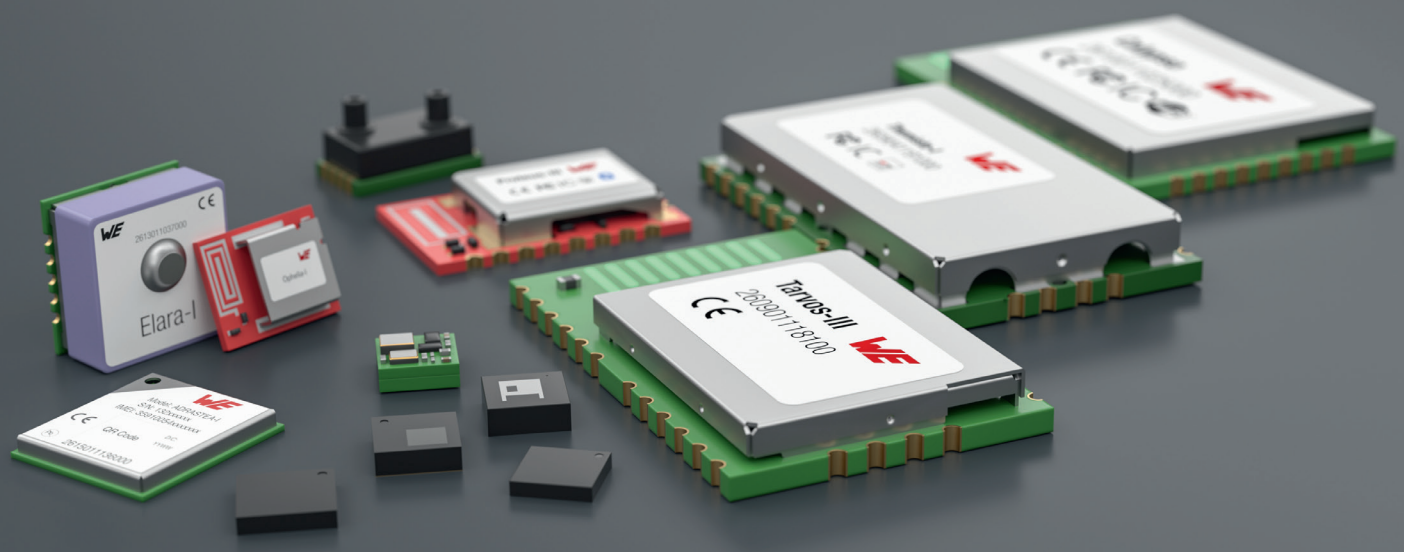

User manual

Mini EV-Board Thetis-I

2611109021011

Version 1.1

May 23, 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	1.0	• Initial version	March 2021
1.1	1.1	• Updated the values C2 and C12 values in the Hardware version 1.1 • Updated `Schematic`. • New corporate design.	May 2023

Abbreviations

Abbreviation	Name	Description
API	Application Programming Interface	
ASCII	American Standard Code For Information Interchange	
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	

Contents

1 Supported radio modules

The evaluation 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 evaluation 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 evaluation 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 evaluation 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 evaluation 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 evaluation 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 evaluation board into operation, please perform the following steps:

1. Connect the evaluation board to the PC
   a) Connect the TTL-232R-3V3 FTDI cable to the connector P3 of the evaluation 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 evaluation 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 evaluation board and press the "Open/Close COM port" button.

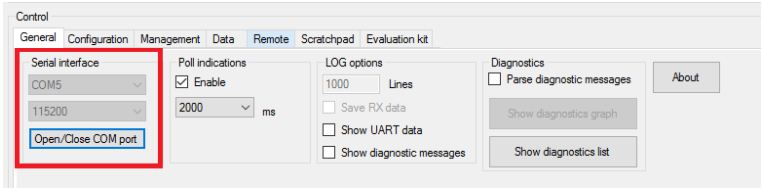

Figure 1: Open COM port

   c) Configure the connected Thetis-I evaluation 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".

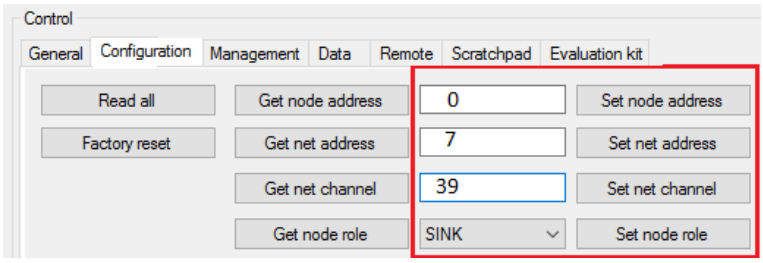

Figure 2: Configure the sink

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

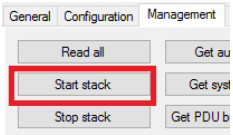

Figure 3: Start the sink

3. To make other Mini EV-Board Thetis-I mini evaluation board units join this Wirepas network, connect them to the PC in the same way.

4. Configure these mini evaluation 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 evaluation board and press the "Open/Close COM port" button (see figure 1).
   c) Configure the connected Thetis-I mini evaluation 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 evaluation board to the sink enter the data you want to transmit in the fields of the "Data" tab. As destination node address type "sink".

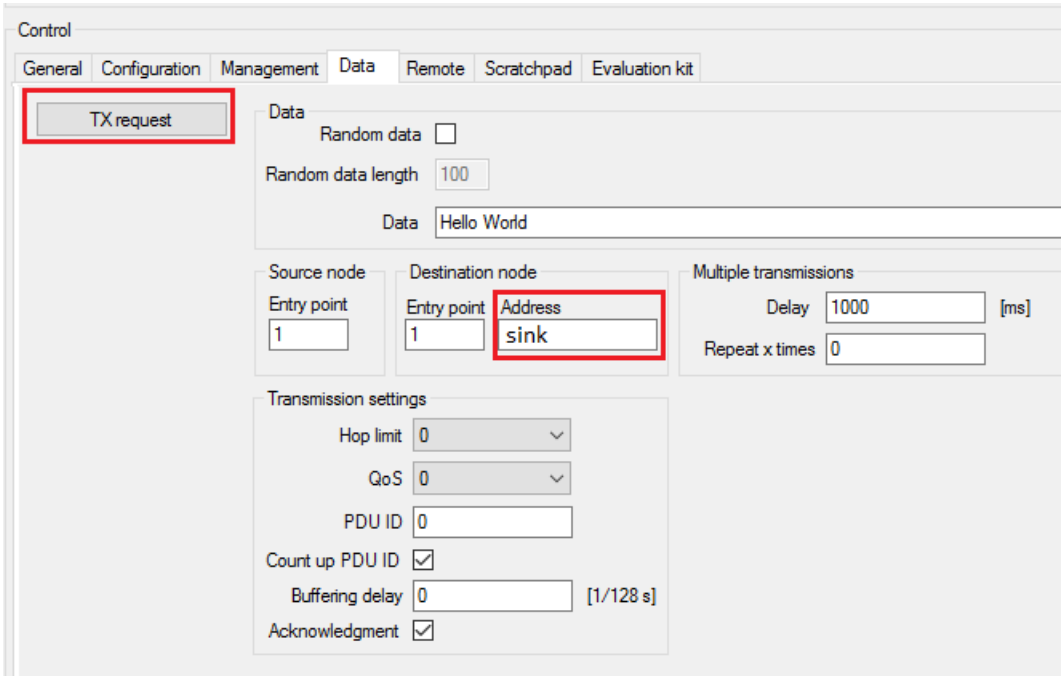

Figure 4: Transmit data to the sink

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 evaluation board into operation using a host controller, pin header P3 shall be used.

An external power supply shall be connected to the evaluation 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 evaluation board

3.1 Block diagram

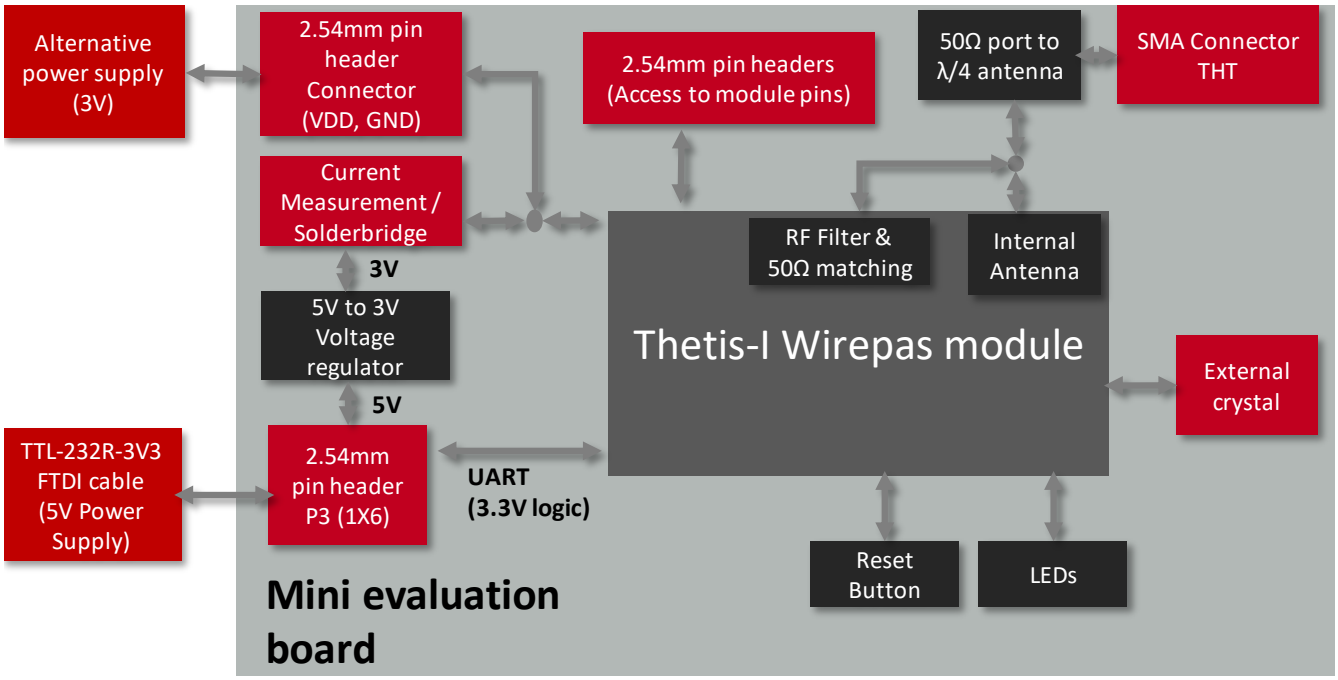

Figure 5: Block diagram

3.2 Connectors and pin headers

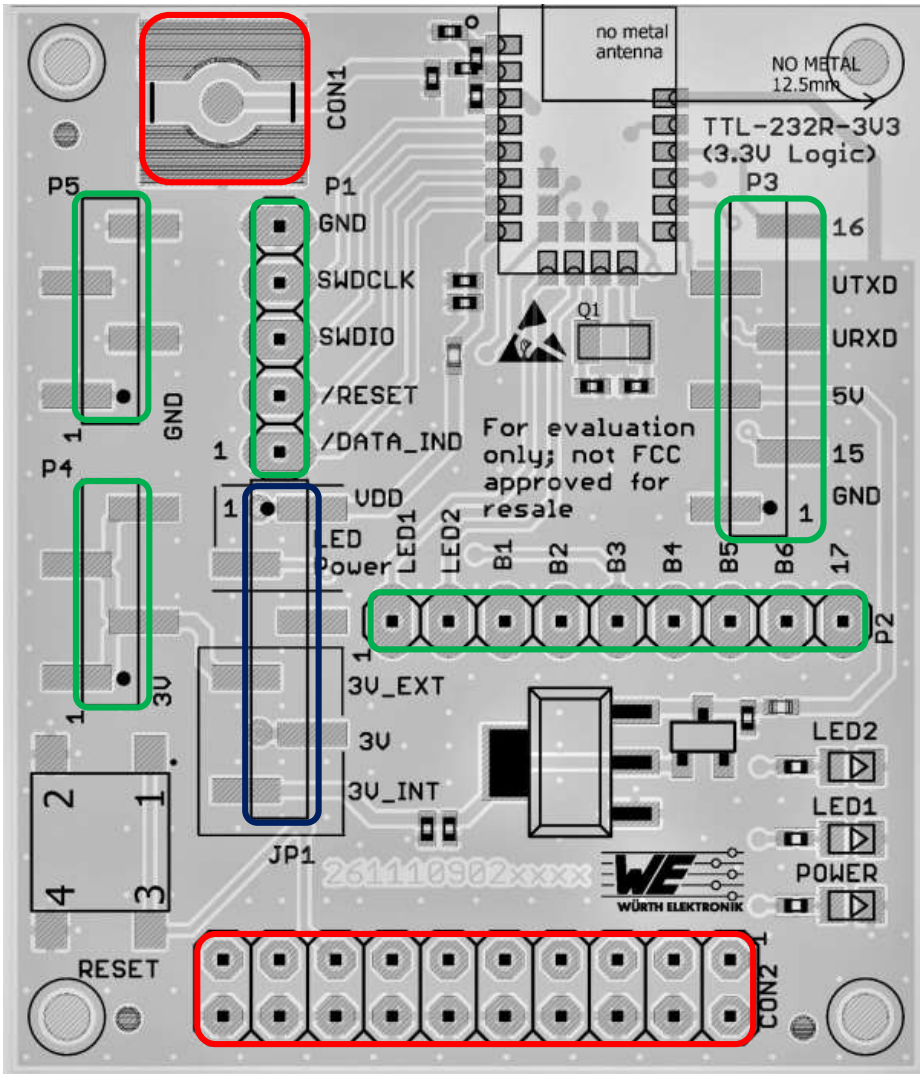

Figure 6: Connectors and pin headers

The table 3 lists the pin headers assembled on the evaluation 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 evaluation 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 2.4GHz antenna Himalia from Würth Elektronik eiSos (order code 2600130021) is a perfect match: *https://www.we-online.de/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.

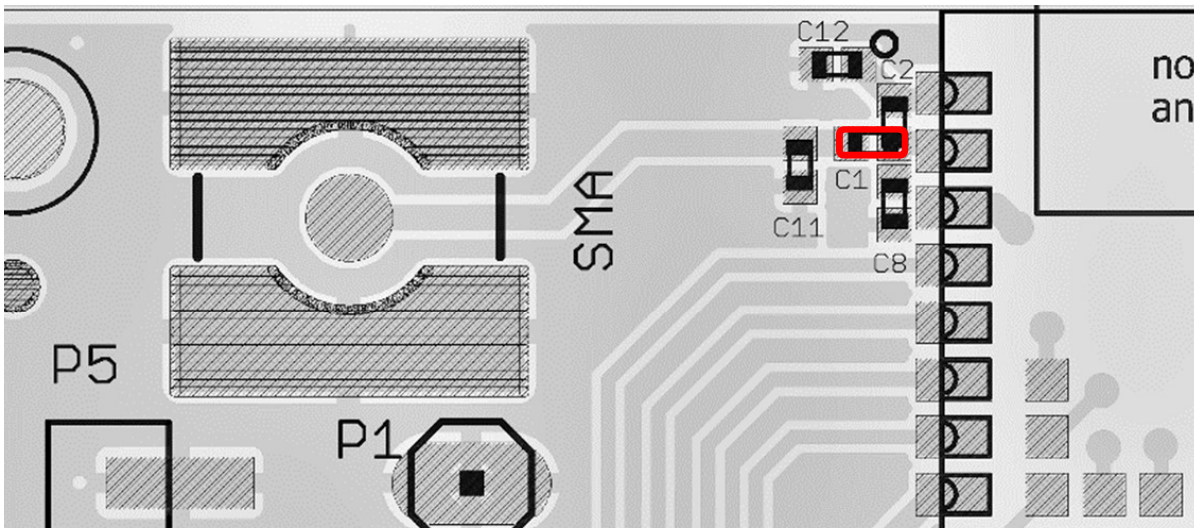

Figure 7: Capacitor connection to external antenna

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.

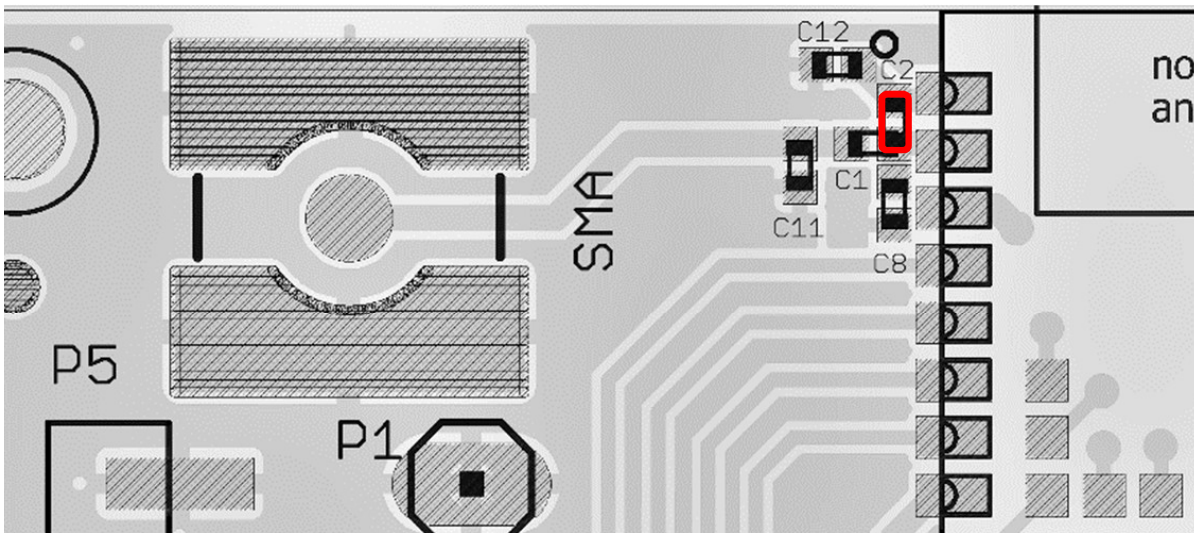

Figure 8: Capacitor connection to internal antenna

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

3.3 Jumpers

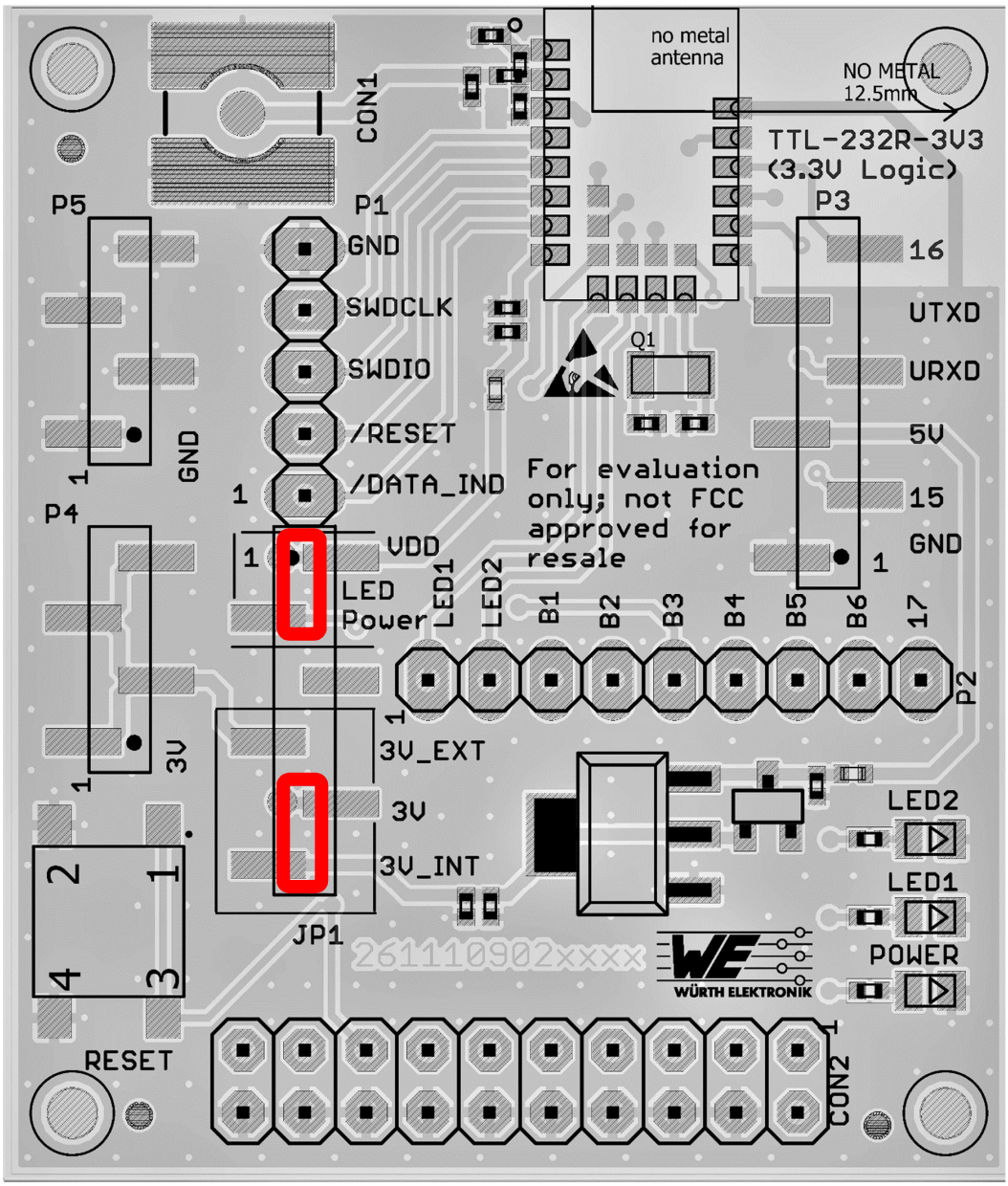

Figure 9: Jumpers

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

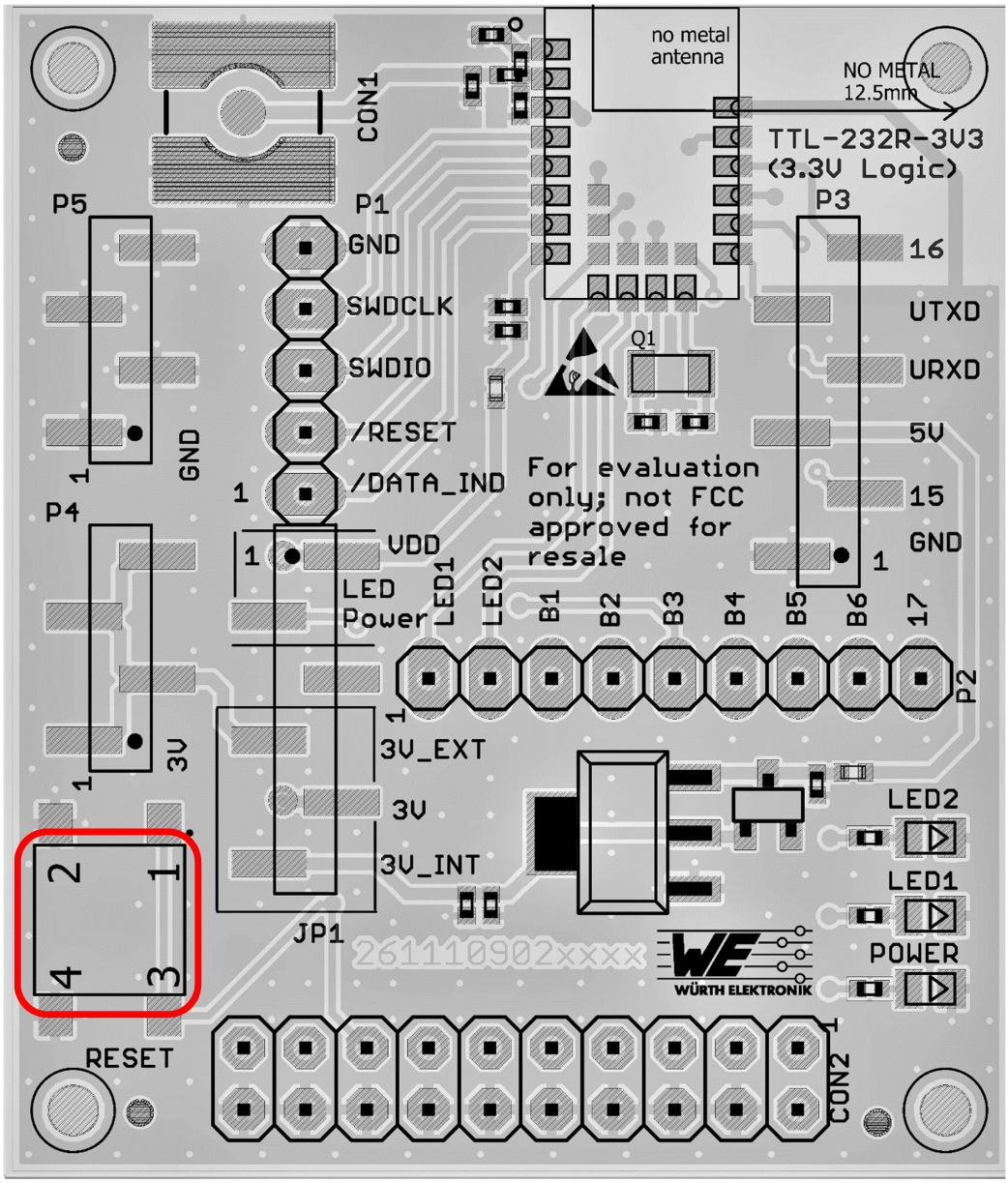

Figure 10: Buttons

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 evaluation 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 evaluation 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 evaluation 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 evaluation 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 evaluation 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.

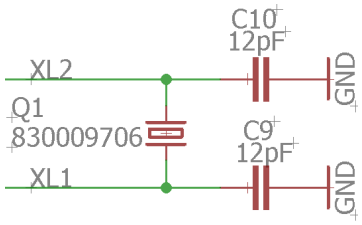

Figure 11: LFXO

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.

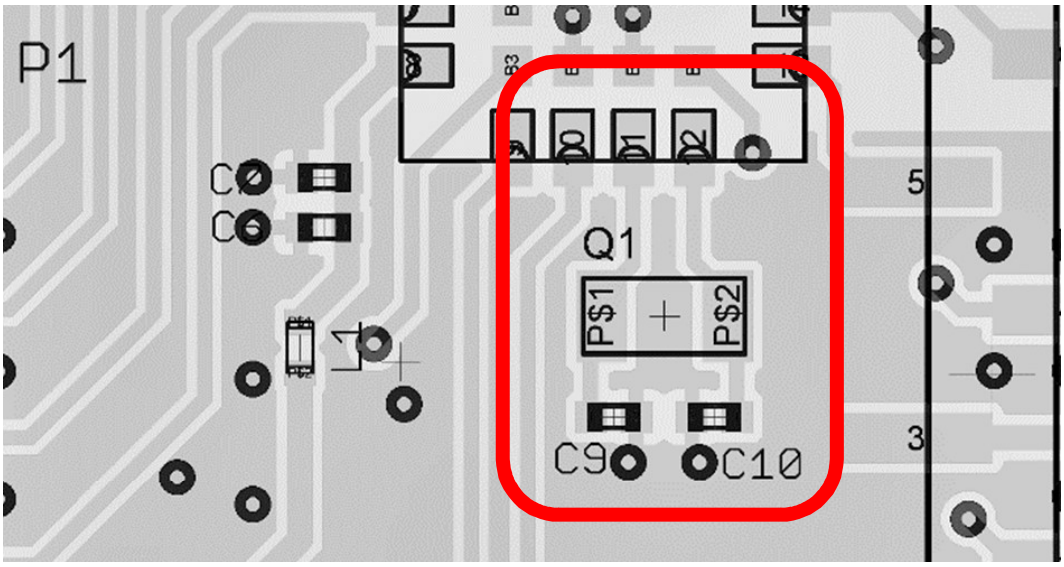

Figure 12: LFXO assembly

3.5.5 Programming interface

The evaluation 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

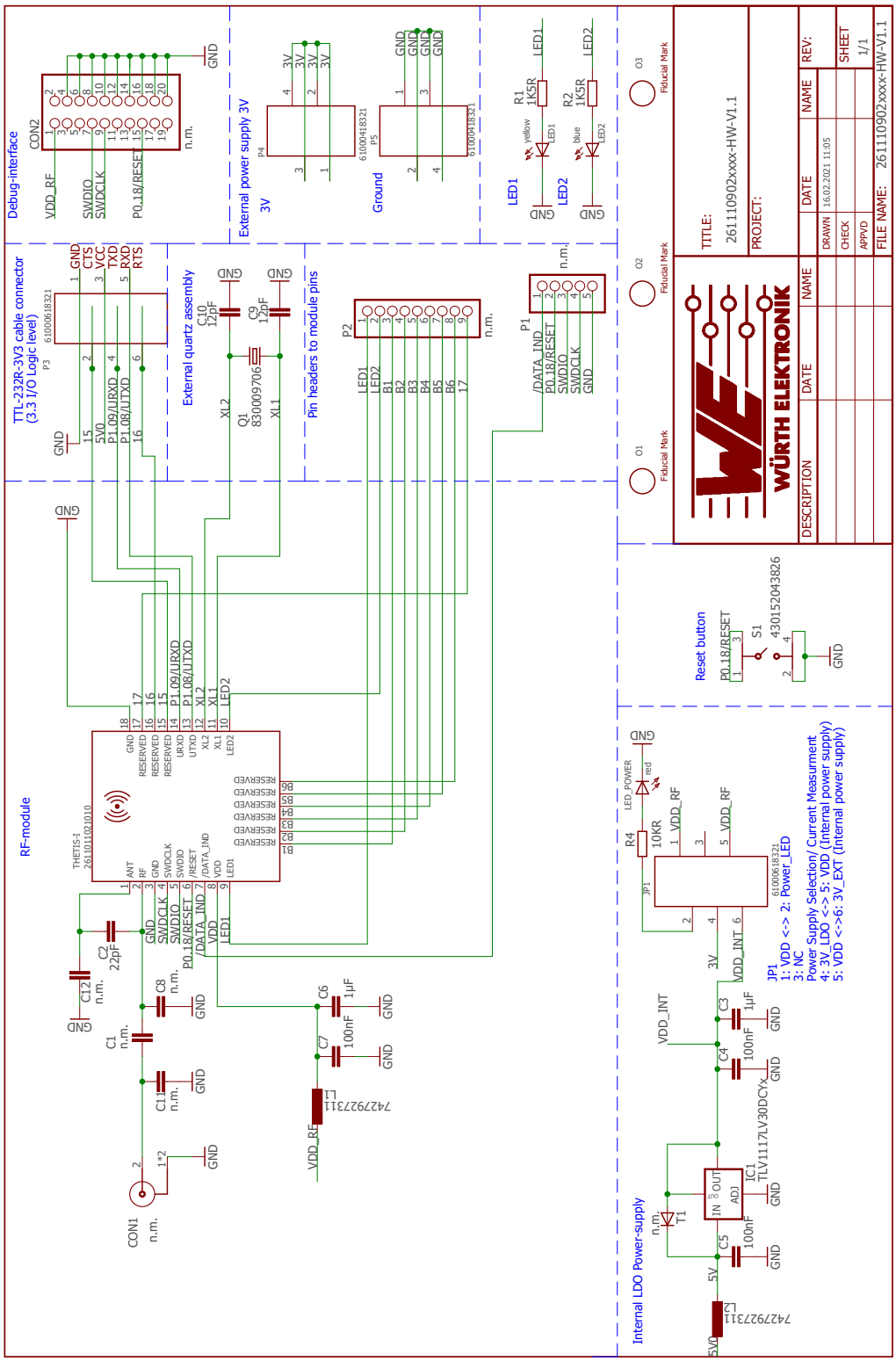

Figure 13: Schematic sheet

3.7 Layout

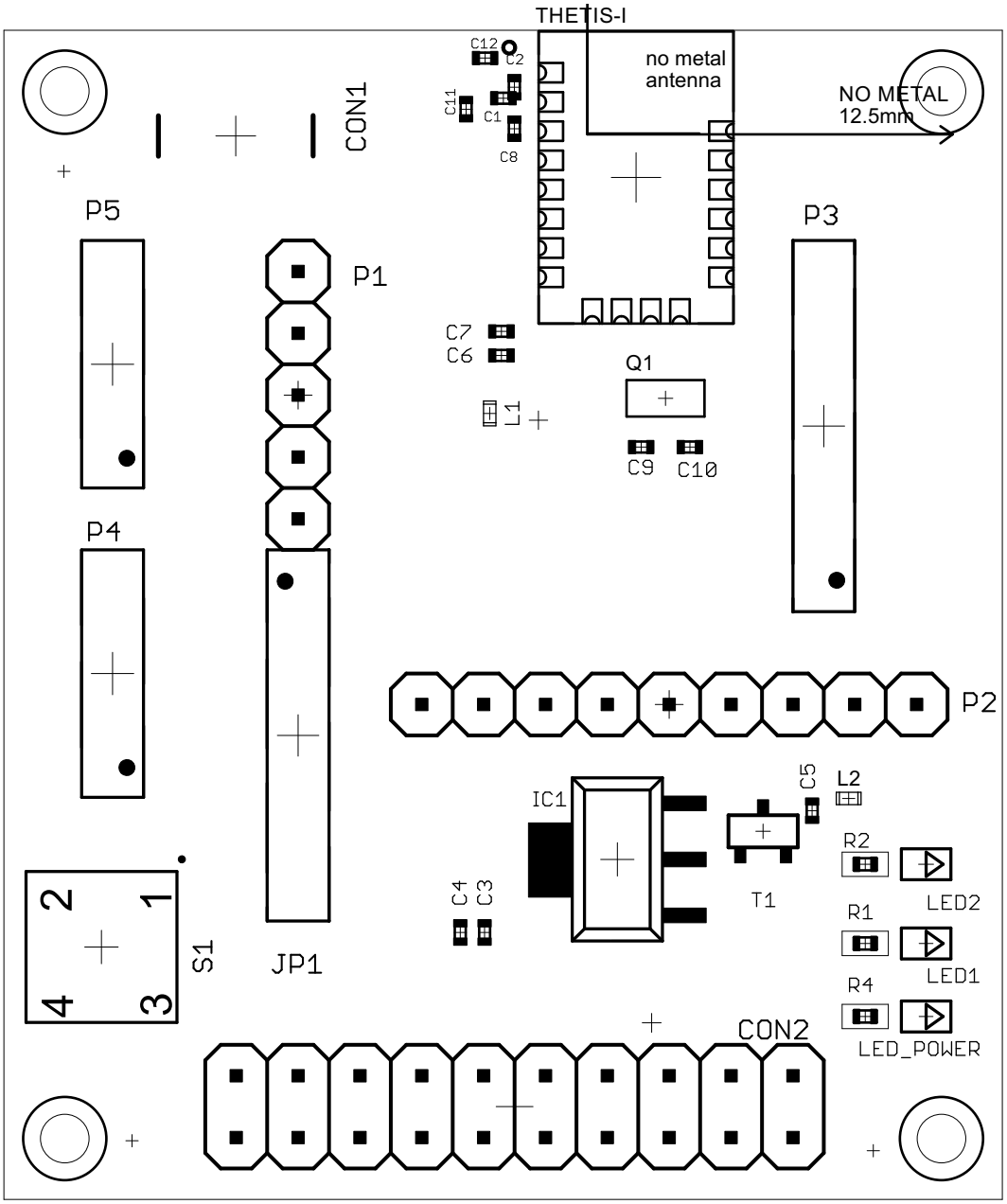

Figure 14: Assembly

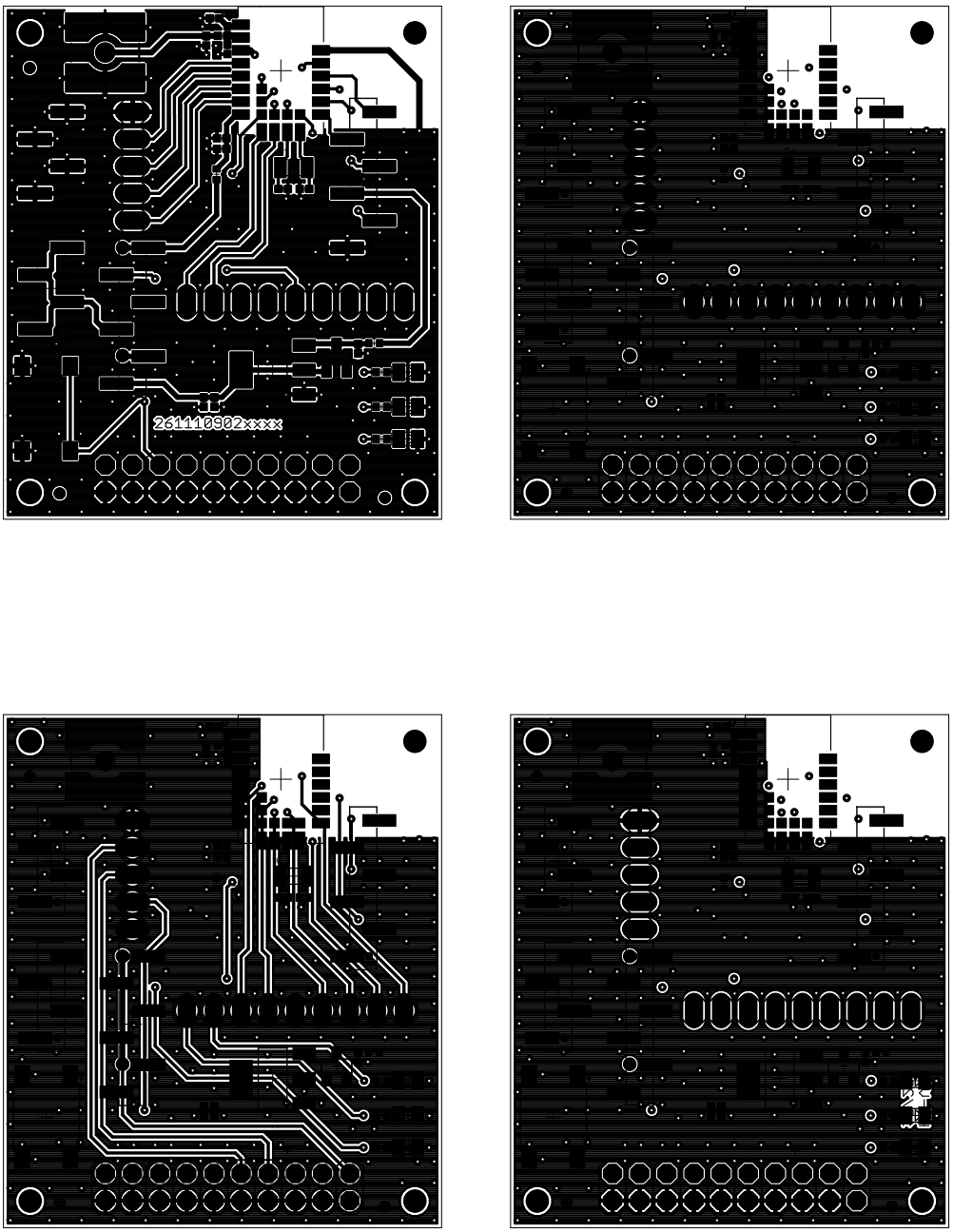

Figure 15: Top, bottom & internal layers

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-I.

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 evaluation 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 evaluation 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 Important notes

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

6.1 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.

6.2 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.

6.3 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.

6.4 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.

6.5 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 6.1 and 6.2 remains unaffected. All wireless connectivity module driver software ¨wireless connectivity SDK¨ and it's source codes as well as all PC software tools are not subject to the Product Change Notification information process.

6.6 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.

6.7 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.

6.8 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*.

7 Legal notice

7.1 Exclusion of liability

Würth Elektronik eiSos GmbH & Co. KG considers the information in this document to be correct at the time of publication. However, Würth Elektronik eiSos GmbH & Co. KG reserves the right to modify the information such as technical specifications or functions of its products or discontinue the production of these products or the support of one of these products without any written announcement or notification to customers. The customer must make sure that the information used corresponds to the latest published information. Würth Elektronik eiSos GmbH & Co. KG does not assume any liability for the use of its products. Würth Elektronik eiSos GmbH & Co. KG does not grant licenses for its patent rights or for any other of its intellectual property rights or third-party rights.

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7.2 Suitability in customer applications

The customer bears the responsibility for compliance of systems or units, in which Würth Elektronik eiSos GmbH & Co. KG products are integrated, with applicable legal regulations. Customer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of Würth Elektronik eiSos GmbH & Co. KG components in its applications, notwithstanding any applications-related in-formation or support that may be provided by Würth Elektronik eiSos GmbH & Co. KG. Customer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences lessen the likelihood of failures that might cause harm and take appropriate remedial actions. The customer will fully indemnify Würth Elektronik eiSos GmbH & Co. KG and its representatives against any damages arising out of the use of any Würth Elektronik eiSos GmbH & Co. KG components in safety-critical applications.

7.3 Trademarks

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7.4 Usage restriction

Würth Elektronik eiSos GmbH & Co. KG products have been designed and developed for usage in general electronic equipment only. This product is not authorized for use in equipment

where a higher safety standard and reliability standard is especially required or where a failure of the product is reasonably expected to cause severe personal injury or death, unless the parties have executed an agreement specifically governing such use. Moreover, Würth Elektronik eiSos GmbH & Co. KG products are neither designed nor intended for use in areas such as military, aerospace, aviation, nuclear control, submarine, transportation (automotive control, train control, ship control), transportation signal, disaster prevention, medical, public information network etc. Würth Elektronik eiSos GmbH & Co. KG must be informed about the intent of such usage before the design-in stage. In addition, sufficient reliability evaluation checks for safety must be performed on every electronic component, which is used in electrical circuits that require high safety and reliability function or performance. By using Würth Elektronik eiSos GmbH & Co. KG products, the customer agrees to these terms and conditions.

8 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.

8.1 Limited license

Würth Elektronik eiSos hereby grants you a limited, non-exclusive, non-transferable and royalty-free license to use the software and under the conditions that will be set forth in these license terms. You are free to use the provided software only in connection with one of the products from Würth Elektronik eiSos to the extent described in these license terms. You are entitled to change or alter the source code for the sole purpose of creating an application embedding the Würth Elektronik eiSos wireless connectivity product. The transfer of the source code to third parties is allowed to the sole extent that the source code is used by such third parties in connection with our product or another hardware provided by Würth Elektronik eiSos under strict adherence of these license terms. Würth Elektronik eiSos will not assume any liability for the usage of the incorporated software and the source code. You are not entitled to transfer the source code in any form to third parties without prior written consent of Würth Elektronik eiSos.
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8.2 Usage and obligations

The responsibility for the applicability and use of the Würth Elektronik eiSos wireless connectivity product with the incorporated firmware in a particular customer design is always solely within the authority of the customer. Due to this fact, it is up to you to evaluate and investigate, where appropriate, and to decide whether the device with the specific product characteristics described in the product specification is valid and suitable for your respective application or not.
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.
Würth Elektronik eiSos' products with the incorporated firmware are not authorized for use in safety-critical applications, or where a failure of the product is reasonably expected to cause severe personal injury or death. Moreover, Würth Elektronik eiSos' products with the incorporated firmware are neither designed nor intended for use in areas such as military, aerospace, aviation, nuclear control, submarine, transportation (automotive control, train control, ship control), transportation signal, disaster prevention, medical, public information network etc. You

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

8.3 Ownership

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

8.4 Firmware update(s)

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

8.5 Disclaimer of warranty

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8.7 Applicable law and jurisdiction

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

8.8 Severability clause

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

8.9 Miscellaneous

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

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