

AN-2032 LMZ14202 / LMZ14203 Demo Board SIMPLE SWITCHER® Power Module Quick Start Guide

1 Description

The LMZ14202/3 SIMPLE SWITCHER power module is a complete, easy to use step-down DC-DC solution capable of driving up to 3A load. The LMZ14202/3 is available in an innovative, easy to use package that enhances thermal performance and allows for hand or machine soldering.

The LMZ14202/3 demo board can accept an input voltage rail between 8V and 42V and deliver an adjustable and highly accurate output voltage as low as 0.8V. The LMZ14202/3 only requires three external resistors and four external capacitors to complete the power solution. The LMZ14202/3 is a reliable and robust solution with the following protection features: thermal shutdown, input under-voltage lockout (UVLO), output over-voltage protection (OVP), short-circuit protection, output current limit, and allows startup into a pre-biased output. A single resistor adjusts switching frequency up to 1 MHz.

2 Packaging Highlights

- 7 lead module package (Similar to TO-263)
- Single exposed die attach pad for enhanced thermal performance
- 10.2 x 13.8 x 4.6 mm module package
- High power density
- 1.7" x 2.3" reduced size demo board form factor

3 Demo Board Features

- Power input voltage range 6V-42V
- UVLO programmed at 8V
- Adjustable output voltage range 0.8V to 6V
- Up to 3A output current (LMZ14203)
- Up to 2A output current (LMZ14202)
- Integrated shielded inductor in module
- Efficiency up to 92%
- All ceramic capacitor design
- No loop compensation required
- Starts into pre-biased loads
- Short circuit protection
- Thermal shutdown
- Only 9 external passives plus module
- Max 78°C ambient at full load
- 2 layer low cost assembly

SIMPLE SWITCHER is a registered trademark of Texas Instruments.
All other trademarks are the property of their respective owners.

4 Typical Applications

- Point of load conversions from 12V and 24V input rail
- Space constrained applications
- Industrial controls
- Telecom
- Networking equipment

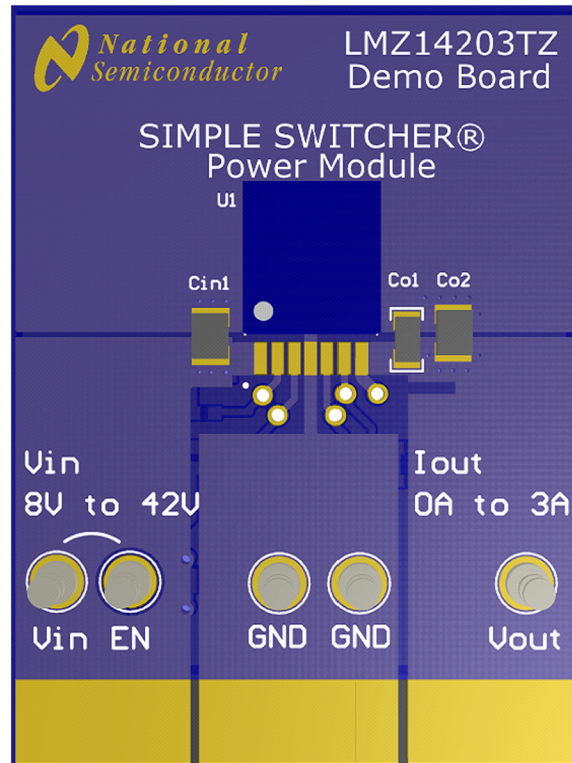


Figure 1. Front View

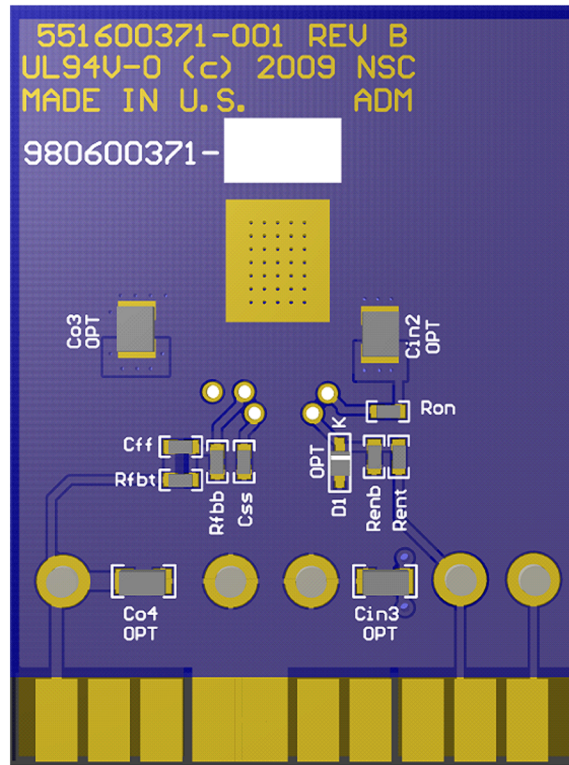


Figure 2. Back View

Table 1. Absolute Maximum Module Ratings

VIN, RON to GND	-0.3V to 47
EN, FB, SS to GND	-0.3V to 7V

Table 2. Module Operating Ratings

VIN	6V to 42V
EN (Input on pin 3 module pin)	0V to 6.5V
Junction Temperature Range (Tj)	- 40C to +125C

Table 3. Demo Board Operating Ratings

VIN	6V to 42V
VOU (Default setting)	3.3V
IOU	0A to 3A or 0A to 2A
EN (Input on demo board post)	0V to 42V
UVLO setting on ENable input	8V
Soft-start time	2.2 mSec
Operating Temperature Range (Tj)	- 40C to +78C (at full 3A load)

Table 4. Board Bill of Materials (BOM) (continued)

Ref Des	Description	Case	Manufacturer Part Number
Alternate resistor values for alternative output voltages			
VOUT	RFBT	RFBB	RON
6	2.49k	3.83k	124k
5	5.62k	1.07k	100k
3.3	3.32k	1.07k	61.9k
2.5	2.26k	1.07k	47.5k
1.8	1.87k	1.50k	32.4k
1.5	1.00k	1.13k	28.0k
1.2	4.22k	8.45k	22.6k
0.8	0.0K	39.2k	24.9k

7 Demo Board Hookup

VOUT Connect the load to VOUT and one of the GND posts. The module can source up to a 2A or 3A load current, depending on the module installed.

VIN : Connect Vin to a positive voltage in the 8 to 42V range. Connect the negative terminal of the source supply to one of the posts labeled GND.

En: The Enable input post is configured for direct connection to the Vin post. The on-board resistive voltage divider is chosen such that when connected to 42V that the enable input at pin 3 of the module will not exceed 6.5V. With the chosen resistor values this results in an under voltage lockout level of 8 V input. The top enable resistor is RENT (aka REN1) and the bottom enable resistor is RENB (aka REN2). The bottom enable resistor may have a location for a shunt zener clamp (Labeled D1 OPT in the silkscreen - Included only in the later revisions of the assembly.)

Quiescent current: If the Enable post is disconnected, the module will be disabled and about 20 μ A of supply current will flow from Vin to ground while in the disabled mode. With the enable input connected to Vin via the 68.1K/11.8K divider there will be about 1.5 mA of no-load quiescent current into the Vin input. Additional current flows into the enable divider string.

8 Demo Board Passive Components

Soft-start capacitor The soft-start capacitor controls the rise time of the output voltage when power is first applied and following the clearing of a fault mode.

Feedback divider Regulator output voltage is programmed through the selection of the two resistors, RFBT (RFB1) and RFB (RFB2) A feed forward capacitor (CFF) is located in parallel with the upper feedback divider resistor. This capacitor improves the step response to abrupt changes in load current. For a different output voltage, see [Table 4](#) when modifying the board. Resistor values shown will minimize error in output voltage setting.

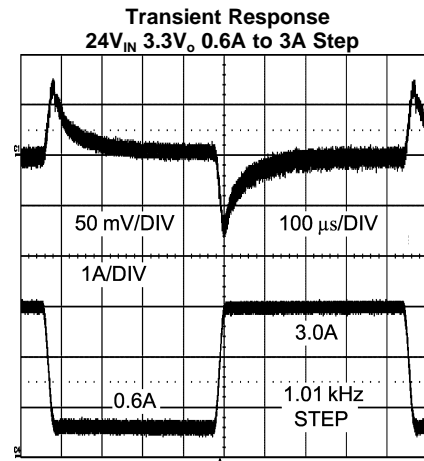
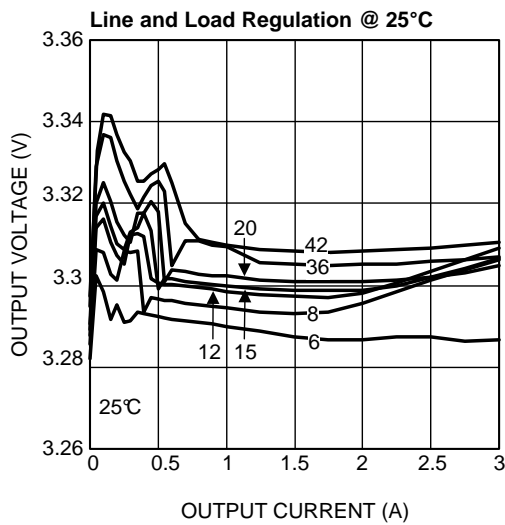
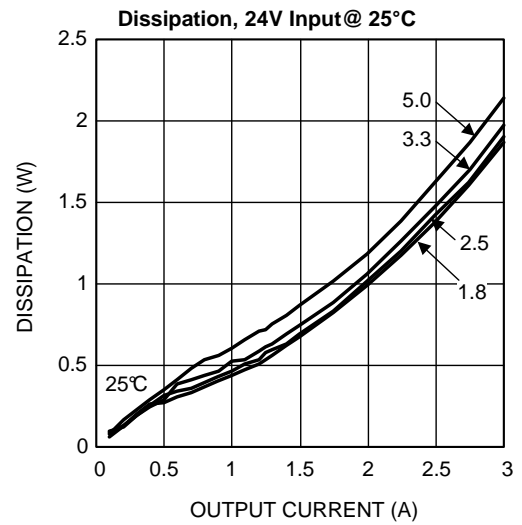
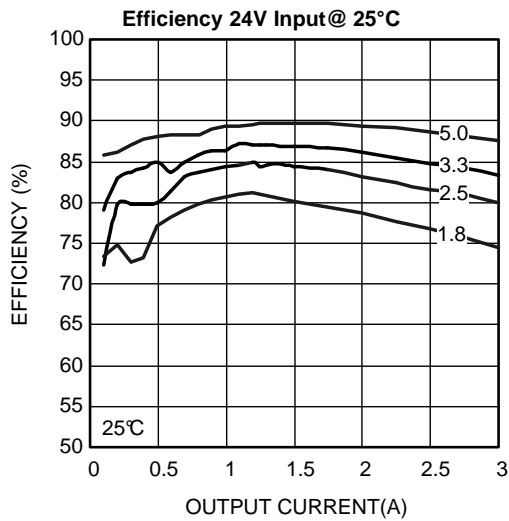
RON Resistor: The primary function of the RON resistor is to set the On-Time interval of the internal control section switching cycle. The secondary function of the RON resistor is to create a nearly constant operating frequency over the input operating voltage range. If the output voltage of the regulator is changed by adjusting the feedback divider then it is generally required that the RON resistor value also be changed in order to maintain the same operating frequency.

Cout A parallel connection of a 1 μ F 50V and a 100 μ F 6.3V multilayer ceramic are used for the output capacitor. Locations are provided on the PCB assembly for experimenting with additional output capacitors. Some recommended values are shown on the schematic as “DNS” and labeled in the PCB silkscreen as “OPT”.

CinA 10 μ F 50V multilayer ceramic is connected as the input filter. Locations are provided on the PCB assembly for experimenting with additional input capacitors. Some recommended values are shown on the schematic as “DNS” and labeled in the PCB silkscreen as “OPT”.

9 Performance Characteristics

The following curves apply to the LMZ14203 Demo Board.



IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com