User Guide

BL54LM20B Development Kits

Part # 453-00672-K1 and 453-00671-K1

Version 0.2

Revision History

Version	Date	Notes	Contributor(s)	Approver
0.1	13 July 2026	Initial version	Louis Chang	Jonathan Kaye
0.2	28 Aug 2026	Updated BL54LM20 Development Kit Application Guide to support BL54LM20B development kit and BL54LM20 Series modules.	Louis Chang	Jonathan Kaye

Contents

1 Overview

The Ezurio DVK for the BL54LM20 Series provides a platform for rapid wireless connectivity prototyping, offering multiple options for the development of Bluetooth LE, 802.15.4 (Thread & Matter), and Near Field Communication (NFC) applications.

The development kit is designed to enable customers to test and validate all hardware interfaces of the BL54LM20 Series module and supports rapid application software development using either Zephyr RTOS or the Nordic nRF Connect SDK.

This document should be read in conjunction with the DVK-BL54LM20B schematics available from the BL54LM20 Series Documentation section.
BL54LM20 Series - Bluetooth LE + 802.15.4 + NFC | Ezurio

2 Ezurio BL54LM20 Development Kit Part Numbers

Part Number	Product Description
453-00672-K1	Development kit, Module, BL54LM20B (Nordic nRF54LM20B), Chip antenna
453-00671-K1	Development kit, Module, BL54LM20B (Nordic nRF54LM20B), MHF4 Connector

Applicable to the following BL54LM20 Series module part numbers:

Part Number	Product Description
453-00586	Module, BL54LM20A, (Nordic nRF54LM20A), Chip antenna
453-00585	Module, BL54LM20A, (Nordic nRF54LM20A), MHF4 Connector
453-00672	Module, BL54LM20B, (Nordic nRF54LM20B), Chip Antenna
453-00671	Module, BL54LM20B, (Nordic nRF54LM20B), MHF4 Connector

3 Package Contents

All kits contain the following items:

Development Board	The development board is supplied with a BL54LM20B module pre-installed and provides access to all available hardware interfaces.
Power Options	• USB cable (x1) – Type A to type C. The cable also provides serial communications via the USB – UART converter chip on the board.
Two-pin jumpers for pin headers (5)	Five jumpers for 2.54 mm pitch headers used on BL54LM20B development board.
Fly leads (6)	Supplied (1 by 1 female to female jumper cable) to allow simple connection to any BL54LM20 Series module signals available on the development board. (available on plated though holes or headers). TBD
External BLE dipole antenna	Supplied with development kit part # 453-00671-K1 only. External antenna, 2 dBi, FlexPIFA (Ezurio part #001-0022) with integral RF coaxial cable with 100 mm length and IPEX-MHF4 compatible RF connector.
External NFC antenna	Ezurio NFC flexi-PCB antenna – Part # 0600-00061
DVK 'Legs'	4 x stand-off and 4 x associated nuts

4 BL54LM20B Development Kit – Main Development Board

This section describes the BL54LM20B development board hardware. The BL54LM20B development kit can be used to evaluate both BL54LM20A and BL54LM20B modules, which share an identical footprint and pinout.

The BL54LM20B development board is a universal development platform that highlights the capabilities of the BL54LM20 Series modules. The development kit is supplied in a default configuration which should be suitable for multiple experimentation options. It also offers several header connectors that help isolate on-board sensors and UART from the BL54LM20 Series module to create different configurations. This allows you to test different operating scenarios.

The board allows BL54LM20 Series modules to connect to a PC through the supplied USB cable for development purposes. The development board provides USB-to-Virtual COM port (UART0, UART1 on BL54LM20 Series module) conversion through a Nordic nRF5340 debugger chip (U1).

4.1 Key Features

The BL54LM20B development board has the following features:

- BL54LM20B module soldered onto the development board
- Powering the development board:
  - USB (type C) connector (J11, J12)
- Powering the BL54LM20 Series module by on-board PMIC (U3) or optional external voltage (from P1 header) anywhere between 1.7V to 3.6V.
- USB(J12) to UART bridge (Nordic nRF5340 debugger chip, U1).
- The BL54LM20 Series supports multiple UART interfaces, on development board we have 2 UARTs that can be interfaced to:
  - USB (PC) (J12) using the USB-UART0 bridge (U1)
  - USB (PC) (J12) using the USB-UART1 bridge (U1)
- Current measuring options:
  - Pin header P1 for measuring current.
- IO break-out 2.54 mm pitch 2-pin header connectors in series on each GPIO of the BL54LM20 Series module – on which various interfaces UART0, UART1, SPI, High Speed SPI (32Mbps), QSPI, I2C, GPIO, AIN, NFC – and allow for plugging in external modules/sensors. These 2-pin series headers allow circuitry to be disconnected from BL54LM20 Series module (by removing jumpers).
- Multiple on-board sensors:
  - QSPI device (Nor flash) chip (U2) via switches (U12, U13) connected by default, the more detail can refer to 7.3.4)
  - Four buttons (BUTTON0, BUTTON1, BUTTON2, BUTTON3)
  - Four LEDs (LED0, LED1, LED2, LED3)
- One reset button SW3
- NFC antenna connector (J5) on-board development board for use with supplied flexi-PCB NFC antenna (0600-00061, see datasheet)
- Optional external 32.768 kHz crystal (X1) circuit (Not required for operation of the BL54LM20 Series).
- Optional external serial (QSPI) Nor flash chip (U2). Not required for operation of the BL54LM20 Series module; is connected via switches (U12, U13) by default. For more details refer to 7.3.4
- Access to BL54LM20 Series Serial Wire Debug (SWD) 2-wire interface (JTAG) by either Nordic nRF5340 debugger chip (U1) that transforms USB to SWD interface or on-board header P4.
- FW upgrade or application loading HW capability:
  - Via SWD (USB to BL54LM20 Series SWD) using on-board SWD programmer circuitry (U1 nRF5340 debugger chip MCU) on the BL54LM20B Development Kit

5 Understanding the Development Board

Development board 453-00672-K1 (fitted with 453-00672 Module, BL54LM20B, (Nordic nRF54LM20B), Chip antenna)

5.1 BL54LM20 Series Default Configuration and Jumper Settings

Important! To ensure correct out-of-the-box configuration, the **BL54LM20B** development board switch and jumpers must be configured as shown in Figure 1.

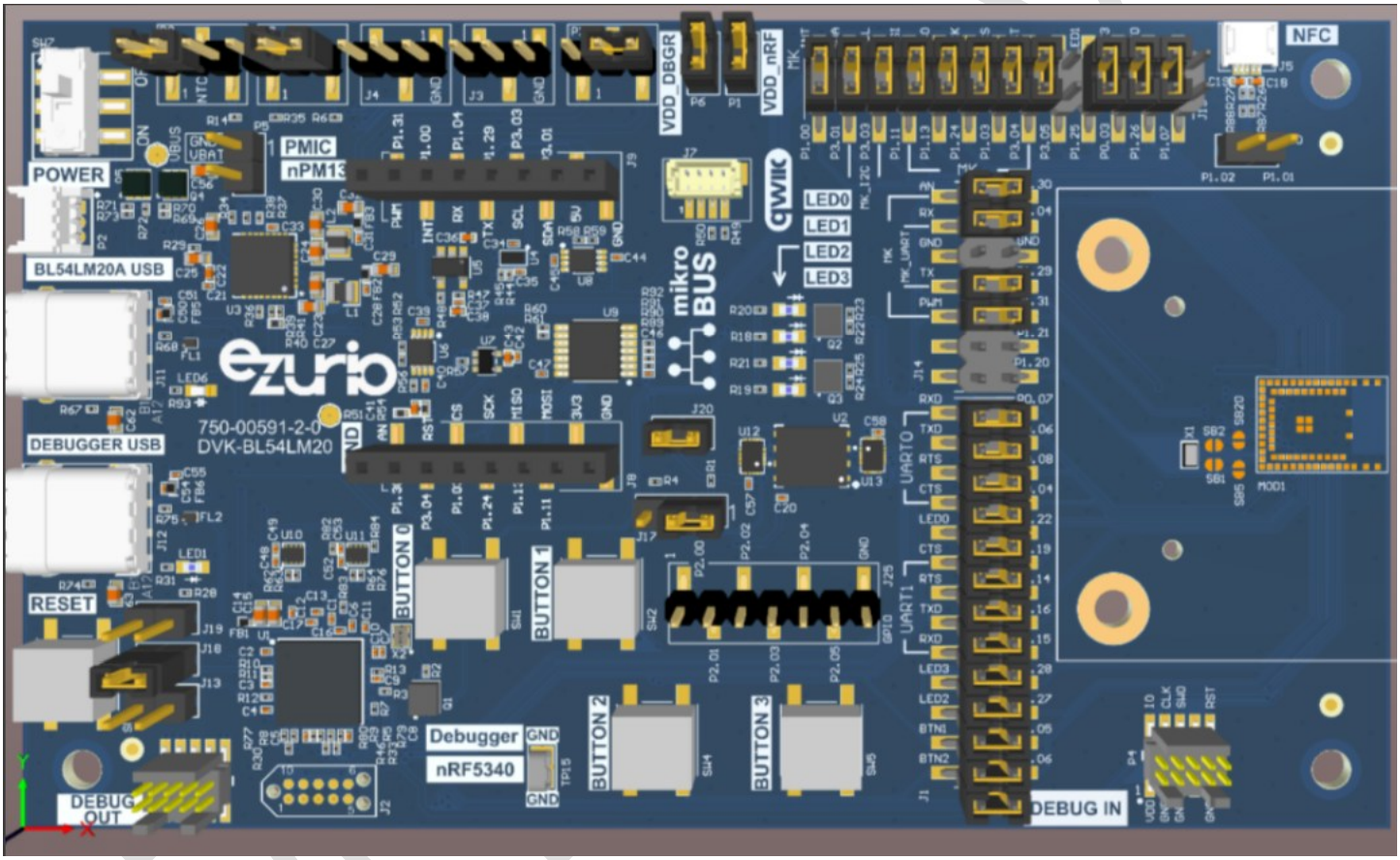


Figure 1: Correct BL54LM20B development board 453-00672-K1 or 453-00671-K1 jumper and switch settings

6 Functional Blocks

6.1 Power Supply

Figure 2 shows the BL54LM20B development board Power Supply block.

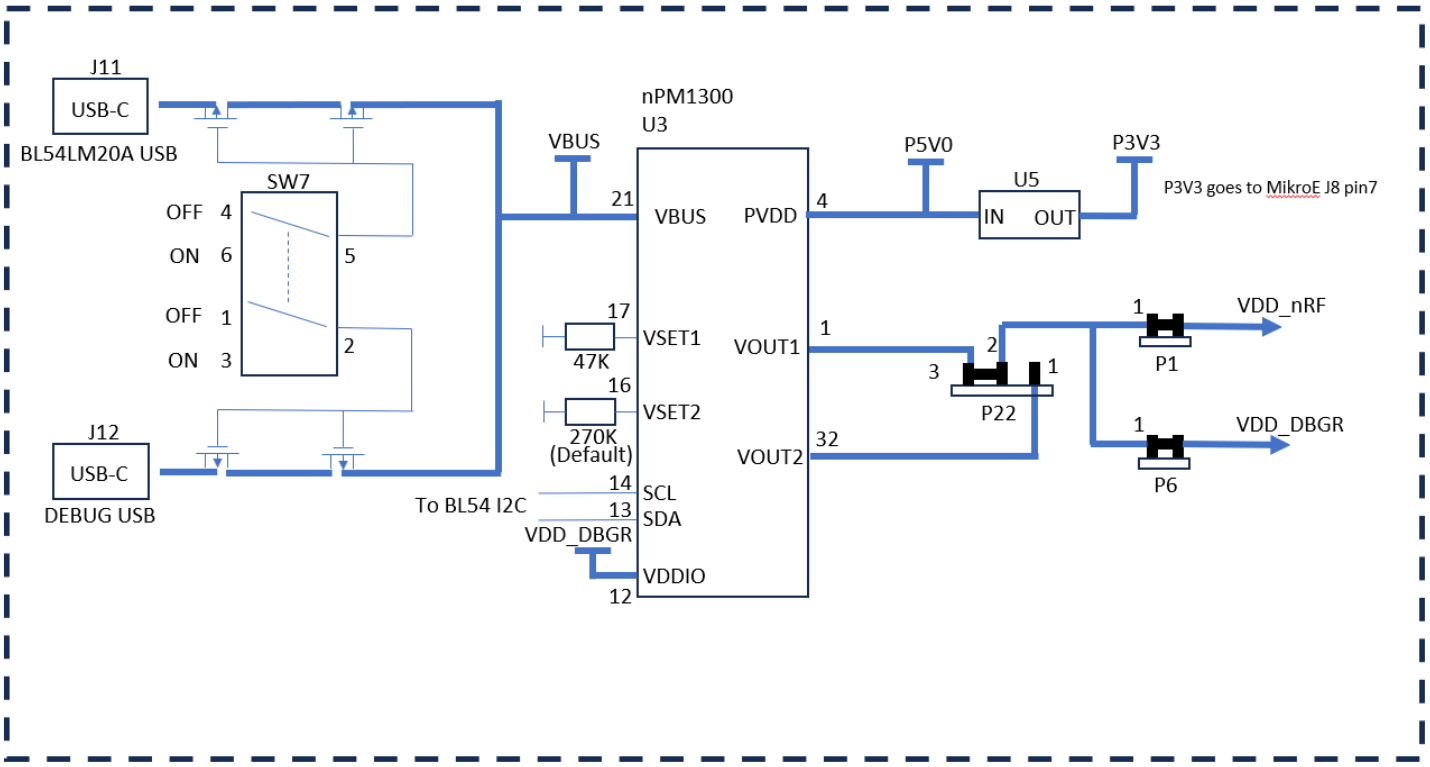


Figure 2: BL54LM20B development Kit power supply

- The BL54LM20B development board can be powered through either USB Type-C connector (J11 or J12). To enable USB power, move SW7 from the OFF position to the ON position.
- The USB cable supplied power (5V) goes into nPM1300 (U3) power management chip on the development board which produces 3.3V (on Vout2 pin) and 1.8V (on Vout1 pin). User can adjust jumper on P22 to select use 1.8V (P22, pin2-3) or 3.3V (P22, pin1-2) for BL54LM20 Series module and on-board peripheral devices.

The BL54LM20 Series module is powered through the following pin:

- VDD_nRF pin (operating range of 1.7V to 3.6V) – the development board generates 1.8V from the nPM1300 Vout1 pin to power the BL54LM20 Series module. This voltage can be adjusted with resistor R34 (default 47K) or by I2C commands from the BL54LM20 Series module.

Note: The BL54LM20B development board has on-board circuitry to allow access to the BL54LM20 Series module SWD interface (via USB connector J12). Refer to SWD (JTAG) Interface.

- VDD_nRF pin can also be powered from external power supply by using P1 header.

Power circuitry net names

On the development board, the power circuity net names are as follows:

- VBUS – This voltage from USB cable plugged into connector J11 or J12. The main development board power supplies nPM1300 power management chip (U3) which on output generates 3V3 on Vout2 pin and 1V8 on Vout1 pin.
- VDD_DBGR – Supplies nRF5340 debugger chip MCU(U1) and some peripheral devices such as NOR flash(U2), level shifter(U4,U6,U8,U9), switch(U12,U13).

- VDD_nRF – Supplies the BL54LM20 series module only.
- P5V0 – for MikroE 5V and LED power supply.
- P3V3 – for MikroE 3.3V and Qwiic 3.3V

6.2 Reset Button

The development board has a reset button (SW3) with the net name RESET_BUTTON. The RESET_BUTTON (is active low when SW3 pushed down) is routed to nRF5340 debugger chip MCU (with jumper populated default on J18) and BL54LM20 Series module RESET pin (with jumper unpopulated default on J13). The placement of the SW3 reset button and circuitry is shown in Figure 3.

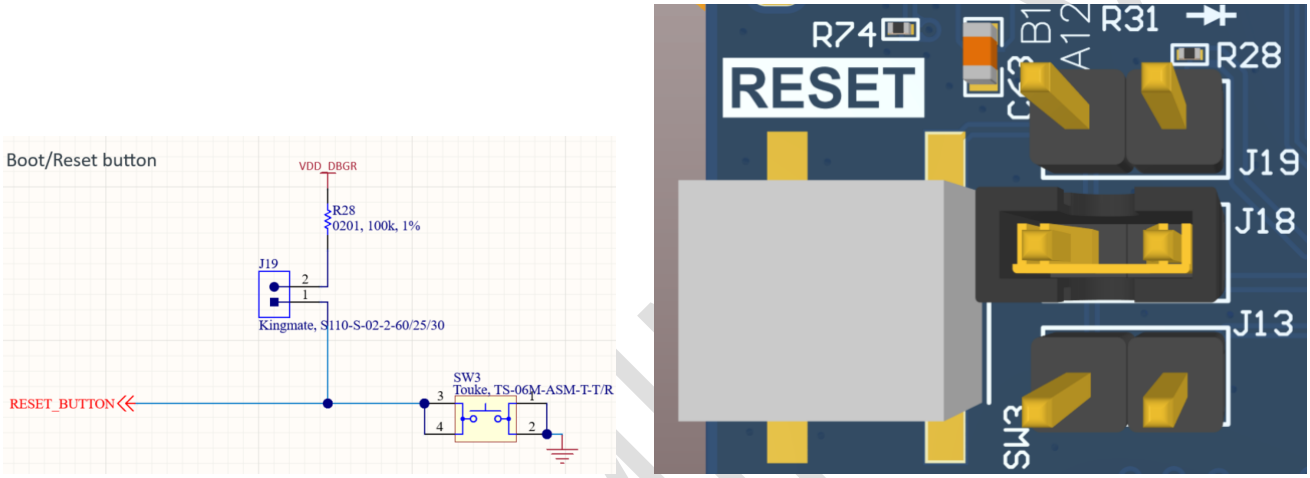


Figure 3: Reset button placement

BL54LM20 Series module reset (nRF54LM20_RESET) can be driven by 2 sources:

- Reset button SW3 (net name RESET_BUTTON)
- P4 header pin10 (net name SWD_nRF54_RESET), see section 6.3 SWD (JTAG) Interface

6.3 SWD (JTAG) Interface

The development board provides access to the BL54LM20 Series module two-wire SWD interface by either Nordic nRF5340 (U1) debugger MCU or P4 connector. This SWD interface is REQUIRED for customer use for FW programming.

Note: We recommend SWD two-wire interface used for FW loading. Customer MUST wire out the SWD two-wire interface (namely SWDIO, SWDCLK, nReset, GND, and VCC).

For those customers that require access to BL54LM20 Series SWD (JTAG) interface, the BL54LM20B development board (see Understanding the Development Board) has on-board circuitry to allow access to BL54LM20 Series module SWD interface (via USB connector J12 or P4 connector). The SWD(JTAG) connection can be formed by Nordic nRF5340 (U1) debugger MCU via USB connector J12 or using connector P4 with external debugging board.

Figure 4 shows the schematic, PCB location for USB J12, U1 and P4 connector

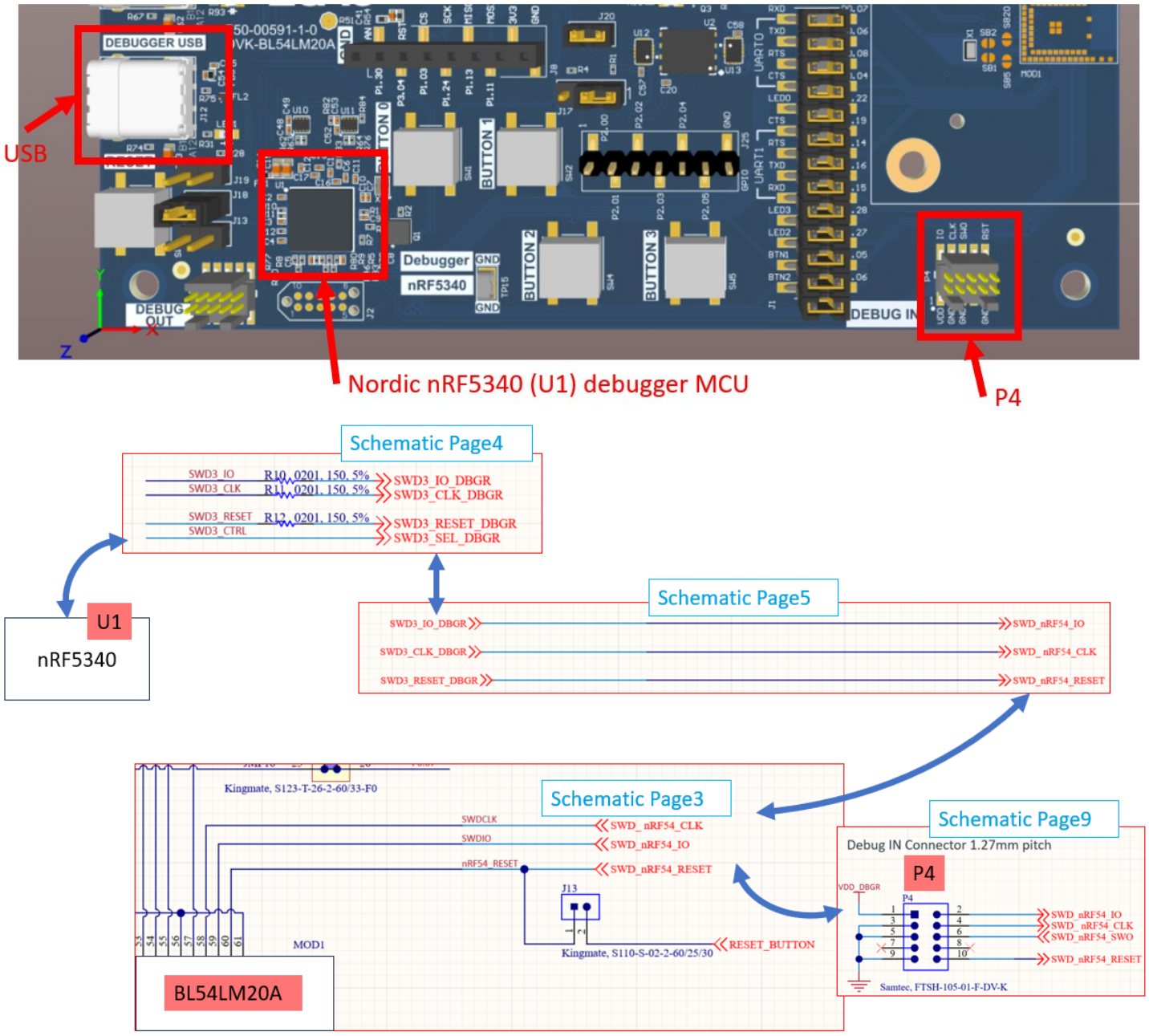


Figure 4: BL54LM20 Series SWD (JTAG) interface schematic and PCB location

6.4 Debug out for programming external boards

The BL54LM20B Development Kit supports programming and debugging external boards using BL54LM20 Series modules. To program or debug an external board, connect to the Debug out header P3 using a 10-pin cable.

Note: The programming cable used to connect to the external board must be no longer than 10 cm. Power the external board separately from the BL54LM20B Development Kit. The VDD_SWD0 voltage must be within the range of 1.8 V and 3.6 V.

Table 1 Header P3 pinout for programming external targets

P3 pin	P3 pin signal	Description
1	VDD_SWD0	I/O voltage reference input from the external target.
2	SWD0_IO_EXT	Serial Wire Debug (SWD) data I/O.

P3 pin	P3 pin signal	Description
3	SWD0_SEL_EXT	Debug out select signal. Connect to ground on the external board.
4	SWD0_SEL_EXT	Serial Wire Clock line.
5	GND	Ground.
6	SWD0_SEL_EXT	Serial Wire Output (SWO) line is not used for programming and debugging over SWD.
7	N.C.	Not used.
8	N.C.	Not used.
9	N.C.	Not used.
10	SWD0_SEL_EXT	Reset line.

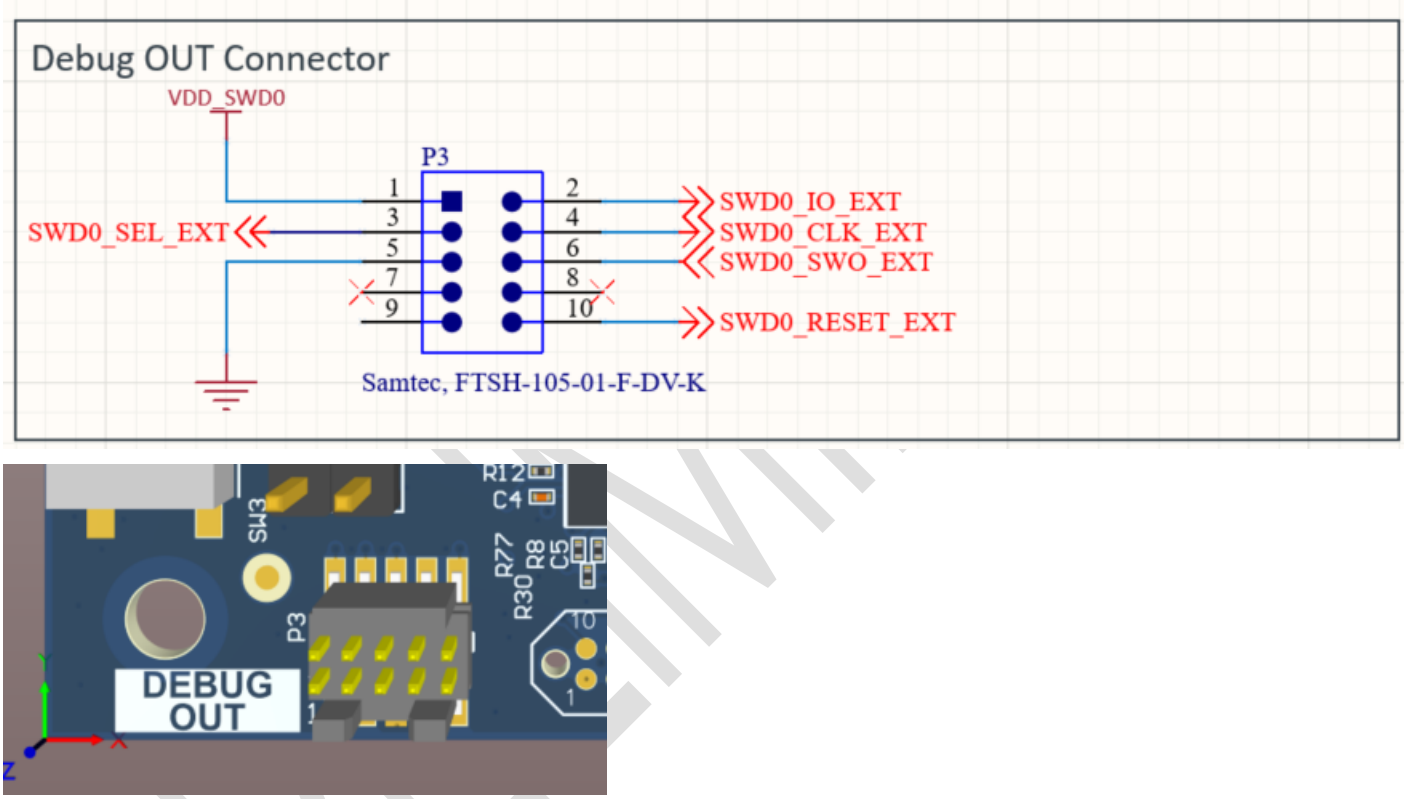


Figure 5: BL54LM20 Series DEBUG out interface schematic and PCB location

6.5 Four-wire UART Serial Interfaces

The BL54LM20 Series supports multiple four-wire UART's (TX, RX, CTS, RTS). On the DVK-BL54LM20B development board, 2 UARTs can be interfaced.

6.5.1 UART0 Interface (on BL54LM20 Series) Driven by USB (J12) connector (USB to UART0 debugger chip U1)

- **USB Connector:** The development kit provides a USB Type C connector (J12) which allows connection to any USB host device. The connector also supplies power to the development kit and the USB(J12) signals are connected to debugger nRF5340 MCU (U1) to-serial converter device.
- **USB – UART0:** The development kit is fitted with a (U1) debugger nRF5340 USB-to-UART converter which provides USB-to-Virtual COM port (UART0 on BL54LM20 Series module) on any Windows PC.

The UART0 connection on the BL54LM20B Development Board and the nRF5340 (U1) are shown in Table 2 and how the BL54LM20 Series module UART0 is mapped to the breakout header connector J1.

Table 2: UART0 Connections on the BL54LM20B Development Board

BL54LM20 Series (MOD1) pin	BL54LM20 module UART0 assigned	nRF5340 (U1) IC UART0 _DBGR	Comments
P0.06 (pin43)	UART0_TX (output)	RX0	via J1 header (pins 23-24) JMP15
P0.07 (pin41)	UART0_RX (input)	TX0	via J1 header (pins 25-26) JMP16
P0.08 (pin44)	UART0_RTS (output)	CTS	via J1 header (pins 21-22) JMP14
P0.04 (pin46)	UART0_CTS (input)	RTS	via J1 header (pins 19-20) JMP13

6.5.2 UART1 Interface (on BL54LM20 Series) Driven by USB (J12) connector (USB to UART1 debugger chip U1)

- **USB Connector:** The development kit provides a USB Type C connector (J12) which allows connection to any USB host device. The connector also supplies power to the development kit and the USB(J12) signals are connected to debugger nRF5340 MCU (U1) to-serial converter device.
- **USB – UART1:** The development kit is fitted with a (U1) debugger nRF5340 USB-to-UART converter which provides USB-to-Virtual COM port (UART1 on BL54LM20 Series module) on any Windows PC.

The UART1 connection on the DVK-BL54LM20B and the nRF5340 (U1) are shown in Table 3 and how the BL54LM20 series module UART1 is mapped to the breakout header connector J1.

Table 3: UART1 Connections on the BL54LM20B Development Board

BL54LM20 Series (MOD1) pin	BL54LM20 module UART1 assigned	nRF5340 (U1) IC UART 1_DBGR	Comments
P1.16 (pin51)	UART1_TX (output)	RX0	via J1 header (pins 11-12) JMP9
P1.15 (pin52)	UART1_RX (input)	TX0	via J1 header (pins 9-10) JMP8
P1.14 (pin50)	UART1_RTS (output)	CTS	via J1 header (pins 13-14) JMP10
P1.19 (pin49)	UART1_CTS (input)	RTS	via J1 header (pins 15-16) JMP11

7 Development Board Interfaces and Peripherals

7.1 UART Software

The development board connects the BL54LM20 Series module to a virtual COM port (UART0 or UART1) of a PC or other device. From a PC, you can communicate with the module using a terminal emulator like PuTTY https://www.chiark.greenend.org.uk/~sgtatham/putty/

This utility allows connections to serial devices using any combination of the communications parameters listed in **Error! Reference source not found.**. If you want to send commands via UART PuTTY settings can be seen https://developer.nordicsemi.com/nRF_Connect_SDK/doc/latest/nrf/gs_testing.html

Table 4: PuTTY communication parameters for BL54LM20 Series

Port (Windows)	1 to 255
Port (Mac/Linux)	Any /dev/tty device
Baud Rate	1200 to 1000000 **Note:** Baud rate default is 19200 for the BL54LM20 Series module firmware.
Parity	None
Data Bits	8
Stop Bits	1
Handshaking	None or CTS/RTS

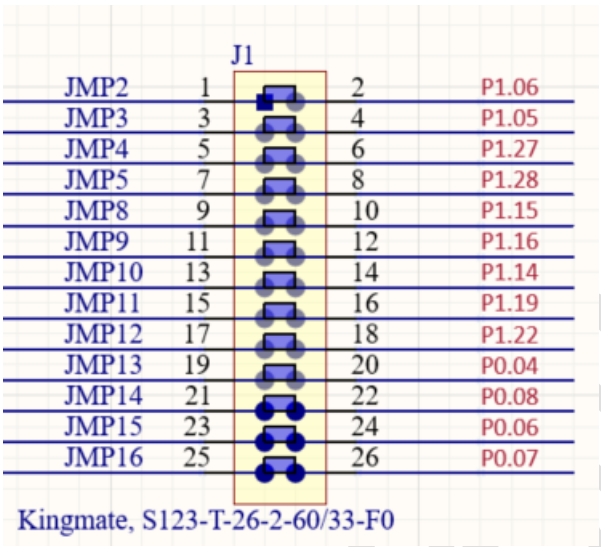
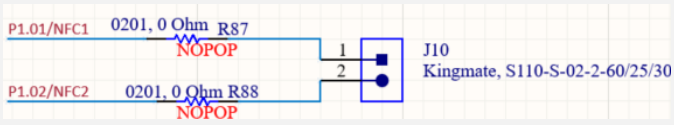
7.2 GPIO Breakout Connectors

Access to all 40 BL54LM20 Series module signal pins (GPIO = General Purpose Input /Output) is available on 2.54mm pitch header connectors on J1, J10, J14, J15, J25 (2.54mm header connector).

These breakout connectors can interface to a wide array of sensors via customer developed FW, and the DVK incorporates additional fly-lead cables inside the box to enable simple, hassle-free testing of these multiple interfaces.

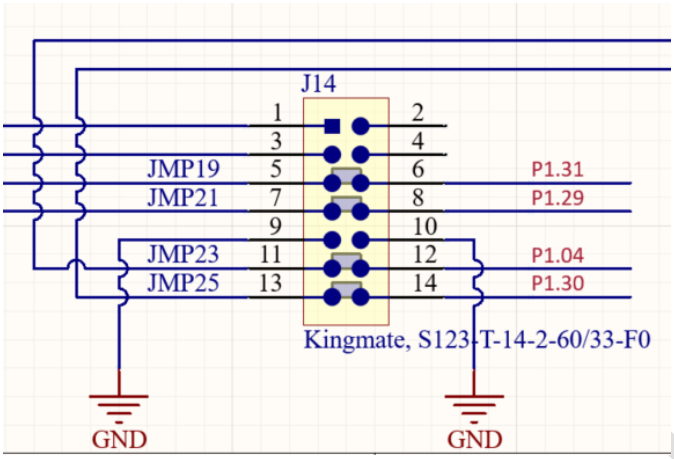
Table 5 shows the BL54LM20 Series module pins that are brought out to 2.54mm pitch header connectors and plated through holes (suitable for 2.54 mm pitch headers).

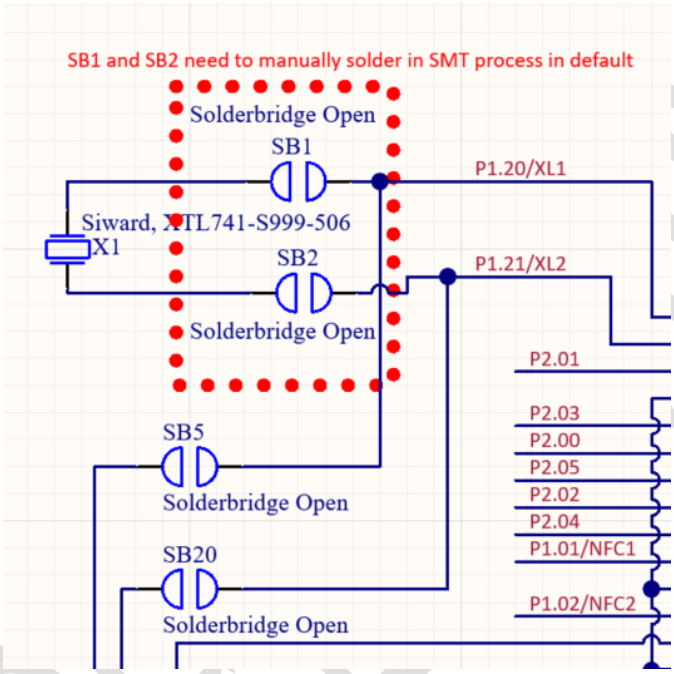
Table 5: Module pins exposed via in-series header pins and jumpers

Header Connector	BL54LM20 Series Module Signals Exposed
J1 	BL54LM20 Series pin header J1 for access: • P1.06 (via JMP2 to Button2) • P1.05 (via JMP3 to Button1) • P1.27 (via JMP4 to LED2) • P1.28 (via JMP5 to LED3) • P1.15 (via JMP8 routes UART1_nRF54_RXD to debugger U1) • P1.16 (via JMP9 routes UART1_nRF54_TXD to debugger U1) • P1.14 (via JMP10 routes UART1_nRF54_RTS to debugger U1) • P1.19 (via JMP11 routes UART1_nRF54_CTS to debugger U1) • P1.22 (via JMP12 to LED0) • P0.04 (via JMP13 routes UART0_nRF54_CTS to debugger U1) • P0.08 (via JMP14 routes UART0_nRF54_RTS to debugger U1) • P0.06 (via JMP15 routes UART0_nRF54_TXD to debugger U1) • P0.07 (via JMP16 routes UART0_nRF54_RXD to debugger U1)
J10 	BL54LM20 Series pin header J10 for access: • P1.01 via R87 0R (default NOPOP) • P1.02 via R88 0R (default NOPOP) To use NFC1 pin as P1.01 GPIO fit R87 0R, remove R26 To use NFC2 pin as P1.02 GPIO fit R88 0R, remove R27

Header Connector	BL54LM20 Series Module Signals Exposed

J14





BL54LM20 Series pin header J14 for access:

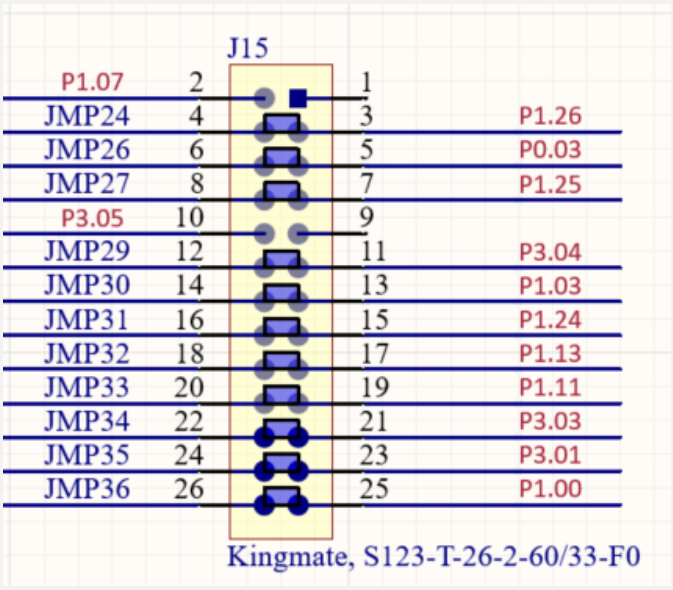
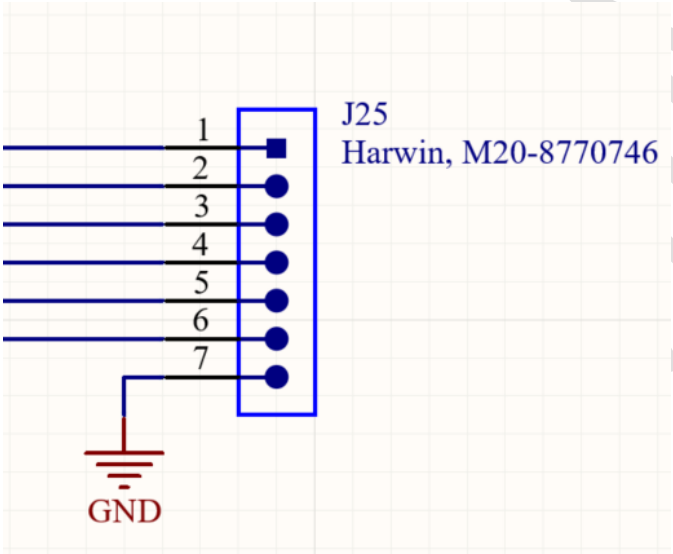
- P1.20/XL1 (via J14 pin1)
- P1.21/XL2 (via J14 pin3)
- P1.31 (via JMP19 routes to MikroE connector PWM)
- P1.29 (via JMP21 routes to MikroE UART TX)
- P1.04 (via JMP23 routes to MikroE UART RX)
- P1.30 (via JMP25 routes to MikroE connector AN)

BL54LM20 Series pins

- P1.20/XL1
- P1.21/XL2

Accessed on J14 via open solder bridges SB5, SB20.

By default, the optional external 32.768 kHz crystal circuit is connected to BL54LM20 Series via closed solder bridge SB1 and SB2. To use P1.20, P1.21 as GPIO on J14 header, then cut SB1, SB2 and solder connect SB5, SB20.

Header Connector	BL54LM20 Series Module Signals Exposed
J15 	BL54LM20 Series pin header J15 for access provides parallel access to: • P1.07 (J15 pin2) • P1.26 (via JMP24 to Button0) • P0.03 (via JMP26 to Button3) • P1.25 (via JMP27 to LED1) • P3.05 (J15 pin10) • P3.04 (via JMP29 routes to MikroE reset) • P1.03 (via JMP30 routes to MikroE SPI CS) • P1.24 (via JMP31 routes to MikroE SPI CLK) • P1.13 (via JMP32 routes to MikroE SPI MISO) • P1.11 (via JMP33 routes to MikroE SPI MOSI) • P3.03 (via JMP34 routes to MIKROE/QWIIC/PMIC SCL) • P3.01 (via JMP35 routes to MIKROE/QWIIC/PMIC SDA) • P1.00 (via JMP36 routes to MikroE INT)
J25 	BL54LM20 Series pin header J25 for access: • P2.00 routes to J25.1 or on board NOR SPI flash IO3 • P2.01 routes to J25.2 or on board NOR SPI flash CLK • P2.02 routes to J25.3 or on board NOR SPI flash IO0 • P2.03 routes to J25.4 or on board NOR SPI flash IO2 • P2.04 routes to J25.5 or on board NOR SPI flash IO1 • P2.05 routes to J25.6 or on board NOR SPI flash CS P2.00 ~ P2.05 can be controlled toward J25 or on board NOR SPI flash by on board switch U12,U13. Default path is to NOR SPI flash, change JMP17 to J17 pin 2-3 can switch P2.00 ~ P2.05 to J25.

7.3 Additional Peripherals/Sensors

The BL54LM20B development board provides for simple and hassle-free connectivity to a wide range of sensors but also includes several on-board sensors and options to enable a developer to test functionality straight out of the box.

7.3.1 MikroE and Qwiic connectors

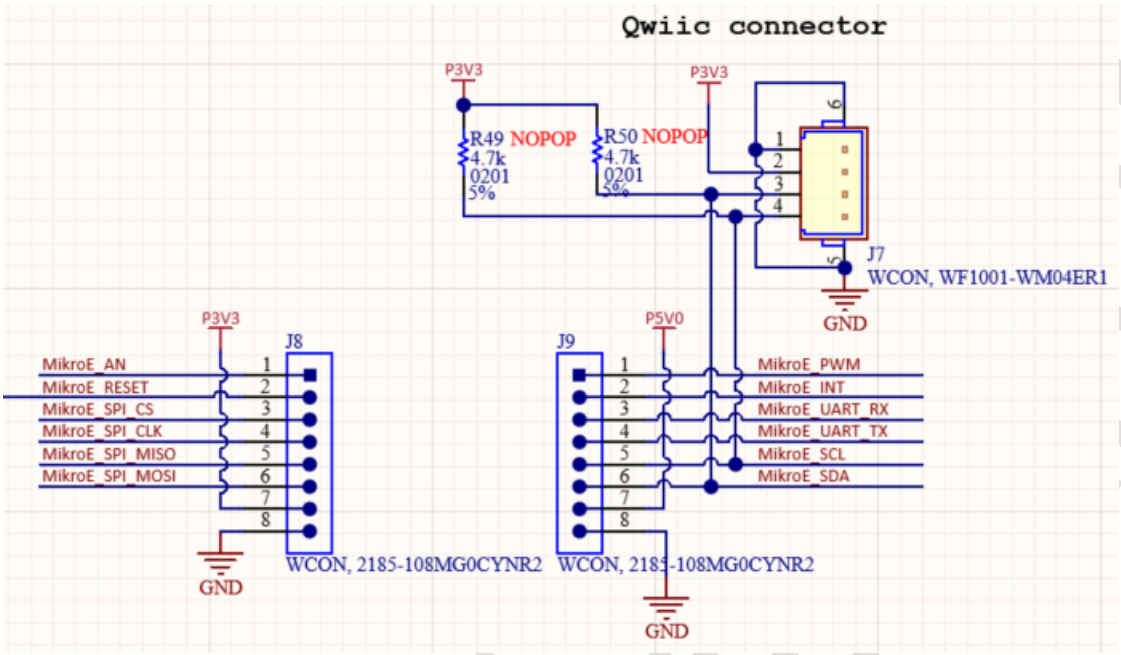


Table 6: MikroE connector J8 signal via level shifter chip U9, buffer U7, LDO U5 on DVK-BL54LM20B to BL54LM20 Series module signal mappings

MikroE connector, pin	MikroE signal	via level shifter, buffer or LDO	BL54LM20 Series module (MOD1) pin signal	Comments
J8pin1	MikroE_AN	R51. R54 resistive divider	P1.30	
J8pin2	MikroE_RESET	U7	P3.04	
J8pin3	MikroE_SPI_CS	U9	P1.03	
J8pin4	MikroE_SPI_CLK	U9	P1.24	
J8pin5	MikroE_SPI_MISO	U9	P1.13	
J8pin6	MikroE_SPI_MOSI	U9	P1.11	
J8pin7	P3V3	Generated by LDO U5		
J8pin8	GND			

Table 7: MikroE connector J9 signal via level shifter chip (U11, U14, U12) on DVK-BL54LM20B to BL54LM20 Series module signal mappings

MikroE connector, pin	MikroE signal	via level shifter, buffer or LDO	BL54LM20 Series module (MOD1) pin signal	Comments
J9pin1	MikroE_PWM	U6	P1.31	
J9pin2	MikroE_INT	U6	P1.00	
J9pin3	MikroE_UART_RX	U8	P1.04	
J9pin4	MikroE_UART_TX	U8	P1.29	
J9pin5	MikroE_SCL	U4	P3.03	
J9pin6	MikroE_SDA	U4	P3.01	
J9pin7	P5V0	From nPM1300		
J9pin8	GND			

Table 8: Qwiic connector J7 signal on DVK-BL54LM20B to BL54LM20 Series module signal mappings

Qwiic connector, pin	MikroE signal	via level shifter	BL54LM20 Series module (MOD1) pin signal	Comments
J7pin1	GND			
J7pin2	P3V3	Generated by LDO U5		
J7pin3	MikroE_SDA	U4	P3.01	
J7pin4	MikroE_SCL	U4	P3.03	

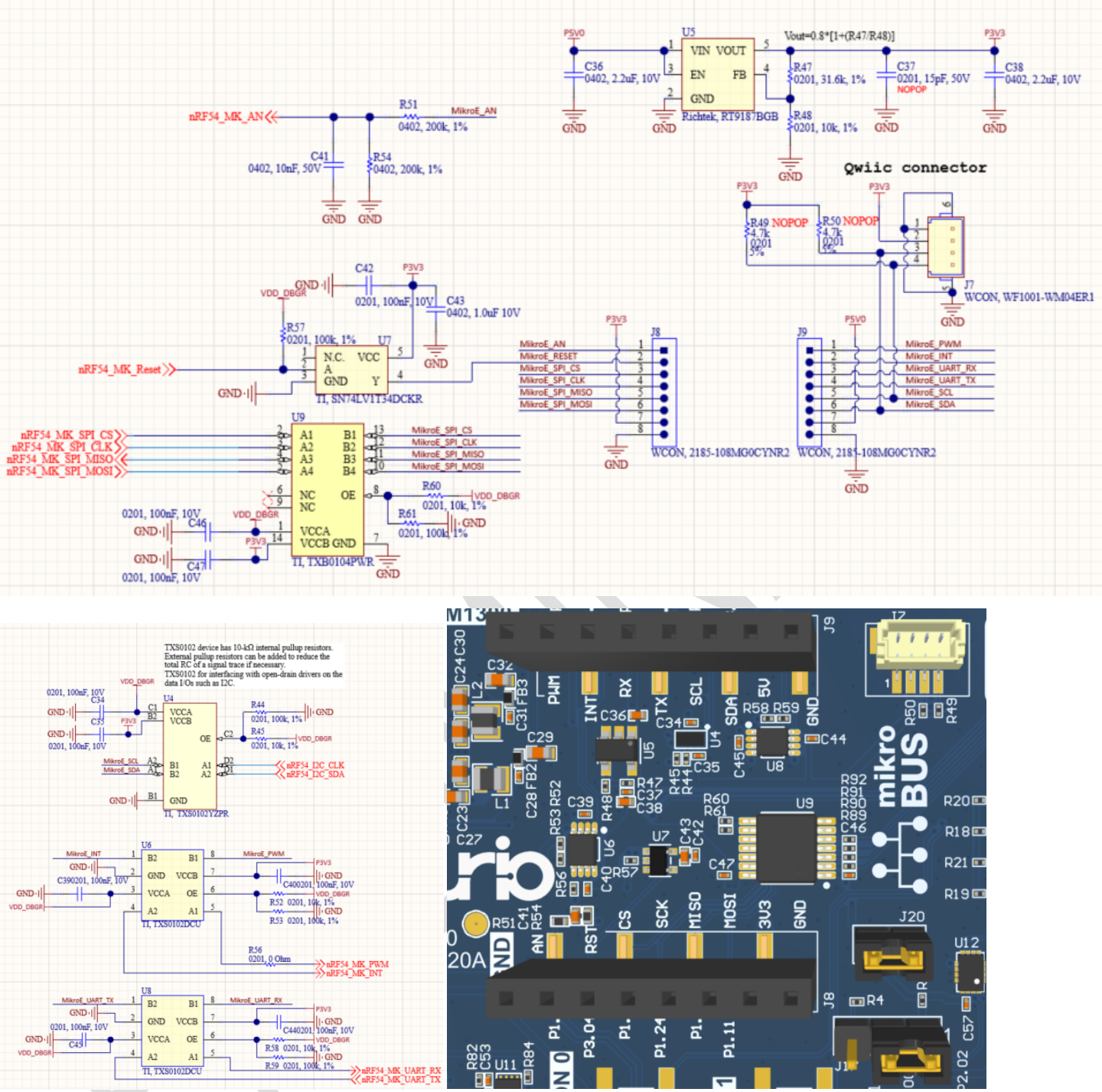


Figure 6: MikroE and Qwiic connectors, level shifters, buffer or LDO circuitry

Level shifters U9 (for MikroE SPI), U6 (MikroE PWM, INT), U8 (MikroE UART), U4 (MikroE I2C) are needed adapt the 3.3 V MikroE I/O levels to the BL54LM20 Series module I/O voltage.

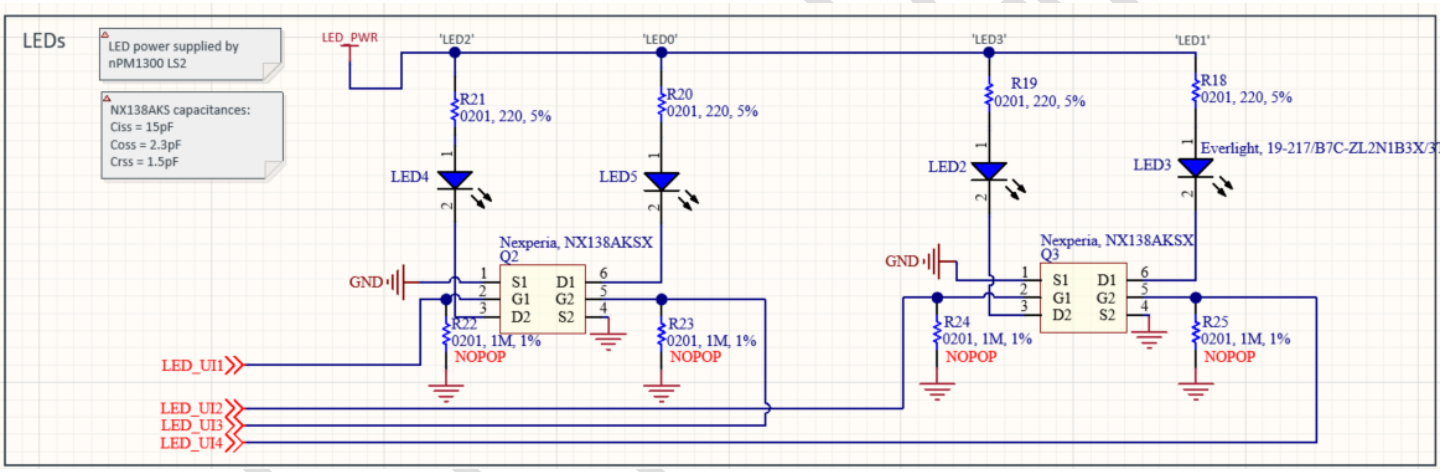
Please note pulldown resistors on the B side of U4, U6, U8 should be avoided because of decreased high levels. If pulldown resistors are necessary, they must be limited to values of 50 kΩ or greater. For more details, refer to the TI TXS level translator documentation.

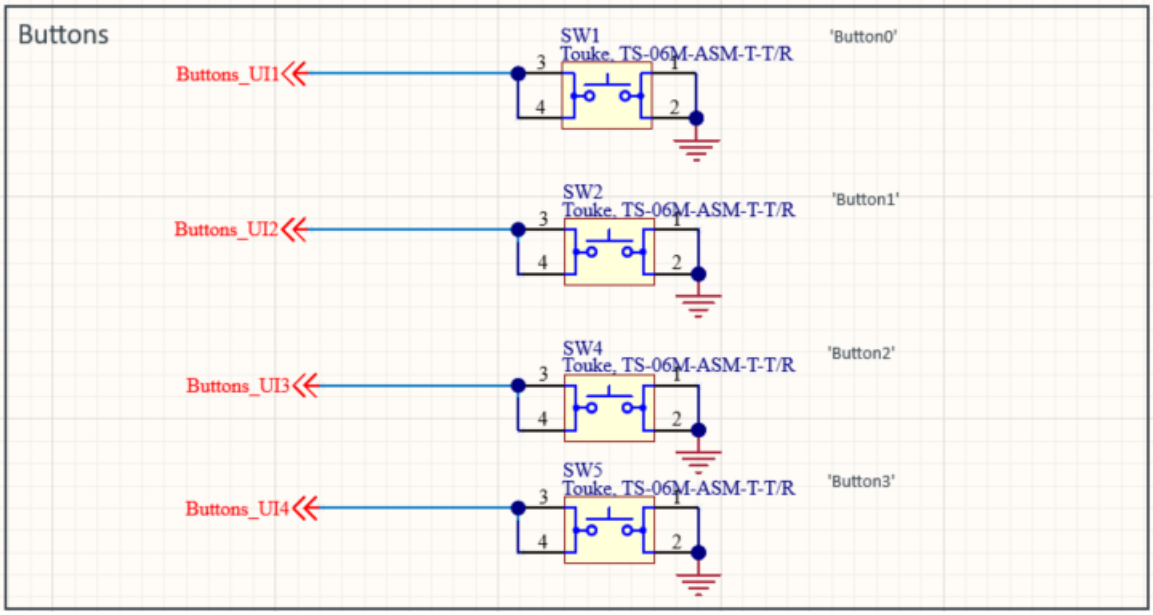
7.3.2 4 Buttons and 4 LEDs connected to the BL54LM20 Series Module

Four Buttons, four LEDs are connected to the BL54LM20 Series pins via pin headers. Table 9 lists signal mappings

Table 9: LEDs and Buttons Signal Mapping on the BL54LM20B Development Board

LED, Button	BL54LM20 Series module (MOD1) pin	Comments
LED0	P1.22	
LED1	P1.25	
LED2	P1.27	
LED3	P1.28	
Button0	P1.26	
Button1	P1.05	
Button2	P1.06	
Button3	P0.03	





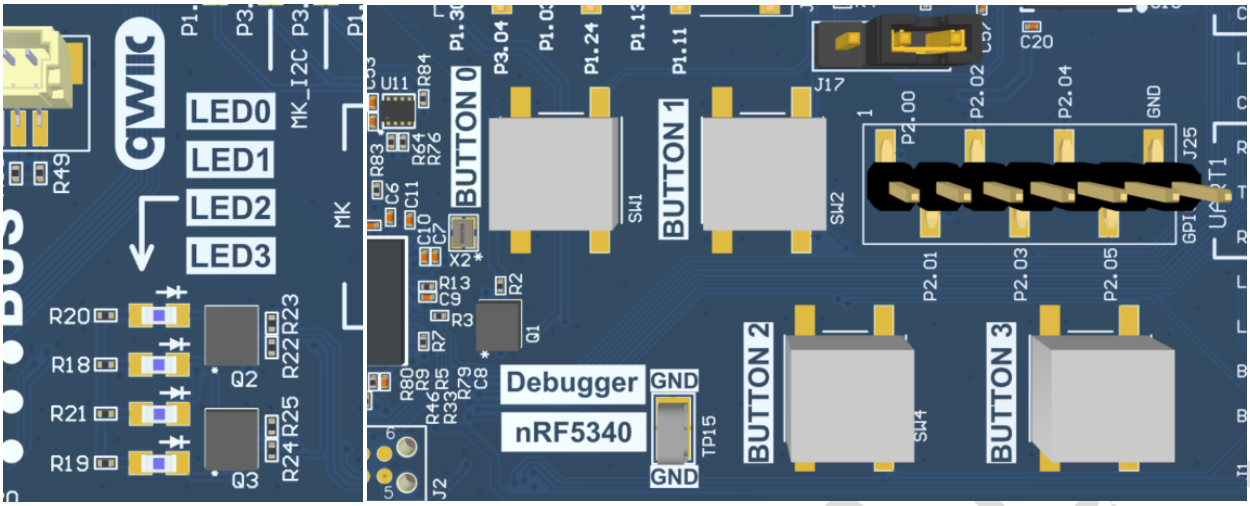


Figure 7: LEDs and Buttons schematic and PCB

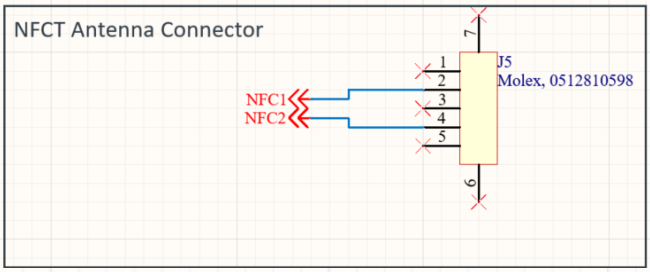
7.3.3 NFC External Antenna Connector and NFC Antenna RF Matching Circuit

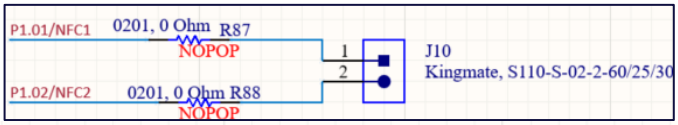
The NFC antenna input connector (J5) allows the Ezurio-supplied flex-PCB NFC antenna to be plugged in. The BL54LM20 Series module NFC circuit uses two pins, pin 30 (**P1.01/NFC1**) and pin 28 (**P1.02/NFC2**) to connect the antenna. These pins are shared with GPIOs (**P1.01** and **P1.02**). Pin 30 (**P1.01/NFC1**) and pin 28 (**P1.02/NFC2**) are configured by default on the development board schematic to use NFC antenna, but if Pin 30 (**P1.01/NFC1**) and pin 28 (**P1.02/NFC2**) are needed as normal GPIOs, R26 and R27 must be removed and R87 and R88 must be shorted by 0R, then user can use on board J10 connector to test GPIO.

C18 (300pF) and C19 (300pF) are RF tuning elements for the flexi-PCB NFC antenna (see datasheet).

Table 10: NFC input BL54LM20 Series signal mappings

BL54LM20 Series (MOD1) pin	Bring out P1.01 and P1.02 to NFC antenna connector (J5)	Bring out P1.01 and P1.02 to Header connector (J10)
(MOD1 pin30) **P1.01/NFC1**	default connected	Fit R87 0R, remove R26
(MOD1 pin28) **P1.02/NFC2**	default connected	Fit R88 0R, remove R27





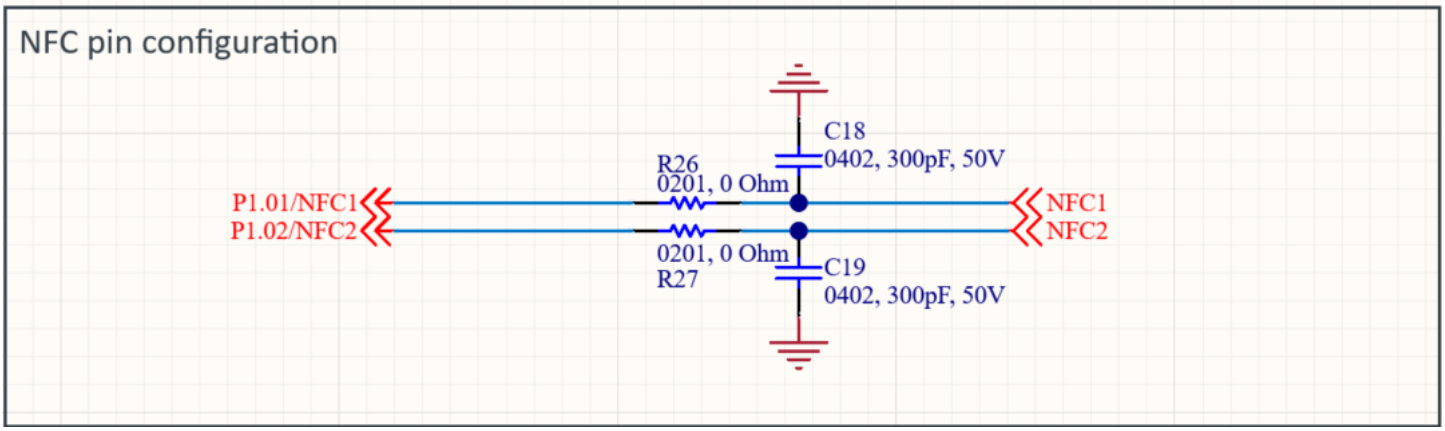
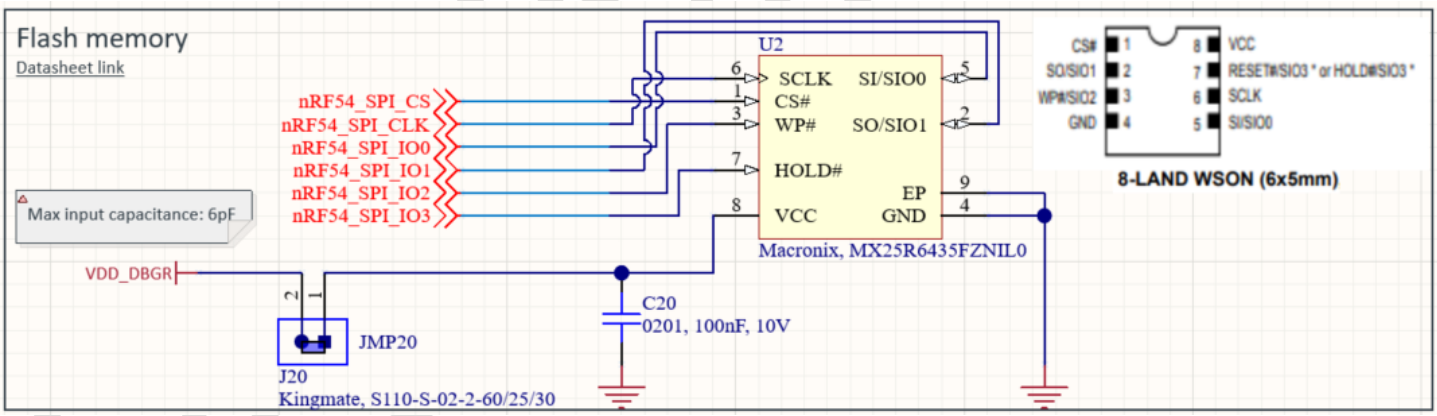


Figure 8: NFC antenna RF matching circuit, NFC antenna connector schematic and NFC plugged in to connector J5

7.3.4 Optional External Serial QSPI Flash IC

There is an optional external serial 64Mb QSPI NOR flash IC (U2) that may be used, for example, for data logging purposes. U2 can also be capable of SPI mode.

GPIOs **P2.00–P2.05** can be enabled as QSPI signals for the external flash. Switches (U12, U13) between the BL54LM20 Series module and the external flash determines if the GPIOs connect to the external flash or act as regular GPIO signals routed to pin headers J25. The state of the switches is controlled by the location of JMP17 on J17 connector, JMP17 to J17 pin1-2 (DVK default) means P2.00-P2.05 switch to NOR flash IC (U2), JMP17 to J17 pin2-3 means P2.00-P2.05 switch to J25 connector.



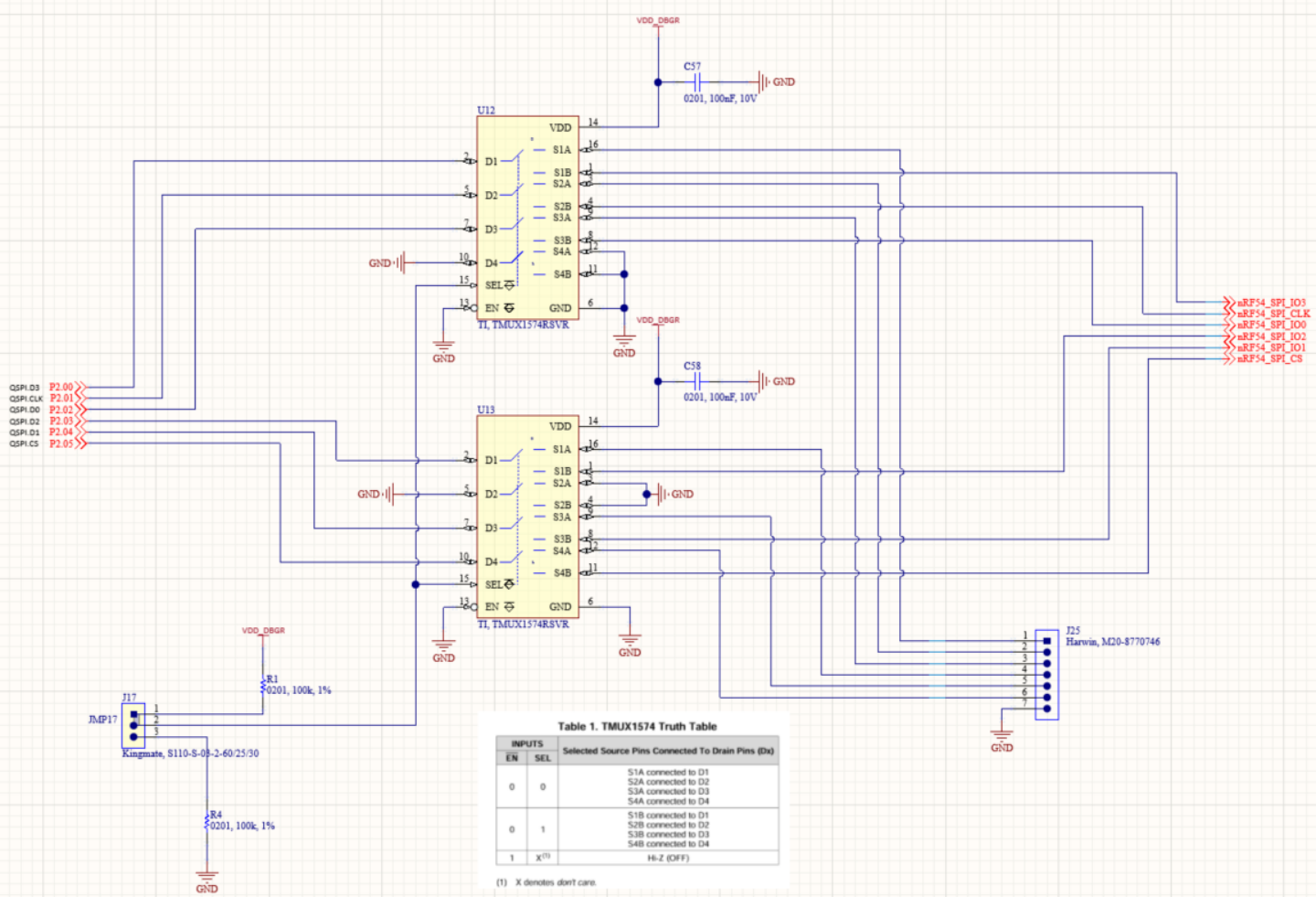


Table 1. TMUX1574 Truth Table

INPUTS		Selected Source Pins Connected To Drain Pins (Dx)
EN	SEL	
0	0	S1A connected to D1 S2A connected to D2 S3A connected to D3 S4A connected to D4
0	1	S1B connected to D1 S2B connected to D2 S3B connected to D3 S4B connected to D4
1	X(1)	Hi-Z (OFF)

(1) X denotes *don't care*.

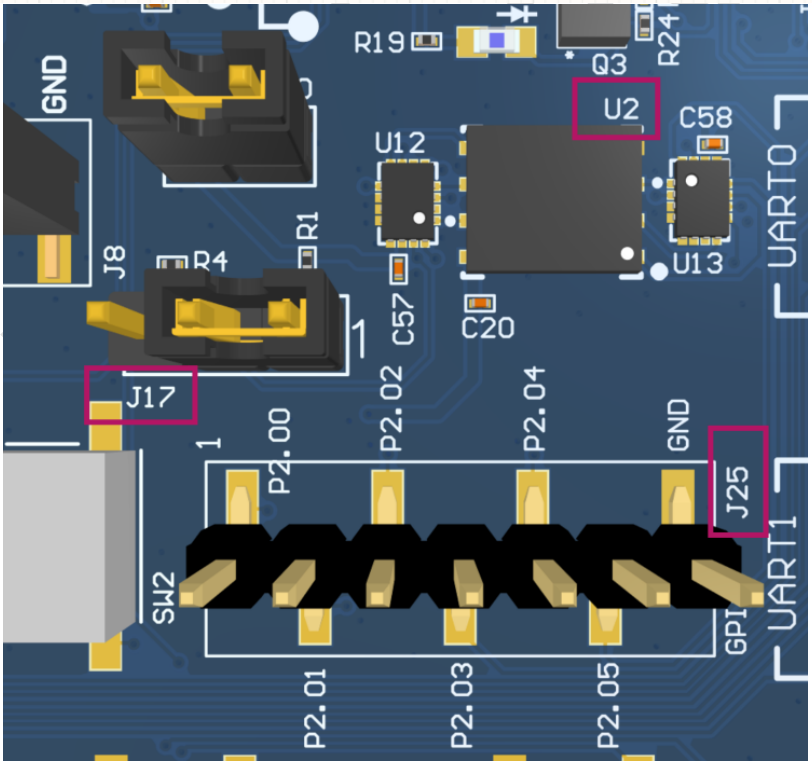


Figure 9: Optional external serial QSPI flash IC (U2) schematic and PCB and J17/J25 connector

shows the U2 pin mapping to BL54LM20 Series GPIO signals.

Table 11 shows the U2 pin mapping to BL54LM20 Series GPIO signals.

Table 11: U2 QSPI (or SPI) flash IC pin mapping to BL54LM20 Series GPIO mappings

BL54LM20 Series (MOD1) pin	BL54LM20 Series GPIO	U2 Pin (QSPI flash IC) and Pin Name
Pin33	P2.05	Pin 1 CS#
Pin37	P2.01	Pin 6 SCLK
Pin32	P2.02	Pin 5 SIO0/SI
Pin31	P2.04	Pin 2 SIO1/SO
Pin35	P2.03	Pin 3 SIO2/WP#
Pin34	P2.00	Pin 7 SIO3/HOLD#

Link to datasheet for QSPI device flash chip (U1)

https://www.macronix.com/Lists/Datasheet/Attachments/8868/MX25R6435F,%20Wide%20Range,%2064Mb,%20v1.6.pdf

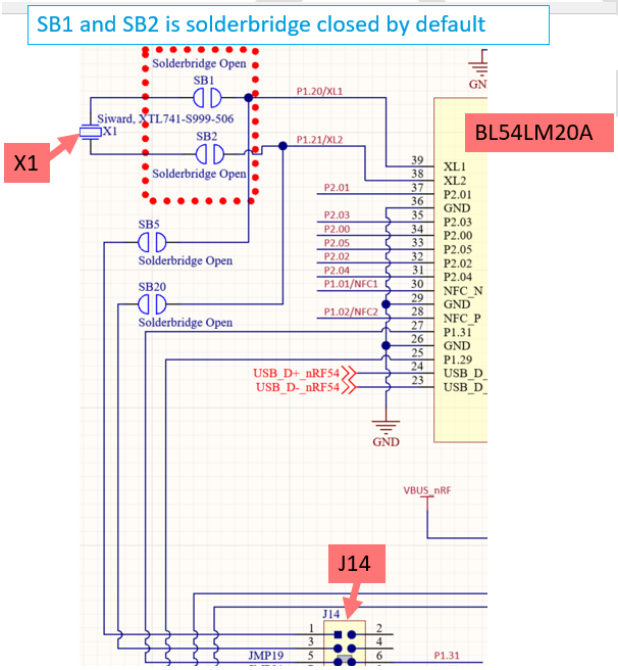
Manufacturer: Macronix
Manufacturer part number: MX25R6435FZNIL0

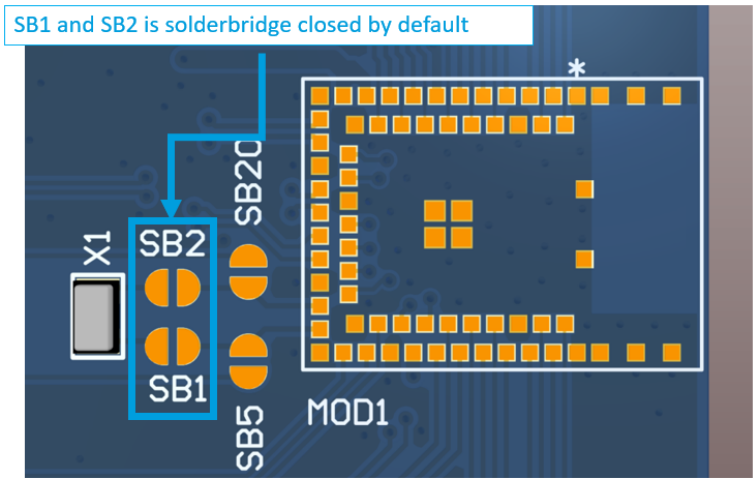
7.3.5 Optional 32.768 kHz Crystal

The BL54LM20 Series module includes an on-chip 32.768 kHz RC oscillator with a typical accuracy of ±250 ppm after periodic calibration, with calibration required every 8 seconds (default) to stay within ±250 ppm.

The BL54LM20 Series module also allows, as an option, to connect an external higher accuracy (±20 ppm) 32.768 kHz crystal to the BL54LM20 Series pins P1.20/XL1 (pin 39) and P1.21/XL2 (pin 38). This provides improved protocol timing and helps with radio power consumption in the system on idle /system off sleep modes by reducing the time that the Rx window must be open.

By default, the optional external 32.768kHz crystal oscillator circuit is connected to the BL54LM20 Series module, By cutting solder bridges **SB1** and **SB2** and soldering **SB5** and **SB20**, crystal **X1** is disconnected and GPIOs **P1.20** and **P1.21** are connected to the header J14 pin1 and pin3 for general use.





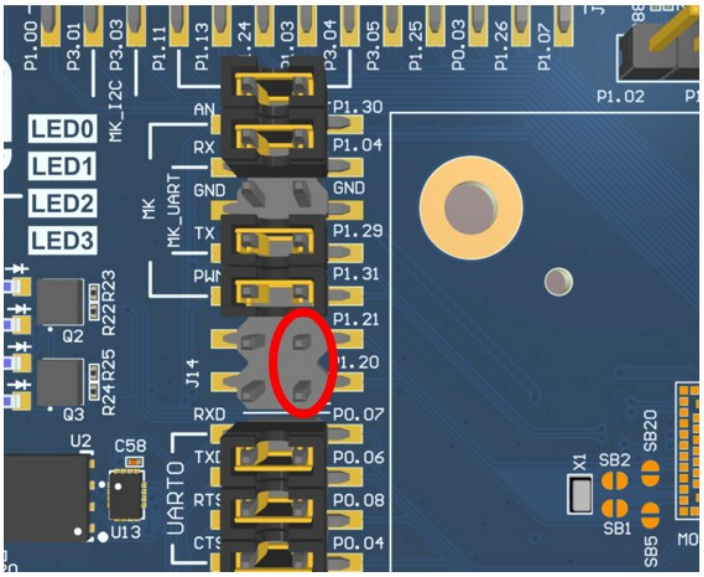


Figure 10: Optional external 32.768kHz crystal (X1) circuit and J14 schematic and PCB

The internal LFXO load capacitance within the nRF54LM20 device for LFXO is set to 17.5pF in Firmware, customer can use Quartz Watch Analyzer by coupling method to fine tune the internal nRF54LM20 Series capacitors on the customer board from 3 pF to 18 pF in 0.65pF step if needed.

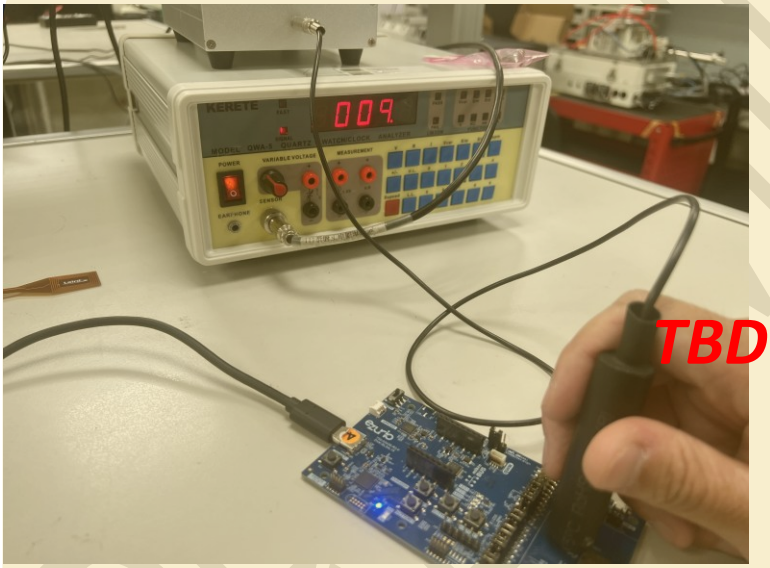
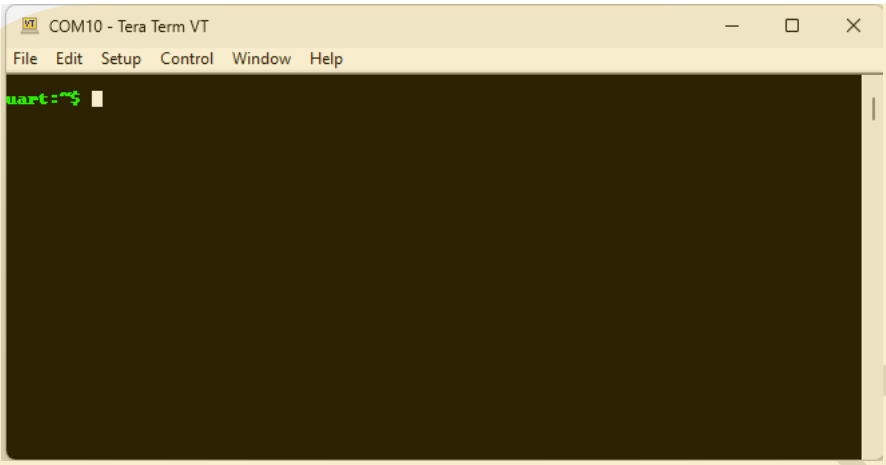


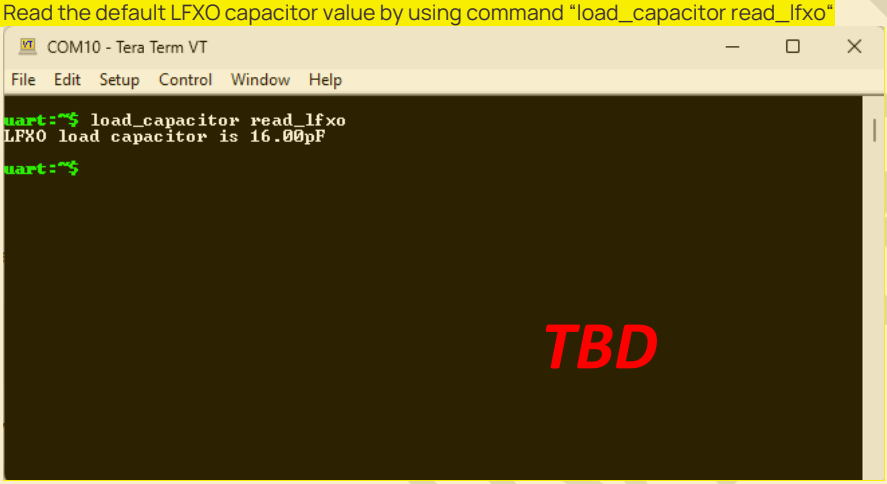
Figure 11 Measuring the 32.768 kHz Crystal Using a Quartz Watch Analyzer

Here is the procedure to alter the load capacitor of LFXO in Radio firmware (v0.5.9)

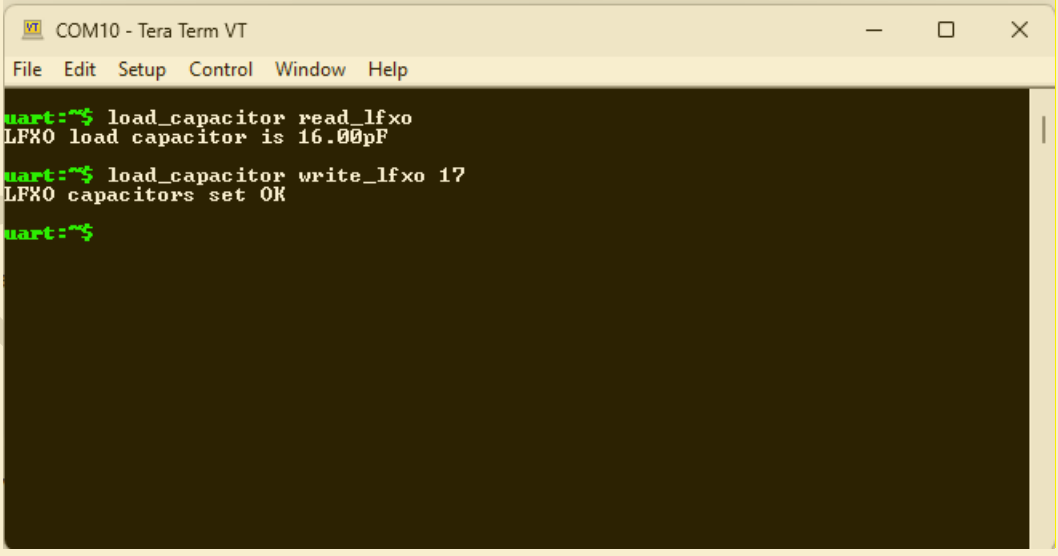
1. Use Tera Term or similar tool to communicate with the DVK



2. Read the default LFXO capacitor value by using command "load_capacitor read_lfxo"



3. Customer can alter the value by using command "load_capacitor write_lfxo Value". Here shows change to 17pF



4. Customer can measure the ppm of 32.768KHz crystal by using Quartz Watch Analyzer or equivalent to get the suitable tuning value.

8 Other Features

8.1 Current Consumption Measurement

A removable jumper (on P1) is provided to break the power supply line directly to the module, allowing you to measure current consumption.

For BL54LM20 Series current consumption measurements, use header P1 pin 2.

Note: This measures the current consumption of the BL54LM20 Series module ONLY.

The current drawn by the BL54LM20 Series module can be monitored on the development board. By default, JMP1 is installed on P1, allowing the PMIC to provide power to the BL54LM20 Series module. Figure 12 shows the schematic and location of measuring points on the PCB related to current measurements.

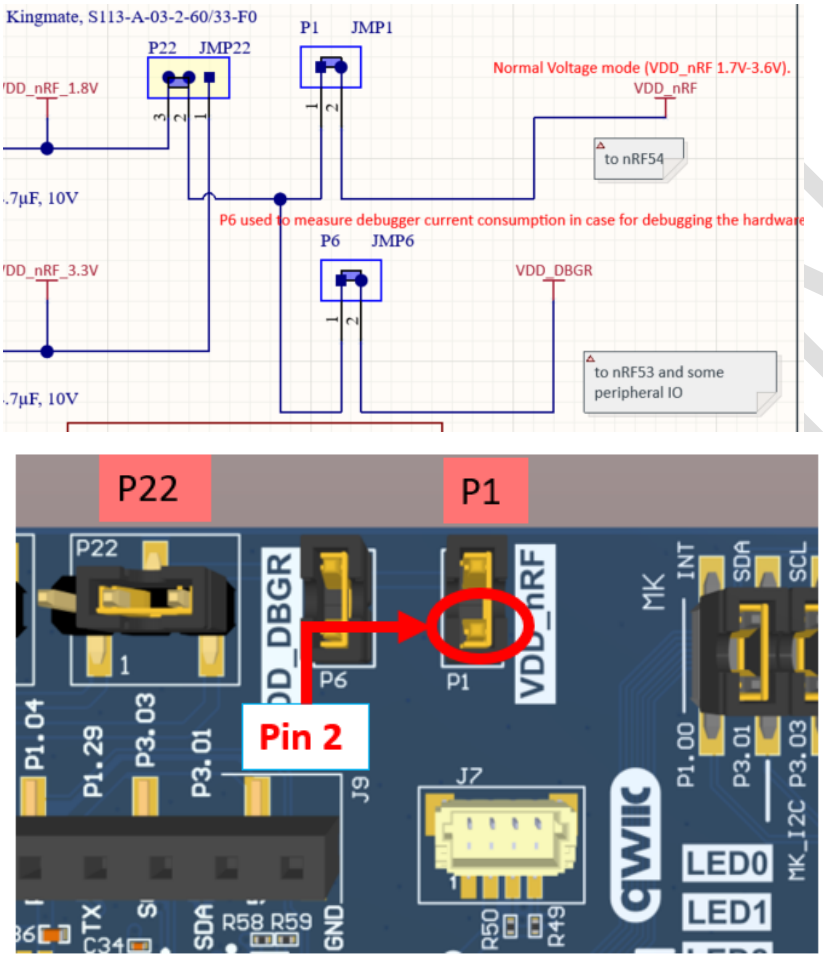


Figure 12: Current Measurement Circuit and PCB Locations

There are three primary ways to measure the current consumption:

- **Using Ammeter –** Remove jumper JMP1 and connect an ampere meter between the two pins of P1 pins.
- **Using External power supply with current reading –**
  a. Current measurement under external power supply voltage 1.8V: Remove JMP1 and connect an external power supply to P1 pin 2 for BL54LM20 Series current measurements.
- Current measurement under external power supply voltage 3.3V: Move JMP22 from default pin2-3 to pin 1-2, it will change voltage supply by PMIC (U3) from VOUT1 to VOUT2, and VOUT2 default setting is 3.3V. After that. Remove JMP1 and connect an external power supply to P1 pin 2 for BL54LM20 Series current measurements.
- **Power Profiler Kit (PPK) from Nordic –** For more details, refer to

https://www.nordicsemi.com/Products/Development-hardware/Power-Profiler-Kit

9 Additional Information

Please contact your local sales representative or our support team for further assistance:

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