

USER MANUAL

EVALUATION BOARD FOR RADIO
MODULES 26701XXXXXX,
260503XXXXXX, 260504XXXXXX,
260702XXXXXX, 260901XXXXXX,
260903XXXXXX

VERSION 2.6

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 - 1.11	-	<ul style="list-style-type: none">• Initial version	July 2017
2.0	4.1	<ul style="list-style-type: none">• New corporate design and structure	December 2018
2.1	4.1	<ul style="list-style-type: none">• Corrected article number of Thebe-II• Added hint to use Thebe-II with external power supply	January 2019
2.2	4.1	<ul style="list-style-type: none">• Added chapter Regulatory compliance information	February 2019
2.3	4.1	<ul style="list-style-type: none">• Added Marketing name	March 2019
2.4	4.1	<ul style="list-style-type: none">• Added Themisto-I• Specified Hardware Version of the evaluation board in detail.	October 2019
2.5	4.1	<ul style="list-style-type: none">• Schematic is updated in chapter 3.6.• Bill of materials is added in chapter 3.8.• FCC exemption information is added in chapter 4.	January 2021

2.6	5.0	<ul style="list-style-type: none">• Updated chapter 3.6 and 3.8.• Added radiation characteristics in chapter 3.9.• New corporate design.	May 2023
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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	Interface which allows communication with the module.
VDD	Supply voltage	

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1 Supported radio modules

The evaluation board described in this manual can be used to evaluate the following WE eiSos wireless connectivity modules:

Order code	Former order code	Marketing Name	Description
260701111100x	AMB3626(-TR)	Titania	169MHz proprietary
260701111300x	AMB3626-M(-TR)	Mimas-I	169MHz wireless M-BUS
260503114100x	AMB4426(-TR)	Thadeus	434MHz proprietary
260504118100x	AMB8426(-TR)	Tarvos-I	868MHz proprietary
260504118300x	AMB8426-M(-TR)	Metis-I	868MHz wireless M-BUS
260702118100x	AMB8626(-TR)	Tarvos-II	868MHz proprietary
260702118300x	AMB8626-M(-TR)	Metis-II	868MHz wireless M-BUS
260901108100x	AMB8826(-TR)	Tarvos-III	868MHz proprietary
260901118100x	AMB8826-1(-TR)	Tarvos-III	868MHz proprietary, PCB antenna
260702119100x	AMB9625(-TR)	Telesto-I	915MHz proprietary, -2dBm tx power for FCC
260702119101x	AMB9626(-TR)	Telesto-II	915MHz proprietary, FHSS for FCC
260901109100x	AMB9826(-TR)	Telesto-III	915MHz proprietary, broadband for FCC
260901119100x	AMB9826-1(-TR)	Telesto-III	915MHz proprietary, broadband for FCC, PCB antenna
260903118100x	AMB8836(-TR)	Thebe-II	868 MHz proprietary, 500mW

Table 1: Compatibility

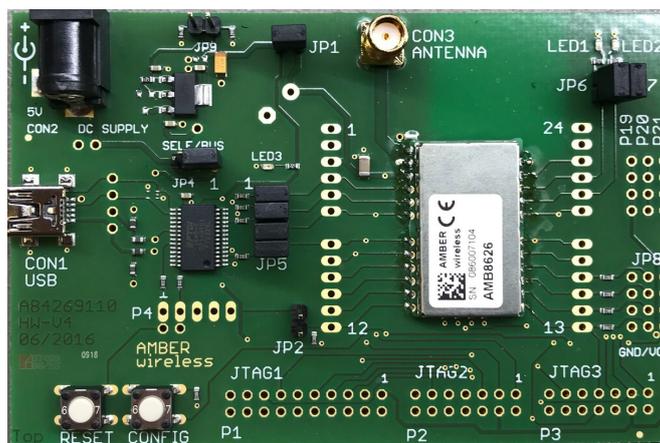


Figure 1: Product image

Contact our sales team to order the corresponding module 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 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 on default position as described in chapter 3. 2. 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 VCC 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 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 /dev/ttyUSB0 in Linux systems.

A 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 user manual to get the detailed module specific quick start instructions.

3 Development board

3.1 Block diagram

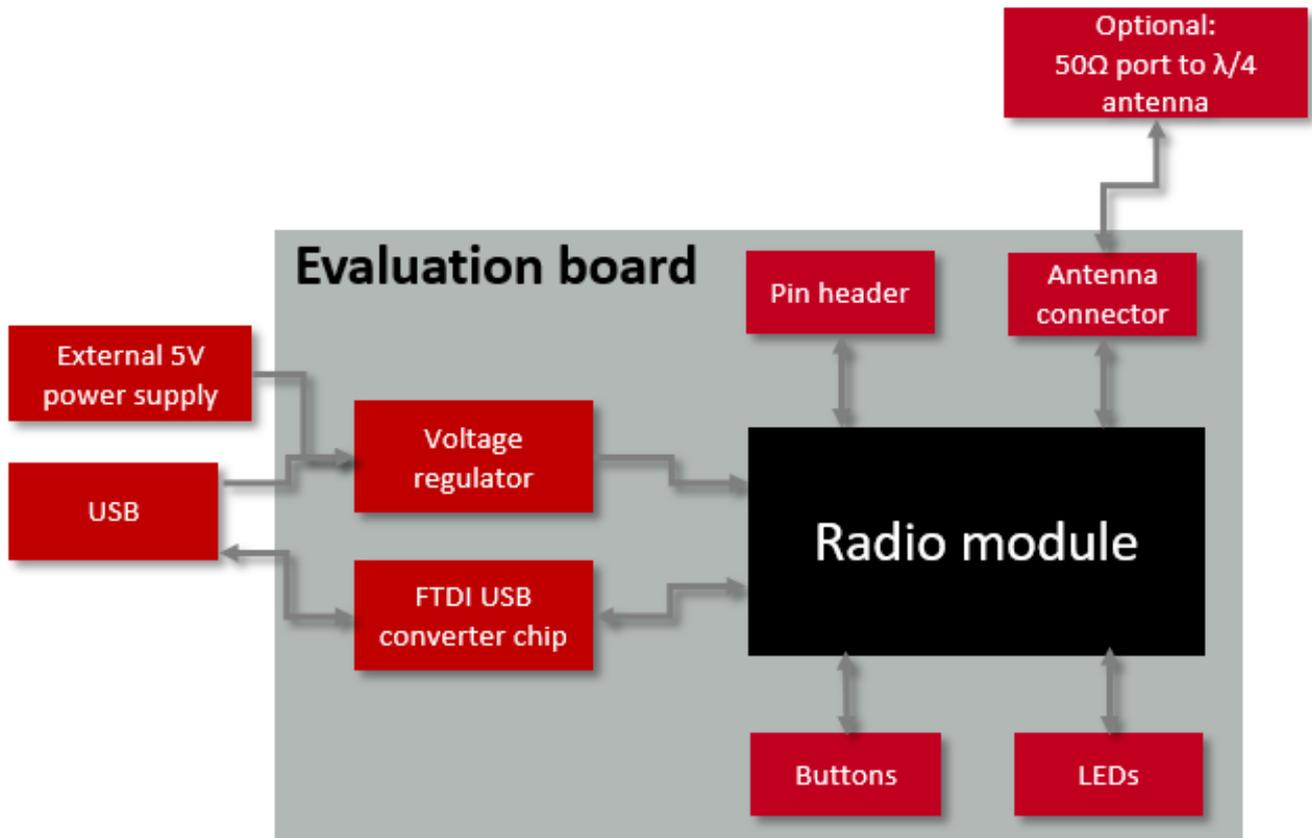


Figure 2: Block diagram

3.2 Jumpers

The following figure shows the default positioning (marked in red) of all jumpers on the EV board.

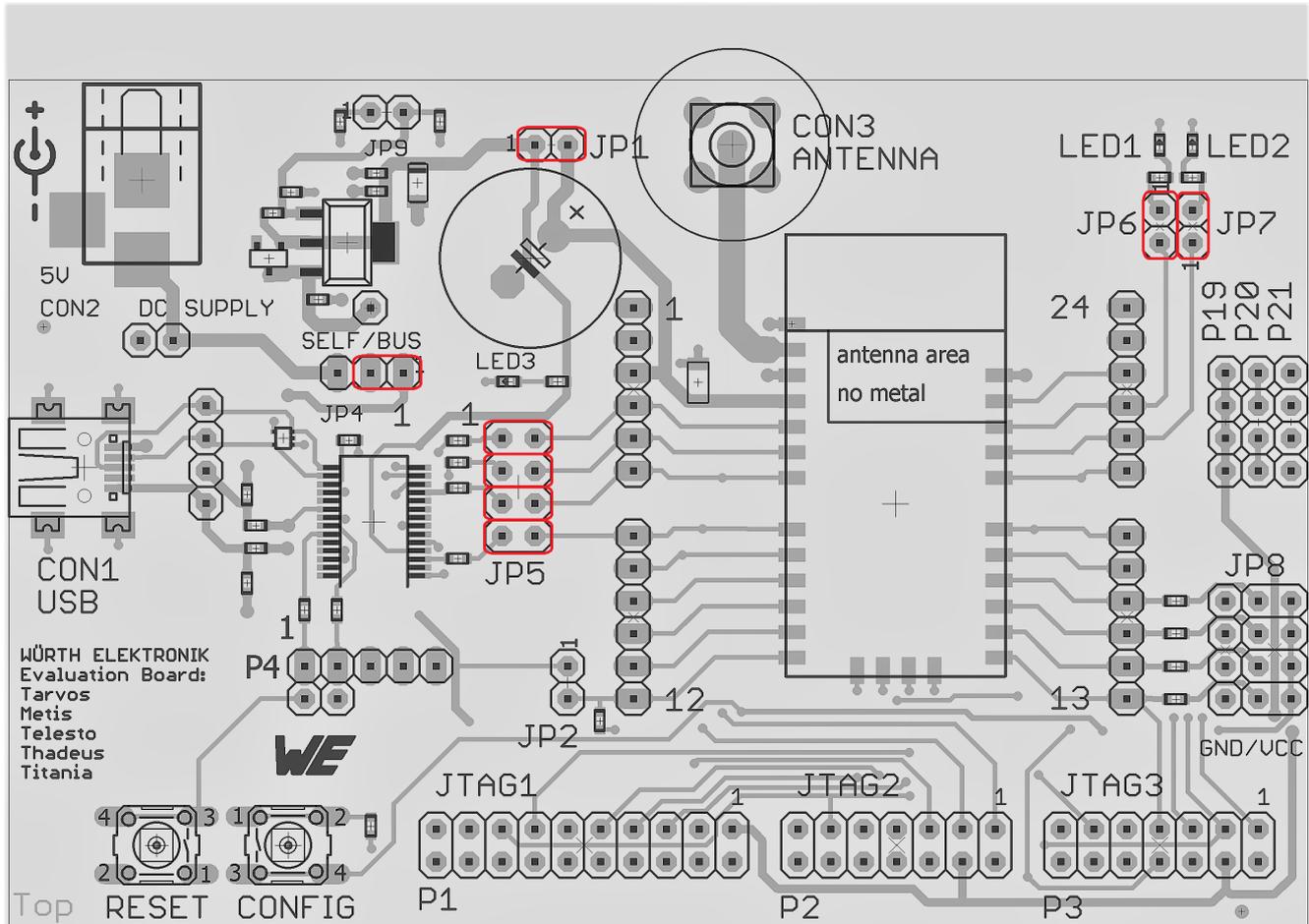


Figure 3: Jumpers in default position

JP1	Jumper placed (default)	Description
1,2	Set 1-2	Connection of the power supply (current measurement)

JP2	Jumper placed (default)	Description
1,2	Not set	Connects module pin to VCC level. Only to be used in case of a module of the Tarvos-III, Telesto-III and Thebe-II family: Set jumper and press reset to start the boot loader.

JP4	Jumper placed (default)	Description
1,2,3	Set 1-2	Selection of the power supply, set left for external power supply, otherwise USB powered. 500mW high power modules shall only use ext. power supply as the USB is not guaranteed to deliver the required current.

JP5	Jumper placed (default)	Description
1,2	Set 1-2	Connects module pin UTXD to USB converter
3,4	Set 3-4	Connects module pin URXD to USB converter
5,6	Set 5-6	Connects module pin RTS to USB converter
7,8	Set 7-8	Connects module pin CTS to USB converter

JP6	Jumper placed (default)	Description
1,2	Set 1-2	Connection of the red status LED (TX_LED)

JP7	Jumper placed (default)	Description
1,2	Set 1-2	Connection of the green status LED (RX_LED)

JP8	Jumper placed (default)	Description
-	Not set	Pulling module pins to high or low level

JP9	Jumper placed (default)	Description
1, 2	Not set	Set jumper to reduce supply voltage to 2.2V instead of 3.3 V. You shall take the module specific electrical characteristics into account when changing VCC to 2.2V.

3.3 Connectors and pin headers

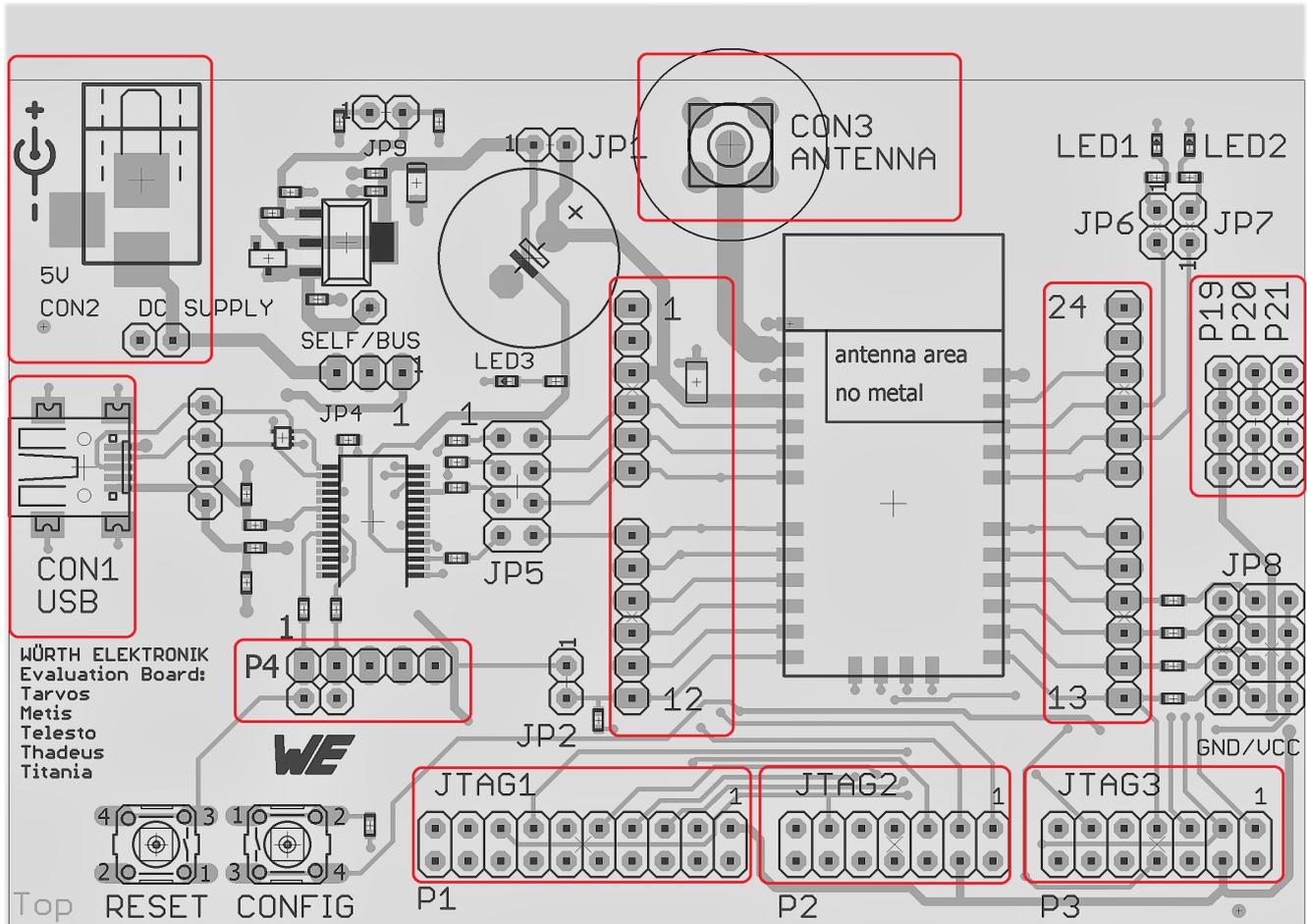


Figure 4: Connectors



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

-	Description
1-24	Direct access to the signals of the radio module

CON1	Description
-	Mini USB jack for USB interface

CON2	Description
-	Power jack, External 5 V power supply

CON3	Description
-	SMA Antenna connector for modules variants wit RF pad (i.e. without integrated antenna)

P1	Function	Description
1-20	JTAG	2×10 pin JTAG interface access for ARM Cortex M

P2	Function	Description
1-20	JTAG	2×7 pin JTAG interface access for modules with MSP430x5xx

P3	Function	Description
1-20	JTAG	2×7 pin JTAG interface access for modules with MSP430x2xx

P4	Function	Description
1,2,3,4,5	FTDI CBUSx	Access to FTDI CBUSx lines

P19	Description
1,2,3,4	Access to VCC

P20	Description
1-2	Prototyping area, internally connected
3-4	Prototyping area, internally connected

P21	Description
1,2,3,4	Access to GND

3.4 Buttons

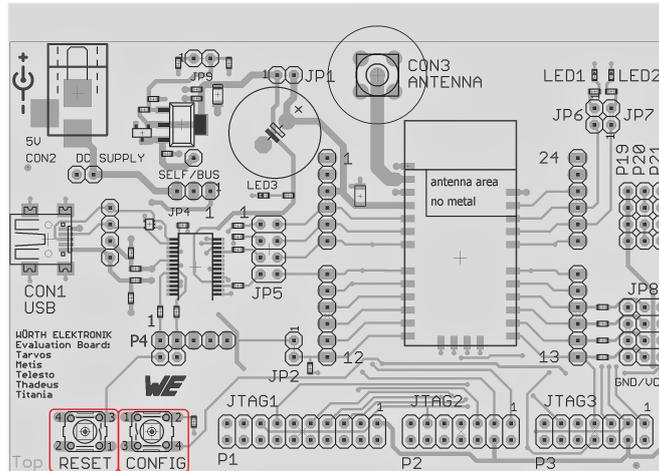


Figure 5: Buttons in layout

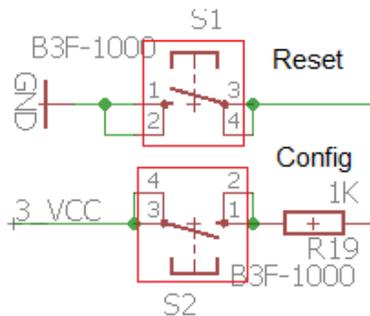


Figure 6: Buttons in circuit

3.4.1 Reset button

Every module provides a */RESET pin* that is connected to this RESET 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.

3.4.2 Config button

Some proprietary wireless connectivity modules use the CONFIG button connected to their */CONFIG pin* to toggle the OpMode 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

JP4 is to be set to 2-3 position.

The development board can be powered via USB. The integrated voltage regulator regulates the connected USB voltage 5 V down to 3V and supplies the remaining parts of the circuit. If the evaluation board is power sourced the power *LED1* lights up.

3.5.1.2 Self powered, power supply through power jack

JP4 is to be set to 1-2 position.

The USB for communication must be connected only after the Power jack was connected and VCC is stable.

The development board can be powered via 5 V Power Jack. The integrated voltage regulator regulates the connected voltage 5 V down to 3V and supplies the remaining parts of the circuit. If the evaluation board is power sourced the power *LED1* lights up.



For 500mW modules such as Thebe-II we highly recommend to use the power jack for power supply to avoid damage of the USB interface when pulling high transmission currents.

3.5.2 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 any supply voltage. However, the 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.

Parts connected to the module, such as LEDs, can be separated from the module via JP6 and JP7.



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

The UART of the module can be connected to the USB converter by setting the bridge JP5. 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 FTDI converter IC has the VCCIO line connected to the Module VCC line to match the logic-levels of both components.

 The USB cable length must not exceed 3 meters.

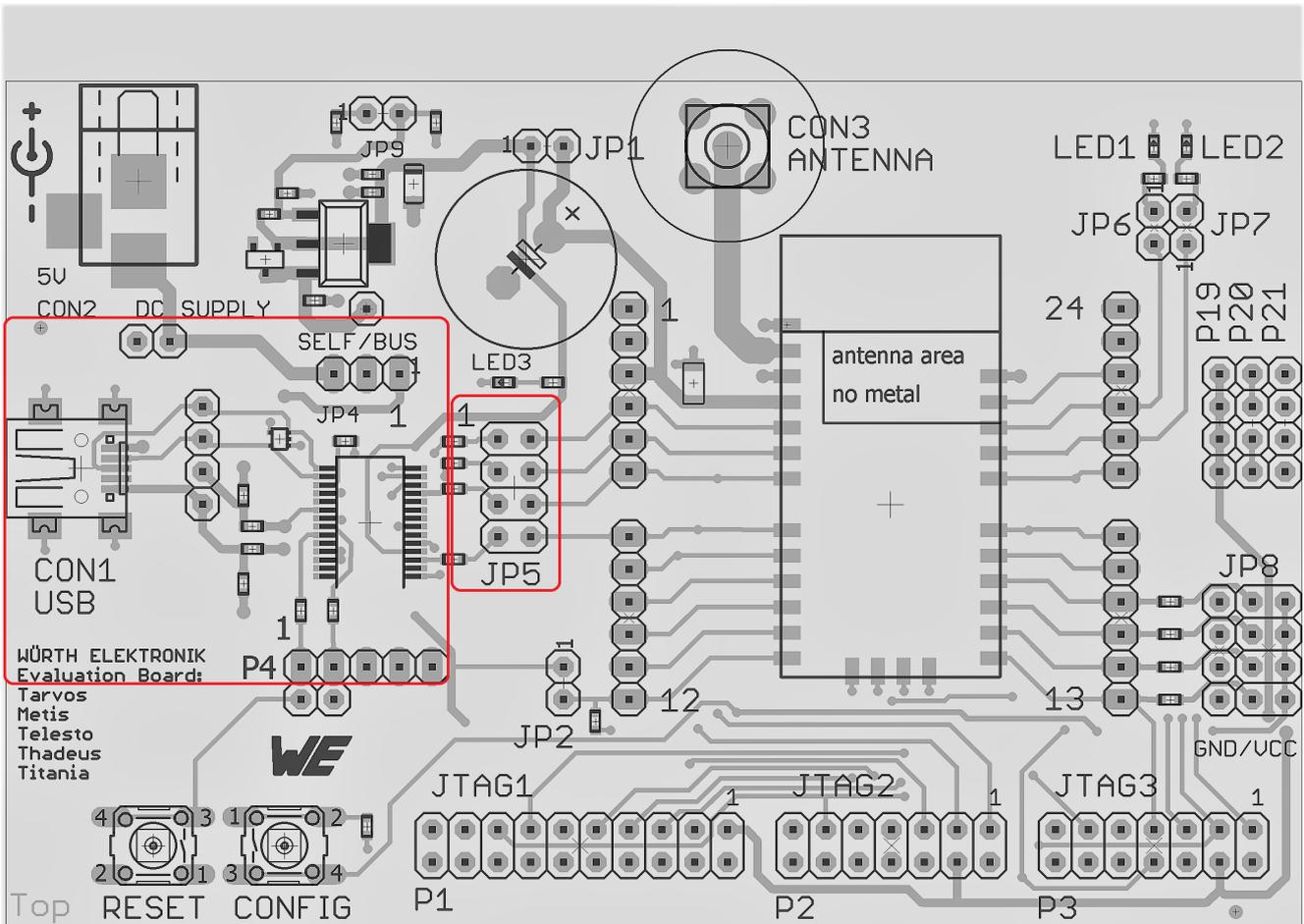


Figure 7: USB interface in layout

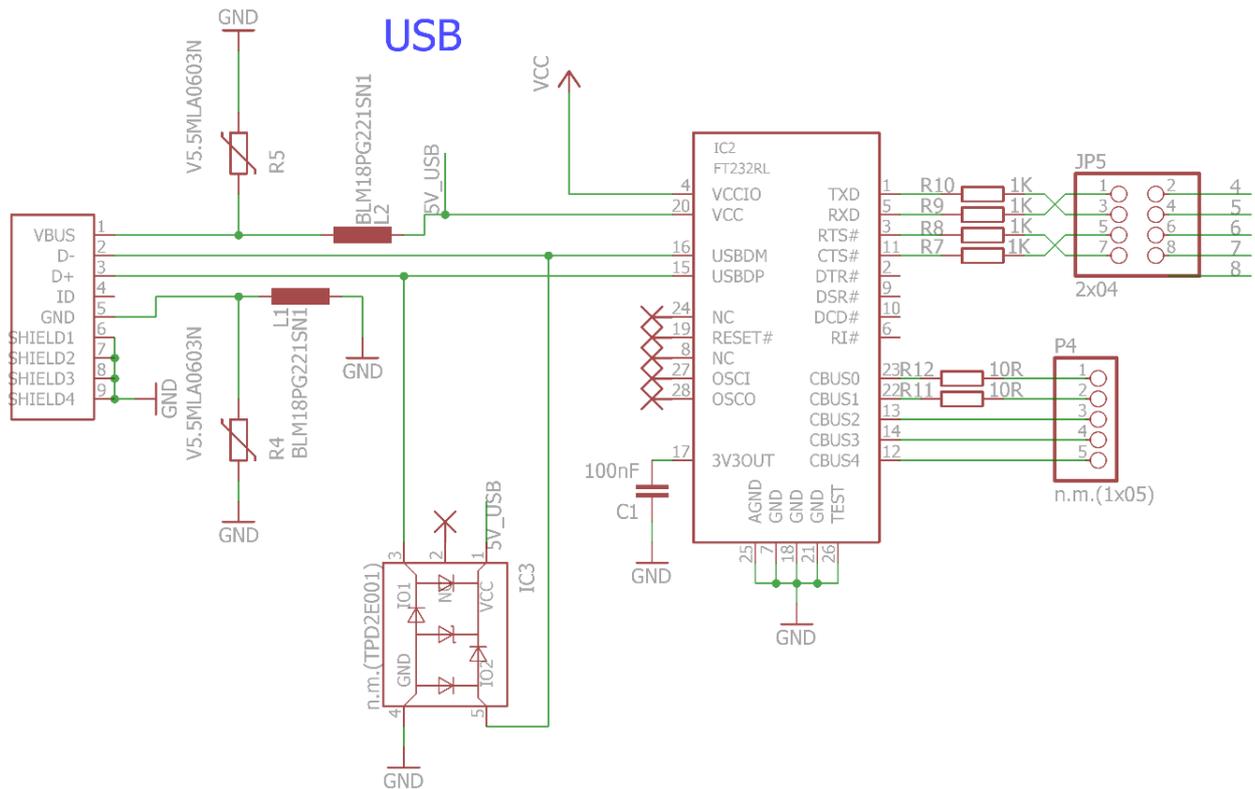


Figure 8: USB interface in circuit

3.5.4 UART direct

If a microcontroller is to be connected to the module, remove the bridges on JP5. The UART can be connected directly on the pin strip JP5 (all even 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 Programming interface



Please choose the correct programmer connection pin header for the type of module mounted on the EV board.

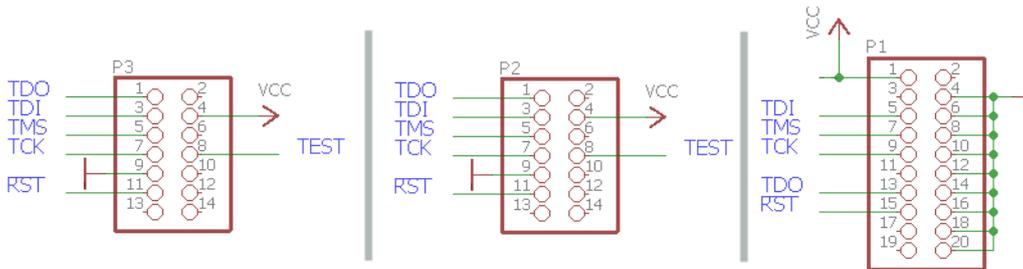


Figure 9: P1, P2 and P3 JTAG connectors

3.5.5.1 P1 ARM JTAG 2*10

The evaluation board provides a 2×10 pin connector in RM2.54 to connect directly to a JTAG 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 JTAG support.

3.5.5.2 P2 MSP430 JTAG connector 2*7

The evaluation board provides a 2*7 pin connector in RM2.54 to connect directly to a JTAG flash adapter used for development. Please take care of the correct mounting of the flash adapter (pin 1 is marked as such). Depending on your flasher an additional adapter may be required.

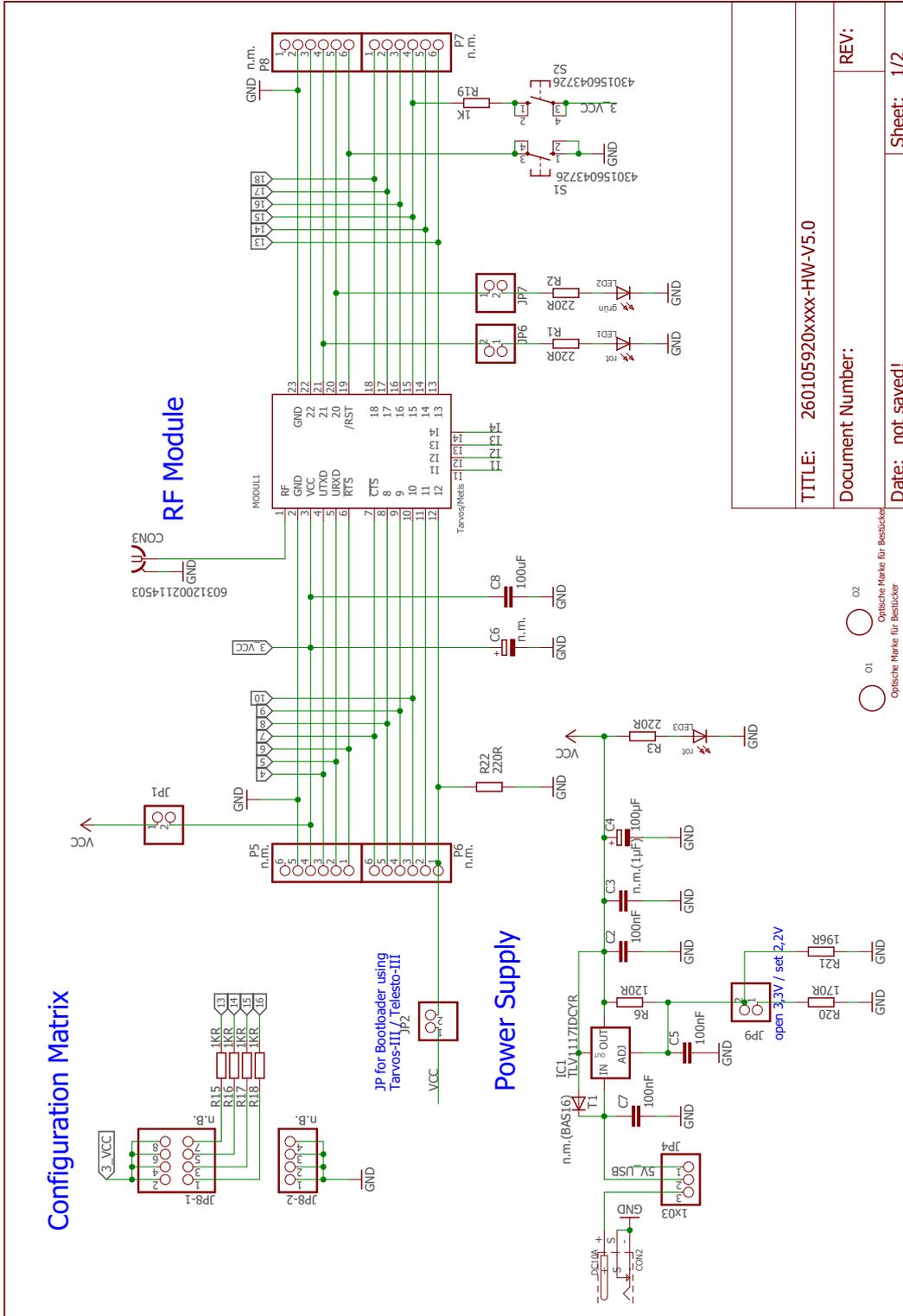
The recommended flash adapters are the "Elprotronic FlashPro-430" and "Ti MSP-FET" family.

3.5.5.3 P3 MSP430 JTAG connector 2*7

The evaluation board provides a 2*7 pin connector in RM2.54 to connect directly to a JTAG flash adapter used for development. Please take care of the correct mounting of the flash adapter (pin 1 is marked as such). Depending on your flasher an additional adapter may be required.

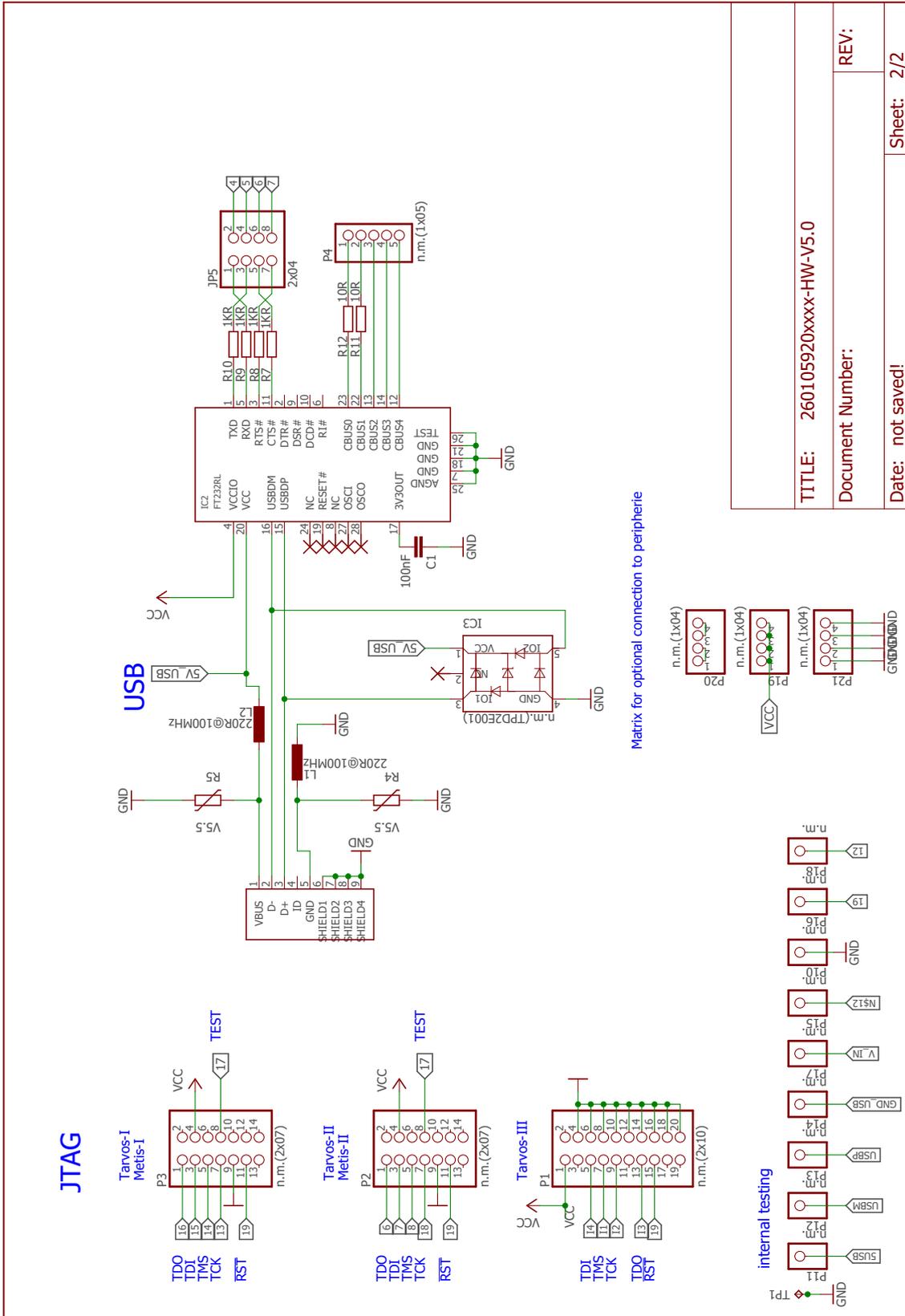
The recommended flash adapters are the "Elprotronic FlashPro-430" and "Ti MSP-FET" family.

3.6 Schematic



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 Optische Marke für Bestückter Optische Marke für Bestückter



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3.7 Full layout

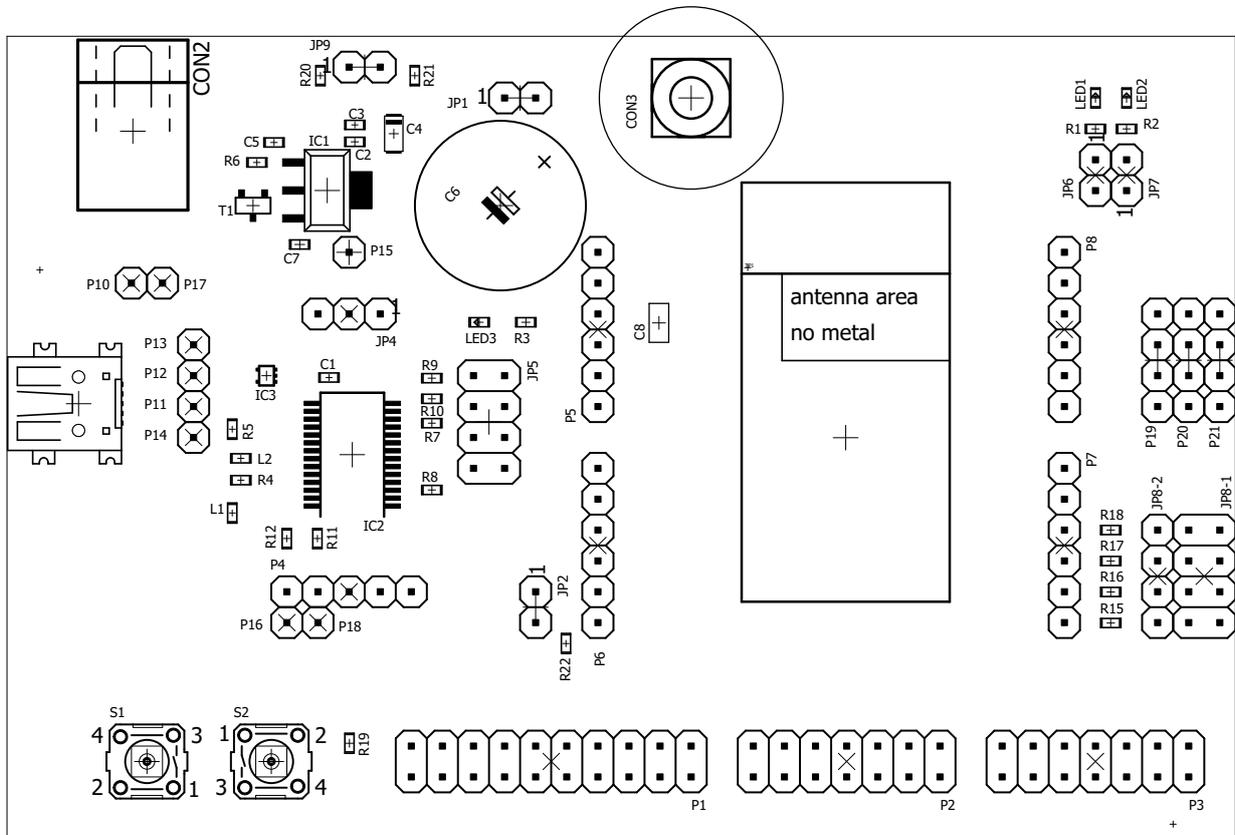


Figure 10: Assembly diagram

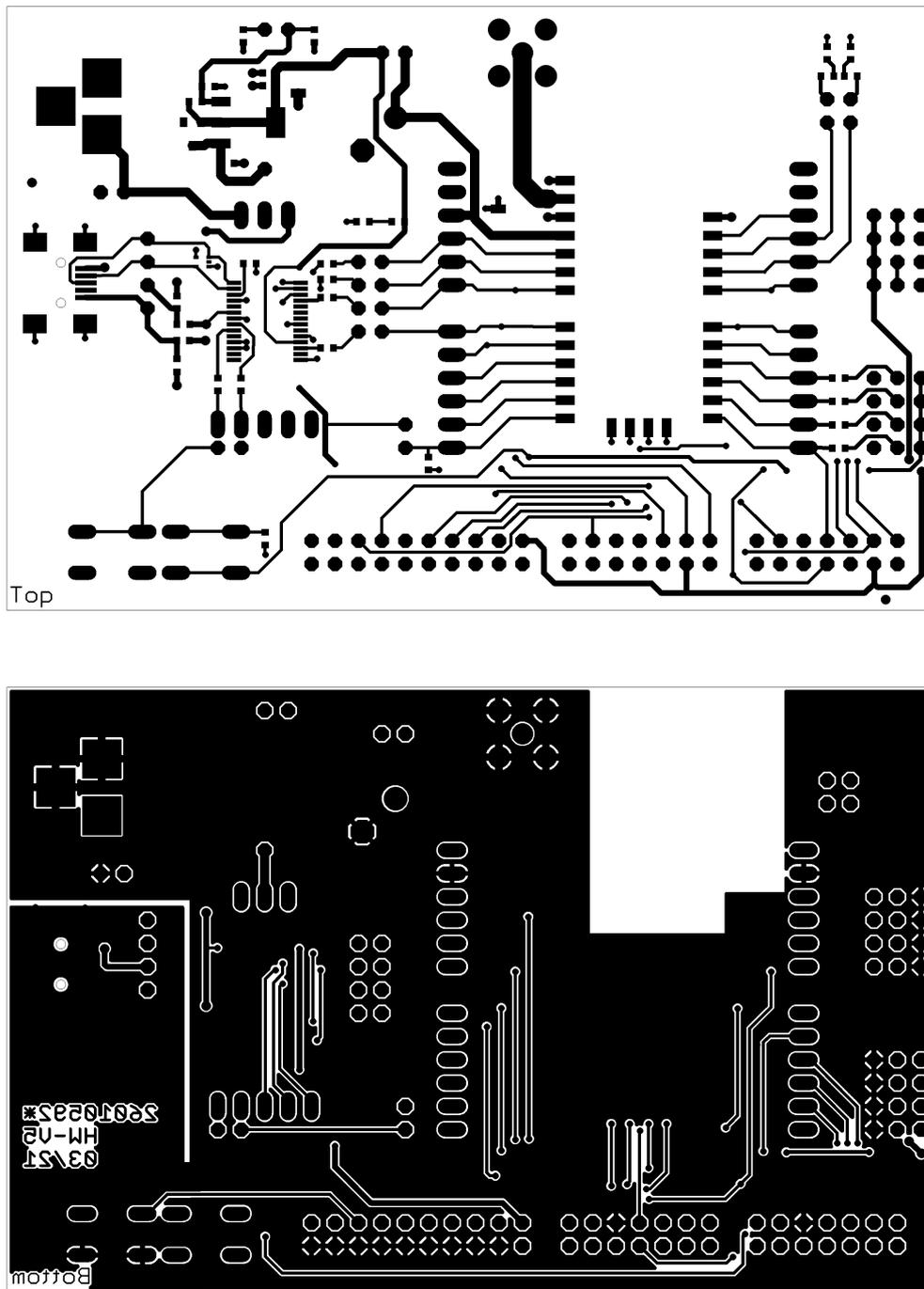


Figure 11: Top and Bottom Layer

3.8 Bill of materials

Qty	Parts	Value	PACK	NR	MANUFACTURER
4	C1, C2, C5, C7	100nF	0603	885012206095	Würth Elektronik
1	C8	100uF	1206	885012108005	Würth Elektronik
1	C4	100µF	A	TLJA107M006R0500	AVX
2	R11, R12	10R	0603		
1	R6	120R	0603		
1	R20	170R	0603		
1	R21	196R	0603		
1	R19	1K	0603		
8	R7, R8, R9, R10, R15, R16, R17, R18	1KR	0603		
1	JP7	1X2		61300211121	Würth Elektronik
1	JP6	1X2		61300211121	Würth Elektronik
1	JP4	1x03		61300311121	Würth Elektronik
1	JP9	1x2		61300211121	Würth Elektronik
2	JP1, JP2	1x2		61300211121	Würth Elektronik
4	R1, R2, R3, R22	220R	0603		
2	L1, L2	220R@100MHz		742863122	Würth Elektronik
1	JP5	2x04		61300821121	Würth Elektronik
2	S1, S2	4.30156E+11		430156043726	Würth Elektronik
1	CON3	6.0312E+13		60312002114503	Würth Elektronik
1	CON2	DC10A		NEB 21 R	Lumberg
1	IC2	FT232RL	SSOP28	FT232RL-REEL	FDTI
1	IC1	TLV1117IDCYR	SOT223-4	TLV1117IDCYR	Texas Instruments
1	TP1	TP10SQ20			
1	MODUL1	Tarvos/Thebe/ Telesto...		* Variants	Würth Elektronik
1	CON1	USB-MINI 2486	SMD	65100516121	Würth Elektronik
2	R4, R5	V5.5		82536040	Würth Elektronik
1	LED2	grün	0603	150060VS75000	Würth Elektronik
1	JP8-2	n.B.		not mounted	
1	JP8-1	n.B.		not mounted	
1	C6	n.m.		not mounted	
9	P10, P11, P12, P13, P14, P15, P16, P17, P18	n.m.		not mounted	
4	P5, P6, P7, P8	n.m.		not mounted	
3	P19, P20, P21	n.m.(1x04)		not mounted	
1	P4	n.m.(1x05)		not mounted	
1	C3	n.m.(1µF)		not mounted	
2	P2, P3	n.m.(2x07)		not mounted	
1	P1	n.m.(2x10)		not mounted	
1	T1	n.m.(BAS16)		not mounted	
1	IC3	n.m.(TPD2E001)		not mounted	
2	LED1, LED3	rot	0603	150060SS75000	Würth Elektronik

3.9 Internal antenna radiation characteristics of Tarvos-III (2609011081000) and Telesto-III (2609011091000)

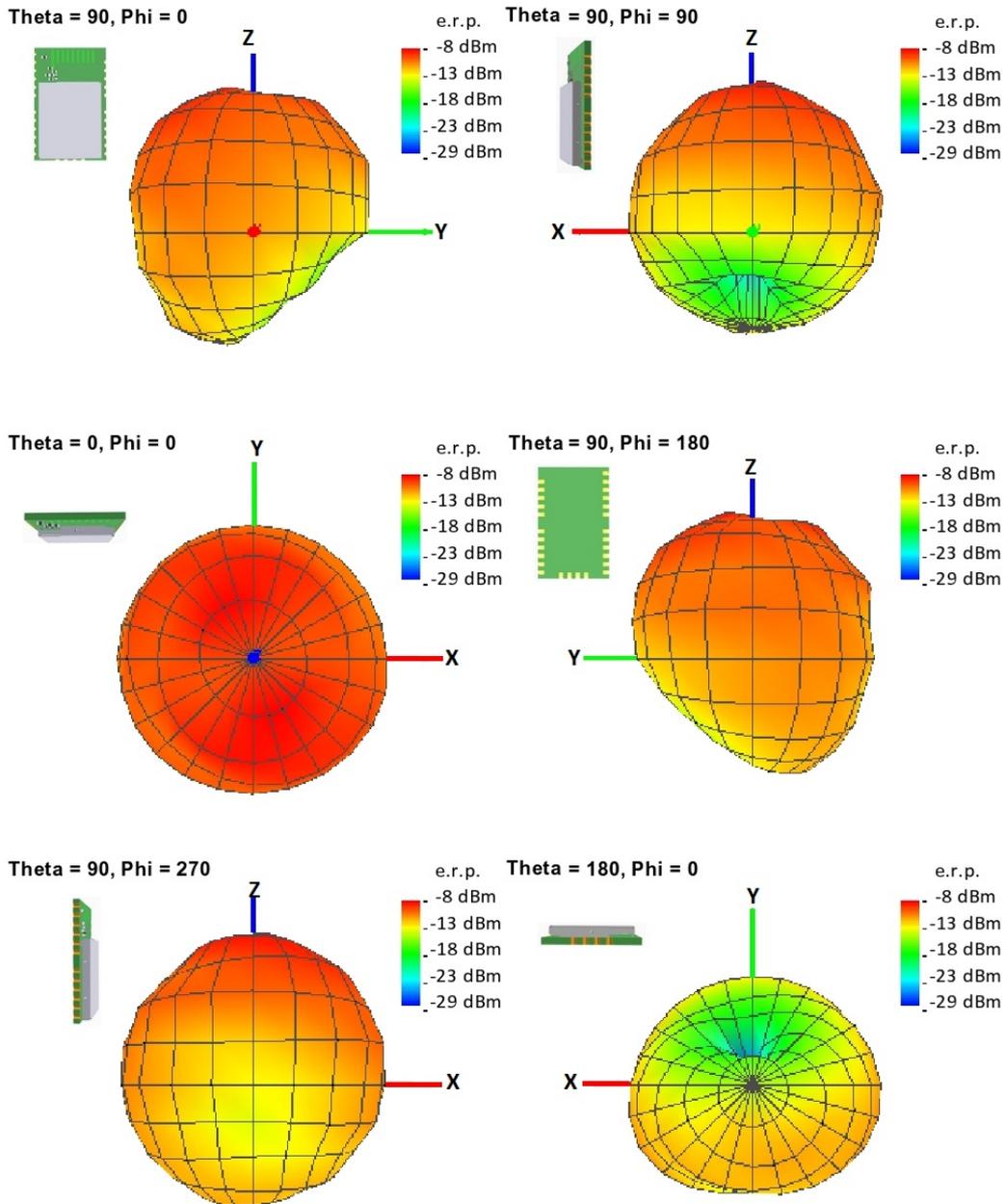


Figure 12: Antenna characteristic from integrated antenna measured on official evaluation board¹

¹Radiation characteristic shown is valid for the module on the evaluation board. It is important to be aware that size of groundplane and placement of module has influence on the radiation pattern.

4 Regulatory compliance information

4.1 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 evaluation kits designed for professionals to be used solely at research and development facilities for such purposes.

4.2 FCC

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

4.3 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.

5 Important notes

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

5.1 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.

5.2 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 sourcecode 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.

5.3 Best care and attention

Any product-specific data sheets, manuals, application notes, PCN's, warnings and cautions must be strictly observed in the most recent versions and matching to the products firmware revisions. This documents can be downloaded from the product specific sections on the wireless connectivity homepage.

5.4 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 field sales engineer or the internal sales person in charge should be contacted who will be happy to support in this matter.

5.5 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 field sales engineer, the internal sales person or the technical support team in charge should be contacted. The basic responsibility of the customer as per section 5.1 and 5.2 remains unaffected. All wireless connectivity module driver software "wireless connectivity SDK" and its source codes as well as all PC software tools are not subject to the Product Change Notification information process.

5.6 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 field sales engineer 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.

5.7 Property rights

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.

5.8 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.

6 Legal notice

6.1 Exclusion of liability

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