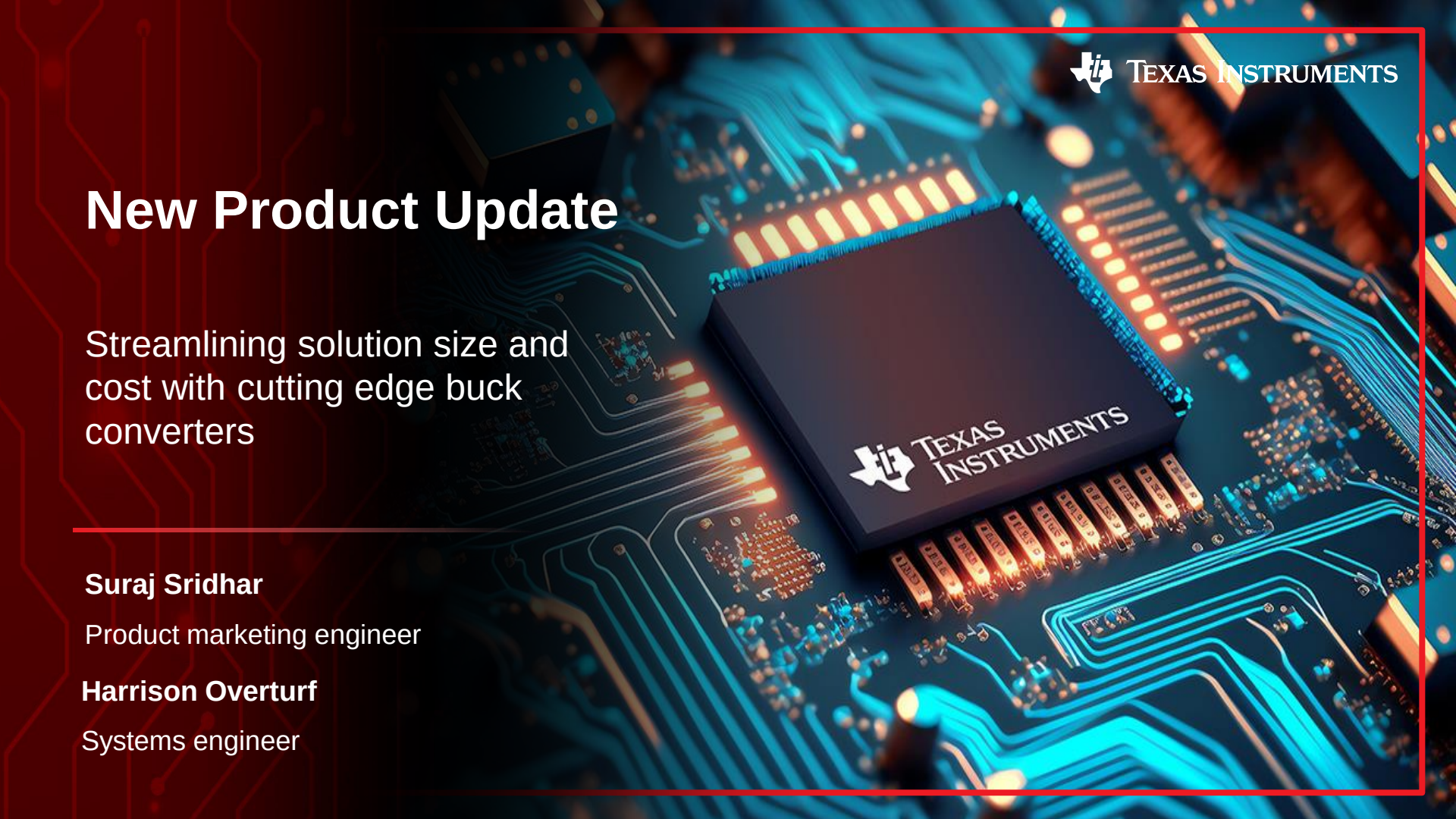
New Product Update

Streamlining solution size and cost with cutting edge buck converters



Suraj Sridhar

Product marketing engineer

Harrison Overturf

Systems engineer

Agenda

- Product overview:
  - LMR43620 (36 V, 2 A)
- Benefits of the Buck Converter
  - Low quiescent current (I_Q)
  - High Efficiency and good thermal performance
  - Scalable solution
  - Small size

Product overview

LMR43610/20 | 1A/2A

36V, 1/2A Synchronous step-down DC-DC converter

Features

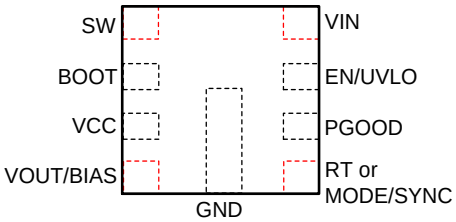
- **2 mmm x 2 mm HotRod™ package**
- **~2.5uA no load switching IQ (AUTO)**
- **VOUT Options 3.3V/5V/Adj.**
- **BIAS available with Fixed 3.3V/5V**
- **Wide VIN range: 3.6 V – 36 V**
  - **VIN UVLO Falling = 3V**
- **Adjustable Fsw** with **RT**
- **MODE/SYNC**
- **Peak Current mode control** with internal compensation
- **Precision EN/UVLO**
- **PGOOD with delay**
- **Cycle-by-Cycle Short circuit protection**
- -40C to **150C** T_J operation

Applications

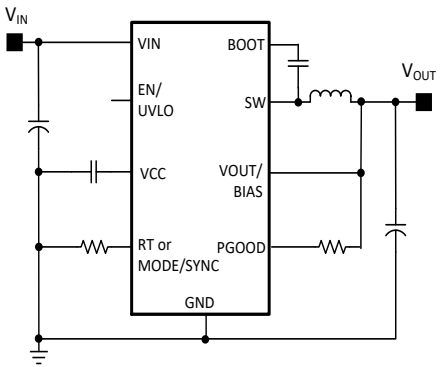
- Industrial: Field Transmitters, Thermostat, Servo Drive Position Sensors

Benefits

- **Smallest Wide-V_{IN} package** for reduced solution size
- Best in class Wide-V_{IN} TI solution size for light load current requirements
  - Typ. Industrial (~**93%** @24VIN, 5VOUT @1A, 1MHz)
- **Fixed frequency** (with external dial-in option) allows for low output ripple at light load
- Excellent EMI and noise mitigation with HOTROD package



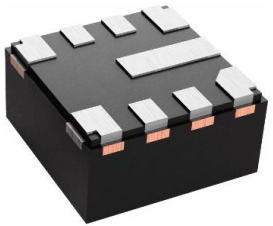
HOTROD-9
2mm x 2mm
(0.5mm lead pitch)

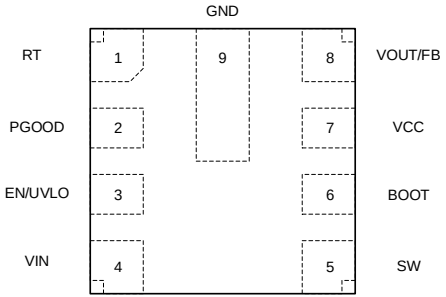


Small size converter P2P family

2mm x 2mm pin-to-pin compatible VQFN-HR 9-pin package solution from 100 mA to 2A

65 Vin **0.1A**	65 Vin **0.15A**	65 Vin **0.3A**	65 Vin **0.6A**	36 Vin **1A**	36 Vin **2A**
LMR36501	LMR36502	LMR36503	LMR36506	LMR43610	LMR43620



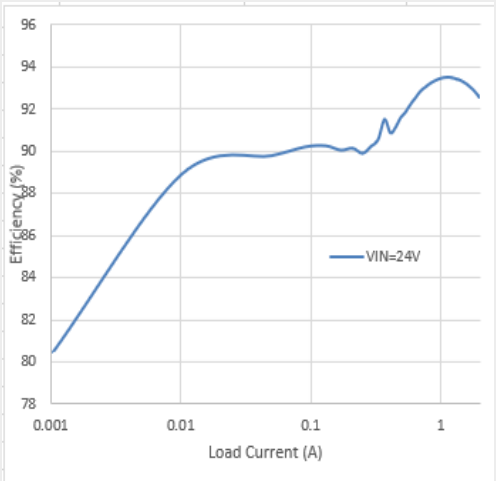


LMR43610/20 value proposition at system level

Efficiency & Thermal

High efficiency and good thermal performance

- Low I_Q: 2uA switching I_Q (AUTO)
- 93% Peak Efficiency 24Vin, 5Vout, 1MHz

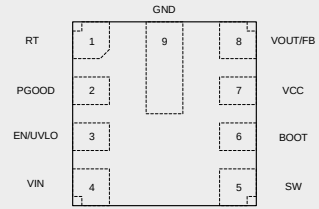


LMR43620MQ3EVM-2M

Scalable Solution

Pin to pin compatible family of devices supporting currents from 0.1A to 2A

- LMR36501/2 (65V, 100mA/150mA)
- LMR36503/6 (65V, 300mA/600mA)
- LMR4361/20 (36V, 1A/2A)
- These devices also have module equivalents



HOTROD QFN 9
2mm x 2mm
(Top View)

Small Solution Size

HOTROD QFN Pacakge allows for minimal PCB area:

- 2-mm x 2-mm QFN Package
- 36mm^2 optimized solution size
- 6 external passives required

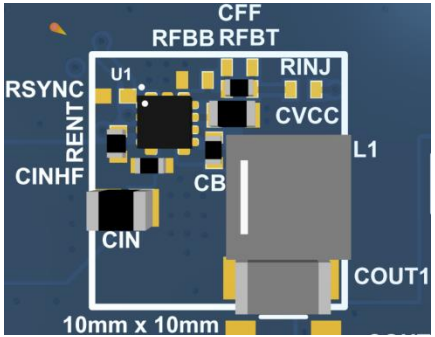
Benefits of TI's buck converter vs competition

Features comparison

Values displayed come from each part's datasheet unless otherwise stated

Manufacturer	Texas Instruments	Competitor A
Input Voltage Range	3 – 42 V	3 – 42 V
Load Current	2 A	1.5 A
Output Voltage Range	3.3V Fixed/ADJ, 5 V FIXED/ADJ	ADJ
Shutdown Current (EN=0V)	0.25 µA	1 µA
I_Q	1.6 µA	56 µA
Switching Frequency	200kHz – 2.2MHz	200kHz – 2.2MHz
Minimum On Time	65 ns	35 ns
Rdson	0.132 / 0.075 Ω	0.35 / 0.23 Ω
Synchronous	Yes	Yes
Internal Compensation	Yes	Yes
Operating T_J	-40°C to 150°C	-40°C to 150°C
Board size	48 cm^2	58 cm^2
Package	2-mm × 2-mm VQFN	5-mm × 3-mm MSOP

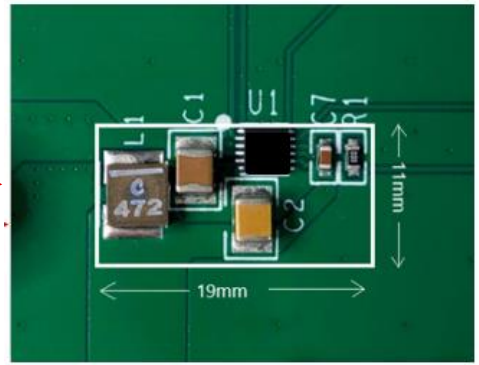
LMR43610/20 solution size comparison using EVMs



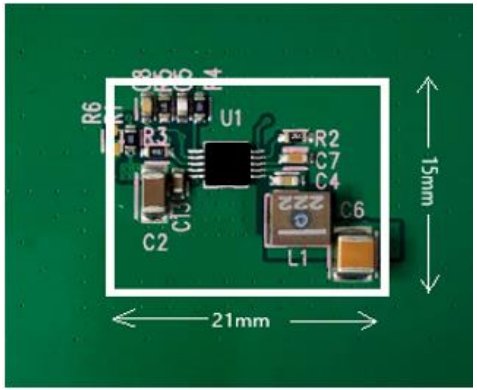
Full LMR43610/20
Single Sided
~90 mm2

*All components in top layer

Competition
~2x Bigger
Solution Size



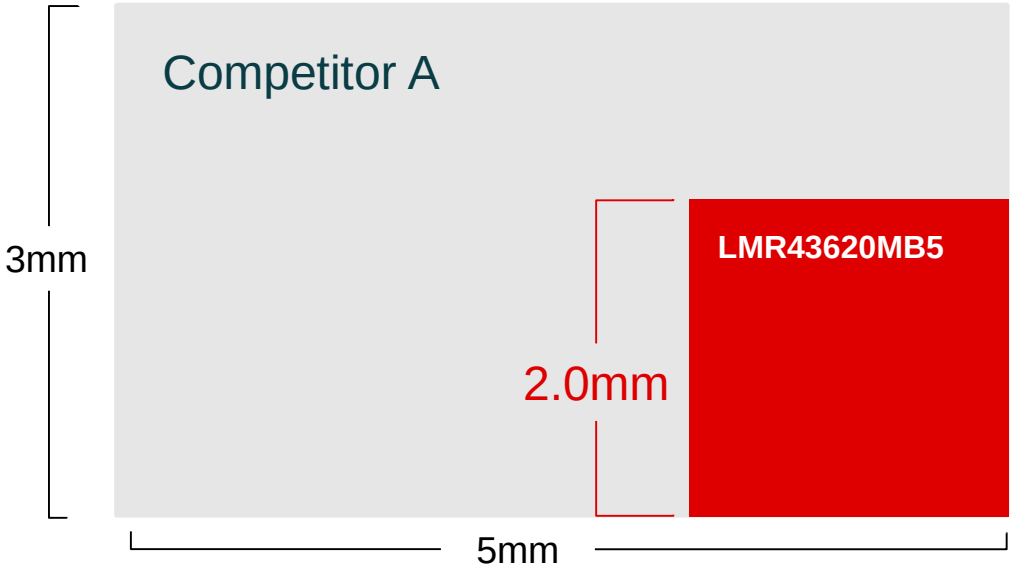
Comp A= ~190mm²



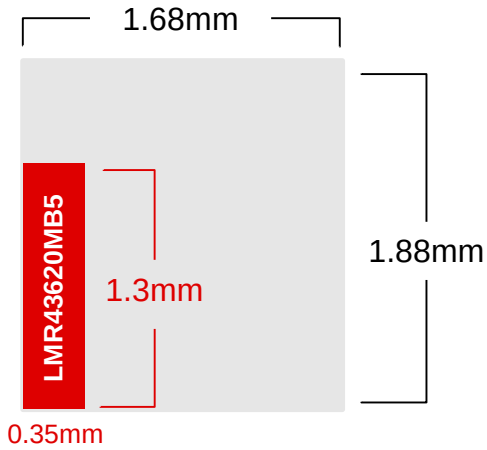
Comp B = 180mm²

Package comparison | LMR43620MB5 vs competitor

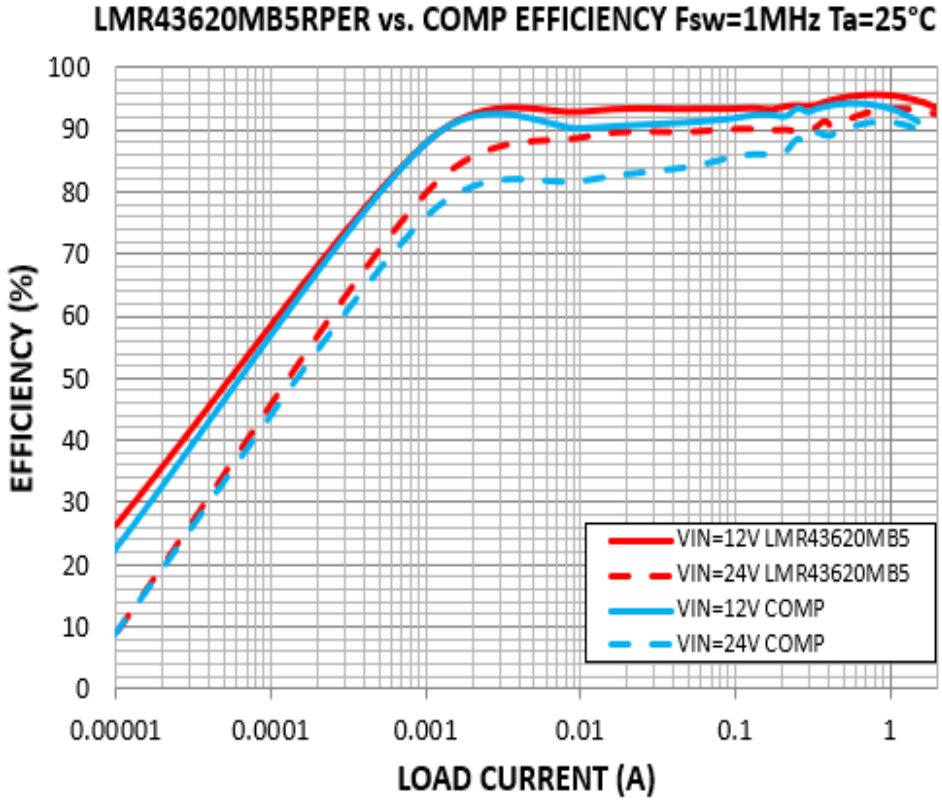
Package size



Ground pad size



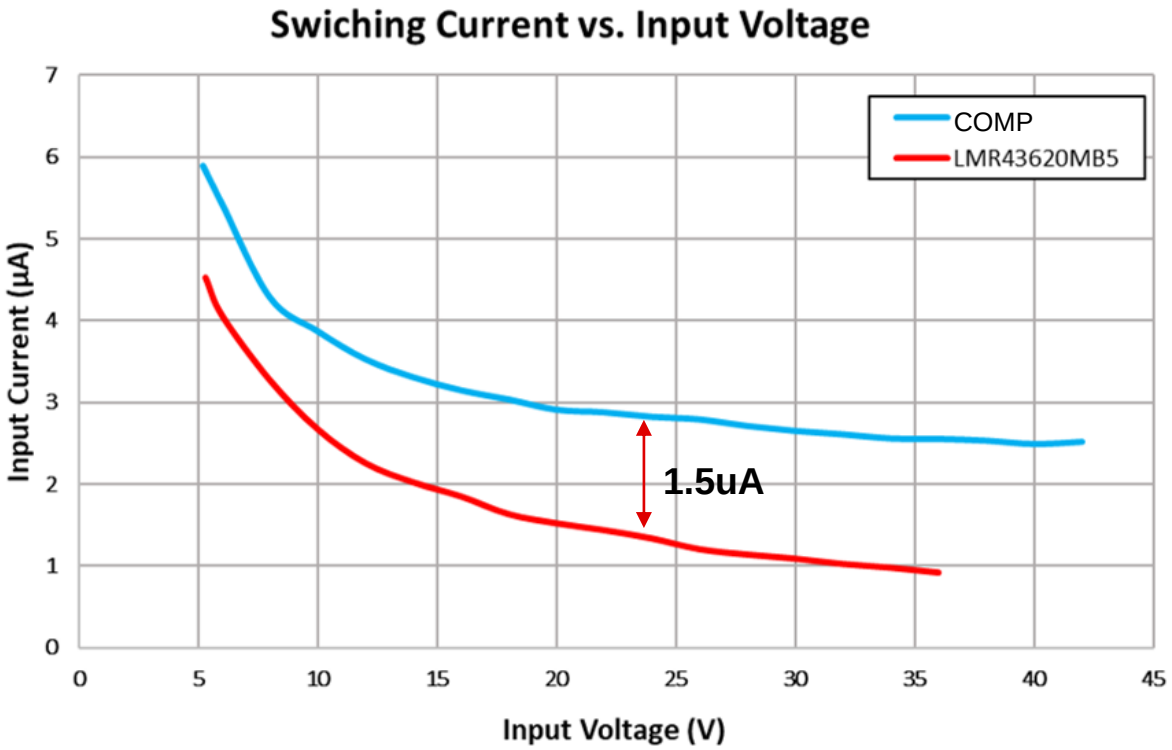
Efficiency 1MHz



Description	Load	Max Efficiency
LMR43620MB5 12Vin	0.77 A	95.5%
COMP 12Vin	0.57 A	94.1%
LMR43620MB5 24Vin	1.17 A	93.5%
COMP 24Vin	0.89 A	91.3%

Inductor part number: XGL4030-472MEC

Switching quiescent current 1MHz



Description	Switching Current at 24V
LMR43620MB5	1.334 µA
COMP	2.823 µA

Getting started with LMR43620

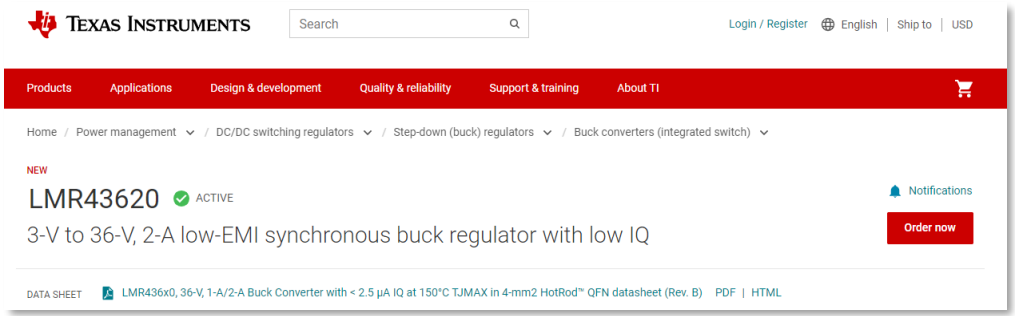
Define power requirements

Step 1

- Confirm the LMR43620 works for your requirements.
- Go to the LMR43620 product folder found on TI.com
- The applications section of the datasheet will provide recommended parts depending on your operating conditions.
  - If your operating conditions are not listed, then follow the design example which will show you how to calculate the passive component values for your application.
  - We also provide WEBENCH®, which can be used to quickly generate a design along with passive components.

Table 9-5. Detailed Design Parameters

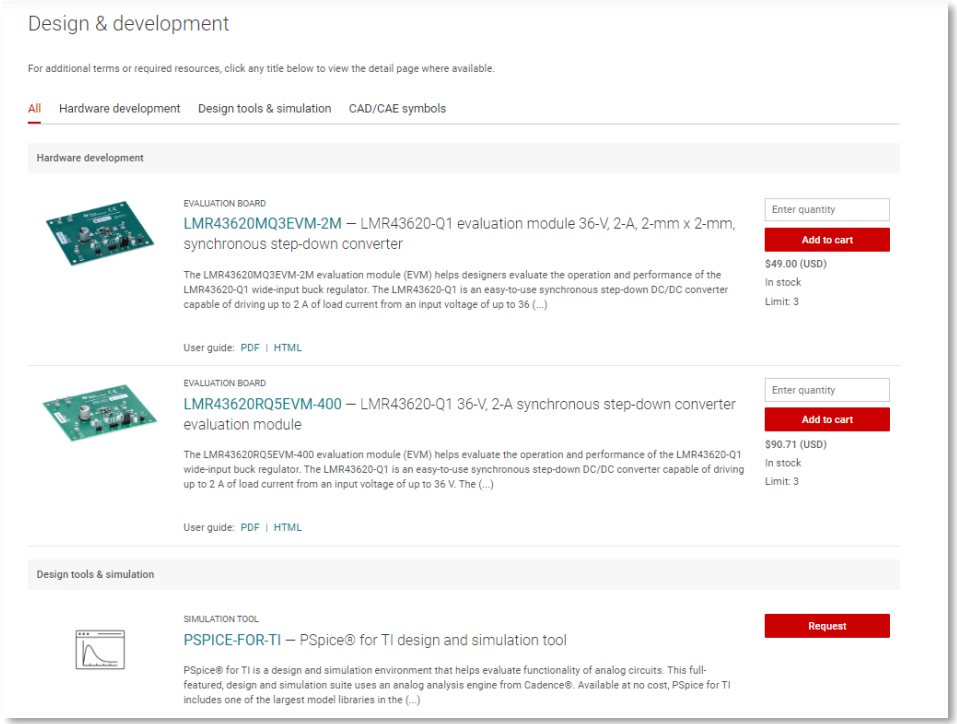
DESIGN PARAMETER	EXAMPLE VALUE
Input voltage	12 V (6 V to 36 V)
Output voltage	5 V
Maximum output current	0 A to 2 A
Switching frequency	1000 kHz



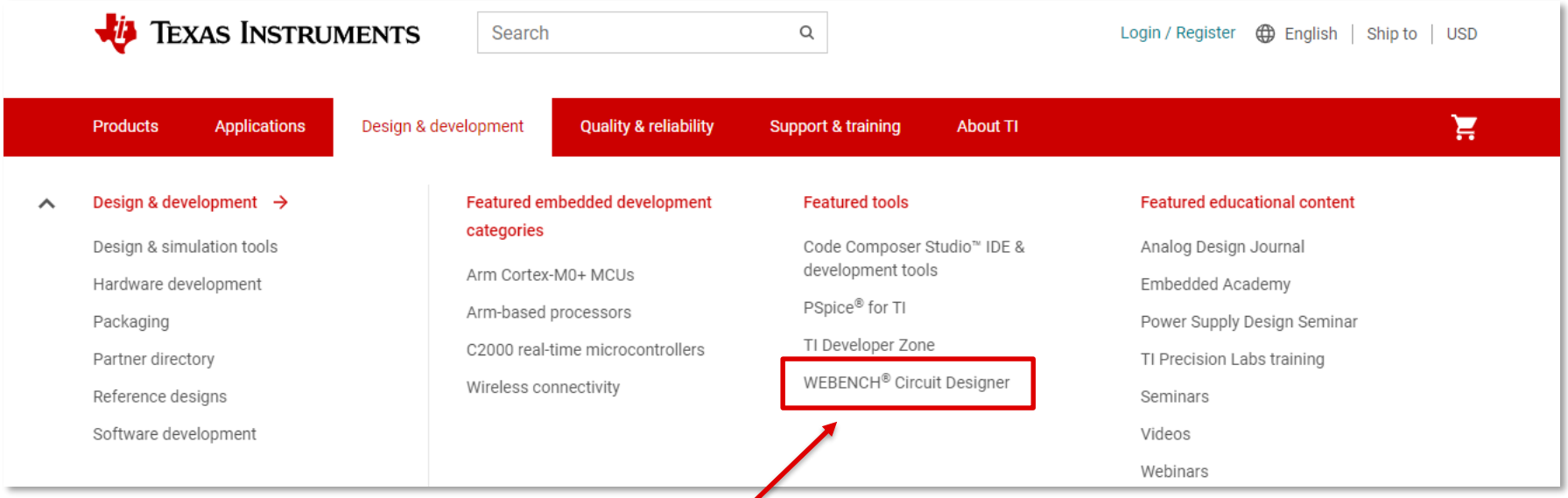
Design and development

Step 2

- Once you've determined your passive components, order an LMR43620 EVM to prototype your design and ensure your selected components give you the desired components
- You can also simulate the transient performance of the LMR43620 with your selected components using the PSpice® for TI model provided on the product folder.
  - **Note** that layout is critical to designing a buck that functions properly, make sure to check the layout guidelines near the end of the datasheet.
  - You can also review the EVM layout in the EVM user's guide and use this as a template.
- If you have questions, you can always post a question on e2e.ti.com where our power experts will be able to assist you.



Start designing with WEBENCH®

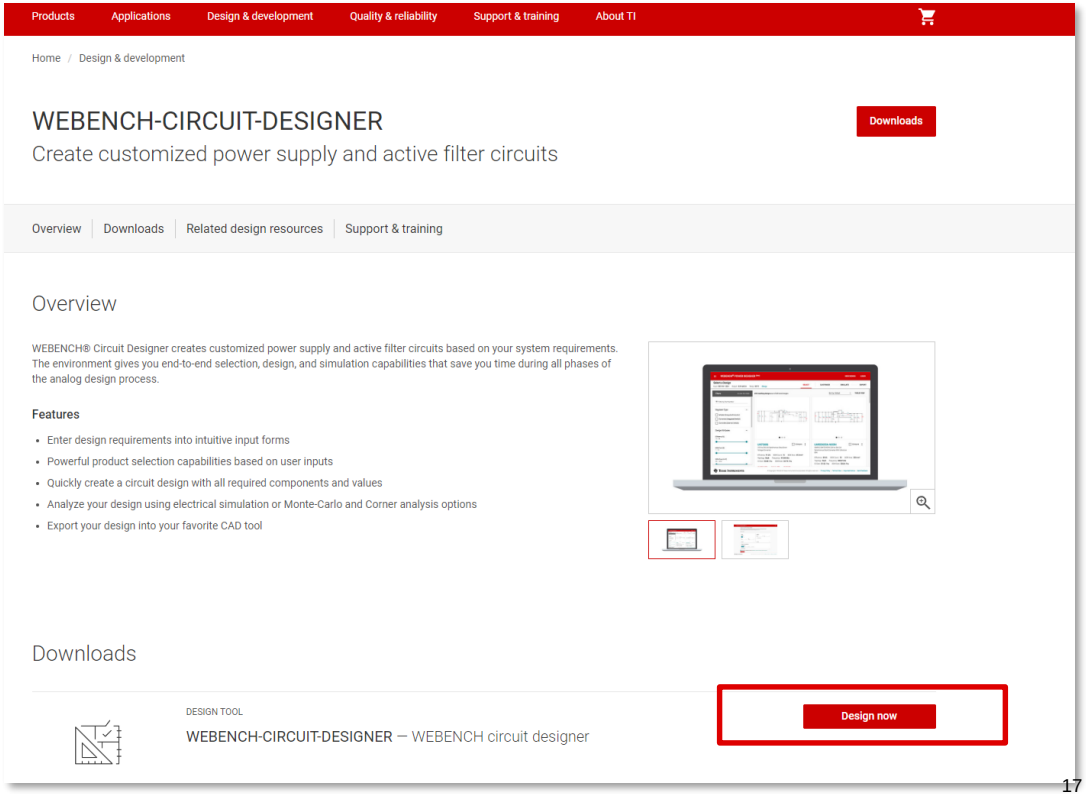


Click “WEBENCH® Circuit Designer”

WEBENCH® -CIRCUIT-DESIGNER

Step 3

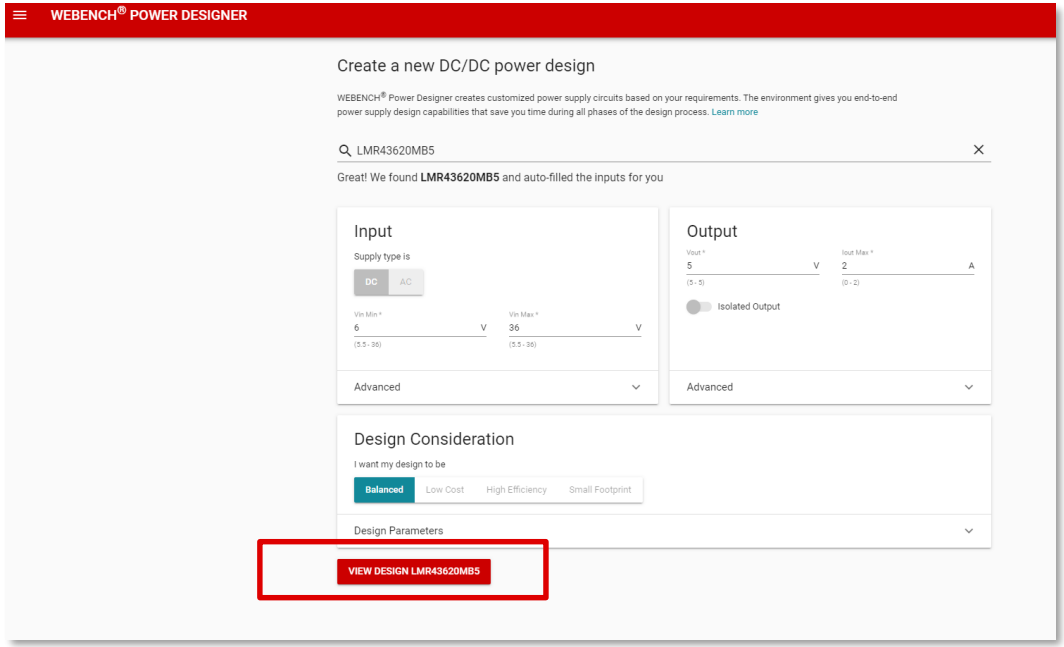
- You will be redirected to the WEBENCH® -CIRCUIT-DESIGNER page
- Click the Design now button at the bottom to get started designing online.



WEBENCH® Power designer

Step 4

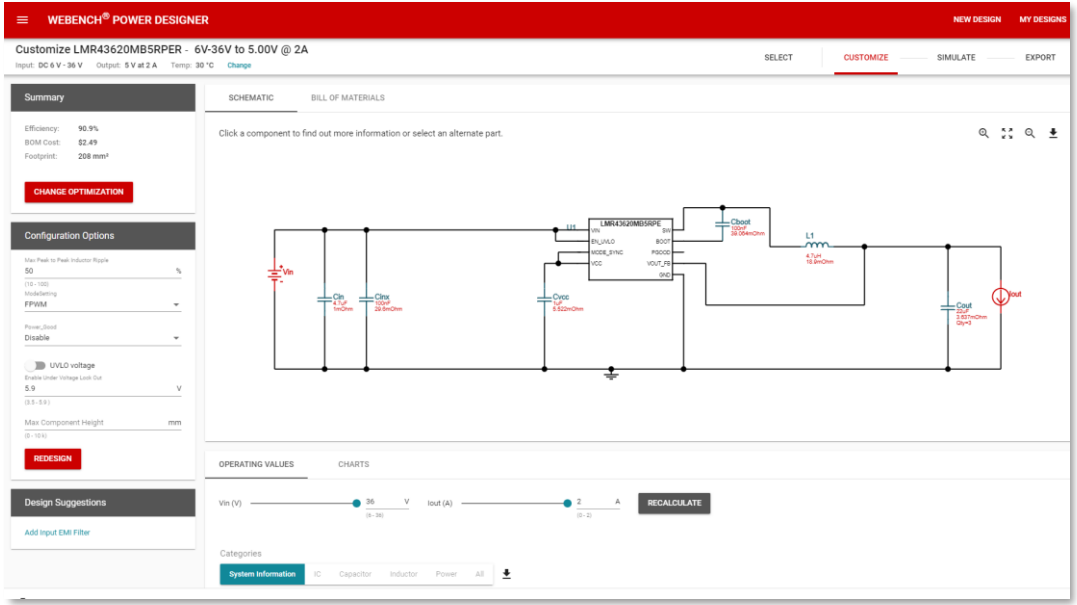
- Enter the LMR43620MB5 part number.
  - Note that there are two versions: FIXED and ADJUSTABLE.
  - Select the option that corresponds to your desired output voltage.
  - If your design requires 5V then select the FIXED option.
  - If your design requires a different output voltage, then select the ADJUSTABLE option.
- Once you've selected the correct OPN, enter in your desired input and output parameters.
- You can also select between Balanced, Low Cost, High Efficiency, and Small Footprint designs which will alter the design depending on what your ultimate design requirement.
- Once complete, select view design.



Completing your design

Step 5

- Now you've successfully generated a WEBENCH® design and can vary the values as needed.



Getting started

You can start evaluating this device leveraging the following:

Content type	Content title	Link to content or more details
Product folder	LMR43620 LMR36501	https://www.ti.com/product/LMR43620 https://www.ti.com/product/LMR43610
Functional Safety Information	LMR436x0/LMR436x0-Q1 Functional Safety, FIT Rate, FMD and pin FMA	https://www.ti.com/lit/pdf/sffs183
Selection and design tools and models	WEBENCH® circuit design and selection simulation services LMR436x0 PSPICE Model	https://www.ti.com/product/LMR43620-Q1#design-tools-simulation https://www.ti.com/tool/WEBENCH-CIRCUIT-DESIGNER
Development tool or evaluation kit	LMR436x0EVM	https://www.ti.com/tool/LMR43620MQ3EVM-2M https://www.ti.com/tool/LMR43620RQ5EVM-400

Visit www.ti.com/npu

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Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265