EVK-M10QSAM

Evaluation kit

User guide

Abstract

This document describes the structure and use of the EVK-M10QSAM evaluation kit and provides information for evaluating the u-blox SAM-M10Q GNSS patch antenna module.

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Product name	Type number	Firmware version	PCN reference
EVK-M10QSAM	EVK-M10QSAM-00-01	ROM SPG 5.10	N/A

Contents

1 Product description

1.1 Overview

The EVK-M10QSAM evaluation kit makes it simple to evaluate the low-power, high performance SAM-M10Q concurrent GNSS antenna module.

The built-in USB interface provides both power supply and USB-to-Serial communication to the receiver, keeping the possibility to also connect through a 14-pin connector or a dedicated RS-233 port. The versatile interfaces and measurement points enable advanced evaluation needs.

u-blox evaluation kits are compact, and their user-friendly interface and power supply make them ideally suited for use in laboratories or vehicles. Furthermore, they can be used with a desktop or a laptop, making them the perfect companion through all stages of design-in projects.

Evaluation kit	Description	Related products
EVK-M10QSAM	u-blox M10 evaluation kit with patch antenna	SAM-M10Q antenna module [1]

Table 1: EVK-M10QSAM supported products

1.2 Kit contents

The delivery package contains:

- The EVK-M10QSAM evaluation unit (plain PCB board).
- A USB cable.

☞ Because of the integrated antennas in the SAM-M10Q module, the standard u-blox GNSS EVK aluminum box cannot be used for the EVK-M10QSAM.

☞ A plastic cap is attached on the top of the antenna module in EVK-M10QSAM. The purpose of the cap is to prevent air flow inside the SAM-M10Q shield.

1.3 System requirements

- PC with USB 2.0 or RS-232 interface
- Operating system: Microsoft Windows 8.1 onwards (x86 and x64 versions)
- Internet connection for the first-time use to download the required Windows drivers. See section Installing u-center 2 software for details.

2 Specifications

Parameter	Specification
Serial interfaces	1 USB 2.0 1 UART, max baud rate 921600 baud RS-232 +/- 5.0 V level 14 pin, 3.3 V logic 1 I2C, max 400 kHz
Timing interfaces	1 time pulse output
Dimensions	100 × 60 × 26 mm
Power supply	5.0 V via USB or powered via external power supply pin 14 (V5_IN) and pin 1 (GND)
Normal operating temperature	-40 °C to +65 °C

Table 2: EVK-M10QSAM specifications

2.1 Safety precautions

EVK-M10QSAM must be supplied by a PS1 class limited power source. See section 6.2.2.4 of IEC 62368-1:2018 [3] for more information on the PS1 class.

In addition to a limited power source, only ES1 class circuits are to be connected to the EVK-M10QSAM, including interfaces and antennas. See section 5.2.1.1 of IEC 62368-1:2018 [3] for more information on the ES1 class.

2.2 Approvals

The EVK-M10QSAM is designed for the presumption of conformity with the essential requirements and other relevant provisions of Radio Equipment Directive (RED) 2014/53/EU.

The EVK-M10QSAM complies with the Directive 2011/65/EU (EU RoHS 2) and its amendment Directive (EU) 2015/863 (EU RoHS 3).

The Declaration of Conformity (DoC) is available at u-blox website within Support > Product Resources > Conformity Declaration.

3 Getting started

3.1 Installing u-center 2 software

u-center 2, the u-blox interactive evaluation software tool is required for configuration, testing, visualization and data analysis of u-blox GNSS receivers as well as EVKs. The EVK user guide together with the u-center 2 evaluation tool provide useful assistance during all phases of a system integration project. To install the u-center 2 evaluation software tool, follow the steps available on www.u-blox.com/product/u-center. For more information on how to use the u-center 2 evaluation software tool, refer to the u-center 2 User guide [4].

The required Windows drivers for the FTDI FT2232D USB-to-UART converter that is used in the EVK are available from the Microsoft Windows Update service. To ensure that the latest FTDI drivers are installed automatically from Windows Update, check and uninstall the previously installed FTDI drivers. The Windows system driver search mechanism will download and install the FTDI drivers automatically from the Microsoft Windows Update service. If the automatic installation fails, contact u-blox support to get the FTDI drivers and install manually.

3.2 Installing hardware

1. Before connecting the interface cable to the EVK, select the interface that you are using for the connection by sliding the interface switch to the correct position:
   - **USB:** Connect via USB port.
   - **UART:** Connect via RS-232 or through the 14-pin connector.

   ⚠ **CAUTION** Changing the interface switch position while the EVK is powered on may damage the GNSS receiver chip. Power off the EVK before changing the interface switch setting.

   Refer to section Device description for more information on the interfaces.
2. Power the device on, either via USB on the back or through the V5_IN input on the front of the EVK.
3. Place the evaluation kit in a location with good sky view. The EVK-M10QSAM includes a SAM-M10Q concurrent GNSS module with an embedded patch antenna. There is no external antenna connectivity to RF IN.
4. Start the u-center 2 evaluation tool and select corresponding COM port and baud rate as shown in the u-center User guide [4].

3.3 Interface default configuration

Parameter	Description	Remark
UART, Input	UBX and NMEA protocol at 9600 baud	
UART, Output	UBX and NMEA protocol at 9600 baud	Only NMEA messages are activated by default
I2C, Input	UBX and NMEA protocol	
I2C, Output	UBX and NMEA protocol	Only NMEA messages are activated by default

Table 3: Default configuration

☞ The I2C and UART interfaces on the 14-pin connector are available for debugging and design-in purposes.

4 Device description

EVK-M10QSAM evaluation kit contains SAM-M10Q concurrent GNSS module embedded with a GNSS patch antenna, along with a built-in USB interface which provides both power supply and high-speed data transfer, and eliminates the need for an external power supply as shown in Figure 5.

4.1 Interface connection

The EVK-M10QSAM supports UART and I2C communication interfaces. To connect the EVK to a PC, use a standard SUBD-9 cable or the included USB cable depending on the interface in use. The EVK also includes an on-board USB-to-Serial converter for USB-to-UART communication with the receiver. For current measurements and to evaluate the available digital interfaces, additional measurement equipment and devices can be connected to the 14-pin connector on the front side of the EVK unit. The EVK design allows the front side pins to be used simultaneously with the other ports.

☞ Do not drive any of the IO pins when the EVK is not connected to a power supply.

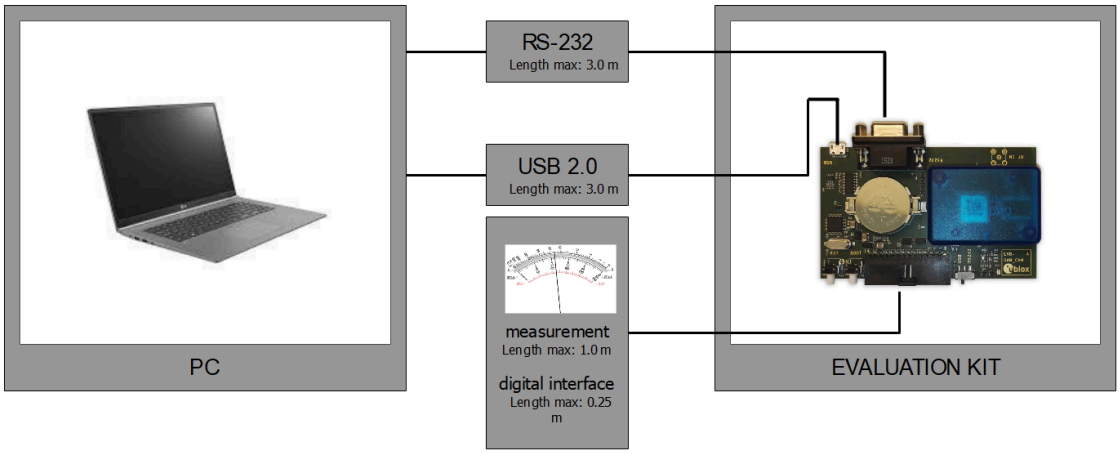

Figure 1: Connecting the EVK-M10QSAM unit for power supply and communication

Figure 2 shows the front and back side of the EVK-M10QSAM evaluation unit.

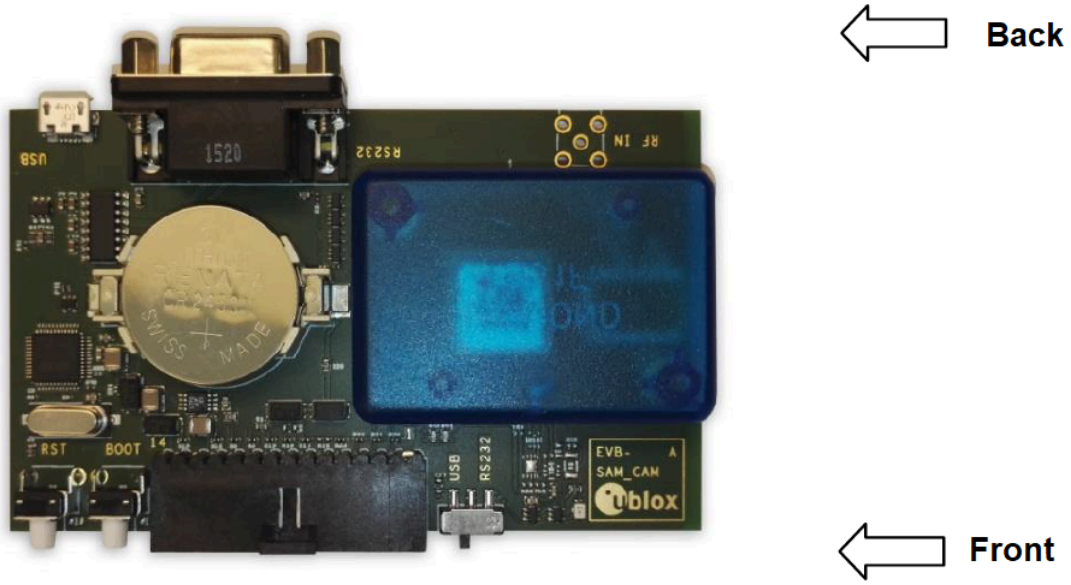

Figure 2: EVK-M10QSAM front and back side

4.1.1 Interface switch

Use the interface switch on the front side of the evaluation kit to choose between the RS-232 and USB communication ports.

⚠ **CAUTION** Changing the interface switch position while the EVK is powered on may damage the GNSS receiver chip. Power off the EVK before changing the interface switch setting.

- RS-232 – In this selection, the EVK operates with the RS-232 (DB9 – back side).
- USB – In this selection, the EVK operates only with the USB interface. RS-232 (DB9) is switched off.

4.1.2 14-pin connector

The EVK-M10QSAM front side has a 14-pin connector that provides programmable input/output signals, communication interfaces and supply options. All these pins are ESD protected. The 14-pin connector can be used for communicating with the receiver through the UART and I2C interfaces. In addition, the 14-pin connector provides flexibility for evaluating other advanced scenarios.

Pin no.	Pin name	I/O	Level	Description
14	V5_IN	I	4.75 - 5.25 V	Power input – can be used instead of USB.
13	GND	I	-	Common ground pin.
12	P1A (VCC)	O	3.3 V	Power output – max. current supply 100 mA. 1 Ω 5% resistor for over-all current measurement to pin 11 (P1B).
11	P1B	O	-	Second connection for overall current measurement as shown in Figure 5.
10	P2A	O	3.0 V	Battery output (unloaded). 100 Ω 5% resistor for battery backup current measurement to pin 9 (P2B). NOTE: There is a current protection to 3 mA. See circuit in Figure 8 (D2, D4, R29).

Pin no.	Pin name	I/O	Level	Description
9	P2B	O	-	Second junction for battery backup current measurement.
8	TIMEPULSE	O	3.3 V	Timepulse output.
7	EXTINT0	I	3.3 V	External interrupt signal. Can be used for time mark feature, time aiding, and wakeup from power save modes.
6	NC	-	-	Not connected.
5	SDA2	I/O	3.3 V	Data input / output for the I2C interface.
4	SCL2	I	3.3 V	Clock input for the I2C interface.
3	TXD1	O	3.3 V	Serial port transmit.
2	RXD1	I	3.3 V	Serial port receive.
1	GND	I	–	Recommended common ground pin.

Table 4: EVK-M10QSAM 14-pin connector pin description

Figure 3: EVK-M10QSAM 5.0 V DC power supply example

☞ When using the 3.3 V digital interfaces with your application (e.g. I2C), a cable length less than 25 cm is recommended.

4.1.3 USB

The USB connector in the evaluation kit can be used for both power supply and communication. The easiest way to evaluate the EVK-M10QSAM operation is to connect the EVK to a PC with the USB cable and then to use the u-center 2 tool to configure and monitor the GNSS functions. The USB connector is internally connected to a USB-to-Serial converter that connects to the UART interface of the u-blox M10 receiver on the EVK. This allows the USB connector to be used for communication as well. Interface switch can be used for USB communication with the receiver.

When the EVK is connected to the PC, Windows creates a virtual COM port to the PC. This newly created virtual COM port needs to be selected in the u-center 2 evaluation tool for communicating with the receiver. EVK-M10QSAM supports USB-to-UART communication speeds up to 921600 baud.

4.1.4 UART

The EVK unit includes two options for the UART connection, via the RS-232 serial port or the 14-pin connector. By default, the UART communication speed is set to 9600 baud and EVK-M10QSAM supports speeds up to 921600 baud.

4.1.4.1 RS-232

The EVK can be connected to a PC using a maximum 3 m straight RS-232 serial cable with male and female connectors. The RS-232 port needs to be configured to connect to the PC. To do this, use the UBX-CFG-VALSET command and select the CFG-UART1 Configuration group in the u-center 2 evaluation tool. The maximum operating baud rate is 230400 baud. Note, if a USB-to-RS-232 adapter cable is used, it can be connected directly to the RS-232 port of the evaluation kit. The RS-232 port also provides a TIMEPULSE output signal.

The 9-pin RS-232 female connector is assigned as listed below:

Pin no.	Assignment
1 & 6	Time pulse
2	TXD (GNSS Transmit Data)
3	RXD (GNSS Receive Data)
4	not connected
5	GND
7, 8 & 9	not connected

Table 5: EVK-M10QSAM RS-232 connector pin description

4.1.4.2 UART through 14-pin connector

The EVK also provides UART communication through the 14-pin connector on pins TxD and RxD. See section 14-pin connector for more information.

4.1.5 I2C

The 14-pin connector contains pins for evaluating I2C bus communication. By default, the I2C pull-up resistors are populated on the EVK board which help if fast communication speed with long cable length is needed.

4.2 GNSS input signal

The SAM-M10Q module is embedded with a GNSS patch antenna and the signal is further filtered and amplified by the internal SAW filter and internal Low Noise Amplifier (LNA). For more information, see the SAM-M10Q Hardware Integration Manual [2].

☞ External antenna connectivity through SMA connector is not available in the EVK-M10QSAM.

4.3 Time pulse

u-blox receivers include a time pulse function that provides pulses with a configurable pulse period, pulse length and polarity (rising or falling edge). The u-center 2 evaluation tool can be used to configure the time pulse parameters. The time pulse signal is available at the 14-pin and RS-232 connectors. In addition, the time pulse signal is inverted and connected to the LED on the front side of the EVK.

☞ The time pulse signal from the 14-pin connector has 50 ohms output and thus, no fast slope output signal is possible.

4.4 Reset button

The RST button on the front side resets the SAM-M10Q module.

4.5 Safe boot button

This button is used to set the receiver into safeboot mode. In this mode, the receiver executes only the minimal functionality.

☞ The safeboot mode is not recommended in EVK-M10QSAM because the u-blox M10 receiver is using a ROM-based firmware and thus, it is not necessary to go into safe boot mode.

4.6 LED

On the front side of the EVK unit, a single blue LED shows the time pulse signal as well as the status that the device is powered on. The LED starts flashing one pulse per second during a GNSS fix. If there is no GNSS fix, the LED will only be lit, without flashing.

4.7 Backup Battery

There is a backup battery in the evaluation unit. This is necessary to store orbital information between operations and to enable faster start-up. It is a RENATA 3.0 V Li / MnO^2 battery of the type CR2450. The battery has a rated capacity of 540 mA. The battery operating temperature range is -40° C to +85° C. In case the built-in backup battery runs low or empty after a long storage period, purchase the above described battery for replacement.

⚠ **CAUTION** Risk of explosion if battery is replaced by an incorrect type. Make sure that battery is of the correct specification.

⚠ **CAUTION** Risk of short circuit when touching the battery with conducting parts. Do not use conductive parts to remove or touch the battery.

4.8 External interrupt

On the EVK-M10QSAM, the external interrupt (EXTINT) signal is available on the 14-pin connector. The EXTINT signal can be used for time mark and time aiding features of the receiver, as well as for waking up the receiver from power save modes. See section 14-pin connector for more information.

5 Measuring current

5.1 Measuring GNSS current

At startup, the receiver starts in acquisition mode to search for available satellites and to download GNSS orbital data, i.e., ephemeris and almanac. Once the data has been downloaded, the receiver enters tracking mode. In continuous operation, the receiver typically remains in tracking mode once entering it. The current consumption reduces when the receiver enters the tracking mode. The time required to enter tracking mode can be reduced by downloading aiding data from the AssistNow™ Online service.

On EVK-M10QSAM, the main supply voltage for the u-blox M10 GNSS receiver is 3.3 V. To measure the total GNSS supply current with EVK-M10QSAM, follow these steps:

1. Power up EVK-M10QSAM.
2. Connect a true RMS voltmeter across P1A (pin 12) and P1B (pin 11) of the 14-pin connector.
3. Read the voltage (and average if necessary) on the voltmeter and convert to current (1 mV equals 1 mA).
4. Perform the test with good signals and clear sky view to ensure that the receiver can acquire the satellite signals.

For more details see the setup below.

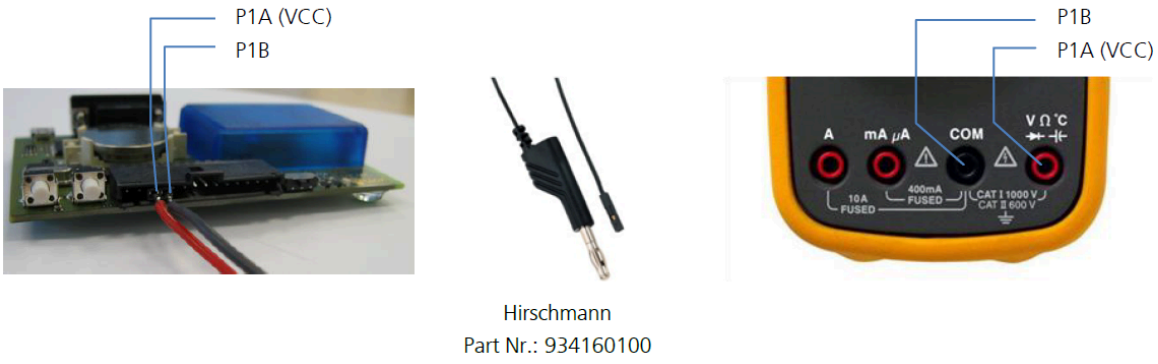

Figure 4: Example – tracking current measurement

5.2 Measuring backup current

To measure the backup current (I_{BCKP}) with EVK-M10QSAM, follow these steps:

1. Connect a true RMS voltmeter across P2A (pin 10) and P2B (pin 9) of the 14-pin connector.
2. Remove power supply (USB cable or other external power supply from the 14-pin connector).
3. Read the voltage (and average if necessary) on the voltmeter and convert to current (1 mV equals 10 µA).

6 Block diagram

EVK-M10QSAM block diagram providing an overview on supply voltages, current measurement and communication interfaces is shown in Figure 5.

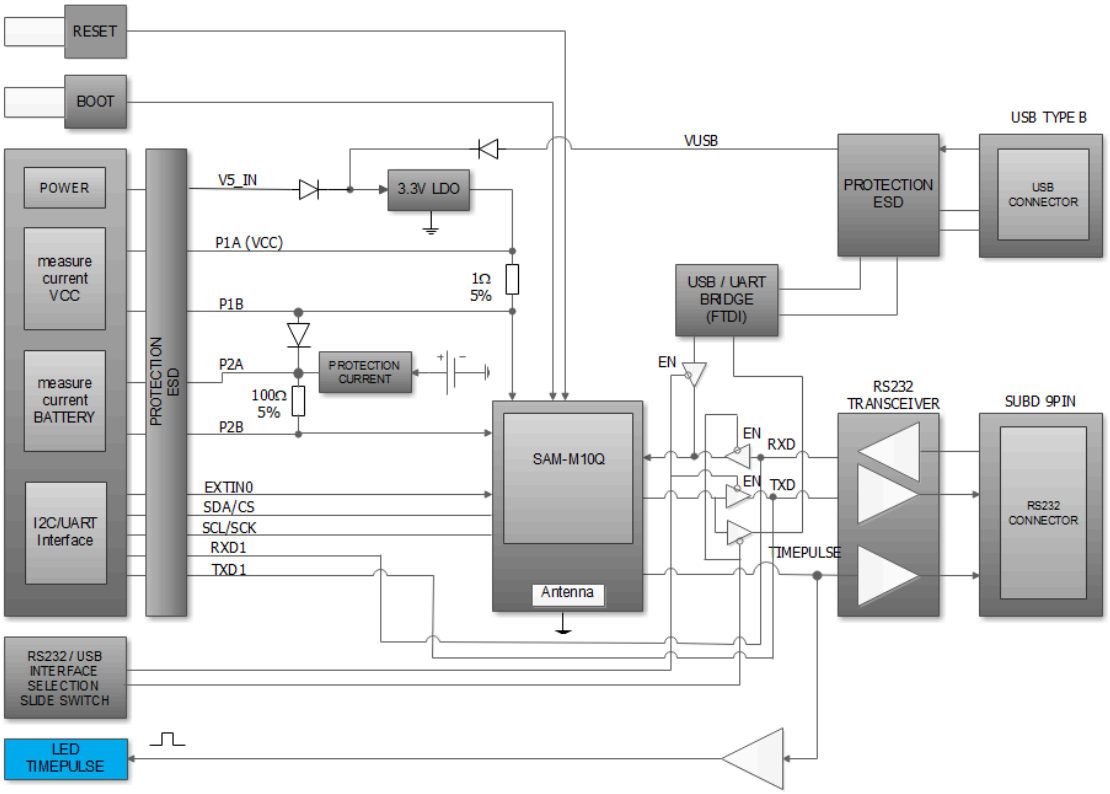

Figure 5: EVK-M10QSAM block diagram

7 Board layout

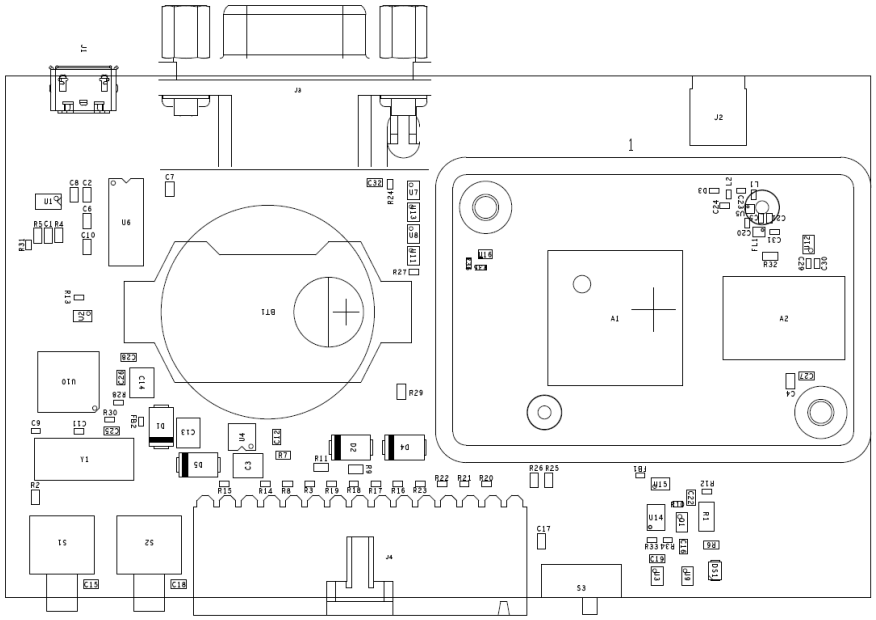

Figure 6: EVK-M10QSAM board layout

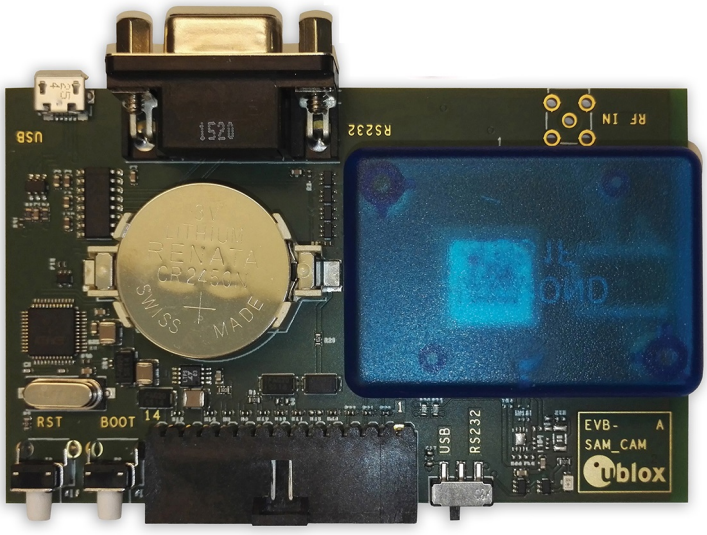

Figure 7: EVK-M10QSAM PCB

8 Schematic

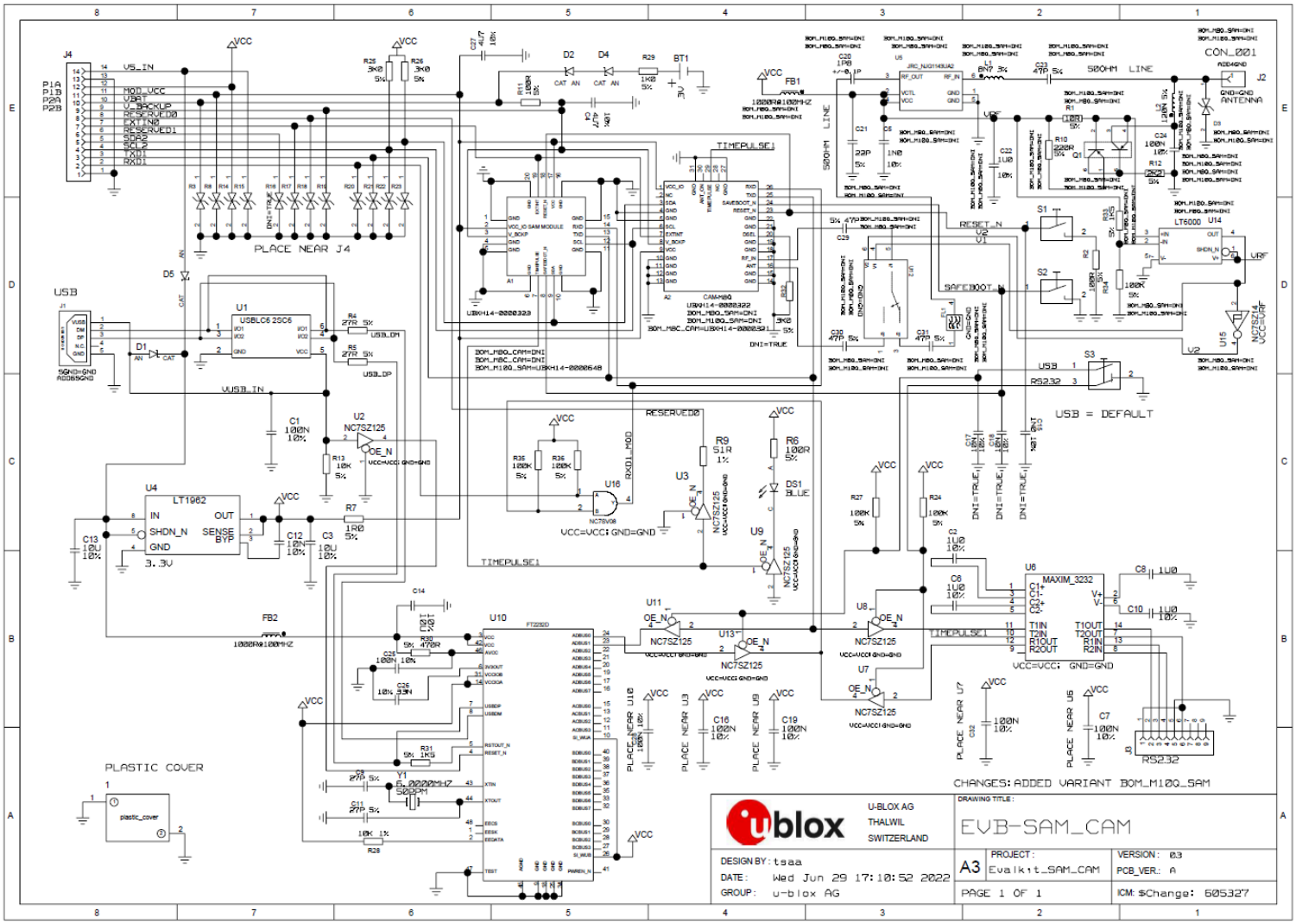

Figure 8: EVK-M10QSAM schematic

9 Device configuration

This section shows how to configure and evaluate some important receiver features on EVK-M10QSAM related to power modes, GNSS constellations, navigation rate of the receiver. In addition, the receiver can be configured with the Advanced Configuration View of the u-center 2 evaluation tool as shown in Figure 9.

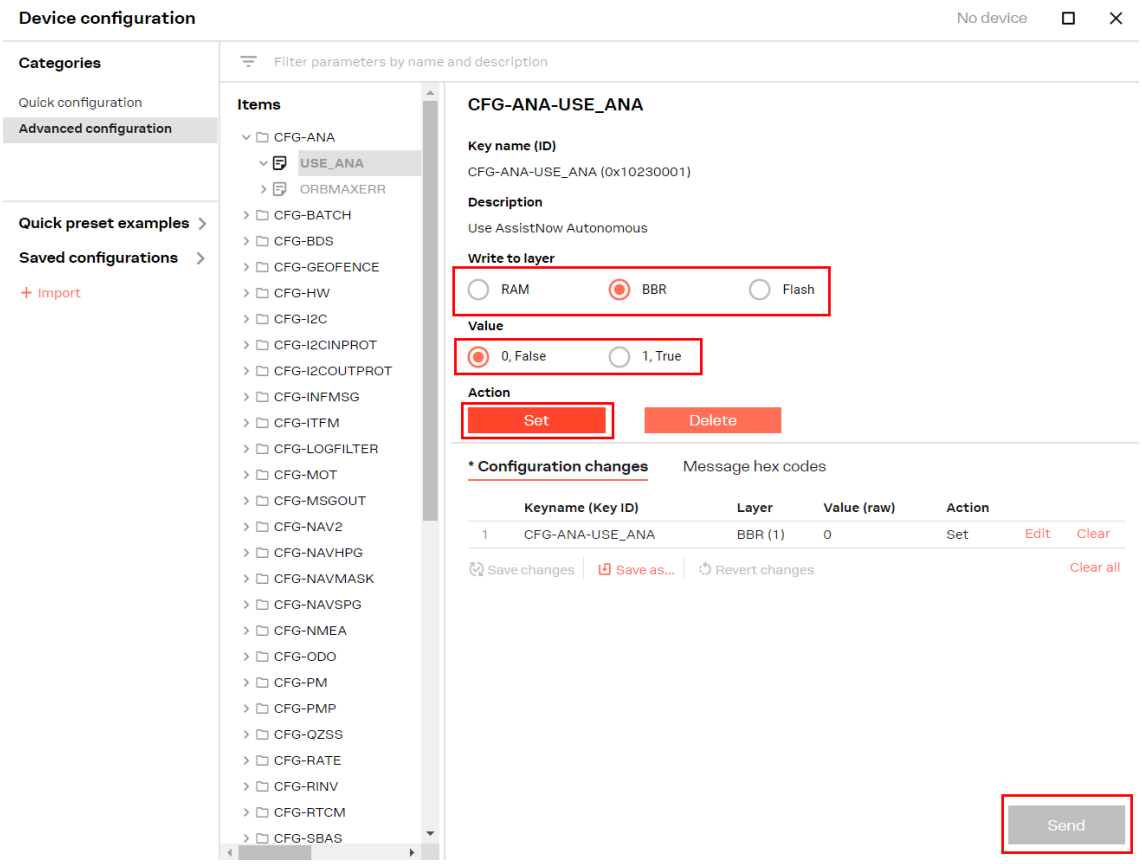

Figure 9: EVK-M10QSAM receiver configuration view

The receiver configuration can be saved to the receiver RAM, or to the battery-backed RAM (BBR). The RAM content is cleared after the power supply is disconnected or in software standby mode and the off state of On/Off power save mode (PSMOO). Therefore, it is recommended to save the receiver configuration to RAM and BBR. The BBR content is maintained as long as the backup battery supply is available.

9.1 Communication ports

The FTDI USB-to-UART converter generates two virtual communication (COM) ports as shown in Figure 10. The first COM port based on the COM port ID is the correct port to use. For example, if the generated COM ports are COM1 and COM2, then the port to use is COM1.

☞ If the RS-232 port is also connected to the same PC, there will be an additional COM port for the RS-232 serial connection.

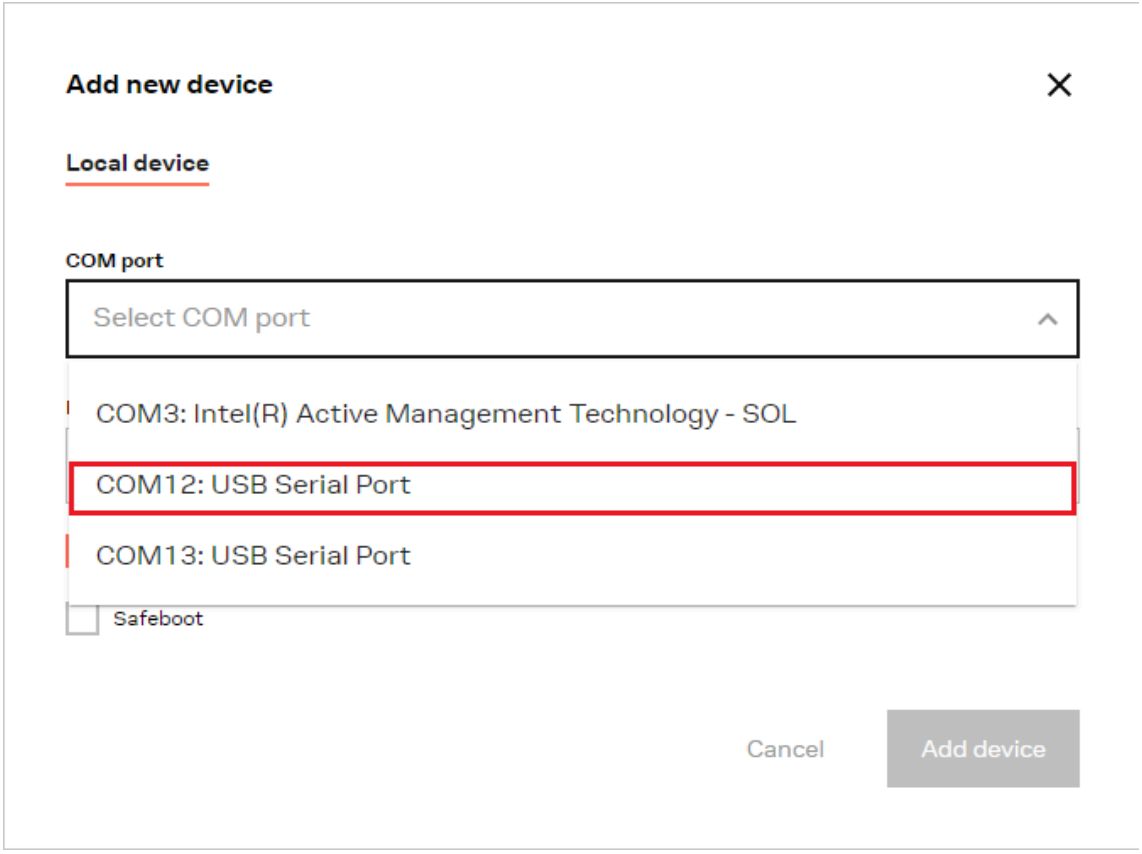

Figure 10: EVK-M10QSAM communication ports

☞ The COM ports may appear differently in different Windows versions. For example, in Windows 10 it appears as shown in Figure 11.

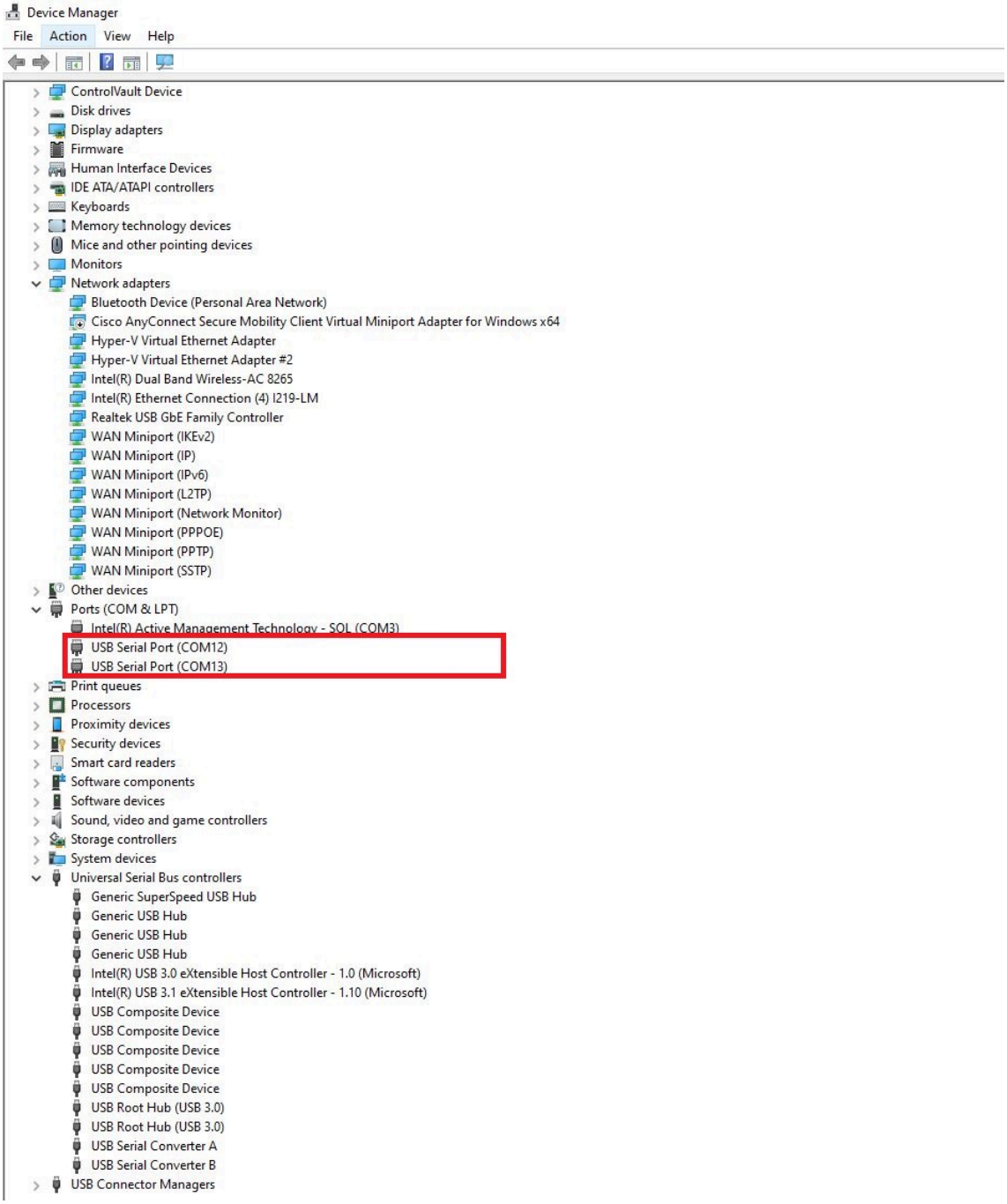

Figure 11: EVK-M10QSAM communication ports identification on Windows

9.1.1 UART baud rate configuration

The baud rate for the UART communication to the receiver can be configured in the **CFG-UART1-BAUDRATE** configuration key. The default baud rate is set to 9600 as shown in Figure 12, and the maximum baud rate is 921600.

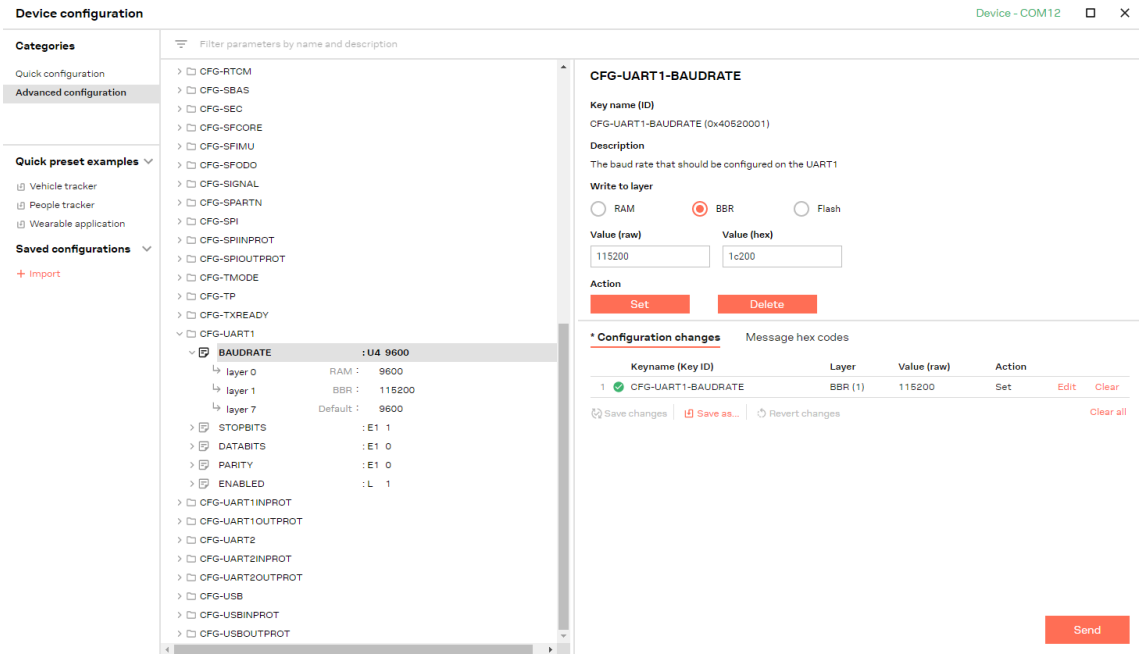

Figure 12: EVK-M10QSAM UART baud rate configuration

Setting a different baud rate will interrupt communication. If other configuration keys were set after, these will not be applied. Therefore, the new baud rate needs to be selected manually to resume communication and apply the remaining configuration items.

9.2 GNSS configuration

The default GNSS constellations that are enabled on the receiver are GPS, Galileo, GLONASS, BeiDou B1C, SBAS and QZSS. The receiver GNSS configuration can be updated by selecting the constellations in the GNSS Configuration View as shown in Figure 13.

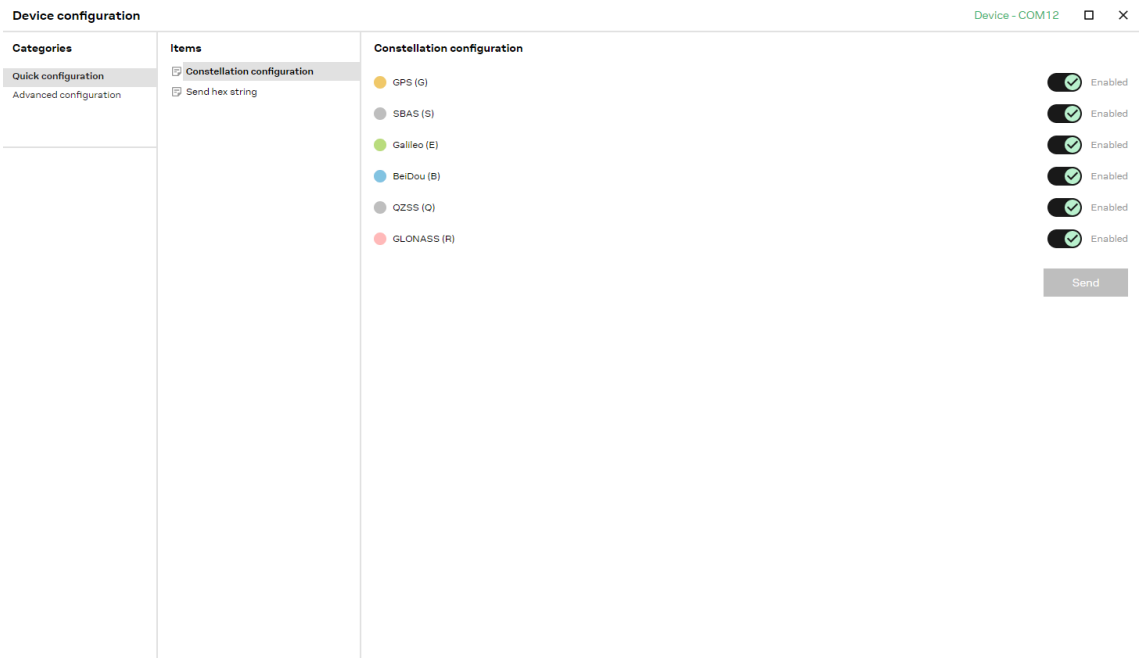

Figure 13: EVK-M10QSAM receiver GNSS configuration

9.3 Navigation update rate

The **CFG-RATE-MEAS** configuration key that is shown in Figure 14 can be used to configure the navigation update rate. The navigation update rate value is defined in ms, where 100 ms corresponds to 10 Hz. The default update rate is 1000 ms which corresponds to 1 Hz. The default 1 Hz update rate is a good tradeoff between position accuracy and power consumption. Certain applications require faster update rates for high performance but this will increase the receiver power consumption.

Increase the communication baud rate and reduce the number of messages that are enabled when high navigation update rates are used. The maximum baud rate of 921600 or 460800 baud rate should be sufficient for most use cases.

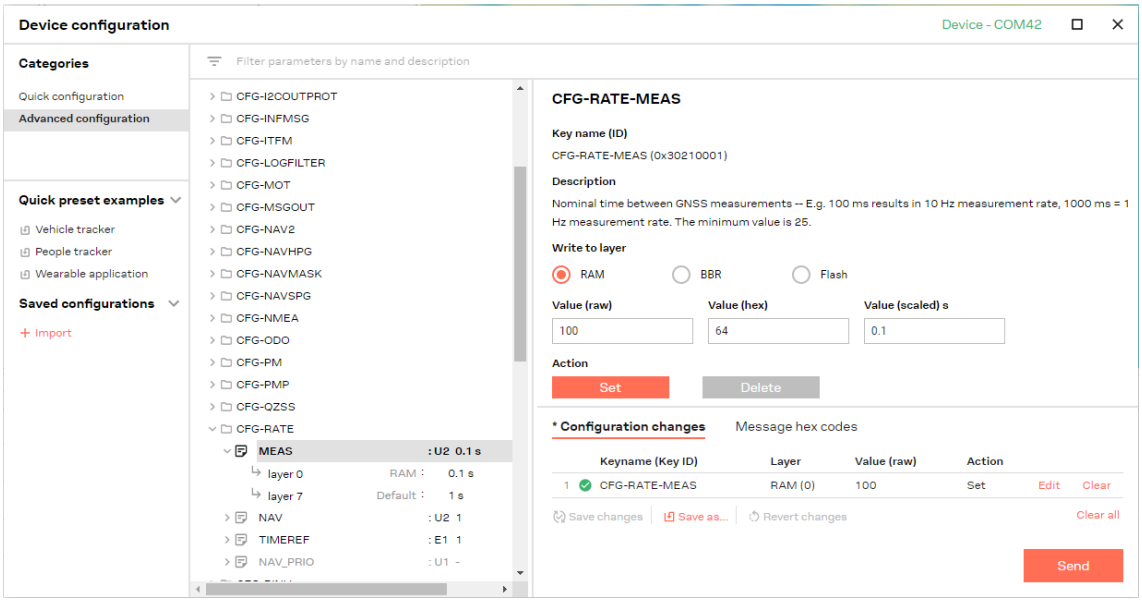

Figure 14: EVK-M10QSAM receiver navigation update rate configuration

9.4 Power modes

EVK-M10QSAM supports the following power modes and can be configured with the **CFG-PM-OPERATEMODE** configuration key.

- **Continuous mode (FULL):** This is the full power mode and the default mode of the receiver. No power save mode is active in this mode.
- **On/Off mode (PSMOO):** This is a power save mode for reducing the power consumption of the receiver. In this mode, the receiver is configured to be periodically turned on or off for applications that require less frequent position updates. Typically used for update periods longer than 10 seconds.
- **Cyclic tracking mode (PSMCT):** This is also a power save mode for applications that require more frequent position updates. Typically used for short update periods in the range of 0.5 to 10 seconds. In this mode, the receiver does not shut down completely between position fixes, but uses low-power tracking instead.

BeiDou B1C is not supported in power save mode (PSM). Some PSM states clear the RAM memory. Store receiver configuration in BBR to maintain the settings. In addition, it is recommended to disable SBAS because the receiver is unable to download or process any SBAS data in PSM.

Figure 15 shows the configuration window for selecting the receiver power mode and configuring the position update period. For the On/Off power mode, the position update period is defined with the **CFG-PM-POSUPDATEPERIOD**. To maintain the configuration during an inactive state, save it both in the RAM and BBR layer.

☞ The CFG-PM-OPERATEMODE configuration is applied last after other required power mode configuration items are defined in the CFG-PM group.

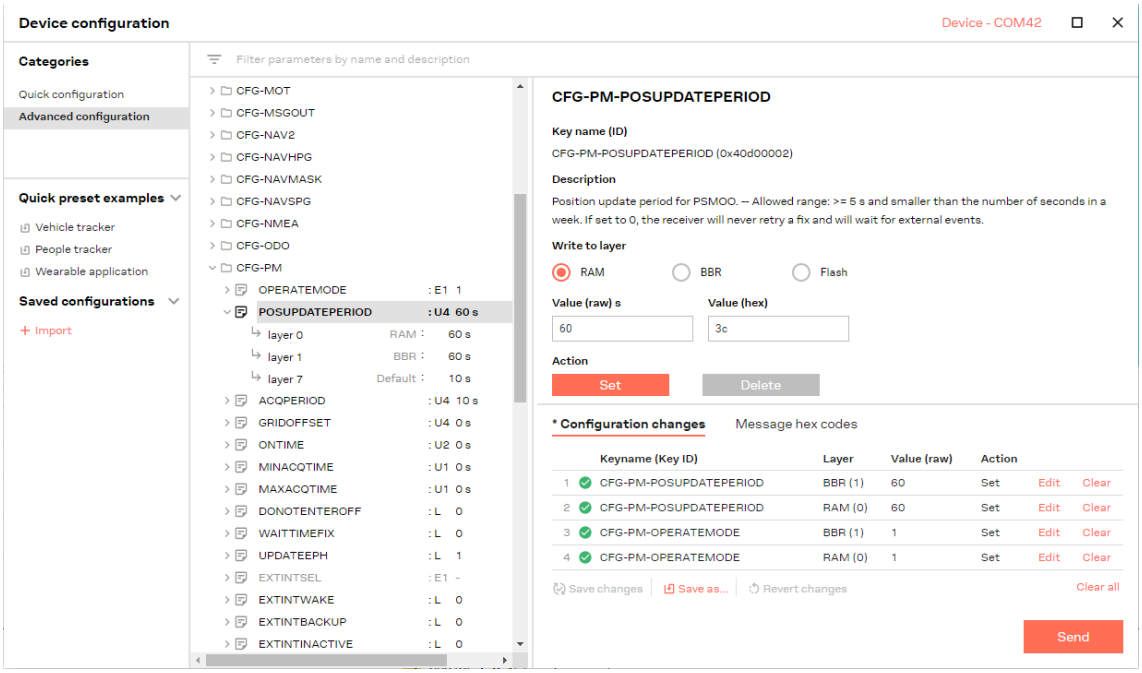

Figure 15: EVK-M10QSAM receiver power mode configuration

9.4.1 Backup modes

SAM-M10Q supports two backup modes: hardware backup mode and software standby mode.

- **Hardware backup mode:** In this mode, other supplies except the backup supply (V_BCKP) are turned off. On the EVK-M10QSAM, this is achieved by turning off the main power supply of the EVK either by removing the USB cable or the 5.0 V supply from the 14-pin connector.
- **Software standby mode:** In this mode, the receiver executes little or no system activity. To wake the receiver up from the software standby mode, the wakeup source can be configured in **UBX-RXM-PMREQ** message. The available wakeup sources are EXTINT and UART RxD signals.

☞ The duration in the UBX-RXM-PMREQ message can be set to 0 for putting the receiver to software standby mode indefinitely until a signal is detected from the configured wakeup source. In addition, ensure that the force option is selected.

☞ The RAM memory is cleared in the software standby mode and in the off state of PSMOO. To maintain the configuration during the inactive state, save it both in the RAM and BBR layer.

Refer to u-blox M10 interface description for more information on advanced configuration of the receiver [5].

10 Troubleshooting

My application (e.g. u-center 2) does not receive all messages

When using UART, check that the baud rate is high enough or reduce the number of enabled messages. The maximum baud rate of 921600 or 460800 baud rate should be sufficient for most use cases. If the baud rate is insufficient, GNSS receivers based on u-blox M10 GNSS technology will skip excessive messages. Some serial port cards/adapters (e.g. USB to RS-232 converter) frequently generate errors. If a communication error occurs while u-center 2 receives a message, the message will be discarded.

My application (e.g. u-center 2) loses the connection to the GNSS receiver

u-blox M10 positioning technology and u-center 2 have an autobauding feature. If frequent communication errors occur (e.g. due to problems with the serial port), the connection may be lost. This happens because u-center 2 and the GNSS receiver both autonomously try to adjust the baud rate, if the GNSS receiver has the autobauding enabled. Select a suitable baud rate from the available list in u-center 2.

Some COM ports are not shown in the port list of my application (e.g. u-center 2)

Only the COM ports that are available on your computer will show up in the COM port drop down list. If a COM port is gray or u-center 2 is not able to connect to the selected COM port, check if there is another application running on the computer that is using the same port.

There is no data received from the EVK after connecting the EVK to my application.

Check the interface switch position and ensure that it is set to the communication interface that is in use.

☞ Do not change the interface switch while the EVK is still powered. Turn off the EVK, change the switch position and turn on the receiver.

EVK-M10QSAM is not able to use the available FTDI drivers automatically in Linux environment.

EVK-M10QSAM does not officially support Linux and the following configuration is only provided to map the available FTDI drivers to the connected EVK, which should be useful in most cases.

Map the FTDI drivers that are available in the Linux system to the EVK device by saving the following configuration in a new rules file under the `/etc/udev/rules.d/` folder.

For example: `> nano /etc/udev/rules.d/10-evk.rules`

```
ACTION=="add" \, ATTRS{idVendor}=="1546" \, ATTRS{idProduct}=="0506" \,
SYMLINK+="ttyEVK%n" \,

RUN+="/sbin/modprobe ftdi_sio" \ RUN+="/bin/sh -c 'echo 1546 0506 > /sys/bus/
usb-serial/drivers/ftdi_sio/new_id'"

RUN+="/bin/stty -F /dev/ttyEVK%n -clocal raw ispeed 9600 ospeed 9600"
```

The configuration will generate two ports as shown in the example in Figure 16 and the first port can be used for UART communication with the receiver.

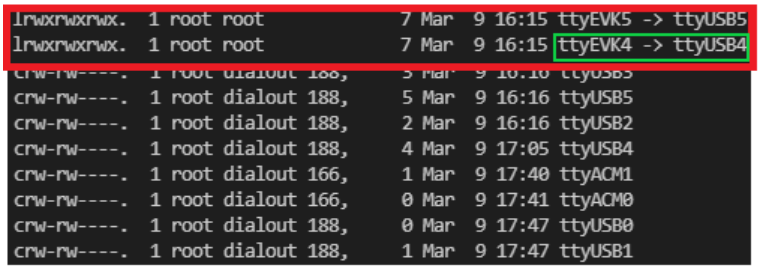

Figure 16: EVK-M10QSAM communication ports in Linux environment

EVK-M10QSAM does not work properly when connected to a GNSS simulator

When using EVK-M10QSAM together with a GNSS simulator, please pay attention to proper handling of the EVK. A GNSS receiver is designed for real-life use (i.e. time is always moving forward). When using a GNSS simulator scenarios, the scenario time can be in the past resulting in the receiver to jump backwards in time. This can have serious side effects on the performance of GNSS receivers.

The solution is to configure the GPS week rollover value to a week number preceding the date in GNSS simulator scenario. For example, setting the GPS week number to 1200 (corresponding to Jan 2003) allows running simulator scenarios taking place after this date. Please refer to Figure 17 for how to set the GPS week number with u-center 2 GNSS evaluation tool. In addition, always issue a cold start command before every simulator test to avoid receiver confusion due to the time jumps.

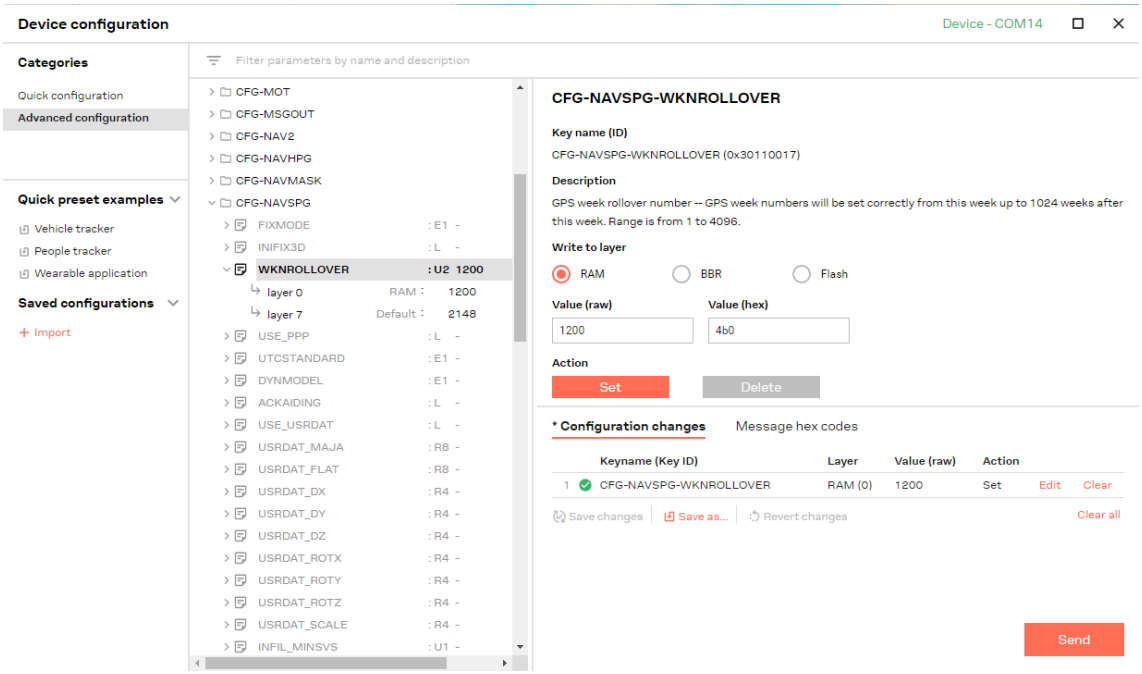

Figure 17: Setting GPS week number with u-center 2 GNSS evaluation tool

11 Common evaluation pitfalls

- **Parameters may have the same name but a different definition.** GNSS receivers may have a similar size, price and power consumption but can still have different functionalities (e.g. no support for passive antennas, different temperature range). Also, the definitions of Hot, Warm, and Cold Start times may differ between suppliers.
- Verify design-critical parameters. Try to **use identical or at least similar settings when comparing** the GNSS performance of different receivers. Data, which has not been recorded at the same time and the same place, should not be compared. The satellite constellation, the number of visible satellites and the sky view might have been different.
- **Do not compare momentary measurements.** GNSS is a non-deterministic system. The satellite constellation changes constantly. Atmospheric effects (i.e. dawn and dusk) have an impact on signal travel time. The position of the GNSS receiver is typically not the same between two tests. Comparative tests should therefore be conducted in parallel by using one antenna and a signal splitter; statistical tests shall be run for 24 hours.
- **Monitor the carrier-to-noise-ratio (C/N0).** The average C/N0 of the high elevation satellites should be between 40 dBHz and about 50 dBHz. A low C/N0 will result in a prolonged TTFF and more position drift.
- Try to **feed the same signal to all receivers in parallel** (i.e. through a splitter) with identical cable length; the receivers will otherwise not have the same sky view. Even small differences can have an impact on the speed, accuracy, and power consumption. One additional satellite can lead to a lower dilution of precision (DOP), less position drift, and lower power consumption.
- **When doing reacquisition tests,** cover the antenna in order to block the sky view.

Appendix

A Glossary

Abbreviation	Definition
BeiDou	Chinese navigation satellite system
BBR	Battery-backed RAM
EVK	Evaluation kit
I2C[1]	Inter-Integrated Circuit bus
ESD	Electrostatic discharge
Galileo	European navigation satellite system
GLONASS	Russian navigation satellite system
GND	Ground
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
IEC	International Electrotechnical Commission
PCB	Printed circuit board
RF	Radio frequency
UBX	u-blox
QZSS	Quasi-Zenith Satellite System

[1] I2C is a registered trademark of Philips/NXP.

Related documents

[1] SAM-M10Q Data sheet, UBX-22013293
[2] SAM-M10Q Integration manual, UBX-22020019
[3] Information technology equipment - Safety Standard IEC 62368-1:2018
[4] u-center 2 User guide, www.u-blox.com/en/info/u-center-2-user-guide
[5] u-blox M10 SPG 5.10 Interface description, UBX-21035062, UBX-21035061 (NDA required)

☞ For regular updates to u-blox documentation and to receive product change notifications please register on our homepage https://www.u-blox.com.

Revision history

Revision	Date	Name	Status / comments
R01	15-Nov-2022	mban	Initial release

Contact

For further support and contact information, visit us at www.u-blox.com/support.