

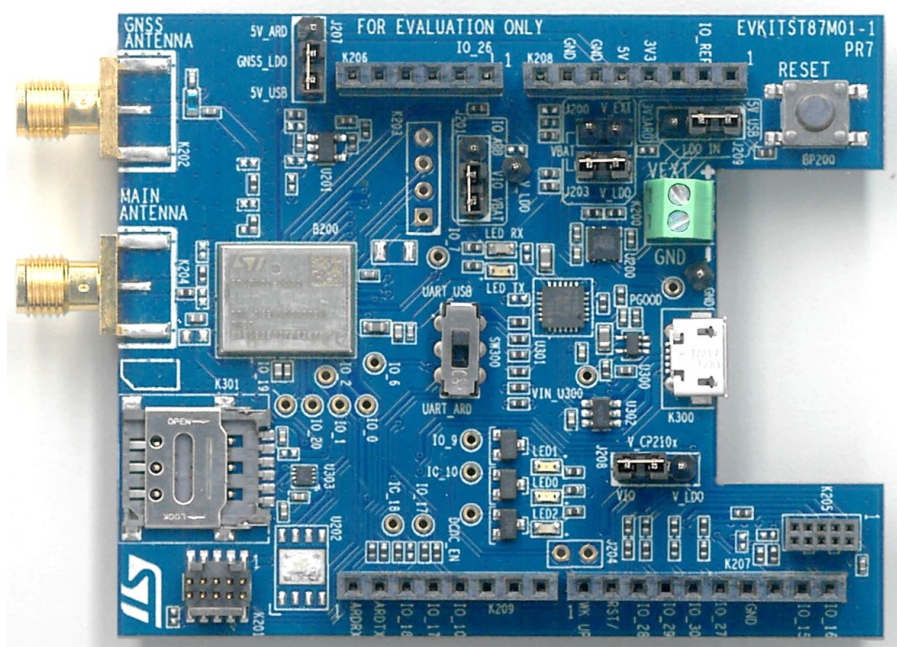
EVKITST87M01-1

Introduction

The **EVKITST87M01-1** board is an evaluation board for the **ST87M01** module. The board is designed as an X-NUCLEO Shield form factor compatible with the Arduino® connector.

In addition, 2 HOST connections to the **ST87M01** are possible: PC or associate board.

Figure 1. ST87M01 module on EVKITST87M01-1 board



1 General information

1.1 Acronyms and terms

Table 1. Acronyms and terms

Term	Definition
PA	Power amplifier
SIM / eSIM	Subscriber identity module / embedded subscriber identity module
LDO regulator	Low dropout regulator
RF	Radio frequency
SoC	System-on-Chip
PC	Personal computer
TPA	Trace port analyzer

1.2 Reference documents

Table 2. Reference documents

Reference	Document
(1)	Datasheet ST87M01
(2)	ST87MXX_UM_AT commands description
(3)	EVLST87M01 databrief

1. www.st.com/ST87M01
2. [ST87MXX_UM_AT](#)
3. www.st.com/EVLST87M01

2 ST87M01 product description

2.1 Module features

See document: [Table 2. Reference documents](#), at line nbr 1 to find the features of the ST87M01 module.

3 EVKITST87M01-1 block diagram

Figure 2. EVKITST87M01-1 block diagram

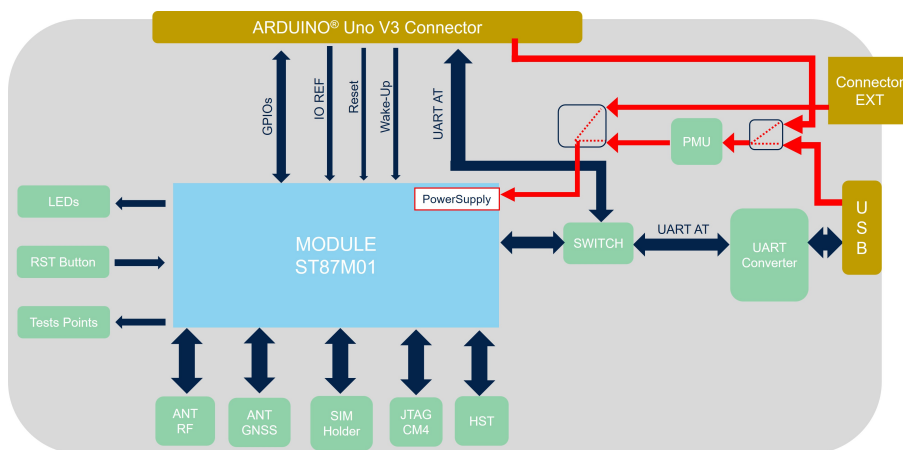
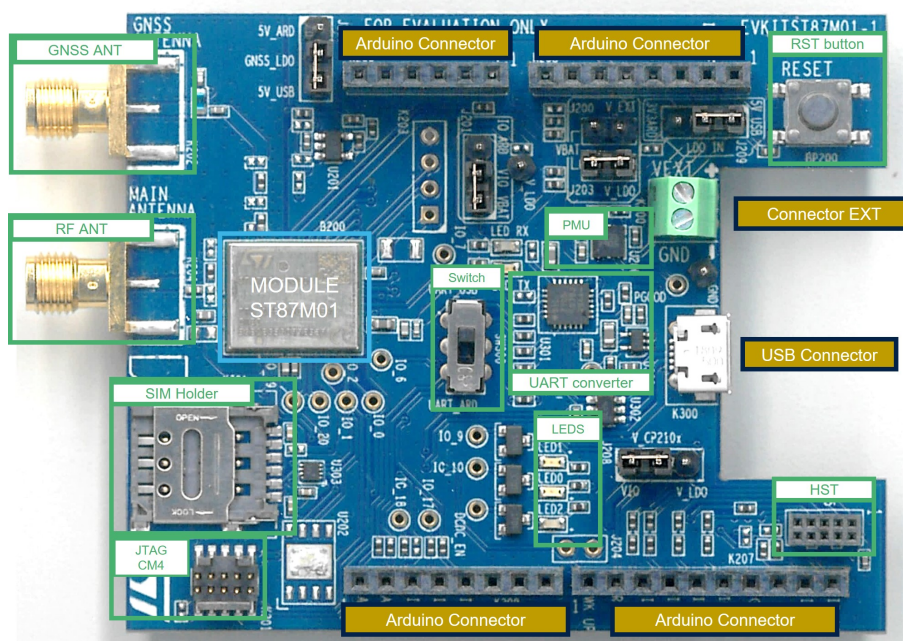


Figure 3. EVKITST87M01-1 board - main functions position on board

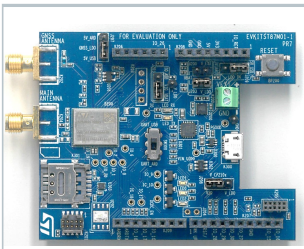


4 EVLST87M01

The EVLST87M01 is a ready-to-use evaluation kit for the ST87M01 module applications.

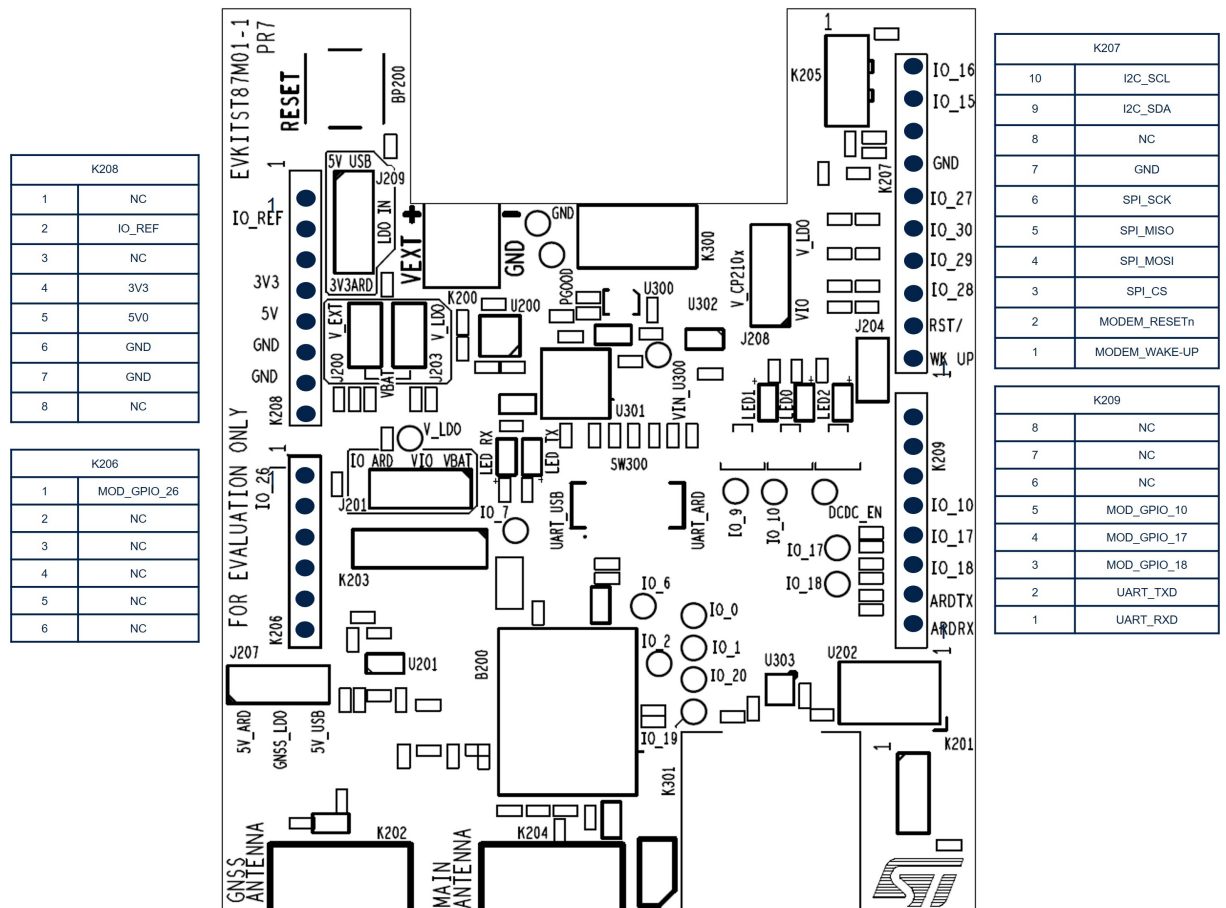
4.1 EVLST87M01 content

- EVKITST87M01-1 board
- RF antenna
- GNSS antenna
- Micro-B USB cable

			
EVLKITST87M01-1 board	GNSS antenna	RF antenna	USB cable

5 Arduino® connectors

Figure 4. EVKITST87M01-1 board - Arduino® connectors



6 Power supply

6.1 Architecture

Different power supply configurations are described in the next sections:

- USB connector power supply
- Arduino® connector power supply
- External connector power supply – variable voltages [2.2;3.0 V]
- External connector power supply – power consumption measurements [2.5 V]

6.2 Default power supply configuration

6.2.1 USB connector power supply

In this configuration, a 5 VDC power supply comes from the PC. All the power supplies of the ST87M01 are 2.5 V, output of the linear voltage regulator *LD39050* on the board.

Figure 5. Micro-USB power supply configuration

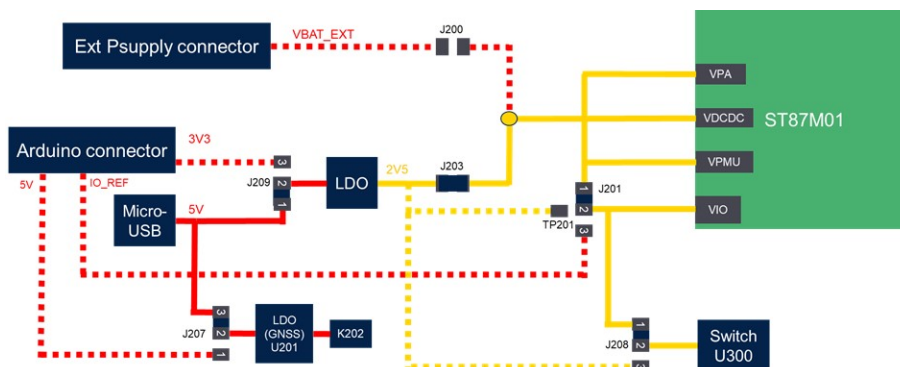


Table 3. Micro-USB power supply configuration

Ref	Configuration	Picture
J200	OPEN	
J201	1-2 CLOSED	
J203	CLOSED	
J207	2-3 CLOSED	
J208	1-2 CLOSED	
J209	1-2 CLOSED	

6.3 Other power supply configurations

6.3.1 Arduino® connector power supply

In this configuration, an associate board, Arduino® connector compatible, must be plugged under the EVKITST87M01-1 board. In addition, the associated board must output a 3.3 VDC and 5.0 VDC supply on the Arduino® connector, EVKITST87M01-1 - K208 pin4 and pin5 (see [Section 5: Arduino® connectors](#)). The IO_REF pin is used in order to have the same IO voltage level.

Figure 6. Arduino® connector power supply configuration

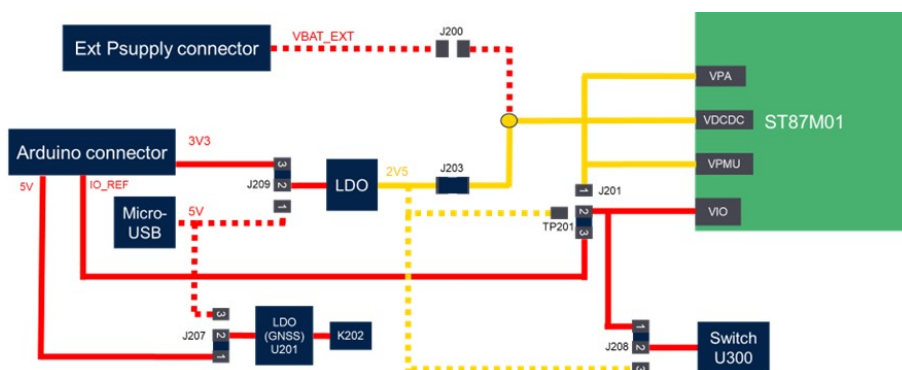


Table 4. Arduino® connector power supply configuration

Ref	Configuration	Picture
J200	OPEN	
J201	2-3 CLOSED	
J203	CLOSED	
J207	1-2 CLOSED	
J208	1-2 CLOSED	
J209	2-3 CLOSED	

6.3.2 External connector power supply variable voltages

In this configuration, an external power supply with the range [2.2;3.0 VDC] must be used.

Figure 7. Arduino® connector power supply configuration

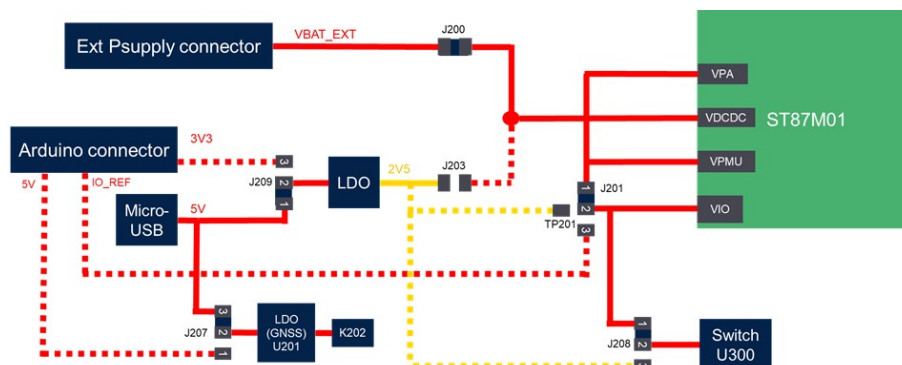


Table 5. External connector power supply variable voltage configuration

Ref	Configuration	Picture
J200	CLOSED	
J201	1-2 CLOSED	
J203	OPEN	
J207	2-3 CLOSED	
J208	1-2 CLOSED	
J209	1-2 CLOSED	

6.3.3 External connector power supply – consumption measurements

In this configuration, the external power supply must be at 2.5 VDC.

Figure 8. External connector power supply consumption measurements configuration

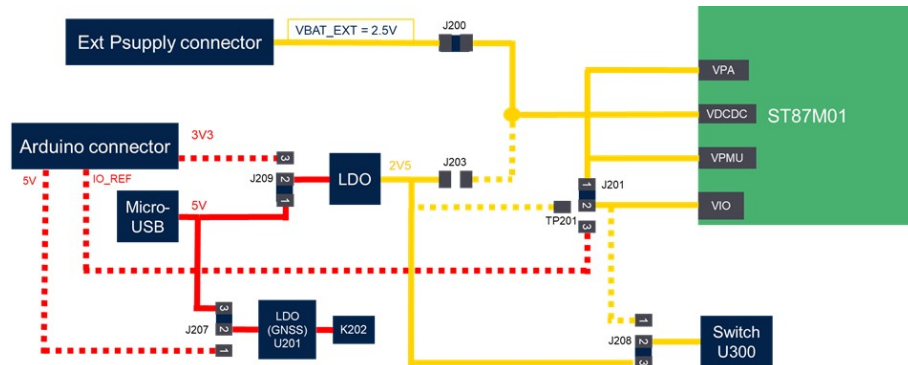


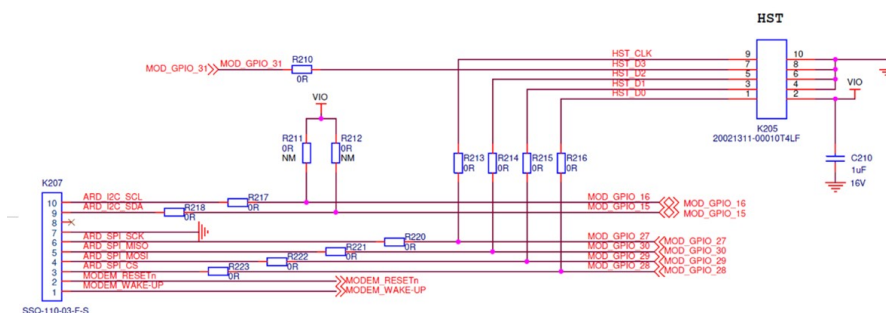
Table 6. External connector power supply consumption measurements configuration

Ref	Configuration	Picture
J200	CLOSED	
J201	1-2 CLOSED	
J203	OPEN	
J207	2-3 CLOSED	
J208	2-3 CLOSED	
J209	1-2 CLOSED	

7 HST interface

Note: The SPI function of the Arduino® connector K207 and the HST trace function cannot be used at the same time.

Figure 9. SPI and HST functions connection to K205 and K207 connectors

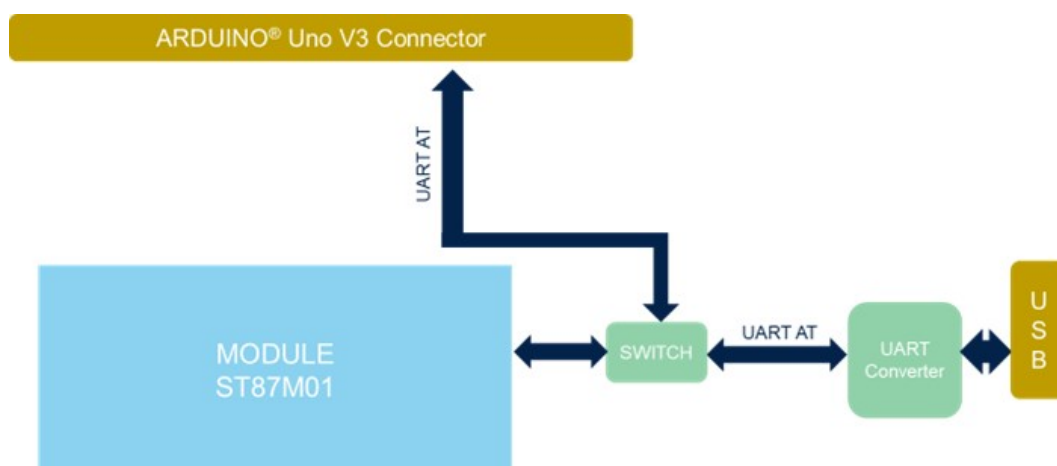


HST (High Speed Interface) is available to output a firmware data log from the application and modem. This interface, which supports high data rate (up to 25 Mb/s), requires an external hardware TPA device (named: Dongle HST Logger) to recover the data flow for ST analysis.

8 UART

The ST87M01 module on the EVKITST87M01-1 board can have 2 hosts: PC or associate board.

Figure 10. UART switch diagram



8.1 USB to UART converter

To convert USB to UART signals, the CP2105-F01-GM converter is used on the EVKITST87M01-1 board. In order to supply its VIO pin, two options are offered to choose the voltage source thanks to jumper J208:

- VIO
- VBAT_LDO (see [Table 6. External connector power supply consumption measurements configuration](#))

Note: It is mandatory to supply the VIO pin of U301 to communicate through the USB connector.

8.2 UART0 (AT)

To switch the UART0 AT TX/RX signals between the ST87M01 and PC (USB connector) or associate board (Arduino® connector), a mechanical switch is used.

Figure 11. UART switch position for PC host

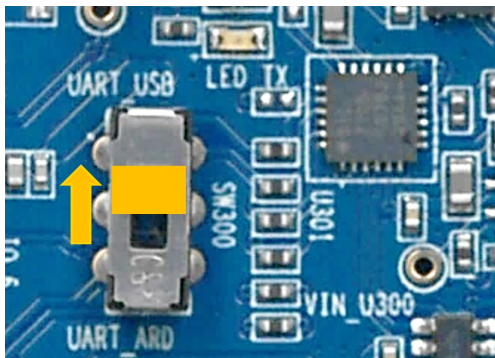
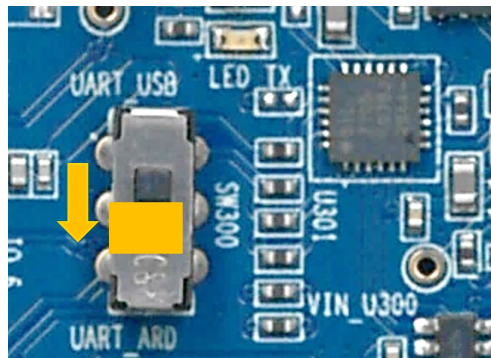


Figure 12. UART switch position for associate board host

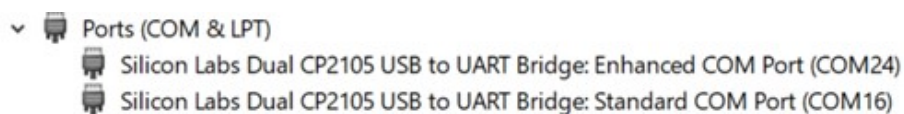


The COM port settings for the UART0 AT communication are:

Baud rate	115200
Data bits	8
Parity	None
Stop bits	1
Flow control	None

The COM port that must be selected for UART0 AT communication is the standard COM port.

Figure 13. UART0 (AT) COM port selection



9 LEDs

Figure 14. LEDs schematic

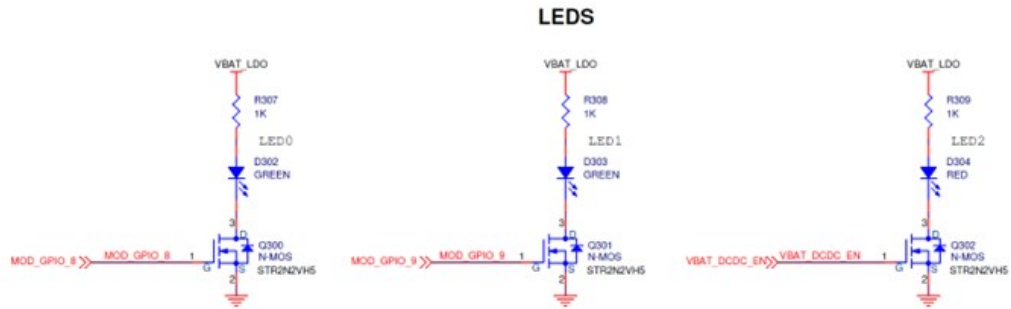
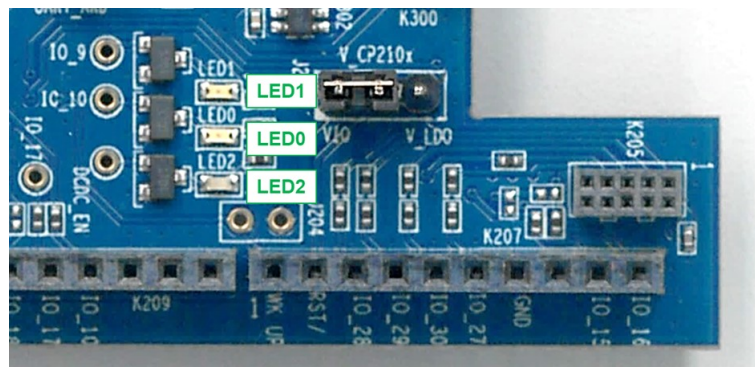


Table 7. LEDs behavior description

LED number	Signal control	Color	Status
LED0	MOD_GPIO8	GREEN	BLINK = S87M01 is running normally
LED1	MOD_GPIO9	GREEN	BLINK = S87M01 is running normally ⁽¹⁾
LED2	VBAT_DCDC_EN	RED	ON = active mode OFF = sleep or low-power mode

1. See Section 1.2: Reference documents, line nbr 1, for blinking behaviors.

Figure 15. LEDs identification on EVKITST87M01-1 board



10 Wakeup and reset

10.1 Wakeup

The wake-up function of the module can be activate through two options:

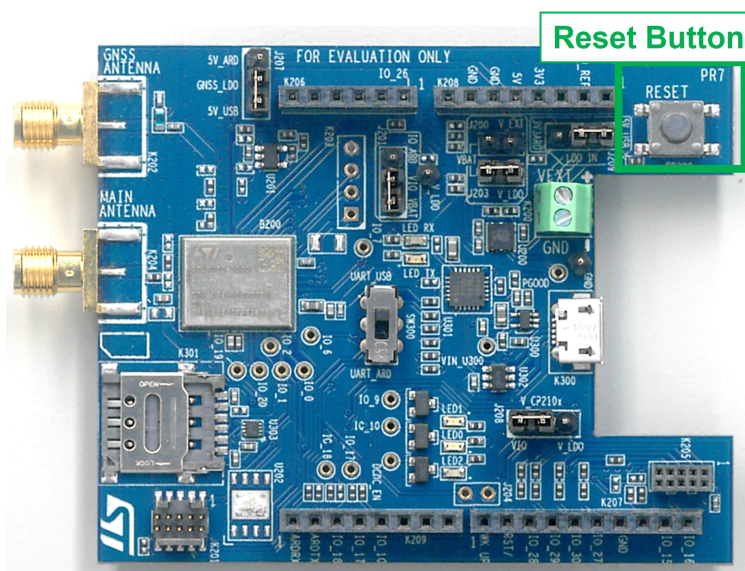
- UART: see ST87MXX_UM_AT commands description (see [Section 1.2: Reference documents](#)).
- WAKE-UP pin: from the Arduino® connector, with signal on pin 1 of K207 (see [Section 1.2: Reference documents](#)).

10.2 Reset

The reset function of the module is an active low input; two options are available to activate it:

- A press-button.

Figure 16. Reset press-button position on EVKITST87M01-1 board



- From the Arduino® connector, the board plugged on the Arduino® connector can activate the reset with the signal on pin 2 of K207.

11 Double antenna mode - GNSS

The ST87M01 module has a GNSS receiver that allows to support multiple satellite constellations to address high accuracy localization applications. In the double antenna mode, the GNSS antenna is connected on the EVKITST87M01-1 to the GNSS receiver through the K202 connector.

The EVKITST87M01-1 board offers the possibility to use an active antenna by mounting the L200 inductor. Then, the power supply source can be chosen depending on the 0R resistor mounted:

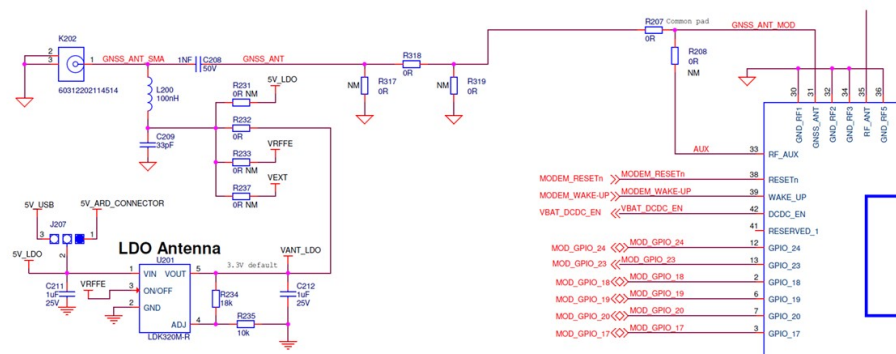
- 5V_LDO
- VANT_LDO
- VRFEE
- VEXT

For the default configuration, R232 is mounted. VANT_LDO, 3.3 V power supply, being the power supply source.

Note: In case the EVKITST87M01-1 is used in [Section 14.1: Standalone configuration](#), the 5 V input of the voltage regulator U201 can be the 5V_USB from the USB connector.

A GNSS active antenna reference is given in [Section 13.2: GNSS antenna](#).

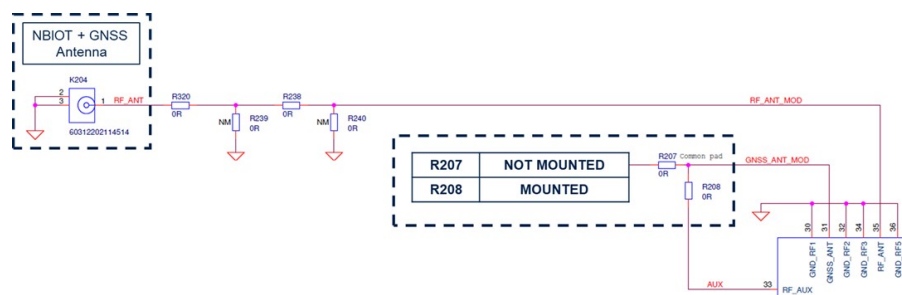
Figure 17. Double antenna mode - GNSS schematic



12 Single antenna mode - GNSS

The ST87M01 module has a GNSS receiver that allows to support multiple satellite constellations to address high accuracy localization applications. In single antenna mode, the antenna used for the NB-IoT and GNSS receiver is the same one connected on the K204 connector. The R208 resistor must be mounted and R207 unsoldered.

Figure 18. Single antenna mode - GNSS



13 Antennas

13.1 RF antenna

The RF antenna that can be found in the EVKITST87M01-1 is:

Manufacturer: MOLEX

Series number: 2203550001

Figure 19. RF antenna *Molex*



13.2 GNSS antenna

Possible active GNSS antenna compatible with [Figure 17](#): Double antenna mode - GNSS schematic configuration:

Manufacturer: ABRACON

Part number: APAMPG-117

Figure 20. GNSS antenna *Abrakon*



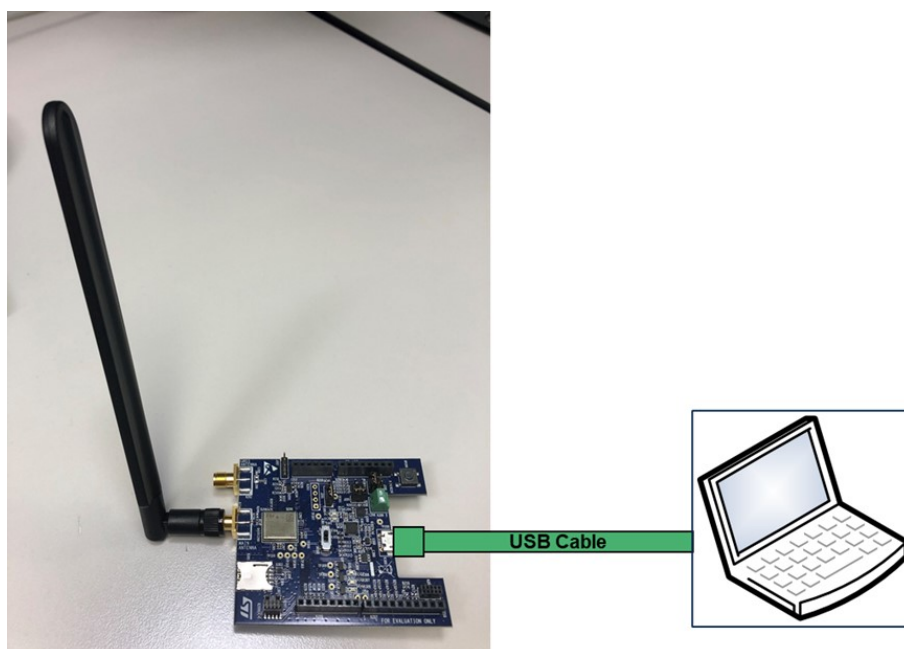
14 Using EVKITST87M01-1

14.1 Standalone configuration

In the standalone configuration, here is the list of hardware parts needed:

- EVKITST87M01-1 board
- PC
- Micro-USB cable
- Antenna

Figure 21. EVKITST87M01-1 board standalone configuration



14.1.1 Power supply

The power supply configuration is the *Default power supply configuration*.
USB connector power supply, described in the [Section 6.2: Default power supply configuration](#).

14.1.2 UART switch position

The UART switch must be in the position PC Host, see [Figure 11](#).

14.1.3 SIM card

An NBIOT SIM – NanoSIM format - should be plugged in the K301 connector to enable modem network connection.

14.1.4 Antenna connection

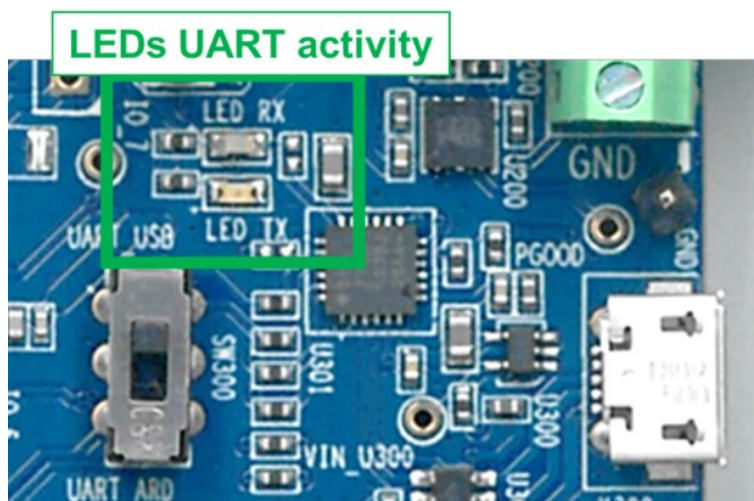
Connect the antenna to the K204 connector.

14.1.5 Drivers installation

In order to connect the EVKITST87M01-1 to the PC, install virtual COM port drivers for the SiLabs CP2105 device (which converts data between the PC USB port and the ST87M01 UART0). The latest drivers are available at: <https://www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers>

The LEDs D300 and D301 show the UART TX and RX activity. LEDs can be programmed thanks to the *SiliconLabs* tool.

Figure 22. LEDs UART activity



14.1.6 Verification procedure

1. Connect the Micro-USB cable from the PC to the K300 (USB connector) connector.
2. Verify that the virtual COM ports have been installed.
3. Verify that LED0 and LED1 are blinking green and LED2 is red lighting continuously.

14.2 Associated board configuration

In the associate board configuration, here is the list of hardware parts needed:

- EVKITST87M01-1 board
- Associate board – Arduino® connector compatible board with 3.3 V power supply
- PC
- Antenna

14.2.1 Power supply

The power supply configuration is described in [Section 6.3: Other power supply configurations](#).

14.2.2 UART switch position

The UART switch must be in the position PC Host, see [Figure 12](#).

14.2.3 SIM card

An NB-IOT SIM – NanoSIM format - should be plugged in the K301 connector to enable modem network connection.

14.2.4 Antenna connection

Connect the antenna to the K204 connector.

14.2.5 EVKITST87M01-1 connection

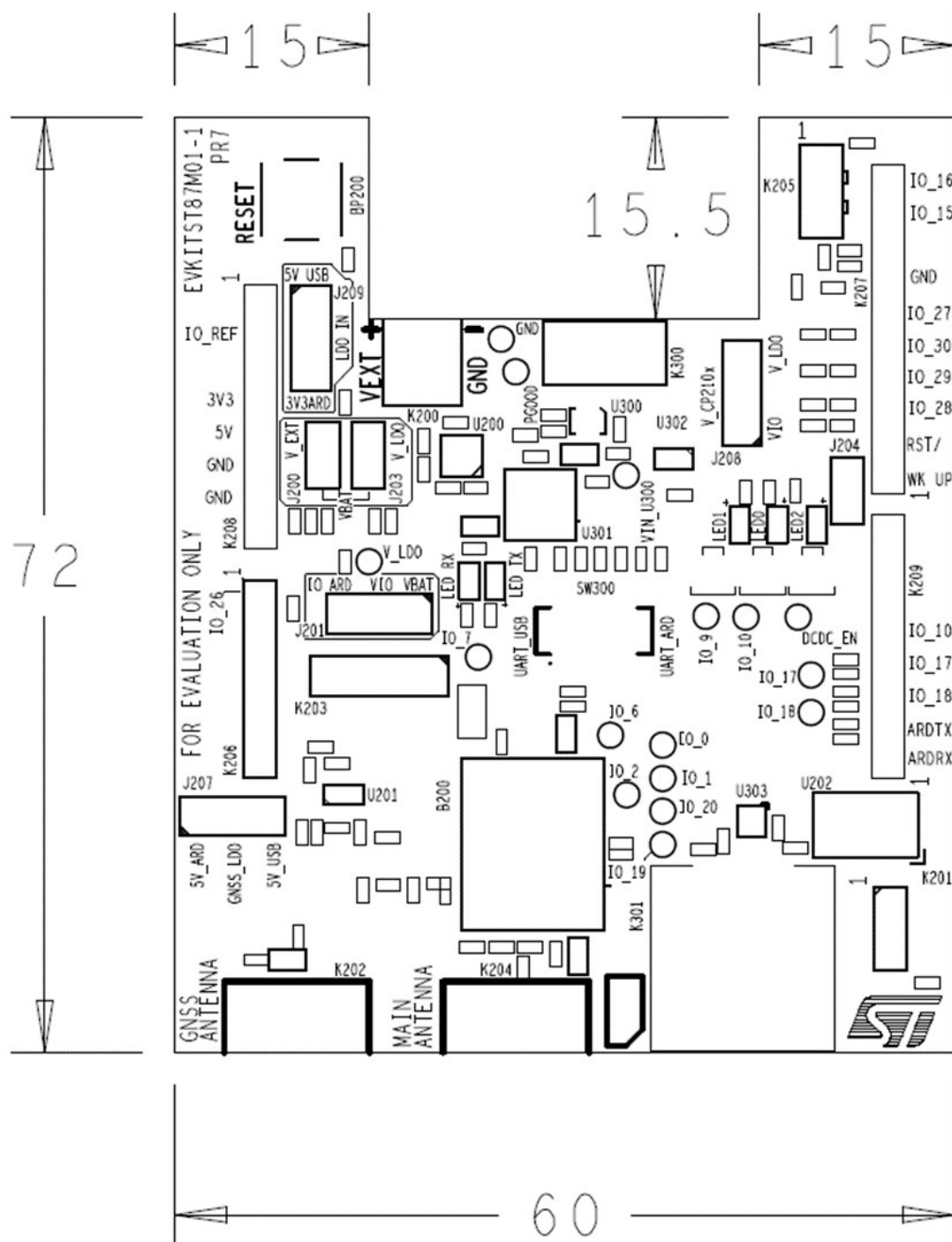
Plug in the EVKITST87M01-1 board on the associate board connectors.

14.2.6 Verification procedure

1. Connect the power supply to the associate board.
2. Verify that the LED0 and LED1 are blinking green and LED2 is red lighting continuously.

15

Figure 23. Mechanical dimensions



Revision history

Table 8. Document revision history

Date	Version	Changes
01-Oct-2024	1	Initial release.

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