



USER MANUAL

MINI EV-BOARD THETIS-I

2611109021011

VERSION 1.2

OCTOBER 22, 2024

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	1.0	<ul style="list-style-type: none">• Initial version	March 2021
1.1	1.1	<ul style="list-style-type: none">• Updated the values C2 and C12 values in the Hardware version 1.1• Updated Schematic.• New corporate design.	May 2023
1.2	1.1	<ul style="list-style-type: none">• Updated document style	October 2024

Abbreviations

Abbreviation	Name	Description
API	Application Programming Interface	
ASCII	American Standard Code For Information Interchange	
BDM	Business Development Engineer	Support and sales contact person responsible for limited sales area
COG	Chip on Glass	
COM Port	Communication Port	
CSAP	Configuration Service Access Point	UART control command for module configuration
DSAP	Data Service Access Point	UART control command for radio data transmission and reception
EV	Evaluation	
ESD	Electro Static Discharge	
FCC	Federal Communications Commission	
FTDI	Future Technology Devices International	USB-to-Serial converter chip
GND	Ground	Ground signal level that corresponds to 0 V
HIGH	High signal level	
IO	Input & Output	
JTAG	Joint Test Action Group	
LDO	Low Dropout	
LED	Light Emitting Diode	
LFCLK	Low frequency clock	
LFXO	Low frequency crystal oscillator	
LOW	Low signal level	
MCU	Micro Controller Unit	
MSAP	Management Service Access Point	UART control command for module management
NPO	Negative-Positive 0	
OTA	Over the air	
PC	Personal Computer	
PCB	Printed Circuit Board	
RF	Radio frequency	Describes everything relating to the wireless transmission.

RSVD	Reserved	
SMA	SubMiniature version A	
SMD	Surface-Mount Device	
SWD	Serial Wire Debug	
THT	Through-hole technology	
TTL	Transistor-Transistor Logic	
UART	Universal Asynchronous Receiver Transmitter	Universal Asynchronous Receiver Transmitter allows communicating with the module of a specific interface.
USB	Universal Serial Bus	
VDD	Voltage Drain Drain	Supply voltage
WE	Würth Elektronik	

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1 Supported radio modules

The EV-Board described in this manual is exclusively for the Thetis-I module:

Order code	Product Name	Description
2611011021010	Thetis-I	Wirepas Mesh 2.4 GHz radio module with smart antenna configuration

Order code	Product Name
2611109021011	Mini EV-Board Thetis-I

Table 1: Compatibility

Content 2611109021011	Quantity
Thetis-I mini EV-Board	1
Packaging: ESD safe cover	1

Table 2: Content Thetis-I Wirepas Mini EV-Board

2 Functional description

Mini EV-Board Thetis-I is an application-oriented development board meant to support the rapid prototyping of a Wirepas mesh network. It offers the user the possibility to develop hardware and software for the Thetis-I radio module.

By default, the basic pin headers and connectors are assembled in the mini EV-Board. The additional components shall be assembled by the user according to requirements and application.

The additional assembly is intended for experienced developers, as additional accessories and basic soldering skills are necessary to take the board into operation.

Accessories required:

- Additional assembly components listed in the table 4.
- Soldering equipment
- (Optional) TTL-232R-3V3 FTDI cable

For the connection to a micro controller or PC the EV-Board is equipped with P3 Pin header which is connected to the pins of the radio module. The additional pin headers can be soldered to the placeholders to access the module pins. Jumpers allow the power selection and current measurement of the module.

The mini EV-Board can be connected to an USB port of a PC using TTL-232R-3V3 FTDI cable.

2.1 Taking into operation - PC

To take the mini EV-Board into operation using a PC, pin header P3 shall be used. The corresponding FTDI driver package (www.ftdichip.com/Drivers/VCP.htm) has to be installed on the PC. The installation guidelines shall be followed: (<https://www.ftdichip.com/Support/Documents/InstallGuides.htm>)

To take the mini EV-Board into operation, please perform the following steps:

1. Connect the EV-Board to the PC
 - a) Connect the TTL-232R-3V3 FTDI cable to the connector P3 of the EV-Board.



Incorrect orientation of TTL-232R-3V3 FTDI cable will damage the radio module.

- b) Then connect TTL-232R-3V3 FTDI cable to the USB port of the PC. In that way a COM port can be detected and installed on the PC. In the device manager the COM port name of the TTL-232R-3V3 FTDI cable can be found. A COM port shall appear for example: "COM12" in Windows systems or "/dev/ttyUSB0" in Linux systems.

2. Configure the mini EV-Board as sink

- a) Open the Wirepas Commander PC tool, available for free download at this page: <https://we-online.de/wcs-software>
- b) Select the right COM port of the Thetis-I EV-Board and press the "Open/Close COM port" button.

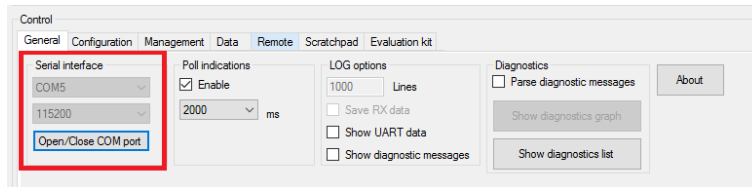


Figure 1: Open COM port

- c) Configure the connected Thetis-I EV-Board as sink of the network: go to the "Configuration" tab and set
 - the node address to a unique address.
 - the address of the network to 7.
 - the channel of the network to 39.
 - the node role to "SINK".

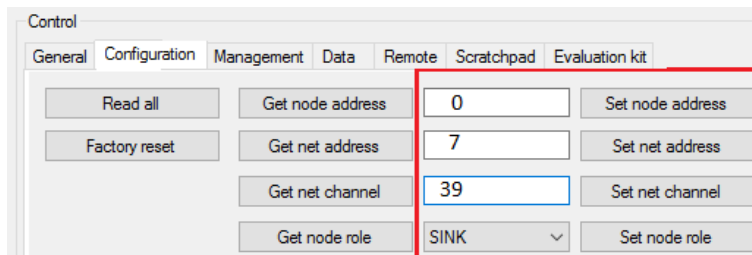


Figure 2: Configure the sink

- d) Start the radio stack on the "Management" tab.

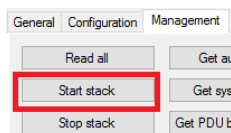


Figure 3: Start the sink

3. To make other mini EV-Board units join this Wirepas network, connect them to the PC in the same way.
4. Configure these mini EV-Boards as routing nodes taking part in the Wirepas network consisting of the previously configured sink device.
 - a) Open further instances of the Wirepas Commander.

- b) Select the right COM port of the Thetis-I EV-Board and press the "Open/Close COM port" button (see figure 1).
- c) Configure the connected Thetis-I mini EV-Boards: go to the "Configuration" tab and set
 - the node address to a unique address (for the sink we used 0 in the example, thus do not use 0 here for the routing node).
 - the address of the network to 7.
 - the channel of the network to 39.
 - the node role to "ROUTER_NODE".
- d) Start the radio stack on the "Management" tab (see figure 3).
- e) To transmit data from the Wirepas mini EV-Board to the sink enter the data you want to transmit in the fields of the "Data" tab. As destination node address type "sink".

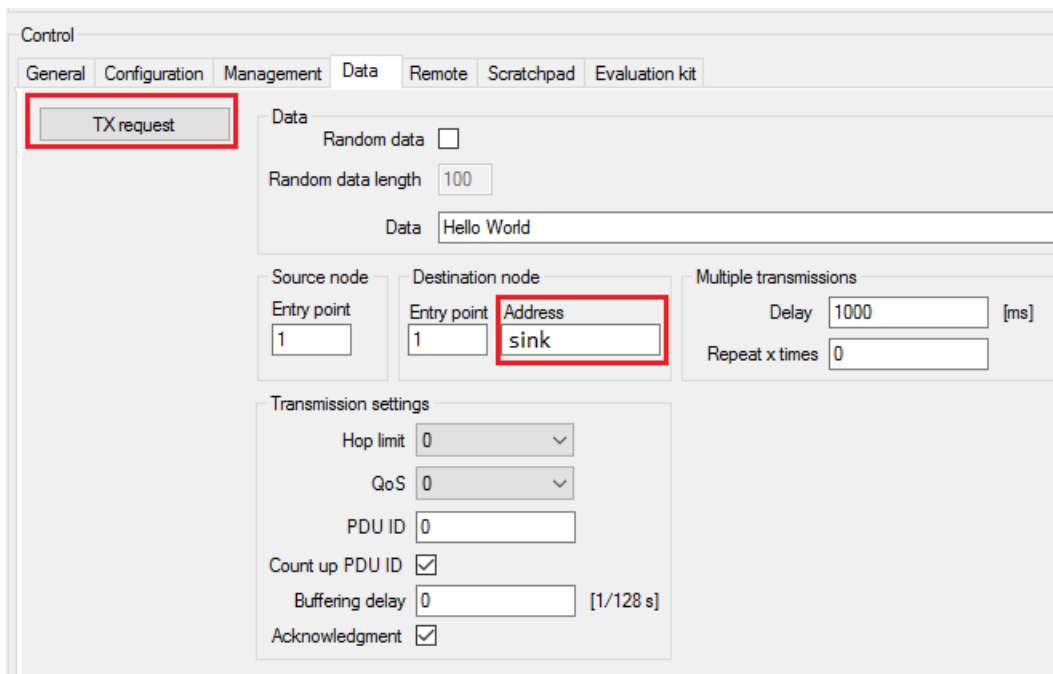


Figure 4: Transmit data to the sink

All details about the UART interface can be found in the Wirepas dual MCU manual [1] and the Mini EV-Board Thetis-I manual.

2.2 Taking into operation - Host controller

To take the mini EV-Board into operation using a host controller, pin header P3 shall be used. An external power supply shall be connected to the EV-Board. The power supply option 2 or 3 from the table 15 shall be used. It is important that 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 communication lines of the module to the host controller. The headers P1, P2 and P3 can be used to connect the module pins to the host.

All details about the UART interface can be found in the Wirepas dual MCU manual [1] and the Mini EV-Board Thetis-I manual. A free C implementation of the Wirepas Dual MCU API is available at: <https://github.com/wirepas/c-mesh-api>.

3 Development board - Thetis-I mini EV-Board

3.1 Block diagram

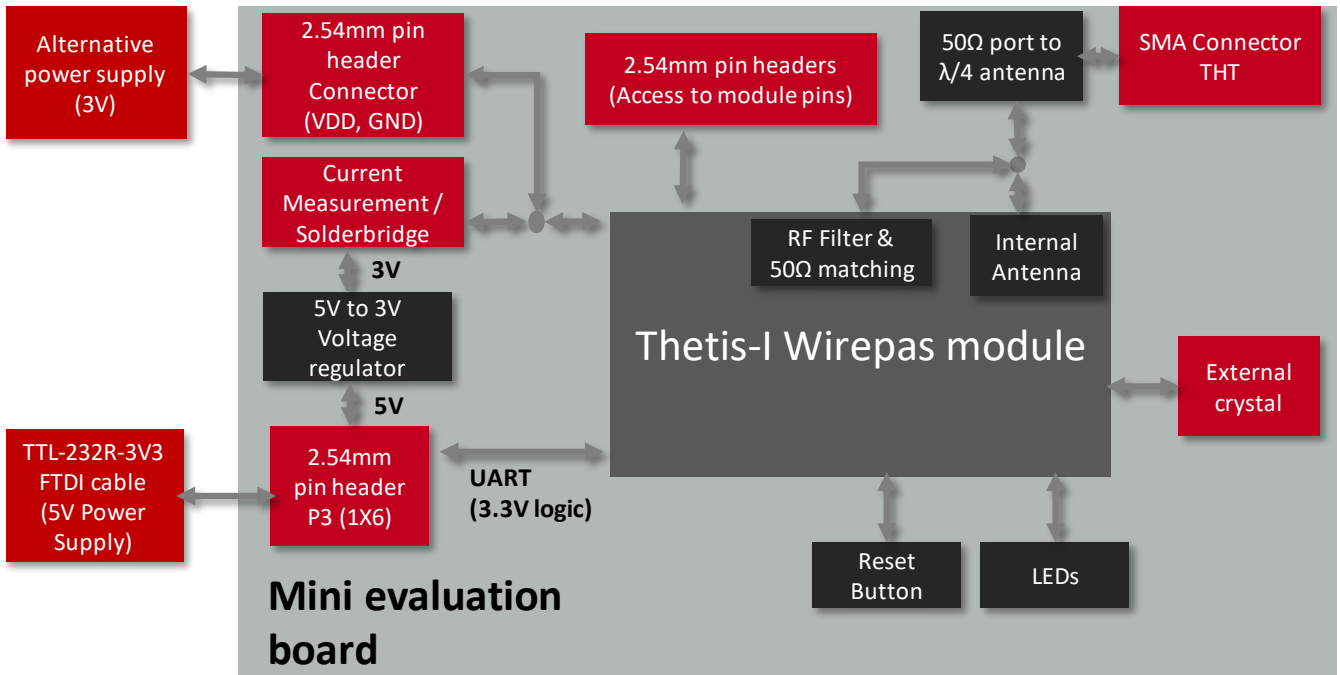


Figure 5: Block diagram

3.2 Connectors and pin headers

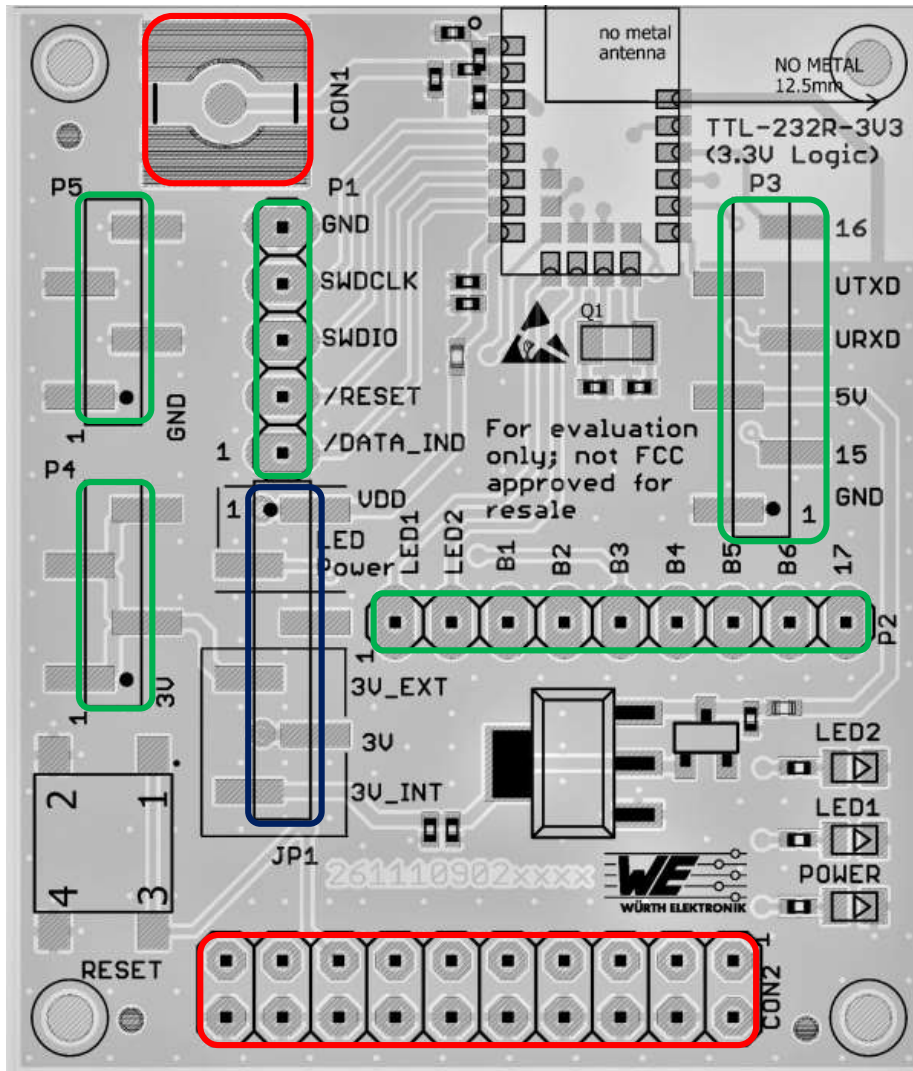


Figure 6: Connectors and pin headers

The table 3 lists the pin headers assembled on the EV-Board by default. All the components listed in the table 3 are SMD components.

Pin header	Function	Pins	WE article number
P3	TTL-232R-3V3 FTDI cable connection / Access to module pins	1X6	61000618321
P5	External power supply GND	1X4	61000418321
P4	External power supply 3V	1X4	61000418321
JP1	Power supply selection	1X6	61000618321

Table 3: Default assembled connectors

The table 4 lists the optional components for the EV-Board. Most of the components are common THT components that can be soldered on manually by the user.

Placeholder	Function	Pins	WE article number
P1	Module access pins	1X5	61300511121
P2	Module access pins	1X9	61300911121
CON1	SMA Connector	SMD	60312102114405
CON2	JTAG Connector	2X10	61302021121

Table 4: Additional assembly components



Based on the necessity the optional components shall be assembled.



Holes with 2mm diameter on all the four corners are available for spacer or standoff connections

3.2.1 P1, P2, P3: Module access pins

P1	nRF52840	Function
1	P0.02	/DATA_IND
2	P0.18	RESET
3	SWDIO	SWDIO
4	SWCLK	SWCLK
5		GND

Table 5: Pin header P1

P2	nRF52840	Function
1	P0.19	LED1
2	P0.22	LED2
3	P0.09	B1, RSVD
4	P0.10	B2, RSVD
5	P0.23	B3, RSVD
6	P1.00	B4, RSVD
7	P0.21	B5, RSVD
8	P0.07	B6, RSVD
9	P0.03	17, RSVD

Table 6: Pin header P2

3.2.2 P3: TTL-232R-3V3 FTDI cable connector

P3	nRF52840	Function
1		GND
2	P0.11	15, RSVD
3		5 V
4	P1.09	URXD
5	P1.08	UTXD
6	P0.12	16, RSVD

Table 7: Pin header P3



Pin header P3 is used to connect the TTL-232R-3V3 FTDI cable. P3 can also be used for direct host connection.

3.2.3 P4, P5: Alternative power supply connection

P4	Connection
1,2,3,4	3V External power supply

Table 8: Pin header P4

P5	Connection
1,2,3,4	GND

Table 9: Pin header P5

All the information related to the power supply are described in the chapter 3.5.1.

3.2.4 JTAG Debugging Interface

JTAG Pin	Function	JTAG Pin	Function
1	VDD	2	Not connected
3	Not connected	4	GND
5	Not connected	6	GND
7	SWDIO	8	GND
9	SWCLK	10	GND
11	Not connected	12	GND
13	Not connected	14	GND
15	RESET	16	GND
17	Not connected	18	GND
19	Not connected	20	GND

Table 10: JTAG debugging interface

3.2.5 SMA

In order to use an external antenna, the SMA connector and relevant capacitors shall be assembled. The 2.4 GHz antenna Himalia from Würth Elektronik eiSos (order code 2600130021) is a perfect match: https://www.we-online.com/katalog/en/WIRL_ACCE_2600130021



By default the internal PCB antenna of the module is used.

SMA	Connection
Inner	Module RF pin
Outer	GND

Table 11: Pin header SMA



In order to use an external SMA antenna, 22 pF capacitor (0402) on position C1 shall be assembled. C2, C8, C11 and C12 should be left unpopulated.



Optional: Experts have the possibility to use C11, C1 and C8 for additional filtering or fine tuning.

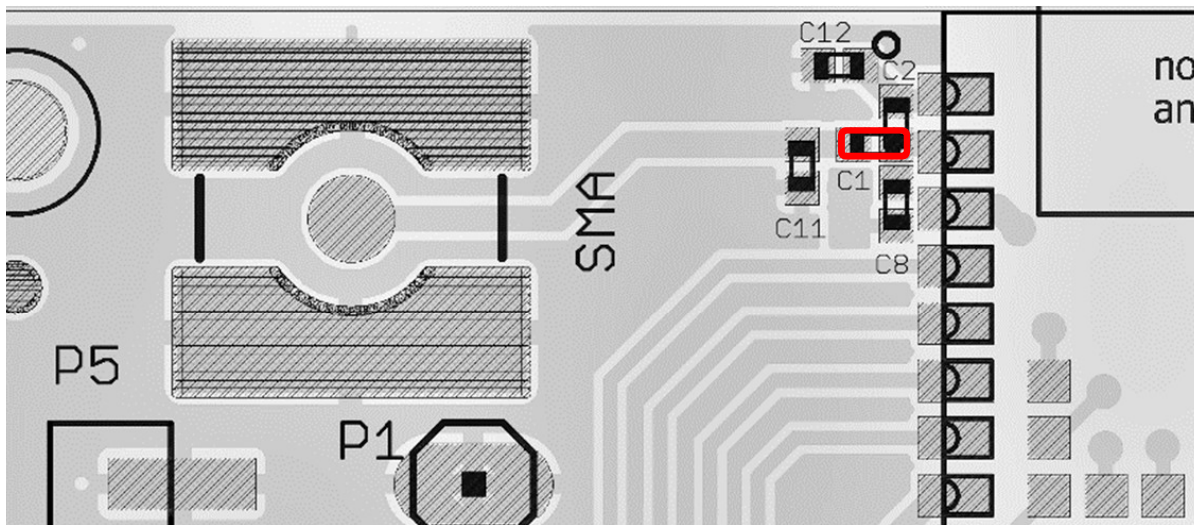


Figure 7: Capacitor connection to external antenna



In order to use the internal PCB antenna of the module, a 22 pF capacitor (0402) on position C2 shall be assembled. C1, C8, C11 and C12 should be left unpopulated.

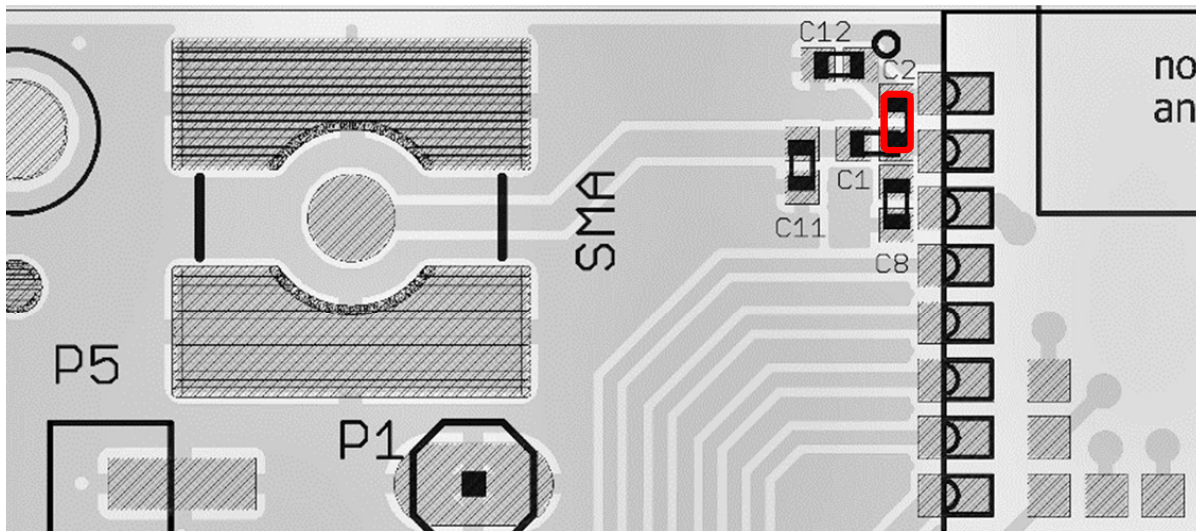


Figure 8: Capacitor connection to internal antenna



Optional: Experts have the possibility to use C2, C8 and C12 for additional filtering or fine tuning.

3.3 Jumpers

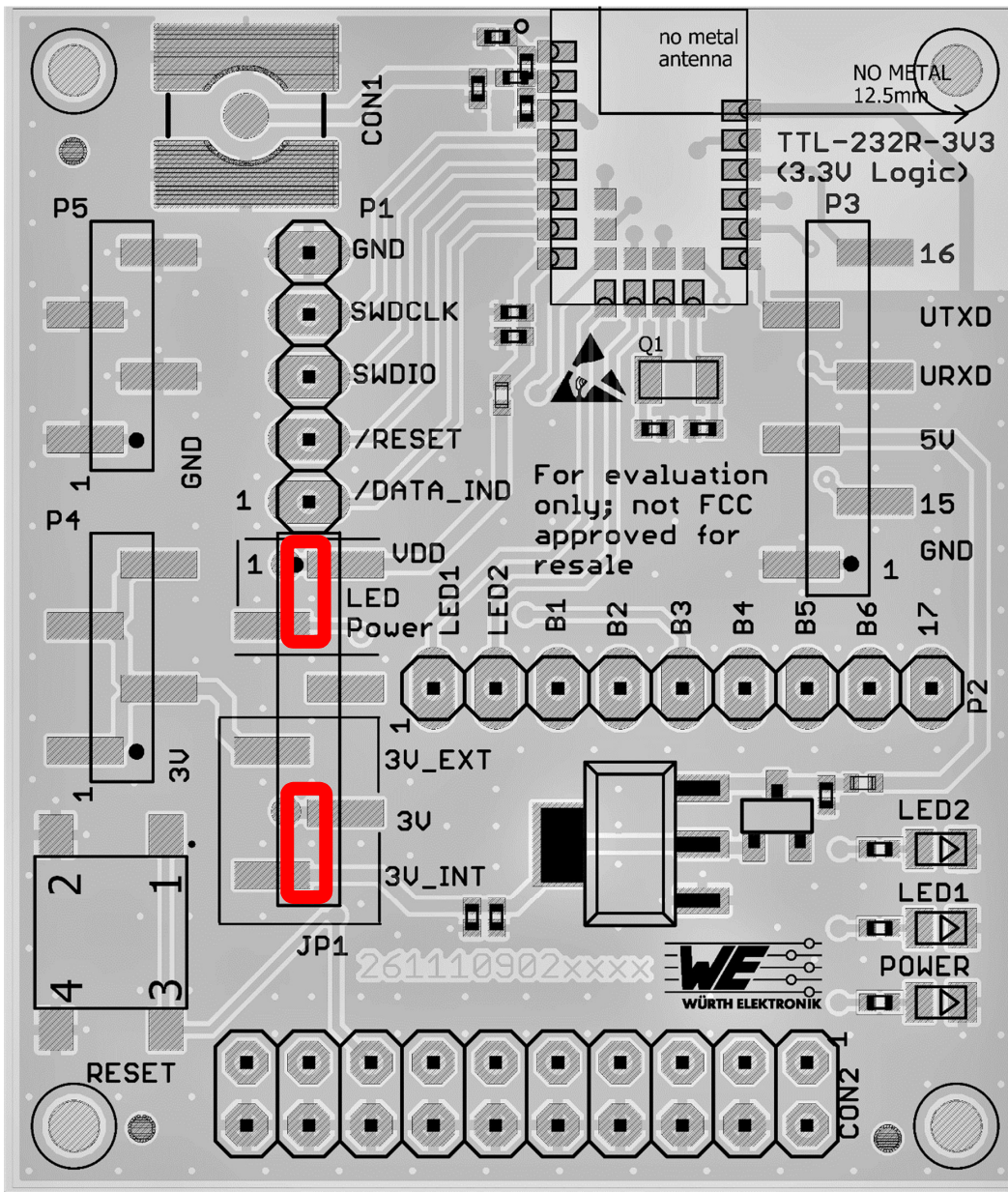


Figure 9: Jumpers

3.3.1 JP1

JP1 pin header is assembled by default.

JP1	Function
1	VDD
2	LED Power
3	Not connected
4	3V LDO Output
5	VDD
6	3V External Power supply

Table 12: Pin header JP1

3.3.1.1 JP1: Power LED separation

JP1	Function	Jumper set(default)
1<->2	Power LED sourced by VDD	Yes

Table 13: Pin header JP1 Power LED

3.3.1.2 JP1: Power supply selection

JP1 shall be set to choose either internal on-board LDO or the external 3V as power supply.



The power LED is connected to the VDD line by the 1-2 pins of JP1. To measure module current consumption, the jumper JP1 (1<->2 pins) shall be removed.

JP1	Function	Jumper set(default)
4<->5	External 3V power supply	No
5<->6	Internal LDO power supply	Yes

Table 14: Pin header JP1 Power supply selection



On JP1 a current meter shall be connected instead of a jumper to measure the current consumption of the module.

3.4 Reset button

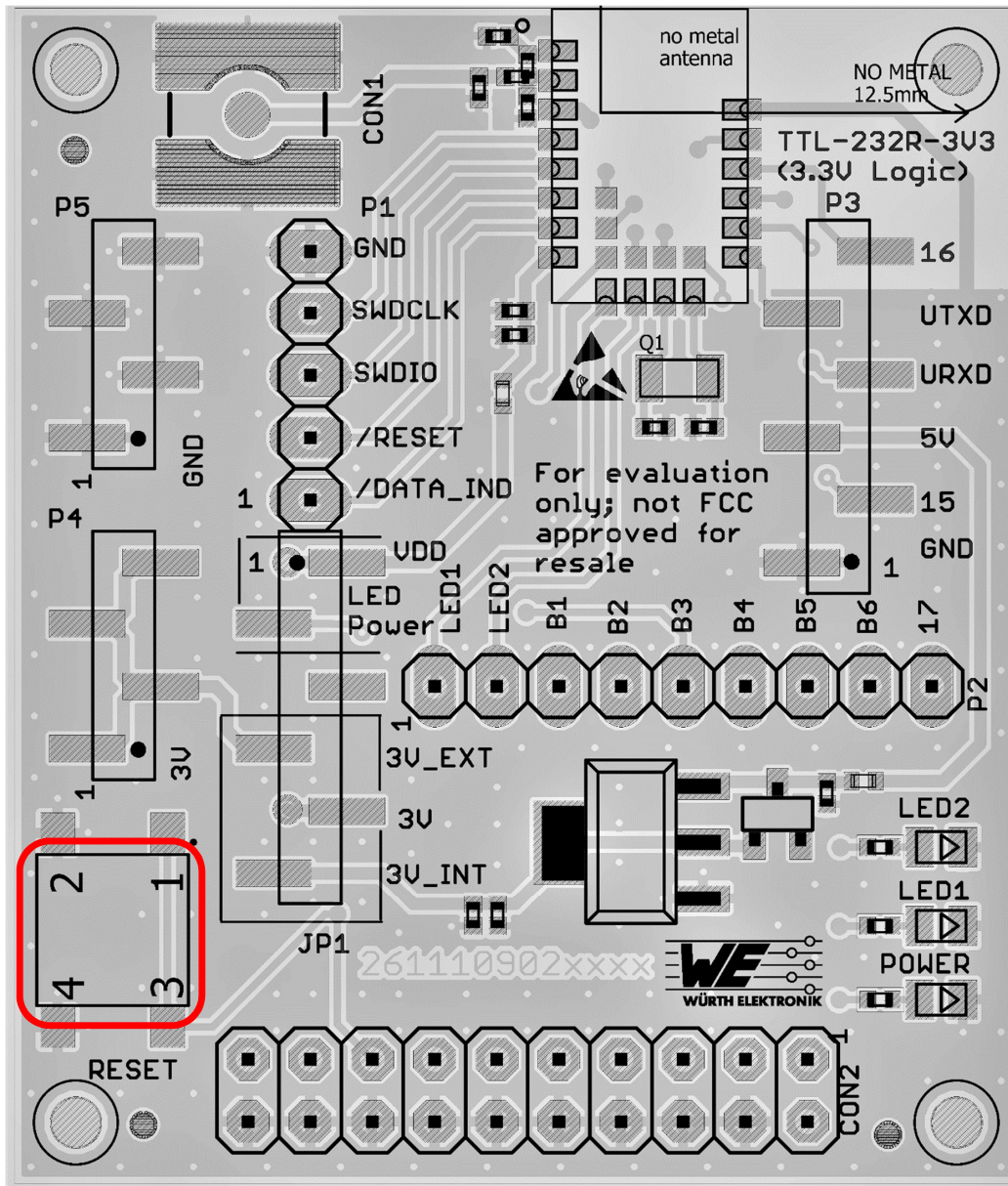


Figure 10: Buttons

On IC level the active low reset input is configured with a pull up resistor. The module provides a **/RESET** pin that is connected to this button so that the module can be restarted properly.

3.5 Function blocks

3.5.1 Power supply

The mini EV-Board can be powered either by TTL-232R-3V3 cable or by an external power supply. The table 15 lists the connection for different power supply options.

No	Power supply	Connector	JP1 Jumper
1	TTL-232R-3V3 cable	P3	Pin (5<->6)
2	External supply	P3 Pin-3 (5 V) P3 Pin-1 (GND)	Pin (4<->5)
3	External supply	P4 (3V) and P5 (GND)	Pin (4<->5)

Table 15: Power supply option

3.5.1.1 Connector P3, power supply through TTL-232R-3V3

The EV-Board can be sourced by TTL-232R-3V3 cable through P3 connector. The TTL-232R-3V3 cable powers the board with 5 V supply. The integrated voltage regulator regulates the connected voltage 5 V down to 3 V and supplies the remaining parts of the circuit. If the module is sourced, the *Power LED* lights up.

3.5.1.2 Connector P3, power supply through external source

The EV-Board can be sourced by an external power supply through the P3 connector Pin-3 (5 V) and P3 Pin-1 (GND). If the module is sourced, the power *Power LED* lights up.

3.5.1.3 Connectors P4 and P5, power supply through external source

The development board can be sourced by an external power supply through the P4 (1.9-3.6 V) and P5 (GND) connector. If the module is sourced, the *Power LED* lights up.

3.5.2 UART / USB

The TTL-232R-3V3 cable is used for USB/UART connection between PC and the EV-Board. The IO level of the TTL-232R-3V3 cable is 3.3 V. Using the FTDI-driver the PC will show a virtual COM port which can be used to communicate with the module.

3.5.3 UART direct

P3 connector shall be used for host connection. The UART of the host can be directly connected to P3 (pins are labelled on the EV-Board). 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 compatibility. 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).

3.5.4 LFXO crystal

For higher LFCLK accuracy (better than ±250 ppm) a low frequency crystal oscillator of 32.768 kHz (LFXO) shall be used. A crystal, 3.2 × 1.6 mm package, order code 830009706 with capacitors C9 (12 pF) and C10 (12 pF), 0402 package is used in the reference design.

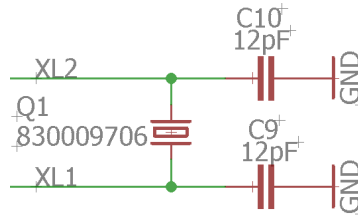


Figure 11: LFXO

Depending on parasitic capacitance of PCB, the capacitance value of C9 and C10 shall be calculated.

nRF52840 pin P0.00/XL1 and P0.01/XL12 are connected to module pad XL1 and XL2 respectively.

The input capacitance of the pad XL1 and XL2 are 4 pF. The values of C9 and C10 can be calculated as follows.

The load capacitance of LFXO is given by

$$C_l = \frac{C9_l * C10_l}{C9_l + C10_l} \tag{1}$$

If $C9_l = C10_l = C$, then

$$C_l = \frac{C}{2} \tag{2}$$

whereas,

$$C9 = C - C_{XL1} - C_{PCB} \tag{3}$$

$$C10 = C - C_{XL2} - C_{PCB} \tag{4}$$

C_l = Load capacitance of LFXO crystal.

C_{XL1} = Input capacitance of Pad XL1 (4 pF)

C_{XL2} = Input capacitance of Pad XL2 (4 pF)

C_{PCB} = Parasitic capacitance of PCB

Parasitic capacitance of the PCB can vary depending on design and track length. Typical values for parasitic capacitors range from 0.5 pF to 2 pF.

For the crystal *830009706* with load capacitance of 9 pF and parasitic capacitance of 2 pF (for the Thetis-I Mini EV-Board), the value of C9 and C10 results in 12 pF, which was also tested on the Thetis-I Mini EV-Board.

3.5.4.1 LFXO Design guidelines

1. LFXO shall be placed away from high frequency components and traces.
2. The ground connection for the load capacitor shall be short using ground vias.
3. The crystal shall be placed close to the module.
4. PCB traces between module and the crystal shall be kept short.
5. Load capacitors shall be low leakage and temperature stable (NPO or COG) type.
6. The differential traces shall be kept to the same length.
7. Ground area shall be placed under the crystal and connected to the main ground plane.
8. Open traces to the pins shall be avoided to reduce parasitic capacitance and coupling effects.
9. Ground area shall be used between the crystal traces and other PCB traces for better decoupling.

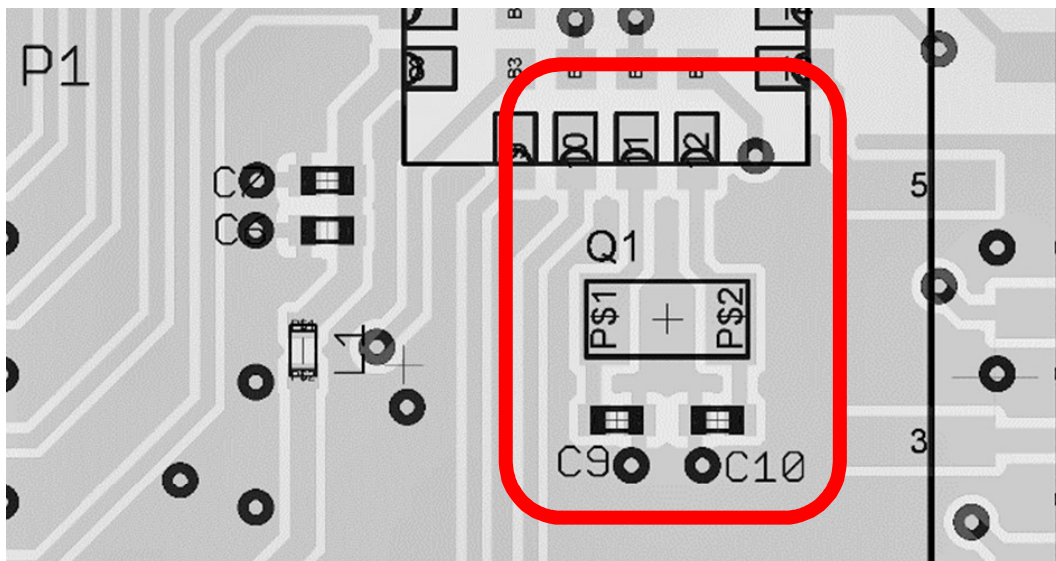


Figure 12: LFXO assembly

3.5.5 Programming interface

The EV-Board provides a place holder for 2×10 pin connector CON2. It can be used 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.

3.6 Schematic

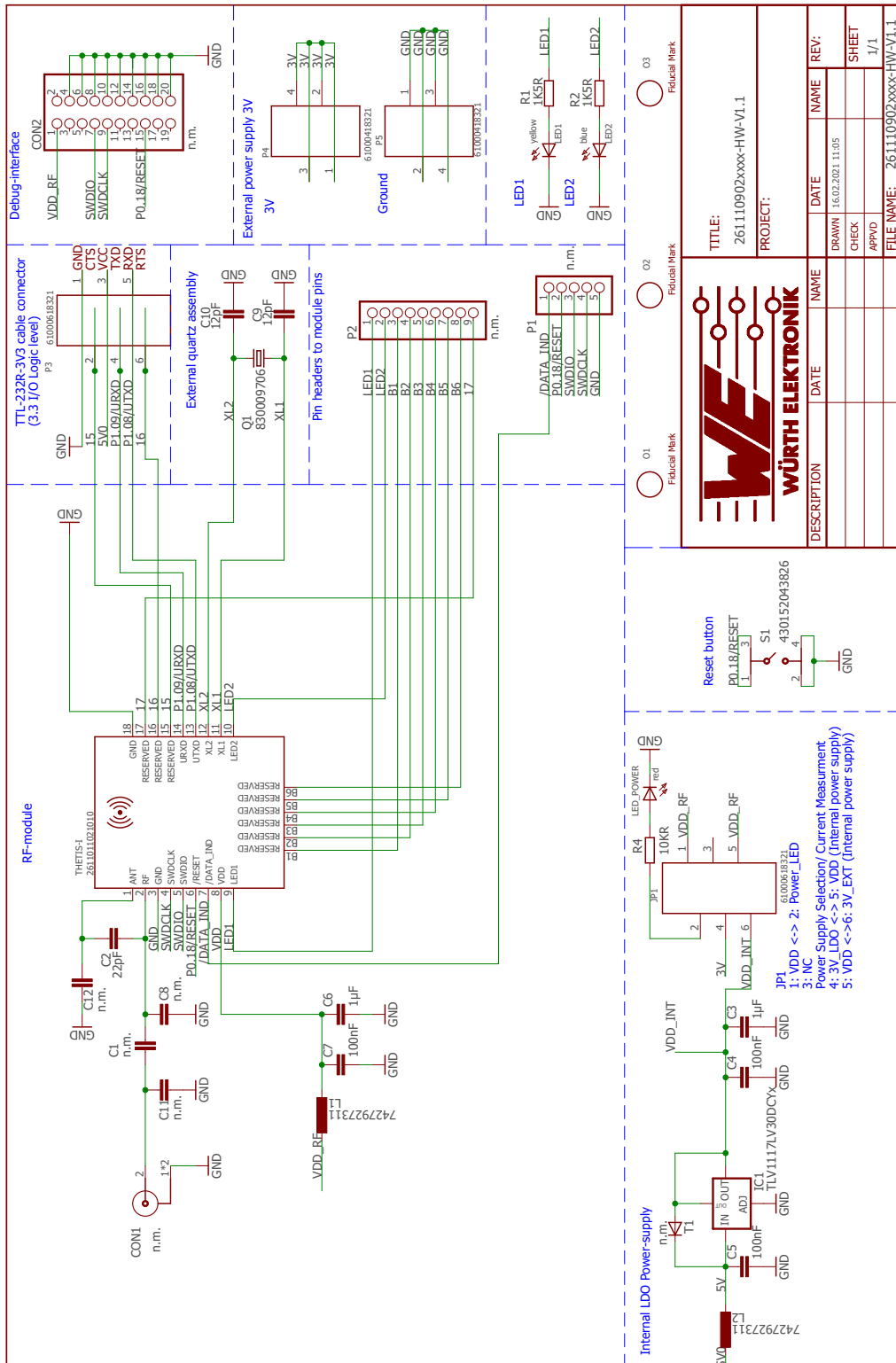


Figure 13: Schematic sheet

3.7 Layout

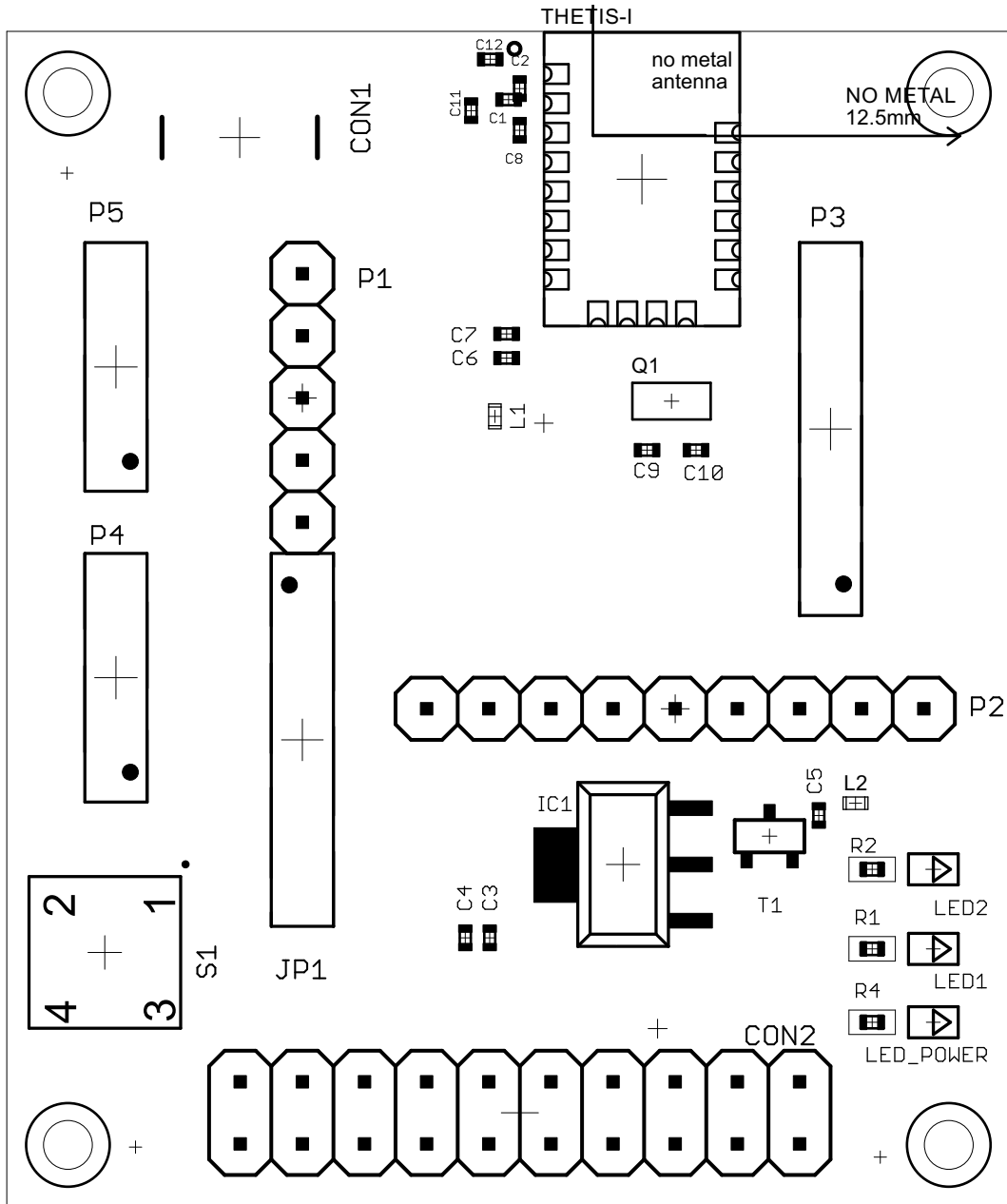


Figure 14: Assembly

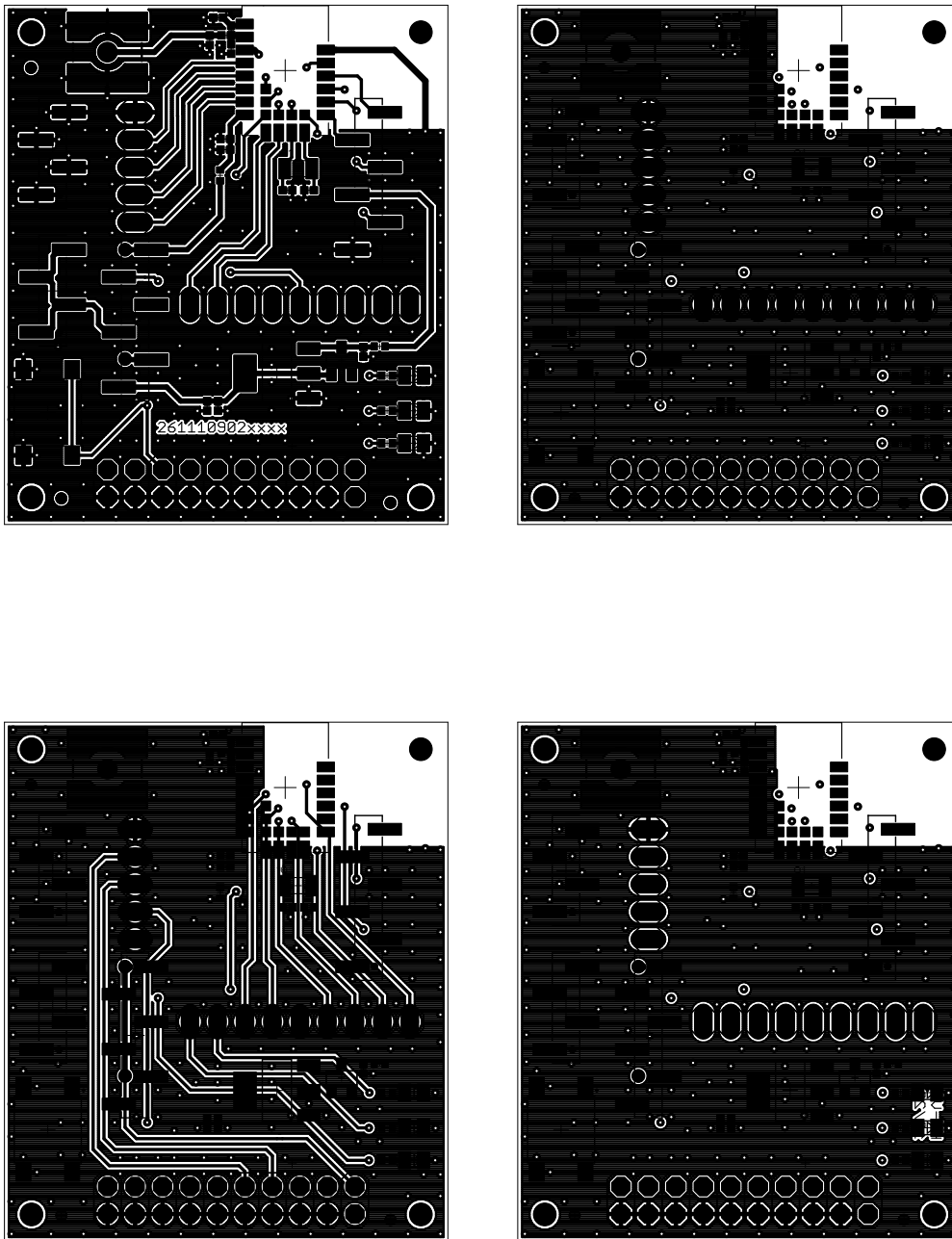


Figure 15: Top, bottom & internal layers

3.8 Bill of materials

Part	Value	PACK	MANUFACTURER	NR
C1	n.m.	0402		
C2	22pF	0.5mm	Würth Elektronik	885012005027
C3	1µF	0402	Würth Elektronik	885012105012
C4	100nF	0402	Würth Elektronik	885012205037
C5	100nF	0402	Würth Elektronik	885012205037
C6	1µF	0402	Würth Elektronik	885012105012
C7	100nF	0402	Würth Elektronik	885012205037
C8	n.m.	0402		
C9	12pF	0402		
C10	12pF	0402		
C11	n.m.	0402		
C12	n.m.	0402		
CON1	n.m.	SMD		
CON2	n.m.			
IC1	LDO, 3V			
JP1	61000618321	SMD	Würth Elektronik	61000618321
L1	7427927311	0402	Würth Elektronik	7427927311
L2	7427927311	0402	Würth Elektronik	7427927311
LED1	yellow	0805	Würth Elektronik	150080YS75000
LED2	blue	0805	Würth Elektronik	150080BS75000
LED_POWER	red	0805	Würth Elektronik	150080RS75000
O1	OPT_MARKE			
O2	OPT_MARKE			
O3	OPT_MARKE			
P1	n.m.			
P2	n.m.			
P3	61000618321	SMT	Würth Elektronik	61000618321
P4	61000418321	SMT	Würth Elektronik	61000418321
P5	61000418321	SMT	Würth Elektronik	61000418321
Q1	830009706	3.2 x 1.5mm S	Würth Elektronik	830009706
R1	1K5R			
R2	1K5R			
R4	10KR			
S1	430152043826		Würth Elektronik	430152043826
T1	n.m.			
THETIS-I	2611011021010	SMD	Würth Elektronik	2611011021010

4 References

- [1] Wirepas. Wirepas Mesh Dual-MCU API Reference Manual, WP-RM-100, version 5.1A.
<https://www.we-online.com/man-wirepas-1>.

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.

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6 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 6 and 6 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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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.

7 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.

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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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8 Legal notice

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9 License terms

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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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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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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