A13-OLinuXino and A13-OLinuXino-WIFI

Open-source single-board system capable of booting Linux or Android

USER'S MANUAL

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Designed by OLIMEX Ltd, 2012

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Table of Contents

CHAPTER 1: OVERVIEW

1. Introduction to the chapter

Thank you for choosing the OLinuXino single board computer from Olimex! This document provides a user's guide for the Olimex OLinuXino board. As an overview, this chapter gives the scope of this document and lists the board's features. The document's organization is then detailed.

The OLinuXino development board enables code development of applications running on the microcontroller A13, manufactured by Allwinner Technology from China.

OLinuXino is an open-source, open-hardware project and all documentation is available to the customer.

1.1 Features

The board has the following set of features:

- A13 Cortex A8 processor at 1GHz, 3D Mali400 GPU
- 512 MB RAM
- 6-16VDC input power supply, noise immune design
- 3 + 1 USB Host, 3 available for users 1 for (only in A13-OLinuXino-WIFI) WIFI RTL8188CU 802.11n 150Mbit module on board
- 1 USB OTG which can power the board
- SD-card connector for booting the Linux image
- (only in A13-OLinuXino-WIFI) 8GB NAND flash (older revisions had 4GB NAND flash)
- VGA video output – 800×600 resolution
- LCD signals available on connector so you still can use LCD if you disable VGA/HDMI
- Audio Output
- Microphone input
- RTC PCF8536 on board for real time clock and alarms
- 5 Keys on board for android navigation
- UEXT connector for connecting additional UEXT modules like Zigbee, Bluetooth, Relays, etc
- GPIO connector with 68/74 pins and these signals: 17 for adding NAND flash; 22 for connecting LCDs; 20+4 including 8 GPIOs which can be input, output, interrupt sources; 3x I2C; 2x UARTs; SDIO2 for connectinf SDcards and modules; 5 system pins: +5V, +3.3V, GND, RESET, NMI

1.2 Target market and purpose of the board

The boards from the OLinuXino family are easy to setup and powerful. They are suitable for embedded programming enthusiasts, Linux and Android gadget fans and also professionals (since its low cost makes it very good solution for application orientated embedded systems). The main usage of the board is software embedded development without the urge of understanding perfectly the hardware.

The strong points of the boards are the processor speed, the mobility of the board and the low ratio price to productivity.

Customers have full access to the technical documentation of the board. The software is released under General Purpose License and the board is considered open-hardware.

1.3 Board variants

Olimex manufactures three types of boards with the same A13 processor – A13-OLinuXino, A13-OLinuXino-MICRO, and A13-SOM. Each of these designs has a different goal and each design might have several different variants (typically each of these designs has a variant with NAND memory).

The base model has two flavors: A13-OLinuXino and A13-OLinuXino-WIFI. The first one is the base model that goes without any operating system image on board, while the second has two additional components – a WIFI module on the board and NAND memory with stored Android image.

The A13-OLinuXino-Micro differs from the base A13-OLinuXino by having only 1 USB host, 1 USB OTG, no power connector, no NAND memory, no WIFI, no audio out connector, less buttons.

If you are looking for an A13 board with tiny dimensions and suitable for implementing in own designs then refer to A13-SOM board – it has tiny dimensions.

There are more powerful A10 and A20 designs that Olimex manufactures nowadays. Boards like A20-OLinuXino-LIME; A20-OLinuXino-MICRO and A20-OLinuXino-LIME2 are generally faster and capable of much better video output.

1.4 Document organization

Each section in this document covers a separate topic, organized as follow:
- Chapter 1 is an overview of the board usage and features
- Chapter 2 provides a guide for quickly setting up the board and software notes
- Chapter 3 contains the general board diagram and layout
- Chapter 4 describes the component that is the heart of the board: the A13 – Allwinner processor
- Chapter 5 is an explanation of the control circuitry associated with the microcontroller to reset. Also shows the clocks on the board
- Chapter 6 covers the connector pinout, peripherals and jumper description
- Chapter 7 provides the schematics
- Chapter 8 contains the revision history, useful links and support information

CHAPTER 2: SETTING UP THE OLINUXINO BOARD

2. Introduction to the chapter

This section helps you set up the OLinuXino development board for the first time. Please consider first the electrostatic warning to avoid damaging the board, then discover the hardware and software required to operate the board.

The procedure to power up the board is given, and a description of the default board behavior is detailed.

2.1 Electrostatic warning

OLinuXino is shipped in a protective anti-static package. The board must not be exposed to high electrostatic potentials. A grounding strap or similar protective device should be worn when handling the board. Avoid touching the component pins or any other metallic element.

2.2 Requirements

In order to set up the OLinuXino optimally, the following items are required:

- Power supply unit which is capable of providing voltage in the (6V-16V) DC range, minimum 6W are required to ensure smooth operation (6V @ 1A or 16V @ 0.4A)
- Output medium – USB-to-serial cable (to connect to a personal computer with serial terminal software), or LCD (preferably with touchscreen panel) display for the LCD_CON, or TV monitor with RGB port

Additional items include:

- USB keyboard – for convenience with text input
- USB-SERIAL-CABLE-F – for serial communication with UART1 connector
- USB-MINI-CABLE – for connecting with the USB OTG and being able to update the Android (if your board has NAND memory)
- Wireless internet connectivity or USB modem – for browser access and access to the Android market

Some of the suggested items can be purchased by Olimex, for instance:

SY0612E – power supply adapter 12V/0.5A for A13-OLinuXino
USB-SERIAL-CABLE-F – USB serial console cable female
USB-MINI-CABLE – standard USB type A to USB type mini cable

The recommended LCD display for the board is 7 inch with an optional touch screen panels suitable for the board:

Display name	Size of display in inches	Native resolution in pixels	Official Debian image support	Official Android image support	Link to product page
LCD-OLinuXino-7	7	800×480	Yes	Yes	Product page
LCD-OLinuXino-7TS	7	800×480	Yes	Yes	Product page

Note that if you wish to use one of the LCD displays mentioned above you need to upload different Android image – configured for 480×800 screen resolution.

2.3 Powering the board

There are three possible ways of powering A13-OLinuXino – via external supply using the power jack, via a battery using the battery connector or via the USB OTG connector. Depending on your preferred way of powering A13-OLinuXino you might need additional hardware.

The preferred way of powering board is via the PWR jack with 6Vdc to 16Vdc with a power of 6W (e.g. 6Vx1A to 16Vx0.4A). This will make the board fully powered and able to power all the peripherals connected to it.

When powered by the typical 3.7V Lithium-polymer battery the board will be fully functional and you will be able to operate with most of the peripherals. However when using all three USB-A connectors and an LCD connected to the LCD_con it might cause flickering and not sufficient power. If you suspect the power is not enough for the peripherals you have connected use the PWR jack.

The board can be also powered by the USB OTG connector (mini USB standard) but the voltage provided is not enough to power a possible LCD connected to the LCD_con. However, this power option is capable of driving the board when using external display connected to the VGA connector.

If you have a standard LCD display connected to LCD_con, Android and WIFI running the typical consumption is between 150mA and 350mA depending on the current load. While the board is in stand-by mode it consumes a minimum of 60mA. All the three approximate values above were taken when I applied 12V to the board.

Important! Avoid disconnecting the power supply while Android or Linux is running, since that might corrupt the operating system and you will need to install the OS again (for Android install instructions check chapter 2.6. Use the PWR_BUT before disconnecting the supply.

If the board has entered power-down state you can bring it back without restart using the PWR_BUT.

For the European customers we sell a power supply adapter 12V/0.5A – **SY0612E**. We also sell USB OTG to USB type A cables if you lack such.

2.4 Prebuilt software

Note that the A13-OLinuXino-WIFI board no longer comes with Android loaded in the NAND memory! Please follow the advice in this chapter to upload it to the NAND.

How we have installed the software? We have configured an Android image with settings suitable for A13-OLinuXino. Then using LiveSuit or PhoenixSuit tools we uploaded the image to the board. To activate A13 bootloader do as follows: run Livesuit, disconnect the power supply and USB cable, then press HOME button, apply power supply, attach USB cable and release the button, Livesuit will detect the bootloader and will ask which file to program to the NAND flash. The image will be available for users to try and tweak the settings. You can find and image with the view of the progress window in LiveSuit:
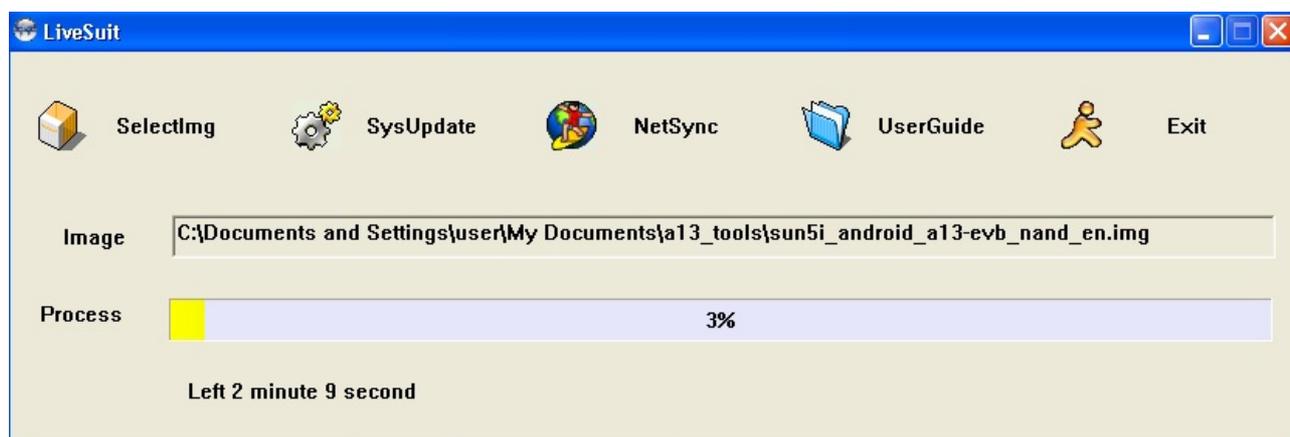
Download links to all available images (and tools needed) can be found at the A13-OLinuXino wiki page: https://www.olimex.com/wiki/A13-OLinuXino.

Helpful information about the Android and Linux images can be found at the OLIMEX forums.

2.5 Button functions in Android

The following buttons represent functions in the Android:

PWR_BUT – used to wake the board from stand-by

HOME – shows the home screen; note that HOME is also used to enter bootloader mode for firmware update

ENTER – to select a choice

MENU – brings up the main menu

VOL+ – increases the volume

VOL- – lowers the volume

For more information on the button functions check the Android documentation.

Note that **RESET** button will perform a hardware reset of the board, not controlled by the OS.

2.6 How we configured the Android image

This is a detailed explanation of how we got to tweak the Android image configuration files. It is worth mentioning that we used Ubuntu with Linux Kernel 3.2 for the steps below.

2.6.1. Getting the Android SDK tools

Download the Android SDK tools for Linux from: http://developer.android.com/sdk/index.html
Note that you have to click "Other platforms" and get the one for Linux. Then you extract it:

tar zxfv android-sdk_r20.0.3-linux.tgz

Note that the above line would vary depending on the version you have downloaded (by the time of writing 20.0.3 was the latest one).

2.6.2. Adding information for the board in the Linux

Create the following file:

.../etc/udev/rules.d/70-android.rules

and add the following line inside:

SUBSYSTEM=="usb_device", SYSFS{idVendor}=="18d1", MODE="0666"

then we save the file and change its properties with chmod +x 70-android.rules and reboot the computer.

2.6.3. Installing the SDK tools

Navigate to the folder where we extracted the tools (folder tools) in point 1 and start it:

./android

From the check boxes select to install Android SDK Tools, Android SDK Platform Tools and Android 4.0 API

2.6.4. Connecting the A13-OLinuXino

Power the A13-OLINUXINO. Now connect the miniUSB to the board and wait a bit for the USB to enumerate.

After the tools are installed we navigate to "platform-tools" folder located in the directory of the tools (where we extracted in point 1), then we enter:

./adb devices

which will show us the list of the available devices. The output should would like:

List of devices attached
20080411 device

However if we get "*bash: ./adb: No such file or directory*"- we have to check if the ia32-libs are installed if not, we install them with:

apt-get install ia32-libs

If again the device is not listed we try to stop and run the server again with the following (we have to be logged as root!):

cd /home/android-sdk/platform-tools/
./adb kill-server
./adb start-server

Exit the root and enter the shell of the device

./adb shell

We then create mounting point for the NAND memory:

mkdir /sdcard/nanda

and finally we mount the NAND:

mount -t vfat /dev/block/nanda /sdcard/nanda

Note: NAND mounting should be performed every time the device is restarted!

2.6.5. Downloading the default config file and script tool

Get the default 800×600 config file from:
https://docs.google.com/open?id=0B7WHuNCASY8caVRlV29GdUVPX3M

Open a new console (which will be used to edit the config file) - - then we download the following script:

https://docs.google.com/file/d/0B_DiNI-XElr-MjQ4MmJhZGEtNmU1NS00MzllLWIzOWMtMzExODc5NTRkMGQ3/edit

We save both of the above files (both should be in the same folder)
Then we execute from the console:

chmod +x script

2.6.6. Applying the script and uploading the confing

After we have edited the file as we win we do:

./script A13_config_600x800.fex_ok

and then we push it on the device

path_to_android_sdk/android-sdk-linux/platform-tools/adb push A13_config_600x800.fexbin
/sdcard/nanda/script.bin

2.6.7. Restarting the A13-OLinuXino

We go to the shell of the A13-OLinuXino board and

reboot

2.7 GPIO under Debian

You can read data from a given GPIO port. The logical ranges are usually as follows:

0V-1V for LOW (or 0)
2.4V-3.3V for HIGH (or 1)

All voltages are measured against ground (GND).

If the input signal is to high, you will at least destroy the port!

The algorithms for writing a value to a GPIO port and reading such a value are pretty similar. The usage of GPIO ports follows the algorithm (we would use GPIO #49 for demonstration purposes):

1. Export GPIO 49:

```
echo 49 > /sys/class/gpio/export
```

Note that you can export GPIOs in range with:

```
for i in `seq 1 1 230`; do echo $i > /sys/class/gpio/export; done
```

2. Set input/output GPIO 49

2.1 Set input:

```
echo "in" > /sys/class/gpio/gpio49_ph9/direction
```

2.2 Set output:

```
echo "out" > /sys/class/gpio/gpio49_ph9/direction
```
3. Set value or read value GPIO 49

3.1 Set value:

```
echo 0 > /sys/class/gpio/gpio49_ph9/value
echo 1 > /sys/class/gpio/gpio49_ph9/value
```

3.2 Read input:

```
cat /sys/class/gpio/gpio49_ph9/value
```

4. Unexport GPIO 49 when finished

```
echo 49 > /sys/class/gpio/unexport
```

A very good document on GPIO usage might be found here:
http://www.py6zgp.com/download/A20-GPIO.pdf – the document was created by Dr. Guido Pelz.

Instructions on how to edit board configurations might be found here:
https://www.olimex.com/wiki/How_to_edit_board_configurations_and_definitions_in_the_official_Debian_Linux

Information on how to use the WIFI, Ethernet or GPIOs is available at the following web address:
https://www.olimex.com/wiki/Configuration_of_hardware_in_the_debian_image

2.8 I2C and SPI under Debian

I2C and SPI are both supported in the latest Debian releases. There is respective kernel support for both. There is a python module called pyA13 might be found here:
https://pypi.python.org/pypi/pyA13

At the same web address you would also find a set of examples on how module is used.

2.9 Software support

We maintain Linux and Android images for SD card which might be downloaded for free and modified as the user wishes. The latest images and updates are featured at the wiki article of the device: https://www.olimex.com/wiki/A13-OLinuXino.

We usually try to provide details on how to build the Linux and the Android images at our wordpress page: http://olimex.wordpress.com/.

Another useful place is the Olimex forums where a lot of people share their experience and advice:
https://www.olimex.com/forum/

Additional Android and Linux support and features are added overtime. The Linux support is a work-in-progress and you should not expect full Linux support after the initial volume of such boards have become available on the market. If you are in a hurry consider the older OLinuXino designs (which have almost everything supported, have examples available and so on).

You are more than welcome to send or share your suggestions and ideas at our e-mail, the public forums or irc channel. We would attempt to help in almost every case. We listen to the feedback and if the majority of users suggest a software change or update we try to implement such. Customer feedback is very important for the overall state of the software support. However, do not expect full Linux or Android software support.

We can share our experience. We can give you full details for things we have tried. We can point you to a resource or a guide. We can give you general directions to solving a specific problem or

places to look for more information. However, we won't install a piece of software for you or write custom program for you. We won't provide a specific software solution to a specific software problem.

CHAPTER 3: A13-OLINUXINO BOARD DESCRIPTION

3. Introduction to the chapter

Here you get acquainted with the main parts of the board. Note the names used on the board might differ from the names used below to describe them. For the actual names check the A13-OLinuXino board itself.

3.1 Layout (top view)
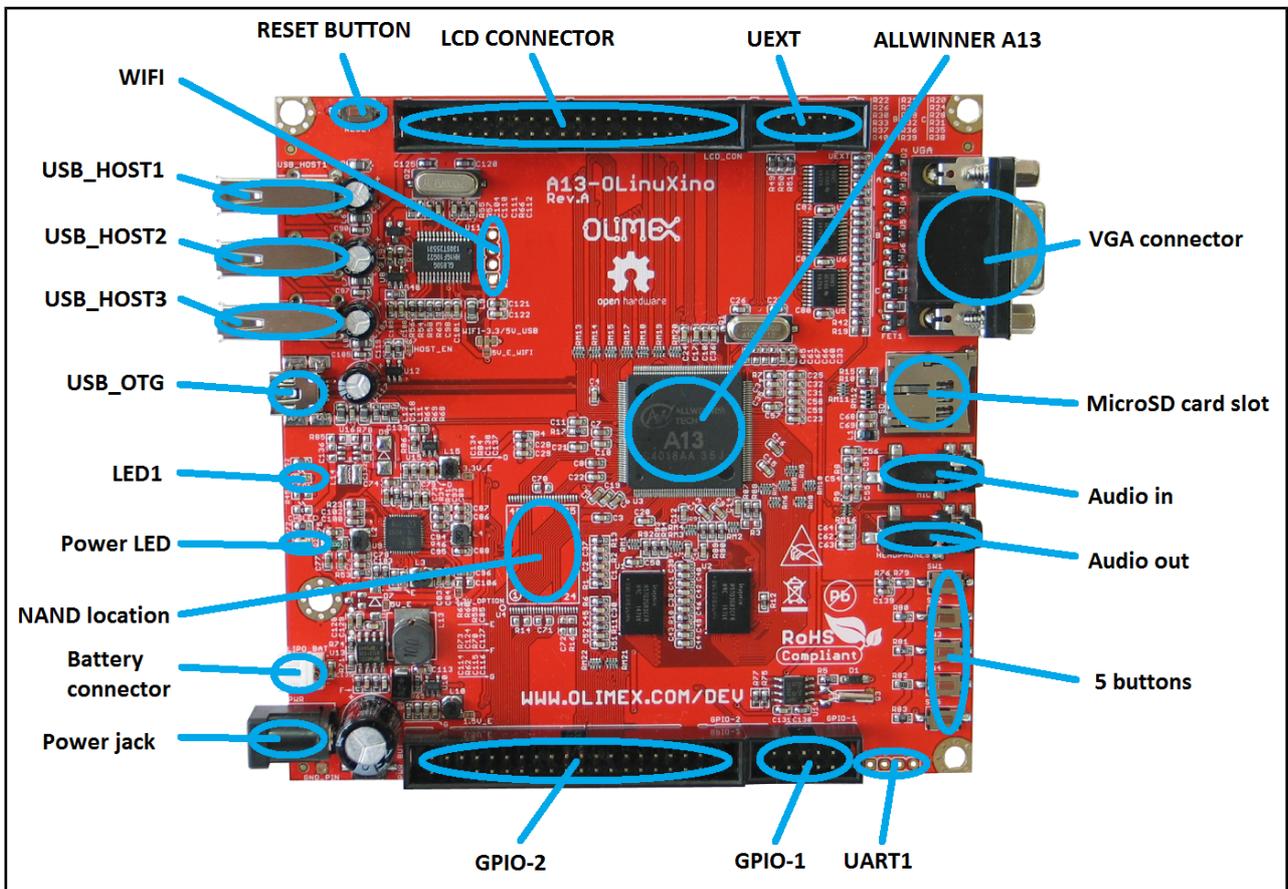
The picture above shows the initial revision of A13-OLinuXino. Note that the version of the board pictured does not have additional NAND memory nor WIFI module.

CHAPTER 4: THE ALLWINNER A13 MICROCONTROLLER

4. Introduction to the chapter

In this chapter is located the information about the heart of OLinuXino – its microcontroller. The information is a modified version of the datasheet provided by its manufacturers.

4.1 The microcontroller

- CPU/GPU
    - ARM Cortex-A8 Core
    - 32KB D-Cache/ 32KB I-Cache
    - 256KB L2 Cache
    - Mali-400 3-D Engine
- VPU
    - HD Video Decoding
        - 1920*1080@30fps
        - Support H.264, H.263, VC1, Mpeg1/2/4
        - Divx 3/4/5/6, Xvid, VP6/8, AVS etc
    - HD Video Encoding
        - Support encoding in H.264 format
        - Up to 1920*1080 at 30fps
- DPU
    - LCD Interfaces: CPU, RGB
- Memory
    - DDR2/DDR3: Up to 533MHz
        - 16 bits Data Bus
        - Memory capacity up to 512MB
    - MLC/TLC/SLC/EF-NAND
        - 2 flash chips, ECC 64-bit
        - Support NAND of 5xnm, 4xnm, 3xnm, 2xnm
    - Support NADN of Samsung, Toshiba, Hynix
- Peripherals
    - USB2.0 OTG, USB2.0 HOST
    - (OHCI/EHCI）
    - SD Card V.3.0, eMMC V.4.2
    - SPI, TWI and UART
    - integrated Audio Codec
    - CSI

- R-TP Controller
    - 4-wire resistive TP interface
    - 2 points and gesture detection
- Boot Devices
    - NAND Flash
    - SPI Nor Flash
    - SD Card
    - USB
- Powerful Acceleration
    - Graphic (3D, Mali400 MP)
    - VPU (1080P）
    - APU
    - E-Reader
- Ultra-low System Power Consumption
    - 15~20% lower than competitors
    - Smart Backlight: auto adjust backlight
    - acc. to the image display
- Package
    - eLQFP176

More information can be found on Allwinner's web site at the following web-address:
http://www.allwinnertech.com/en/clq/processora/A13.html

4.2 Block diagram

The block diagram is taken from Allwinner's datasheet.
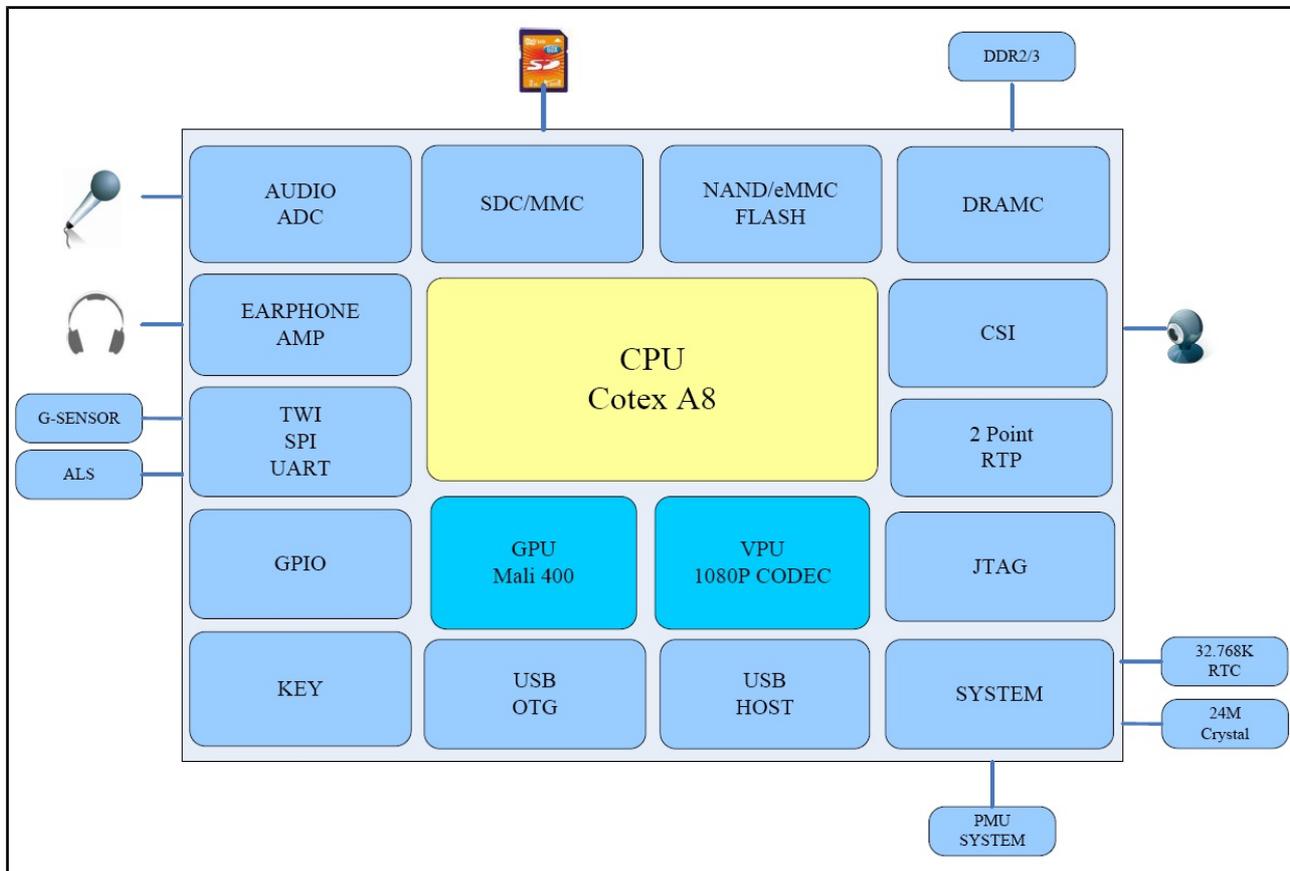
CHAPTER 5: CONTROL CIRCUITY

5. Introduction to the chapter

Here you can find information about reset circuit and quartz crystals locations, the power supply circuit is discussed.

5.1 Reset

The reset line is handled by the AXP209 (which is an enhanced single cell Li-battery and power system management IC that goes together with the Allwinner processor) and goes to processor pin 159 via R4(47k). The reset circuit is connected to button RESET, which means pressing RESET would perform a hardware reset on the board.

5.2 Clocks

24 MHz quartz crystal Q1 is connected to pins 91 and 92 of the A13 processor.

12 MHz quartz crystal Q2 is found at pins 6 and 7 of the GL850G (the USB controller).

32 768 kHz (RTC clock) quartz crystal Q3 is found connected to pins 1 and 2 of the RTC_MODULE (PCF8563T)

5.3 Power supply circuit

The power supply is handled mainly by AXP209 power management system, an Allwinner chip that goes together with the A13 processor. The power supply circuit of A13-OLinuXino allows flexible input supply from 6V to 16V. The minimum amperage suggested is 1A, and this threshold would rise if using all the three USB-HOSTs, a lot of GPIOs and LCD_con.

The board can also be powered by 3.7V Li-Po battery retaining its functionality or by USB (limiting the use of peripherals.

Important! Avoid disconnecting the power supply while Android or Linux is running, since that might corrupt the NAN memory (and the operating system files) and you will need to install the OS again (for Android install instructions check chapter 2.6. Hold the PWR_BUT and then navigate to shut down before disconnecting the supply.

CHAPTER 6: CONNECTORS AND PINOUT

6. Introduction to the chapter

In this chapter are presented the connectors that can be found on the board all together with their pinout and notes about them. Jumpers functions are described. Notes and info on specific peripherals are presented. Notes regarding the interfaces are given.

6.1 Communication with the A13

The chip has a built-in bootloader so everything you need for debugging is an USB cable. However there is a second option which is the male UART1 connector capable of delivering some information on the COM port of your computer. You can use USB-SERIAL-CABLE-F with the UART1 interface allowing you to connect to an USB port.

6.1.1 USB communication

The main way of communicating with the firmware of A13-OLinuXino is via the USB-OTG connector.

You will also need a software tool "LiveSuit" and a newer firmware image if you wish to upgrade the firmware. The "LiveSuit" tool may be downloaded from the A13 wiki page. The simple steps for upgrading the firmware via the bootloader are:

1. Start LiveSuit

2. Disconnect power supply cable and USB cable from A13-OLinuXino

3. Hold "Home" button

4. Connect the board to the power supply and the computer via the USB-OTG

5. Release "Home" button

6. You will be asked for drivers, point the installer to the LiveSuit folder which contains drivers for the bootloader

7. Choose the image in the LiveSuit

8. Update and don't disconnect the board

The three USB type A hosts are wired to a USB-controller GL850G which is an advanced version hub solution fully complying with Universal Serial Bus Specification Revision 2.0. GL850G has proven compatibility, lower power consumption figure and better cost structure above all USB2.0 hub solutions worldwide.

6.1.2 UART1 interface

The UART interface might be used for COM communication. You can use our USB-SERIAL-CABLE-F for debugging via the UART1 or UART0. Note that in both cases the connectors are named at the bottom of the board.

Depending on the revision of the board it is possible to have 1xUART1 or 1xUART0 + 1xUART1.

If having a board with 1xUART1 (board revision B, A13-OlinuXino-WIFI-DEV) the table with the signals can be found below:

UART1		
Pin #	Signal Name	Processor Pin #
1	3.3V	-
2	SDC0_SCK	110
3	SDC0_DATA3	112
4	GND	-

Consider the above table when connecting the USB-SERIAL-CABLE-F according to the wire color code. If you have A13-OLinuXino with 1xUART0 and 1 xUART1 you may find the table with the signals below:

UART0			UART1		
Pin #	Signal Name	Processor Pin #	Pin #	Signal Name	Processor Pin #
1	3.3V	-	1	3.3V	-
2	SDC0_SCK	110	2	UART1_TX	152
3	SDC0_DATA3	112	3	UART1_RX	151
4	GND	-	4	GND	-

Consider the above table when connecting the USB-SERIAL-CABLE-F.

Notice that UART0 data lines are multiplexed with the SD-CARD.
Notice that UART1 data lines are multiplexed with the UART pins in the UEXT connector.

6.2 SD/MMC slot

The microSD card slot is a standard 8pin connector.

The SD card can be used for booting the operating system for A13-OLinuXino. It is suggested to have an SD card with a proper Linux/Android image especially if you have ordered a version of the board without NAND memory.

We have tested a number of microSD cards on the OLinuXino boards and all of them worked fine regardless manufacturer or capacity. However, keep in mind that some of the lower quality microSD cards might draw too much current from the slot which might cause power-state problems. If you suspect the microSD card is causing problems please try using another one of better quality for better results.

microSD card connector		
Pin #	Signal Name	Processor Pin #
1	DAT2/RES	113
2	SDC0_DATA3	112
3	SDC0_CMD	111
4	VDD	-
5	SDC0_SCK	110
6	VSS	-
7	SDC0_DATA0	108
8	SDC0_DATA1	107
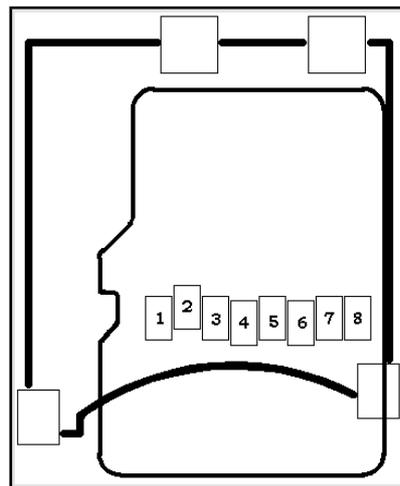
When removing the card, please make sure that you release it from the connector by pushing and NOT by pulling the card directly (this can damage both the connector and the microSD card).

6.3 UEXT module

A13-OLinuXino has an UEXT connector and can connect with Olimex's UEXT modules.
For more information on UEXT please visit:

https://www.olimex.com/Products/Modules/UEXT/resources/UEXT.pdf

UEXT connector		
Pin #	**Signal Name**	**Processor Pin #**
1	3.3V	-
2	GND	-
3	UART1_TX	152
4	UART1_RX	151
5	TWI2_SCK	161
6	TWI2_SDA	160
7	SPI2_MISO	117
8	SPI2_MOSI	116
9	SPI2_CLK	115
10	SPI2_CS0	114
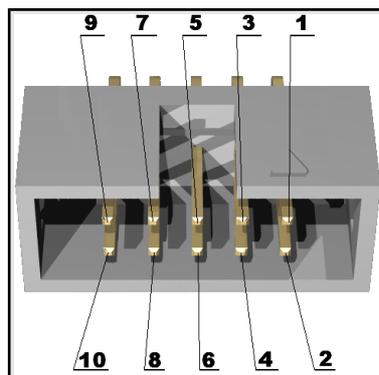
The UEXT pinout is also printed at the bottom of the board under the connector.

Notice that UART1 data lines are multiplexed with the UART pins in the UEXT connector.

6.4 GPIO-1 (General Purpose Input/Output) 10pin connector

The GPIO connector numbers are printed at the bottom of the board for your convenience.

GPIO-1		
Pin #	Signal Name	Processor Pin #
1	5V	-
2	GND	-
3	3.3V	-
4	GND	-
5	RESET_N	159
6	NMI_N	158
7	PIN0	-
8	PIN3	-
9	PIN1	-
10	PIN2	-
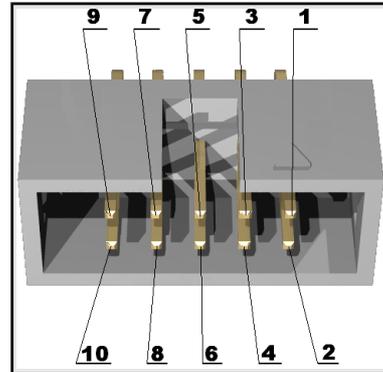
PIN0, PIN1, PIN2 and PIN3 are connected to the power regulator module AXP209.

6.5 GPIO-2 (General Purpose Input/Output) 40pin connector

The GPIO pins are led out on a separate 40pin connecter. They allow the user to attach additional hardware, check readings or perform hardware debug. The GPIO-2 connector numbers are printed at the bottom of the board for your convenience.
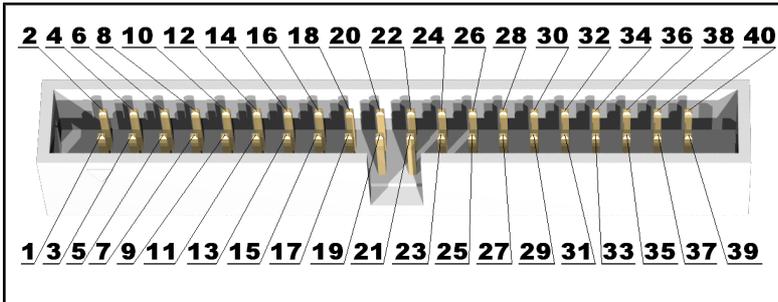
GPIO-2 connector					
GPIO Pin#	Signal Name	Processor pin#	GPIO Pin#	Signal Name	Processor pin#
1	5V	-	2	GND	-
3	3.3V	-	4	GND	-
5	PIN4/TWI0-SCK	101	6	PIN39/USBH_EN	14
7	PIN5/TWI0-SDA	102	8	PIN38/VGA_DIS	13
9	PIN6	103	10	PIN37/LED1	12
11	PIN7	150	12	PIN36	125
13	PIN8	104	14	PIN35	124
15	PIN9	10	16	PIN34	123
17	PIN10/TWI1-SCK	105	18	PIN33	122
19	PIN11/TWI1-SDA	106	20	PIN32	121
GPIO Pin#	Signal Name	Processor pin#	GPIO Pin#	Signal Name	Processor pin#
21	PIN12/NWE	8	22	PIN31	120
23	PIN13/NALE	7	24	PIN30	119
25	PIN14/NCLE	6	26	PIN29	118
27	PIN15/NCE1	3	28	PIN28/NDQS	162
29	PIN16/NCE0	2	30	PIN27/NDQ7	165
31	PIN17/NRE	1	32	PIN26/NDQ6	166
33	PIN18/NRB0	176	34	PIN25/NDQ5	167
35	PIN19/NRB1	175	36	PIN24/NDQ4	168
37	PIN20/NDQ0	174	38	PIN23/NDQ3	170
39	PIN21/NDQ1	172	40	PIN22/NDQ2	171

6.6 LCD_CON 40pin connector

The LCD_CON pins are led out on a separate 40pin connecter for the ease of connecting an LCD. We have tested the ability of the board to interact with such a display. They allow the user to attach additional hardware, check readings or perform hardware debug. The LCD_CON connectors connector numbers are print at the bottom of the board for your convenience.
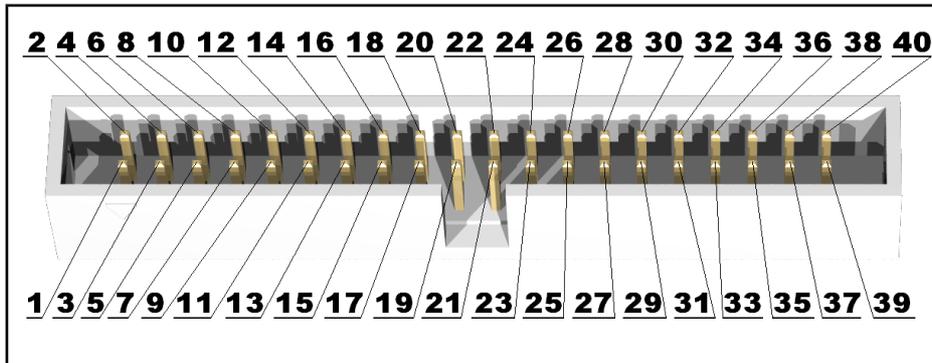
LCD_CON connector					
GPIO Pin#	Signal Name	Processor pin#	GPIO Pin#	Signal Name	Processor pin#
1	5	-	2	GND	-
3	3.3	-	4	GND	-
5	LCD_D18	135	6	LCD_D18	135
7	LCD_D18	135	8	LCD_D19	134
9	LCD_D20	133	10	LCD_D21	132
11	LCD_D22	131	12	LCD_D23	130
13	LCD_D10	141	14	LCD_D10	141
15	LCD_D10	141	16	LCD_D11	140
17	LCD_D12	139	18	LCD_D13	138
19	LCD_D14	137	20	LCD_D15	136
21	LCD_D2	148	22	LCD_D2	148
23	LCD_D2	148	24	LCD_D3	147
25	LCD_D4	146	26	LCD_D5	145
27	LCD_D6	144	28	LCD_D7	143
29	LCD_HSYNC	127	30	LCD_VSYNC	126
31	LCD_CLK	129	32	LCD_DE	128
GPIO Pin#	Name	Processor pin#	GPIO Pin#	Name	Processor pin#
33	PIN7	150	34	PIN8	104
35	PIN9	10	36	PIN6/PWM0	109
37	TPX1	89	38	TPX2	87
39	TPY1	90	40	TPY2	88

6.7 PWR Jack

The power jack used is the typical one used by Olimex in most of our products – the DC barrel jack has 2.0mm inner pin and 6.3mm hole. More information about the exact component might be found here: https://www.olimex.com/wiki/PWRJACK. You should provide between 6 and 16 volts @ 1.5A maximum to the board.

Pin #	Signal Name
1	Power Input
2	GND
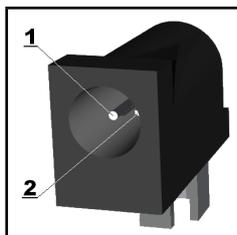
More info about the power supply can be found in chapter 5 of this manual

6.8 Headphones and microphone connector

Standard audio jack and phone jack are mounted for the audio interfacing.

Microphone/Audio out connector		
Pin#	SIGNAL NAME	Processor Pin#
2	L channel	74
3	R channel	78
5	HPCOM	GND pins

The headphones resistance is 32 Ohms! The mic is connected to pins 84 and 85 of the A13 chip.

6.9 Battery connector

When using the battery connector keep in mind that it is an energy solution that wouldn't be able to power the board and all the peripherals. The voltage of a 3.7V LIPO battery would be enough to power the processor and the memory but won't be enough to power external touchscreen LCD.

Pin #	Signal Name
1	VBAT
2	GND
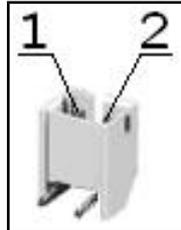
The pins are also print at the bottom of the board under the connector.

6.7 VGA video connector

The female DB15 connector is used for video output on a monitor. At the moment the maximum achieved resolution is 800×600 due to limited maximum frequency and the lack of integrated video controller in the chip.
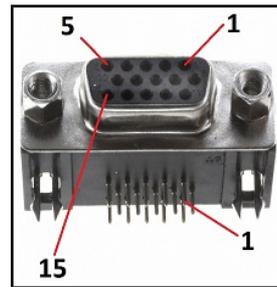
VGA connector			
GPIO Pin#	Signal Name	GPIO Pin#	Signal Name
1	VGA_R	2	VGA_G
3	VGA_B	4	Not Connected
5	GND	6	GND
7	GND	8	GND
9	GND	10	GND
11	Not Connected	12	Not Connected
13	VGA_HSYNC	14	VGA_VSYNC
15	Not Connected	16	Not Connected

6.8 Jumper description

Please note that all the jumpers on the board are SMD type. If you feel insecure of your soldering/cutting technique it is better not to try to adjust the jumpers. The only really important jumper on the board is CE_NAND_E, which needs to be closed if you have board variant with NAND flash memory but you wish to boot OS from SD card.

6.8.1 CE_NAND_E

When cut this board disconnects the NAND flash. Note that it is not a requirement to boot from the SD card since the processor has a routine of detecting such.

The default position is closed.

6.8.2 3.3V_OPTION, 1.5V_E

Both jumpers provide a test pad during production and debugging checking the supply voltages. It is not recommended to change their default positions.

The default positions are closed.

6.8.3 5V_E

The jumper provide a test pad during production and debugging checking the supply voltages. It is not recommended to change its default position. It is also useful if you remove the whole battery part of the board.

The default position is open.

6.8.4 HOST_EN, 5V_E_WIFI, WIFI-3.3V/5V_USB

These jumper provide options to setup the WIFI module to work on 3.3V, and/or the USB host to work on 3.3V. It is strongly not recommended to change the default positions, since then they will be directly powered from source which might cause faults of USB devices when disconnecting them from the hub.

Default positions are:

HOST_EN – open;

5V_E_WIFI – open;

WIFI-3.3V/5V_USB in 5V_USB position.

6.9 Additional hardware components

The components below are mounted on OLinuXino but are not discussed above. They are listed here for completeness:

Reset button – used to reset the board

2×2Gb (512M x 8 bit) DDR3 SDRAM – the memory used in the first revisions of the board was HYNIX H5TQ2G83CFR; we later switched to SAMSUNG K4B2G0846Q

Please note that there are different Debian images for different boards with different hardware – you would need to inspect the DDR3 RAM memory markings and use the image suitable for your board. Previously we used HYNIX H5TQ2G83CFR, now we use SAMSUNG K4B2G0846Q.

(Boards manufactured after 01.08.2017) 8GB NAND flash – 1×64Gb (8192M x 8 bit) NAND flash – the exact memory is Micron MT29F64G08CBABAWP - only present in newer releases of A13-OLinuXino-WIFI

(Boards manufactured before 01.08.2017) 4GB NAND flash – 1×32Gb (4096M x 8 bit) NAND flash – the exact memory is HYNIX H27UBG8BTR – only present in older builds of A13-OLinuXino-WIFI

LED1 + CHLED + PWR_LED – GPIO LED + battery charger activity LED + power-on LED

CHAPTER 7: SCHEMATICS

7. Introduction to the chapter

In this chapter are located the schematics describing logically and physically A13-OLinuXino.

7.1 Eagle schematic

OLinuXino schematics may be found it on the OLinuXino's GitHub repository: https://github.com/OLIMEX/OLINUXINO/tree/master/HARDWARE/A13-OLinuXino. You can download the whole repository as .zip without having a GitHub account.

We mostly use Eagle by Cad Soft 4.16r2 for designing. However, the files should be compatible with the latest Eagle available. Cad Soft offers a trial version of their software that allows you to inspect schematics and board files (without being able to modify them).

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If you are looking for a schematic of an older revision of the board and it isn't available at our web site you may request it by the support e-mail.

Note that A13-OLinuXino-WIFI has all the components shown in the schematics. The stripped down version (A13-OLinuXino, without the -WIFI part) lacks two components: the NAND memory and the embedded WIFI module RTL8188CU. To reduce this document's size only one of the schematics is listed on the next page.
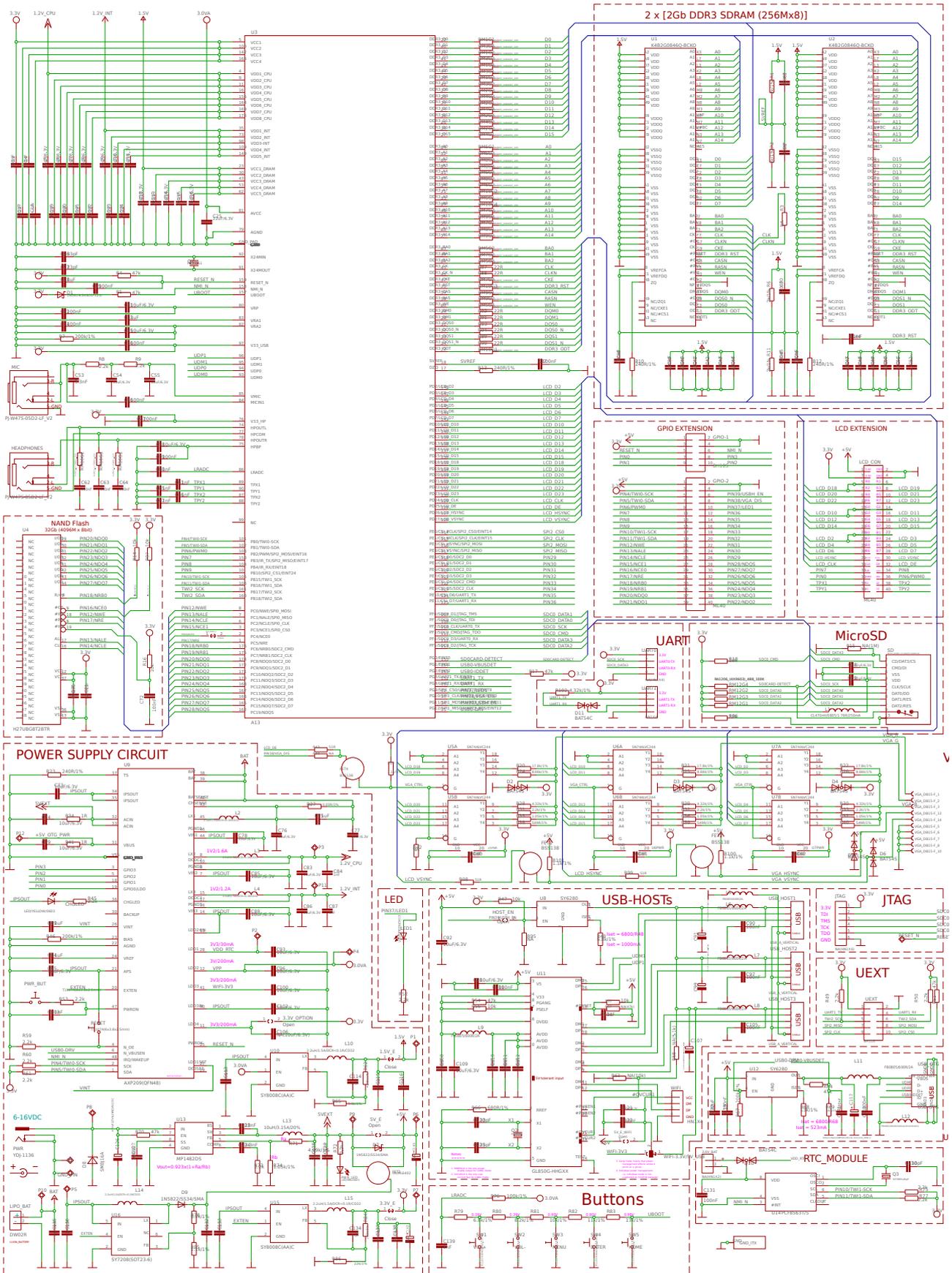
7.2 Physical dimensions

Note that all dimensions are in mils.
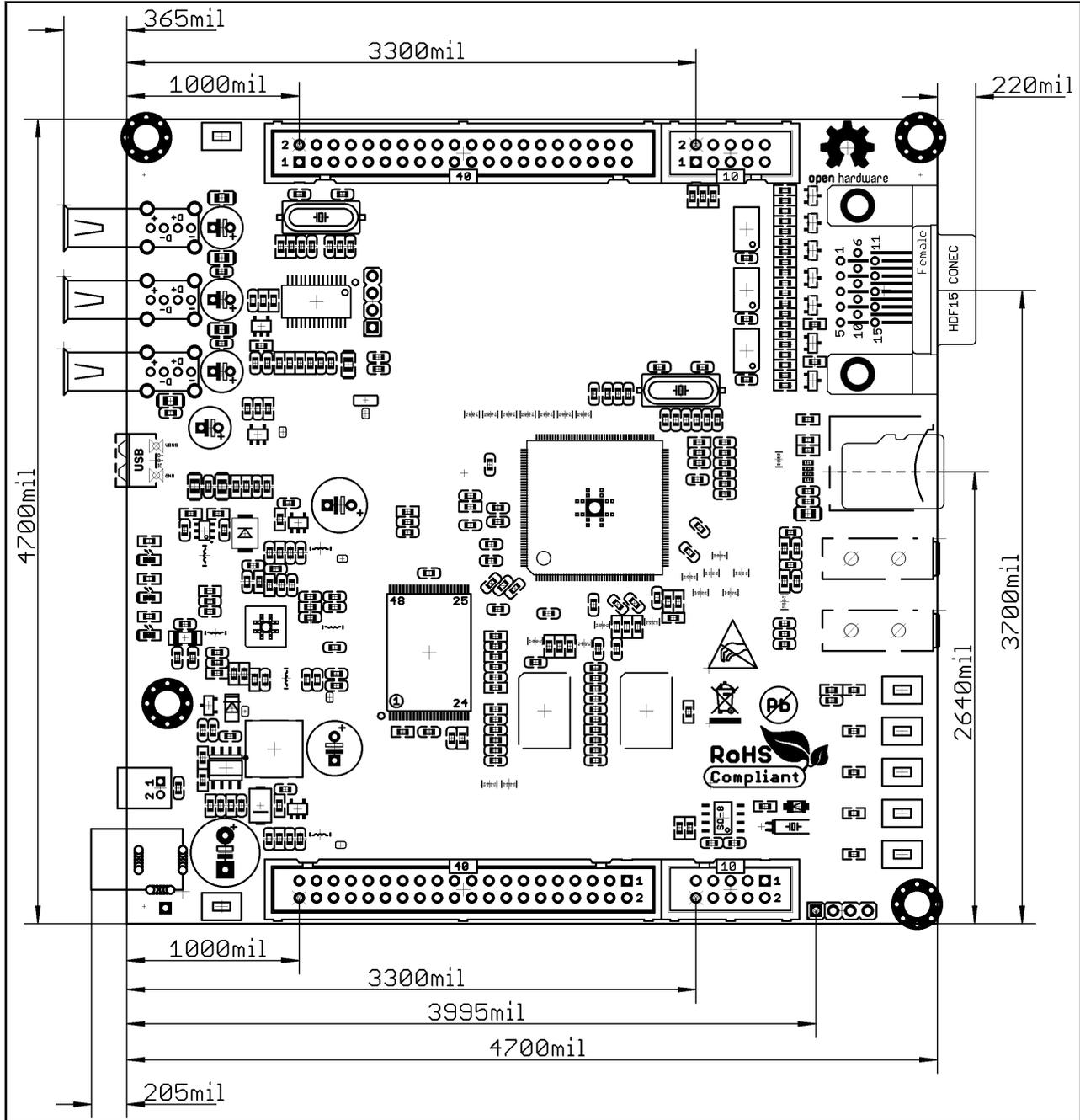
The three highest elements on the board in order from the tallest to the shortest are: capacitor C126 – 650mils, the three USB hosts – 500mils, the VGA connector – 475mils

CHAPTER 8: REVISION HISTORY AND SUPPORT

8. Introduction to the chapter

In this chapter you will find the current and the previous version of the document you are reading. Also the web-page for your device is listed. Be sure to check it after a purchase for the latest available updates and examples.

8.1 Document revision

Revision	Changes	Modified Page#
A, 19.09.12	Initial Creation	All
B, 21.09.12	Page 9 – Fixed several errors in voltage requirements and power consumption	9
C, 24.09.12	Pages 8, 9 – Fixed a typo of the wattage required Page 11 – Added info how to change the configuration of the Android image	8, 9, 11
D, 26.09.12	Pages 9, 19 – added important note about powering down Pages 13, 14 – changed the default config file	9, 13, 14, 19
E, 31.10.12	Pages 9, 10, 37 – added info about Android images Page 29 – fixed erroneous information about CE_NAND_E Various pages – made it clear that the standard version lacks NAND and WIFI	9, 10, 29, 37
F, 21.03.13	Pages 9, 19 – added info about LiveSuit and cleared the instructions Page 29 – fixed erroneous memory descriptions Pages 20, 22 – added some multiplexing notes for clarity Pages 33, 34 – updated board revisions Various pages- updated several links	9, 19, 20, 22, 29 33, 34
G, 03.11.14	Added new Allwinner boards Added GPIO, I2C and SPI information Page 35 – manual revision updated Page 36 – board revision	6, 14, 16, 36
H, 18.02.15	Added information about different DDR3 memories and the fact that they require different Debian image	31
I, 11.02.16	Added clarifications that A13-OLinuXino-WIFI no longer comes with Android loaded in the NAND	10
J, 09.10.17	Added info about the new 8GB NAND memories in A13-OLinuXino-WIFI	5, 32

8.2 Board revision

Remember to check the schematics and the board design files to compare the differences.

Revision	Notable Changes
B	Initial release of the board
C	1. Fixed the VGA problem with development edition; 2. changed UART1 to UART0 and added new UART1; 3. added SMD jumper to be able to disable CS if you wish to boot from SD card in future; 4. JTAG signals are on led to pads; 5. added test pads for the voltage of all regulators; 6. moved couple of elements for better distance between each other
D	1. Removed resistor matrices, except the ones near DDR3 memories – to lower production fault rates and improve repair-ability of the boards 2. Added header NA(HN1X2) so you can power only the RTC from external battery 3. BAT54C is added to allow RTC powering either from VDD_RTC or 3.0V_BAT
E	1. Added BAT54C after Rx to UART1 connector 2. Added 4.32k pull-up resistor on the RX line 3. Changed wrong prints of the revision and the Olimex web-site 4. Some libraries updated and some component prints removed due to space restrictions 5. Optimization of R10, R12, R13 with (239R/1%) value to 330R/1%
F	1. Changed the SD card package with a more easier to replace one 2. Changed to package of the 32768 quartz crystal with an SMD type
G	1. Updated component libraries 2. Some of the boards might use the new SAMSUNG memory – these require different Debian image

8.3 Useful web links and purchase codes

The web page you can visit for more info on your device is
https://www.olimex.com/Products/OLinuXino/A13/A13-OLinuXino-WIFI/.

A place for general questions, FAQ or friendly talk check our forums:
https://www.olimex.com/forum/

Links to some of the ready images are available in the wiki: https://www.olimex.com/wiki/A13-OLinuXino

You can get the latest updates on the software at: https://github.com/OLIMEX/OLINUXINO.

ORDER CODES:

A13-OLinuXino-WIFI – the full version of A13-OLinuXino with added NAND memory (Android image) and MOD-WIFI_RTL8188
A13-OLinuXino – the lite version of A13-OLinuXino with no external NAND and no embedded internet interface

USB-SERIAL-CABLE-F – USB serial console cable for connecting to UART1

SY0612E – power supply adapter 12V/0.5A for A13-OLinuXino and A13-OLinuXino-WIFI
BATTERY-LIPO1400mAh – battery capable of powering A13-OLinuXino-WIFI for a couple of hours (4+ hours standby with WiFi on)

How to order?

You can order directly from our online shop or from any of our distributors. The list of distributors is found here: https://www.olimex.com/Distributors/.

Check https://www.olimex.com/ **for more info.**

8.4 Product support

For product support, hardware information and error reports mail to: support@olimex.com. All document or hardware feedback is welcome. Note that we are primarily a hardware company and our software support is limited. Please consider reading the paragraph below about the warranty of Olimex products.

All goods are checked before they are sent out. In the unlikely event that goods are faulty, they must be returned, to OLIMEX at the address listed on your order invoice.

OLIMEX will not accept goods that have clearly been used more than the amount needed to evaluate their functionality.

If the goods are found to be in working condition, and the lack of functionality is a result of lack of knowledge on the customers part, no refund will be made, but the goods will be returned to the user at their expense.

All returns must be authorized by an RMA Number. Email support@olimex.com for authorization number before shipping back any merchandise. Please include your name, phone number and order number in your email request.

Returns for any unaffected development board, programmer, tools, and cables permitted within 7 days from the date of receipt of merchandise. After such time, all sales are considered final.

Returns of incorrect ordered items are allowed subject to a 10% restocking fee. What is unaffected? If you hooked it to power, you affected it. To be clear, this includes items that have been soldered to, or have had their firmware changed. Because of the nature of the products we deal with (prototyping electronic tools) we cannot allow returns of items that have been programmed, powered up, or otherwise changed post shipment from our warehouse.

All returned merchandise must be in its original mint and clean condition. Returns on damaged, scratched, programmed, burnt, or otherwise 'played with' merchandise will not be accepted.

All returns must include all the factory accessories which come with the item. This includes any In-Circuit-Serial-Programming cables, anti-static packing, boxes, etc.

With your return, enclose your PO#. Also include a brief letter of explanation of why the merchandise is being returned and state your request for either a refund or an exchange. Include the authorization number on this letter, and on the outside of the shipping box.

Please note: It is your responsibility to ensure that returned goods reach us. Please use a reliable form of shipping. If we do not receive your package we will not be held liable.

Shipping and handling charges are not refundable. We are not responsible for any shipping charges of merchandise being returned to us or returning working items to you.

The full text might be found at https://www.olimex.com/wiki/GTC#Warranty for future reference.

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