WÜRTH ELEKTRONIK

EVALUATION BOARD USER MANUAL

FOR RADIO MODULES

EV Order Code	Module order code	Product Name
2611019024001	2611011024000	Proteus-III
2611019021001	2611011021000	Thyone-I

VERSION 1.1

MARCH 13, 2020

Revision history

Manual version	HW version	Notes	Date
1.0	2.0	• Initial version	February 2020
1.1	2.0	• JP3 description in HW V2.0 is invalid. Updated jumper JP3 description in table 6	March 2020

Abbreviations and abstract

Abbreviation	Name	Description
FSE	Field Sales Engineer	Support and sales contact person responsible for limited sales area
HIGH	High signal level	
LFCLK	Low frequency clock	
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	Product Name	Description
2611011024000	Proteus-III	Bluetooth® LE 5.1 radio module with smart antenna configuration
2611011021000	Thyone-I	2.4GHz proprietary with smart antenna configuration

Order code	Product Name
2611019024001	Proteus-III Bluetooth 5.1 EV-kit
2611019021001	Thyone-I EV-kit

Table 1: Compatibility

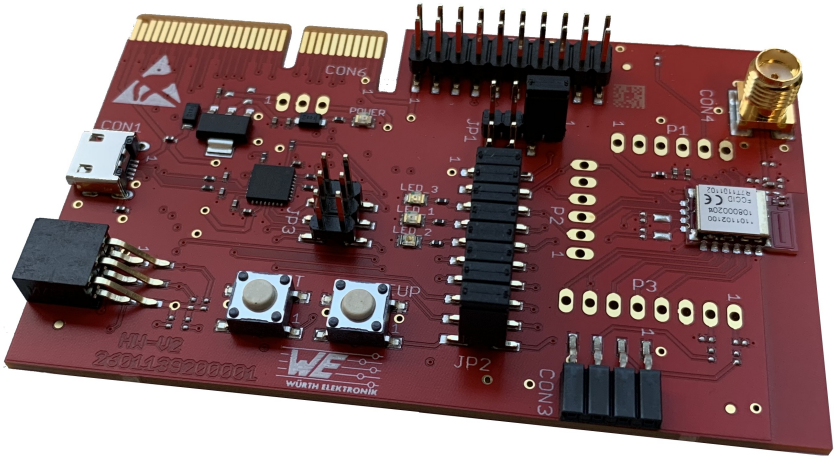

Figure 1: Product image

Kit Content 2611019024001	Quantity
Evaluation board with Proteus-III	1
USB2 A to USB Micro cable	1
Packaging: Cardboard Box, ESD bag	1

Table 2: Content Proteus-III Bluetooth 5.1 EV-kit

Kit Content 2611019021001	Quantity
Evaluation board with Thyone-I	2
USB2 A to USB Micro cable	2
Packaging: Cardboard Box, ESD bag	1

Table 3: Content Thyone-I EV-kit

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 micro controller 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 such as the USB interface which are not required.

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

To run the evaluation board place the jumpers on default location as shown in figure 3.
The corresponding FTDI driver package (*www.ftdichip.com/Drivers/VCP.htm*) has to be installed on your PC.

Connect the power jack or external power supply to the EV board and make sure the VDD is stable and able to reliably supply the module's static and peak current consumption as specified by the module manual.

The next step is to connect the evaluation board to the PC using a 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 "/dev/ttyUSB0" in Linux systems.

The WE-SmartCommander or any other serial terminal program (like hterm for Windows) has to be run and the corresponding COM port has to be opened using the default settings of the mounted radio module. After the module is powered through the USB jack or an alternative power supply, the reset button should be pressed to ensure a clean start-up of the module.

Please refer to the module reference manual to get the detailed module specific quick start instructions.

3 Development board

3.1 Block diagram

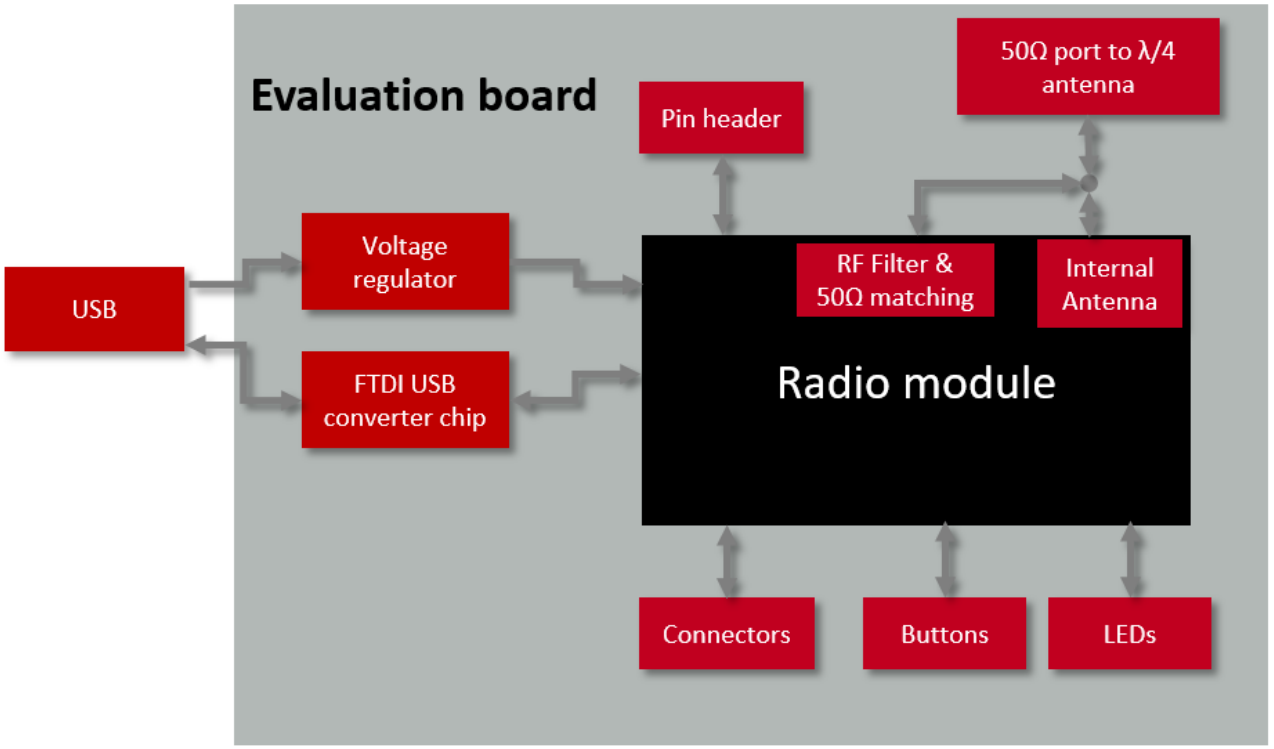

Figure 2: Block diagram

3.2 Jumpers

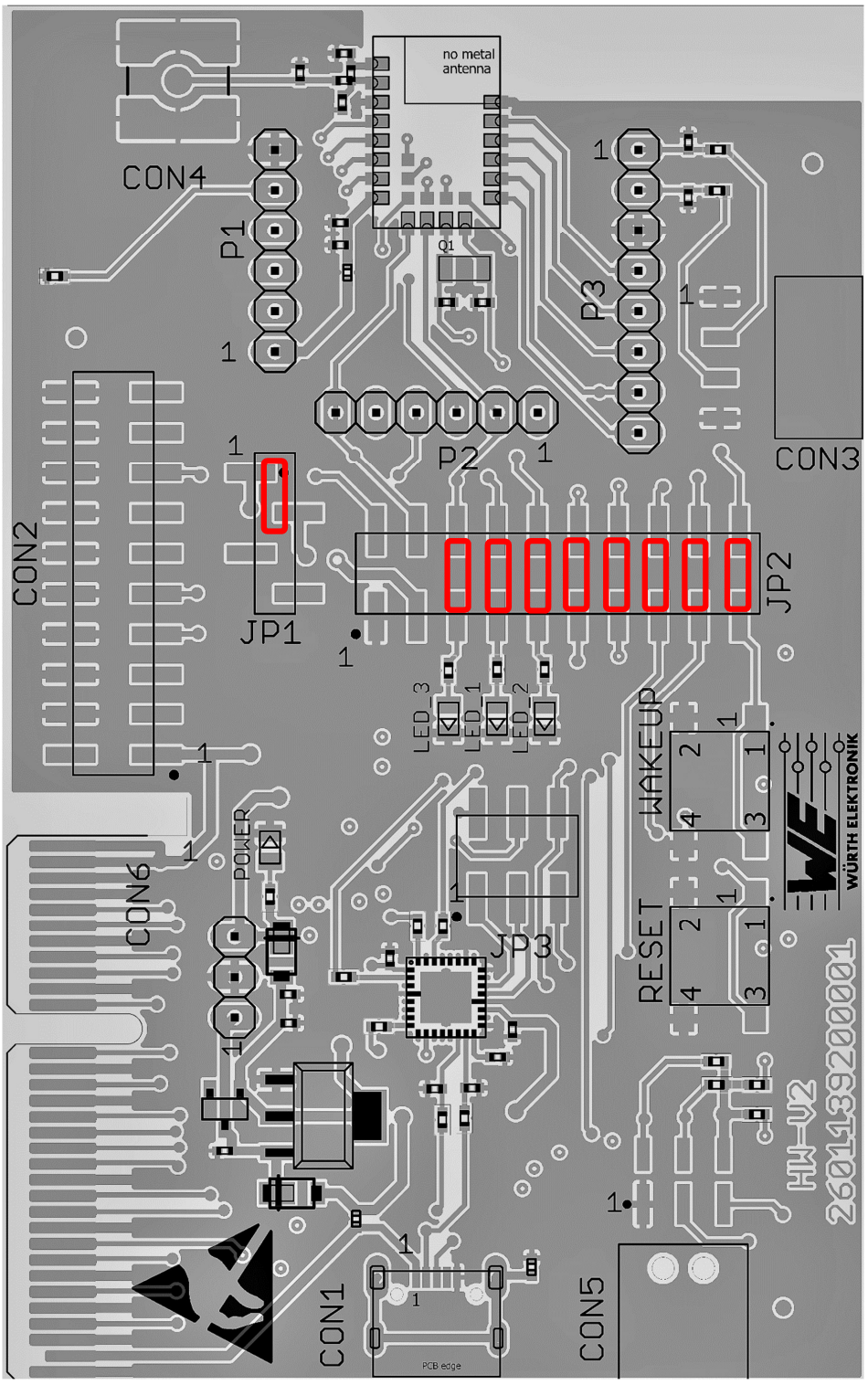

Figure 3: Jumpers, defaults

JP1	Function	Jumper set (default)
1,2	Power bridge	Yes

Table 4: Jumper JP1

JP2	Module Pin Function	Jumper set (default)
1,2	Connet BOOT pin to GND if set	No
3,4	Connect MODE_1 to VDD if set	No
5,6	LED3	Yes
7,8	LED1	Yes
9,10	LED2	Yes
11,12	UART TX	Yes
13,14	UART RX	Yes
15,16	CTS	Yes
17,18	RTS	Yes
19,20	Wake_up	Yes

Table 5: Jumper JP2

JP3	CBUS Connections	Jumper set (default)
1,2	CBUS 0 - Reset	No
3,4	CBUS 1 - Boot	No
5,6	CBUS 2 - Wake-up	No

Table 6: Jumper JP3

JP3 description printed on the bottom of the evaluation board Hardware Version 2.0 is invalid.

Jumper JP3 connections in the table 6 are updated and shall be used.

3.3 Connectors and pin headers

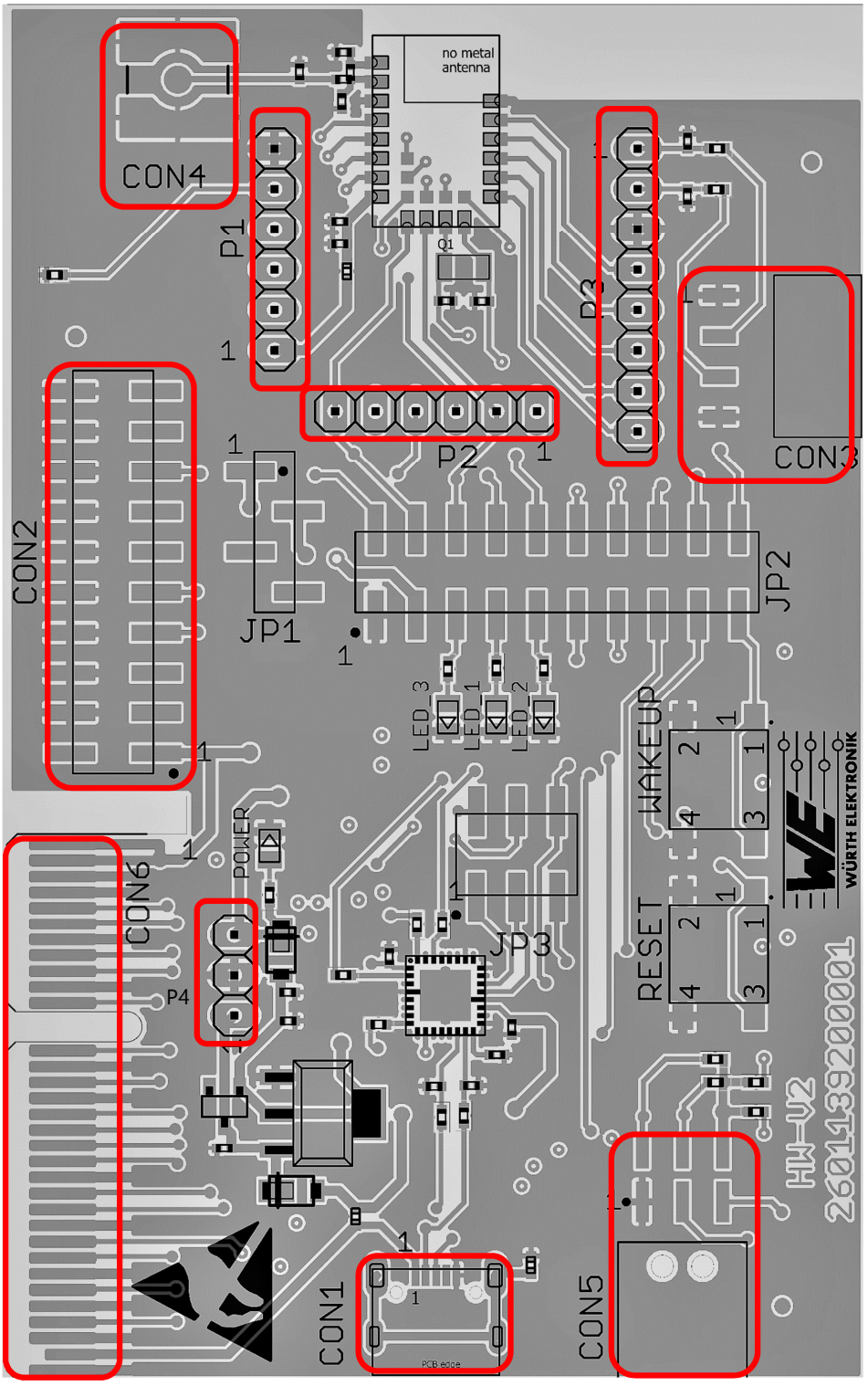

Figure 4: Connectors

Connector	Function
CON1	Micro-USB connector for host connection and VDD bus supply
CON2	2×10 JTAG/SWD Connector
CON3	Optional connection for NFC Antenna
CON4	SMA connector for external antenna
CON5	Optional connection for WE sensor EV-boards
CON6	Edge card connector, see table 9

Table 7: Connector overview

3.3.1 CON1

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

CON1	Function
	Micro-USB connector for host connection and VDD bus supply

3.3.2 CON2

Connector CON2 is the JTAG debugging interface.

CON2	nRF52840	Function
1		VDD
7	SWDIO	SWDIO
9	SWCLK	SWCLK
15	P0.18	RESET
4,6,8,10,12,14,16,18,20		GND
2,3,5,11,13,17,19		Not Connected

Table 8: Connector CON2

3.3.3 CON3

Connector CON3 is used to connect a NFC antenna. This feature is subjected to a customized firmware and not supported by default firmware.

CON3	nRF52840	Function
1		GND
2	P0.09	NFC1
3	P0.10	NFC2
4		GND

3.3.4 CON4

Connector CON4 (SMA receptacle) is used to connect an external antenna.

CON4	Function
Inner	RF signal
Outer	GND

STOP By default the SMA connector is not connected to the module

The board supports 50 Ohm connection by just soldering/unsoldering one component for conducted measurements or to connect an external antenna. To prevent misinterpretation of the assembled connector there is no antenna included in the kit.

By default the integrated PCB antenna of the module is connected for RF communication. In order to use the external antenna, Capacitor C6 has to be populated with a 22pF capacitor and C28 should be left unpopulated.

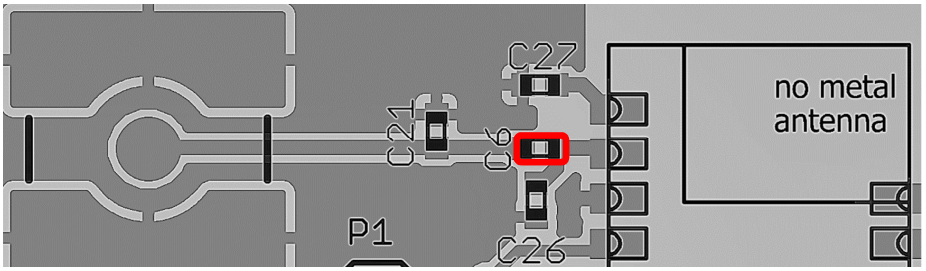

Figure 5: Capacitor connection for external antenna

In order to use the integrated PCB antenna of the module, C28 has to be populated with a 22pF capacitor and C6 should be left unpopulated.

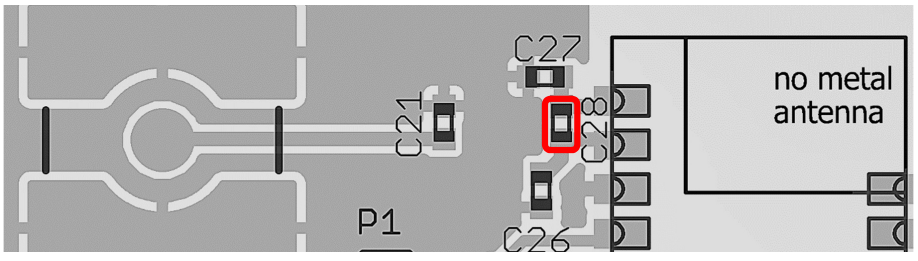

Figure 6: Capacitor connection for internal antenna

3.3.5 CON5

Connector CON5 is used to connect the WE Sensor evaluation boards. This feature is subjected to a customized firmware and not supported by default firmware.

CON5	nRF52840	Function
1		GND
2	P0.07	RSVD
3	P0.23	RSVD
4	P1.00	RSVD
5	P0.21	RSVD
6		VDD

3.3.6 CON6

Connector CON6 is an Edge card connector.

CON6	nRF52840	Function
B1, B2		VDD 3V
B3, B4, B7,B9, B13, B15, B20, B23, B26, B28, B30, B32		GND
B5	SWCLK	SWCLK
B6	SWDIO	SWDIO
B8	P0.03	WAKE_UP
B9	P0.02	BOOT
B11	P0.12	CTS
B12	P0.11	RTS
B14	P0.18	RESET
B16	P0.23	RSVD
B17	P0.21	RSVD
B18	P0.07	RSVD
B19	P1.00	RSVD
B21	P1.08	UTXD
B22	P1.09	URXD
B24	P0.19	MODE_1
B25	P0.22	BUSY
B27		D+ USB
B29		D- USB
B31		VDD 5V

Table 9: Connector CON6

P1	nRF52840	Function
1		VDD 3V
2	P0.02	BOOT
3	P0.18	RESET
4	SWDIO	SWDIO
5	SWCLK	SWCLK
6		GND

Table 10: Pinheader P1

P2	nRF52840	Function
1	P0.21	RSVD
2	P0.22	BUSY
3	P0.23	RSVD
4	P1.00	RSVD
5	P0.07	RSVD
6	P0.19	MODE_1

Table 11: Pinheader P2

P3	nRF52840	Function
1	P0.09	NFC1, RSVD
2	P0.10	NFC2, RSVD
3		GND
4	P0.03	WAKE_UP
5	P0.12	CTS
6	P0.11	RTS
7	P1.09	URXD
8	P1.08	UTXD

Table 12: Pinheader P3

P4	nRF52840	Function
1		VDD 3V
2		GND
3		VDD 5V

Table 13: Pinheader P4

3.4 Buttons

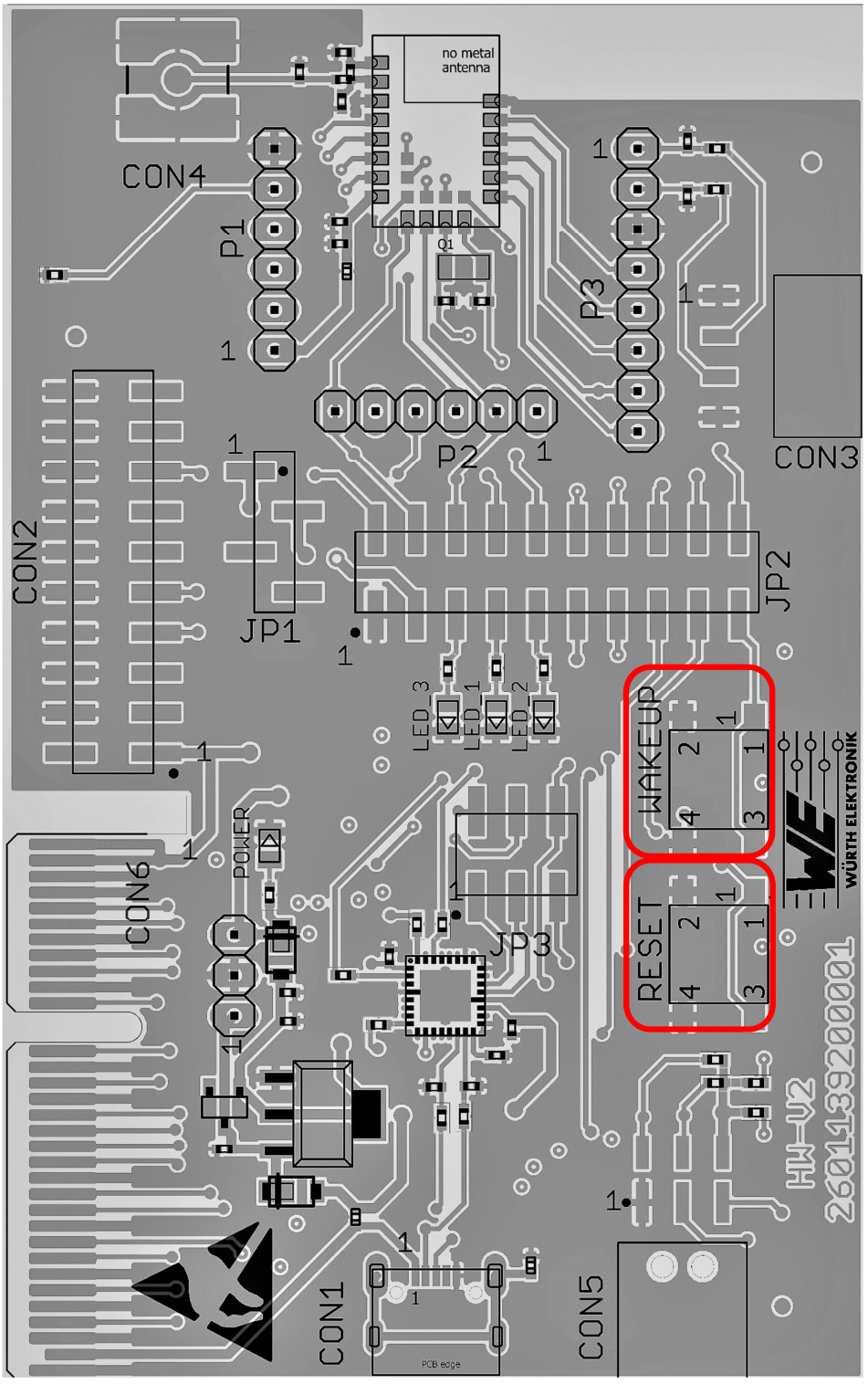

Figure 7: Buttons

3.4.1 RESET button

Internally the active low reset input of the micro processor is connected via a RC combination with the power supply to ensure a proper startup of the module. Any module provides a */RESET* pin that is connected to this button so the module can be restarted properly. Most modules provide an internal pull-up resistor. Please refer to the module specific manual for detailed information.

3.4.2 WAKE-UP button

Some modules use the wake-up button connected to their *WAKE-UP* pin to exit from sleep mode of the module. Please 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 development board can be run via USB. The integrated voltage regulator regulates the connected USB voltage 5V down to 3V and supplies the remaining parts of the circuit. If the evaluation board is power sourced the power *Power LED* lights up.

3.5.2 JP1 - Current measurement

By default, JP1 is bridged for normal operation. If a current meter is connected in place of the jumper, the power consumption of the radio module can be measured.
If the meter is not attached and the bridge is not set, the module will not receive a supply voltage. However, the power *Power LED* may be active, as it is connected prior to the current measurement bridge in order not to distort the module's power consumption.

3.5.3 UART / USB

The UART of the module can be connected to the USB converter by setting the bridge JP2. In this case it is available on the USB jack. Using the FTDI-driver the PC will show a virtual COM-Port which can be used to communicate with the module.

The USB cable length must not exceed 3 meters.

3.5.4 UART direct

If a micro-controller is to be connected to the module, remove the bridges on JP5. The UART can be connected directly on the pin strip JP5 (all odd numbered pins). 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 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).

3.5.5 LFXO crystal

For higher LFCLK accuracy (better than ±250ppm) a low frequency crystal oscillator of about 32.768kHz (LFXO) may be used. A crystal, 3.2 ×1.6mm package, for example CC7V-T1A-32.768kHz-9pF-20PPM-TC-QC, can be placed on the evaluation board to position Q2. The needed load capacitance can be reached with capacitors C9 and C10, 0402 package. Depending on parasitic capacities a capacity of 4.8pF may be a good starting value for C9 and C10.
Furthermore, the LFXO Crystal avoids the regular recalibration of the clock and therefore optimizes current consumption.
If a LFXO is mounted to the EV board the JP2.7-8 and JP2.9-10 jumpers shall not be connected, therefore the LED2 and LED3 function is no longer available.

Using standard firmware the external crystal is not needed. To enable use of the LFXO a custom firmware is required.

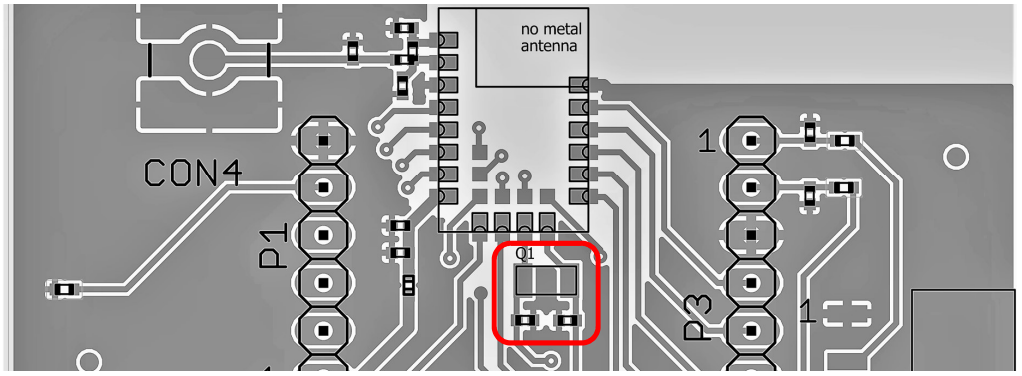

Figure 8: LFXO mounting

3.5.6 NFC

Using standard firmware NFC is not supported. To enable use of the NFC a custom firmware is required and an antenna and antenna matching network needs to be connected to the corresponding pins. In case of using NFC function, the corresponding pins are connected to the CON3 through place holders for matching circuitry to tune the NFC antenna.

3.5.7 Programming interface

The evaluation board provides a 2×10 pin connector to connect directly to a JTAG flash adapter used for development. Please take care of the correct mounting of the flash adapter. The recommended flash adapter is one of the "Segger J-Link" family.
Jumper JP6 will prevent the module from starting in debug mode when no flash adapter is connected. To apply this, remove the flash adapter connection. Make sure a jumper at JP6 is placed. Unplug and replug the USB connection of the device. Press the reset button on the evaluation board.

3.6 Schematic

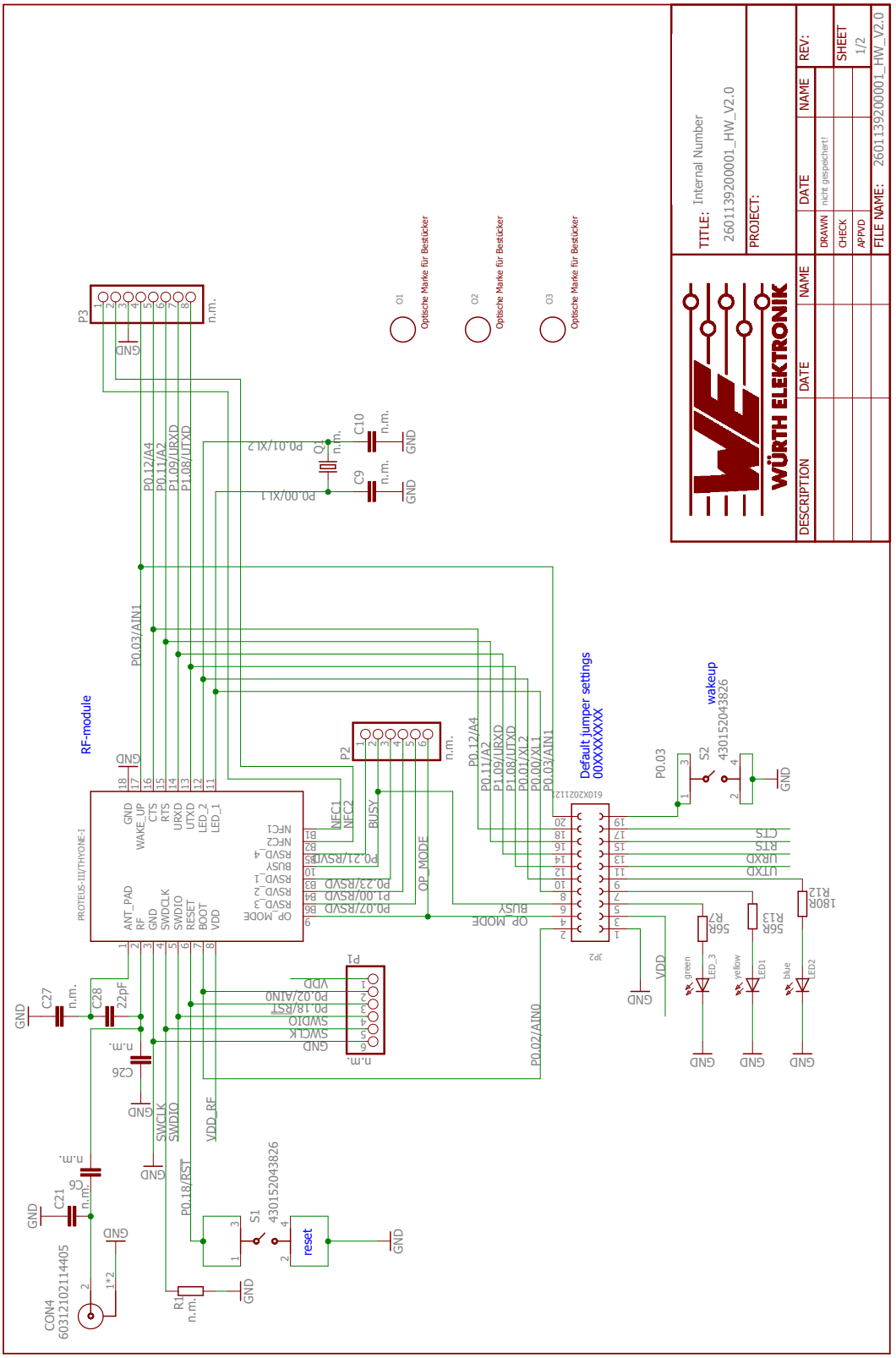

Figure 9: Schematic sheet-1

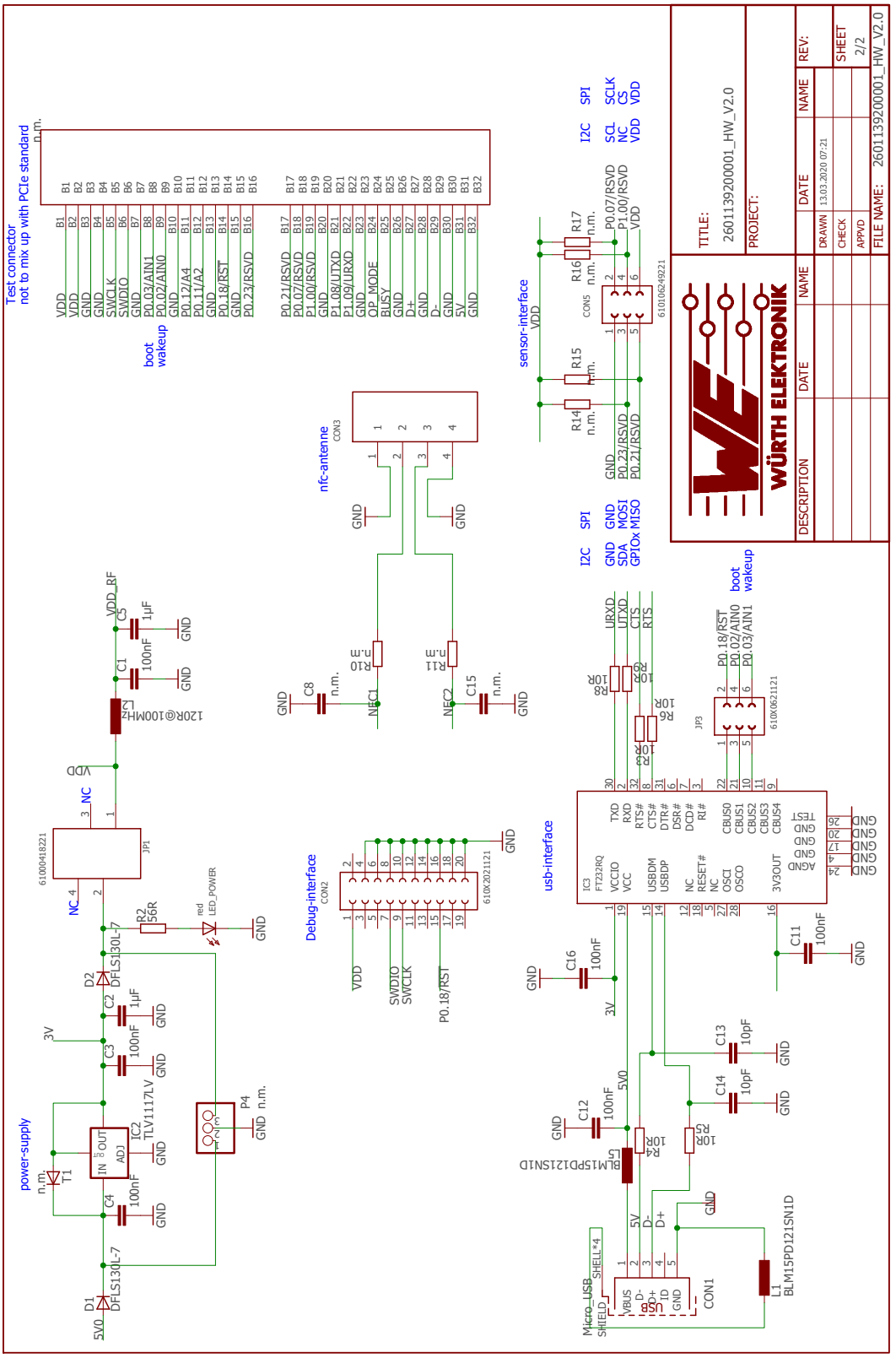

Figure 10: Schematic sheet-2

3.7 Layout

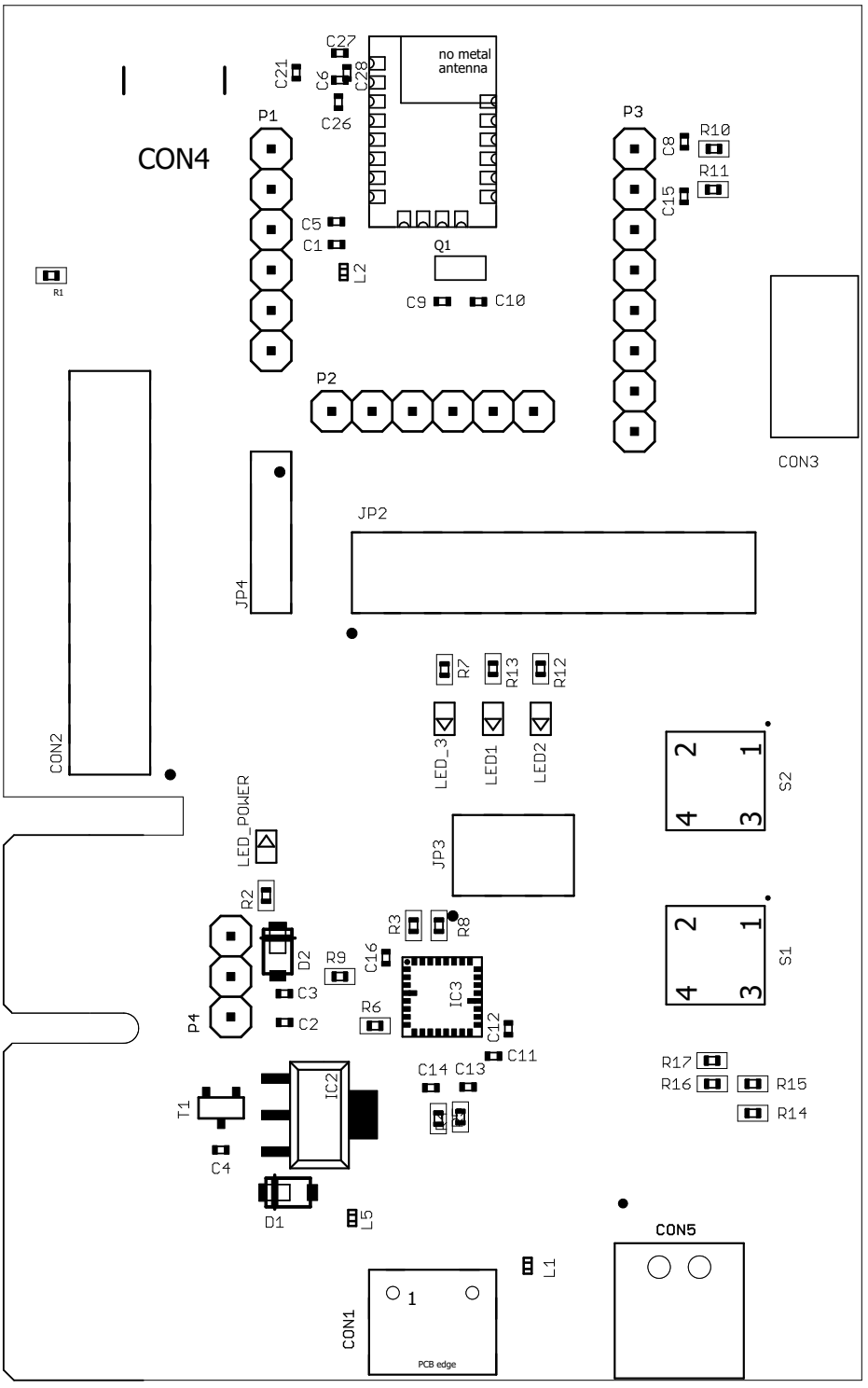

Figure 11: Assembly diagram

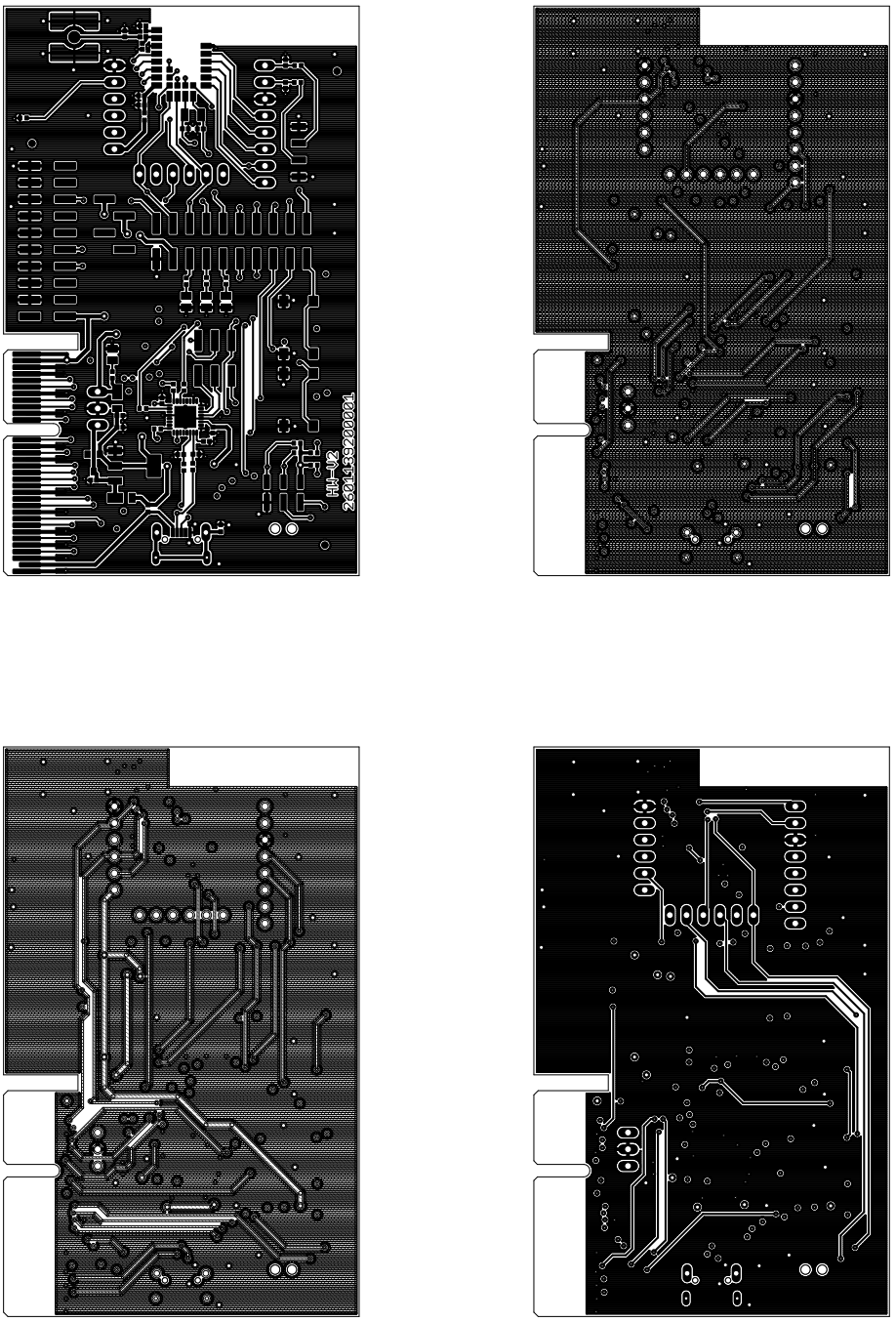

Figure 12: Top,bottom & internal layers

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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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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.

7.3 Ownership

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

7.4 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.

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7.9 Miscellaneous

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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 wireless connectivity product, you accept this license terms in all terms.

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