

USER MANUAL

SERIAL(RS232/RS485) BRIDGE
FEATHERWING

2601167101001

VERSION 1.0

FEBRUARY 22, 2024

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

Revision history

Manual version	HW version	Notes	Date
1.0	2.0	Initial version	February 2024

Abbreviations

Abbreviation	Name	Description
CTS	Clear To Send	
DC	Direct Current	
EV	Evaluation	
ESD	Electro Static Discharge	
EMC	Electro Magnetic Compatibility	
GND	Ground	
HIGH	High signal level	
LED	Light Emitting Diode	
Li-Po	Lithium-Polymer	
LOW	Low signal level	
PCB	Printed Circuit Board	
RTS	Request To Send	
RX	Data Receive	
TX	Data Transmit	
UART	Universal Asynchronous Receive Transmit	Serial protocol
VCC		Supply voltage
VDD	Voltage Drain Drain	Supply voltage

Contents

1	General description	5
1.1	Introduction	5
1.2	Block diagram	6
1.3	Contents	6
2	Functional description	7
2.1	Adafruit Feather	7
2.2	Key features of the Serial(RS232/RS485) bridge FeatherWing	7
3	Hardware description	8
3.1	Connectors	8
3.1.1	CON1	8
3.1.2	Feather connector	9
3.2	Switches	11
3.2.1	S2	11
3.3	Jumpers	12
3.3.1	J1	12
3.3.2	J2	12
3.3.3	J3	13
3.4	LEDs	13
3.5	Schematics	14
3.6	Layout	15
4	Regulatory compliance information	18
4.1	Exemption clause	18
5	Important notes	19
5.1	General customer responsibility	19
5.2	Customer responsibility related to specific, in particular safety-relevant applications	19
5.3	Best care and attention	19
5.4	Customer support for product specifications	19
5.5	Product improvements	20
5.6	Product life cycle	20
5.7	Property rights	20
5.8	General terms and conditions	20
6	Legal notice	21
6.1	Exclusion of liability	21
6.2	Suitability in customer applications	21
6.3	Trademarks	21
6.4	Usage restriction	21
7	License terms	23
7.1	Limited license	23
7.2	Usage and obligations	23
7.3	Ownership	24

7.4	Firmware update(s)	24
7.5	Disclaimer of warranty	24
7.6	Limitation of liability	25
7.7	Applicable law and jurisdiction	25
7.8	Severability clause	25
7.9	Miscellaneous	25

1 General description

1.1 Introduction

The Würth Elektronik eiSos Serial(RS232/RS485) bridge FeatherWing is a development board that acts as a bridge between UART and RS232/RS485/RS422. It is fully compatible with the popular Adafruit Feather line of development boards and can be used as plug-and-play solution to connect any D-SUB9 interfaced device to the Feather ecosystem. This FeatherWing acts as a bridge between legacy RS232/RS485 devices and modern wired/wireless digital interfaces.

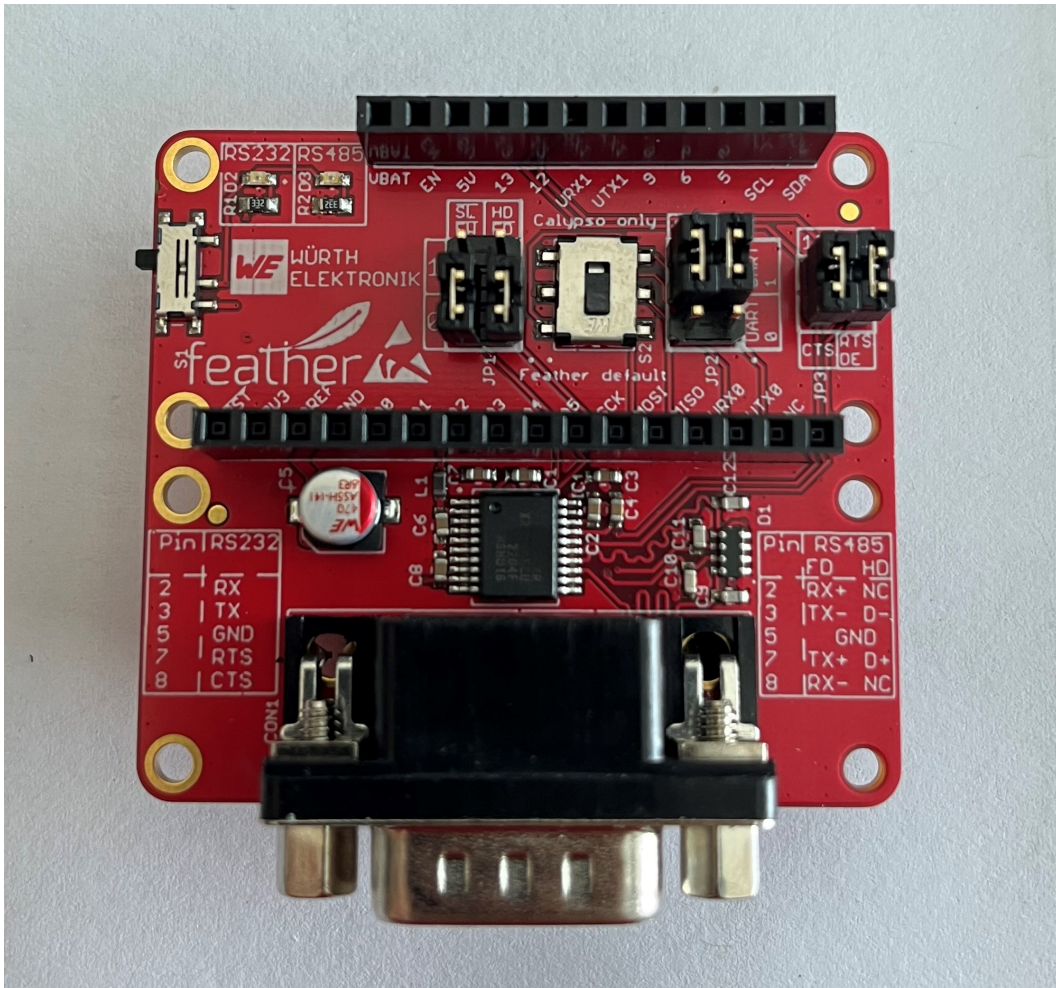


Figure 1: The WE Serial(RS232/RS485) bridge FeatherWing (2601167101001)

1.2 Block diagram

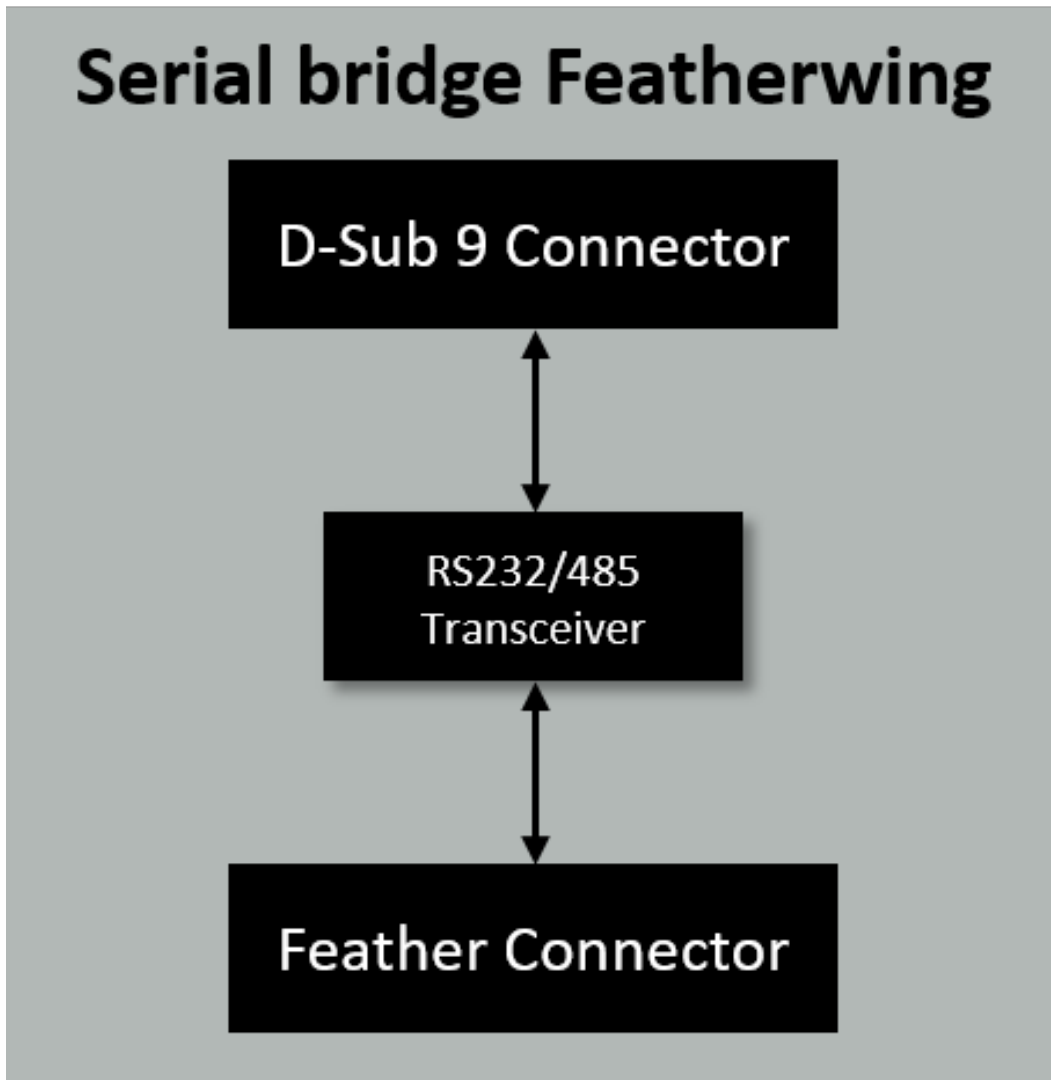


Figure 2: Block diagram - Serial(RS232/RS485) bridge FeatherWing

1.3 Contents

Description	Quantity
WE Serial(RS232/RS485) bridge FeatherWing	1
Packaging: ESD safe bag	1

Table 1: Contents 2601167101001

2 Functional description

The Serial(RS232/RS485) bridge FeatherWing was designed with rapid prototyping in mind. Being fully compatible with the Adafruit ecosystem, this FeatherWing allows the user the flexibility to choose the preferred host microcontroller.

The inherent modularity of the ecosystem allows the FeatherWing to be easily integrated into any project. The next sections provide a brief introduction to Adafruit's Feather ecosystem and details on the power modules.

Feel free to check our youtube channel:

www.youtube.com/user/WuerthElektronik/videos for video tutorials, hands-ons and webinars relating to our products.

2.1 Adafruit Feather

The Adafruit Feather ecosystem consists of two types of boards apart from a host of accessories:

- **Feather:** Adafruit Feathers are a complete line of development boards from Adafruit that are standalone and stackable. They can be powered either over the on-board micro-USB plugs or using a Li-Po battery. Feathers are portable, flexible and light as their namesake.
- **FeatherWing:** FeatherWings are stackable boards that when used along with a Feather add a certain functionality to the system.

The Feather system with more than 50+ Wings, several different types of accessories and arduino/circuit python based code support, provides a perfect ecosystem for rapid prototyping. Please refer to adafruit.com/feather for more details on the Adafruit Feather ecosystem.

2.2 Key features of the Serial(RS232/RS485) bridge FeatherWing

- 3V3 logic level UART interface on the Feather pin header.
- Support to 5V logic level
- RS232 with and without flow control
- Full and half duplex RS485
- Double throw slider to switch between RS232 and RS485

3 Hardware description

This section contains a detailed description of the hardware features of the Serial(RS232/RS485) bridge FeatherWing. The design files for this hardware can be downloaded from <https://github.com/WurthElektronik/FeatherWings>.

3.1 Connectors

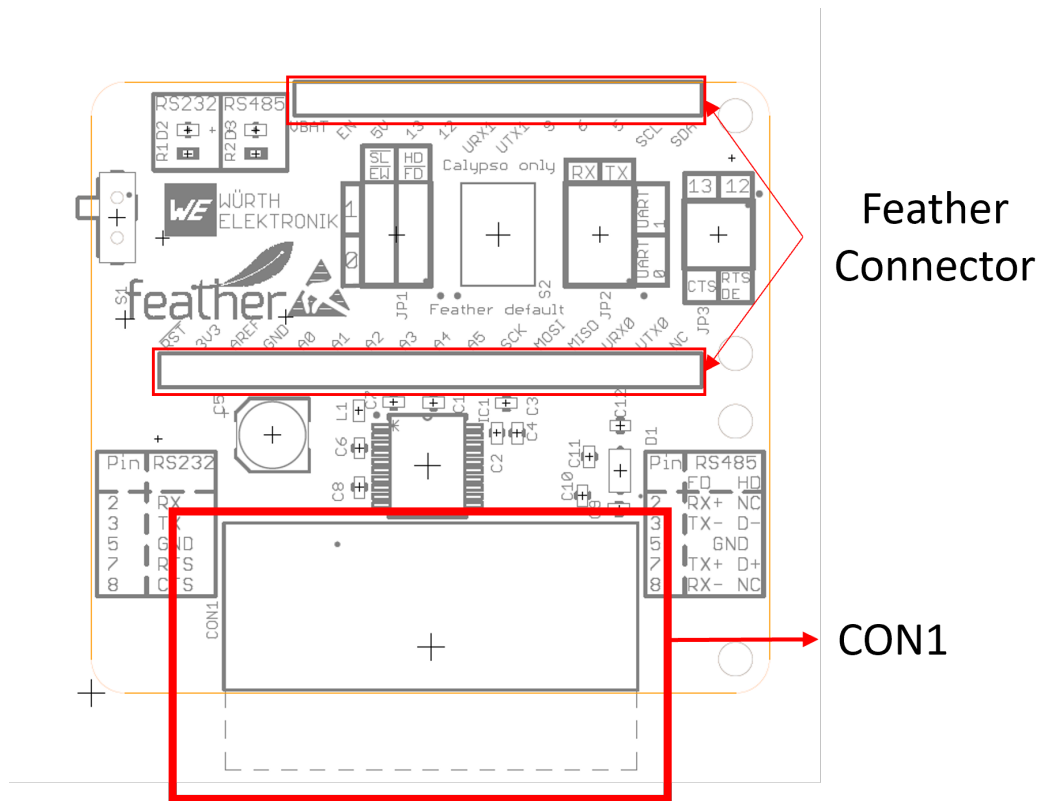


Figure 3: Connectors

3.1.1 CON1

This is a standard D-subminiature Male connector. The pinout for different modes of operation are as described in the table below.

Pin	RS232	RS485(Full Duplex)	RS485(Half Duplex)
1	Not connected	Not connected	Not connected
2	RX	RX+	Not connected
3	TX	TX-	D-
4	Not connected	Not connected	Not connected
5	GND	GND	GND
6	Not connected	Not connected	Not connected
7	RTS	TX+	D+
8	CTS	RX-	Not connected
9	Not connected	Not connected	Not connected

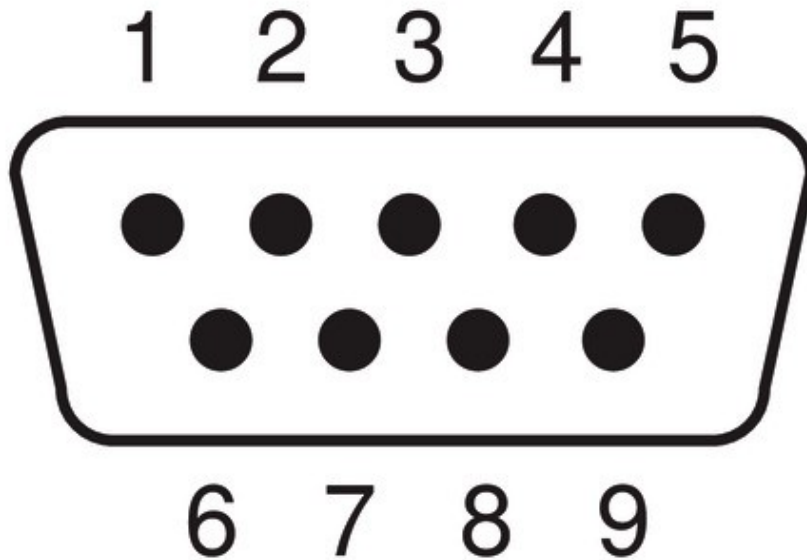


Figure 4: Pinout DSUB 9 connector

3.1.2 Feather connector

This is the standard set of connectors that is used across the Feather ecosystem. The table below describes the functions of each of the 28 pins as applicable to this FeatherWing.

Pin Number	Pin name	Function
1	\overline{RST}	Not connected
2	3V3	3.3 V power supply
3	AREF	Not connected
4	GND	Ground
5	A0	Not connected
6	A1	Not connected
7	A2	Not connected
8	A3	Not connected
9	A4	Not connected
10	A5	Not connected
11	SCK	Not connected
12	MOSI	Not connected
13	MISO	Not connected
14	U0RX	Connected to UART TX(RS232/RS485 TX)
15	U0TX	Connected to UART RX(RS232/RS485 RX)
16	NC	Not connected
17	SDA	Not connected
18	SCL	Not connected
19	5	Not connected
20	6	Not connected
21	9	Not connected
22	U1TX	(optional) Connected to UART RX(RS232 RS485 RX)
23	U1RX	(optional) Connected to UART RX(RS232 RS485 RX)
24	12	Connected to RTS/DE via JP3
25	13	Connected to CTS via JP3
26	5 V	5 V Power supply
27	EN	Not connected
28	VBAT	Not connected

3.2 Switches

This sliding switch can be used to select between the two input signal options, RS232 or RS485.

Position	Mode
Top (Away from D-SUB 9 connector)	RS232
Bottom (Towards D-SUB 9 connector)	RS485

3.2.1 S2

This sliding switch determines if the RX/TX lines are crossed to connect directly to another UART peripheral such as a radio module.

Position	Mode
Top (Away from D-SUB 9 connector)	TX and RX are crossed
Bottom (Towards D-SUB 9 connector)	TX and RX are not crossed

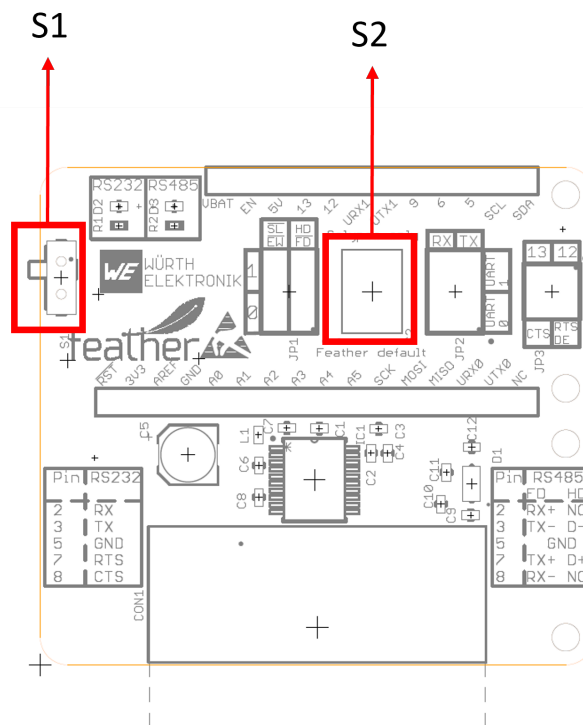


Figure 5: Switches

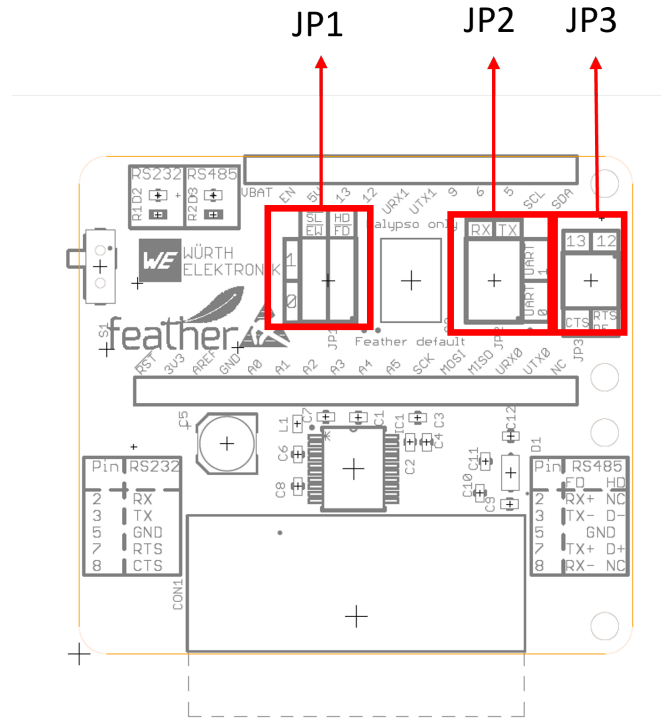


Figure 6: Jumpers

3.3 Jumpers

3.3.1 J1

This jumper enables switching between half and full duplex modes as well as enabling/disabling the slew rate.

Connection	Mode
1-3	Full duplex
3-5	Half duplex

Connection	Mode
2-4	Slew rate enabled
4-6	Slew rate disabled

3.3.2 J2

This jumper enables switching between the UART0 and UART1 on the feather connector.

Connection	Mode
1-3 and 2-4	UART0
3-5 and 4-6	UART1

3.3.3 J3

This jumper enables connecting the flow control pins to the GPIOs on the feather connector

Connection	Mode
1-2	RTS/DE connected to GPIO12
3-4	CTS connected to GPIO13

3.4 LEDs

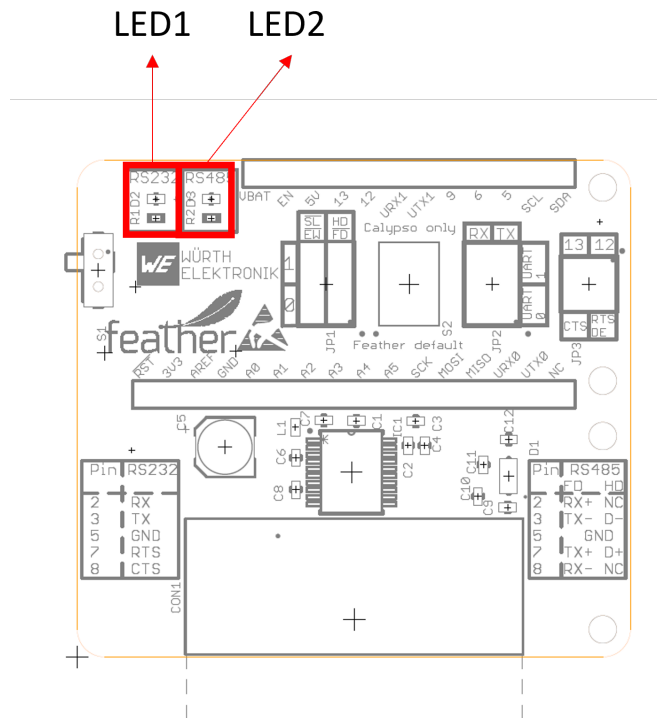


Figure 7: LEDs

There are two LEDs on this FeatherWing with the following indications when switched on,

LED	Indication
D2	RS232 mode
D3	RS485 mode

3.5 Schematics

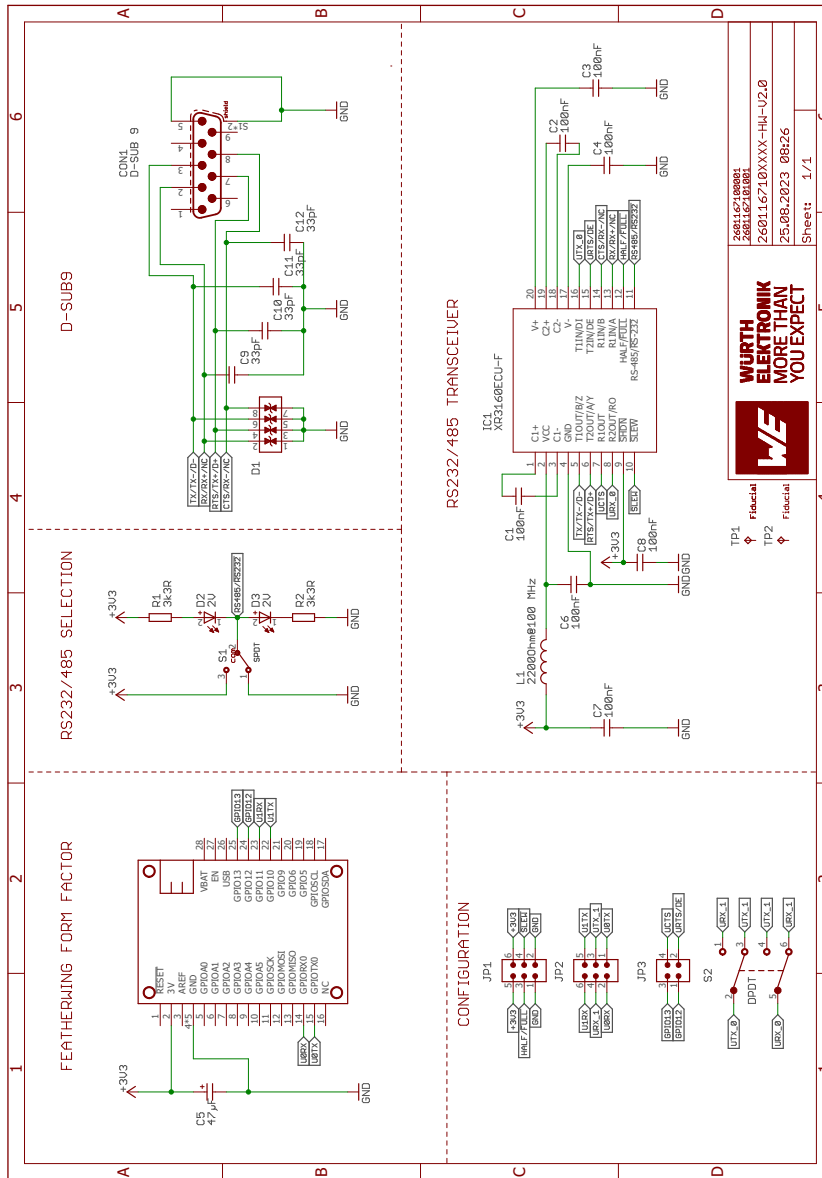


Figure 8: Schematics

3.6 Layout

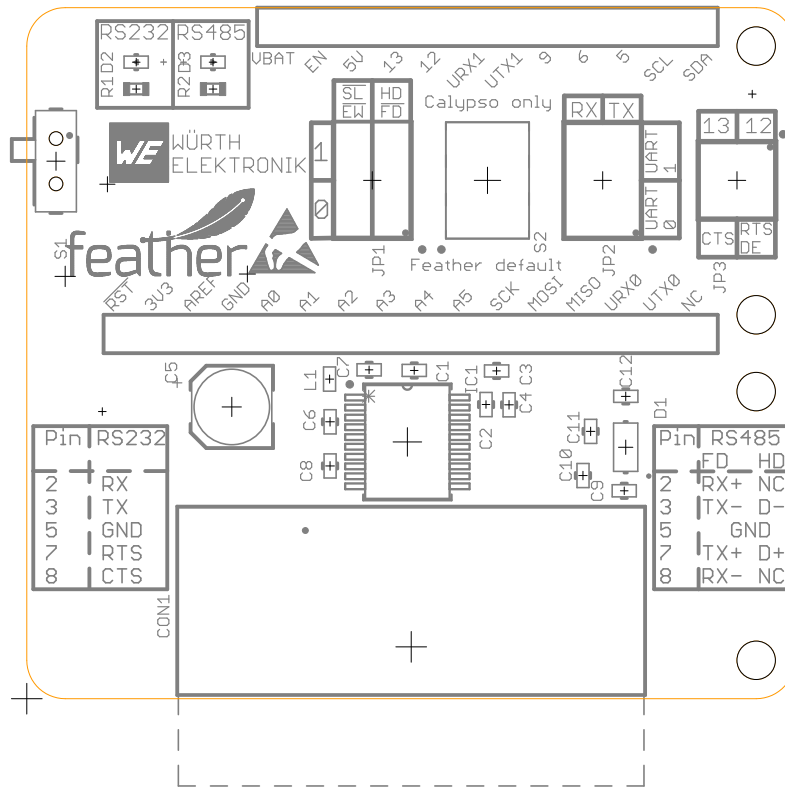


Figure 9: Assembly diagram

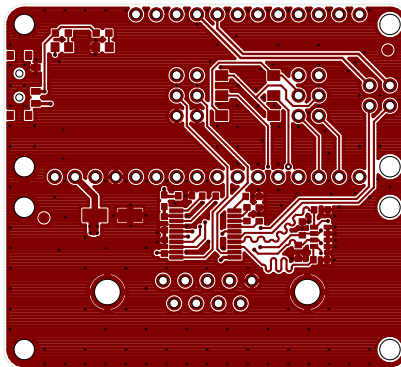


Figure 10: Top layer

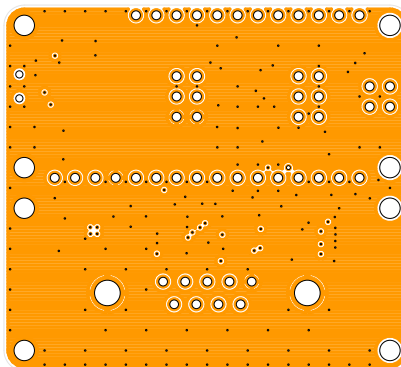


Figure 11: Layer 2

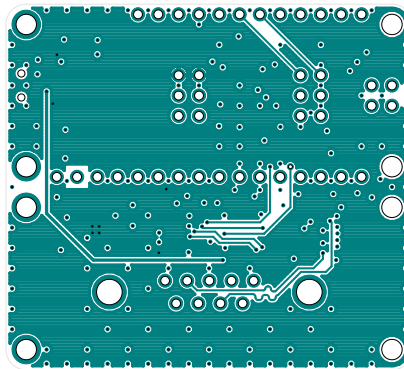


Figure 12: Layer 3

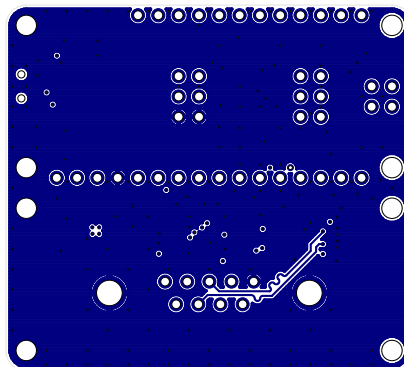


Figure 13: Bottom layer

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.

Nevertheless this evaluation board has been tested to satisfy general EMC requirements. Following standards have been applied:

- IEC 61000-4-3
- IEC 61000-4-4
- IEC 61000-4-6
- CISPR 16-2-1
- CISPR 16-2-3

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.

Notwithstanding the above, Würth Elektronik eiSos makes no representations and warranties of any kind related to their accuracy, correctness, completeness and/or usability for customer applications. No responsibility is assumed for inaccuracies or incompleteness.

5 Important notes

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

5.1 General customer responsibility

Some goods within the product range of Würth Elektronik eiSos GmbH & Co. KG contain statements regarding general suitability for certain application areas. These statements about suitability are based on our knowledge and experience of typical requirements concerning the areas, serve as general guidance and cannot be estimated as binding statements about the suitability for a customer application. The responsibility for the applicability and use in a particular customer design is always solely within the authority of the customer. Due to this fact, it is up to the customer to evaluate, where appropriate to investigate and to decide whether the device with the specific product characteristics described in the product specification is valid and suitable for the respective customer application or not. Accordingly, the customer is cautioned to verify that the documentation is current before placing orders.

5.2 Customer responsibility related to specific, in particular safety-relevant applications

It has to be clearly pointed out that the possibility of a malfunction of electronic components or failure before the end of the usual lifetime cannot be completely eliminated in the current state of the art, even if the products are operated within the range of the specifications. The same statement is valid for all software 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.

5.3 Best care and attention

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

5.4 Customer support for product specifications

Some products within the product range may contain substances, which are subject to restrictions in certain jurisdictions in order to serve specific technical requirements. Necessary information is available on request. In this case, the field sales engineer or the internal sales person in charge should be contacted who will be happy to support in this matter.

5.5 Product improvements

Due to constant product improvement, product specifications may change from time to time. As a standard reporting procedure of the Product Change Notification (PCN) according to the JEDEC-Standard, we inform about major changes. In case of further queries regarding the PCN, the field sales engineer, the internal sales person or the technical support team in charge should be contacted. The basic responsibility of the customer as per section 5.1 and 5.2 remains unaffected. All wireless connectivity module driver software "wireless connectivity SDK" and its source codes as well as all PC software tools are not subject to the Product Change Notification information process.

5.6 Product life cycle

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

5.7 Property rights

All the rights for contractual products produced by Würth Elektronik eiSos GmbH & Co. KG on the basis of ideas, development contracts as well as models or templates that are subject to copyright, patent or commercial protection supplied to the customer will remain with Würth Elektronik eiSos GmbH & Co. KG. Würth Elektronik eiSos GmbH & Co. KG does not warrant or represent that any license, either expressed or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, application, or process in which Würth Elektronik eiSos GmbH & Co. KG components or services are used.

5.8 General terms and conditions

Unless otherwise agreed in individual contracts, all orders are subject to the current version of the "General Terms and Conditions of Würth Elektronik eiSos Group", last version available at www.we-online.com.

6 Legal notice

6.1 Exclusion of liability

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 provided information related to their accuracy, correctness, completeness, usage of the products and/or usability for customer applications. Information published by Würth Elektronik eiSos GmbH & Co. KG regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof.

6.2 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 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.

6.3 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.

6.4 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.

7 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.

7.1 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.

You are not allowed to reproduce, translate, reverse engineer, decompile, disassemble or create derivative works of the incorporated software and the source code in whole or in part. No more extensive rights to use and exploit the products are granted to you.

7.2 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.

7.3 Ownership

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

7.4 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.

7.5 Disclaimer of warranty

THE FIRMWARE IS PROVIDED "AS IS". YOU ACKNOWLEDGE THAT WÜRTH ELEKTRONIK EISOS MAKES NO REPRESENTATIONS AND WARRANTIES OF ANY KIND RELATED TO, BUT NOT LIMITED TO THE NON-INFRINGEMENT OF THIRD PARTIES' INTELLECTUAL PROPERTY RIGHTS OR THE MERCHANTABILITY OR FITNESS FOR YOUR INTENDED PURPOSE OR USAGE. WÜRTH ELEKTRONIK EISOS DOES NOT WARRANT OR REPRESENT THAT ANY LICENSE, EITHER EXPRESS OR IMPLIED, IS GRANTED UNDER ANY PATENT RIGHT, COPYRIGHT, MASK WORK RIGHT, OR OTHER INTELLECTUAL PROPERTY RIGHT RELATING TO ANY COMBINATION, MACHINE, OR PROCESS IN WHICH THE WÜRTH ELEKTRONIK EISOS' PRODUCT WITH THE INCORPORATED FIRMWARE IS USED. INFORMATION PUBLISHED BY WÜRTH ELEKTRONIK EISOS REGARDING THIRD-PARTY PRODUCTS OR SERVICES DOES NOT CONSTITUTE A LICENSE FROM WÜRTH ELEKTRONIK EISOS TO USE SUCH PRODUCTS OR SERVICES OR A WARRANTY OR ENDORSEMENT THEREOF.

7.6 Limitation of liability

Any liability not expressly provided by Würth Elektronik eiSos shall be disclaimed. You agree to hold us harmless from any third-party claims related to your usage of the Würth Elektronik eiSos' products with the incorporated firmware, software and source code. Würth Elektronik eiSos disclaims any liability for any alteration, development created by you or your customers as well as for any combination with other products.

7.7 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.

7.8 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.

7.9 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.

List of Figures

1	The WE Serial(RS232/RS485) bridge FeatherWing (2601167101001)	5
2	Block diagram - Serial(RS232/RS485) bridge FeatherWing	6
3	Connectors	8
4	Pinout DSUB 9 connector	9
5	Switches	11
6	Jumpers	12
7	LEDs	13
8	Schematics	14
9	Assembly diagram	15
10	Top layer	16
11	Layer 2	16
12	Layer 3	17
13	Bottom layer	17

List of Tables

1	Contents 2601167101001	6
---	----------------------------------	---



Contact

Würth Elektronik eiSos GmbH & Co. KG
Division Wireless Connectivity & Sensors

Max-Eyth-Straße 1
74638 Waldenburg
Germany

Tel.: +49 651 99355-0
Fax.: +49 651 99355-69
www.we-online.com/wireless-connectivity

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT