

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

Sheet: power

File: power.sch

Sheet: gpio

File: gpio.sch

Sheet: usb

File: usb.sch

Sheet: gpdi

File: gpdi.sch

Sheet: blinky

File: blinky.sch

Sheet: analog

File: analog.sch

Sheet: ram

File: ram.sch

Sheet: wifi

File: wifi.sch

Sheet: serdes

File: serdes.sch

Sheet: flash

File: flash.sch

Root sheet

EMARD

Sheet: /

File: ulx3s.sch

Title: ULX3S

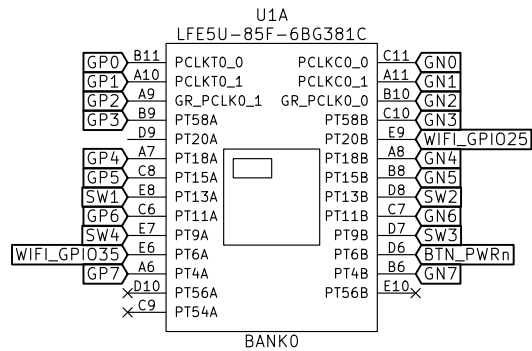
Size: A4

Date:

KiCad E.D.A. kicad 5.1.9+dfsg1-1

Rev: 3.1.6

Id: 1/11

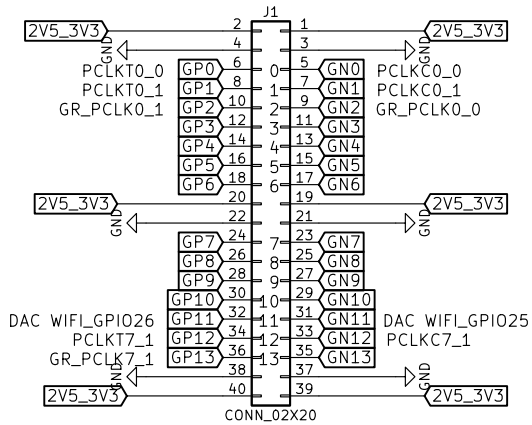


NC v1.7

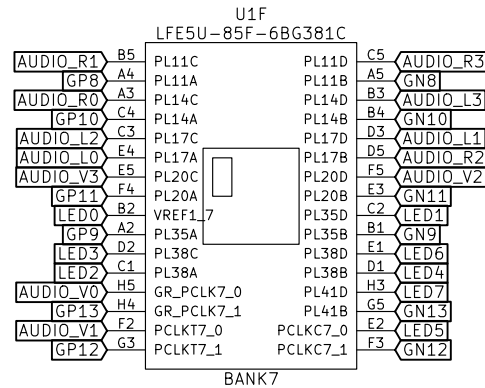
NC <v3.1.2

NC v1.7

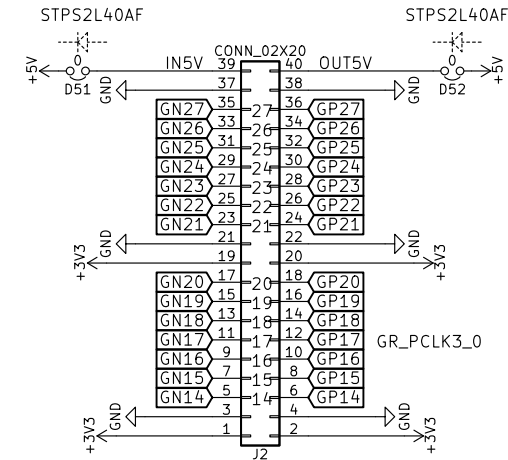
J1 J2 PIN numbering 1-40 is for FEMALE 90° ANGLED header.
For MALE VERTICAL header, SWAP EVEN and ODD pin numbers.



GP,GN 0-7 single-ended connected to BANK0
GP,GN 8-13 differential bidirectional connected to BANK7



J1 J2 PIN numbering 1-40 is for FEMALE 90° ANGLED header.
For MALE VERTICAL header, SWAP EVEN and ODD pin numbers.



GP,GN 14-21 differential bidirectional connected to BANK2,3 on "ram" sheet
GP,GN 22-27 single-ended 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
BANK0,1 are single-ended (non-differential)

GPIO 2.54 mm connectors

EMARD

Sheet: /gpio/

File: gpio.sch

Title: ULX3S

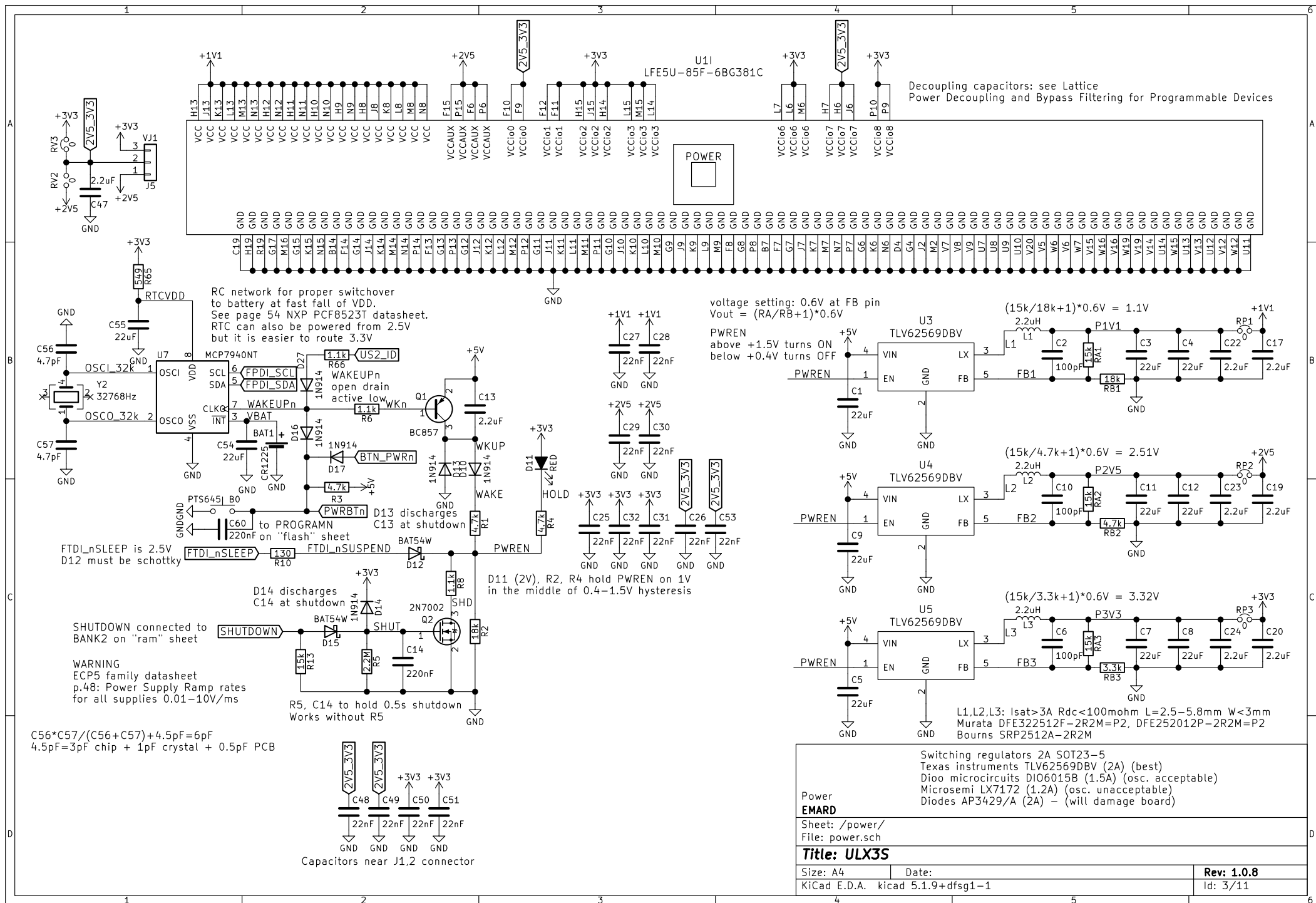
Size: A4

Date:

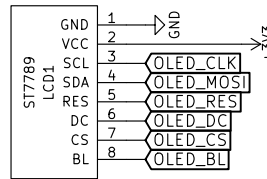
KiCad E.D.A. kicad 5.1.9+dfsg1-1

Rev: 1.0.2

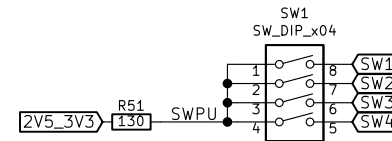
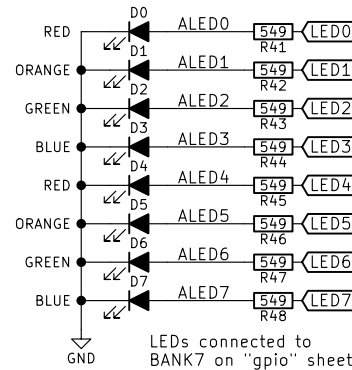
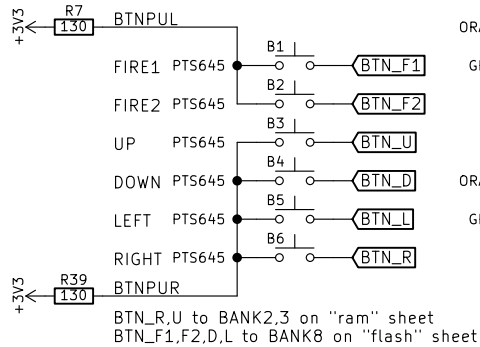
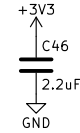
Id: 2/11



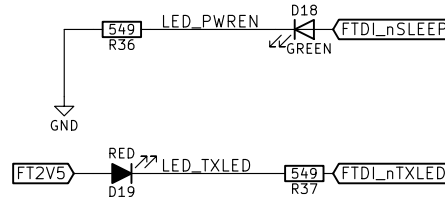
ST7789/SSD1331/SSD1351/SSD1306
compatible LCD/OLED 0.96/1.3/1.54" PCB
14x14 units
1 unit = 2.54 mm



OLED connected to
BANK6 on "usb" 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



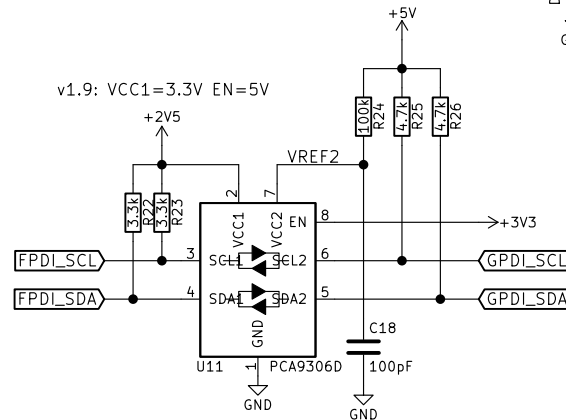
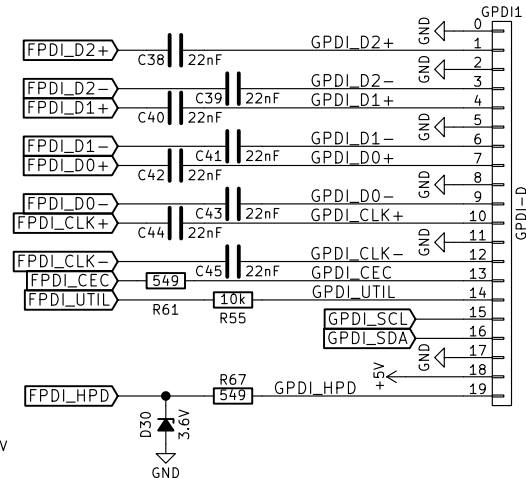
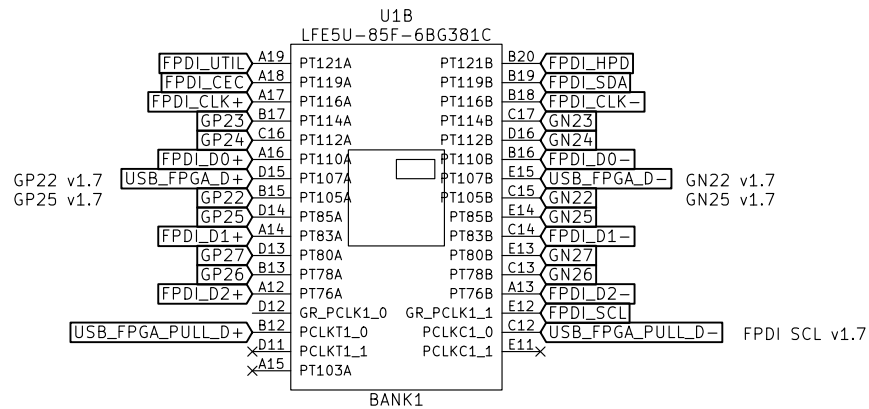
Buttons, LEDs, OLED display
EMARD

Sheet: /blinky/
File: blinky.sch

Title: ULX3S

Size: A4 Date:
KiCad E.D.A. kicad 5.1.9+dfsg1-1

Rev: 1.0.3
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

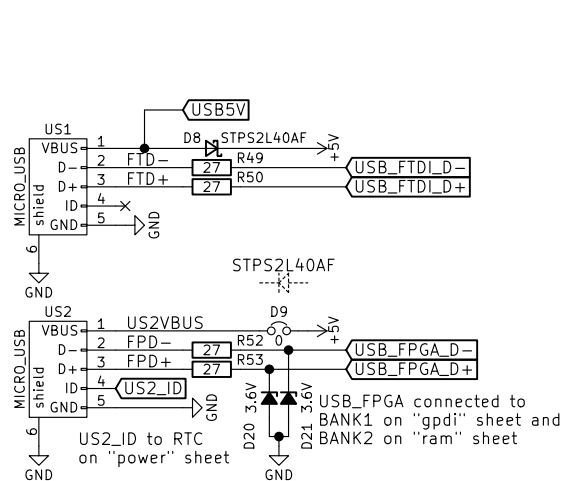
PCB v1.7 and v1.8 accept
mouser PN: 538-47151-1001 (Molex)
https://www.molex.com/pdm_docs/sd/471511001_sd.pdf
mouser PN: 710-685119134923 (Würth)
https://catalog.we-online.com/em/datasheet/685119134923.pdf

Digital Video and Ethernet
General Purpose Differential Interface
EMARD

Sheet: /gpd1/
File: gpd1.sch

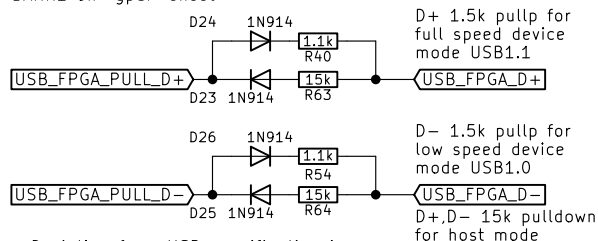
Title: ULX3S

Size: A4 Date: Rev: 1.0.5
KiCad E.D.A. kicad 5.1.9+dfsg1-1 Id: 5/11

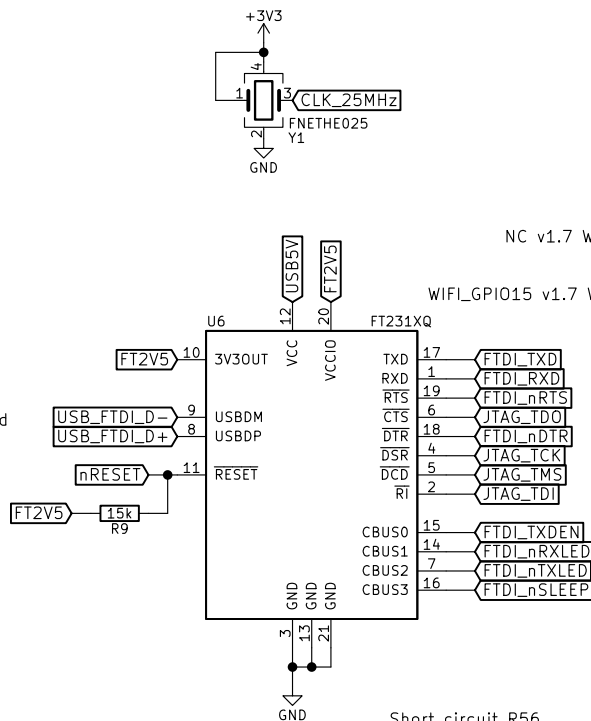


D8,D9: Schottky 2A/30V
Low drop $V_{fmax}=0.375V$
Parts reduction: Only D8 is required.
D9 D51 D52 can be 1206
1A polyfuses or 0-ohm/2A jumpers

USB pull lines connected to
BANK1 on "gpd" sheet

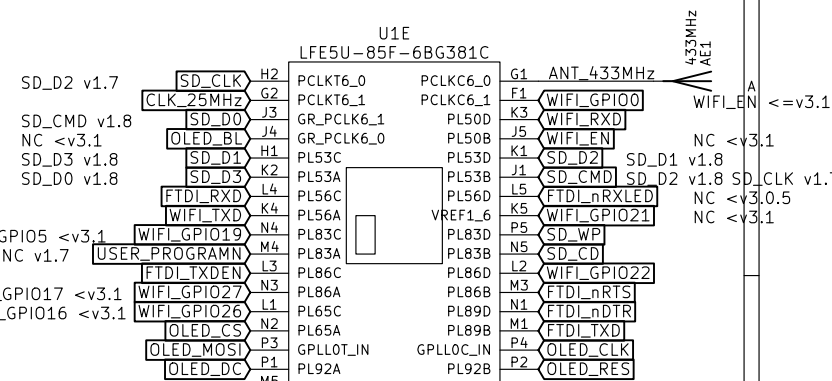


Deviation from USB specification in
pulldowns for BOM simplification.
With series diode, correct value R63 R64
should be 12k but 15k is used.



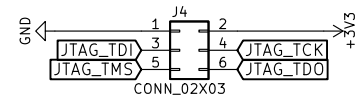
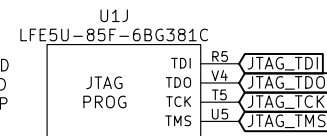
warning:
ULX3S has different pinout
for simpler PCB routing and
because FT230X has weak CTS
drive capability. (Undocumented,
FLEAfpga mail from 13-Nov-2015)
ULX2S pinout was:
TCK = DSR
TMS = RI
TDI = CTS
TDO = DCD

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

FTDI default
CBUS0=TXDEN
CBUS1=nRXLED
CBUS2=nTXLED
CBUS3=nSLEEP



USB serial and JTAG

EMARD

Sheet: /usb/
File: usb.sch

Title: ULX3S

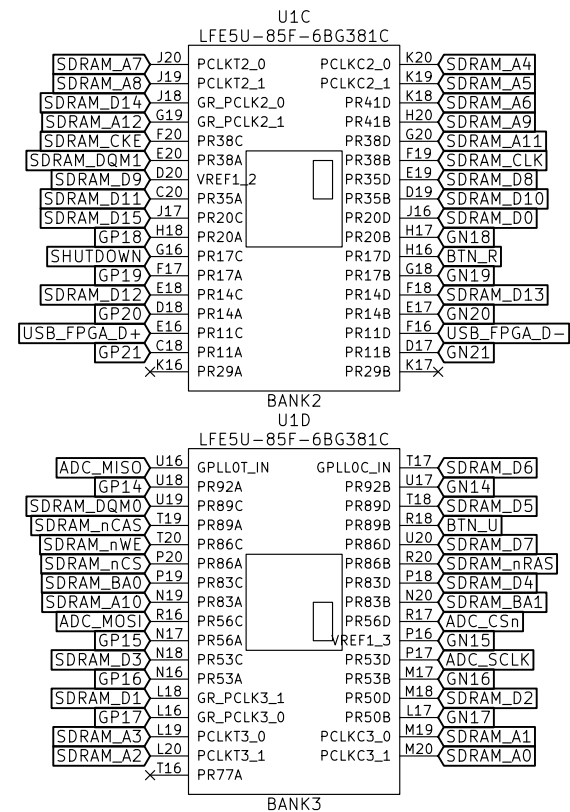
Size: A4

Date:

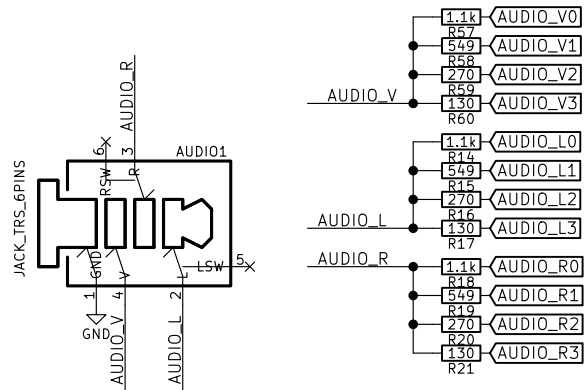
KiCad E.D.A. kicad 5.1.9+dfsg1-1

Rev: 1.0.9

Id: 6/11



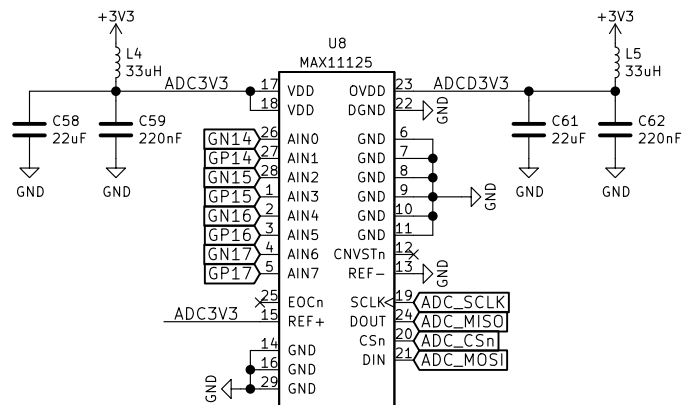
Id: 8/11



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

Output resistance: 75 ohm
 Internal resistance of FPGA pin: 10 ohm
 $1/(1/(130+10)+1/(270+10)+1/(549+10)+1/(1100+10))=74.6$



ADC SPI connected to
 BANK3 of "ram" sheet

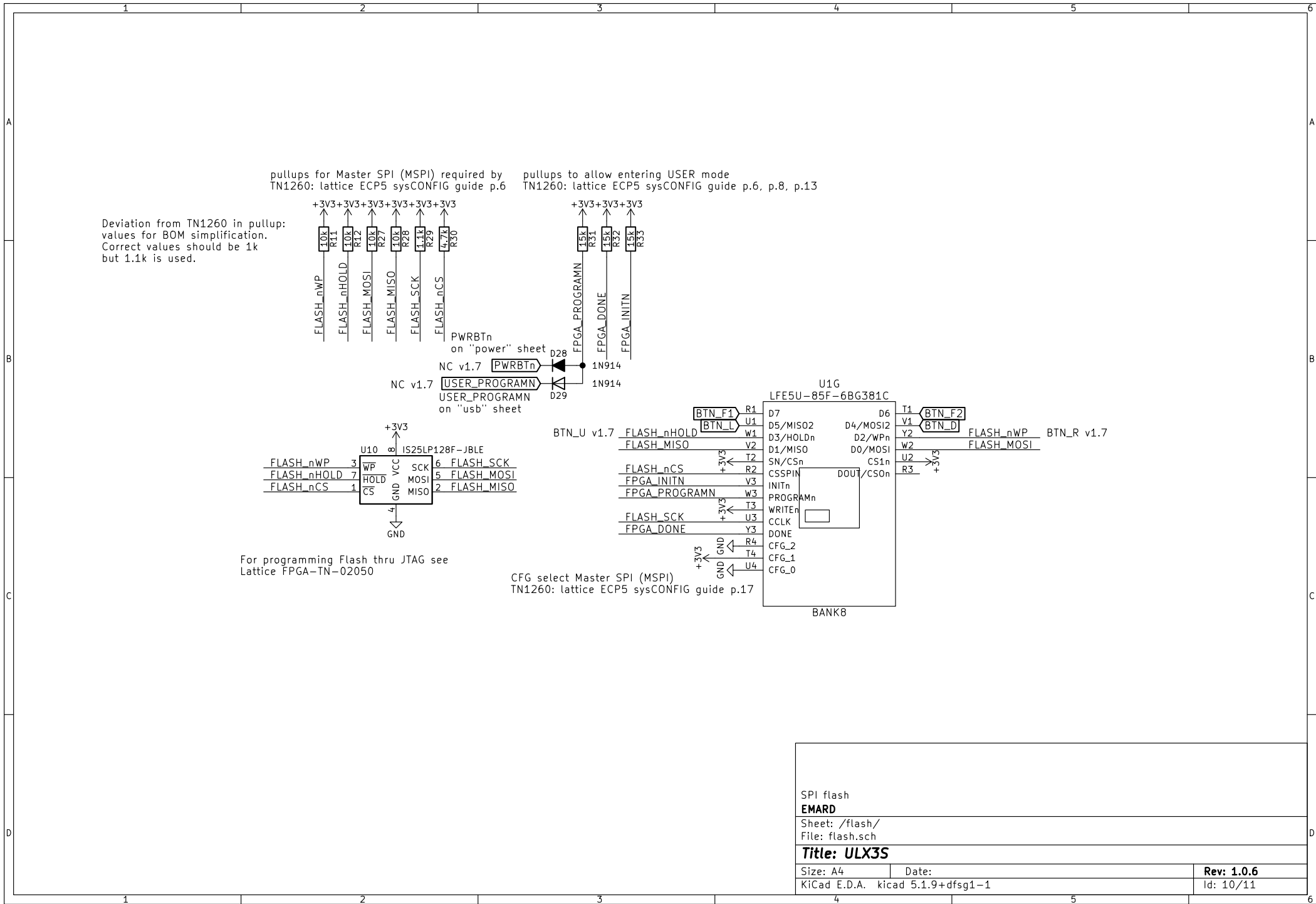
Analog audio and video
EMARD

Sheet: /analog/
 File: analog.sch

Title: ULX3S

Size: A4 Date:
 KiCad E.D.A. kicad 5.1.9+dfsg1-1

Rev: 1.0.4
 Id: 9/11



Id: 11/11