AN-2183 LMR62014/LMR64010 Demo Board

1 Introduction

The Texas Instruments LMR62014 and LMR64010 are high frequency switching boost regulators that offer small size and high power conversion efficiency. The parts operate at a 1.6MHz switching frequency. The primary difference between the LMR62014 and LMR64010 is that the LMR62014 has a higher current internal switch FET (with lower breakdown voltage), while the LMR64010 has a higher voltage FET which handles less current. The LMR64010 targets applications with higher output voltages, while the LMR62014 is intended for applications requiring higher load currents at lower output voltages. This user's guide describes the demo board supplied to demonstrate the operation of these parts and give information on its usage.

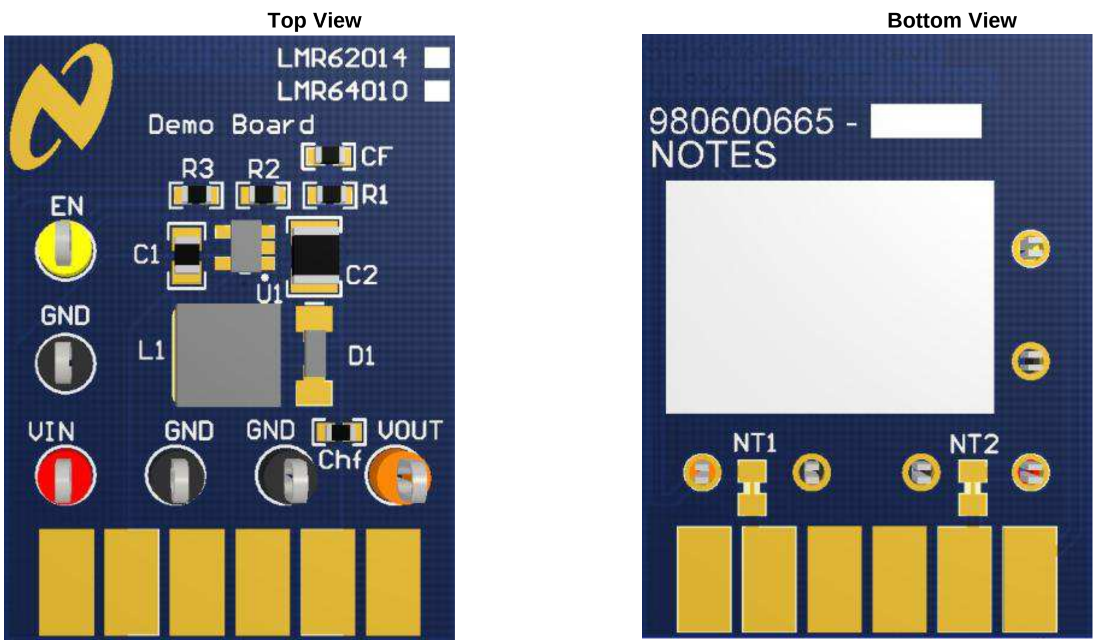

Figure 1. LMR62014/LMR64010 Demo Board

2 Features

- 2.7V to 12V Input Voltage Range
- 12V Output Voltage, and 450mA Output Current from 5V input supply (LMR62014)
- 24V Output Voltage, and 125mA Output Current from 5V input supply (LMR64010)
- Switching Frequency of 1.6 MHz
- Minimal Component Count
- Small Solution Size (12mm × 17mm)

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3 Shutdown Operation

The demo board includes a pull-up resistor R3 to enable the device once V_{IN} has exceeded 1.5V. 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/24V 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 1.23V.

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:

- *LMR62014 SIMPLE SWITCHER 20Vout, 1.4A Step-Up Voltage Regulator in SOT-23* (SNVS735)
- *LMR64010 SIMPLE SWITCHER 40Vout, 1A Step-Up Voltage Regulator in SOT-23* (SNVS736)

6 LMR62014 Demo Board Schematic

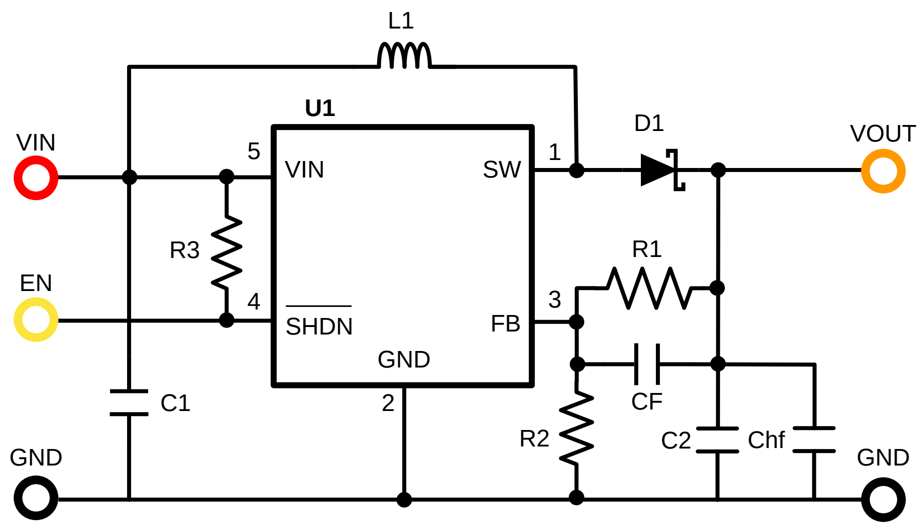


Figure 2. LMR62014 Demo Board Schematic

Table 1. Bill of Materials LMR62014

ID	Part Number	Type	Size	Parameters	Qty	Vendor
U1	LMR62014	Boost Regulator	SOT-23		1	Texas Instruments
L1	NR6045T100M	Inductor	SMD	10uH, 2.5A, 0.061 ohm,	1	Sumida
D1	CRS08	Diode	S-Flat	Schottky, 30V, 1.5A	1	Toshiba
C1	GRM21BR71C225KA12L	Capacitor	0805	Ceramic, 2.2uF, 16V, X7R	1	Murata
C2	GRM32ER71H475KA88L	Capacitor	1210	Ceramic, 4.7uF, 50V, X7R	1	Murata
CF	C0603C221J5GACTU	Capacitor	0603	Ceramic, 220pF, 50V, C0G/NP0	1	Kemet
CHF	GRM188R71H223KA01D	Capacitor	0603	Ceramic, 0.022uF, 50V, X7R	1	Murata
R1	CRCW0603115KFKEA	Resistor	0603	115 kΩ	1	Vishay
R2	CRCW060313K3FKEA	Resistor	0603	13.3 kΩ	1	Vishay
R3	CRCW06031M00JNEA	Resistor	0603	1.0 MegΩ	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 LMR64010 Demo Board Schematic

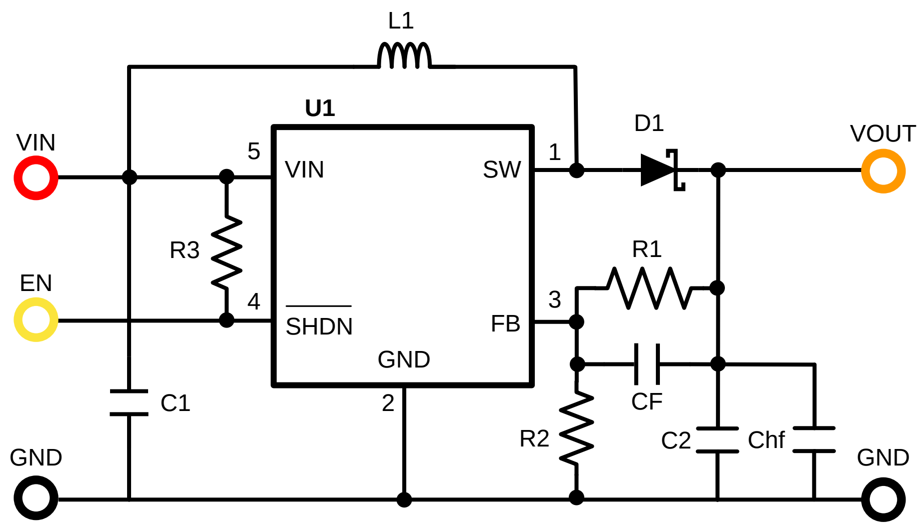


Figure 3. LMR64010 Demo Board Schematic

Table 2. Bill of Materials LMR64010

ID	Part Number	Type	Size	Parameters	Qty	Vendor
U1	LMR64010	Boost Regulator	SOT-23		1	Texas Instruments
L1	NR6045T100M	Inductor	SMD	10uH, 2.5A, 0.061 ohm,	1	Sumida
D1	CRS04	Diode	S-Flat	Schottky, 40V, 1.0A	1	Toshiba
C1	GRM21BR71C225KA12L	Capacitor	0805	Ceramic, 2.2uF, 16V, X7R	1	Murata
C2	GRM32ER71H475KA88L	Capacitor	1210	Ceramic, 4.7uF, 50V, X7R	1	Murata
CF	C0603C121J5GACTU	Capacitor	0603	Ceramic, 120pF, 50V, C0G/NP0	1	Kemet
CHF	GRM188R71H223KA01D	Capacitor	0603	Ceramic, 0.022uF, 50V, X7R	1	Murata
R1	CRCW0603243KFKEA	Resistor	0603	243 kΩ	1	Vishay
R2	CRCW060313K3FKEA	Resistor	0603	13.3 kΩ	1	Vishay
R3	CRCW06031M00JNEA	Resistor	0603	1.0 MegΩ	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

8 Quick Setup Procedures

8.1 LMR62014

Step 1: Connect a power supply to VIN terminals

Step 2: Connect a load to VOUT terminals

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

Step 4: Set VIN = 5V, with 0A load applied, check VOUT with a voltmeter. Nominal 11.9V

Step 5: Apply a 450mA load and check VOUT. Nominal 11.9V

8.2 LMR64010

Step 1: Connect a power supply to VIN terminals

Step 2: Connect a load to VOUT terminals

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

Step 4: Set VIN = 5V, with 0A load applied, check VOUT with a voltmeter. Nominal 23.7V

Step 5: Apply a 125mA load and check VOUT. Nominal 23.5V

9 Measurements

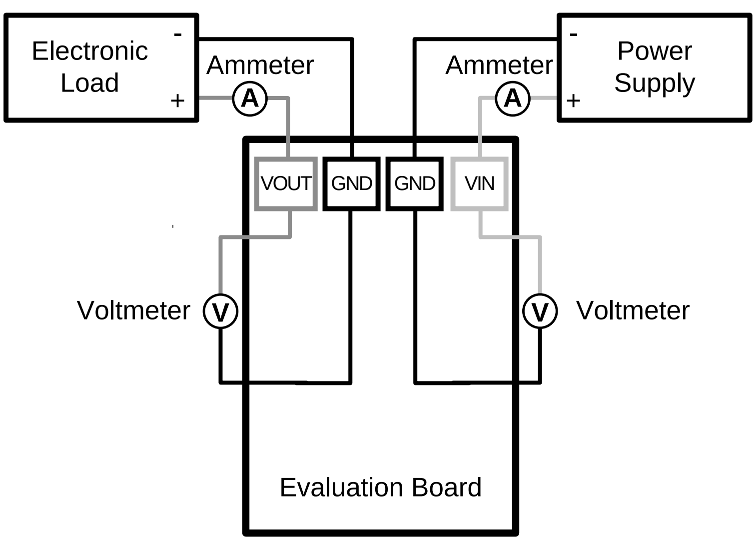


Figure 4. Efficiency Measurements

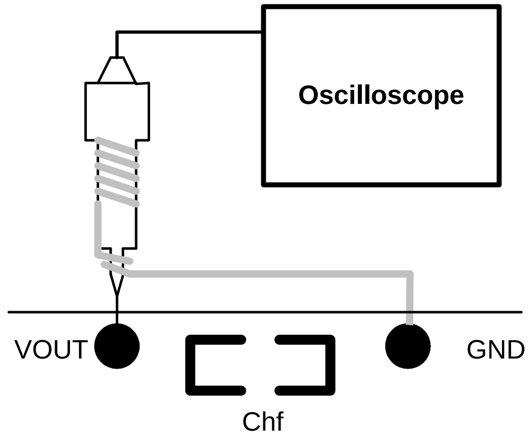


Figure 5. Voltage Ripple Measurements

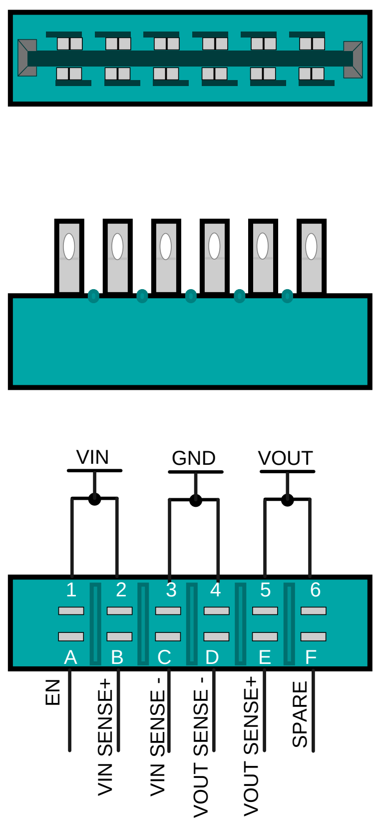
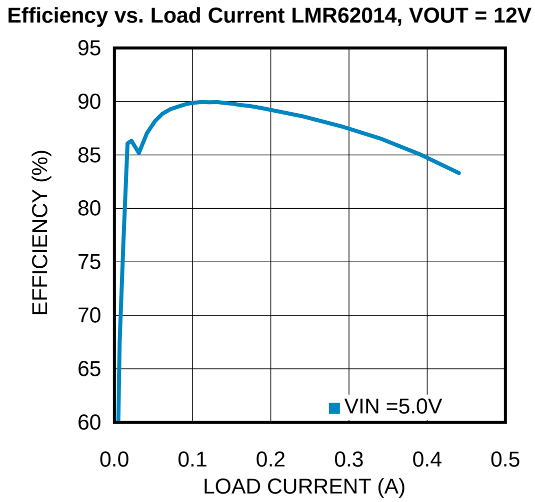
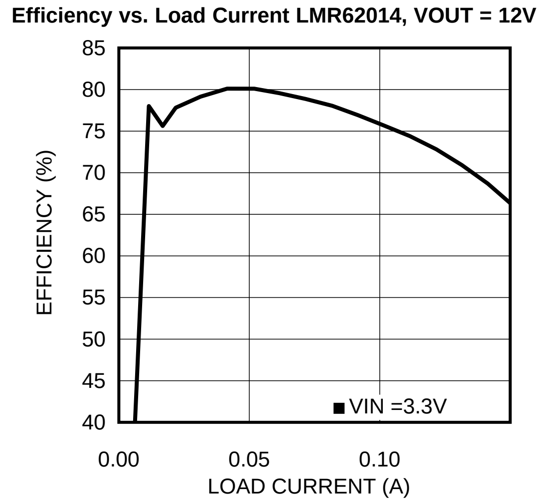
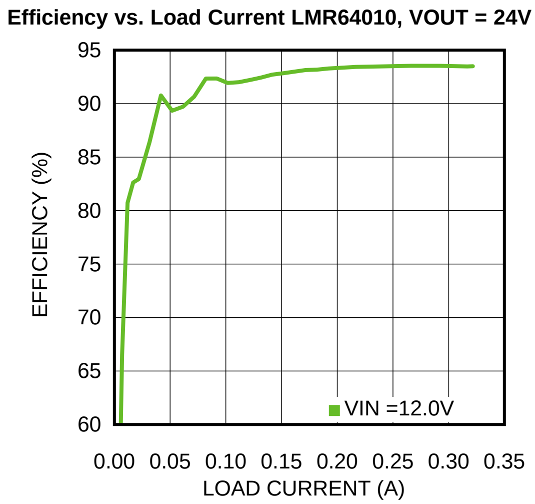


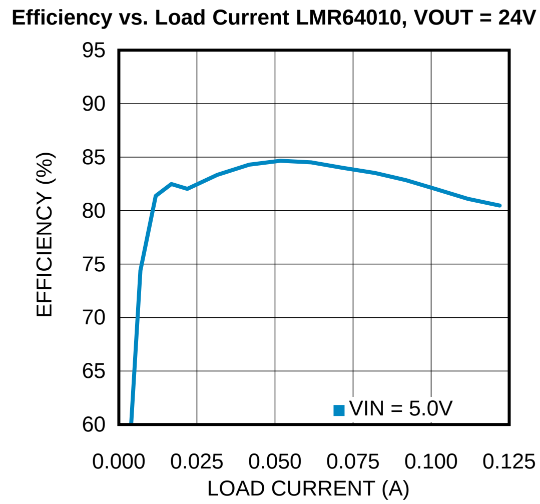
Figure 6. Edge Connector Schematic

10 Typical Performance Characteristics

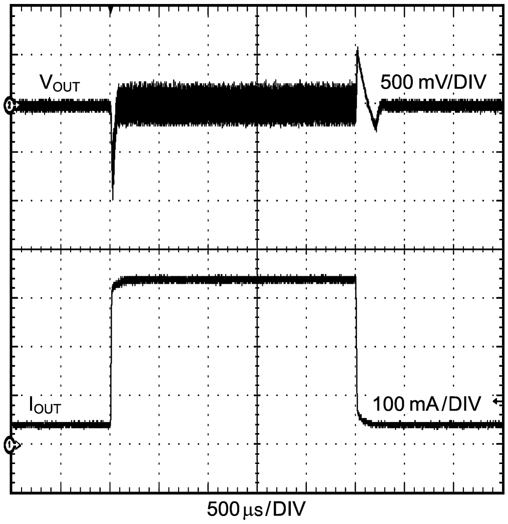




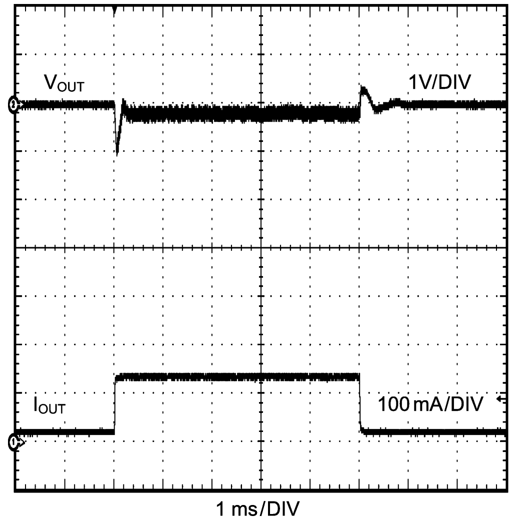




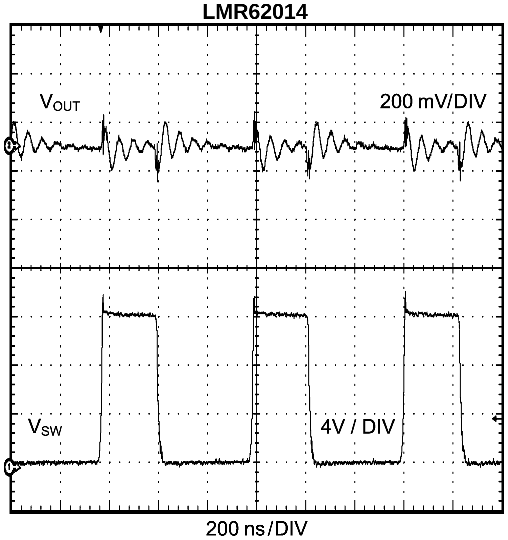
Load Transient Waveforms LMR62014 IOUT = 33 to 330mA



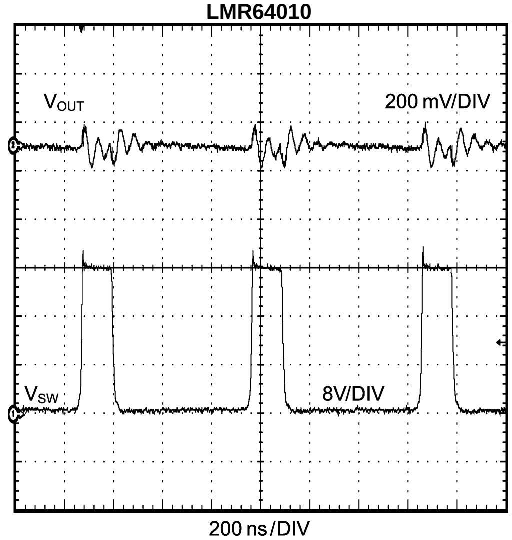
Load Transient Waveforms LMR64010 IOUT = 13 to 125mA



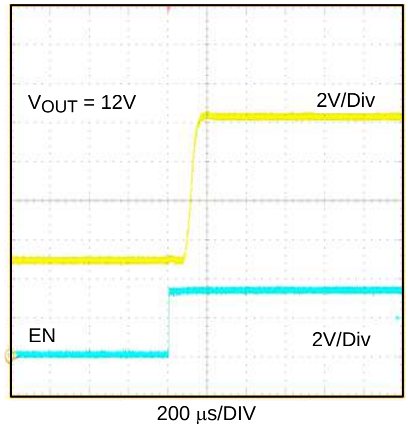
Switching Node and Output Voltage Waveforms LMR62014



Switching Node and Output Voltage Waveforms LMR64010



Startup Waveform



11 Layout

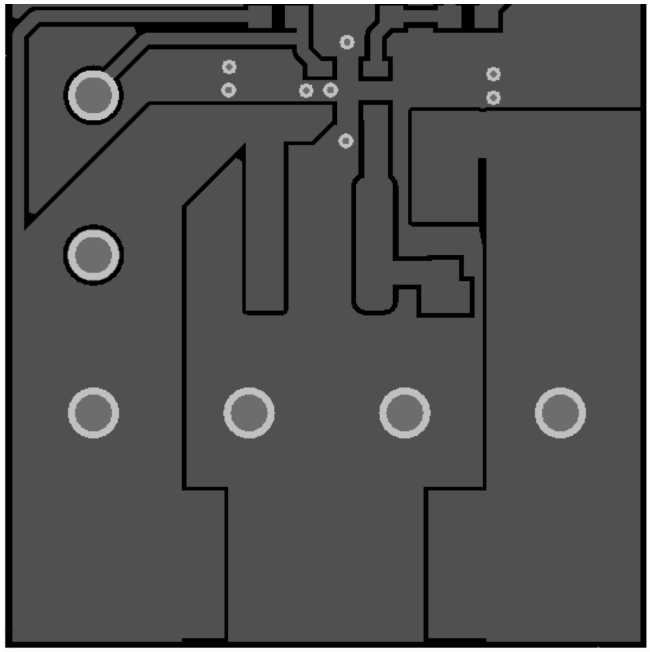


Figure 7. Top Layer

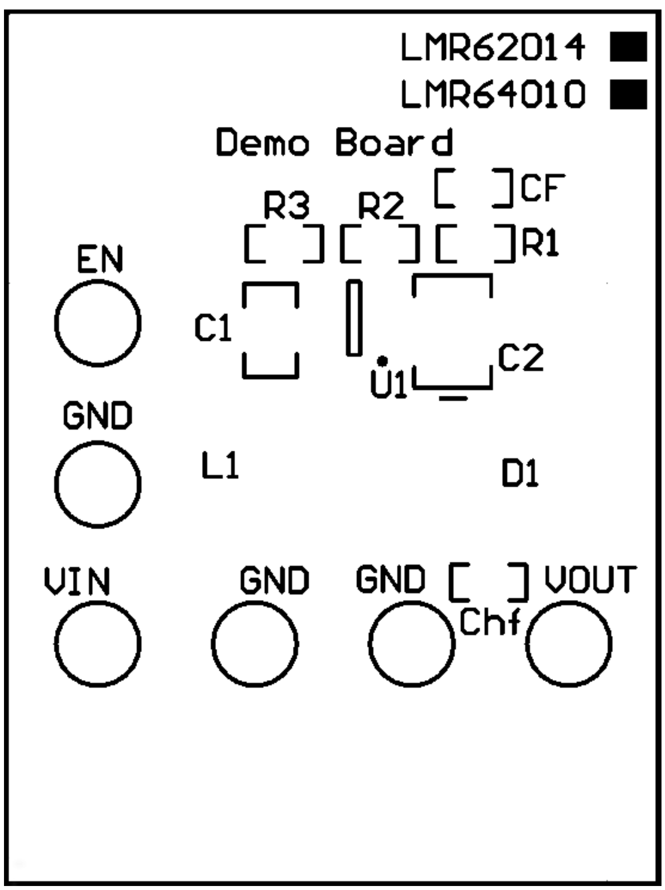


Figure 8. Top Overlay

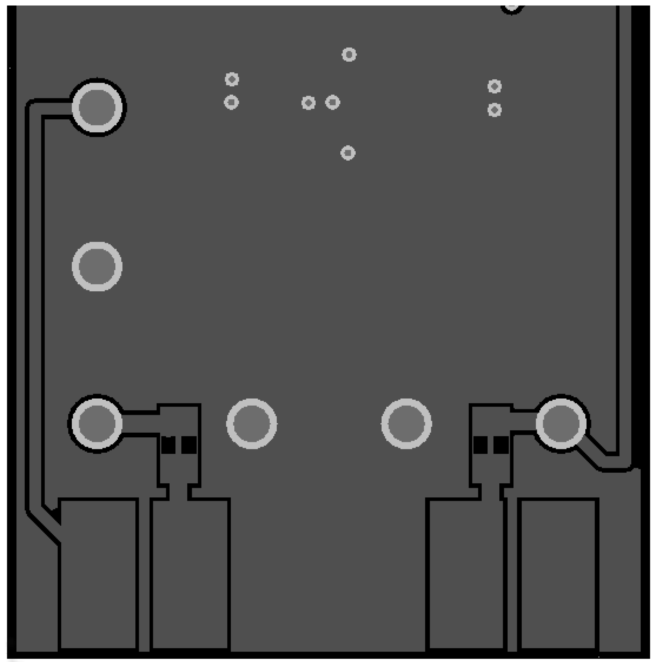


Figure 9. Bottom Layer

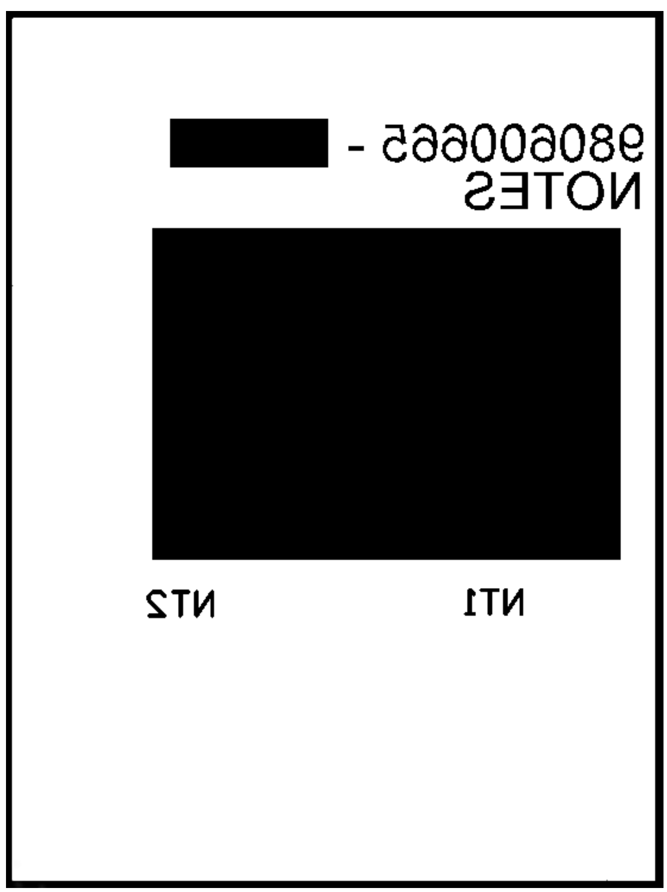


Figure 10. Bottom Overlay

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