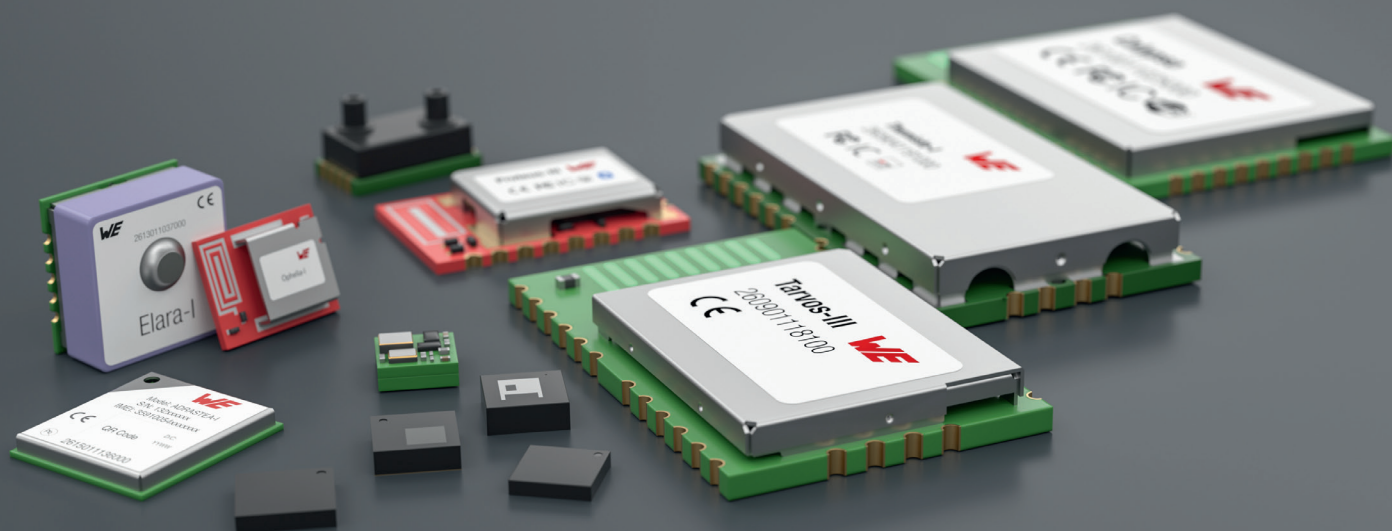




USER MANUAL

PROTEUS-IV

2621011024000

VERSION 1.0

SEPTEMBER 3, 2025

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

MUST READ

Check for firmware updates

Before using the product, make sure you use the most recent firmware version, data sheet, and user manual. This is especially important for Wireless Connectivity products that were not purchased directly from Würth Elektronik eiSos. A firmware update on these respective products may be required.

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

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Overview of helpful application notes

Application note ANR008 - Wireless Connectivity Software Development Kit

<http://www.we-online.com/ANR008>

To ease the integration of the Würth Elektronik eiSos radio modules into an application, Würth Elektronik eiSos offers the corresponding Software Development Kit (SDK) for most commonly used host processors. This SDK contains drivers and examples in C-code to communicate with the corresponding radio module. This application note shows which SDKs are available and describes how to download and use them.

Application note ANR010 - Range estimation

<http://www.we-online.com/ANR010>

This application note presents the two most used mathematical range estimation models, Friis and two ray ground reflection, and its implementation in the range estimation tool of the RED-EXPERT.

Application note ANR027 - Bluetooth qualification guide

<http://www.we-online.com/ANR027>

Every product containing Bluetooth® technology needs to be qualified at the Bluetooth® SIG (special interest group). This application note explains the steps to be done to gain a Bluetooth® qualification for the end product using a Würth Elektronik eiSos Bluetooth® LE radio module.

Application note ANR030 - nRF Connect

<http://www.we-online.com/ANR030>

This application note gives a short overview about the options to create a custom firmware for Würth Elektronik eiSos radio modules by using the hardware platform and the embedded nRF5x system on chip. It presents options on firmware development environments and accessories (like SDKs) for the use within the nRF5 ecosystem. The reader is informed on how to access to a multitude of radio standards (like Bluetooth® LE, Bluetooth® MESH, Bluetooth® LE Audio, Matter, Zigbee, Thread, Wirepas) for custom firmware developments whilst the hardware platform can stay the same.

Application note ANR031 - Certification of custom modules

<http://www.we-online.com/ANR031>

This application note explains how certifications of a standard product can be used to gain the certification of a customized product. This is done for firmware, which has been adapted by Würth Elektronik eiSos, as well as for firmware written by customer.

1. Revision history

Manual version	FW version	HW version	Notes	Date
1.0	1.0	2.0	Initial version	September 2025

2. Abbreviations

Abbreviation	Name	Description
BTMAC		Bluetooth® conform MAC address of the module used on the RF-interface.
CS	Checksum	Byte wise XOR combination of the preceding fields.
DSSS	Direct sequence spread spectrum	Technique to spread a message on the radio
DTM	Direct test mode	Mode to test Bluetooth® specific RF settings.
EV (Board)	Evaluation (Board)	Proteus-III populated on motherboard with USB interface for test and evaluation purpose.
FEC	Forward error correction	Technique to correct received erroneous radio messages
GAP	Generic Access Profile	The GAP provides a basic level of functionality that all Bluetooth® devices must implement.
I/O	Input/output	Pinout description.
LESC	Low energy secure connection	Elliptic curve encryption method for Bluetooth® LE encryption and authentication
LPM	Low power mode	Mode for efficient power consumption.
LRM	Long range mode	Radio mode with higher range and lower throughput.
MAC		MAC address of the module.
MTU	Maximum transmission unit	Maximum packet size of the Bluetooth® connection.
Payload		The intended message in a frame / package.
RF	Radio frequency	Describes wireless transmission.
RSSI	Receive Signal Strength Indicator	The RSSI indicates the strength of the RF signal. Its value is always printed in two's complement notation.
Soft device		Operating system used by the nRF52 chip.
SPI	Serial Peripheral Interface	Allows the serial communication with the module.
UART	Universal Asynchronous Receiver Transmitter	Allows the serial communication with the module.
	User settings	Settings to configure the module.
[HEX] 0xhh	Hexadecimal	All numbers beginning with 0x are hexadecimal numbers. All other numbers are decimal, unless stated otherwise.

3. Introduction

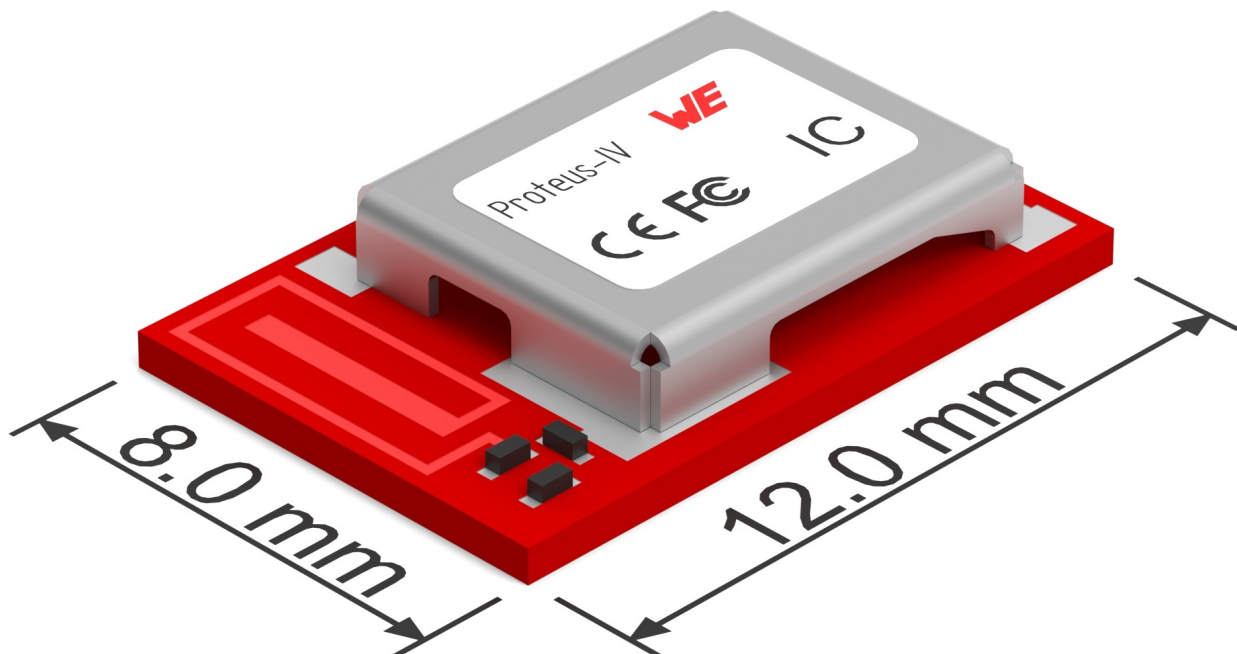


Figure 1: Proteus-IV

The Proteus-IV module is a radio sub module/device for wireless communication between devices such as control systems, remote controls, sensors et cetera. On the basis of Bluetooth® LE 6.0 [1] it offers a fast and secure data transmission of data packages between two or more parties. A serial interface (UART) is available for communication with the host system.

Even with its small dimensions of 8 x 12 mm the Proteus-IV provides a strongly miniaturized integrated PCB antenna. Beside it is possible to connect an external antenna if high radio ranges are of interest.

3.1. Block diagram

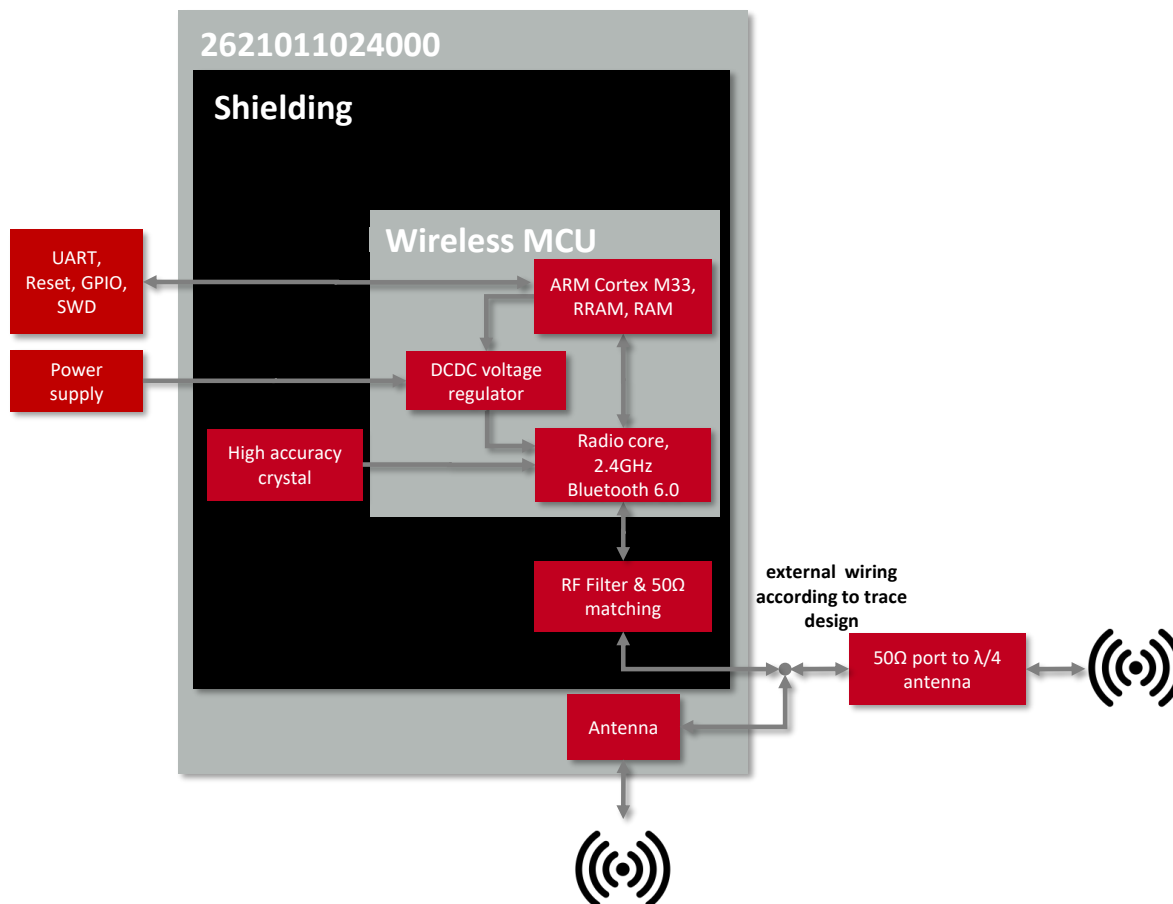


Figure 2: Block diagram of the module

3.2. Key features

The Proteus-IV offers the following key features that are described in this document in more detail:

Connection-based secured data transmission: The Proteus-IV firmware implements the **SP-PlikeyV2** Bluetooth® LE profile that allows the bidirectional data transmission between several Proteus-IV and/or to other Bluetooth® LE devices supporting this profile. Any module in the network can initiate a connection setup. Secured connections allow the transmission of authenticated and encrypted data.

Fast serial interface: The Proteus-IV offers a UART-interface to communicate with a host using a user-defined baud rate.

Latest microprocessor generation provided by Nordic Semiconductor nRF54L15 series: The heart of the Proteus-IV is a Bluetooth® LE chip of the nRF54L15 series offering high performance values combined with low power consumption. It is a 128 MHz Arm Cortex-M33 processor with 1.5 MB flash and 256 KB RAM and up to 8 dBm output power.

Bluetooth® stack: The Bluetooth® 6 stack enables fast and energy efficient data transmission using state-of-the-art technology of Nordic Semiconductors.

All Bluetooth® LE roles supported: The integrated Bluetooth® LE stack supports all Bluetooth® LE roles. Depending on the current state of operation the Proteus-IV firmware automatically switches its role to execute the user's instructions.

OTA firmware update: The Proteus-IV firmware provides over the air firmware update capabilities. Firmware updates can be applied using the Nordic Apps for cell phones.

Transparent mode: The Proteus-IV firmware provides the "transparent mode", that allows the exchange of payload data without the need of software integrating the radio module.

Config mode: The so called "config mode" allows to safely configure or recover the device settings.

Additional Bluetooth® radio modes: The Proteus-IV provides the advanced radio modes 2 MBit mode for faster data transmission and the LE coded mode, that allows long range data transmissions. For more information.

Flexible wired interfacing: The Proteus-IV is equipped with extra pins suited for custom device/sensor connection. With help of these, a tailored firmware can be developed which is optimized to the customer's needs. The pins can be configured to various functions such as UART, SPI, I2C, ADC, PWM, NFC and GPIO.

3.3. Ordering information

WE order code	Description
2621011024000	Proteus-IV Bluetooth® LE Module, Tape & Reel
2621019024001	Bluetooth® LE EV-Kit with Proteus-IV EV-Board

Table 3: Ordering information

4. Electrical specifications

If not otherwise stated, the following values have been measured on an Proteus-IV EV-Board with $T = 25\text{ °C}$, $V_{DDS} = 3\text{ V}$, $f = 2.44\text{ GHz}$, internal DC-DC converter in use.

4.1. Operating conditions

Description	Min.	Typ.	Max.	Unit
Temperature	-40	25	105	°C
Supply voltage (VDD) at -40 - 85 °C	1.7	3	3.6	V
Supply voltage (VDD) at 85 - 105 °C	1.7	3	3.4	V

Table 4: Operating conditions

4.2. Absolute maximum ratings

Description	Min.	Typ.	Max.	Unit
Supply voltage (VDD)	-0.3		+3.9	V
Voltage on any digital pin, $V_{DD} \leq 3.6\text{ V}$	-0.3		$V_{DD}+0.3$	V
Voltage on any digital pin, $V_{DD} > 3.6\text{ V}$			3.9	V

Table 5: At -40 - 85 °C

Description	Min.	Typ.	Max.	Unit
Supply voltage (VDD)	-0.3		+3.7	V
Voltage on any digital pin, $V_{DD} \leq 3.4\text{ V}$	-0.3		$V_{DD}+0.3$	V
Voltage on any digital pin, $V_{DD} > 3.4\text{ V}$			3.7	V

Table 6: At 85 - 105 °C

Description	Min.	Typ.	Max.	Unit
Input RF level			10	dBm
Flash endurance	10 000			Write/erase cycles

Table 7: General

4.3. Power consumption

4.3.1. Static

Parameter	Power	Test conditions	Value	Unit
TX current consumption	Maximum output power	Transmitter only, DC/DC converter enabled, 1 Mbps Bluetooth® LE, CPU current not included, nRF54L15 product specification	9.8	mA
		Full ¹ module current consumption DC/DC converter enabled, (Bluetooth® LE firmware)	12	mA

Table 8: Current consumption - transmitting

Parameter	Test conditions	Value	Unit
RX current consumption	Receiver only, DC/DC converter enabled, 1 Mbps Bluetooth® LE, CPU current not included, nRF54L15 product specification	3.4	mA
	Full ¹ module current consumption DC/DC converter enabled, (Bluetooth® LE firmware)	3.6	mA

Table 9: Current consumption - receiving

Parameter	Test conditions	Value	Unit
Current consumption	Sleep (system off mode)	0.6	µA

Table 10: Current consumption - low power

¹For ease of use, our current measurements include all active components and options of the SoC that are active in an operation state in the stated value (e.g. CPU, radio, UART, timers, flash, RAM...).

4.4. Radio characteristics

Parameter	Min.	Max.	Unit
Frequency	2402	2480	MHz

Table 11: Frequency range

Parameter	Min.	Max.	Unit
RSSI accuracy valid range (± 2 dB)	-90	-30	dBm

Table 12: RSSI accuracy

Parameter	Test conditions	Value	Unit
Output power	Conducted, RF_TXPower = 8	7.5	dBm
	Radiated, RF_TXPower = 8	2.0	dBm
Input sensitivity	Conducted, BER = 1E-3, 1 Mbps, Bluetooth® LE	-96	dBm
	Radiated, BER = 1E-3, 1 Mbps, Bluetooth® LE	-92	dBm

Table 13: Transmit and receive power

All transmit and receive power levels are measured on the EV-Board. The values already include losses of transitions from module to motherboard to SMA or modules PCB antenna. They are realistic values for the end application.

4.5. Pin characteristics

The following specifications are from the nRF54L15 datasheet.

Description	Min.	Typ.	Max.	Unit
Input high voltage	$0.7 \times V_{CC}$		V_{CC}	V
Input low voltage	V_{SS}		$0.3 \times V_{CC}$	V
Current at $V_{SS}+0.4$ V, output set low, standard drive, $V_{DD} \geq 1.7$ V	1	3	4	mA
Current at $V_{SS}+0.4$ V, output set low, high drive, $V_{DD} \geq 1.7$ V	3			mA
Current at $V_{SS}+0.4$ V, output set low, extra drive, $V_{DD} \geq 1.7$ V	16			mA
Current at $V_{DD}-0.4$ V, output set high, standard drive, $V_{CC} \geq 1.7$ V	1	3	4	mA
Current at $V_{DD}-0.4$ V, output set high, high drive, $V_{DD} \geq 1.7$ V	4			mA
Current at $V_{DD}-0.4$ V, output set high, extra drive, $V_{DD} \geq 1.7$ V	14			mA
Internal pull-up resistance	12	14	16	k Ω
Internal pull-down resistance	12	14	18	k Ω

Table 14: Pin characteristics

5. Pinout

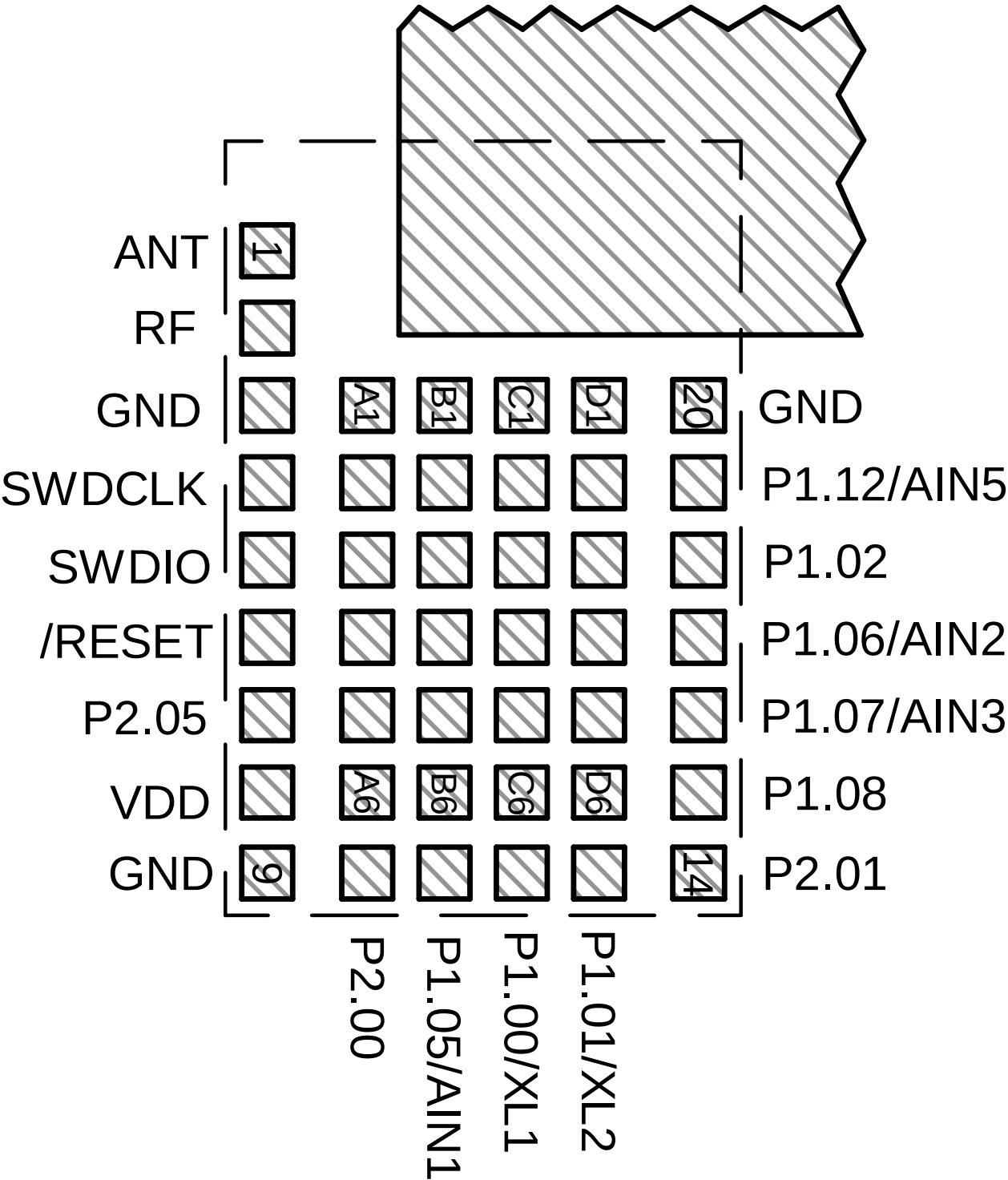


Figure 3: Pinout (top view)

No	μC Pin	Designation	I/O	Description
1		<i>ANT</i>	I/O	RF connection to PCB antenna. (see section 9)
2	<i>RF</i>	<i>RF</i>	I/O	50 Ω RF connection through radio front end to transceiver part of chipset. (see section 9)
3	<i>GND</i>	<i>GND</i>	Supply	Ground
4	<i>SWDCLK</i>	<i>SWDCLK</i>	I/O	Serial wire clock (SWD interface). Uses internal pull down resistor. Do not connect if not needed.
5	<i>SWDIO</i>	<i>SWDIO</i>	I/O	Serial wire input/output (SWD interface). Uses internal pull up resistor. Do not connect if not needed.
6	<i>/RESET</i>	<i>/RESET</i>	I/O	Reset pin with internal pull-up. Triggers reset, when released to HIGH.
7	P2.05	<i>MODE_1</i>	Input	Operation mode pin with internal pull-down resistor during start-up. Otherwise floating.
8	<i>VDD</i>	<i>VDD</i>	Supply	Supply voltage
9	<i>GND</i>	<i>GND</i>	Supply	Supply voltage
10	P2.00	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
11	P1.05/AIN1	<i>MODE_0</i>	Input	Operation mode pin with internal pull-down resistor during start-up. Otherwise floating.
12	P1.00/XL1 ¹	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
13	P1.01/XL2 ¹	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
14	P2.01	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
15	P1.08	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
16	P1.07/AIN3	<i>/CTS</i>	Input	<i>/CTS</i> signal with internal pull-down resistor. Do not connect if not needed.
17	P1.06/AIN2	<i>/RTS</i>	Output	<i>/RTS</i> signal, if UART is enabled. High otherwise. Do not connect if not needed.
18	P1.02/NFC1 ²	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
19	P1.12/AIN5	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
20	<i>GND</i>	<i>GND</i>	Supply	Ground
A1	P0.00	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.

A2	P2.10	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
A3	P2.09	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
A4	P2.06	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
A5	P2.04	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
A6	P2.02	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
B1	P0.01	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
B2	P2.08	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
B3	GND	GND	Supply	Ground
B4	GND	GND	Supply	Ground
B5	P2.03	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
B6	P2.07	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
C1	GND	GND	Supply	Ground
C2	P1.10	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
C3	GND	GND	Supply	Ground
C4	GND	GND	Supply	Ground
C5	P1.03/NFC2 ²	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
C6	P1.04/AIN0	UTXD	Output	UART (Transmission), if UART is enabled. High otherwise.
D1	GND	GND	Supply	Ground
D2	P1.09	LED_0	Output	Indicates the module state (active high). Do not connect if not needed.
D3	P1.11/AIN4	LED_1	Output	Indicates the module state (active high). Do not connect if not needed
D4	P1.13/AIN6	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
D5	P1.14/AIN7	RESERVED	I/O	Reserved pin for future use. High impedance, no pull. Do not connect.
D6	P1.15	URXD	Input	UART (Reception) with internal pull up resistor ¹ .

Table 15: Pinout

¹Pins available to connect an external crystal in custom firmware. The standard firmware of Proteus-IV does not implement this function.

²NFC pins available for NFC function in custom firmware. The standard firmware of Proteus-IV does not implement this function.

6. Custom firmware

6.1. Custom configuration of standard firmware

The configuration of the standard firmware includes adoption of the non-volatile settings to customer requirements and creating a customized product based on the standard product.

This variant will result in a customer exclusive module with a unique ordering number. It will also freeze the firmware version to a specific and customer tested version and thus results in a customer exclusive module with a unique ordering number.

Further scheduled firmware updates of the standard firmware will not be applied to this variant automatically. Applying updates or further functions require a customer request and release procedure.

6.2. Customer specific firmware

A customer specific firmware may include "Custom configuration of standard firmware" plus additional options or functions and tasks that are customer specific and not part of the standard firmware.

Further scheduled firmware updates of the standard firmware will not be applied to this variant automatically. Applying updates or further functions require a customer request and release procedure.

This also results in a customer exclusive module with a unique ordering number.

An example for this level of customization are functions like host-less operation where the module will perform data generation (e.g. by reading a SPI or I²C sensor) and cyclic transmission of this data to a data collector, while sleeping or being passive most of the time.

Also replacing UART with SPI as host communication interface is classified as a custom specific option.

Certification critical changes need to be re-evaluated by an external qualified measurement laboratory. These critical changes may occur when e.g. changing radio parameters, the channel access method, the duty-cycle or in case of various other functions and options possibly used or changed by a customer specific firmware.

6.3. Customer firmware

A customer firmware is a firmware written and tested by the customer himself or a 3rd party as a customer representative specifically for the hardware platform provided by a module.

This customer firmware (e.g. in form of an Intel hex file) will be implemented into the module's production process at our production site.

This also results in a customer exclusive module with a unique ordering number.

The additional information needed for this type of customer firmware, such as hardware specific details and details towards the development of such firmware are not available for the public and can only be made available to qualified customers.



The qualification(s) and certification(s) of the standard module cannot be applied to this customer firmware solution without a review and verification.

6.4. Contact for firmware requests

Please contact your Business Development Manager (BDM) or WCS@we-online.com for quotes regarding these topics.

7. Firmware history

Version 1.0.0 "Release"

- Initial version

8. Hardware history

Version 2.0 "Release"

- Initial version

9. Antenna connection

Proteus-IV's smart antenna configuration enables the user to choose between two antenna options:

9.1. On-board PCB antenna

The Proteus-IV has an on-board PCB antenna optimized for strong miniaturization operating in the 2.4 GHz frequency band. A simple short between the pins *RF* and *ANT* feeds the RF output of the module to the on-board antenna of the Proteus-IV. In this configuration, the module does not require any additional RF circuitry.

9.2. External antenna

For applications that use an external antenna, the Proteus-IV provides a 50 Ω RF signal on pin *RF* of the module. In this configuration, pin *ANT* of the module has to be connected to ground and pin *RF* to the external antenna via 50 Ω feed line. Refer to chapter 11 for further information.



The use cases for the integrated antenna are miniaturization and re-use of module certifications for the end-application. The use cases for the external antenna are optimization of radio range spending more space for the antenna and differentiated antenna for example when metal housings are used.

10. Design in guide

10.1. Advice for schematic and layout

For users with less RF experience it is advisable to closely copy the relating EV-Board with respect to schematic and layout, as it is a proven design. The layout should be conducted with particular care, because even small deficiencies could affect the radio performance and its range or even the conformity.

The following general advice should be taken into consideration:

- A clean, stable power supply is strongly recommended. Interference, especially oscillation can severely restrain range and conformity.
- Variations in voltage level should be avoided.
- LDOs, properly designed in, usually deliver a proper regulated voltage.
- Blocking capacitors and a ferrite bead in the power supply line can be included to filter and smoothen the supply voltage when necessary.



No fixed values can be recommended, as these depend on the circumstances of the application (main power source, interferences etc.).



The use of an external reset IC should be considered if one of the following points is relevant:



- The slew rate of the power supply exceeds the electrical specifications.
- The effect of different current consumptions on the voltage level of batteries or voltage regulators should be considered. The module draws higher currents in certain scenarios like start-up or radio transmit which may lead to a voltage drop on the supply. A restart under such circumstances should be prevented by ensuring that the supply voltage does not drop below the minimum specifications.
- Voltage levels below the minimum recommended voltage level may lead to malfunction. The reset pin of the module shall be held on LOW logic level whenever the VDD is not stable or below the minimum operating Voltage.
- Special care must be taken in case of battery powered systems.

- Elements for ESD protection should be placed on all pins that are accessible from the outside and should be placed close to the accessible area. For example, the RF-pin is accessible when using an external antenna and should be protected.
- ESD protection for the antenna connection must be chosen such as to have a minimum effect on the RF signal. For example, a protection diode with low capacitance such as the 8231606A or a 68 nH air-core coil connecting the RF-line to ground give good results.
- Placeholders for optional antenna matching or additional filtering are recommended.
- The antenna path should be kept as short as possible.



Again, no fixed values can be recommended, as they depend on the influencing circumstances of the application (antenna, interferences etc.).

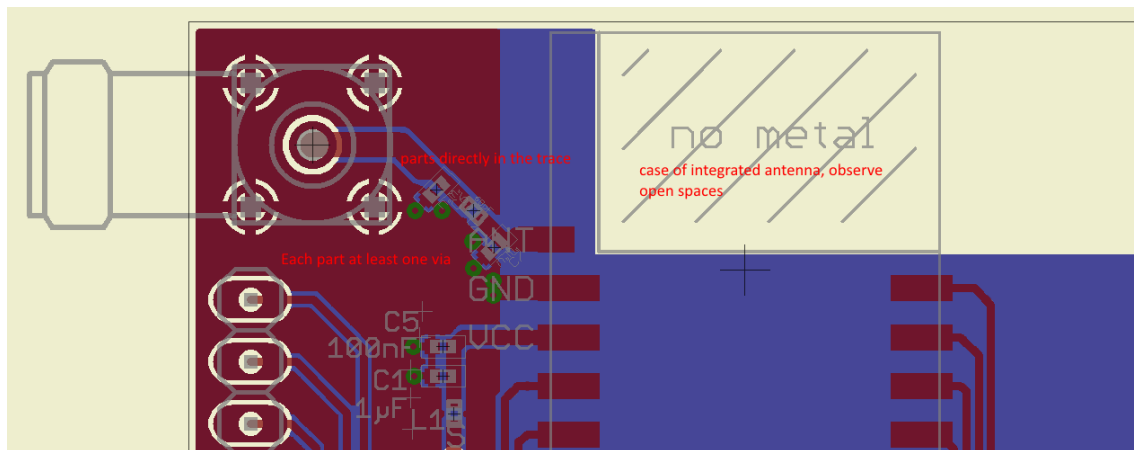


Figure 4: Layout

- To avoid the risk of short circuits and interference there should be no routing underneath the module on the top layer of the baseboard.
- On the second layer, a ground plane is recommended, to provide good grounding and shielding to any following layers and application environment.
- In case of integrated antennas it is required to have areas free from ground. This area should be copied from the EV-Board.
- The area with the integrated antenna must overlap with the carrier board and should not protrude, as it is matched to sitting directly on top of a PCB.
- Modules with integrated antennas should be placed with the antenna at the edge of the main board. It should not be placed in the middle of the main board or far away from the edge. This is to avoid tracks beside the antenna.

- Filter and blocking capacitors should be placed directly in the tracks without stubs, to achieve the best effect.
- Antenna matching elements should be placed close to the antenna / connector, blocking capacitors close to the module.
- Ground connections for the module and the capacitors should be kept as short as possible and with at least one separate through hole connection to the ground layer.
- ESD protection elements should be placed as close as possible to the exposed areas.

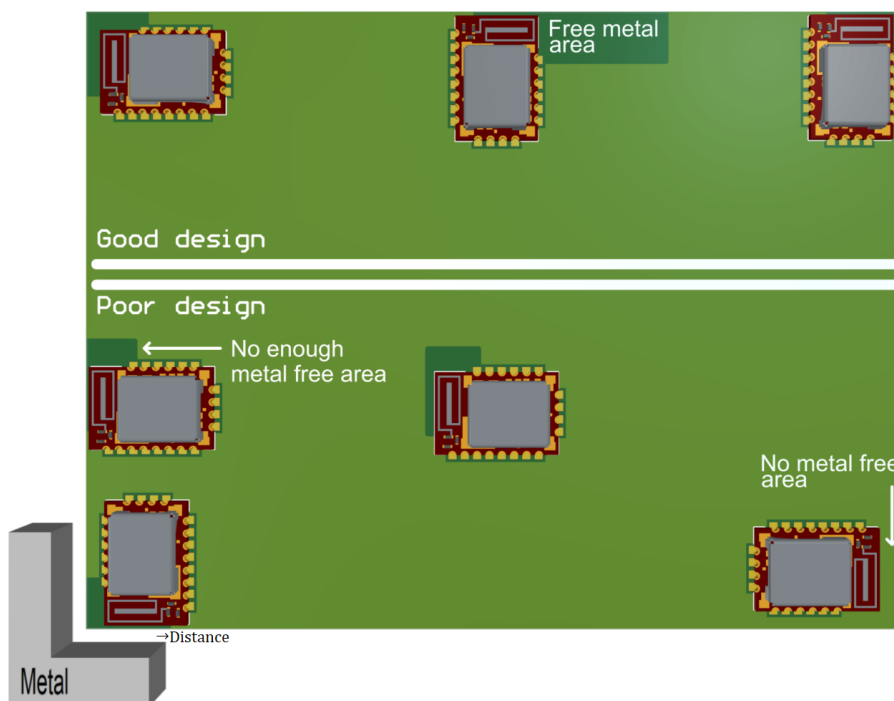


Figure 5: Placement of the module with integrated antenna

11. Reference design

Proteus-IV was tested and certified on the corresponding Proteus-IV EV-Board. For the compliance with the EU directive 2014/53/EU Annex I, the EV-Board serves as reference design. This is no discrepancy due to the fact that the EV-Board itself does not fall within the scope of the EU directive 2014/53/EU Annex I as the module is tested on the EV-Board, which is also the recommended use.

Further information concerning the use of the EV-Board can be found in the manual of the Proteus-IV EV-Board.





Figure 7: Reference design: schematic page 2

11.2. Layout

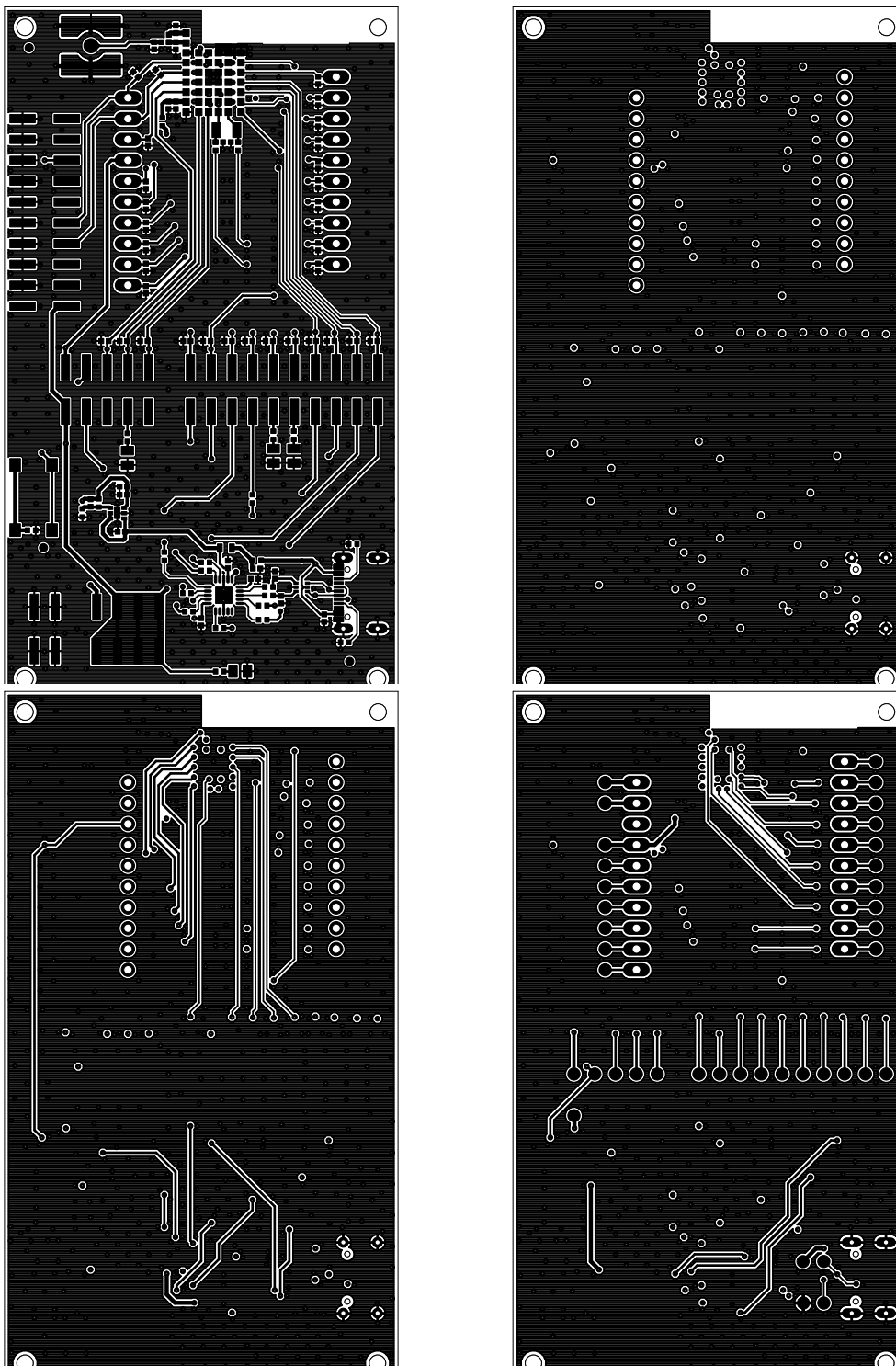


Figure 8: Top layer (top left), second layer (top right), third layer (bottom left), bottom layer (bottom right)

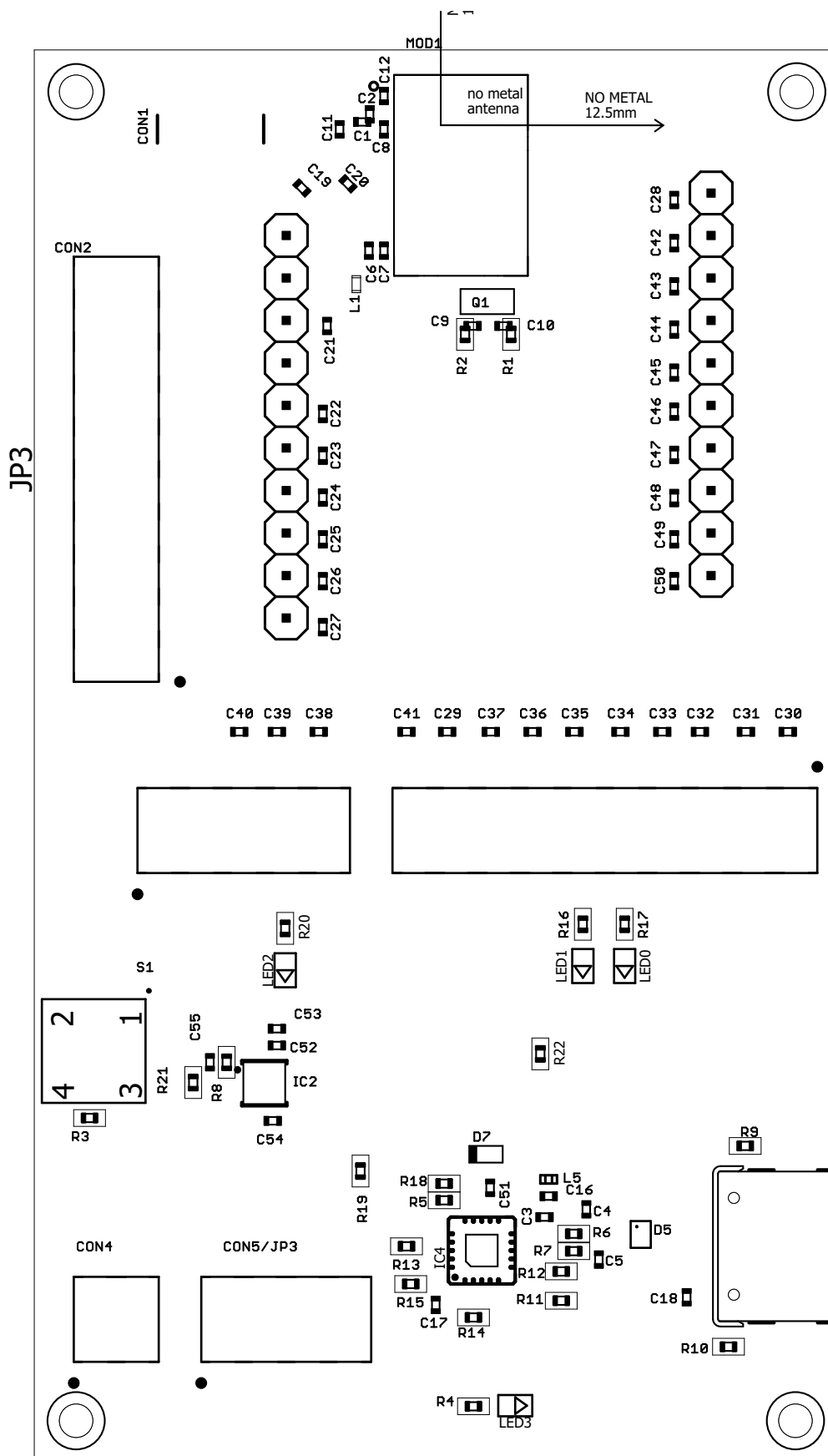


Figure 9: Reference design assembly plan

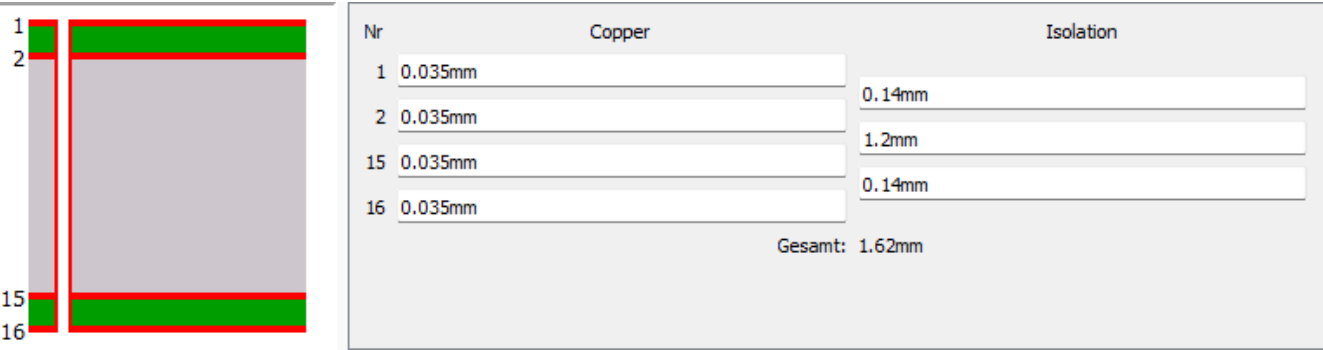


Figure 10: Reference design: Stack-up

- Top layer is used for routing and filled up with ground except underneath the module and the antenna free area.
- Second layer is ground, except the antenna free area.
- Third layer is the supply layer, except antenna free area. Some routing is allowed, not dividing the supply layer in to many or to small parts.
- Bottom layer is used for routing.

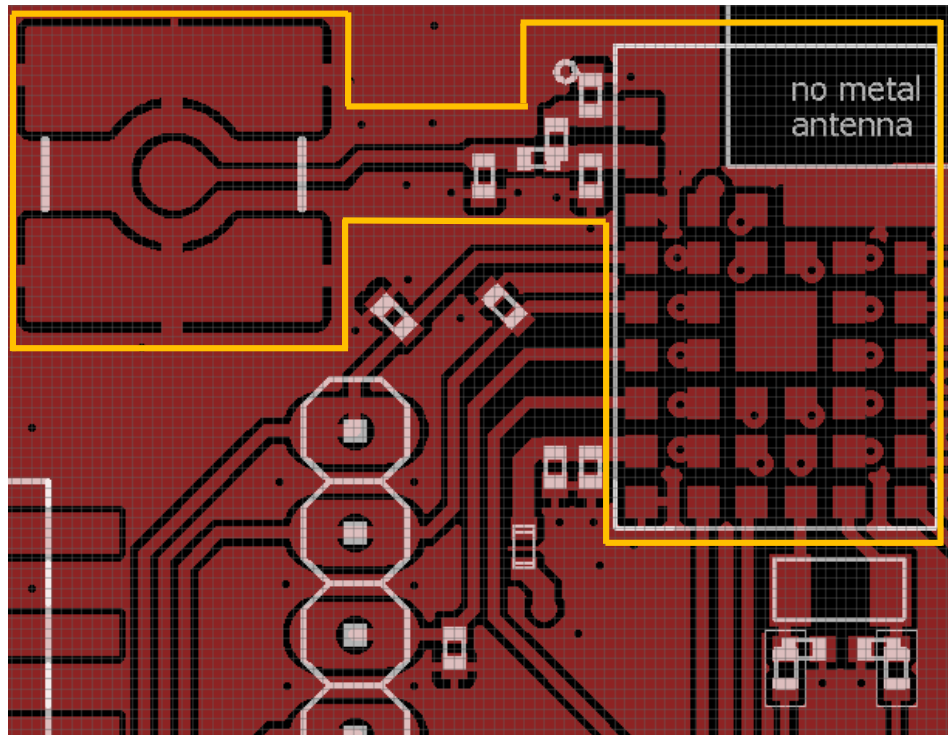


Figure 11: Trace design: Schematic

12. Manufacturing information

12.1. Moisture sensitivity level

This wireless connectivity product is categorized as JEDEC Moisture Sensitivity Level 3 (MSL3), which requires special handling.

More information regarding the MSL requirements can be found in the IPC/JEDEC J-STD-020 standard on www.jedec.org.

More information about the handling, picking, shipping and the usage of moisture/reflow and/or process sensitive products can be found in the IPC/JEDEC J-STD-033 standard on www.jedec.org.

12.2. Soldering

12.2.1. Reflow soldering

Attention must be paid on the thickness of the solder resist between the host PCB top side and the modules bottom side. Only lead-free assembly is recommended according to JEDEC J-STD020.

Profile feature		Value
Preheat temperature, min	$T_{S \text{ Min}}$	150 °C
Preheat temperature, max	$T_{S \text{ Max}}$	200 °C
Preheat time from $T_{S \text{ Min}}$ to $T_{S \text{ Max}}$	t_S	60 - 120 s
Ramp-up rate (T_L to T_P)		3 °C/s max.
Liquidous temperature	T_L	217 °C
Time t_L maintained above T_L	t_L	60 - 150 s
Peak package body temperature	T_P	260 °C
Time within 5 °C of actual peak temperature	t_P	20 - 30 s
Ramp-down rate (T_P to T_L)		6 °C/s max.
Time 20 °C to T_P		8 min max.

Table 16: Classification reflow soldering profile, Note: refer to IPC/JEDEC J-STD-020E

It is recommended to solder this module on the last reflow cycle of the PCB. For solder paste use a LFM-48W or Indium based SAC 305 alloy (Sn 96.5 / Ag 3.0 / Cu 0.5 / Indium 8.9HF / Type 3 / 89 %) type 3 or higher.

The reflow profile must be adjusted based on the thermal mass of the entire populated PCB, heat transfer efficiency of the reflow oven and the specific type of solder paste used. Based on the specific process and PCB layout the optimal soldering profile must be adjusted and verified. Other soldering methods (e.g. vapor phase) have not been verified and have to be validated by the customer at their own risk. Rework is not recommended.

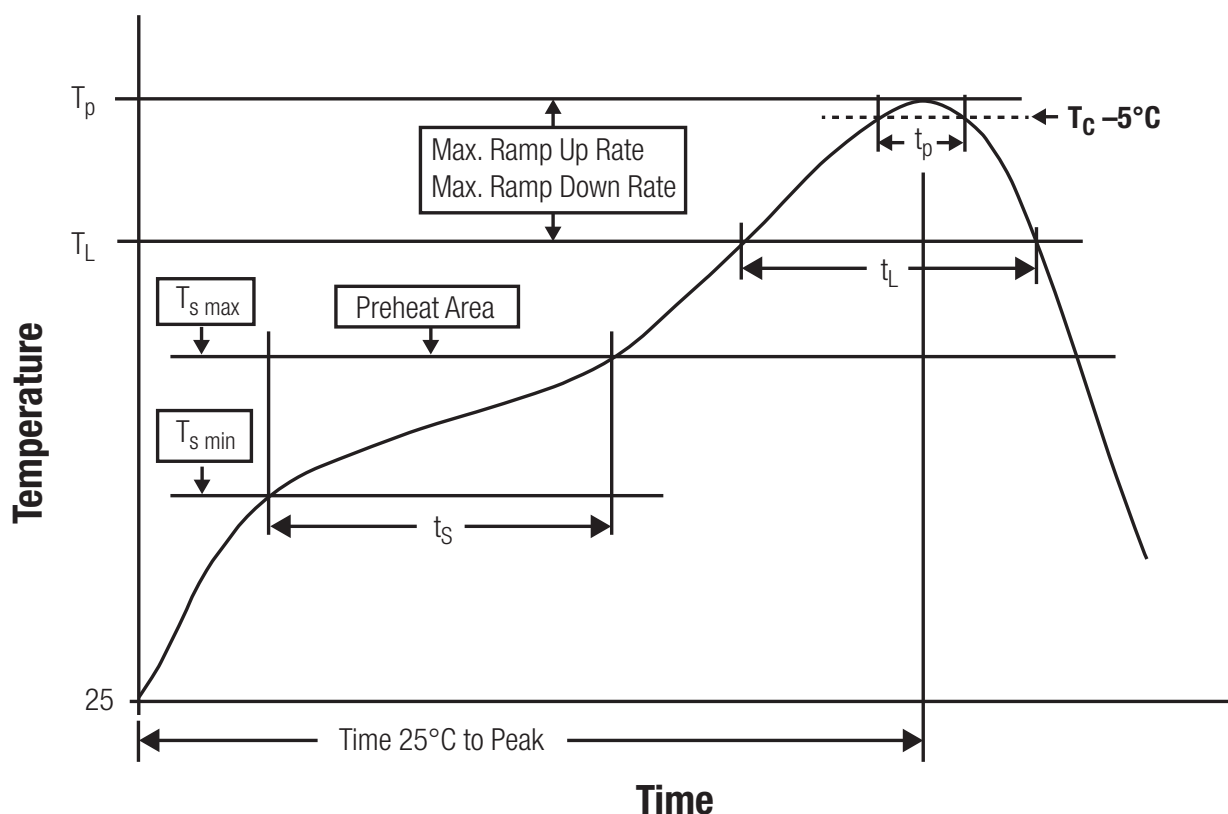


Figure 12: Reflow soldering profile

After reflow soldering, visually inspect the board to confirm proper alignment.

12.2.2. Cleaning

Do not clean the product. Any residue cannot be easily removed by washing. Use a "no clean" soldering paste and do not clean the board after soldering.

- Do not clean the product with water. Capillary effects can draw water into the gap between the host PCB and the module, absorbing water underneath it. If water is trapped inside, it may short-circuit adjoining pads. The water may also destroy the label and ink-jet printed text on it.
- Cleaning processes using alcohol or other organic solvents may draw solder flux residues into the housing, which won't be detected in a post-wash inspection. The solvent may also destroy the label and ink-jet printed text on it.
- Do not use ultrasonic cleaning as it will permanently damage the part, particularly the crystal oscillators.

12.2.3. Potting and coating

- If the product is potted in the customer application, the potting material might shrink or expand during and after hardening. Shrinking could lead to an incomplete seal, allowing contaminants into the component. Expansion could damage components. We recommend a manual inspection after potting to avoid these effects.
- Conformal coating or potting results in loss of warranty.
- The RF shield will not protect the part from low-viscosity coatings and potting. An undefined amount of coating and potting will enter inside the shielding.
- Conformal coating and potting will influence the parts of the radio front end and consequently influence the radio performance.
- Potting will influence the temperature behavior of the device. This might be critical for components with high power.

12.2.4. Other notations

- Do not attempt to improve the grounding by forming metal strips directly to the EMI covers or soldering on ground cables, as it may damage the part and will void the warranty.
- Always solder every pad to the host PCB even if some are unused, to improve the mechanical strength of the module.
- The part is sensitive to ultrasonic waves, as such do not use ultrasonic cleaning, welding or other processing. Any ultrasonic processing will void the warranty.

12.3. ESD handling

This product is highly sensitive to electrostatic discharge (ESD). As such, always use proper ESD precautions when handling. Make sure to handle the part properly throughout all stages of production, including on the host PCB where the module is installed. For ESD ratings, refer to the module series' maximum ESD section. For more information, refer to the relevant chapter 4. Failing to follow the aforementioned recommendations can result in severe damage to the part.

- The first contact point when handling the PCB is always between the local GND and the host PCB GND, unless there is a galvanic coupling between the local GND (for example work table) and the host PCB GND.
- Before assembling an antenna patch, connect the grounds.
- While handling the RF pin, avoid contact with any charged capacitors and be careful when contacting any materials that can develop charges (for example coaxial cable with around 50-80 pF/m, patch antenna with around 10 pF, soldering iron etc.)
- Do not touch any exposed area of the antenna to avoid electrostatic discharge. Do not let the antenna area be touched in a non ESD-safe manner.
- When soldering, use an ESD-safe soldering iron.

12.4. Safety recommendations

It is your duty to ensure that the product is allowed to be used in the destination country and within the required environment. Usage of the product can be dangerous and must be tested and verified by the end user. Be especially careful of:

- Use in areas with risk of explosion (for example oil refineries, gas stations).
- Use in areas such as airports, aircraft, hospitals, etc., where the product may interfere with other electronic components.

It is the customer's responsibility to ensure compliance with all applicable legal, regulatory and safety-related requirements as well as applicable environmental regulations. Disassembling the product is not allowed. Evidence of tampering will void the warranty.

- Compliance with the instructions in the product manual is recommended for correct product set-up.
- The product must be provided with a consolidated voltage source. The wiring must meet all applicable fire and security prevention standards.
- Handle with care. Avoid touching the pins as there could be ESD damage.

Be careful when working with any external components. When in doubt consult the technical documentation and relevant standards. Always use an antenna with the proper characteristics.



Würth Elektronik eiSos radio modules with high output power of up to 500 mW generate a large amount of heat while transmitting. The manufacturer of the end device must take care of potentially necessary actions for his application.

13. Product testing

13.1. Würth Elektronik eiSos in-house production tests

To achieve a high quality standard, Würth Elektronik eiSos follows a philosophy of supplying fully tested radio modules. At the end of the production process, every unit undergoes an optical inspection. Here the quality of soldering, edge castellation and edge milling is monitored.

If this has been passed, the radio modules are handed over to the automatic test equipment for the electrical characterization. This includes:

- Voltage and current tests to ensure proper electrical performance
- RF characteristics (frequency, spectrum, TX power) measurement and calibration
- Radio communication tests
- Firmware and serial number programming
- Host interface communication tests

The automated testing process is logged for internal quality control. The gained measurement data of each unit is analysed to detect defective parts and investigate the corresponding root cause. Defective radio modules are discarded, in order to guarantee a 100% failure-free delivery to customers.

13.2. EMS production tests

The rigorous in-series production testing ensures that EMS don't need to duplicate firmware tests or measurements. This streamlines the process and eliminates the need for additional testing over analogue and digital interfaces during device production. When it comes to device testing, the ideal focus should be on module assembly quality:

- All module pins are soldered properly on the base PCB
- There are no short circuits
- The mounting process did not damage the module
- The communication between host and radio module is working
- The antenna is connected properly

Simple "Go/No go" tests, like checking the RSSI value, give already a hint if the power supply and antenna have been connected properly.

In addition to such standard testing procedures, radio module integrators have the flexibility to perform additional dedicated tests to thoroughly evaluate the device. Specific tests they can consider are:

- Measure module current consumption in a specified operating state. Deviations from expected results (compared to a "Golden Device") can signal potential issues.

- Perform functional tests, including communication checks with the host controller and verification of interfaces.
- Assess fundamental RF characteristics (modulation accuracy, power levels, spectrum). Verify that the device meets expected performance standards.

14. Physical specifications

14.1. Dimensions

Dimensions
12 x 8 x 2.3 mm

Table 17: Dimensions

14.2. Weight

Weight
< 1 g

Table 18: Weight

14.3. Module drawing

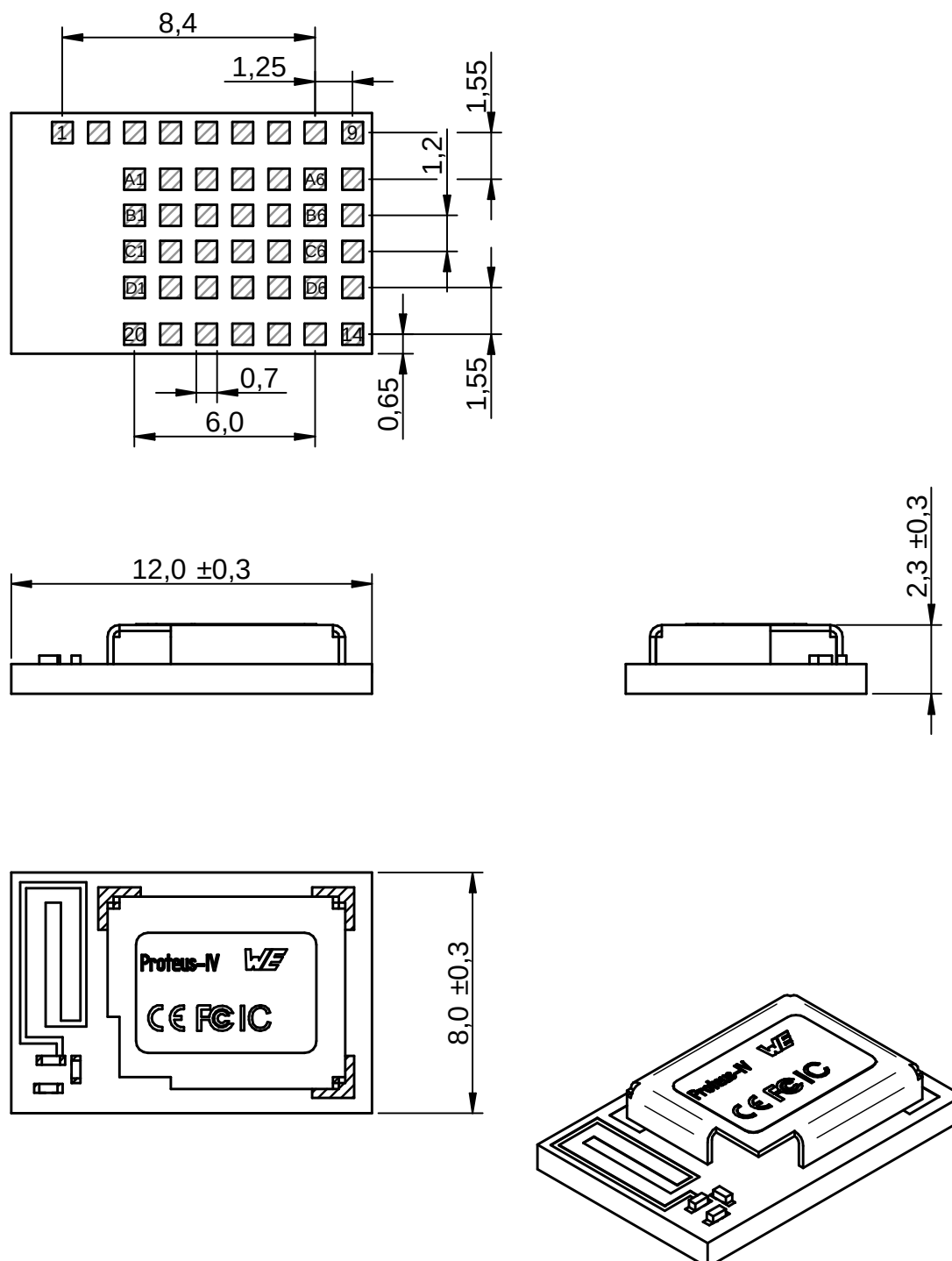


Figure 13: Module dimensions [mm]

14.4. Footprint

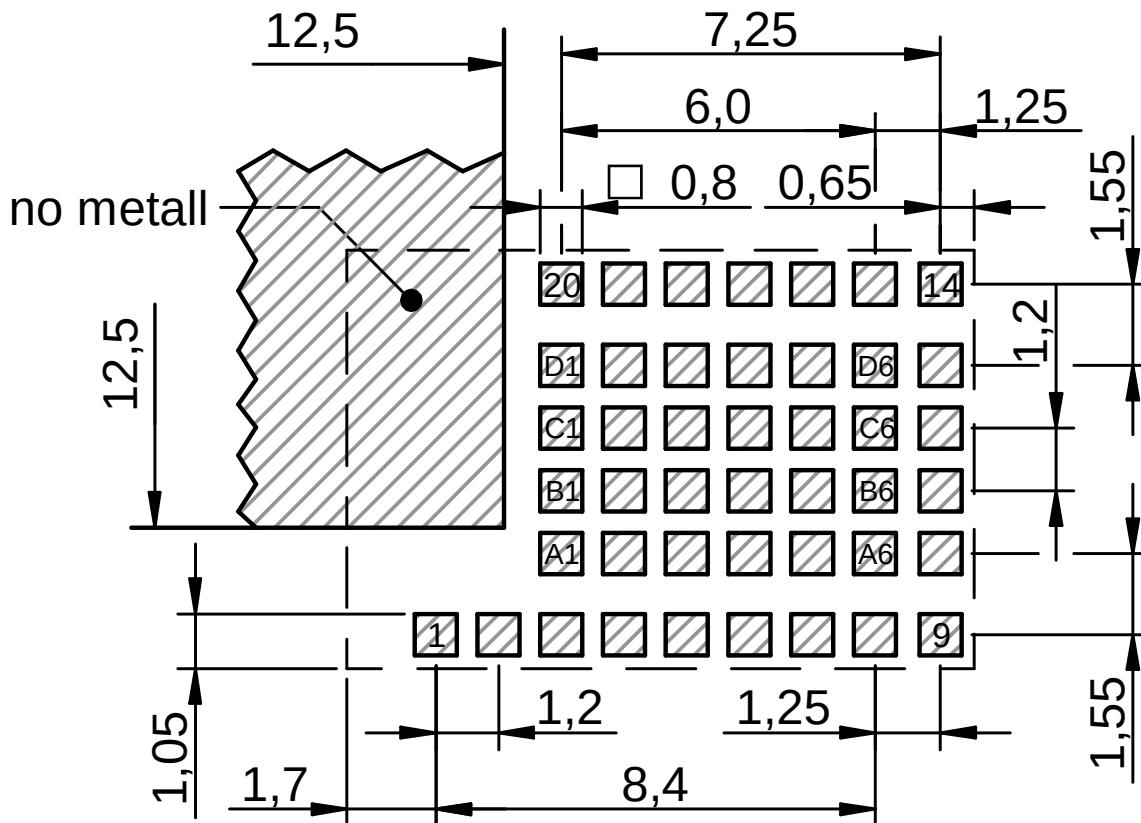


Figure 14: Footprint [mm]

14.5. Antenna free area

To avoid influence and mismatching of the antenna the recommended free area around the antenna should be maintained. As rule of thumb a minimum distance of metal parts to the antenna of $\lambda/10$ should be kept (see figure 14). Even though metal parts would influence the characteristic of the antenna, but the direct influence and matching keep an acceptable level.

15. Marking

15.1. Lot number

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

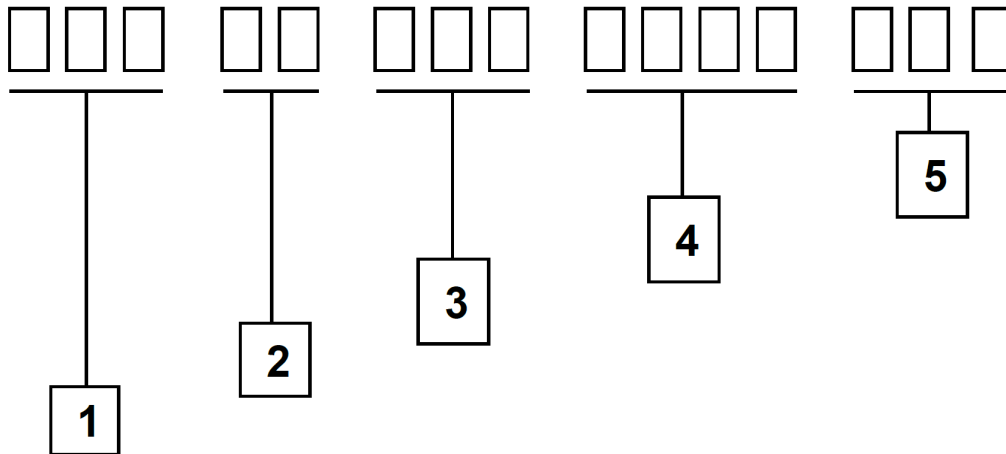


Figure 15: Lot number structure

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

Table 19: Lot number details

As the user can perform a firmware update the printed lot number only shows the factory delivery state. The currently installed firmware can be requested from the module using the corresponding product specific command. The firmware version as well as the hardware version are restricted to show only major and minor version not the patch identifier. Block 5 is not applicable for products without firmware.

15.2. General labeling information

Labels of Würth Elektronik eiSos radio modules include several fields. Besides the manufacturer identification, the product's *WE* order code, serial number and certification information are placed on the label. In case of small labels, additional certification marks are placed on the label of the reel.

The information on the label are fixed. Only the serial number changes with each entity of the radio module. For Proteus-IV the label is as follows:

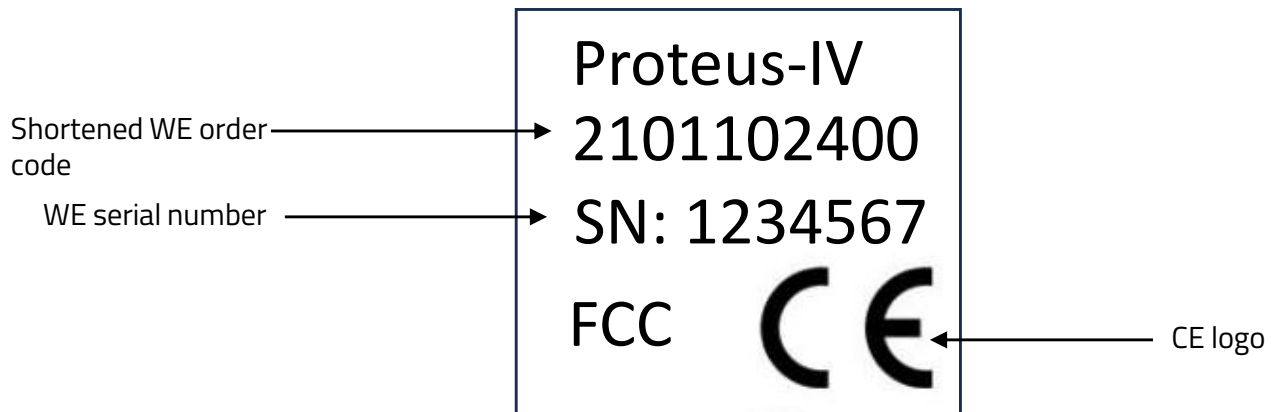


Figure 16: Label of the Proteus-IV

16. Information for explosion protection

In case the end product should be used in explosion protection areas the following information can be used:

- The module itself is unfused.
- The maximum output power of the module is 7.5 dBm for external antenna and 2 dBm for internal antenna.
- The total amount of capacitance of all capacitors is 14.62 μF .
- The total amount of inductance of all inductors is 4.71 μH .

17. Bluetooth® SIG listing/qualification

Type	Data
Design name	2621011024000
DN	
Specification name	6.0
Project type	Core Complete

Each product containing intellectual property of the Bluetooth® Special Interest Group (SIG) must be qualified by the SIG to obtain the corresponding Declaration ID.

Due to the qualification of the Proteus-IV as end product no further Bluetooth® tests are required. The only arising expenses are those for purchasing a Bluetooth® Declaration ID.

To obtain the Bluetooth® qualification of the end device, refer to the application note ANR027 [2].

18. Regulatory compliance information

18.1. Important notice EU

The use of RF frequencies is limited by national regulations. The Proteus-IV has been designed to comply with the RED directive 2014/53/EU of the European Union (EU).

The Proteus-IV can be operated without notification and free of charge in the area of the European Union. However, according to the RED directive, restrictions (e.g. in terms of duty cycle or maximum allowed RF power) may apply.

Modifications (2014/53/EU article 3 (i))

Caution: Changes or modifications for this equipment not expressly approved by Würth Elektronik eiSos may void the CE conformity to operate this equipment.



Since the module itself is not fused the voltage supply shall be fed from a power source which is class PS2 according to EN 62368-1.

18.2. Important notice UKCA

The UK's government has laid legislation to continue recognition of current EU requirements for a range of product regulations, including the CE marking. The Radio Equipment Regulation 2017/1206 is within the scope of this announcement, among others.

Consequently, the Proteus-IV can be sold and utilized in the UK with the CE marking, without the need of UKCA declaration of conformity or UKCA marking.

Source: <https://www.gov.uk/guidance/ce-marking>

18.3. Important notice FCC

The use of RF frequencies is limited by national regulations. The Proteus-IV has been designed to comply with the FCC Part 15.

The Proteus-IV can be operated without notification and free of charge in the area of the United States of America. However, according to the FCC Part 15, restrictions (e.g. in terms of maximum allowed RF power and antenna) may apply.

18.4. Conformity assessment of the final product

The Proteus-IV is a subassembly. It is designed to be embedded into other products (products incorporating the Proteus-IV are henceforward referred to as "final products").

It is the responsibility of the manufacturer of the final product to ensure that the final product is in compliance with the essential requirements of the underlying national radio regulations.

The conformity assessment of the subassembly Proteus-IV carried out by Würth Elektronik eiSos does not replace the required conformity assessment of the final product.

18.5. 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.

18.6. EU Declaration of conformity



EU DECLARATION OF CONFORMITY

Radio equipment: 2621011024000

The manufacturer: Würth Elektronik eiSos GmbH & Co. KG
Max-Eyth-Straße 1
74638 Waldenburg

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Object of the declaration: 2621011024000

The object of the declaration described above is in conformity with the relevant Union harmonisation legislation Directive 2014/53/EU. Following harmonised norms or technical specifications have been applied:

EN 300 328 V2.2.2 (2019-07)
EN 301 489-1 V2.2.3 (2019-11)
EN 301 489-17 V3.2.4 (2020-09)
EN 62479 : 2010
EN 62368-1:2014 + AC:2015 + A11:2017 + AC:2017
2011/65/EU with its amending Annex II EU 2015/863

i.A. G. Eschardt

Trier, 12th of August 2025

Place and date of issue

18.7. FCC Compliance Statement (US)

FCC ID: R7T2101102

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
 - (2) this device must accept any interference received, including interference that may cause undesired operation.
- (FCC 15.19)

Modifications (FCC 15.21)

Caution: Changes or modifications for this equipment not expressly approved by Würth Elektronik eiSos may void the FCC authorization to operate this equipment.

18.8. IC Compliance Statement (Canada)

Certification Number: 5136A-2101102

HVIN: 2101102

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

18.9. FCC and IC requirements to OEM integrators

This module has been granted modular approval. OEM integrators for host products may use the module in their final products without additional FCC/IC (Industry Canada) certification if they meet the following conditions. Otherwise, additional FCC/IC approvals must be obtained. The host product with the module installed must be evaluated for simultaneous transmission requirements.

- The users manual for the host product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC/IC RF exposure guidelines.
- A label must be affixed to the outside of the host product with the following statements:
This device contains FCC ID: R7T2101102
This equipment contains equipment certified under IC ID: 5136A-2101102
- The final host / module combination may also need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.
- If the final host / module combination is intended for use as a portable device (see classifications below) the host manufacturer is responsible for separate approvals for the SAR requirements from FCC Part 2.1093 and RSS-102.

OEM requirements:

The OEM must ensure that the following conditions are met.

- The Proteus-IV will be used at a distance of at least 10 mm to the human body.
- End users of products, which contain the module, must not have the ability to alter the firmware that governs the operation of the module. The agency grant is valid only when the module is incorporated into a final product by OEM integrators.
- The end-user must not be provided with instructions to remove, adjust or install the module.
- The Original Equipment Manufacturer (OEM) must ensure that FCC labeling requirements are met. This includes a clearly visible label on the outside of the final product. Attaching a label to a removable portion of the final product, such as a battery cover, is not permitted.
- The label must include the following text:
Contains FCC ID: R7T2101102
The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(i.) this device may not cause harmful interference and
(ii.) this device must accept any interference received, including interference that may cause undesired operation.

When the device is so small or for such use that it is not practicable to place the statement

above on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

- The user manual for the end product must also contain the text given above.
 - Changes or modifications not expressly approved could void the user's authority to operate the equipment.
 - The OEM must ensure that timing requirements according to 47 CFR 15.231(a-c) are met.
 - The OEM must sign the OEM Modular Approval Agreement.
 - The module must be used with only the following approved antenna(s).

18.9.1. Pre-certified antennas

The Proteus-IV is pre-certified with the following antennas.

Product	Certified antenna
Proteus-IV (2621011024000)	PCB antenna included in the Proteus-IV

19. References

- [1] Bluetooth®. Bluetooth® Core Specification, version 6.0. <https://www.bluetooth.com/specifications/specs/core-specification-6-0/>.
- [2] Würth Elektronik. Application note 27 - Bluetooth listing guide. <http://www.we-online.com/ANR027>.

20. 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 20 and 20 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.

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.

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.

21. Legal notice

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.

Notwithstanding anything above, Würth Elektronik eiSos GmbH & Co. KG makes no representations and/or warranties of any kind for the

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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 information 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.

Trademarks

AMBER wireless is a registered trademark of Würth Elektronik eiSos GmbH & Co. KG. All other trademarks, registered trademarks, and product names are the exclusive property of the respective owners.

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.

22. 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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A. Additional CRC8 Information

This Annex gives an example CRC8 implementation and test vectors.

A.1. Example CRC8 Implementation

```
#include <stdint.h>

uint8_t Get_CRC8(uint8_t * bufP, uint16_t len)
{
    uint8_t crc = 0x00;
    for (uint16_t i = 0; i < len; i++)
    {
        crc ^= bufP[i];
    }
    return crc;
}
```

Code 1: Example CRC8 Implementation

A.2. CRC8 Test Vectors

Input data	Data length	Resulting CRC8
Null	0	0x00
0x02 0x01 0x00 0x00	4	0x03
0x02 0x87 0x01 0x00 0x16	5	0x92
0x02 0x04 0x04 0x00 0x41 0x42 0x43 0x44	8	0x06
0x02 0x88 0x07 0x00 0x00 0x55 0x00 0x00 0xDA 0x18 0x00	11	0x1A

Table 20: CRC8 Test Vectors

B. Example code for host integration

The following code is an example implementation of a function to transmit data using a 2 byte length field in the command frame. For demonstration reasons, the Proteus-III has been taken. The full function codes of all radio modules are available in the Wireless Connectivity SDK (www.we-online.com/wco-SDK).

```
#define CMD_PAYLOAD_MAX 964
typedef struct {
    uint8_t Stx;
    uint8_t Cmd;
    uint16_t Length;           /* LSB first */
    uint8_t Data[CMD_PAYLOAD_MAX+1]; /* +1 for CRC8 */
} CMD_Frame_t;

#define CMD_OFFSET_TO_DATAFIELD 4
#define CMD_OVERHEAD (CMD_OFFSET_TO_DATAFIELD+1)

bool ProteusIII_Transmit(uint8_t *PayloadP, uint16_t length)
{
    /* fill request message with STX, command byte and length field */
    CMD_Frame_t CMD_Frame;
    CMD_Frame.Stx = CMD_STX; /* 0x02 */
    CMD_Frame.Cmd = ProteusIII_CMD_DATA_REQ; /* 0x04 */
    CMD_Frame.Length = length;

    /* fill request message with user payload */
    memcpy(CMD_Frame.Data, PayloadP, length);

    /* fill request message with CRC8 */
    CMD_Frame.Data[CMD_Frame.Length] = Get_CRC8(&CMD_Frame, CMD_Frame.Length +
        CMD_OFFSET_TO_DATAFIELD);

    /* transmit full message via UART to radio module */
    UART_SendBytes(&CMD_Frame, (CMD_Frame.Length + CMD_OVERHEAD));

    /* wait for response message from radio module */
    return UART_Wait_for_Response(CMD_WAIT_TIME, ProteusIII_CMD_TXCOMPLETE_RSP,
        CMD_Status_Success, true);
}
```

Code 2: Example function implementation for radio modules with 2 byte length field



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