base board A9M2410DEV.

9.1. System Connector X1

Pin	Type	U-Boot	5V tol.	A9M2410 Name	A9M2410 Description	Application A9M2410DEV
1	P	-	-	GND		GND
2	I	-	No	RSTIN#	Reset Input, i.e. Push Button on the module this signal is the input to a reset controller Pull-up 10k to +3.3V already on module	Push Button with 10k pull-up
3	I/O	-	No	PWRGOOD	Output of the reset controller push pull with 470R current limiting resistor	
4	O	RSTOUT#	No	RSTOUT#/ GPA21	Output of CPU, Softw. + WDT + RSTIN#	
5	I	-	No	TCK	JTAG, Pull-up 10k to +3.3V on module	
6	I	-	No	TMS	JTAG, Pull-up 10k to +3.3V on module	
7	I	-	No	TDI	JTAG, Pull-up 10k to +3.3V on module	
8	O	-	No	TDO	JTAG, Pull-up 10k to +3.3V on module	
9	I	-	No	TRST#	JTAG, Pull-up 10k to +3.3V on module	
10	I	-	No	CONF0/ DEBUGEN#	Debug Enable, Pull-up 10k to +3.3V on module 0 = Debug enabled, TRST# isolated from PWRGOOD	Connected to DIP-switch S2.1 ON: connected to GND
11	I	-	No	CONF1/ NAND_FWP#	NAND Flash Write Protect, Pull-up 10k to +3.3V on module 0 = NAND Flash write protected	Connected to DIP-switch S2.2 ON: connected to GND
12	I	-	No	CONF2/	Reserved, do not connect; Pull-up 10k to +3.3V on module	Connected to DIP-switch S2.3 ON: connected to GND
13	I	-	No	CONF3/	Reserved, do not connect, Pull-up 10k to +3.3V on module	Conected to DIP-switch S2.4 ON: connected to GND
14	I/O	I	No	CONF4/ GPF2/EINT2	Pull-up 10k to +3.3V on module	Connected to DIP-switch S2.5 ON: connected to GND
15	I/O	I	No	CONF5/ GPF3/EINT3	Pull-up 10k to +3.3V on module	Connected to DIP-switch S2.6 ON: connected to GND
16	I/O	I	No	CONF6/ GPF4/EINT4	Pull-up 10k to +3.3V on module	Connected to DIP-switch S2.7 ON: connected to GND
17	I/O	I	No	CONF7/ GPF5/EINT5	Pull-up 10k to +3.3V on module	Connected to DIP-switch S2.8 ON: connected to GND
18	I/O	TxD0	No	TxD0/ GPH2	Configured to TxD0	Connected via RS232 driver to COMA, X12
19	I/O	RxD0	No	RxD0/ GPH3	Configured to RxD0	Connected via RS232 driver to COMA, X12
20	I/O	RTS0#	No	RTS0#/ GPH1	Configured to RTS0#	Connected via RS232 driver to COMA, X12
21	I/O	CTS0#	No	CTS0#/ GPH0	Configured to CTS0#	Connected via RS232 driver to COMA, X12
22				NC		Connected to X28
23				NC		Connected to X28
24	I/O	TxD1	No	TxD1/ GPH4	Configured to TxD1	Connected via RS232 driver to COMB, X13
25	I/O	RxD1	No	RxD1/ GPH5	Configured to RxD1	Connected via RS232 driver to COMB, X13
26	I/O	RTS1#	No	RTS1#/ GPH6/TxD2	Configured to RTS1#, Could also be used as TxD2	RTS1# connected via RS232 driver to COMB, X13; TxD2 connected to COMC, X8
27	I/O	CTS1#	No	CTS1#/ GPH7/RxD2	Configured to CTS1#, Could also be used as RxD2	CTS1# connected via RS232 driver to COMB, X13; RxD2 connected to COMC, X8
28				NC		Connected to X28
29				NC		Connected to X28
30				NC		Connected to X28

Pin	Type	U-Boot	5V tol.	A9M2410 Name	A9M2410 Description	Application A9M2410DEV
31				NC		Connected to X28
32				NC		Connected to X28
33				NC		Connected to X28
34				NC		Connected to X28
35				NC		Connected to X28
36				NC		Connected to X28
37	I/O	I	No	VD0/ GPC8	Configured as input, pull-up enabled	Not used
38	I/O	I	No	VD1/ GPC9	Configured as input, pull-up enabled	Not used
39	P	P	-	GND		GND
40	I/O	VD2	No	VD2/ GPC10	Configured as output, pull-up enabled	Connected to LCD adapter X26
41	I/O	VD3	No	VD3/ GPC11	Configured as output, pull-up enabled	Connected to LCD adapter X26
42	I/O	VD4	No	VD4/ GPC12	Configured as output, pull-up enabled	Connected to LCD adapter X26
43	I/O	VD5	No	VD5/ GPC13	Configured as output, pull-up enabled	Connected to LCD adapter X26
44	I/O	VD6	No	VD6/ GPC14	Configured as output, pull-up enabled	Connected to LCD adapter X26
45	I/O	VD7	No	VD7/ GPC15	Configured as output, pull-up enabled	Connected to LCD adapter X26
46	I/O	I	No	VD8/ GPD0	Configured as input, pull-up enabled	Not used
47	I/O	I	No	VD9/ GPD1	Configured as input, pull-up enabled	Not used
48	I/O	VD10	No	VD10/ GPD2	Configured as output, pull-up enabled	Connected to LCD adapter X26
49	I/O	VD11	No	VD11/ GPD3	Configured as output, pull-up enabled	Connected to LCD adapter X26
50	I/O	VD12	No	VD12/ GPD4	Configured as output, pull-up enabled	Connected to LCD adapter X26
51	I/O	VD13	No	VD13/ GPD5	Configured as output, pull-up enabled	Connected to LCD adapter X26
52	I/O	VD14	No	VD14/ GPD6	Configured as output, pull-up enabled	Connected to LCD adapter X26
53	I/O	VD15	No	VD15/ GPD7	Configured as output, pull-up enabled	Connected to LCD adapter X26
54	I/O	I	No	VD16/ GPD8	Configured as input, pull-up enabled	Not used
55	I/O	I	No	VD17/ GPD9	Configured as input, pull-up enabled	Not used
56	I/O	VD18	No	VD18/ GPD10	Configured as output, pull-up enabled	Connected to LCD adapter X26
57	I/O	VD19	No	VD19/ GPD11	Configured as output, pull-up enabled	Connected to LCD adapter X26
58	I/O	VD20	No	VD20/ GPD12	Configured as output, pull-up enabled	Connected to LCD adapter X26
59	I/O	VD21	No	VD21/ GPD13	Configured as output, pull-up enabled	Connected to LCD adapter X26
60	I/O	VD22	No	VD22/ GPD14/SS1#	Configured as output, pull-up enabled	Connected to LCD adapter X26
61	I/O	VD23	No	VD23/ GPD15/SS0#	Configured as output, pull-up enabled	Connected to LCD adapter X26
62	I/O	LCD_PW REN	No	LCD_PWREN/ GPG4/EINT12	Configured as output, pull-up disabled	Connected to LCD adapter X26
63	I/O	VDEN	No	VM/I2SSDI GPC4	Configured as output, pull-up disabled	Connected to LCD adapter X26
64	I/O	VSYNC	No	VFRAME/ GPC3	Configured as output, pull-up disabled	Connected to LCD adapter X26
65	I/O	HSYNC	No	VLINE/ GPC2	Configured as output, pull-up disabled	Connected to LCD adapter X26
66	I/O	LCD_HCL K	No	VCLK/ GPC1	Configured as output, pull-up disabled	Connected to LCD adapter X26
67	I/O	I	No	LEND/ GPC0	Configured as input, pull-up enabled	Not used
68	I/O	LCD_VF0	No	LCD_VF0/ GPC5	Configured as output, pull-up disabled	Connected to LCD adapter X26

Pin	Type	U-Boot	5V tol.	A9M2410 Name	A9M2410 Description	Application A9M2410DEV
69	I/O	LCD_VF1	No	LCD_VF1/ GPC6	Configured as output, pull-up disabled	Connected to LCD adapter X26
70	I/O	LCD_VF2	No	LCD_VF2/ GPC7	Configured as output, pull-up disabled	Connected to LCD adapter X26
71	I/O	I	No	TOUT0/ GPB0	10k pull-up to 3.3V	Connected to CPLD
72	I/O	I	No	TOUT1/ GPB1	10k pull-up to 3.3V	Connected to CPLD
73	I/O	O	No	TOUT2/ GPB2	Configured as output, 10k pull-up to 3.3V	connected to Audio Codec as L3MODE
74	I/O	I	No	TOUT3/ GPB3	Configured as input, pull-up enabled	connected to Audio Codec as L3DATA
75	I/O	SDCLK	No	SDCLK/ GPE5	SD-Interface, pull-up disabled	Connected to SD connector X29
76	I/O	SDCMD	No	SDCMD/ GPE6	10k pull-up on base board	Connected to SD connector X29
77	I/O	SDDATA0	No	SDDATA0/ GPE7	10k pull-up on base board	Connected to SD connector X29
78	I/O	SDDATA1	No	SDDATA1/ GPE8	10k pull-up on base board	Connected to SD connector X29
79	P	-	-	GND		GND
80	I/O	SDDATA2	No	SDDATA2/ GPE9	10k pull-up on base board	Connected to SD connector X29
81	I/O	SDDATA3	No	SDDATA3/ GPE10	10k pull-up on base board	Connected to SD connector X29
82	I/O	I	No	EINT0/ GPF0	Configured as input, pull-up disabled	Connected to User Key1
83	-	-	-	NC		Not connected
84	I/O	O	No	EINT6/ GPF6	DEBUG LED	DEBUG LED
85	I/O	I	No	EINT11/ GPG3/SS1#	Configured as input, pull-up disabled	Connected to User Key2
86	I/O	EINT13	No	EINT13/ GPG5/SPIMISO1	External Interrupt, pull-up enabled	Connected to CPLD
87	I/O	EINT14	No	EINT14/ GPG6/SPIMOSI1	External Interrupt, pull-up enabled	Connected to CPLD
88	I/O	EINT15	No	EINT15/ GPG7/SPICLK1	External Interrupt, pull-up enabled	Connected to CPLD
89	I/O	SD_WP#	**Yes**	EINT17/ GPG9	Configured as input, pull-up disabled Write protect	Connected to SD connector X29
90	I/O	SD_CD#	**Yes**	EINT18/ GPG10	Configured as input, pull-up disabled Card detect	Connected to SD connector X29
91	-	-	-	NC		Not connected
92	O	-		OE#		Connected to CPLD
93	O	-		WE#	22R series resistor on module	Connected to CPLD
94	I	-	No	WAIT#	Pullup 5k to +3.3V on module	Connected to CPLD
95	I/O	CS1#	No	CS1#/ GPA12	Chip select, not used on module, 22R series resistor on module, Defaults to Ouput/High at reset, can be redefined as I/O pin.	Connected to CPLD
96	I/O	CS2#	No	CS2#/ GPA13	Chip select, not used on module, 22R series resistor on module, Defaults to Ouput/High at reset, can be redefined as I/O pin.	Connected to CPLD
97	I/O	CS3#	No	CS3#/ GPA14	Chip select, not used on module, 22R series resistor on module, Defaults to Ouput/High at reset, can be redefined as I/O pin.	Connected to CPLD
98	I/O	CS4#	No	CS4#/ GPA15	Chip select, not used on module, 22R series resistor on module, Defaults to Ouput/High at reset, can be redefined as I/O pin.	Connected to CPLD
99	O	-	No	PWREN	1.8V power control signal 0 = Power for unneeded parts is switched off Must be left unconnected if not used.	Connected to CPLD
100	I	-	No	BATT_FLT#	Battery Fault Pullup 10k to +3.3V on module, can be left unconnected	Not used
101				NC		Connected to X28
102				NC		Connected to X28

Pin	Type	U-Boot	5V tol.	A9M2410 Name	A9M2410 Description	Application A9M2410DEV
103	O	-	No	DQM0	Upper Byte/Lower Byte Enable	Connected to CPLD
104	O	-	No	DQM1		Connected to CPLD
105	O	-	No	DQM2		Not used
106	O	-	No	DQM3		Not used
107	I/O	SS0#	No	SS0# GPG2/EINT10	SPI0, pull-up enabled	Not used
108	I/O	SPIMISO0	No	SPIMISO0 GPE11	Pull-up enabled	Not used
109	I/O	SPIMOSI0	No	SPIMOSI0 GPE12	Pull-up enabled	Not used
110	I/O	SPICLK0	No	SPICLK0 GPE13	Pull-up disabled	Not used
111	I/O	IICSCL	No	IICSCL GPE14	I²C clock, Pullup 4k7 to 3.3V on module	used on module,
112	I/O	IICSDA	No	IICSDA GPE15	I²C data, Pullup 4k7 to 3.3V on module	used on module
113	I/O	O	No	USB_DT/PW GPG0/EINT8	USB Detect/PowerEnable, by default set to output, pull-up enabled	output to switch on 1k5 pull-up resistor for USB device
114	I/O	USBP	**YES**	USBP	USB device, 22R series resistor has to be mounted on base board	USB device data line +, connected to X15
115	I/O	USBN	**YES**	USBN	USB device, 22R series resistor has to be mounted on base board	USB device data line -, connected to X15
116	P	-	-	VRTC	Backup Battery for RTC, for 3V cell, power-switch-over is on the module, Can be left floating, if RTC backup not needed.	3V battery connected
117	P	-	-	GND		GND
118	P	-	-	+3.3V		+3.3V
119	P	-	-	VLIO	Mobile: Power from Li-Ion Battery Non-Mobile: connected to 3.3V	Delivers either power from Li-Ion battery or 3.3V
120	P	-	-	+3.3V		+3.3V

9.2. System Connector X2

Pin	Type	U-Boot	5V tol.	A9M2410 Name	A9M2410 Description	Application A9M2410DEV
1	I/O	USBP0	**Yes**	USBP0	USB host0, 22R series resistor has to be mounted on base board	USB host data line +, connected to X14
2	P	-	**-**	GND		GND
3	I/O	USBN0	**Yes**	USBN0	USB host0, 22R series resistor has to be mounted on base board	USB host data line -, connected to X14
4	O	A0	No	A0/GPA0	used as address of ETH-Contr. on module, should not be used as I/O pin for compatibility	Connected to CPLD
5	O	-	No	A1		Connected to CPLD
6	O	-	No	A2		Connected to CPLD
7	O	-	No	A3		Connected to CPLD
8	O	-	No	A4		Connected to CPLD
9	O	-	No	A5		Connected to CPLD
10	O	-	No	A6		Connected to CPLD
11	O	-	No	A7		Connected to CPLD
12	O	-	No	A8		Connected to CPLD
13	O	-	No	A9		Connected to CPLD
14	O	-	No	A10		Connected to CPLD
15	O	-	No	A11		Connected to CPLD
16	O	-	No	A12		Connected to CPLD
17	O	-	No	A13		Not used
18	O	-	No	A14		Not used
19	O	-	No	A15		Not used
20	O	A16	No	A16/GPA1	used as address of ETH-Contr. on module, should not be used as I/O pin for compatibility	Not used
21	O	A17	No	A17/GPA2	used as address of ETH-Contr. on module, should not be used as I/O pin for compatibility	Not used
22	O	A18	No	A18/GPA3	used as address of ETH-Contr. on module, should not be used as I/O pin for compatibility	Not used
23	O	A19	No	A19/GPA4	used as address of ETH-Contr. on module, should not be used as I/O pin for compatibility	Not used
24	O	A20	No	A20/GPA5	should not be used as I/O pin for compatibility	Not used
25	O	A21	No	A21/GPA6	should not be used as I/O pin for compatibility	Not used
26	O	A22	No	A22/GPA7	should not be used as I/O pin for compatibility	Not used
27	O	A23	No	A23/GPA8	should not be used as I/O pin for compatibility	Connected to CPLD
28	O	A24	No	A24/GPA9	should not be used as I/O pin for compatibility	Not used
29	O	A25	No	A25/GPA10	should not be used as I/O pin for compatibility	Not used
30	O	A26	No	A26/GPA11	should not be used as I/O pin for compatibility	Not used
31	-	-	-	Reserved	(A27)	Not connected
32	-	-	-	Reserved	(A28)	Not connected
33	-	-	-	Reserved	(A29)	Not connected
34	-	-	-	Reserved	(A30)	Not connected
35	-	-	-	Reserved	(A31)	Not connected
36	I/O	I	No	XDREQ0#/ GPB10	Configured as input, pull-up enabled	Not used
37	I/O	I	No	XDREQ1#/ GPB8	Configured as input, pull-up enabled	Not used
38	I/O	I	No	XDACK0#/ GPB9	Configured as input, pull-up enabled	Not used
39	I/O	I	No	XDACK1#/ GPB7	Configured as input, pull-up enabled	Not used
40	P	-	-	GND		GND

Pin	Type	U-Boot	5V tol.	A9M2410 Name	A9M2410 Description	Application A9M2410DEV
41	-	-	-	NC	-	Not connected
42	-	-	-	NC	-	Not connected
43	AI	-	No	AIN0	Analog in, unused analog inputs should be connected to AGND over a 10k series resistor to avoid cross over.	Not used
44	AI	-	No	AIN1		Not used
45	AI	-	No	AIN2		Not used
46	AI	-	No	AIN3		Not used
47	AI	-	No	AIN4	Used for touch screen TSYM	Connected to Touch screen connector X27
48	AI	-	No	AIN5	Used for touch screen TSYP	Connected to Touch screen connector X27
49	AI	-	No	AIN6	Used for touch screen TSXM	Connected to Touch screen connector X27
50	AI	-	No	AIN7	Used for touch screen TSXP	Connected to Touch screen connector X27
51	REF	-	No	AVCC	Analog VCC, Is the extra filtered +3.3V, connected with the AVCC ball of the CPU Can be used as an analog reference, do not connect to any other power source.	Not used
52	REF	-	No	AGND	Analog GND, Is the extra filtered GND, connected with the AGND ball of the CPU, Can be used as an analog reference, do not connect to any other power source.	Connected to Touch screen connector X27
53	I/O	XPON#	No	XPON#/ GPG13/EINT21	Touch Screen, pull-up disabled	Used for touch screen
54	I/O	XMON	No	XMON/ GPG12/EINT20	pull-up disabled	Used for touch screen
55	I/O	YPON#	No	YPON#/ GPG15/EINT23	pull-up disabled	Used for touch screen
56	I/O	YMON	No	YMON/ GPG14/EINT22	pull-up disabled	Used for touch screen
57	I/O	I	No	XBREQ#/ GPB6	Configured as input, pull-up enabled	Not used
58	I/O	I	No	XBACK#/ GPB5	Configured as input, pull-up enabled	Not used
59	I/O	I	**Yes**	USBH0PEN/ GPG8/EINT16	USB host0 Power Enable	USB host: input to recognize current limit from connected device
60	-	-	NC			Not connected
61	I/O	I2SSDO	No	I2SSDO/ GPE4/I2SSDI	I2S-Interface, pull-up disabled	Connected to Audio Codec
62	I/O	I2SSDI	No	I2SSDI/ GPE3/SS0#	pull-up disabled	Connected to Audio Codec
63	I/O	CDCLK	No	CDCLK/ GPE2	pull-up disabled	Connected to Audio Codec
64	I/O	I2SSCLK	No	I2SSCLK/ GPE1	pull-up disabled	Connected to Audio Codec
65	I/O	I2SLRCK	No	I2SLRCK/ GPE0	pull-up disabled	Connected to Audio Codec
66	I	-	No	TPIN	Ethernet 0 Input-, 100R differential termination on module	Connected to RJ45 with integrated magnetics
67	O	-	No	LEDLNK	Ethernet 0 Line/Activity LED High, when link ok Low, while active.	Connected to Link/Activity LED
68	I	-	No	TPIP	Ethernet 0 Input+, 100R differential termination on module	Connected to RJ45 with integrated magnetics
69	O	-	No	not used	reserved for high speed LED	Not connected
70	O	-	No	TPON	Ethernet 0 Output-, 100R differential termination on module	Connected to RJ45 with integrated magnetics
71	I	-	No	not used		Not connected
72	O	-	No	TPOP	Ethernet 0 Output+, 100R differential termination on module	Connected to RJ45 with integrated magnetics
73	P	-		Not used		Not connected
74	-	-	-	Reserved		Not connected

Pin	Type	U-Boot	5V tol.	A9M2410 Name	A9M2410 Description	Application A9M2410DEV
75	-	-	-	Reserved		Not connected
76	-	-	-	Reserved		Not connected
77	-	-	-	Reserved		Not connected
78	-	-	-	Reserved		Not connected
79	-	-	-	Reserved		Not connected
80	P	-	-	GND		GND
81	I/O	-	No	D0	Data Bus	Connected to CPLD
82	I/O	-	No	D1		Connected to CPLD
83	I/O	-	No	D2		Connected to CPLD
84	I/O	-	No	D3		Connected to CPLD
85	I/O	-	No	D4		Connected to CPLD
86	I/O	-	No	D5		Connected to CPLD
87	I/O	-	No	D6		Connected to CPLD
88	I/O	-	No	D7		Connected to CPLD
89	I/O	-	No	D8		Connected to CPLD
90	I/O	-	No	D9		Connected to CPLD
91	I/O	-	No	D10		Connected to CPLD
92	I/O	-	No	D11		Connected to CPLD
93	I/O	-	No	D12		Connected to CPLD
94	I/O	-	No	D13		Connected to CPLD
95	I/O	-	No	D14		Connected to CPLD
96	I/O	-	No	D15		Connected to CPLD
97	I/O	-	No	D16		Not used
98	I/O	-	No	D17		Not used
99	I/O	-	No	D18		Not used
100	I/O	-	No	D19		Not used
101	I/O	-	No	D20		Not used
102	I/O	-	No	D21		Not used
103	I/O	-	No	D22		Not used
104	I/O	-	No	D23		Not used
105	I/O	-	No	D24		Not used
106	I/O	-	No	D25		Not used
107	I/O	-	No	D26		Not used
108	I/O	-	No	D27		Not used
109	I/O	-	No	D28		Not used
110	I/O	-	No	D29		Not used
111	I/O	-	No	D30		Not used
112	I/O	-	No	D31		Not used
113	I/O	O	No	TCLK0/ GPB4	Configured as output, pull-up enabled	connected to Audio Codec as L3CLOCK
114	I/O	I	No	TCLK1/ GPG11/EINT19	Configured as input, pull-up enabled	Not used
115	-	-	-	NC	-	Not connected
116	O	CLKOUT1	No	CLKOUT1/ GPH10	Clock output, unbuffered CLKOUT1 signal, 22R series resistor on module	Connected to CPLD via 0R but 0R resistor not equipped
117	-	-	-	NC	-	Connected to CAN driver
118	-	-	-	NC	-	Connected to CAN driver
119	O	CLKOUT0	No	BCLKOUT0/ GPH9	Clock output, buffered CLKOUT0 signal	Connected to CPLD
120	P	-	-	GND	-	GND

AI: Analog Input
I: Input
O: Output
I/O: Input or Output
P: Power
REF: Analog Reference Voltage

9.3. System Connector X3

Pin	Signal	Type	Signal Name	Description
X3-1	GND	P	GND	
X3-2				
X3-3				
X3-4				
X3-5				
X3-6				
X3-7				
X3-8				
X3-9				
X3-10				
X3-11				
X3-12				
X3-13				
X3-14				
X3-15				
X3-16				
X3-17				
X3-18				
X3-19				
X3-20				
X3-21				
X3-22				
X3-23				
X3-24				
X3-25				
X3-26				
X3-27				
X3-28				
X3-29				
X3-30				
X3-31	GND	P	GND	
X3-32				
X3-33				
X3-34				
X3-35				
X3-36				
X3-37				
X3-38				
X3-39				
X3-40				
X3-41				
X3-42				
X3-43				
X3-44				
X3-45				
X3-46				
X3-47				
X3-48				
X3-49				

Pin	Signal	Type	Signal Name	Description
X3-50				
X3-51				
X3-52				
X3-53				
X3-54				
X3-55				
X3-56				
X3-57				
X3-58				
X3-59	GND	P	GND	
X3-60				

9.4. System Connector X4

Pin	Signal	Type	Signal Name	Description
X4-1				
X4-2	GND	P	GND	
X4-3				
X4-4				
X4-5				
X4-6				
X4-7				
X4-8				
X4-9				
X4-10				
X4-11				
X4-12				
X4-13				
X4-14				
X4-15				
X4-16				
X4-17				
X4-18				
X4-19				
X4-20				
X4-21				
X4-22				
X4-23				
X4-24				
X4-25				
X4-26				
X4-27				
X4-28				
X4-29				
X4-30	GND	P	GND	
X4-31				
X4-32				
X4-33				
X4-34				
X4-35				
X4-36				

Pin	Signal	Type	Signal Name	Description
X4-37				
X4-38				
X4-39				
X4-40				
X4-41				
X4-42				
X4-43				
X4-44				
X4-45				
X4-46				
X4-47				
X4-48				
X4-49				
X4-50				
X4-51				
X4-52				
X4-53				
X4-54				
X4-55				
X4-56				
X4-57				
X4-58				
X4-59				
X4-60	GND	P	GND	

10. Appendix A: Expansion Connectors

10.1. Module Connector X1 versus Expansion Connectors X10/X11

Pin	X10, Row A	X10, Row B	X11, Row C	X11, Row D
1	GND	RSTIN#	PWRGOOD	RSTOUT#
2	TCK	TMS	TDI	TDO
3	TRST#	DEBUGEN#	NAND_FWP#	CONF2
4	CONF3	CONF4	CONF5	CONF6
5	CONF7	TXD0	RXD0	RTS0#
6	CTS0#	nc	nc	TXD1
7	RXD1	RTS1#	CTS1#	nc
8	PLD_I/O0	PLD_I/O1	PLD_I/O2	PLD_I/O3
9	PLD_I/O4	PLD_I/O5	PLD_I/O6	PLD_I/O7
10	VD0	VD1	GND	VD2
11	VD3	VD4	VD5	VD6
12	VD7	VD8	VD9	VD10
13	VD11	VD12	VD13	VD14
14	VD15	VD16	VD17	VD18
15	VD19	VD20	VD21	VD22
16	VD23	LCD_PWREN	VDEN	VSYNC
17	HSYNC	LCD_HCLK	LEND	LCDVF0
18	LCDVF1	LCDVF2	TOUT0	TOUT1
19	L3MODE	L3DATA	SDCLK	SDCMD
20	SDDATA0	SDDATA1	GND	SDDATA2
21	SDDATA3	USER_KEY1	nc	DEBUG_LED
22	USER_KEY2	EINT13	EINT14	EINT15
23	SD_WP#	SD_CD#	nc	OE#
24	WE#	WAIT#	CS1#	CS2#
25	CS3#	CS4#	PWREN	BATT_FLT#
26	nc	nc	DQM0	DQM1
27	DQM2	DQM3	SS0#	SPIMISO0
28	SPIMOSI0	SPICLK0	IICSCL	IICSDA
29	USB_DT/PW	USBP	USBN	VRTC
30	GND	GND	VLIO	VLIO
31	nc	nc	nc	nc
32	+3.3V	+3.3V	+3.3V	+3.3V

10.2. Module Connector X2 versus Expansion Connectors X20/X21

Pin	X20, Row A	X20, Row B	X21, Row C	X21, Row D
1	USBP0	GND	USBN0	A0
2	A1	A2	A3	A4
3	A5	A6	A7	A8
4	A9	A10	A11	A12
5	A13	A14	A15	A16
6	A17	A18	A19	A20
7	A21	A22	A23	A24
8	A25	A26	nc	nc
9	nc	nc	nc	XDREQ0#
10	XDREQ1#	XDACK0#	XDACK1#	GND
11	nc	nc	AIN0	AIN1
12	AIN2	AIN3	AIN4	AIN5
13	AIN6	AIN7	AVCC	AGND
14	XPON#	XMON	YPON#	YMON
15	XBREQ#	XBACK#	USBH0PEN	nc
16	I2SSDO	I2SSDI	CDCLK	I2SSCLK
17	nc	nc	LEDLNK	I2SLRCK
18	nc	nc	nc	nc
19	nc	nc	nc	nc
20	nc	nc	nc	GND
21	D0	D1	D2	D3
22	D4	D5	D6	D7
23	D8	D9	D10	D11
24	D12	D13	D14	D15
25	D16	D17	D18	D19
26	D20	D21	D22	D23
27	D24	D25	D26	D27
28	D28	D29	D30	D31
29	L3CLOCK	TCLK1	nc	CLKOUT1
30	nc	nc	BCLKOUT0	GND
31	VLIO	VRTC	GND	GND
32	+3.3V	+3.3V	RSTIN#	PWRGOOD

10.3. Module Connector X3 versus Expansion Connectors X30, X31

Pin	X30 Row A	X30, Row B	X31, Row C	X31, Row D
1	GND	X3_2	X3_3	X3_4
2	X3_5	X3_6	X3_7	X3_8
3	X3_9	X3_10	X3_11	X3_12
4	X3_13	X3_14	X3_15	X3_16
5	X3_17	X3_18	X3_19	X3_20
6	X3_21	X3_22	X3_23	X3_24
7	X3_25	X3_26	X3_27	X3_28
8	X3_29	X3_30	GND	X3_32
9	X3_33	X3_34	X3_35	X3_36
10	X3_37	X3_38	X3_39	X3_40
11	X3_41	X3_42	X3_43	X3_44
12	X3_45	X3_46	X3_47	X3_48
13	X3_49	X3_50	X3_51	X3_52
14	X3_53	X3_54	X3_55	X3_56
15	X3_57	X3_58	GND	X3_60
16	+3.3V	+3.3V	VLIO	VLIO
17	NC	NC	NC	NC
18	NC	NC	NC	NC
19	NC	NC	NC	NC
20	NC	NC	NC	NC

10.4. Module Connector X4 versus Expansion Connectors X40, X41

Pin	X40 Row A	X40, Row B	X41, Row C	X41, Row D
1	X4_1	GND	X4_3	X4_4
2	X4_5	X4_6	X4_7	X4_8
3	X4_9	X4_10	X4_11	X4_12
4	X4_13	X4_14	X4_15	X4_16
5	X4_17	X4_18	X4_19	X4_20
6	X4_21	X4_22	X4_23	X4_24
7	X4_25	X4_26	X4_27	X4_28
8	X4_29	GND	X4_31	X4_32
9	X4_33	X4_34	X4_35	X4_36
10	X4_37	X4_38	X4_39	X4_40
11	X4_41	X4_42	X4_43	X4_44
12	X4_45	X4_46	X4_47	X4_48
13	X4_49	X4_50	X4_51	X4_52
14	X4_53	X4_54	X4_55	X4_56
15	X4_57	X4_58	X4_59	GND
16	+3.3V	+3.3V	VLIO	VLIO
17	NC	NC	NC	NC
18	NC	NC	NC	NC
19	NC	NC	NC	NC
20	NC	NC	NC	NC