

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

# USER MANUAL

# 2601157101001

VERSION 1.0

NOVEMBER 20, 2020

## **Revision history**

Manual version	HW version	Notes	Date
1.0	2.0	Initial version	November 2020

## 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	
РСВ	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 5V and 3.3V 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 (5V, 9V, 12V, 15V, 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 5V output.
- Magl<sup>3</sup>C VDMM (171010550) A power module with Input 2.5V 5.5V, 1.2A current and a 3.3V 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

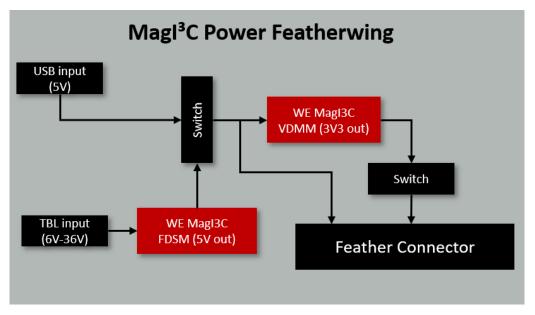


Figure 2: Block diagram - Magl<sup>3</sup>C Power FeatherWing

#### 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 Magl<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* 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* for more details on the Adafruit Feather ecosystem.

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

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

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

The FDSM series of the Magl<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 5V
- Output voltage accuracy: ±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
- 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 Magl<sup>3</sup>C FDSM can be found under we-online.de/katalog/en/MAGIC\_FDSM\_FIXED\_OUTPUT\_VOLTAGE

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

The VDMM 171010550 Magl<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

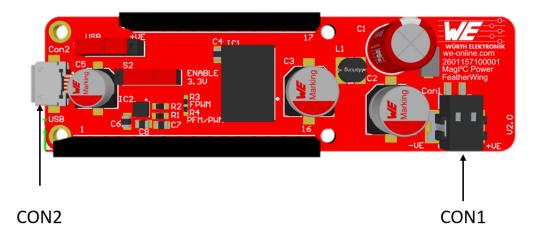
- Peak efficiency up to 96 %
- Output current up to 1.2 A
- Input voltage range: 2.5 V to 5.5 V
- Output voltage range: 0.8 V to 5.5 V
- 25 µA typical quiescent current
- · Integrated shielded inductor
- Low output voltage ripple:  $\pm 6 \text{ mV}$  typ.
- Output voltage accuracy over temperature: 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  $^{\circ}\mathrm{C}$
- Operating junction temp. range: -40 to 125 ℃
- 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* 

## 3 Hardware description

This section contains a detailed description of the hardware features of the Magl<sup>3</sup>C Power FeatherWing. The design files for this hardware can be downloaded from *github.com/WE-eiSmart/FeatherWings-Hardware*.

#### 3.1 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 5V input.



Exceeding the absolute maximum values given in the data sheets of the Magl<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	3.3V 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	5V	5V Power supply
27	EN	Not connected
28	VBAT	Not connected

#### 3.2 Switches

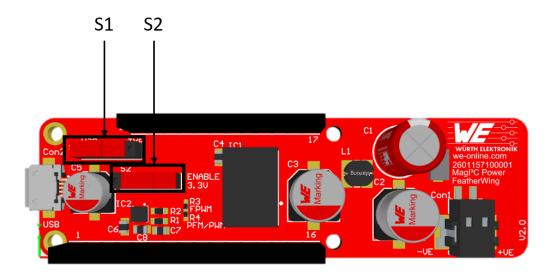


Figure 4: Switches

#### 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 (5V USB) as input source

#### 3.2.2 S2

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

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

### 3.3 Schematics

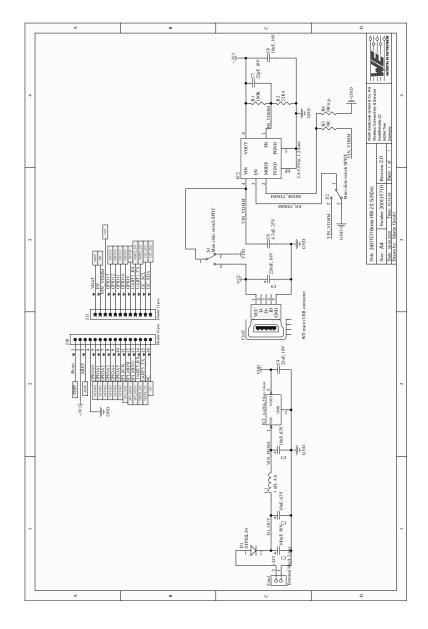


Figure 5: Schematics

#### 3.4 Layout

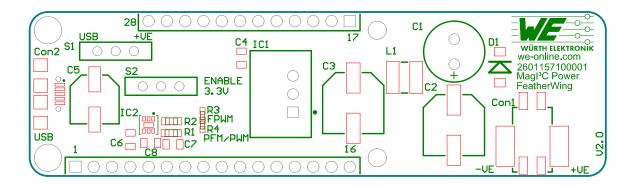


Figure 6: Assembly diagram

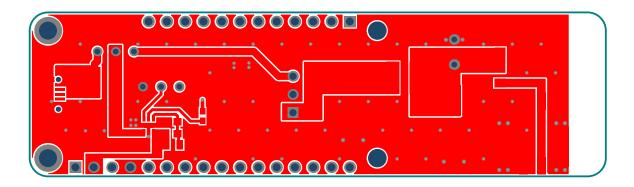


Figure 7: Top layer

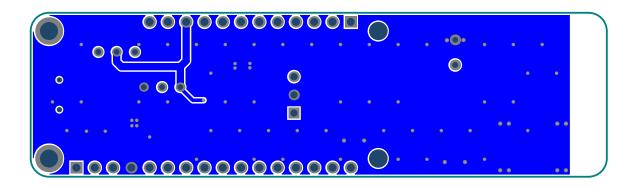


Figure 8: Bottom layer

## 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

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# List of Figures

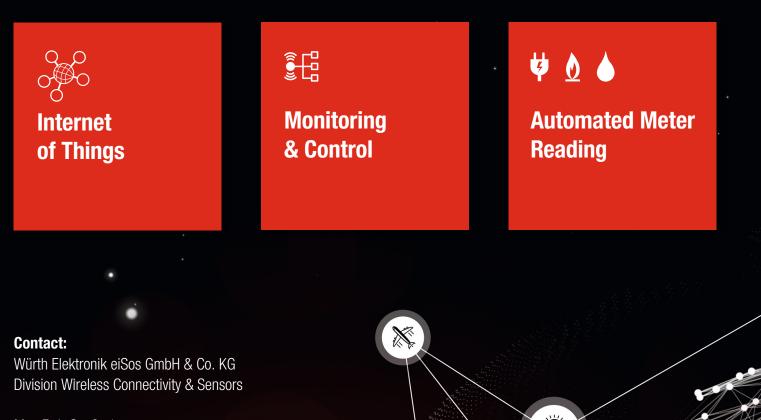
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# more than you expect



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