

LMZ14203 3A Demo Board SIMPLE SWITCHER® Power Module Quick Start Guide

National Semiconductor
Application Note 2032
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Description

The LMZ14203 SIMPLE SWITCHER power module is a complete, easy to use step-down DC-DC solution capable of driving up to 3A load. The LMZ14203 is available in an innovative, easy to use package that enhances thermal performance and allows for hand or machine soldering.

The LMZ14203 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 LMZ14203 only requires three external resistors and four external capacitors to complete the power solution. The LMZ14203 is a reliable and robust solution with the following protection features: thermal shutdown, input under-voltage lockout, output over-voltage protection, short-circuit protection, output current limit, and allows startup into a pre-biased output. A single resistor adjusts switching frequency up to 1 MHz.

Packaging Highlights

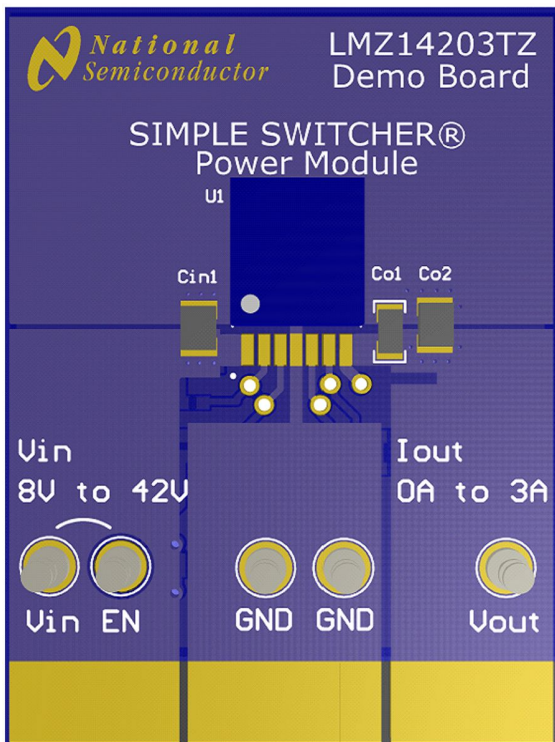
- 7 lead module package (Similar to TO-263)
- Single exposed die attach pad for enhanced thermal performance
- 10.2 x 13.8 x 4.6 mm module package
- High power density
- 1.7" x 2.3" reduced size demo board form factor

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
- 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

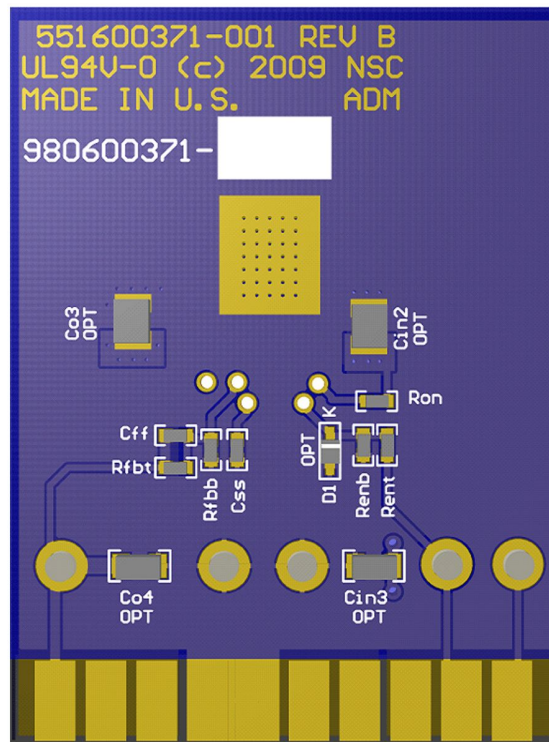
Typical Applications

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



Front View

30114401



Back View

30114402

Absolute Maximum Module Ratings

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

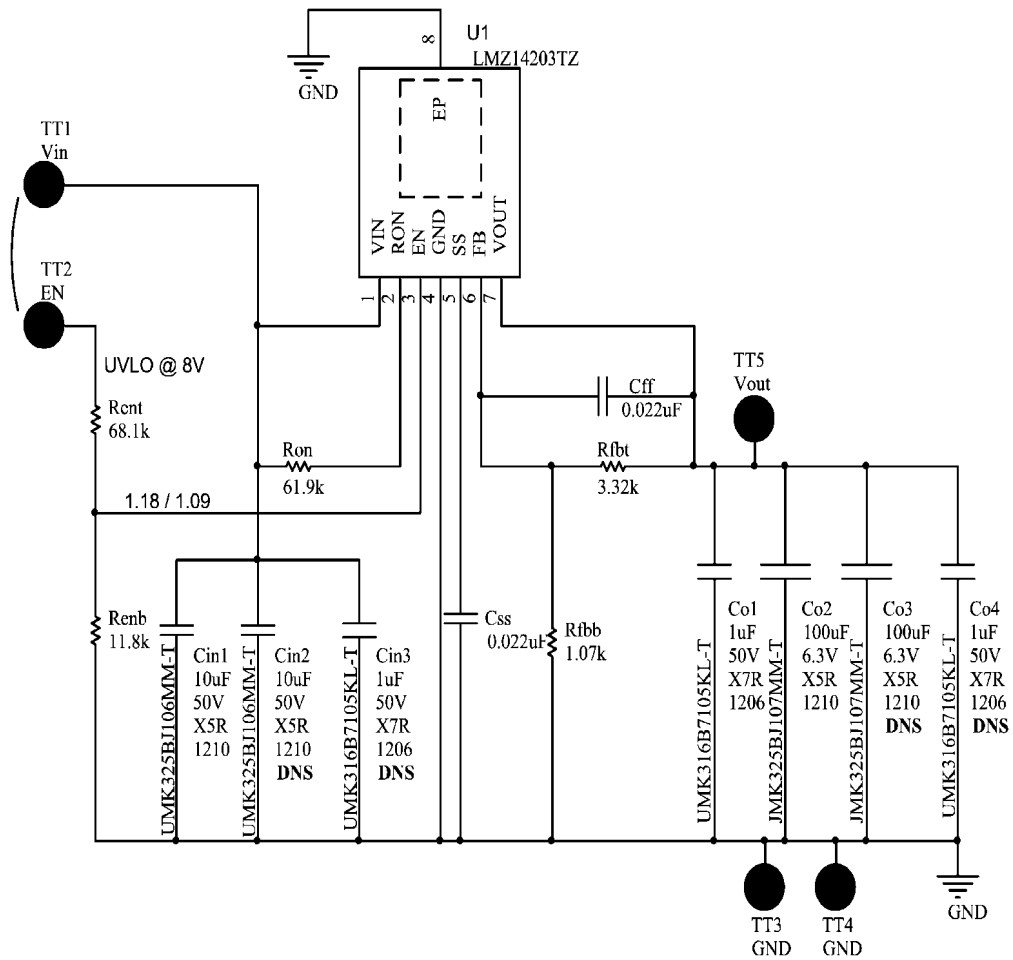
Demo Board Operating Ratings

VIN	6V to 42V
VOUT (Default setting)	3.3V
IOUT	0A to 3A
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)

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

Demo Board Schematic



30114403

Demo Board Bill of Materials

Ref Des	Description	Case	Manufacturer Part Number
RON	61.9 kohm 1% resistor	603	
RENT	68.1 kohm 1% resistor	603	
RENB	11.8 kohm 1% resistor	603	
RFBT	3.32 kohm 1% resistor	603	
RFBB	1.07 kohm 1% resistor	603	
CFF	0.022 uF 50V X7R ceramic capacitor	603	
CSS	0.022 uF 50V X7R ceramic capacitor	603	
CIN1	10 uF 50V X5R ceramic capacitor	1210	UMK325BJ106M M-T
CO1	1.0 uF 50V X7R ceramic capacitor	1206	UMK316B7105KL -T
CO2	100 uF 6.3V X5R ceramic capacitor	1210	JMK325BJ107M M-T
U1	LMZ14203 SIMPLE SWITCHER Power Module	TO-PMOD	LMZ14203TZ-ADJ

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

Demo Board Hookup

VOUT Connect the load to VOUT and one of the GND posts. The module can source up to a 3A load current.

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 uA 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.

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 (aka RFB1) and RFB (aka 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. Refer to the table above when modifying the board for a different output voltage. Resistor values shown will minimize error in output voltage setting.

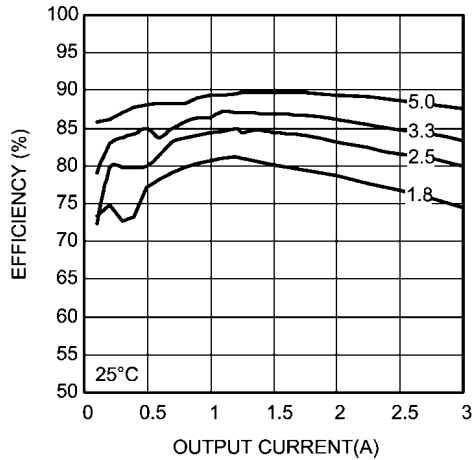
RON Resistor: The primary function of the RON resistor is to set the On-Time interval of the internal control section switching cycle. The secondary function of the RON resistor is to create a nearly constant operating frequency over the input operating voltage range. If the output voltage of the regulator 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 1uF 50V and a 100uF 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 uF 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”.

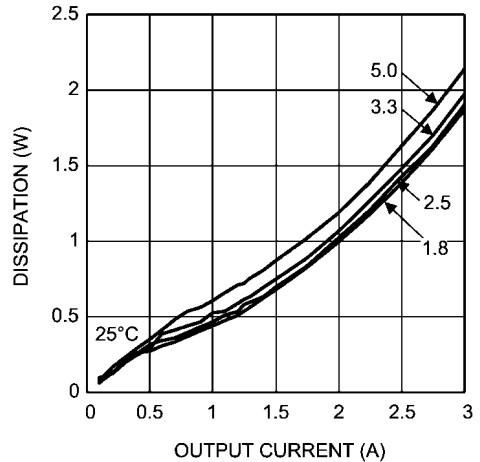
Performance Characteristics

Efficiency 24V Input@ 25°C



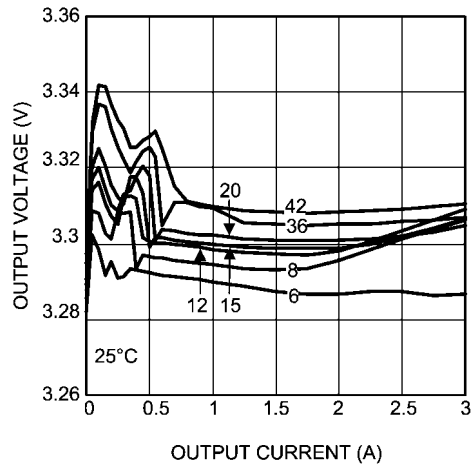
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Dissipation, 24V Input@ 25°C



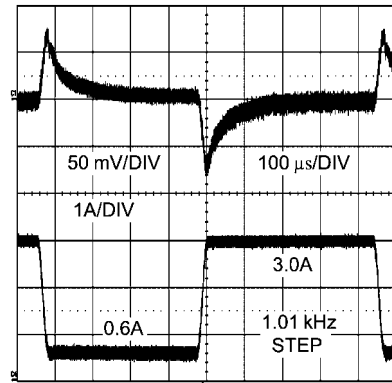
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Line and Load Regulation @ 25°C



30114406

Transient Response
24V_{IN} 3.3V_O 0.6A to 3A Step



30114407

Notes

AN-2032

Notes

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