

## USER MANUAL

MAGI<sup>3</sup>C POWER FEATHERWING

2601157101001

VERSION 1.2

JUNE 19, 2023

**WÜRTH ELEKTRONIK** MORE THAN YOU EXPECT

## Revision history

| Manual version | HW version | Notes                           | Date          |
|----------------|------------|---------------------------------|---------------|
| 1.0            | 2.0        | Initial version                 | November 2020 |
| 1.1            | 2.0        | Updated github repository links | February 2020 |
| 1.2            | 2.0        | New corporate design            | June 2023     |

## Abbreviations

| Abbreviation | Name  | Description                              |
|--------------|---|--|
| CISPR        | Comité International Spécial des Perturbations Radioélectriques | International Special Committee on Radio |
| DC           | Direct current  |  |
| EV           | Evaluation  |  |
| ESD          | Electro Static Discharge  |  |
| FDSM         | Fixed Step Down Regulator Module                                |  |
| EMC          | Electro Magnetic Compatibility                                  |  |
| GND          | Ground  |  |
| HIGH         | High signal level   |  |
| IDE          | Integrated development environment                              |  |
| IEC          | International Electrotechnical Commission                       |  |
| IEEE         | Institute for electrical and electronic engineers               |  |
| JTAG         | Joint Test Action Group   |  |
| LED          | Light Emitting Diode  |  |
| Li-Po        | Lithium-Polymer   |  |
| LOW          | Low signal level  |  |
| PC           | Personal Computer   |  |
| PCB          | Printed Circuit Board   |  |
| VCC          |   | Supply voltage                           |
| VDD          | Voltage Drain Drain   | Supply voltage                           |
| VDMM         | Variable Step Down MicroModule                                  |  |

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# 1 General description

## 1.1 Introduction

The Würth Elektronik eiSos Magl<sup>3</sup>C Power FeatherWing is a development board that offers 5 V and 3.3 V power supply. It is fully compatible to popular the Adafruit Feather line of development boards and can be used as plug-and-play solution for a range of industrial input voltages (5 V, 9V, 12V, 15 V, 18V and 24V ).

The Magl<sup>3</sup>C Power FeatherWing consists of two important components,

- Magl<sup>3</sup>C FDSM (173010535) - A power module with Input 6V - 36V, 1A current and a 5 V output.
- Magl<sup>3</sup>C VDMM (171010550) - A power module with Input 2.5 V - 5.5 V, 1.2A current and a 3.3 V output.

It offers a stable output voltage for a wide range of input voltages making it an ideal power supply add-on to any Feather project.

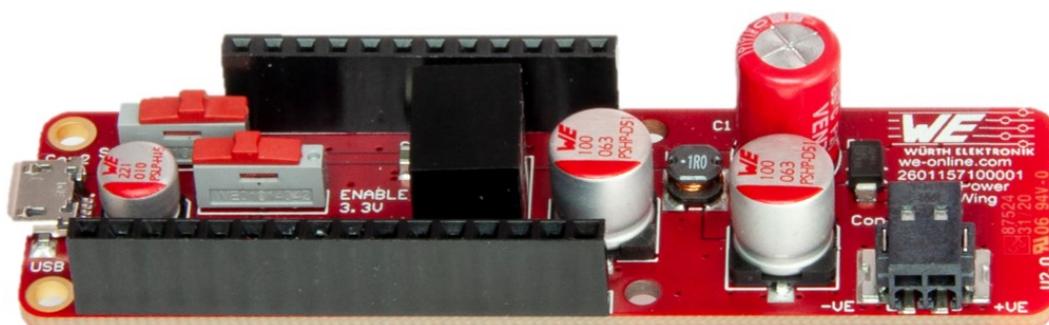


Figure 1: The WE Magl<sup>3</sup>C Power FeatherWing (2601157101001)

## 1.2 Block diagram

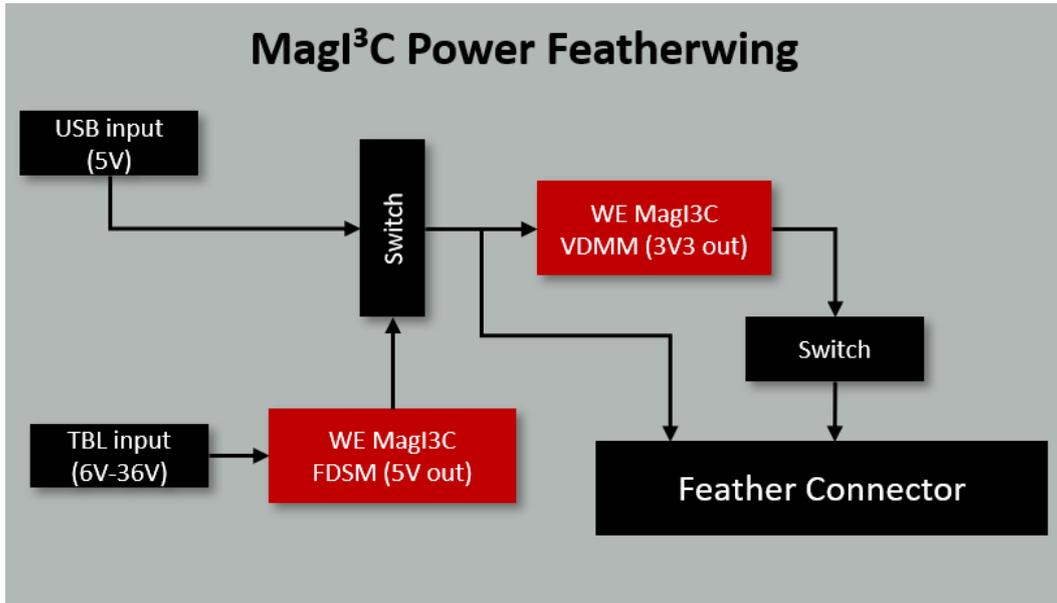


Figure 2: Block diagram - Magl<sup>3</sup>C Power FeatherWing

## 1.3 Contents

| Description                              | Quantity |
|--|----------|
| WE Magl <sup>3</sup> C Power FeatherWing | 1        |
| Packaging: ESD safe bag                  | 1        |

Table 1: Contents 2601157101001

## 2 Functional description

The MagI<sup>3</sup>C Power FeatherWing was designed with rapid prototyping in mind. Being fully compatible with the Adafruit ecosystem, this FeatherWing allows the user the flexibility to choose from a range of input voltages to power the system. 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](http://www.youtube.com/user/WuerthElektronik/videos) for video tutorials, hands-ons and webinars relating to our products.

### 2.1 Adafruit Feather

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

- **Feather:** Adafruit Feather 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](http://adafruit.com/feather) for more details on the Adafruit Feather ecosystem.

### 2.2 MagI<sup>3</sup>C Power modules

In this section a brief description of the power modules is given.

#### 2.2.1 MagI<sup>3</sup>C FDSM (173010535)

The FDSM series of the MagI<sup>3</sup>C Power Module family is a fixed output voltage, fully integrated DC-DC power supply including the switching regulator, inductor and capacitors all in one package.

The module requires only an input capacitor and no other external components for operation, reducing design effort and complexity to a minimum.

The FDSM ensures fast time to market and low development costs. It is pin compatible with the common 78xx linear regulator series. The high efficiency reduces the power dissipation and in many cases a heatsink and assembly parts are unnecessary.

## Key features

- Peak efficiency up to 94 %
- Current capability up to 1 A
- Output voltage: 3.3 V or 5 V
- Output voltage accuracy:  $\pm 4$  % max
- No minimum load required
- Partially integrated input and output capacitors
- Integrated inductor
- Low output voltage ripple (< 20 mVpp)
- Fixed 520kHz switching frequency
- Current mode control
- Pulse skipping for high efficiency at light loads
- Internal soft-start
- Thermal shutdown
- Short circuit protection
- Cycle by cycle current limit
- Pin compatible with the FDSM power modules series
- Operating ambient temperature range: 40 °C to 85 °C
- RoHS and REACH compliant
- Case and potting material UL 94 Class V0 (flammability testing) certified
- Complies with EN55032 class B conducted and radiated emissions standard

Further details about MagI<sup>3</sup>C FDSM can be found under  
[we-online.de/katalog/en/MAGIC\\_FDSM\\_FIXED\\_OUTPUT\\_VOLTAGE](http://we-online.de/katalog/en/MAGIC_FDSM_FIXED_OUTPUT_VOLTAGE)

### 2.2.2 MagI<sup>3</sup>C VDMM (171010550)

The VDMM 171010550 MagI<sup>3</sup>C MicroModule provides a fully integrated DC-DC power supply including the switching regulator with integrated MOSFETs, compensation, and shielded inductor in one package.

The 171010550 offers high efficiency and delivers up to 1.2 A of output current. It operates with an input voltage from 2.5 V to 5.5 V and is designed for a small solution size.

The selectable forced PWM or PFM/PWM mode allows for the choice between high efficiency and low output voltage ripple at light load.

It is available in an LGA-6EP package (2.5 x 2.5 x 1.2 mm). This module has integrated protection circuitry that guards against thermal overstress with thermal shut-down and protects against electrical damage using over-current, short-circuit and under-voltage protections.

### Key features

- Peak efficiency up to 96 %
- Output current up to 1.2 A
- Input voltage range: 2.5 V to 5.5 V
- Output voltage range: 0.8 V to 5.5 V
- 25  $\mu$ A typical quiescent current
- Integrated shielded inductor
- Low output voltage ripple:  $\pm 6$  mV typ.
- Output voltage accuracy over temperature: 2 % max.
- Fixed switching frequency: 4 MHz
- Constant On-Time control
- Synchronous operation
- Selectable forced PWM or PFM/PWM mode
- Undervoltage lockout protection (UVLO)
- Embedded soft-start
- Thermal shutdown
- Short-circuit protection
- Cycle-by-cycle current limit
- RoHS and REACH compliant
- Operating ambient temperature up to 85 °C
- Operating junction temp. range: -40 to 125 °C
- Complies with EN55032 class B radiated emissions standard

Further details about the MagI<sup>3</sup>C FDSM can be found under [we-online.de/katalog/en/MAGIC-VDMM](http://we-online.de/katalog/en/MAGIC-VDMM)

### 3 Hardware description

This section contains a detailed description of the hardware features of the MagI<sup>3</sup>C Power FeatherWing. The design files for this hardware can be downloaded from [github.com/WurthElektronik/FeatherWings-Hardware](https://github.com/WurthElektronik/FeatherWings-Hardware).

#### 3.1 Connectors

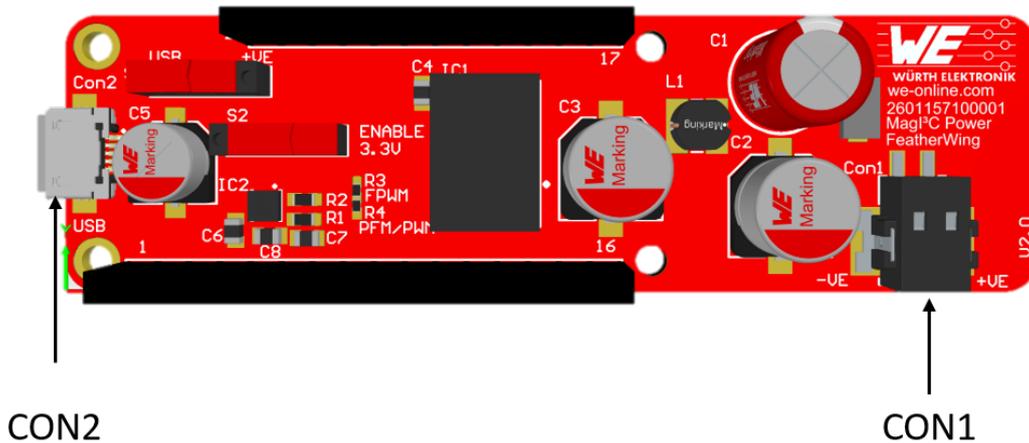


Figure 3: Connectors

##### 3.1.1 CON1

This is a 2-pole WR-TBL series horizontal entry screwless connector to connect input DC voltage from 6V to 36V.

| Pin | Function | Description                                   |
|-----|----------|---|
| 1   | -VE      | Connect to GND                                |
| 2   | +VE      | Connect to positive supply voltage (6V - 36V) |

##### 3.1.2 CON2

This is a standard micro-USB connector to connect 5 V input.



Exceeding the absolute maximum values given in the data sheets of the MagI<sup>3</sup>C Power modules may affect the devices negatively and may cause permanent damage.



Please make sure that the USB power source is able to deliver enough current necessary for the application.

### 3.1.3 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             | Not connected      |
| 15         | U0TX             | Not connected      |
| 16         | NC               | Not connected      |

| Pin Number | Pin name | Function         |
|------------|----------|------------------|
| 17         | SDA      | Not connected    |
| 18         | SCL      | Not connected    |
| 19         | 5        | Not connected    |
| 20         | 6        | Not connected    |
| 21         | 9        | Not connected    |
| 22         | U1TX     | Not connected    |
| 23         | U1RX     | Not connected    |
| 24         | 12       | Not connected    |
| 25         | 13       | Not connected    |
| 26         | 5 V      | 5 V Power supply |
| 27         | EN       | Not connected    |
| 28         | VBAT     | Not connected    |

### 3.2 Switches

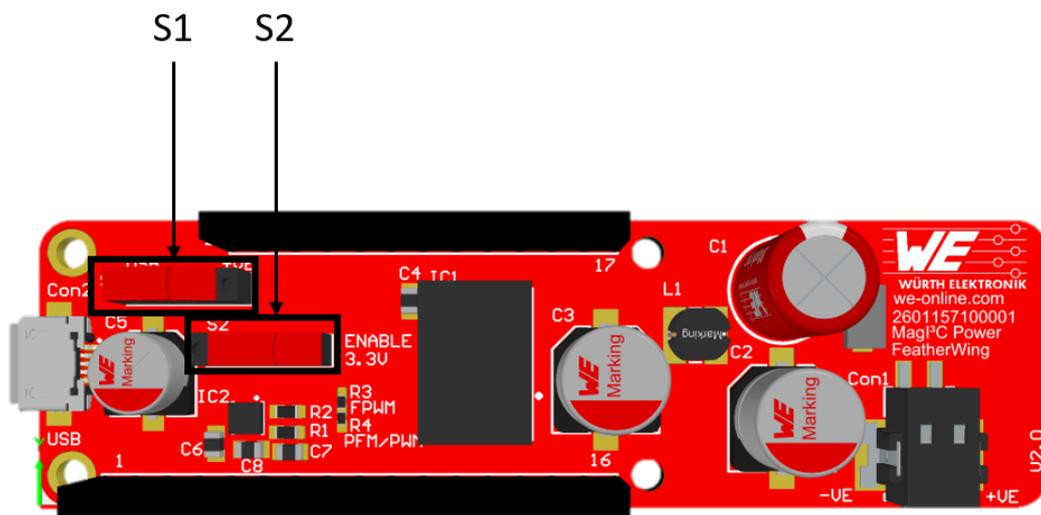


Figure 4: Switches

#### 3.2.1 S1

This sliding switch can be used to select between the two input power sources.

| Position             | Source                          |
|----------------------|---------------------------------|
| Left (towards CON2)  | CON1 (6V - 36V) as input source |
| Right (towards CON1) | CON2 (5 V USB) as input source  |

### 3.2.2 S2

This sliding switch can be used to enable/disable the 3.3 V output.

| Position             | Source           |
|----------------------|------------------|
| Left (towards CON2)  | Power supply ON  |
| Right (towards CON1) | Power supply OFF |

### 3.3 Schematics

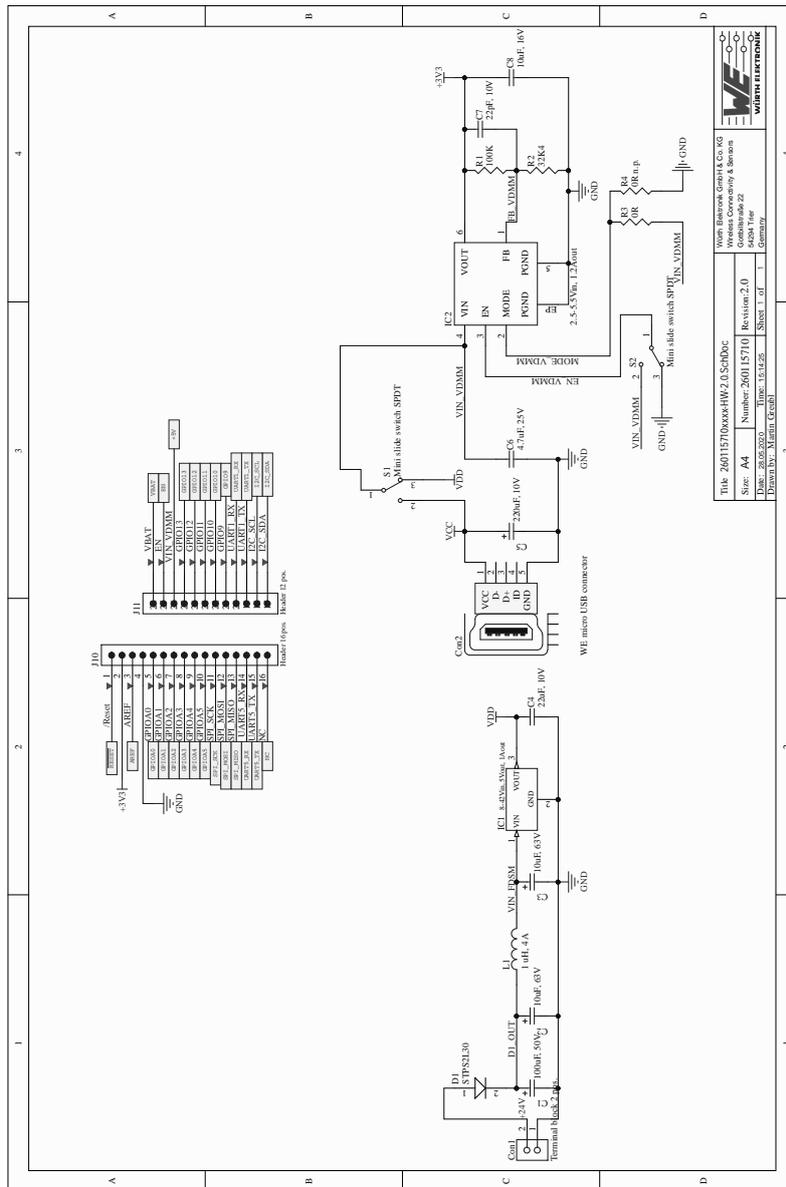


Figure 5: Schematics

### 3.4 Layout

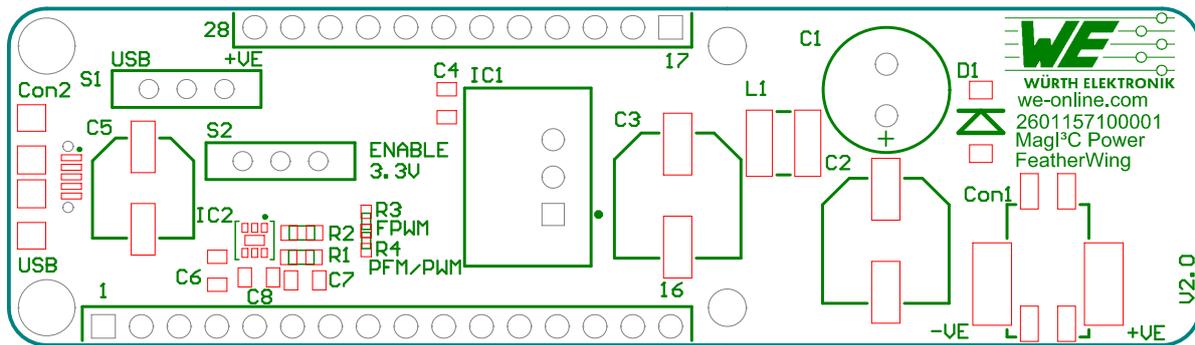


Figure 6: Assembly diagram

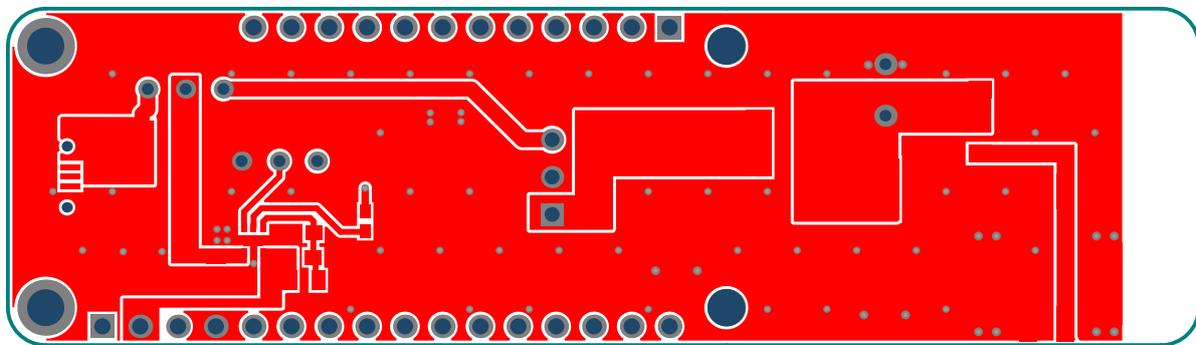


Figure 7: Top layer

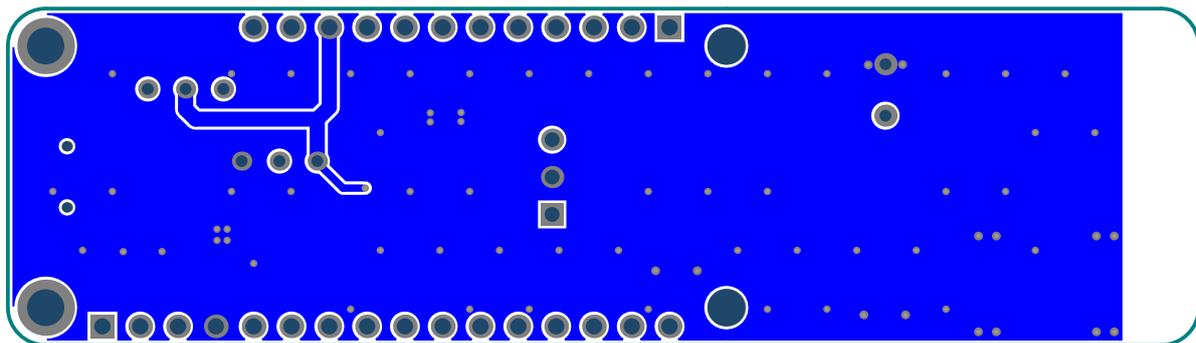


Figure 8: Bottom layer

## 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.

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

### 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.

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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.

## 5.5 Product improvements

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### **7.3 Ownership**

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### **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**

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## **7.8 Severability clause**

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## **7.9 Miscellaneous**

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We recommend you to be updated about the status of new firmware and software, which is available on our website or in our data sheet and manual, and to implement new software in your device where appropriate.

By ordering a product, you accept these license terms in all terms.

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