

Informations about the „uBook64“ Board

(Final Prototype)

Last Changes

21.01.2023

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1 Features

The special feature of the "uBook64" board is the size of the board, which is very small with only 184x146mm (or 170x146), so that it is suitable for Mini ATX and laptop cases. There is also an extra interface for a Pi1541 Zero drive so that a 1541 with high compatibility can be practically onboard. In spite of the small dimensions, the user port, expansion port and serial socket are available in addition to the usual joystick sockets.

1.1 Memory Controller

The uBook64 board is deliberately based on the MMU 252535-01 or 251715-01 (for both variants the Color-RAM socket U31 must be equipped with a 2114 SRAM). Because the 64-pin IC is almost indestructible (in contrast to the old PLA IC of the old C64 model), and should last longer than all other highly integrated ICs of the C64. A further advantage is the saving of many more ICs, as well as the high distribution, because millions of the last C64 II model were produced until the 90s (from 1987-1994). And last but not least you get a suitable socket for this IC, even though this IC is far away from the usual 2.54 pitch. And since the board can be equipped with SRAM, there is no VSP bug anymore, so there is nothing against using the 469 PLA/MMU IC.

1.2 The Headphone/Audio out jack

Apart from the size of the board, the other feature is an existing headphone jack with adjustable volume (which can also be used as an audio-out).

2 Supply Voltage

For the board, a 5V drop-down voltage regulator is used, with a fixed filtered input voltage of 12V. For example the Pololu D36V28F5. Of course any other 5V voltage regulator can be used, but it should be noted that each regulator has different specifications and functions which should be studied carefully before use to determine if it is suitable for the intended application. If a voltage regulator without overcurrent protection/short circuit protection/polarity reversal protection is used, an additional external fuse circuit should be used to prevent possible damage.

In the case of the Pololu D36V28F5, the exact characteristics of the controller can be found on the website <http://pololu.com>. This controller has reverse polarity protection up to 40 V, undervoltage and overvoltage protection at the output, overcurrent protection and short-circuit protection. A thermal shutdown function also helps to prevent damage from overheating, and a soft start function limits the inrush current and allows the output voltage to rise gradually during start-up.

For the connection of a 12V plug-in power supply unit a placeholder for a 2.1 mm panel jack is provided (inner conductor +12V, outer conductor earth/GND).

A new three-pole "toggle switch" or an old six-pole "C64 Power Switch" can be used as power switch. It should also be noted that a voltage source in the form of a power supply unit or a battery/accumulator must not only be able to supply the correct voltage but also the necessary current (at least 12V/1A). Car chargers or toy train transformers are not suitable as voltage sources and will lead to damage to any components that may be fitted or to malfunctioning of the circuit board. Before connecting the voltage source, check the correct polarity and the correct polarity of all placed components. If a power supply unit is used as a voltage source, it is imperative that it complies with VDE regulations.

Important: Before ICs are inserted into the sockets of the board, all voltage input pins of each IC should be checked while the power supply is on to ensure that the correct voltage is applied to all ICs and their corresponding pins.

3 Board Areas

3.1 12V/9V Board Voltages

For the 9V/12V voltages, which are provided for the cartridge drive, VIC II and SID chips, 9V (placeholder U37) and 12V (placeholder U36) Step-Up converters are required. For example the U3V12F9 and U3V12F12 from Pololu. It is up to you which regulators are used, if they are suitable for this case.

3.2 Clock Generator Circuit

Around the 8701 IC, as well as the two crystals for PAL and NTSC frequencies, you can choose between PAL and NTSC with the jumper (J14). Of course, the VIC II chip must be changed accordingly, and the VDD supply voltage for the VIC II must be set between 12V and 5V. Instead of the 8701 IC there is also enough space for an 8701 replica board.

3.3 Kernel/Basic ROM

The U22 socket is equipped with an EPROM/EEPROM (28C256=32K).

0000-2000 = BASIC
2000-3FFF = KERNEL
7000-7FFF = CHARS

3.4 SRAM

There is no DRAM on the uBook64 board, only space for one SRAM chip and 2 auxiliary chips with sockets **U104 / U2 / U32**, which are fitted with a **UM61512AK-15 / 74HCT573 / 74HCT32 IC**. During tests LS and HC types could be used without visible problems.

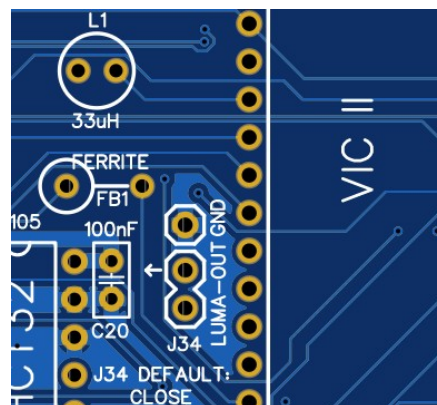
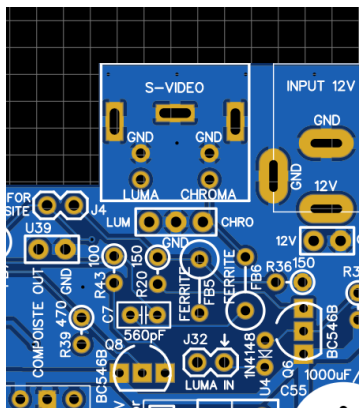
3.5 VIC II

Depending on which VIC II type is plugged into socket U32, the VDD voltage must also be adjusted with jumper J5 (12V/5V). If this is not done, the VIC II will be damaged!

3.6 S-Video

An S-video socket is provided for video output to ensure the highest possible picture quality. **Note:** To get the best picture over a connected S-Video cable, the "J4 Close For Composite" jumper must not be closed!

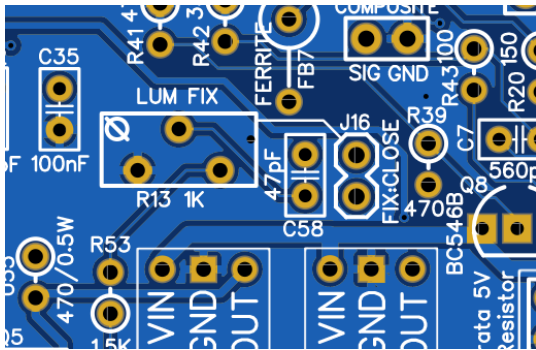
HINT: The jumpers J32 (in the modulator circuit) and J34 (on the VIC II) must be closed.



These two jumpers route the LUMA signal through the board from the VIC II to the modulator. To prevent any kind of signal falsification by the circuit board, these jumpers can be left open and a shielded cable can be connected from the J34 VIC II ("OUT" pin, marked with an arrow, and "GND" pin) to J32 in the modulator ("IN" pin, marked with an arrow).

3.7 LUMA FIX

If excessive vertical stripes are visible on the picture, they can be reduced with the LUMA FIX potentiometer. However, jumper J16 must be plugged in first.



3.8 SID

CAP Filter

If an 8580 SID is used, the "8580 Filter" jumpers must be closed. Be careful, as users have reported that incorrect filter capacitors have damaged SID ICs.

Digi-Fix

If an 8580 SID is used, the "Digi-Fix" jumper must be closed so that samples (speech/drums/etc.) are played louder.

Audio 1K Resistor

If a 6581 SID is used, the "Audio 1K" jumper must be closed (to the right of the expansion socket).

Audio Channels L/R

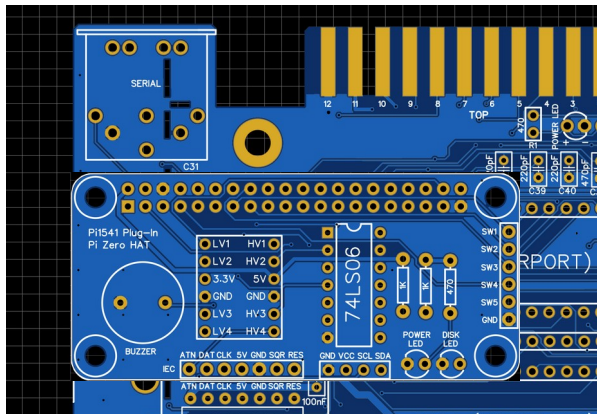
The SID audio output is routed to the left audio channel of the headphone jack, and the volume can be adjusted with the potentiometer R6 (at the bottom of the board). If you want to hear the SID on both channels, you have to close the "mono" jumper J9. It is also possible to set a 2nd audio signal on the right channel, which can be connected to the "AUDIO2" pin.

Voltages

As with the VIC II, the SID must also be set to the correct VDD voltage and 12V or 9V, depending on the model (JP3, to the right of the NE555). If you do not do this, you run the risk of destroying the SID.

If you want to be on the safe side, you should only use replica SIDs

3.9 Internal Pi1541



The "Serial PORT" (7 Pins) slot on the board provides space for a small pluggable Pi1541 adapter board which can be used to accommodate a Pi1541 Zero. Thus a highly compatible 1541 drive OnBoard is available.

To ensure that the internal Pi1541 functions reliably, the CIA 6526 (U8) socket should be equipped with a CSG 6526/216A on the rear side if possible. According to one user, MOS 6526/216A should also work, but during my tests I already had problems with MOS 6526/216A chips. Furthermore the following files on the SD-card of the Raspberry pin should be changed.

File: config.txt

kernel_address=0x1f00000

force_turbo=1

boot_delay=1

arm_freq=1100

over_voltage=8

sdram_freq=500

sdram_over_voltage=2

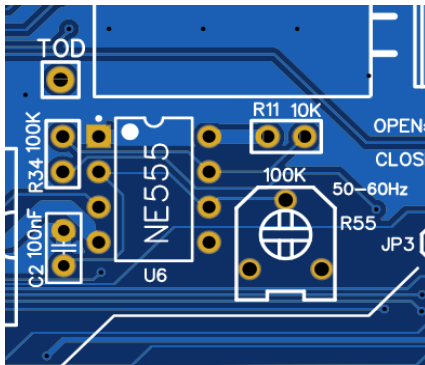
File: options.txt (only for "7406 Only", without extra level shifter board)

invertIECInputs = 1

invertIECOutputs = 1

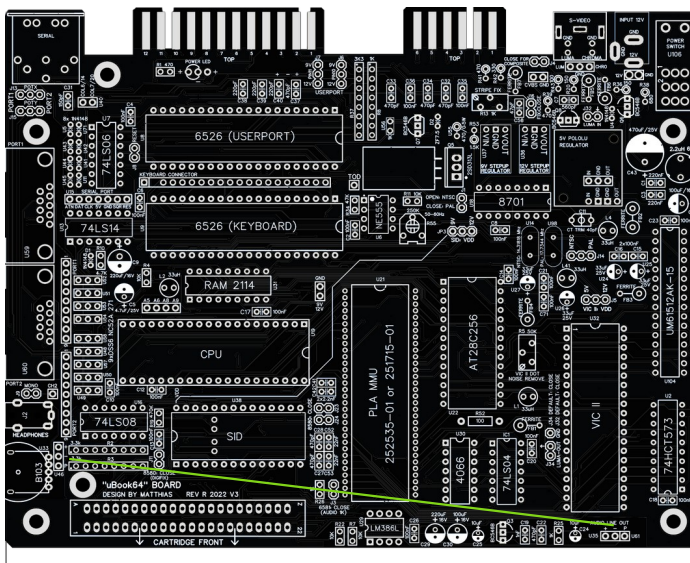
With this, problematic demos, which even with an original C64 and a Pi1541 drive according to user reports sometimes do not work, worked perfectly in tests.

3.10 Time Of Day (TOD)



With the potentiometer R55 to the right of the NE555 IC the TOD frequency can be adjusted from 50-60 Hz.

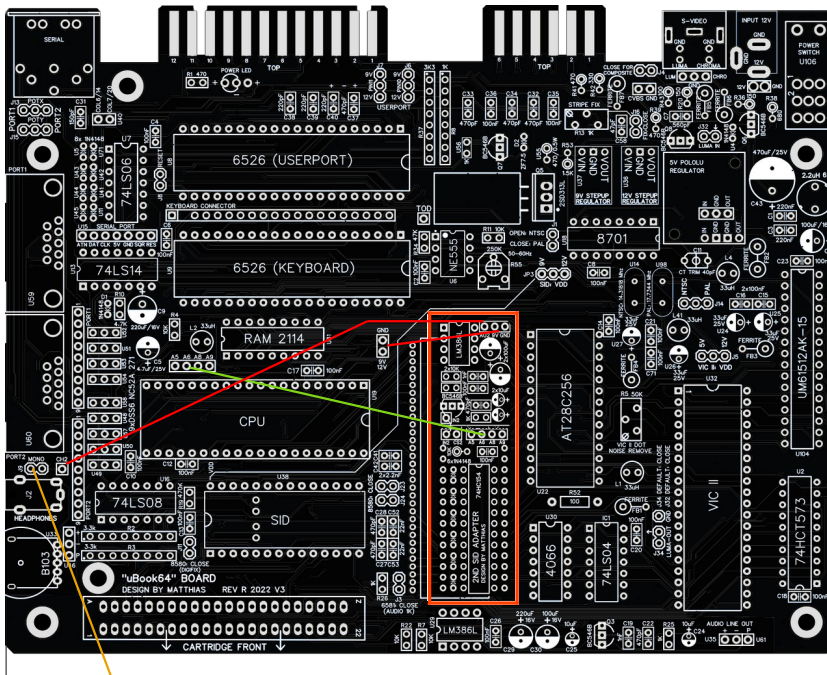
3.11 Volume control



The volume control on the left side is initially without function (without connection). In order for this to control the volume, a 3-pin connection to the audio output must be established (green line).

4 New Features in Version 3

4.1 Stereo SID Option with uSID64



The 2nd SID Socket Adapter board is placed as a whole on the uBook64 board (take care of good isolation), and the pins A5 to A9 (green) are connected to each other. Additionally the pins AU2, 9V and GND (red) are connected to the board. Finally remove the "Mono" jumper.

5 Assembly instructions

5.1 Expansionsport

It is intended that the module is plugged in vertically and thus the label points "forward" when plugged in. If an angled expansion port socket is soldered in, the module label looks downwards! To change this, a 180° expansion port adapter can be soldered in between, so that the module port label "points" upwards at the end.

5.2 Components under Sockets

If components are to be placed under a socket, these should be soldered first, and only then the socket should be soldered.

6 Picture Quality

To make it clear what picture quality can be achieved, here are two screenshots with "ODV" Zero Latency S-VIDEO -> HDMI converter and 1080p DELL Touch Monitor (Sharpness 100%). Taken with a Moto G5 smartphone, without any processing. If the picture is worse than seen on the two screenshots, other converters/monitors/cables should be used.

