

New Product Update

Streamlining solution size and cost with cutting edge buck converters

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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

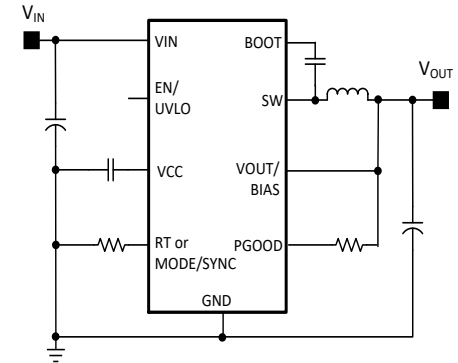
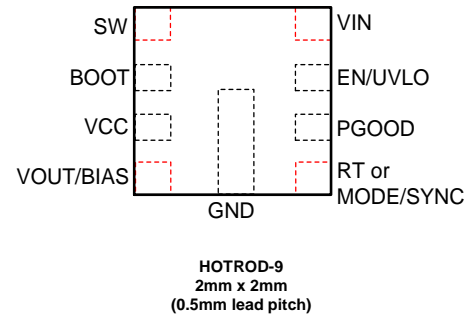
- 2 mm x 2 mm **HotRod™** package
- ~2.5uA no load switching IQ (AUTO)
- VOUT Options 3.3V/5V/Adj.
- BIAS available with Fixed 3.3V/5V
- Wide VIN range: 3.6 V – 36 V
 - VIN UVLO Falling = 3V
- Adjustable Fsw with RT
- MODE/SYNC
- Peak Current mode control with internal compensation
- Precision EN/UVLO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

Applications

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

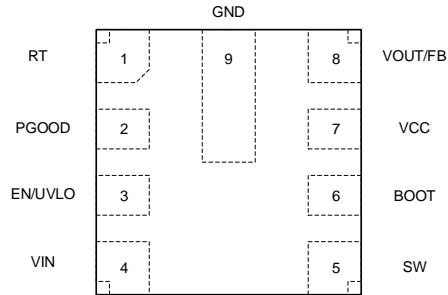
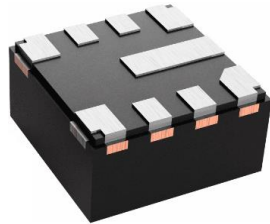
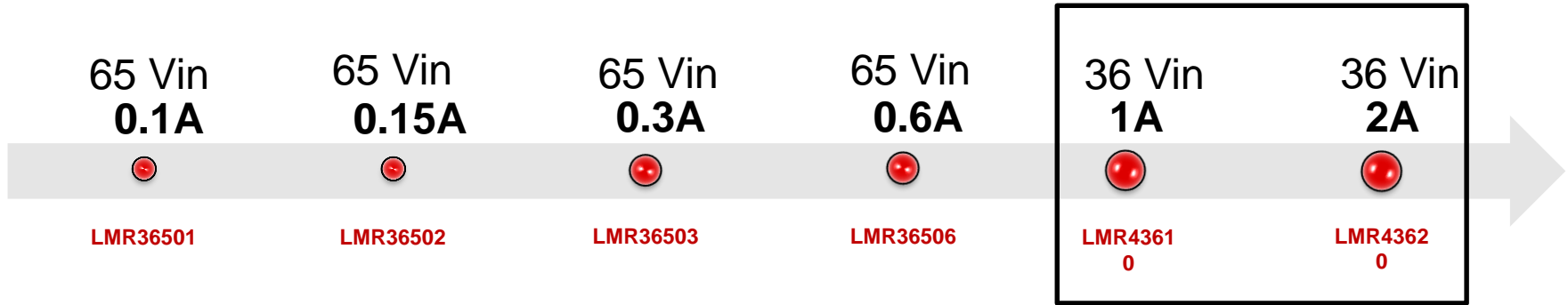
Benefits

- **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



Small size converter P2P family

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

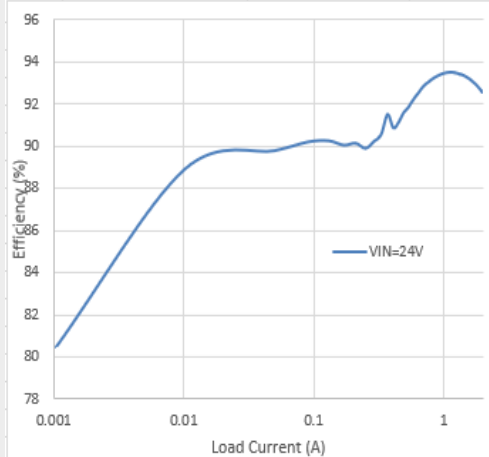


LMR43610/20 value proposition at system level

Efficiency & Thermal

High efficiency and good thermal performance

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

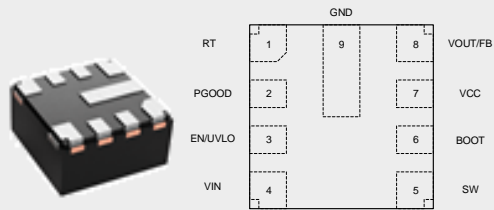


[LMR43620MQ3EVM-2M](#)

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 Package allows for minimal PCB area:

- 2-mm x 2-mm QFN Package
- 36mm² optimized solution size
- 6 external passives required



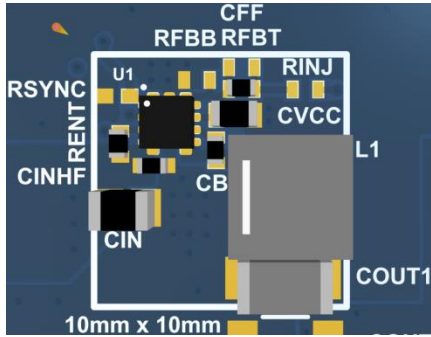
Benefits of TI's buck converter vs competition

Features comparison

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

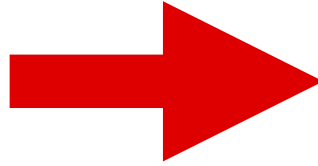
Manufacturer	Texas Instruments	Competitor A
Input Voltage Range	3 – 42 V	3 – 42 V
Load Current	2 A	1.5 A
Output Voltage Range	3.3V Fixed/ADJ, 5 V FIXED/ADJ	ADJ
Shutdown Current (EN=0V)	0.25 μ A	1 μ A
I_Q	1.6 μ A	56 μ A
Switching Frequency	200kHz – 2.2MHz	200kHz – 2.2MHz
Minimum On Time	65 ns	35 ns
Rdson	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 x 2-mm VQFN	5-mm x 3-mm MSOP

LMR43610/20 solution size comparison using EVMs

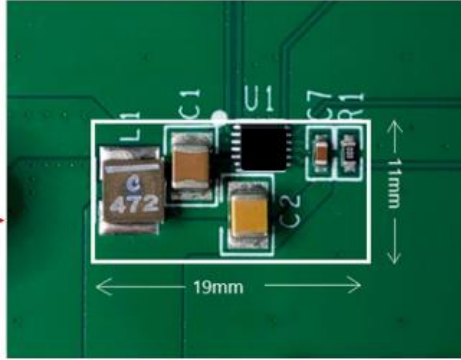
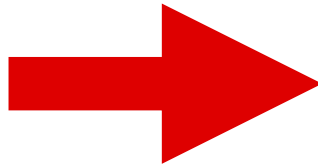


Full LMR43610/20
Single Sided
~90 mm²

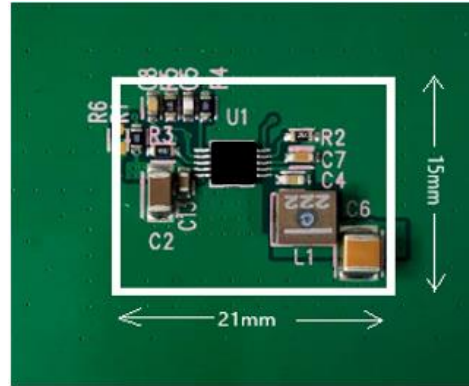
*All components in top layer



Competition
~2x Bigger
Solution Size



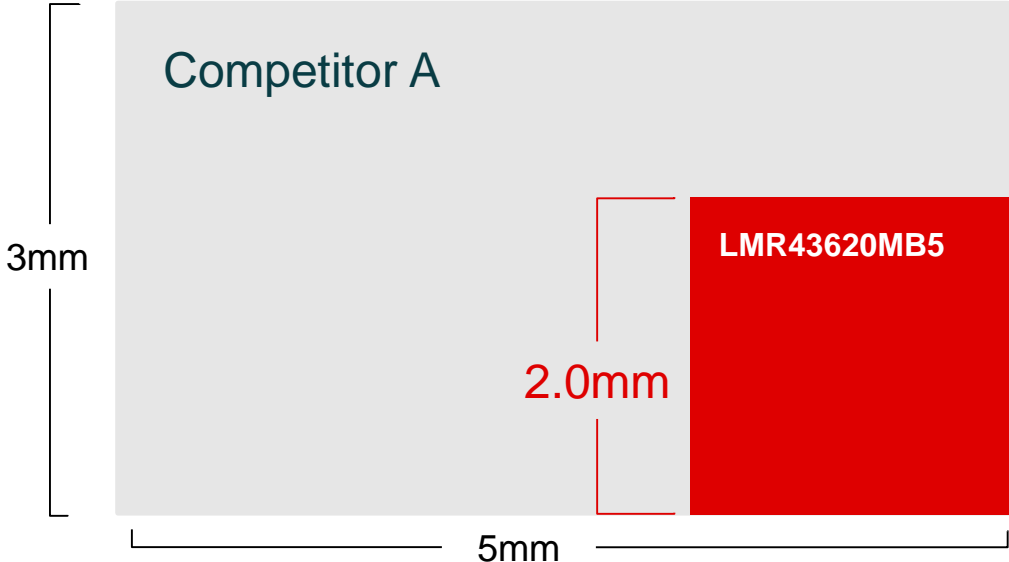
Comp A = ~190mm²



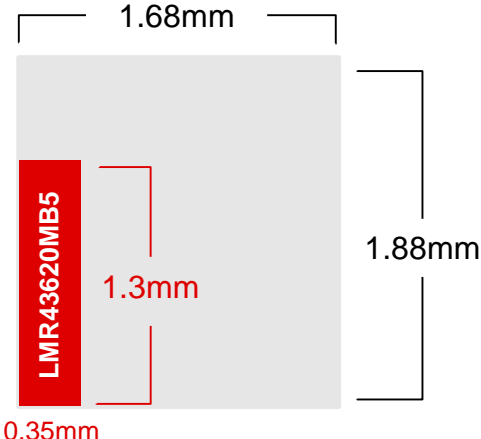
Comp B = 180mm²

Package comparison | LMR43620MB5 vs competitor

Package size

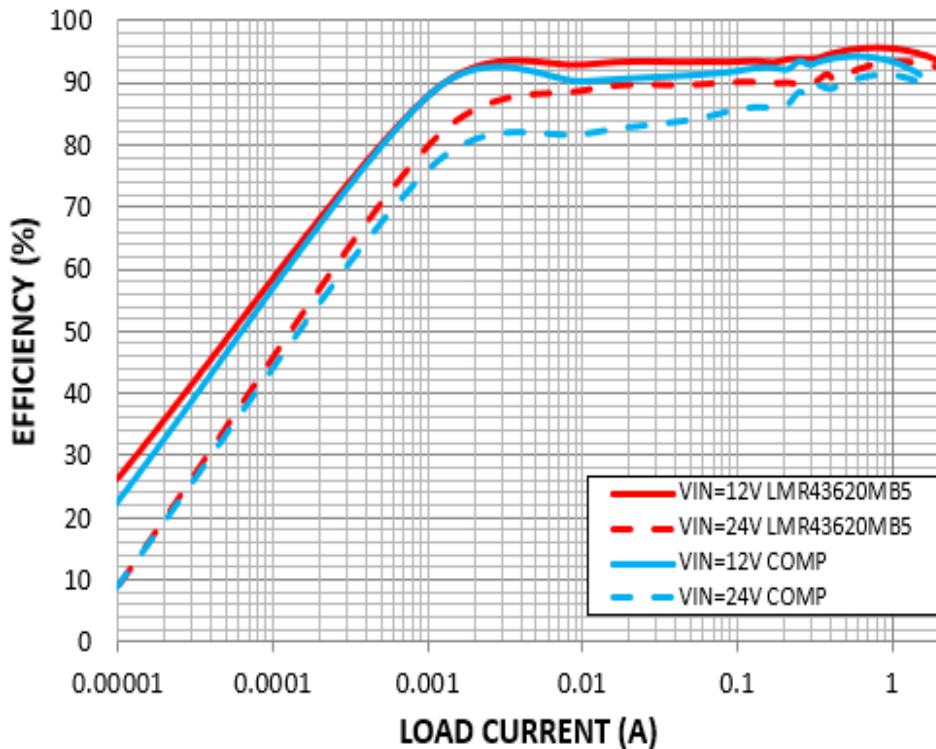


Ground pad size



Efficiency 1MHz

LMR43620MB5RPER vs. COMP EFFICIENCY Fsw=1MHz Ta=25°C

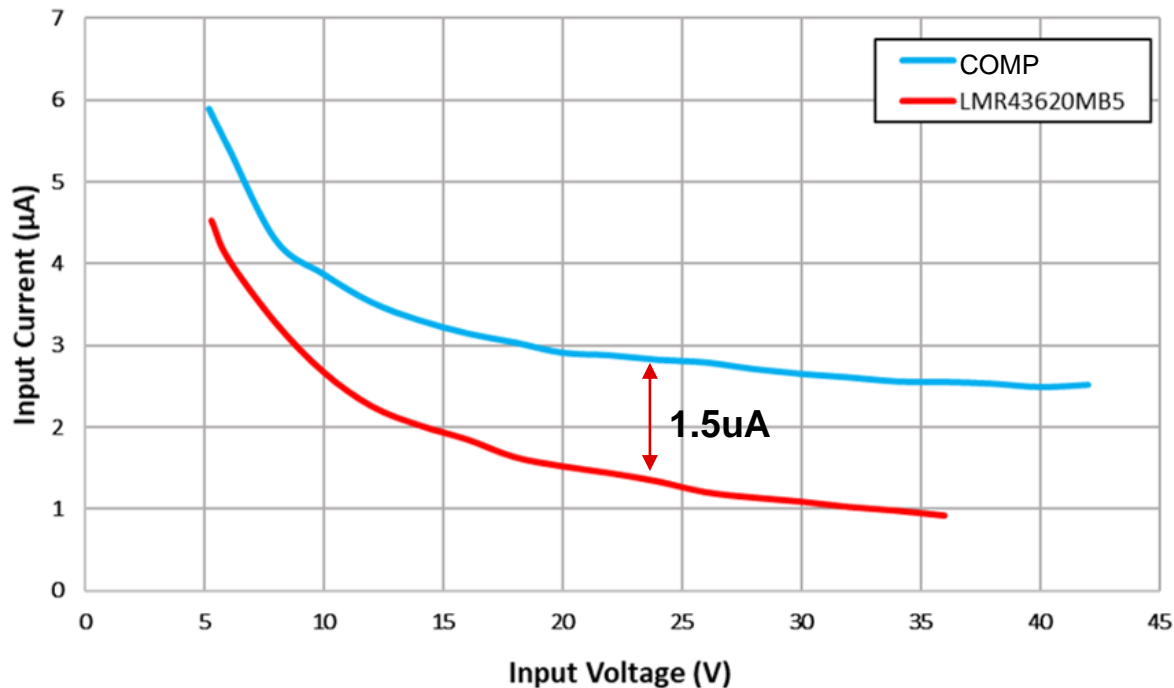


Description	Load	Max Efficiency
LMR43620MB5 12Vin	0.77 A	95.5%
COMP 12Vin	0.57 A	94.1%
LMR43620MB5 24Vin	1.17 A	93.5%
COMP 24Vin	0.89 A	91.3%

Inductor part number: XGL4030-472MEC

Switching quiescent current 1MHz

Switching Current vs. Input Voltage



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

The screenshot shows the Texas Instruments website interface. At the top, there is a search bar and navigation links for 'Login / Register', 'English', and 'Ship to | USD'. Below the search bar is a red navigation bar with links for 'Products', 'Applications', 'Design & development', 'Quality & reliability', 'Support & training', and 'About TI'. The main content area shows the breadcrumb path: 'Home / Power management / DC/DC switching regulators / Step-down (buck) regulators / Buck converters (integrated switch)'. The product 'LMR43620' is highlighted as 'NEW' and 'ACTIVE'. The product description is '3-V to 36-V, 2-A low-EMI synchronous buck regulator with low IQ'. There is a 'Notifications' bell icon and an 'Order now' button. At the bottom, there are links for 'DATA SHEET', 'LMR436x0, 36-V, 1-A/2-A Buck Converter with < 2.5 μA IQ at 150°C TJMAX in 4-mm2 HotRod™ QFN datasheet (Rev. B)', 'PDF', and 'HTML'.

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.

Design & development

For additional terms or required resources, click any title below to view the detail page where available.

[All](#) [Hardware development](#) [Design tools & simulation](#) [CAD/CAE symbols](#)

Hardware development




EVALUATION BOARD
LMR43620MQ3EVM-2M – LMR43620-Q1 evaluation module 36-V, 2-A, 2-mm x 2-mm, synchronous step-down converter

The LMR43620MQ3EVM-2M evaluation module (EVM) helps designers evaluate the operation and performance of the LMR43620-Q1 wide-input buck regulator. The LMR43620-Q1 is an easy-to-use synchronous step-down DC/DC converter capable of driving up to 2 A of load current from an input voltage of up to 36 (...)

User guide: [PDF](#) | [HTML](#)

Enter quantity
Add to cart
\$49.00 (USD)
In stock
Limit: 3




EVALUATION BOARD
LMR43620RQ3EVM-400 – LMR43620-Q1 36-V, 2-A synchronous step-down converter evaluation module

The LMR43620RQ3EVM-400 evaluation module (EVM) helps evaluate the operation and performance of the LMR43620-Q1 wide-input buck regulator. The LMR43620-Q1 is an easy-to-use synchronous step-down DC/DC converter capable of driving up to 2 A of load current from an input voltage of up to 36 V. The (...)

User guide: [PDF](#) | [HTML](#)

Enter quantity
Add to cart
\$90.71 (USD)
In stock
Limit: 3

Design tools & simulation



SIMULATION TOOL
PSPICE-FOR-TI – PSpice® for TI design and simulation tool

PSpice® for TI is a design and simulation environment that helps evaluate functionality of analog circuits. This full-featured, design and simulation suite uses an analog analysis engine from Cadence®. Available at no cost, PSpice for TI includes one of the largest model libraries in the (...)

Request

Start designing with WEBENCH®

The screenshot shows the top navigation bar of the Texas Instruments website. The header includes the TI logo and 'TEXAS INSTRUMENTS' on the left, a search bar in the center, and 'Login / Register', a globe icon, 'English', 'Ship to', and 'USD' on the right. Below the header is a red navigation bar with menu items: 'Products', 'Applications', 'Design & development', 'Quality & reliability', 'Support & training', 'About TI', and a shopping cart icon. The 'Design & development' menu is expanded, showing a list of sub-items. The 'Featured embedded development categories' section lists 'Arm Cortex-M0+ MCUs', 'Arm-based processors', 'C2000 real-time microcontrollers', and 'Wireless connectivity'. The 'Featured tools' section lists 'Code Composer Studio™ IDE & development tools', 'PSpice® for TI', 'TI Developer Zone', and 'WEBENCH® Circuit Designer', which is highlighted with a red box and a red arrow pointing to it. The 'Featured educational content' section lists 'Analog Design Journal', 'Embedded Academy', 'Power Supply Design Seminar', 'TI Precision Labs training', 'Seminars', 'Videos', and 'Webinars'.

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.

The screenshot shows the product page for WEBENCH-CIRCUIT-DESIGNER. The navigation bar includes links for Products, Applications, Design & development, Quality & reliability, Support & training, and About TI. The breadcrumb trail is Home / Design & development. The main heading is WEBENCH-CIRCUIT-DESIGNER, with a sub-heading 'Create customized power supply and active filter circuits' and a red 'Downloads' button. Below this is a secondary navigation bar with links for Overview, Downloads, Related design resources, and Support & training. The 'Overview' section contains a description of the tool's capabilities and a list of features. A large image shows the software interface on a laptop. The 'Downloads' section at the bottom features a 'DESIGN TOOL' icon, the text 'WEBENCH-CIRCUIT-DESIGNER – WEBENCH circuit designer', and a prominent red 'Design now' button.

Products Applications Design & development Quality & reliability Support & training About TI

Home / Design & development

WEBENCH-CIRCUIT-DESIGNER

Create customized power supply and active filter circuits

Downloads

Overview Downloads Related design resources Support & training

Overview

WEBENCH[®] Circuit Designer creates customized power supply and active filter circuits based on your system requirements. The environment gives you end-to-end selection, design, and simulation capabilities that save you time during all phases of the analog design process.

Features

- Enter design requirements into intuitive input forms
- Powerful product selection capabilities based on user inputs
- Quickly create a circuit design with all required components and values
- Analyze your design using electrical simulation or Monte-Carlo and Corner analysis options
- Export your design into your favorite CAD tool

Downloads

DESIGN TOOL

WEBENCH-CIRCUIT-DESIGNER – WEBENCH circuit designer

Design now

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.

The screenshot displays the WEBENCH[®] POWER DESIGNER interface. At the top, a red header contains the text "WEBENCH[®] POWER DESIGNER". Below this, the main heading reads "Create a new DC/DC power design". A sub-header states: "WEBENCH[®] Power Designer creates customized power supply circuits based on your requirements. The environment gives you end-to-end power supply design capabilities that save you time during all phases of the design process. [Learn more](#)".

A search bar contains the text "Q LMR43620MB5" with a clear button (X) on the right. Below the search bar, a message says: "Great! We found LMR43620MB5 and auto-filled the inputs for you".

The interface is divided into two main columns: "Input" and "Output".

Input Section: "Supply type is" has two buttons: "DC" (selected) and "AC". Below this, there are two input fields for "Vin Min" and "Vin Max". The "Vin Min" field is set to "6" with a range of "(5.5 - 36)". The "Vin Max" field is set to "36" with a range of "(5.5 - 36)".

Output Section: "Vout" is set to "5" with a range of "(5 - 5)". "Iout Max" is set to "2" with a range of "(0 - 2)". There is a radio button for "Isolated Output" which is currently unselected.

Below the input and output sections, there is a "Design Consideration" section with the text "I want my design to be" and four buttons: "Balanced" (selected), "Low Cost", "High Efficiency", and "Small Footprint".

At the bottom of the interface, there is a "Design Parameters" section with a dropdown arrow. Below this, a red button labeled "VIEW DESIGN LMR43620MB5" is highlighted with a red rectangular box.

Completing your design

Step 5

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

The screenshot displays the WEBENCH POWER DESIGNER interface for a power converter design. The main title is "Customize LMR43620MBSRPER - 6V-36V to 5.00V @ 2A". The input is DC 4 V-36 V, output is 5 V at 2 A, and temperature is 30 °C. The interface is divided into several sections:

- Summary:** Efficiency: 90.9%, BOM Cost: \$2.49, Footprint: 208 mm². A "CHANGE OPTIMIZATION" button is present.
- Configuration Options:** Max Peak-to-Peak Inductor Ripple: 50% (10-100), Modulation: PFM, Freq. Limit: Disable, LVLO voltage: 5.9V (0.5-5.9), Max Component Height: mm (0-100). A "REDESIGN" button is present.
- Design Suggestions:** Add Input EMI Filter.
- SCHEMATIC:** Shows a circuit diagram with an LMR43620MBSRPER IC, input capacitors (Cin), an output capacitor (Cout), and an inductor (L1). The IC pins are labeled: SW, SW/ALO, MOSFET_DRV, PFC, and GND.
- OPERATING VALUES:** Vin (V) is set to 36 V (0-36), Iout (A) is set to 2 A (0-2). A "RECALCULATE" button is present.
- CHARTS:** A section for displaying performance charts.
- CATEGORIES:** System Information, IC, Capacitor, Inductor, Power, All.

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

For more information on the New Product Update series, calendar and archived recordings



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