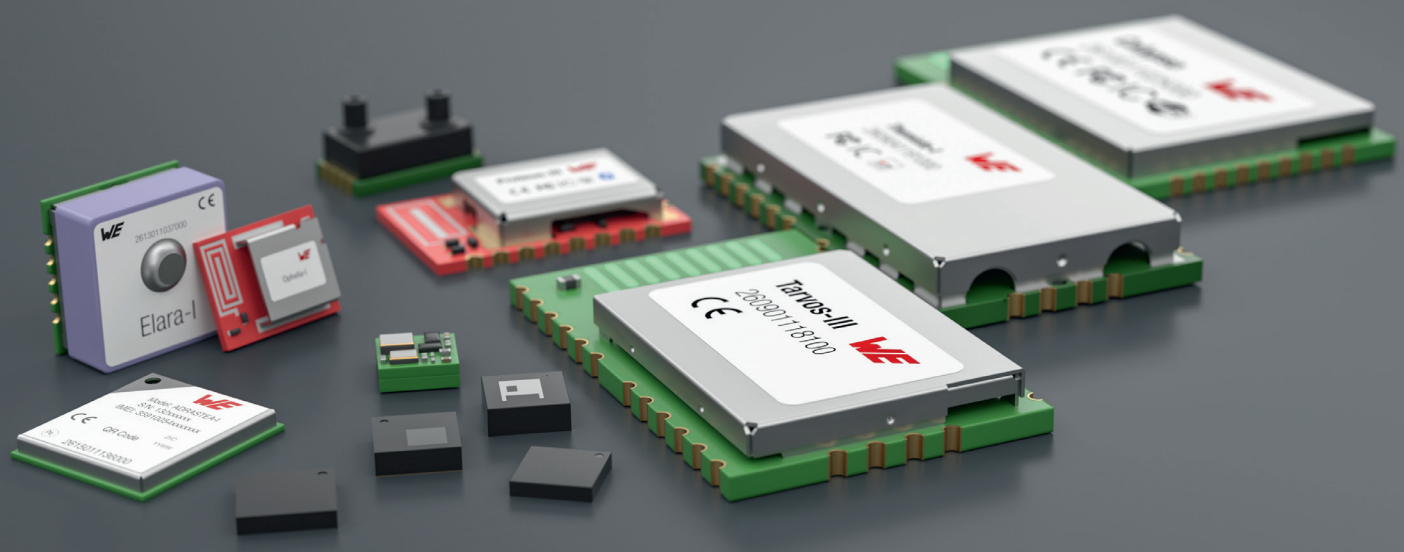

User manual

Evaluation board/kit for radio modules Daphnis-I and Oceanus-I

2618011181000, 2618011182000

Version 1.3

April 7, 2025

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 including the possibility of a firmware update in the customer system design.

Revision history

Manual version	HW version	Notes	Date
1.0	1.1	• Initial version	March 2024
1.1	1.1	• Updated we-online.de to we-online.com and EV information. • Added information on UART baud rates supported by the FTDI chipset. • Added information on the LOT number.	October 2024
1.2	1.1	• Added Oceanus-I related information to chapter `Supported radio modules`, `Functional description` and `Development board`. • Added Daphnis-I supported GPIOs to chapter `Connectors and pin headers`.	December 2024
1.3	1.1	• Updated Daphnis-I supported GPIOs in chapter `Connectors and pin headers`. • Updated symbol of Daphnis-I module in chapter `Schematic`.	April 2025

Abbreviations

Abbreviation	Name
BYOF	Build Your Own Firmware
COM port	Communication port
EJTAG	Embedded Joint Test Action Group
EV	Evaluation
ESD	Electro Static Discharge
FEM	Front End Modem
FTDI	Future Technology Devices International
FW	Firmware
GND	Ground
HIGH	High signal level
IC	Integrated Circuit
IO	Input & Output
LED	Light Emitting Diode
LOW	Low signal level
LPUART	Low-power Universal Asynchronous Receiver Transmitter
MCU	Micro Controller Unit
PC	Personal Computer
PCB	Printed Circuit Board
RF	Radio Frequency
SWD	Serial Wire Debug
THT	Through Hole Technology
UART	Universal Asynchronous Receiver Transmitter
UMRF	Ultra Miniature Radio Frequency
USB	Universal Serial Bus
VDD	Voltage Drain Drain

Contents

1 Supported radio modules

The EV-Board described in this manual can be used to evaluate the following products:

Order code	Product name	Description
2618011181000	Daphnis-I	868 MHz radio module [1]
2618011182000	Oceanus-I	868 MHz BYOF radio module [2]

Table 1: Compatibility

Order code	Product name
2618019381001	Daphnis-I EV-Kit
2618019382001	Oceanus-I EV-Kit

Table 2: Order codes

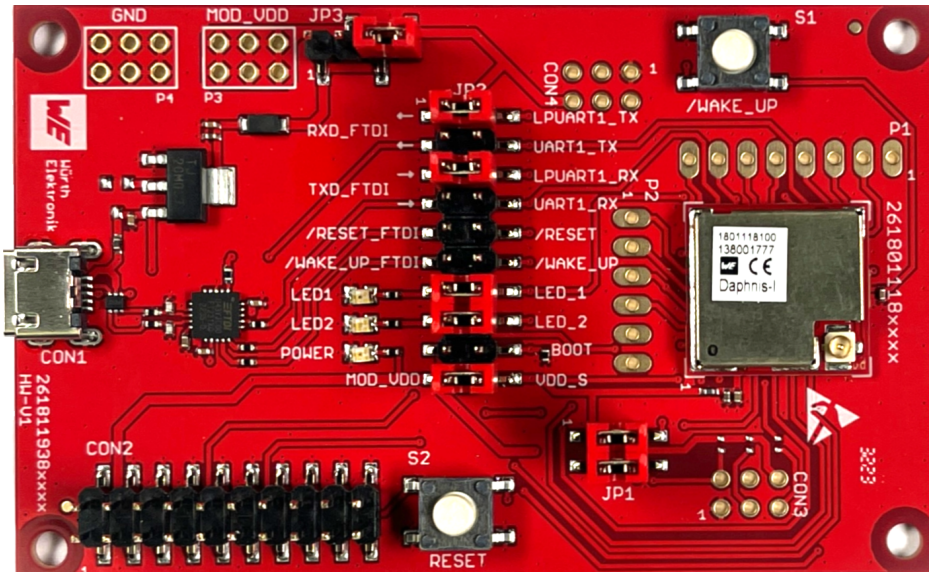

Figure 1: Evaluation board image

Kit content 2618019381001	Quantity
EV-Board with Daphnis-I Module (80mmx50mmx1.6mm)	1
868 MHz dipole antenna (2600130081)	1
USB-2.0-Typ-A to USB-2.0-Micro-B cable	1
WR-UMRF SMA Bulkhead Jack to UMRF Right Angle Plug (636207100200)	1
Packaging: Cardboard Box (230mmx230mmx78mm), ESD safe cover	1

Table 3: Content Daphnis-I EV-Kit

Kit content 2618019382001	Quantity
EV-Board with Oceanus-I Module (80mmx50mmx1.6mm)	1
868 MHz dipole antenna (2600130081)	1
USB-2.0-Typ-A to USB-2.0-Micro-B cable	1
WR-UMRF SMA Bulkhead Jack to UMRF Right Angle Plug (636207100200)	1
Packaging: Cardboard Box (230mmx230mmx78mm), ESD safe cover	1

Table 4: Content Oceanus-I EV-Kit

2 Functional description

The EV-Board enables users to develop hardware and software for the compatible radio module. It can be connected to a PC via a USB port.

For the connection to a MCU system, the EV-Board is equipped with a multi-pin connector which is connected to all pins of the RF module. Jumpers allow to disconnect unused components, such as the USB interface, from the module when not used.

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

2.1 Taking into operation

When using the Oceanus-I EV-Board, the USB connector supplies power to the board. Communication with the module is not possible because the module does not have firmware.

- Step 1: Install or update the corresponding FTDI driver package on your PC . (*www.ftdichip.com/Drivers/VCP.htm*)
- Step 2: Place the jumpers on default location, as shown in figure 4.
- Step 3: Connect the EV-Board to the PC using a USB-cable. A COM port will 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 /dev/ttyUSB0 in Linux systems.
- Step 4: Run the WE UART Terminal PC tool [3] or any other serial terminal program (like hterm for Windows). Open the corresponding COM port using the default settings of the mounted radio module: 9600 Baud, 8 Data Bits, 1 Stop Bit and Parity set to none (8n1).
- Step 5: After the module is powered through the USB jack or an external power supply, the reset button should be pressed to ensure a clean start-up of the module. After pressing the reset button, the module sends the message `+SYSNOTF:READY`.

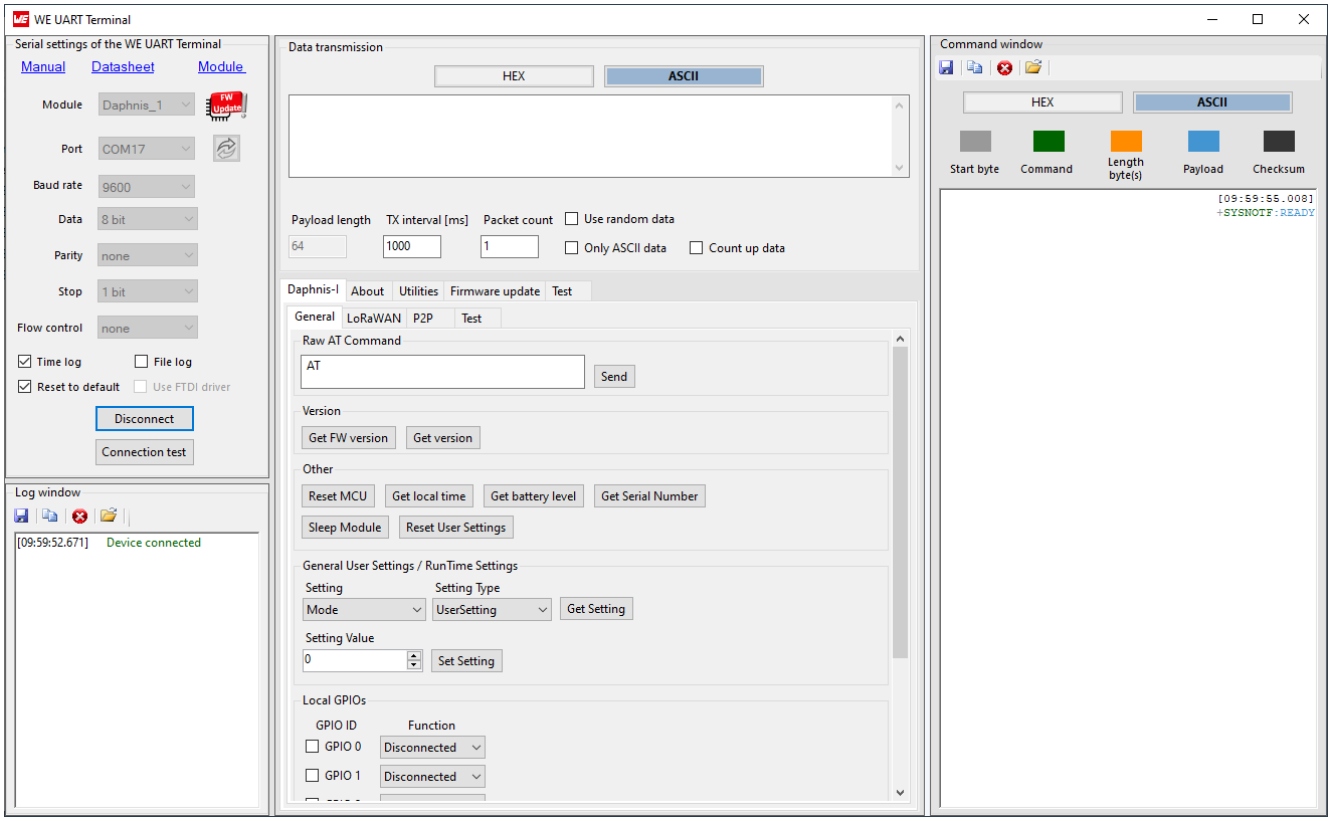

Figure 2: WE UART Terminal `+SYSNOTF` event

For more detailed quick start instructions, refer to the Daphnis-I user manual [1].

3 Development board

3.1 Block diagram

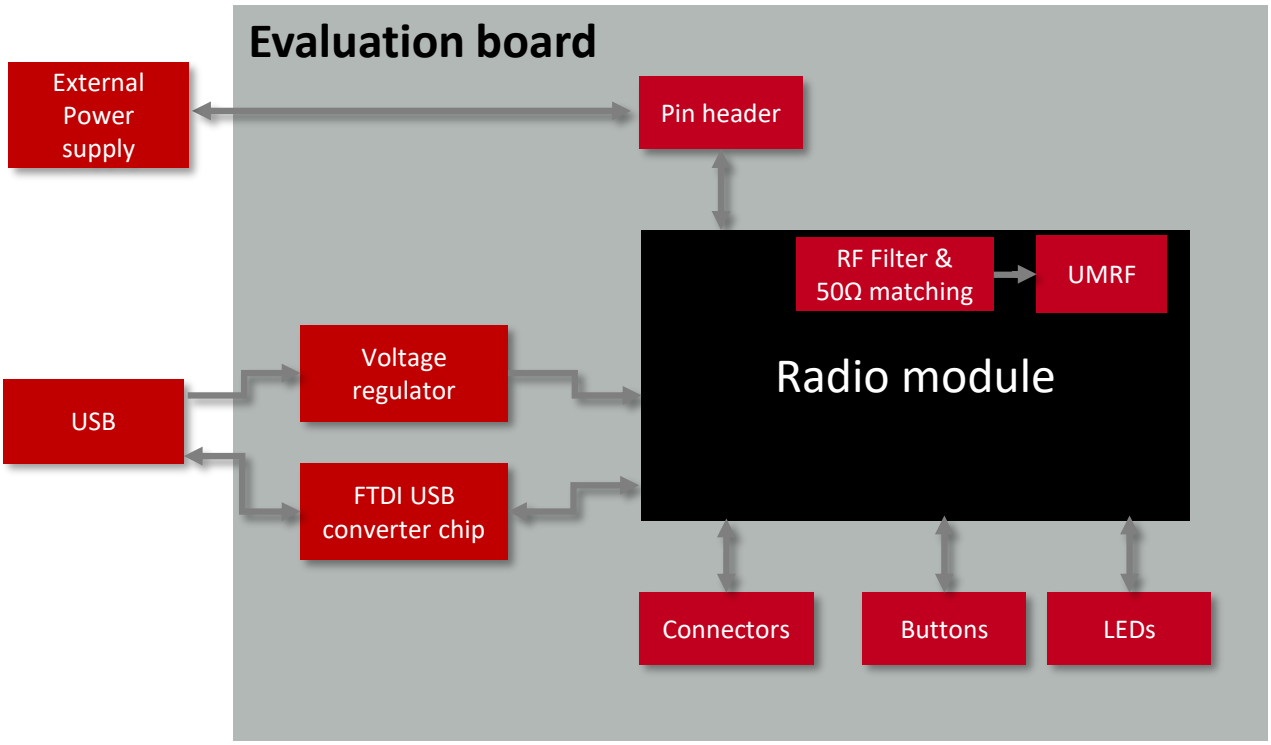

Figure 3: Block diagram

3.2 Jumpers

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

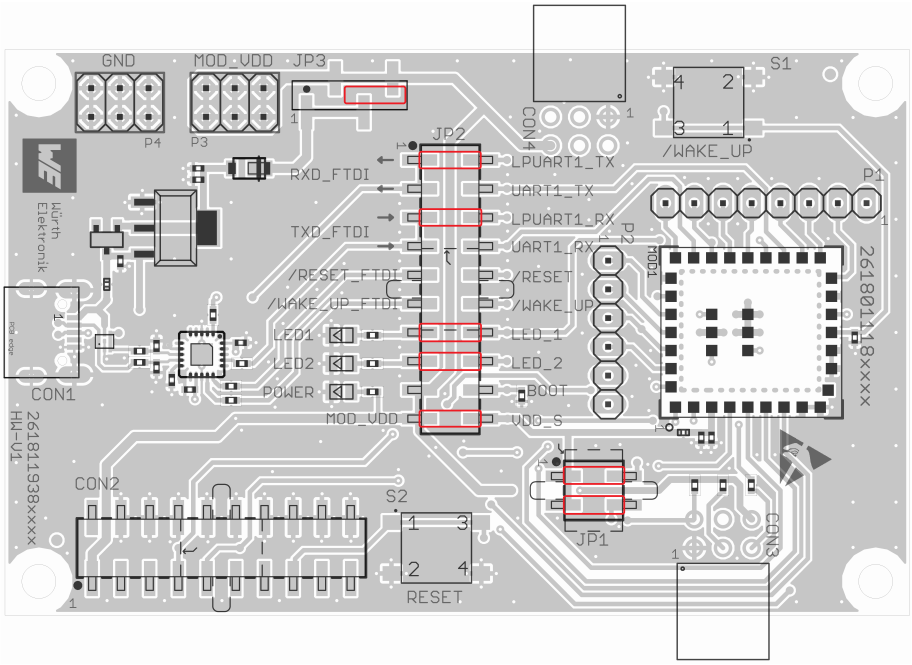

Figure 4: Default jumpers configuration for Daphnis-I EV-Board

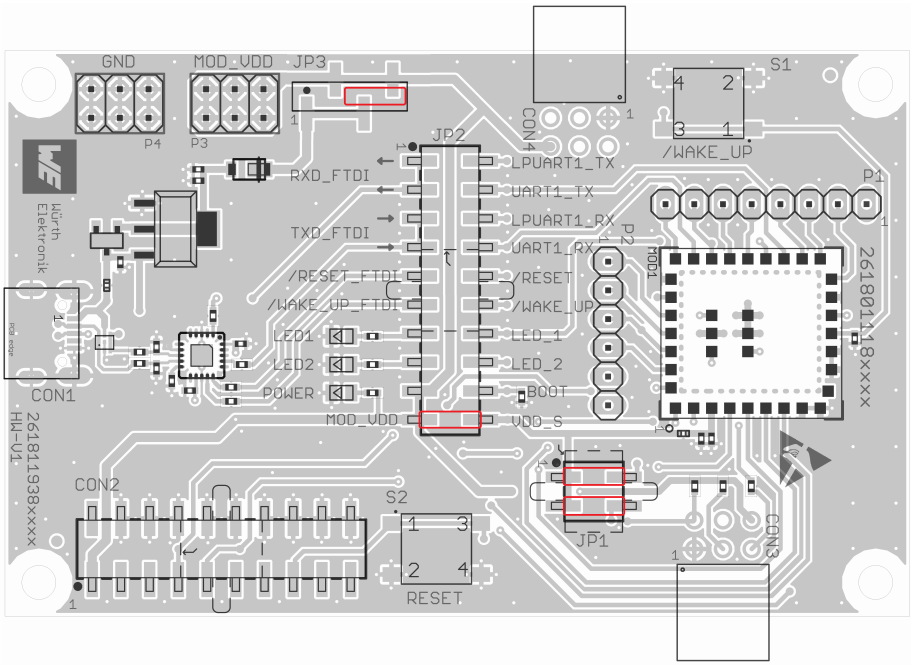

Figure 5: Default jumpers configuration for Oceanus-I EV-Board

JP1	Function	Daphnis-I EV-Board (default)	Oceanus-I EV-Board (default)
1,2	Power rail bridge. Remove to connect an external voltage reference to *VDDA*	Yes	Yes
3,4	Power rail bridge. Remove to connect an external voltage reference to *VBAT*	Yes	Yes

Table 5: Jumper JP1. *VDDA* and *VBAT* connection to *VDD*

JP2	Function	Daphnis-I EV-Board (default)	Oceanus-I EV-Board (default)
1,2	FTDI *RXD* to module UART *LPUTXD1*. Application UART	Yes	No
3,4	FTDI *RXD* to module UART *UTXD1*. Bootloader UART	No	No
5,6	FTDI *TXD* to module UART *LPURXD1*. Application UART	Yes	No
7,8	FTDI *TXD* to module UART *URXD1*. Bootloader UART	No	No
9,10	FTDI *CBUS0* to module */RESET*	No	No
11,12	FTDI *CBUS1* to module */WAKE_UP*	No	No
13,14	Yellow LED1 to pin *LED_1*	Yes	No
15,16	Blue LED2 to pin *LED_2*	Yes	No
17,18	MOD_VDD to pin *BOOT*. When set, the bootloader mode starts after a reset event	No	No
19,20	MOD_VDD to VDD_S. Current consumption measurement bridge	Yes	Yes

Table 6: Jumper JP2

JP3	Function	Daphnis-I EV-Board (default)	Oceanus-I EV-Board (default)
1,2	LDO supplies the module	No	No
3,4	LDO supplies the module	Yes	Yes

Table 7: Jumper JP3

By default pin 3 is connected to pin 4 to provide power to the module via internal LDO power supply. Likewise, pin 1 can be linked to pin 2 for internal power supply.

When sourcing the module via an external power supply, the jumper on JP3 shall be removed. Pin headers P3 and P4 shall be used to source the EV-Board.

3.3 Connectors and pin headers

This section describes all connectors and pin headers on the EV-Board.

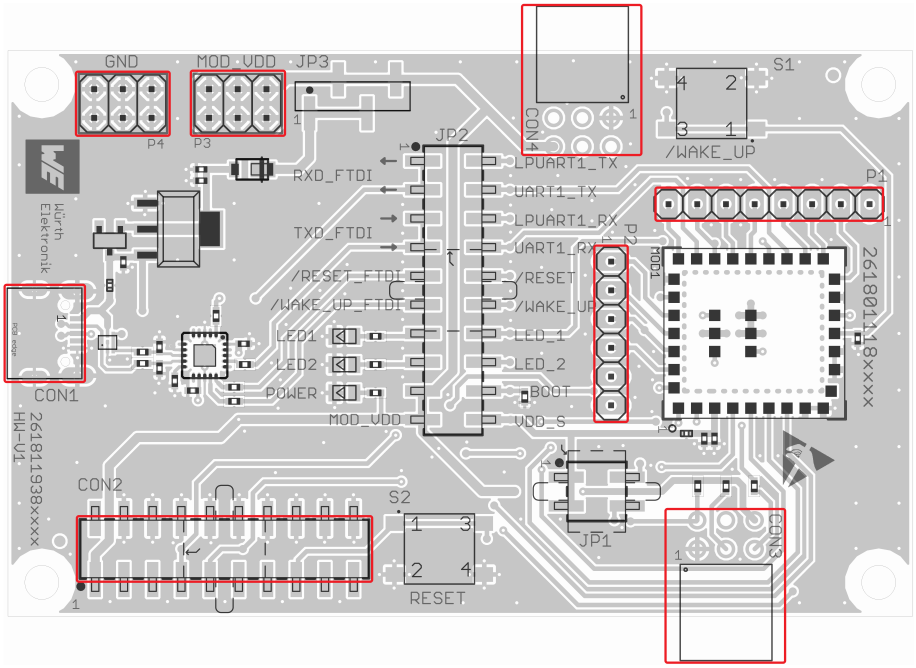

Figure 6: Connector and pin headers

Pin header	Function	WE article number
CON1	Micro-USB connector for host connection and VDD bus supply	*629105150521*
CON2	EJTAG debug	*61302021121*

Table 8: Default assembled connectors and pin headers

Additionally, the following connectors can be assembled, if needed.

Pin header	Function	WE article number
CON3	I^2C interface (reserved)	*613006243121*
CON4	SPI interface (reserved)	*613006243121*
P1	Direct access to the reserved pins of the radio module	*61300811121*
P2	Direct access to the reserved pins of the radio module	*61300611121*
P3	Positive connection for the power supply (MOD_VDD)	*61300621121*
P4	Ground connection for the external power supply (GND)	*61300621121*

Table 9: Optional connectors

By default, P1, P2, P3 and P4 are not mounted.

By default, CON3 and CON4 are not mounted.

CON3 and CON4 are suited to connect *WSEN-EVAL* by mounting the corresponding headers.

3.3.1 CON1

Connector CON1 is a micro-USB connector that enables connection to PC via standard micro-USB cable.

CON1	Daphnis-I EV-Board	Oceanus-I EV-Board
-	Micro-USB connector for host connection and VDD bus supply	VDD bus supply

Table 10: Micro-USB connector

3.3.2 CON2

Connector CON2 is the EJTAG debug interface.

CON2	STM32WLE5CC - Oceanus-I Module	Daphnis-I Module	Board connection
1	-	-	MOD_VDD
7	*PA13*	*SWDIO*	JTAG data input/output
9	*PA14*	*SWDCLK*	JTAG clock
15	*NRST*	*/RESET*	Reset pin for the JTAG probe
4,6,8,10,12, 14,16,18,20	GND	GND	GND
2,3,5,11, 13,17,19	-	-	Not Connected

Table 11: 2x10 EJTAG connector

3.3.3 CON3

Connector CON3 is compatible with the *WE* sensor EV-Boards via I^2C interface. This feature is subjected to a customized firmware and not supported by standard firmware.

CON3	STM32WLE5CC - Oceanus-I Module	Daphnis-I Module	Board connection
1	GND	GND	GND
2	*PB8* (suitable for SCL)	*GPIO_1*	RSVD14
3	*PB7* (suitable for SDA)	*GPIO_0*	RSVD13
4	GND	GND	GND
5	-	-	open solderbridge to RSVD7
6	-	-	MOD_VDD

Table 12: 2x3 right angle socket

3.3.4 CON4

Connector CON4 is compatible with the *WE* sensor EV-Boards via SPI interface. This feature is subjected to a customized firmware and not supported by standard firmware.

CON4	STM32WLE5CC - Oceanus-I Module	Daphnis-I Module	Board connection
1	GND	GND	GND
2	*PB3* (suitable for CLK)	*RESERVED*	RSVD12
3	*PB5* (suitable for MOSI)	*RESERVED*	RSVD11
4	*PA15*	*RESERVED*	RSVD9
5	*PB4* (suitable for MISO)	*RESERVED*	RSVD10
6	-	-	MOD_VDD

Table 13: 2x3 socket

3.3.5 P1

On P1 additional GPIOs and non-categorized module pins are available.

P1	STM32WLE5CC - Oceanus-I Module	Daphnis-I Module	Board connection
1	*PA1*	*RESERVED*	RSVD1
2	*PA5*	*GPIO_2*	RSVD2
3	*PA6*	*GPIO_3*	RSVD3
4	*PB2*	*GPIO_4*	RSVD4
5	*PA8*	*GPIO_5*	RSVD5
6	*PA12*	*GPIO_6*	RSVD6
7	*PB6*	*GPIO_7*	RSVD7
8	*PA11*	*RESERVED*	RSVD8

Table 14: Pin header P1

3.3.6 P2

On P2 non-categorized module pins are available.

P2	STM32WLE5CC - Oceanus-I Module	Daphnis-I Module	Board connection
1	*PA15*	*RESERVED*	RSVD9
2	*PB4*	*RESERVED*	RSVD10
3	*PB5*	*RESERVED*	RSVD11
4	*PB3*	*RESERVED*	RSVD12
5	*PB7*	*RESERVED*	RSVD13
6	*PB8*	*RESERVED*	RSVD14

Table 15: Pin header P2

3.3.7 P3

Pin header P3 can be used to provide the positive output of an external power supply to the board. This pin header is not populated by default.

P3	Function
1-6	MOD_VDD (2V to 3.6 V)

Table 16: External power connection (MOD_VDD)

3.3.8 P4

Pin header P4 can be used to provide the negative output of an external power supply to the board. This pin header is not populated by default.

P4	Function
1-6	GND

Table 17: External power connection (GND)

3.4 Buttons

3.4.1 Reset button

Internally, the reset input of the MCU is connected via an RC combination with the power supply to ensure a proper startup of the module. The */RESET* / *NRST* pin is connected to this button which restarts the module when pressed and released. The module provides an internal pull-up resistor. Refer to the module specific manual for detailed information.

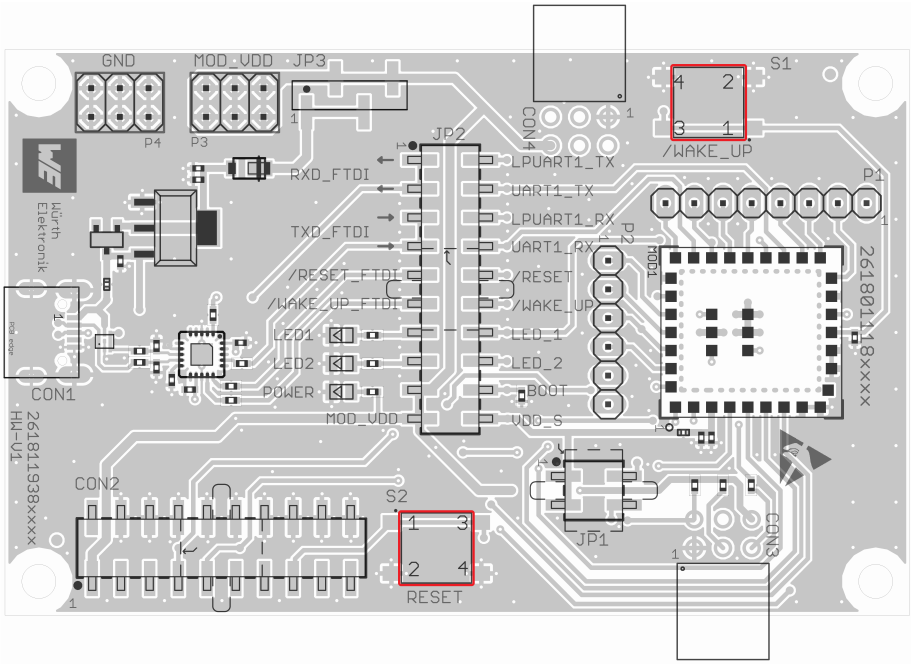

Figure 7: Push buttons

3.4.2 Wake-up button

The active low wake-up input of the MCU is connected via an RC combination to ensure a proper wake-up of the module. This button enables the user to exit from the sleep mode, when using Daphnis-I module. In case of Oceanus-I module, the button is connected to *PA0* of the MCU. Refer to the module specific manual for detailed information.

3.5 Function blocks

3.5.1 Power supply

3.5.1.1 Bus powered, power supply through USB

The EV-Board can be operated via USB. The integrated voltage regulator regulates the connected 5 V down to 3.3 V and supplies the remaining parts of the circuit. If the EV-Board is powered up, the power LED lights up.

When powering the EV-Board via USB connector, place a jumper link on any of the possibles pin-pairs in JP3.

3.5.2 Current measurement

As shown in table 6, pin 19 and pin 20 of JP2 are bridged for normal operation. Connect a current meter in place of the jumper to measure power consumption.

If the meter is not attached and the jumper link is not set, the module will not receive a supply voltage. However, the power LED may be active, because it is connected before to the current measurement bridge in order not to distort the module's power consumption.

To achieve the stated low power current, the module pins must be terminated as stated in the module specific manual.

3.5.3 UART / USB

Only valid for Daphnis-I module.

The UART interface of the module can be connected to the USB converter by setting the corresponding jumper links in JP2. Thus, the module can be connected directly to a PC via the USB jack. Using the FTDI driver, the PC will show a virtual COM port which can be used to communicate with the module.

Interface	Jumper link position	Function
Application UART	1 to 2, 5 to 6	Application UART is converted to USB
Bootloader UART	3 to 4, 7 to 8	Bootloader UART is converted to USB. Only for FW update purposes

Table 18: Jumper link position for different UART to USB conversion

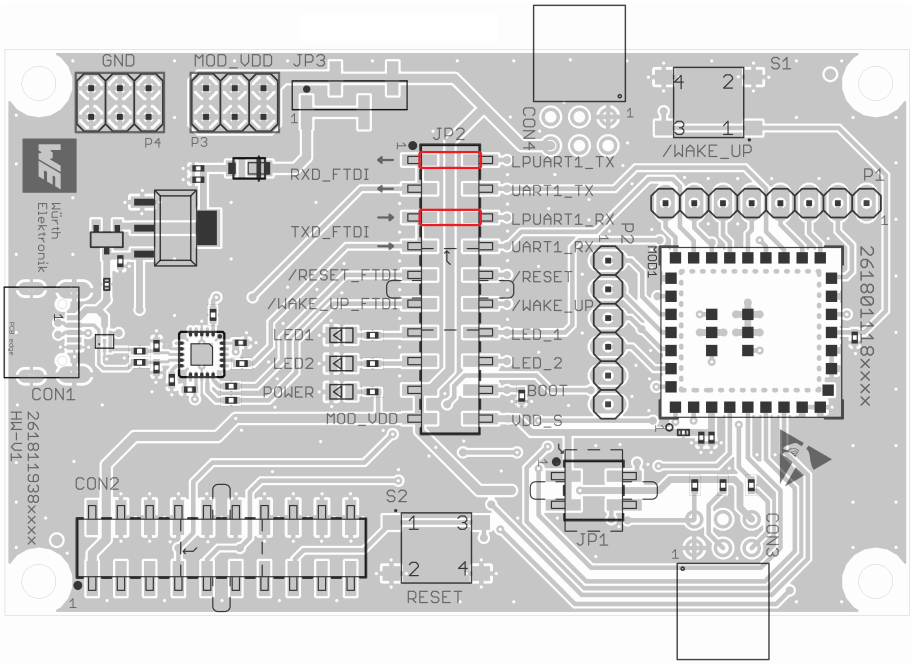

Figure 8: Application UART connected to USB communication

Only one UART can be converted to USB at the same time.

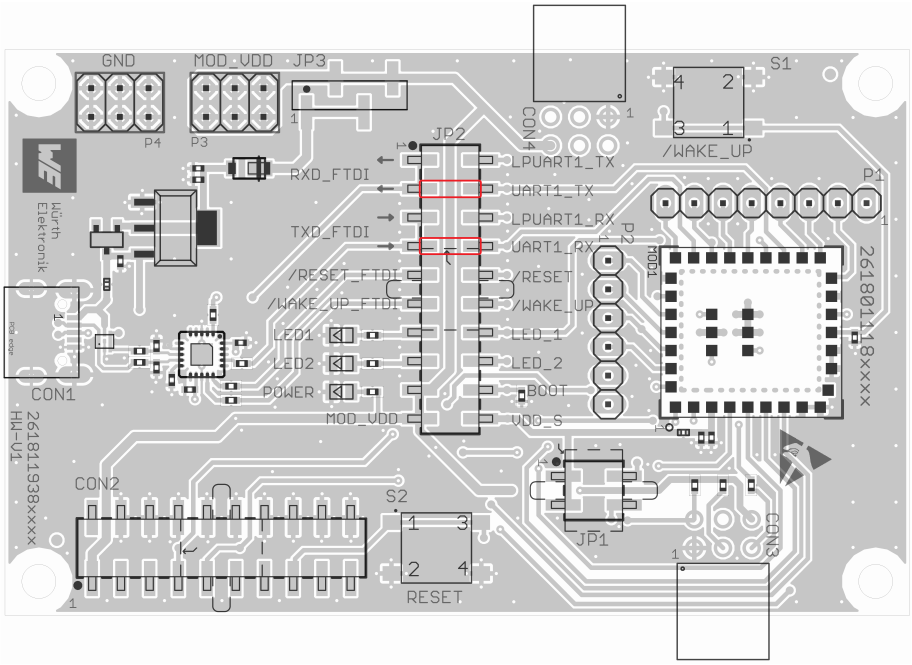

Figure 9: Bootloader UART converted to USB communication

In order to establish a stable UART communication between the FTDI USB to UART converter chipset and the radio module's chipset, the difference between the baud rates of each entity must not exceed the respective immunity level. Both devices use an internal clock to generate the configured UART baud rate. Due to the fixed clock frequency, only specific baud rates can be run without frequency error.
To figure out which baud rates of the radio module can be evaluated using the mounted FTDI chipset (FT232R or FT231X), it is important to know the real baud rate B with its introduced error. To get them, the FTDI's clock of 3000 kHz must be divided by the respective prescaler P:

$$B = \frac{3000}{P} \text{ [kBaud]}$$

The supported prescalers P can be chosen as:

$$P \in \{1, 1.5\} \text{ or } P = 2 + (N \cdot 0.125) \text{ with } N \in \{0, 1, 2, 3, 4, \ldots\}$$

When a baud rate is configured in the FTDI chip, the prescaler is chosen that meets the closest baud rate. In that case, the real baud rate differs from the configured one, introducing a UART clock error, which may lead to UART communication issues.

Example: In case the desired baud rate $B_{desired} = 1250$ kBaud, the desired prescaler is $P_{desired} = \frac{3000}{1250} = 2.4$. The closest prescaler P is determined by $P = 2 + (N \cdot 0.125) = 2.375$ with $N = 3$. This results in a real baud rate $B = \frac{3000}{2.375} = 1263$ kBaud, which introduces an error of $\frac{B - B_{desired}}{B_{desired}} = 1.04$ % with respect to the desired baud rate.

Desired baud rate [kBaud]	Closest prescaler P	Real baud rate B [kBaud]	Error [%]

3000	1	3000	0
2500	1.5	2000	-20
2000	1.5	2000	0
1500	2	1500	0
1250	2.375	1263	1.04
1411.764706	2.125	1411.764706	0
⋮	⋮	⋮	⋮
1000	3	1000	0
921.6	3.25	923.0769231	0.16
⋮	⋮	⋮	⋮
230.4	13	230.7692308	0.16
⋮	⋮	⋮	⋮
115.2	26	115.3846154	0.15
⋮	⋮	⋮	⋮
38.4	78.125	38.4	0
⋮	⋮	⋮	⋮
19.2	156.25	19.2	0
⋮	⋮	⋮	⋮
9.6	312.5	9.6	0
⋮	⋮	⋮	⋮

Table 19: Example baud rates

3.5.4 UART direct

Only valid for Daphnis-I module.

If an MCU is to be connected to the module, remove the jumper links on pin 1 - 2 and pin 5 - 6 in JP2. The UART can be connected directly on the pin strip. The module RXD line must be handled accordingly by your host (i.e. pulled up while inactive and during module boot-up).

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

3.5.5 Programming interface

The EV-Board provides a 2*10 pin connector to connect directly to a JTAG flash adapter used for development. Consider the correct mounting of the flash adapter (pin 1 marking). Depending on your flasher, an additional adapter may be required.

The recommended flash adapter is one of the "Segger J-Link" family.

3.6 Schematic

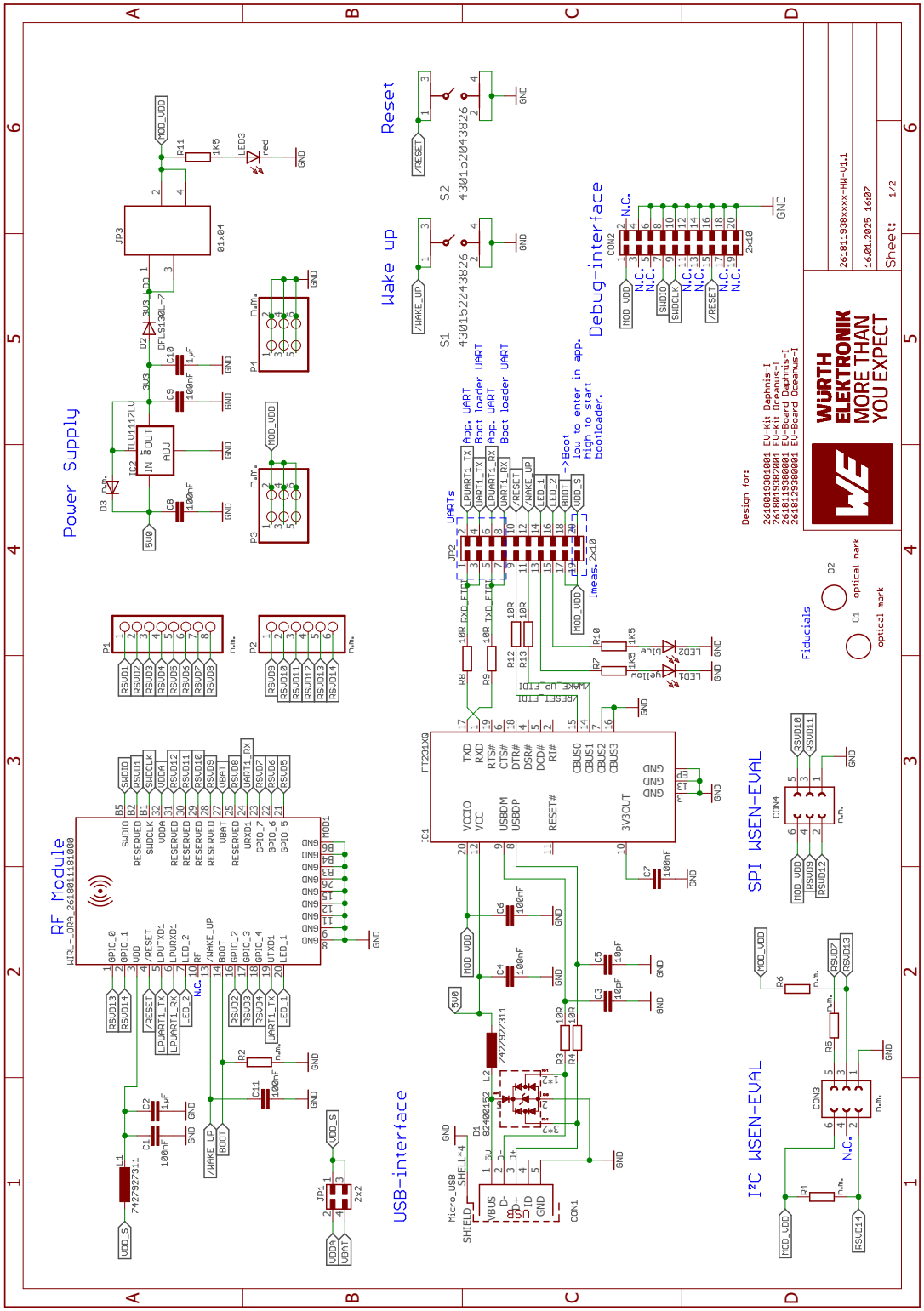

Figure 10: Reference design: Schematic diagram Daphnis-I EV-Board

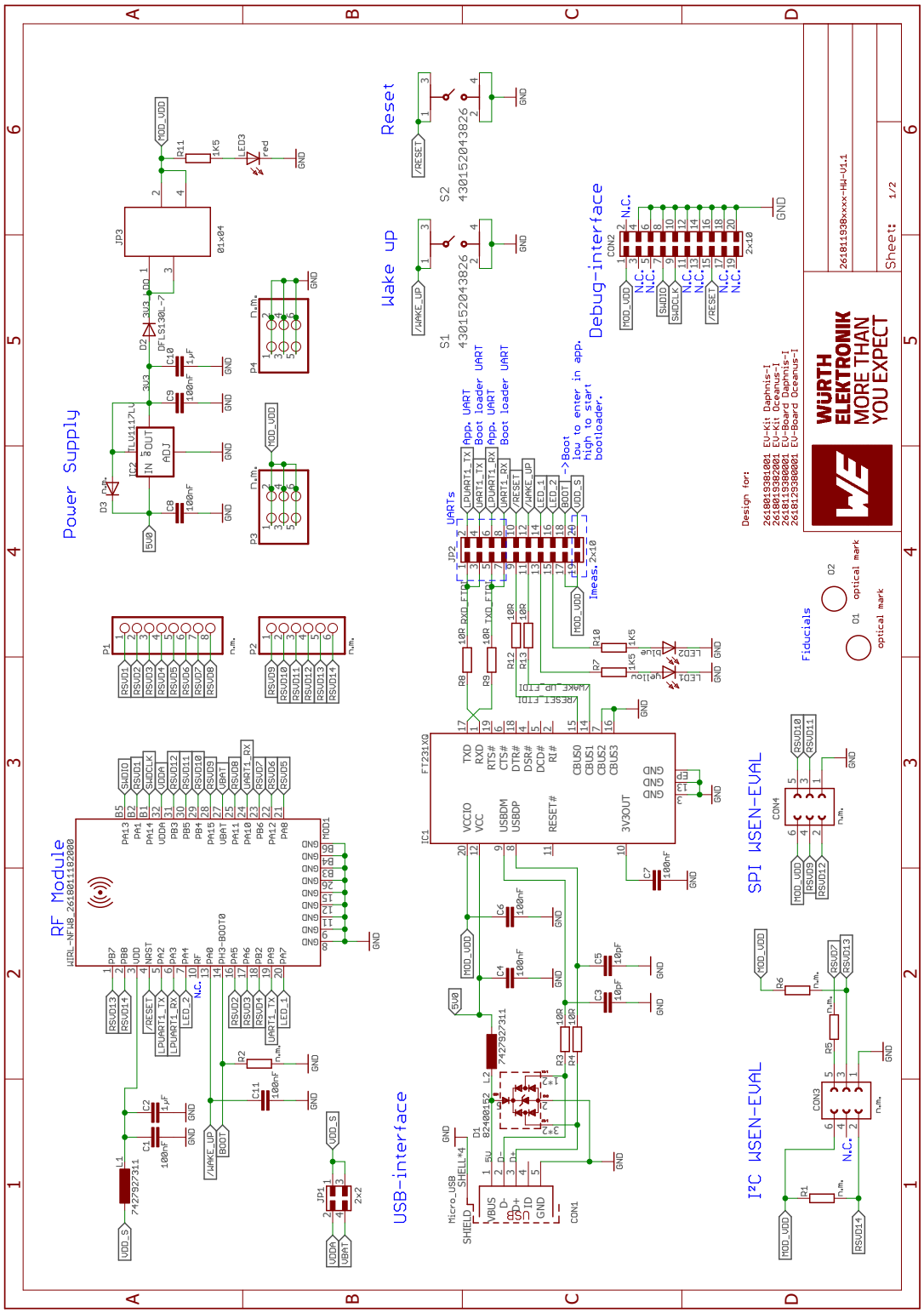

Figure 11: Reference design: Schematic diagram Oceanus-I EV-Board

3.7 Layout

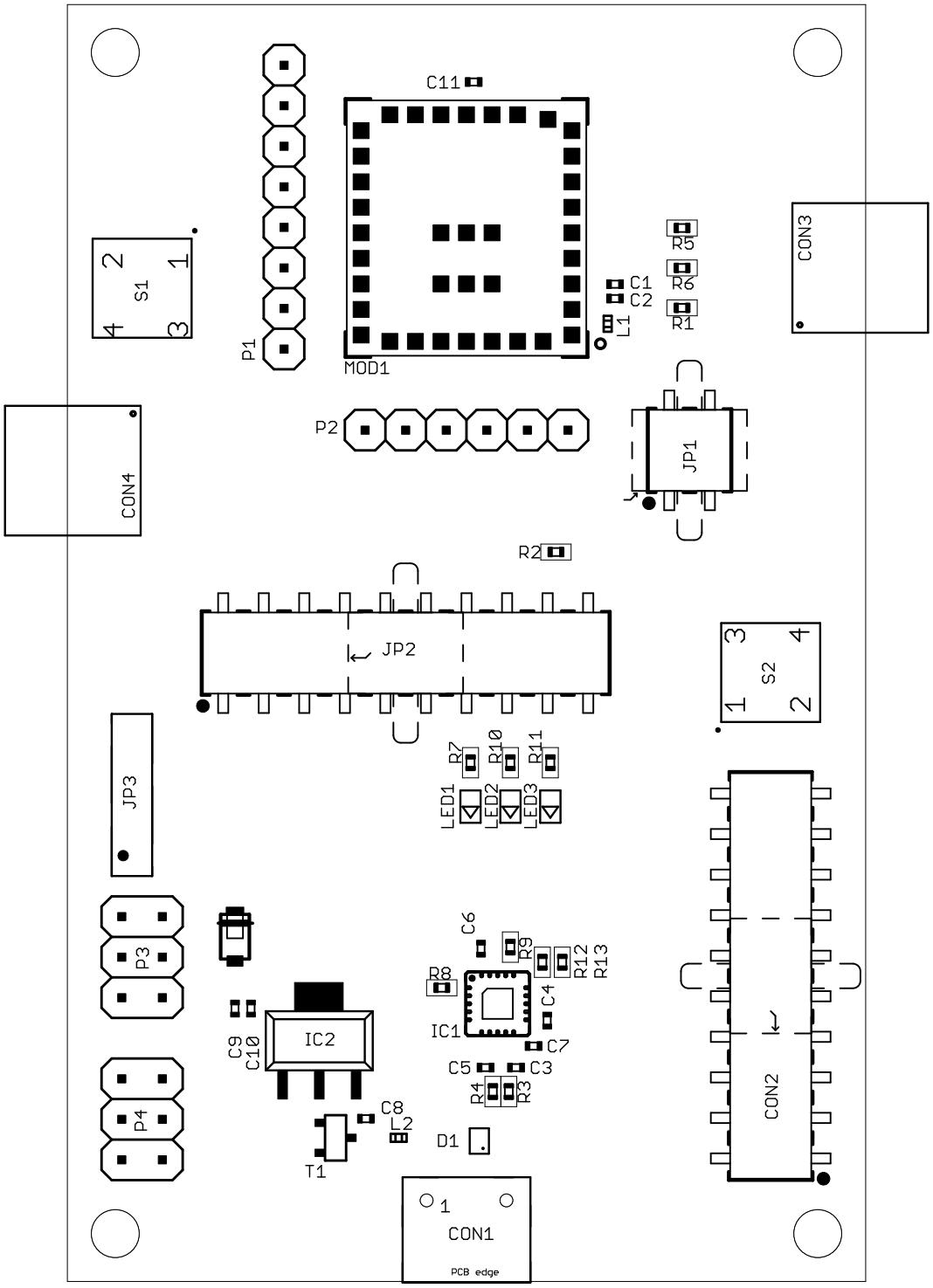

Figure 12: Reference design: Assembly diagram

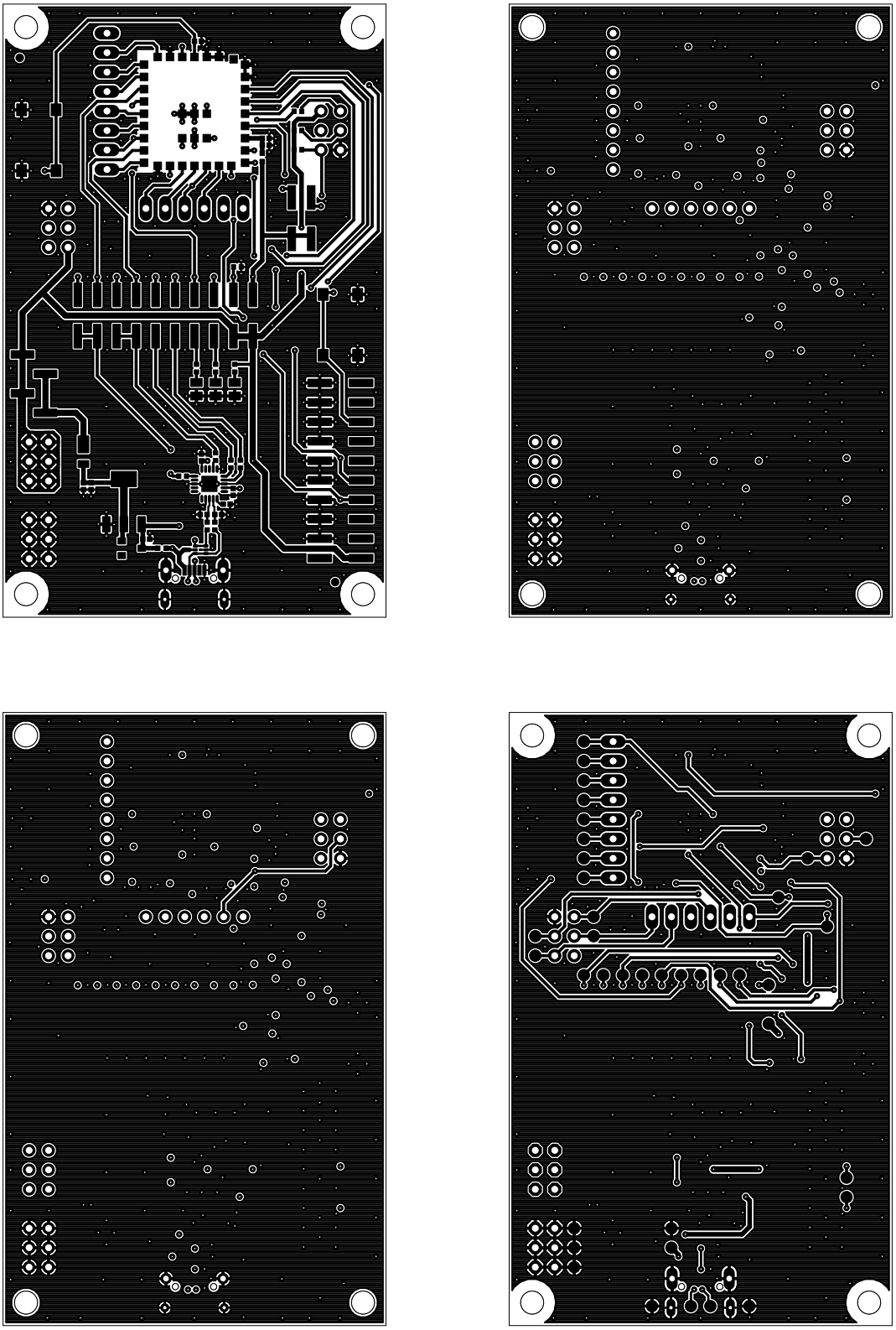

Figure 13: Top layer (upper left), second layer (upper right), third layer (bottom left), fourth layer (bottom right)

3.8 Bill of materials

Part	Value	Pack	Manufacturer	NR
C1	100nF	0402	Würth Elektronik eiSos	*885012205037*
C2	1µF	0402	Würth Elektronik eiSos	*885012105012*
C3	10pF	0402	Würth Elektronik eiSos	*885012005055*
C4	100nF	0402	Würth Elektronik eiSos	*885012205037*
C5	10pF	0402	Würth Elektronik eiSos	*885012005055*
C6	100nF	0402	Würth Elektronik eiSos	*885012205037*
C7	100nF	0402	Würth Elektronik eiSos	*885012205037*
C8	100nF	0402	Würth Elektronik eiSos	*885012205037*
C9	100nF	0402	Würth Elektronik eiSos	*885012205037*
C10	1µF	0402	Würth Elektronik eiSos	*885012105012*
C11	100nF	0402	Würth Elektronik eiSos	*885012205037*
CON1	Micro USB 2.0	SMT-THT	Würth Elektronik eiSos	*629105150521*
CON2	2x10	THT	Würth Elektronik eiSos	*61032021121*
CON3	n.m.	THT	n.m.	n.m.
CON4	n.m.	THT	n.m.	n.m.
D1	82400152	SMT	Würth Elektronik eiSos	*82400152*
D2	DFLS130L-7	SMT	Diodes incorporated	DFLS130L-7
D3	n.m.	THT	n.m.	n.m.
IC1	FT231XQ	SMT	FTDI	FT231XQ
IC2	TLV1117LV33DCY	SMT	Texas Instruments	TLV1117LV33DCY
JP1	2x2	THT	Würth Elektronik eiSos	*61030421121*
JP2	2x10	THT	Würth Elektronik eiSos	*61032021121*
JP3	2x10	THT	Würth Elektronik eiSos	*61000418221*
L1	7427927311	0402	Würth Elektronik eiSos	*7427927311*
L2	7427927311	0402	Würth Elektronik eiSos	*7427927311*
LED1	Yellow	0805	Würth Elektronik eiSos	*150080YS75000*
LED2	Blue	0805	Würth Elektronik eiSos	*150080BS75000*
LED3	Red	0805	Würth Elektronik eiSos	*150080RS75000*
MOD1	WIRL-LORA	SMT	Würth Elektronik eiSos	2618011181000
P1	n.m.	THT	n.m.	n.m.
P2	n.m.	THT	n.m.	n.m.
P3	n.m.	THT	n.m.	n.m.
P4	n.m.	THT	n.m.	n.m.

Table 20: Bill of materials part 1

Part	Value	Pack	Manufacturer	NR
R1	n.m.	0402	n.m.	n.m.
R2	n.m.	0402	n.m.	n.m.
R3	10R	0402	Yageo	RC0402FR-0710RL
R4	10R	0402	Yageo	RC0402FR-0710RL
R5	n.m.	0402	n.m.	n.m.
R6	n.m.	0402	n.m.	n.m.
R8	10R	0402	Yageo	RC0402FR-0710RL
R9	10R	0402	Yageo	RC0402FR-0710RL
R10	1.5k	0402	Yageo	RC0402FR-071K5L
R11	1.5k	0402	Yageo	RC0402FR-071K5L
R12	10R	0402	Yageo	RC0402FR-0710RL
R13	10R	0402	Yageo	RC0402FR-0710RL
S1	WS-TASV	SMT	Würth Elektronik eiSos	*430152043826*
S2	WS-TASV	SMT	Würth Elektronik eiSos	*430152043826*

Table 21: Bill of materials part 2

4 Marking

4.1 Lot number

The 15 digit lot number is printed in numerical digits as well as in form of a machine readable bar code. It is divided into 5 blocks as shown in the following picture and can be translated according to the following table.

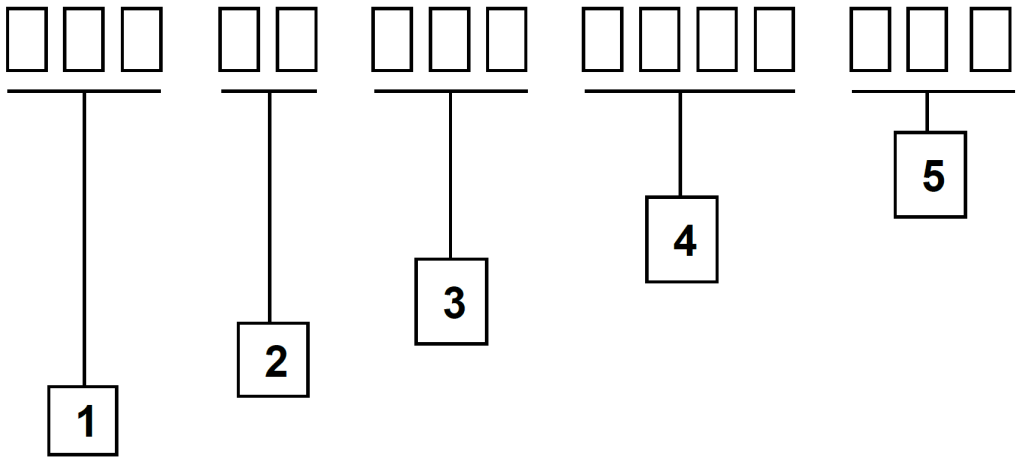

Figure 14: Lot number structure

Block	Information	Example(s)
1	eiSos internal, 3 digits	438
2	eiSos internal, 2 digits	01
3	Radio module hardware version, 3 digits	V2.4 = 024, V12.2 = 122
4	Date code, 4 digits	1703 = week 03 in year 2017, 1816 = week 16 in year 2018
5	Radio module firmware version, 3 digits	V3.2 = 302, V5.13 = 513

Table 22: Lot number details

As the user can perform a firmware update the printed lot number only shows the factory delivery state. The currently installed firmware can be requested from the module using the corresponding product specific command. The firmware version as well as the hardware version are restricted to show only major and minor version not the patch identifier.

5 Regulatory compliance information

5.1 European Conformity

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 EV-Kits designed for professionals to be used solely at research and development facilities for such purposes.

5.2 FCC

Pursuant to §2.803 (c) of Title 47 Chapter I Subchapter A Part 2 Subpart I, the EV-Kit falls under the FCC exception. Therefore it is marked as "For evaluation only; not FCC approved for resale".

5.3 Exemption clause

Relevant regulation requirements are subject to change. Würth Elektronik eiSos does not guarantee the accuracy of the before mentioned information. Directives, technical standards, procedural descriptions and the like may be interpreted differently by the national authorities. Equally, the national laws and restrictions may vary with the country. In case of doubt or uncertainty, we recommend that you consult with the authorities or official certification organizations of the relevant countries. Würth Elektronik eiSos is exempt from any responsibilities or liabilities related to regulatory compliance.

Notwithstanding the above, Würth Elektronik eiSos makes no representations and warranties of any kind related to their accuracy, correctness, completeness and/or usability for customer applications. No responsibility is assumed for inaccuracies or incompleteness.

6 References

[1] Würth Elektronik. Daphnis-I user manual. https://www.we-online.de/katalog/de/manual/2618011181000.

[2] Würth Elektronik. Oceanus-I user manual. https://www.we-online.de/katalog/de/manual/2618011182000.

[3] Würth Elektronik. WE UART Terminal PC tool (Smart Commander). https://www.we-online.de/wcs-software.

7 Important notes

The following conditions apply to all goods within the wireless connectivity and sensors product range of Würth Elektronik eiSos GmbH & Co. KG:

General customer responsibility
Some goods within the product range of Würth Elektronik eiSos GmbH & Co. KG contain statements regarding general suitability for certain application areas. These statements about suitability are based on our knowledge and experience of typical requirements concerning the areas, serve as general guidance and cannot be estimated as binding statements about the suitability for a customer application. The responsibility for the applicability and use in a particular customer design is always solely within the authority of the customer. Due to this fact, it is up to the customer to evaluate, where appropriate to investigate and to decide whether the device with the specific product characteristics described in the product specification is valid and suitable for the respective customer application or not. Accordingly, the customer is cautioned to verify that the documentation is current before placing orders.

Customer responsibility related to specific, in particular safety-relevant applications
It has to be clearly pointed out that the possibility of a malfunction of electronic components or failure before the end of the usual lifetime cannot be completely eliminated in the current state of the art, even if the products are operated within the range of the specifications. The same statement is valid for all software source code and firmware parts contained in or used with or for products in the wireless connectivity and sensor product range of Würth Elektronik eiSos GmbH & Co. KG. In certain customer applications requiring a high level of safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health, it must be ensured by most advanced technological aid of suitable design of the customer application that no injury or damage is caused to third parties in the event of malfunction or failure of an electronic component.

Best care and attention
Any product-specific data sheets, manuals, application notes, PCNs, warnings and cautions must be strictly observed in the most recent versions and matching to the products revisions. These documents can be downloaded from the product specific sections on the wireless connectivity and sensors homepage.

Customer support for product specifications
Some products within the product range may contain substances, which are subject to restrictions in certain jurisdictions in order to serve specific technical requirements. Necessary information is available on request. In this case, the Business Development Engineer (BDM) or the internal sales person in charge should be contacted who will be happy to support in this matter.

Product improvements
Due to constant product improvement, product specifications may change from time to time. As a standard reporting procedure of the Product Change Notification (PCN) according to the JEDEC-Standard, we inform about major changes. In case of further queries regarding the PCN, the Business Development Engineer (BDM), the internal sales person or the technical support team in charge should be contacted. The basic responsibility of the customer as per section 7 and 7 remains unaffected.
All software like ¨wireless connectivity SDK¨, ¨Sensor SDK¨ or other source codes as well as all PC software tools are not subject to the Product Change Notification information process.

Product life cycle
Due to technical progress and economical evaluation, we also reserve the right to discontinue production and delivery of products. As a standard reporting procedure of the Product Termination Notification (PTN) according to the JEDEC-Standard we will inform at an early stage about inevitable product discontinuance. According to this, we cannot ensure that all products within our product range will always be available. Therefore, it needs to be verified with the Business Development Engineer (BDM) or the internal sales person in charge about the current product availability expectancy before or when the product for application design-in disposal is considered. The approach named above does not apply in the case of individual agreements deviating from the foregoing for customer-specific products. The approach named above does not apply in the case of EV-Boards. EV-Boards may be changed without any notification.

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All the rights for contractual products produced by Würth Elektronik eiSos GmbH & Co. KG on the basis of ideas, development contracts as well as models or templates that are subject to copyright, patent or commercial protection supplied to the customer will remain with Würth Elektronik eiSos GmbH & Co. KG. Würth Elektronik eiSos GmbH & Co. KG does not warrant or represent that any license, either expressed or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, application, or process in which Würth Elektronik eiSos GmbH & Co. KG components or services are used.

General terms and conditions
Unless otherwise agreed in individual contracts, all orders are subject to the current version of the "General Terms and Conditions of Würth Elektronik eiSos Group", last version available at *www.we-online.com*.

8 Terms of Use for Würth Elektronik eiSos GmbH & Co. KG EV-Boards, evaluation kits and evaluation modules

Würth Elektronik eiSos GmbH & Co. KG provide you as a user with technical data (including data sheets), design resources (including reference designs), recommendations for use or other design recommendations, web tools, safety information and other information in the form of evaluation-boards, -kits or -modules (hereinafter jointly referred to as "EVB") in accordance with the terms and conditions contained here. The EVB is provided in the "as is" state. WE disclaims all express and implied warranties, in particular those concerning the suitability for a certain purpose, the absence of defects or non-violation of third-party rights. The EVB is intended for experienced developers to develop

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General warnings
Do not touch the EVB when it is live, and allow charged components, such as capacitors, to discharge completely before handling the EVB. Depending on the individual application, high voltages can occur on the EVB and some components can reach temperatures above 50 °C. Even after disconnecting the EVB from the power source, these conditions remain for a significant time. Please ensure that the appropriate safety precautions are taken when installing and operating this EVB, as one of the following may occur if you handle or use this EVB without observing the relevant safety precautions: - Death - Serious injury - Electric shock - Electric burns - Severe heat burns -
When using the EVB, you undertake to read the instructions for use in full together with the relevant information supplied and/or available on the homepage *www.we-online.de/wcs-manuals* before putting this EVB into operation. The following points have to be observed in particular:
- Do not touch the EVB while it is live.
- The EVB must be fully assembled and all devices to be tested must be connected before voltage is applied to the EVB.
- The EVB should never be left unattended during operation.
- Capacitors must be completely discharged. The capacitors must be actively discharged using a suitable resistor.

Protection against static electricity
Use the unpackaged product only in ESD protected areas. Wear the ESD personal protective equipment prescribed for these areas. Ground all conductive components, including personnel, as prescribed in ESD protected areas. Ensure that the product is only used by trained personnel.

Purpose and use
The EVB is not a finished product and is not intended for general use by the consumer. The EVB is intended exclusively for use in the evaluation of WE components in the lab or in development environments by highly qualified technicians or engineers, familiar with the risks involved in handling electrical or mechanical components, systems and subsystems. The use of the EVB is your full and independent responsibility. The EVB is expressly not intended to be installed in a terminal device or to be part of a terminal device in whole or in part. WE reserves the right, at its own discretion, to make corrections, improvements, adjustments or other changes to the EVB or to discontinue the EVB. The EVB is not intended for use in devices and applications for which a higher safety and reliability standard is prescribed. It is also not approved for use in safety-relevant applications or where personal injury or fatal consequences must be expected in the event of failure.

Operation of the EVB
The EVB may only be operated within the specifications and environmental parameters recommended by WE, as described in the instructions for use. Exceeding the specified parameters (including, but not limited to, input and output voltage, current, power, and ambient conditions) may result in damage to property. If you have questions about these electrical parameters, please contact WE at (regulatory-compliance@we-online.com) prior to connecting peripheral electronics (including the input voltage and intended loads). Any load outside a certain power range may lead to negative consequences, including, but not limited to, unintended or inaccurate evaluations or possibly permanent damage to the EVB or the electronics connected to it. Please ensure that the appropriate safety precautions are taken when working with the EVB, as serious injuries, including severe or even fatal injuries from electric shock or electric burns, may occur if you do not follow the appropriate safety precautions. Under no circumstances should the EVB be touched while live. When the EVB is connected to a power source, some of its components are electrically charged and/or have temperatures above 50 °C. This condition also applies for a short time after disconnecting from the supply voltage until the capacitors are completely discharged and hot components have cooled down. These components include connectors, linear regulators, switching transistors, heat sinks, resistors, diodes, inductors and other components, which can be identified from the documentation in the instructions for use. As with all electronic lab work, only qualified persons with knowledge of electronic performance evaluation, measurement and diagnostic tools, should use the EVB.

Hazards and warnings
Before putting the EVB into operation, please read the instructions for use and especially the various hazards and warnings described therein. The instructions for use contain important safety information on voltages and temperatures. You take full responsibility and liability for the proper and safe handling of the EVB. You agree to comply with all safety requirements, rules and regulations related to the use of the EVB. You also take full responsibility for: (1) establishing safeguards to ensure that the use of the EVB does not cause damage to property, personal injury or death, even if the EVB does not function as described, intended or expected, (2) the test setup in which the EVB is integrated, all safety requirements, rules and regulations and also that no damage to property, personal injury or other hazardous situation occurs even if the EVB fails, and (3) ensuring the safety of all activities performed by you or your employees when using the EVB. In particular, this means that the technical rules VDE [German Electrical Engineering, Electronic and Information Technology Association] 0105-100 and BGI [German trade association information] 891 (or corresponding applicable safety regulations outside Germany) for the operation of electrical test setups must be observed, the test area is protected against unauthorized access or accidental touching, current limitations, and emergency stop mechanisms are functional and test setups are never operated unattended. If you have any questions about the safe use of the EVB, please contact WE at *regulatory-compliance@we-online.com* for more information.

Your responsibility with regard to the applicable laws
- You are responsible for being sufficiently informed about and complying with all international, national, state and local applicable laws, rules and regulations that apply to the handling or use of the EVB by you or your employees.
- The EVB generates, uses and radiates radio frequency energy, but has not been tested for conformity with the limits applicable to the product category, which are applicable according to the European Union regulations for protection against radio frequency interference. Operation of the EVB may cause interference with radio communication. In this case, the costs incurred for necessary measures to remedy the interference are to be borne by the user.

As the EVB is not a finished product, it may not comply with applicable regulatory, safety or certification standards that are normally as-

sociated with other products, such as Directive 2011/65/EC of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of hazardous substances and Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). You take full responsibility for compliance with such standards that apply to the EVB. You also take responsibility for the proper disposal of the components and materials of the EVB.

Exclusion of further rights and rights of use for intellectual property of EVB
The sale of an EVB does not constitute the granting by WE of any license or other right of any kind - expressly or implicitly - including, but not limited to, any patent, copyright, trademark or other proprietary rights. All rights from such patent, copyright, trademark or other proprietary rights are expressly reserved by WE. The EVB must not be used in any manner that directly or indirectly infringes any patent, copyright, trademark or other proprietary rights of WE.

Warranty of EVB
WE ensures that the EVB meets the specifications given in the instructions for use (within the deviations stated therein) for a period of 12 months from the date of purchase and functions in accordance with the instructions for use. On the basis of the underlying statutory provisions, WE shall rectify defects or offer free replacement of the EVB to which damage occurs that is evidently attributable to a defect for which WE is responsible and is at fault. A warranty claim is subject to the user having complied with the statutory duties of inspection and notification of defects and that the EVB has been received by WE no later than ten (10) days after expiry of the warranty period. This warranty is not transferable to others. This warranty does not apply to defects or impairments in performance resulting from incorrect use, use contrary to WE's instructions, improper installation, improper operation or misuse. WE accepts no liability whatsoever for the failure of equipment or other items not manufactured by or for WE, including, but not limited to, equipment or items to which the EVB is attached or for which the EVB is used. WE DOES NOT GRANT ANY WARRANTIES OR ASSURANCES WHATSOEVER, EXPRESS OR IMPLIED, WITH RESPECT TO THE EVB, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MARKETABILITY OR SUITABILITY FOR A PARTICULAR PURPOSE.

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These License terms will take effect upon the purchase and usage of the Würth Elektronik eiSos GmbH & Co. KG wireless connectivity products. You hereby agree that these license terms are applicable to the product and the incorporated software, firmware and source codes (collectively, "Software") made available by Würth Elektronik eiSos in any form, including but not limited to binary, executable or source code form. The software included in any Würth Elektronik eiSos wireless connectivity product is purchased to you on the condition that you accept the terms and conditions of these license terms. You agree to comply with all provisions under these license terms.

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You are responsible for using the Würth Elektronik eiSos wireless connectivity product with the incorporated firmware in compliance with all applicable product liability and product safety laws. You acknowledge to minimize the risk of loss and harm to individuals and bear the risk for failure leading to personal injury or death due to your usage of the product.
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The incorporated firmware created by Würth Elektronik eiSos is and will remain the exclusive property of Würth Elektronik eiSos.

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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.

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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.

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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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