

AN-2185 LMR14203/LMR14206 Demonstration Board

1 Introduction

The Texas Instruments LMR14203/06 is a PWM DC/DC buck (step-down) regulator. With a wide input range from 4.5V–42V, it is suitable for a variety of applications from automotive to power conditioning of unregulated sources. The LMR14203/LMR14006 demonstration board is designed to provide the design engineer with a fully functional power converter based on the buck topology to evaluate the LMR14203/06 series of buck regulators. The demonstration board comes populated with either the LMR14203XMK or LMR14206XMK, but can easily be modified to accommodate any of the LMR14203/06 regulator ICs.

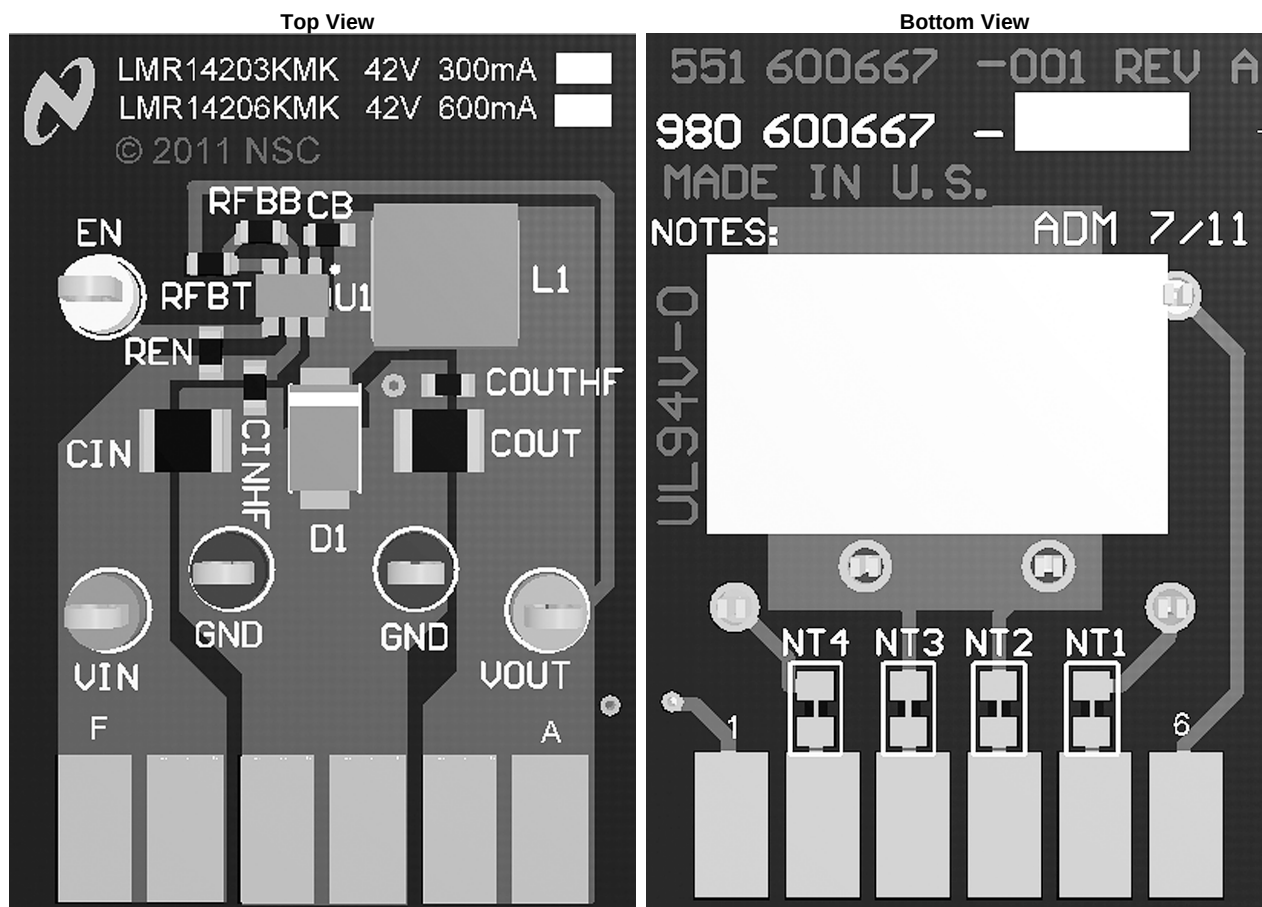


Figure 1. LMR14203/LMR14206 Demonstration Board

2 Features

- 4.5V to 42V Input Voltage Range
- 1.2V Output Voltage
- Up to 300/600 mA Output Current
- Switching Frequency of 1.25 MHz
- Internal Compensation

3 Shutdown Operation

The demonstration board includes a pull-up resistor to enable the device once V_{IN} has exceeded 1.0V (typ). Using the EN post to disable the device by pulling this node to GND. A logic signal may be applied, to the post, to test startup and shutdown of the device.

4 Adjusting the Output Voltage

The output voltage can be changed from 1.2V to another voltage by adjusting the feedback resistors using the following equation:

$$V_{OUT} = V_{FB}(1 + (R_{FBT}/R_{FBB})) \quad (1)$$

Where V_{FB} is 0.765V.

For more information on component selection and features, see:

- *LMR14203 SIMPLE SWITCHER 42Vin, 0.3A Step-Down Voltage Regulator in SOT-23* ([SNVS732](#))
- *LMR14206 SIMPLE SWITCHER 42Vin, 0.6A Step-Down Voltage Regulator in SOT-23* ([SNVS733](#))

5 LMR14203 Demonstration Board Schematic

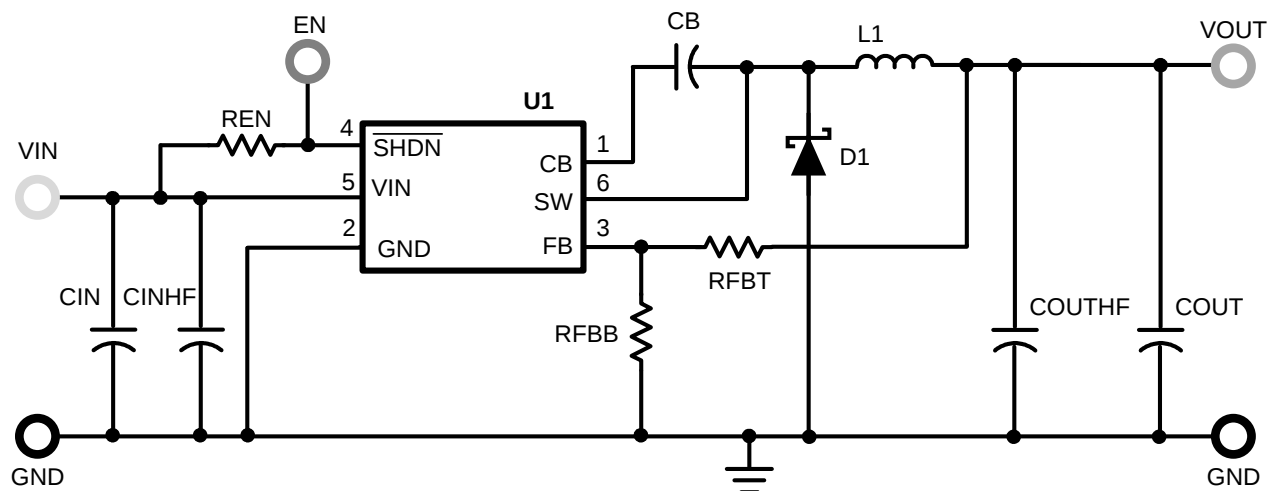


Figure 2. LMR14203 Demonstration Board Schematic

Table 1. Bill of Materials LMR14203

ID	Part Number	Type	Size	Parameters	Qty	Vendor
U1	LMR14203	Buck Regulator	SOT-6		1	Texas Instruments
L1	NR6045T150M	Inductor	NR6045	15 μ H, 2.3A	1	Taiyo Yuden
D1	B260A-13-F	Diode	SMA	60V, 2 A	1	Diodes Inc
CIN	GRM32ER72A225KA35L	Capacitor	1210	2.2 μ F, 100V	1	Murata
CINHF, COUTHF	C0603C223K3RACTU	Capacitor	0603	0.022 μ F, 25V	2	Kemet
COUT	GRM32ER61A476KE20L	Capacitor	1210	47 μ F, 10V	1	Murata
CB	C0603C224K4RACTU	Capacitor	0603	0.22 μ F, 16V	1	Kemet
RFBT	CRCW06036K04FKEA	Resistor	0603	6.04 k Ω , 1%	1	Vishay
RFBB	CRCW060310K5FKEA	Resistor	0603	10.5 k Ω , 1%	1	Vishay
REN	CRCW06031M00JNEA	Resistor	0603	1.0 M Ω , 5%	1	Vishay
EN	5014	Test Point Loop		Yellow	1	Keystone
VIN	5010	Test Point Loop		Red	1	Keystone
VOUT	5013	Test Point Loop		Orange	1	Keystone
GND	5011	Test Point Loop		Black	2	Keystone

6 LMR14206 Demonstration Board Schematic

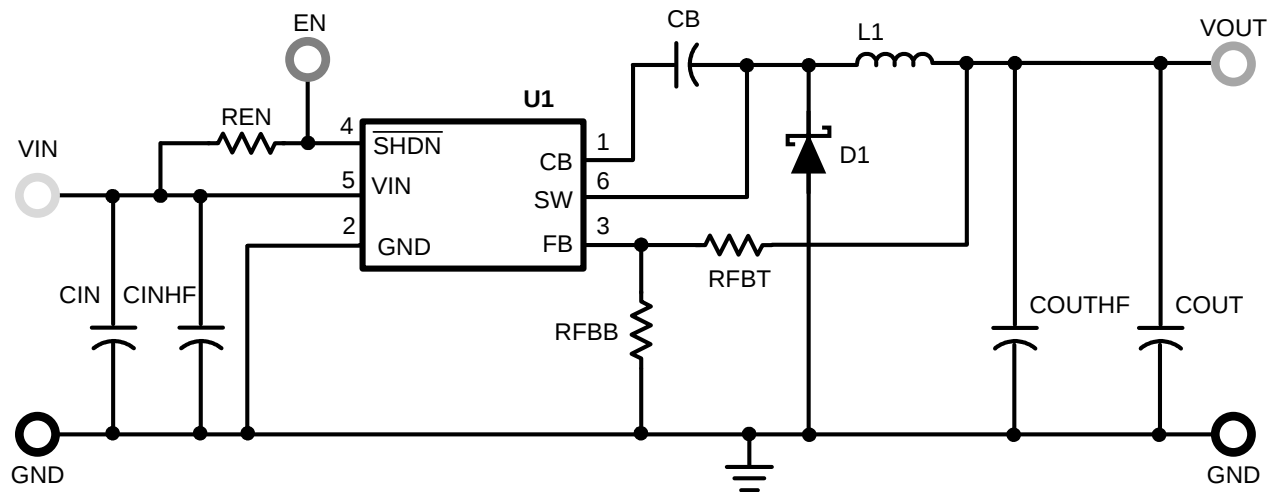


Figure 3. LMR14206 Demonstration Board Schematic

Table 2. Bill of Materials (BOM) LMR14206

ID	Part Number	Type	Size	Parameters	Qty	Vendor
U1	LMR14206	Buck Regulator	SOT-6		1	Texas Instruments
L1	NR6045T150M	Inductor	NR6045	15 μ H, 2.3A	1	Taiyo Yuden
D1	B260A-13-F	Diode	SMA	60V, 2 A	1	Diodes Inc
CIN	GRM32ER72A225KA35L	Capacitor	1210	2.2 μ F, 100V	1	Murata
CINHF, COUTHF	C0603C223K3RACTU	Capacitor	0603	0.022 μ F, 25V	2	Kemet
COUT	GRM32ER61A476KE20L	Capacitor	1210	47 μ F, 10V	1	Murata
CB	C0603C224K4RACTU	Capacitor	0603	0.22 μ F, 16V	1	Kemet
RFBT	CRCW06036K04FKEA	Resistor	0603	6.04 k Ω , 1%	1	Vishay
RFBB	CRCW060310K5FKEA	Resistor	0603	10.5 k Ω , 1%	1	Vishay
REN	CRCW06031M00JNEA	Resistor	0603	1.0 M Ω , 5%	1	Vishay
EN	5014	Test Point Loop		Yellow	1	Keystone
VIN	5010	Test Point Loop		Red	1	Keystone
VOUT	5013	Test Point Loop		Orange	1	Keystone
GND	5011	Test Point Loop		Black	2	Keystone

7 Quick Setup Procedures

Step 1: Connect a power supply to VIN terminals.

Step 2: Connect a load to VOUT terminals.

Step 3 EN should be left floating for normal operation. Short this to ground to shutdown the part.

Step 4: Set $V_{IN} = 24V$, with 0A load applied, check V_{OUT} with a voltmeter. Nominal 1.2V

Step 5: Apply a 300mA load and check V_{OUT} . Nominal 1.2V

8 Measurements

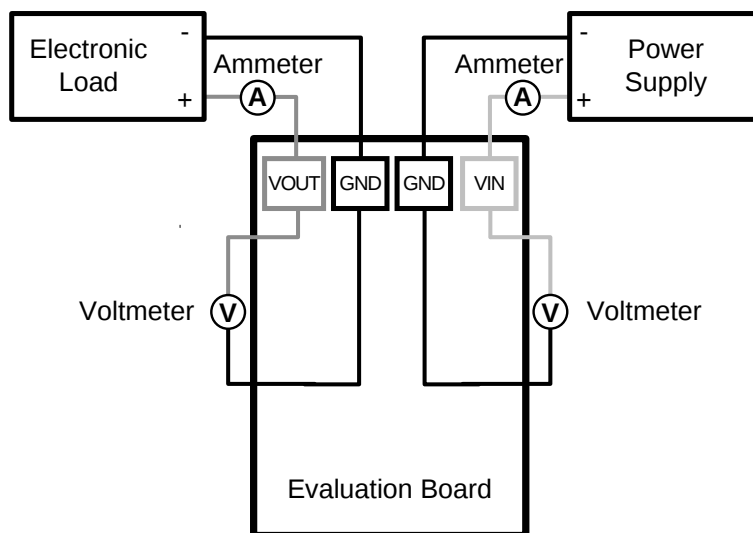


Figure 4. Efficiency Measurements

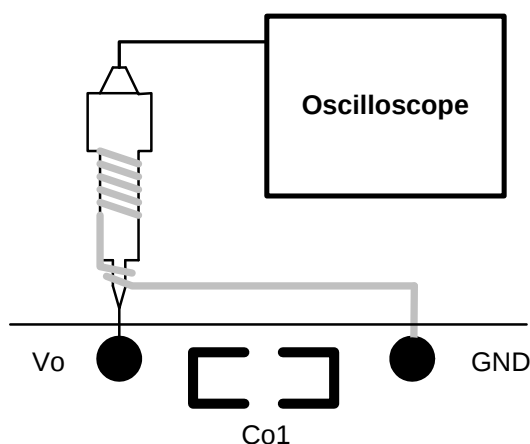


Figure 5. Voltage Ripple Measurements

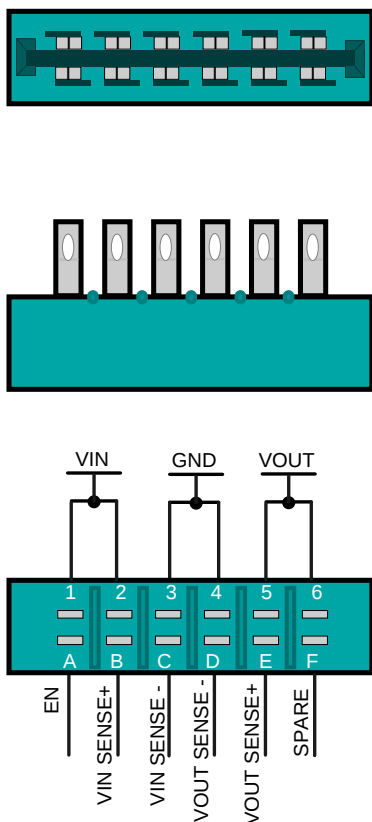
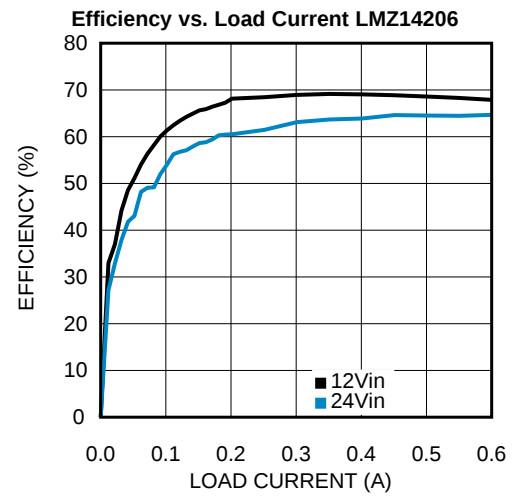
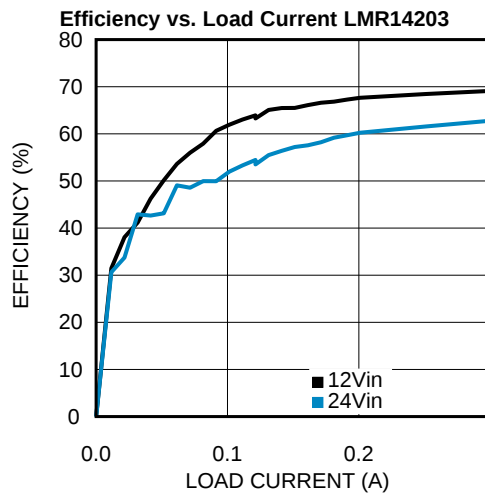
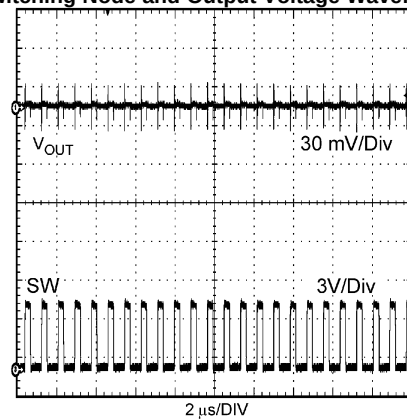


Figure 6. Edge Connector Schematic

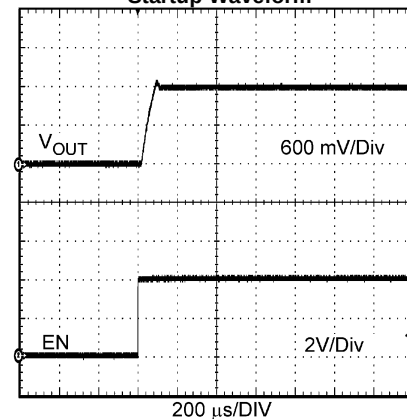
9 Typical Performance Characteristics



Switching Node and Output Voltage Waveforms



Startup Waveform



10 Layout

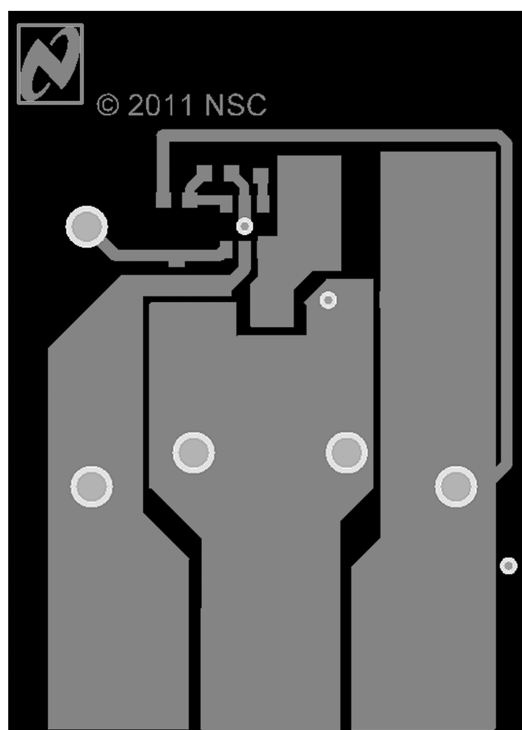


Figure 7. Top Layer

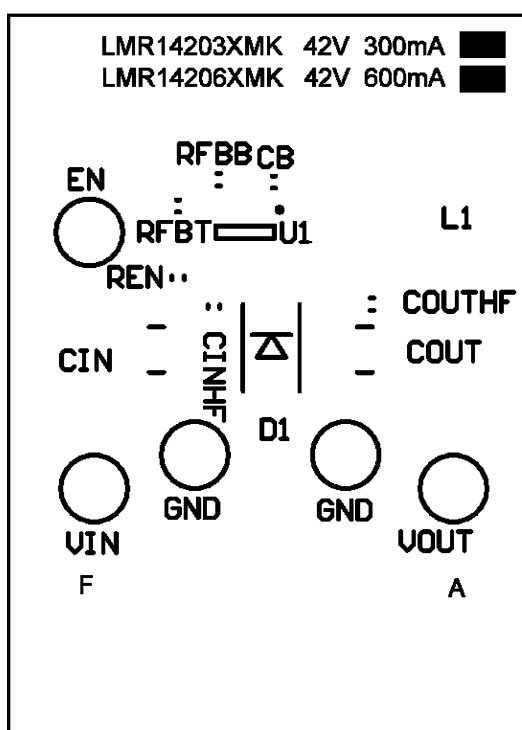


Figure 8. Top Overlay

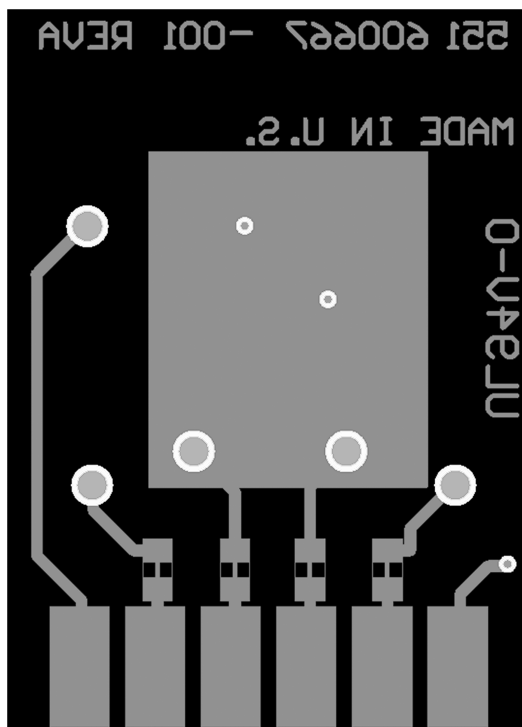


Figure 9. Bottom Layer

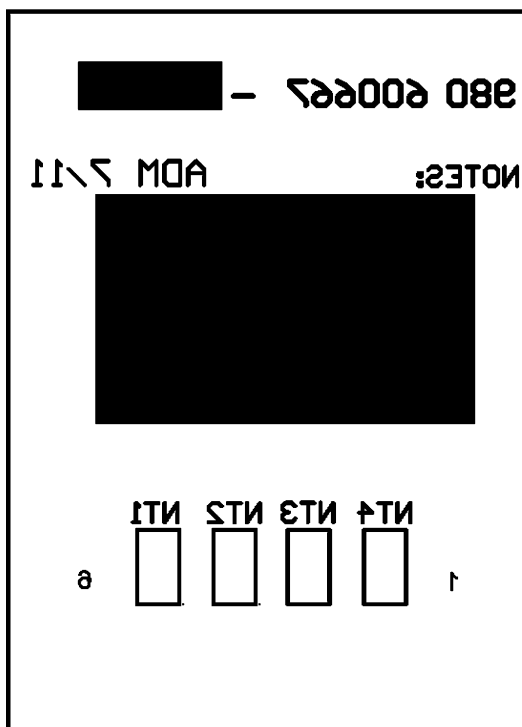


Figure 10. Bottom Overlay

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