AN-2197 LMR62421 Demo Board

1 Introduction

The Texas Instruments LMR62421 is a high frequency switching boost regulator which offers small size and high power conversion efficiency. The part operates at a 1.6MHz switching frequency. It provides all the active functions to provide local DC/DC conversion with fast-transient response and accurate regulation in the smallest PCB area capable of supplying up to 2.1A of switch current. The LMR62421 is internally compensated, so it is simple to use, and requires few external components. The LMR62421 uses current-mode control to regulate the output voltage in a range from 3V to 24V. Additional features include internal soft start which helps reduce inrush current and thermal shutdown. This application note describes the demo board supplied to demonstrate the operation of this part and give information on its usage.

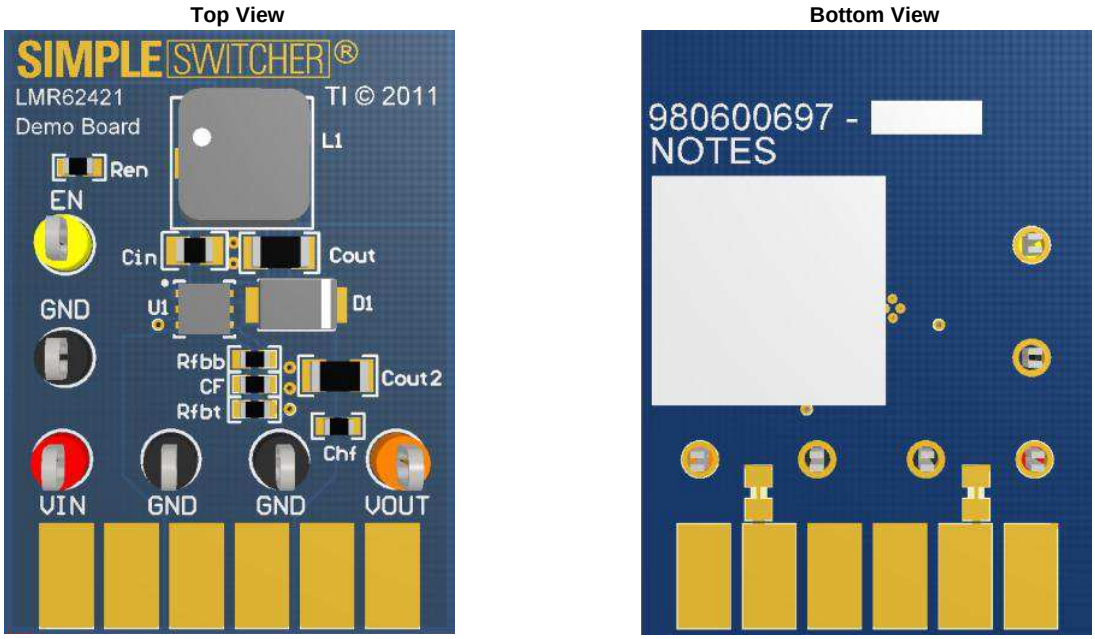


Figure 1. LMR62421 Demo Board

2 Features

- 2.7V to 5.5V Input Voltage Range
- 12V Output Voltage (default setting)
- 500mA Output Current from 3.5V input supply
- 300mA Output Current from 2.7V input supply
- Switching Frequency of 1.6 MHz
- Low Component Count
- PCB size: 27.5mm × 36.9mm

3 Shutdown Operation

The demo board includes a pull-up resistor R3 to enable the device once V_{IN} has exceeded 1.8V. Use 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 12V to another voltage by adjusting the feedback resistors using the following equation:

$$V_{OUT} = V_{FB}(1 + (R1/R2)) \quad (1)$$

Where V_{FB} is 1.255V.

5 Feedforward Compensation

The feedforward capacitor CF should be selected to set the compensation zero at approximately 8 kHz. The value of CF is calculated using:

$$CF = 1 / (2 \times \pi \times 8k \times R1) \quad (2)$$

The value of CF is calculated after R1 is selected for the output voltage needed for the specific application.

For more information on component selection and features, see *LMR62421 SIMPLE SWITCHER 24Vout, 2.1A Step-Up Voltage Regulator in SOT-23* (SNVS734).

6 LMR62421 Demo Board Schematic

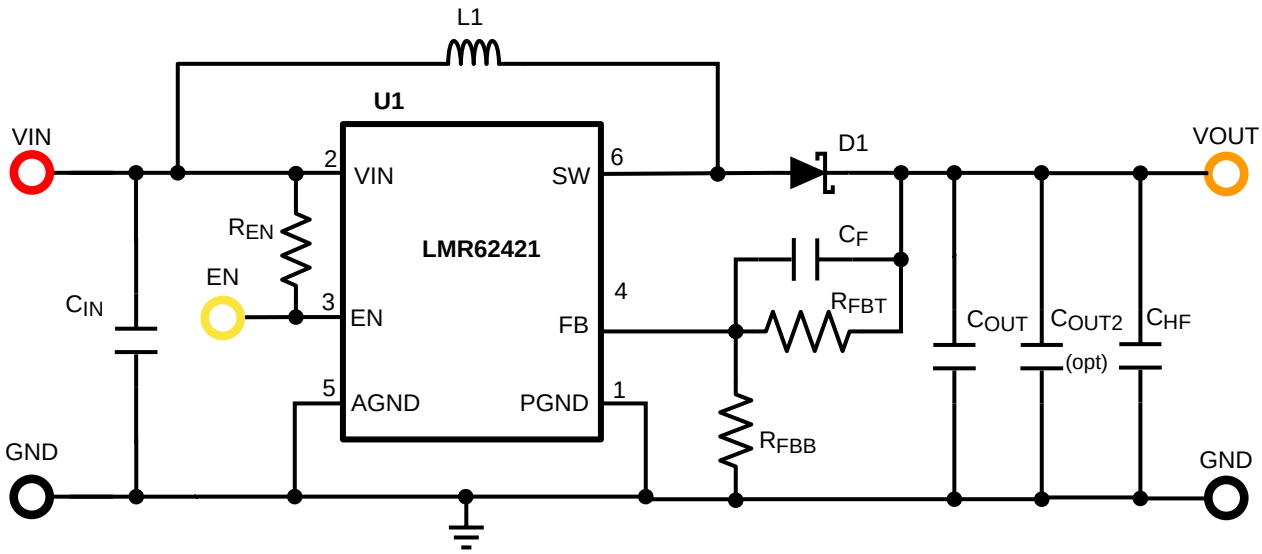


Figure 2. LMR62421 Demo Board Schematic

Table 1. Bill of Materials LMR62421

ID	Part Number	Type	Size	Parameters	Vendor
U1	LMR62421	1.6MHz - Space-Efficient Boost	6-pin WSON		Texas Instruments
L1	7447779006	Inductor		Shielded Inductor, 6.8µH, 2.91A	Wurth
D1	B220A-13-F	Diode	SMA	Schottky, 20V, 2A	Diodes Inc.
Cin	GRM21BR71A106KE51L	Capacitor	0805	Ceramic, 10µF, 10V, X7R	Murata
Cout	GRM31CR71E106KA12L	Capacitor	1206	Ceramic, 10µF, 25V, X7R	Murata
Cout2	optional		1206	additional output cap	
CF	C0603C221J5GACTU	Capacitor	0603	Ceramic, 220pF, 50V, C0G/NP0	Kemet
CHF	GRM188R71H223KA01D	Capacitor	0603	Ceramic, 0.022uF, 50V, X7R	Murata
Rfbt	CRCW060386K6FKEA	Resistor	0603	86.6 kΩ	Vishay
Rfbb	CRCW060310K2FKEA	Resistor	0603	10.2 kΩ	Vishay
Ren	CRCW06031M00JNEA	Resistor	0603	1.0 MegΩ	Vishay
EN	5014	Test Point Loop		Yellow	Keystone
VIN	5010	Test Point Loop		Red	Keystone
VOUT	5013	Test Point Loop		Orange	Keystone
GND	5011	Test Point Loop		Black	Keystone

7 Quick Setup Procedures

Step 1: Connect a power supply to V_{IN} terminals. V_{IN} range: 2.7V to 5.5V

Step 2: Connect a load to V_{OUT} terminals. I_{OUT} range: 0mA to 500mA

Step 3: Do not allow the EN pin to float or be greater than V_{IN} + 0.3V. EN pin must be connected to V_{IN} by means R3 for normal operation. Short this to ground to shutdown the part.

Step 4: Turn on V_{IN} with 0A load applied, check V_{OUT} with a voltmeter. Nominal 12V

Step 5: Apply a 500mA load and check V_{OUT}. Nominal 12V

8 Measurements

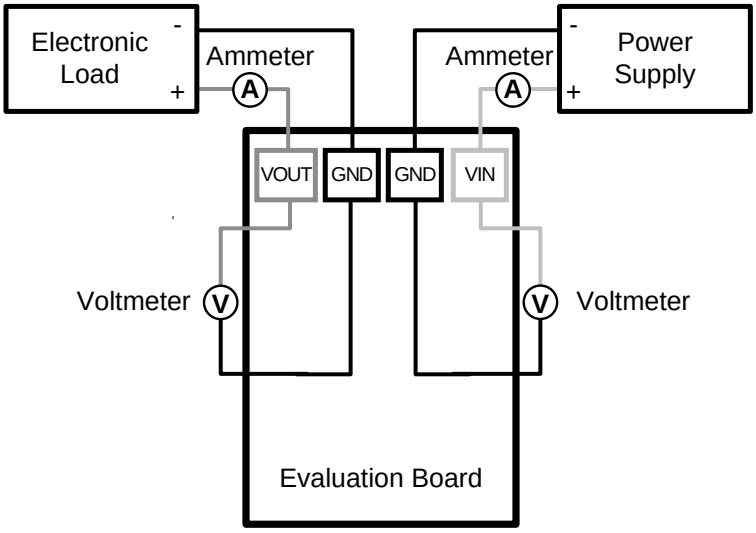


Figure 3. Efficiency Measurements

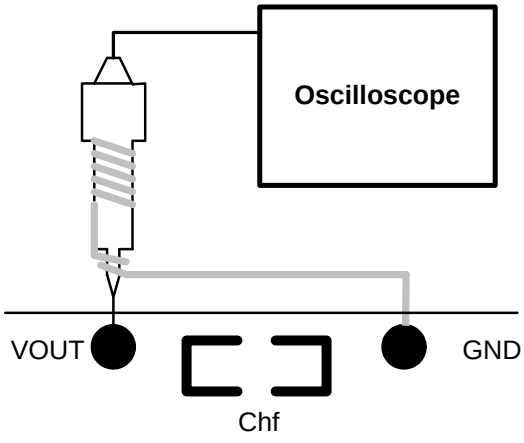


Figure 4. Voltage Ripple Measurements

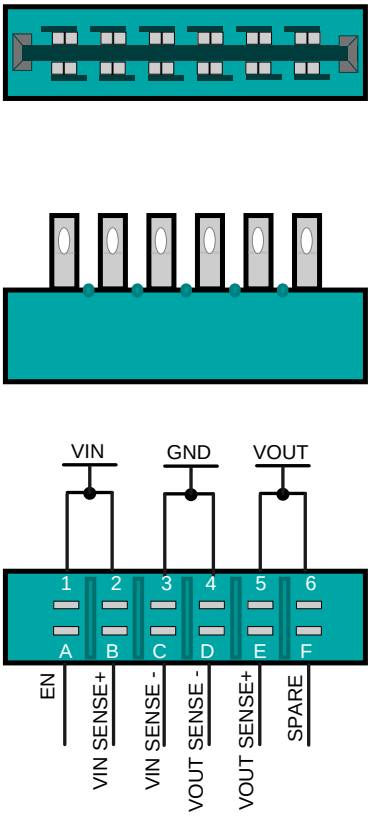
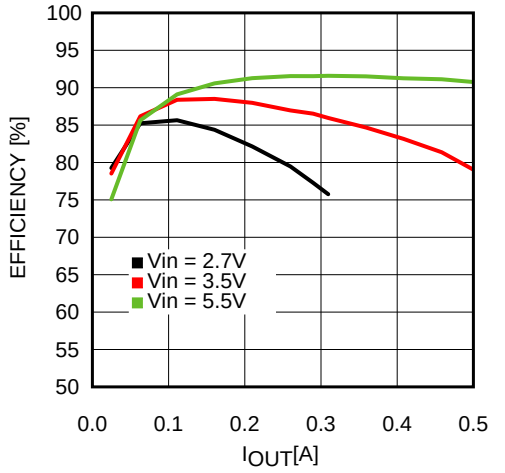


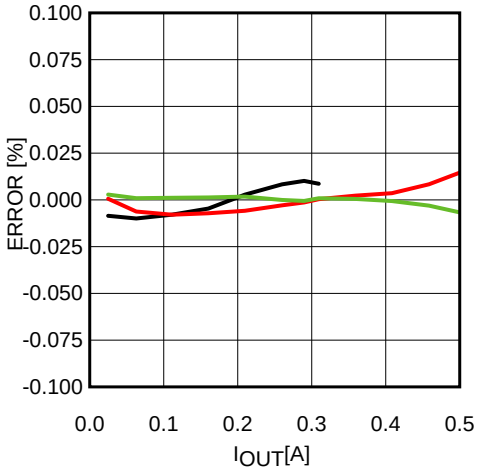
Figure 5. Edge Connector Schematic

9 Typical Performance Characteristics

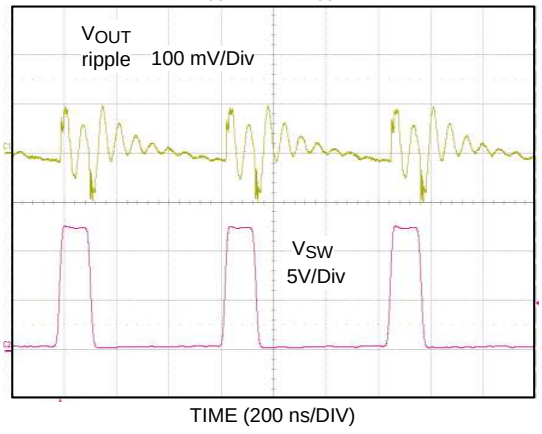
Efficiency vs. Load Current LMR62421, V_{OUT} = 12V



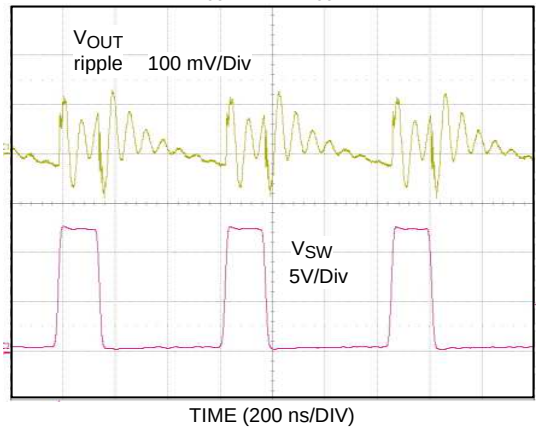
Load regulation, V_{OUT} = 12V



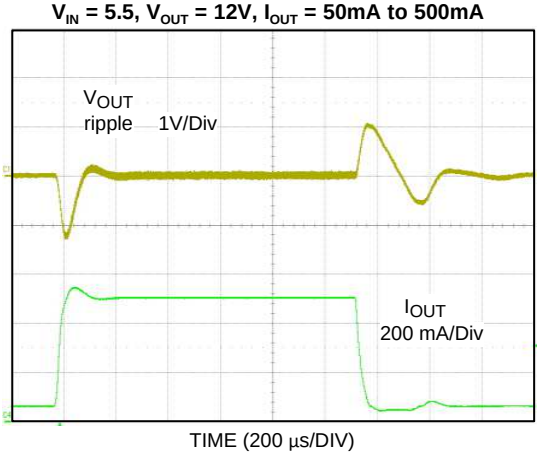
Output Voltage Ripple and Switching Waveform, V_{IN} = 2.7, V_{OUT} = 12V, I_{OUT} = 300mA



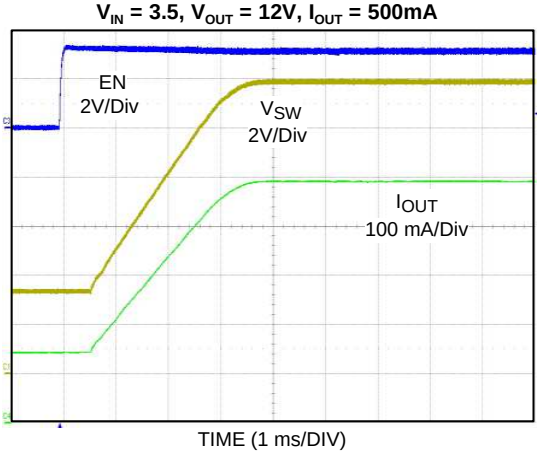
Output Ripple and Switching Waveform, V_{IN} = 3.5, V_{OUT} = 12V, I_{OUT} = 500mA



Load Transient V_{IN} = 5.5, V_{OUT} = 12V, I_{OUT} = 50mA to 500mA



Start Up with Enable V_{IN} = 3.5, V_{OUT} = 12V, I_{OUT} = 500mA



10 Layout

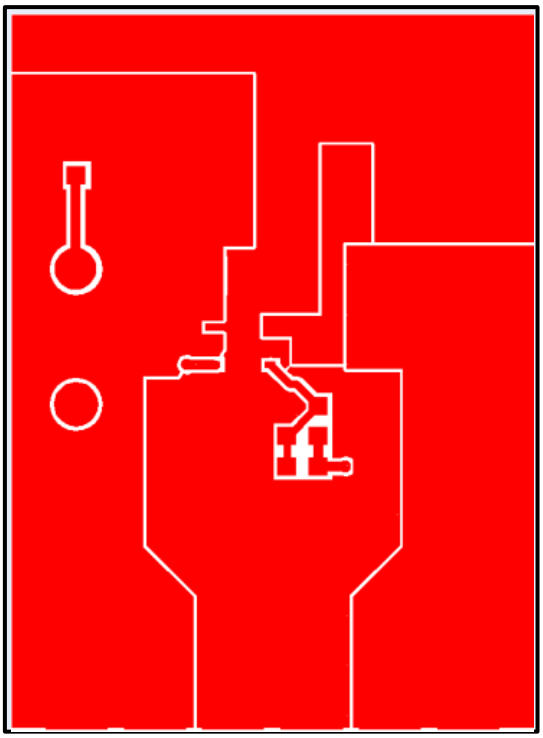


Figure 6. Top Layer

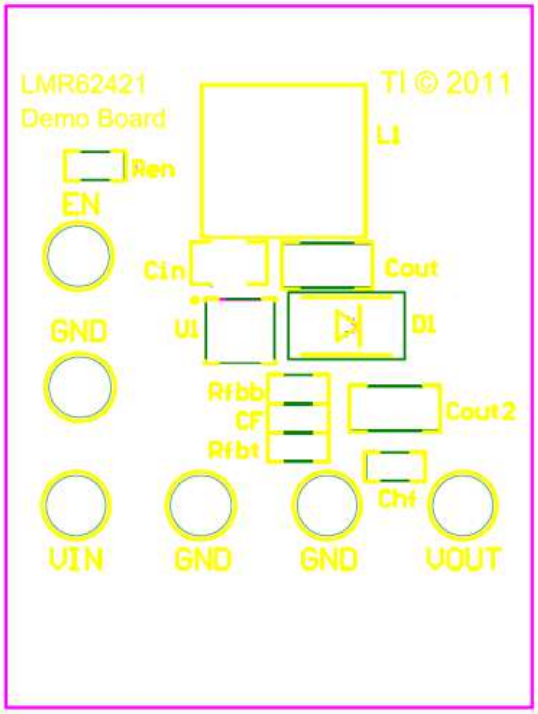


Figure 7. Top Overlay

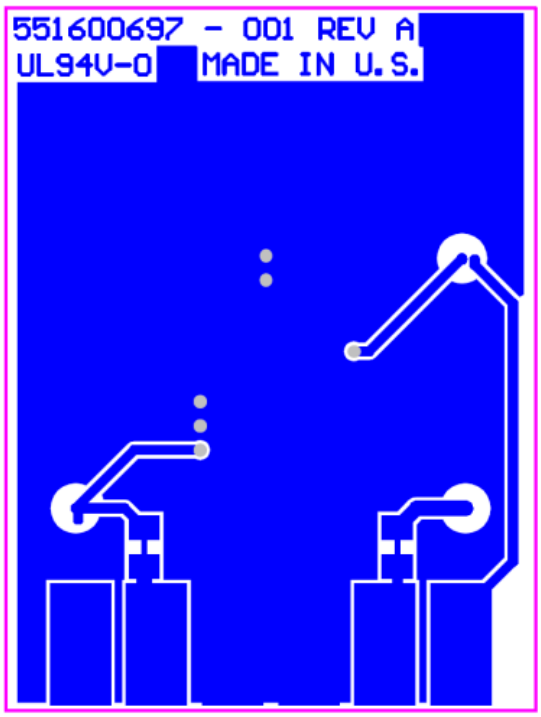


Figure 8. Bottom Layer

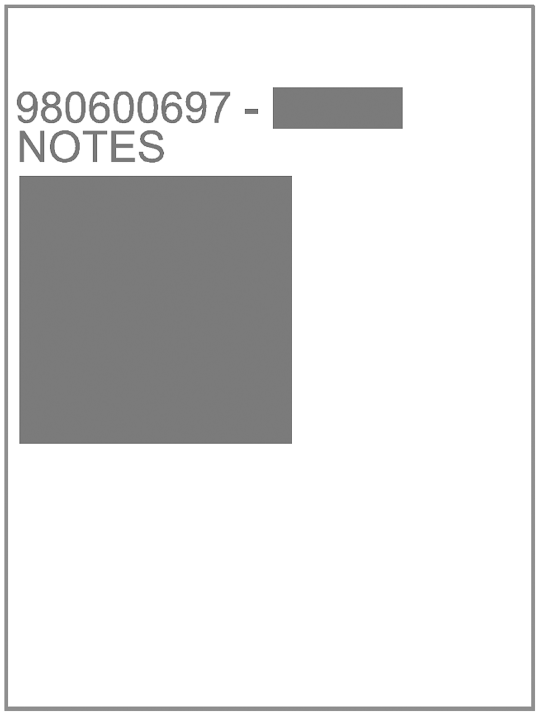


Figure 9. Bottom Overlay

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