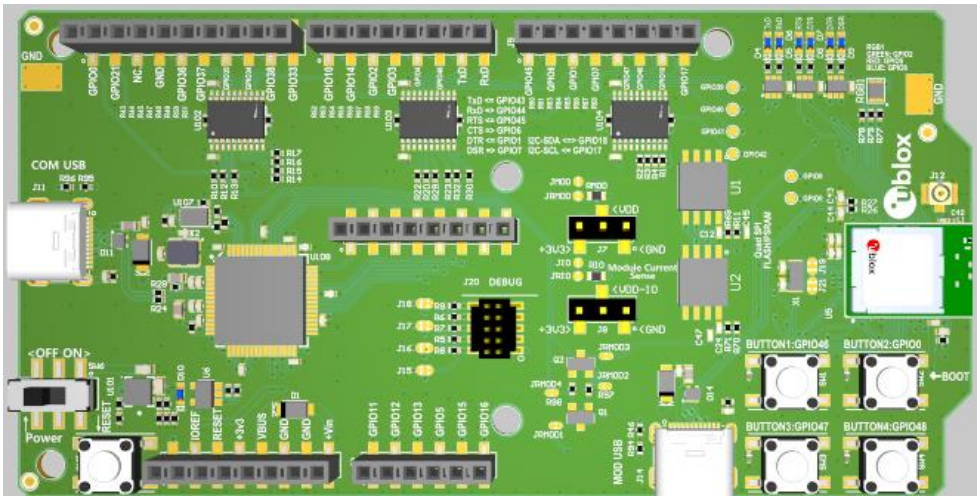
EVK-NORA-W10

Evaluation kit for NORA-W10 series modules

User guide



Abstract

The document describes how to set up the EVK-NORA-W101 and EVK-NORA-W106 evaluation kits to evaluate the NORA-W10 series modules. To obtain the different options for debugging and the development capabilities included in the evaluation board see NORA-W10 system integration manual [2].

Document information

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Product status	**Corresponding content status**	
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:

Product name	**Document status**
EVK-NORA-W101	Objective specification
EVK-NORA-W106	Objective specification

☞ For information about the hardware, software, and status of the available product types, see the NORA-W10 data sheet [1].

Contents

1 Product description

The EVK-NORA-W10 evaluation kit provides stand-alone use of the NORA-W10 series module.

All features of the NORA-W10 series modules are easily accessed from the evaluation board. A simple USB connection provides power, programming, and COM ports. Four user buttons are available, as well as a USB peripheral connector, user LEDs, and a reset button.

GPIO signals are available on headers that are compatible with the Arduino® form factor. This allows easy use of existing Arduino shields. Current sense resistors allow for measuring current into the module and into the shield.

This guide provides setup instructions for starting development and describes the hardware functionality of the EVK-NORA-W10 board.

1.1 Key features

- Used for evaluation of NORA-W101 or NORA-W106 modules
- COM ports and debug ports over USB
- Full GPIO of the NORA-W1 series
- Buttons and LEDs for user interaction
- 32.768 kHz Crystal
- USB peripheral connector
- Power input via USB-C or pin sockets
- Current measurements via pin headers and jumpers

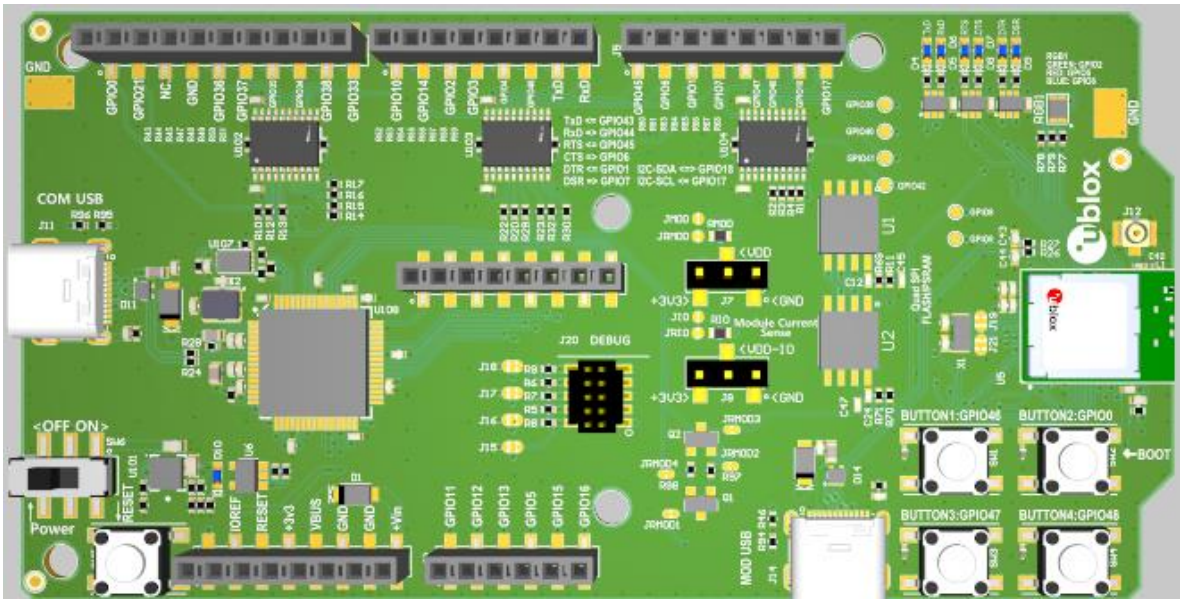

Figure 1: EVK-NORA-W10 evaluation board (top view)

1.2 Items included in kit

1.2.1 EVK-NORA-W101 kit contents

- EVK-NORA-W10 evaluation board with NORA-W101 module
- USB-C to USB-A cable
- 2.4 GHz U.FL antenna kit

1.2.2 EVK-NORA-W106 kit contents

- EVK-NORA-W10 evaluation board with NORA-W106 module
- USB-C to USB-A cable
- 2.4 GHz antenna integrated onto NORA-W106 module (no external antenna)

2 Setting up the evaluation board

The EVK-NORA-W10 is delivered without any software (open CPU) and the software must be developed by the user.

The following devices are applicable:

- EVK-NORA-W101
- EVK-NORA-W106

The module is designed to be used only with the applicable software and only compatible software can be flashed on the module.

Connect external power supply to the EVK as described in Powering the board. The status light (D10) (green) lights up, indicating that the internal EVK 3.3 V is on.

⚠ When using the evaluation board with external antenna, before powering up the EVK, ensure that you have connected the 2.4 GHz antenna with the U.FL antenna connector (J12). Failing to do so may cause undesired operation.

⚠ Observe that the inrush current when powering-up the EVK can be significantly higher than during normal operation.

The operating system will install the correct COM port drivers automatically. The drivers will need to be installed only when you connect the unit to a new computer for the first time. For more information about the COM ports and their configuration, see the FTDI FT231XQ-R Datasheet [3].

One COM port will automatically be assigned to the unit by the Windows OS. To view the assigned COM ports on Windows 10, follow the steps mentioned below:

- Open the **Control Panel** and click **Hardware and Sound**.
- Click **Device Manager** in **Devices and Printers**. This will open the Device Manager window where you can view the assigned COM ports.

The NORA-W10 open CPU variants are to be used when developing custom software based on the Espressif SDK ESP-IDF. Before compiling custom software, the ESP-IDF must be configured for the NORA-W10 open CPU variant.

More information on this topic can be found in the NORA-W10 system integration manual [2].

3 Hardware description

Design files for the EVK-NORA-W10 PCB may be requested from your local u-blox support team.

3.1 Power

The EVK-NORA-W1 has three possible power sources, as listed below:

- USB from the debug interface
- USB peripheral on the NORA-W1 itself
- 2.54 mm pitch pin header (J1 pin-8) for supplying + 5 V [3.6 – 5.5 V]

Each of the three power sources are separated via a Schottky diode (D1 – D3, MBR120VLSFT3G). This prevents reverse voltage to any of the other supplies thus the power sources can be connected simultaneously.

⚠ Only if the power protection circuits are left intact can the USB be safely connected at the same time as external power. This makes programming of the module easier.

⚠ The EVK USB type C connectors are only capable of handling 5 V input, 12 V is not allowed.

3.1.1 Powering the board

By moving the power switch to "ON" **VBUS** is fed into the 3.3 V LDO regulator and the board is powered-up. This is indicated by the power LED D10 (green) lights up. The LDO regulator powers the **+3V3, VDD**, and **VDD-IO** power rails.

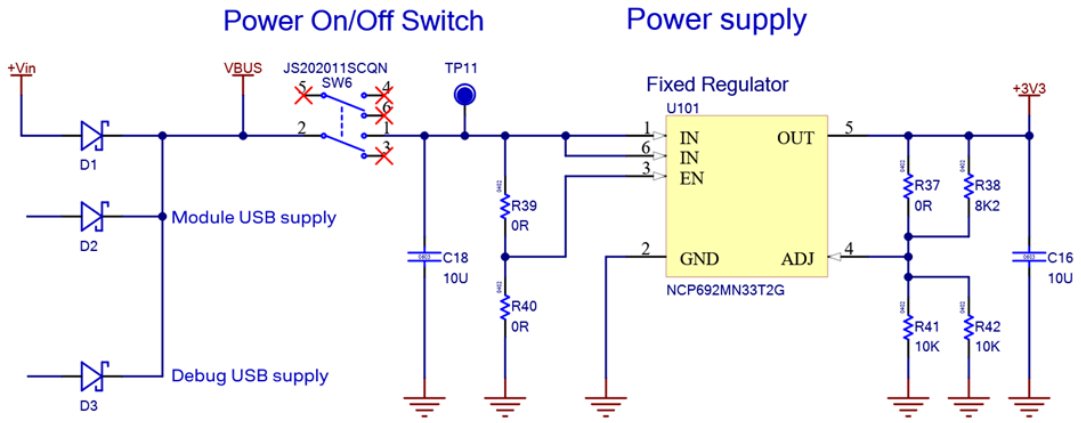

Figure 2: EVK schematic - power supply

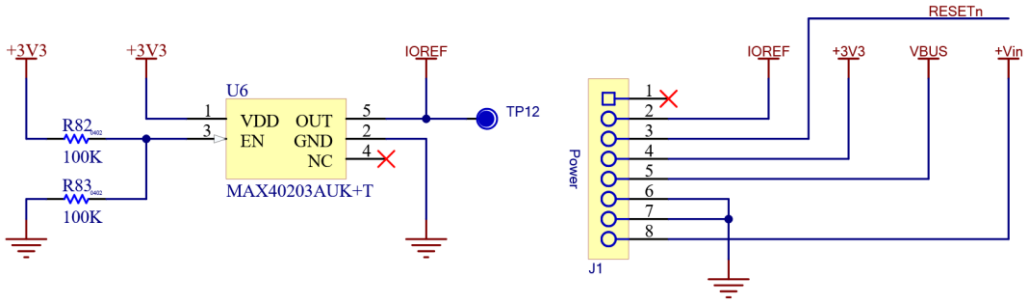

Figure 3: EVK schematic - IOREF separation

+3V3 (J1 pin 4) can source max 50 mA to supply external parts.

IOREF (J1 pin 2) is the external supply input to the IO voltage level shifters (optional). It is separated from +3V3 with a protection diode (Maxim MAX40203AUK) having voltage drop of 28 mV at 100 mA.

3.2 Reset

The EVK-NORA-W10 provides a hardware reset to the NORA-W10 module. The Reset button is connected to the module **RESETn** signal.

If the BOOTn button is held down during the EVK power on, it causes the module to enter its bootloader mode.

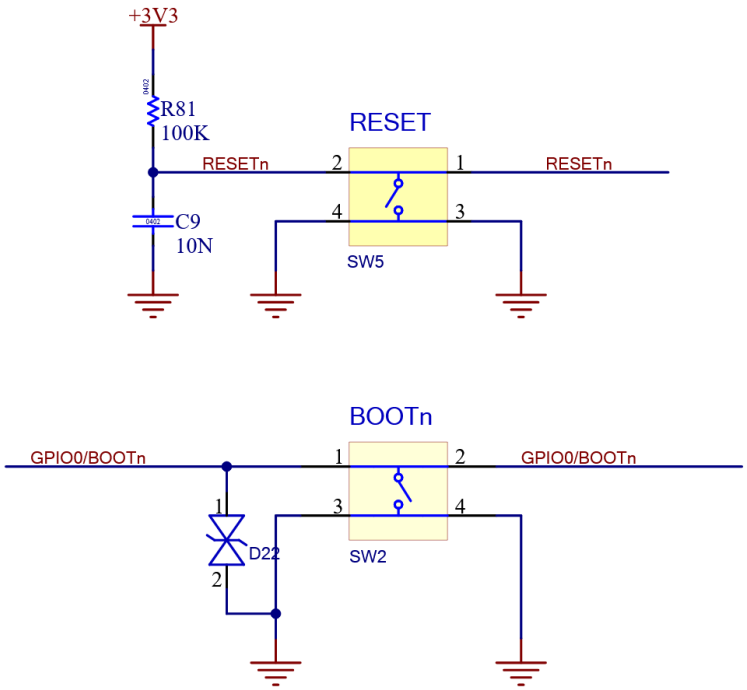

Figure 4: EVK schematic - reset and boot buttons

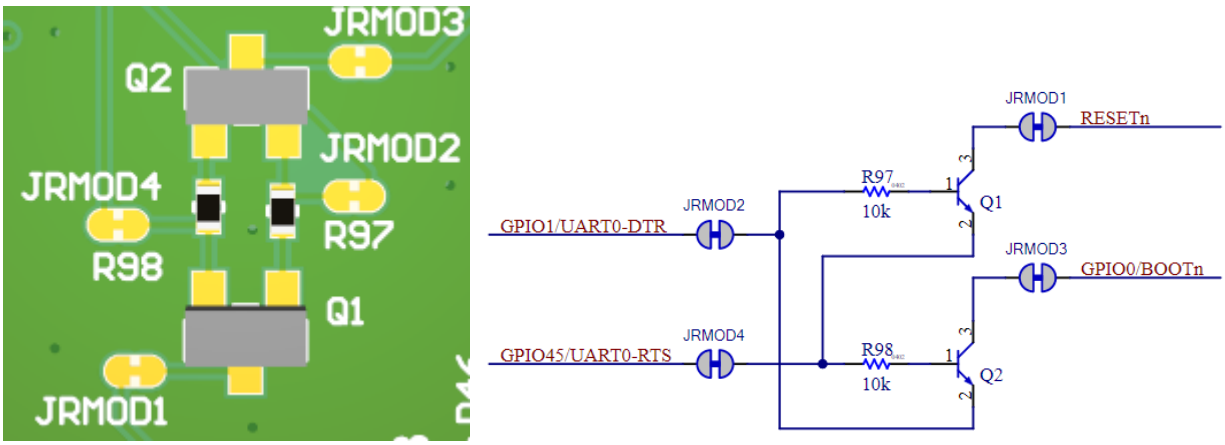

Figure 5: Alternative BOOTn and RESET via UART-DTR and RTS

Signal name	Description
GPIO0/BOOTn	GPIO0 input to module interface during normal operation. Drive low during power-up to enter bootloader mode on NORA-W1 module.
RESETn	NORA-W1 reset signal.

Table 1: EVK reset signals

3.3 Buttons

The evaluation board has four user buttons that are active low and connect to ground when pressed. Table 2 associates the button number and corresponding components.

The internal pull-up resistor of each NORA-W10 GPIO pin must be enabled for proper operation.

Button	Switch	GPIO	Protection diode
1	SW1	GPIO46	D21
2	SW2	GPIO0	D22
3	SW3	GPIO47	D23
4	SW4	GPIO48	D24

Table 2: User button components

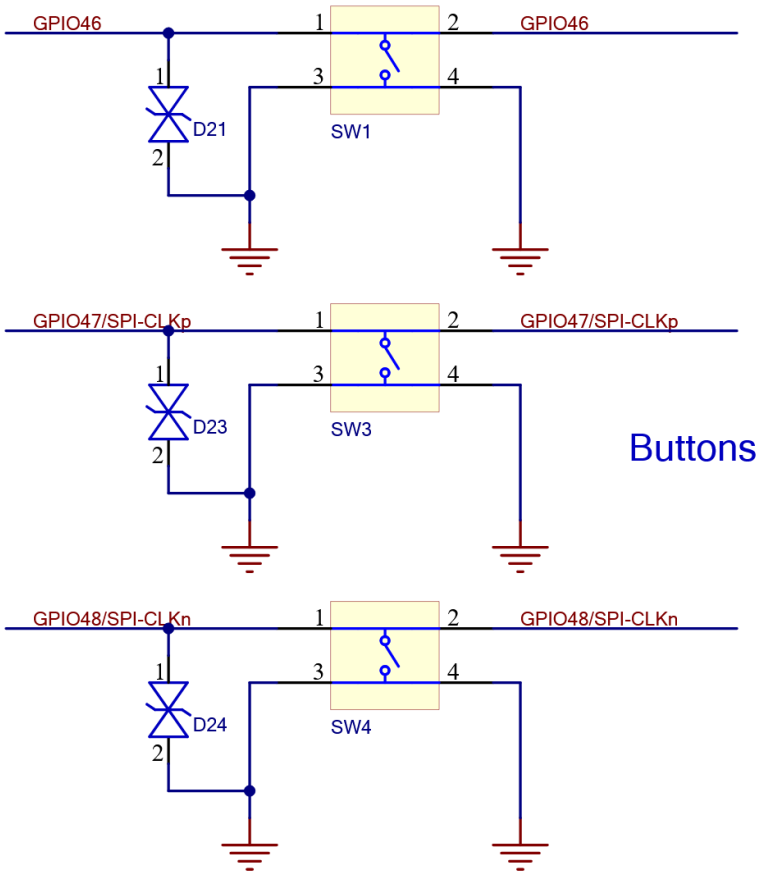

Figure 6: EVK schematic - user buttons

3.4 LEDs

A RGB LED is provided on the evaluation board. It is powered by **+3V3** and turned on by pulling the associated GPIO low.

The RGB LED can be disconnected from the GPIO by removing the associated resistor R78 – R79.

The evaluation board is also equipped with LEDs that shows the signal status of UART0

RGB LED	Associated GPIO	Comments
Red (pin1)	GPIO5/ADC1-CH4	Remove R77 to disconnect R-LED
Green (pin2)	GPIO2/ADC-CH1	Remove R78 to disconnect G-LED
Blue (pin3)	GPIO8/ADC1-CH7	Remove R79 to disconnect B-LED

Table 3: RGB LED associated signals

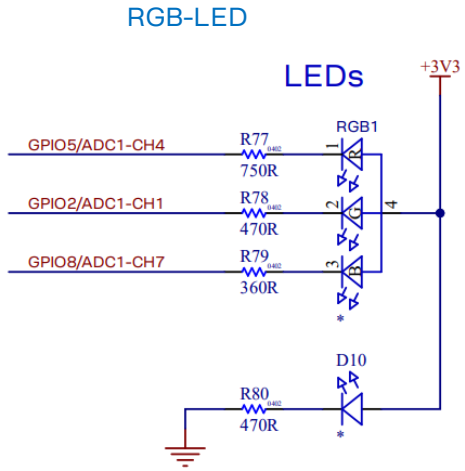

Figure 7 Schematic – RGB and power LED

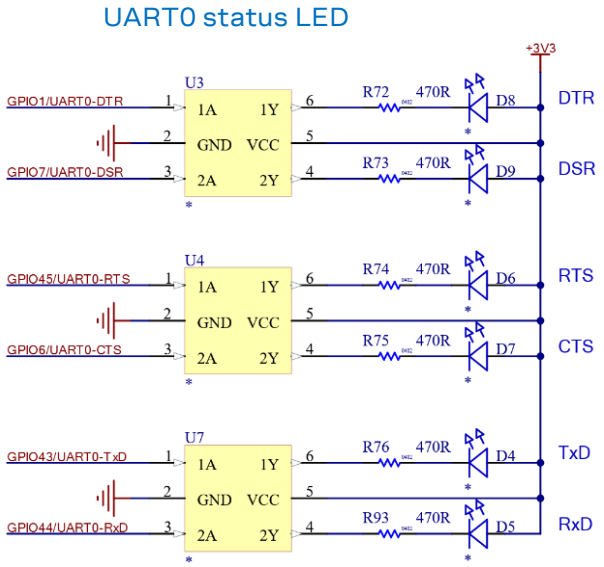

Figure 8 Schematic – UART0 status LEDs

Table 4: UART0 LEDs associated signals

LED	LED color	GPIO	Pin socket	Comments
D4	Green	GPIO43/UART0-TxD	J3-7	
D5	Orange	GPIO44/UART0-RxD	J3-8	
D6	Green	GPIO45/UART0-RTS	J5-1	
D7	Orange	GPIO6/UART0-CTS	J5-2	
D8	Green	GPIO1/UART0-DTR	J5-3	
D9	Orange	GPIO7/UART0-DSR	J5-4	
D10	Green	-		Power ON LED

3.5 Serial communication

The evaluation board allows for easy serial communication with the NORA-W10 module and a connected computer. The EVK is using a single FTDI interface IC providing one COM port.

- The single port is connected to module UART0 through 1K resistors. This allows for simultaneously connecting UART0 signals to pin sockets J3 and J5. See also Table 5.

NORA-W1 pin name	NORA-W1 function	Resistor/Jumper enable	Interface IC function
G9	GPIO44/UART0-RxD	R20	FTDI-TxD
G8	GPIO43/UART0-TxD	R22	FTDI-RxD
F9	GPIO6/UART0-CTS	R23	FTDI-RTS
F8	GPIO45/UART0-RTS	R29	FTDI-CTS
E9	GPIO7/UART0-DSR	R30	FTDI-DTR
E8	GPIO1/UART0-DTR	R32	FTDI-DSR

Table 5: COM port connections

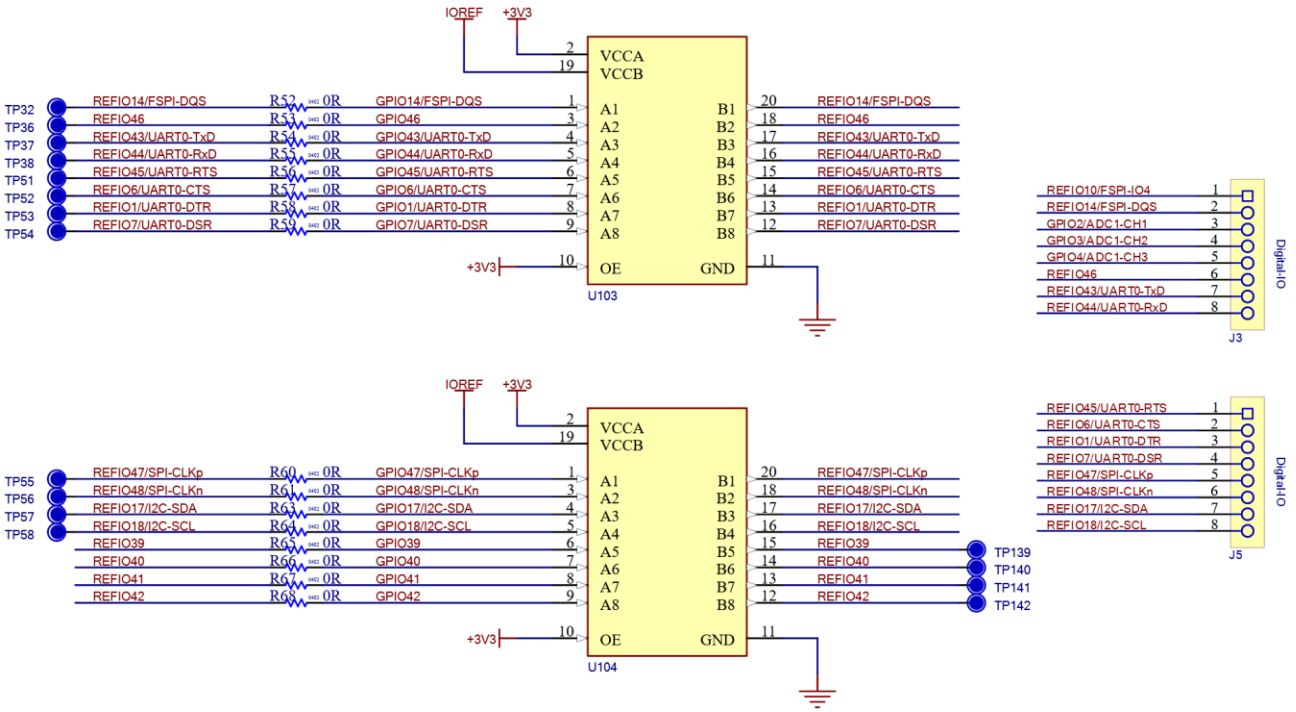

Figure 9: UART0 level shifters and pin socket

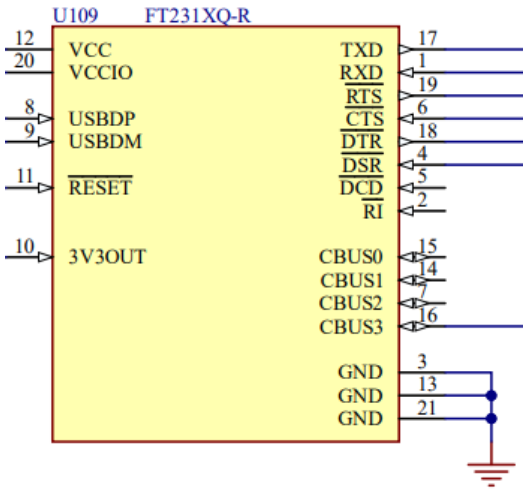

Figure 10: The FTDI drawing, 1 port default

3.6 32.768 kHz low frequency clock

The evaluation board has a 32.768 kHz crystal connected to the NORA-W10 module to allow use of the external crystal oscillator option

If the signals GPIO15/ADC2-CH4 and GPIO16/ADC2-CH5 want to be used, the crystal can be removed from the circuit by opening jumpers J19 and J21 and soldering across the normally open positions. This connects XT-32k-p and XT-32k-n to the EVK pin socket J2 pin 5 and pin 6.

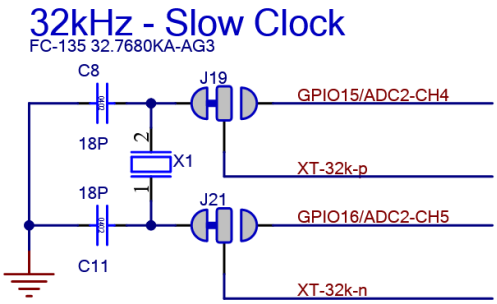

Figure 11: Schematic – 32 kHz crystal

3.7 Current sensing headers

The evaluation board provides two current sensing headers:

- J7 allows for power consumption measurement of the NORA-W10 module VDD supply.
- J8 allows for power consumption measurement of the NORA-W10 module VDD-IO supply.

Each of the 2.54 mm pitch 3-pin header have two pins connected across a 1 Ω current-sense resistor and the third pin connected to **GND**. Module VDD supply and module VDD-IO supply is sourced via these resistors. To measure current consumption, use a multimeter or other precision voltage measurement device to measure voltage drop across pins 2 and 3. Current can also be measured directly by opening **JRMOD**, or **JRIO** to remove the current-sense resistor from the circuit. Use an amp meter in series with the two voltage pins.

⚠ Pin 1 of J7, J8 is connected to GND.

Any current sense resistor can be bypassed by soldering the respective jumper: **JMOD**, or **JIO**.

The default hardware configuration does not require any modification of the current sense headers for the EVK-NORA-W10 to perform properly.

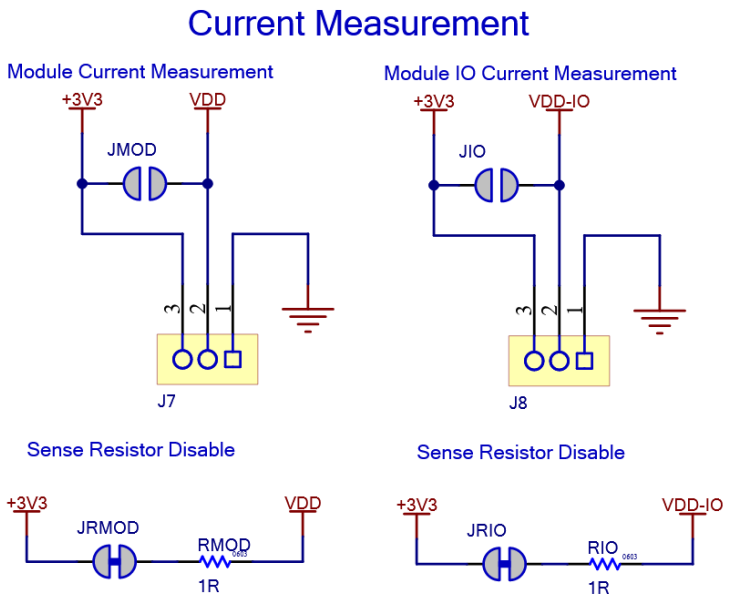

Figure 12: Current sensing header layout

3.8 External JTAG debug interface

External target hardware can be connected to J20 for firmware programming and debug. The JTAG debug interface is implemented, as shown in Figure 13.

J20 is implemented with a 2x5, header with 1.27 mm pitch.

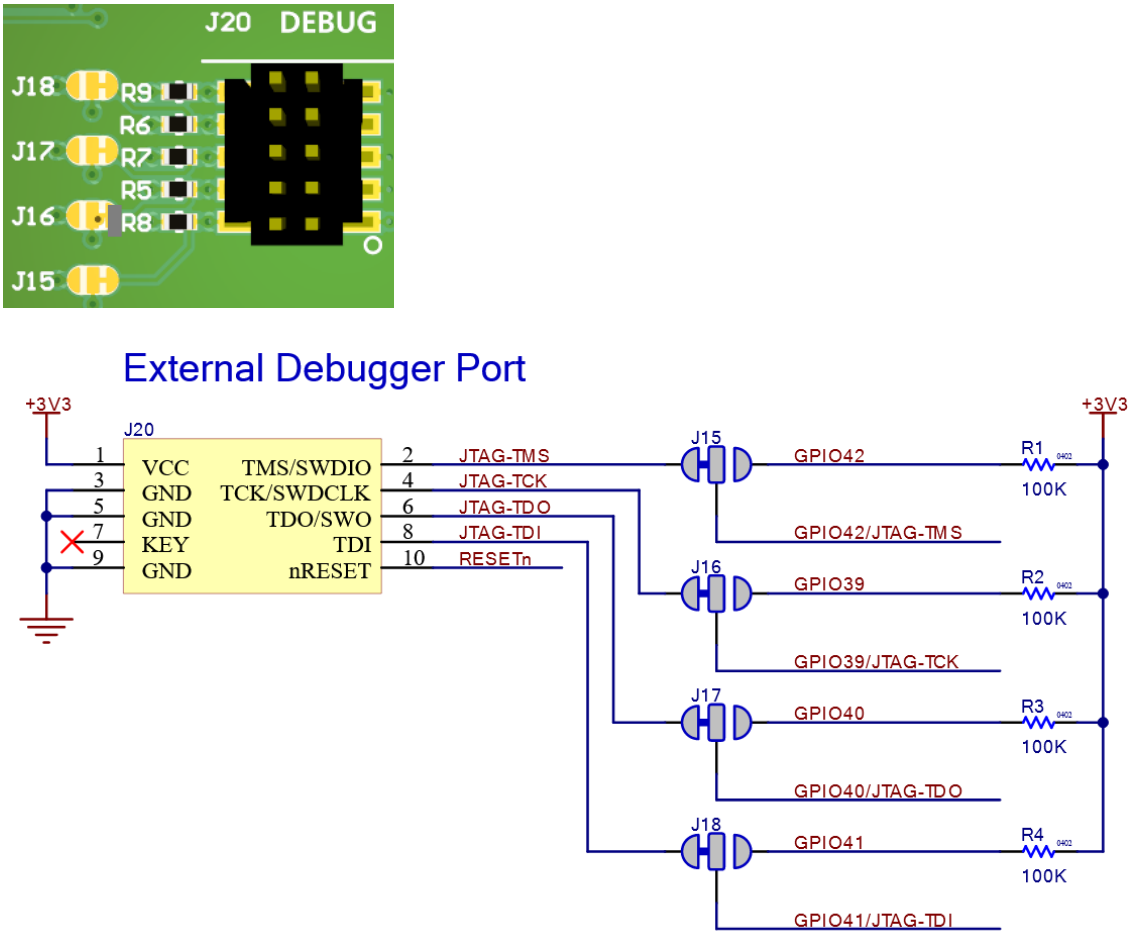

Figure 13: External J-Link debug interface

3.9 QSPI

EVK-NORA-W10 can be populated with a Quad SPI FLASH and a Quad SPI PSRAM. These can be supplied via +3V3 or NORA-W10 module internal VDD-SPI supply. The selection between the two are made by populating either R11 or R69 (U1) and R70 or R71 (U2).

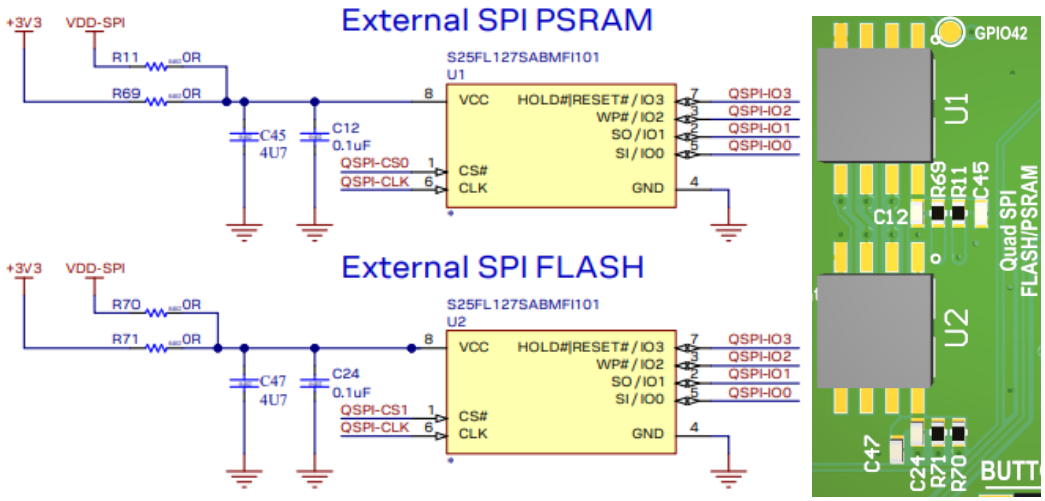

Figure 14: Quad SPI FLASH and PSRAM EVK - schematic and EVK board view

Table 6: Quad SPI interface signal overview

Interface function	ESP32-S3 pin	NORA-W10 pin	Interface IC function
QSPI-CS0	28	E1	
QSPI-CS1	32	C4	
QSPI-CLK	33	F1	
QSPI-IO3 HD	30	F2	
QSPI-IO2 WP	31	D1	
QSPI-IO1 Q	34	E2	
QSPI-IO0 D	35	D2	

3.10 GPIO jumpers

Several solder bridge jumpers on the board are available to configure the GPIO functions. Most solder jumpers disconnect on-board components from the GPIO nets thus eliminate interference with external circuitry added on the I/O sockets (female).

The GPIO jumpers and associated functions are shown on the bottom of the EVK-NORA-W10 PCB.

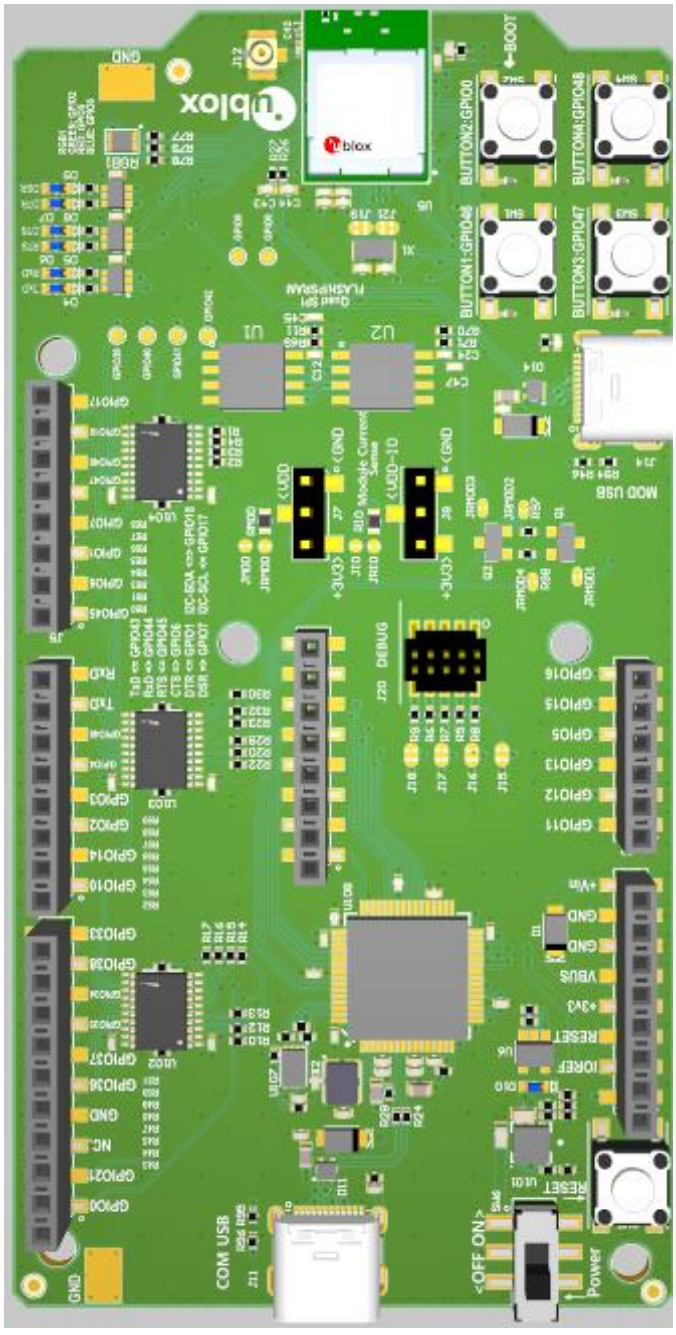

Figure 15: Legend for GPIO jumpers

3.11 Header pin-out

Figure 14 shows the 2.54 mm pitch sockets exposing the IO signals in the NORA-W10 module.

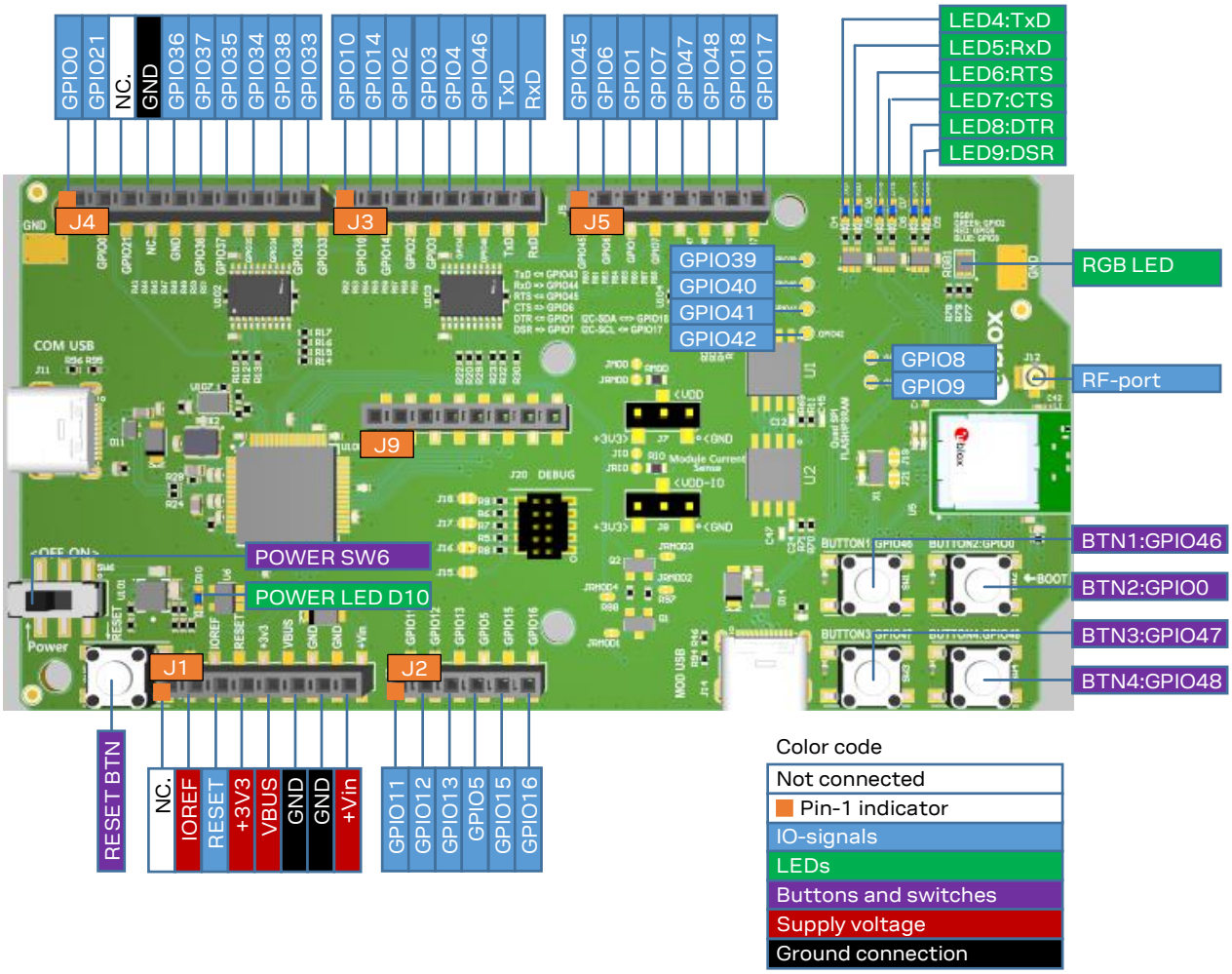

Figure 16: EVK-NORA-W10 IO connectors pin-out, buttons and LEDs

⚠ To enable the EVK-NORA-W10 I/O pins to handle 5 V signals the level shifters (U102 – U104, TI TXS0108EPWR) must be populated and **IOREF** must be supplied with +5 V. If using 3.3 V on the EVK-NORA-W1 I/O pins, the Arduino Uno® style shields must be configured to use +3.3 V I/O voltage reference.

Table 7: Header J1Table 7 - Table 12 show the pin assignments of each header.

Pin	Pin name	NORA-W1 pin	Function
1	NC.	-	No connection
2	IOREF	-	Level shifter supply voltage
3	RESET	J3	ESP-GPIO/AIN6
4	+3V3	–	Supply
5	VBUS		Supply
6	GND		Ground
7	GND		Ground
8	+Vin		Supply

Table 7: Header J1

Pin	Pin name	NORA-W1 pin PT1/PT2	Function
1	GPIO11	G3	GPIO ADC2-CH0
2	GPIO12	G2	GPIO ADC2-CH1
3	GPIO13	A6	GPIO ADC2-CH2
4	GPIO5	J8	GPIO ADC1-CH4
5	GPIO15	C6	GPIO ADC2-CH4, XTAL-32K-P
6	GPIO16	B6	GPIO ADC2-CH5, XTAL-32K-N

Table 8: Header J2

Pin	Pin name	NORA-W1 pin	Function
1	GPIO10	H3	FSPI-IO4
2	GPIO14	A5	FSPI-DQS
3	GPIO2	H8	ADC1-CH1
4	GPIO3	J9	ADC-CH2
5	GPIO4	D8	ADC1-CH3
6	GPIO46	H7	GPIO46
7	TxD	G8	GPIO43
8	RxD	G9	GPIO44

Table 9: Header J3

Pin	Pin name	NORA-W1 pin	Function
1	GPIO0	F7	BOOTn
2	GPIO21	C8	GPIO21
3	NC.	–	
4	GND	–	
5	GPIO36	B1	FSPI-CLK
6	GPIO37	C1	FSPI-Q
7	GPIO35	C2	FSPI-D
8	GPIO34	B3	FSPI-CS0
9	GPIO38	A2	FSPI-WP
10	GPIO33	D3	FSPIHD

Table 10: Header J4

Pin	Pin name	NORA-W1 pin	Function
1	GPIO45	F8	RTS
2	GPIO6	F9	CTS
3	GPIO1	E8	DTR
4	GPIO7	E9	DSR
5	GPIO47	F3	SPICLK_P
6	GPIO48	E3	SPICLK_N
7	GPIO18	B4	SDA
8	GPIO17	A3	SCL

Table 11: Header J5

Pin	Pin name	NORA-W1 pin	Function
1	+3V3	-	Supply
2	JTAG-TMS	H2	GPIO42 if J15 is changed
3	GND	-	Ground
4	JTAG-TCK	J2	GPIO-39 if J16 is changed
5	GND	-	Ground
6	JTAG-TDO	G1	GPIO40 if J17 is changed
7	NC.	-	No connection
8	JTAG-TDI	H1	GPIO41 if J18 is changed
9	GND	-	Ground
10	RESET	J3	Module reset

Table 12: Header J20

Appendix

A Glossary

Abbreviation	Definition
ARM	Arm (Advanced RISC Machines) Holdings
CPU	Central Processing Unit
CTS	Clear To Send
DC	Direct Current
DC-DC	DC to DC converter
DFU	Device Firmware Update
EVK	Evaluation Kit
FICR	Factory Information Configuration Register
GPIO	General Purpose Input / Output
LDO	Low Drop-Out voltage regulator
LE	Low Energy
LED	Light Emitting Diode
LF	Low Frequency
LiPo	Lithium-Polymer battery
NCS	nRF Connect SDK
NFC	Near-Field Communications
QSPI	Quad Serial Peripheral Interface
RC	Resistor-Capacitor network
RTS	Request To Send
RXD	Receive data signal
SES	SEGGER Embedded Studio
SIG	Special Interest Group
SoC	System on Chip
SPI	Serial Peripheral Interface
TXD	Transmit data signal
UICR	User Information Configuration Register
USB	Universal Serial Bus

Table 13: Explanation of the abbreviations and terms used

Related documentation

[1] NORA-W10 data sheet, UBX-21036702
[2] NORA-W10 system integration manual, UBX-22005601
[3] FTDI FT231XQ-R Datasheet, FT231X (ftdichip.com)

☞ For product change notifications and regular updates of u-blox documentation, register on our website, www.u-blox.com.

Revision history

Revision	Date	Name	Comments
R01	29-04-2022	ovik, hekf	Initial release for EVK-NORA-W1 PT2

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