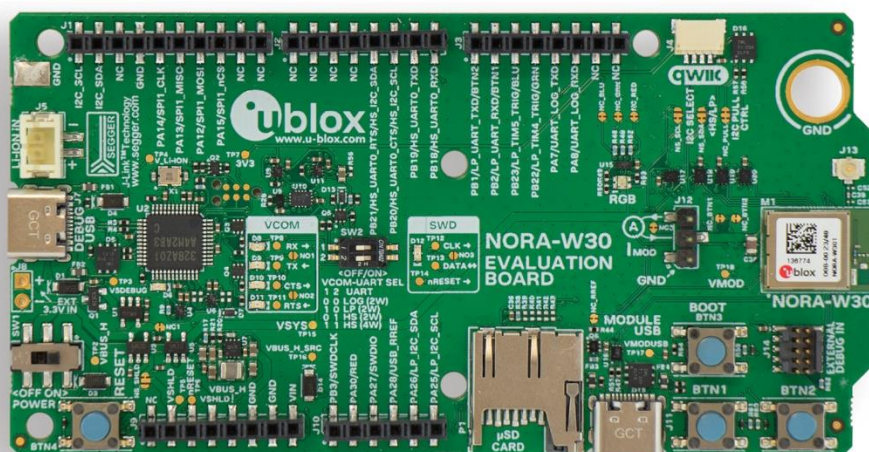


## User guide



## Abstract

This document describes how to set up the EVK-NORA-W30 evaluation kit for NORA-W30 series stand-alone modules. It also describes the different options for debugging and the development capabilities included in the evaluation board.

# Document information

|                               |                                            |             |
|-------------------------------|--------------------------------------------|-------------|
| <b>Title</b>                  | <b>EVK-NORA-W30</b>                        |             |
| <b>Subtitle</b>               | Evaluation kit for NORA-W30 series modules |             |
| <b>Document type</b>          | User guide                                 |             |
| <b>Document number</b>        | UBX-22035799                               |             |
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| <b>Disclosure restriction</b> | C1-Public                                  |             |

| <b>Product status</b>         | <b>Corresponding content status</b> |                                                                                        |
|-------------------------------|-------------------------------------|----------------------------------------------------------------------------------------|
| Functional sample             | Draft                               | For functional testing. Revised and supplementary data will be published later.        |
| In development / Prototype    | Objective specification             | Target values. Revised and supplementary data will be published later.                 |
| Engineering sample            | Advance information                 | Data based on early testing. Revised and supplementary data will be published later.   |
| Initial production            | Early production information        | Data from product verification. Revised and supplementary data may be published later. |
| Mass production / End of life | Production information              | Document contains the final product specification.                                     |

This document applies to the following products:

| <b>Product name</b> | <b>Document status</b>       | <b>Comment</b> |
|---------------------|------------------------------|----------------|
| EVK-NORA-W301       | Early production information |                |
| EVK-NORA-W306       | Early production information |                |

 **Regulatory limitations:** The products included in the scope of this document are supplied strictly as "application development platforms" / "evaluation kits" / "evaluation tools" only. These products have not been RF certified with worldwide agencies and may not be offered for sale as an end-user product.

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# 1 Quick start guide

EVK-NORA-W30 software and documentation are available at the [u-blox website](#).

Realtek SDK information and instructions are available on the Realtek Ameba IoT website [\[6\]](#).

## 1.1 USB device drivers

A SEGGER® J-Link-OB debug interface on EVK-NORA-W30 provides both a serial wire debug (SWD) and virtual COM port (VCOM) connection to the NORA-W30. The development PC requires an internet connection and sufficient access rights to automatically download and install the required device drivers when the EVK is plugged into an available upstream USB port.

## 1.2 Realtek SDK

Realtek provides application development information and SDKs through the Ameba IoT website [\[6\]](#) and repositories on GitHub [\[7\]](#).

### 1.2.1 Windows - install Cygwin 32-bit

As Cygwin x86 for Windows 10 and newer versions have reached “end-of-life” and can no longer be downloaded from the official web site, Realtek SDKs only support the 32-bit version.

To download and install the latest 32-bit version:

1. Download the latest 32-bit Cygwin "setup-x86.exe" application [here](#).
2. Open the command prompt in administrator mode.
3. Type "start <setup-x86.exe location> --allow-unsupported-windows option --site http://ctm.crouchingtigerhiddenfruitbat.org/pub/cygwin/circa/2022/11/23/063457"
4. During the install, add Devel > Make and Math > bc into the Cygwin package. Use the Search function to find the individual packages. For search details, see the images at Realtek GitHub [\[8\]](#).

### 1.2.2 Linux

For installation of the tools on Linux, see the Realtek Ameba-D application note [\[5\]](#), section 1.2.2.

### 1.2.3 Standard SDK

NORA-W30 is supported through the standard Realtek SDK that covers Global Community Cloud (GCC) and IAR development environments. To use Cygwin in the GCC development environment, go to the Realtek GitHub Ameba-D standard SDK repository [\[8\]](#) and see Realtek Ameba-D application note [\[5\]](#), sections 3, 4, and 5. For IAR, see the Realtek Ameba-D application note [\[5\]](#), section 6.

### 1.2.4 Arduino IDE

NORA-W30 is supported through the Arduino IDE, version 2.1 and above. See the Arduino IDE website [\[11\]](#). After installing the standard Arduino IDE, add support for NORA-W30 by following the available instructions at the Realtek GitHub Ameba-D Arduino repository [\[9\]](#). Arduino IDE support for NORA-W30 was added in version 3.1.7.

 RF output power control is not currently supported under Arduino development environments. Contact u-blox support for information about the regulatory approvals when using these environments.

 The UART on the debug interface on EVK-NORA-W30 supports baud rates up to 1 Mbps. The latest files at the Realtek GitHub site contain the necessary settings.

### 1.2.5 SDK support

Realtek provides SDK support through the issues and pull requests from the Realtek Ameba IoT site [\[7\]](#), standard SDK repository [\[8\]](#), Arduino repository [\[9\]](#), and IoT support forum [\[10\]](#).

## 2 Product description

### 2.1 Overview

The u-blox EVK-NORA-W30 evaluation kit is a versatile development platform that allows quick prototyping of a variety of Internet of Things (IoT) applications, using Bluetooth® LE 5.3 and Wi-Fi 4 (IEEE 802.11 a/b/g/n).

EVK-NORA-W30 boards are available in the following variants that accommodate alternative antenna and software solutions:

- EVK-NORA-W301, with a NORA-W301 open CPU module and an antenna pin. The antenna pin is routed to a U.FL connector on the EVK to allow use of different external antennas.
- EVK-NORA-W306, with a NORA-W306 open CPU module and an internal PCB trace antenna.

All signals are clearly marked on both top (Figure 1) and bottom (Figure 2) sides.

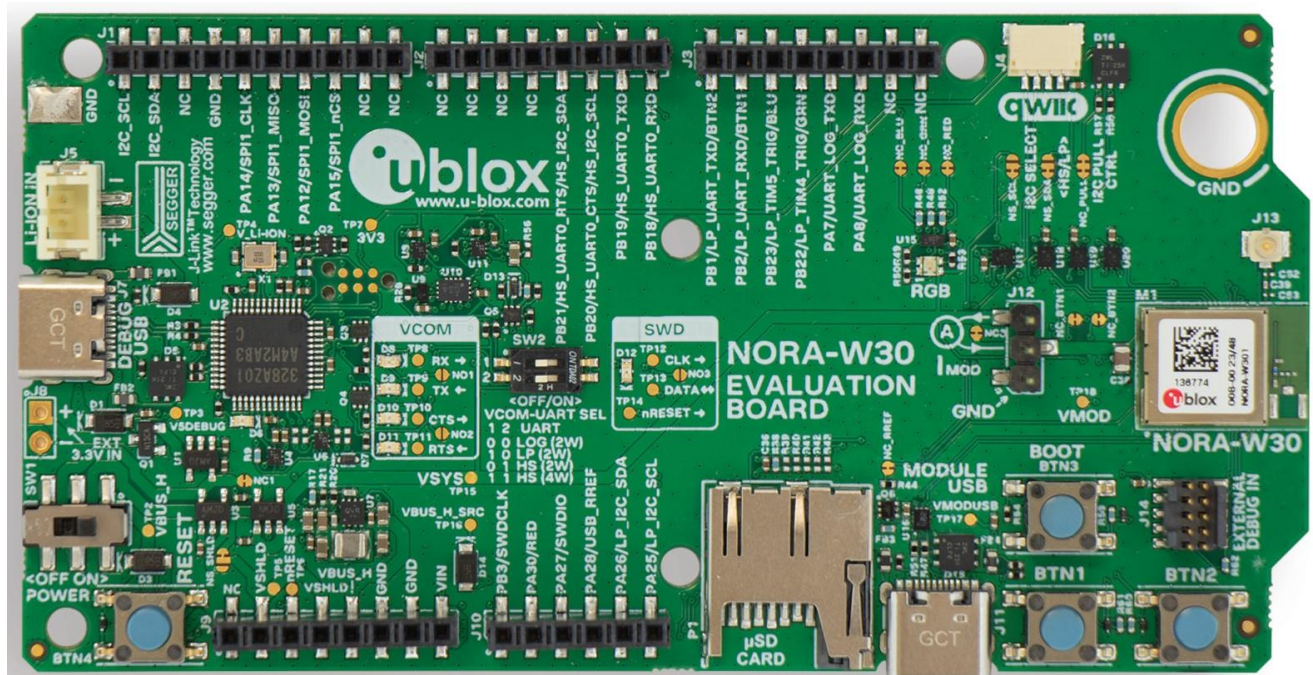


Figure 1: EVK-NORA-W30 top side (EVK-NORA-W301 shown)



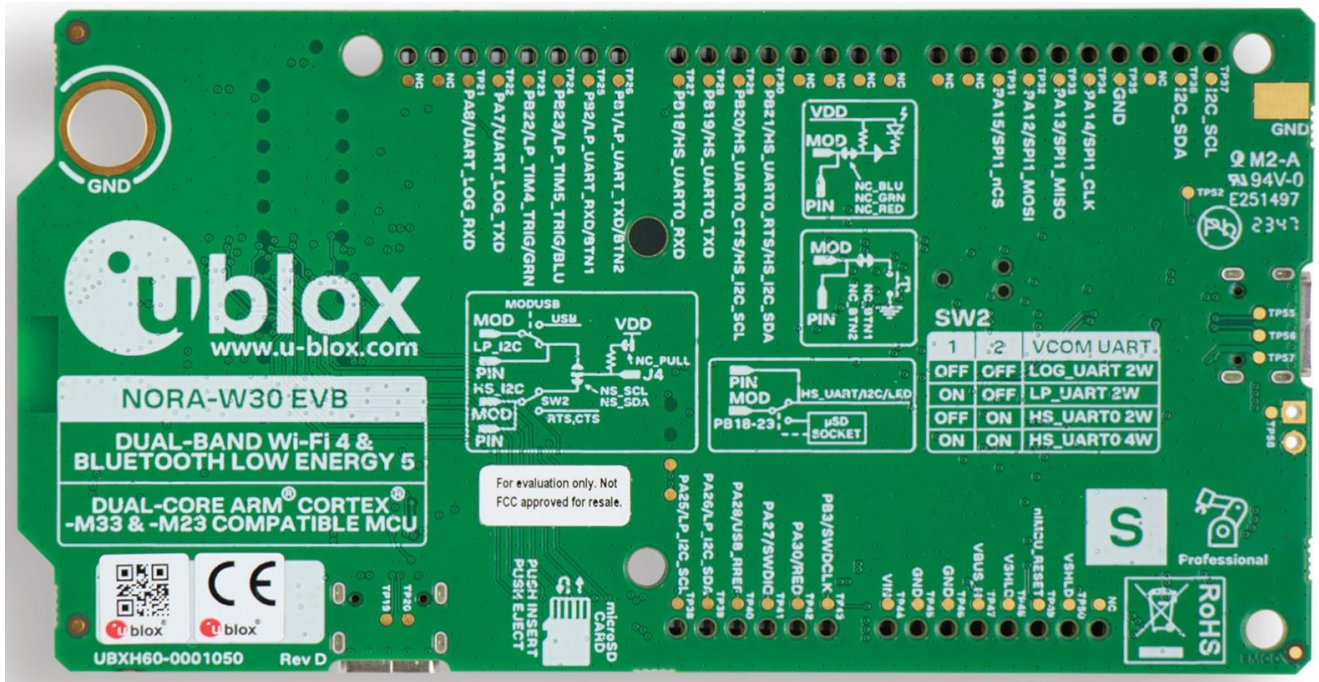


Figure 2: EVK-NORA-W30 bottom side

## 2.2 Kit includes

### 2.2.1 EVK-NORA-W301

- EVK-NORA-W30 evaluation board with NORA-W301 module
- USB-A to USB-C adapter cable
- Dual band U.FL antenna

### 2.2.2 EVK-NORA-W306

- EVK-NORA-W30 evaluation board with NORA-W306 module
- USB-A to USB-C adapter cable
- A dual-band integrated PCB trace antenna (external antenna not supplied)

## 2.3 Key features

EVK-NORA-W30 boards provide:

- Evaluation board for NORA-W301 or NORA-W306 modules
- On-board programming and debug (SEGGER J-Link-OB)
- USB-C peripheral and power connector (USB 2.0 HS)
- USB-Serial interface for connection to host systems
- COM port isolation to remove USB-Serial to allow header use
- 18 GPIO signals that can be configured for specific peripherals
- Buttons and status LEDs for user interaction
- Arduino compatible pin socket interface
- Current measurement access points from pin headers and jumpers

NORA-W30 open CPU modules, based on the Realtek RTL8720DF, provide:

- IEEE 802.11 a/b/g/n protocol Wi-Fi subsystem in 2.4 and 5 GHz bands
- Bluetooth LE subsystem supporting Bluetooth 5.3 in 2.4 GHz band
- Bluetooth LE central, peripheral, and GATT client / server roles
- AT command set for Wi-Fi and Bluetooth protocol stacks
- TLS encryption
- MQTT protocols
- WPA2/WPA3 Wi-Fi enterprise security
- Peripherals<sup>1</sup>: ADC, GPIO, I2C, I2S, IR, Key-scan, PWM, QDEC, RTC, SDIO, SPI, UART, USB

## 2.4 Block diagram

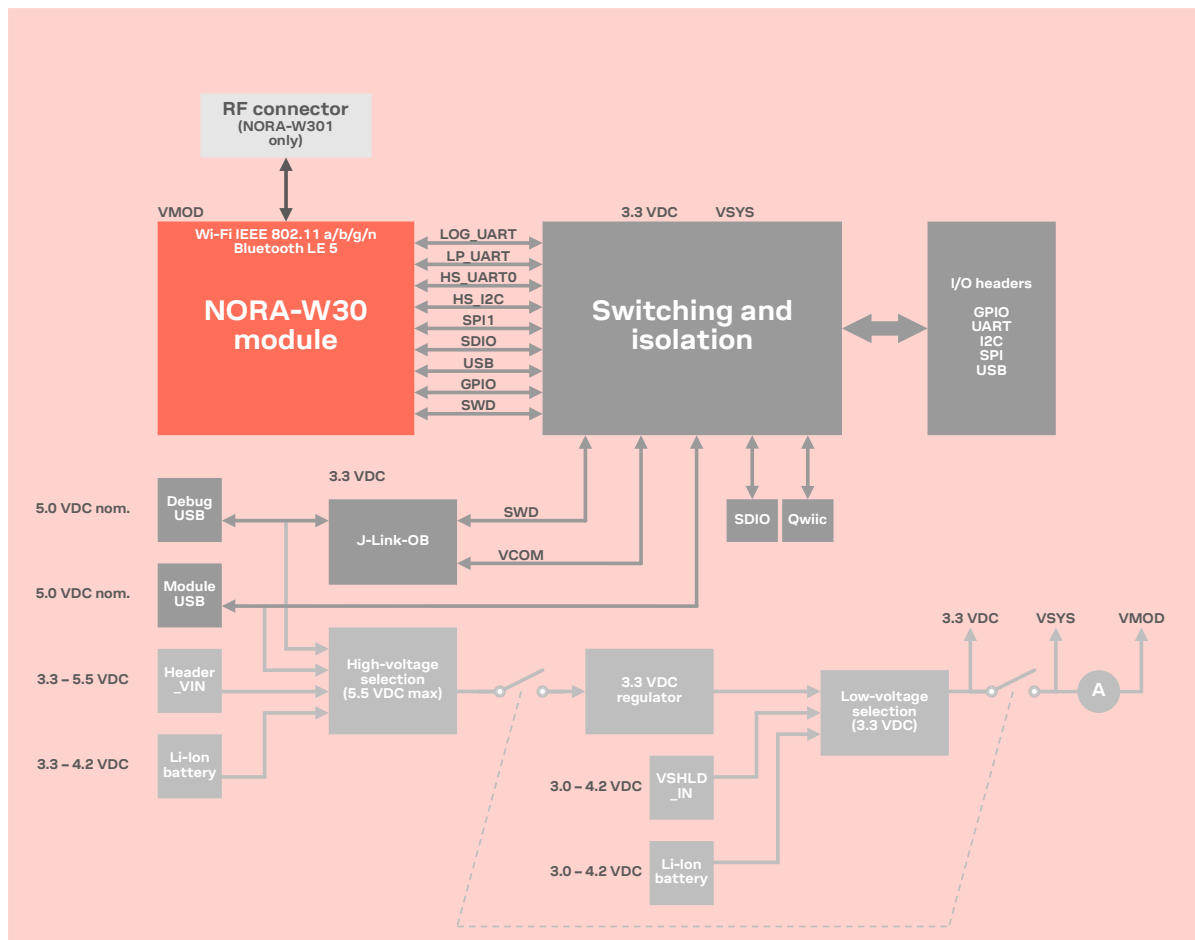


Figure 3: EVK-NORA-W30 block diagram

<sup>1</sup> Not all peripherals available simultaneously



### 3 Hardware description

The major functions provided by EVK-NORA-W30 are shown in [Figure 4](#).

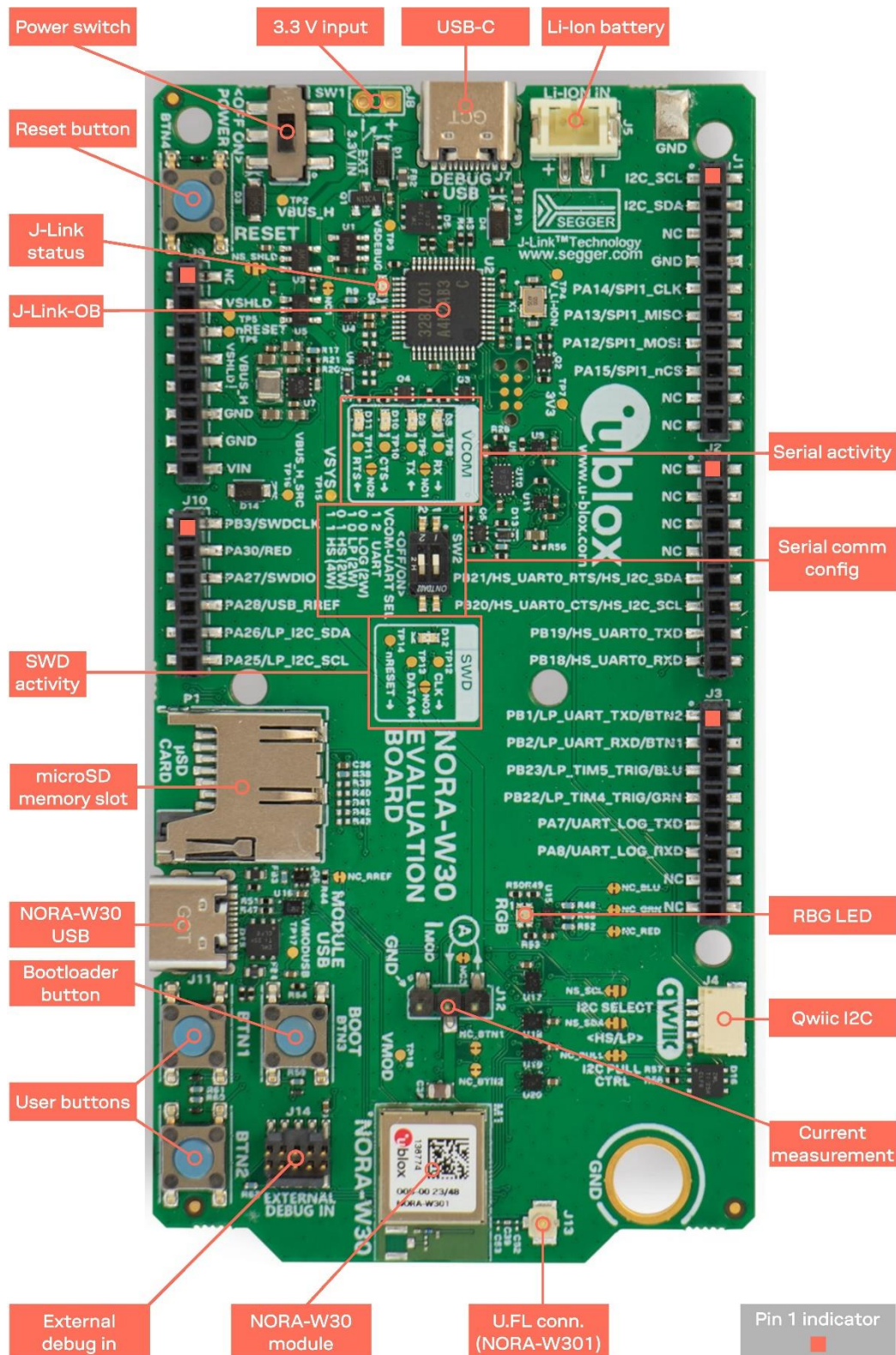


Figure 4: Header and major function locations

## 3.1 Power

EVK-NORA-W30 can be powered from five sources:

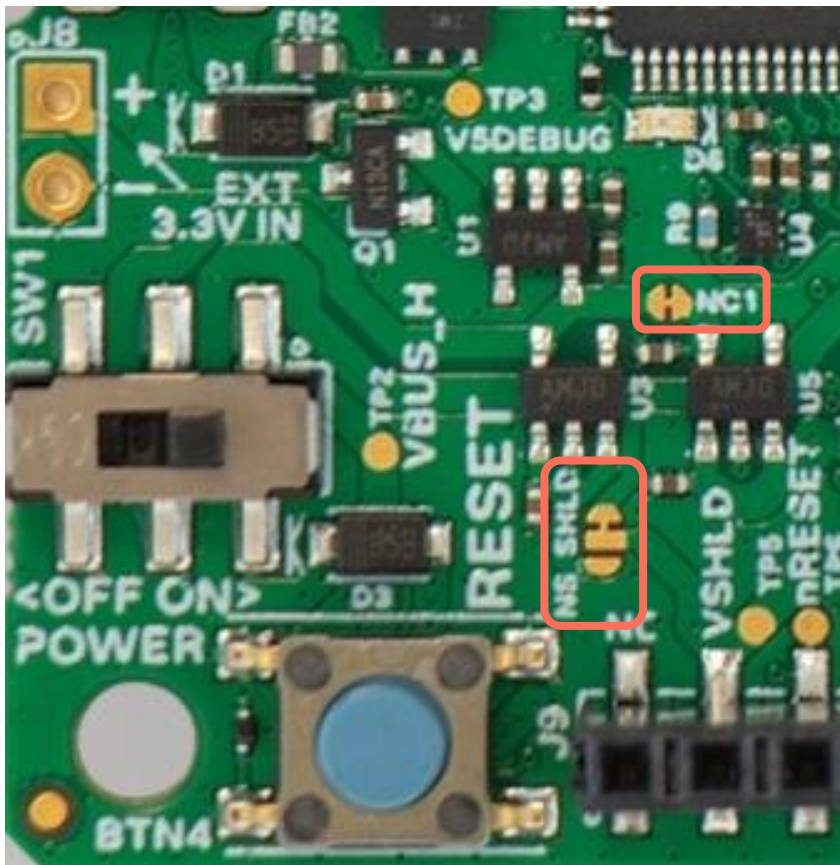
| Source             | Component / pin  | Input range     | Remarks                                                    |
|--------------------|------------------|-----------------|------------------------------------------------------------|
| USB-C (debug/UART) | J7               | 5.0 VDC nominal | Power provided by upstream USB port                        |
| USB-C (NORA-W30)   | J11              | 5.0 VDC nominal | Power provided by upstream USB port                        |
| Li-Ion battery     | J5               | 3.3 – 4.2 VDC   | An external charger may be connected during operation      |
| VIN                | J9, pin 8        | 3.3 – 5.5 VDC   | Arduino power input                                        |
| VSHLD              | J9, pins 2 and 4 | 3.0 – 3.6 VDC   | Arduino shield power<br>(requires changing jumper NS_SHLD) |
| Power header       | J8               | 3.0 – 3.6 VDC   |                                                            |

**Table 1: EVK-NORA-W30 power sources**

The power sources are protected from reverse polarity by protection diodes, which allow multiple sources to be present simultaneously.

**VSHLD** is normally a power output for a connected shield. The EVK may be powered by **VSHLD** when the jumper **NS\_SHLD** is changed. Cut the upper trace and solder across the lower pads.

When powering the EVK from either **VSHLD** or the power header, the Li-Ion battery and USB power sources can be isolated by cutting jumper NC1, as shown in [Figure 5](#). This allows disconnecting the USB cable or battery while continuing to power the module through J8 or J10, **VSHLD**.



**Figure 5: Power configuration**

After applying power to one of the sources, slide SW1 to the ON position to power-on the EVK.

### 3.1.1 Current sensing header

A single header is provided for measuring the current to the NORA-W30 power supply pins. Cut the normally closed jumper, NC3, to enable use of J12.

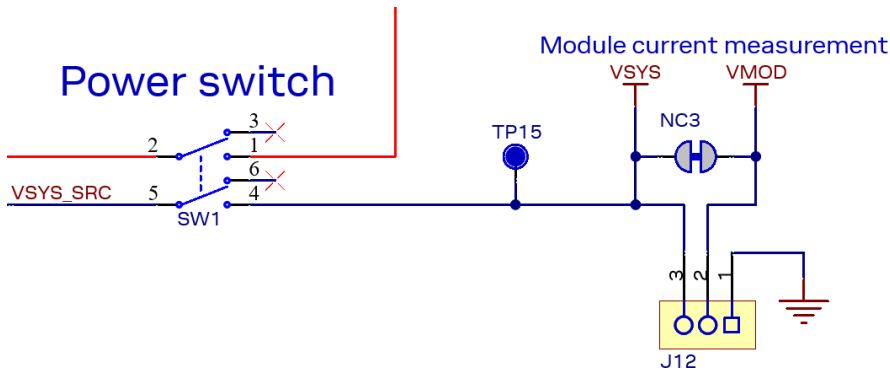


Figure 6: Current measurement

After cutting NC3, place an ammeter or power analyzer in line with pins 2 and 3. Only the current supplied to NORA-W30 through the **VMOD** power signal, connected to the **VDD** pins, is measured. Current sunk by the GPIO pins is not measured.

Pin 1 of J12 is connected to GND.

### 3.2 Reset

An active-low reset signal (**nRESET**) is connected to the NORA-W30 module, the Arduino header J10, pin 3, and a momentary button switch. Pressing the switch or driving the signal low resets NORA-W30. **nRESET** is pulled high internally, so an open-drain source may be used. Figure 7 shows the reset circuit.

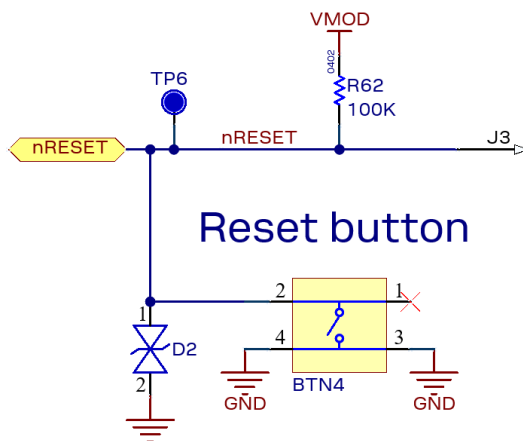


Figure 7: Reset circuit



### 3.2.1 Bootloader

The RTL8720DF within NORA-W30 includes a ROM bootloader from the factory. To use the Realtek ImageTool, see the Ameba-D application note [5], section 8.

## 3.3 Debug interface

A SEGGER J-Link-OB debug interface chip is provided on the EVK. One SWD and one VCOM interface allow debugging and UART communications to a development PC.

The EVK provides several LEDs to indicate the status of SWD and VCOM communications to the J-Link-OB interface. The SWD LED is solid when SWD port is active, either when programming or debugging the module. The VCOM LEDs are active low and flicker with activity on each signal. The SWD and VCOM LEDs are described in Table 2.



Figure 8: Communication status LEDs

| J-Link-OB interface | LED | Signal | Test point | Direction on NORA-W30 | Isolation jumper |
|---------------------|-----|--------|------------|-----------------------|------------------|
| VCOM                | D8  | _RXD   | TP8        | Input                 | NO1              |
|                     | D9  | _TXD   | TP9        | Output                |                  |
|                     | D10 | _CTS   | TP10       | Input                 | NO2              |
|                     | D11 | _RTS   | TP11       | Output                |                  |
| SWD                 | D12 | SWDCLK | TP12       | Input                 | NO3              |
|                     |     | SWDIO  | TP13       | I/O                   |                  |
|                     |     | nRESET | TP14       | Input                 |                  |

Table 2: J-Link-OB communication signals and status LED definitions

Test point voltages are referenced to the J-Link-OB interface.

### 3.3.1 Serial wire debug (SWD)

SWD is a debug interface specified by ARM® as a low pin count alternative to the traditional 4-wire JTAG debug interface. It consists of two signals, SWDCLK and SWDIO. SWD is used for programming and interactively debugging NORA-W30.

The on-board SWD interface can be isolated from NORA-W30 by soldering jumper NO3 or by connecting an external debugger to J14. See Figure 8.

When J14 is connected to an external debug probe, the on-board J-Link-OB interface is disabled.

### 3.3.2 Serial communication (VCOM)

A standard universal asynchronous receiver transmitter (UART) is also available through the J-Link-OB interface. Four signals (\_RXD, \_TXD, \_RTS, and \_CTS) are present, as shown in Table 2.

To isolate the VCOM interface from NORA-W30 signals, use SW2 to direct VCOM to other, unused, signal lines. Alternatively, solder jumpers NO1 and NO2. If VCOM **RTS** and **CTS** are not required, disable the signals by setting SW2 to 0,1 or by only soldering NO2.

The VCOM interface can be connected to one of the three available UART peripherals on the NORA-W30. Use SW2 to set your preferred configuration, as shown in [Table 3](#).

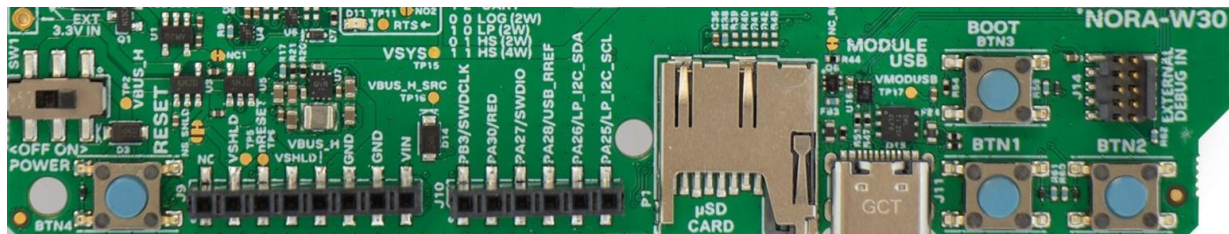
| Function                       | SW2, pos 1 | SW2, pos 2 | NORA-W30 connection to VCOM port                                                     |
|--------------------------------|------------|------------|--------------------------------------------------------------------------------------|
| LOG_UART (default)             | Off        | Off        | UART_LOG_TXD / UART_LOG_RXD                                                          |
| LP_UART                        | On         | Off        | LP_UART_TXD / LP_UART_RXD                                                            |
| HS_UART0 (2-wire) <sup>2</sup> | Off        | On         | HS_UART0_TXD / HS_UART0_RXD                                                          |
| HS_UART0 (4-wire) <sup>2</sup> | On         | On         | HS_UART0_TXD / HS_UART0_RXD<br>HS_UART0_RTS <sup>3</sup> / HS_UART0_CTS <sup>3</sup> |

**Table 3: NORA-W30 UART selections for J-Link-OB VCOM port**

LOG\_UART is used for the Realtek ROM bootloader. See also [Bootloader](#).

## 3.4 Buttons

EVK-NORA-W30 has four momentary push-button switches.



**Figure 9: Button locations**

| Button function | Reference designator | Remarks                                                                                                                                                                           |
|-----------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BTN_1           | BTN1                 | User button.<br>Shares signal with LP_UART_RXD.                                                                                                                                   |
| BTN_2           | BTN2                 | User button.<br>Shares signal with LP_UART_TXD.                                                                                                                                   |
| BOOT            | BTN3                 | Pressing BTN3 while power-cycling the EVK or resetting the module (BTN4) starts the Realtek bootloader.<br>Shares signal with UART_LOG_TXD. See also <a href="#">Bootloader</a> . |
| RESET           | BTN4                 | Pressing BTN4 resets module and circuitry connected to J10, pin 3                                                                                                                 |

**Table 4: Button definitions**

<sup>2</sup> External storage not available for applications

<sup>3</sup> GPIO PB[20], PB[21] not available for applications



## 3.5 User RGB LED

The active-low tricolor RGB LED is available on PA[30], PB[22], and PB[23].

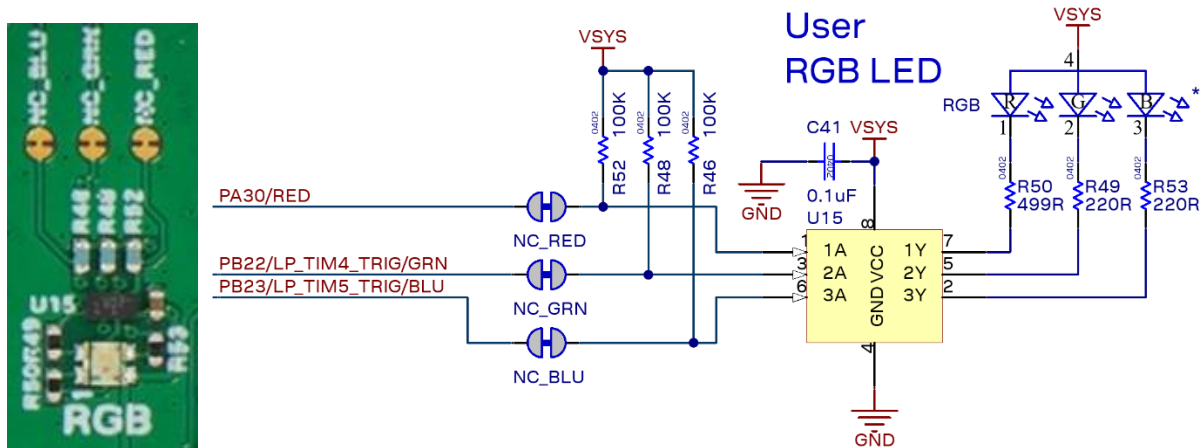


Figure 10: RGB LED and schematic

Each element and corresponding pull-up resistor of the RGB LED can be disabled by cutting its associated jumper, as shown in [Figure 10](#) and [Table 5](#).

| RGB color | Disable jumper | GPIO signal        |
|-----------|----------------|--------------------|
| Red       | NC_RED         | PA[30]/RED         |
| Green     | NC_GRN         | PB[22]/LP_TIM4/GRN |
| Blue      | NC_BLU         | PB[23]/LP_TIM5/BLU |

Table 5: User RGB LED configuration

## 3.6 USB

A Universal Serial Bus (USB) connection is available on NORA-W30. The second USB connector, J11, is connected whenever the port is connected to an upstream USB port.

The PA[26] (HSDP or USB\_D+) and PA[25] (HSDM or USB\_D-) signals can be configured for other peripheral functions by disconnecting the module USB port, J11.

A 12 kΩ resistor connected between USB\_RREF and ground is required for USB functionality. The resistor is automatically attached to the PA[28] signal whenever the module USB port (J11) is connected to an upstream USB port. If the signal is required for other functions and USB is not needed, the resistor can also be removed from the PA[28] signal by cutting NC\_RREF of PA[28].

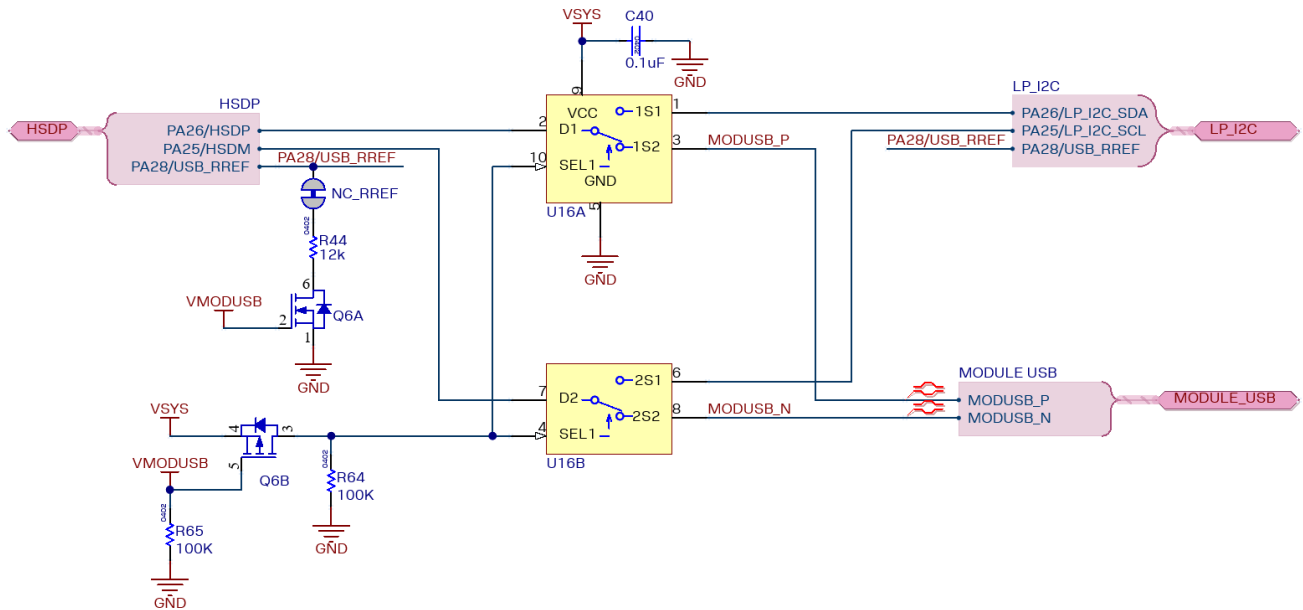


Figure 11: USB / I2C function selection

## 3.7 I2C / Qwiic

Two I2C peripherals are available on EVK-NORA-W30. See [USB](#) for EVK pin configuration.

The HS\_I2C peripheral is shared with HS\_UART pins and the LP\_I2C peripheral with the USB pins. To use the HS\_I2C peripheral, configure SW2, positions 1 and 2 for HS\_UART0 (2-wire) to disable the UART hardware flow control. **HS\_UART0\_RTS** can be assigned to the alternate function of **HS\_USI\_I2C\_SCL**. **HS\_UART0\_CTS** can be assigned to the alternate function of **HS\_USI\_I2C\_SDA** on the EVK. See [1], table 6, and [2], table 4. In this configuration, the HS\_UART0 and HS\_USI\_I2C peripherals can both be enabled by the application.

## 3.8 SPI

EVK-NORA-W30 supports usage of the SPI1 peripheral on PA[12] through PA[15] and these signals are accessible on the J1 Arduino header at pins 5-8.

### 3.8.1 SDIO / microSD socket

A SDIO interface is available in the form of a microSD socket. Inserting a memory card or adapter into the socket enables the SDIO interface and disables HS\_UART0, HS\_I2C, the green and blue elements of the RGB LED, and any other peripherals on PB[18]-PB[23]. External storage may be added to the EVK with the microSD socket.

The microSD socket can also be used as a high-speed SDIO interface to obtain the highest Wi-Fi throughput.

### 3.9 Header pin-out

EVK-NORA-W30 can be used independently, with a host PC over USB, or connected to an Arduino host/shield through headers J1, J2, J3, J9, and J10.

| J1 pin | Direction | GPIO port | Available peripherals                                          | Remarks                                                                                                                                                         |
|--------|-----------|-----------|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | I/O       | I2C_SCL   |                                                                | Except when SW2 configured for HS_UART0 with hardware flow control. Defaults to HS_I2C peripheral. See also <a href="#">Table 3</a>                             |
| 2      | I/O       | I2C_SDA   |                                                                | Except when SW2 configured for HS_UART0 with hardware flow control. Defaults to HS_I2C peripheral. See also <a href="#">Table 3</a>                             |
| 3      |           | n/c       |                                                                |                                                                                                                                                                 |
| 4      |           | GND       |                                                                |                                                                                                                                                                 |
| 5      | I/O       | PA[14]    | SPI1_CLK, LP_UART_RTS, I2S_SD_TX2, KEY_ROW2                    | Only certain peripherals are available at one time. See also the pin multiplexing table data in the system integration manual <a href="#">[2]</a> . Arduino D13 |
| 6      | I/O       | PA[13]    | SPI1_MISO, LP_UART_RXD, HS_PWM1, LP_PWM1, I2S_SD_TX1, KEY_ROW1 | Only certain peripherals are available at one time. See also the pin multiplexing table data in the system integration manual <a href="#">[2]</a> . Arduino D12 |
| 7      | I/O       | PA[12]    | SPI1_MOSI, LP_UART_TXD, HS_PWM0, LP_PWM0, I2S_MCLK, KEY_ROW0   | Only certain peripherals are available at one time. See also the pin multiplexing table data in the system integration manual <a href="#">[2]</a> . Arduino D11 |
| 8      | I/O       | PA[15]    | SPI1_CS, LP_UART_CTS, KEY_ROW2, KEY_COL6                       | Only certain peripherals are available at one time. See also the pin multiplexing table data in the system integration manual <a href="#">[2]</a> . Arduino D10 |
| 9      |           | n/c       |                                                                |                                                                                                                                                                 |
| 10     |           | n/c       |                                                                |                                                                                                                                                                 |

**Table 6: J1 pin-out**

| J2 pin | Direction | Signal | Available peripherals                                                                               | Remarks                                                                                                                                                        |
|--------|-----------|--------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      |           | n/c    |                                                                                                     |                                                                                                                                                                |
| 2      |           | n/c    |                                                                                                     |                                                                                                                                                                |
| 3      |           | n/c    |                                                                                                     |                                                                                                                                                                |
| 4      |           | n/c    |                                                                                                     |                                                                                                                                                                |
| 5      | I/O       | PB[21] | HS_UART0_RTS, HS_USI_I2C_SDA, HS_USI_UART_RXD, SPI0_CS, SD_CLK, HS_PWM13, LP_PWM1, I2S_WS, QDEC_IDX | Only certain peripherals are available at one time. See also the pin multiplexing table data in the system integration manual <a href="#">[2]</a> . Arduino D3 |
| 6      | I/O       | PB[20] | HS_UART0_CTS, HS_USI_I2C_SCL, HS_USI_UART_TXD, SPI0_CLK, SD_CMD, HS_PWM12, LP_PWM0, I2S_CLK         | Only certain peripherals are available at one time. See also the pin multiplexing table data in the system integration manual <a href="#">[2]</a> . Arduino D2 |

| J2 pin | Direction | Signal | Available peripherals                                                                    | Remarks                                                                                                                                                                 |
|--------|-----------|--------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7      | I/O       | PB[19] | HS_UART0_TXD, HS_USI_UART_CTS, SPI0_MISO, SD_D3, HS_PWM11, LP_PWM5, SWD_DATA, I2S_SD_TX0 | Only certain peripherals are available at one time. See also the pin multiplexing table data in the system integration manual <a href="#">[2]</a> .<br>Arduino D1 / TXD |
| 8      | I/O       | PB[18] | HS_UART0_RXD, HS_USI_UART_RTS, SPI0_MOSI, SD_D2, HS_PWM10, LP_PWM4, SWD_CLK              | Only certain peripherals are available at one time. See also the pin multiplexing table data in the system integration manual <a href="#">[2]</a> .<br>Arduino D0 / RXD |

**Table 7: J2 pin-out**

| J3 pin | Direction | Signal | Available peripherals                                               | Remarks                                                                                                                                                                                                                     |
|--------|-----------|--------|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | I/O       | PB[1]  | LP_UART_TXD, HS_TIM4_TRIG                                           | Analog capable<br>Connected to button BTN2<br>Only certain peripherals are available at one time. See also the pin multiplexing table data in the system integration manual <a href="#">[2]</a> .<br>Arduino D14 / UART out |
| 2      | I/O       | PB[2]  | LP_UART_RXD, HS_TIM5_TRIG                                           | Analog capable<br>Connected to button BTN1<br>Only certain peripherals are available at one time. See also the pin multiplexing table data in the system integration manual <a href="#">[2]</a> .<br>Arduino D15 / UART in  |
| 3      | I/O       | PB[23] | LP_TIM5_TRIG, SD_D1, HS_PWM15, LP_PWM3, I2S_MCLK, QDEC_PHA, EXT_32K | RGB LED - blue element control<br>Only certain peripherals are available at one time. See also the pin multiplexing table data in the system integration manual <a href="#">[2]</a> .<br>Arduino D16                        |
| 4      | I/O       | PB[22] | LP_TIM4_TRIG, SD_D0, HS_PWM14, LP_PWM2, I2S_SD_RX, QDEC_PHB         | RGB LED - green element control<br>Only certain peripherals are available at one time. See also the pin multiplexing table data in the system integration manual <a href="#">[2]</a> .<br>Arduino D17                       |
| 5      | I/O       | PA[7]  | UART_LOG_TXD                                                        | Only certain peripherals are available at one time. See also the pin multiplexing table data in the system integration manual <a href="#">[2]</a> .<br>Arduino D18                                                          |
| 6      | I/O       | PA[8]  | UART_LOG_RXD                                                        | Only certain peripherals are available at one time. See also the pin multiplexing table data in the system integration manual <a href="#">[2]</a> .<br>Arduino D19                                                          |
| 7      |           | n/c    |                                                                     |                                                                                                                                                                                                                             |
| 8      |           | n/c    |                                                                     |                                                                                                                                                                                                                             |

**Table 8: J3 pin-out**



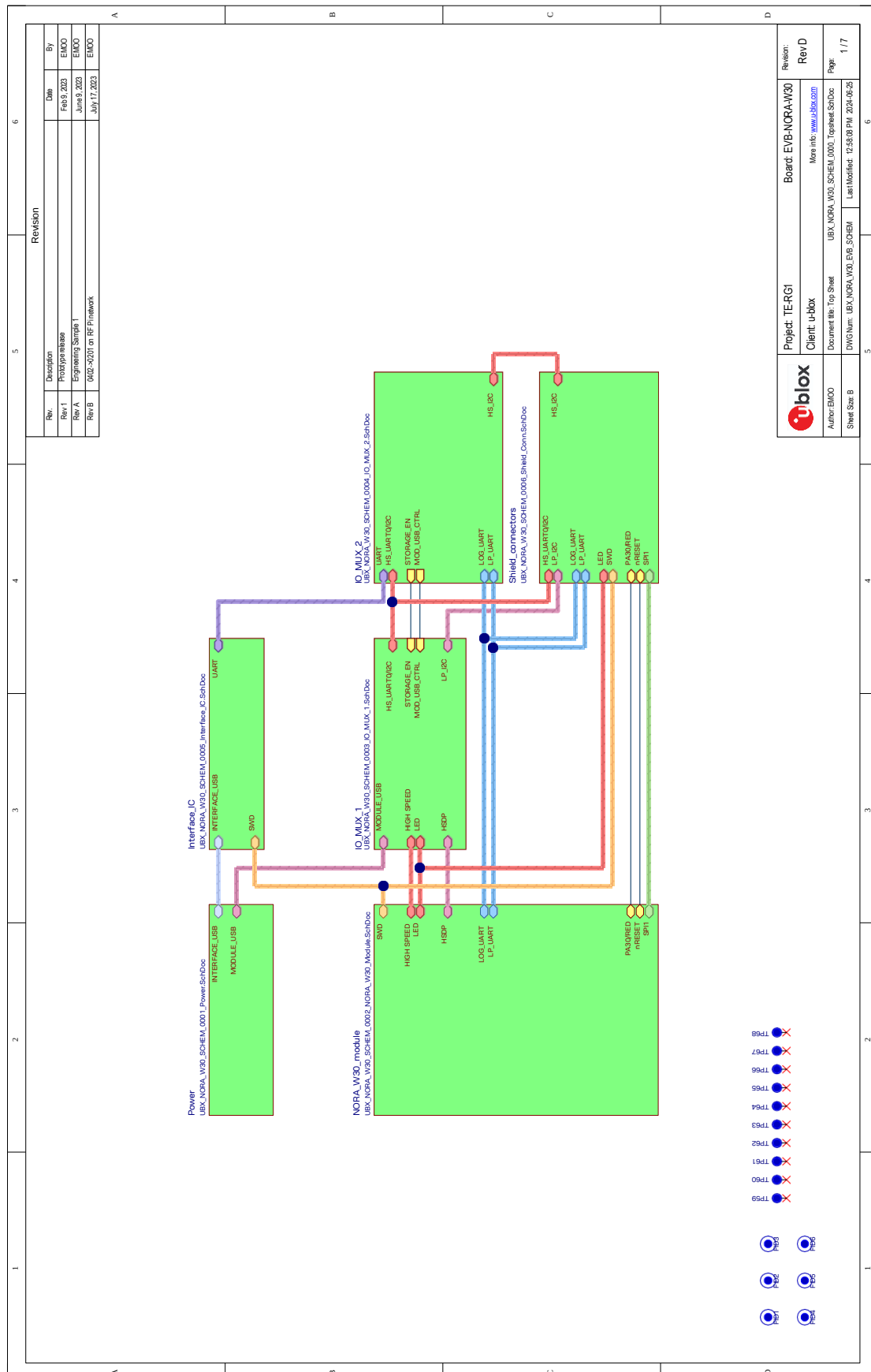
| J9 pin | Direction | Signal | Remarks – see also <a href="#">Power</a>                             |
|--------|-----------|--------|----------------------------------------------------------------------|
| 1      |           | n/c    |                                                                      |
| 2      |           | VSHLD  | 3.3 VDC nominal<br>Arduino IOREF                                     |
| 3      | I         | nRESET | Active-low reset input                                               |
| 4      |           | VSHLD  | 3.3 VDC nominal<br>Arduino 3V3                                       |
| 5      |           | VBUS_H | 5.0 VDC nominal with USB,<br>3.3 – 4.2 VDC with Li-Ion<br>Arduino 5V |
| 6      |           | GND    |                                                                      |
| 7      |           | GND    |                                                                      |
| 8      |           | VIN    | 5.0 VDC nominal<br>Arduino 5V                                        |

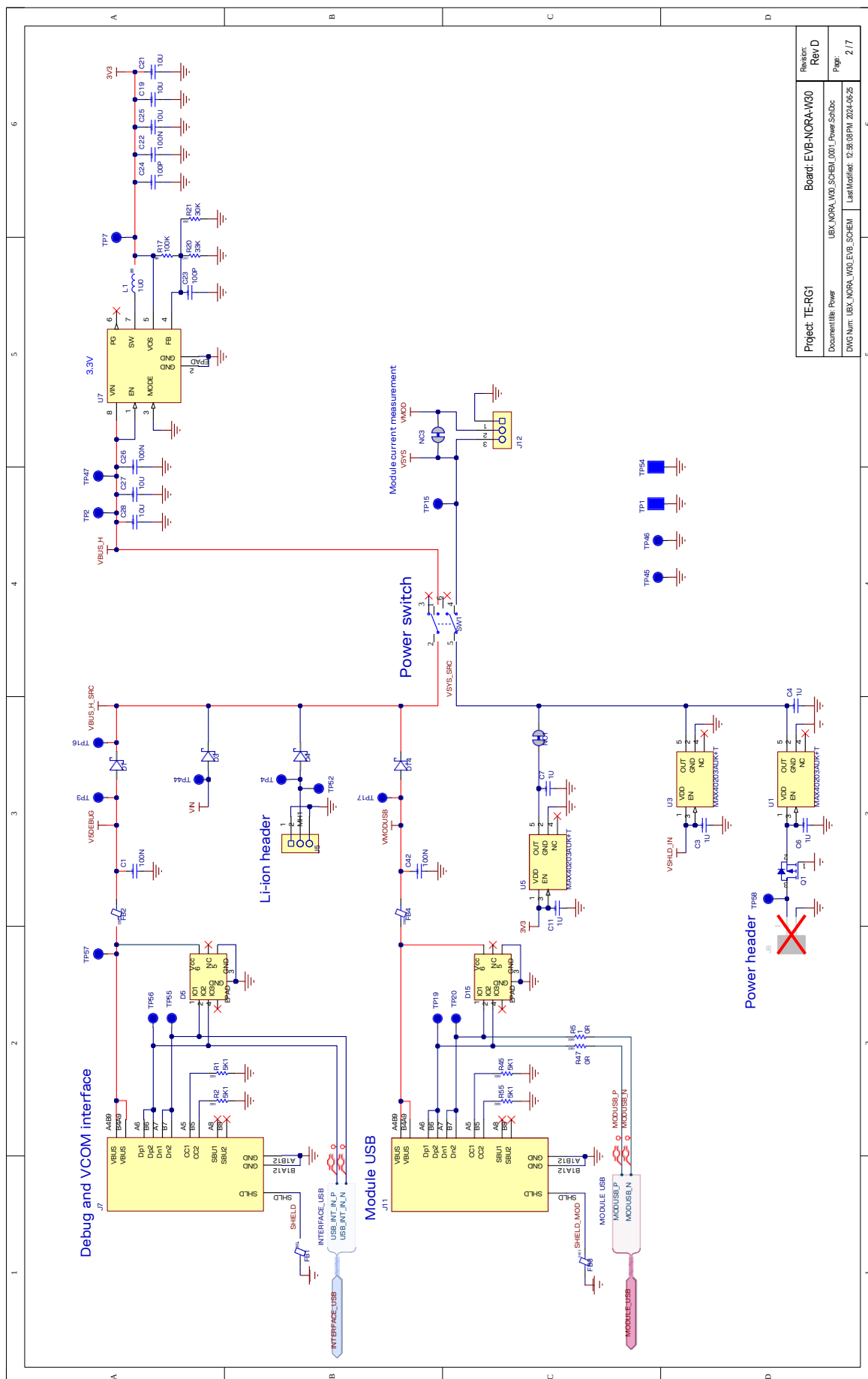
**Table 9: J9 pin-out**

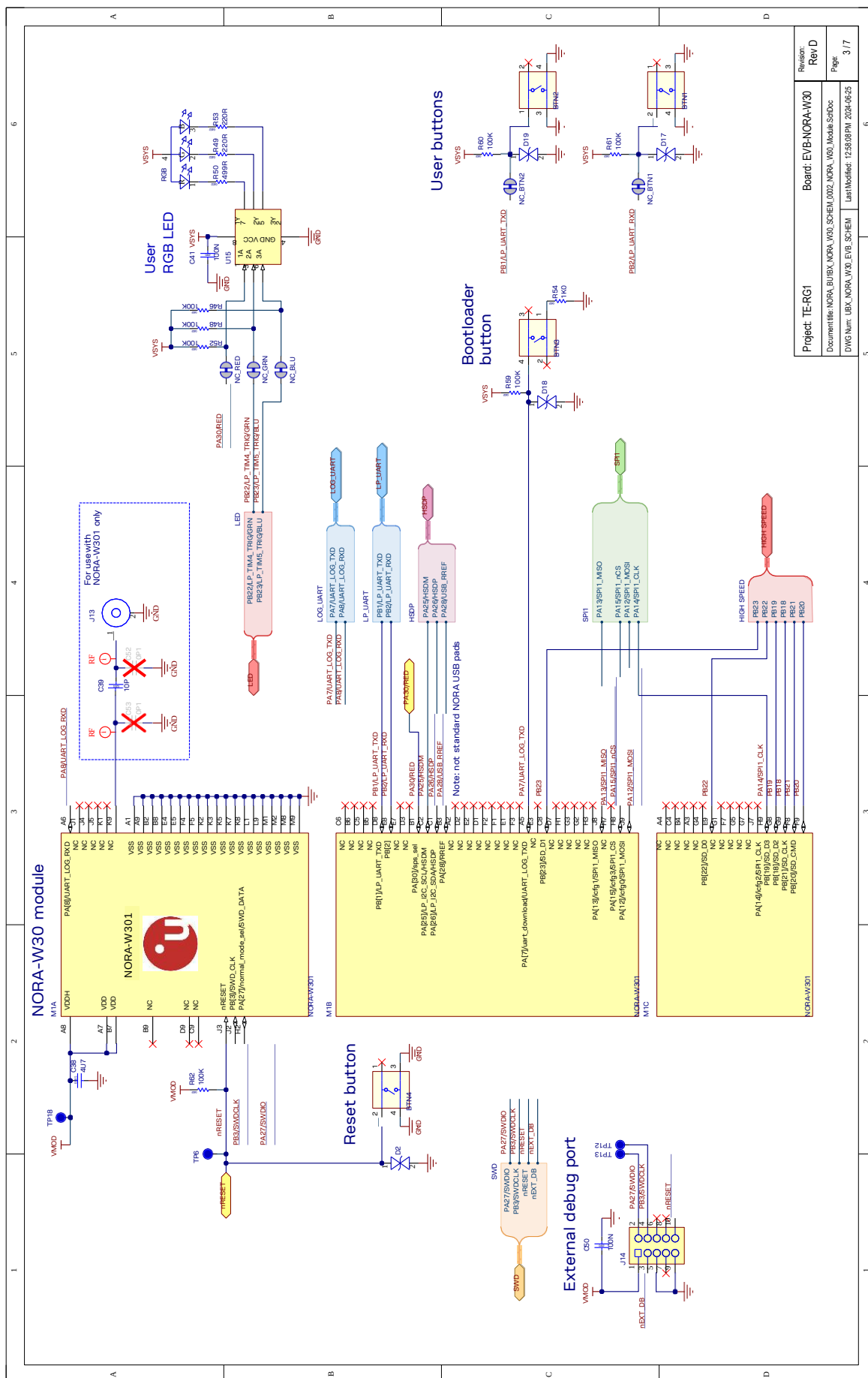
| J10 pin | Direction | Signal | Available peripherals                                                   | Remarks                                                                                                                                                     |
|---------|-----------|--------|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | I/O       | PB[3]  | SWD_CLK                                                                 | SWD_CLK default, analog capable<br>Only certain peripherals are available at one time. See <a href="#">[2]</a> , pin multiplexing table data.<br>Arduino A0 |
| 2       | I/O       | PA[30] | HS_USI_SPI_CLK, HS_PWM7, LP_PWM1                                        | RGB LED - red element control<br>Only certain peripherals are available at one time. See <a href="#">[2]</a> , pin multiplexing table data.<br>Arduino A1   |
| 3       | I/O       | PA[27] | SWD_DATA, LP_UART_RTS                                                   | SWD_DATA default,<br>Only certain peripherals are available at one time. See <a href="#">[2]</a> , pin multiplexing table data.<br>Arduino A2               |
| 4       | I/O       | PA[28] | USB_RREF, LP_UART_CTS, HS_USI_SPI_CS, HS_PWM6, LP_PWM0                  | Only certain peripherals are available at one time. See <a href="#">[2]</a> , pin multiplexing table data.<br>Arduino A3                                    |
| 5       | I/O       | PA[26] | LP_UART_TXD, HS_USI_SPI_MISO, IR_RX, LP_I2C_SDA, HS_PWM5, LP_PWM5, HSDP | Only certain peripherals are available at one time. See <a href="#">[2]</a> , pin multiplexing table data.<br>Arduino A4                                    |
| 6       | I/O       | PA[25] | LP_UART_RXD, HS_USI_SPI_MOSI, IR_TX, LP_I2C_SCL, HS_PWM4, LP_PWM4, HSDM | Only certain peripherals are available at one time. See <a href="#">[2]</a> , pin multiplexing table data.<br>Arduino A5                                    |

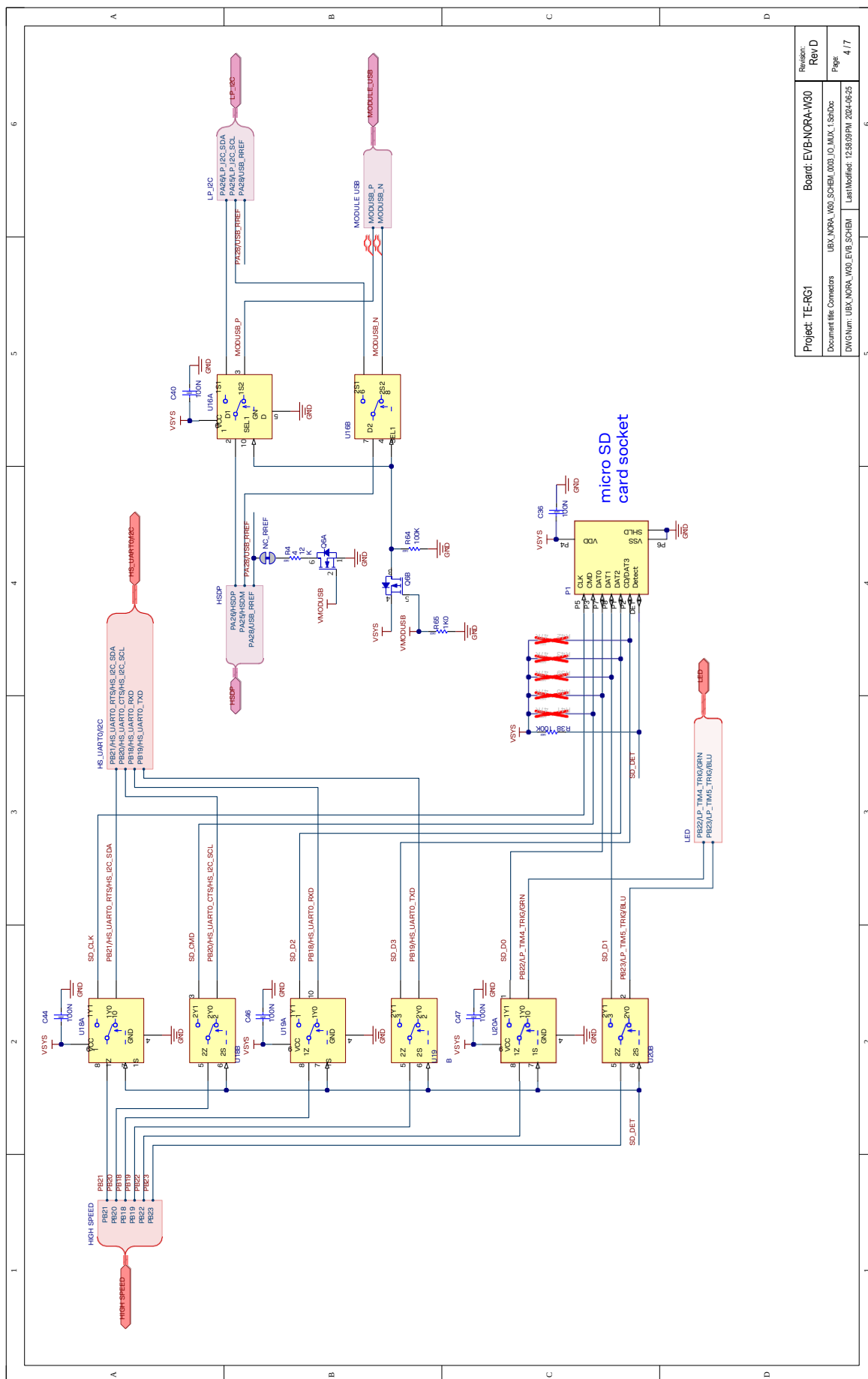
**Table 10: J10 pin-out**

## 4 Evaluation board schematics

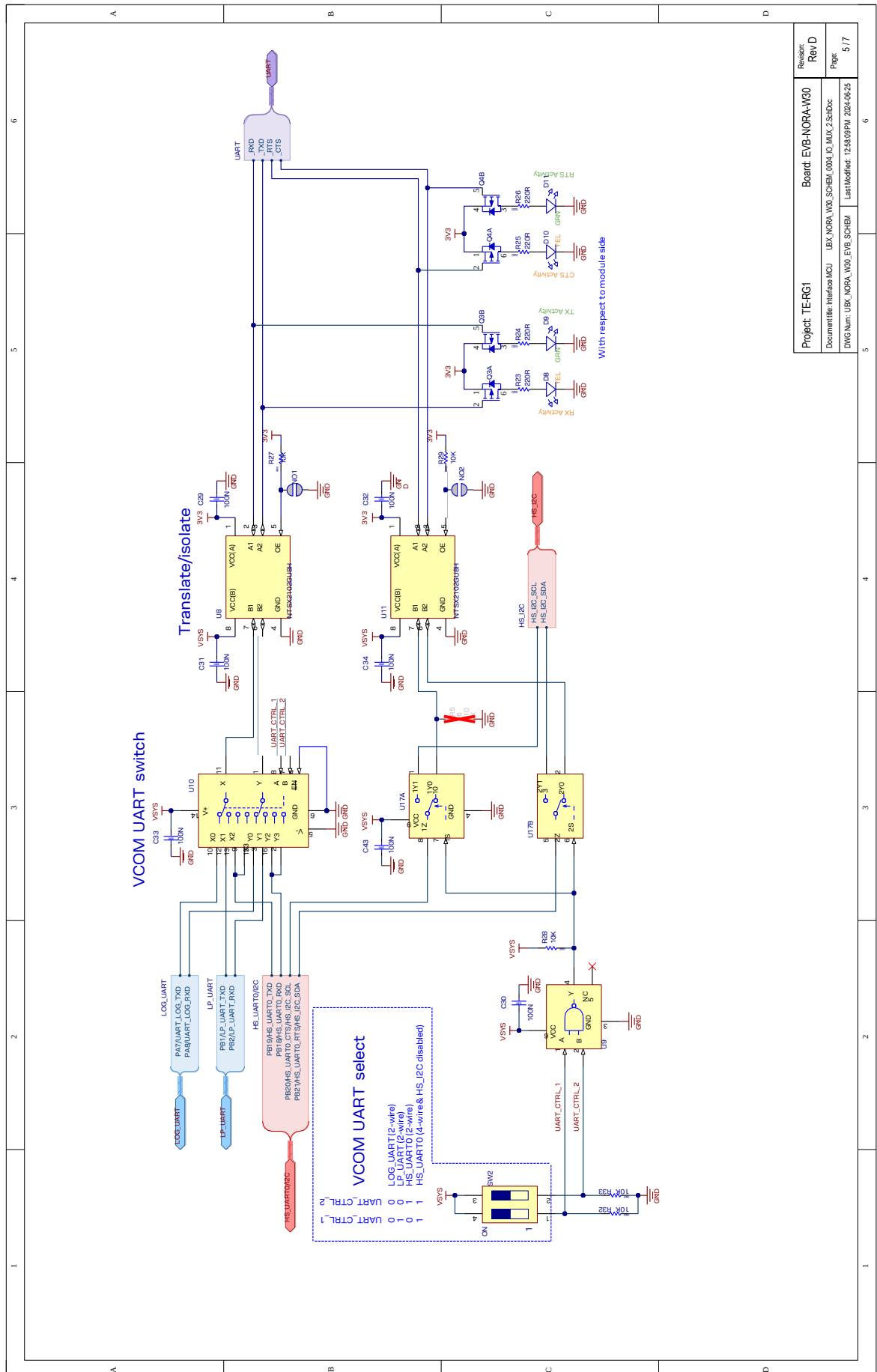


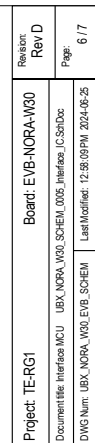


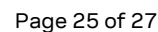












# Appendix A

## Glossary

| Abbreviation          | Definition                                          |
|-----------------------|-----------------------------------------------------|
| ARM                   | Arm (Advanced RISC Machines) Holdings               |
| GPIO                  | General Purpose Input / Output                      |
| I2C                   | Inter-Integrated Circuit                            |
| LE                    | Low Energy                                          |
| PCB                   | Printed Circuit Board                               |
| PCBA                  | Printed Circuit Board Assembly                      |
| PWM                   | Pulse Width Modulation                              |
| Q-Decoder (also QDEC) | Quadrature Decoder                                  |
| RAM                   | Random Access Memory                                |
| RF                    | Radio Frequency                                     |
| RTC                   | Real-Time Clock                                     |
| SDK                   | Software Development Kit                            |
| SPI                   | Serial Peripheral Interface                         |
| SWD                   | Serial Wire Debug                                   |
| UART                  | Universal Asynchronous Receiver Transmitter         |
| USI                   | Universal Serial Interface (see I2C, SPI, and UART) |
| WPA                   | Wi-Fi Protected Access                              |

**Table 11: Explanation of the abbreviations and terms used**

## Related documentation

- [1] NORA-W30 data sheet, [UBX-22021117](#)
- [2] NORA-W30 system integration manual, [UBX-22021119](#)
- [3] Realtek UM0401 RTL872xD [data sheet](#)
- [4] Realtek UM0400 Ameba-D [user manual](#)
- [5] Realtek AN0400 Ameba-D [application note](#)
- [6] Realtek Ameba IoT [website](#)
- [7] Realtek GitHub [Ameba IoT site](#)
- [8] Realtek GitHub [Ameba-D standard SDK repository](#)
- [9] Realtek GitHub [Ameba-D Arduino repository](#)
- [10] Realtek Ameba IoT [support forum](#)
- [11] Arduino IDE [website](#)

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## Revision history

| Revision | Date        | Name | Comments                                                                                                                                                                                                                                                                                                           |
|----------|-------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| R01      | 06-Nov-2023 | brec | Initial release                                                                                                                                                                                                                                                                                                    |
| R02      | 17-Jul-2024 | brec | Updated document status, updated order of signals <a href="#">Table 2</a> , corrected LP and HS UART selection in <a href="#">Table 3</a> , added button references in <a href="#">Table 8</a> , updated board images with corrected UART selection table, and added <a href="#">Evaluation board schematics</a> . |

## Contact

### u-blox AG

Address: Zürcherstrasse 68  
8800 Thalwil  
Switzerland

For further support and contact information, visit us at [www.u-blox.com/support](http://www.u-blox.com/support).