

LTEWatch - PCB Rooting Instructions :

Introduction

Nordic Semiconductor in Norway has developed the NRF91 family of cellular LTE-M / NB-IoT communication devices. The goal of this Master Thesis is to develop the prototype of an analog wristwatch using a such device. There are many challenges to overcome in this project, to name just the most difficult ones as the mechanical as well the energy consumption constraints.

LTEWatch Description:

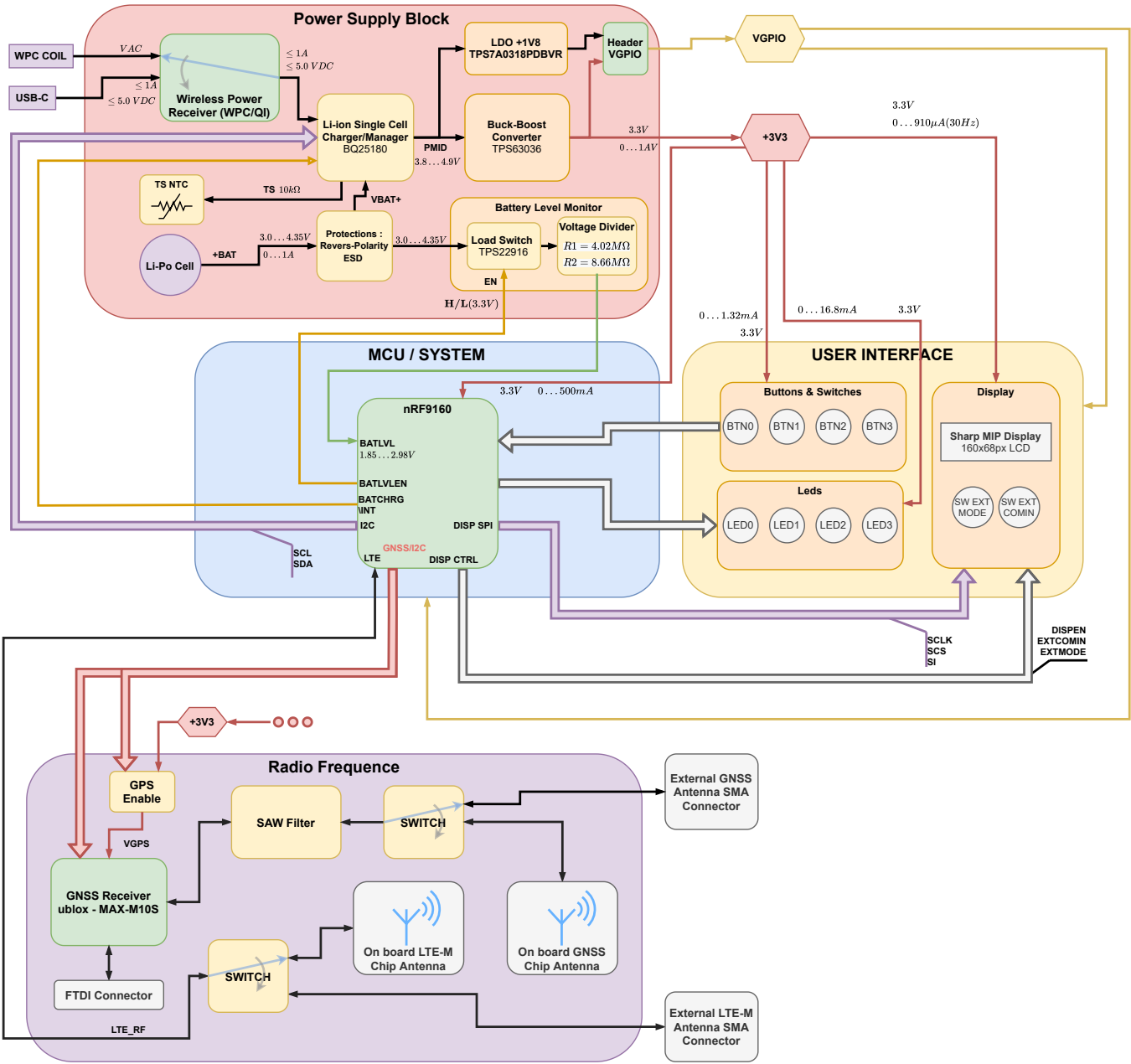
LTEWatch project consist in the design and the fabrication of an "*hybrid*" Smart-Watch. The "*hybrid*" qualification consist in integration of mechanical watch hands (H:M:S) in a smart connected wearable device. Since the project desirve a large amount of work, the idea is to first creat a prototype board as a Proof Of Concept (POC) enabling the design and developpment of the Smart-Watch application software and also to test and have a better idea of the device consumption and performance.

The LTEWatch actual schematic is a prototype board, this mean that the PCB size and dimension is not really constraint by its final application, but in a reasonable size, like the [nRF9160 DK board](#) (150 x 60 mm).

The project includes several critical block and componant that require special attention, more precisely blocks like LTE transmission line and antenna and GNSS receiver, transmission line and antenna.

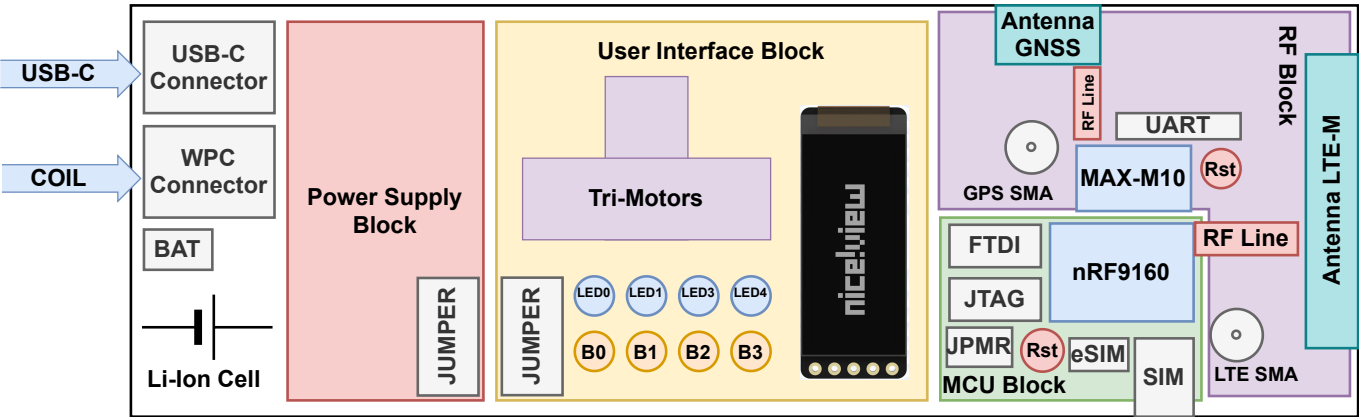
To have a better idea of the overall board, a fonctionnal diagram is illustrated in the next section.

Fonctionnal Diagram



Protoyte Board Placement (Idea)

The overall idea of prototype board structure is the following:



Critical blocks and components list

1. Power Supply Block :

1. Wireless Power Receiver (WPC/QI) :

1. BQ51003YFPT : [Refer to layout recommandation](#) in section "*11 Layout*"

2. Battery connector : Must be accessible to connect this [LiPo Battery](#) (keep enough avaylable space to stick the battery to the PCB)

2. MCU Block :

1. If possible, regroup the multiples jumpers to make their location easier

2. Follow the layout recommandation for the [nRF9160](#) from section "*Hardware and layout*" of the datasheet [nRF9160 Product Specification v2.0](#)

3. Sim and eSIM : Possible to follow the layout from [nRF9160 DK - RF Layout and BOM resources](#)

3. User Interface Block :

1. Try to keep LEDs and Buttons regrouped in a logical order. The LEDs represent some of the motors command lines

2. Keep enough space to stick the motor to the PCB (a bit bigger than the footprint)

4. Radio Freq. Block :

1. u-blox Max-M10S : Follow the layout recomandation from :

1. Section "*3.4 Layout*" : [MAX-M10S - Standard precision GNSS module - Integration manual](#)

2. [MAX-M10S-Standard precision GNSS module - Professional grade - Data sheet](#)

2. LTE-M Antenna : follow the layout recommandation from

1. [Antenna Layout \(P822601\)](#)

2. [nRF9160 DK - RF Layout and BOM resources](#)

3. GNSS Antenna : follow the layout recommandation from :

1. [Antenna Intelligence Cloud™ report](#) in [datasheet/LTEWatch_NNS1.0.pdf](#)

2. [DUO mXTENDTM \(NN03-320\) - GNSS SOLUTION \(1-port\)](#)

3. [DUO mXTENDTM: TWO INDEPENDENT RADIOS IN THE SMALLEST ANTENNA FOOTPRINT](#)

4. [A small antenna with big performance for asset tracking](#)

4. RF transmission line :

1. Must be kept as short as possible

2. Follow general instructions from [GNSS antennas : 3.3 Monopole antennas - Chip antenna](#)
