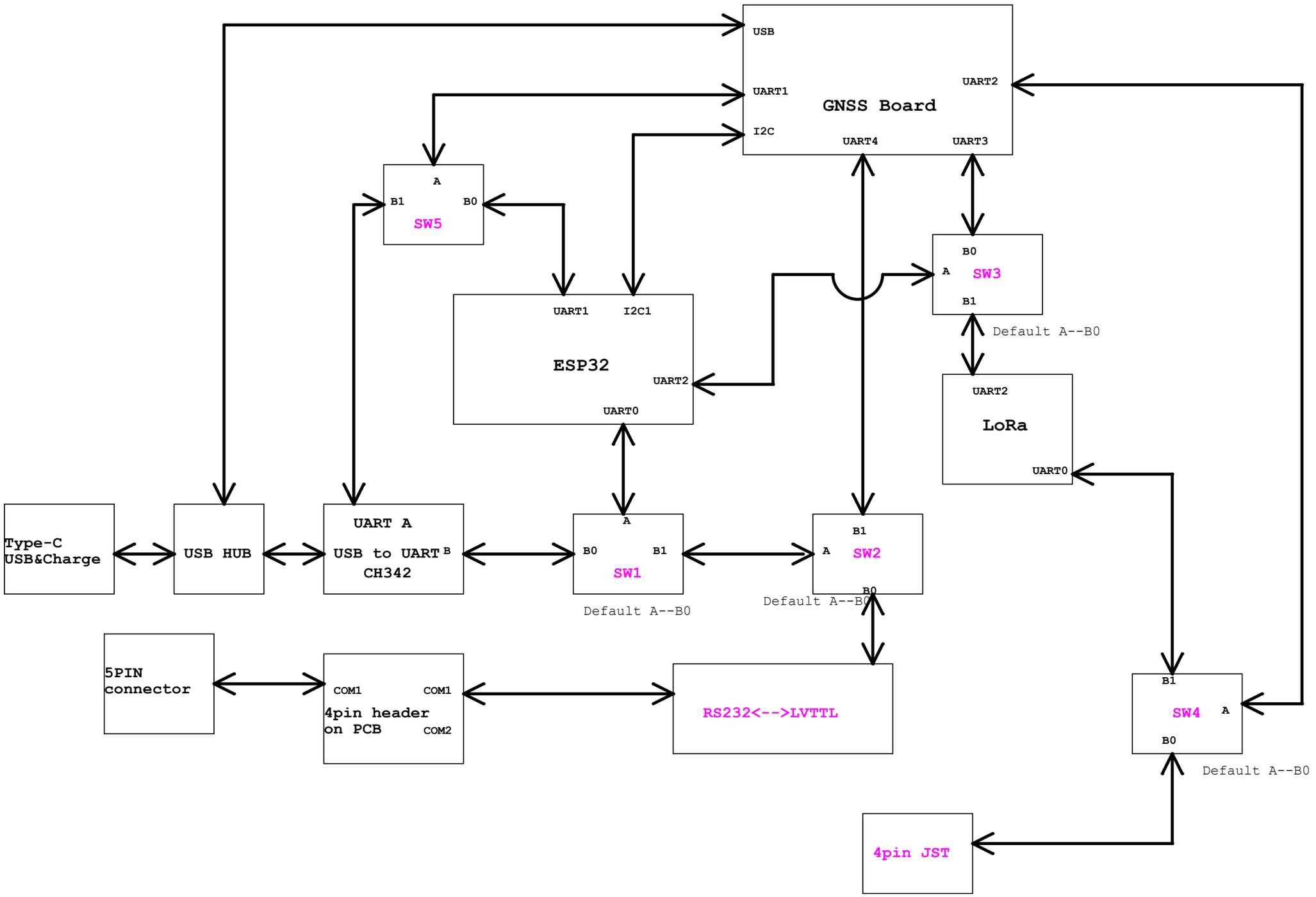
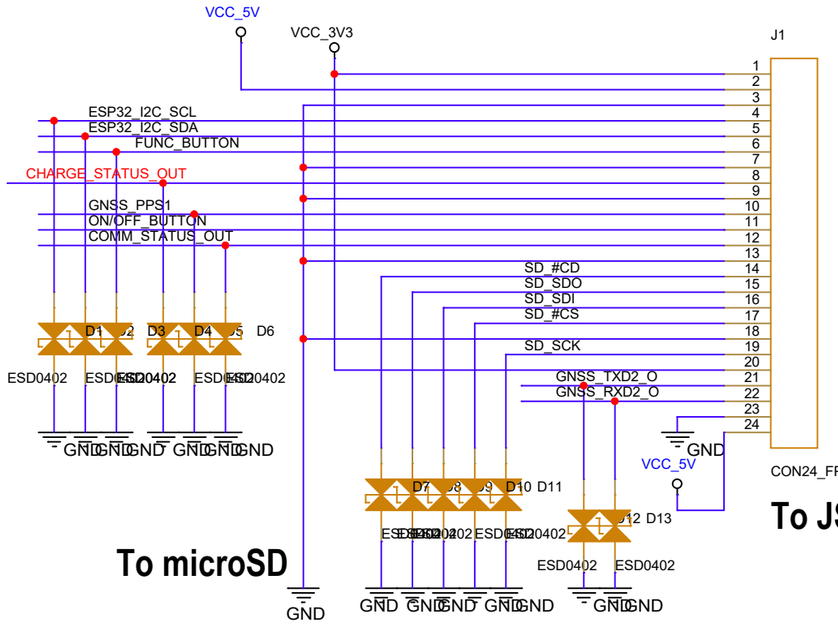


Title	<Title>	
Size A3	Document Number <Doc>	Rev <RevCo
Date: Wednesday, September 17, 2025	Sheet 1 of 11	

To front OLED panel

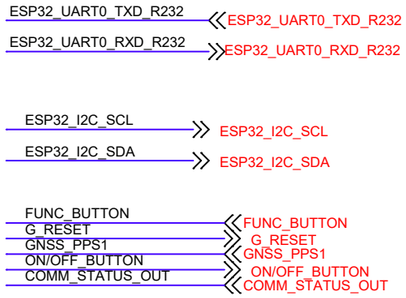
128 × 64 OLED Display module
Driven by ESP32 I2C bus

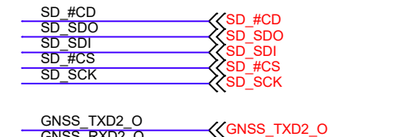
PPS LED and BT/WIFI status LED controlled by mother board



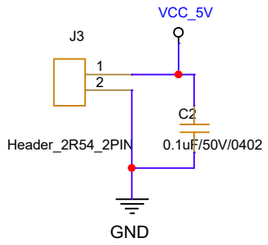
To microSD

To JST 1.0mm 4pin for GNSS UART2

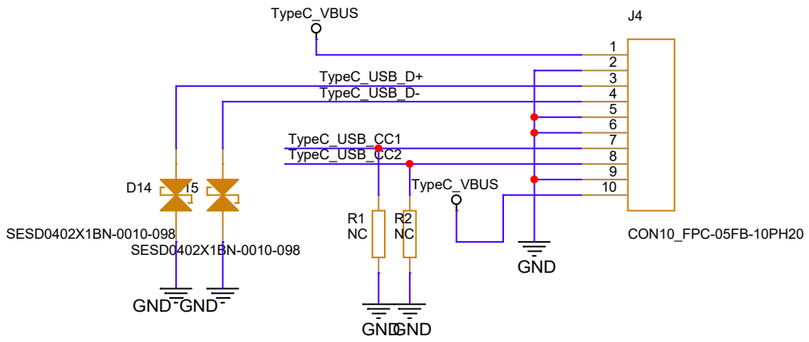


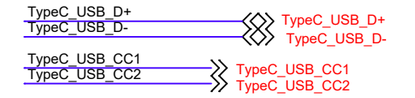


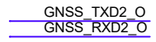
5V on Board

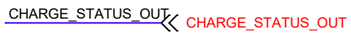


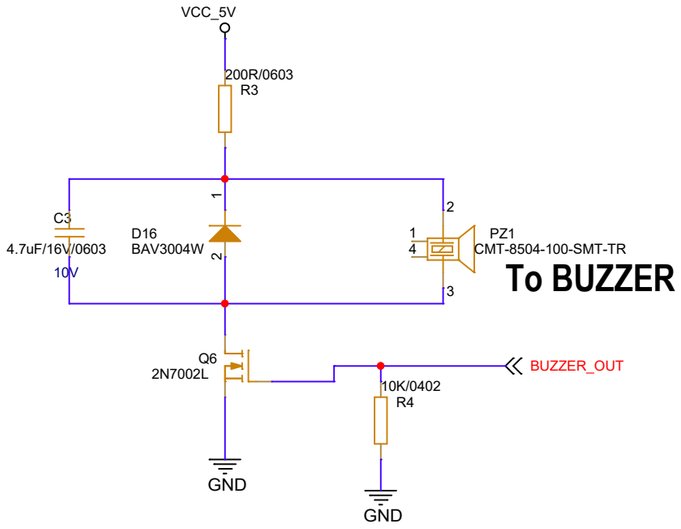
To USBC connector





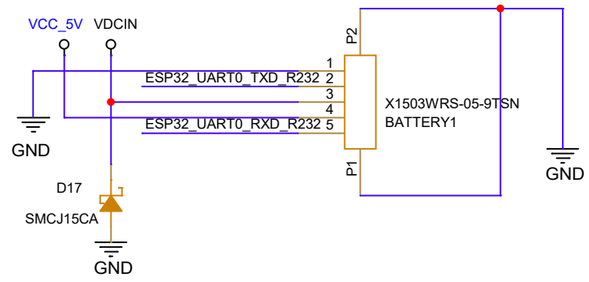






To BUZZER

To 5Pin circle connector



Title	INTERFACE PORTs	
Size A3	Document Number <Doc>	Rev <Rev
Date: Thursday, September 18, 2025	Sheet 2 of 11	

USB 2.0 4-Port MTT Hub Controller

VCC_3V3 — 350mA / 40 mil — Hub_3V3

FB1: 120R@100MHz/550mA, BLM15AG121SZ1D

C4 0.1uF/50V/0402 GND

C5 22uF/0805/16V GND

C6 0.1uF/16V/0402 GND

C7 1.0uF/16V/0402 GND

C8 22uF/0805/16V GND

TP1 TP

R6 10K/0402 Hub_3V3

R7 1K/0402

U1 FE1_QFP48

1	OVCB2	BUS_B	36
2	PWRB2	VBUSM	35
3	VD18	XRSTJ	34
4	PWRB3	VSS	33
5	OVCB3	VD33	32
6	VSS	DPU	31
7	OVCB4	DMU	30
8	PWRB4	VD18	29
9	VD_PLL	REXT	28
10	VS_PLL	VD3_IN	27
11	XOUT	VREG18	26
12	XIN	VS_A	25

48	OVCB1	VD33	13
47	PWRB1	DM4	14
46	LED4	DP4	15
45	LED3	VSS	16
44	LED2	DM3	17
43	LED1	DP3	18
42	DRV	VD33	19
41	VD33	DM2	20
40	TEST	DP2	21
39	VD33_OUT	VSS	22
38	VD5_IN	DM1	23
37	DIS_REG	DP1	24

FE1.1-AQFP48A

VD18

C9 0.1uF/16V/0402 GND

C10 0.1uF/16V/0402 GND

VD18 — 20 mil

C12 18pF/0402 GND

Y1 SX32Y012000BI1T001 (GND1, GND2)

C14 18pF/0402 GND

R11 2.2M/0402

20 mil

Crystal 12MHZ/16~20pF
30~50ppm/ (3225)
ESR 50 ohm Max

Hub_3V3

R8 100K/0402/1%

8 mil

R9 100K/0402/1%

R224 NC(100K/0402/1%)

R5 10K/0402

C11 0.1uF/16V/0402

U2 (SDCW1210S) choke

R10 2.7K/0402 1%

C15 22uF/0805/16V GND

C16 1.0uF/16V/0402 GND

VD18

VD33

C13 0.1uF/16V/0402 GND

TypeC_USB_D+
TypeC_USB_D-

Punch 3 more GND vias near by pin 25&28 GND side.

C17 1.0uF/16V/0402 GND

U3 (SDCW1210S) choke — GNSS_USB_D+ / GNSS_USB_D-

U4 (SDCW1210S) choke — RSV1_USB_DP / RSV1_USB_DM

U5 (SDCW1210S) choke — UART_USB_D+ / UART_USB_D-

U6 (SDCW1210S) choke — RSV2_USB_DP / RSV2_USB_DM

GNSS_USB_D+ / GNSS_USB_D-

TypeC_USB_D+ / TypeC_USB_D-

MC1 MC2 MC3 MC4 MC5 MC6 — GND — Hole

TO ESP32 Program

CHIP_PU

ESP32_GPIO0_BOOT

ESP32_UART0_TXD_O

ESP32_UART0_RXD_O

USB to UARTs

VCC_3V3

FB2 BLM15AX121SN1#/0402

FB3 BLM15AX121SN1#/0402

C21 C0402 1.0uF/16V/0402 GND

C22 0.1uF/50V/0402

C23 4.7uF/16V/0603 10V GND

C24 0.1uF/50V/0402 GND

C25 0.1uF/50V/0402 GND

C18 4.7uF/16V/0603 10V GND

C19 0.1uF/50V/0402 GND

C20 0.1uF/50V/0402 GND

R12 10K/0402

U7 CH342F

8	VBUS	TXD1	13
7	VDD5	RXD1	12
6	V3	RTS1	11
5	VIO	CTS1	10
9	RST	DTR1	15
		DSR1	14
		DCD1	16
		RI1	17
3	USB_D+	TXD0	21
4	USB_D-	RXD0	20
2	GND	RTS0	19
25	Pad	CTS0	18
		DTR0	23
		DSR0	22
		DCD0	24
		RI0	1

UART_USB_D+ / UART_USB_D-

ESP32_UART0_RXD_O / ESP32_UART0_TXD_O

R13 33R/0402 RTS

R14 33R/0402 DTR

GNSS_RXD1_O / GNSS_TXD1_O

GND

GNSS_TXD1_O / GNSS_RXD1_O

CHIP_PU

DTR — 4.7K — 47K — T2 — DTC043ZEBTL

RTS — DTC043ZEBTL — 47K — 4.7K — T3

ESP32_GPIO0_BOOT

Title	USBIN&HUB		
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Power from Type-c or 12V DC port or EXT

VDCIN
2.2uF/25V/0603 C61
D50 SMCJ12CA
GND GND
Q10 NMOS_NCE3025Q
S3 S2 S1 D G
C212 1uF/50V/0603
U225
VCAP ANODE
GND GATE
EN CATHOLE
GNDR21 100R/0603
LM74700QDBVRQ1

TypeC_VBUS
D19 SMCJ5.0CA
C62 2.2uF/25V/0603
GND GND
Q11 NMOS_NCE3025Q
C45 1uF/50V/0603
U226
R31 22R/0402
LM74700QDBVRQ1
C55 22uF/25V/0805

FDMC4435BZ Q2
R42 2K/0402
R26 0R/0402
ACOK
LED/0603-Green
D47
R27 27.4K/0402
R28 10K/0402
C52 22uF/25V/0805
C53 2.2uF/25V/0603
C54 0.1uF/50V/0402
L3 1.5uH/6A/5R4X5R4
R22 0R/0402
C44 0.1uF/50V/0603
R24 0R/0402
R36 2K/0402 D49 LED/0603-Green
PD_I2C_SDA R34 22R/0402
PD_I2C_SCL R33 22R/0402
R41 30K/0402
R37 12K/0402

VCC_2672
C42 0.47uF/50V/0402
C41 0.47uF/50V/0402
U224
SW BST VCC SYS BATT
SW_2
*ACOK
IN
VLIM
SDA
SCL
CV
MID
*STAT
NTC
ISET AGND PGND
MP2672AGD-0000-P
R30 22R/0402
CHG_STAT
R35 13.7K/0402
R38 37.4K/0402
R39 10K/0805
C63 0.1uF/50V/0402

VSYSIN
C46 0.1uF/50V/0402
C47 C48 C49 C50 C51 22uF/25V/0805
VBAT
C56 C57 22uF/25V/0805
C58 0.1uF/50V/0402
C60 0.1uF/50V/0402
R29 0R/0402 ESP32_I2C_SDA
R32 0R/0402 ESP32_I2C_SCL
P2 P1
BATTERY2
X1503WRS-04-9TSN
D22 ESD7551N2T5G ESD7551N2T5G

DCDC 5V@1A

VSYSIN
C29 22uF/25V/0805
C30 0.1uF/50V/0402
R17 10K/0402
U9
IN LX
EN BS
GND FB
SY8301
L2 4.7uH/74438333047
C32 0.1uF/50V/0402
R18 169K/0402/1%
R20 32.4K/0402/1%
C35 47pF/50V/0402
C36 22uF/16V/0603
C38 22uF/16V/0603
TP3
VCC_5V
C39 0.1uF/50V/0402

VOUT=0.8x(1+Rtop/Rbot)

CHARGER

TypeC_USB_CC1 → TypeC_USB_CC1
TypeC_USB_CC2 → TypeC_USB_CC2
ESP32_I2C_SCL → ESP32_I2C_SCL
ESP32_I2C_SDA → ESP32_I2C_SDA

I2C ADDRESS
4BH

LEDs for Charge(Should remove it)

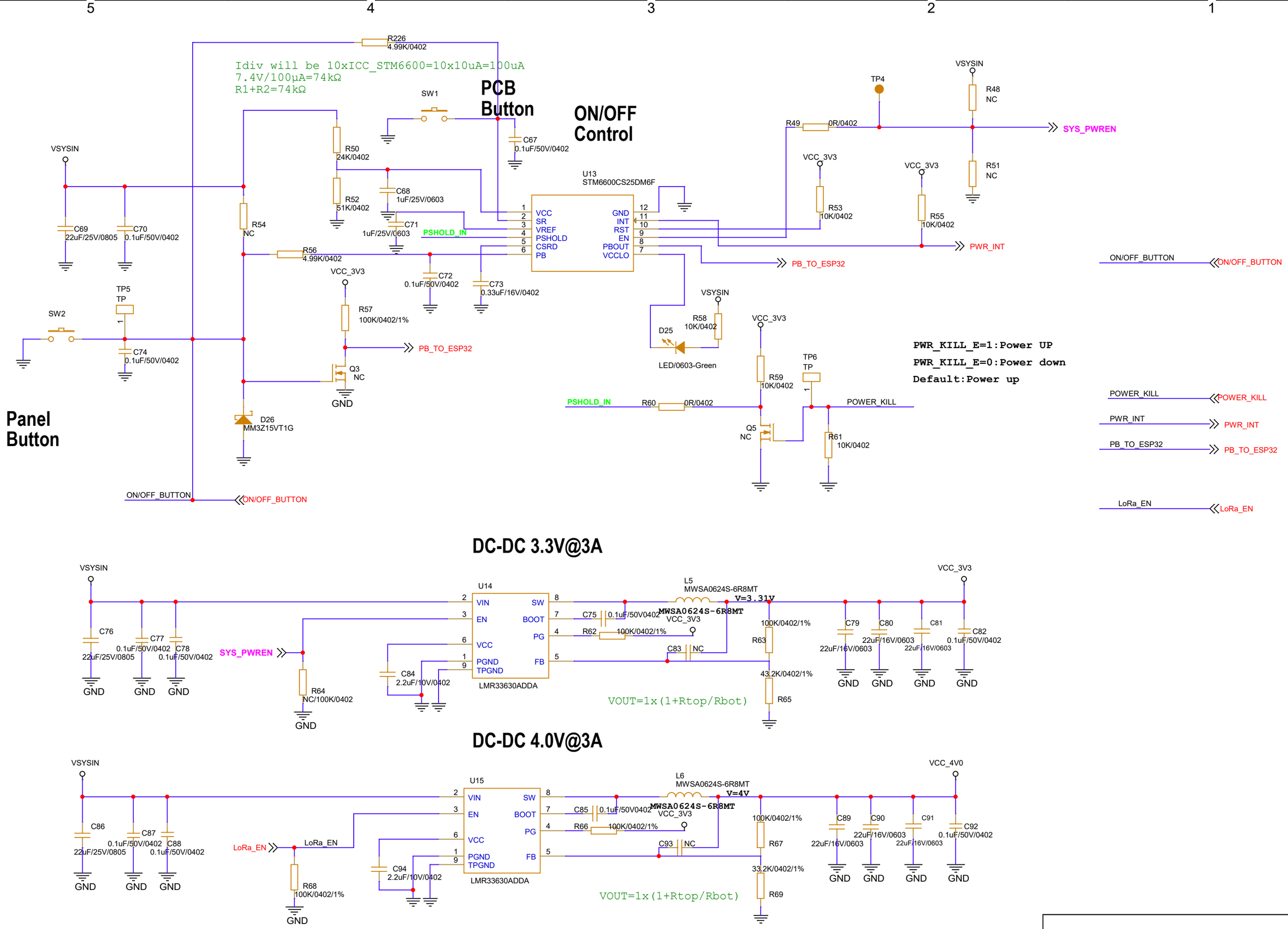
VCC_3V3
R43 330R/0402
LED/0603-Green
D46
CHG_ACOK_OUT R47 33R/0402
T4 DTC043ZEBTL 4.7K 47K

VCC_2672
R40 10K/0402
R44 4.7K/0402
R45 4.7K/0402
C64 0.1uF/50V/0402
C65 0.1uF/50V/0402
U12
VCCB VCCA
B1 A1
B2 A2
B3 A3
B4 A4
NC2 NC1
OE GND
UM3204UE
CHG_STAT
PD_I2C_SCL
PD_I2C_SDA
R46 10K/0402
C66 0.1uF/50V/0402
CHG_STAT_OUT
ESP32_I2C_SCL
ESP32_I2C_SDA

CHG_STAT_OUT R235 0R/0402 → CHARGE_STATUS_OUT

BATTERY connector

Title	PWRIN&CHARGE		
Size A3	Document Number <Doc>		Rev <Rev
Date: Thursday, September 18, 2025	Sheet 4	of 11	



DC-DC 3.3V@3A

DC-DC 4.0V@3A

Title	DC/DC_ON/OFF	
Size A3	Document Number <Doc>	Rev <Rev
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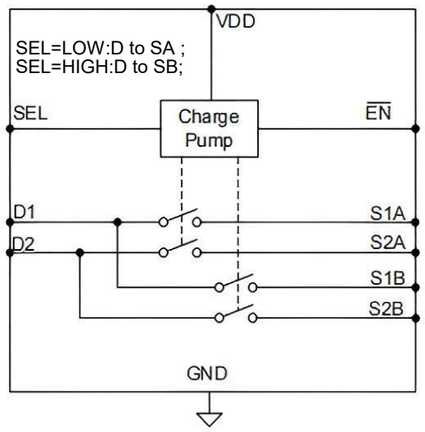
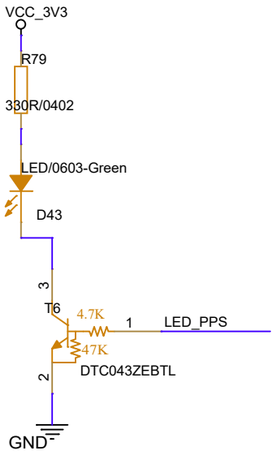
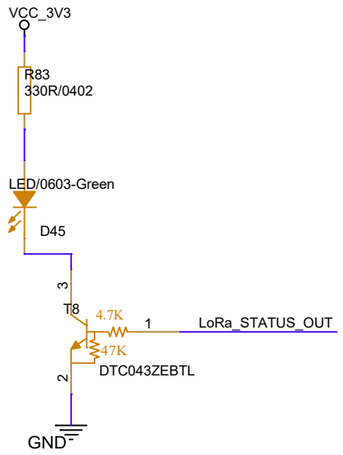


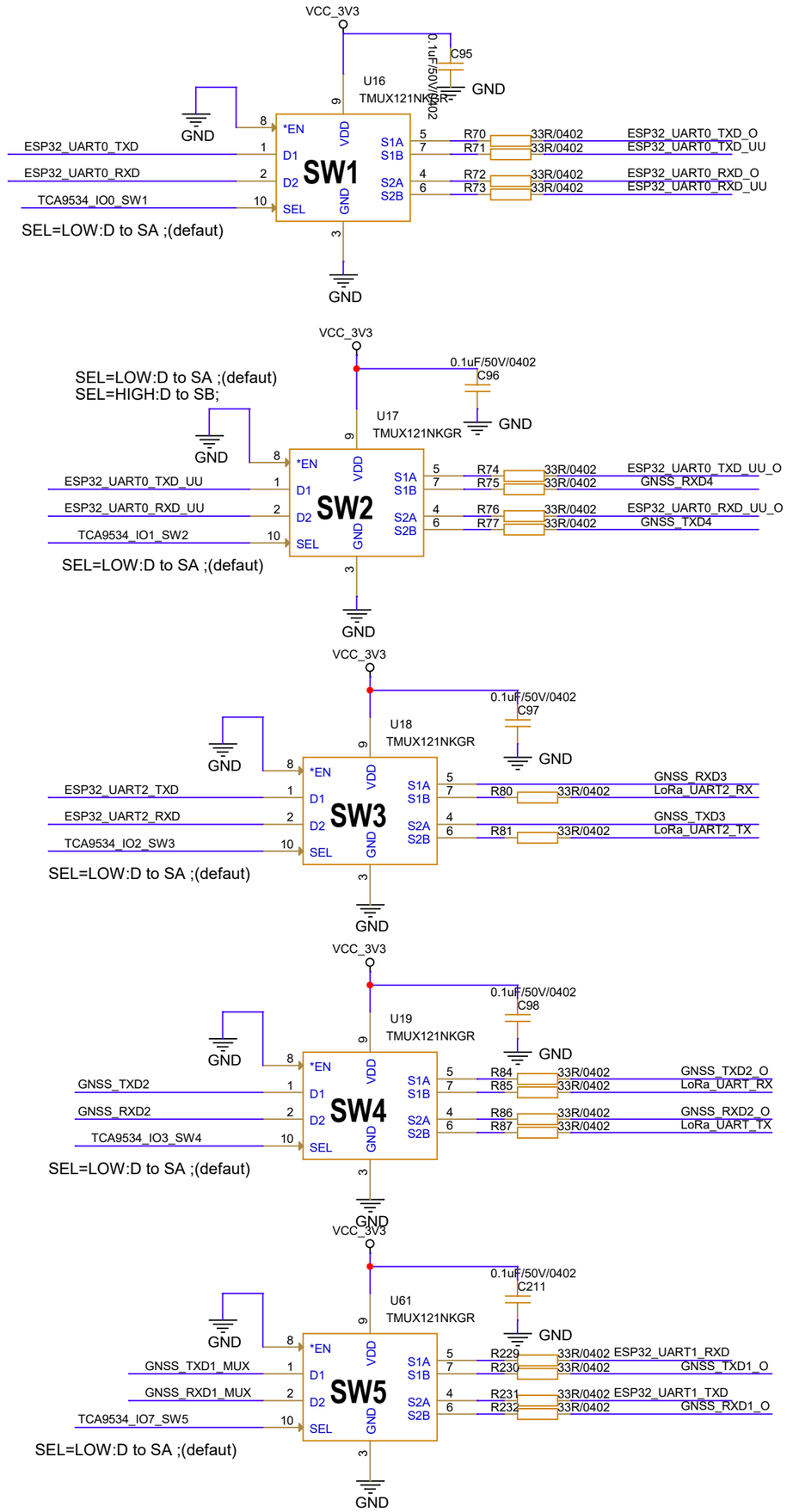
These LEDs will be reserved on motherboard

LED for GNSS



LED for BT-Wi-Fi & LoRa





ESP32_UART0_TXD ESP32_UART0_TXD
ESP32_UART0_RXD ESP32_UART0_RXD

TCA9534_IO0_SW1 TCA9534_IO0_SW1
TCA9534_IO1_SW2 TCA9534_IO1_SW2
TCA9534_IO2_SW3 TCA9534_IO2_SW3
TCA9534_IO3_SW4 TCA9534_IO3_SW4
GNSS_TXD2_O GNSS_TXD2_O
GNSS_RXD2_O GNSS_RXD2_O
TCA9534_IO7_SW5 TCA9534_IO7_SW5

ESP32_UART0_TXD_UU_O ESP32_UART0_TXD_UU_O
ESP32_UART0_RXD_UU_O ESP32_UART0_RXD_UU_O

ESP32_UART0_TXD_O ESP32_UART0_TXD_O
ESP32_UART0_RXD_O ESP32_UART0_RXD_O

GNSS_TXD1 GNSS_TXD1
GNSS_RXD1 GNSS_RXD1
GNSS_TXD2 GNSS_TXD2
GNSS_RXD2 GNSS_RXD2
GNSS_TXD3 GNSS_TXD3
GNSS_RXD3 GNSS_RXD3
GNSS_TXD4 GNSS_TXD4
GNSS_RXD4 GNSS_RXD4

LoRa_UART_TX LoRa_UART_TX
LoRa_UART_RX LoRa_UART_RX
LoRa_UART2_TX LoRa_UART2_TX
LoRa_UART2_RX LoRa_UART2_RX

ESP32_UART0_RXD_UU ESP32_UART0_RXD_UU
ESP32_UART0_TXD_UU ESP32_UART0_TXD_UU

ESP32_UART2_RXD ESP32_UART2_RXD
ESP32_UART2_TXD ESP32_UART2_TXD

GNSS_STATUS GNSS_STATUS
BT_STATUS BT_STATUS

LoRa_STATUS_OUT LoRa_STATUS_OUT
LED_PPS R88 33R/0402 GNSS_PPS1

GNSS_TXD1_MUX GNSS_TXD1_MUX
GNSS_RXD1_MUX GNSS_RXD1_MUX
ESP32_UART1_RXD ESP32_UART1_RXD
ESP32_UART1_TXD ESP32_UART1_TXD

GNSS_TXD1_O GNSS_TXD1_O
GNSS_RXD1_O GNSS_RXD1_O

Title	UART SWITCHs	
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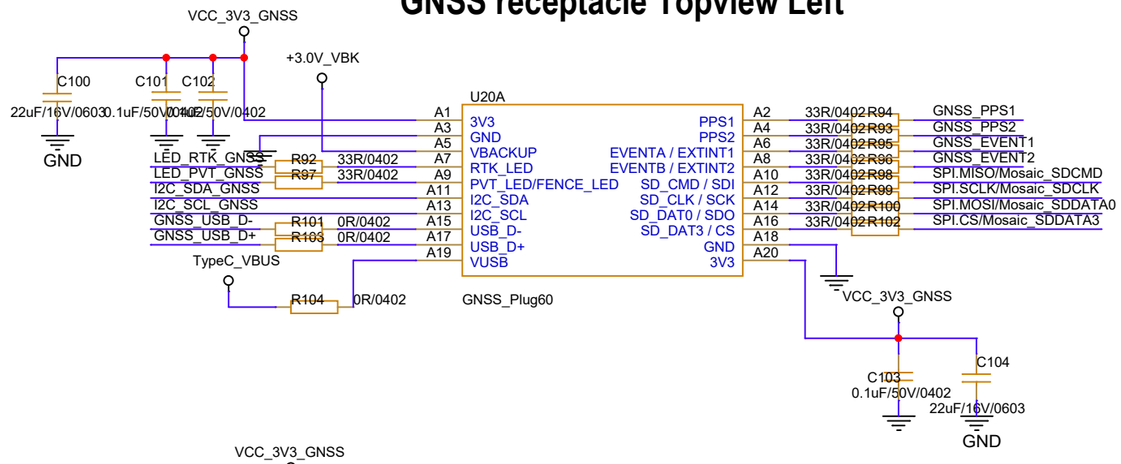
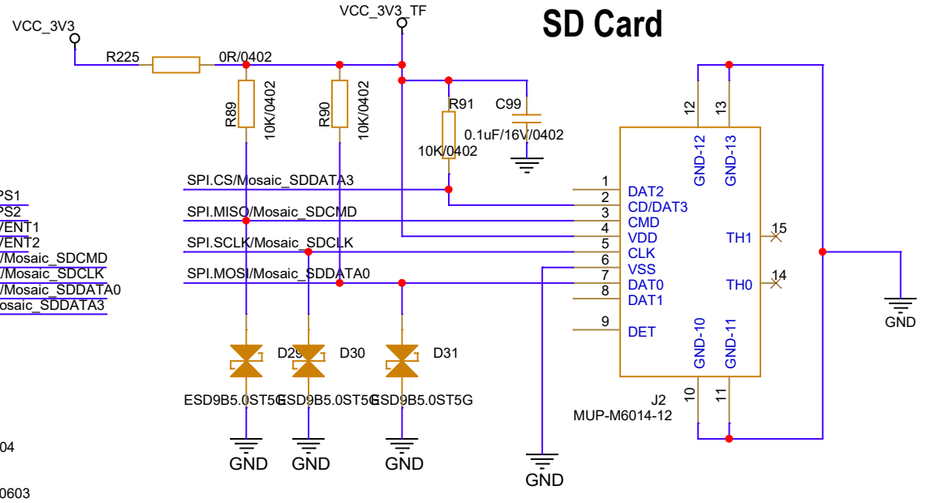
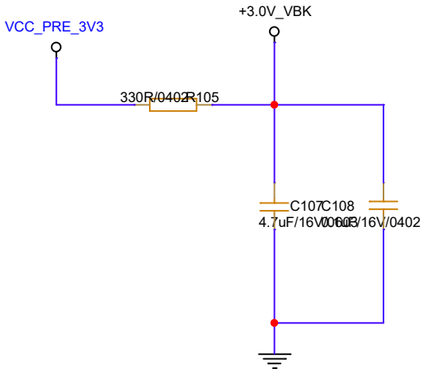
GNSS receptacle Topview Left

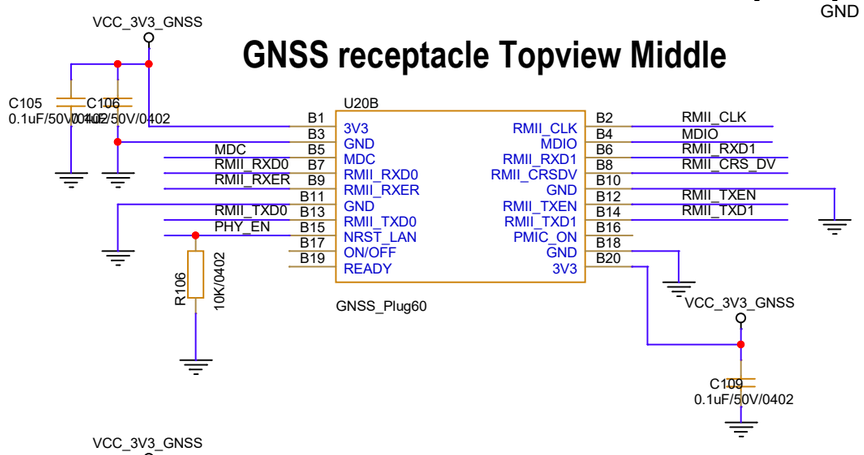


SD Card

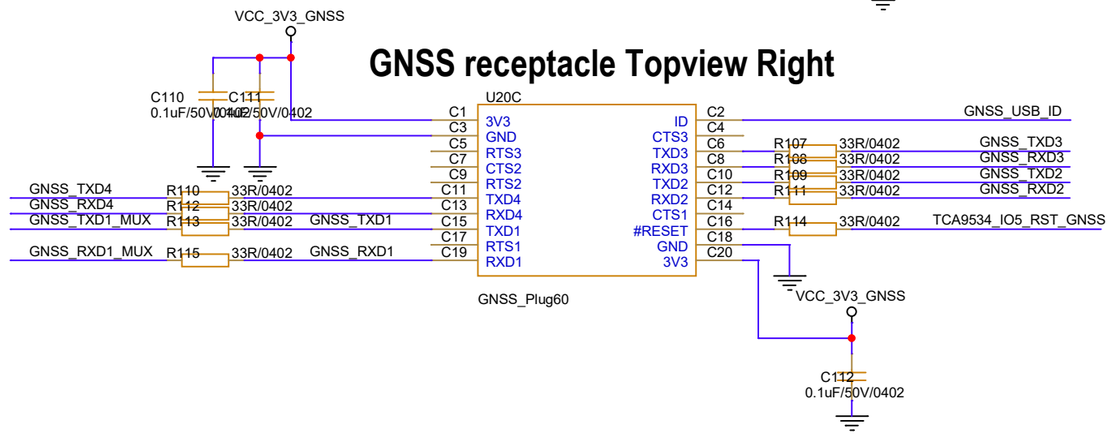


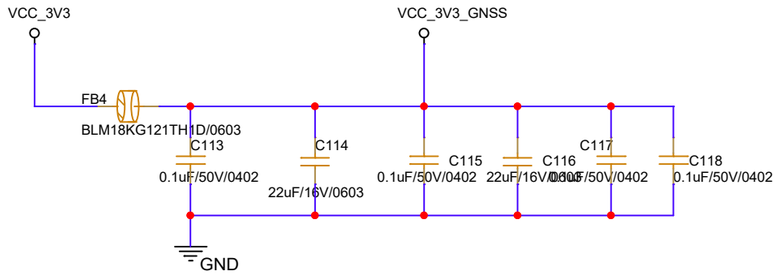


GNSS receptacle Topview Middle



GNSS receptacle Topview Right





GNSS_USB_ID → GNSS_USB_ID
PHY_EN → PHY_EN
MDIO → MDIO
MDC → MDC
RMII_TXD0 → RMII_TXD0
RMII_TXD1 → RMII_TXD1
RMII_TXEN → RMII_TXEN
RMII_CLK → RMII_CLK
RMII_RXD0 → RMII_RXD0
RMII_RXD1 → RMII_RXD1
RMII_RXER → RMII_RXER
RMII_CRS_DV → RMII_CRS_DV
TCA9534_IO5_RST_GNSS → TCA9534_IO5_RST_GNSS
GNSS_PPS1 → GNSS_PPS1
GNSS_TXD1_MUX → GNSS_TXD1_MUX
GNSS_RXD1_MUX → GNSS_RXD1_MUX
GNSS_TXD2 → GNSS_TXD2
GNSS_RXD2 → GNSS_RXD2
GNSS_TXD3 → GNSS_TXD3
GNSS_RXD3 → GNSS_RXD3
GNSS_TXD4 → GNSS_TXD4
GNSS_RXD4 → GNSS_RXD4
GNSS_USB_D+ → GNSS_USB_D+
GNSS_USB_D- → GNSS_USB_D-
I2C_SCL_GNSS — R116 33R/0402 → ESP32_I2C_SCL
I2C_SDA_GNSS — R117 33R/0402 → ESP32_I2C_SDA

Title	GNSS PLUG	
Size A3	Document Number <Doc>	Rev <RevC
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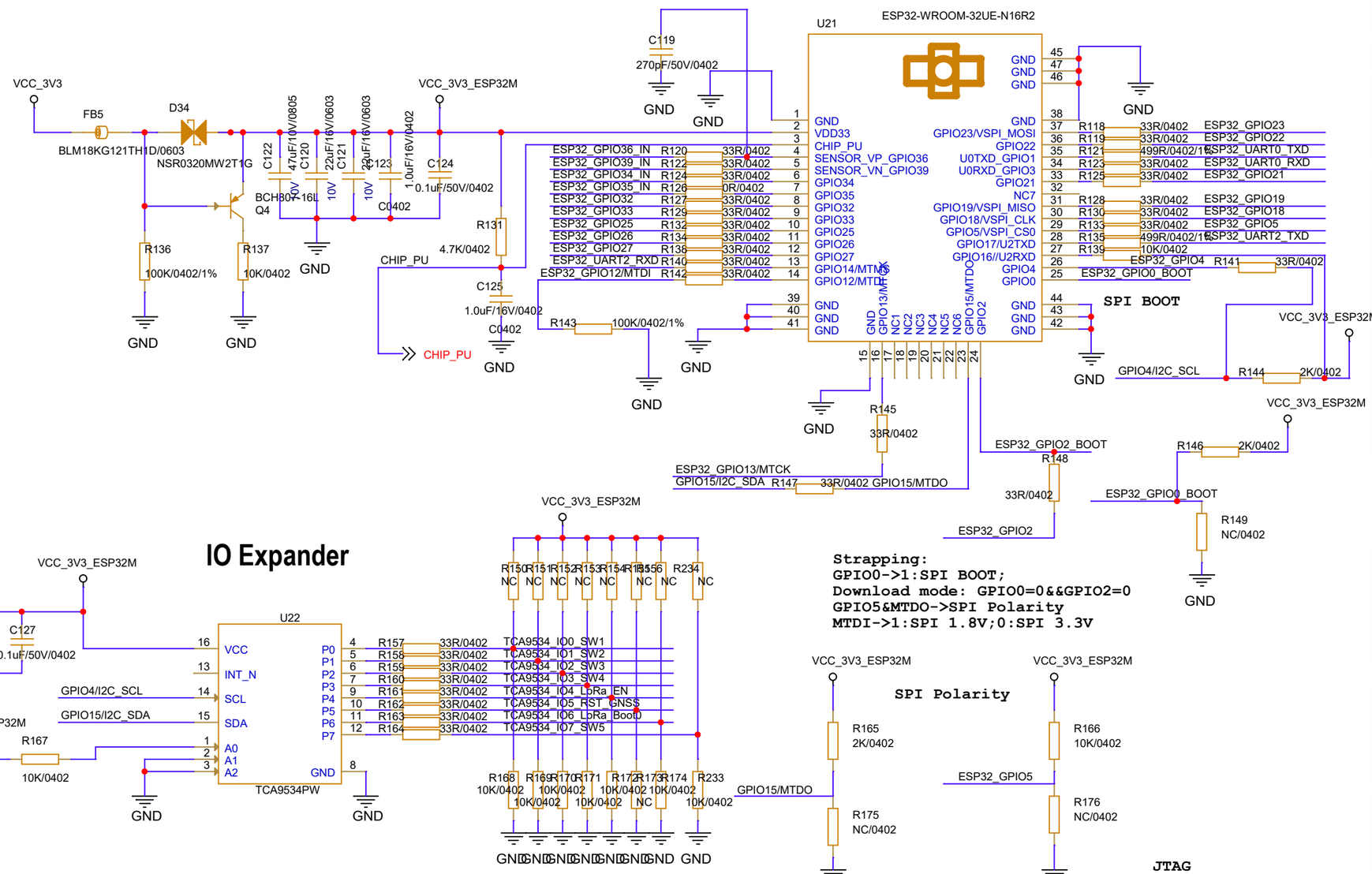
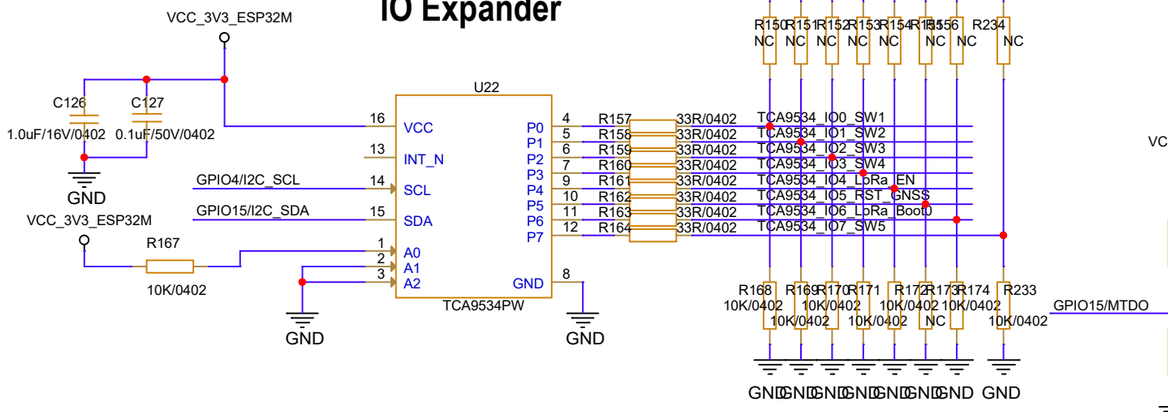
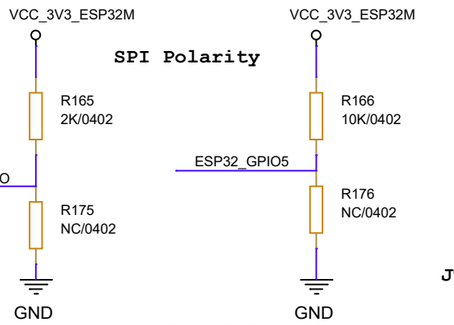
ESP32-WROOM-32UE-N16R2

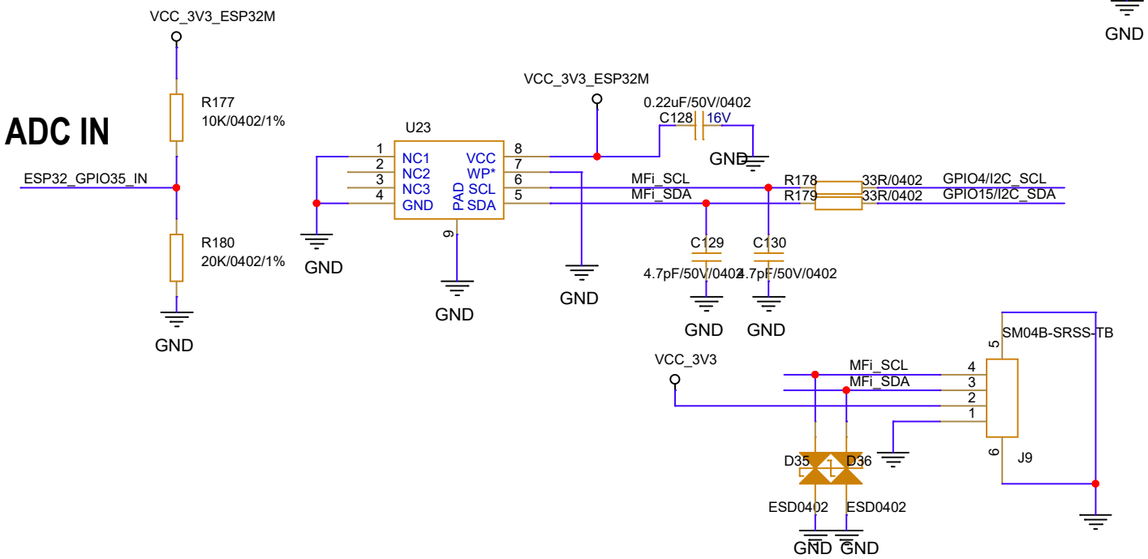


Strapping:
GPIO0->1:SPI BOOT;
Download mode: GPIO0=0&&GPIO2=0
GPIO5&MTDO->SPI Polarity
MTDI->1:SPI 1.8V;0:SPI 3.3V

IO Expander







LoRa control

TCA9534_IO4_LoRa_EN — R190 33R/0402 LoRa_EN → LoRa_EN
TCA9534_IO6_LoRa_Boot0 → LoRa_BOOT0

UART1 to GNSS UART1

ESP32_GPIO26 — ESP32_UART1_RXD → ESP32_UART1_RXD
ESP32_GPIO27 — ESP32_UART1_TXD → ESP32_UART1_TXD

UART0 OUT or to UU

ESP32_UART0_TXD → ESP32_UART0_TXD
ESP32_UART0_RXD → ESP32_UART0_RXD

UART2 to LoRa or External JST

ESP32_UART2_TXD → ESP32_UART2_TXD
ESP32_UART2_RXD → ESP32_UART2_RXD

ON/OFF

ESP32_GPIO34_IN → PB_TO_ESP32
ESP32_GPIO25 — FUNC_BUTTON → FUNC_BUTTON

BUZZER

ESP32_GPIO33 — BUZZER_OUT → BUZZER_OUT

LEDs

ESP32_GPIO32 — COMM_STATUS_OUT → COMM_STATUS_OUT
ESP32_GPIO13/MTCK — free

I2C expanded IOs

TCA9534_IO0_SW1 → TCA9534_IO0_SW1
TCA9534_IO1_SW2 → TCA9534_IO1_SW2
TCA9534_IO2_SW3 → TCA9534_IO2_SW3
TCA9534_IO3_SW4 → TCA9534_IO3_SW4
TCA9534_IO5_RST_GNSS → TCA9534_IO5_RST_GNSS
TCA9534_IO7_SW5 → TCA9534_IO7_SW5

Boot

CHIP_PU → CHIP_PU
ESP32_GPIO0_BOOT → ESP32_GPIO0_BOOT

ESP32 SPI to SD Card

VCC_3V3_ESP32M
R228 10K/0402
ESP32_GPIO39_IN — SD_#CD → SD_#CD
ESP32_GPIO19 — SD_SDO → SD_SDO
ESP32_GPIO21 — SD_SDI → SD_SDI
ESP32_GPIO22 — SD_#CS → SD_#CS
ESP32_GPIO18 — SD_SCK → SD_SCK

I2C1 chargeIC/LED/

GPIO4/I2C_SCL → ESP32_I2C_SCL
GPIO15/I2C_SDA → ESP32_I2C_SDA
ESP32_GPIO36_IN → CHARGE_STATUS_OUT

ESP32_GPIO35_IN — R181 NC — GNSS_USB_ID → GNSS_USB_ID
ESP32_GPIO23 — POWER_KILL → POWER_KILL

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LoRa SoC

VCC_3V3=3.36V
When Vout=3.2V, Dropout=160mV, Iout=300mA

R1=R2((VOUT/1.206)-1)
R2=47K
Choose 78.7K for R1, Vout=3.22V

Reset LoRa

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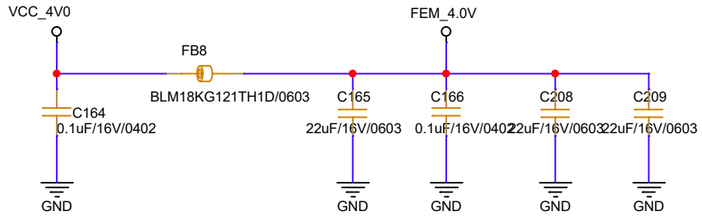
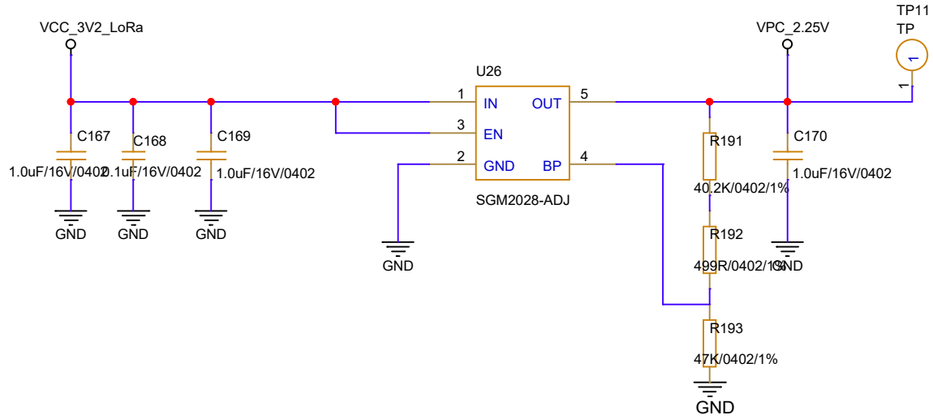
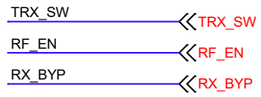
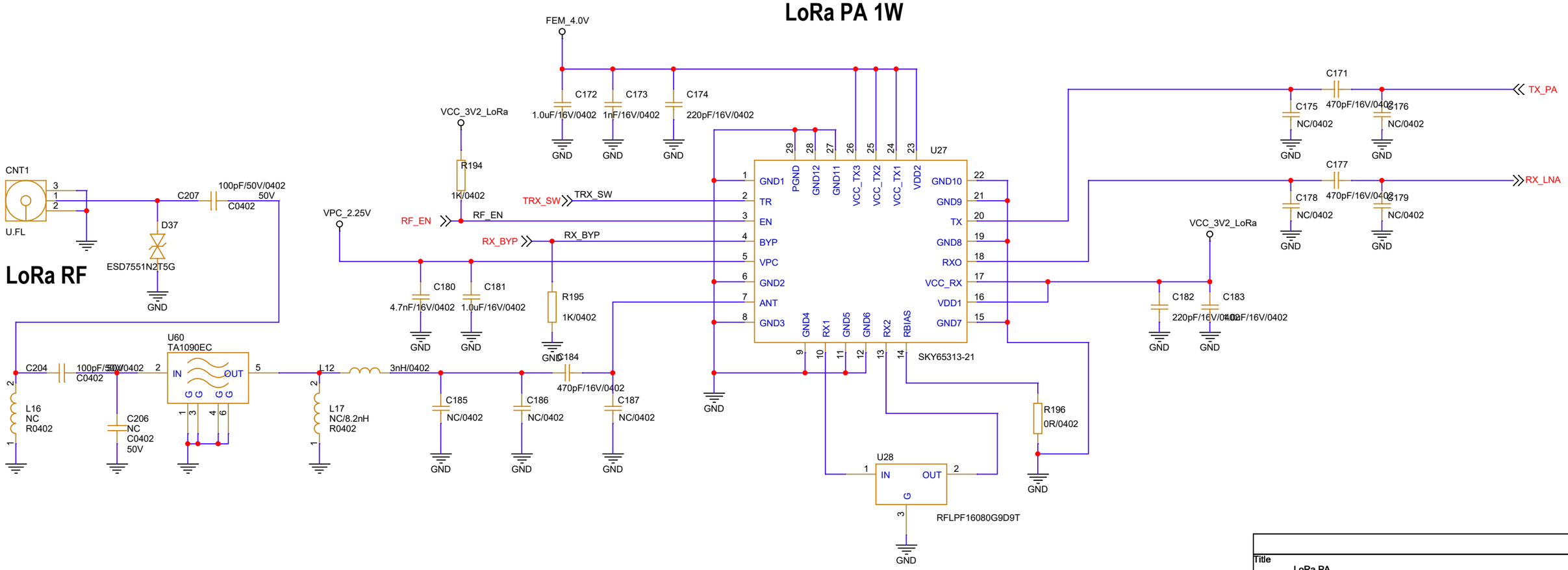






LoRa PA 1W



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Eth PHY

Not Populated

U29 KSZ8041NLI

PHY_EN, MDIO, MDC, RMII_TXD0, RMII_TXD1, RMII_TXEN, RMII_CLK, RMII_RXD0, RMII_RXD1, RMII_RXER, RMII_CRS_DV

R197 4.7K/0402 to VCC_3V3

VCCA_3V3 via L13 Z=22 Ohm R=0.20

C188 16V 10uF/16V/0603 + C189 16V 0.1uF/16V/0402

C190 16V 10uF/16V/0603 + C192 16V 0.1uF/16V/0402

C193 16V 10uF/16V/0603 + C191 16V 0.1uF/16V/0402

VDDPLL_1.8, VDDA_3.3, VDDIO_3.3

RST# ← PHY_EN via R198 33R/0402

MDIO, MDC via R200 22R/0402

RMII_RXD1 via R201 22R/0402, RMII_RXD0 via R202 22R/0402, RMII_CRS_DV via R203 22R/0402

RMII_RXER via R204 22R/0402

RMII_TXEN via R205 22R/0402, RMII_TXD0 via R206 22R/0402, RMII_TXD1 via R210 22R/0402

RXD1/PHYAD2, RXD0/PHYAD0, RXD3/PHYAD0, RXD2/PHYAD1, RXDV/CRSDV/CINFIG2, RXD0/DUPLEX, RXC, RXER/ISO, INTRP, COL/CONFIG0, CRS/CONFIG1

LED0/NWAYEN, LED1/SPEED → R199 2K/0402 → LED/0603-Green D48 → ETH_LINK_LED

RX-, RX+, TX-, TX+ → PHY_ETH_RX-, PHY_ETH_RX+, PHY_ETH_TX-, PHY_ETH_TX+

XO, XI /REFCLK

TXC, TXD2, TXD3, TXEN, TXD0, TXD1, REXT → R212 6.49K/0402, C194 50V 100pF/50V/0402

R211, R207, R208, R209 49.9R/0402

C195, C196 0.1uF/16V/0402 16V

L14, L15 LF1005G2R2JT000

VCCA_3V3

RMII_CLK ← RMII_CLK via R213 22R/0402

GND, GND

PHY ADRESS 00001

RXD1_PHYAD2 → R215 NC/DNP

RMII Mode

COL_CONFIG0 → R214 4.7K/0402 to VCC_3V3

CRS_CONFIG2 → R216 NC/DNP

Not Populated

VCCA_3V3

PHY_ETH_RX-, PHY_ETH_RX+, PHY_ETH_TX-, PHY_ETH_TX+ → SM06B-SRSS-TB J10

ESD5V0D4 ESD0402 ×4, D41

GND GND GND GND

ESP32_UART0_TXD_UU_O → ESP32_UART0_TXD_UU_O

ESP32_UART0_RXD_UU_O → ESP32_UART0_RXD_UU_O

RS232

U30 SP3223EEY

VCC_3V3, GND

R217 10K/0402, R218 10K/0402

ESP32_UART0_TXD_UU_O → R219 33R/0402 → T2IN

ESP32_UART0_RXD_UU_O → R220 33R/0402 → R2OUT

R222 10K/0402

C198 16V 0.1uF/16V/0402

C199 0.22uF/16V/0402

C200 0.22uF/16V/0402

C201 0.22uF/16V/0402

C202 0.22uF/16V/0402

C203 0.22uF/16V/0402

EN#, SHDN#, VCC, V+, V-, C2+, C2-, C1+, C1-, T1IN, R1OUT, T1OUT, T2OUT, STATUS, ONLINE, GND, R1IN, R2IN

T2OUT → R221 33R/0402 → ESP32_UART0_TXD_R232 → ESP32_UART0_TXD_R232

R2IN → R223 33R/0402 → ESP32_UART0_RXD_R232 → ESP32_UART0_RXD_R232

ESP32_UART0_TXD_R232 → ESP32_UART0_TXD_R232

ESP32_UART0_RXD_R232 → ESP32_UART0_RXD_R232

JST 1.0mm 4PIN

VCC_3V3, J11, SM04B-SRSS-TB

ESP32_UART0_TXD_R232, ESP32_UART0_RXD_R232

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