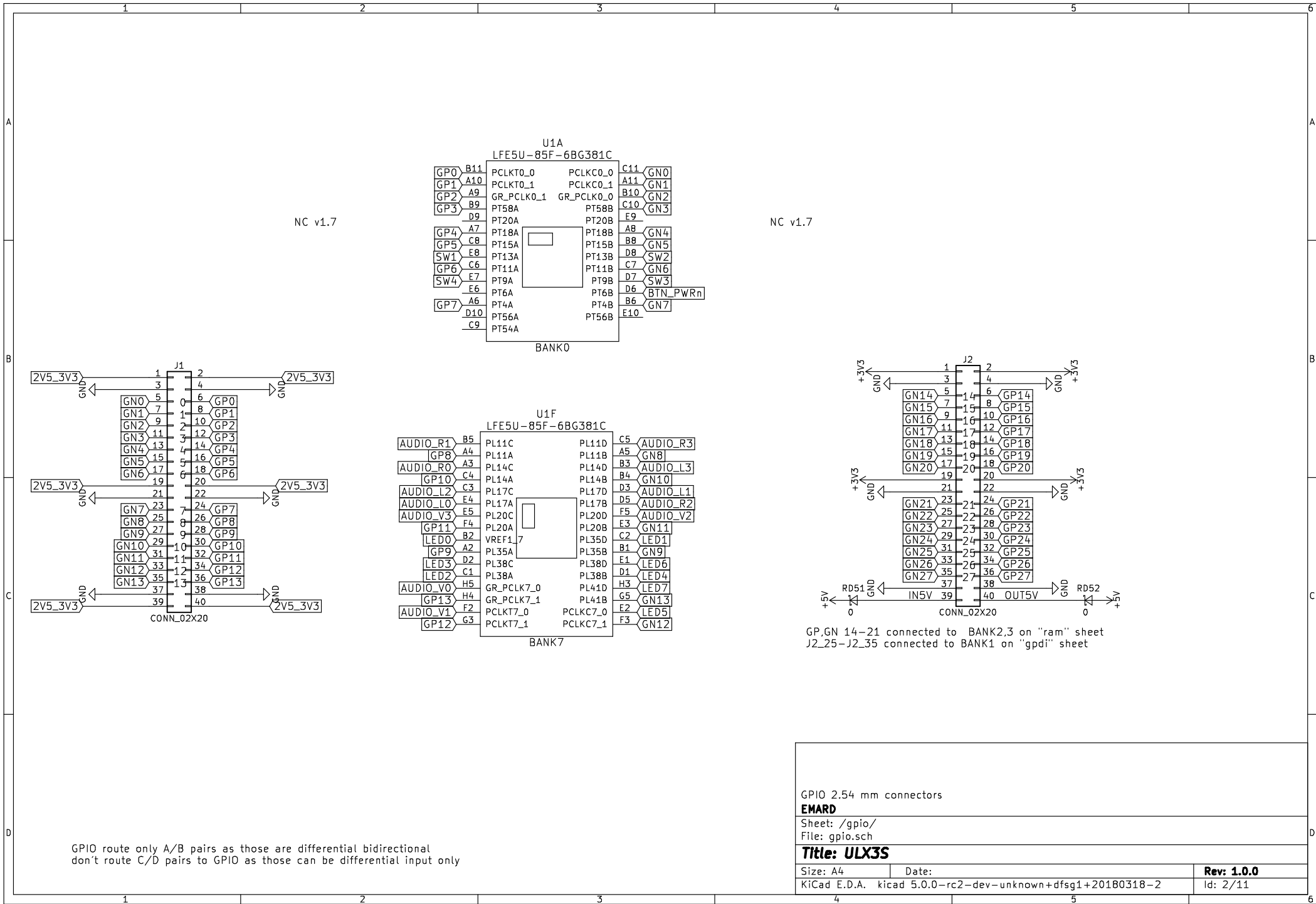


click on mouse pointer arrow on top of right toolbar
and double-click on sheet to open

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	
EMARD	
Sheet: /	
File: ulx3s.sch	
Title: ULX3S	
Size: A4	Date:
KiCad E.D.A. kicad 5.0.0-rc2-dev-unknown+dfsg1+20180318-2	
Rev: 1.8.9	
Id: 1/11	



NC v1.7

NC v1.7

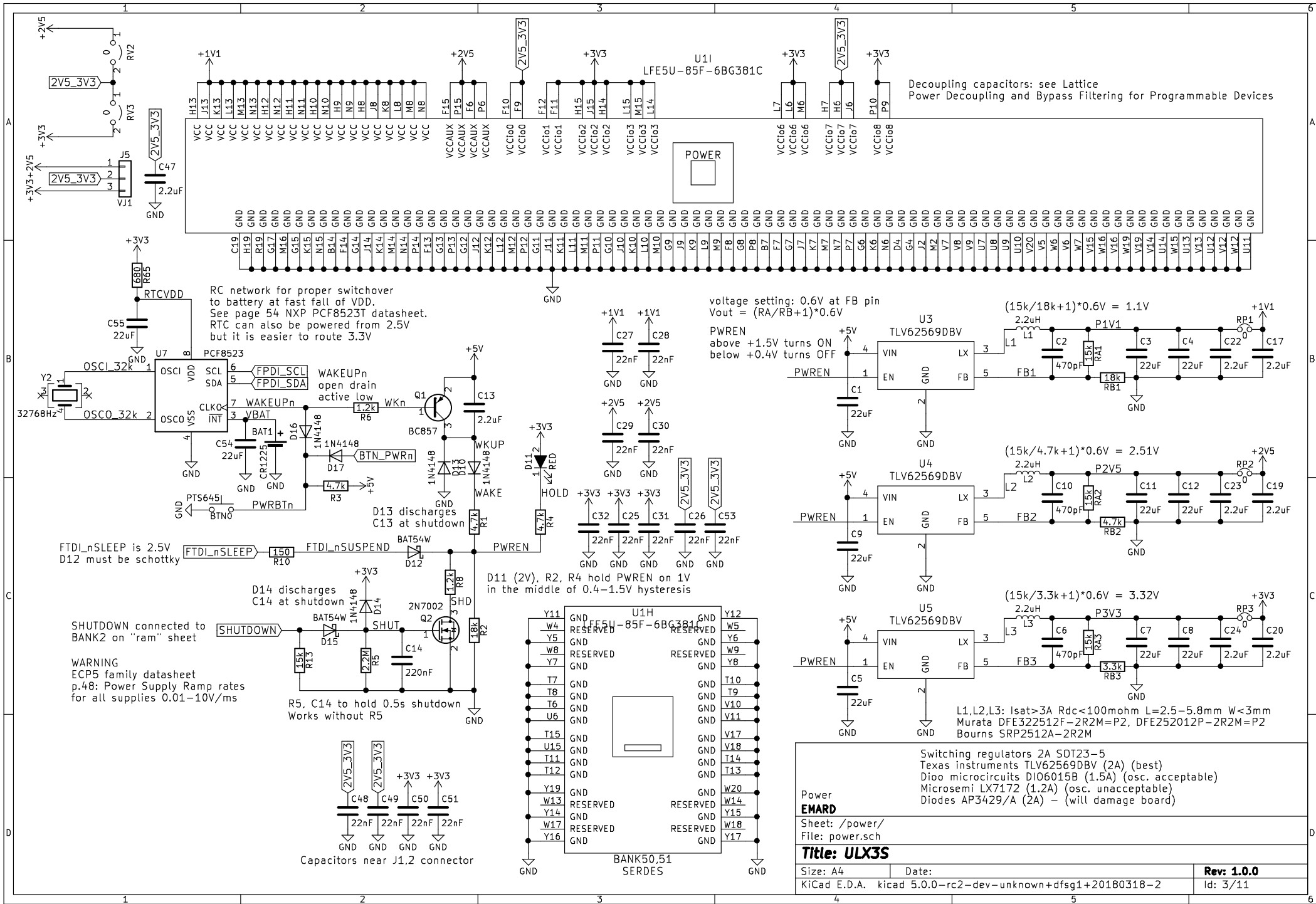
BANK0

BANK7

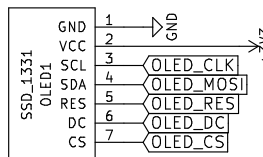
GP,GN 14-21 connected to BANK2,3 on "ram" sheet
 J2_25-J2_35 connected to BANK1 on "gpi" sheet

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

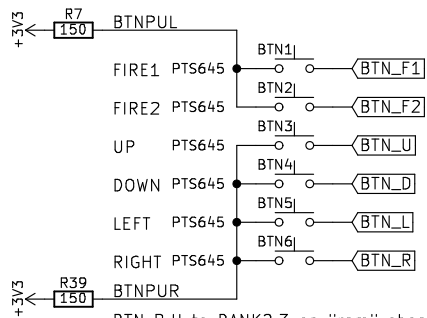
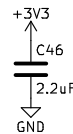
GPIO 2.54 mm connectors	
EMARD	
Sheet: /gpio/	
File: gpio.sch	
Title: ULX3S	
Size: A4	Date:
KiCad E.D.A. kicad 5.0.0-rc2-dev-unknown+dfsg1+20180318-2	Rev: 1.0.0
	Id: 2/11



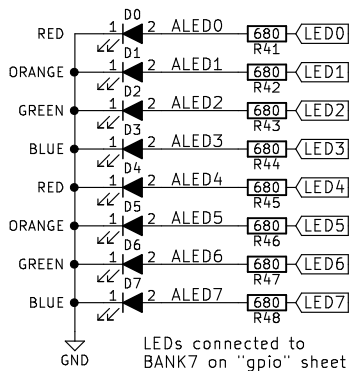
SSD1306 B/W or SSD1331 COLOR
compatible OLED 0.96" or 1.3" PCB
14x14 units
1 unit = 2.54 mm



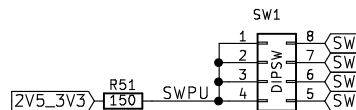
OLED connected to
BANK6 on "usb" sheet



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

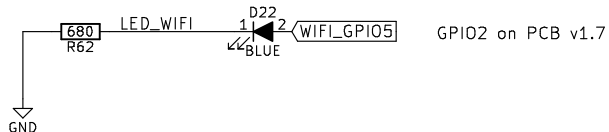
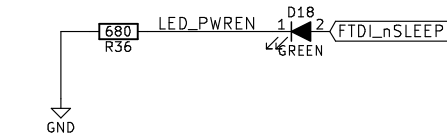


LEDs connected to
BANK7 on "gpio" sheet



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

EMARD

Sheet: /blinky/

File: blinky.sch

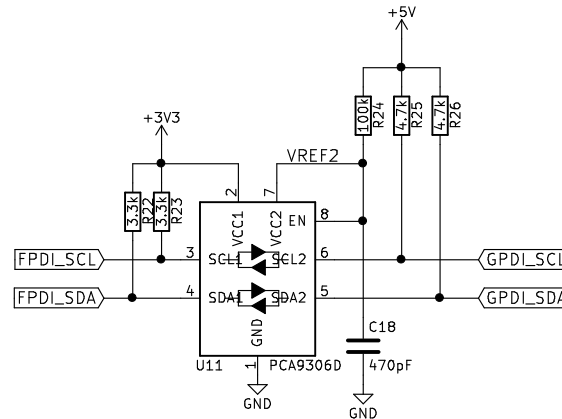
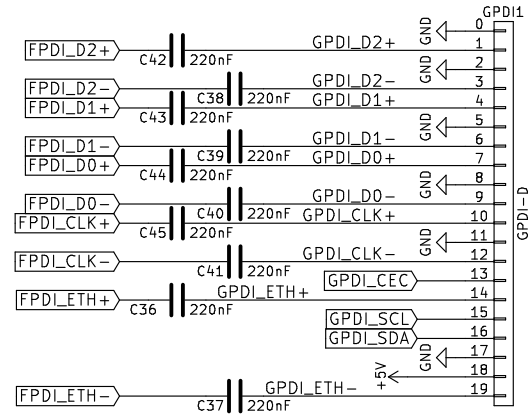
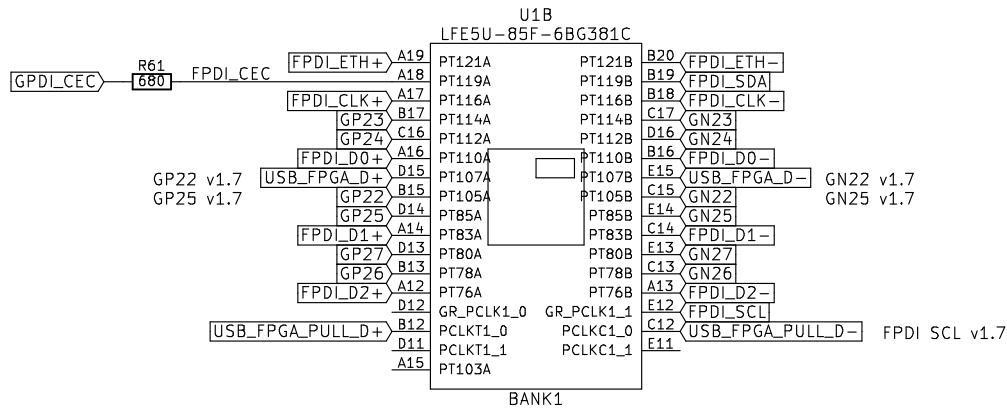
Title: ULX3S

Size: A4 Date:

Rev: 1.0.0

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>

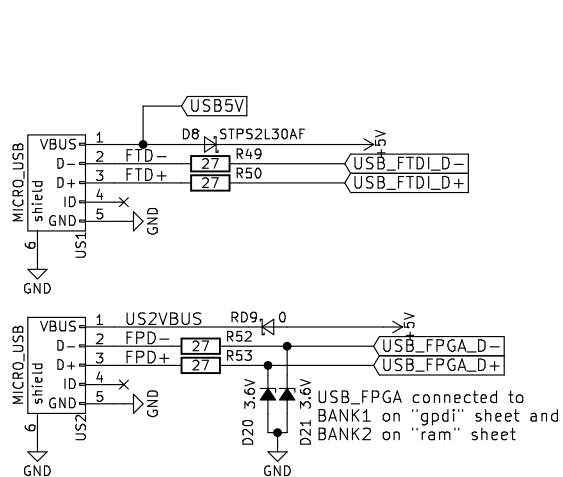
Digital Video and Ethernet
 General Purpose Differential Interface

EMARD

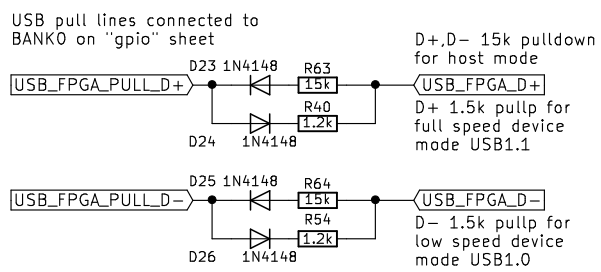
Sheet: /gpd/
 File: gpd.sch

Title: ULX3S

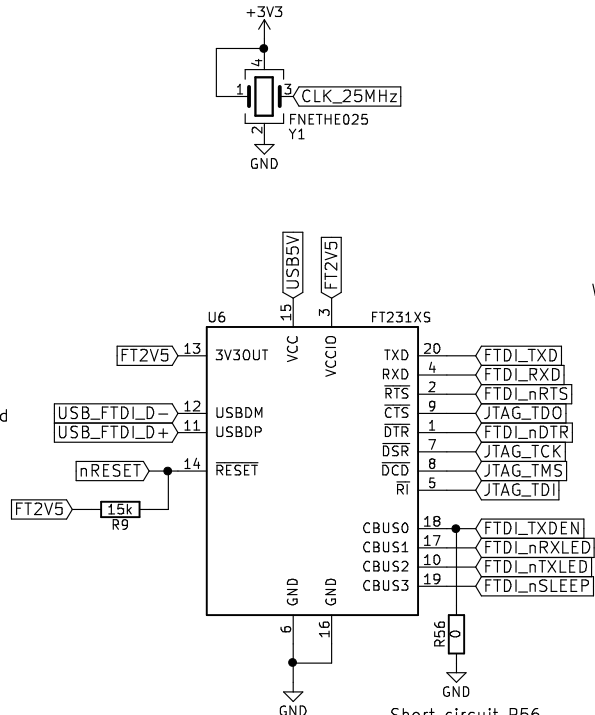
Size: A4	Date:	Rev: 1.0.0
KiCad E.D.A. kicad 5.0.0-rc2-dev-unknown+dfsg1+20180318-2		Id: 5/11



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

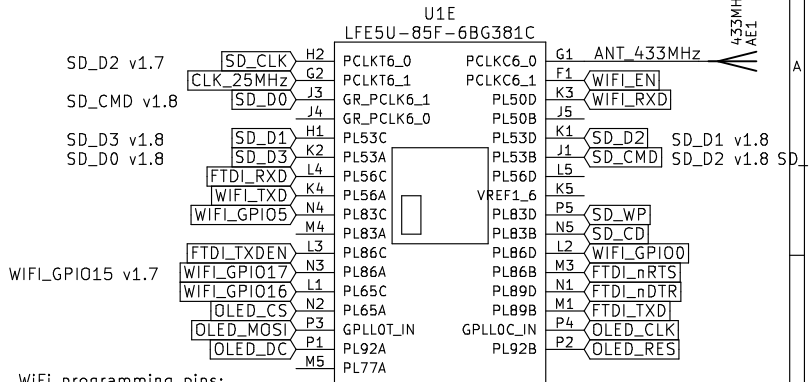


Deviation from USB specification in pulldowns for BOM simplification. With series diode, correct value R63 R64 should be 12k but 15k is used.



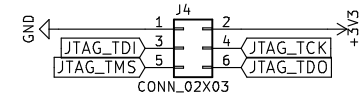
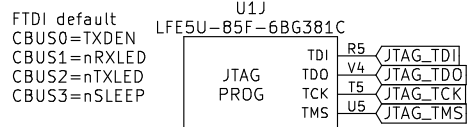
warning:
 ULX3S has different pinout for simpler PCB routing and because FT230X has weak CTS drive capability. (Undocumented, FLEAfpga mail from 13-Nov-2015)
 ULX2S pinout was:
 TCK = DSR
 TMS = RI
 TDI = CTS
 TDO = DCD

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



WiFi programming pins:
 TXD RXD RTS DTR

VNC2 programming pins:
 TXD RXD TXDEN



USB serial and JTAG

EMARD	
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: 1.0.0
	Id: 6/11

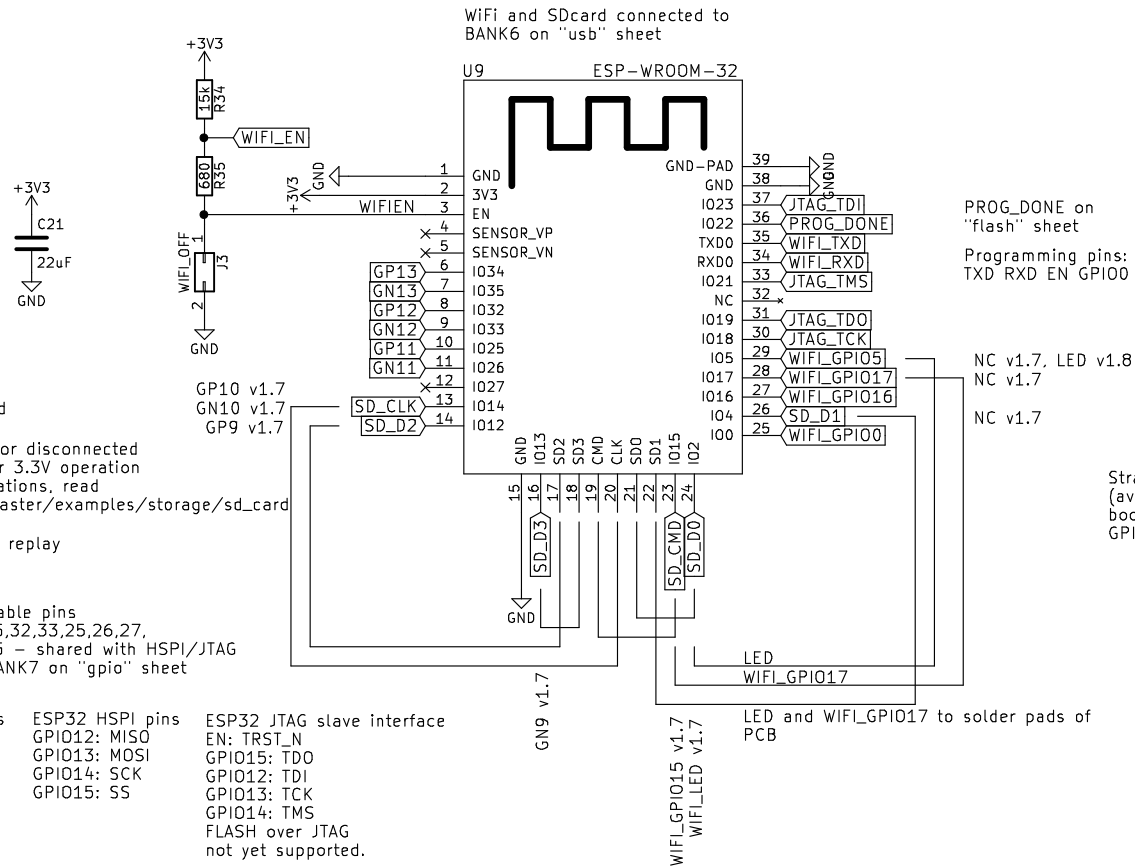
SD card connected according to
 Arduino->Examples->ESP32->SD_MMC_Test
https://github.com/espressif/esp-idf/blob/master/examples/storage/sd_card/README.md

GPIQ12 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

GPIQ25,26 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.



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

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

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

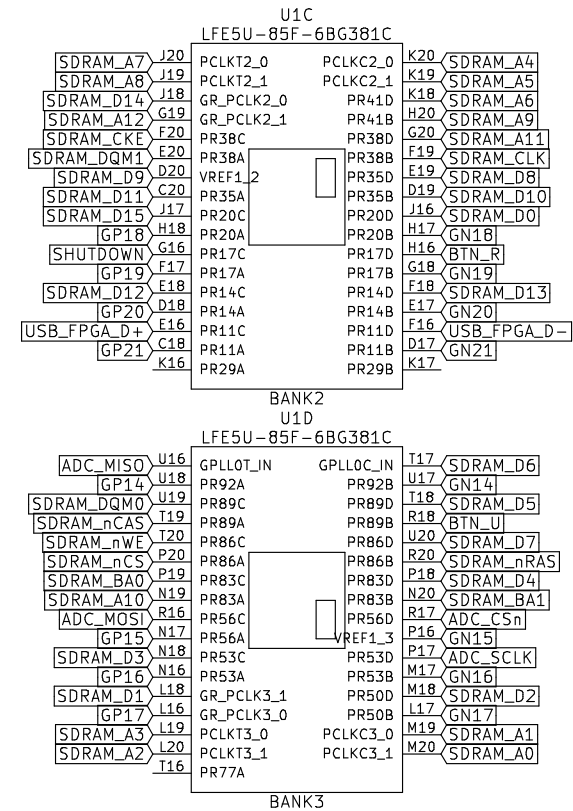
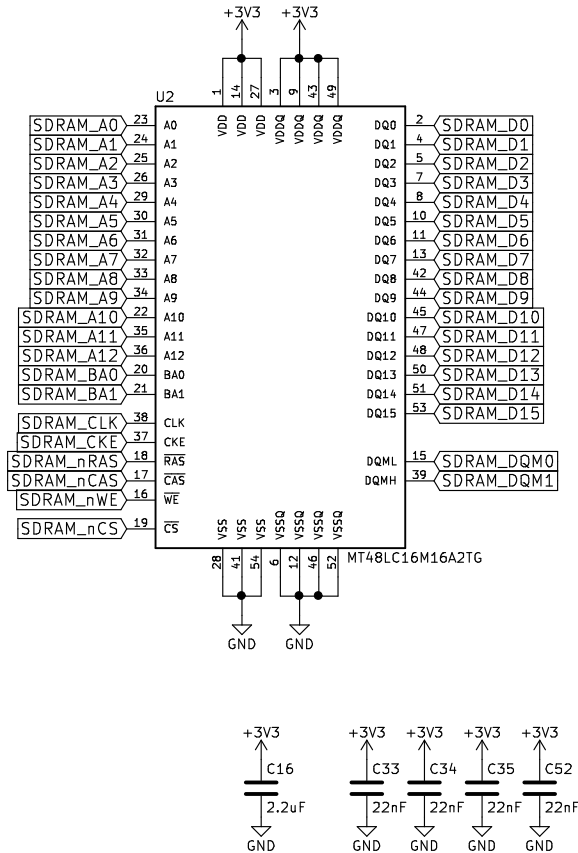
WiFi module ESP32

EMARD

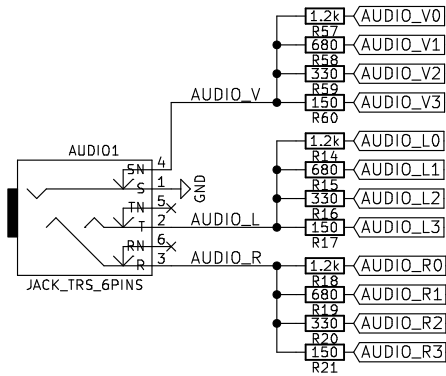
Sheet: /wifi/
 File: wifi.sch

Title: ULX3S

Size: A4	Date:	Rev: 1.0.0
KiCad E.D.A. kicad 5.0.0-rc2-dev-unknown+dfsg1+20180318-2		Id: 7/11

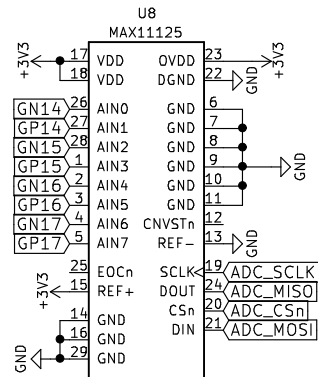


SDRAM memory	
EMARD	
Sheet: /ram/	
File: ram.sch	
Title: ULX3S	
Size: A4	Date:
KiCad E.D.A. kicad 5.0.0-rc2-dev-unknown+dfsg1+20180318-2	Rev: 1.0.0
	Id: 8/11



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

EMARD

Sheet: /analog/

File: analog.sch

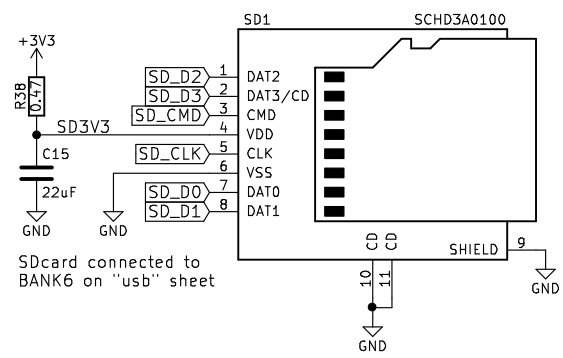
Title: ULX3S

Size: A4 Date:

Rev: 1.0.0

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

Id: 9/11

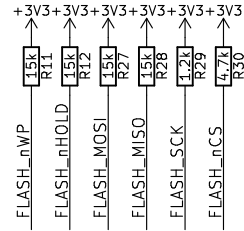


SDcard connected to BANK6 on "usb" sheet

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

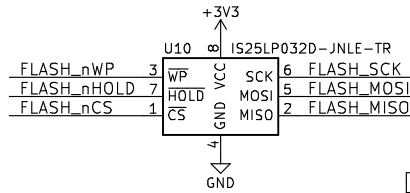
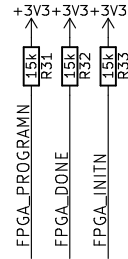
SD card		
EMARD		
Sheet: /sdcards/		
File: sdcards.sch		
Title: ULX3S		
Size: A4	Date:	Rev: 1.0.0
KiCad E.D.A. kicad 5.0.0-rc2-dev-unknown+dfsg1+20180318-2		Id: 10/11

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

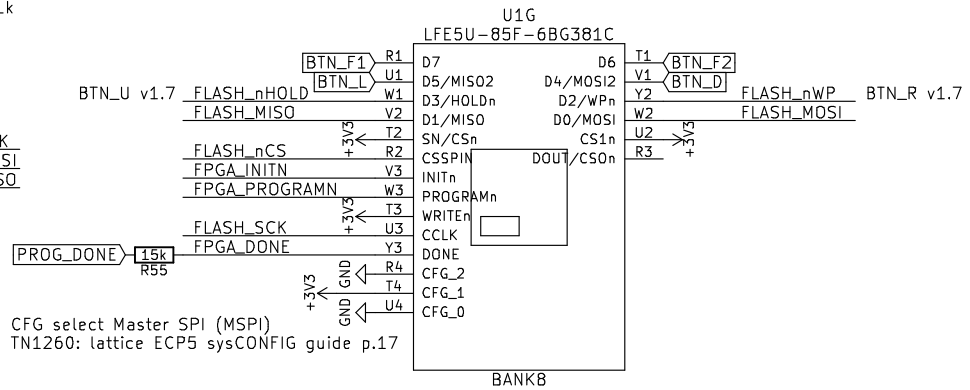


Deviation from TN1260 in pullup:
values for BOM simplification.
Correct values should be 10k and 1k
but 15k and 1.2k are used.

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



SPI flash	
EMARD	
Sheet: /flash/	
File: flash.sch	
Title: ULX3S	
Size: A4	Date:
KiCad E.D.A. kicad 5.0.0-rc2-dev-unknown+dfsg1+20180318-2	Rev: 1.0.0
	Id: 11/11