

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

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4 Typical Applications

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

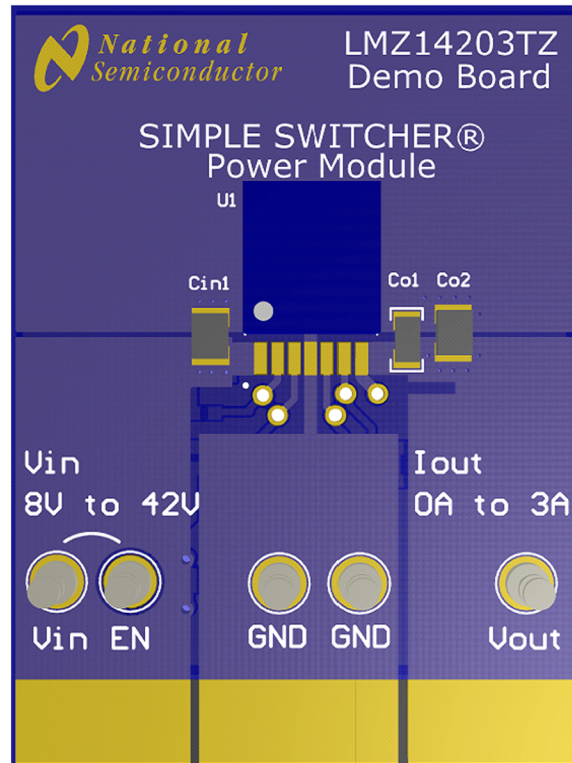


Figure 1. Front View

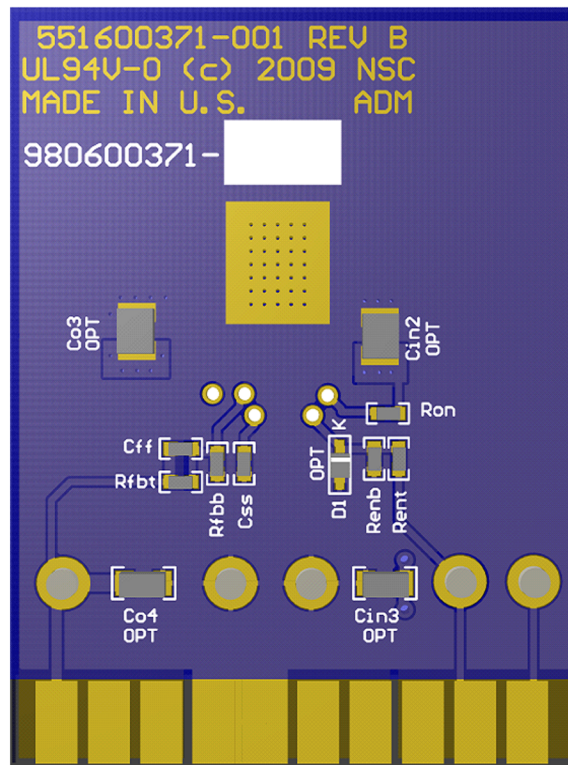


Figure 2. Back View

Table 1. Absolute Maximum Module Ratings

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

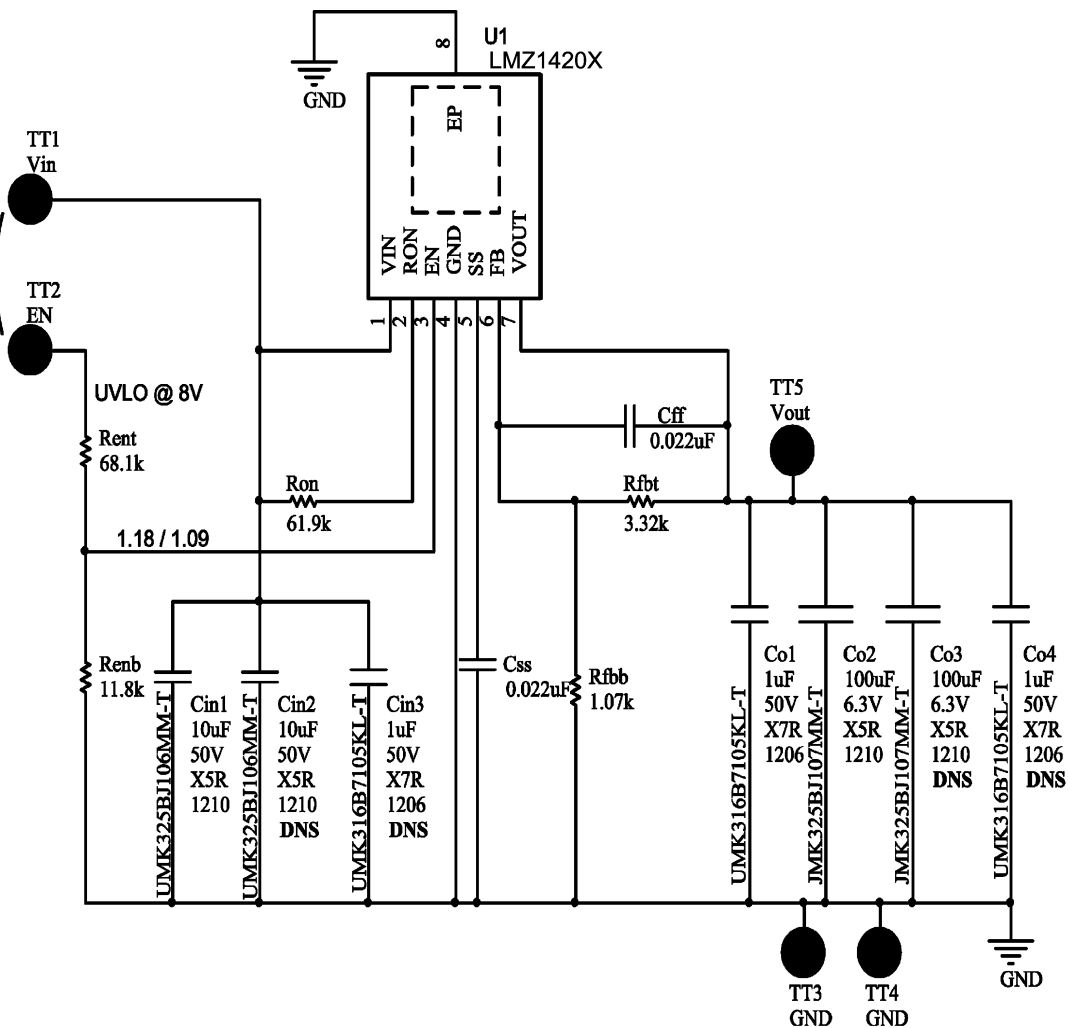
Table 2. Module Operating Ratings

| | |
|---------------------------------|----------------|
| 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) |

5 Demo Board Schematic



6 Demo Board Bill of Materials (BOM)

Table 4. Board Bill of Materials (BOM)

| Ref Des | Description | Case | Manufacturer Part Number |
|---------|--|-------|--------------------------|
| RON | 61.9 kΩ 1% resistor | 0603 | |
| RENT | 68.1 kΩ 1% resistor | 0603 | |
| RENB | 11.8 kΩ 1% resistor | 0603 | |
| RFBT | 3.32 kΩ 1% resistor | 0603 | |
| RFBB | 1.07 kΩ 1% resistor | 0603 | |
| CFF | 0.022 μF 50V X7R ceramic capacitor | 0603 | |
| CSS | 0.022 μF 50V X7R ceramic capacitor | 0603 | |
| CIN1 | 10 μF 50V X5R ceramic capacitor | 1210 | UMK325BJ106MM-T |
| CO1 | 1.0 μF 50V X7R ceramic capacitor | 1206 | UMK316B7105KL-T |
| CO2 | 100 μF 6.3V X5R ceramic capacitor | 1210 | JMK325BJ107MM-T |
| U1 | LMZ14202/3SIMPLE SWITCHER Power Module | PFM-7 | LMZ14203/LMZ14202 |

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.

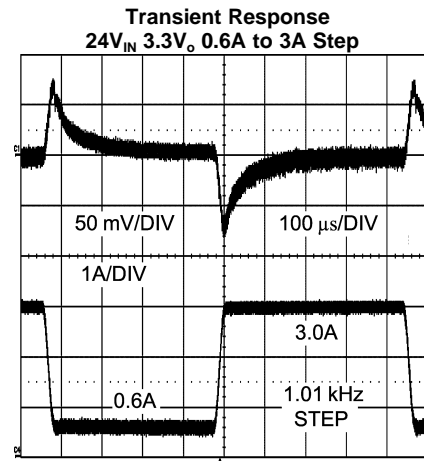
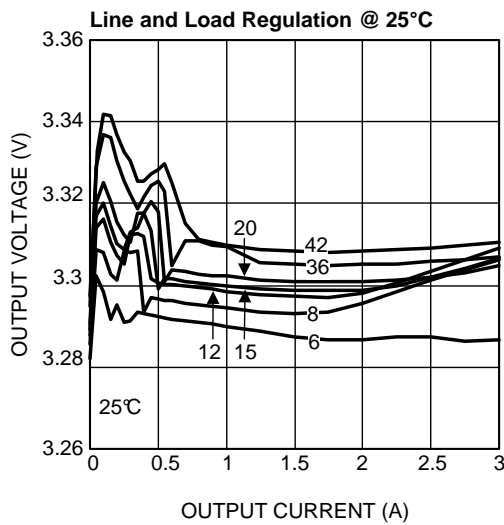
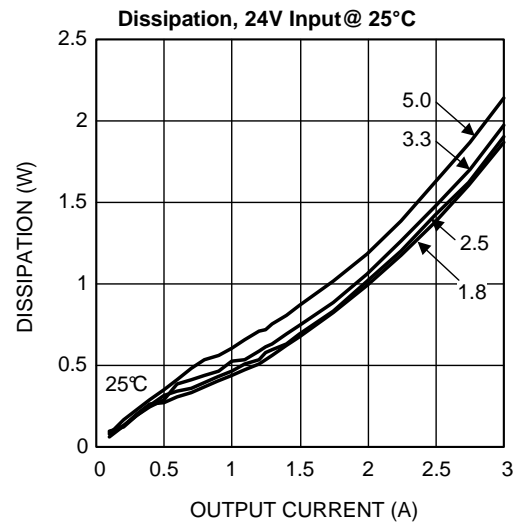
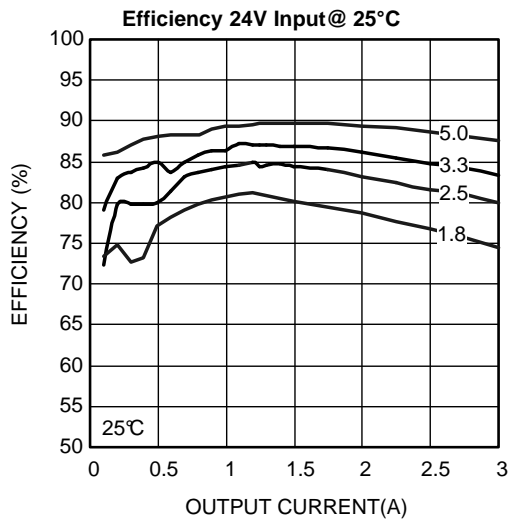
RON Resistor: The primary function of the RON resistor is to set the On-Time interval of the internal control section switching cycle. The secondary function of the RON resistor is to create a nearly constant operating frequency over the input operating voltage range. If the output voltage of the regulator 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.



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CAUTION

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

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Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

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