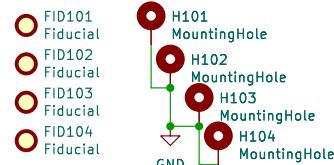
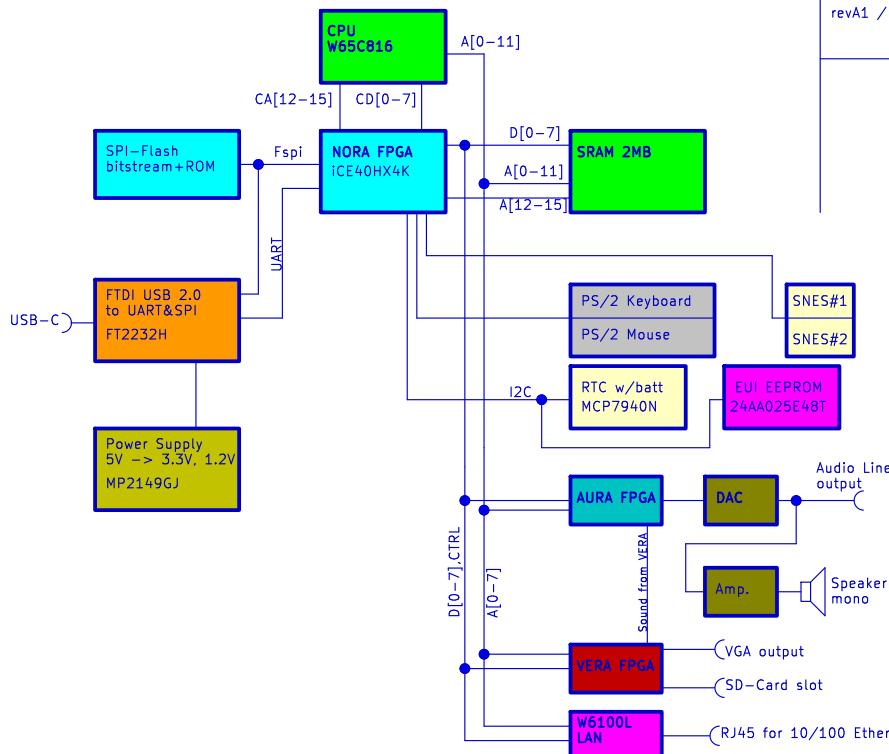


X65 SBC rev.A1

Single-Board-Computer WITH THE 65816 (6502) CPU,
2MB RAM, VGA, Sound, 2x PS/2, 2x SNES Joypad, Ethernet LAN

Block Diagram:

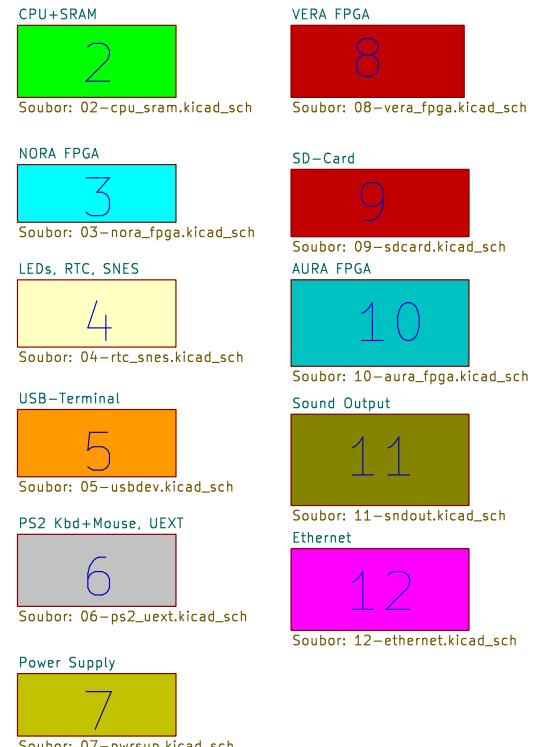


Important Links:
x65.eu
www.jsykora.info
github.com/jsyk/x65

Revision History:

revA1 / 13.1.2024	Initial design based on MOBO+VABO rev001. PCB 180x100mm, 4-L.
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Schematic sheets:



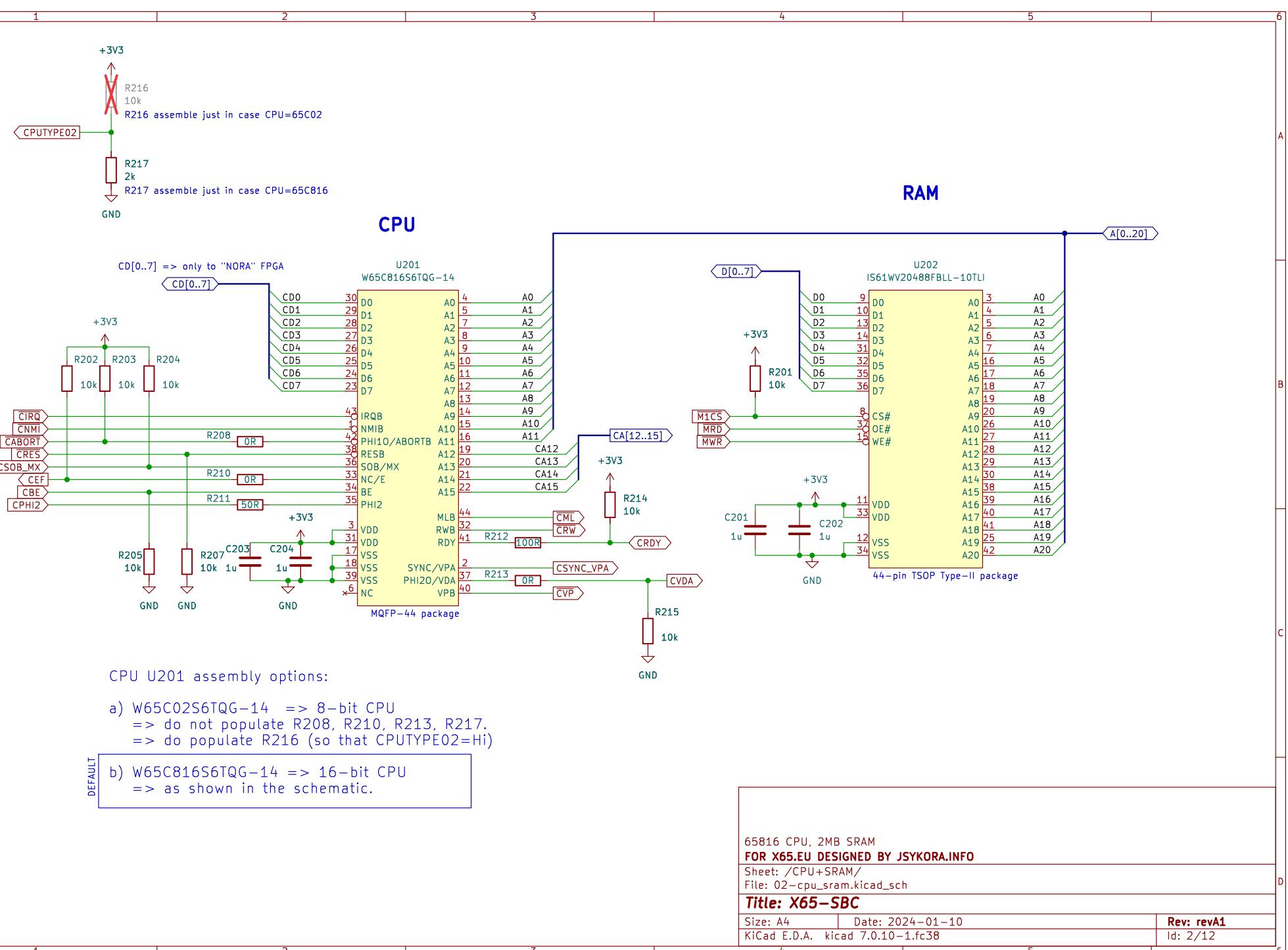
X65 IS
OPEN SOURCE:
+ CIRCUIT SCHEMATIC
+ PCB LAYOUT
+ VERILOG FPGA DESIGN
+ TOOLS USED
+ ORIGINAL SOFTWARE

X65 Single Board Computer
FOR X65.EU DESIGNED BY JSYKORA.INFO
Sheet: /
File: x65-sbc-revA1.kicad_sch

Title: X65-SBC

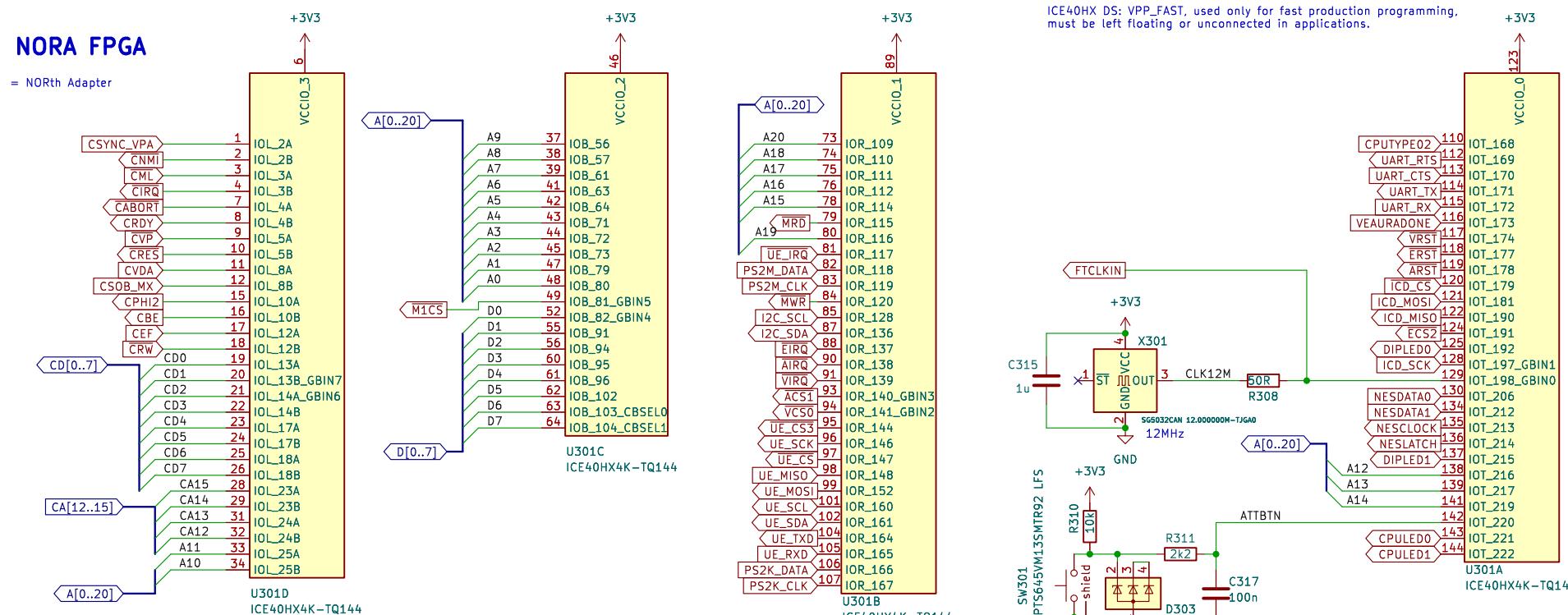
Size: A4 Date: 2024-01-10
KiCad E.D.A. kicad 7.0.10-1.fc38

Rev: revA1
Id: 1/12

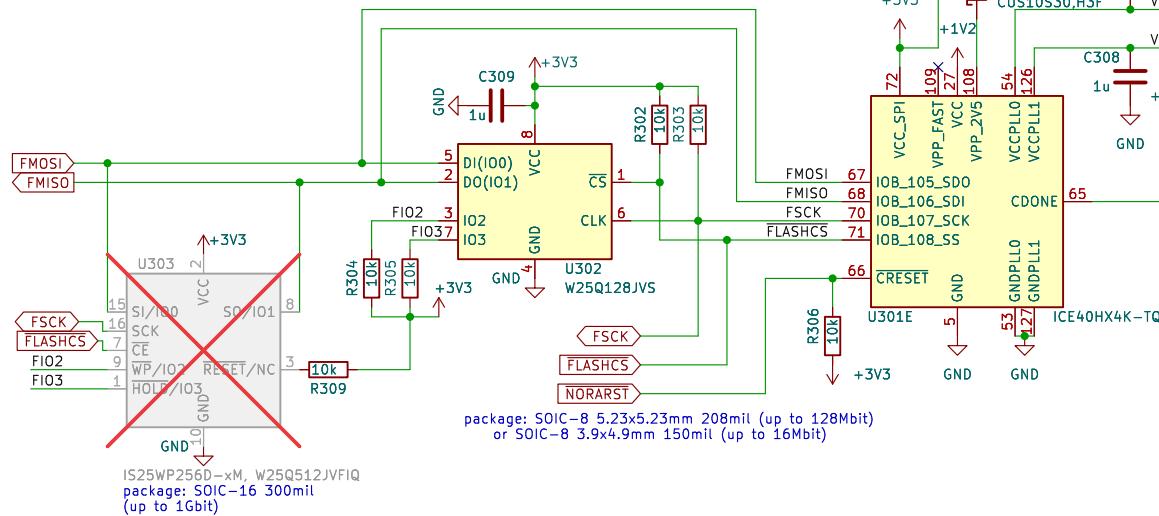


NORA FPGA

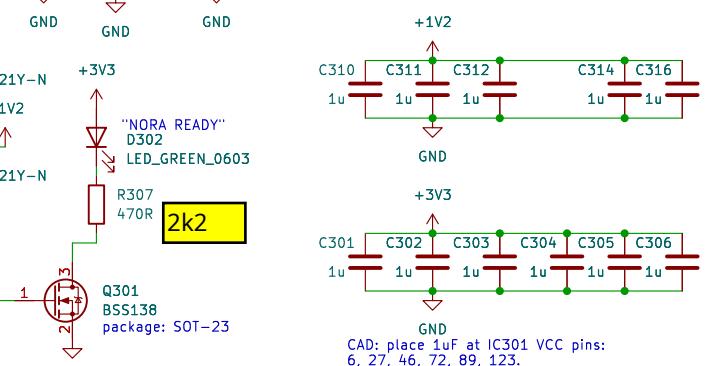
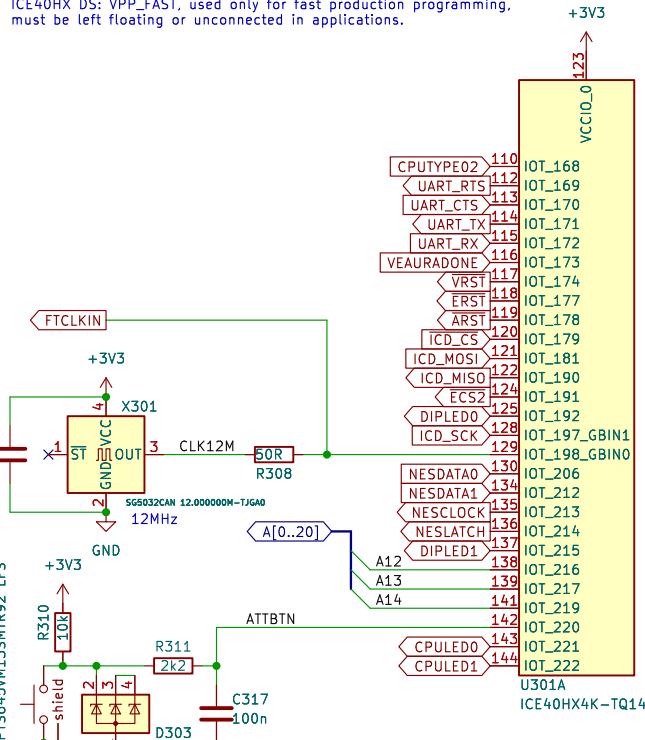
= NORth Adapter



UNIFIED ROM



ICE40HX DS: VPP_FAST, used only for fast production programming,
must be left floating or unconnected in applications.



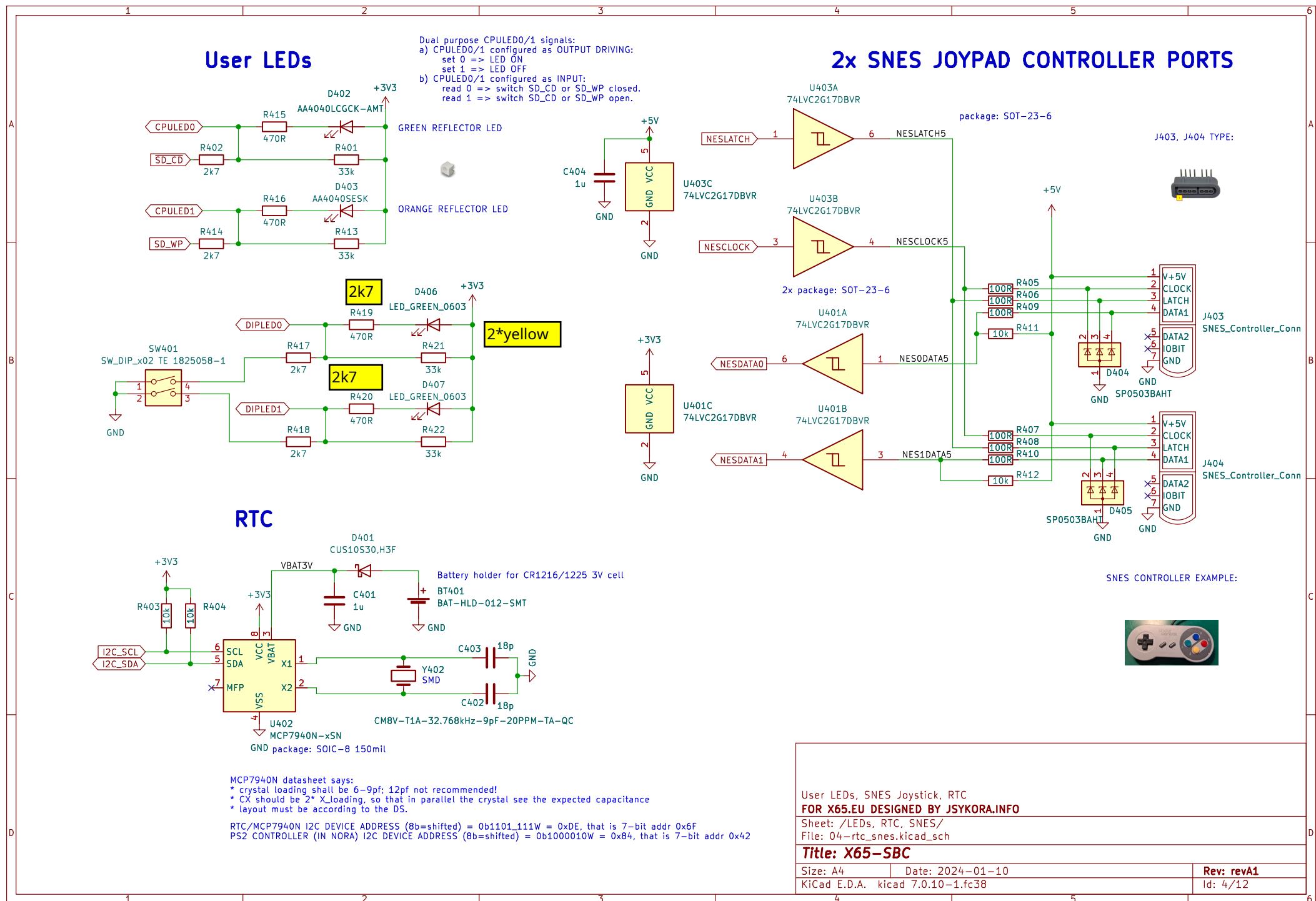
NORA FPGA with UNIFIED ROM SPI-Flash
FOR X65.EU DESIGNED BY JSYKORA.INFO

Sheet: /NORA FPGA/
File: 03-nora_fpga.kicad_sch

Title: X65-SBC

Size: A4 Date: 2024-01-10
KiCad E.D.A. kicad 7.0.10-1.fc38

Rev: revA1
Id: 3/12



User LEDs, SNES Joystick, RTC
FOR X65.EU DESIGNED BY JSYKORA.INFO

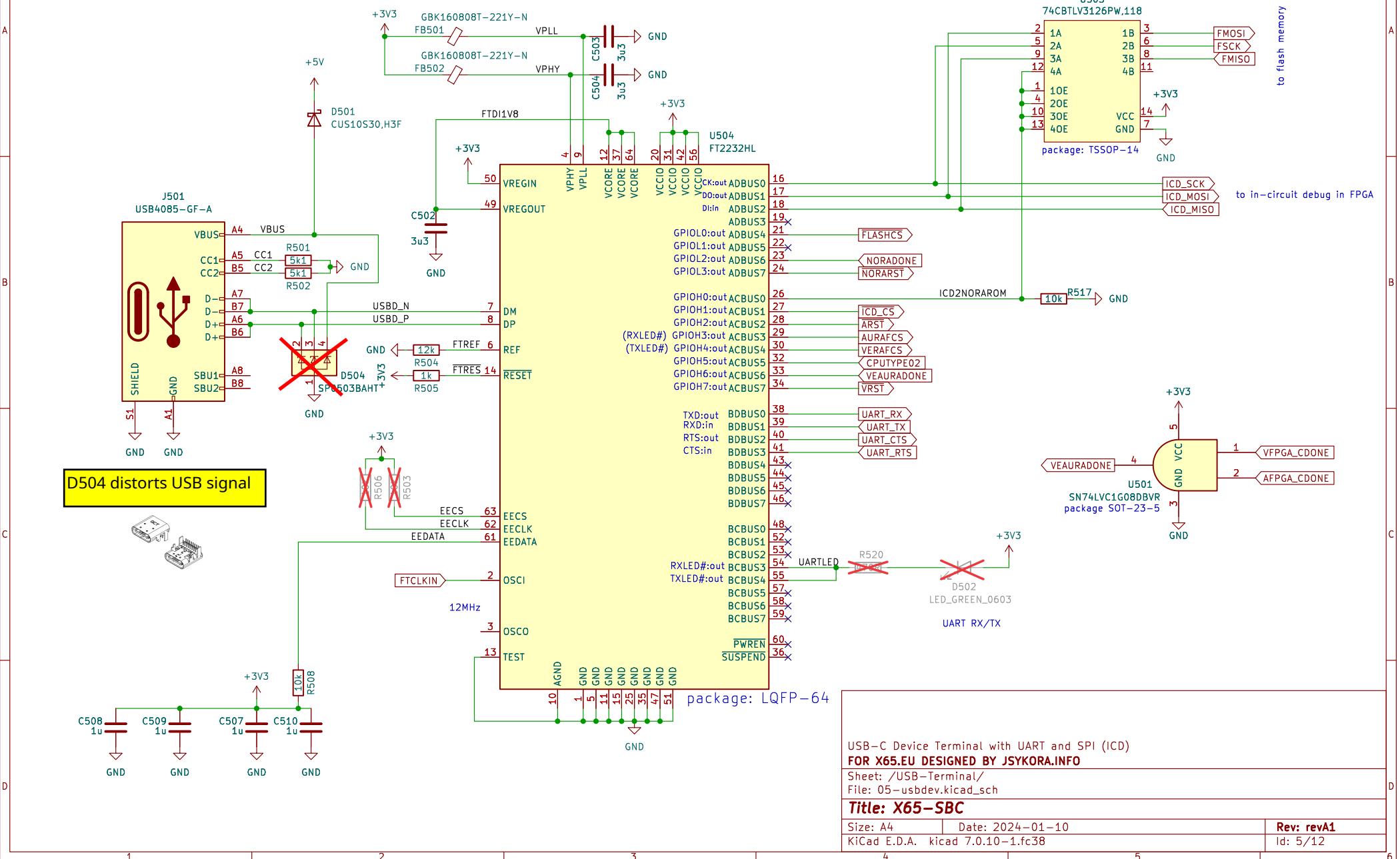
Sheet: /LEDs, RTC, SNES/
File: 04-rtc_snes.kicad_sch

Title: X65-SBC

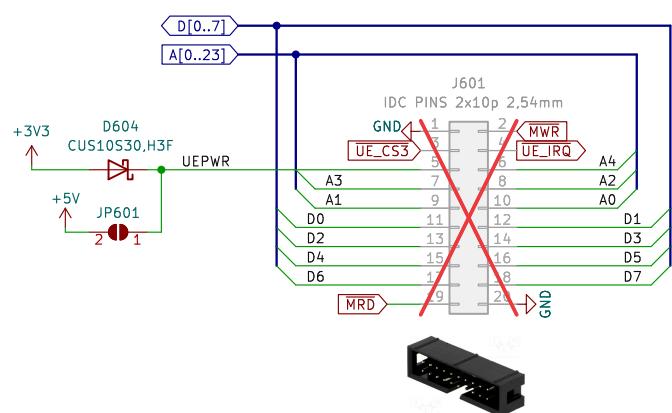
Size: A4 Date: 2024-01-10
KiCad E.D.A. kicad 7.0.10-1.fc38

Rev: revA1
Id: 4/12

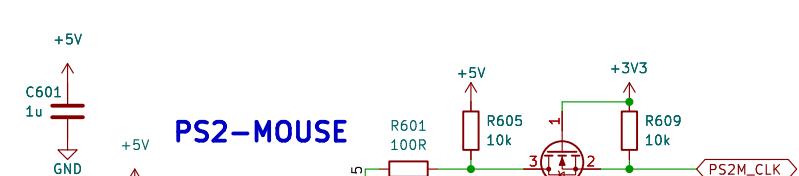
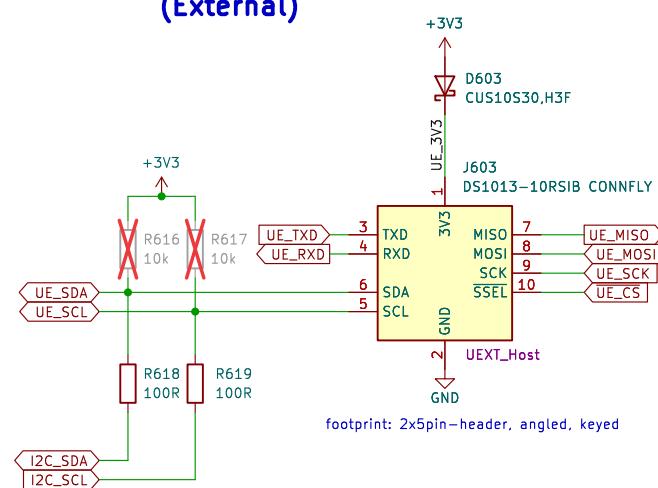
USB 2.0 WITH USB-C / UART TERMINAL AND ICD (In-Circuit Debugger)



Extension Connector (Internal)



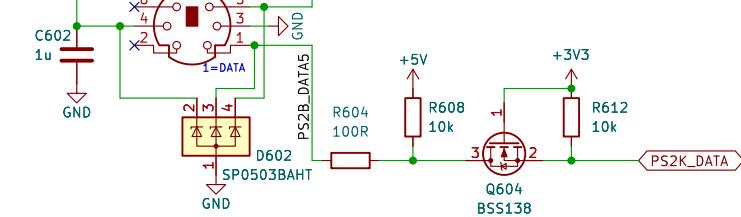
UEXT HOST Connector (External)



PS2-MOUSE

ps2 conn add: KMDGX-6S-BS

PS2-KBD



Extension Connectors, PS2 KBD and Mouse ports
FOR X65.EU DESIGNED BY JSYKORA.INFO

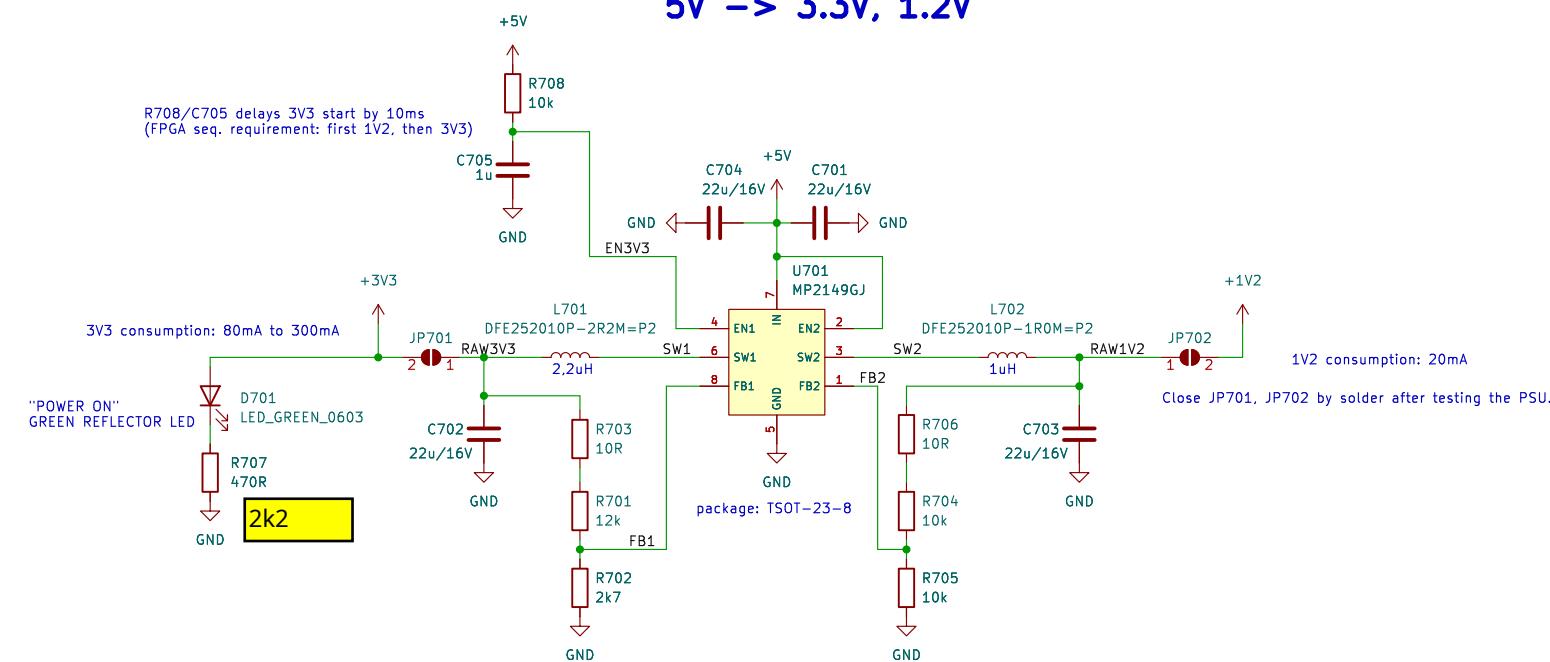
Sheet: /PS2_Kbd+Mouse, UEXT/
File: 06-ps2_uext.kicad_sch

Title: X65-SBC

Size: A4 Date: 2024-01-10
KiCad E.D.A. kicad 7.0.10-1.fc38

Rev: revA1
Id: 6/12

POWER SUPPLY 5V → 3.3V, 1.2V



Alternative power input connector



GND testpoints

- GND ↗ J702 Conn_01x01
- GND ↗ J703 Conn_01x01
- GND ↗ J704 Conn_01x01

Power supplies 3.3V and 1.2V
FOR X65.EU DESIGNED BY JSYKORA.INFO

Sheet: /Power Supply/
File: 07-pwrsup.kicad_sch

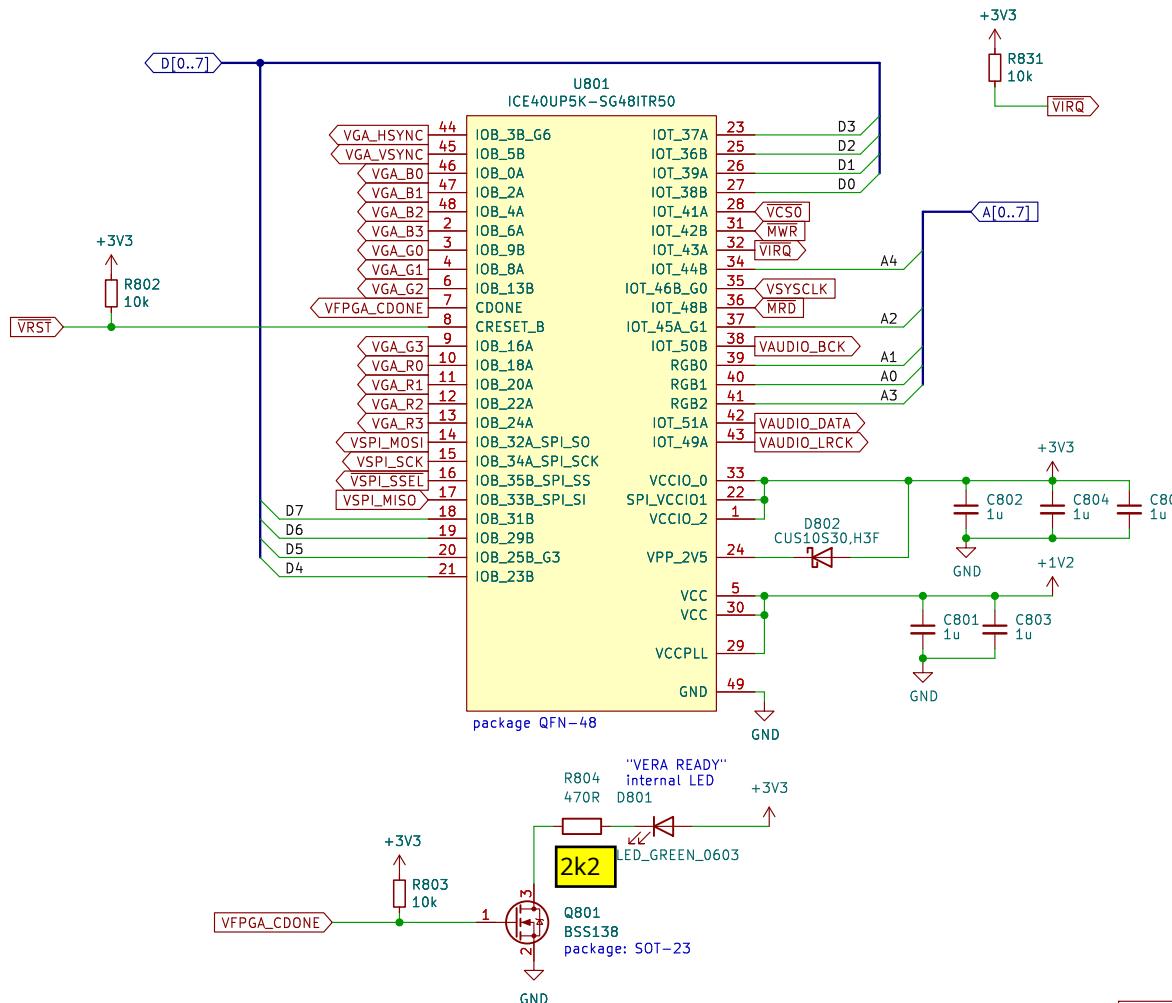
Title: X65-SBC

Size: A4 Date: 2024-01-10
KiCad E.D.A. kicad 7.0.10-1.fc38

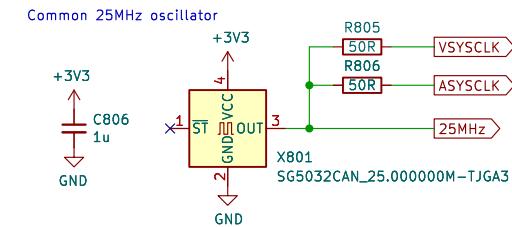
Rev: revA1
Id: 7/12

"VERA" FPGA – Video Embedded Retro Adapter

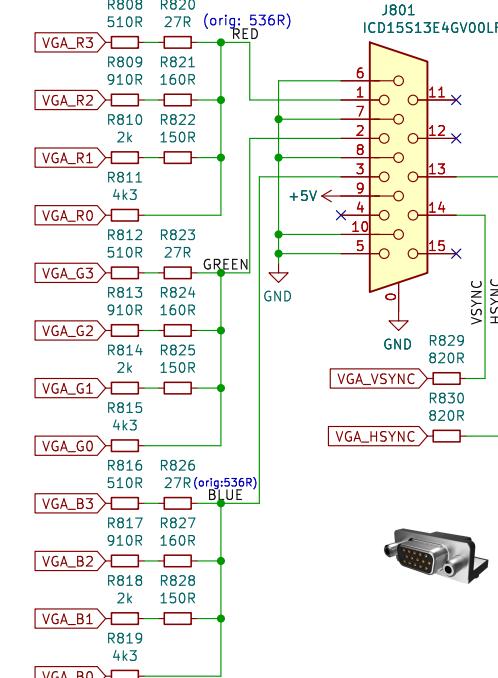
A



B



VGA interface



This schematic contains portions of work done by Frank van den Hoe for the project VERA: <https://github.com/fvdhoef/vera-module>

VERA FPGA – VGA Adapter
FOR X65.EU DESIGNED BY JSYKORA.INFO

Sheet: /VERA FPGA/
File: 08-vera_fpga.kicad_sch

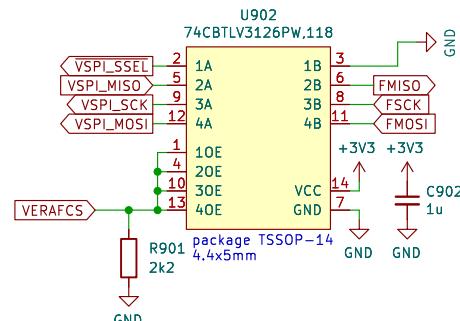
Title: X65-SBC

Size: A4 Date: 2024-01-10
KiCad E.D.A. kicad 7.0.10-1.fc38

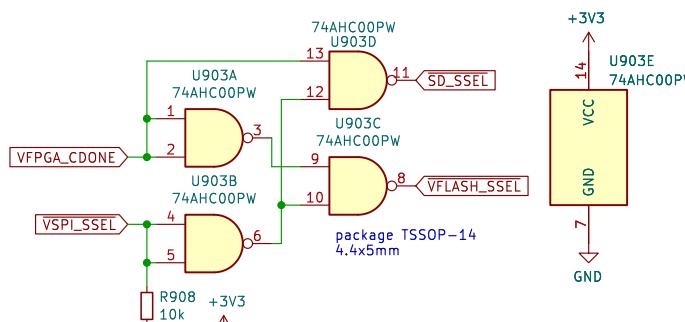
Rev: revA1
Id: 8/12

1 2 3 4 5 6

FTDI/ICD access multiplexer to VERA SPI flash memory

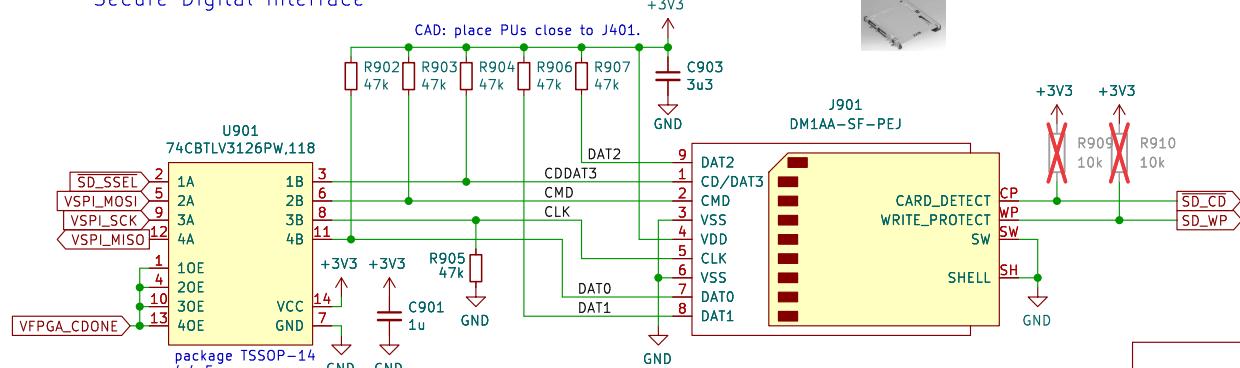


VERA SPI pins multiplexing

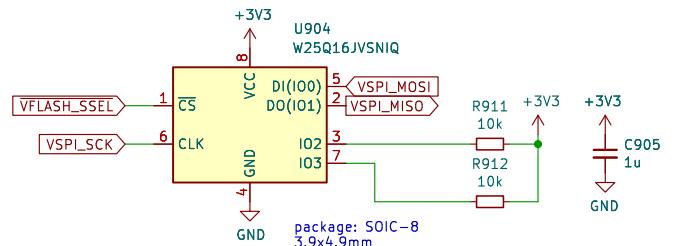


Inputs		Outputs	Description
VFPGA_CDONE	VSPI_SSEL	SD_SSEL	FPGA configuring from the SPI-Flash, or FTDI/ICD accessing.
0	0	1	FPGA empty/in-reset
0	1	1	FPGA loaded; User Design r/w to SDC
1	0	0	FPGA loaded; idle
1	1	1	

Secure Digital Interface



SPI flash for VERA Bitstream



This schematic contains portions of work done by Frank van den Hoe for the project VERA: <https://github.com/fvdhoef/vera-module>

SD-Card slot, SPI-Flash for VERA
FOR X65.EU DESIGNED BY JSYKORA.INFO

Sheet: /SD-Card/
File: 09-sdcard.kicad_sch

Title: X65-SBC

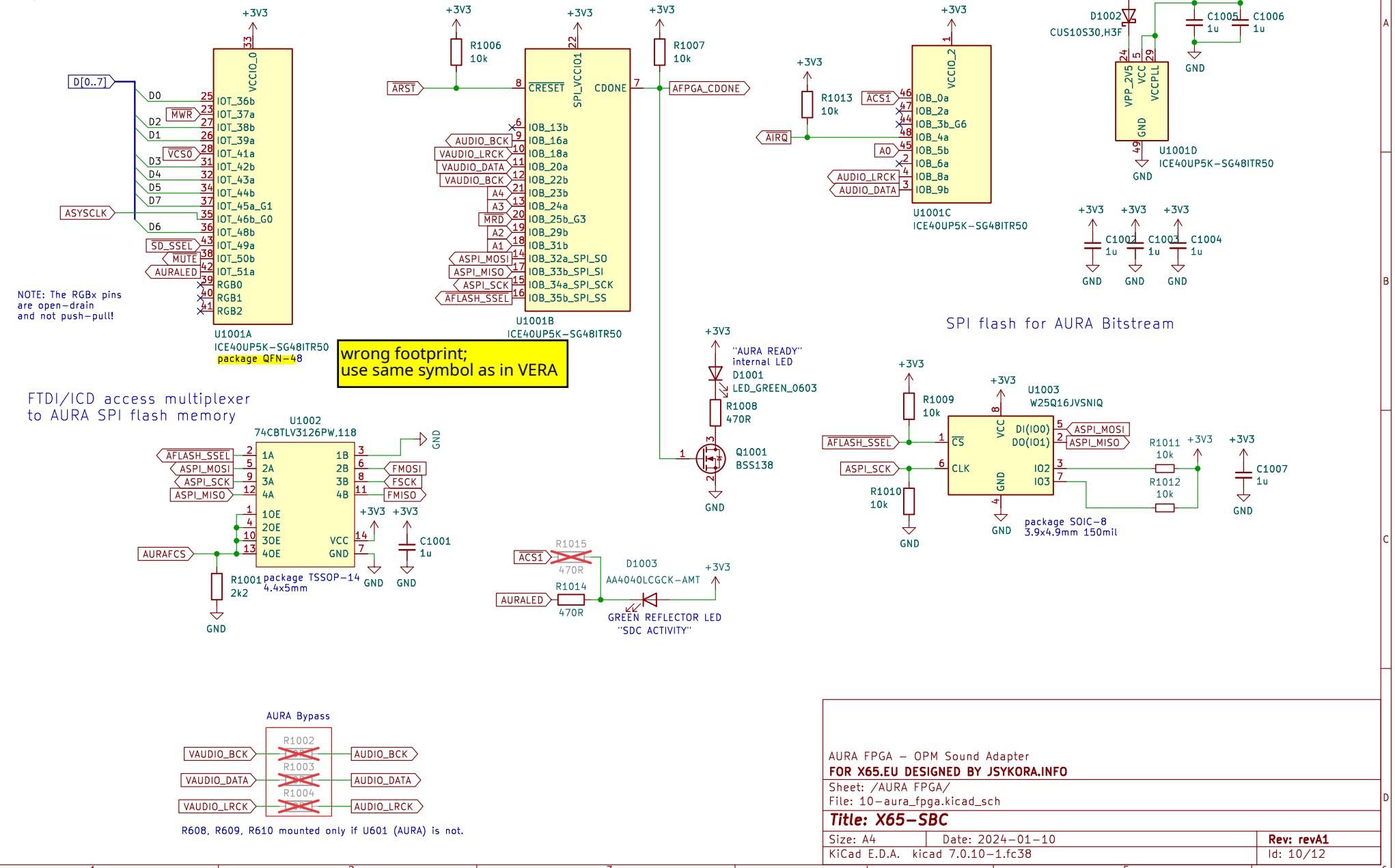
Size: A4 Date: 2024-01-10
KiCad E.D.A. kicad 7.0.10-1.fc38

Rev: revA1
Id: 9/12

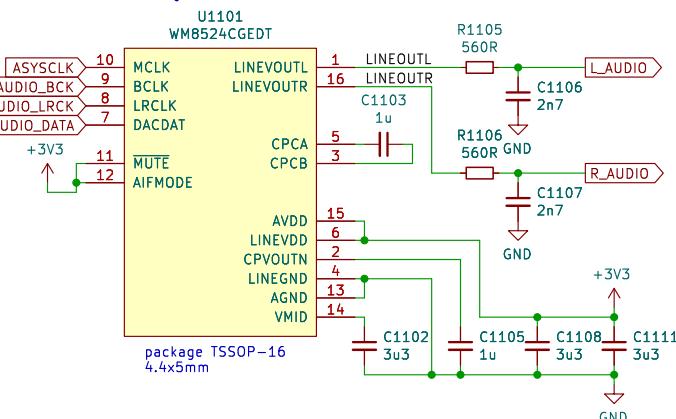
1 2 3 4 5 6

"AURA" FPGA – Audio Retro Adapter

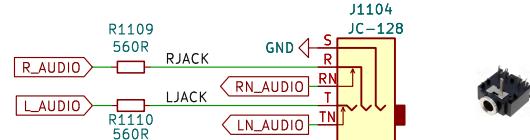
AURA implements the YM2151 FM-Synthesis (the chip is long out of production).
Design is based on IKAOPM core.



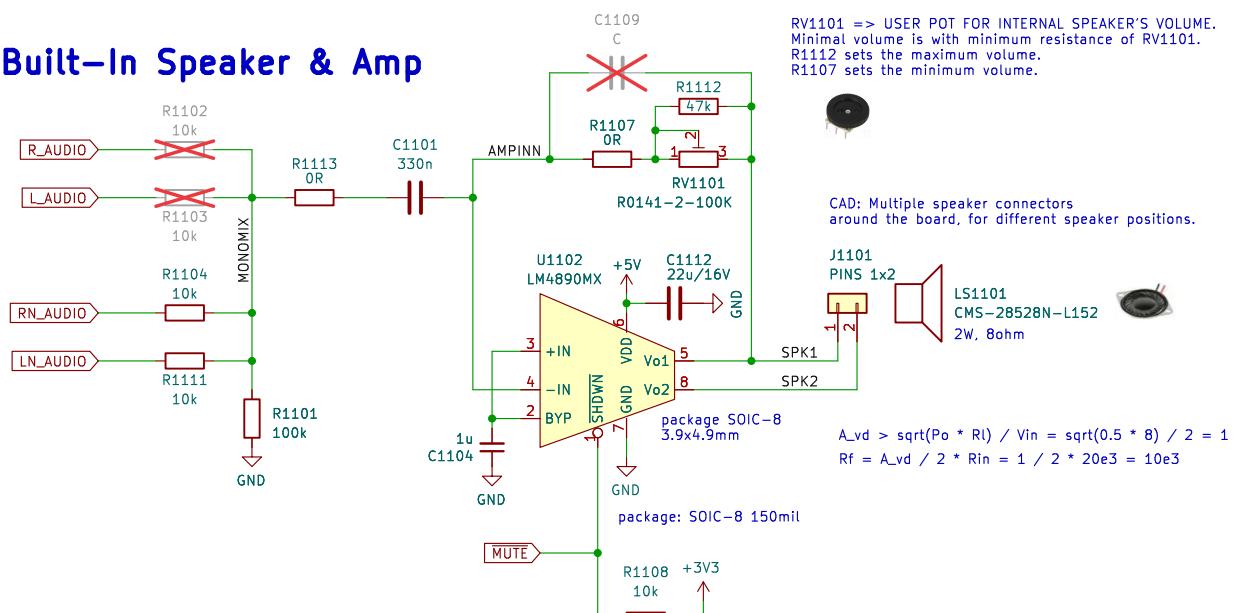
Audio DAC (PCM/PSG in VERA, FM in AURA)



3.5mm jack – AUDIO LINE output



Built-in Speaker & Amp



Sound DAC and output port
FOR X65.EU DESIGNED BY JSYKORA.INFO

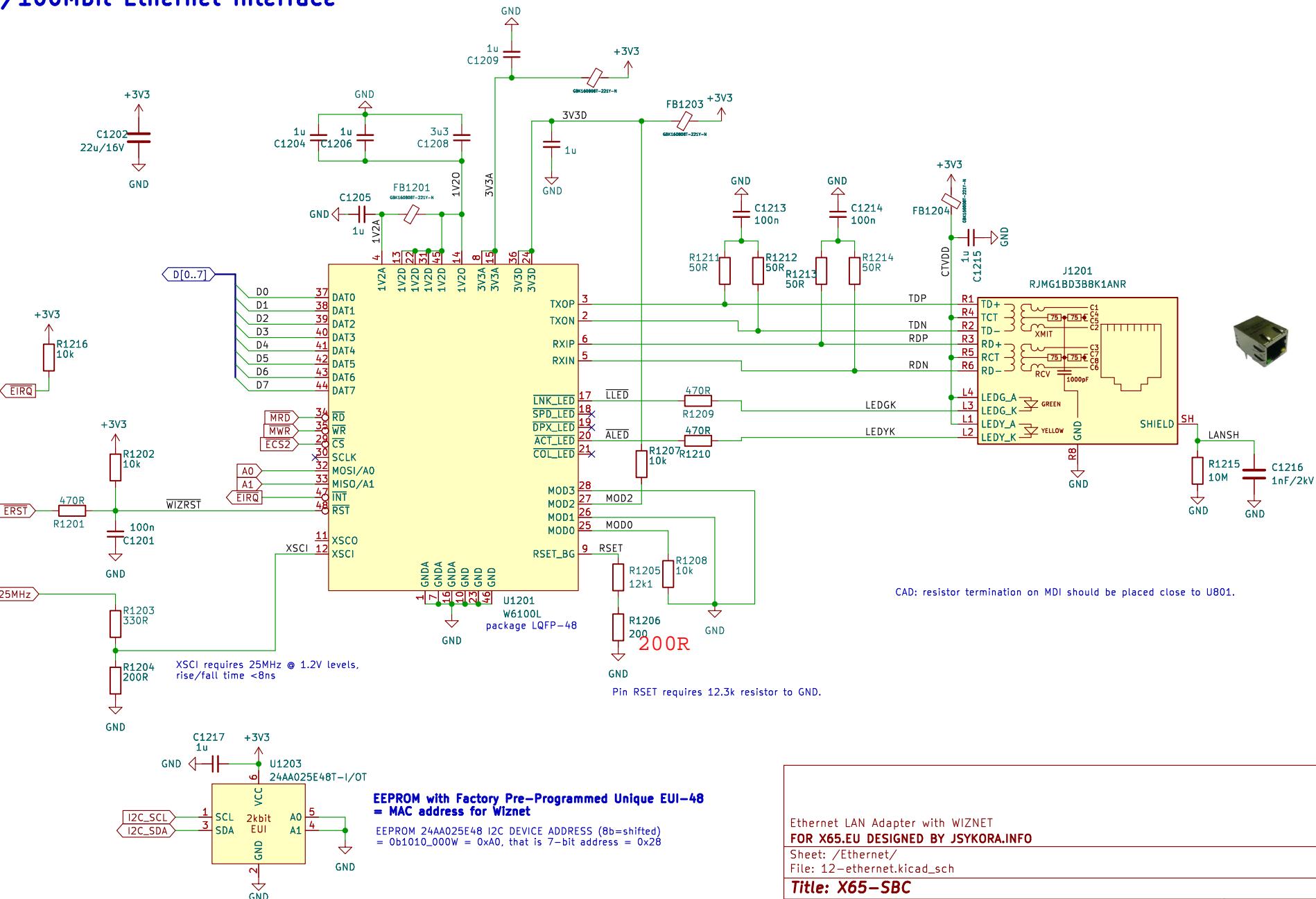
Sheet: /Sound Output/
File: 11-sndout.kicad_sch

Title: X65-SBC

Size: A4 Date: 2024-01-10
KiCad E.D.A. kicad 7.0.10-1.fc38

Rev: revA1
Id: 11/12

10/100Mbit Ethernet Interface



EEPROM with Factory Pre-Programmed Unique EUI-48
= MAC address for Wiznet

EEPROM 24AA025E48 I₂C DEVICE ADDRESS (8b=shifted)
= 0b1010_000W = 0xA0, that is 7-bit address = 0x28

Ethernet LAN Adapter with WIZNET
FOR X65.EU DESIGNED BY JSYKORA.INFO

Sheet: /Ethernet/
File: 12-ethernet.kicad_sch

Title: X65-SBC

Size: A4 Date: 2024-01-10
KiCad E.D.A. kicad 7.0.10-1.fc38



Rev: revA1
Id: 12/12