WÜRTH ELEKTRONIK

EVALUATION BOARD MANUAL

FOR RADIO MODULES

WE order code	Former order code	Marketing Name
2607031281001	AMB8636	Thebe-I

VERSION 2.2

MARCH 5, 2019

Revision history

Manual version	HW version	Notes	Date
1.0-1.1	2.0	• Initial Version	June 2017
2.0	2.0	• New corporate design and structure	December 2018
2.1	2.0	• Added chapter `Regulatory compliance information`	February 2019
2.2	2.0	• Added Marketing name	March 2019

Abbreviations and abstract

Abbreviation	Name	Description
FSE	Field Sales Engineer	Support and sales contact person responsible for limited sales area
HIGH	High signal level	
LOW	Low signal level	
RF	Radio frequency	Describes everything relating to the wireless transmission.
UART	Universal Asynchronous Receiver Transmitter	Interface which allows communicating with the module of a specific interface.
VDD	Supply voltage	

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1 Supported radio modules

The evaluation board described in this manual can be used to evaluate the following products:

Order code	Former order code	Marketing Name
2607031281001	AMB8636	Thebe-I

Order code	Description
2607031281001	869MHz 500mW proprietary radio module, Band P

Table 1: Compatibility

Figure 1: Product image

2 Functional description

The evaluation board offers the user the possibility to develop hard- and software for the compatible radio module. It can be connected to an USB port of a PC.

For the connection to a microcontroller system the development board is equipped with a multi-pin connector which is connected to all pins of the RF module. Jumpers allow the module to be disconnected from components which are not required such as the USB interface.

Feel free to check our youtube channel for video tutorials, hands-ons and webinars related to our products:
www.youtube.com/user/WuerthElektronik/videos

2.1 Taking into operation

To run the evaluation board place the jumpers on default position as described in chapter 3.2.
The corresponding FTDI driver package (*www.ftdichip.com/Drivers/VCP.htm*) has to be installed on your PC.

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

The next step is to connect the evaluation board to the PC using an USB-cable. In that way a COM port can be detected and installed on your PC. Check the device manager to acquire the COM port name of the EV board. A typical name is "COM12" in Windows systems or /dev/ttyUSB0 in Linux systems.

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

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

3 Development board

3.1 Block diagram

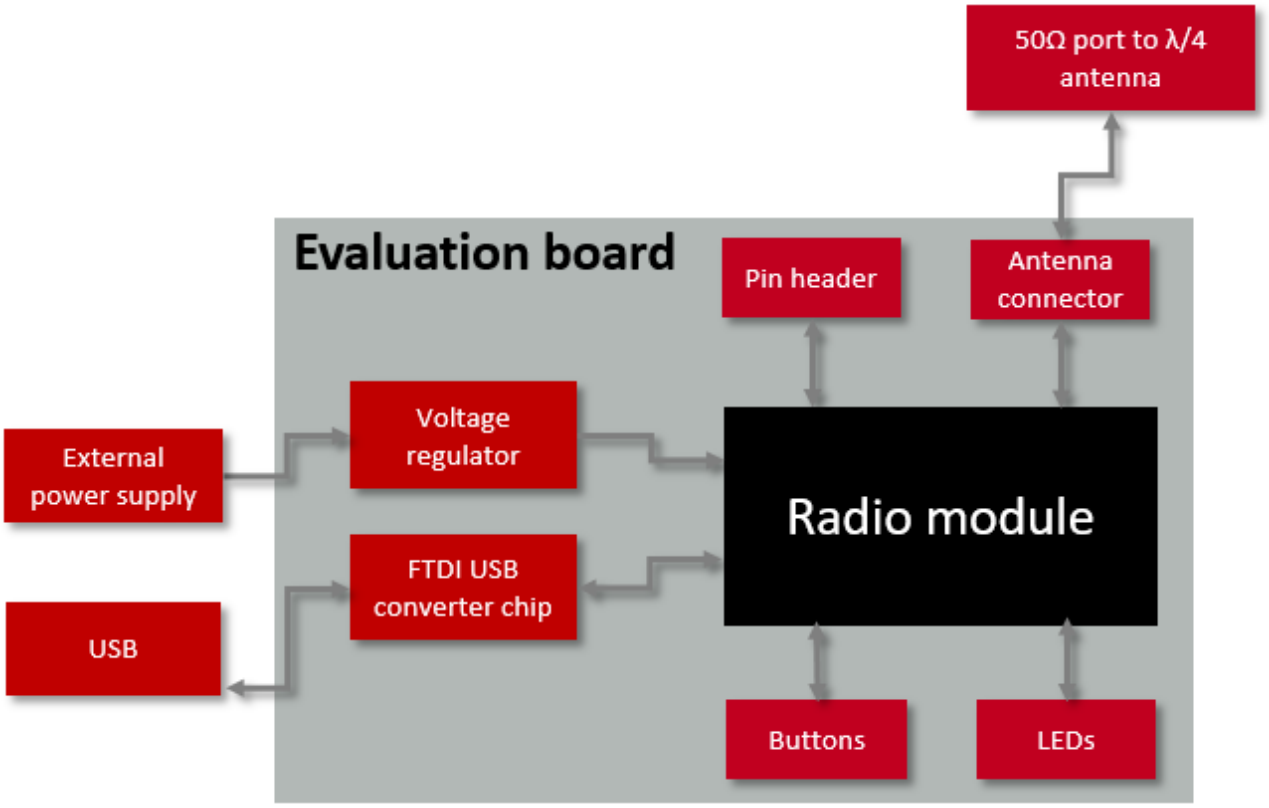

Figure 2: EV board block diagram

3.2 Jumpers

The following figure shows the default positioning (marked in red) of all jumpers on the EV board. This section also contains the details to any jumper connection that is supported by the EV board.

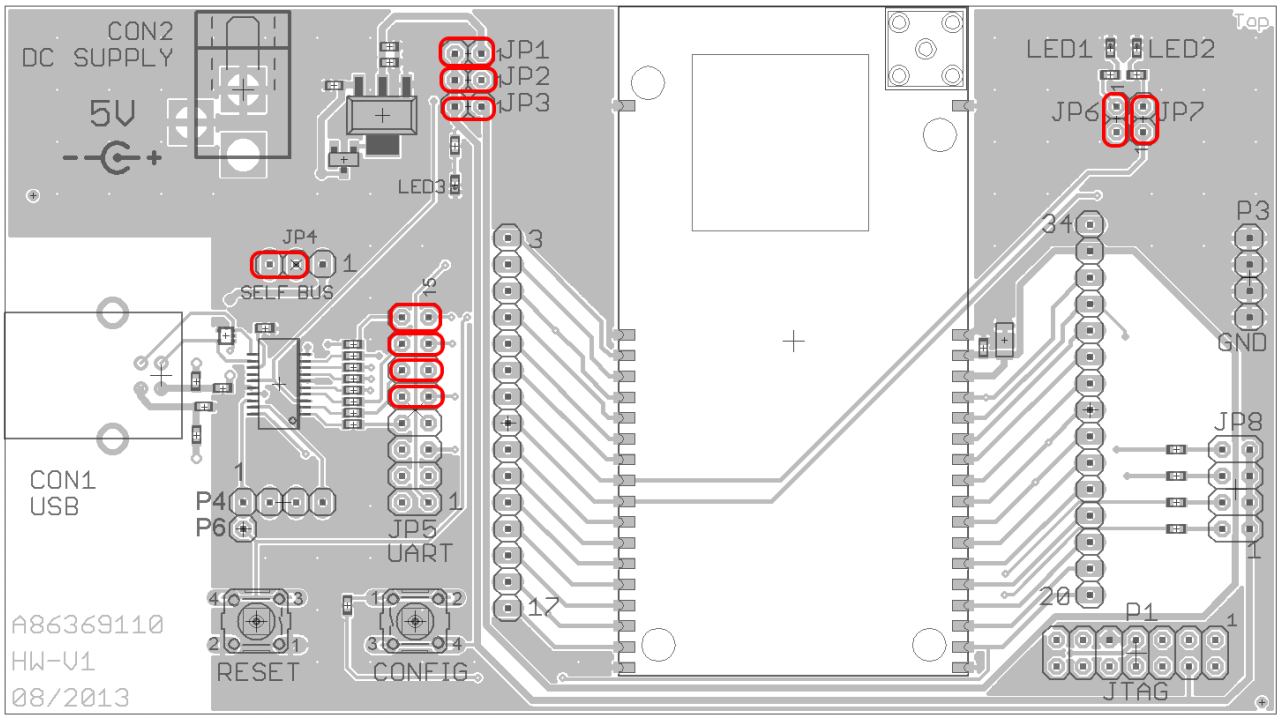

Figure 3: Jumpers, default

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

JP2	Jumper placed (default)	Description
1,2	Set	Connection for the power supply of the USB converter

JP3	Jumper placed (default)	Description
1,2	Set	Connection of the power supply toward the radio module (current measurement)

JP4	Jumper placed (default)	Description
1,2,3	2-3	Selection of the power supply, 1-2 USB powered, 2-3 external power supply

JP5	Jumper placed (default)	Description
1,2	Not set	RI host - PJ.2 module
3,4	Not set	DCD host - PJ.1 module
5,6	Not set	DSR host - PJ.0 module
7,8	Not set	DTR host - PJ.3 module
9,10	Set	/CTS host - /RTS module
11,12	Set	/RTS host - /CTS module
13,14	Set	UART RX host - UART TX module
15,16	Set	UART TX host - UART RX module

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

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

3.3 Connectors and pin headers

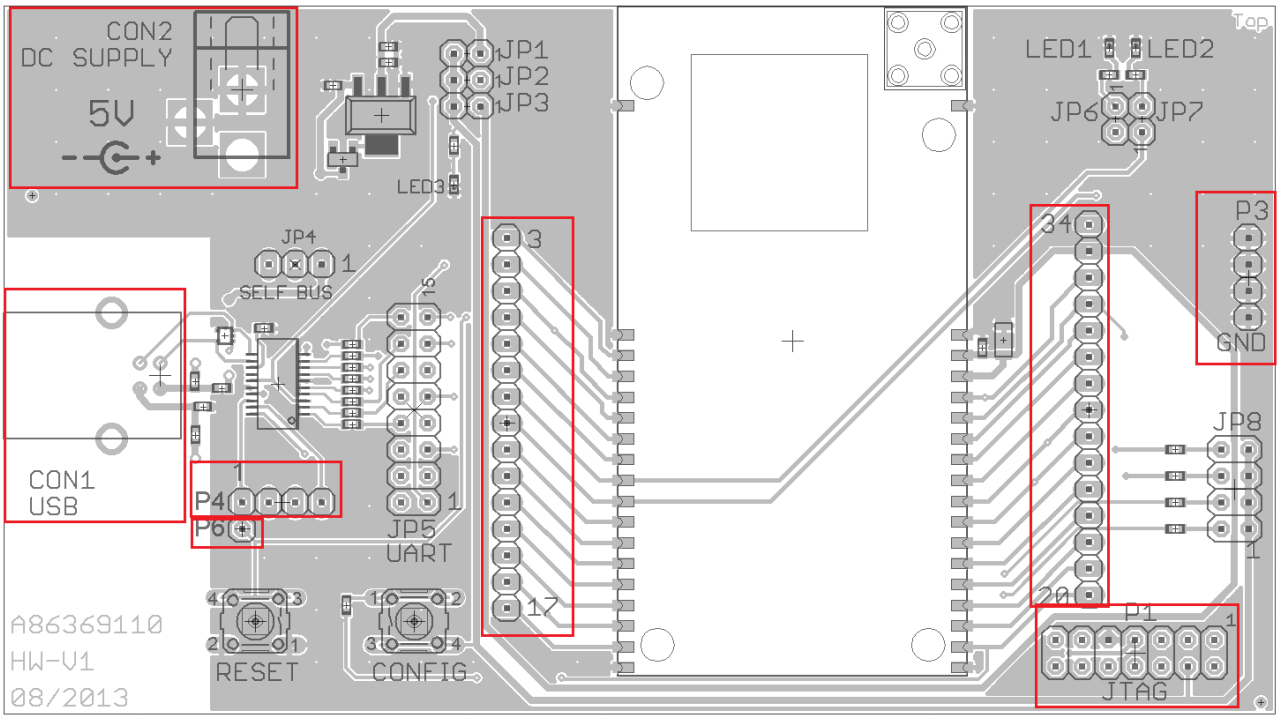

Figure 4: Connectors

CON1	Function	Description
-	USB	USB jack for USB interface

CON2	Function	Description
-	Power supply	Power jack for 5V power supply

P1	Function	Description
1-14	JTAG	JTAG-interface for programming, see chapter 3.5.5

P3	Function	Description
1-4	GND	Ground

P4	Function	Description
1-4	FTDI CBUS 0..3	connector to the 4 CBUS pins of FTDI

P6	Function	Description
1	RESET	connector to */RESET* pin of module, can be connected to P4-1 to provide access to the */RESET pin* through FTDI CBUS0.

	Description
3-17	Direct access to the signals of the radio module
20-34	Direct access to the signals of the radio module

3.4 Buttons

3.4.1 Reset button

Internally the active low reset input of the microprocessor is connected via a RC combination with the power supply to ensure a proper startup of the module. The module provides a */RESET* pin that is connected to this button so the module can be restarted properly. Please refer to the module specific manual for detailed information.
The reset is also available on pin 19 (P8) and P6.

3.4.2 Config button

By means of the Config pushbutton the module can be switched between the command mode and transparent mode.

The switching takes place after recognition of a falling edge on the */CONFIG* pin (pushing Config button) and is acknowledged through a respective command. The switching of the modes can only take place while no data is being received via RF (*/RTS* has to be low).
Please refer to the module specific manual for detailed information.

3.5 Function blocks

3.5.1 Power supply

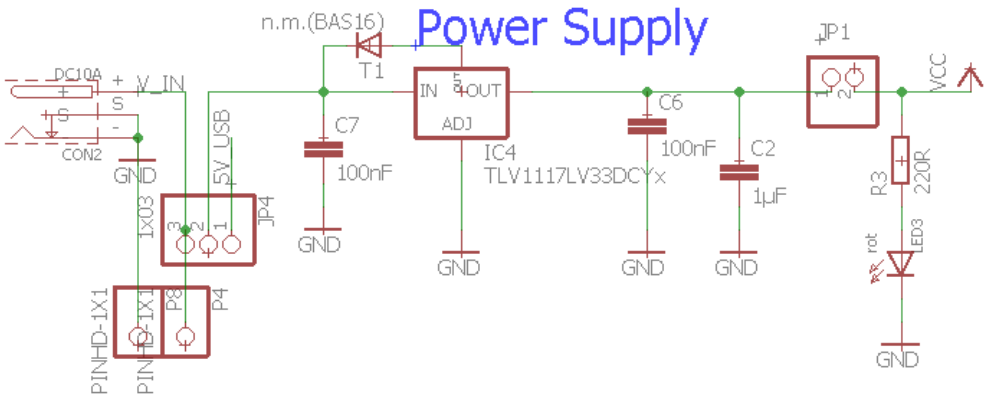

Figure 5: Power Supply Circuit

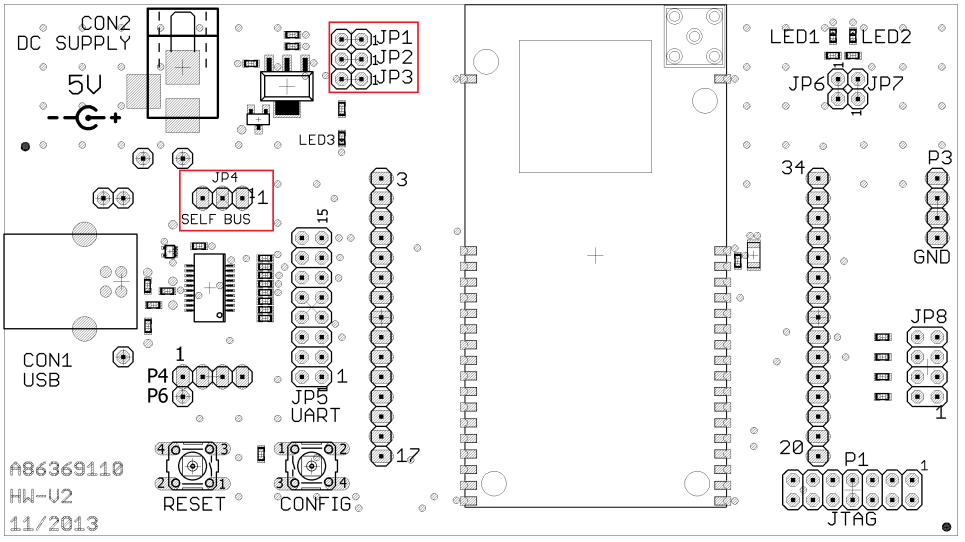

Figure 6: Power Supply Layout

3.5.1.1 Self powered, power jack

Make sure JP4 is in default position (2-3, "self powered") and JP2 jumper set.

The development board can be operated by connecting a 5V voltage source to the power jack. Pay special attention to the polarity before connecting the power jack to the board.

If the power supply is connected and the bridges on JP1, JP2, JP3 and JP4 are set correctly (as in the factory state), then the power LED3 should be ON.

The integrated voltage regulator regulates the connected 5V down to 3.3V with which the remaining parts of the circuit are supplied. Make sure that the power jack (or external power supply) is connected to the module and VCC is stable before the USB is connected to a PC.

3.5.1.2 Self powered, external power supply trough JP1-2

Remove the JP1 jumper.
JP1 should not be set in order to avoid voltage on the output of the integrated voltage regulator.

The radio module may be powered via pin 2 of JP1 (JP1-2) behind the voltage regulator. Applying GND to the board can take place via any P3 pin. Using the USB-interface in parallel to this power supply method (with JP2 jumper set) the voltage range of the external supply has to be kept in between 3.0V and 3.6V to operate the USB converter in its specified range.

When the power is connected the power LED3 will be on. Make sure that the power jack (or external power supply) is connected to the module and VCC is stable before the USB is connected to a PC.

3.5.1.3 Bus powered, power supply through USB

The radio module may be powered via USB connector (requires the JP4 to be placed at 1-2). As the module's peak current in TX mode is higher (see product specific manual) than the "Max Bus Power" configured in the FTDI IC this method is not recommended to be used as it may damage the connected PC permanently.

Supplying the board solely via USB is only recommended in case of receiving. When sending with high output power the supply of the board must be done via the power jack with jumper setting "self" to avoid damaging the USB-host through to too high power drain.

3.5.2 Current measurement

JP3 can be used to measure the power consumption of the module. By default a bridge is set on JP3 to close the circuit. Remove the bridge and connect a current meter in place of the jumper to measure the power consumption of the module.

If the meter is not attached and the bridge is not set, the module will not receive supply voltage. However, the power LED may be active, as it is connected prior to the current measurement bridge in order not to distort the module's power consumption.

Parts connected to the module, such as LEDs, can be separated from the module via JP6 and JP7. Power may also be supplied to the module via JP3 (2.0V - 3.6V). However, in this

case the USB converter will not be powered.

3.5.3 UART / USB

The UART of the module can be connected to the USB converter by setting the according jumpers (see defaults) to JP5 and is available on the USB jack so that the module can be connected directly to a PC or host . Using the FTDI-driver the PC will show a virtual COM-Port which can be used to communicate with the module.
Verify that the JP2 jumper is mounted (important for correct IO levels) and make sure that the power jack (or external power supply) is connected to the module and VCC is stable before the USB is connected to a PC.

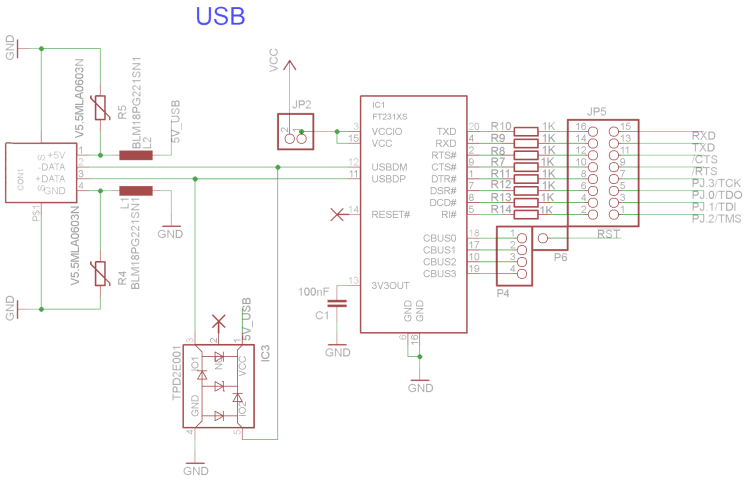

Figure 7: USB

3.5.4 UART direct

If a microcontroller is to be connected to the module, remove the bridges on JP5. The UART can be connected directly on the pin strip JP5 (all odd numbered pins). The module RXD line must be handled accordingly by your host (i.e. pulled up while inactive and during module boot-up).

Beware of IO level incompatibility. The host must obey the values stated in the module's manual. Especially the IO level restrictions must be implemented by a host system (i.e. using a level shifter to use the allowed IO levels).

3.5.5 Programming interface

The evaluation board provides a 2*7 pin connector (P1) in 2.54 RM to connect directly to a JTAG flash adapter used for development. Please take care of the correct mounting of the flash adapter (Pin 1 is marked as such).

3.6 Schematic

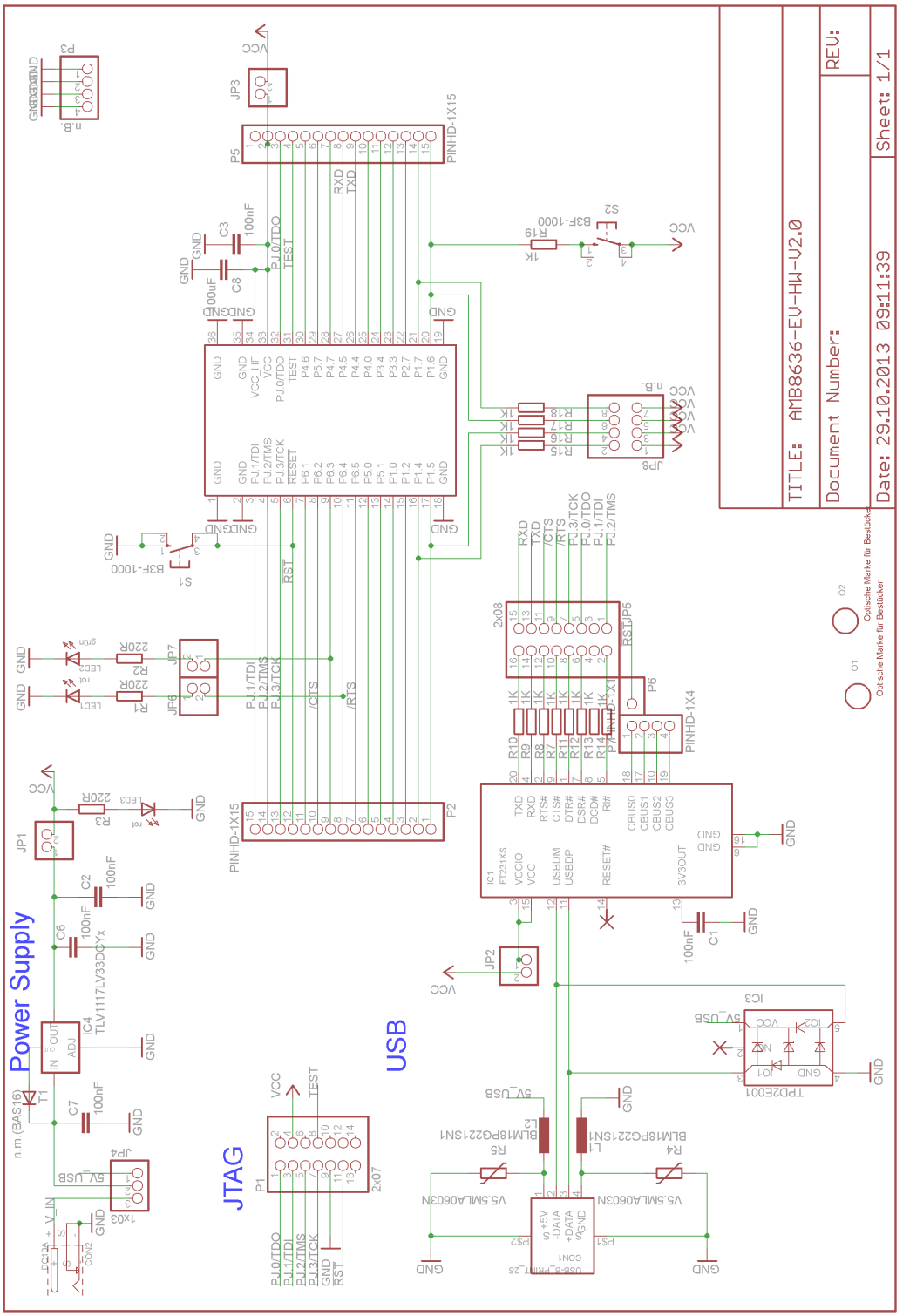

Figure 8: Wiring diagram

3.7 Full layout

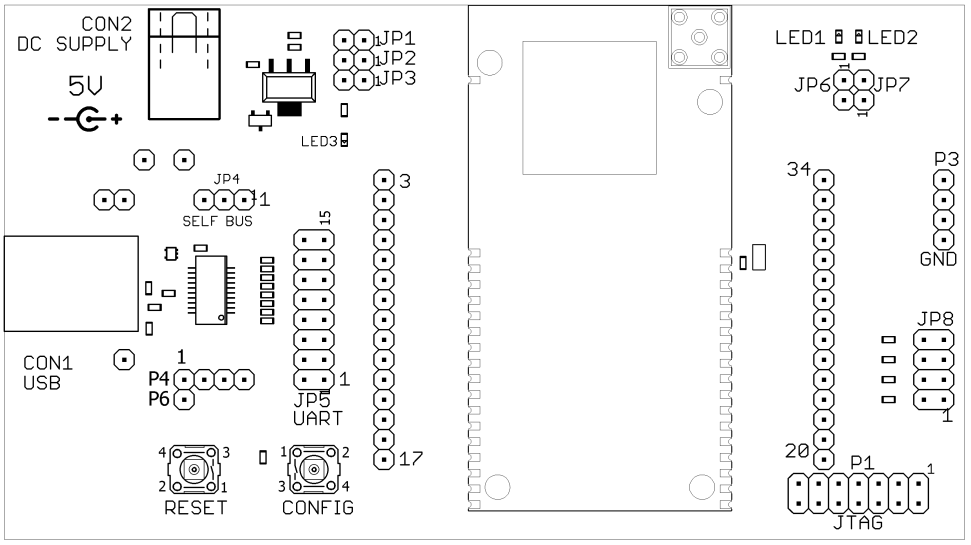

Figure 9: Assembly diagram

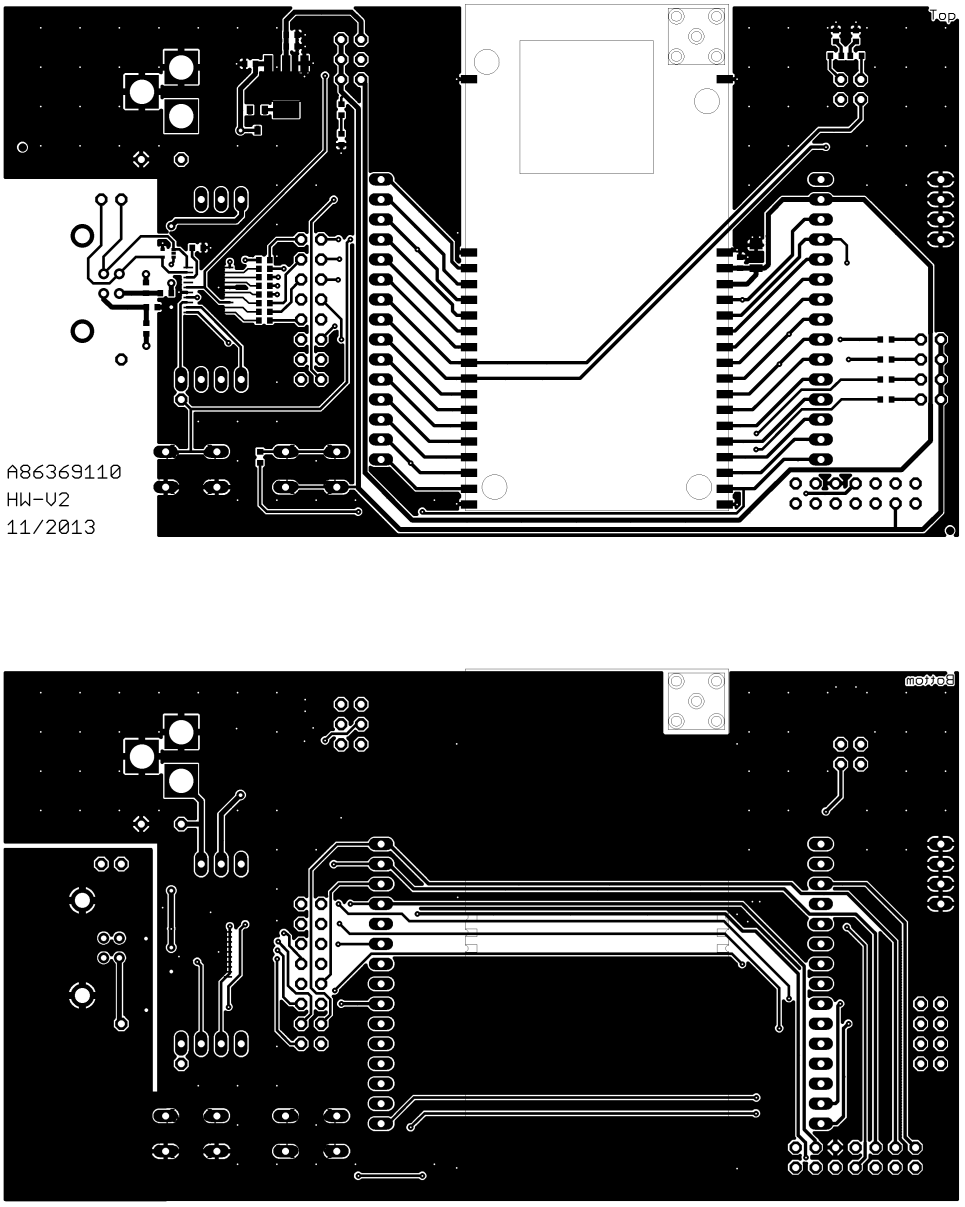

Figure 10: Top and Bottom Layer

4 Regulatory compliance information

Pursuant to Article 1 (2.) of the EU directive 2014/53/EU, Article 1 (2.) the directive does not apply to equipment listed in Annex I (4.): custom-built evaluation kits destined for professionals to be used solely at research and development facilities for such purposes.

4.1 Exemption clause

Relevant regulation requirements are subject to change. Würth Elektronik eiSos does not guarantee the accuracy of the before mentioned information. Directives, technical standards, procedural descriptions and the like may be interpreted differently by the national authorities. Equally, the national laws and restrictions may vary with the country. In case of doubt or uncertainty, we recommend that you consult with the authorities or official certification organizations of the relevant countries. Würth Elektronik eiSos is exempt from any responsibilities or liabilities related to regulatory compliance.

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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 and firmware parts contained in or used with or for products in the wireless connectivity product range of Würth Elektronik eiSos GmbH & Co. KG . In certain customer applications requiring a high level of safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health, it must be ensured by most advanced technological aid of suitable design of the customer application that no injury or damage is caused to third parties in the event of malfunction or failure of an electronic component.

5.3 Best care and attention

Any product-specific datasheets, 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.

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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.

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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 hard- or firmware. In case of further queries regarding the PCN, the field sales engineer, the internal sales person or the technical support team in charge should be contacted. The basic responsibility of the customer as per section 5.1 and 5.2 remains unaffected.

5.6 Product life cycle

Due to technical progress and economical evaluation we also reserve the right to discontinue production and delivery of products. As a standard reporting procedure of the Product Termination Notification (PTN) according to the JEDEC-Standard we will inform at an early stage about inevitable product discontinuance. According to this, we cannot ensure that all products within our product range will always be available. Therefore, it needs to be verified with the field sales engineer or the internal sales person in charge about the current product availability expectancy before or when the product for application design-in disposal is considered. The approach named above does not apply in the case of individual agreements deviating from the foregoing for customer-specific products.

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

7.8 Severability clause

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

7.9 Miscellaneous

This license agreement constitutes the entire understanding and merges all prior discussions between the parties relating to this license agreement.
No ancillary verbal agreements have been made and no such agreements shall be valid. Any additions and amendments to this license agreement shall require the written form in order to be binding.
We recommend you to be updated about the status of new firmware, which is available on our website or in our data sheet, and to implement new firmware in your device where appropriate. In case only firmware is provided, we expressly exclude the automatic receipt of PCN information. Thus, new firmware will also not be provided automatically.
By ordering a wireless connectivity Product, you accept this license agreement in all terms.

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