Application Report
SNVA502A–November 2011–Revised November 2011

# AN-2185 LMR14203/LMR14206 Demonstration Board

**ABSTRACT**

The 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.

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## 1 Introduction

The 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.

## 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:

$$V_{OUT} = V_{FB}(1+(RFBT/RFBB)) \quad (1)$$

Where $V_{FB}$ is 0.765V.

For more information on component selection and features see the LMR14203/LMR14206 datasheet.

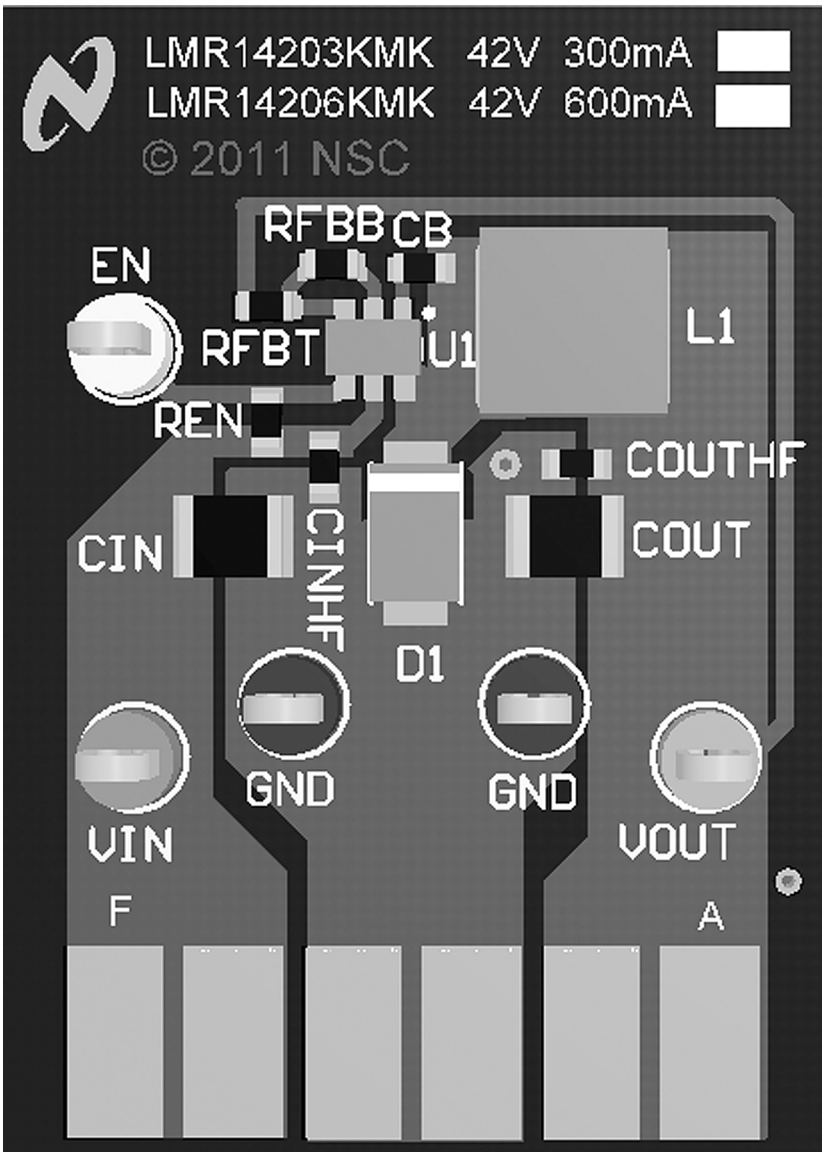


**Figure 1. Top View, LMR14203/LMR14206 Demonstration Board**

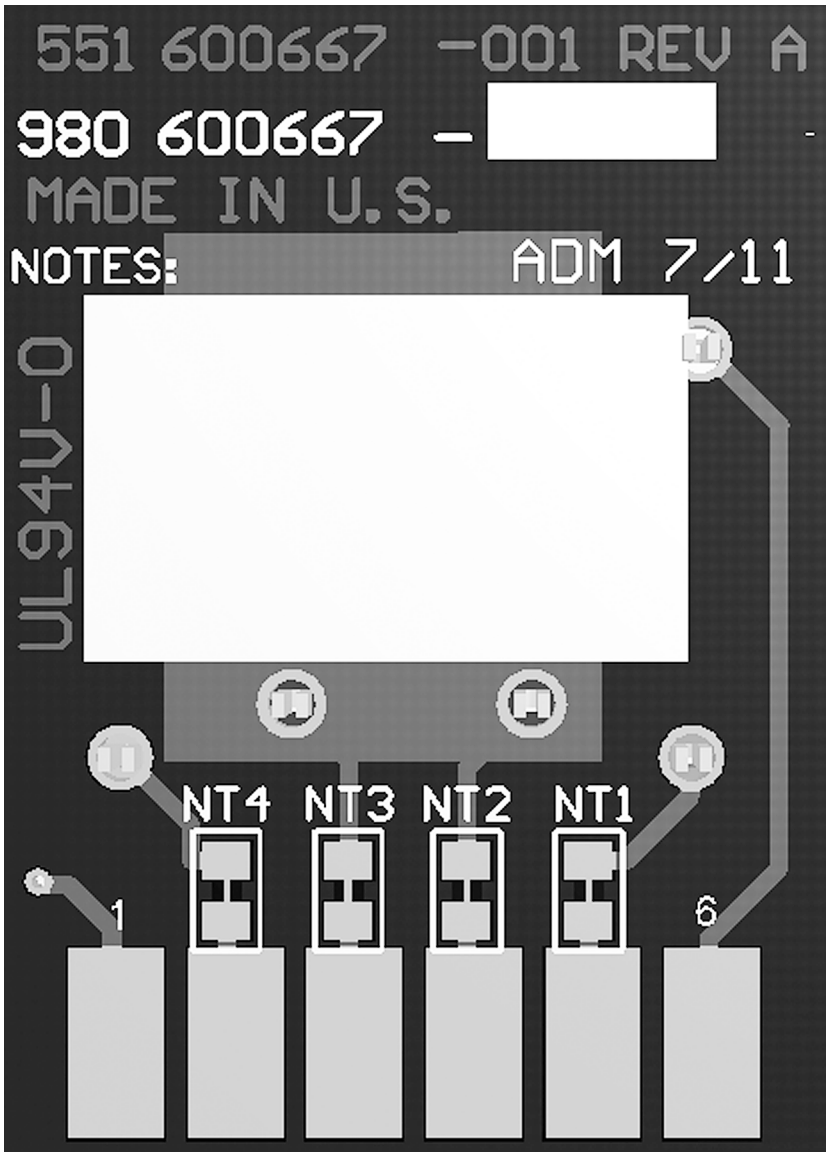


**Figure 2. Bottom View, LMR14203/LMR14206 Demonstration Board**

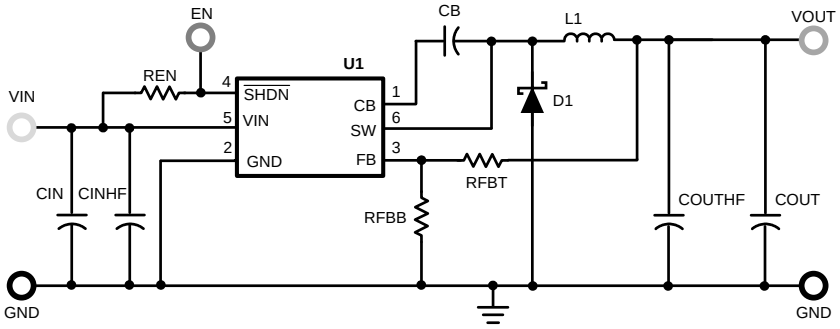


**Figure 3. LMR14203 Demonstration Board Schematic**

**Table 1. Bill of Materials (BOM) LMR14203**

| ID | Part Number | Type | Size | Parameters | Qty | Vendor |
|---|---|---|---|---|---|---|
| U1 | LMR14203XMK-ADJL | Buck Regulator | TSOT-6 | | 1 | NSC |
| L1 | NR6045T150M | Inductor | NR6045 | 15 µH, 2.3A | 1 | Taiyo Yuden |
| D1 | B260A-13-F | Diode | SMA | 60V, 2 A | 1 | Diodes Inc |
| CIN | GRM32ER72A225KA35L | Capacitor | 1210 | 2.2 µF, 100V | 1 | Murata |
| CINHF, COUTHF | C0603C223K3RACTU | Capacitor | 0603 | 0.022 µF, 25V | 2 | Kemet |
| COUT | GRM32ER61A476KE20L | Capacitor | 1210 | 47 µF, 10V | 1 | Murata |
| CB | C0603C224K4RACTU | Capacitor | 0603 | 0.22 µF, 16V | 1 | Kemet |
| RFBT | CRCW06036K04FKEA | Resistor | 0603 | 6.04 kΩ, 1% | 1 | Vishay |
| RFBB | CRCW060310K5FKEA | Resistor | 0603 | 10.5 kΩ, 1% | 1 | Vishay |
| REN | CRCW06031M00JNEA | Resistor | 0603 | 1.0 MΩ, 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 |

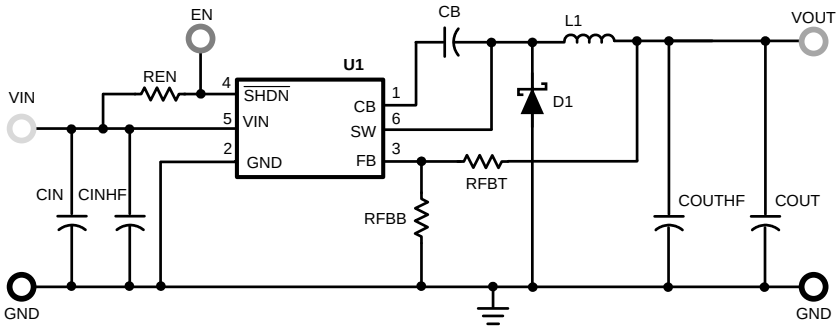


**Figure 4. LMR14206 Demonstration Board Schematic**

**Table 2. Bill of Materials (BOM) LMR14206**

| ID | Part Number | Type | Size | Parameters | Qty | Vendor |
|---|---|---|---|---|---|---|
| U1 | LMR14206XMK-ADJL | Buck Regulator | TSOT-6 | | 1 | NSC |
| L1 | NR6045T150M | Inductor | NR6045 | 15 µH, 2.3A | 1 | Taiyo Yuden |
| D1 | B260A-13-F | Diode | SMA | 60V, 2 A | 1 | Diodes Inc |
| CIN | GRM32ER72A225KA35L | Capacitor | 1210 | 2.2 µF, 100V | 1 | Murata |
| CINHF, COUTHF | C0603C223K3RACTU | Capacitor | 0603 | 0.022 µF, 25V | 2 | Kemet |
| COUT | GRM32ER61A476KE20L | Capacitor | 1210 | 47 µF, 10V | 1 | Murata |
| CB | C0603C224K4RACTU | Capacitor | 0603 | 0.22 µF, 16V | 1 | Kemet |
| RFBT | CRCW06036K04FKEA | Resistor | 0603 | 6.04 kΩ, 1% | 1 | Vishay |
| RFBB | CRCW060310K5FKEA | Resistor | 0603 | 10.5 kΩ, 1% | 1 | Vishay |
| REN | CRCW06031M00JNEA | Resistor | 0603 | 1.0 MΩ, 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 |

## 5 Test Setup

**Table 3. Demonstration Board Quick Setup Procedures**

| Step | Description | Notes |
|---|---|---|
| 1 | Connect a power supply to VIN terminals | |
| 2 | Connect a load to VOUT terminals | |
| 3 | EN should be left floating for normal operation. Short this to ground to shutdown the part | |
| 4 | Set $V_{IN}$ = 24V, with 0A load applied, check $V_{OUT}$ with a voltmeter | Nominal 1.2V |
| 5 | Apply a 300mA load and check $V_{OUT}$ | Nominal 1.2V |

## 6 Typical Performance Characteristics

## 7 Layout

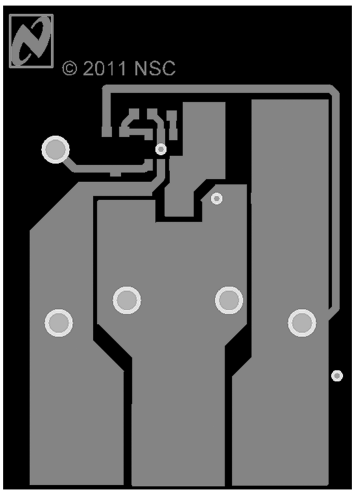


**Figure 5. Top Layer**

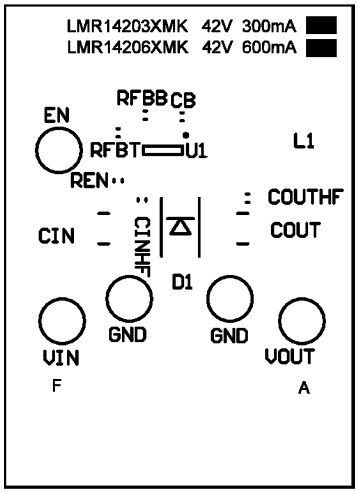


**Figure 6. Top Overlay**

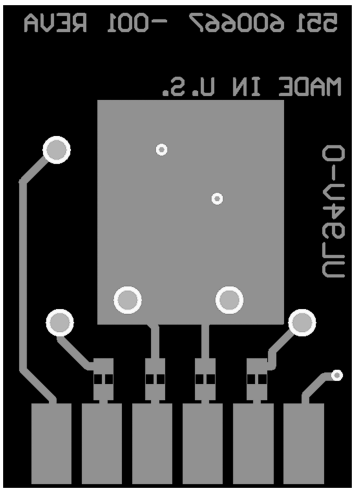


**Figure 7. Bottom Layer**

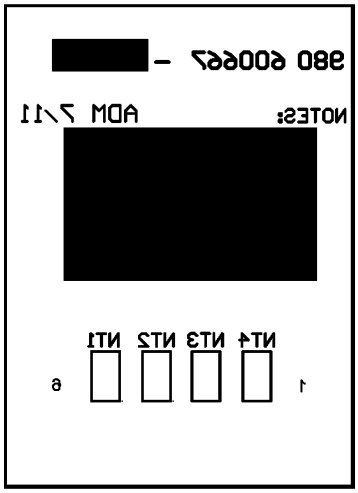


**Figure 8. Bottom Overlay**

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