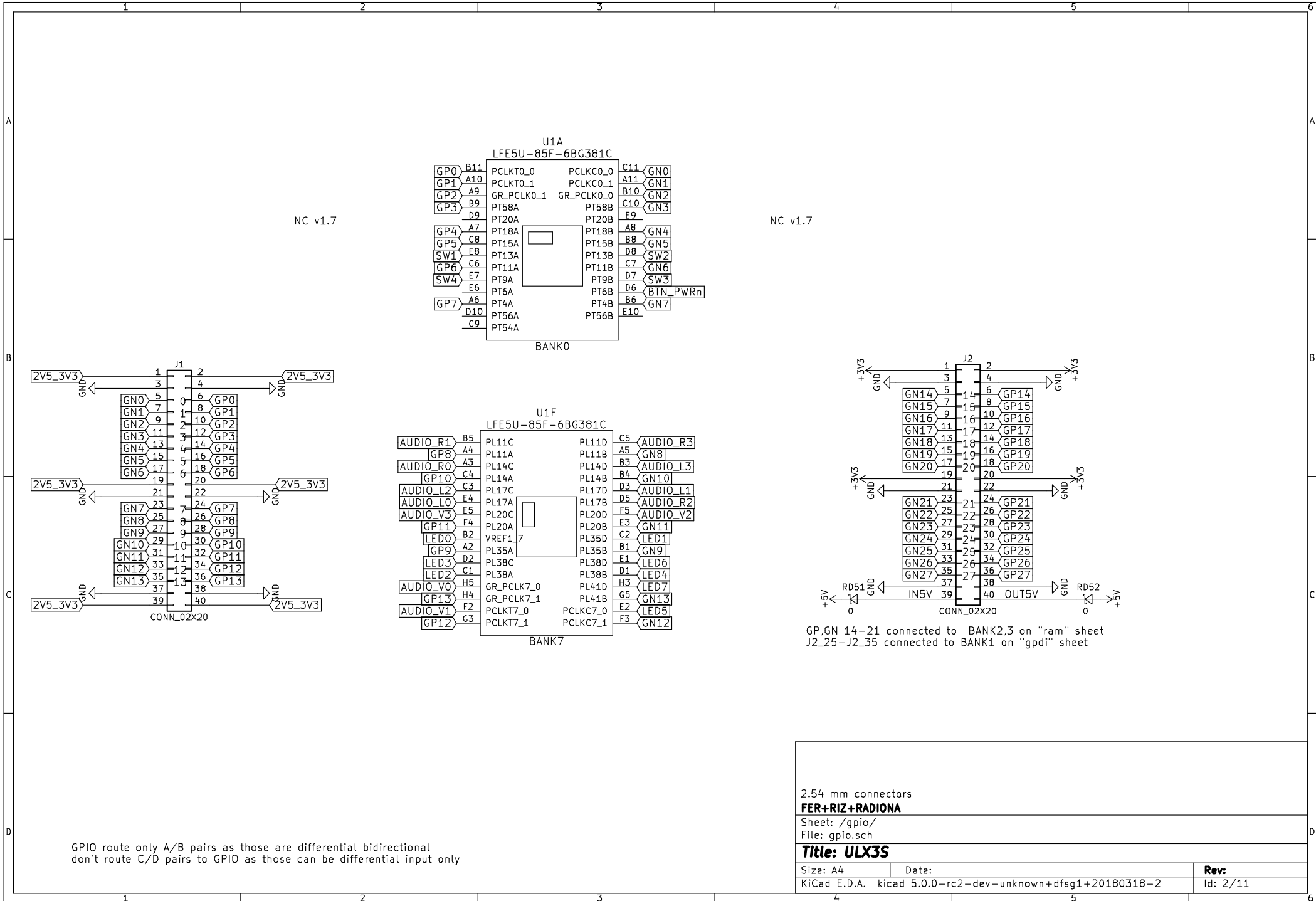


click on mouse pointer arrow on top of right toolbar
and double-click on sheet to open

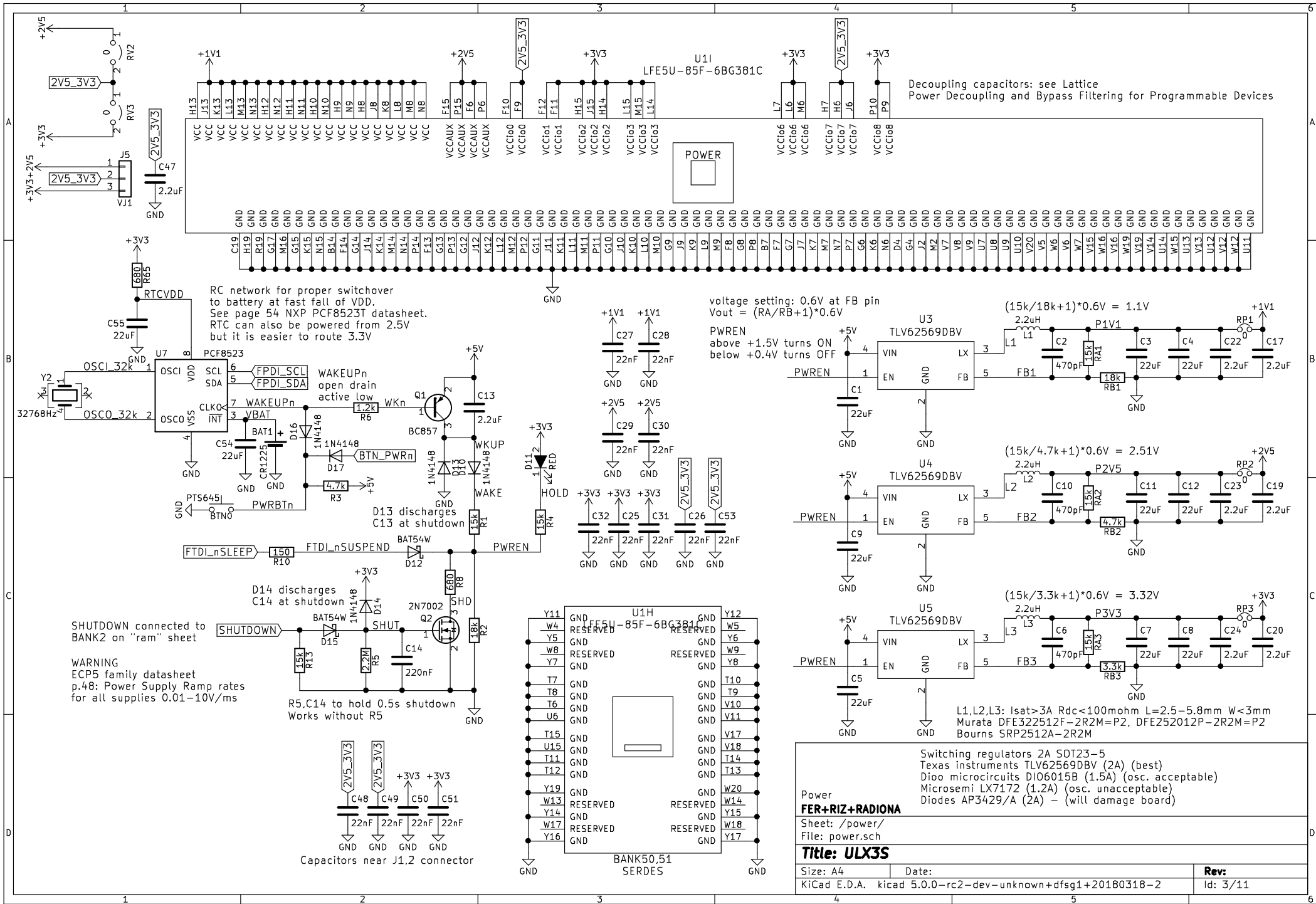
Sheet: power File: power.sch	Sheet: usb File: usb.sch	Sheet: blinkey File: blinkey.sch	Sheet: ram File: ram.sch	Sheet: sdcard File: sdcard.sch
Sheet: gpio File: gpio.sch	Sheet: gpdi File: gpdi.sch	Sheet: analog File: analog.sch	Sheet: wifi File: wifi.sch	Sheet: flash File: flash.sch

Root sheet	
FER+RIZ+RADIONA	
Sheet: /	
File: ulx3s.sch	
Title: ULX3S	
Size: A4	Date:
KiCad E.D.A. kicad 5.0.0-rc2-dev-unknown+dfsg1+20180318-2	Rev: 1.8.8 Id: 1/11

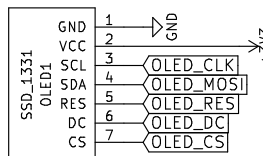


GPIO route only A/B pairs as those are differential bidirectional
don't route C/D pairs to GPIO as those can be differential input only

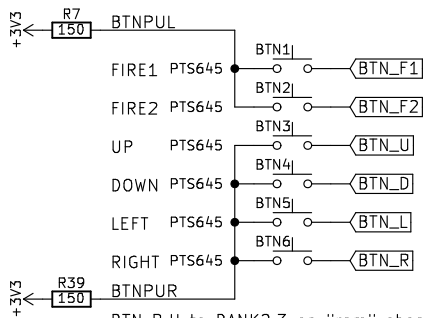
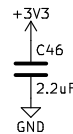
2.54 mm connectors	
FER+RIZ+RADIONA	
Sheet: /gpio/	
File: gpio.sch	
Title: ULX3S	
Size: A4	Date:
KiCad E.D.A. kicad 5.0.0-rc2-dev-unknown+dfsg1+20180318-2	Rev: 2/11



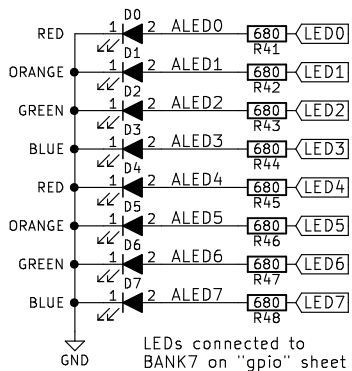
SSD1306 B/W or SSD1331 COLOR
compatible OLED 0.96" or 1.3" PCB
14x14 units
1 unit = 2.54 mm



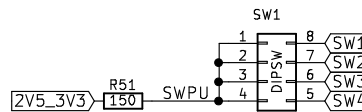
OLED connected to BANK6 on "usb" sheet



BTN_R,U to BANK2,3 on "ram" sheet
BTN_F1,F2,D,L to BANK8 on "flash" sheet

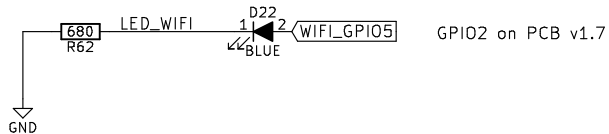
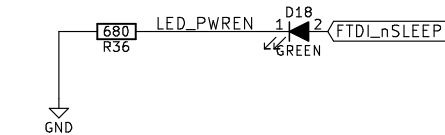


LEDs connected to BANK7 on "gpio" sheet



DIP switch connected to BANK0 on "gpio" sheet

To fix issues with FT231XS rev A,B,C
Short-circuit D18 LED, but then board cannot keep awake by USB.
chip rev D works properly
See TN140_FT231X Errata



Buttons, LEDs, OLED display

FER+RIZ+RADIONA

Sheet: /blinky/

File: blinky.sch

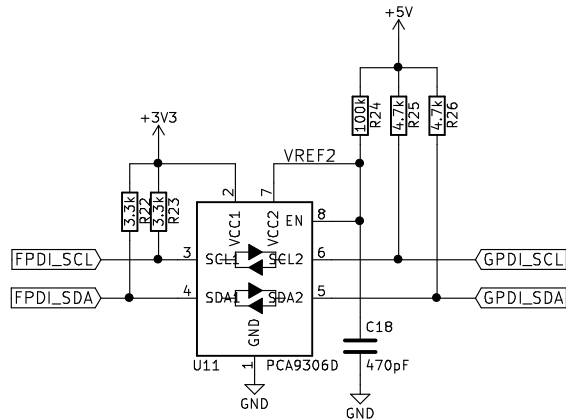
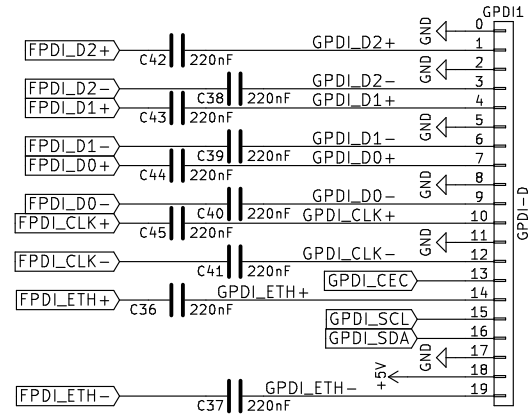
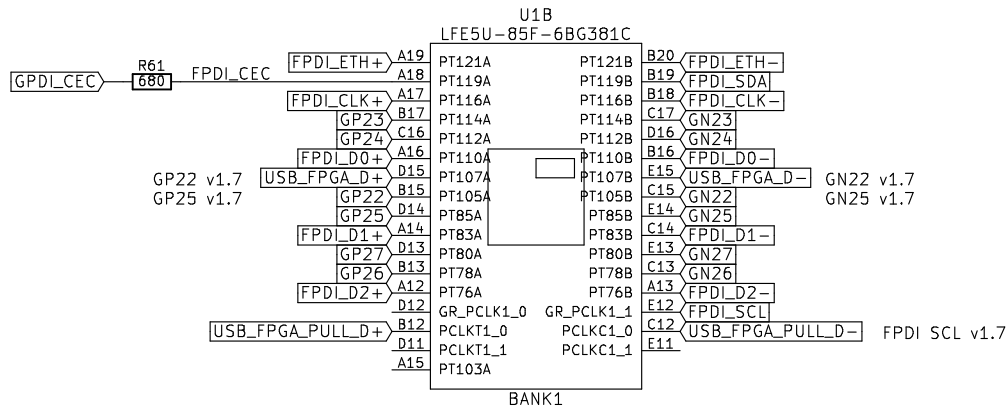
Title: ULX3S

Size: A4 Date:

Rev: 0.0.1

KiCad E.D.A. kicad 5.0.0-rc2-dev-unknown+dfsg1+20180318-2

Id: 4/11



i2c shared with RTC
on "power" sheet

PCB v1.8.1 and higher accept FCI 10029449-111RLF
www.amphenol-icc.com
mouser PN: 649-10029449-111RLF
<http://portal.fciconnect.com/Comergent/fci/drawing/10029449.pdf>

PCB v1.7 and v1.8 accept
mouser PN: 538-47151-1001 (Molex)
https://www.molex.com/pdm_docs/sd/471511001_sd.pdf
mouser PN: 710-685119134923 (Würth)
<https://katalog.we-online.com/em/datasheet/685119134923.pdf>

Digital Video and Ethernet
General Purpose Differential Interface

FER+RIZ+RADIONA

Sheet: /gpd1/

File: gpd1.sch

Title: ULX3S

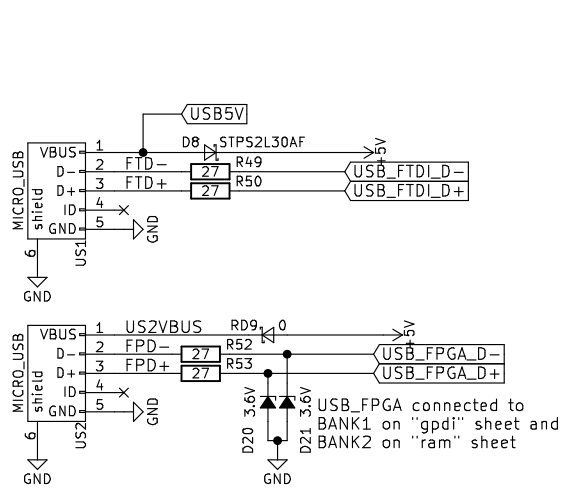
Size: A4

Date:

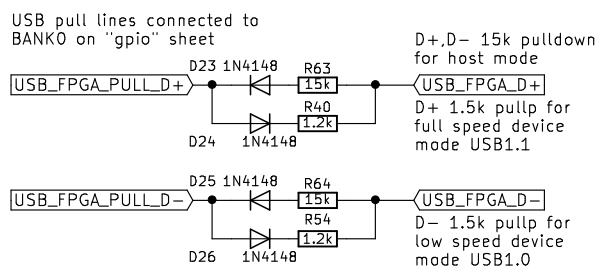
Rev: 0.0.1

KiCad E.D.A. kicad 5.0.0-rc2-dev-unknown+dfsg1+20180318-2

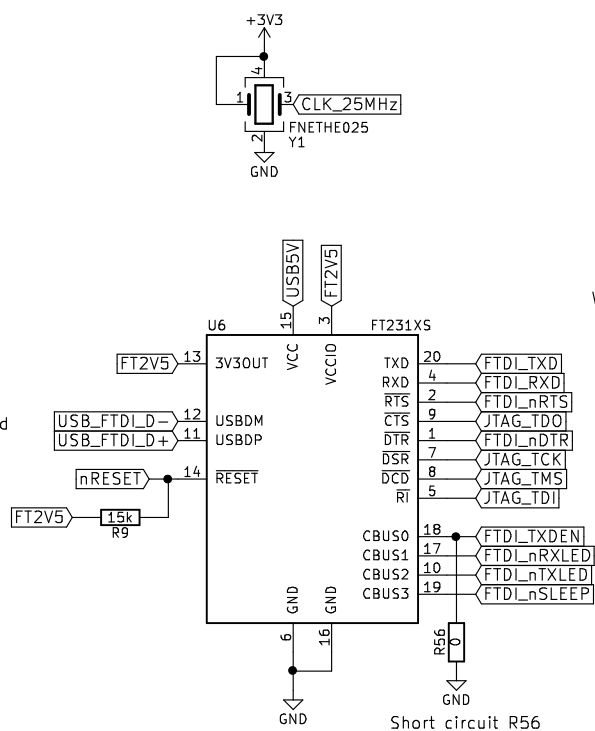
Id: 5/11



D8,D9: Schottky 2A/30V
 Low drop V_{fmax}=0.375V
 Parts reduction: Only D8 is required.
 D9 D51 D52 can be 1206
 1A polyfuses or 0-ohm/2A jumpers

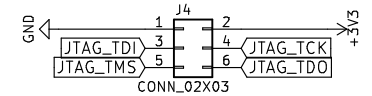
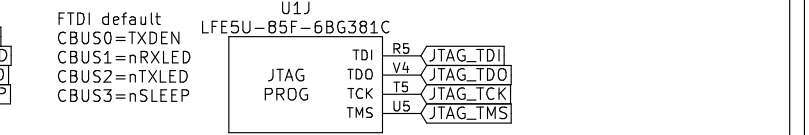
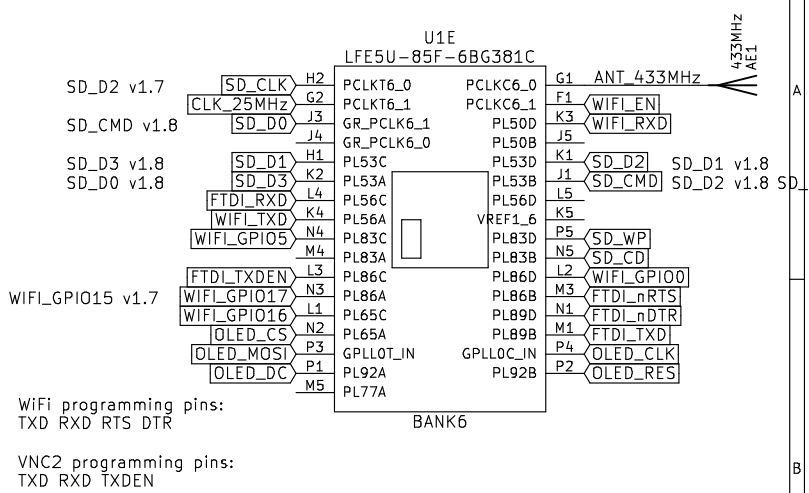


Deviation from USB specification in pulldowns for BOM simplification. With series diode, correct value R63 R64 should be 12k but 15k is used.



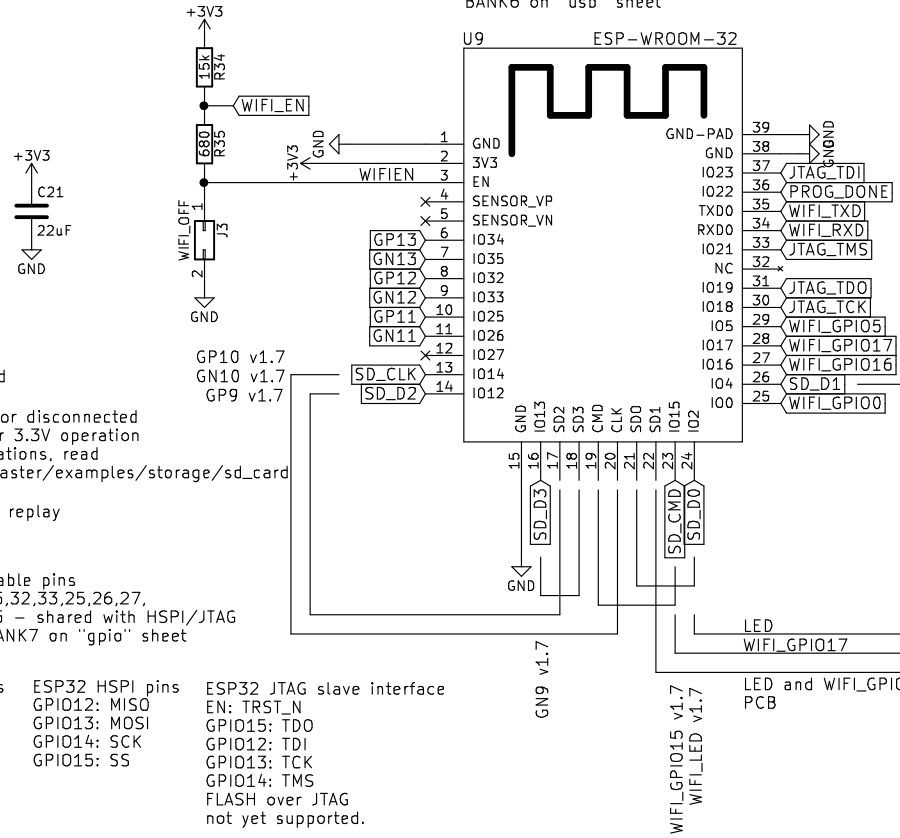
warning:
 ULX3S has different pinout for simpler PCB routing and because FT230X has weak CTS drive capability. (Undocumented, FLEAfpga mail from 13-Nov-2015)
 ULX2S pinout was:
 TCK = DSR
 TMS = RI
 TDI = CTS
 TDO = DCD

Short circuit R56 for chip rev A,B,C workaround in TN140_FT231X Errata



Root sheet	
FER+RIZ+RADIONA	
Sheet: /usb/	
File: usb.sch	
Title: ULX3S	
Size: A4	Date:
KiCad E.D.A. kicad 5.0.0-rc2-dev-unknown+dfsg1+20180318-2	Rev: 0.0.1
	Id: 6/11

WiFi and SDcard connected to BANK6 on "usb" sheet



PROG_DONE on "flash" sheet
Programming pins: TXD RXD EN GPIO0

NC v1.7, LED v1.8
NC v1.7

Strapping pins (avoid using to avoid boot problems)
GPIO0,2,4,5,12,15

SD card connected according to Arduino->Examples->ESP32->SD_MMC_Test
https://github.com/espressif/esp-idf/blob/master/examples/storage/sd_card/README.md

GPIO12 probably should be held low at reset or disconnected other option is to burn flash voltage efuse for 3.3V operation for GPIO2 and GPIO12 bootstrapping considerations, read https://github.com/espressif/esp-idf/tree/master/examples/storage/sd_card

GPIO25,26 are DAC channels that can directly replay audio material over i2s bus

ESP32 ADC capable pins
GPIO36,39,34,35,32,33,25,26,27,
GPIO14,12,13,15 - shared with HSPI/JTAG
Connected to BANK7 on "gpio" sheet

ESP32 VSPI pins	ESP32 HSPI pins	ESP32 JTAG slave interface
GPIO5: SS	GPIO12: MISO	EN: TRST_N
GPIO18: SCK	GPIO13: MOSI	GPIO15: TDO
GPIO19: MISO	GPIO14: SCK	GPIO12: TDI
GPIO23: MOSI	GPIO15: SS	GPIO13: TCK
		GPIO14: TMS
		FLASH over JTAG not yet supported.

WiFi module ESP8266-12E

FER+RIZ+RADIONA

Sheet: /wifi/

File: wifi.sch

Title: ULX3S

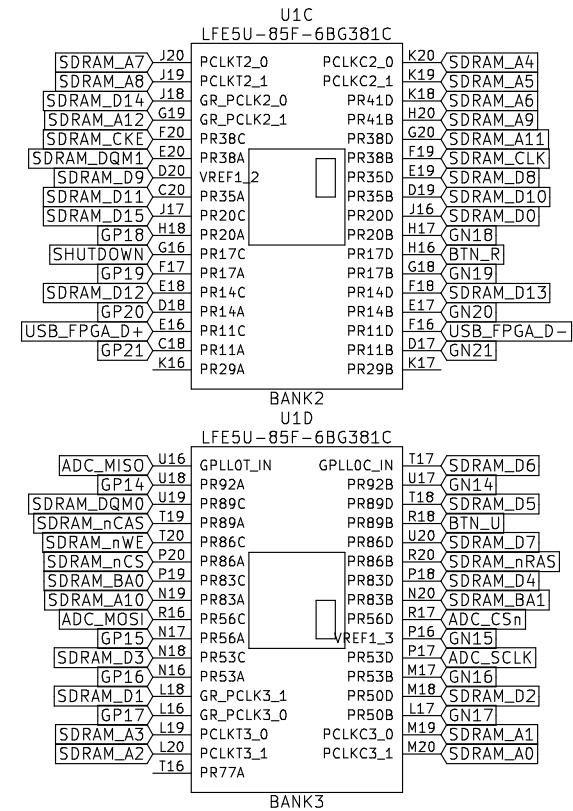
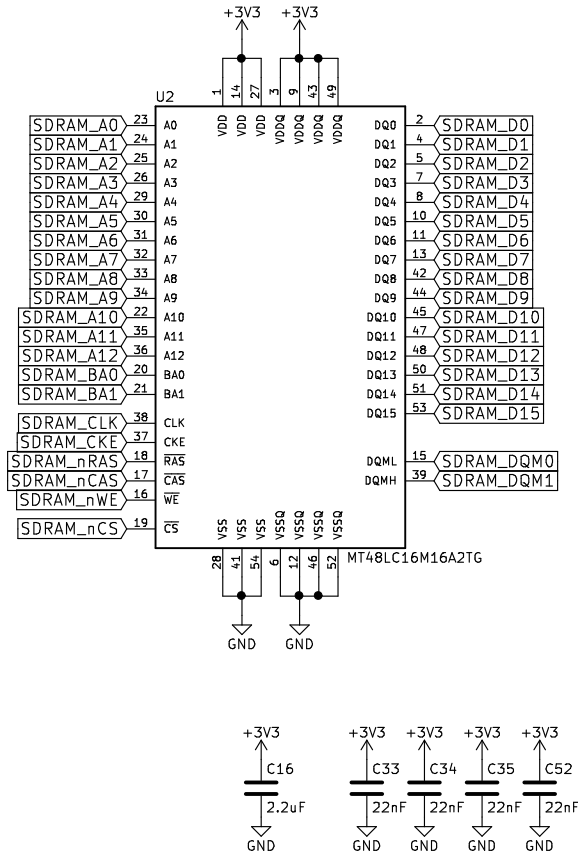
Size: A4

Date:

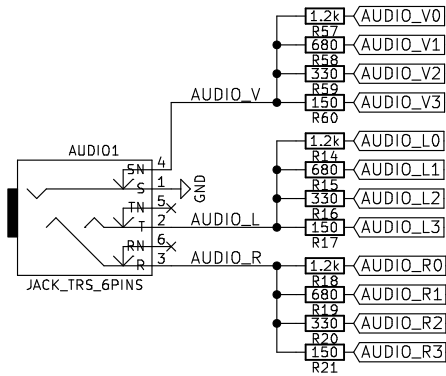
Rev: 0.0.1

KiCad E.D.A. kicad 5.0.0-rc2-dev-unknown+dfsg1+20180318-2

Id: 7/11

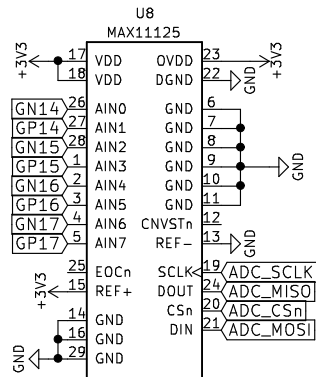


SDRAM memory		
FER+RIZ+RADIONA		
Sheet: /ram/		
File: ram.sch		
Title: ULX3S		
Size: A4	Date:	Rev: 0.0.1
KiCad E.D.A. kicad 5.0.0-rc2-dev-unknown+dfsg1+20180318-2		Id: 8/11



JACK pinout for SJ-43516-SMT-TR
<http://www.cui.com/product/resource/sj-4351x-smt-series.pdf>
 pin 1 - sleeve (GND)
 pin 2 - tip (left channel)
 pin 3 - ring1 (right channel)
 pin 4 - ring2 (video)
 pin 5 - tip switch
 pin 6 - ring1 switch

Audio connected to
 BANK7 on "gpio" sheet



ADC SPI connected to
 BANK3 of "ram" sheet

Analog audio and video

FER+RIZ+RADIONA

Sheet: /analog/

File: analog.sch

Title:

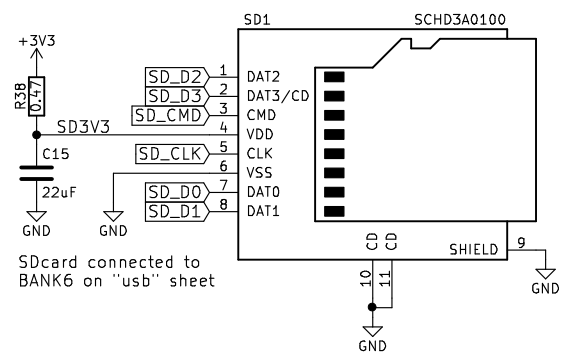
Size: A4

Date:

Rev:

KiCad E.D.A. kicad 5.0.0-rc2-dev-unknown+dfsg1+20180318-2

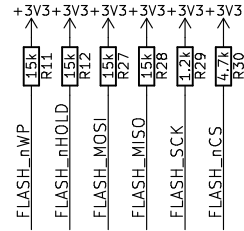
Id: 9/11



minimum pins for compatible mode
SD_CLK, SD_CMD, SD_D0, SD_D3

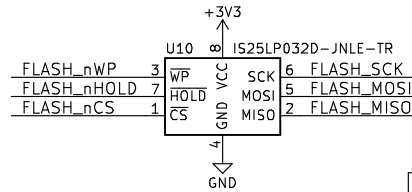
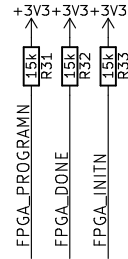
SD card		
FER+RIZ+RADIONA		
Sheet: /sdcards/		
File: sdcards.sch		
Title: ULX3S		
Size: A4	Date:	Rev: 0.0.1
KiCad E.D.A. kicad 5.0.0-rc2-dev-unknown+dfsg1+20180318-2		Id: 10/11

pullups for Master SPI (MSPi) required by
TN1260: lattice ECP5 sysCONFIG guide p.6

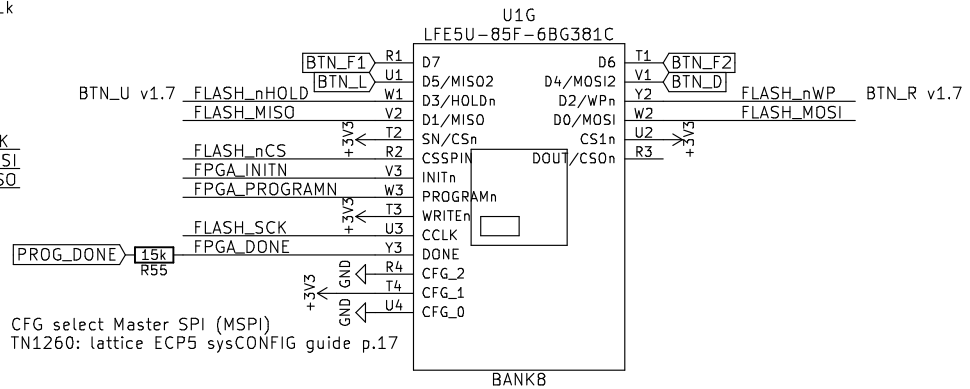


Deviation from TN1260 in pullup:
values for BOM simplification.
Correct values should be 10k and 1k
but 15k and 1.2k are used.

pullups to allow entering USER mode
TN1260: lattice ECP5 sysCONFIG guide p.6, p.8, p.13



For programming Flash thru JTAG see
Lattice FPGA-TN-02050



Sheet: /flash/
File: flash.sch

Title:

Size: A4

Date:

Rev:

KiCad E.D.A. kicad 5.0.0-rc2-dev-unknown+dfsg1+20180318-2

Id: 11/11