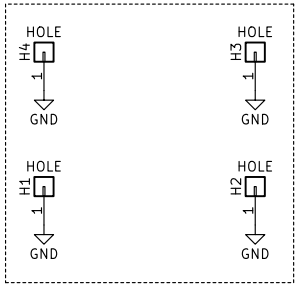


click on mouse pointer arrow on top of right toolbar
and double-click on sheet to open

power	usb	blinkey	ram	sdcard
power.sch	usb.sch	blinkey.sch	ram.sch	sdcard.sch

gpio	gpdi	analog	wifi	flash
gpio.sch	gpdi.sch	analog.sch	wifi.sch	flash.sch

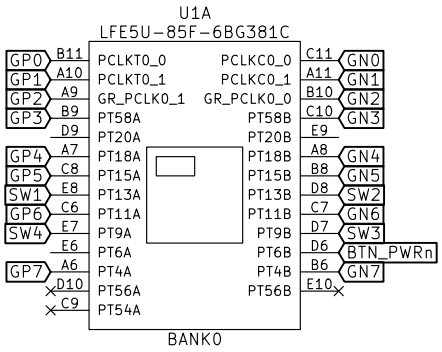
Root sheet
EMARD

Sheet: /
File: ulx3s.sch

Title: ULX3S

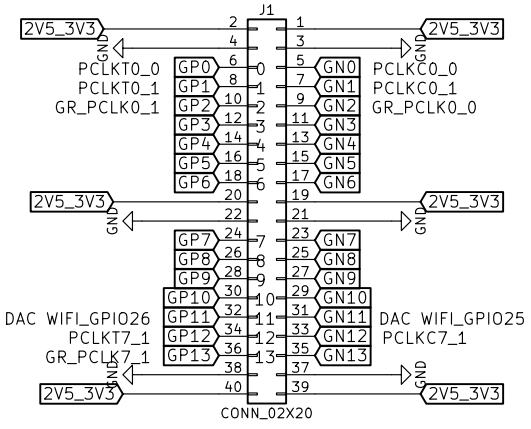
Size: A4	Date:	**Rev: 3.0.5**
KiCad E.D.A. kicad 5.0.2+dfsg1-1		Id: 1/11

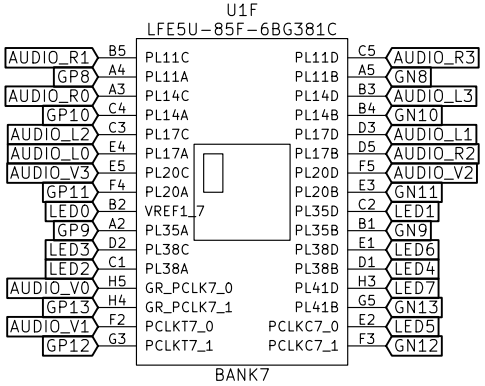
NC v1.7



NC v1.7

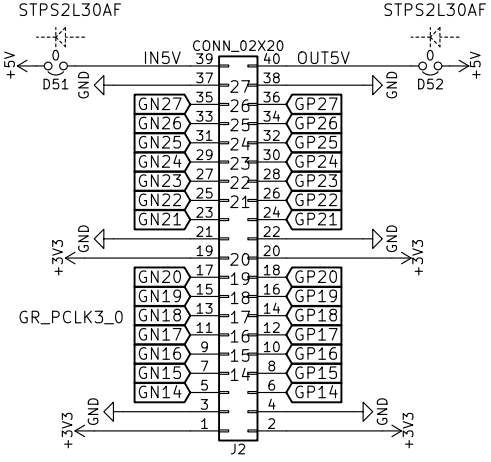
J1 J2 PIN numbering 1–40 is for FEMALE 90° ANGLED header.
For MALE VERTICAL header, SWAP EVEN and ODD pin numbers.





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.



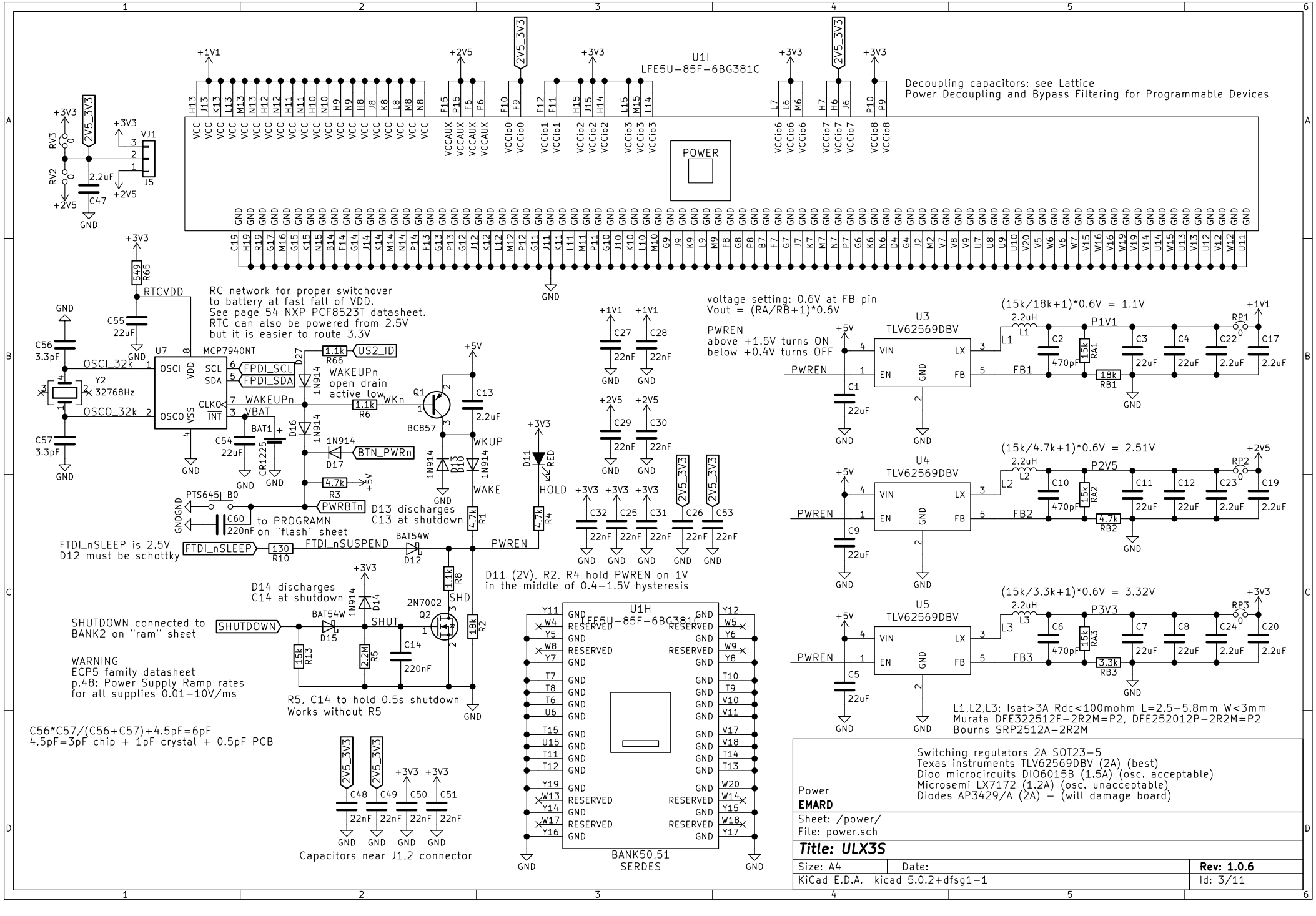
GP,GN 14–21 differential bidirectional connected to BANK2,3 on "ram" sheet
GP,GN 22–27 single–ended connected to BANK1 on "gpdi" sheet

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)

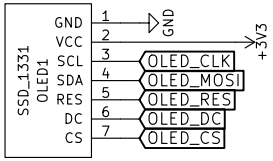
GPIO 2.54 mm connectors
EMARD
Sheet: /gpio/
File: gpio.sch

Title: ULX3S

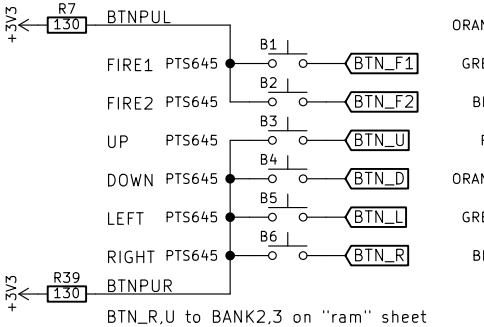
Size: A4	Date:	**Rev: 1.0.1**
KiCad E.D.A. kicad 5.0.2+dfsg1–1		Id: 2/11


U1I
LFE5U-85F-6BG381C
POWER
Decoupling capacitors: see Lattice
Power Decoupling and Bypass Filtering for Programmable Devices
RC network for proper switchover
to battery at fast fall of VDD.
See page 54 NXP PCF8523T datasheet.
RTC can also be powered from 2.5V
but it is easier to route 3.3V
MCP7940NT
WAKEUPn
open drain
active low
PWRBTn
BTN_PWRn
US2_ID
FPDI_SCL
FPDI_SDA
OSCI_32k
OSCO_32k
32768Hz
D13 discharges
C13 at shutdown
to PROGRAMN
on "flash" sheet
FTDI_nSLEEP is 2.5V
D12 must be schottky
FTDI_nSUSPEND
PWREN
HOLD
WAKE
WKUP
D14 discharges
C14 at shutdown
SHUTDOWN
SHUTDOWN connected to
BANK2 on "ram" sheet
WARNING
ECP5 family datasheet
p.48: Power Supply Ramp rates
for all supplies 0.01-10V/ms
R5, C14 to hold 0.5s shutdown
Works without R5
D11 (2V), R2, R4 hold PWREN on 1V
in the middle of 0.4-1.5V hysteresis
C56*C57/(C56+C57)+4.5pF=6pF
4.5pF=3pF chip + 1pF crystal + 0.5pF PCB
Capacitors near J1,2 connector
BANK50,51
SERDES
voltage setting: 0.6V at FB pin
Vout = (RA/RB+1)*0.6V
PWREN
above +1.5V turns ON
below +0.4V turns OFF
(15k/18k+1)*0.6V = 1.1V
(15k/4.7k+1)*0.6V = 2.51V
(15k/3.3k+1)*0.6V = 3.32V
L1,L2,L3: Isat>3A Rdc<100mohm L=2.5-5.8mm W<3mm
Murata DFE322512F-2R2M=P2, DFE252012P-2R2M=P2
Bourns SRP2512A-2R2M
Switching regulators 2A SOT23-5
Texas instruments TLV62569DBV (2A) (best)
Dioo microcircuits DIO6015B (1.5A) (osc. acceptable)
Microsemi LX7172 (1.2A) (osc. unacceptable)
Diodes AP3429/A (2A) - (will damage board)
Power
EMARD
Sheet: /power/
File: power.sch
Title: ULX3S
Size: A4
Date:
Rev: 1.0.6
KiCad E.D.A. kicad 5.0.2+dfsg1-1
Id: 3/11

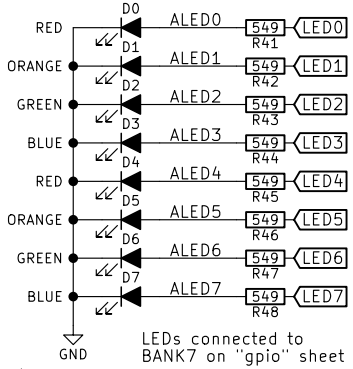
SSD1306 B/W or SSD1331 COLOR
compatible OLED 0.96" or 1.3" PCB
14x14 units
1 unit = 2.54 mm



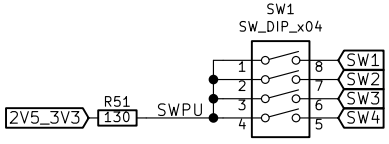
OLED connected to
BANK6 on "usb" sheet



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

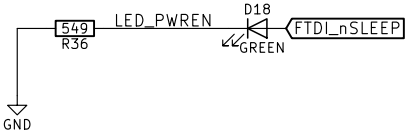


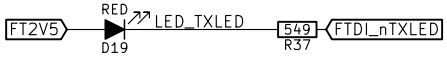
LEDs connected to
BANK7 on "gpio" sheet



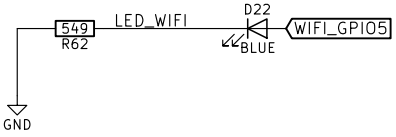
DIP switch connected to
BANK0 on 'gpio' sheet

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





TXLED blinks when FPGA sends data to FTDI

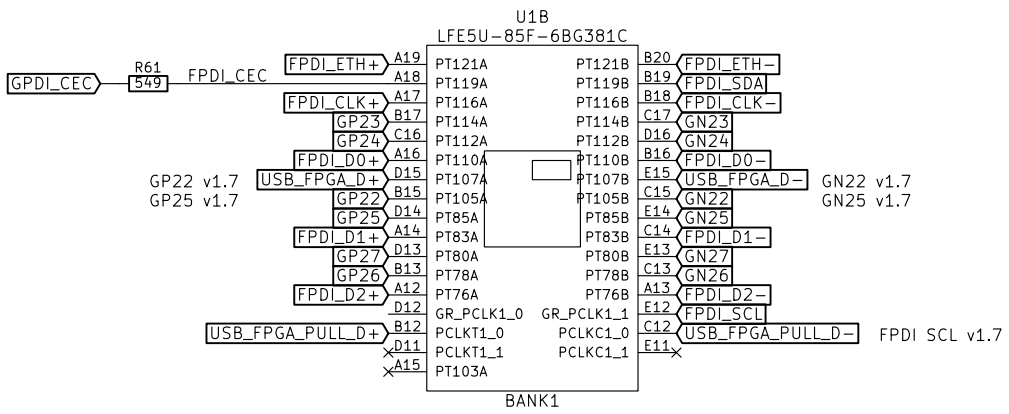


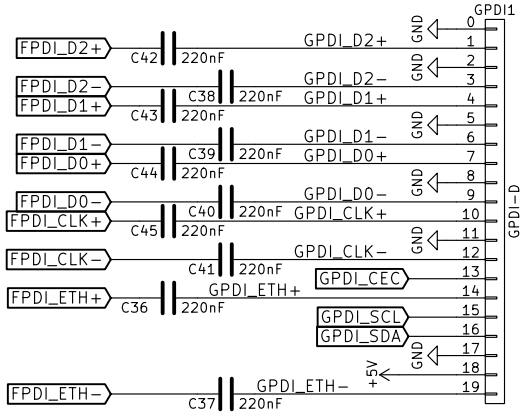
GPIO2 on PCB v1.7

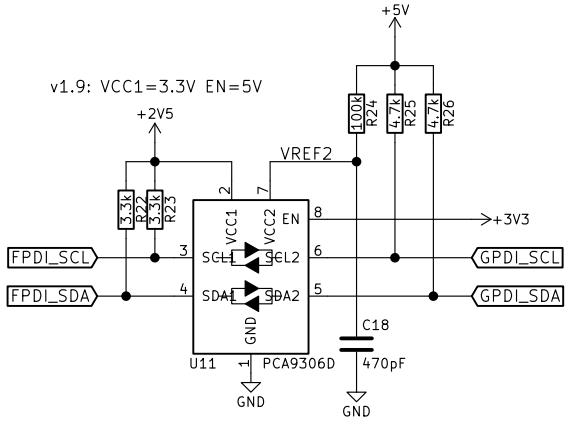
Buttons, LEDs, OLED display
EMARD
Sheet: /blinkey/
File: blinkey.sch

Title: ULX3S

Size: A4	Date:	**Rev: 1.0.0**
KiCad E.D.A. kicad 5.0.2+dfsg1-1		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

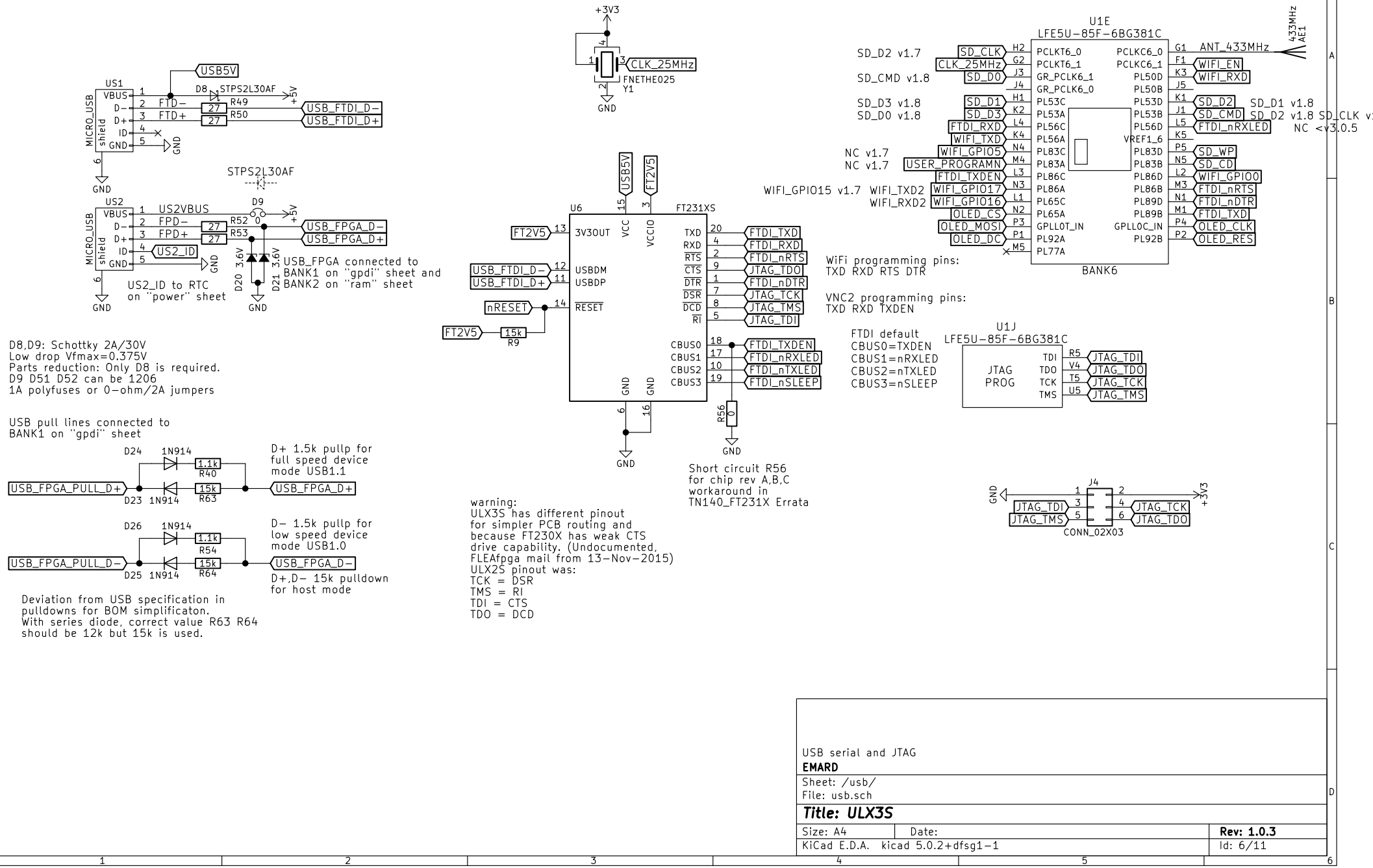
PCB v1.7 and v1.8 accept
mouser PN: 538-47151-1001 (Molex)
https://www.molex.com/pdm_docs/sd/471511001_sd.pdf
mouser PN: 710-685119134923 (Wurth)
https://katalog.we-online.com/em/datasheet/685119134923.pdf

Digital Video and Ethernet
General Purpose Differential Interface
EMARD

Sheet: /gpdi/
File: gpdi.sch

Title: ULX3S

Size: A4	Date:	**Rev: 1.0.2**
KiCad E.D.A. kicad 5.0.2+dfsg1-1		Id: 5/11



USB serial and JTAG

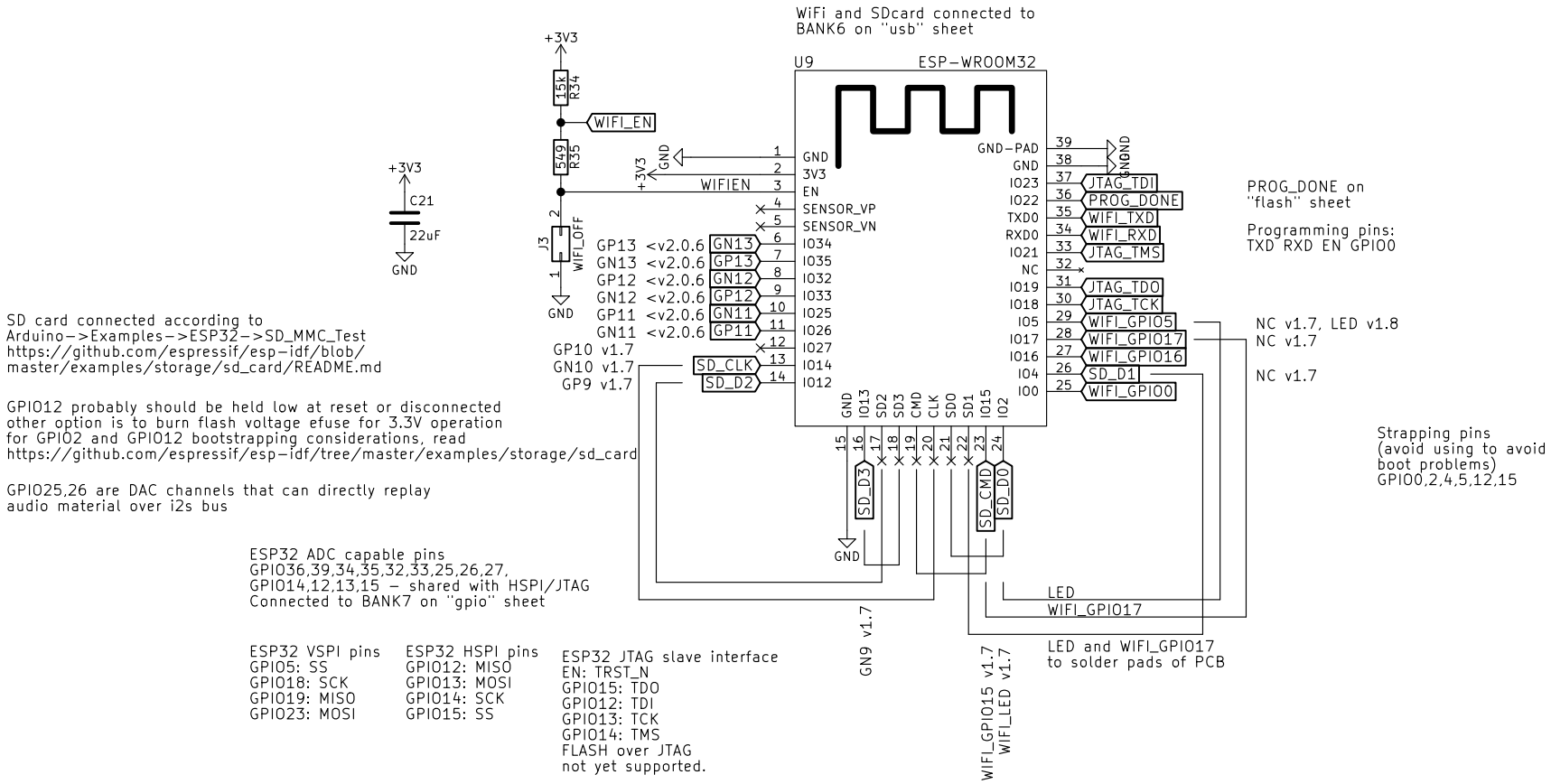
EMARD

Sheet: /usb/

File: usb.sch

Title: ULX3S

Size: A4	Date:	**Rev: 1.0.3**
KiCad E.D.A. kicad 5.0.2+dfsg1-1		Id: 6/11



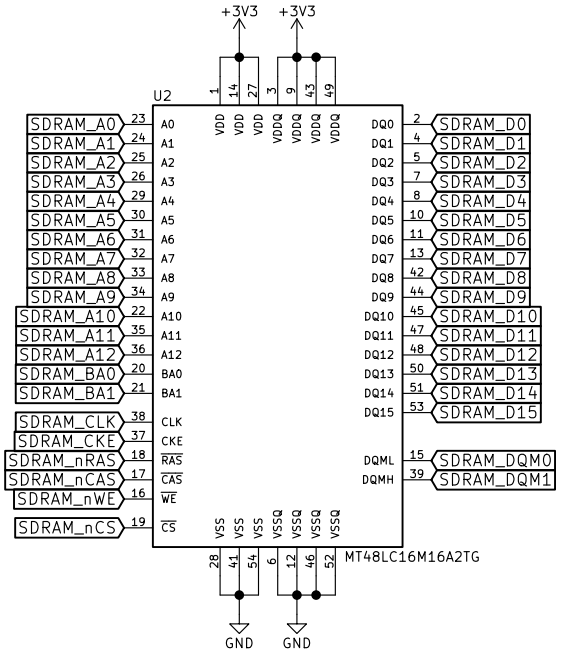
WIFI module ESP32

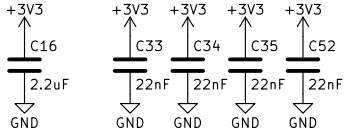
EMARD

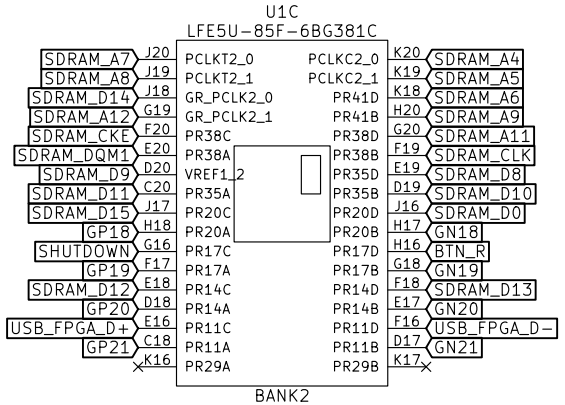
Sheet: /wifi/
File: wifi.sch

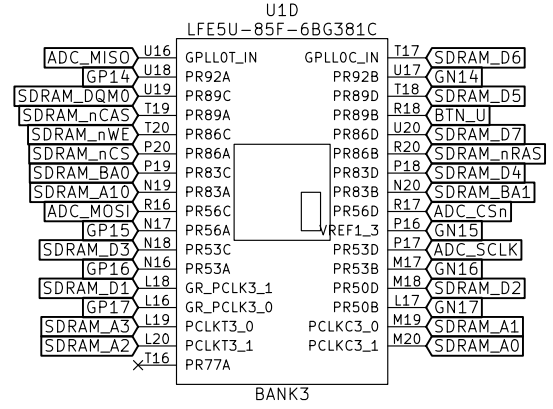
Title: ULX3S

Size: A4	Date:	**Rev: 1.0.1**
KiCad E.D.A. kicad 5.0.2+dfsg1-1		Id: 7/11









SDRAM memory

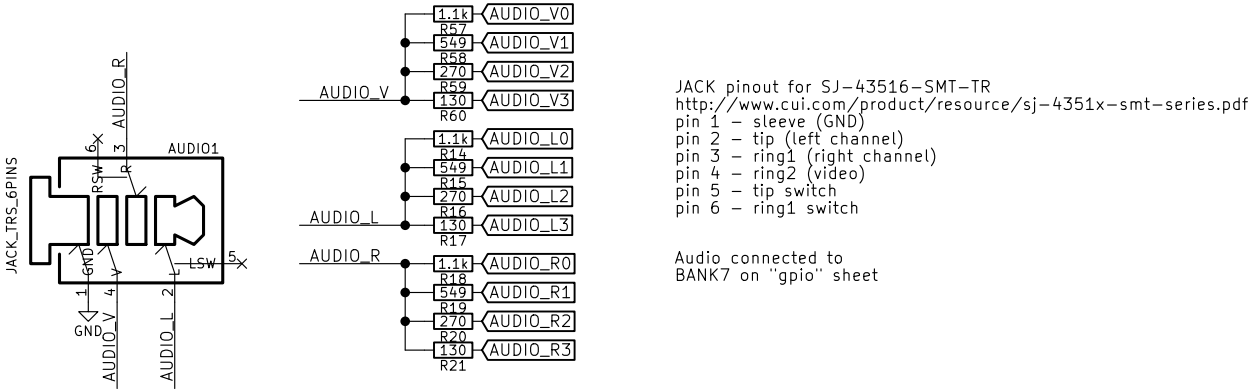
EMARD

Sheet: /ram/

File: ram.sch

Title: ULX3S

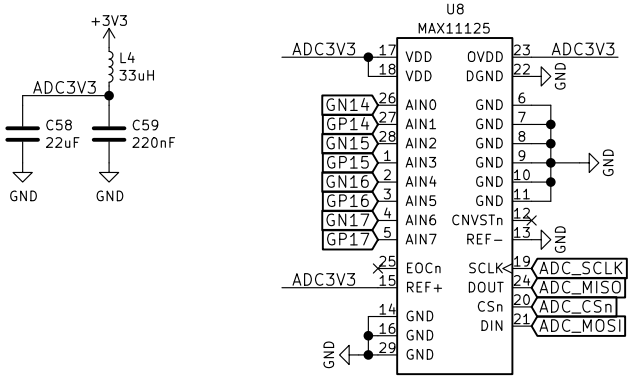
Size: A4	Date:	**Rev: 1.0.0**
KiCad E.D.A. kicad 5.0.2+dfsg1-1		Id: 8/11



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



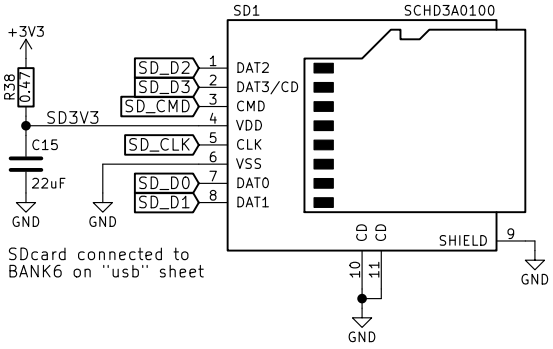
ADC SPI connected to
BANK3 of "ram" sheet

Analog audio and video
EMARD

Sheet: /analog/
File: analog.sch

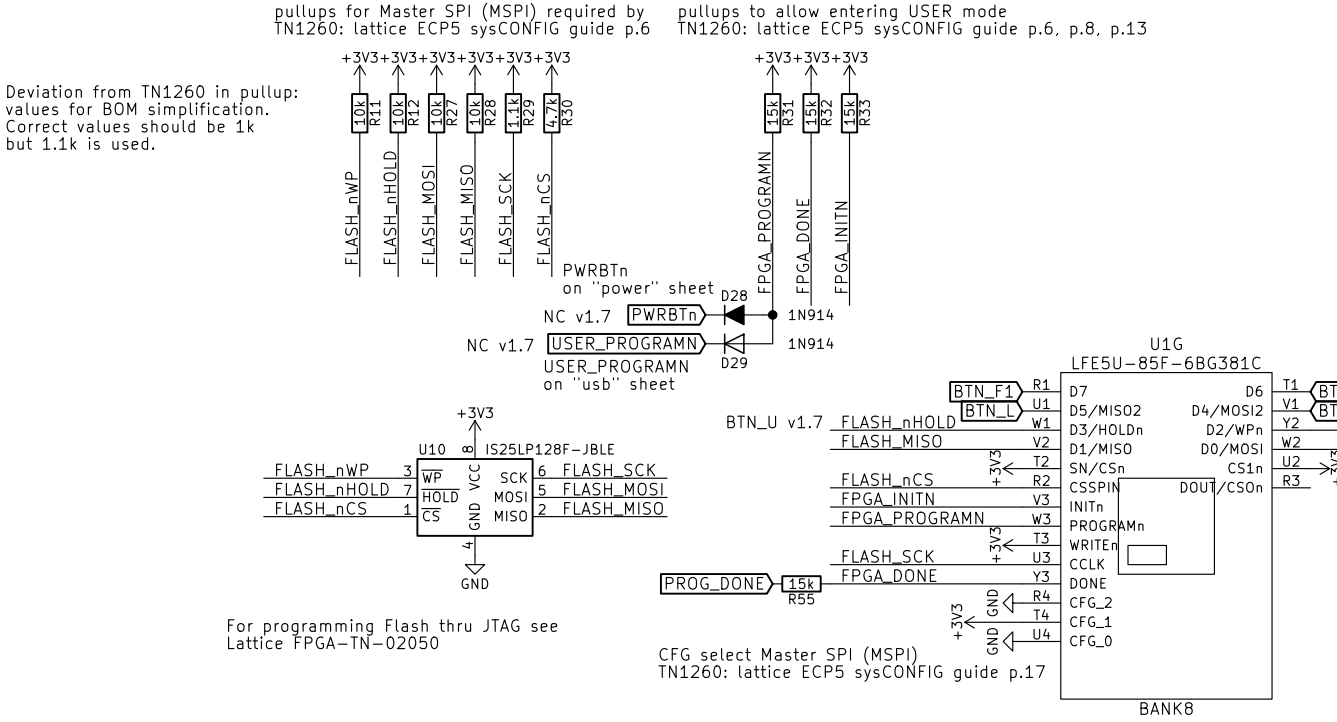
Title: ULX3S

Size: A4	Date:	**Rev: 1.0.3**
KiCad E.D.A. kicad 5.0.2+dfsg1-1		Id: 9/11



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

SD card **EMARD**		
Sheet: /sdcard/ File: sdcard.sch		
Title: ULX3S		
Size: A4	Date:	**Rev: 1.0.0**
KiCad E.D.A. kicad 5.0.2+dfsg1-1		Id: 10/11



SPI flash

EMARD

Sheet: /flash/

File: flash.sch

Title: ULX3S

Size: A4	Date:	**Rev: 1.0.5**
KiCad E.D.A. kicad 5.0.2+dfsg1-1		Id: 11/11