Nordic Thingy:53 Hardware

User Guide

4471_002 / 2022-06-17

NORDIC® SEMICONDUCTOR

Contents

Revision history

Date	Description
2022-06-17	First release

1 Introduction

The Nordic Thingy:53™ is a battery-operated prototyping platform for *Internet of Things (IoT)*. It is ideal for rapid development of prototypes for IoT systems.

The Nordic Thingy:53 includes sensors that gather data about its own movements and the surrounding environment. Temperature, humidity, air quality, air pressure, color, audio, and light data can be easily extracted for local or remote analysis. For input, the Nordic Thingy:53 offers two user-programmable buttons. Visual output is achieved with an RGB indicator LED, while a buzzer can provide audible output.

The preprogrammed firmware on the Nordic Thingy:53 allows to connect to the nRF Edge Impulse mobile application that can be used to sample training and test data from the Nordic Thingy:53 sensors. The sampled data can be used to train machine learning models in the Edge Impulse Studio. Trained machine learning models can be deployed to the Nordic Thingy:53 through *Bluetooth*® Low Energy using the nRF Edge Impulse mobile application. The firmware has been developed using the nRF Connect *Software Development Kit (SDK)*.

The preprogrammed firmware on the Nordic Thingy:53 can be easily updated through Bluetooth Low Energy to other samples from the nRF Connect SDK using the nRF Programmer application for iOS and Android or through *Universal Serial Bus (USB)* using the nRF Connect Programmer.

The firmware can be updated and debugged also by using an external programmer or debug probe, for example, the nRF5340 *Development Kit (DK)* or a J-Link device supporting Arm® Cortex®-M33.

The Nordic Thingy:53 integrates the nRF5340 SoC which supports Bluetooth Low Energy, 802.15.4, and *Near Field Communication (NFC)* as a passive tag. The Nordic Thingy:53 integrates also the nRF21540 RF Front-End Module (FEM) for extended range and the nPM1100 *Power Management Integrated Circuit (PMIC)* for power management and charging of the 1350 mA *Li-Po* battery.

Source code for firmware, hardware layout, and schematics are available on the Nordic web site www.nordicsemi.com.

The Nordic Thingy:53 has two 2.4 GHz antennas. One of them is connected to the nRF5340 SoC through an RF switch for TX output power up to +3 dBm. The other one is connected to the nRF21540 RF FEM with TX output power up to +20 dBm.

NFC in the Nordic Thingy:53 operates as a passive tag which means that it does not feature a reader function. The Nordic Thingy:53 can use the tag function for the *Out of Band (OOB)* pairing feature as described in the *Bluetooth Core Specification*.

Key features of Nordic Thingy:53

- Two 2.4 GHz antennas and one NFC passive tag antenna
- RF FEM for increased range
- Insertable current measurement and debug board for easy power profiling and debugging
- Qwiic and STEMMA QT compatible connector for easy prototyping with breakout boards
- User-programmable buttons and RGB LED
- Environmental sensor for temperature, humidity, air quality, and air pressure
- Color and light sensor
- Low-power accelerometer
- 6-axis IMU with gyroscope and accelerometer
- Magnetometer
- *Pulse Density Modulation (PDM)* microphone with wake-on-sound functionality
- Buzzer

- 64 Mb external memory with *Quad Serial Peripheral Interface (QSPI)* interface
- Rechargeable *Li-Po* battery with 1350 mAh capacity
- Computer connection and battery charging through USB-C
- Normal operating temperature range 0–35°C

nRF5340 aQFN94 SoC

- Application core
  - 128–64 MHz Arm Cortex-M33 with TrustZone® technology
  - 1 MB flash and 512 kB low leakage RAM
  - Arm TrustZone CryptoCell™-312 security subsystem
  - QSPI peripheral for communicating with an external flash memory device
    - Execute-in-place with optional on-the-fly encryption and decryption
  - NFC-A tag with wake-on field and touch-to-pair
  - Up to five *Serial Peripheral Interface (SPI)* master/slave with EasyDMA
  - Up to four *Inter-integrated Circuit (I^2C)* compatible two-wire master/slave with EasyDMA
  - Up to four *Universal Asynchronous Receiver/Transmitter (UART)* (*Clear to Send (CTS)*/*Request to Send (RTS)*) with EasyDMA
  - Audio peripherals: I^2C, digital microphone interface (PDM)
  - Up to four *Pulse Width Modulation (PWM)* units with EasyDMA
  - 12-bit, 200 ksps ADC with EasyDMA, eight configurable channels with programmable gain
  - Full-speed (12 Mbps) USB device
- Network core
  - 64 MHz Arm Cortex-M33
  - 256 kB flash and 64 kB low leakage RAM
  - Bluetooth 5.2, IEEE 802.15.4-2006, 2.4 GHz enabled transceiver
  - SPI master/slave with EasyDMA
  - I^2C compatible two-wire master/slave with EasyDMA
  - *UART* (*CTS*/*RTS*) with EasyDMA

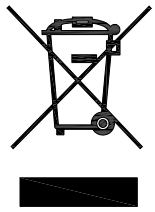
nRF21540 RF FEM

- FEM with RF *Power Amplifier (PA)* and *Low-Noise Amplifier (LNA)*
- Supports Bluetooth Low Energy, IEEE 802.15.4, and proprietary applications
- Output power 20 dBm at 3.0 V (maximum TX output power +22 dBm at 3.6 V)
- Adjustable output power to ±1 dB from 5 to 21 dBm
- Receive gain +13 dB
- Control interface through I/O, SPI, or a combination of both

nPM1100 PMIC

- 400 mA linear Li-ion/Li-Po battery charger with thermal protection
  - Automatic trickle, constant current, and constant voltage charging
  - Battery thermal protection
  - Discharge current limitation
- 1.8– 3.0 V, 150 mA step-down buck regulator
  - Automatic transition between hysteretic and PWM modes
  - Forced PWM mode for clean power operation
- Input regulator with USB compatible current limit of 100 mA and 500 mA

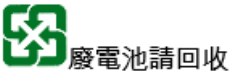
  - 4.1–6.7 V input voltage range for normal operation
- LED drivers for charger state indication
- 2.3–4.35 V battery operating input range



Environmental Protection

Waste electrical products should not be disposed of with household waste.

Please recycle where facilities exist. Check with your local authority or retailer for recycling advice.



WARNING: The battery in this product shall not be replaced by users themselves. Batteries should be removed only by qualified professionals due to the following safety concerns:

- Replacing the battery with an incorrect battery type can cause a fire or explosion.
- Disposing the battery into a fire or hot oven, crushing it mechanically, or cutting it can cause an explosion.
- Leaving the battery in an environment with an extremely high temperature can cause an explosion or the leakage of flammable liquid or gas.
- Subjecting the battery to extremely low air pressure can cause an explosion or the leakage of flammable liquid or gas.

The Nordic Thingy:53 shall not be operated outside the internal battery's discharge temperature range between –20°C and +60°C or stored or transported outside the internal battery's storage temperature range between –20°C and +30°C.

2 Kit content

The Nordic Thingy:53 kit consists of hardware and access to software components, hardware design files, applications, and documentation.

Figure 1: Nordic Thingy:53 hardware content

The Nordic Thingy:53 kit contains the following:

- Nordic Thingy:53 board with plastic enclosure and battery
- Nordic Thingy:53 current measurement and debug board
- Information leaflet

> **Note:** Power supply adapter is not included in the kit.

The power supply adapter is not included in the safety certification test report. See a separate test report according to IEC 62368. Use a power supply adapter that meets the PS1 requirements.

2.1 Downloadable content

The Nordic Thingy:53 prototyping platform includes firmware source code, documentation, hardware schematics, and layout files.

Firmware

- nRF Connect *SDK*

Computer tools

- nRF Connect Programmer

Mobile applications

For Android and iOS:

- nRF Programmer
- nRF Edge Impulse

Web applications

- Edge Impulse Studio

Hardware files

The hardware files can be downloaded from the Nordic Thingy:53 product page.

The zip file and its subdirectories contain the hardware design files for the Nordic Thingy:53. The hardware files for the circuit board are available in the following folder in the hardware files zip package:

```
\Thingy53 - Hardware files x_x_x\PCA20053-Thingy53 Board x_x_x
```

In this folder, you can find the following hardware design files:

- Altium Designer files
- Schematics and PCB layout files in PDF format
- Bill of materials
- Production files:
  - Drill files
  - Assembly drawings
  - Gerber files
  - Pick-and-place files

3 Firmware

The firmware on the Nordic Thingy:53 is developed using the nRF Connect *SDK*.

The Edge Impulse firmware, which is preloaded onto the Nordic Thingy:53, enables the device to gather motion, sound, and environmental sensor data. The sensor data can be uploaded to the Edge Impulse Studio through the nRF Edge Impulse mobile application. In Edge Impulse Studio, the data can be used to train and test machine learning models that can be deployed to the Nordic Thingy:53 through Bluetooth Low Energy.

For more information on the firmware and associated features, see Developing with Thingy:53 in nRF Connect SDK documentation.

3.1 Programming Nordic Thingy:53

You can use the following methods to program the modem and applications on the Nordic Thingy:53.

- *Over-the-Air (OTA)* update with the nRF Programmer mobile application
- *USB* (*MCUboot*) update with the nRF Connect for Desktop Programmer application
- External debug probe update with the nRF Connect for Desktop Programmer application

If you program applications with an external debug probe, you can use the nRF5340 *DK* or any J-Link device supporting Arm Cortex-M33 as the external debug probe.

For more information, see *Updating Nordic Thingy:53 firmware* in Getting started with Thingy:53.

4 Hardware description

This section focuses on the hardware components of the Nordic Thingy:53 with detailed descriptions of the various hardware components that are present on the device.

The sensors available in the Nordic Thingy:53 are not calibrated in production. Nordic Semiconductor does not specify the accuracy of measurements. Users who want to reuse parts of this design to create measurement devices should conform to the documentation of the specific sensors.

4.1 Block diagram

The block diagram represents interactions between the hardware components on the Nordic Thingy:53.

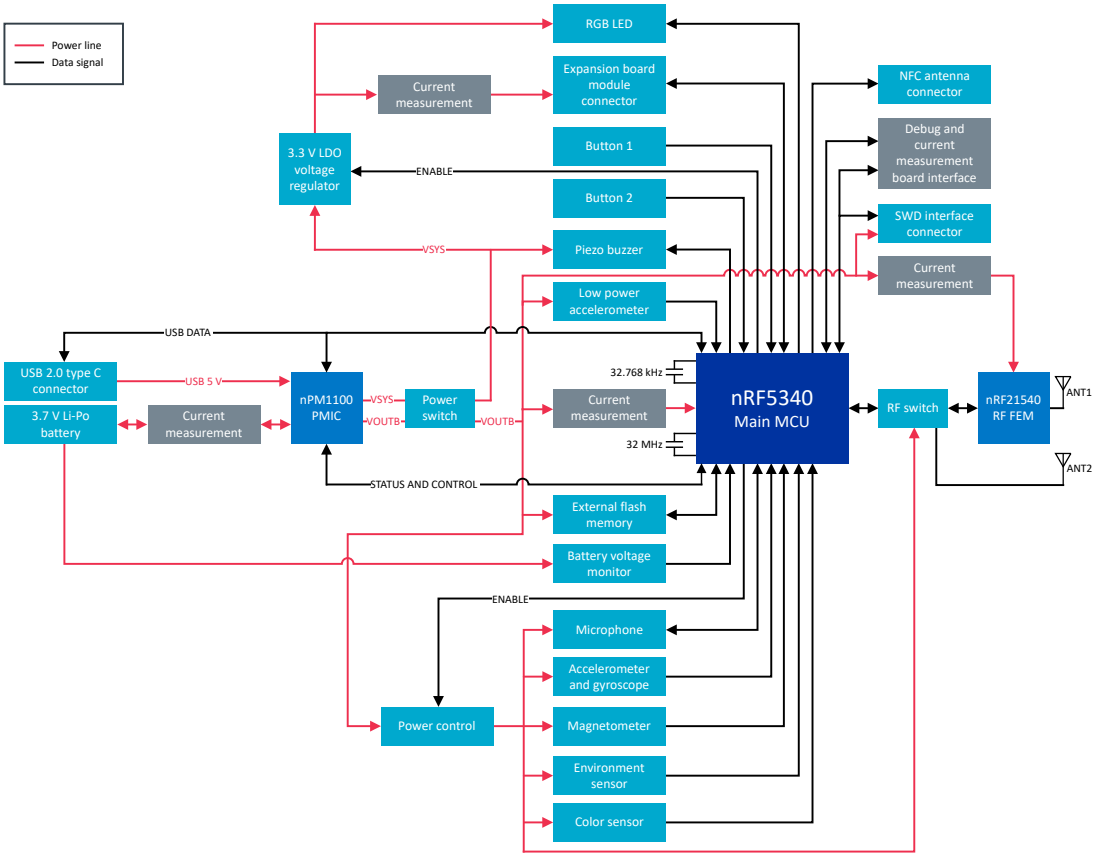


Figure 2: Nordic Thingy:53 hardware block diagram

4.2 Hardware figures

The hardware figures show elements on both sides of the Nordic Thingy:53 *Printed Circuit Board (PCB)* and the Nordic Thingy:53 current measurement and debug PCB.

The following figure shows the top side of the Nordic Thingy:53.

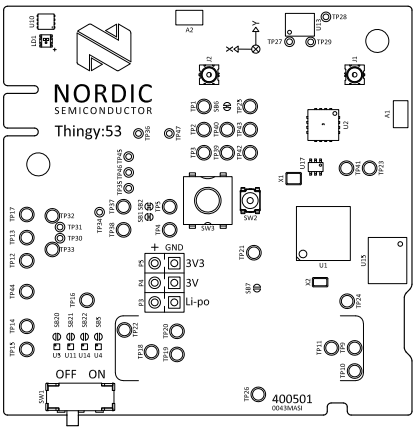


Figure 3: Nordic Thingy:53 PCB, top

The following figure shows the bottom side of the Nordic Thingy:53.

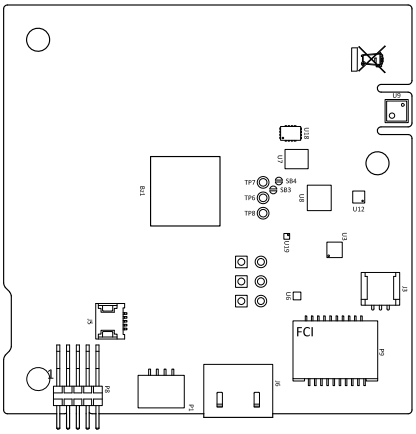


Figure 4: Nordic Thingy:53 PCB, bottom

The following figure shows the top side of the Nordic Thingy:53 current measurement and debug PCB.

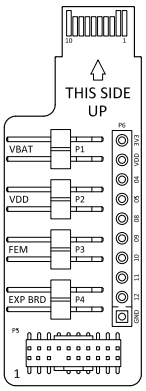


Figure 5: Nordic Thingy:53 current measurement and debug PCB, top

The following figure shows the bottom side of the Nordic Thingy:53 current measurement and debug PCB.

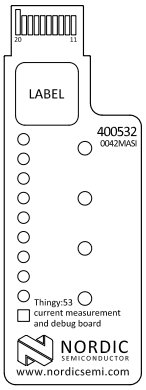


Figure 6: Nordic Thingy:53 current measurement and debug PCB, bottom

4.3 nRF5340 SoC

nRF5340 is an ultra-low power wireless *System on Chip (SoC)* with two Arm Cortex-M33 processors and a multiprotocol 2.4 GHz transceiver.

The two flexible processors combined with advanced security features and an operating temperature up to 105°C make the nRF5340 SoC a great choice for professional lighting, advanced wearables, and other complex *IoT* applications.

For more information on the nRF5340 SoC, see nRF5340 Product Specification.

The following schematic describes the nRF5340 SoC.

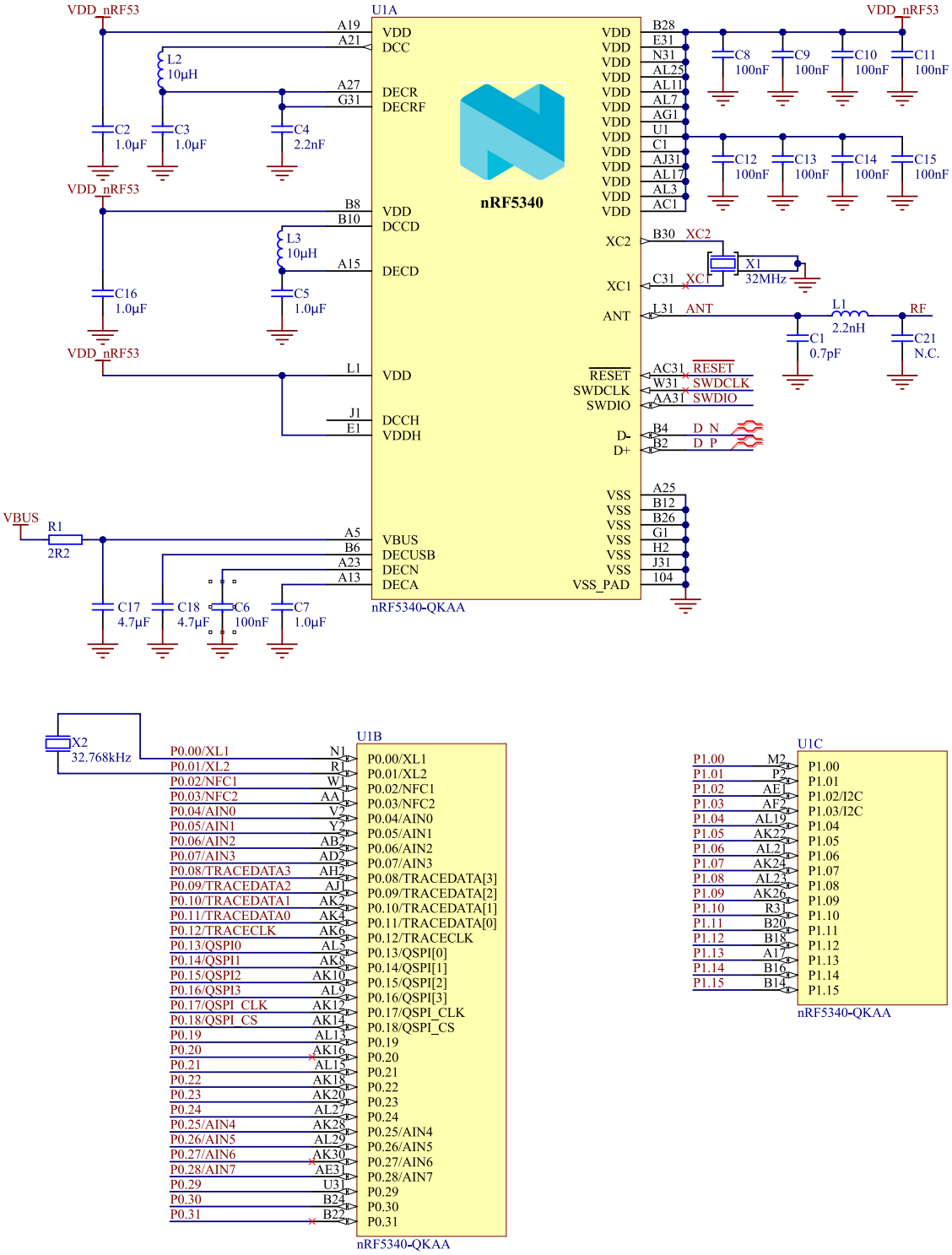


Figure 7: nRF5340 SoC schematic

4.3.1 NFC

The Nordic Thingy:53 supports the *NFC* antenna. The *NFC-A Listen Mode* operation is supported by the nRF5340 *SoC*. The NFC antenna input is available on connector **J5**.

The following figure shows the NFC antenna connector on the Nordic Thingy:53.

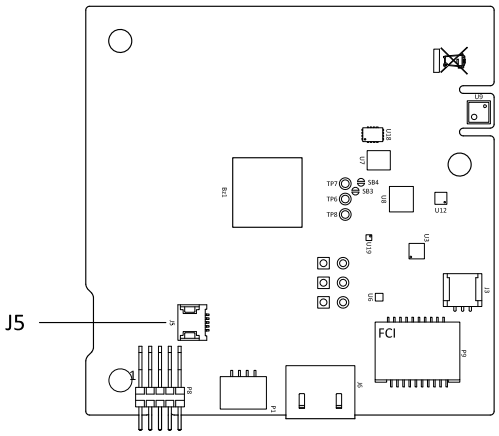


Figure 8: NFC antenna connector

NFC uses pins **P0.02** and **P0.03** to connect to the antenna. The pins can be used as regular *General-Purpose Input/Output (GPIO)*s by changing their configurations. The PROTECT field in the NFCPINS register in UICR defines the usage of the pins and their protection level against abnormal voltages. The content of the NFCPINS register is reloaded at every reset.

Note: The NFC pins are enabled by default.

4.3.2 USB

The Nordic Thingy:53's *USB* connector (**J6**) is connected to the USB interface on the nRF5340 *SoC* and the nPM1100 *PMIC*. This enables the Nordic Thingy:53's communication with a computer and the charging of the battery.

The following schematic describes the USB-C interface.

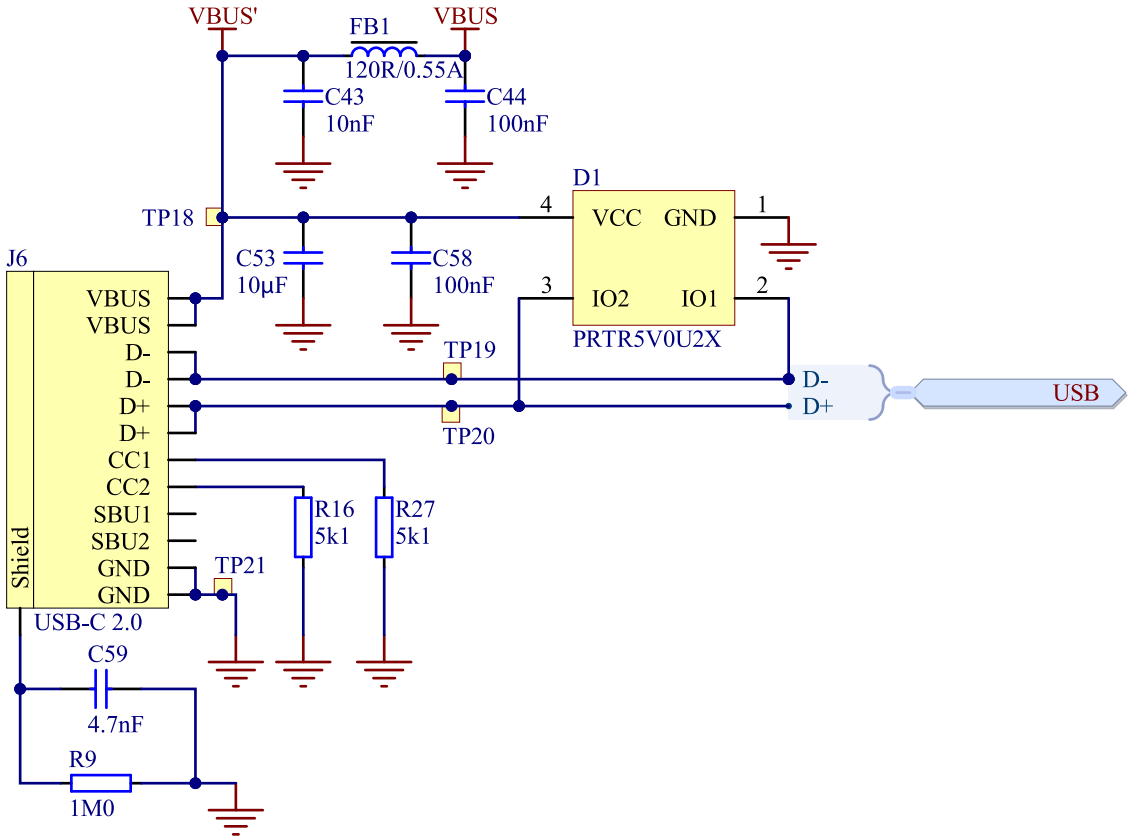


Figure 9: USB-C interface

4.3.3 Antenna selection

The single-ended antenna output (**ANT**) of the nRF5340 *SoC* is connected to an RF switch (**U17**), which allows you to select either antenna **A1** or antenna **A2**. The RF front end allows the nRF5340 SoC to transmit using only one antenna at a time, that is, **A1** or **A2**. It is not possible to transmit with both antennas at the same time. The antenna selection is controlled through the **SEL** pin (**P1.10**).

Antenna **A1** is connected to the **ANT1** port of the nRF21540 RF FEM, which is connected to the **RF1** port of the RF switch. The nRF21540 RF FEM supports TX output power gain up to +20 dBm on the **A1** antenna. The **A2** antenna is connected directly to the **RF2** port of the RF switch. The maximum TX output power supplied to **A2** is +3 dBm.

The following table shows antenna gain over frequency for the **A1** and **A2** antennas.

Antenna	2402 MHz	2440 MHz	2480 MHz
A1	+1.10 dBi	+1.15 dBi	+0.55 dBi
A2	–0.17 dBi	–0.11 dBi	-0.20 dBi

Table 1: Antenna gain for A1 and A2

Note: The RF switch adds approximately 0.5 dB insertion loss. The OR gate (**U16**) is not mounted.

The following schematic describes the antenna selection.

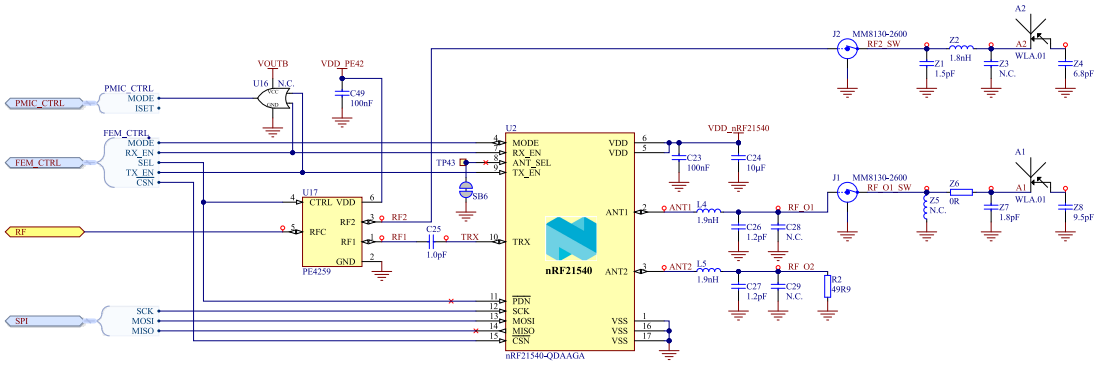


Figure 10: Antenna selection

4.3.4 RF measurements

The 2.4 GHz signals can be propagated through the coaxial connectors **J1** and **J2**. The connectors allow you to perform conducted measurements or to attach external antennas.

When an adapter cable is not connected, the RF signal is routed to the onboard antenna. When an adapter cable is connected, the internal switch in the *SWF* connector disconnects the onboard antenna and connects the RF signal from the nRF5340 *SoC* or nR21540 RF FEM to the adapter.

You can use a Murata adapter cable (part no. MXHS83QE3000) with a standard SMA connection on the other end for connecting instruments. The adapter is not included in the kit. The insertion loss in the adapter cable is approximately 0.5–1 dB.

4.4 nRF21540 RF FEM

The Nordic Thingy:53 uses the nRF21540 RF FEM (**U2**) to improve the range and robustness of the connection on the nRF5340 *SoC*. The nRF21540 RF FEM enables RX gain up to +13 dB, low noise figure of 2.5 dB, and TX output power up to +21 dBm.

> **Note:** The **ANT2** port of nRF21540 RF FEM is terminated to 50 Ω as recommended in the nRF21540 RF FEM reference circuitry for single antenna. The **ANT_SEL** pin of the nRF21540 RF FEM is therefore connected to ground.

The nRF21540 RF FEM can be controlled through direct pin control or a built-in *SPI* slave interface. You can select a predefined output level of +10 dBm or +20 dBm with direct pin control using the **P0.12** *GPIO* that is connected to the nRF21540 RF FEM **MODE** pin. To set an output power level that is not predefined you must use the SPI. For more information on the TX power control on the nRF21540 RF FEM, see TX power control in nRF21540 Product Specification.

4.5 Pin maps

The pin assignments for the nRF5340 *SoC* are listed in the pin map table.

The following table describes the pin numbers, their label names, and their functions.

I/O	Label	Description
P0.00	**XL1**	Low frequency crystal
P0.01	**XL2**	
P0.02	**NFC1**	*NFC* antenna
P0.03	**NFC2**	
P0.04	**EXP_BOARD_PIN1**	*GPIO*/*I2C* SDA line for external boards
P0.05	**EXP_BOARD_PIN2**	GPIO/I^2C SCL line for external boards
P0.06	**BAT_MEAS**	Analog input for measuring battery voltage
P0.07	**PMIC_CTRL_ISET**	Pin for configuring nPM1100 *PMIC*'s VBUS current limit
P0.08	**TRACE3**	**P0.08** GPIO/trace data line 3
P0.09	**TRACE2**	**P0.09** GPIO/trace data line 2
P0.10	**TRACE1**	**P0.10** GPIO/trace data line 1
P0.11	**TRACE0**	**P0.11** GPIO/trace data line 0
P0.12	**TRACECLK**	**P0.12** GPIO/trace clock line
P0.13	**EXT_FLASH_QSPI0**	External flash data line 0
P0.14	**EXT_FLASH_QSPI1**	External flash data line 1
P0.15	**3V3_ENABLE**	Enable signal for 3V3 regulator
P0.16	**BAT_MEAS_ENABLE**	Enable signal for battery measurement circuit
P0.17	**EXT_FLASH_CLK**	External memory clock line

I/O	Label	Description
P0.18	**EXT_FLASH_CS**	External memory *Integrated Circuit (IC)* select line
P0.19	**ADXL362_INT1**	ADXL362 interrupt 1 line
P0.20	**BMM150_INT**	BMI150 interrupt line
P0.21	**BMI150_DRDY**	BMI150 data ready line
P0.22	**ADXL362_CS**	ADXL362 chip select line
P0.23	**BMI270_INT1**	BMI interrupt 1 line
P0.24	**FEM_CTRL_CSN**	nRF21540 RF FEM chip select line
P0.25	**VM3011_DOUT**	VM3011 data out line
P0.26	**MISO**	*SPI* master input slave output line
P0.27	**VM3011 PDM DIN**	*PDM* data line from VM3011
P0.28	**MOSI**	SPI master output slave input line
P0.29	**SCK**	SPI clock line
P0.30	**FEM_CTRL_TX_EN**	nRF21540 RF FEM TX enable signal
P0.31	**SENS_PWR_CTRL**	Enable signal for load switch controlling sensor power
P1.00	**CHG**	Charging indication signal from nPM1100 PMIC I^2C
P1.01	**ERR**	Charging error indication signal from nPM1100 PMIC I^2C
P1.02	**SDA**	I^2C data Line
P1.03	**SCL**	I^2C clock line
P1.04	**BMI270_CS**	BMI270 chip select line
P1.05	**BH_INT**	BH1749NUC color sensor interrupt line
P1.06	**LED_GREEN**	Green color of the RGB LED
P1.07	**LED_BLUE**	Blue color of the RGB LED
P1.08	**LED_RED**	Red color of the RGB LED
P1.09	**PDM_CLK**	PDM clock line
P1.10	**SEL**	Antenna select line
P1.11	**FEM_CTRL_RX_EN**	nRF21540 RF FEM RX enable signal
P1.12	**MODE**	nRF21540 RF FEM mode signal
P1.13	**BUTTON1**	Button input 1
P1.14	**BUTTON2**	Button input 2
P1.15	**BUZZER**	Buzzer *PWM* signal

Table 2: nRF5340 SoC pin map

4.6 Motion sensors

The Nordic Thingy:53 includes a low-power 3-axis accelerometer (**U8**), 6-axis IMU (**U7**) combining accelerometer and gyroscope, and 3-axis magnetometer (**U12**).

When the Nordic Thingy:53 is in low-power sleep mode, any user interaction is detected by the low-power accelerometer. The accelerometer can be used to generate a *GPIO* interrupt that wakes up the device. It has an *SPI*, and it can detect motion on three axes.

Note: Only the **ADXL_INT1** pin is connected to the nRF5340 *SoC*.

The following schematic describes the low-power accelerometer.

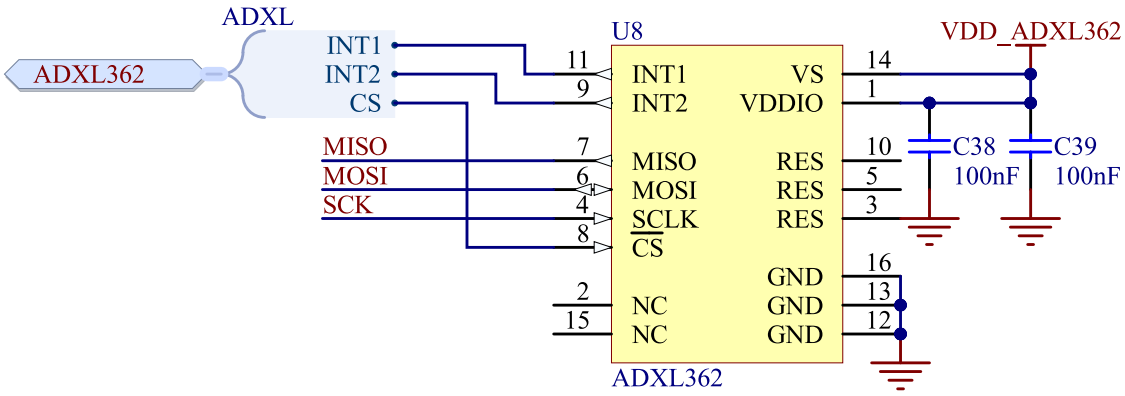


Figure 11: Low-power accelerometer

The 6-axis IMU has an SPI, and it can be used for more advanced motion sensing applications. The IMU can generate a GPIO interrupt when sensor data is ready.

Note: Only the **BMI270_INT1** pin is connected to the nRF5340 SoC.

The following schematic describes the IMU.

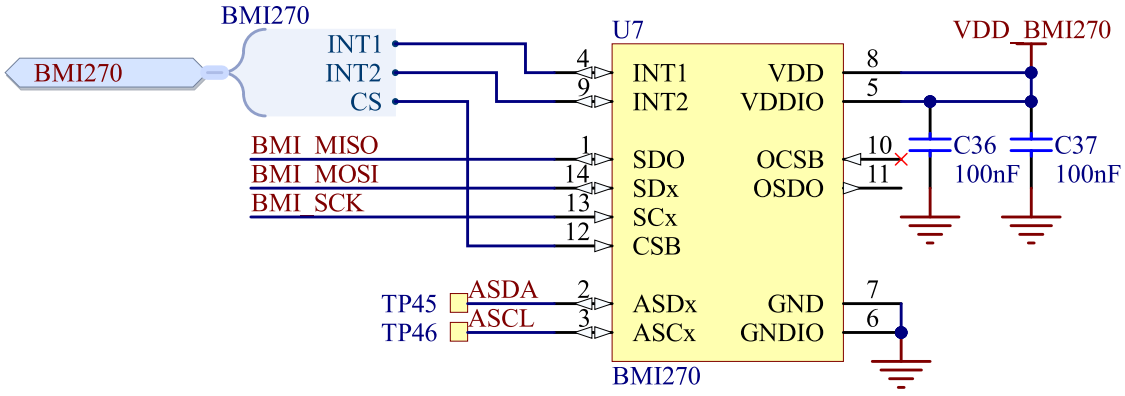


Figure 12: IMU

The magnetometer can be used to detect magnetic fields around the Nordic Thingy:53. It can be used as a standalone device or with the 6-axis IMU. The magnetometer has an *I2C* interface, and it can generate a GPIO interrupt when magnetometer sensor data is ready.

Note: Only the **BMM150_INT1** pin is connected to the nRF5340 SoC.

The magnetometer can be connected to the auxiliary I^{2}C bus of the 6-axis IMU to ensure that the data sampling is synchronized. This means that the magnetometer data is sampled at the same time as the accelerometer and gyroscope data. This can be important especially for sensor fusion applications. To connect the magnetometer to the auxiliary I^{2}C bus of the IMU, you must cut **SB1** and **SB2** and solder **SB3** and **SB4**.

The following schematic describes the magnetometer.

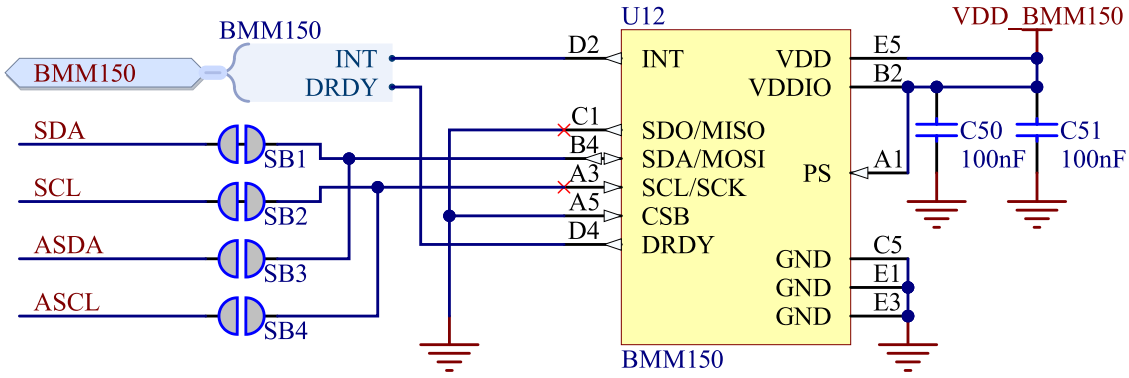


Figure 13: Magnetometer

4.7 Environmental sensors

The multisensor device (**U9**) on the Nordic Thingy:53 contains sensors for temperature, humidity, air quality, and air pressure. The multisensor device is connected to the *I2C* bus.

The following schematic describes the environmental sensors.

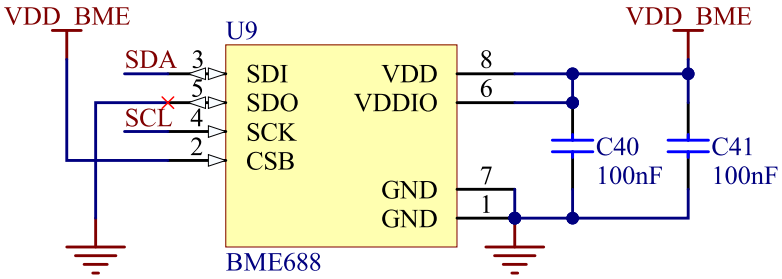


Figure 14: Environmental sensors

The color sensor (**U10**) on the Nordic Thingy:53 senses red, green, and blue light. The sensor is located under the RGB LED light guide to direct the light to the sensor. The color sensor is accessed through I^{2}C.

The following schematic describes the color sensor.

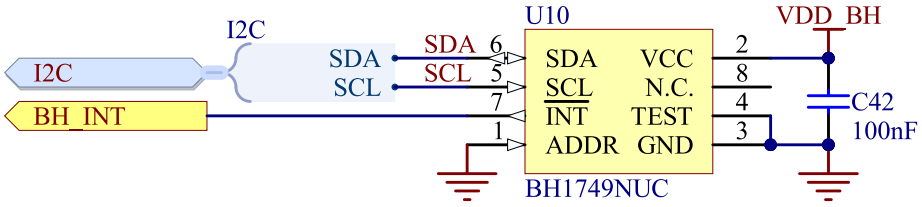


Figure 15: Color sensor

4.8 Microphone and buzzer

The *PDM* microphone (**U13**) on the Nordic Thingy:53 captures audio input. The PDM microphone has also a Wake-on-Sound feature that can be used to wake up the nRF5340 *SoC* when an audio event exceeds a set threshold. In an audio event, the **DOUT** pin (**P0.25**) is pulled high. The nRF5340 SoC can use the interrupt to start the PDM clock and sample audio data.

The following schematic describes the PDM microphone.

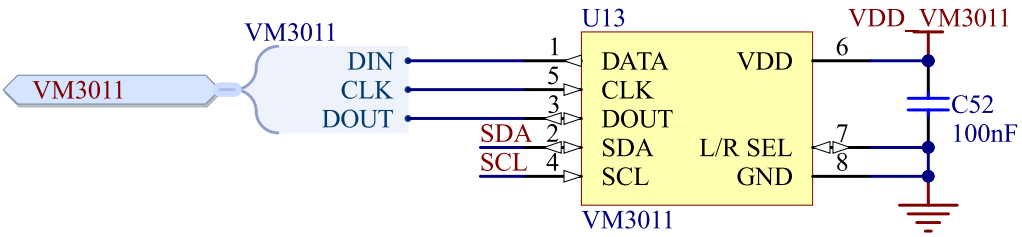


Figure 16: PDM microphone

For audio output, the Nordic Thingy:53 has a piezo buzzer (**BZ1**). The buzzer is driven by a transistor using the *PWM* input.

The following schematic describes the buzzer.

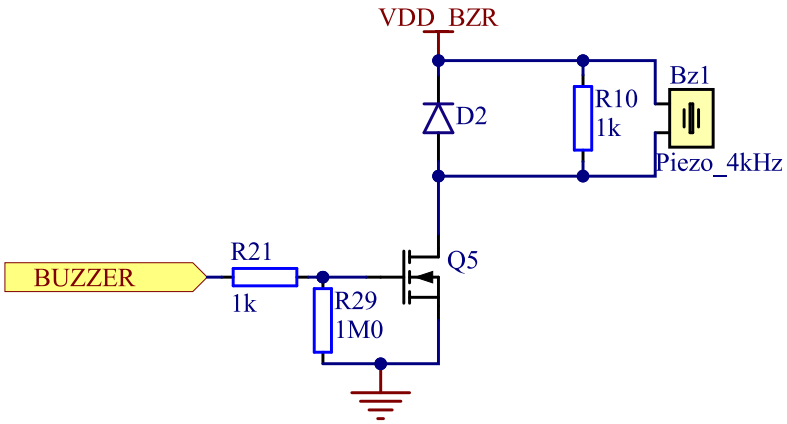


Figure 17: Buzzer

4.9 External memory

The Nordic Thingy:53 has a 64 Mb external flash memory (**U15**). The memory is a multi-I/O memory supporting regular *SPI* and *QSPI*.

The following schematic describes the external memory.

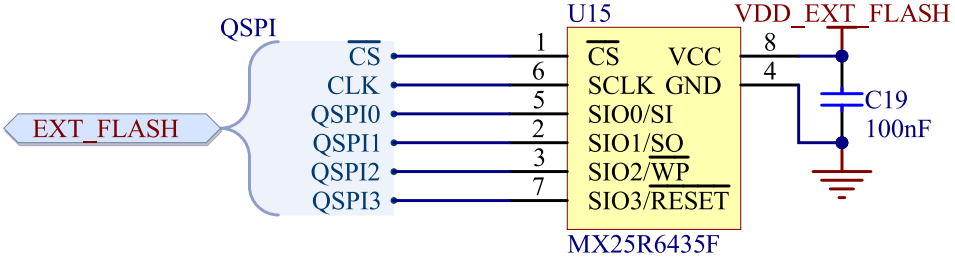


Figure 18: External memory

Note: Only **QSPI0** and **QSPI1** are connected to the nRF5340 *SoC*.

4.10 LEDs and buttons

The user interface on the Nordic Thingy:53 consists of an RGB LED and two buttons.

4.10.1 RGB LED

The Nordic Thingy:53 is equipped with a single RGB LED (**LD1**) that is controlled by three signals from the nRF5340 *SoC* that are connected to transistors acting as switches.

The RGB LED provides visual feedback to the user. It can be used also as an auxiliary light for color measurements.

The following schematic describes the RGB LED.

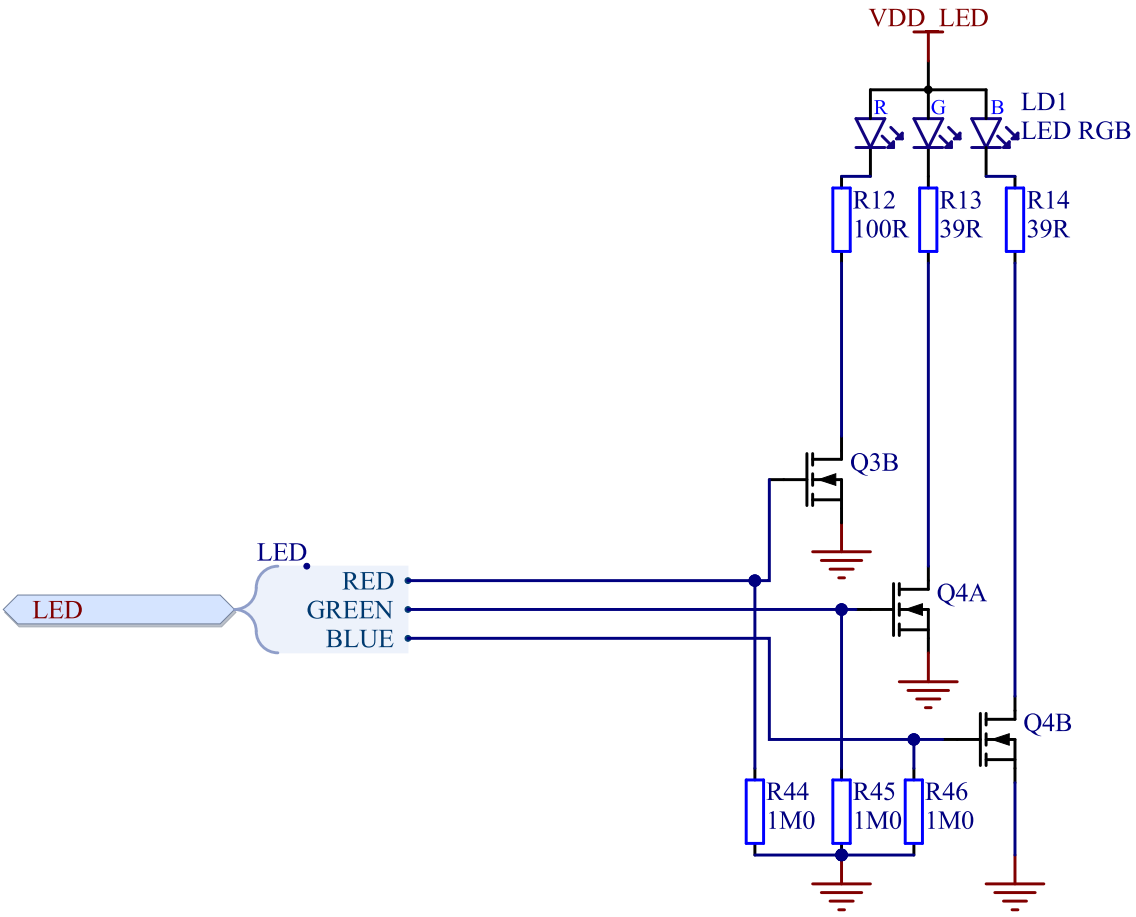


Figure 19: RGB LED

4.10.2 Buttons

The Nordic Thingy:53 has two buttons that are connected to the nRF5340 *SoC*.

The main button (**SW3**) is located under the circle on the top part of the casing and used for user input. The other button (**SW2**) can also be used for user input, but it can be accessed only by removing the top part of the casing. You can activate serial recovery mode by pressing and holding **SW2** when power-cycling the device.

The following schematic describes the buttons.

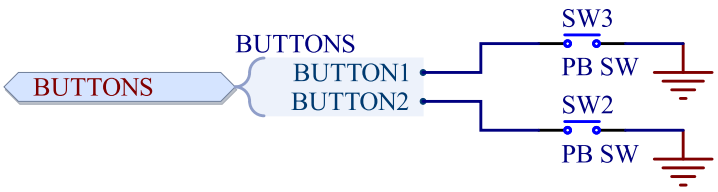


Figure 20: Buttons

The following figure shows the buttons on the Nordic Thingy:53.

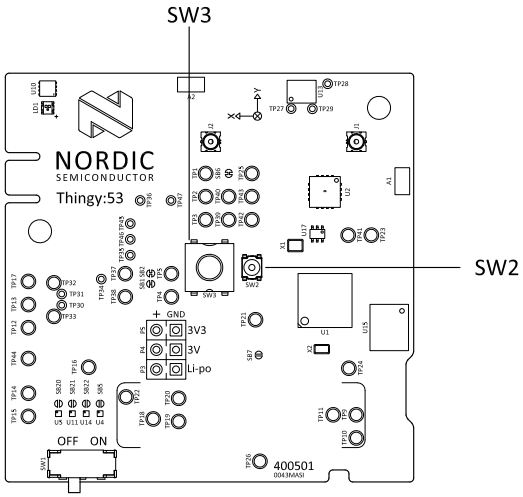


Figure 21: Nordic Thingy:53 buttons

4.11 Power supply

The main power source on the Nordic Thingy:53 is a rechargeable *Li-Po* battery. The battery has a nominal capacity of 1350 mAh and can be recharged through *USB*.

The Li-Po battery is connected directly to the nPM1100 *PMIC* (**U3**), which ensures that the Nordic Thingy:53 is charged regardless of the position of the power switch (**SW1**). In the `ON` position, the nPM1100 PMIC supplies power to the rest of the Nordic Thingy:53 board through its VSYS and VOUTB voltage domains. When the power switch is in the `OFF` position, the two voltage domains of the nPM1100 PMIC are disconnected. With the power switch in the `OFF` position, a circuit drains the voltage charge across the capacitors that are connected to the VOUTB power domain.

The following schematic describes the power switch.

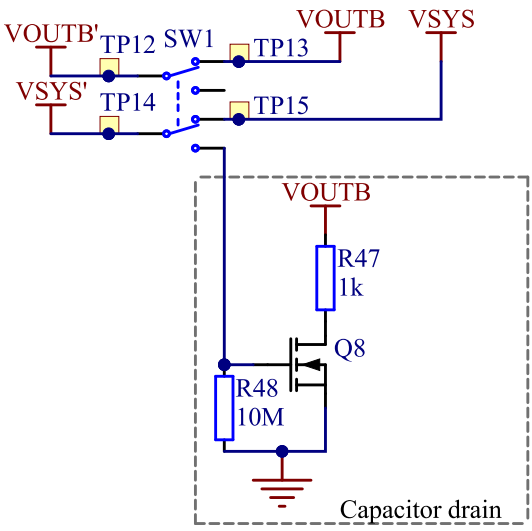


Figure 22: Power switch

4.11.1 nPM1100 PMIC

The Nordic Thingy:53 uses the nPM1100 *PMIC* (**U3**) for power management and battery charging.

The nPM1100 PMIC has two voltage domain outputs:

- Unregulated VSYS output (3.2–4.2 V)
- VOUTB output (3.0 V)

The unregulated VSYS output is used to supply the external 3V3 regulator and the buzzer (**BZ1**). The 3V3 regulator supplies the RGB LED (**LD1**) and any external boards connected to the expansion board connector (**P1**).

The VOUTB domain is configured to 3.0 V and used to supply the nRF5340 *SoC*, the nRF21540 RF FEM, and all the sensors. The VOUTB output is configured to 3.0 V by connecting VOUTBSET0 and VOUTBSET1 to the **DEC** pin (A3) (see Output voltage selection (VOUTBSET0, VOUTBSET1) in nPM1100 Product Specification).

The following schematic describes the nPM1100 PMIC.

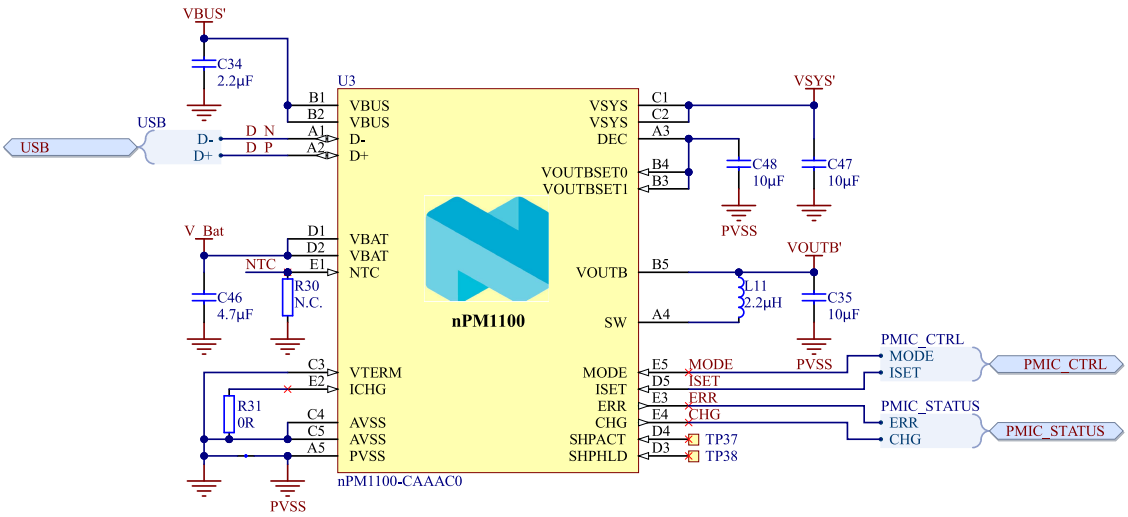


Figure 23: nPM1100 PMIC

The current limit of the nPM1100 PMIC's battery charger is set to 400 mA, but the actual charging current depends on the VBUS current limit. The nPM1100 PMIC detects automatically if it is connected to a

Standard Downstream Port (SDP), *Dedicated Charging Port (DCP)*, or Charging Downstream Port (CDP) *USB* port and sets the VBUS current limit according to the USB port type.

The following table describes the VBUS current limits for the different USB port types.

USB port type	VBUS current limit
SDP	100 mA
DCP	500 mA
CDP	

Table 3: VBUS charging limits for different USB port types

The nRF5340 SoC can negotiate a 500 mA limit with the USB host if the USB host supports this. If the 500 mA limit is negotiated, the nRF5340 SoC can set the **ISET** pin on the nPM1100 PMIC high to set the VBUS current limit to 500 mA.

> **Note:** The **ISET** pin must be set to `LOW` on reset and whenever USB is disconnected. ISET should be set to `HIGH` only when the USB port type is SDP and negotiation for a higher current limit is completed.

The nPM1100 PMIC has a charging indication pin **CHG** and charging error indication pin ERR that signal the charger status to the nRF5340 SoC. The **CHG** pin is connected to *GPIO* **P1.00**, and the **ERR** pin is connected to GPIO **P1.01**. **P1.00** and **P1.01** have pull-ups enabled. When the nPM1100 PMIC is charging the battery, the **CHG** pin is pulled low. When a charging error occurs, the **ERR** pin is pulled low.

The buck regulator on the nPM1100 PMIC can operate in two modes: in hysteretic mode for low load currents and in *PWM* mode for high load currents. The nPM1100 PMIC switches automatically between the two modes based on the load. For the load threshold values, see nPM1100 Product Specification.

In some cases, such as in high-accuracy ADC measurement, it can be beneficial to force the nPM1100 PMIC to operate in *PWM* mode. This is done by pulling the **MODE** pin on the nPM1100 PMIC high by using the **TRACEDATA3** (**P0.08**) pin that is routed to the current measurement and debug interface connector (**P9**). The nPM1100 PMIC **MODE** pin is connected to **P0.08** and pulled to ground through **R7**.

The following schematic describes the nPM1100 PMIC status and control.

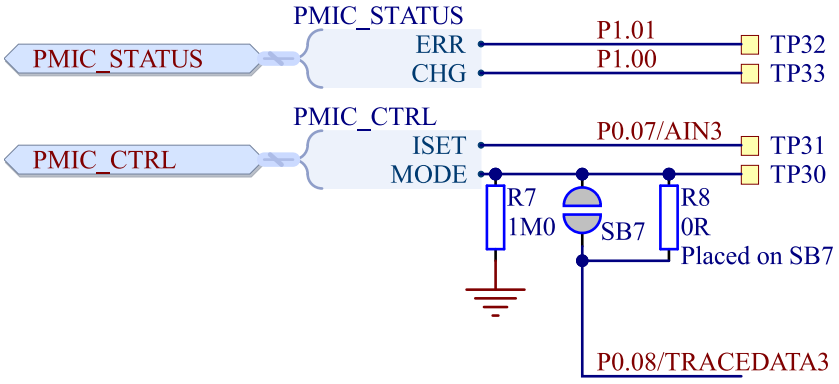


Figure 24: nPM1100 PMIC status and control

4.11.2 Battery voltage monitor

The Nordic Thingy:53 has a battery monitoring circuit which allows the battery voltage to be sampled by the nRF5340 *SoC* ADC.

Transistors **Q7A** and **Q7B** enable battery voltage sensing through a resistive divider (**R11** and **R15**). When not sampling, the transistors can be turned off with the **BAT_MEAS_ENABLE** (**P0.16**) signal to prevent current leakage to ground. The circuit is designed to ensure that the voltage range on the **BAT_MEAS** pin over the battery voltage is within the limits required by the nRF5340 *SoC GPIO* and ADC. When sampling, the battery voltage of 2.8–4.2 V is scaled down to 360–540 mV at **BAT_MEAS** (**P0.06**).

The following schematic describes the battery voltage monitor.

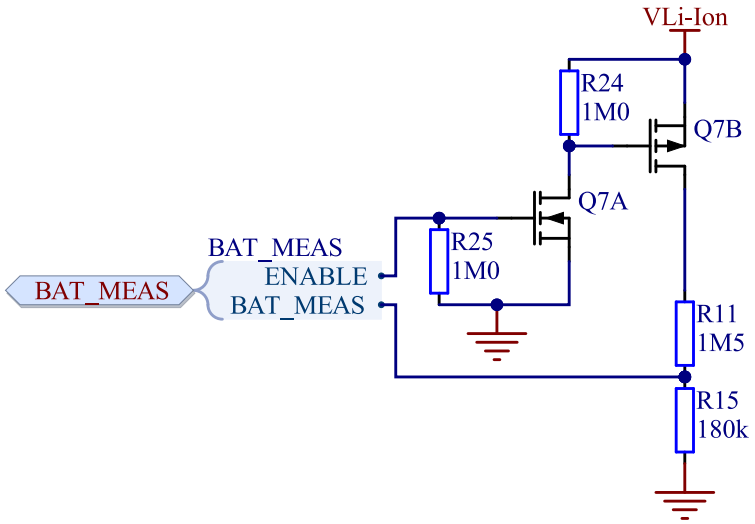


Figure 25: Battery voltage monitor

4.11.3 External 3.3 V regulator

The Nordic Thingy:53 can power external devices with up to 300 mA through a 3.3 V regulator (**U6**) that is connected to the nPM1100 *PMIC*'s VSYS output. The VSYS output is exposed also on the current measurement and debug connector (**P6**).

When the 3.3 V regulator is not in use, it can be turned off by pulling the **3V3_ENABLE** pin (**P0.15**) low.

> **Note:** In the Nordic Thingy:53 board files in Zephyr™, **3V3_ENABLE** is set low by default.

The following schematic describes the regulator.

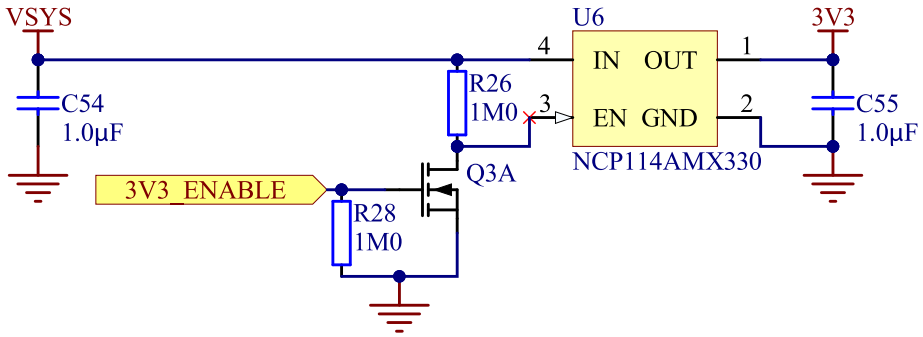


Figure 26: Regulator

4.11.4 Sensor power control

The sensors on the Nordic Thingy:53 can be powered down through a load switch (**U19**) which is connected to **P0.31** on the nRF5340 *SoC*.

> **Note:** In the Nordic Thingy:53 boards files, the **SENS_PWR_CTRL** pin (**P0.31**) is pulled high by default.

The following schematic describes the sensor power control circuit.

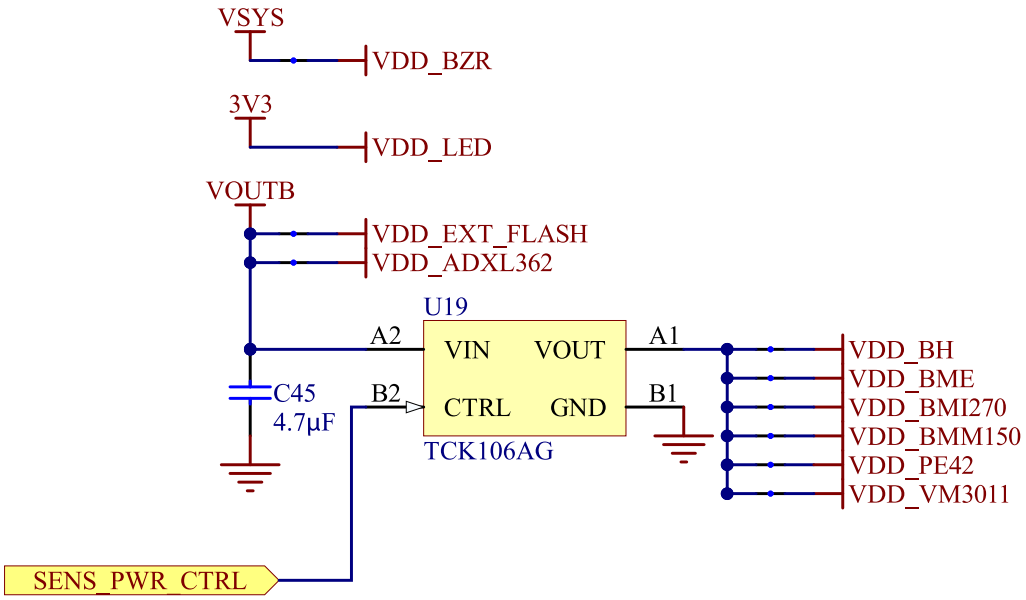


Figure 27: Sensor power control circuit

4.11.5 Current measurement

You can use the Nordic Thingy:53 current measurement and debug board to measure certain currents on the Nordic Thingy:53.

The currents are the following:

- The current flowing to the nPM1100 *PMIC* from the battery through the **P1** connector
- The current flowing to the nRF5340 *SoC* from the VOUTB rail through the **P2** connector
- The current flowing to the nRF21540 RF FEM from the VOUTB rail through the **P3** connector
- The current flowing to external devices from the 3V3 regulator through the **P4** connector

Load switches **U4**, **U5**, **U11**, and **U14** are disengaged when the Nordic Thingy:53 current measurement and debug board is inserted into the debug board interface (**P9**).

The following schematic describes the load switches.

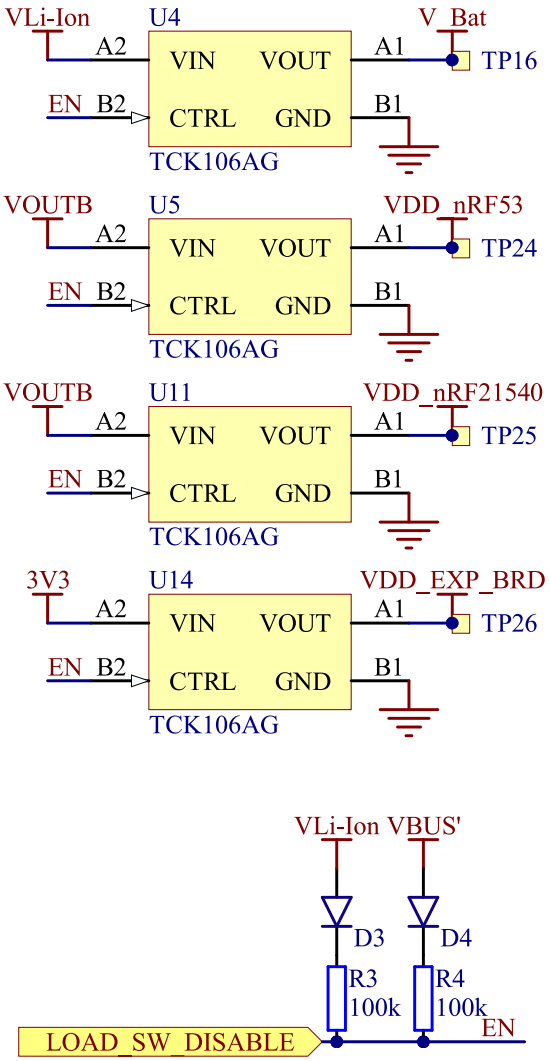


Figure 28: Load switches

4.12 Programming and debugging interface

The Nordic Thingy:53 has a programming and debugging interface connector (**P8**). The programming and debugging interface is available also on the current measurement and debug interface connector (**P9**).

The following schematic describes the SWD Interface.

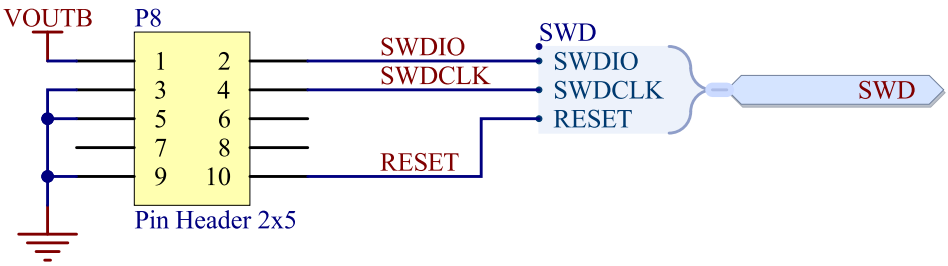


Figure 29: SWD Interface

4.13 Interfaces

Some of the *GPIO*s on the nRF5340 *SoC* are routed to test points for test purposes or to connectors to enable to connect to external hardware. The following sections describe these connectors and test points.

CAUTION: The trace functionality through the current measurement and debug board, *Serial Wire Debug (SWD)* interface, and expansion board interface (4-pin JST connector) are disabled by software in the factory-programmed firmware. These features can be enabled by custom firmware, but such modification may void the FCC authorization of the device. See Regulatory notices on page 36.

4.13.1 Current measurement and debug interface

The Nordic Thingy:53 kit comes with a current measurement and debug board that can be inserted into the **P9** connector on the Nordic Thingy:53.

The current measurement and debug board simplifies the current consumption measurement of the four different power domains with a power profiling tool, such as the Power Profiler Kit II. The interface also enables a trace debugging functionality and the possibility to connect external circuits or boards to the Nordic Thingy:53 by using the TRACE pins as regular *GPIO*s. The pins are configured as GPIOs by default.

Its recommended to connect external loads to VOUTB or 3V3. The maximum load on VOUTB is 150 mA. The maximum allowed current drawn by external circuitry on VOUTB depends on the total internal current draw. The maximum load on the 3V3 rail is 300 mA.

The following schematic describes the current measurement and debug interface.

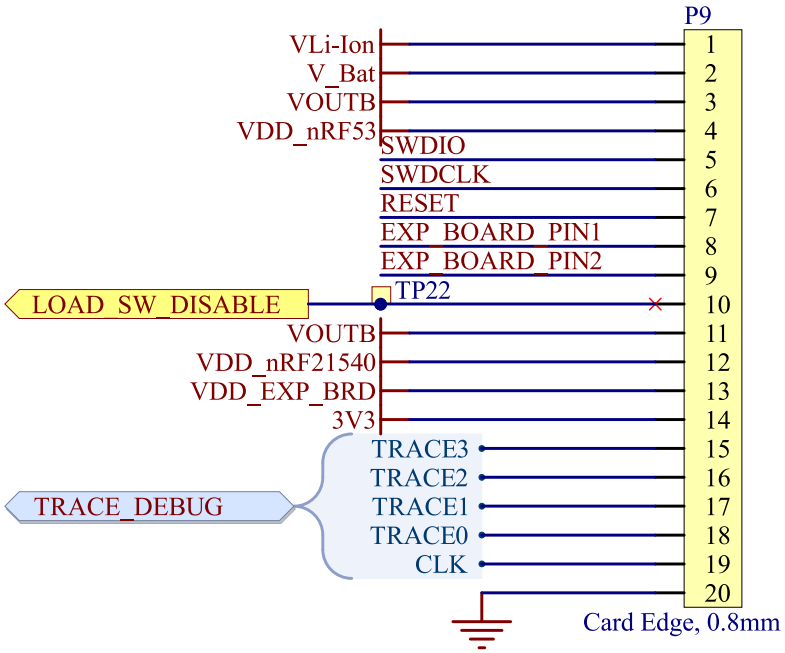


Figure 30: Current measurement and debug interface

The following table describes the pinout of the **P9** connector.

I/O	Label	Description
1	VLi-Ion	*Li-ion* battery. Input to load switch **U4**.
2	V_Bat	Output from load switch **U4**.
3	VOUTB	nPM1100 *PMIC* VOUTB voltage domain. Configured to 3.0 V.
4	VDD_nRF5340	nRF21540 RF FEM voltage supply. Output from load switch **U5**.
5	SWDIO	*SWD* I/O line for the nRF5340 *SoC*.
6	SWDCLK	SWD clock line for the nRF5340 SoC.
7	RESET	Reset line for the nRF5340 SoC.
8	EXP_BOARD_PIN1	GPIO/*I2C* SDA line for external boards.
9	EXP_BOARD_PIN2	GPIO/I^2C SCL line for external boards.
10	LOAD_SW_DISABLE	Load switch disable signal. Connected to ground when current measurement and debug board is inserted.
11	VOUTB	nPM1100 PMIC VOUTB voltage domain. Configured to 3.0 V.
12	VDD_nRF21540	nRF21540 RF FEM voltage supply. Output from load switch **U11**.
13	VDD_EXP_BRD	External board voltage supply. Output from load switch **U14**.
14	3V3	3.3 V regulator output.
15	TRACE3	Trace data line 3/**P0.08**.
16	TRACE2	Trace data line 2/**P0.09**.
17	TRACE1	Trace data line 1/**P0.10**.
18	TRACE0	Trace data line 0/**P0.11**.
19	CLK	Trace clock line for the nRF5340 SoC/**P0.12**.
20	Ground	Ground.

Table 4: Pinout of P9 connector

Note: It is not recommended to connect any load to the VLi-ion or V_Bat pins because it can affect the charging cycle of the nPM1100 *PMIC*.

4.13.2 Expansion board interfaces

On the Nordic Thingy:53, connector **P1** is compatible with Qwiic and STEMMA QT and can be used to connect expansion boards. Connector **P1** is compatible also with the STEMMA, Grove, and DFRobot Gravity prototyping systems, but they require a cable to convert from a 1 mm pitch connector to a 2 mm pitch connector.

The following schematic describes the expansion board interface.

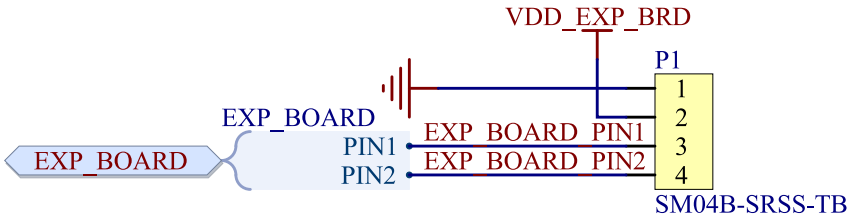


Figure 31: Expansion board interface

4.13.3 Connectors

The *Li-Po*, 3 V, and 3V3 power domains are available on connectors **P3**–**P5** on the Nordic Thingy:53 *PCB*.

The following schematic describes the power connectors.

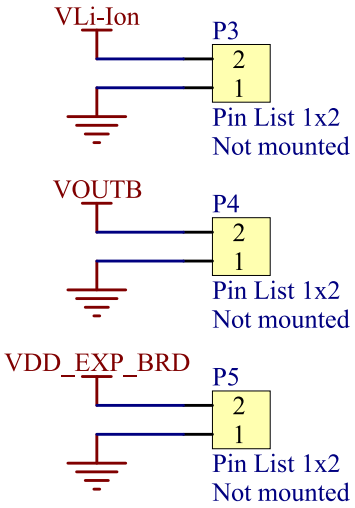


Figure 32: Power connectors

For more information, see Connector pinouts on page 31.

4.13.3.1 Connector pinouts

The following tables describe the pinouts of the power domain connectors **P3**, **P4**, and **P5** on the Nordic Thingy:53.

The following table describes the pinout of the **P3** connector.

Pin	Signal	Description
1	GND	Ground
2	VLi-ion	Battery voltage

Table 5: Pinout of connector P3

The following table describes the pinout of the **P4** connector.

Pin	Signal	Description
1	GND	Ground
2	VOUTB	Regulated 3.0 V domain

Table 6: Pinout of connector P4

The following table describes the pinout of the **P5** connector.

Pin	Signal	Description
1	GND	Ground
2	VDD_EXP_BOARD	Regulated 3.3 V domain

Table 7: Pinout of connector P5

4.13.4 Test points

The Nordic Thingy:53 has several test points that can be useful during development and debugging.

The following table describes the test points.

Test point	Location	Signal	Description
TP1	Top	SCK	*SPI* clock line.
TP2		MOSI	SPI MOSI line.
TP3		MISO	SPI MISO line.
TP4		SDA	*I2C* SDA line.
TP5		SCL	I^2C SCL line.
TP6	Bottom	ADXL362 CS	ADXL362 chip select pin.
TP7		BMI270 CS	BMI270 chip select pin.
TP8		BMM150 INT	BMM150 interrupt pin.
TP9	Top	SWDIO	*SWD* I/O line.
TP10		SWDCLK	SWD clock line.
TP11		RESET	nRF5340 *SoC* reset line.
TP12		VOUTB'	VOUTB voltage before the power switch.
TP13		VOUTB	VOUTB voltage after the power switch.
TP14		VSYS'	VSYS voltage before the power switch.
TP15		VSYS	VSYS voltage after the power switch.
TP16		V_Bat	Battery voltage. Output of load switch **U4**.
TP17		Ground	Ground at battery connector (**J3**).
TP18		VBUS'	VBUS voltage before low pass filter.
TP19		D-	*USB* D- line.
TP20		D+	USB D+ line.
TP21		GND	Ground at USB connector (**J6**).
TP22		LOAD_SW_DISABLE	Load switch disable line.
TP23		CSN	nRF21540 RF FEM chip select line.
TP24		VDD_nRF53	nRF5340 supply voltage. Output of load switch **U5**.
TP25		VDD_nRF21540	nRF21540 RF FEM supply voltage. Output of load switch **U11**.
TP26		VDD_EXP_BOARD	Expansion board supply voltage. Output of load switch **U14**.
TP27		DIN	*PDM* data in line.
TP28		CLK	PDM clock line.
TP29		DOUT	VM3011 **DOUT** pin.
TP30		ISET	nPM1100 *PMIC* **ISET** pin.

Test point	Location	Signal	Description
TP31		MODE	nPM1100 PMIC **MODE** pin.
TP32		ERR	nPM1100 PMIC charging error indication pin.
TP33		CHG	nPM1100 PMIC charging indication pin.
TP34		ADXL362_INT1	ADXL362 interrupt pin 1.
TP35		BMI270_INT1	BMI270 interrupt pin 1.
TP36		BH_INT	BH1749NUC interrupt pin.
TP37		SHPACT	nPM1100 PMIC shipping mode hold pin.
TP38		SHPHLD	nPM1100 PMIC shipping mode activate pin.
TP39		RX_EN	nRF21540 RF FEM RX enable pin.
TP40		MODE	nRF21540 RF FEM mode pin.
TP41		SEL	Antenna selection pin.
TP42		TX_EN	nRF21540 RF FEM TX enable pin.
TP43		CSN	nRF21540 RF FEM antenna selection pin.
TP44		VLi-ion	Battery voltage at battery connector (**J3**).
TP45		ASDA	BMI270 auxiliary I^2C SDA pin.
TP46		ASCL	BMI270 auxiliary I^2C SCL pin.
TP47		SENS_PWR_CTRL	Sensor power control pin connected to **U19 CTRL** pin.

Table 8: Test points

4.13.5 Solder bridge configuration

The Nordic Thingy:53 has a range of solder bridges for enabling and disabling functionalities. Changes to these are not needed for normal use of the Nordic Thingy:53.

The following table provides a complete overview of the solder bridges on the Nordic Thingy:53.

Solderbridge	Default	Position	Function
SB1	Closed	Top	Cut to disconnect magnetometer from the SDA and SCL *I2C* lines.
SB2			
SB3		Bottom	Solder to connect the SDA line from the magnetometer to the ASDA line of the IMU.
SB4	Open		Solder to connect the SCL line from the magnetometer to the ASCL line of the IMU.
SB5		Top	Short to bypass load switch **U4**.
SB6	Closed		Cut to disconnect the ANT_SEL pin on the nRF21540 RF FEM from ground.
SB7	Open		Short to connect the MODE pin on the nPM1100 PMIC to **P0.08**.
SB20			Short to bypass load switch **U5**.
SB21			Short to bypass load switch **U11**.
SB22			Short to bypass load switch **U14**.

Table 9: Solder bridges

5 Regulatory notices

The following regulatory notices apply to Nordic Thingy:53.

5.1 FCC regulatory notices

Modification statement

Nordic Semiconductor ASA has not approved any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

Interference statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Wireless notice

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. The antenna should be installed and operated with minimum distance of 20 cm between the radiator and your body.

FCC Class B digital device notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

5.2 Extended FCC modification statement

Operation of the Nordic Thingy:53™ with the Nordic Thingy:53™ current measurement and debug board inserted or with a programming probe or any third-party board that is not included in the kit connected to the 4-pin JST connector is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference.

Unless the assembled kit is designed to operate under Part 15, Part 18, or Part 95 of 47 CFR Chapter I - FCC, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under Part 5 of the latter chapter.

5.3 FCC Title 47 CFR Part 15.247

The Nordic Thingy:53 complies with the radiated emission limits in the FCC Title 47 of the Code of Federal Regulations (CFR) Part 15 Subpart C – Intentional radiators when the nRF5340 TX output power and nRF21540 gain configurations are set according to the following protocol-specific channel maps.

Setting/Frequency	2402–2480 MHz
nRF5340 TX output power	–3 dBm
nRF21540 gain	20 dB
Conducted output power nRF21540 ANT1 PORT	16.24 dBm (2402 MHz) 14.08 dBm (2440 MHz) 14.32 dBm (2480 MHz)

Table 10: BLE1M

Setting/Frequency	2404–2474 MHz	2476 MHz	2478 MHz
nRF5340 TX output power	–1 dBm	–4 dBm	–8 dBm
nRF21540 gain	20 dB	20 dB	20 dB
Conducted output power nRF21540 ANT1 PORT	16.95 dBm (2404 MHz) 14.82 dBm (2440 MHz)	14.05 dBm	11.47 dBm (2478 MHz)

Table 11: BLE2M

Setting/Frequency	2405–2475 MHz
nRF5340 TX output power	0 dBm
nRF21540 gain	20 dB
Conducted output power nRF21540 ANT1 PORT	17.22 dBm (2405 MHz) 15.24 dBm (2444 MHz) 15.70 dBm (2475 MHz)

Table 12: 802.15.4

5.4 FCC Title 47 CFR Part 2.1091, 2.093, 1.1307

The Nordic Thingy:53 complies with FCC Title 47 of the Code of Federal Regulations (CFR) Part 2.1091, 2.093, 1.1307, and 1.1310 when the minimum distance between the Nordic Thingy:53's antennas and the

user is 20 cm or more. Operation in closer proximity to the user, for example, in hand, is allowed as long as the operation is limited to a 60 s/15 min period.

5.5 CE regulatory notices

The Nordic Thingy:53 operates in the 2402–2480 MHz band. The maximum radio frequency power transmitted (EIRP) is 17.953 dBm.

The EIRP is restricted to 10 dBm when operating the Nordic Thingy:53 in Europe. For more information, see ETSI EN 300 328 on page 38.

5.6 ETSI EN 300 328

ETSI EN 300 328 v 2.2.2, Ch 4.3.2.3 limits the power spectral density to 10 dBm/MHz for non-FHSS equipment. The Nordic Thingy:53 conforms to this requirement when the nRF5340 TX output power and nRF21540 gain configurations are set according to the following protocol-specific channel maps.

Setting/Frequency	2402–2480 MHz
nRF5340 TX output power	–5 dBm
nRF21540 gain	10 dB
Conducted output power nRF21540 ANT1 PORT[1]	5.6 dBm (2402 MHz) 6.4 dBm (2440 MHz) 6.1 dBm (2480 MHz)
Max. EIRP[2]	7.71 dBm (2402 MHz) 9.19 dBm (2440 MHz) 7.7 dBm (2480 MHz)

Table 13: BLE1M

[1] Measured at T_{nom} = 25°C
[2] Measured at T_{low} = 0°C

Setting/Frequency	2404–2478 MHz
nRF5340 TX output power	–5 dBm
nRF21540 gain	10 dB
Conducted output power nRF21540 ANT1 PORT[1]	5.6 dBm (2404 MHz) 6.5 dBm (2440 MHz) 6.2 dBm (2478 MHz)
Max. EIRP[2]	7.88 dBm (2402 MHz) 9.36 dBm (2440 MHz) 7.64 dBm (2480 MHz)

Table 14: BLE2M

Setting/Frequency	2405–2480 MHz
nRF5340 TX output power	–5 dBm
nRF21540 gain	10 dB
Conducted output power nRF21540 ANT1 PORT	6.1 dBm (2404 MHz) 6.8 dBm (2440 MHz) 5.9 dBm (2478 MHz)

Table 15: 802.15.4

5.7 EN IEC 62311:2020 and IEC 62479:2021

The Nordic Thingy:53 complies with the EN IEC 62311:2020 and IEC 62479:2021 standards when the minimum distance between the Nordic Thingy:53's antennas and the user is 20 cm or more. Operation in closer proximity to the user, for example, in hand, is allowed as long as the operation is limited to 60 s/6 min period.

5.8 REACH SVHC statement

To the present and best of our knowledge, and based upon information available to us from our suppliers, the following components used in the Nordic Thingy:53 contain substances of very high concern (SVHC), as identified in the ECHA Candidate list, above a limit of 0.1% w/w.

Designator	Manufacturer part number	Substance	CAS no.	Safe use instruction
Bz1	PKMCS0909E4000-R1	Lead titanium zirconium oxide [(Pbx Tiy Zrz) O3]	12626-81-2	The substance is bound inside the article and is not released during regular use. Specific precautions in handling are not required. The article can be disposed of as electronic scrap according to the relevant regulations.

Table 16: Components in Nordic Thingy:53 BOM containing REACH SVHC on ECHA Candidate list

Glossary

Clear to Send (CTS)

In flow control, the receiving end is ready and telling the far end to start sending.

Dedicated Charging Port (DCP)

A downstream port on a device that outputs power through a USB connector but is not capable of enumerating a downstream device.

Development Kit (DK)

A hardware development platform used for application development.

General-Purpose Input/Output (GPIO)

A digital signal pin that can be used as input, output, or both. It is uncommitted and can be controlled by the user at runtime.

Integrated Circuit (IC)

A semiconductor chip consisting of fabricated transistors, resistors, and capacitors.

Integrated Development Environment (IDE)

A software application that provides facilities for software development.

Inter-integrated Circuit (I^2C)

A multi-master, multi-slave, packet-switched, single-ended, serial computer bus.

Internet of Things (IoT)

Physical objects that are embedded with sensors, processing ability, software, and other technologies that connect and exchange data with other devices and systems of the Internet or other communications networks.

Li-ion

Lithium-ion

Li-Po

Lithium-polymer

Low-Noise Amplifier (LNA)

In a radio receiving system, an electronic amplifier that amplifies a very low-power signal without significantly degrading its signal-to-noise ratio.

MCUboot

A secure bootloader for 32-bit microcontroller units, which is independent of hardware and operating system.

Near Field Communication (NFC)

A standards-based short-range wireless connectivity technology that enables two electronic devices to establish communication by bringing them close to each other.

NFC-A Listen Mode

Initial mode of an NFC Forum Device when it does not generate a carrier. The device listens for the remote field of another device. See Near Field Communication (NFC) on page 41.

Out of Band (OOB)

A communication channel that is outside of the defined activity. For example, in Bluetooth Low Energy, Out of Band pairing can be used to share encryption keys or authentication data using a different communication channel (such as NFC).

Over-the-Air (OTA)

Refers to any type of wireless transmission.

Power Amplifier (PA)

A device used to increase the transmit power level of a radio signal.

Power Management Integrated Circuit (PMIC)

A chip used for various functions related to power management.

Printed Circuit Board (PCB)

A board that connects electronic components.

Pulse Density Modulation (PDM)

A form of modulation used to represent an analog signal with a binary signal where the relative density of the pulses corresponds to the analog signal's amplitude.

Pulse Width Modulation (PWM)

A form of modulation used to represent an analog signal with a binary signal where the switching frequency is fixed, and all the pulses corresponding to one sample are contiguous in the digital signal.

Quad Serial Peripheral Interface (QSPI)

A *SPI* controller that allows the use of multiple data lines.

Request to Send (RTS)

In flow control, the transmitting end is ready and requesting the far end for a permission to transfer data.

SEGGER Embedded Studio (SES)

A cross-platform *Integrated Development Environment (IDE)* for embedded C/C++ programming with support for Nordic Semiconductor devices, produced by SEGGER Microcontroller.

Serial Peripheral Interface (SPI)

Synchronous serial communication interface specification used for short-distance communication.

Serial Wire Debug (SWD)

A standard two-wire interface for programming and debugging Arm CPUs.

Software Development Kit (SDK)

A set of tools used for developing applications for a specific device or operating system.

Standard Downstream Port (SDP)

A downstream port on a device that complies with the USB 2.0 definition of a host or hub.

System in Package (SiP)

Several integrated circuits, often from different technologies, enclosed in a single module that performs as a system or subsystem.

System on Chip (SoC)

A microchip that integrates all the necessary electronic circuits and components of a computer or other electronic systems on a single integrated circuit.

SWF

A small, RF surface-mount switch connector series for wireless applications.

Universal Asynchronous Receiver/Transmitter (UART)

A hardware device for asynchronous serial communication between devices.

Universal Serial Bus (USB)

An industry standard that establishes specifications for cables and connectors and protocols for connection, communication, and power supply between computers, peripheral devices, and other computers.

Recommended reading

In addition to the information in this document, you may need to consult other Nordic documents.

- nRF5340 Product Specification
- nRF21540 Product Specification
- nPM1100 Product Specification
- nRF5340 Errata
- nRF21540 Errata
- nPM1100 Errata
- nRF Connect SDK documentation
- nRF Connect Programmer

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