# TACNPR project

Tatu OH2EAT, Lasse OH3HZB & Tommi OH1GJV & SCOMS team
Special thanks to: Mikko OH2FLO & Vili OH5GE

Major changes since revA:
–revA: first release
–revB: integrated Ethernet
–revC: enhanced RF performance
–revD: Powerpole connector
–revE: RX_LED (J4), minor enhancements

## SUBSHEETS (revision E):

cpu

MCU, SRAM, SERIAL

File: cpu–sheet.kicad_sch

radio

Si4463 & RF switching

File: radio–sheet.kicad_sch

RF–PA

RF LNA & PA

File: RF–PA–sheet.kicad_sch

tacbucks

DC/DC converters

File: tacbuck–sheet.kicad_sch

linear–regs

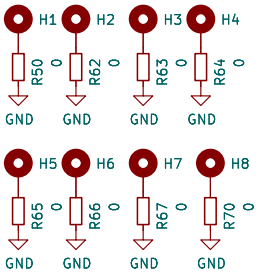
3V3 lin.reg. & terminals

File: linreg–sheet.kicad_sch

ethernet

W5500 Ethernet

File: ethernet–sheet.kicad_sch





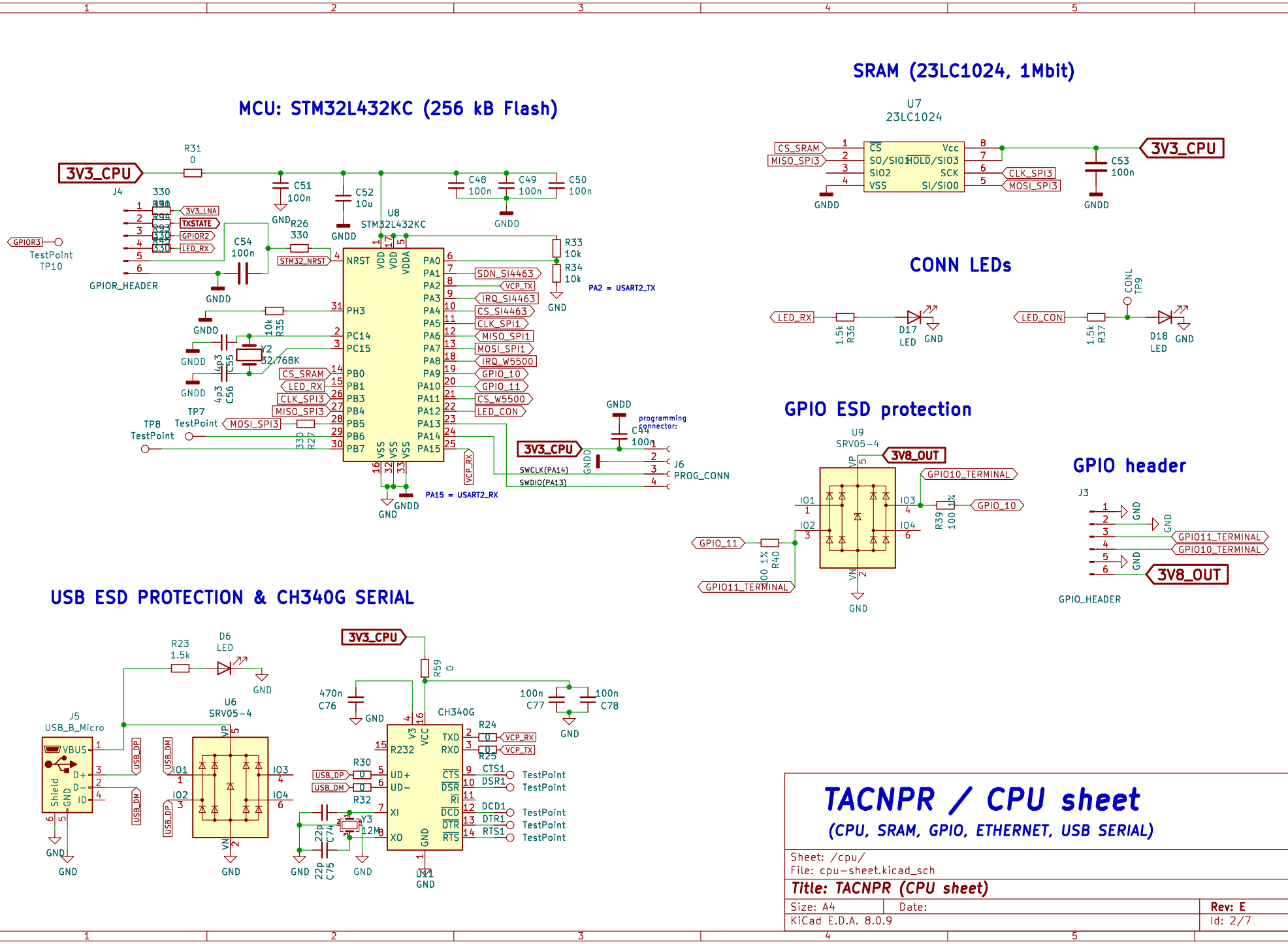

**TACNPR project**

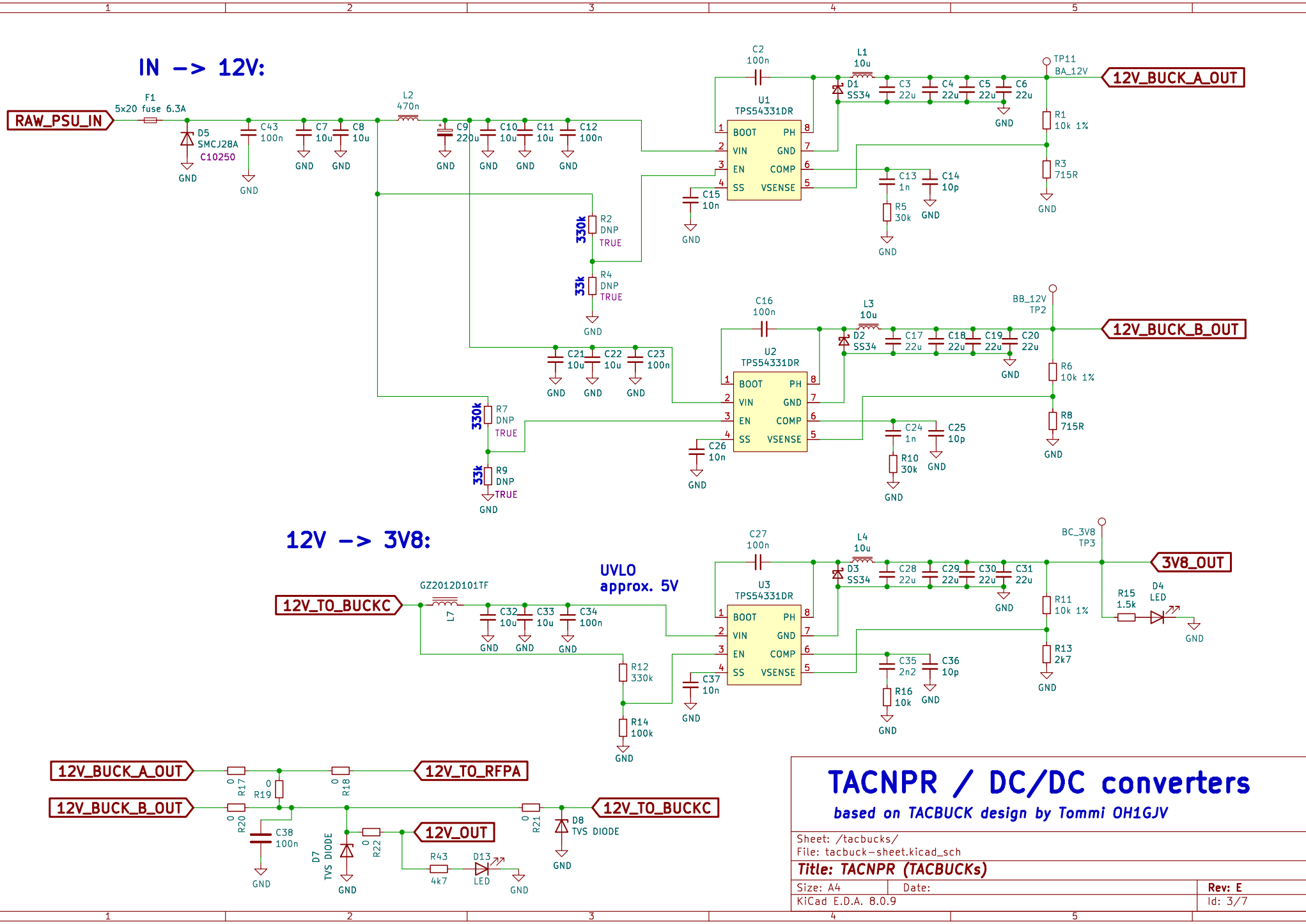
OH1GJV, OH2EAT, OH2FLO, OH3HZB, OH5GE

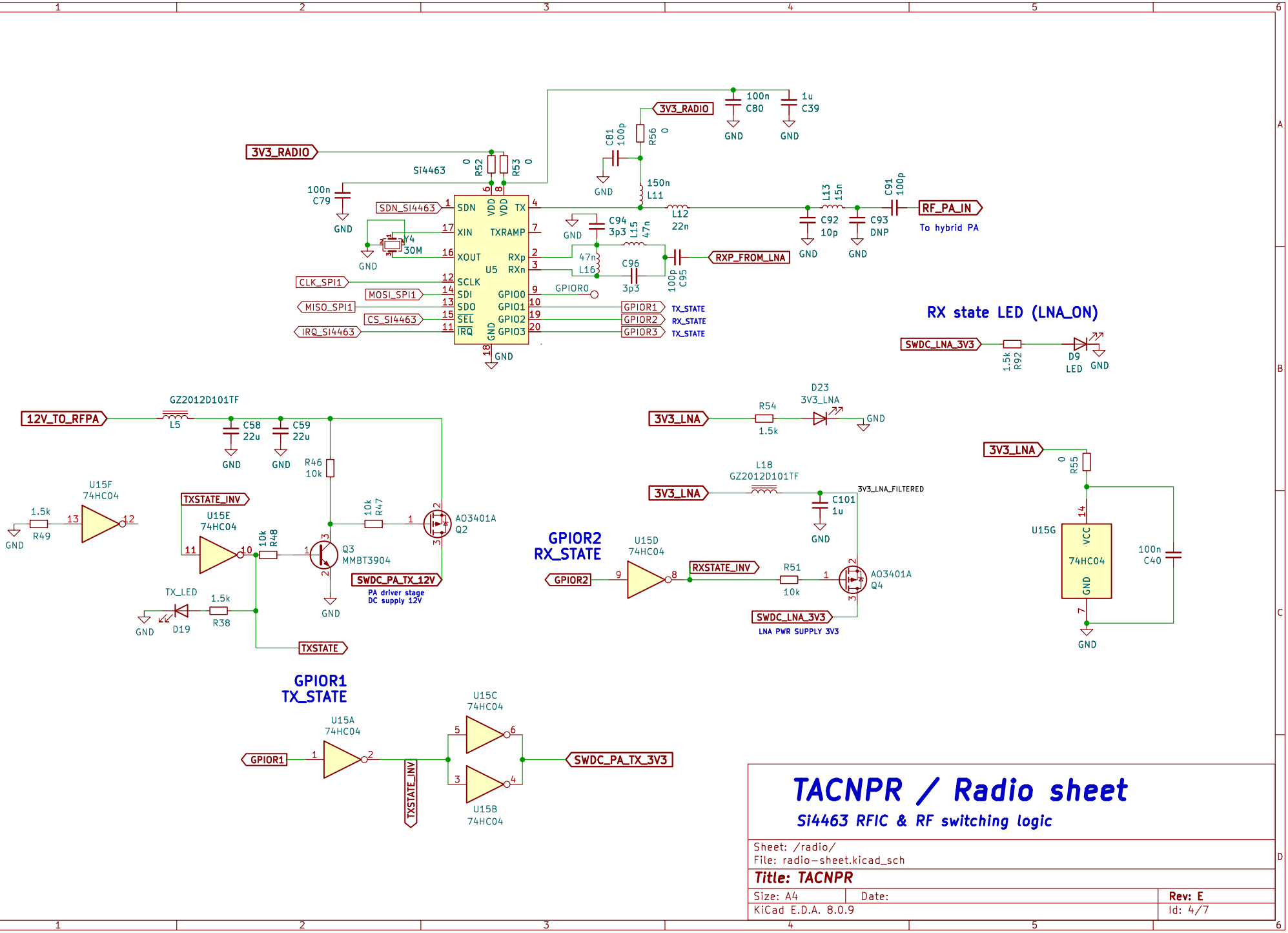
Sheet: /
File: TACNPR.kicad_sch

Title: TACNPR

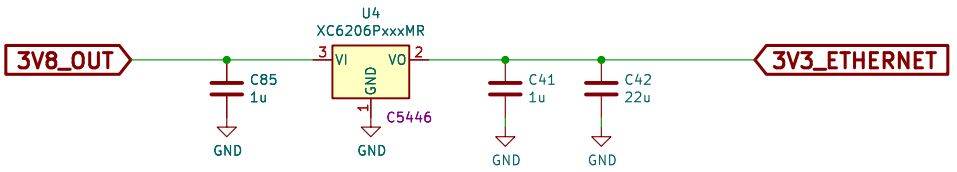
Size: A4 | Date: 2021–03–22 | Rev: E
KiCad E.D.A. 8.0.9 | Id: 1/7


MCU: STM32L432KC (256 kB Flash)
SRAM (23LC1024, 1Mbit)
CONN LEDs
GPIO ESD protection
GPIO header
USB ESD PROTECTION & CH340G SERIAL
U8
STM32L432KC
U7
23LC1024
U9
SRV05-4
U6
SRV05-4
CH340G
J4
J5
USB_B_Micro
J6
PROG_CONN
J3
GPIO_HEADER
3V3_CPU
3V8_OUT
GNDD
GND
TACNPR / CPU sheet
(CPU, SRAM, GPIO, ETHERNET, USB SERIAL)
Sheet: /cpu/
File: cpu-sheet.kicad_sch
Title: TACNPR (CPU sheet)
Size: A4
Date:
Rev: E
KiCad E.D.A. 8.0.9
Id: 2/7

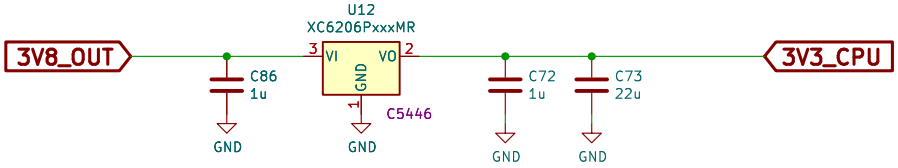

IN -> 12V:
RAW_PSU_IN
F1
5x20 fuse 6.3A
D5
SMCJ28A
C10250
C43 100n
C7 10u
C8 10u
L2
470n
C9 220u
C10 10u
C11 10u
C12 100n
C2 100n
L1 10u
U1
TPS54331DR
BOOT
PH
VIN
GND
EN
COMP
SS
VSENSE
D1 SS34
C3 22u
C4 22u
C5 22u
C6 22u
TP11
BA_12V
12V_BUCK_A_OUT
R1 10k 1%
R3 715R
C13 1n
C14 10p
R5 30k
C15 10n
R2 DNP TRUE
330k
R4 DNP TRUE
33k
C16 100n
L3 10u
U2
TPS54331DR
D2 SS34
C17 22u
C18 22u
C19 22u
C20 22u
BB_12V
TP2
12V_BUCK_B_OUT
R6 10k 1%
R8 715R
C21 10u
C22 10u
C23 100n
C24 1n
C25 10p
R10 30k
C26 10n
R7 DNP TRUE
330k
R9 DNP TRUE
33k
12V -> 3V8:
UVLO
approx. 5V
12V_TO_BUCKC
GZ2012D101TF
L7
C32 10u
C33 10u
C34 100n
C27 100n
L4 10u
U3
TPS54331DR
D3 SS34
C28 22u
C29 22u
C30 22u
C31 22u
BC_3V8
TP3
3V8_OUT
R11 10k 1%
R13 2k7
R15 1.5k
D4 LED
C35 2n2
C36 10p
R16 10k
C37 10n
R12 330k
R14 100k
12V_BUCK_A_OUT
12V_BUCK_B_OUT
R17 0
R18 0
R19 0
R20 0
R21 0
R22 0
12V_TO_RFPA
12V_TO_BUCKC
12V_OUT
C38 100n
D7 TVS DIODE
D8 TVS DIODE
R43 4k7
D13 LED
GND
TACNPR / DC/DC converters
based on TACBUCK design by Tommi OH1GJV
Sheet: /tacbucks/
File: tacbuck-sheet.kicad_sch
Title: TACNPR (TACBUCKs)
Size: A4
Date:
Rev: E
KiCad E.D.A. 8.0.9
Id: 3/7


3V3_RADIO
Si4463
SDN_SI4463
CLK_SPI1
MOSI_SPI1
MISO_SPI1
CS_SI4463
IRQ_SI4463
SDN
XIN
XOUT
SCLK
SDI
SDO
SEL
IRQ
VDD
TXRAMP
RXp
RXn
GPIO0
GPIO1
GPIO2
GPIO3
TX
U5
GPIOR0
GPIOR1
GPIOR2
GPIOR3
TX_STATE
RX_STATE
RXP_FROM_LNA
RF_PA_IN
To hybrid PA
RX state LED (LNA_ON)
SWDC_LNA_3V3
D9
LED
12V_TO_RFPA
GZ2012D101TF
L5
TXSTATE_INV
SWDC_PA_TX_12V
PA driver stage
DC supply 12V
TX_LED
D19
TXSTATE
3V3_LNA
D23
3V3_LNA
L18
3V3_LNA_FILTERED
GPIOR2
RX_STATE
RXSTATE_INV
SWDC_LNA_3V3
LNA PWR SUPPLY 3V3
GPIOR1
TX_STATE
SWDC_PA_TX_3V3
TACNPR / Radio sheet
Si4463 RFIC & RF switching logic
Sheet: /radio/
File: radio-sheet.kicad_sch
Title: TACNPR
Size: A4
Date:
Rev: E
KiCad E.D.A. 8.0.9
Id: 4/7

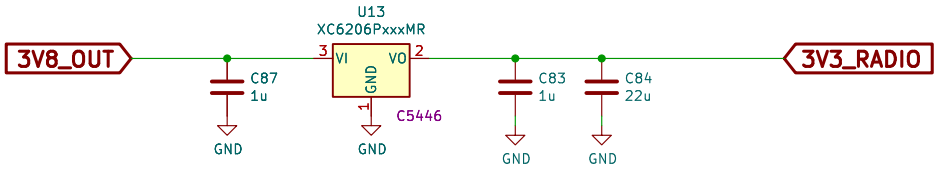
## 3V3 for Ethernet transceiver



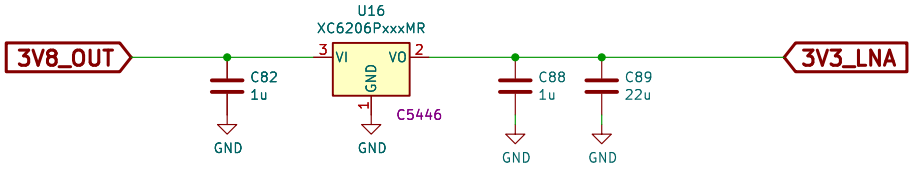

## 3V3 for STM32 CPU




## 3V3 for Si4463 radio chip

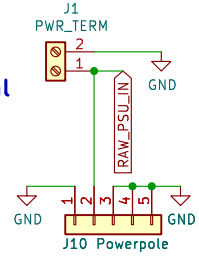


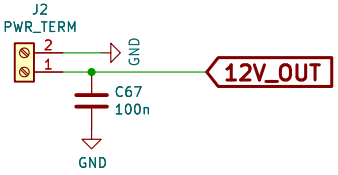

## 3V3 for LNA




## Screw terminals (power in and 12V DC out)

DC power can be fed either using screw terminal or Anderson Powerpole connector (7,9mm pitch)




Powerpole strain relief options:
1) solder a wire around it into GND pads 3 and 4
2) use the mounting hole (machine screw and nut)

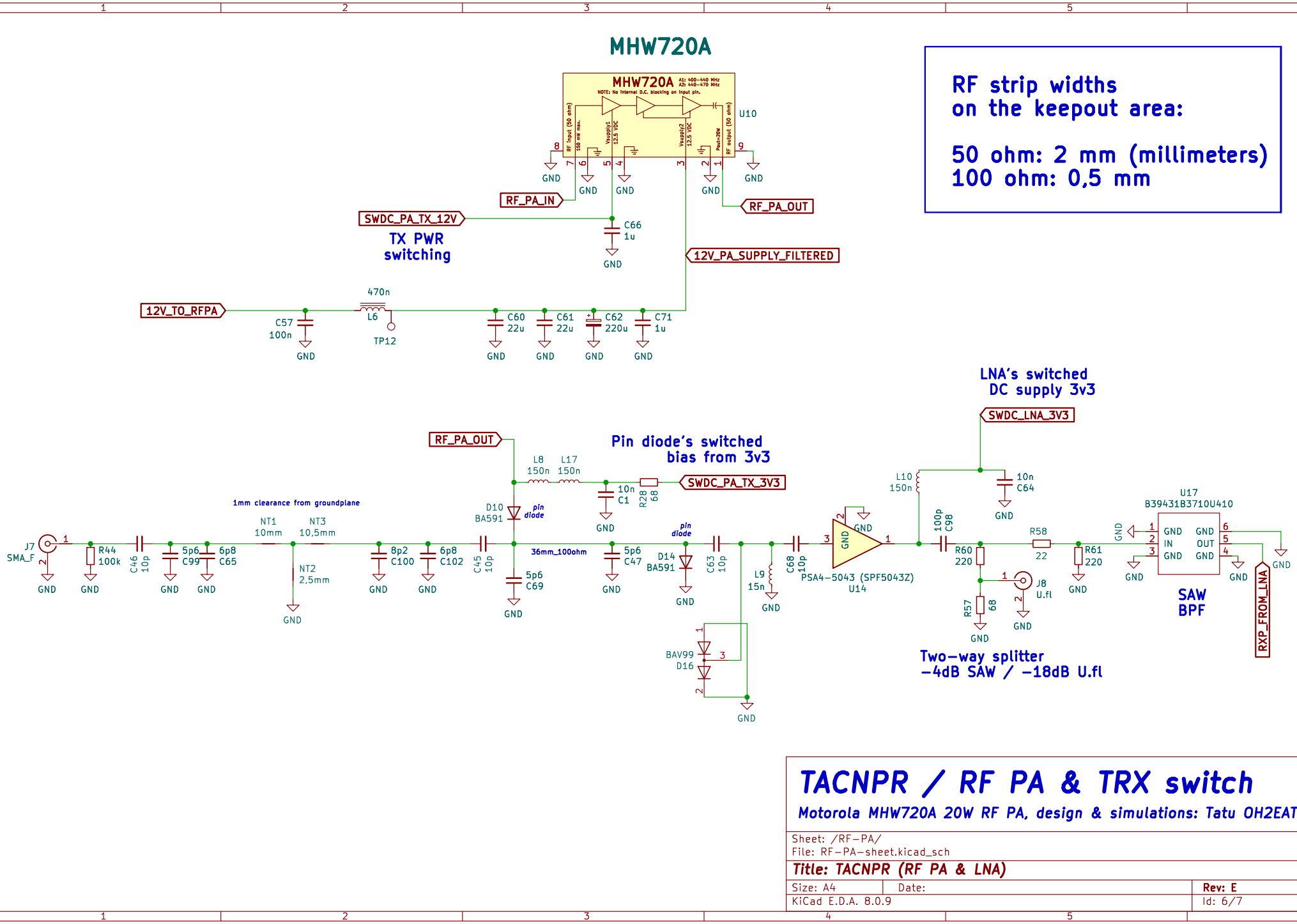
# TACNPR / regulators & terminals

*3V8 -> 3V3 LDO linear regulators & screw terminals*

Sheet: /linear-regs/
File: linreg-sheet.kicad_sch

***Title: TACNPR (linear regulators)***

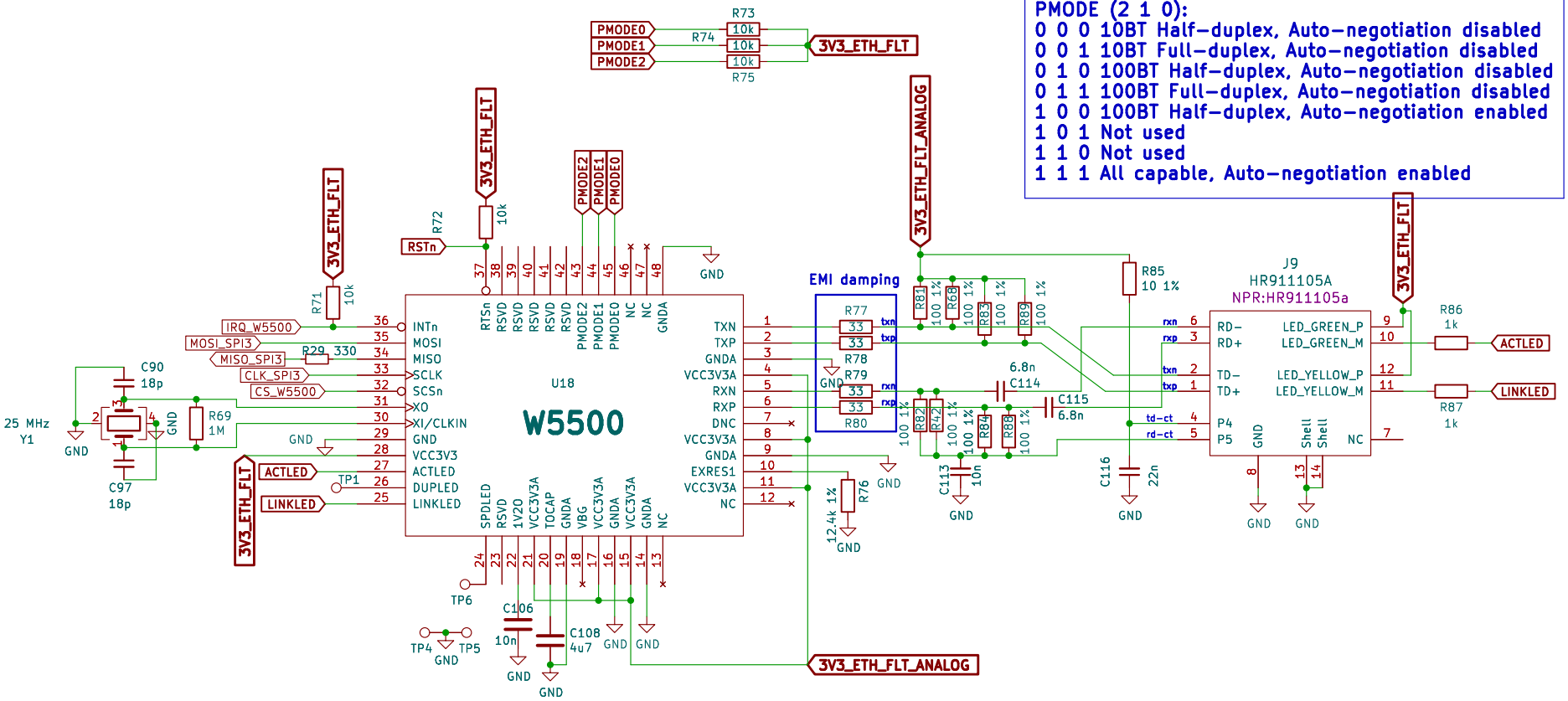
| Size: A4 | Date: | **Rev: E** |
|---|---|---|
| KiCad E.D.A. 8.0.9 | | Id: 5/7 |

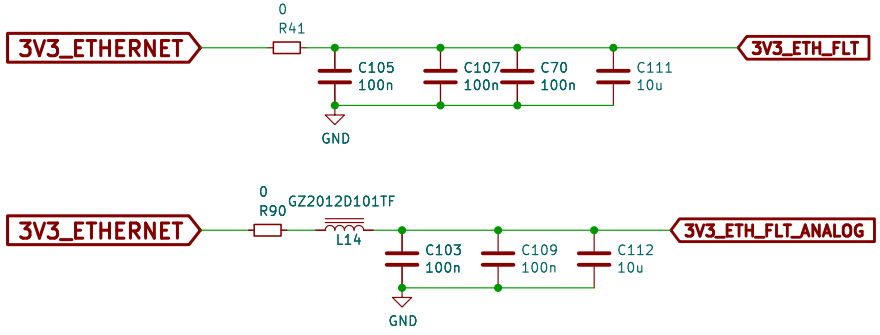



# TACNPR / RF PA & TRX switch

*Motorola MHW720A 20W RF PA, design & simulations: Tatu OH2EAT*

| | | |
|---|---|---|
| Sheet: /RF-PA/ | | |
| File: RF-PA-sheet.kicad_sch | | |
| **Title: TACNPR (RF PA & LNA)** | | |
| Size: A4 | Date: | **Rev: E** |
| KiCad E.D.A. 8.0.9 | | Id: 6/7 |




W5500 reference schematic:
https://docs.wiznet.io/Product/iEthernet/W5500/ref-schematic
W5500 Ref.Schematic – RJ45 with Transformer

See also the HR911105A datasheet.
On page 1 (REV A/2): "Connect CHS GND to PCB ground".
The connector is equipped with an internal 1nF 2kV CAP (P8).

Reviewed by OH2EAT 2023
Drawn by OH3HZB 2022-2023
Scoms

# TACNPR Ethernet

Sheet: /ethernet/
File: ethernet-sheet.kicad_sch

**Title: TACNPR (Ethernet)**

| Size: A4 | Date: | Rev: E |
|---|---|---|
| KiCad E.D.A. 8.0.9 | | Id: 7/7 |