RuuviTag

Open Source Bluetooth Smart Sensor Beacon

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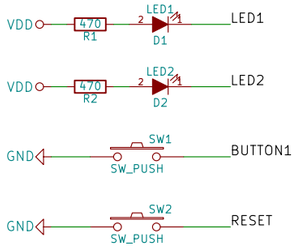
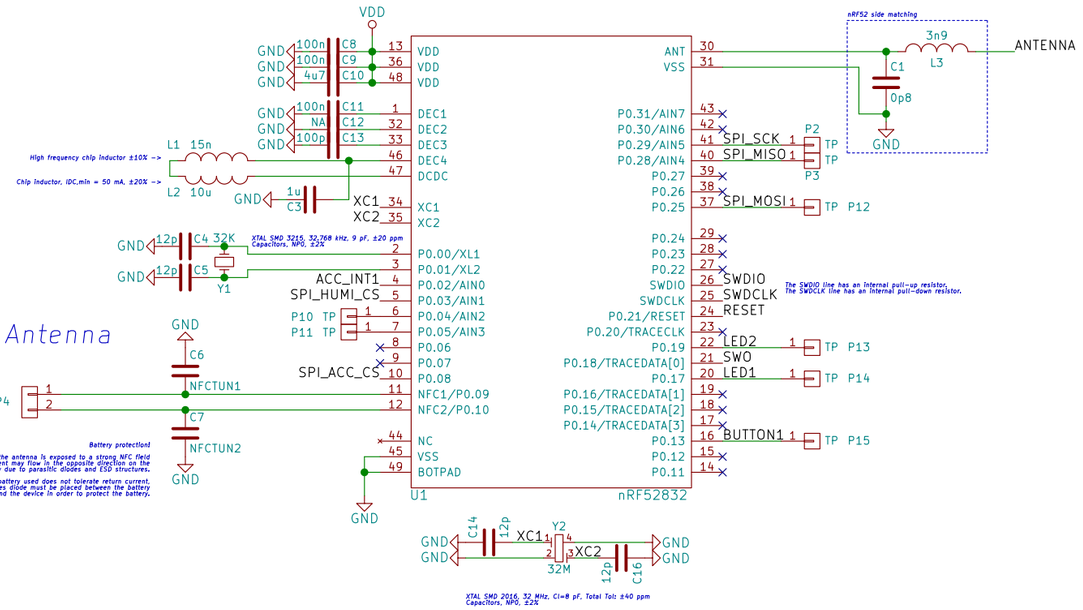
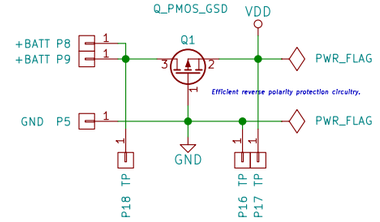
LEDs & Buttons



Bluetooth Smart SoC



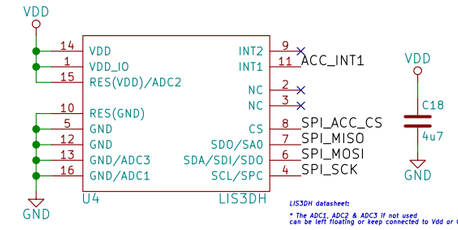
Power Source



Supply voltage: 1V7 – 3V6
Absolute maximum: 3V6

The default is to use CR2477N Lithium coin cell, but alternative power sources are also supported. Supercapacitor for example.

Accelerometer



LIS3DH datasheet:

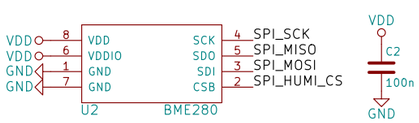
* The ADC1, ADC2 & ADC3 if not used can be left floating or keep connected to Vdd or GND.

* When no communication is on-going, data on CS, SPC, SDI and SDO are driven by internal pull-up resistors.

Accelerometer choices:

* H3LIS100DL: 8bit, 100g, 400Hz
* H3LIS200DL: 8bit, 100–200g, 1kHz
* H3LIS331DL: 12bit, 100–400g, 1kHz
* LIS331DLH: 2–8g, 1uA sleep, 11uA 10Hz, 250uA 1kHz max datarate, 1000pcs, 1EUR (Mouser)
* LIS3DH: 12bit, 2–16g, 1uA sleep, 10uA 10Hz, 200uA 1kHz max datarate, 1000pcs, 2.31EUR (Mouser)
* LIS3DH: 12bit, 2–16g, 2uA sleep, 11uA 1Hz, 225uA 1.6kHz max datarate, 1000pcs, 1.31EUR (Mouser)
* LIS3DH: 12bit, 2–16g, 0.5uA sleep, 2uA 1Hz, 11uA 50Hz, 5kHz max datarate, 1000pcs 0.96EUR (Mouser).
* LIS3DE: 8bit, 2–16g, 0.5uA sleep, 2uA 1Hz, 11uA 50Hz, 5kHz max datarate, 1000pcs 0.62EUR (Mouser, not yet in stock)

Pressure + Humidity + Temperature

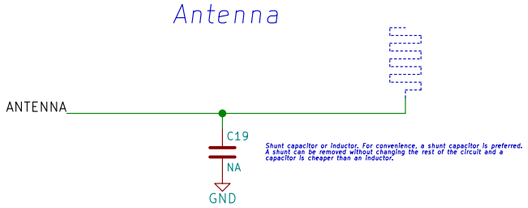


Bosch BME280 – Pressure + humidity + temperature (2.5mm x 2.5mm x 1mm)

Average current consumption (1Hz data refresh rate):
1.8 µA @ 1 Hz (H)
2.8 µA @ 1 Hz (H, T)
3.6 µA @ 1 Hz (H, P, T)

Average current consumption in sleep mode 0.1 µA

Antenna



Shunt capacitor or inductor. For convenience, a shunt capacitor is preferred. A shunt can be removed without changing the rest of the circuit and a capacitor is cheaper than an inductor.

Nordic Semiconductor's 1/4 wavelength monopole antenna design guide states:
When implementing the monopole as a trace on the PCB, the length of the trace should be extended somewhat to allow for some fine-tuning of the antenna to resonance at 2.45GHz. If the size of available ground plane is approaching the ideal size and the antenna trace is uniformly surrounded by the FR4 substrate, then the length of the trace should be extended by about 20%. If the ground plane size is considerably smaller than the ideal size and/or much of the antenna trace is routed close to the edge of the PCB, then the length of the antenna trace should be extended by about 30%.

Theoretical length: L = 92mm / 4 = 23mm –> 23mm * 1.3 = 30mm.

There are the following two methods to tune an antenna:

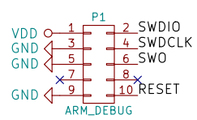
* If the physical dimensions of the antenna can be altered, for example, withe PCB antenna, adjusting the length will be one part of the tuning. Another part is to add a component. Inductor, or capacitor, to pull the antenna impedance towards the 50 ohm center point.

* If the antenna cannot be altered physically, more external components must be used to tune the antenna. These external components are called the matching network.

If it is not possible to get the impedance exactly 50 ohm by adjusting the length of the antenna, a component must be used to pull the impedance to the 50 ohm point. It is preferable to use a shunt capacitor since a capacitor is cheaper than an inductor and because a shunt component can be removed without any impact.

For more info, check Nordic Semiconductor's White Paper about antenna tuning: Google "nWP-017_Antenna_Tuning"

Debug In



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