UM3537

User manual

EVB-ELE6A evaluation board

Introduction

EVB-ELE6A is a complete standalone evaluation platform for Teseo VI-based Teseo-ELE6A module. The Teseo-ELE6A GNSS receiver from STMicroelectronics is designed with high performance Arm Cortex®-M7 with RF front end able to support GALILEO (E1, E5a, E5b, E6), GPS (L1, L2C, L5), GPSIII (L1C), GLONASS (L1OF, L2OF), QZSS, QZSS LEX, BeiDou, BeiDou2 (B1C, B2a, B2b, B3i), NAVIC (former IRNSS) satellites. EVB-ELE6A is designed to support -40°C to 105°C operating temperature range.

1 Scope

The document is a guide to use the EVB-ELE6A. The target audience of the document includes any end users of the board for evaluation, validation, or system development activities.

If the board is used in a standalone manner on the workbench, it must be in a static-free environment, always maintaining antistatic precautions. For example, the board must be placed on a grounded antistatic mat and the user must always wear the wrist strap connected to the mat.

2 Features

EVB-ELE6A offers different interfaces to the user, all functions needed to evaluate the GNSS performance are accessible through front and rear panels (user interface). Some specific functions require opening the casing for access (internal features).

User interface

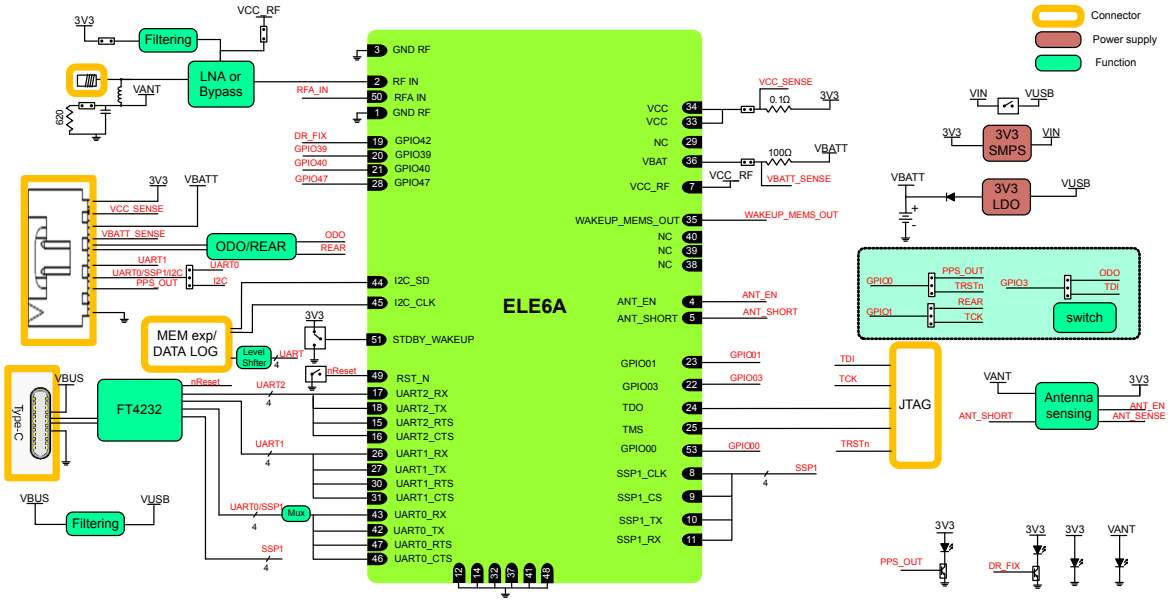
- RF input, SMA connector with 3.3 V voltage for active antenna power supply
- USB type-C connector used for board power supply and communication interface with PC
- 3 full-UART with hardware flow control by USB interface
- Power ON/OFF button
- Reset button
- 14 pins connector with:
  - I2C (in alternate of UART RTS/CTS)
  - PPS_OUT
  - Full UART or SPI
  - Wheel tick for car speed
  - Reverse signal for car direction
  - Current measurement (VCC and back-up)
  - Wake-up sensor signal
- LED indicator:
  - Power ON/OFF
  - PPS
  - Antenna power supply state
  - Dead reckoning fix state (if supported by SW)
- JTAG/GPIO switch selection
- JTAG connector

Internal features

- Rechargeable backup battery (not mounted)
  - Reference example: MS920SE from SEIKO INSTRUMENTS
- Current measurement headers
- PPS micro-FL connector
- 3.3 V antenna power supply with current sense monitoring and current limiter
- Internal UART headers
- MEMS expansion connector
- Standby/wake-up button

3 Platform block diagram

Figure 1. **Board block diagram**



4 Board overview

4.1 Kit description

The EVB-ELE6A kit is composed of the following elements:

- EVB-ELE6A populated with Teseo-ELE6A module and mounted into metallic casing.
- 1 USB cable type C and type A on the other side for power supply and PC connection.
- JTAG MIPI 20 to MIPI 10 adapter. (alternate ref: 8.06.00 Segger Microcontroller).
- One-page quick starting guide.

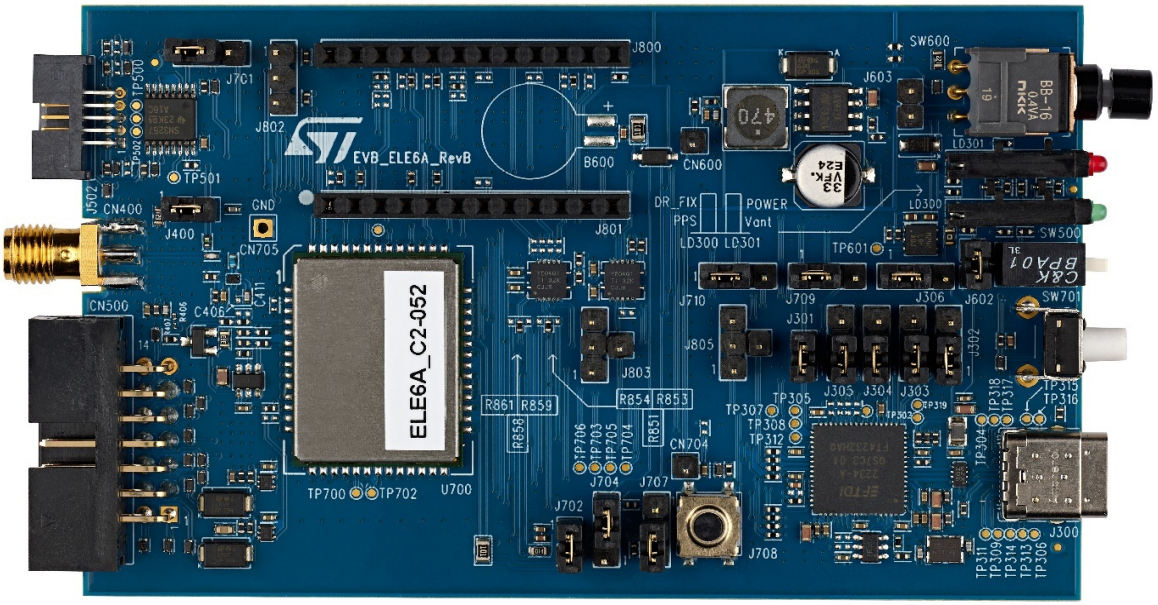
Figure 2. Kit content

Figure 3. Front panel

Figure 4. **Rear panel**

4.2 Top view

Figure 5. **EVB-ELE6A top view**



5 User interfaces

5.1 USB connector

5.1.1 Power by USB

Figure 6. USB type C position

The USB type C connector is used to supply the board.

5.1.2 External trace by USB

Figure 7. USB type C position

The USB type C connector is also used to download firmware in the module (see Section 7.1: SW binary download) and get GNSS messages (NMEA or RTCM format). USB type C® connection, being symmetrical, allows the USB cable to be connected in any orientation on the EVB-ELE6A.

The bridge UART/USB converter is used like a Virtual COM Port (VCP). It allows the device on EVB-ELE6A to appear to the PC's application software as a standard COM port. Data transfer between PC/laptop is serial through USB interface.

5.2 Prerequisite:

- Before using UART/USB bridge FT4232 the installation of the driver is needed, download it on FTDI web page: https://ftdichip.com/drivers/vcp-drivers/.(1)
- Need to install to read trace:
  - **ST TESEO-SUITE** is a powerful PC tool able to manage all the capabilities of ST Teseo GNSS solution.

1. *The URL belongs to a third party. It is active at document publication, however STMicroelectronics shall not be liable for any change, move or inactivation of the URL or the referenced material.*

Register and download at: https://www.st.com/en/embedded-software/teseo-suite.html#overview.

5.3 Serial com port configuration:

Table 1. Serial com port configuration

Communication default parameters					
Baud rate	**Data bits**	**Stop bits**	**Parity**	**Handshake**	**Flow control**
3000000 baud	8 bits	1 bit	None	None	HW

5.4 Antenna current monitoring

RF_IN signal on SMA connector is polarized by VANT, power supply image of 3.3 V generated on EVB-ELE6A. This power is protected in case of short circuit over 97 mA VANT is cut OFF by SW (to come back in normal state push reset button) and for over temperature detection. In case of over consumption VANT current is limited by design at 112 mA.

The current drawn by the active antenna through the RF SMA connector is monitored by an internal current monitoring circuit embedded into the EVB-ELE6A. The purpose of this circuit is double:

1. To limit the maximum current at ~112mA in case of short circuit and to switch-off antenna voltage in case of over temperature condition or reverse voltage condition.
2. To provide a voltage proportional to the antenna current (current sense circuit) to the Teseo-ELE6 module to determine the antenna status (open, normal, short circuit, thermal shutdown or reverse current).

5.5 GNSS RF input

Figure 8. GNSS RF input with antenna connected

GNSS RF input is available through a SMA female connector. Thanks to the internal EVB-ELE6A on-board LNA with 22 dB gain, it is possible to directly connect a passive antenna or a GNSS simulator.

The 3V3 DC power supply for active antenna is also available on SMA connector feed with a current limitation (70 mA) in case of short circuit.

The gain of the active antenna used with the EVB-ELE6A should be 30 dB maximum to guarantee best in class GNSS performances.

Attention: *Please use DC block for passive antenna or active antenna with supply different than 3V3 or GNSS simulator connected to EVB-ELE6A.*

5.6 ON/OFF switch

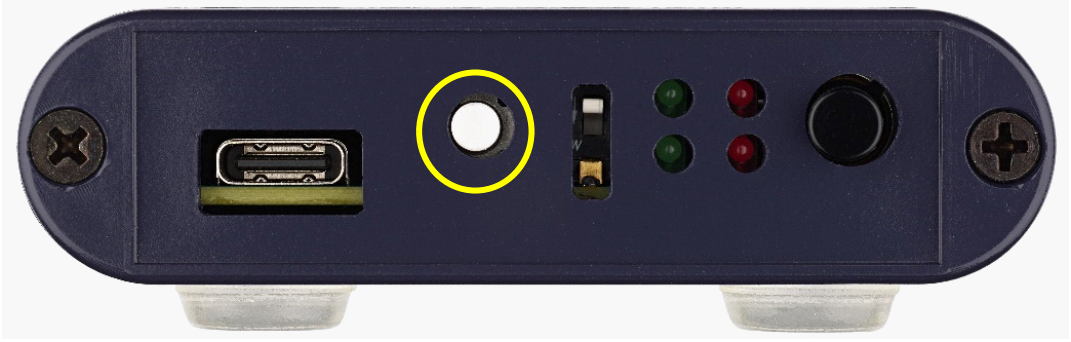
Figure 9. ON/OFF button position

ON/OFF switch is a push button with latchdown. When the button is pushed, the board turns ON and PWR LED turns ON (refer to Section 5.8: LED indicators).

When the button is not pushed (power OFF), the main power supply of the Teseo-ELE6A module (VCC) is switched OFF. In that condition, only the always-on domain (VBATT) of module is supplied as long as the USB is connected or when the backup battery is soldered on PCB (not mounted by default).

5.7 Reset

Figure 10. Reset button position



A reset button is present on the front panel of the case, it resets Teseo-ELE6A module.

5.8 LED indicators

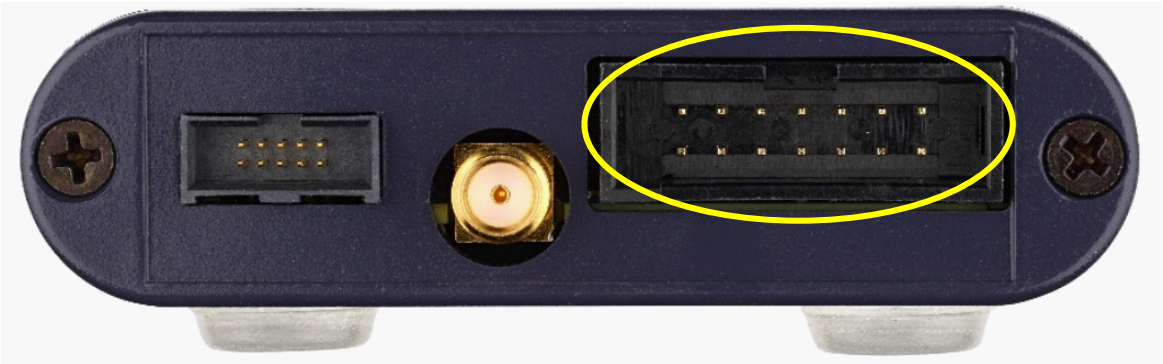
Figure 11. **LED indicators position**

EVB-ELE6A offers four LED Indicators:

- **PPS** (GREEN LED): When the GNSS software is running, the PPS LED is blinking otherwise it is always ON.
- **DR fix** (GREEN LED): When DR fix is achieved, the DR LED is ON (if supported by SW).
- **PWR ANT** (RED LED): When antenna power supply (3.3 V) is present on the SMA connector, the PWR ANT LED is ON (default state).
- **PWR** (RED LED): When power ON/OFF button is pushed to supply the EVB, the PWR LED is ON.

5.9 External 14 pins connector

Figure 12. **14 pins connector**



The EVB-ELE6A offers an external connector to get access to different input or output signals coming from the Teseo-ELE6A module. For more details see Table 2. 14 pins connector pin out.

Example of plug connector reference for connection to CN500:

SAMTEC - HCSD-07-D-05.00-01-T-N-RW

Table 2. **14 pins connector pin out**

Pin number	Signal name	Signal type	Comment
1	VCC_SENSE	Power 3.3 V	Signal after sense resistor on VCC (-)
2	VCC	Power 3.3 V	Main 3.3 V power supply (+)
3	FORWARD	Input	Reverse (direction) signal from car (compatible with car signal, low voltage detection)

Pin number	Signal name	Signal type	Comment
4	WHEELTICK	Input	Wheeltick signal from car (odometer) (compatible with car or simulator signal, low voltage detection)
5	VBATT_SENSE	Power 3.3 V	Signal after sense resistor on VBATT (-)
6	VBATT	Power 3.3 V	3.3 V backup voltage (+)
7	UART0_RTS /SSPRXD_1	Output 3.3 V	UART0 request to send / SSP RX alternate IO function / I2C_SCL
8	UART0_CTS/SSPTXD_1	Input 3.3 V	UART0 clear to send / SSP TX alternate IO function / I2C_SDA
9	UART0_RX/SSPCLK_1	Input 3.3 V	UART0 received signal / SSP clock alternate IO function
10	UART0_TX/SSPFRM_1	Output 3.3 V	UART0 transmit signal / SSP chip select alternate IO function
11	PPS_OUT	Output 3.3 V	PPS_OUT signal
12	WAKEUP_MEMS_OUT	Output 3.3 V	WAKEUP sensor signal
13	GND	na	Ground signal
14	GND	na	Ground signal

5.10 JTAG connector

EVB-ELE6A offer an external access to JTAG connectors.

Figure 13. JTAG connector

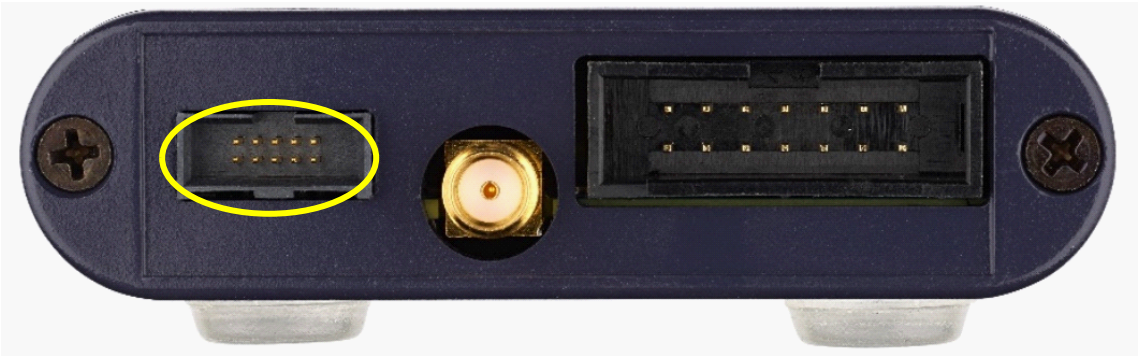


Table 3. JTAG connector pin out

Pin number	Signal name	Comment
1	VCC	3.3 V power supply
2	TMS	JTAG TMS signal
3	GND	Ground signal
4	TCLK	JTAG CLOCK
5	GND	Ground signal
6	TDO	JTAG TDO signal
7	RTCK	Not connected signal
8	TDI	JTAG TDI signal
9	GND	Ground signal
10	RESET	JTRSTn

Figure 14. **Switch JTAG selection**

The JTAG interface connector meets the standard pin out for JTAG debugging (for example, ARM® tools).

Adaptor MIPI10 to MIPI20, is provided in kit with the board to connect JTAG probe (Lauterbach with ARM® M7 license or JLINK ULTRA+).

5.11 Switch IO/JTAG selection

The EVB-ELE6A has three pins muxed between JTAG function and IO function. To select between JTAG or IO position of switch SW500 below has to be correctly set, please follow Table 4. Switch IOs selection for the corresponding position between IO or JTAG.

This switch is used to have JTAG signals on JTAG connector (see Table 3. JTAG connector pin out).

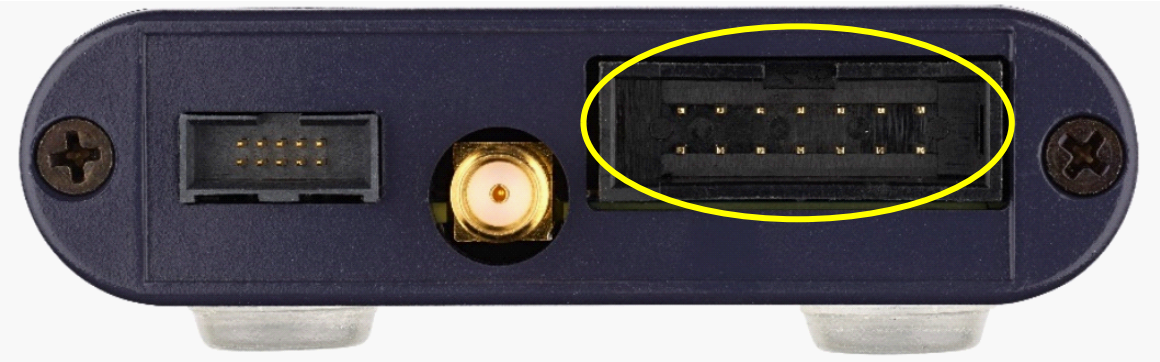
Because JTAG signals are muxed with some IO functions, please note that when JTAG switch position is up, the following signals PPS0_OUT / ODO / REAR are not present on the 14-pin connectors.

Figure 15. **JTAG / IO switch**

Table 4. **Switch IOs selection**

Switch position	Signal connected	Comment
UP (OFF)	PPS0_OUT / ODO / REAR	General function on 14 pins connector (JTAG deactivated)
DOWN (ON)	TRSTn/ TDI / TCK	JTAG signals on the JTAG connector

Figure 16. 14-pin connector for PPS/ODO/REAR IO access



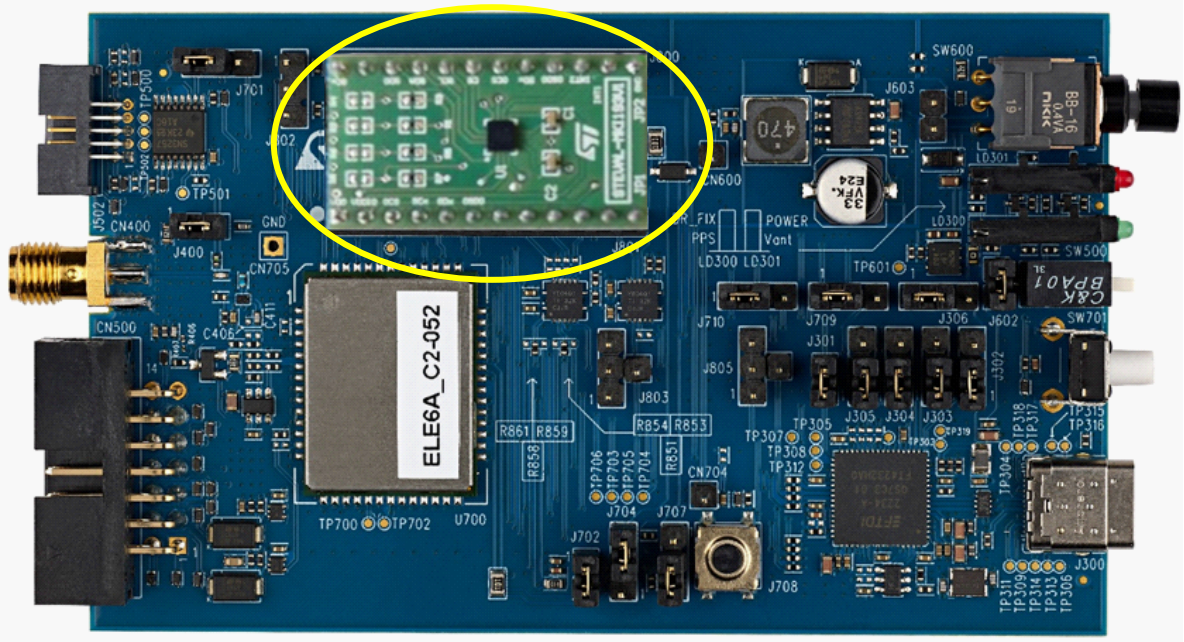
6 Internal specific function

6.1 MEMS expansion connector

The EVB-ELE6A has a DIL24 connector (J800+J801) that allows to plug sensors evaluation board. For example support board ref: STEVAL-MKI193V1

The control interface used is the I2C interface.

Figure 17. **MEMS expansion connector**



6.2 PPS

The evaluation board offers the possibility to select as PPS_OUT signal either PPS0_OUT or PPS1_OUT coming from the Teseo-ELE6A module. The PPS0_OUT or PPS1_OUT signal is enabled by the GNSS SW (by default only PPS0_OUT is enabled) and provides a pulse per second. These two signals are powered by 3V3 domain.

PPS_OUT signal is connected to LED indicator, as described in Section 5.8: LED indicators and is also available on the 14 pins external connector (pin #11) as described in Section 5.9: External 14 pins connector.

For selection of PPS_OUT signal see Table 5. PPS_OUT selection

Figure 18. PPS_OUT selection J701 position

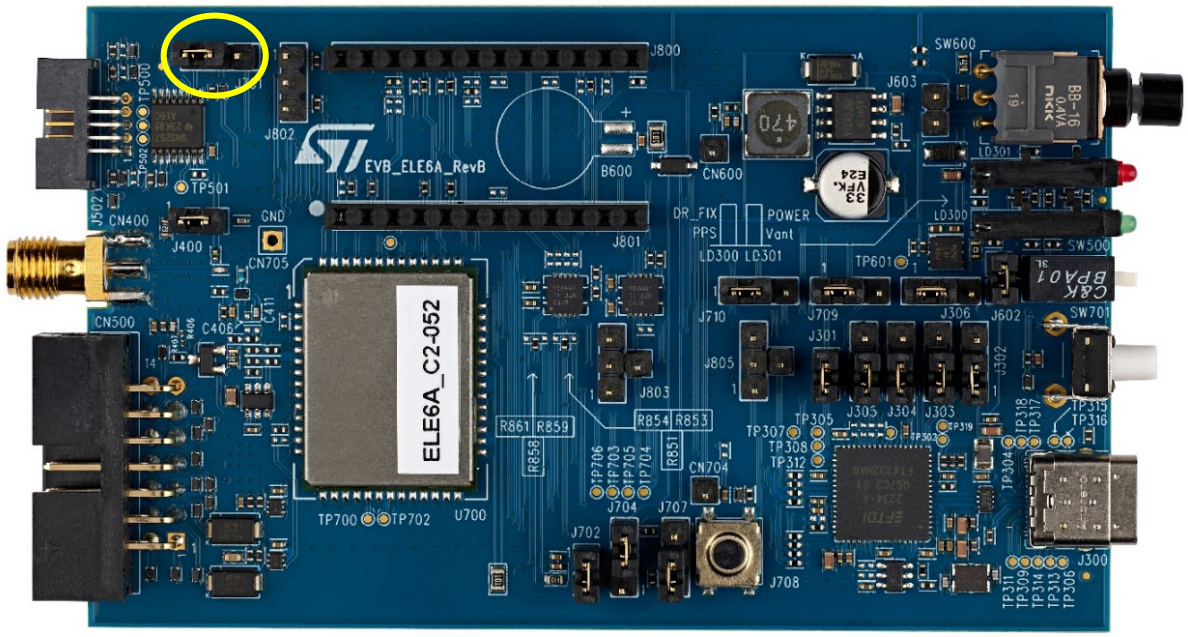
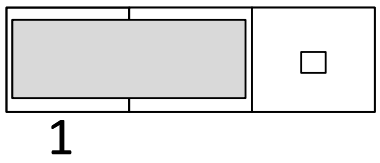
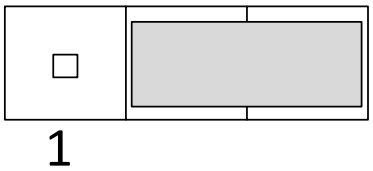


Table 5. PPS_OUT selection

PPS0_OUT (default)	PPS1_OUT
 J701	 J701

6.3 Standby/ wakeup

The EVB-ELE6A offers a standby/wakeup button with selectable active level.

This button can be used to force HW standby (active low level) or wake-up from SW standby. Configuration should be activated in SW between standby and wakeup active high or wakeup active low (not activated by default).

Figure 19. Wakeup button position

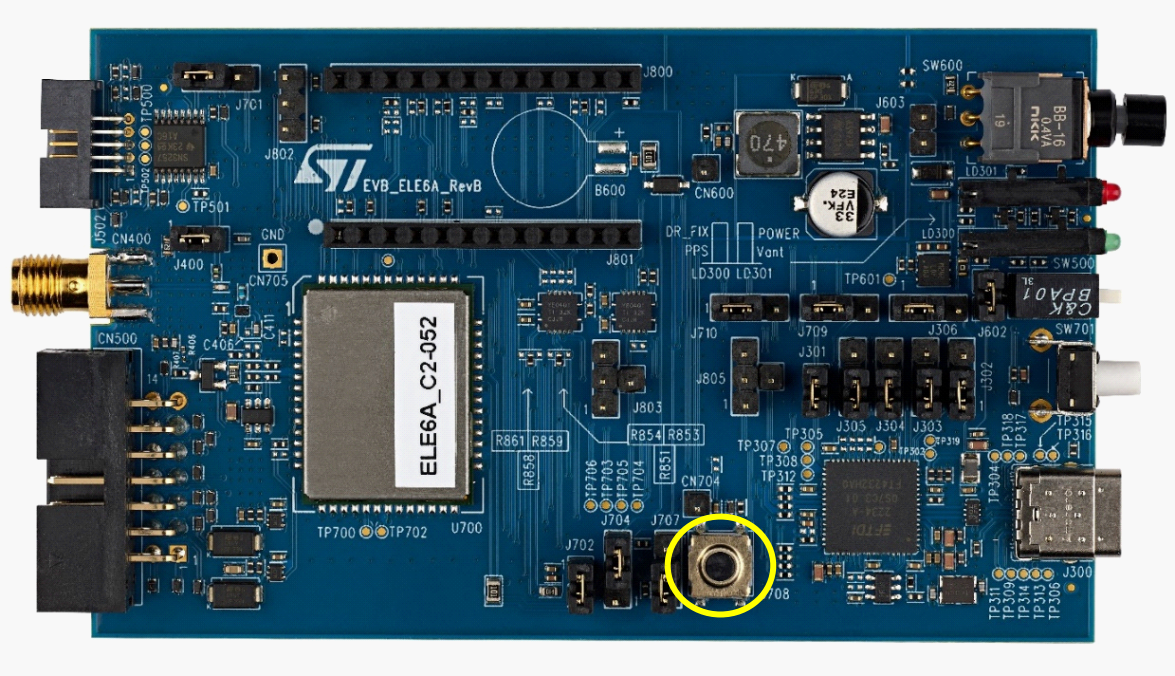
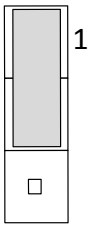
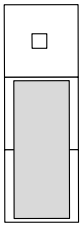


Table 6. Wakeup level selection

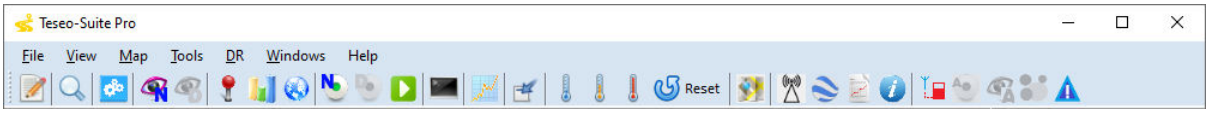
Wakeup high level section	Standby or wakeup low level section
 J707	 J707

7 Board general view

7.1 SW binary download

For download please refer to TESEO-SUITE user manual.
Help → User manual

Figure 20. Teseo-Suite example user interface view



7.2 Jumper and solder pads configuration

Detailed jumper configuration:

Table 7. Jumper description

Jumper reference	Signal selection	Comment
J301	nReset	Connection for automatization
J302	UART0_RX	UART0_RX or SSP_CLK selection
J303	UART0_TX	UART0_TX or SSP_RX selection
J304	UART0_CTS	UART0_CTS or SSP_TX selection
J305	UART0_RTS	UART0_RTS or SSP_CS selection
J306	VALWON	FTDI power supply on always on domain
J400	Resistance to ground	Purpose of this jumper is to drive a minimum current on antenna current monitoring circuit to avoid error when an active antenna is not connected
J602	Enable U602	Enable VBATT power supply
J603	VON to VIN connection	Bypass ON/OFF button
J701	PPS0_OUT or PPS1_OUT	PPS_OUT selection between PPS0_OUT and PPS1_OUT
J702	3V3	Main 3.3 V current measurement
J704	VBATT	VBATT current measurement and selection between always domain and common 3.3 V with main supply
J707	GND	Wakeup level selection
J709	GPIO18	I2C_SCL or UART0_RTS selection
J710	GPIO19	I2C_SDA or UART0_CTS selection
J802	-	Reserved
J803 + CN801	-	UART0_RTS or UART1_RTS or UART2_RTS
J805 + CN800	-	UART0_CTS or UART1_CTS or UART2_CTS

Appendix A Acronyms

Table 8. **Acronyms**

Acronyms	Definition
CDB	Configuration data block
DC	Direct current
EVB	Evaluation board
GNSS	Global navigation satellite system
I2C	Inter-integrated circuit
IO	Input output signals
LED	Light-emitting diode
MEMS	Micro-electro-mechanical-systems
PCM	Phase change memory
PPS	Pulse per second
SSP	Synchronous serial port
SW	Software
UART	Universal asynchronous receiver-transmitter

Revision history

Table 9. **Document revision history**

Date	Revision	Changes
02-Jul-2025	1	Initial release.

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