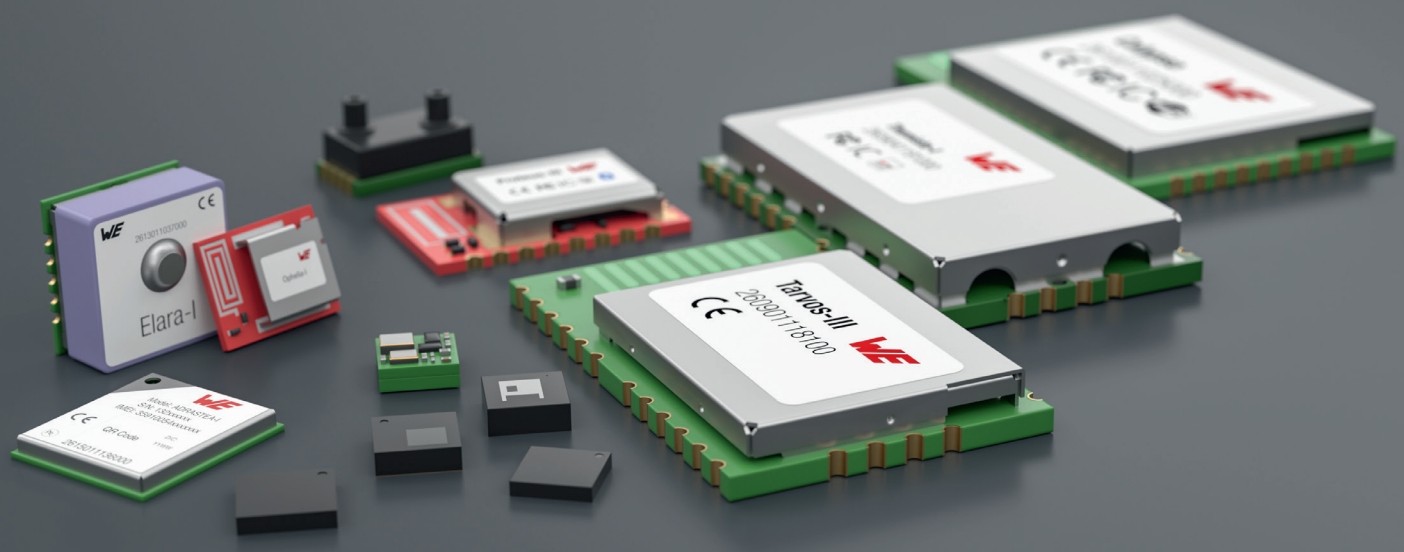


User manual

Evaluation board for radio module Triton

2603011021000 / 2603011121000

Version 2.3

May 22, 2023

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

****

MUST READ

Check for firmware updates

Before using the product make sure you use the most recent firmware version, data sheet and user manual. This is especially important for Wireless Connectivity products that were not purchased directly from Würth Elektronik eiSos. A firmware update on these respective products may be required.

We strongly recommend to include in the customer system design, the possibility for a firmware update of the product.

Revision history

Manual version	HW version	Notes	Date
1.0-1.4	2.1	• Initial version	June 2017
2.0	2.1	• New corporate design and structure	December 2018
2.1	2.1	• Added chapter `Regulatory compliance information`	February 2019
2.2	2.1	• Added marketing name	March 2019
2.3	2.1	• New corporate design	May 2023

Abbreviations

Abbreviation	Name	Description
FSE	Field Sales Engineer	Support and sales contact person responsible for limited sales area
HIGH	High signal level	
LOW	Low signal level	
RF	Radio frequency	Describes everything relating to the wireless transmission.
UART	Universal Asynchronous Receiver Transmitter	Universal Asynchronous Receiver Transmitter allows communicating with the module of a specific interface.
VDD	Supply voltage	

Contents

1 Supported radio modules

The evaluation board described in this manual can be used to evaluate the following products:

Order code	Former order code	Marketing Name
260301102100x	AMB2220(TR)	Triton
260301112100x	AMB2220-1(TR)	Triton

Order code	Description
260301102100x	2.4 GHz proprietary radio module with integrated chip antenna
260301112100x	2.4 GHz proprietary radio module with antenna pad

Table 1: Compatibility

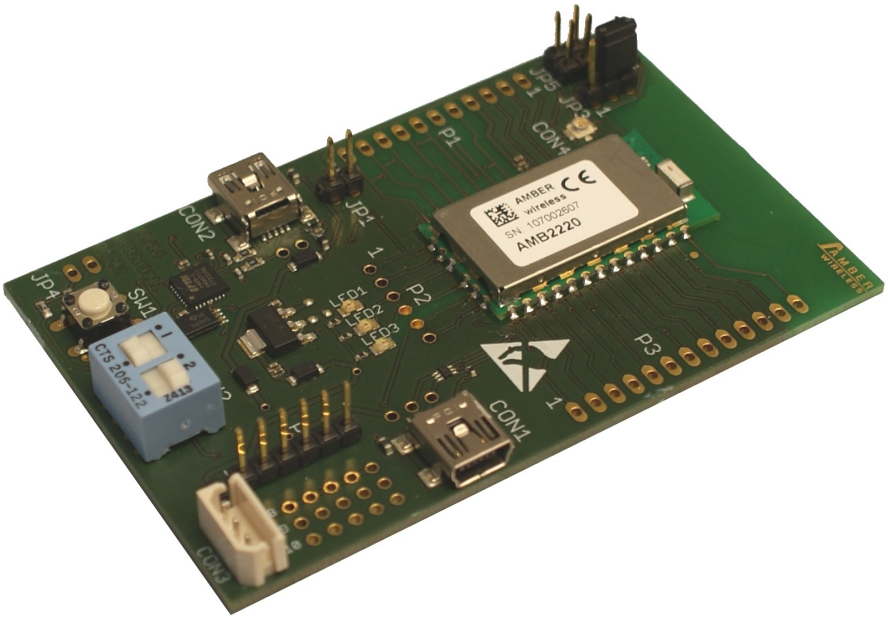


Figure 1: Product image

2 Functional description

The evaluation board offers the user the possibility to develop hard- and software for the compatible radio module. It can be connected to an USB port of a PC.

For the connection to a microcontroller system the development board is equipped with a multi-pin connector which is connected to all pins of the RF module. Jumpers allow the module to be disconnected from components which are not required such as the USB interface.

Feel free to check our youtube channel for video tutorials, hands-ons and webinars related to our products:
www.youtube.com/user/WuerthElektronik/videos

2.1 Taking into operation

To run the evaluation board place the jumpers and switches on their default position (see section 3.2).
The corresponding FTDI driver package (*http://www.ftdichip.com/Drivers/VCP.htm*) has to be installed on your PC. Please make sure you keep that driver up-to-date.

The next step is to connect the Mini-USB (CON2) of the evaluation board to the PC using an USB-cable. In that way a COM port can be detected and installed on your PC. Check the device manager to acquire the COM port name of the EV board. a typical name is "COM12" in Windows systems or in Linux system /dev/ttyUSB0

A terminal program (like *hterm*) has to be run and the corresponding COM port has to be opened using the default settings of the mounted radio module (e.g. 9600 Baud with 8 data bits, no parity, 1 stop bit).
After the module is powered through the USB jack, the reset button should be pressed to ensure a clean start-up of the module.
Please refer to the module user manual to get the detailed quick start instructions.

3 Development board

3.1 Block diagram

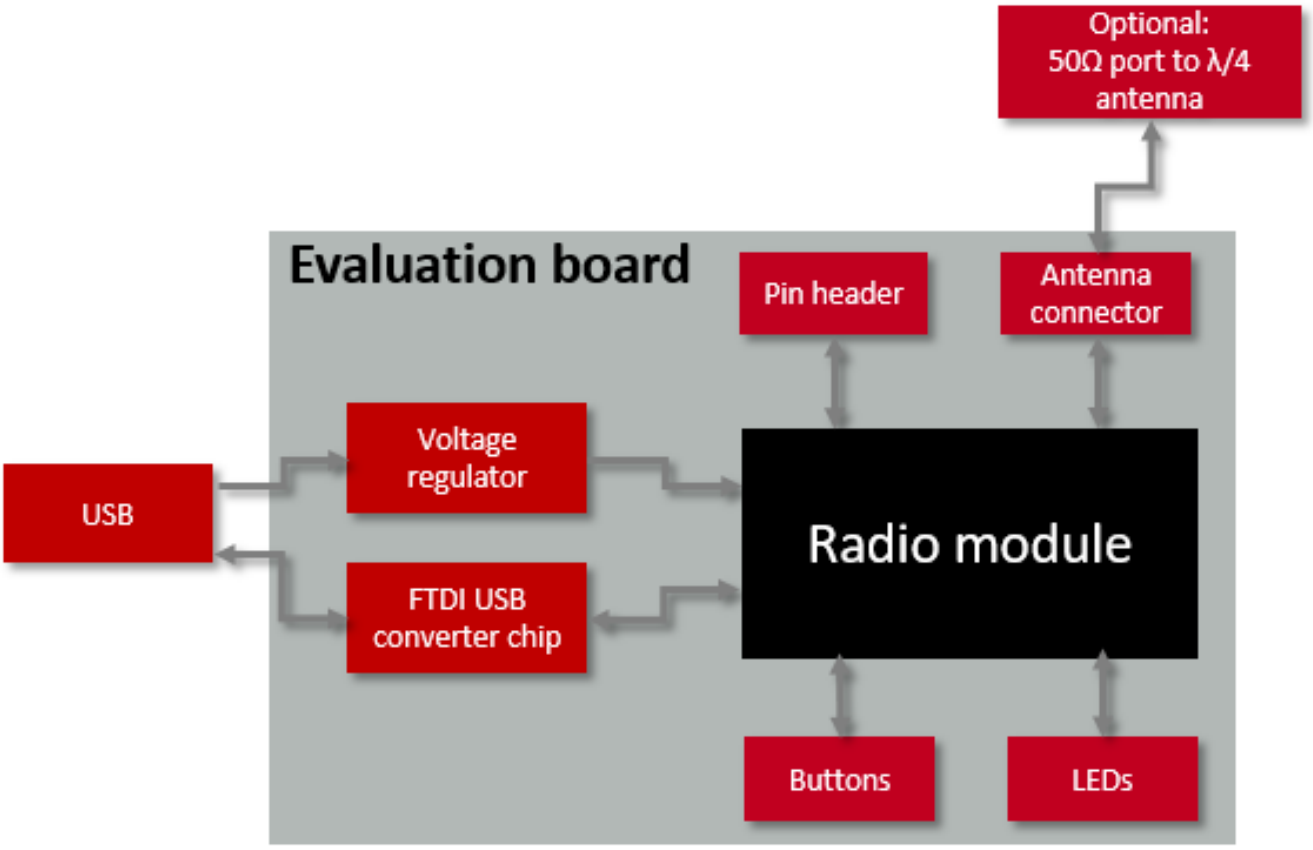


Figure 2: Block diagram

3.2 Jumpers

The following figure shows the default positioning (marked in red) of all jumpers on the EV board. This section also contains the details to any jumper connection that is supported by the EV board.

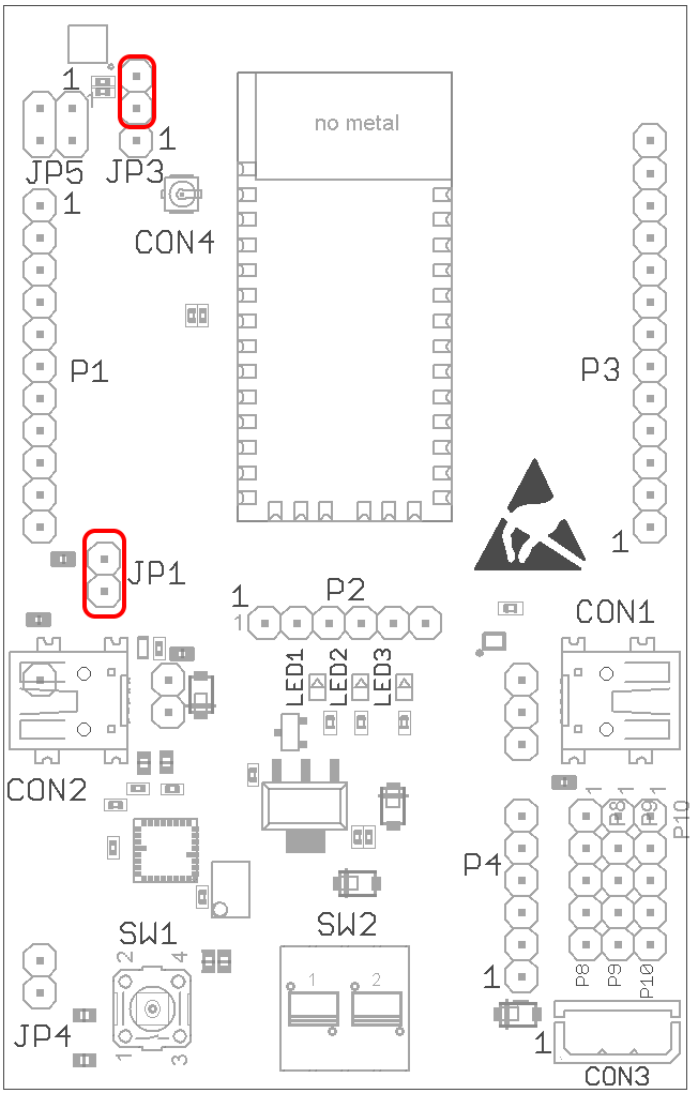


Figure 3: Jumpers, defaults

JP1	Jumper placed (default)	Description
1,2	Set 1-2	Measuring bridge current supply of the module

JP3	Jumper placed (default)	Description
1,2,3	Set 2-3	1-2 enable the accelerometer 2-3 turn off the accelerometer

JP4	Jumper placed (default)	Description
1-2	Not Set	BOOT0 pin of module

JP5	Jumper placed (default)	Description
1,2	Not Set	Connection of interrupt pin 1 of accelerometer sensor
3,4	Not Set	Connection of interrupt pin 2 of accelerometer sensor

3.3 Connectors and pin headers

This section explains all connectors and pin headers on the EV board.

STOP

All reserved pins shall be handled/terminated as described in the module specific manual.

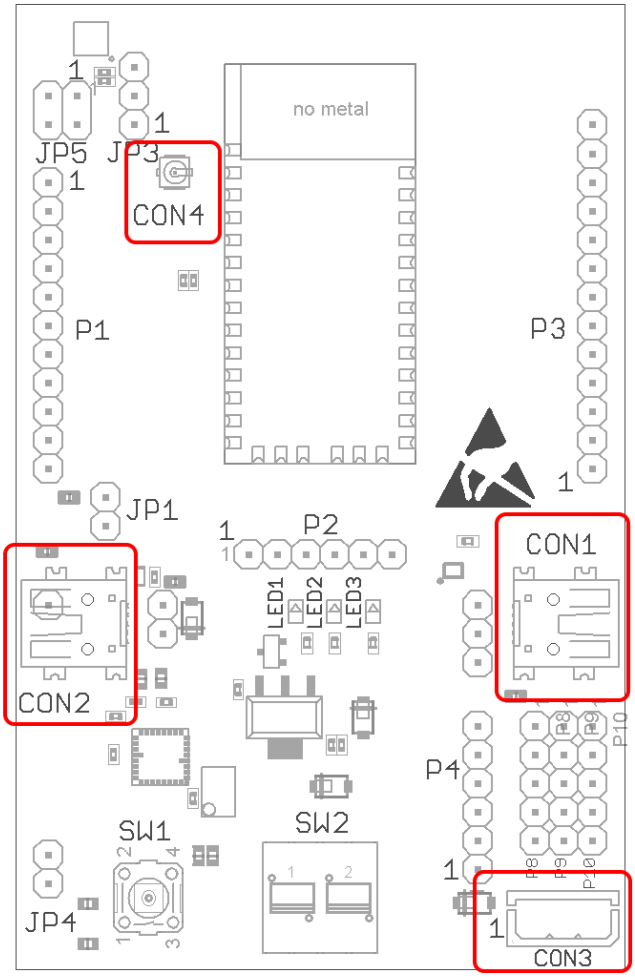


Figure 4: Connectors

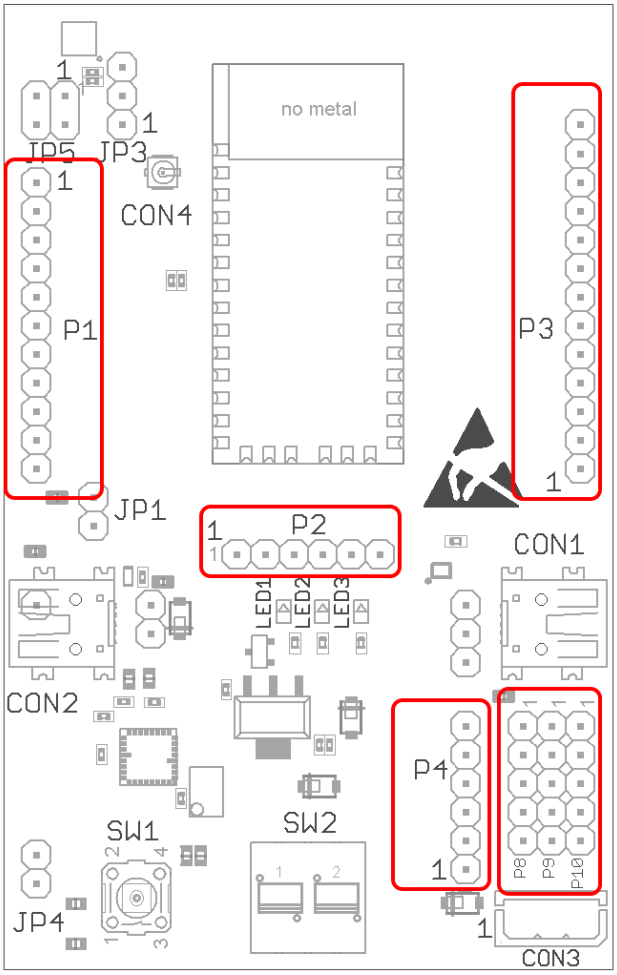


Figure 5: Pin headers

CON1	Function	Description
-	USB1	USB connector to STM32 USB, not supported by standard firmware, do not connect

CON2	Function	Description
-	USB2	USB connector to module UART and power supply

CON3	Function	Description
-	Battery	Connector for battery-pack, 3 Volt

CON4	Function	Description
-	Antenna	U.FL socket connection to 50 Ω radio path of the module, only active for Modules with RF-pad (i.e. without internal antenna).

P1	Description
1-11	Direct access to module pins

P2	Description
1-6	Direct access to module pins

P3	Description
1-11	Direct access to module pins

P8	Function	Description
1-5	VDD	Power

P9	Function	Description
1-5	n.c.	not connected

P10	Function	Description
1-5	GND	Ground

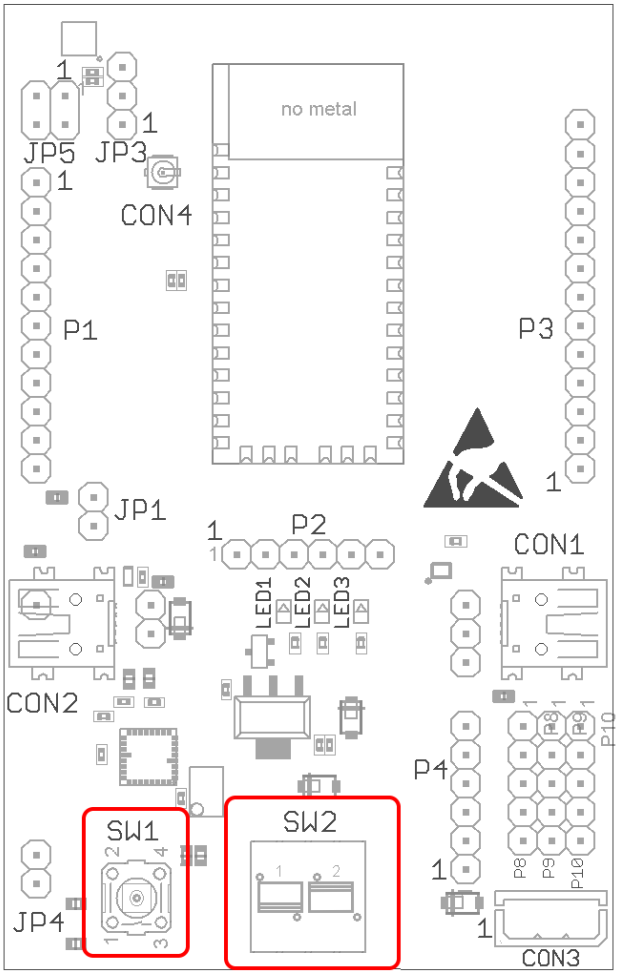
3.4 LEDs

This section explains all LEDs on the EV board.

	Function	Description
LED1	Power LED	Lights up if EV board power is supplied
LED2	TX LED	Lights up if module transmits radio data
LED3	RX LED	Lights up if module receives radio data

3.5 Switch

This section explains all switches on the EV board. The default switch positions are indicated in red.



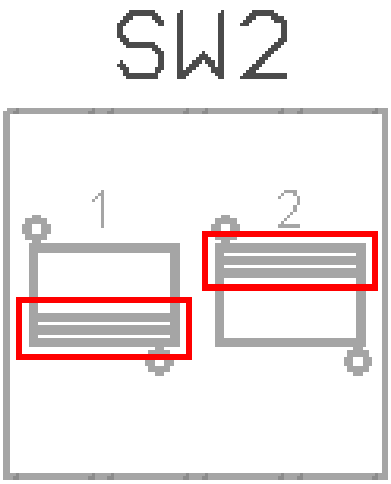


Figure 6: Switch SW2 default position and SW1 Reset button

SW2	Function	Description
1	SW2.1	*WAKE_UP* pin of module
2	SW2.2	*Boot1* pin of module

Table 2: Switch SW2

3.6 Reset button

Every module provides a */RESET pin* that is connected to this SW1 button so the module can be (re)started properly. A pressed button connects the */RESET* to LOW logic level and holds the module in reset until it is released. Most modules provide an internal pull-up resistor.
Please refer to the module specific manual for detailed information upon the module's */RESET* pin and recommended start-up sequences for the module.

SW1	Function	Description
	SW1	Button to */RESET* pin of module

Table 3: Button SW1

4 Function blocks

4.1 Power supply

There are several possibilities to supply the evaluation board and the module with power.

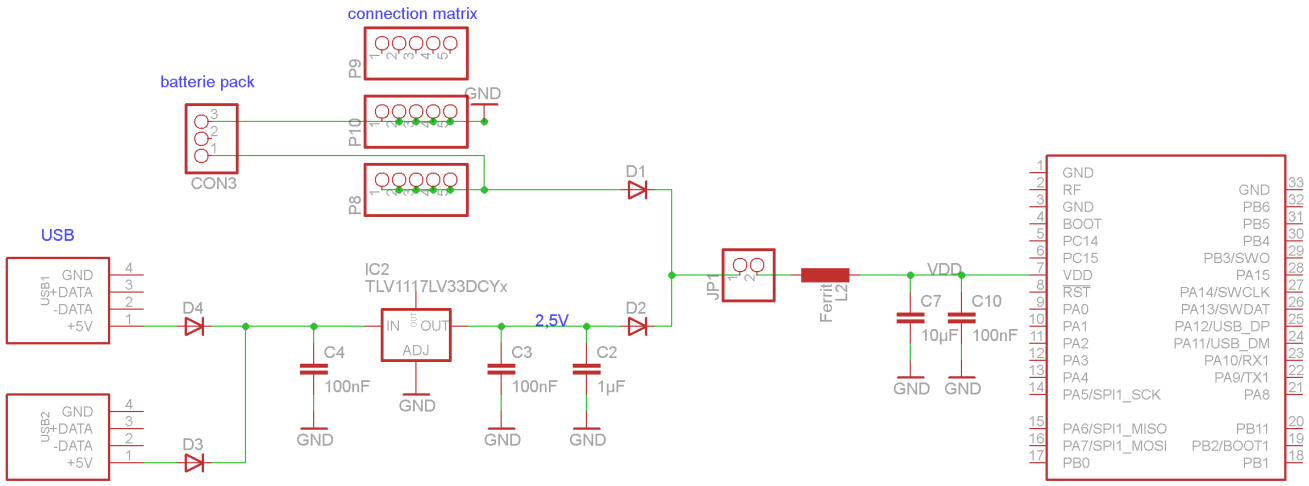


Figure 7: Power supply schematic

The different power terminals are all connected with diodes to protect them from each other, therefore no selection by additional jumpers is necessary. Nevertheless the customer shall apply only one USB connector to the EV board. An external power supply through P8 and P10 shall not be used when a battery pack is connected to CON3.

4.1.1 Power supply over USB: CON2

Connecting the USB interface CON2 supplies the board through the low dropout voltage (LDO) regulator. The module is supplied by approximately 2.5 V (2.5 V LDO minus forward voltage of the diode of approx. 0.2V).

4.1.2 Power supply over battery pack 3V: CON3

Connecting the battery pack supplies the module with the voltage delivered from the pack minus approx. 0.2V forward voltage of the diode.

4.1.3 External supply: P8, P10

Two 2.54 mm headers are available for connection from an external source to VCC and GND. Make sure you provide a stable current in the range of 2.5 to 3.6 Volt to this pins. It is suitable to supply the development board and associated electronics from one power supply, as well as to test the system with different voltage levels.

4.2 Current measurement

JP1 can be used to measure the power consumption of the module. By default a bridge is set on JP1 to close the circuit. Remove the bridge and connect a current meter in place of the jumper to measure the power consumption of the module. If the meter is not attached and the bridge is not set, the module will not receive a supply voltage and is not active.

When the EV board is supplied with VCC the power LED is active even if JP1 is left open. This is to avoid measuring the current through the LED during module current measurements.

Measuring module currents, especially in low power mode, SW2.2 has to be turned to position "up" (default position) and SW2.1 has to be left in position "down" (default position), else additional leakage current because of the pull resistors will be observed. All other module pins shall be terminated as indicated in the module specific manuals.

4.3 Host interface: USB, CON2

The UART of the module is available on CON2 as USB. The parallel usage of the USB on CON2 and standalone UART TX1 & RX1 on P3 is not possible as these two share the same module pins. Using P3 for direct UART connection requires the CON2 to be not connected to USB as the electronic switch will then disable the connection of TX and RX module to the FTDI converter IC to prevent signal disturbance because of the converter IC.

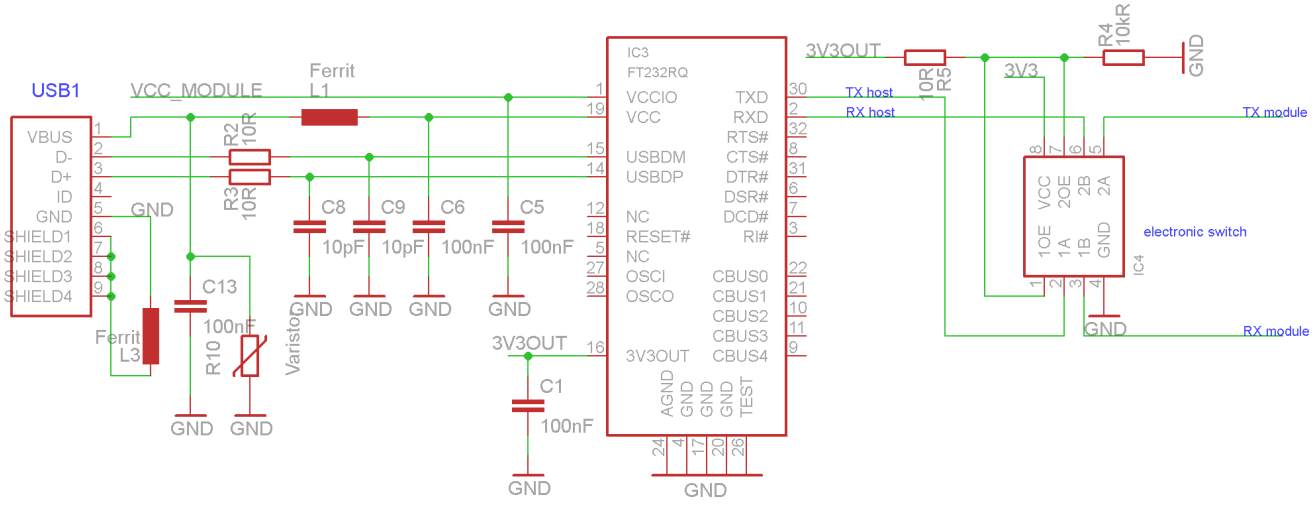


Figure 8: UART to USB converter: FT232R

4.4 Host interface: UART P3

The UART of the module is available on P3.11 and P3.12. The parallel usage of the USB on CON2 and standalone UART TX1 & RX1 on P3 is not possible as these two share the same module pins. Using P3 for direct UART connection requires the CON2 not to be connected to USB as the electronic switch will then disable the connection of TX and RX module to the FTDI converter IC to prevent signal disturbance because of the converter IC.

Beware of IO level incompatibility. The host must obey the values stated in the module's manual. Especially the IO level restrictions must be implemented by a host system (i.e. using a level shifter to use the allowed IO levels).

4.5 UART bootloader vs. application

The levels at the pins *Boot0* and *Boot1* decide, right after a module reset, if the application or the UART bootloader of the module is started.
To start the application safely and measure a correct current the default switch and jumper settings of the evaluation board are sufficient. See figures 3 and 6.

To safely start the module's bootloader JP4 must be mounted while SW2.2 is in position "up". Then a reset of the module using the reset button SW1 must be performed to start the module in UART bootloader mode.

The UART bootloader mode can be left by reverting the Jumpers and switches back to defaults and perform another reset of the module.

4.6 Wake-up function, switch SW2.1

Switch SW2.1 is connected to module pin 10, which is used as wake-up in the standard firmware. In default case the SW2.1 is in position "down".
If the module is in sleep mode, the SW2.1 can be used as *WAKE-UP* pin. To trigger the wake up a falling edge has to be applied at the *WAKE-UP* pin of the module, which means to switch SW2.1 from position "down" to position "up". When the module is no longer in sleep mode, SW2.1 should be switched back to default position "down" to prevent leakage current.

Figure 9: SW2.1: Switching from pos.1 to pos.2

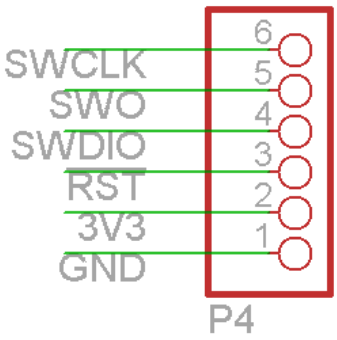


Figure 10: P4 SWD connector

4.7 Programming interface

The evaluation board provides a 1*6 pin connector in RM2.54 to connect to a SWD flash adapter used for development. Please take care of the correct mounting of the flash adapter. Depending on your Flasher an additional adapter may be required.
The recommended flash adapter is one of the "Segger J-Link" family with SWD support or an ST-Link V2 adapter with SWD support.

4.8 Full schematic

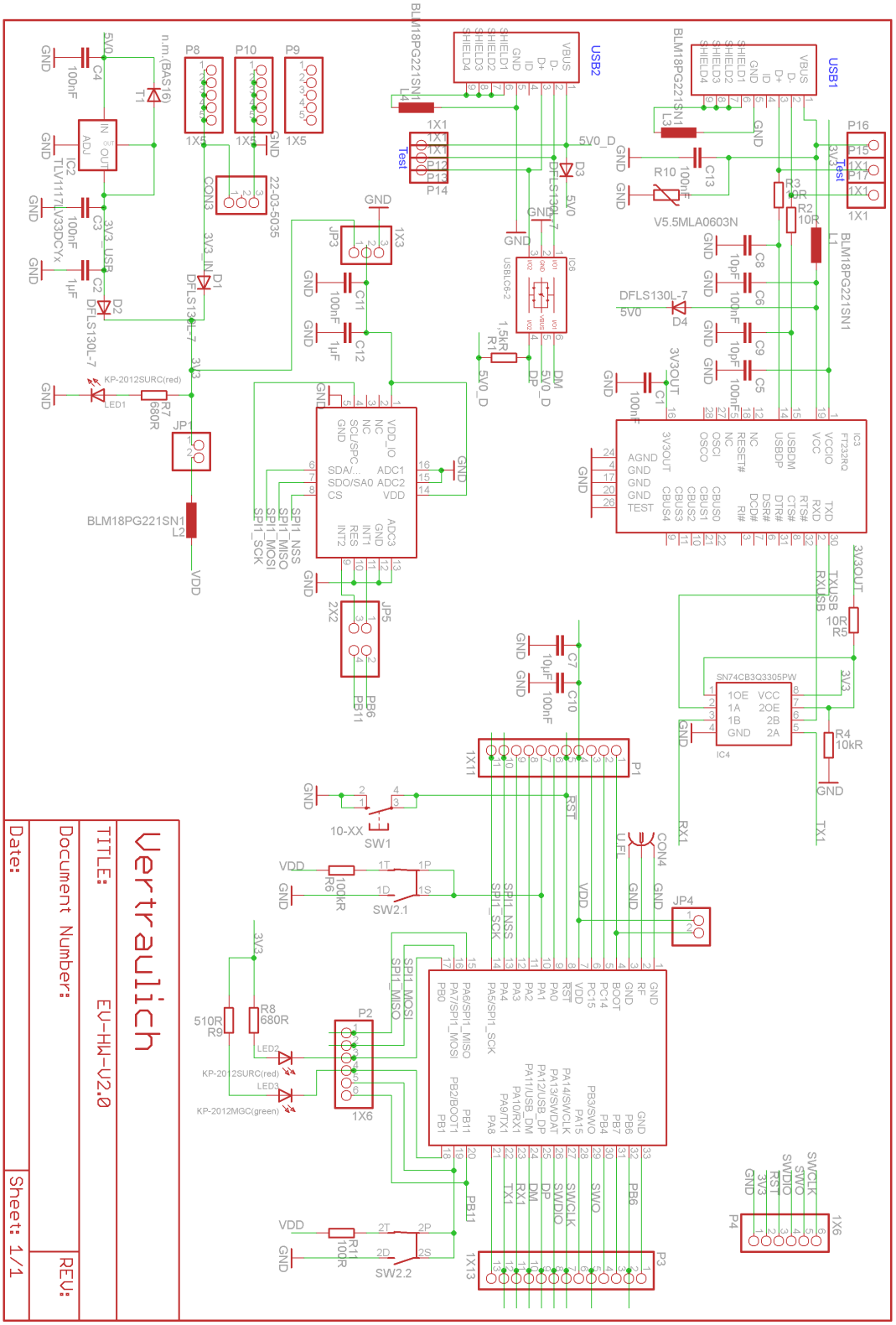


Figure 11: Wiring diagram

4.9 Full layout

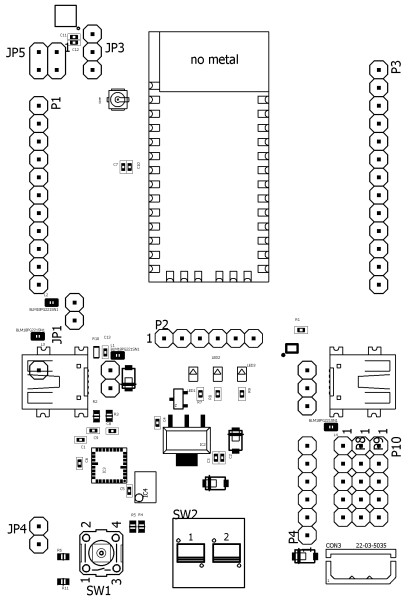


Figure 12: Assembly diagram

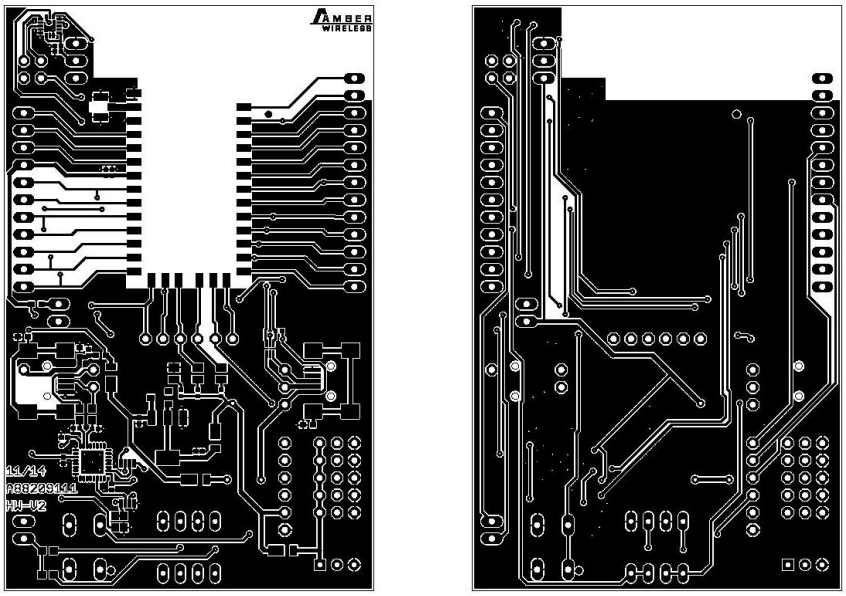


Figure 13: Top and Bottom Layer

4.10 Sensor: SPI accelerometer

JP3 serves to either supply the accelerometer from the common power supply, or to deactivate the accelerometer (triple axis, type: STM LIS3DH) by holding its supply pin to GND level.
To be able to use the accelerometer a customer specific module firmware is required.

STOP

The accelerometer is not used in AMB2220/Triton standard firmware, thus JP3 should be placed to connect 2-3 and JP5 connections 1-2 and 3-4 shall be left open.

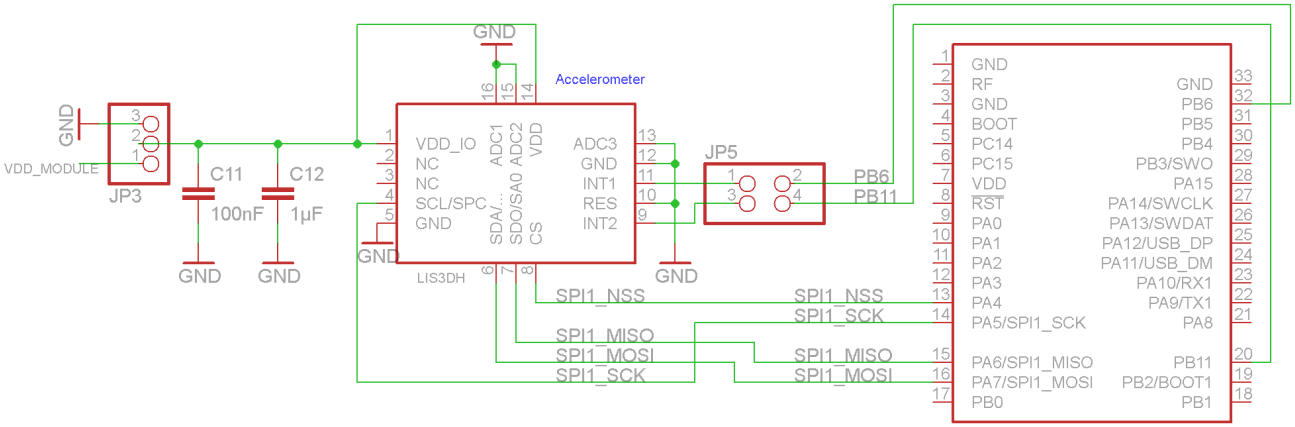


Figure 14: Connection of SPI accelerometer to module

5 Regulatory compliance information

Pursuant to Article 1 (2.) of the EU directive 2014/53/EU, Article 1 (2.) the directive does not apply to equipment listed in Annex I (4.): custom-built evaluation kits destined for professionals to be used solely at research and development facilities for such purposes.

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shall inform Würth Elektronik eiSos about the intent of such usage before design-in stage. In certain customer applications requiring a very high level of safety and in which the malfunction or failure of an electronic component could endanger human life or health, you must ensure to have all necessary expertise in the safety and regulatory ramifications of your applications. You acknowledge and agree that you are solely responsible for all legal, regulatory and safety-related requirements concerning your products and any use of Würth Elektronik eiSos' products with the incorporated firmware in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by Würth Elektronik eiSos. YOU SHALL INDEMNIFY WÜRTH ELEKTRONIK EISOS AGAINST ANY DAMAGES ARISING OUT OF THE USE OF WÜRTH ELEKTRONIK EISOS' PRODUCTS WITH THE INCORPORATED FIRMWARE IN SUCH SAFETY-CRITICAL APPLICATIONS.

8.3 Ownership

The incorporated firmware created by Würth Elektronik eiSos is and will remain the exclusive property of Würth Elektronik eiSos.

8.4 Firmware update(s)

You have the opportunity to request the current and actual firmware for a bought wireless connectivity product within the time of warranty. However, Würth Elektronik eiSos has no obligation to update a modules firmware in their production facilities, but can offer this as a service on request. The upload of firmware updates falls within your responsibility, e.g. via ACC or another software for firmware updates. Firmware updates will not be communicated automatically. It is within your responsibility to check the current version of a firmware in the latest version of the product manual on our website. The revision table in the product manual provides all necessary information about firmware updates. There is no right to be provided with binary files, so called "firmware images", those could be flashed through JTAG, SWD, Spi-Bi-Wire, SPI or similar interfaces.

8.5 Disclaimer of warranty

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8.6 Limitation of liability

Any liability not expressly provided by Würth Elektronik eiSos shall be disclaimed.
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8.7 Applicable law and jurisdiction

Applicable law to these license terms shall be the laws of the Federal Republic of Germany. Any dispute, claim or controversy arising out of or relating to these license terms shall be resolved and finally settled by the court competent for the location of Würth Elektronik eiSos registered office.

8.8 Severability clause

If a provision of these license terms is or becomes invalid, unenforceable or null and void, this shall not affect the remaining provisions of the terms. The parties shall replace any such provisions with new valid provisions that most closely approximate the purpose of the terms.

8.9 Miscellaneous

Würth Elektronik eiSos reserves the right at any time to change this terms at its own discretion. It is your responsibility to check at Würth Elektronik eiSos homepage for any updates. Your continued usage of the products will be deemed as the acceptance of the change.
We recommend you to be updated about the status of new firmware and software, which is available on our website or in our data sheet and manual, and to implement new software in your device where appropriate.
By ordering a product, you accept these license terms in all terms.

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