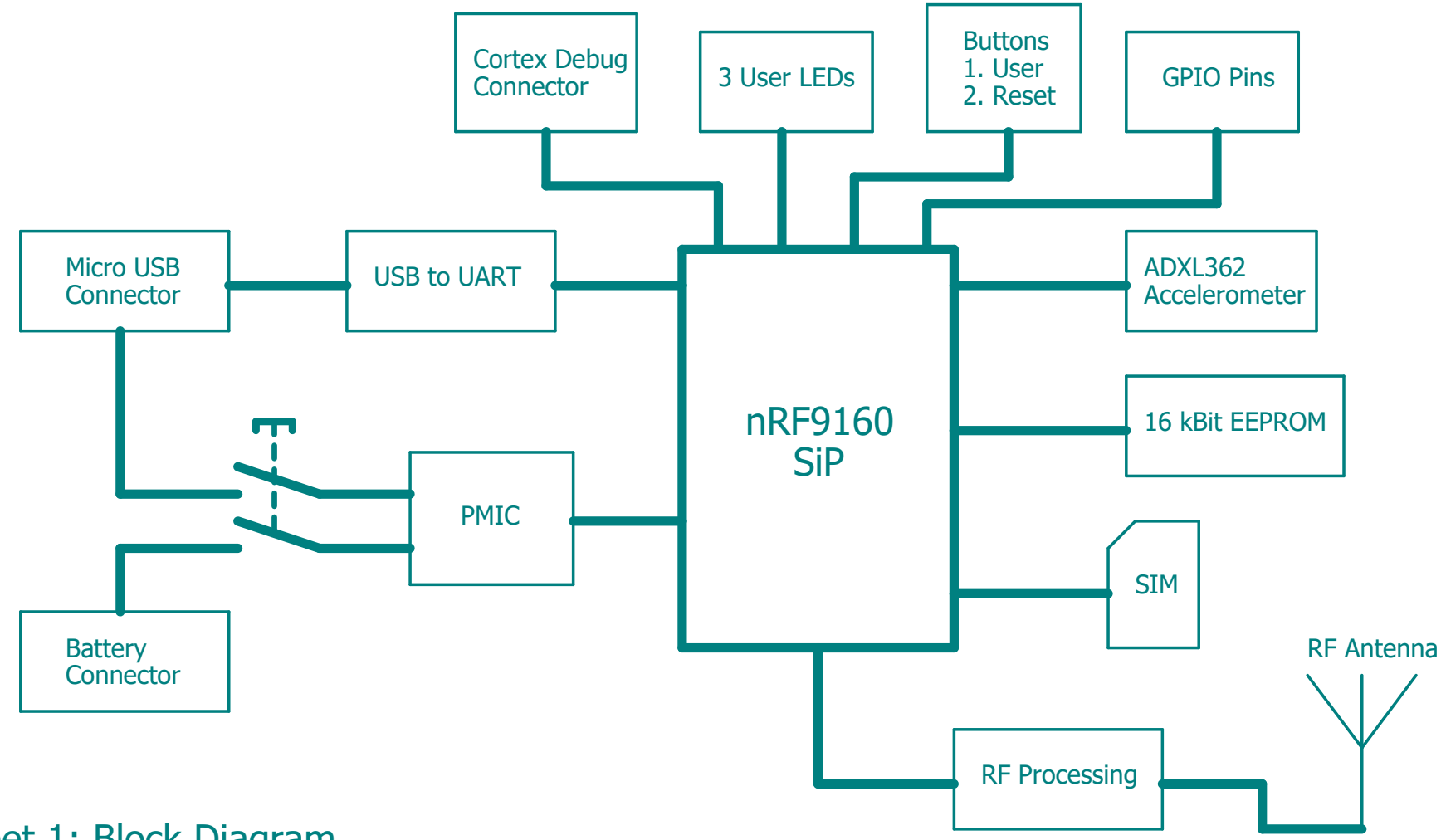
# IoT-Tracker Prototype




Sheet 1: Block Diagram
Sheet 2: nRF9160 MCU
Sheet 3: Power-Supply
Sheet 4: I/O Interface
Sheet 5: Onboard Sensors/ICs
Sheet 6: RF Processing

| | |
|---|---|
| Block diagram | IoT_Tracker_Prototype |
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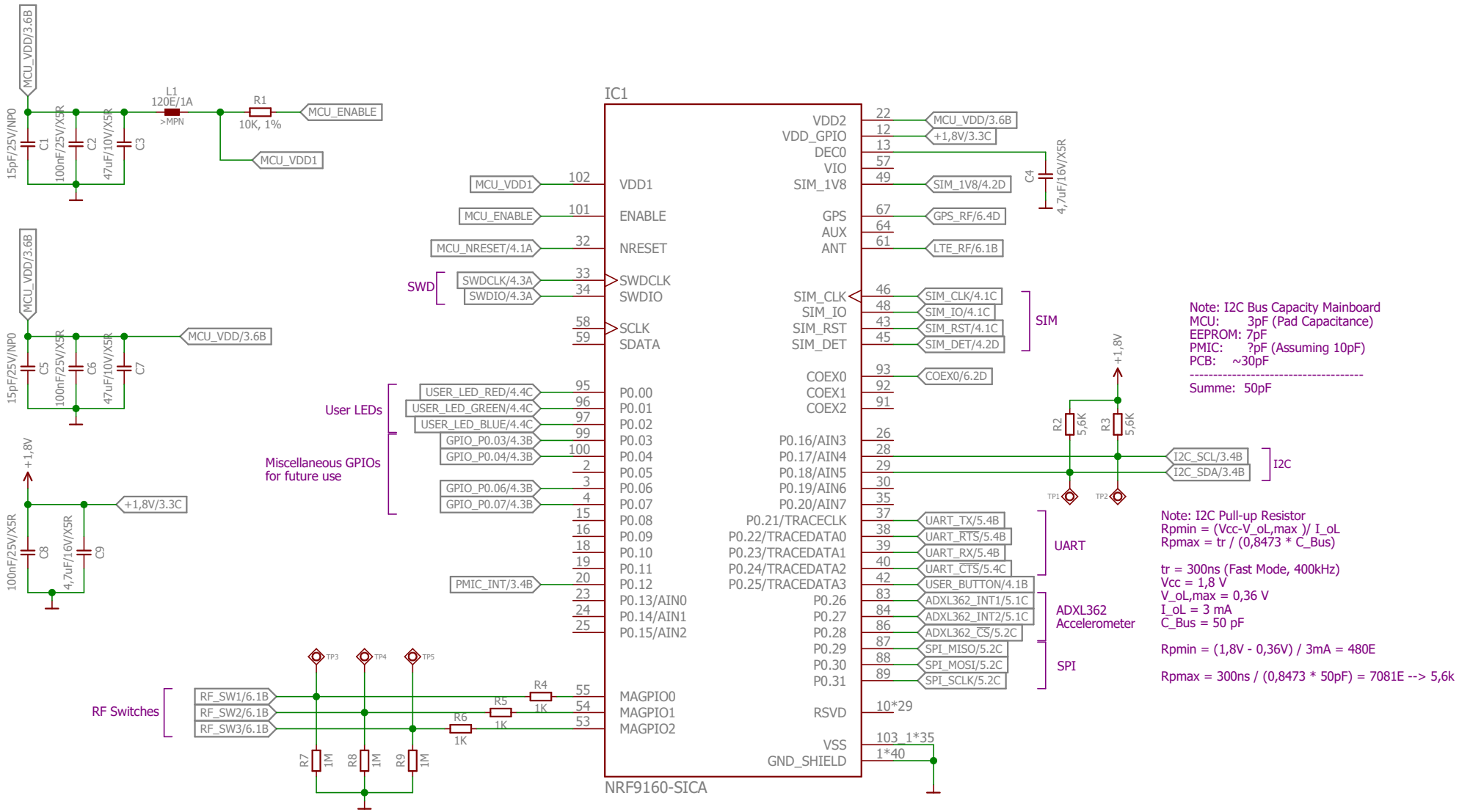


# nRF9160 MCU

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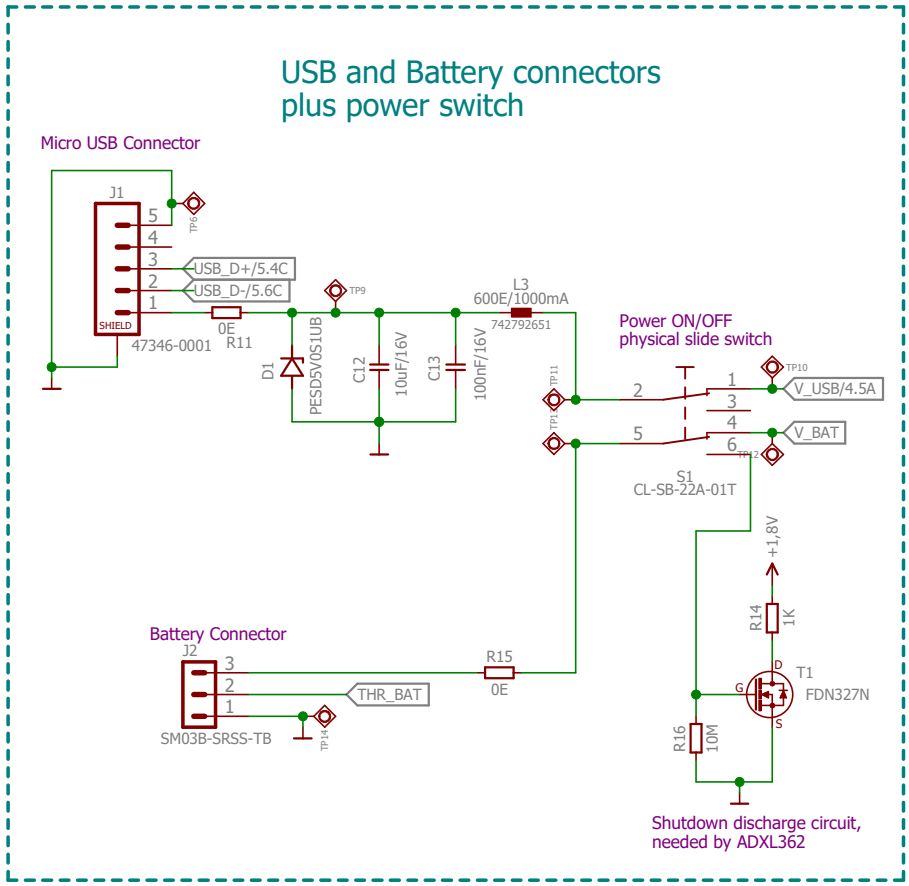


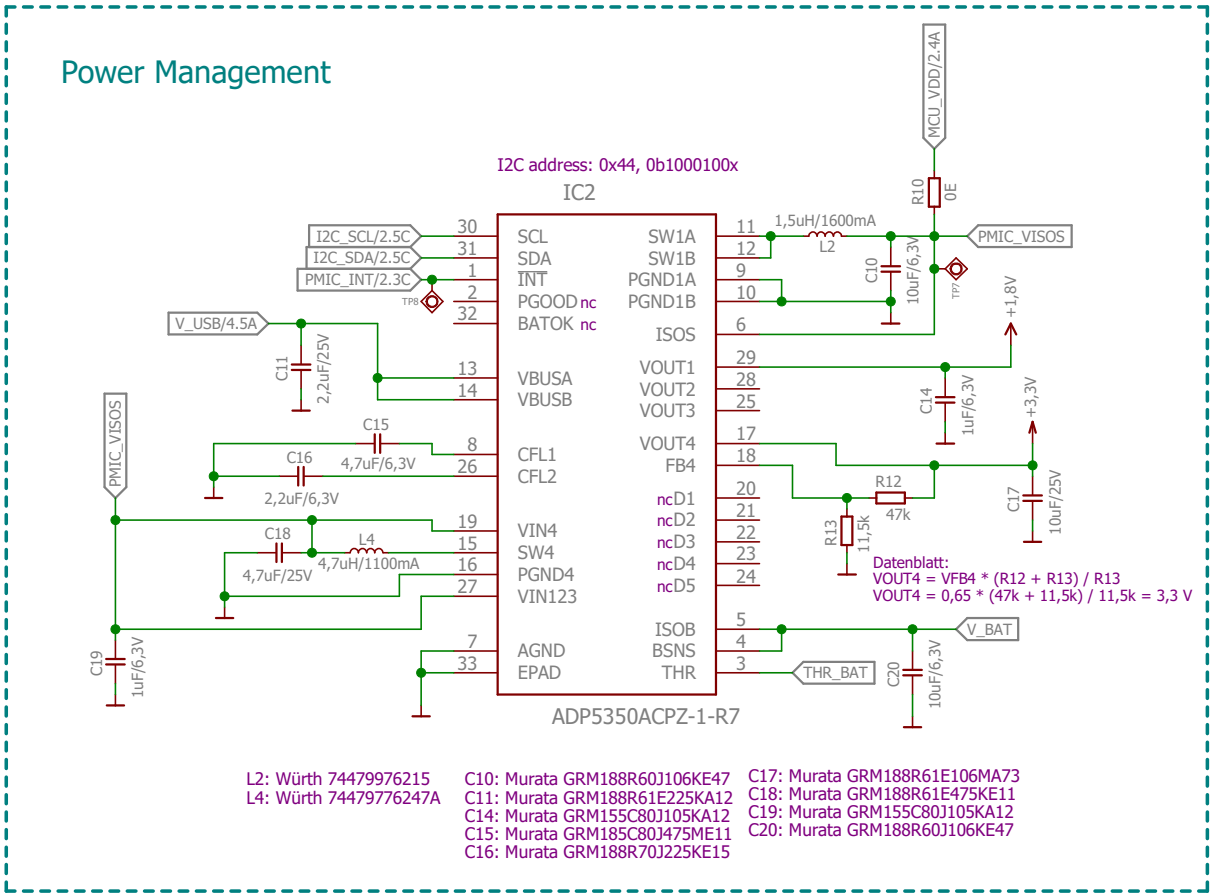


# Power-Supply

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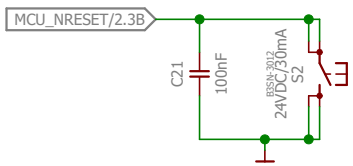
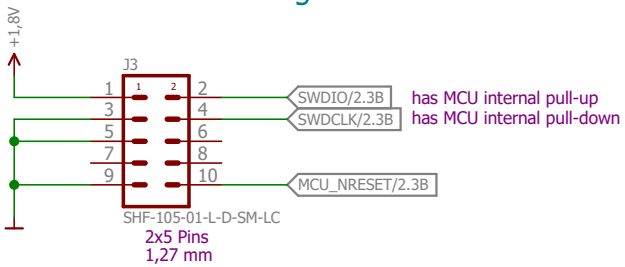
## Reset Button

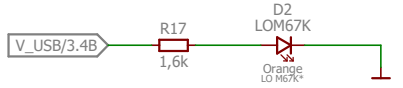



## Cortex-Debug Connector



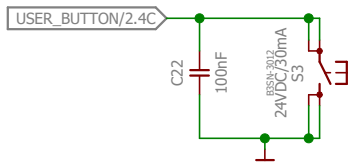

## USB Power LED

Indicates wheter device is USB powered or not



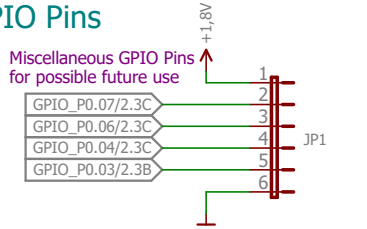

Series resistance for LED:
Orange: Vf=1,8V, If=2mA
R = (5V-1,8V) / 2mA = 1600 Ohm --> 1600 Ohm

## User Button



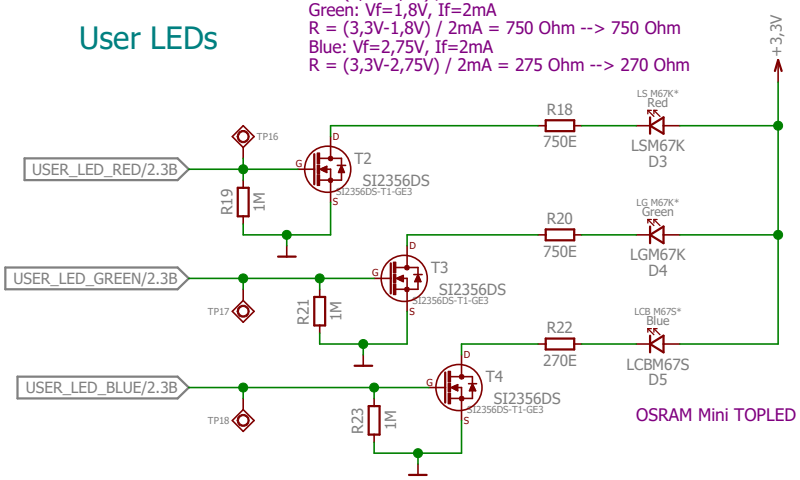

## GPIO Pins

Miscellaneous GPIO Pins
for possible future use

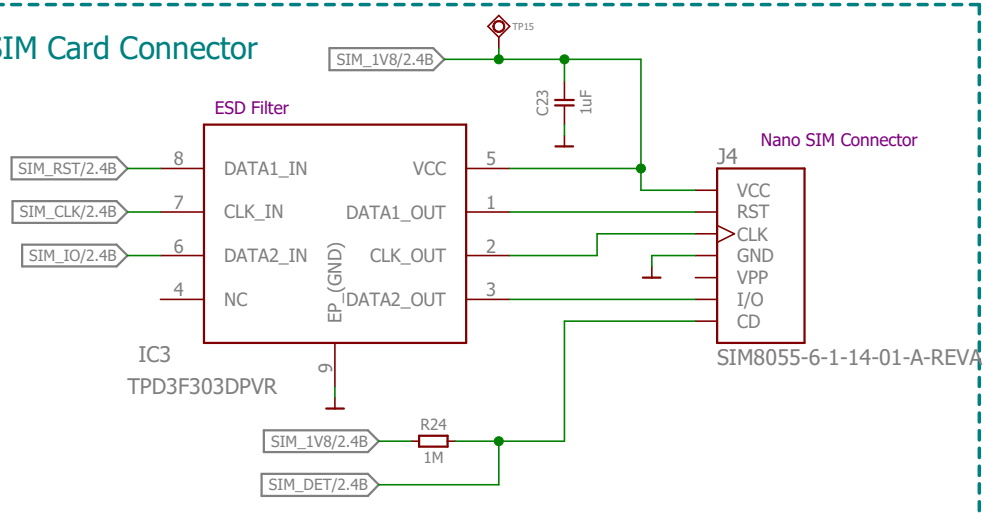



## User LEDs

Series resistance for LEDs:
Red: Vf=1,8V, If=2mA
R = (3,3V-1,8V) / 2mA = 750 Ohm --> 750 Ohm
Green: Vf=1,8V, If=2mA
R = (3,3V-1,8V) / 2mA = 750 Ohm --> 750 Ohm
Blue: Vf=2,75V, If=2mA
R = (3,3V-2,75V) / 2mA = 275 Ohm --> 270 Ohm




## SIM Card Connector




# I/O Interface

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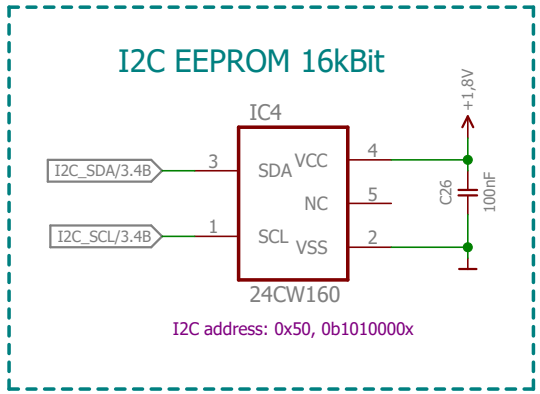


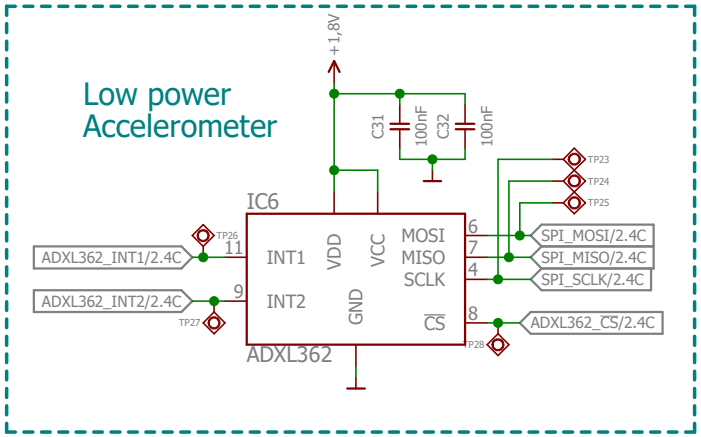


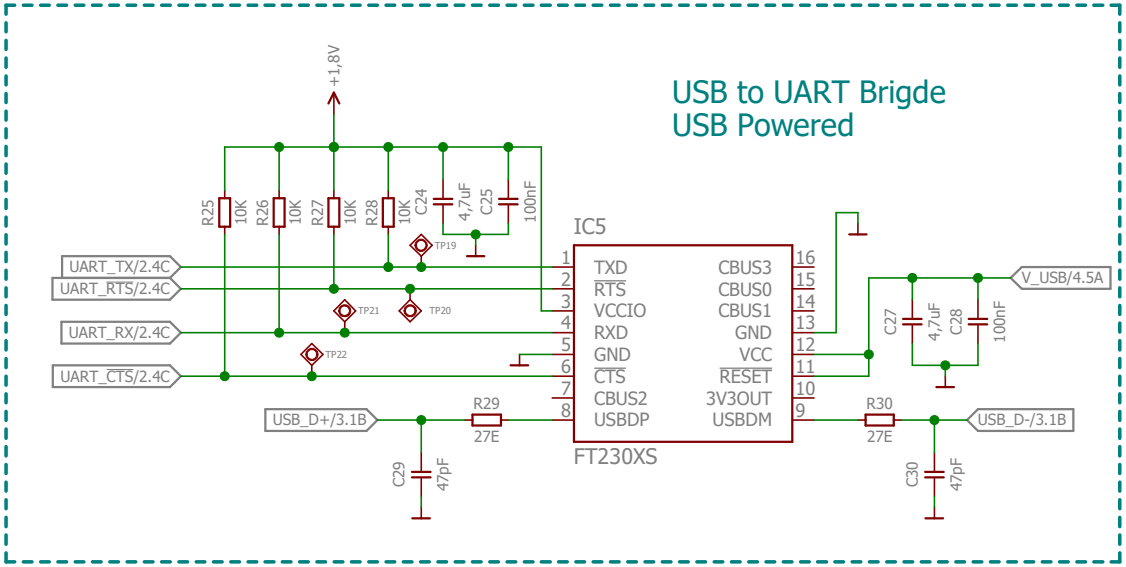


# Onboard Sensors/ICs

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Matching networks for different LTE bands and GPS.

Values taken from Nordic-Thingy-91 schematic and the Fractus Antenna Application Note
"TRIO mXTEND Antenna Component & nRF91 Products"

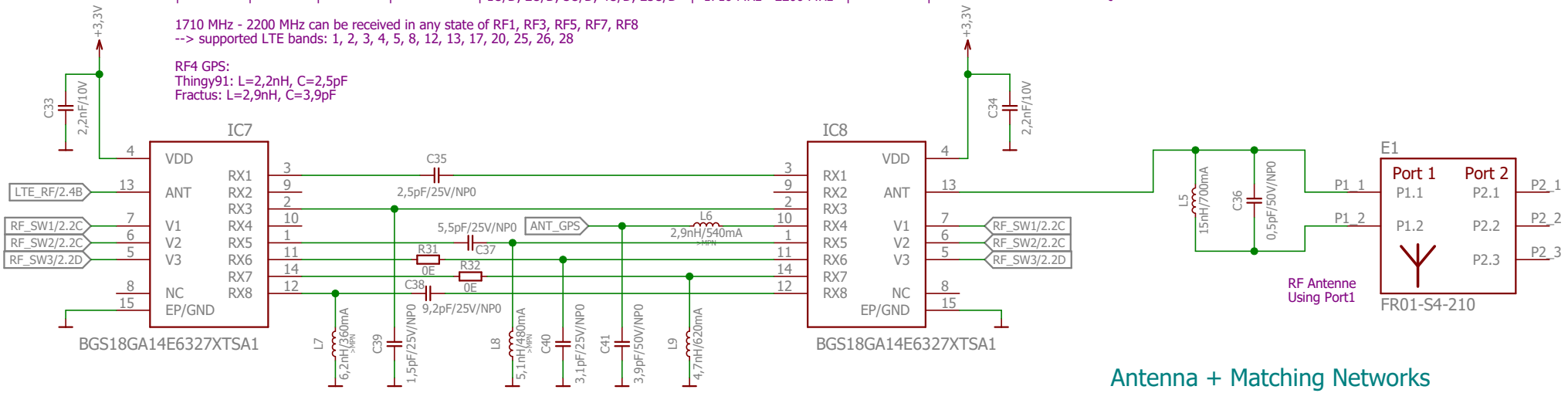
| RF_SW3 | RF_SW2 | RF_SW1 | State | Band | Frequency | Components |
|---|---|---|---|---|---|---|
| 0 | 0 | 0 | RF1 - RFC | 8U/D | 880 MHz - 960 MHz | C35 |
| 0 | 0 | 1 | RF2 - RFC | Not used | Not used | N.A. |
| 0 | 1 | 0 | RF3 - RFC | 5D, 20U, 26D | 824 MHz - 894 MHz | C39 |
| 0 | 1 | 1 | RF4 - RFC | GPS | 1574 MHz - 1577 MHz | C41, L6 |
| 1 | 0 | 0 | RF5 - RFC | 12U/D, 17U/D, 28U | 698 MHz - 748 MHz | C37, L8 |
| 1 | 0 | 1 | RF6 - RFC | Not used | Not used | R31, C40 |
| 1 | 1 | 0 | RF7 - RFC | 13U/D, 28D | 746 MHz - 803 MHz | R32, L9 |
| 1 | 1 | 1 | RF8 - RFC | 5U, 20D, 26U | 791 MHz - 849 MHz | L7, C38 |
| | | | | 1U/D, 2U/D, 3U/D, 4U/D, 25U/D | 1710 MHz - 2200 MHz | |

1710 MHz - 2200 MHz can be received in any state of RF1, RF3, RF5, RF7, RF8
--> supported LTE bands: 1, 2, 3, 4, 5, 8, 12, 13, 17, 20, 25, 26, 28

RF4 GPS:
Thingy91: L=2,2nH, C=2,5pF
Fractus: L=2,9nH, C=3,9pF

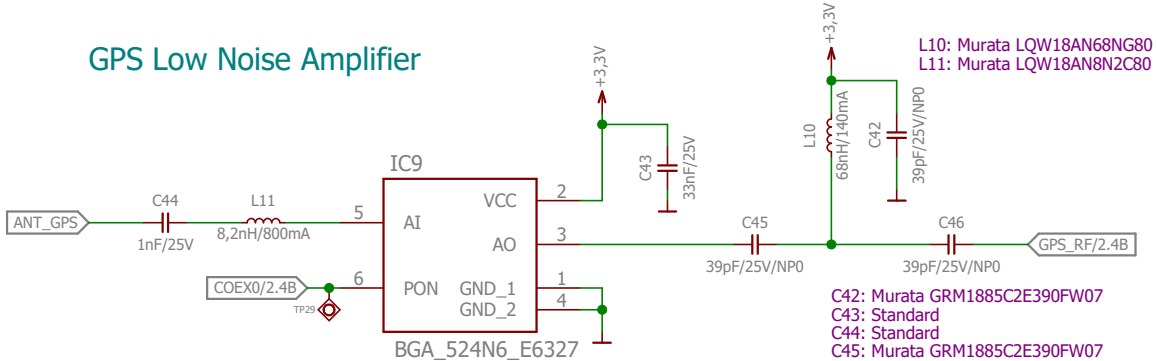
C33: Standard
C34: Standard
C35: Murata GQM1875C2E2R5WB12
C36: Murata GQM1875C2ER50WB12
C37: Murata GQM1875C2E5R5WB12
C38: Murata GQM1875C2E9R2BB12
C39: Murata GQM1875C2E1R5WB12
C40: Murata GQM1875C2E3R1WB12
C41: Murata GQM1875C2E3R9WB12

L5: Murata LQW18AN15NG80
L6: Murata LQW15AN2N9C80
L7: Murata LQW15AN6N2C80
L8: Murata LQW15AN5N1C80
L9: Murata LQW18AN4N7C80




Antenna + Matching Networks

## GPS Low Noise Amplifier




L10: Murata LQW18AN68NG80
L11: Murata LQW18AN8N2C80

C42: Murata GRM1885C2E390FW07
C43: Standard
C44: Standard
C45: Murata GRM1885C2E390FW07
C46: Murata GRM1885C2E390FW07

# RF Processing

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| IoT_Tracker_Prototype | |
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