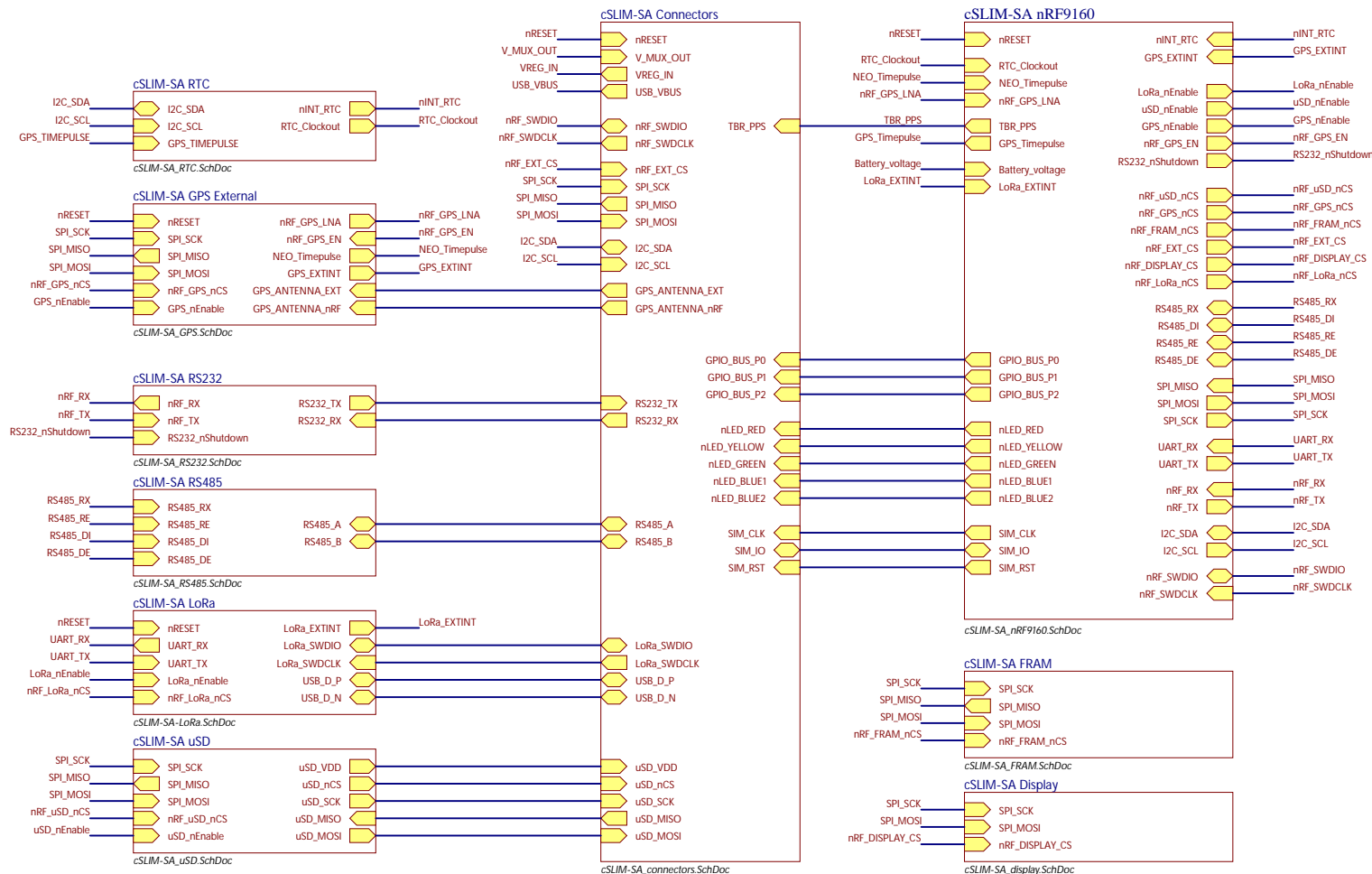
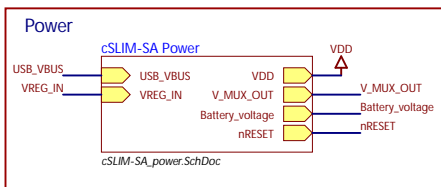


cSLIM-v1 (Stand Alone buoy-controller)

Project 2021 NTNU

Vetle Berg Abrahamsen

Sheet 1: Overview
Sheet 2: nRF9160
Sheet 3: LoRa Module
Sheet 4: RS485
Sheet 5: RS232
Sheet 6: Connectors
Sheet 7: Power
Sheet 8: uSD
Sheet 9: Display
Sheet 10: GNSS
Sheet 11: FRAM
Sheet 12: RTC



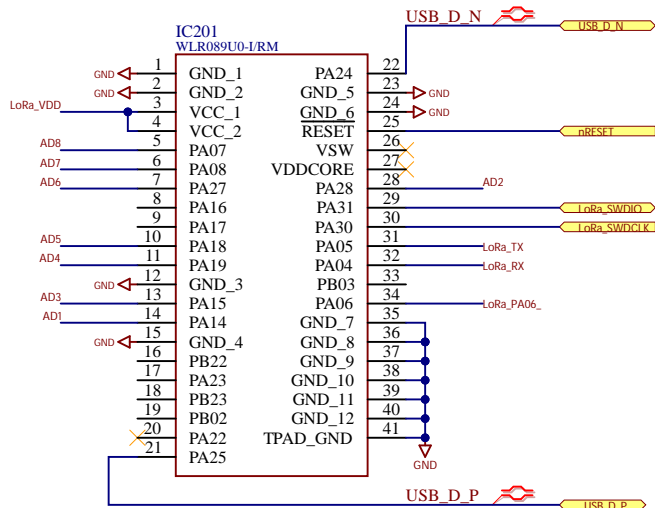
✗ This symbol is used on components that is normally not mounted on the PCB. However, the components will be found in the bill of materials. Hence, schematics should be used together with the bill of material when assembling the pcb.

✗ The No ERC object is a design directive. This directive is placed on a node in the circuit to suppress harmless warnings and/or error violation conditions that are detected when the schematic project is compiled.

Based on framework for the cSLIM-shield by Eivind Holen Jølsgard
See Eyvinds Github for schematics and PCB on this link.
https://github.com/eivinhj/cSLIM_nRF9160-DK_shield

	Title cSLIM v1 - Overview		
	Size A4	Number	Revision v1
Date: 21.01.2022	Sheet 1 of 12		
File: cSLIM-SA.SchDoc	Drawn by: Vetle Berg Abrahamsen		

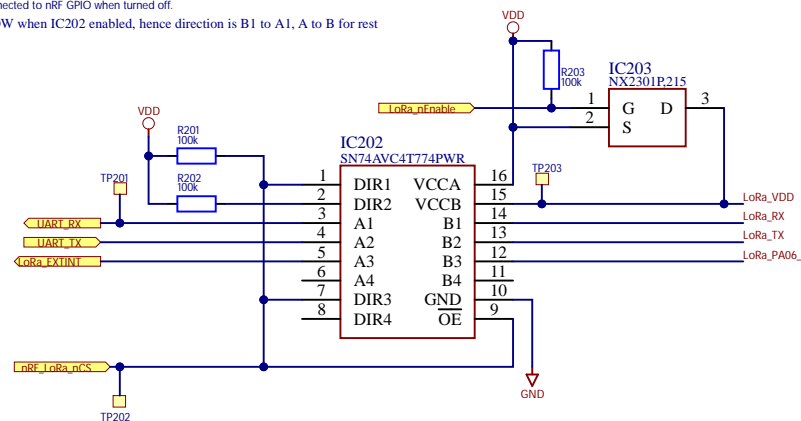
LoRa Module



LLC

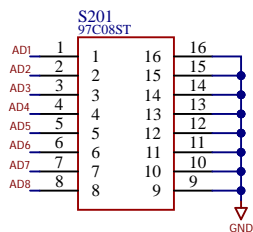
Logic level converter with controlled output enable used to ensure tri-state on pins connected to nRF GPIO when turned off.

DIR1 = LOW when IC202 enabled, hence direction is B1 to A1, A to B for rest



Address Switch

Functionality must be added to the LoRa software to make use of Address switches.



REMOVED interface for LoRa:

I2C_SDA - PA16
I2C_SCL - PA17

LoRa MOSI - PB22
LoRa MISO - PB02
LoRa SCK - PB23
LoRa nCS - PA23

PB03 output removed (used for led)

MARK: LoRa module pins will draw power from nRF GPIO if it is not powered on. This lead to problems with I2C, SPI and UART communication with other devices. Remove unneeded connections and/or insert LLC to ensure tri-state-inputs if LoRa module should be powered down completely.



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cSLIM v1

Title
cSLIM v1 - LoRa Module

Size
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Number

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v1

Date: 21.01.2022

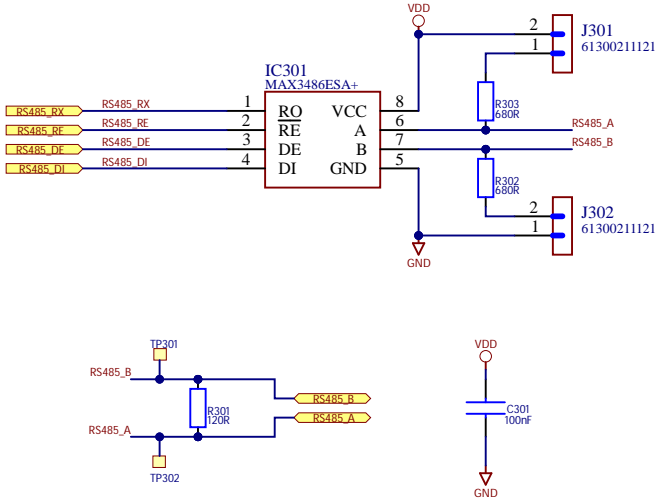
Sheet 3 of 12

File: cSLIM-SA-LoRa.SchDoc

Drawn by: Vette Berg Abrahamsen

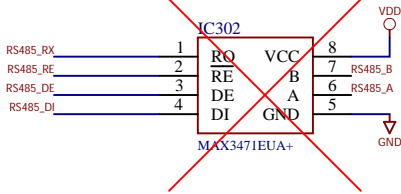
RS485 controller
MAX3486

Only mount either MAX3486 or MAX3471,
dependent on baudrate of TBR.
Default baudrate of TBR-700 is 115.200kbps.
MAX3471 is more power efficient, however
it has a maximum baud of 64kbps.



RS485 controller
MAX3471

Only mount either MAX3486 or MAX3471,
dependent on baudrate of TBR.
Default baudrate of TBR-700 is 115.200kbps.
MAX3471 is more power efficient, however
it has a maximum baud of 64kbps.



NTNU

cSLIM v1

Title

cSLIM v1 - RS485

Size

A4

Number

Revision

v1

Date: 21.01.2022

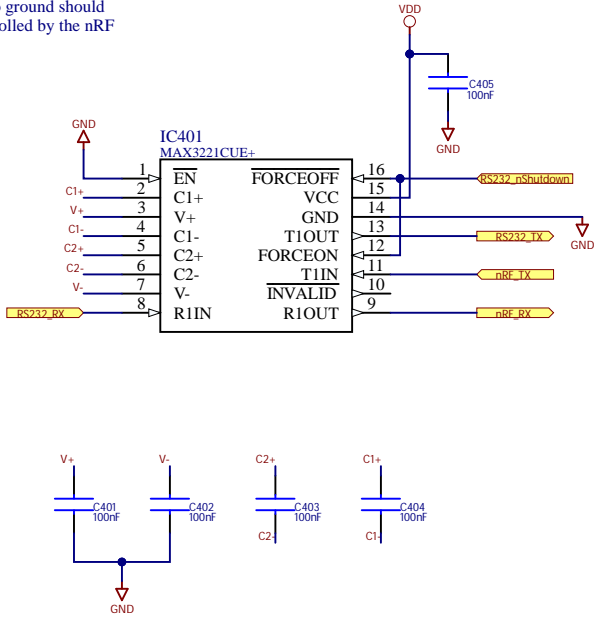
Sheet 4 of 12


File: cSLIM-SA_RS485.SchDoc

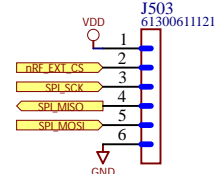
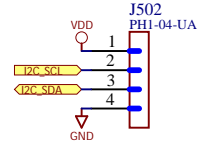
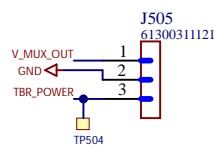
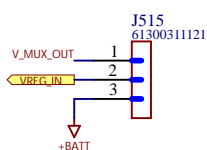
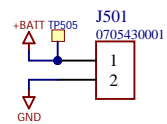
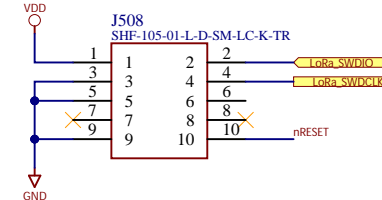
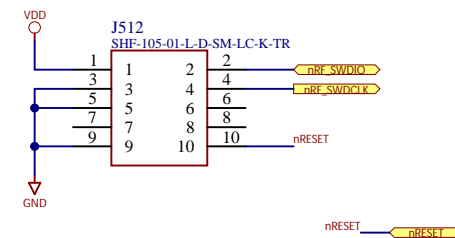
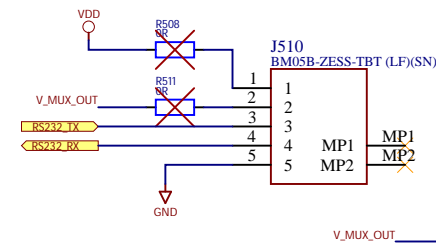
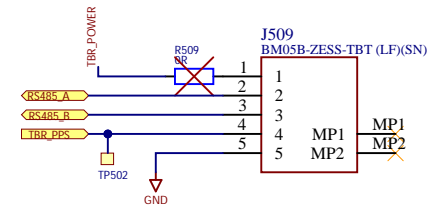
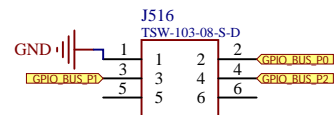
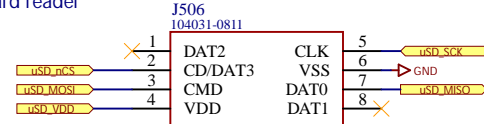
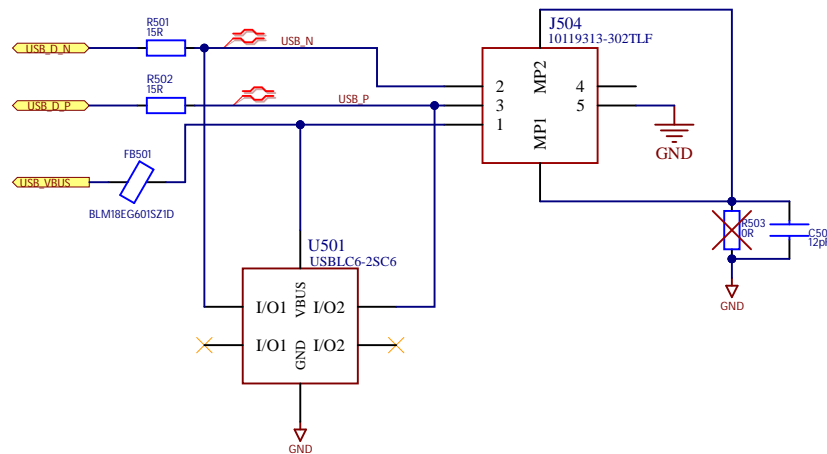
Drawn by: Vette Berg Abrahamsen

RS232 controller

Note: The nEN pin connected to ground should be considered to be controlled by the nRF for future designs



 NTNU cSLIM v1	Title cSLIM v1 - RS232		
	Size A4	Number	Revision v1
Date: 21.01.2022		Sheet 5 of 12	
File: cSLIM-SA_RS232.SchDoc		Drawn by: Vette Berg Abrahamsen	



Title

cSLIM v1 - Connectors

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v1

Date: 21.01.2022

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File: cSLIM-SA_connectors.SchDoc

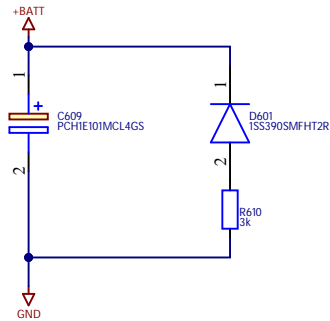
Drawn by: Vetle Berg Abrahamsen

A

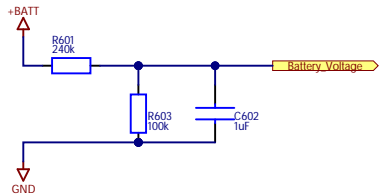
A

Polarization protection

Capacitor for battery supply and diode to protect circuitry of wrong polarization

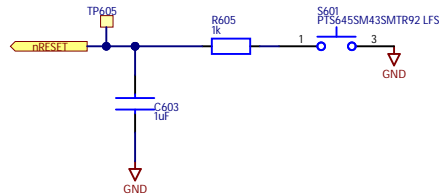


Battery measurement



nRESET signal

RESET button
The nRESET pin of the nRF9160 has a 13kOhm internal pull up

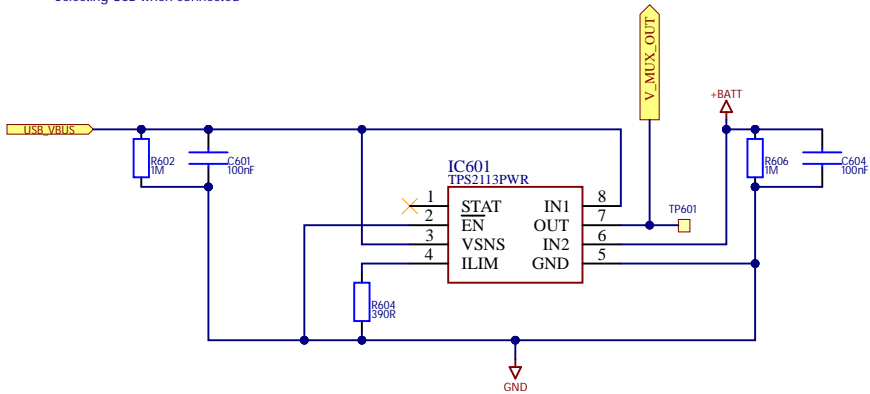


B

B

Power multiplexer

Selecting USB when connected



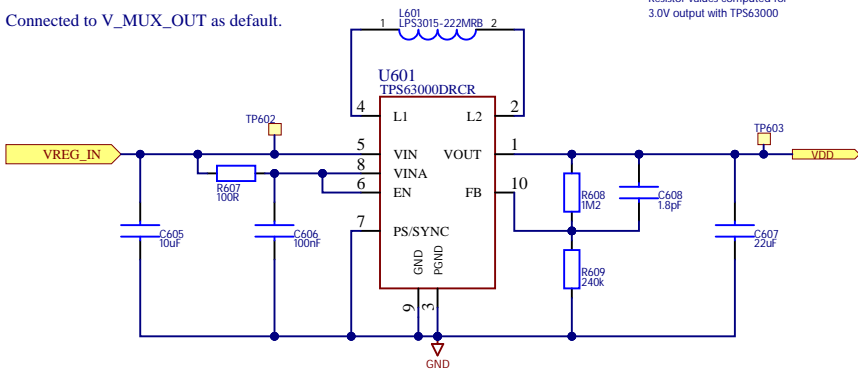
3.3V Buck-Boost regulator

VREG_IN selects either V_MUX_OUT or +BAT as VIN on Buck-boost regulator
Physical jumper J515. This is due to battery related problems where the battery do not get selected by voltage multiplexer, even when USB is not connected.

Connected to V_MUX_OUT as default.

R608 and R609 is not necessary when using TPS63001 as the output voltage is fixed to 3.3V. If another voltage is required use TPS63000 with appropriate resistor values

Resistor values computed for 3.0V output with TPS63000



C

C

D

D



NTNU
cSLIM v1

Title
cSLIM v1 - Power

Size
A4

Number

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v1

Date: 21.01.2022

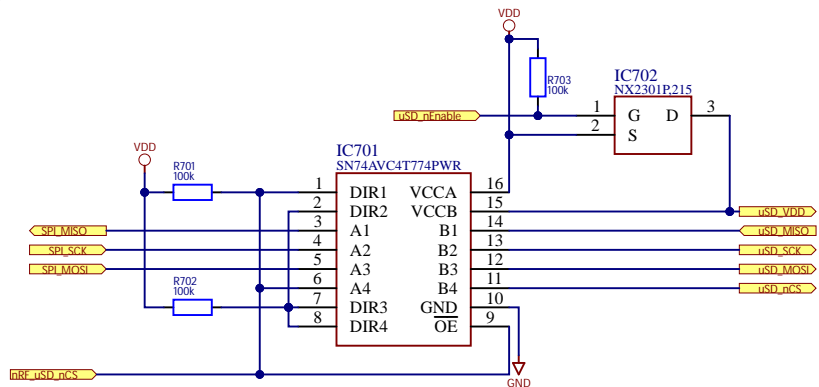
Sheet 7 of 12

File: cSLIM-SA_power.SchDoc

Drawn by: Vette Berg Abrahamsen

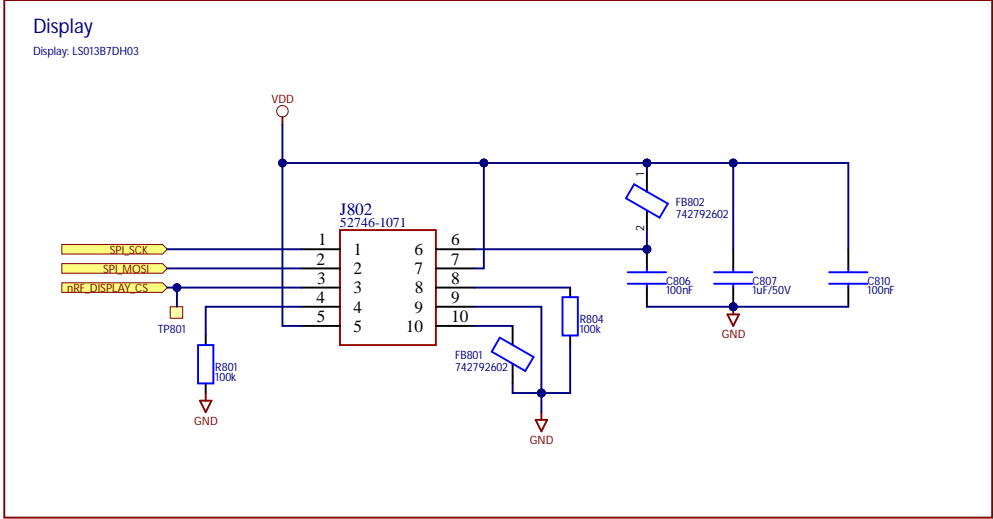
uSD LLC


Logic level converter with controlled output enable used to ensure tri-state on MOSI pins when uSD is turned off



NTNU
cSLIM v1

Title			
cSLIM v1 - uSD			
Size	Number		Revision
A4			v1
		Sheet 8	of 12
_uSD.SchDoc		Drawn by: Vette Berg Abrahamsen	

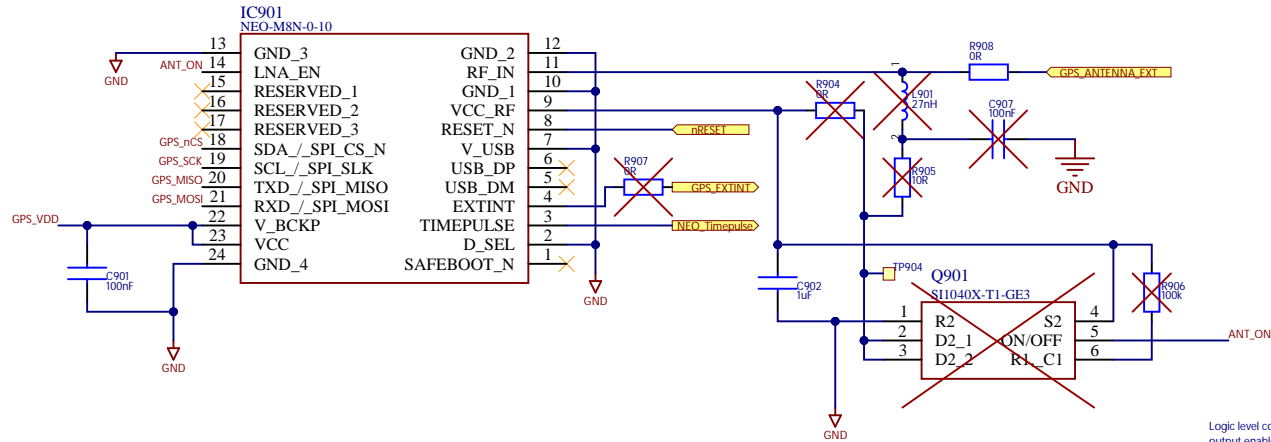


 NTNU cSLIM v1	Title cSLIM v1 - Display		
	Size A4	Number	Revision v1
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File: cSLIM-SA_display.SchDoc		Drawn by: Vette Berg Abrahamsen	

Ublox GNSS receiver and LLC

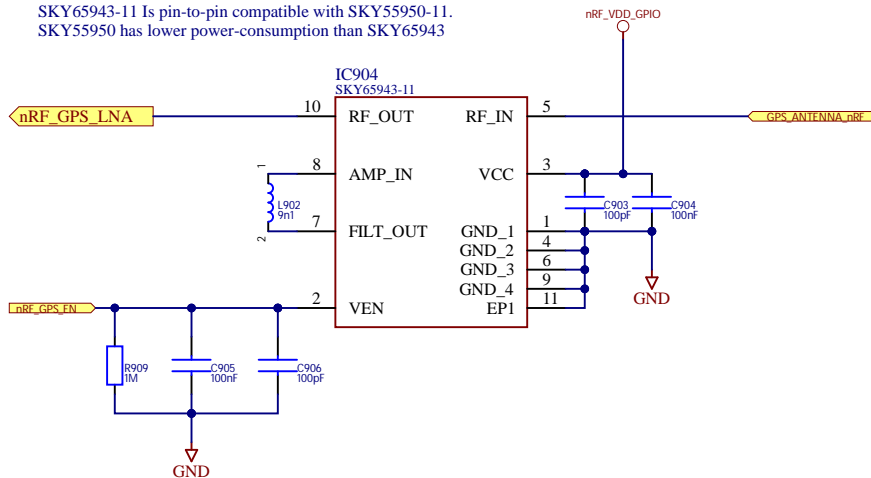
C901, L901, R905, and C902 is only needed with active antenna (Taoglass FXP.611 is passive).R904 can be used instead of C901, C902 and R906 for antenna always on.

Only mounting one of the two GNSS receivers is required. Both can be mounted.

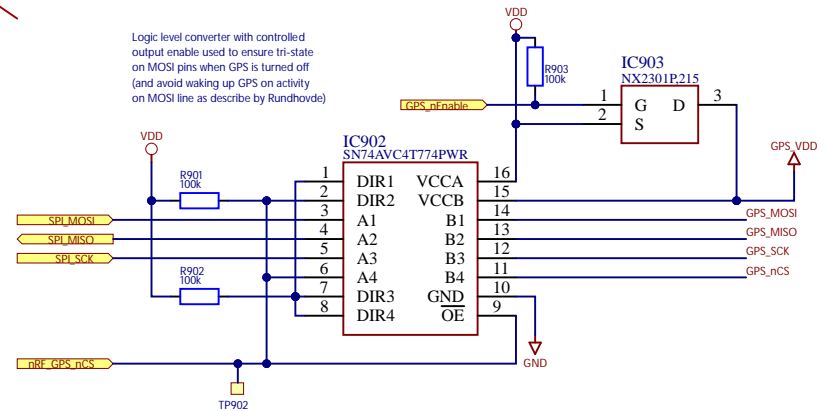


External LNA for internal GNSS receiver

SKY65943-11 Is pin-to-pin compatible with SKY55950-11. SKY55950 has lower power-consumption than SKY65943



Logic level converter with controlled output enable used to ensure tri-state on MOSI pins when GPS is turned off (and avoid waking up GPS on activity on MOSI line as describe by Rundhovde)



cSLIM v1

cSLIM v1 - GNSS

Size A4

Number

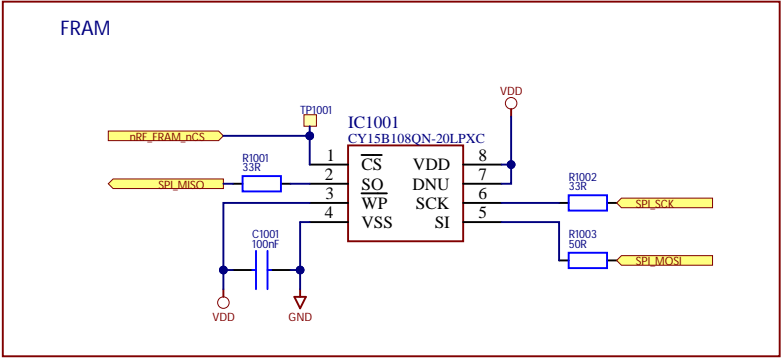
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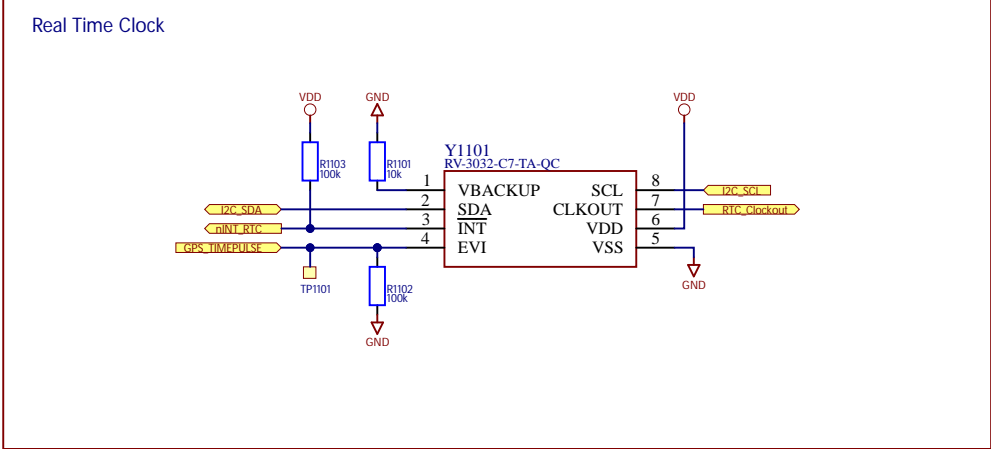
Sheet 10 of 12


File: cSLIM-SA_GPS.SchDoc

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 NTNU cSLIM v1	Title cSLIM v1 - FRAM		
	Size A4	Number	Revision v1
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File: cSLIM-SA_FRAM.SchDoc		Drawn by: Vette Berg Abrahamsen	



 NTNU cSLIM v1	Title cSLIM v1 - RTC		
	Size A4	Number	Revision v1
Date: 21.01.2022			Sheet 12 of 12
File: cSLIM-SA_RTC.SchDoc			Drawn by: Vette Berg Abrahamsen