

DIGITAL WE DAYS

2023



INTRODCUTION OF MAGI<sup>3</sup>C POWER  
MODULE DESIGNER IN REDEXPERT

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

## TODAY'S SPEAKERS



### **PRESENTATION**

Timur Uludag  
Product Manager



### **MODERATION**

Markus Eberle  
Marketing Department

# INFORMATION ABOUT THE WEBINAR

**You are muted during the webinar.**

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**Duration of the presentation** 30 Min  
**Q&A:** 10 – 15 Min

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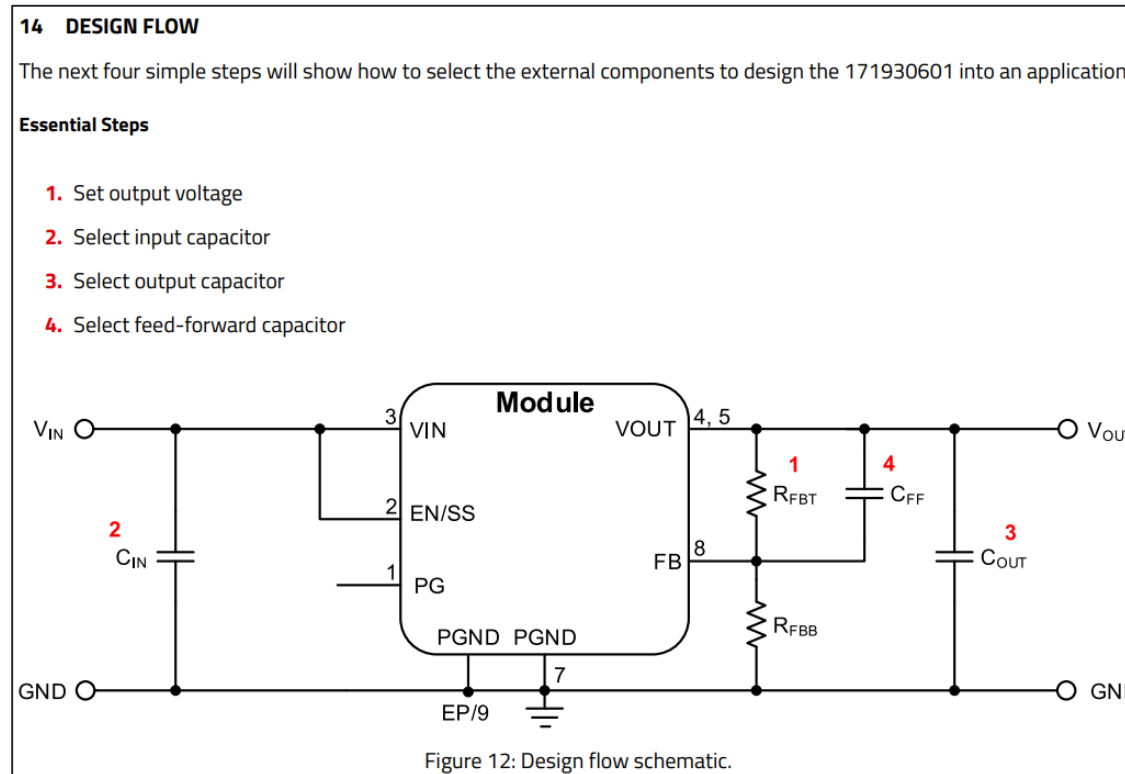


# MAGI<sup>3</sup>C POWER MODULE DESIGNER

What are the benefits?

## Background:

Magi<sup>3</sup>C Power Module Designer is based on the „DESIGN FLOW“ section that is an integral part of every Magi<sup>3</sup>C power module datasheet.



**Example: Datasheet screenshot 171930601**

# MAGI<sup>3</sup>C POWER MODULE DESIGNER

What are the benefits?

## **Philosophy of the MagI<sup>3</sup>C Power Module Designer.**

- “*Simplify and accelerate the design-in of power modules into the customer application.*”
- “*Generate the optimal circuit for the power module without detailed knowledge!*”

## **The MagI<sup>3</sup>C Power Module Designer can be used to:**

- Set output voltage
- Select input capacitor
- Select output capacitor
- Select feed-forward capacitor
- Set switching frequency
- Select soft start



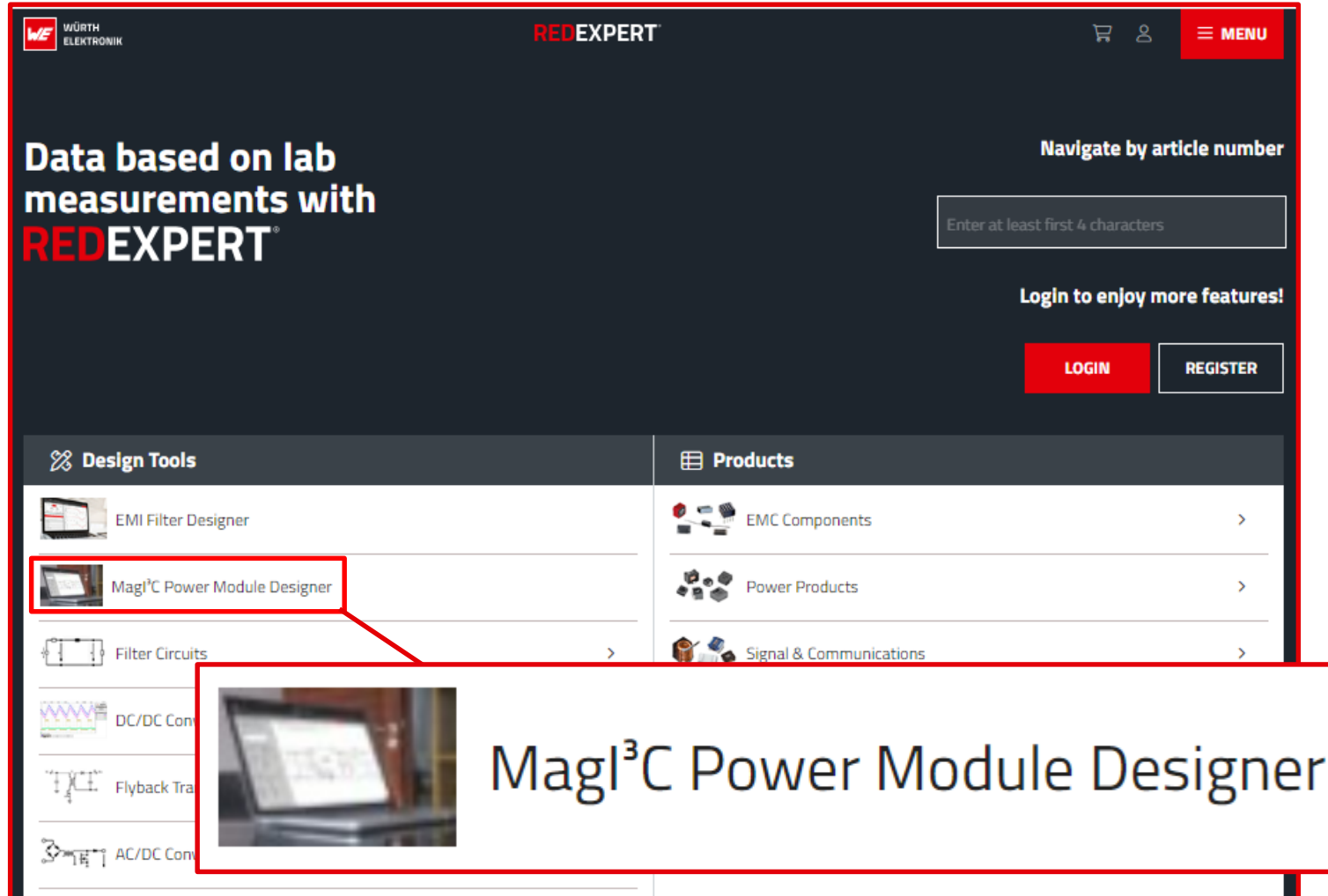
## **Additionally:**

- The summary of the design can be downloaded in PDF format.
- The BOM of the design can directly be sampled out of the tool.

→ The MagI<sup>3</sup>C Power Module Designer is currently not capable to select or design an EMC filter for a MagI<sup>3</sup>C Power Module

# MAGI<sup>3</sup>C POWER MODULE DESIGNER

Where to find?



The screenshot shows the WÜRTH ELEKTRONIK RED EXPERT website. The header includes the logo, the name 'RED EXPERT', and navigation icons for a shopping cart, user profile, and a 'MENU' button. A search bar is present with the placeholder text 'Enter at least first 4 characters'. Below the search bar, there are 'LOGIN' and 'REGISTER' buttons. The main content area is divided into two columns: 'Design Tools' and 'Products'. Under 'Design Tools', the 'MagI<sup>3</sup>C Power Module Designer' is highlighted with a red box. Under 'Products', there are categories for 'EMC Components', 'Power Products', and 'Signal & Communications'. A callout box with a red border points to the highlighted tool, containing a small image of the tool's interface and the text 'MagI<sup>3</sup>C Power Module Designer'.

# MAGI<sup>3</sup>C POWER MODULE DESIGNER

Starting screen

**3**

My Magi<sup>3</sup>C Module Project

PARAMETERS SIMULATION SUMMARY NEXT →

Use this application to design your Magi<sup>3</sup>C Power Module application and evaluate the realistic performance based on real components.

**1**

Title  
My Magi<sup>3</sup>C Module Project

**Application requirements**

Input Voltage (min)	12 V	Input Voltage (max)	12 V
Output Voltage	5 V	Output Current	200 mA
Isolation Voltage	<input type="checkbox"/> 1 kV		

**2**

**177920521**

Fixed Isolated SIP/SMT Module  
10.8 - 13.2V / 5V @ 0.2A

**177920524**

Fixed Isolated SIP/SMT Module  
10.8 - 13.2V / 5V @ 0.2A

**176920522**

Fixed Isolated SIP/SMT Module  
10.8 - 13.2V / 5V @ 0.2A

**1779205211**

Fixed Isolated SIP/SMT Module  
10.8 - 13.2V / 5V @ 0.2A

**1779205241**

Fixed Isolated SIP/SMT Module  
10.8 - 13.2V / 5V @ 0.2A

**1769205241**

Fixed Isolated SIP/SMT Module  
10.8 - 13.2V / 5V @ 0.2A

See more

# MAGI<sup>3</sup>C POWER MODULE DESIGNER

Starting screen section description

- 1** **Input parameters section of the application.**  
-> Here you define the input and output parameters of the power module
- 2** **Recommended suitable power modules for the chosen application parameters.**
- 3** **Navigation bar of the design flow.**  
→ Here you can see where you are in the design flow.



# MAGI<sup>3</sup>C POWER MODULE DESIGNER

Example project

- 1 **Input parameters section of the application.**  
-> Here you define the input and output parameters of the power module

## Application parameters

Project name = High VIN range project

Input voltage (min) = 4V

Input voltage (max) = 36V

Output voltage = 3.3V

Output current = 200mA

Isolation voltage = n.a. (not ticked)

**Note:**  
 $V_{OUT} > V_{IN\ min}!$

# MAGI<sup>3</sup>C POWER MODULE DESIGNER

## High VIN range project - Parameters

The screenshot displays the 'High VIN range project' in the 'PARAMETERS' tab of the 'Magi<sup>3</sup>C Module Designer' software. The interface includes a progress bar with 'PARAMETERS', 'SIMULATION', and 'SUMMARY' stages, and a 'NEXT' button. On the left, the 'Application requirements' section is highlighted with a red box and contains the following data:

Parameter	Value
Input Voltage (min)	4 V
Input Voltage (max)	36 V
Output Voltage	3.3 V
Output Current	200 mA
Isolation Voltage	<input type="checkbox"/> 1 kV

A red arrow points to the 'Input Voltage (min)' field with the note: **Note:  $V_{OUT} > V_{IN min}!$**

The 'Application parameters' label is positioned below the requirements table. The main area displays 'Suggested power modules' with four options, each featuring a circuit diagram and a PDF icon:

- 171930601**: Variable Step Down Micro Module, 3.5 - 36V / 1 - 6V @ 0.3A
- 171013801**: Variable Step Down LGA Module, 3.5 - 38V / 0.85 - 13V @ 1A
- 171033801**: Variable Step Down LGA Module, 3.5 - 38V / 0.85 - 6V @ 3A
- 171023801**: Variable Step Down LGA Module, 3.5 - 38V / 0.85 - 13V @ 2A

Red arrows point from the 'Starting the simulation' text to the 'NEXT' button and from the 'Datasheet of the power module' text to the PDF icons. A large red arrow also points from the 'Starting the simulation' text towards the 'NEXT' button.

# MAGI<sup>3</sup>C POWER MODULE DESIGNER

## High VIN range project - Simulation

The screenshot displays the 'MagI<sup>3</sup>C Module Designer' software interface. The top navigation bar includes the WÜRTH ELEKTRONIK logo, 'REDEXPERT' branding, and the title 'MagI<sup>3</sup>C Module Designer'. A progress indicator shows the current step is 'SIMULATION', with 'PARAMETERS' and 'SUMMARY' also visible. The interface is divided into three main sections:

- Input Parameters:** Lists  $V_{in}(\min)$  as 4.00 V,  $V_{in}(\max)$  as 36.0 V,  $V_{out}$  as 3.30 V, and  $I_{out}$  as 200 mA.
- Module Parameters:** Lists order code 171930601, package LGA-8EP, series VDMM, height 1.80 mm, length 5.00 mm, and width 2.50 mm.
- Typical circuit diagram with recommended component values:** Shows a schematic for the 171930601 module. The input is 36.0 V connected to pin 3 (VIN). Pin 2 (EN/SS) is connected to VIN. Pin 1 (PG) is connected to GND. Pin 7 (EP/9) is connected to GND. The output is 3.31 V connected to pins 4 and 5 (VOUT). The feedback pin (FB, pin 8) is connected to a voltage divider consisting of  $R_{FBT}$  (100 k $\Omega$ ) and  $R_{FBB}$  (22.1 k $\Omega$ ). A feedback capacitor  $C_{FF}$  (15.0 pF) is connected between the feedback pin and the output. An input capacitor  $C_{IN}$  (94.0  $\mu$ F (2)) is connected between VIN and GND. An output capacitor  $C_{OUT}$  (331 nF) is connected between VOUT and GND.

**Simulated values**

Results									
Efficiency	78.1 %	$I_{in}(\max)$	212 mA	$I_{in}(\min)$	23.5 mA	Vout	3.31 V	Vout ripple	33.1 mV
Fsw	1.20 MHz	Pout	662 mW						

# MAGI<sup>3</sup>C POWER MODULE DESIGNER

## High VIN range project - Simulation

The screenshot displays the 'MagI<sup>3</sup>C-VDMM Variable Step Down Micro Module' simulation interface. The top navigation bar includes the Würth Elektronik logo, 'REDEXPERT' branding, and the product name. A progress indicator shows the current step is 'SIMULATION'. The left sidebar contains 'Input Parameters' (Vin min: 4.00 V, Vin max: 36.0 V, Vout: 3.30 V, Iout: 200 mA) and 'Module Parameters' (Order code: 171930601, Package: LGA-8EP, Series: VDMM, Height: 1.80 mm, Length: 5.00 mm, Width: 2.50 mm). The main area shows a circuit diagram with components highlighted in red: CIN (94.0 µF (2)), RFBT (100 kΩ), CFF (15.0 pF), RFBP (22.1 kΩ), and COUT (331 nF). A dropdown menu for RFBT is open, showing a list of values (100 kΩ, 102 kΩ, 105 kΩ, 107 kΩ, 110 kΩ) with 100 kΩ selected. A red arrow points to the 105 kΩ option with the text 'Example: Selection of different R<sub>FBT</sub>'. The 'Results' table at the bottom provides simulation data.

**Input Parameters**

- Vin (min) 4.00 V
- Vin (max) 36.0 V
- Vout 3.30 V
- Iout 200 mA

**Module Parameters**

- Order code 171930601
- Package LGA-8EP
- Series VDMM
- Height 1.80 mm
- Length 5.00 mm
- Width 2.50 mm

**MagI<sup>3</sup>C-VDMM Variable Step Down Micro Module**

Every red highlighted parameter can be manually selected.

**Results**

Parameter	Value	Parameter	Value	Parameter	Value	Parameter	Value	Parameter	Value
Efficiency	78.1 %	Iin (max)	212 mA	Iin (min)	23.5 mA	Vout	3.31 V	Vout ripple	33.1 mV
Fsw	1.20 MHz	Pout	662 mW						

# MAGI<sup>3</sup>C POWER MODULE DESIGNER

## High VIN range project - Simulation

The screenshot displays the 'Magi<sup>3</sup>C-VDMM Variable Step Down Micro Module' simulation interface. The top navigation bar includes 'PARAMETERS', 'SIMULATION', and 'SUMMARY' tabs. The left sidebar shows 'Input Parameters' (Vin (min) 4.00 V, Vin (max) 36.0 V, Vout 3.30 V, Iout 200 mA) and 'Module Parameters' (Order code 171930601, Package LGA-8EP, Series VDMM, Height 1.80 mm, Length 5.00 mm, Width 2.50 mm). The main area shows a circuit diagram with components: CIN (94.0 μF (2)), EP79, RFBT (105 kΩ), RFFB (22.1 kΩ), CFF (15.0 pF), and COUT (331 nF). A red circle highlights the output voltage '3.44 V' at the output terminal. A dialog box titled 'RFBT is USER SELECTED' is open, showing a list of resistor values (100 kΩ, 102 kΩ, 105 kΩ, 107 kΩ, 110 kΩ) with '105 kΩ' selected. A red arrow points from the '105 kΩ' value to the '3.44 V' output. Below the circuit, a 'Results' table shows simulation outcomes:

Results	
Efficiency	78.1 %
Fsw	1.20 MHz
Iin (max)	221 mA
Iin (min)	24.5 mA
Pout	689 mW
Vout	3.44 V
Vout ripple	34.4 mV

Red arrows point from the '3.44 V' output in the circuit to the 'Vout' and 'Vout ripple' values in the results table. A red text label 'Value changed on the fly.' is positioned above the results table.

# MAGI<sup>3</sup>C POWER MODULE DESIGNER

## High VIN range project - Summary

**High VIN range project** ← BACK

PARAMETERS SIMULATION **SUMMARY**

### Summary

**Circuit Schematic**

**Specifications**

Project "High VIN range project"

**Input Parameters**

Vin (min)	4.00 V	Vin (max)	36.0 V
Iout	200 mA		

**Simulation Results**

Iin (min)	24.5 mA	Iin (max)	221 mA
Pout	689 mW	Vout	3.44 V
Efficiency	78.1 %	Vout ripple	34.4 mV
Fsw	1.20 MHz		

**Technical Resources**

**EDA Design example**

- Altium

**EDA Models**

- Altium
- Eagle

**CAD Files**

- IGS
- STP

[Download all files](#)

**Bill of Materials**

#	Ref. Des.	Order Code	Properties	Mount	Qty	Datasheet
1	U1	171930601	3.5 - 36V / 1 - 6V @ 0.3A Variable Step Down Micro Module Package = LGA-8EP		1	
2	Rfbb		Resistance = 22.1 kΩ		1	
	Rfbt		Resistance = 105 kΩ		1	

**Package**

**Dimensions**

Create a summary report as PDF  
Order directly the BOM as samples

Print

Free samples

# MAGI<sup>3</sup>C POWER MODULE DESIGNER

## High VIN range project - Summary – Sample order

**High VIN range project** ← BACK

PARAMETERS SIMULATION SUMMARY

### Summary

#### Circuit Schematic

#### Specifications

Project "High VIN range project"

#### Input Parameters

Vin (min) 4.00 V  
Iout 200 mA

#### Simulation Results

Iin (min) 24.5 mA  
Pout 689 mW  
Efficiency 78.1 %  
Fsw 1.20 MHz

#### Output Parameters

Vin (max) 36.0 V  
Iin (max) 22.1 mA  
Vout 3.44 V  
Vout ripple 34.4 mV

#### Bill of Materials

#	Ref. Des.	Order Code	Properties	Mount	Qty	Datasheet
1	U1	171930601	3.5 - 36V / 1 - 6V @ 0.3A Variable Step Down Micro Module Package = LGA-8EP		1	
2	Rfbb		Resistance = 22.1 kΩ		1	
	Rfbt		Resistance = 105 kΩ		1	

#### Package

#### Dimensions

- Free samples
- Copy to clipboard
- Empty cart

171930601	X	-	1	+
870575774003	X	-	2	+
885012209044	X	-	1	+
885012007001	X	-	1	+

Download all files

# MAGI<sup>3</sup>C POWER MODULE DESIGNER

## High VIN range project - Summary – PDF report

**SUMMARY**  
Magic Module Designer

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**SUMMARY**  
Magic Module Designer

**Package**

**Dimensions**

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**SUMMARY**  
Magic Module Designer

2	Rfbb	17
3	Rfbt	17
4	Cin	87
5	Cout	88
6	Cff	88

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**SUMMARY**  
Magic Module Designer

**Bill Of Materials**

#	Ref. Des.	Qrc
1	U1	17

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**SUMMARY**  
Magic Module Designer

**REDEXPERT**

**Specifications**

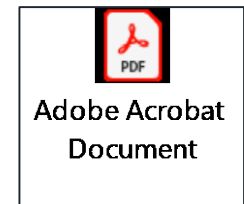
Project "High VIN range project"

Input Parameters	Simulation Results
Vin (min) 4,00 V	Iin (min) 24,5 mA
Vin (max) 36,0 V	Pout 689 mW
Iout 200 mA	Efficiency 78,1 %
	Fsw 1,20 MHz
	Iin (max) 221 mA
	Vout 3,44 V
	Vout ripple 34,4 mV

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Summary available as PDF.





# Data based on lab measurements with **REDEXPERT**

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## Design Tools

EMI Filter Designer

Mag<sup>3</sup>C Power Module Designer

Filter Circuits

DC/DC Converter

Flyback Transformer

AC/DC Converter

Wireless Connectivity and Sensors

Power

## Products

EMC Components

Power Products

Signal & Communications



# Mag<sup>3</sup>C Power Module Designer



# Questions

& Answers



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