A20-SOM-EVB
Shield of peripherals

USER'S MANUAL

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Designed by OLIMEX Ltd, 2014

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CHAPTER 1: OVERVIEW

1. Introduction to the chapter

Thank you for choosing this expansion board from Olimex! This document provides a user's guide for the A20-SOM-EVB 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.

A20-SOM-EVB lacks a main processor. That is why it is typically used together with A20-SOM. A20-SOM-EVB is a hardware extension to another Olimex board – A20-SOM. This extension board provides most of connectors and peripherals needed for a full evaluation of the A20 processor.

A20-SOM itself features the main processor and enables code development of applications running on the A20 microcontroller, manufactured by Allwinner Technology from China.

In our web-shop the product named "A20-SOM-EVB" includes two items – A20-SOM-4GB and A20-SOM-EVB.

A20-SOM-EVB board is an open-source, open-hardware project and all documentation is available to the customer.

The hardware design of A20-SOM development board is considered intellectual property of Olimex. The hardware design files are considered copyright material and would not be distributed.

The software support for both boards is open-source and released under GPL license.

1.1 Introduction to SOM (System-On-a-Module)

OLIMEX System-on-Module (SOM) boards are powerful Linux-capable boards. They follow a low-cost modular design which allows rapid product development. Each of these boards has two parts – a main part which nests the processor, the memory, and the power control unit and the peripheral part which contains the USB ports, the video output and most of the connectors. SOM designs are targeted at customers who want to apply custom modifications and own solutions based on a specific processor without having to deal with multi layer PCBs with controlled impedance and BGA assembly. This makes it possible to create simple boards (that might be manufactured by your local board manufacturer) containing only the peripherals you need with the dimensions and shape suitable for your specific solution.

Both the main part and the peripheral part of the SOM system have support in the official Android and Debian images distributed by Olimex and maintained by Olimex and the Linux community. These images are typically available at the wiki articles of the boards.

The peripheral part of the SOM design is considered Open Source HardWare (OSHW) and the customer has access to the board source files that we used to manufacture it. The part of the design that has the main microcontroller is considered proprietary design and design files would not be shared. If you are looking for open source design of the processors used please check the

OLinuXino boards. OLinuXino board designs are fully open source but harder to implement in own solutions and require more of a hardware experience to do so. Nevertheless, OLinuXino boards are pretty good choice for evaluating the capabilities of the embedded processors.

1.2 Target market of the board

A20-SOM-EVB is typically used altogether with A20-SOM. As mentioned in the previous chapter the board is meant to serve as an example that helps the customer in creating custom board of peripherals. In that case, the board's target market is suitable for embedded programming enthusiasts, Linux and Android gadget fans (they can just use the board as a media center or fully functional Linux-PC, for instance) and also professionals (since its low cost makes it very good solution for application-orientated embedded systems). The reason is the additional hardware that A20-SOM-EVB – it provides direct HDMI output and easier ways to connect peripherals to the board. Generally, the processors features become easy-to-access.

It is highly recommended to use A20-SOM-EVB with A20-SOM initially, unless you have previous experience with either SOM or OLinuXino boards manufactured by OLIMEX.

If you are not interested into implementing the A20-SOM design into your own production it might be a better idea to take a look at the OLinuXino boards (like A20-OLinuXino-MICRO or A20-OLiuXino-LIME2).

1.3 Features of A20-SOM-EVB

The product called A20-SOM-EVB includes both A20-SOM-EVB (board of peripherals) and A20-SOM-4GB (main board).

The board of peripherals A20-SOM-EVB has the following set of features:

- A20-SOM(-4GB) matching connectors
- VGA output with a connector
- HDMI output with a connector
- LCD output on a row-of-pins
- Gigabit interface with a connector
- Camera 2 Mpix
- 2xUEXT connectors
- SATA connector and SATA power connector
- USB-OTG with power control and current limiter
- LiPo Battery connector with battery-charging capabilities
- Mic input and headphones out with connectors
- Android 7 buttons
- SD-MMC connector
- UART0 connector for console debug
- 5 GPIO connectors x40 pin 0.1"
- Status LEDs
- 4×M3×8mm screws and 4×M3×6mm metal spacers
- Dimensions of the A20-SOM-EVB: (5300×4050)mil ~ (134.62×102.87)mm

1.4 Board versions used in the manual

The documents follows the hardware layout of A20-SOM-EVB board revisions C.

Different board revisions might have different features or settings. It is possible that parts of this document do not apply to all board revisions.

1.5 Document organization

Each section in this document covers a separate topic, organized as follows:
   – 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 is an explanation of the control circuitry associated with the microcontroller
   – Chapter 5 covers the connector pinout, peripherals and jumper description
   – Chapter 6 provides the schematics and the dimensions of the board
   – Chapter 7 contains the revision history, useful links and support information

CHAPTER 2: SETTING UP THE A20-SOM-EVB BOARD

2. Introduction to the chapter

This section helps you set up the extension 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 and electrical polarity warning

A20-SOM-EVB boards are 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.

Ensure that your development board gets attached to properly working hardware. For example, it is common for cheap HDMI monitors to lack grounding. Avoid TVs which have no grounding on their power supply cable! If you can't avoid them try to add the grounding yourself, if this is not possible please use USB-ISO to save your development board from potential over voltage.

If you connect other electrical devices to the SOM board make sure that they have equal electrical polarity. For example, when you connect an HDMI cable between a TV and the A20-SOM-EVB board it is a good idea to have them both connected to the same electrical source (to the same utility power socket). This might be said for a serial cable connected between a PC and the board's DEBUG port. In rare cases different polarity might cause hardware damage to the board.

2.2 Requirements

In order to set up the A20-SOM-EVB board optimally one or more additional items may be needed. They might be generally placed in two categories:

Required – items that are needed in order to achieve minimum functionality;
Recommended – items that is good to have in order to be able to interact with the most important of the features of the board;
Additional – items that provide access to additional features or expand the features of the board.

Required items:

- A20-SOM or A20-SOM-4GB – the main board featuring the A20 processor.

AN A20-SOM-4GB BOARD IS INCLUDED IN A20-SOM-EVB PRODUCT BY DEFAULT, NO NEED TO ORDER IT SEPARATELY.

- External power supply unit capable of providing voltage between 6V and 16V with proper connector – A20-SOM-EVB has a female DC barrel jack, suitable for 6-16V power supply
- Output device and hardware to connect to the output device – there are different ways to interact with the board, refer to chapter "2.5 Interacting with the board" for more information

Recommended items:

- <u>SD card with compatible image</u> – if you intend to boot the official Debian image you would need a blank microSD card with at least 8GB of storage or more. Preferably a class 10 card. If you have A20-SOM board with NO additional NAND memory you will need a microSD card for one of the images available. Official Android and Debian images are available at the wiki article for the board.

Additional items:

- Small heatsink for the processor **–** during long video playbacks the A20 processor might heat up
- External 2.5" SATA hard disk drive (proper cables sold separately)
- Ethernet cable for wired Ethernet

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

SY0612E – reliable power supply adapter 50Hz (for EU) 12V/0.5A
SY0612E-CHINA – cheaper power supply adapter 50Hz (for EU) 12V/0.5A

USB-SERIAL-CABLE-F – female USB serial console cable – provides the easiest way of debugging
LCD-OLINUXINO-4.3TS – low-cost 4.3" LCD display with touchscreen component – 480×272
LCD-OLINUXINO-7TS – low-cost 7" LCD display with optional touchscreen component – 800×480
LCD-OLINUXINO-10TS – low-cost 10" LCD display with optional touchscreen component – 1024×600
LCD-OLINUXINO-15.6 – low-cost 15.6" LCD display – 1366×768
LCD-OLINUXINO-15.6FHD – low-cost Full HD 15.6" LCD display – 1920×1080
CABLE-IDC40-15cm – a cable used to connect an LCD display to the board; compatible with Olimex-made LCD displays
SATA-HDD-2.5-500GB – 5GB 2.5" SATA hard disk, can be powered by the board
SATA-CABLE-SET – cables that allow the connection of a 2.5" hard disk to the board

2.3 Powering the board

A20-SOM gets evaluated when mounted on A20-SOM-EVB. In this case the former is powered via the latter. The power line, altogether with a number of other important processor lines, is transferred via the 40-pin headers. A20-SOM receives power from A20-SOM-EVB, but what are the requirements to power A20-SOM-EVB?

You need to provide 6V to 16V DC voltage to the power jack (named PWR) of A20-SOM-EVB board. 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

Do not provide AC voltage to the A20-SOM-EVB board! Do not provide more than 16V of voltage to the A20-SOM-EVB board!

The typical consumption of A20-SOM-EVB + A20-SOM is between 150mA @ 12V and 250mA @ 12V depending on the processor's current load.
For the European customers, we also stock and sell basic power supply adapters, please check

chapter 2.2.

The default username/password combination for the default Linux image on the SD card (if purchased) is: root/olimex.

Note that it is normal that when the board is powered some integrated circuits might appear hotter than others. This is perfectly normal for some chips – for instance – the voltage regulators and the main processor.

2.4 Button functions

The buttons of A20-SOM-EVB are listed below. They are usually supported under Android only:

VOL+
VOL-
MENU
SEARCH
HOME
ESC
ENTER

The three buttons located on the A20-SOM can also be used while the board is mounted over A20-SOM-EVB. These buttons are:

PWR_BUT – used to perform software turn off, software turn on; used to turn on board when powered by battery – has to be held down for at least 5 seconds to perform each action

RECOVERY – used to wake up the board from sleep

RESET – used for hardware reset of the board – before using it, please refer to the note below

It is always recommended to perform a soft "turn off" of the A20 board. If that is not possible then please hold PWR button down for a few seconds to "turn off the board". Then you are free to remove the power supply.

If you disconnect the power supply (either the USB, the battery or the power jack) before turning off the board you may corrupt your SD card. If your board has NAND memory you can corrupt the image located on the NAND memory.

2.5 Accessing the board

The typical and recommended way of interacting with A20-SOM board is via a serial cable connected between the UART0 header and a personal computer. You would probably need a cable suitable for such a connection due to the fact that most personal computers lack a serial port nowadays. Even if you have serial port you should respect the CMOS levels of the board which are incompatible with the TTL levels of your computer. We distribute a ready-to-use plug-and-play cable – it is called USB-SERIAL-CABLE-F. Even if you already have such a cable or you decide to purchase it elsewhere it is advisable to check this product page for a reference: https://www.olimex.com/Products/Components/Cables/USB-Serial-Cable/USB-Serial-Cable-F/

There are two locations where the serial cable can be attached – the first one is located on the A20-SOM board, the other one at the A20-SOM-EVB. Both connectors are named UART0 but the first one consists of 5 pins while the second one consists of 3 pins only.

In case you want to use the interface located at the A20-SOM board then connect: RX line to UART0-TX pin; TX line to UART0-RX pin; GND to GND.

If you want to use the one located on the A20-SOM-EVB – the three pins RX, TX and GND are located near the HDMI connector.

After the hardware connection is established, open a terminal program on the serial (COM) port which the cable is associated with. The typical baud rate is 115200, the rest of the settings should be left as per default.

After everything else is set, you would need to power the board as explained in "2.3 Powering the board". At this point you should see the boot messages in your terminal window and a successful boot would leave you in the command line interface of the Debian Linux.

When the A20-SOM is attached to A20-SOM-EVB, in addition to the serial communication, you might also use one or more of the following mediums to interact with the board:

1. a monitor via HDMI connector
2. a monitor via the VGA connector
3. SSH via the mini USB connector trough a mini USB cable
4. SSH with a remote computer via LAN connector
5. a display via LCD_CON connector

More details on each of the connections might be found in the consequent sub-chapters.

Note that not all interface options are available for all images. Furthermore, some of the ways of interaction are not suitable for Android OS. The official Debian image should give you the most possible options of interfacing the board!

Using HDMI, LCD_CON or LAN might require additional configurations. Furthermore, it is possible to corrupt the output settings over those interfaces and, thus, lose the output. In such cases, you can always use the serial cable USB-SERIAL-CABLE-F as a reliable way to establish connection to the board.

2.5.1 HDMI monitor

All official Debian and Android images for A20-SOM have HDMI output enabled by default. The board would work out-of-the-box with a native HDMI monitor (if you use A20-SOM + A20-SOM-EVB altogether with one of the official images from the board's wiki article).

Make sure to use a tested HMDI cable.

The default HDMI resolution in the official images is 720p60 (1280×720p at 60Hz). In order to change that setting the video output on the LCD display you would need to run a configuration script (if you use Debian Linux) or download a suitable image (if you use Android). Video output settings are hard-coded in Android images but there are ways to edit the images. You might more information about editing pre-built Android images at this wiki article: how to edit prebuilt Android images.

More information about the video output settings and the usage of video settings script might be found in A20-SOM's user's manual ("2.7 Changing the default image resolution")

2.5.2 VGA monitor

All official Debian images for A20-SOM have the option to for VGA video output via the 15-pin DB VGA connector. The board would work out-of-the-box with a native VGA monitor (if you use A20-SOM + A20-SOM-EVB altogether with one of the official images from the board's wiki article).

More information about the video output settings and the usage of video settings script might be found in A20-SOM's user's manual ("2.6 Changing the default image resolution").

2.5.3 SSH via mini USB cable in Debian

The latest official Debian Linux image allows the use the USB_OTG connector for SSH connection without the need of a LAN cable or a serial cable. You can use a mini USB cable connected between your host PC and the on-board mini USB connector. For connection convenience there is a DHCP server running specifically for USB0 interface. The DHCP server should give IP address to the new USB0 interface of your host PC so you can make SSH connection from your PC to the default board IP address of the USB0 interface – 192.168.2.1.

You can connect to the board using a mini USB cable and an SSH client (for example "puTTY") at address 192.168.2.1.

For Windows operating system – upon connection, the board should show up in "Windows Device Manager" as "RNDIS Ethernet Gadget". You might be asked to install a driver. The drivers can be found online as "RNDIS driver" (Remote Network Driver Interface Specification). The drivers are provided by Microsoft and they should be available for every Windows distribution – refer to the respective files and articles provided by Microsoft on how to install the required drivers.

2.5.4 SSH via Ethernet

By default the board IP address is 192.168.1.254. This allows you to connect to the board using an SSH client (for example "telnet" or "puTTY") then you have to use this address. You can change this address in /etc/network/interfaces file.

Note that for internet connection you have to set your gateway address in /etc/network/interfaces file and you have to set your DNS server in /etc/resolv.conf (for example "nameserver 192.168.1.1").

The port used for the connection the default one – port 22.

2.5.5 LCD display

One of the ways to interact with the board is via an external display (with or without touchscreen component). The 40-pin male connector LCD_CON has the typical 0.1" pin step. All Olimex displays have corresponding 40-pin male connector. You would only need a 0.1" female-female cable for the hardware connection.

In order to get the video output on the LCD display you might need either to run at least once a configuration script (if you use Debian Linux) or download a suitable image (if you use Android). Video output settings are hard-coded in Android images. More information about the video output settings and the usage of video settings script might be found in A20-SOM's user's manual ("2.6 Changing the default image resolution").

The displays recommended for the board at the moment of writing might be found in the table below:

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-4.3TS	4.3	480×272	Yes	No	[Product page](#)
LCD-OLinuXino-7	7	800×480	Yes	Yes	[Product page](#)
LCD-OLinuXino-7TS	7	800×480	Yes	Yes	[Product page](#)
LCD-OLinuXino-10	10.1	1024×600	Yes	Yes	[Product page](#)
LCD-OLinuXino-10TS	10.1	1024×600	Yes	Yes	[Product page](#)
LCD-OLinuXino-15.6	15.6	1366×768	Yes	No	[Product page](#)
LCD-OlinuXino-15.6FHD	15.6	1920×1080	Yes	No	[Product page](#)

The displays whose names contain "TS" - include a resistive touch screen component.

Each of the displays listed in the table above has a connector suitable for a cable that can be purchased from Olimex:

CABLE-IDC40-15cm – 15cm long cable suitable for 0.1" step connectors – [Product page](#)

2.6 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 helpful document on A20's GPIO usage might be found here:
http://www.py6zgp.com/download/A20-GPIO.pdf – the document was created by Dr. Guido Pelz.

2.7 I2C and SPI under Debian

I2C and SPI are both supported in the latest Debian releases. There is a python module called pyA20SOM, which also might be found here: https://pypi.python.org/pypi/pyA20SOM

At the same web address you would also find information on how the library is used.

2.8 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/A20-SOM.

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/.

The official images are a constant work-in-progress – newer releases are packed with better hardware support, newer kernels and extra features.

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: 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 A20-SOM-EVB board itself.

Only the top side of the board is shown since there is only the SD/MMC card connector at the bottom.

3.1 Layout (top view)

The picture below shows the top side of the C hardware revision of the A20-SOM-EVB board with A20-SOM attached. The picture highlights the most important parts.
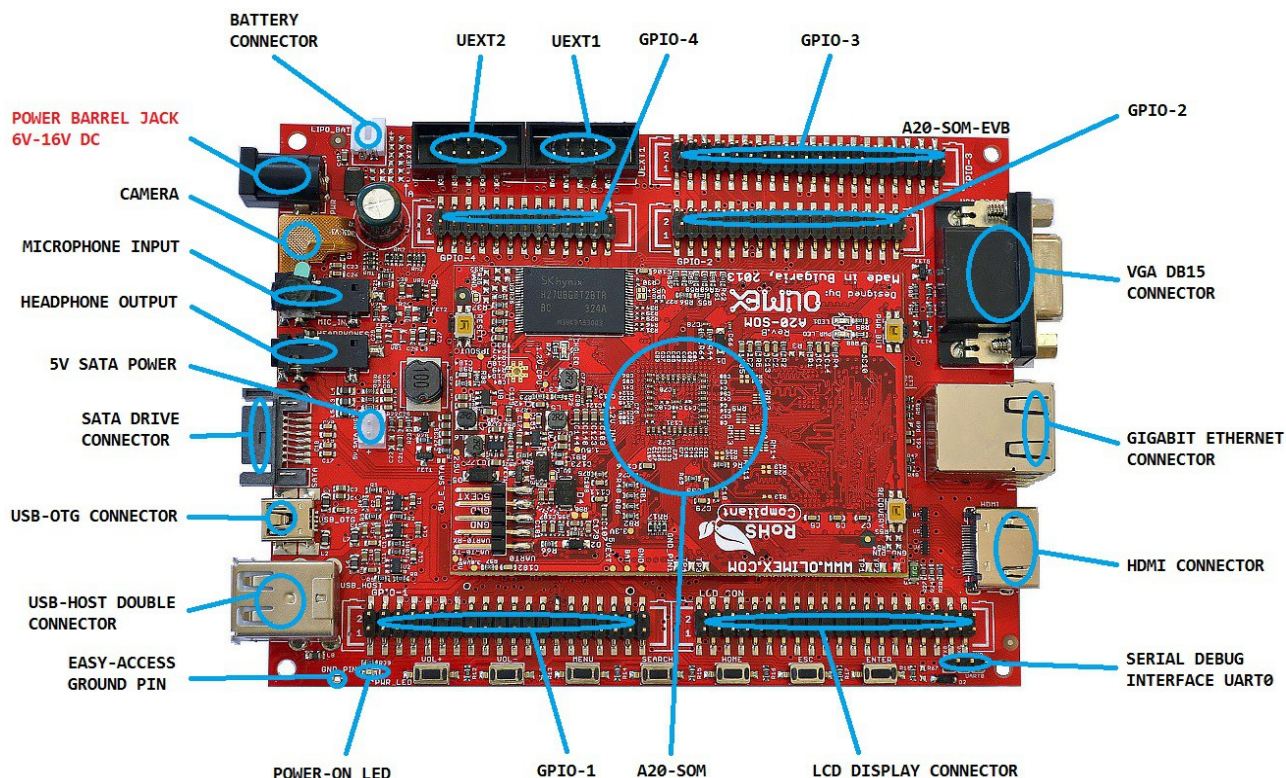
CHAPTER 4: CONTROL CIRCUITY

4. Introduction to the chapter

Here you can find information about reset circuit and quartz crystals locations on the A20-SOM-EVB, the power supply circuit is also briefly discussed. For more information on the control circuitry of the A20-SOM + A20-SOM-EVB, make sure to also check on the documentation available for A20-SOM.

4.1 Reset

The board doesn't extend the reset features of the A20-SOM. The reset is handled by the A20-SOM.

4.2 Clocks

The only quartz located on A20-SOM-EVB is the one associated with the Gigabit Ethernet transceiver – RTL8211CL-GR. The quartz is the 25MHz/20pF/20ppm/5×3.2mm Q1.

4.3 Power supply circuit

A20-SOM-EVB extends the power supply options over A20-SOM. It provides a barrel jack for external powering, a LIPO connector for battery powering, and a mini USB that can also power the board.

There are three possible ways of powering A20-SOM-EVB:

- providing 6-16V DC at the power jack
- using the USB_OTG interface to provide 5V
- connecting a charged 3.7V Li-Po battery to the LIPO_BAT connector
- providing 5V DC at pin #1 of any of the GPIO connectors

The recommended way of powering the board is via the PWR jack with 6-16V DC with a power of 5W (e.g. 6Vx0.8A; 16Vx0.3A). This will make the board fully powered and able to supply all the peripherals connected to it.

Important: Not all USB ports would be able to provide enough power for the board. Try using another USB port/USB hub or a cable of higher quality. Do not rely on the USB_OTG as a single power source!

The power supply is handled mainly by AXP209 power management system, an Allwinner chip that goes together with the A20 processor. It is located on the A20-SOM board but since it is relatively hard to find we also sell it separately (if you have provided over voltage and want to repair the board yourself).

The consumption of the combination A20-SOM + A20-SOM-EVB is between 0.10A and 0.15A when A20-SOM-EVB is connected to a 12V voltage source (provided at the board's PWR jack). During heavy load of the processor the consumption might raise up to 0.20A @ 12V (tested with

'top d0'). The current consumed might have peaks as high as 0.25A @ 12V during start-up when different modules are initialized.

CHAPTER 5: CONNECTORS AND PINOUT

5. Introduction to the chapter

In this chapter are presented the connectors that can be found on the A20-SOM-EVB board all together with their pinout and notes about them. For the connectors available at the A20-SOM board, please refer to its own user's manual. Jumpers functions are described. Notes and info on specific peripherals are presented. Notes regarding the interfaces are given.

5.1 UART0 pins

The direct communication method to the heart of the setup (A20-SOM + A20-SOM-EVB) is via the serial interface. Such interface is available at the UART0 connector (three male pins near the edge of the board). It is capable of interfacing the COM port of your computer with the help of your favorite terminal program (puTTy, minicom, picocom, teraterm, etc). You can use USB-SERIAL-CABLE-F to interface UART0 – that allows you to debug the board with a personal computer with a free USB port. In case of a video output problem a cable might provide the needed feedback and would greatly reduce the efforts needed to repair the board or to adjust the software settings.

If you decide to make your own debugging cable you would need to consider that the levels at board's UART0 are in CMOS level (3.3V) and you would need a convertor to bring them to the TTL level of your computer or cable! That is true for the RX and TX also!

Note that by default only UART0 is defined as a port suitable for serial debug.

For more information please refer to chapter "2.5 Interacting with the board".

UART0 pins pinout			
Pin #	Signal name	Header; pin #	A20 processor pin
1	UART0-TX	A20_CON-GPIO2; 21	A7
2	UART0-RX	A20_CON-GPIO2; 22	B7
3	GND	Any A20_CON-GPIOX; 2	Any GND

Consider table above when connecting the USB-SERIAL-CABLE-F according to the wire color code. The RX line of the cable (GREEN wire) should go to TX line of the target board; the TX line of the cable (RED wire) should go to the RX line of the target board. The BLUE wire should go to the target's GND line.

5.2 UEXT connectors

Universal EXTension (UEXT) is a connector layout which includes power, ground and three popular buses: data UART, I2C, and SPI. The UEXT connector consists of 10 pins, in a two row by five male pin configuration, with a plastic keyed-shroud. All pins have a spacing of 0.1 inch (2.54 mm). The UEXT connectors are typically used as an interface for the Olimex's UEXT modules (usually boards with MOD- prefix in their commercial names).

The general layout of every UEXT connector follows the picture below:
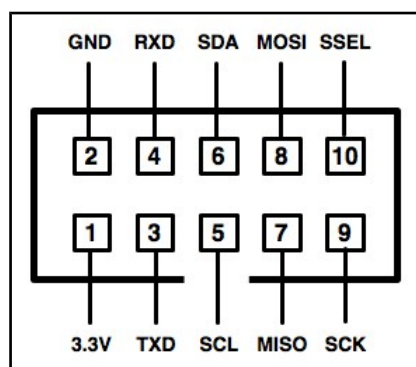
For more information on UEXT please visit:
https://www.olimex.com/Products/Modules/UEXT/resources/UEXT.pdf

A20-SOM-EVB has two UEXT connectors. Hardware-wise each of them has its own UART, own I2C and own SPI. The pinout of the connectors might be found in the following sub-chapters.

5.2.1 UEXT1

UEXT1* connector pinout							
Pin#	Signal name	Header; pin#	A20 pin	Pin #	Signal name	Header; pin#	A20 pin
1	3.3V	A20_CON-GPIO1–A20_CON-GPIO4; 3	-	2	GND	Any A20_CON-GPIOX; 2	Any GND
3	UART6-TX	A20_CON-GPIO4; 27	C16	4	UART6-RX	A20_CON-GPIO4; 28	D16
5	TWI2-SCK	A20_CON-GPIO4; 29	C8	6	TWI2-SDA	A20_CON-GPIO4; 30	C7
7	SPI2-MISO	A20_CON-GPIO4; 31	J20	8	SPI2-MOSI	A20_CON-GPIO4; 32	J21
9	SPI2-CLK	A20_CON-GPIO4; 33	K21	10	SPI2-CS0	A20_CON-GPIO4; 34	L21

*The first column represents the pin number of the signal in the UEXT connector. The second column has the signal name as per hardware design files and schematic. The column named "Header; pin#" shows the exact header pin where the signal might be found. The "A20 pin" column shows where the signal connects with the Allwinner A20 processor – this can be tracked in the A20-SOM's schematic, starting from the header.

5.2.2 UEXT2

Pin#	Signal name	Header; pin#	A20 pin	Pin #	Signal name	Header; pin#	A20 pin
UEXT2* connector pinout
1	3.3V	A20_CON-GPIO1–A20_CON-GPIO4; 3	-	2	GND	Any A20_CON-GPIOX; 2	Any GND
3	UART7-TX	A20_CON-GPIO4; 19	E14	4	UART7-RX	A20_CON-GPIO4; 20	E13
5	PB18/TWI1-SCK	A20_CON-GPIO4; 21	A8	6	PB19/TWI1-SDA	A20_CON-GPIO4; 22	B8
7	SPI1-MISO	A20_CON-GPIO4; 23	D14	8	SPI1-MOSI	A20_CON-GPIO4; 24	E15
9	SPI1-CLK	A20_CON-GPIO4; 25	E16	10	SPI1-CS0	A20_CON-GPIO4; 26	E17

The first column represents the pin number of the signal in the UEXT connector. The second column has the signal name as per hardware design files and schematic. The column named "Header; pin#" shows the exact header pin where the signal might be found. The "A20 pin" column shows where the signal connects with the Allwinner A20 processor – this can be tracked in the A20-SOM's schematic, starting from the header.

5.3 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 6 to 16 volts direct current and the required current may vary depending on the peripherals connected to the board. The power supply you use should be capable of providing at least 500mA of current.

Pin #	Signal name
1	Power input
2	GND
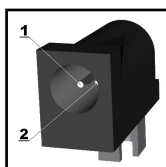
More info about the power supply can be found in chapter 4 of this manual.

5.4 SD/MMC slot

SD/MMC slot is a SD card slot connector, located on the bottom of the A20-SOM-EVB board. It works with the "larger" SD and MMC cards. The connector was placed by a popular demand.

Note that by default this connector is not suitable for booting OS. Such support is possible but not implemented in the official software releases.

SD/MMC card connector				
Pin #	Connector signal name	Wire name	Header; pin#	A20 pin
1	CD/DAT3/CS	SDC3-D3	A20_CON-GPIO5; 10	B16
2	CMD/DI	SDC3-CMD	A20_CON-GPIO5; 12	A18
3	VSS1	GND	Any A20_CON-GPIOX; 2	Any GND
4	VDD	SD_VCC1	Any A20_CON-GPIOX; 3	AXP209**
5	CLK/SCLK	SDC3-CLK	A20_CON-GPIO5; 14	B18
6	VSS2	GND	Any A20_CON-GPIOX; 2	-
7	DAT0/DO	SDC3-D0	A20_CON-GPIO5; 4	A17
8	DAT1/RES	SDC3-D1	A20_CON-GPIO5; 6	B17
9	DAT2/RES	SDC3-D2	A20_CON-GPIO5; 8	A16

**AXP209 – power supply circuit is handled by the AXP209 unit

Additionally, there are the WP and CP (PH0/SDC3-DET#) switches that are responsible, respectively, for sensing whether the card is locked for reading and whether there is a card inserted.

Please note that there is a connector with the same name "SD/MMC" on the A20-SOM board – it works with microSD cards and it is the default connector to boot the board's operating system.

5.5 MIC_IN & HEADPHONES connectors

The part of the schematic related to those connectors is listed below:

Standard MIC_IN jack is mounted for audio input to the board. Note that it is a single channel MIC_IN. The MIC_IN is a mono input.

MIC_IN connector			
Pin #	Signal name	Header; pin#	A20 pin
2	MICIN	A20_CON-GPIO1; 16	AC20
3	MICIN	A20_CON-GPIO1; 16	AC20
5	GND	Any A20_CON-GPIOX; 2	Any GND

The socket can interface standard 3.5 mm phone connector (also known stereo plug or audio plug).

Headphones connector			
Pin #	Signal name	Header; pin#	A20 pin
2	HPOUTL	A20_CON-GPIO1; 12	Y19
3	HPOUTR	A20_CON-GPIO1; 10	W19
5	HPCOM	A20_CON-GPIO1; 14	AA19, AA20
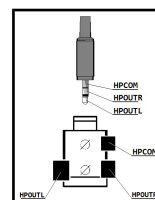
The connector can interface standard 3.5 mm phone connector (also known stereo plug or audio plug).

The default audio output is set to the HDMI connector (for displays and monitors with built-in audio speakers). If you wish to use audio out you need to first disconnect the HDMI, boot the board, connect the audio out device (speakers) and finally connect the HDMI.

The part of the schematic that handles the audio in and out interfaces:
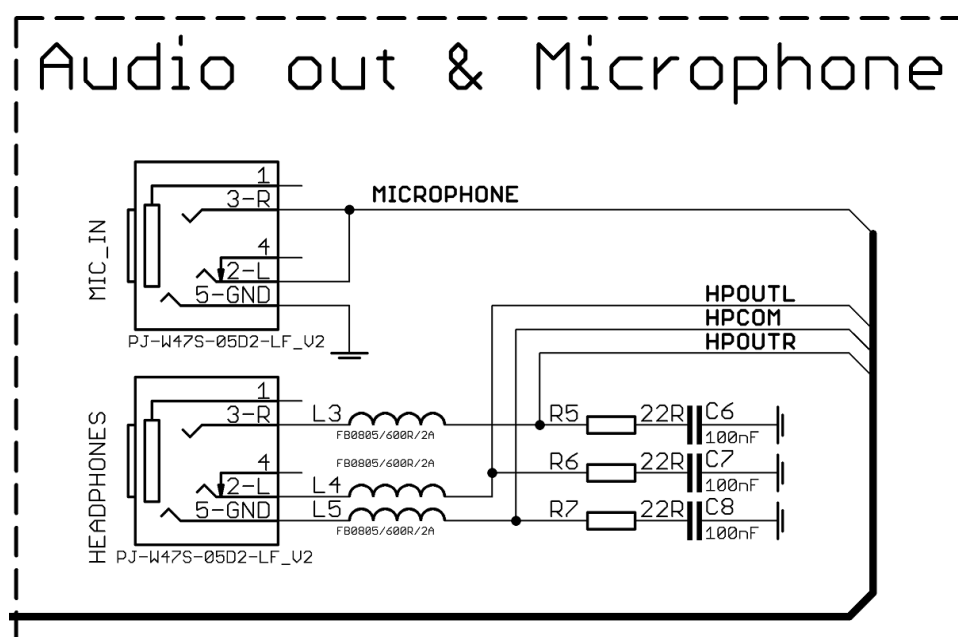
5.6 USB_OTG interface

The USB_OTG interface of A20-SOM-EVB uses USB mini connector.

The main way of changing the firmware image located on the NAND of A20-SOM-4GB is via the USB-OTG connector of A20-SOM-EVB. The connector can also be used for establishing SSH connection to the default Debian Linux of SOM boards (for more information about the tethering please refer to "2.5.3 SSH via mini USB cable in Debian").

The USB_OTG features Low Loss Power Distribution Switch SY6280 which protects the board in case the devices you have plugged to the USB_OTG attempt to draw more current than 523mA combined. The maximum current available on the 5V USB_OTG is exactly 523mA.

The SY6280 responsible for the USB_OTG is enabled by USB0-DRV (processor pin C12), thus the USB_OTG is also controlled by the same signal.

There are two parts of a successful OTG device/host mode switch and usage – hardware part and software part.

The hardware part is the cable – to use the OTG as a host you would need a mini USB to USB adapter cable. Do not confuse micro and mini USB! To use it as a device simply use mini USB to mini USB cable.

The software part is loading a kernel module responsible for the behavior of the board while in device mode. If such software is not enabled or missing in the official distribution – you would need, respectively, either to load the module or rebuild the kernel to enable the module. There are several modules that you might need depending on what your goals are.

Pin #	Signal name	Header; pin#	A20 pin
USB_OTG connector		
1	+5V_OTG_PWR	A20_CON-GPIO1; 5	AXP209**
2	UDM0	A20_CON-GPIO1; 19	N20
3	UDP0	A20_CON-GPIO1; 17	N21
4	USB0-IDDET	A20_CON-GPIO1; 11	B5
5	GND	Any A20_CON-GPIOX; 2	Any GND

*AXP209 – power supply circuit is handled by the AXP209 unit

The connector case is also grounded. The schematic might be seen below:
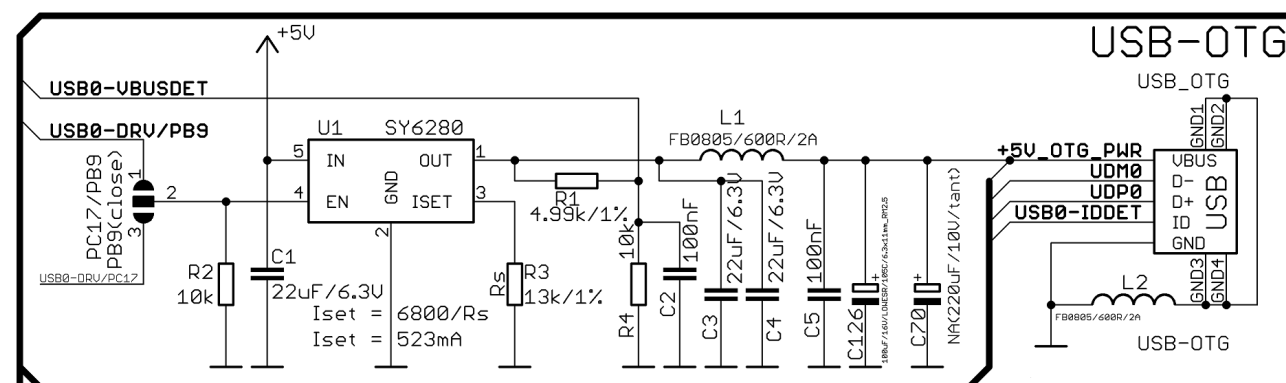
5.7 USB_HOST connector

The USB_HOST connector features two levels – called USB1 and USB2 in the schematic. The connector is situated between the USB_OTG and the HDMI connector. Each of slots them features a low loss power distribution switch SY6280 which protects the board in case the devices you have plugged to each level USB_HOST try to draw more than the allowed current.

Please note the pads of capacitors C222 and C223 where you can solder tantalum capacitors (220uF/18V). If you do so you would be able to increase the stability of the powering by the USB ports when the powered device has high current consumption.

The maximum current available on each slot of the 5V USB_HOST is different! USB1 is capable of providing 1000mA of current; while USB2 is capable of providing only 523mA. If you have a device that draws higher current please plug it into USB1.

The SY6280 responsible for the USB1 is enabled by USB0-DRV1 (processor pin A4).

The SY6280 responsible for the USB2 is enabled by USB0-DRV2 (processor pin A5).

USB_HOST two-level connector							
Pin #	Signal	Header; pin#	A20 pin	Pin #	Signal	Header; pin#	A20 pin
1.1	5V	-	-	2.1	5V	-	-
1.2	UDM1	A20_CON-GPIO1; 23	P20	2.2	UDM2	A20_CON-GPIO1; 27	R20
1.3	UDP1	A20_CON-GPIO1; 21	P21	2.3	UDP2	A20_CON-GPIO1; 25	R21
1.4	GND	Any A20_CON-GPIOX; 2	Any GND	2.4	GND	Any A20_CON-GPIOX; 2	Any GND

The GND is common for both levels of the USB_HOST. The part of the schematic related to the USB hosts is shown below:
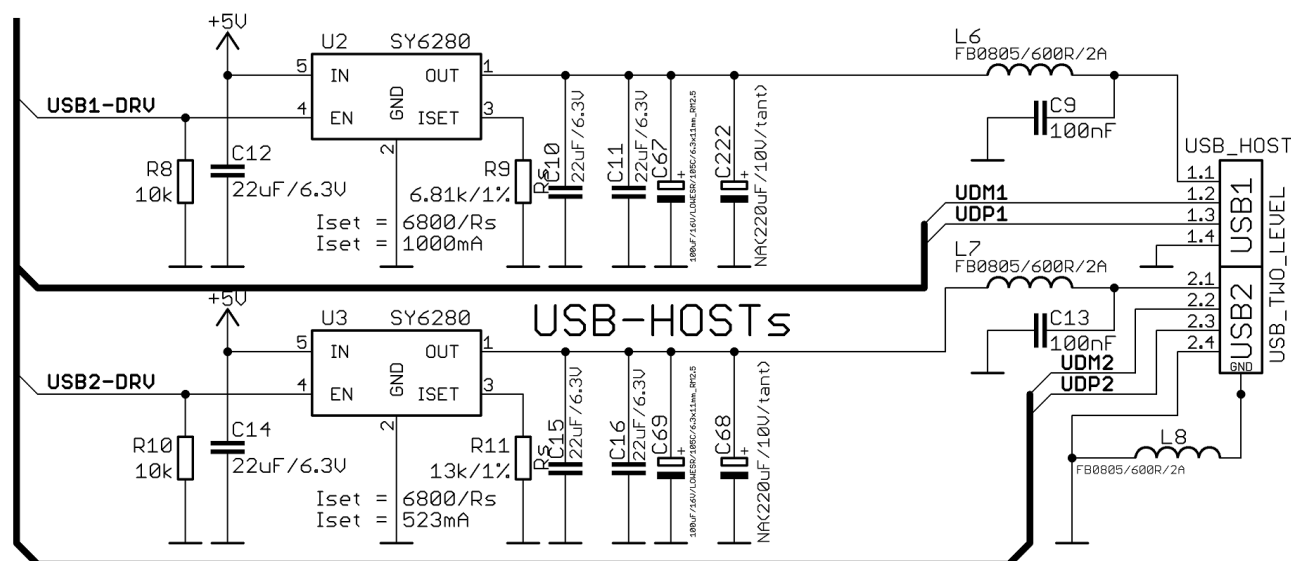
5.8 Gigabit Ethernet

The LAN connectivity is handled by Realtek's RTL8211CL. It is capable of transmission rate up to 1Gbps over industry standard CAT.5 UTP cable with BER less than 10-10 in 1000Base-T. The controller is compatible with some of the major industry standards. It complies with 1000Base-T IEEE 802.3ab; 100Base-TX IEEE 802.3u; 10Base-T IEEE 802.3; and IEEE 802.3 RGMII; among others.

The Ethernet connector is grounded according to the standard (check GND1 and GND2 lines on the schematics).

If you use Linux then the Ethernet connector might be used for SSH connection to the board. If you lack any other option for debugging it might be hard to guess the correct IP of the board since it has DHCP enabled by default (especially if you are in a large network). It is good idea to check the default settings by exploring the Linux image settings. Those are usually stored in:

/etc/network/interfaces

For DHCP you need to enable auto detection and dhcp as shown below:

auto eth0
iface eth0 inet dhcp

For setting a static address please follow the pattern below:

auto eth0
iface eth0 inet static
address 192.168.1.5
netmask 255.255.255.0
gateway 192.168.1.254

The EEPROM memory may be used to store the MAC address.

Important: In some Debian images it is possible that the Ethernet doesn't get auto-detected during boot-up. This is done on purpose because if there is auto-detection enabled and you don't want to use the Ethernet connector or you have forgotten to plug a cable the start-up would be greatly delayed. This might be problem in the first start-up to users counting only on SSH connection. You can enable the Ethernet after a successful boot-up with:

ifconfing -a
dhclient eth#(as seen after after the ifconfing command)

Important: You can configure static/DHCP-given IP addresses in /etc/network/interfaces

LED		
LED	Color	Usage
Bi-color LED1	Orange/Green	Speed status/Link status
Single color LED2	Yellow	Activity status

*The speed status of LED1 (typically indicated by the orange color of the bi-color LED1) is not available. Only the link status indicated by the green LED is available currently.

5.9 HDMI connector

The part of the schematic that describes the HDMI module is shown below:
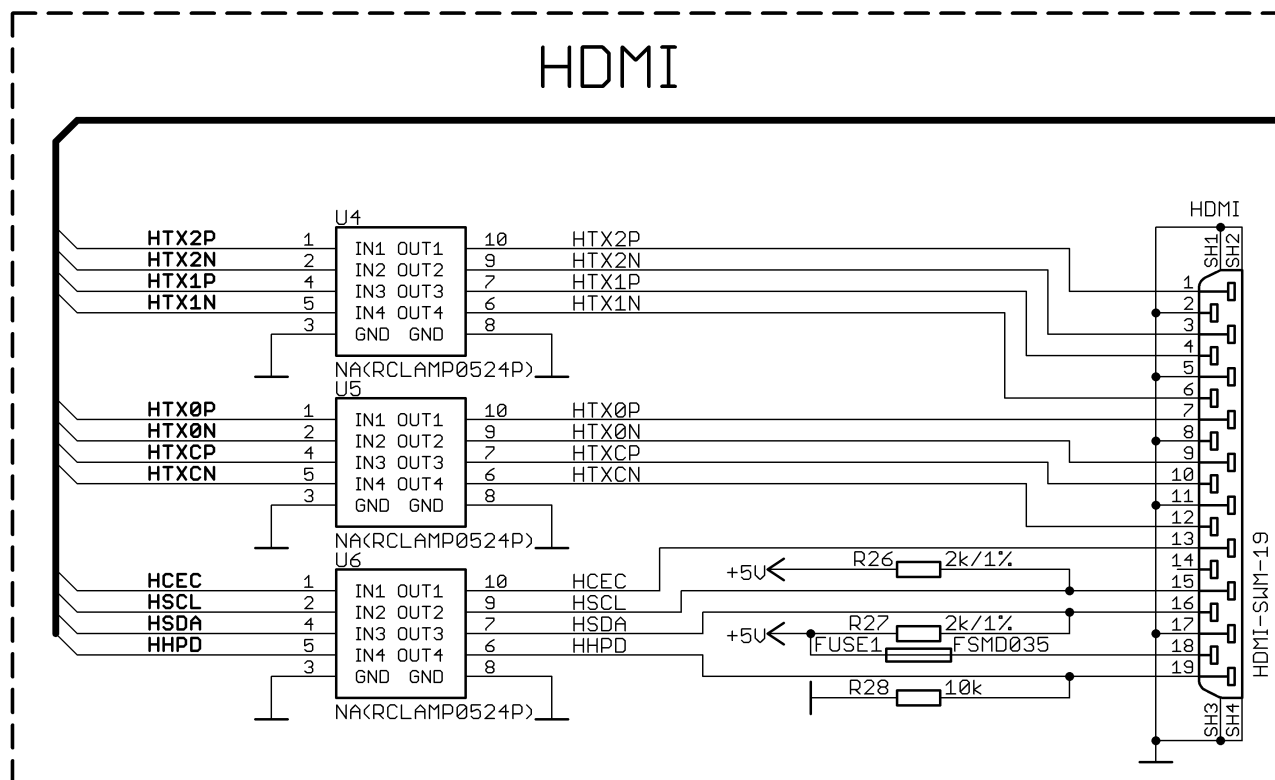
Note that there are different Linux images depending whether the HDMI TV works at 50Hz or 60Hz refresh rate. If you board runs Android there is a specific option to set the appropriate HDMI output. The signals of the HDMI connector can be found at A20_CON-GPIO2 connector.

HDMI connector					
Pin #	**Signal name**	**A20 pin**	**Pin #**	**Signal name**	**A20 pin**
1	HTX2P	T23	**11**	GND	–
2	GND	–	**12**	HTXCN	W22
3	HTX2N	T22	**13**	HCEC	P23
4	HTX1P	U23	**14**	NA*	NA
5	GND	–	**15**	HSCL	R23
6	HTX1N	U22	**16**	HSDA	R22
7	HTX0P	U23	**17**	GND	–
8	GND	–	**18**	+5V	–
9	HTX0N	U22	**19**	HHPD	P22
10	HTXCP	W23			

Pin 14 of the HDMI is not mandatory. In HDMI 1.0-1.3c it is reserved pin; in HDMI 1.4+ it is optional.

Note that the signals of the HDMI monitor can be found at GPIO-2 connector.

5.10 VGA connector

You would probably need an adapter cable for the VGA display (6-pin connector to 15-pin female RGB cable). You can make the cable or the connection yourself or you can purchase the Olimex-made cable: https://www.olimex.com/Products/Components/Cables/A20-VGA-CABLE/.Note that you also have to change the script under Debian as explained in A20-SOM's user's manual ("2.6 Changing the default image resolution").

Please note that you would need a specific Android image for the VGA output (with proper display and output settings). **We don't provide such image ready at the moment!**

The VGA output has been tested only with the official Debian Linux image so far and it works fine (after selecting the proper mode by executing ./change_display*.sh).

VGA 6-pin connector			VGA 15-pin connector (back numbering)	
Connector pin #	Signal name	Processor pin	Connector pin # (back numbering)	Color code (according to the image below)
1	VGA-R	AC17	1	RED
2	VGA-B	AB16	3	BLUE
3	VGA-G	AC16	2	GREEN
4	VGA_VSYNC	AC9	14	BLACK
5	VGA_HSYNC	AB9	13	BROWN
6	GND	-	6	PINK

Back view of the 15 pin connector
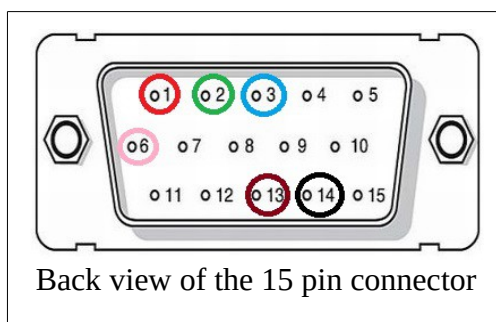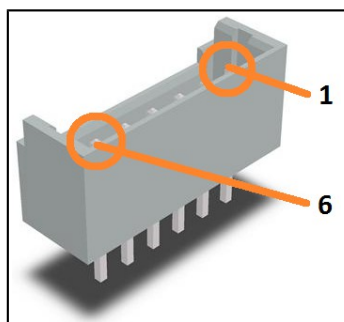
The part of the schematic that describes the VGA connector is shown below:
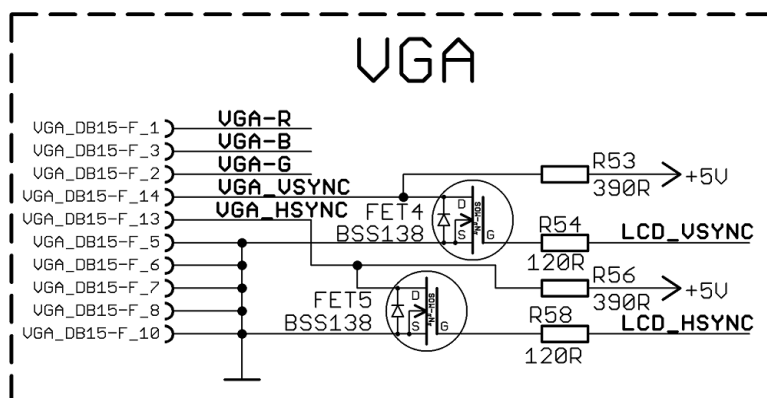
5.11 SATA connector and power

The SATA connector allows you to connect hard drives to the board. There is support for SATA drives in the official images. The connector is suitable for both regular hard-drives and SSD ones.

Note that you can power only 5V hard drives via the board's 5V_SATA_PWR connector. If your hard drive requires 12V of voltage you would need to provide external power supply.

The part of the schematic describing the SATA module is shown below:
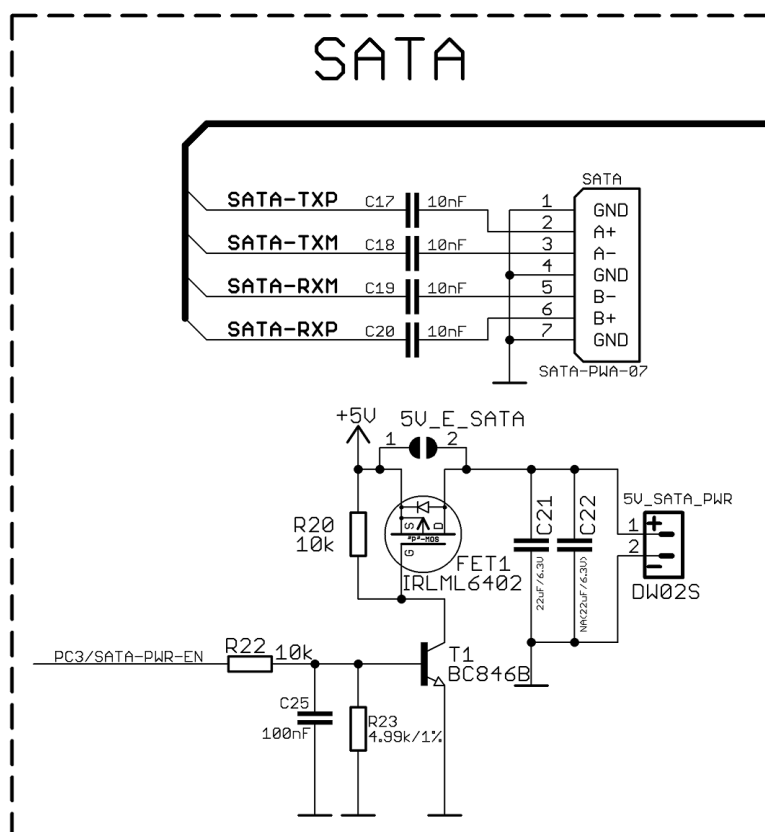
The pinout of the SATA connector is in the following table:

SATA connector pinout		
Pin #	Signal name	Processor pin
1	GND	-
2	SATA-TXP	T20
3	SATA-TXM	T21
4	GND	-
5	SATA-RXM	U21
6	SATA-RXP	U20
7	GND	-

5.12 CAM1 connector and camera

There is a two megapixel color CMOS camera on the CAM1 connector by default. The camera is GT2005, manufactured by Galaxy Core. There is support for the camera in the official images for the A20-SOM board. The camera part of the schematic is visible below:
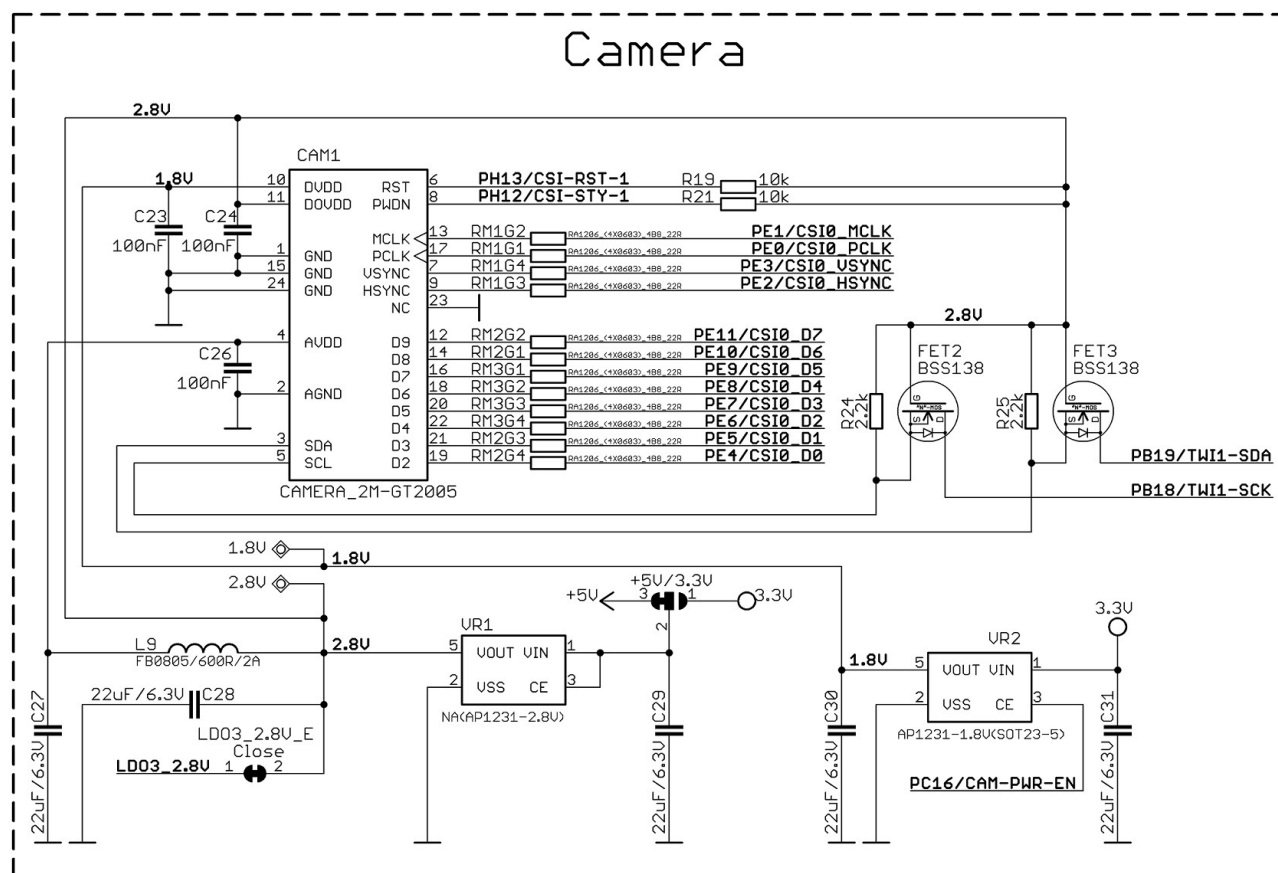
5.13 GPIO connectors

There are 4 GPIO connectors named GPIO-1, GPIO-2, GPIO-3 and GPIO-4 located on the top side of A20-SOM-EVB. They ease the access to free processor's pins. Each of the connectors has two rows of male pins at 0.1" step.

Below you would find tables with the signal at each pin. To understand better what each processor pin does it might be a good idea to refer to the datasheet of the A20 processor. The schematic of the main board A20-SOM might also help you identify the main function of the pins.

The GPIO headers provide additional ways to power the board. However, always double check your hardware setup since there is possibility of accidental short-circuits (especially if you power the board from multiple sources).

It is always recommended to use the mounted connectors to power the board and use the GPIO pins related to the power circuit only for measurements.

5.13.1 GPIO-1 (General Purpose Input/Output) 40pin connector

At the GPIO-1 you can find the signals of the audio input and output. The VGA and composite video signals might also be measured at GPIO-1. There are also a number of free GPIO pins.

Most of the signals of GPIO-1 are routed from A20_CON-GPIO5 and A20_CON-GPIO1.

GPIO-1 connector					
Pin #	Signal name	Processor pin	Pin #	Signal name	Processor pin
1	+5V	-POWER CIRCUIT-	2	GND	-POWER CIRCUIT-
3	+3.0VA	-POWER CIRCUIT-	4	AGND	-POWER CIRCUIT-
5	PG0	F20	6	LINEINR	AB21
7	PG1	E21	8	LINEINL	AB20
9	PG2	E20	10	HPOUTR	W19
11	PG3	D21	12	HPOUTL	Y19
13	PG4	D20	14	HPCOM	AA19/AA20
15	PG5	C21	16	MICROPHONE	-MIC CIRCUIT-
17	PG6	E19	18	MIC1OUTP	AC22
19	PG7	C20	20	MIC1OUTN	AC23
21	PG8	D19	22	MICIN2	AC21
23	PG9	C19	24	LRADC0	AB23
25	PG10	D18	26	LRADC1	AB22
27	PG11	C18	28	TVIN0	AC18
29	PI0	A20	30	TVIN1	AB18
31	PI1	B20	32	TVOUT3	AB17
33	PI2	A19	34	VGA-R	AC17
35	PI3	B19	36	VGA-B	AB16
37	PI10	C17	38	VGA-G	AC16
39	PI11	D17	40	PI14	C15

5.13.2 GPIO-2 (General Purpose Input/Output) 34pin connector

GPIO-2 nests primarily the camera signals and some of the buttons. Most of the signals of GPIO-2 are routed from A20_CON-GPIO4.

GPIO-2 connector					
GPIO pin#	Signal name	Processor pin#	GPIO pin#	Signal name	Processor pin#
1	+5	-POWER CIRCUIT-	2	GND	-POWER CIRCUIT-
3	3.3V	-POWER CIRCUIT-	4	GND	-POWER CIRCUIT-
5	TWI0-SCK	A15	6	PE0/CSI0_PCLK	E23
7	TWI0-SDA	B15	8	PE1/CSI0_MCLK	E22
9	PE7/CSIO_D3	B22	10	PE2/CSI0_HSYNC	D23
11	PE8/CSIO_D4	A23	12	PE3/CSI0_VSYNC	D22
13	PE9/CSIO_D5	A22	14	PE4/CSI0_D0	C23
15	PE10/CSIO_D6	B21	16	PE5/CSI0_D1	C22
17	PE11/CSIO_D7	A21	18	PE6/CSI0_D2	B23
19	GPIO1	-AXP209-	20	PI15	D15
21	GPIO2	-AXP209-	22	NMI_N	F5
23	GPIO3	-AXP209-	24	RESET_N	C14
25	UART0-TX	A7	26	UART0-RX	B7
27	VOL+_BUT	-SAME AS LRADC0-*	28	MENU_BUT	-SAME AS LRADC0-*
29	VOL-_BUT	-SAME AS LRADC0-*	30	HOME_BUT	-SAME AS LRADC0-*
31	CLK125	D13	32	PA14	D13
33	EPHY-RST#	C13	34	PA9	E9

The button lines is determined by signal LRADC0. The button pressed gets distinguished by a simple voltage divider. You can use the above GPIOs to mount additional buttons or measurements.

5.13.3 GPIO-3 (General Purpose Input/Output) 40pin connector

GPIO-3 nests primarily free GPIO signals. Most of the signals of GPIO-3 are routed from A20_CON-GPIO3.

GPIO-3 connector					
GPIO pin#	Signal name	Processor pin#	GPIO pin#	Signal name	Processor pin#
1	+5V	-POWER CIRCUIT-	2	GND	-POWER CIRCUIT-
3	3.3V	-POWER CIRCUIT-	4	GND (PB9)*	-POWER CIRCUIT- (A11)
5	PC16/CAM-PWR-EN	M21	6	PB3	B14
7	PH2/LED	C6	8	PB4	A13
9	PH8	C4	10	PB5	B13
11	PH9	D4	12	PB6	A12
13	PH10	A3	14	PB7	B12
15	PH11	B3	16	PB8	A11
17	PH12/CSI-STY-1	C3	18	PB10	C11
19	PH13/CSI-RST-1	A2	20	PB11	C10
21	PH14	B2	22	PB12	C9
23	PH15	A1	24	PB13	B11
25	PH16	B1	26	PB14	A10
27	PH17	C1	28	PB15	B10
29	PH18	C2	30	PB16	A9
31	PH19	D1	32	PB17	B9
33	PH20	D2	34	PH24	E3
35	PH21	D3	36	PH25	E4
37	PH22	E1	38	PH26	F3
39	PH23	E2	40	PH27	F4

The signal available at pin 2 of GPIO-3 is controlled by jumper PB9/GND. By default it is set to GND position. Alternatively, it might be set to USB0-DRV/PB9 position.

The yellow part of the table shows the JTAG signals.

These signals might be conveniently accessed on GPIO-3 connector. These JTAG signals might be found at processor port PB. The pins of the connector are respectively GPIO-3 #26; GPIO-3 #28; GPIO-3 #30; GPIO-4 #32. More specifically:

PB14 – MS0 (TMS) - GPIO-3 #26
PB15 – CK0 (TCK) - GPIO-3 #28
PB16 – DO0 (TDO) - GPIO-3 #30
PB17 – DI0 (TDI) - GPIO-4 #32

You would also need Vdd and GND which might be found on various places on the board. This information should be sufficient to establish a hardware connection. The connection would depend on the debugger you have and the type of its connector (20-pin JTAG, 10-pin JTAG, etc).

Software-wise – the JTAG should be enabled by default but you might also edit the script.bin/fex file that contains special JTAG part. Please check here: http://linux-sunxi.org/Fex_Guide#.5Bjtag_para.5D; the [jtag_para] part.

The real issue would be finding piece of software that has Allwinner A20 support. The sunxi community has some experimental configuration files for A10 and A13 boards, but they were never tested by an Olimex employee.

Furthermore, we have no experience with the JTAG debug, nor have we performed any JTAG debug sessions ourselves.

5.13.4 GPIO-4 (General Purpose Input/Output) 26pin connector

GPIO-4 nests primarily free GPIO signals. VIN can be used to power the board if there is no power supply provided at the power jack!

Most of the signals of GPIO4 are routed from A20_CON-GPIO5.

GPIO-4 connector					
GPIO pin#	Signal name	Processor pin#	GPIO pin#	Signal name	Processor pin#
1	+5V	-POWER CIRCUIT-	2	GND	-POWER CIRCUIT-
3	3.3V	-POWER CIRCUIT-	4	GND	-POWER CIRCUIT-
5	NDQ0	H23	6	PC7/NRB1	J22
7	NDQ1	H22	8	NRB0	J23
9	NDQ2	G23	10	NRE	K22
11	NDQ3	G22	12	PC3/SATA-PWR-EN	L22
13	NDQ4	H21	14	NCLE	L23
15	NDQ5	H20	16	NALE	M22
17	NDQ6	G21	18	NWE	M23
19	NDQ7	G20	20	NCE0	K23
21	PC24/NQS	F21	22	USB0-DRV/PC17	F23
23	PC23	G19	24	PC18	F22
25	VIN	-POWER CIRCUIT-	26	GND	-POWER CIRCUIT-

Do not provide power simultaneously at the PWR_JACK and the VIN! This would lead to a short-circuit.

5.14 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.

Important: you need additional 40PIN ribbon cable to connect an Olimex display and the LCD_CON.

The LCD connector is suitable for a number of Olimex displays and touchscreen panels with different native resolution – the smallest available is the **4.3''** one called **LCD-OLinuXino-4.3TS** with native screen resolution of **480×272**, through the **7''** one named **LCD-OlinuXino-7TS** with **800×480**, to the **1024×600 10.1'' LCD-OLinuXino-10TS.**

Full list of recommended displays for the board might be found in chapter "2.5.5 LCD display".

Please note that the smallest display (4.3'', 480×272) is not suitable for the official Android images we provide.

Most of the signals of LCD_CON are routed from A20_CON-LCD.

LCD_CON connector					
GPIO pin#	Signal name	Processor pin	GPIO pin#	Signal name	Processor pin
1	+5V	-POWER CIRCUIT-	2	GND	-POWER CIRCUIT-
3	3.3V	-POWER CIRCUIT-	4	GND	-POWER CIRCUIT-
5	LCD_D16	Y12	6	LCD_D17	AA12
7	LCD_D18	Y11	8	LCD_D19	AA11
9	LCD_D20	Y10	10	LCD_D21	AA10
11	LCD_D22	AB12	12	LCD_D23	AC10
13	LCD_D8	AB11	14	LCD_D9	AC11
15	LCD_D10	Y15	16	LCD_D11	AA15
17	LCD_D12	Y14	18	LCD_D13	AA14
19	LCD_D14	Y13	20	LCD_D15	AA13
21	LCD_D0	AB15	22	LCD_D1	AC15
23	LCD_D2	AB14	24	LCD_D3	AC14
25	LCD_D4	AB13	26	LCD_D5	AC13
27	LCD_D6	AB12	28	LCD_D7	AC12
29	LCD_HSYNC	AB9	30	LCD_VSYNC	AC9
31	LCD_CLK	Y9	32	LCD_DE	AA9
33	LCD LEFT/RIGHT	B14	34	LCD UP/DOWN	A13
35	LCD_PWR	B4	36	LCD_BKL	A14
37	TPX1	Y22	38	TPX2	AA22
39	TPY1	Y23	40	TPY2	AA23

5.15 A20_CON-GPIO connectors

There are six male connectors located in the middle of the top side of A20-SOM-EVB. They have a smaller step (0.05") compared to the step of the GPIO connectors (0.1") mentioned in chapter 5.13. These connectors provide a way to attach the board with peripherals to the main board A20-SOM.

The manual and schematic of the main board A20-SOM might help you identify the main function of these interface pins.

The hardware connections between the A20-SOM and A20-SOM-EVB are as follows:

1. A20-SOM's GPIO-1 connects to A20-SOM-EVB's A20_CON-GPIO1.
2. A20-SOM's GPIO-2 connects to A20-SOM-EVB's A20_CON-GPIO2.
3. A20-SOM's GPIO-3 connects to A20-SOM-EVB's A20_CON-GPIO3.
4. A20-SOM's GPIO-4 connects to A20-SOM-EVB's A20_CON-GPIO4.
5. A20-SOM's GPIO-5 connects to A20-SOM-EVB's A20_CON-GPIO5.
6. A20-SOM's LCD_CON connects to A20-SOM-EVB's A20_CON-LCD.

IMPORTANT: the A20_CON-xxx connectors are very fragile – if you attempt to disconnect the A20-SOM board by pulling only one side out it might break! Furthermore – you might bend the pins or the header! Use pliers or other suitable object to disconnect the connectors carefully!

5.16 Jumper description

Please note that jumpers on the board are SMT type. If you feel insecure of your soldering/cutting technique it is better not to try to adjust the jumpers since it is possible to damage the board.

Board jumpers			
Jumper name	Type	Default position	Function
PC17/PB9	SMT	PB9	In case you want to use I2S audio interface, you might want to free PB9 that is used by default for USB0.
PB9/GND	SMT	GND	Controls the signal available at pin #2 of GPIO-3 connector.
LDO3_2.8V_E	SMT	CLOSED	The jumper is primarily used for test purposes. It is not recommended to change its position. The LDO3_2.8V line powers the camera.
5V_E_SATA	SMT	OPEN	By default the powering of the SATA drive is enabled by software means through the PC3/SATA-PWR-EN signal. If you want to always power the SATA without software control then close 5V_E_SATA.
+5V/3.3V	SMT	+5V	The jumper is primarily used for test purposes. It is not recommended to change its position.

5.17 Additional hardware components

The components below are mounted on the A20-SOM-EVB but are not discussed above. They are listed here for completeness:

A20-SOM-EVB adds 7 Android buttons – VOL+; VOL-; MENU; SEARCH; HOME; ESC; ENTER

The buttons are handled by LRADC0 via voltage dividing. The part of the schematic related to the buttons is shown below:
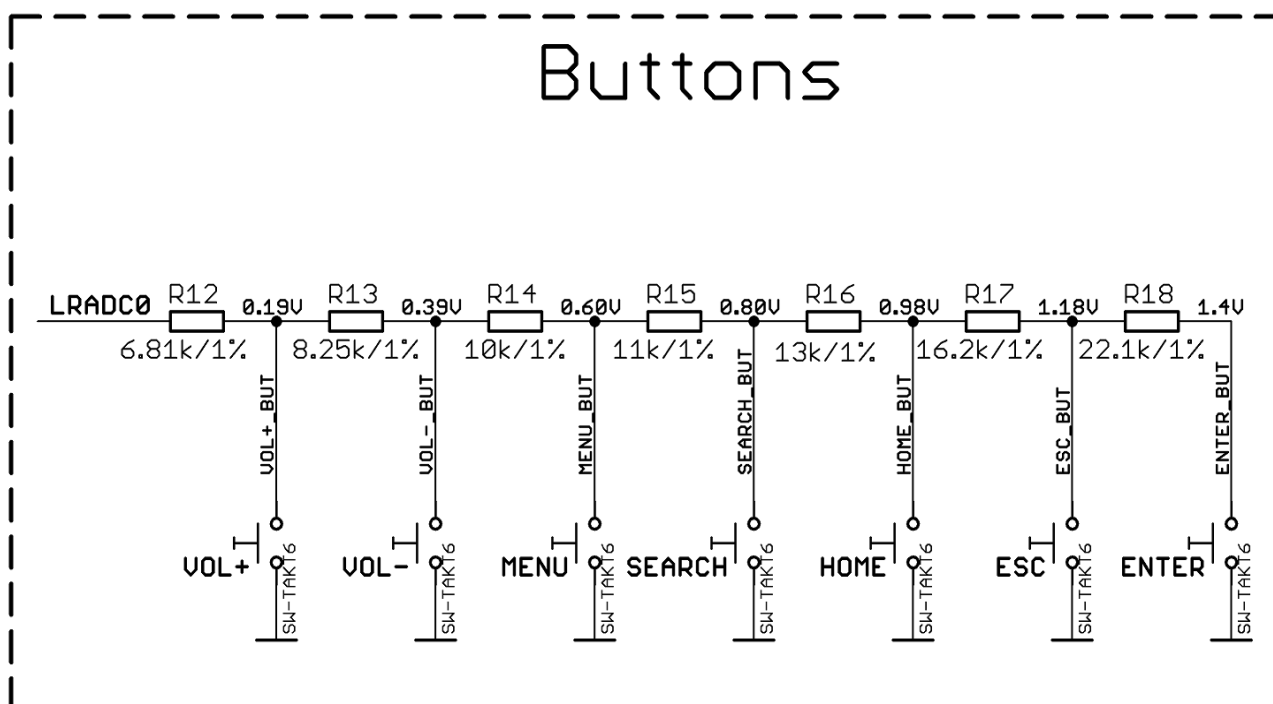
PWR_LED – turns on upon powering the board (there is also a power-on LED on A20-SOM).

CHAPTER 6: SCHEMATICS

6. Introduction to the chapter

In this chapter is located information about the schematics describing logically and physically A20-SOM-EVB.

6.1 Eagle schematic

OLinuXino schematics may be found it on the OLinuXino's GitHub repository: https://github.com/OLIMEX/SOM/tree/master/A20. 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.

6.2 Physical dimensions

Note that all dimensions are in mils.
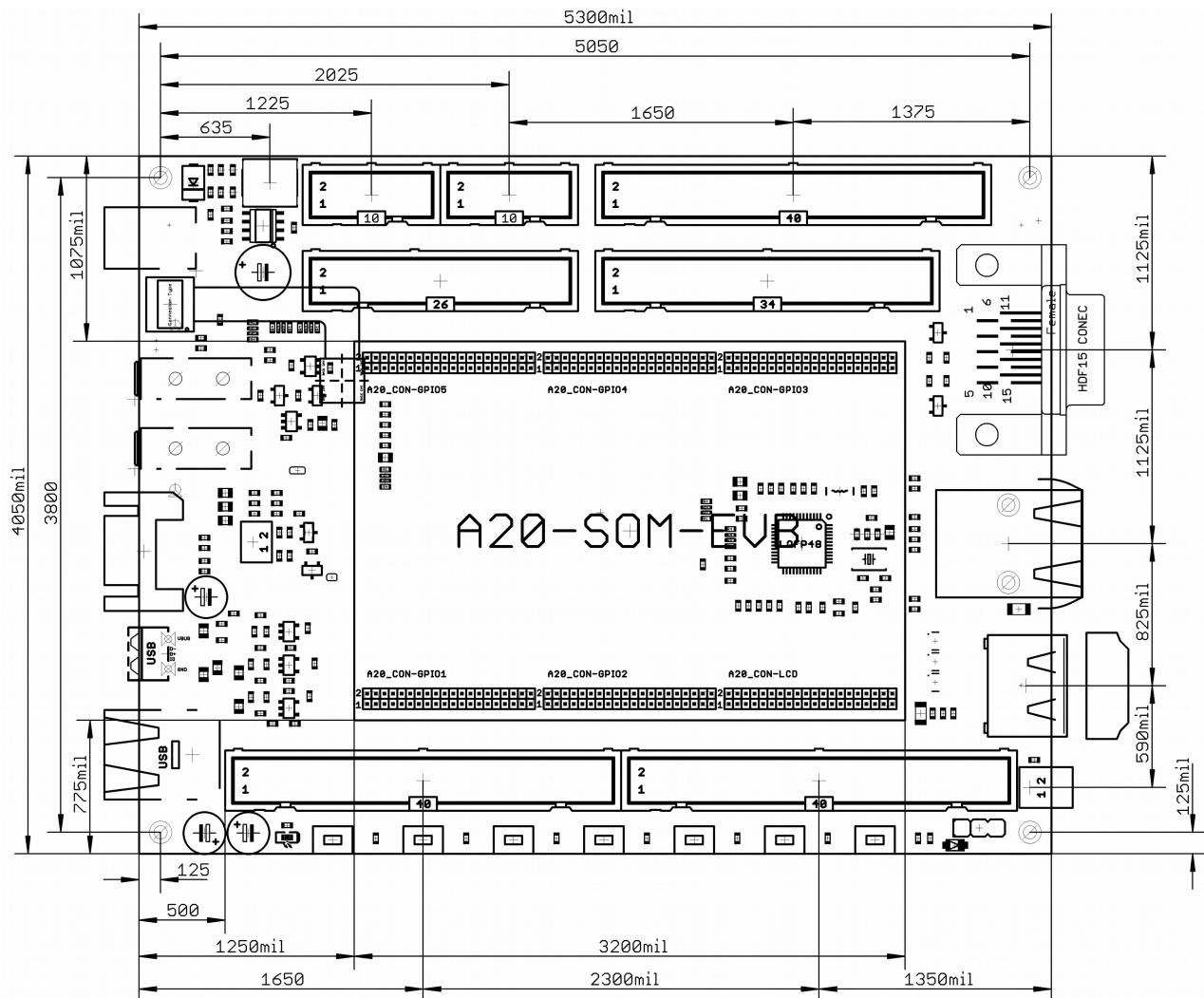
CHAPTER 7: REVISION HISTORY AND SUPPORT

7. 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.

7.1 Document revision

Document revision	Changes	Modified page
A, 24.02.15	Initial manual release	All
B, 17.03.15	Updated HDMI part according to the latest schematic	26
C, 02.04.15	Multiple spelling and stylistic errors fixed	All

7.2 Board revision

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

Board revision	Notable changes
C	Initial release of the board

7.3 Useful web links and purchase codes

A20-SOM-EVB's web page is here: https://www.olimex.com/Products/SOM/A20/A20-SOM-EVB/open-source-hardware

The web pages you can visit for more information about A20-SOM are:
https://www.olimex.com/Products/SOM/A20/A20-SOM/ and
https://www.olimex.com/Products/SOM/A20/A20-SOM-4GB/.

Wiki articles of the board: https://www.olimex.com/wiki/A20-SOM and
https://www.olimex.com/wiki/A20-SOM-EVB

A place for general questions, FAQ or friendly talk: https://www.olimex.com/forum/.
You can get the latest updates on the software at:
https://github.com/OLIMEX/SOM/tree/master/A20.

You may may join our IRC channel #olimex @ freenode.net (http://webchat.freenode.net/?channels=olimex).

The sunxi community is behind the Allwinner Linux support: http://linux-sunxi.org/Main_Page.

ORDER CODES:

A20-SOM-EVB – A20-SOM-4GB + A20-SOM-EVB shield with all important peripherals (HDMI port, Gigabit interface, SATA port, Headphones jack, Microphone jack, Camera, etc)
A20-SOM – the main board of the SOM design that has the processor and the RAM memory for which this manual is about

USB-SERIAL-CABLE-F – USB serial console cable female
A20-SOM-Android-SD – a tested class 10 micro SD card with the latest (by the time of leaving the Olimex facilities) official Android release
A20-SOM-REV-D-DEBIAN-SD – a tested, class 10 micro SD card suitable for A20-SOM boards revision C or newer; with latest (by the time of leaving the Olimex facilities) official Debian release
A20-SOM-DEBIAN-SD – a tested, class 10 micro SD card suitable for A20-SOM boards revision A and revision B; with latest (by the time of leaving the Olimex facilities) official Debian release
LCD-OLINUXINO-4.3TS – low-cost 4.3" LCD display with touchscreen component – 480×272
LCD-OLINUXINO-7TS – low-cost 7" LCD display with touchscreen component – 800×480
LCD-OLINUXINO-10TS – low-cost 10" LCD display with touchscreen component – 1024×600
LCD-OLINUXINO-15.6 – low-cost 15.6" LCD display – 1366×768
LCD-OLINUXINO-15.6FHD – low-cost Full HD 15.6" LCD display – 1920×1080

How to purchase?

You may purchase directly from our online shop or from any of our distributors. Note that usually it might be faster and cheaper to purchase Olimex products from our distributors. List of confirmed Olimex LTD distributors and resellers: https://www.olimex.com/Distributors.

Please visit https://www.olimex.com/ for more info.

7.4 Frequently asked questions

Q: I powered my board, it showed a logo and then nothing happened. What might be the problem?

A: This might be due to a number of reasons but it is recommended to try the following:

1. Download latest official image from our wiki (either Android or Debian for SD card), and upload it to an SD card again. There are instructions how to do it in the other questions below. Try if the board works now.

2. Check if your power supply provides enough current, try with different/better power supply.

3. Check the USB hub you are using, plug the USB cable directly to the back of your personal computer, check the USB cable.

4. The board might enter sleep mode very fast (especially if the Android was turned off without the "Quick Boot" mode being ticked on). Try pressing or holding down the PWR button for a couple of seconds to wake it up.

Q: How do I write the Linux image to a micro SD card to use with my A20 board?

A: First visit the wiki article for the board and download the archive with the image. Then write the Linux image to a microSD card.

Under Windows we use Win32 Disk Imager: http://sourceforge.net/projects/win32diskimager/

Download Win32 Disk Imager software
Insert card
Start program
Select file
Click "write"

To write a Linux image to an SD card under Linux:

For instance you have an image with the file name of "debian_2g.img". It would be downloaded to the SD card connected to a Linux machine using one of the following commands:

dd bs=4M oflag=sync if=debian_2g.img of=/dev/sdX
or

cp debian_2g.img /dev/sdX

where X is the uSD card.

The tips above can also be used to prepare a microSD card with an Android image, suitable for a microSD card.

Q: How to edit board configurations and definitions in the official Debian Linux?

A: Do you want a custom video resolution output? Do you need a different port definition? Do you need to change the hardware definitions of the board?

It is explained above in the manual. But you can also visit this wiki article: wiki article.

Q: How to edit board configurations and definitions in the official Android images?

A: There is a wiki article about that, please visit: wiki article.

Q: Is it possible to boot Debian from NAND? Do you provide such image?

A: It is possible bu we don't provide such image. There are people who were successful in booting Debian from the NAND, however. Make sure to check on the forum.

Q: How to generate boot-able SD-card Debian Linux image for A20-SOM?

A: Build instructions and required files for the latest Debian images: GitHub location

Note that Linux-Sunxi Kernel is a work-in-progress, this means you can try the current stage/sunxi-x.x branch but if something is broken and doesn't work just revert to the git tags we give in the blog and they would work for sure.

Sunxi u-boot loader - the linux-sunxi git page contains a lot of sources for all Olimex Allwinner boards.

Q: How to detect and enable the Ethernet controller (if it is disabled by default)?

A: You can enable it by following these two steps:

1. To check under what name the LAN is associated write "ifconfig –a"

2. If, for example, it is under eth0 name, then write: "dhclient eth0"

This should enable the Ethernet and then SSH would also be available.

You can also enable auto detection of Ethernet on power-up by removing the comment #auto eth0 in /etc/network/interfaces in the Linux image.

Q: How to download the prebuilt Android image to a microSD card?

A: First download one of the official Android images, which might be found in the Android section above.

Make sure that the download link you visit clearly indicates that the image is suitable for the microSD card since there are images suitable for NAND memory also. The images suitable for the microSD memory and those suitable for NAND card are different. However, the upload method is almost identical – using PhoenixSuit.

There are two types of Android images for microSD card that we usually provide and each of them has to be downloaded to a microSD card using a different method. The image provided for microSD card is either the native Android image that can be downloaded to the card via a software tool like

PhoenixSuit (through the board) or an image taken from an already prepared microSD card that requires to simply write the image (through a microSD card reader).

It is more likely that you have an Android image that requires a simple copy to a card. If that is the case you can follow the exact steps as for Linux (e.g. using "Win32 Disk Imager" or "dd" command).

In order to prepare a microSD card with a native Android you will need a software tool called PhoenixSuit and then:

- Install and run PhoenixSuit.
- Go to the firmware tab of the program and point to a valid Android image (note that the images on Google drive are compressed and you have to extract the archives to .img files to be able write them with PhoenixSuit)
- Disconnect the power supply and USB cable from the A20 board. Put an SD card in micro SD holder. We recommend 4GB class 10 card.
- Press and hold RECOVERY button, apply power supply (the requirement various depending on whether you use the board stand-alone or on top of A20-SOM-EVB), release RECOVERY button.
- Connect USB cable to the mini USB connector.
- You will be asked for drivers for the boot-loader. Navigate to the folder where you extracted the PhoenixSuit and install the drivers from the respective executables (or manually point the installer to the drivers folder in the PhoenixSuit installation path).
- PhoenixSuit will detect the board and would ask for the method of writing the image. Choose method of writing the image and confirm your wish to write the image.
- Wait till upgrade succeeds

Note that it is not recommended to have your mini USB connected to an external USB hub. This might cause delays and might distort the signal levels. Always test with the USB connected straight to the USB ports of your computer.

Important: When Android runs for very first time it takes several minutes to initialize all files and buffers please do not cut the power supply during this process! Also when fresh image is installed fast boot may be disabled, which means that when you apply power supply after few seconds Android will go in sleep mode and you have to press PWR button to start it, you can change to fast boot when you power off there is dialog box asking you if you want next boot to be fast boot, you have to check this box before you power off. Also note that you must do touch screen calibration when you run Android for very first time which might require a mouse.

How to download Android image to the NAND memory of my A20 board?

To repair the image on the NAND re-upload it following these steps:

1. Install and run PhoenixSuit (can be found here: google drive).
2. Download and extract the latest official image from the Android section of the wiki: A20-SOM article. Make sure that the download link you visit clearly indicates that the image is suitable for the NAND memory since there are images suitable for microSD card also. The images suitable for the microSD memory and those suitable for microSD card are different. However, the upload method is almost identical – using PhoenixSuit.
3. Go to firmware tab of the program and point to the already downloaded and extracted Android

image.
4. Disconnect the power supply and USB cable from the A20 board.
5. Press and hold RECOVERY button, apply power supply (the requirement various depending on whether you use the board stand-alone or on top of A20-SOM-EVB), release RECOVERY button.
6. Connect USB cable to the mini USB connector.
7. You will be asked for drivers for the bootloader. Navigate to the folder where you extracted the PhoenixSuit and install the drivers from the respective executable (or manually point the installer to the drivers folder in the PhoenixSuit installation path).
8. PhoenixSuit will detect the board and would ask whether you wish to also of writing the image. Choose method of writing the image and confirm your wish to write the image.
9. Wait till upgrade succeeds

Note that it is not recommended to have your mini USB connected to an external USB hub. This might cause delays and might distort the signal levels. Always test with the USB connected straight to the USB ports of your computer.

Q: How to edit board configurations and definitions in the official Debian Linux?

A: Do you want a custom video resolution output? Do you need a different port definition? Do you need to change the hardware defitions of the board?

It is explained above in the manual. But you can also visit this wiki article: wiki article.

Q: How to edit board configurations and definitions in the official Android images?

A: There is a wiki article about that, please visit: wiki article.

Q: Is it possible to boot Debian from NAND? Do you provide such image?

A: It is possible bu we don't provide such image. There are people who were successful in booting Debian from the NAND, however. Make sure to check on the forum. Make sure to check the number of very good and optimized A20-OLinuXino Debian images by Igor Pečovnik. There are also instructions for NAND installation of Debian: link to his web-site.

7.5 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.
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The full text might be found at https://www.olimex.com/wiki/GTC#Warranty for future reference.