

AN-2184 LMR10510/LMR10515/LMR10520 Demo Board

1 Introduction

The Texas Instruments LMR10510/LMR10515/LMR10520 is a PWM DC/DC buck (step-down) regulator. With a switching frequency of 3MHz or 1.6MHz the overall solution size is very compact and requires a minimum number of components. The LMR10510/LMR10515/LMR10520 Demo Board is designed to provide the design engineer with a fully functional power converter to evaluate the LMR10510/LMR10515/LMR10520 series of buck regulators. The demo board comes populated with either the LMR10510Y, LMR10515Y, or LMR10520Y but can easily be modified to accommodate any of the LMR10510/LMR10515/LMR10520 regulator ICs.

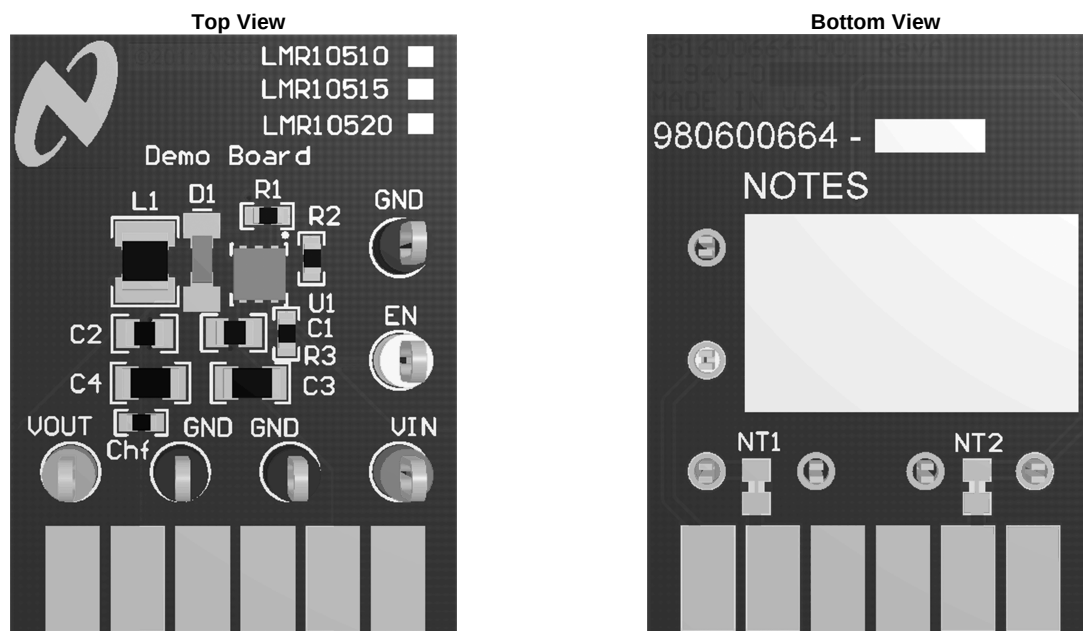


Figure 1. LMR10510/LMR10515/LMR10520 Demo Board

2 Features

- 3.0V to 5.5V Input Voltage Range
- 1.8V Output Voltage (Default Setting)
- 1A/1.5A/2.0A Output Current
- Switching Frequency of 3MHz
- Small Solution Size (13 × 12mm)

3 Shutdown Operation

The demo board includes a pull-up resistor, R3, to enable the device once V_{IN} has exceeded 1.8V (typ). 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 1.8V 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 0.6V.

For more information on component selection and features, see:

- *LMR10510 SIMPLE SWITCHER 5.5Vin, 1A Step-Down Voltage Regulator in SOT-23 and WSON* ([SNVS727](#))
- *LMR10515 SIMPLE SWITCHER 5.5Vin, 1.5A Step-Down Voltage Regulator in SOT-23 and WSON* ([SNVS728](#))
- *LMR10520 SIMPLE SWITCHER 5.5Vin, 2.0A Step-Down Voltage Regulator in WSON* ([SNVS730](#))

5 LMR10510 Demo Board Schematic

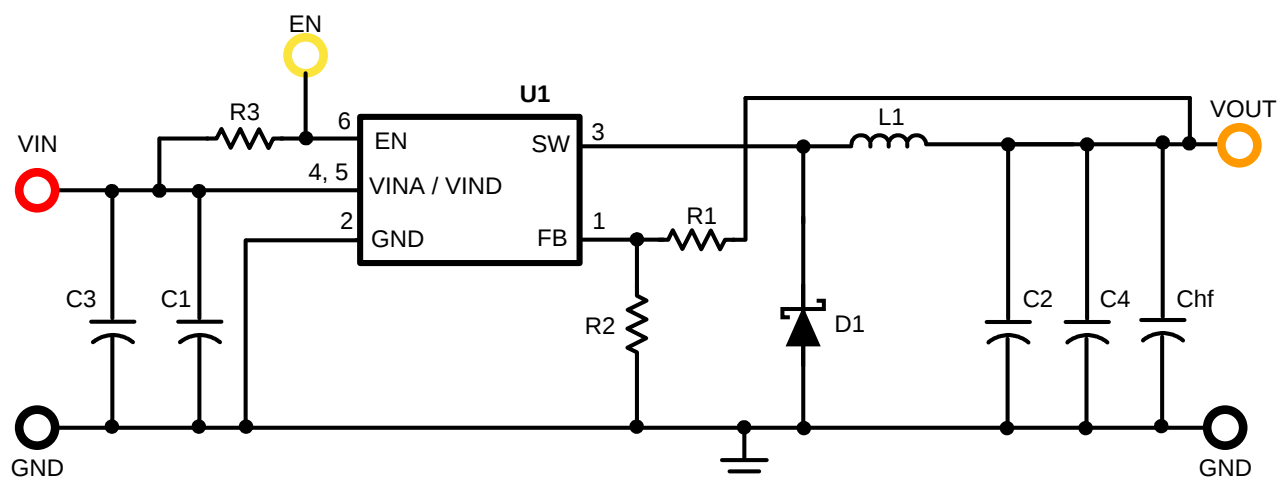


Figure 2. LMR10510 Demo Board Schematic

Table 1. Bill of Materials LMR10510Y

Part ID	Part Value	Manufacturer	Part Number	Package Type
U1	1A Buck Regulator	Texas Instruments	LMR10510	WSO8
C1, C2	2.2 μ F, 10V, X5R	TDK	C2012X5R1A225K	0805
C3, C4	22 μ F, 6.3V, X5R	TDK	C3216X5R0J226M	1206
Chf	22nF, 50V, X7R	Murata	GRM188R71H223KA01D	0603
D1, Catch Diode	Schottky 1.5A, 30VR	Toshiba	CRS08	SFLAT
L1	1.0 μ H, 2.05A, 45m Ω	Murata	LQH32PN1R0NN0	
R1	20.0 K Ω , 1%	Vishay	CRCW060320K0FKEA	0603
R2	10.0 K Ω , 1%	Vishay	CRCW060310K0FKEA	0603
R3	1 Meg Ω , 5%	Vishay	CRCW06031M00JNEA	0603
GND	Test Point, Black	Keystone	5011	
VIN	Test Point, Red	Keystone	5010	
VOUT	Test Point, Orange	Keystone	5013	
EN	Test Point, Yellow	Keystone	5014	

6 LMR10515 Demo Board Schematic

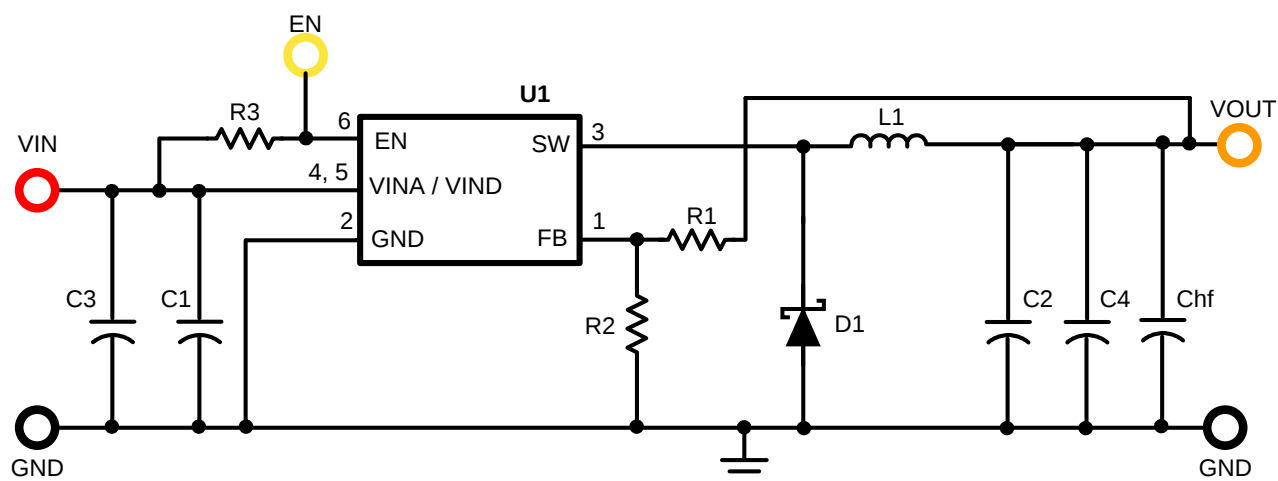


Figure 3. LMR10515 Demo Board Schematic

Table 2. Bill of Materials LMR10515Y

Part ID	Part Value	Manufacturer	Part Number	Package Type
U1	1.5A Buck Regulator	Texas Instruments	LMR10515	WSO8
C1, C2	2.2μF, 10V, X5R	TDK	C2012X5R1A225K	0805
C3, C4	22μF, 6.3V, X5R	TDK	C3216X5R0J226M	1206
Chf	22nF, 50V, X7R	Murata	GRM188R71H223KA01D	0603
D1, Catch Diode	Schottky 1.5A, 30VR	Toshiba	CRS08	SFLAT
L1	1.0 μH, 2.05A, 45mΩ	Murata	LQH32PN1R0NN0	
R1	20.0 KΩ, 1%	Vishay	CRCW060320K0FKEA	0603
R2	10.0 KΩ, 1%	Vishay	CRCW060310K0FKEA	0603
R3	1 MegΩ, 5%	Vishay	CRCW06031M00JNEA	0603
GND	Test Point, Black	Keystone	5011	
VIN	Test Point, Red	Keystone	5010	
VOUT	Test Point, Orange	Keystone	5013	
EN	Test Point, Yellow	Keystone	5014	

7 LMR10520 Demo Board Schematic

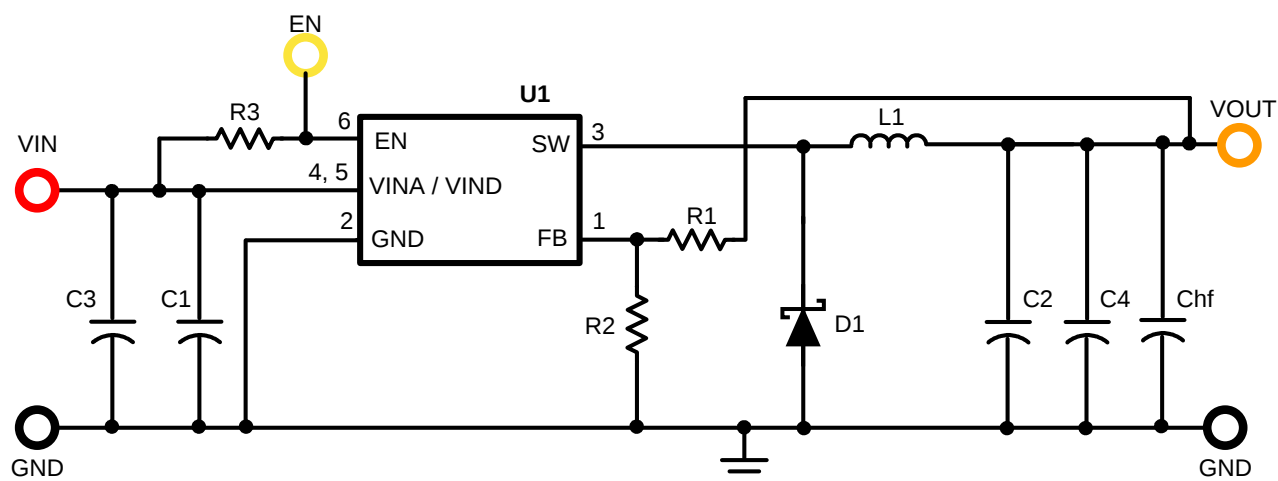


Figure 4. LMR10520 Demo Board Schematic

Table 3. Bill of Materials LMR10520Y

Part ID	Part Value	Manufacturer	Part Number	Package Type
U1	2A Buck Regulator	Texas Instruments	LMR10520	WSO8
C1, C2	2.2µF, 10V, X5R	TDK	C2012X5R1A225K	0805
C3, C4	22µF, 6.3V, X5R	TDK	C3216X5R0J226M	1206
Chf	22nF, 50V, X7R	Murata	GRM188R71H223KA01D	0603
D1, Catch Diode	Schottky 2A, 30V	Toshiba	CMS06	MFLAT
L1	1.0 µH, 2.45A, 30mΩ	Murata	LQH44PN1R0NP0L	
R1	20.0 KΩ, 1%	Vishay	CRCW060320K0FKEA	0603
R2	10.0 KΩ, 1%	Vishay	CRCW060310K0FKEA	0603
R3	1 MegΩ, 5%	Vishay	CRCW06031M00JNEA	0603
GND	Test Point, Black	Keystone	5011	
VIN	Test Point, Red	Keystone	5010	
VOUT	Test Point, Orange	Keystone	5013	
EN	Test Point, Yellow	Keystone	5014	

8 Quick Setup Procedures

Step 1: Connect a power supply to VIN terminals. V_{IN} range: 3V to 5.5V

Step 2: Connect a load to VOUT terminals. I_{OUT} range: 0A to 1A / 1.5A / 2.0A

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

Step 4: Apply $V_{IN} = 5V$, with 0A load applied, check V_{OUT} with a voltmeter. Nominal 1.8V

Step 5: Apply a 1A / 1.5A / 2.0A load and check V_{OUT} . Nominal 1.8V

9 Measurements

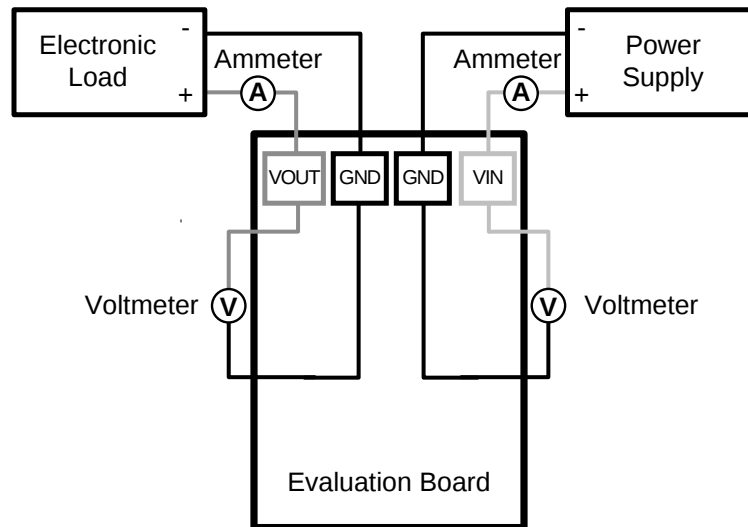


Figure 5. Efficiency Measurements

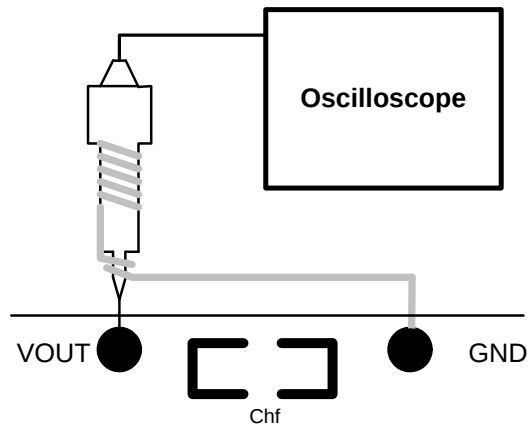


Figure 6. Voltage Ripple Measurements

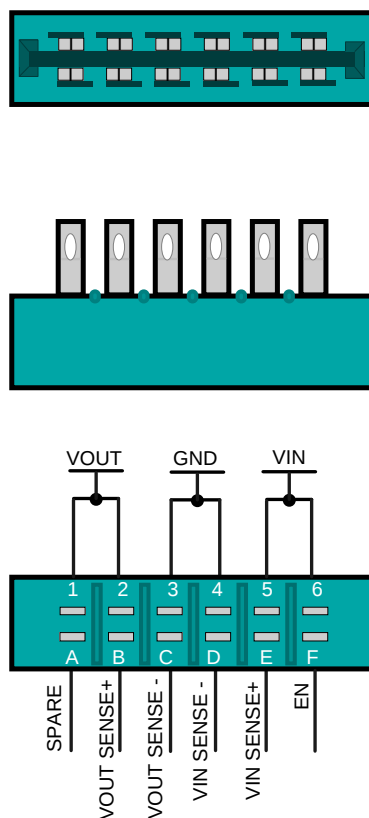
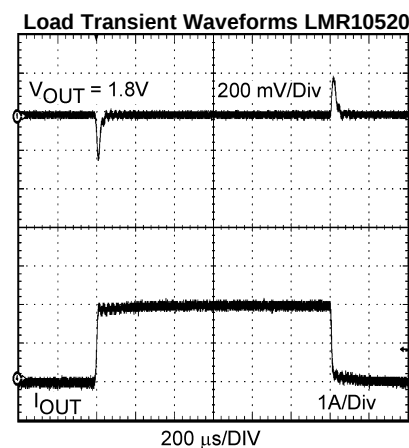
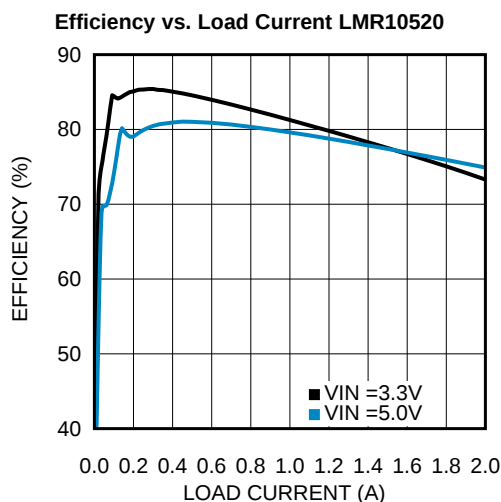
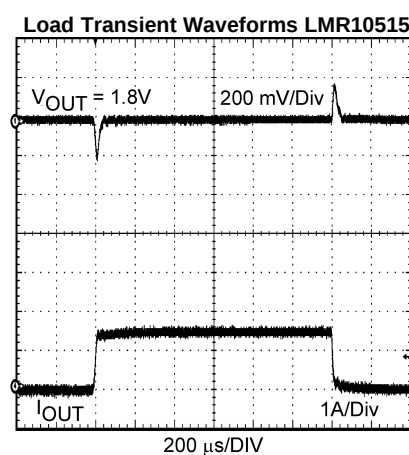
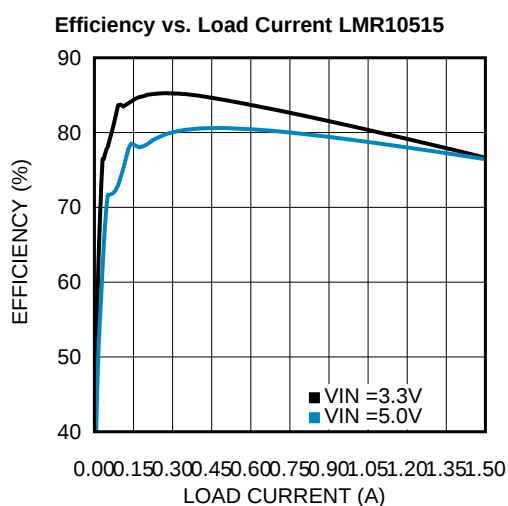
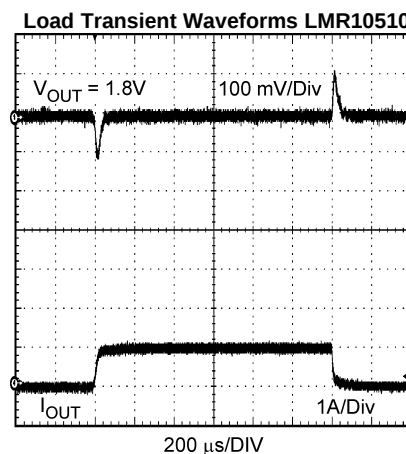
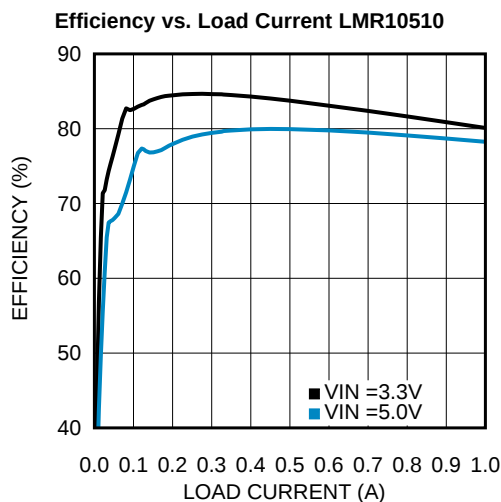
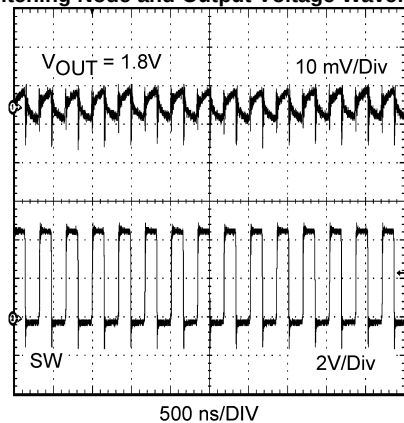


Figure 7. Edge Connector Schematic

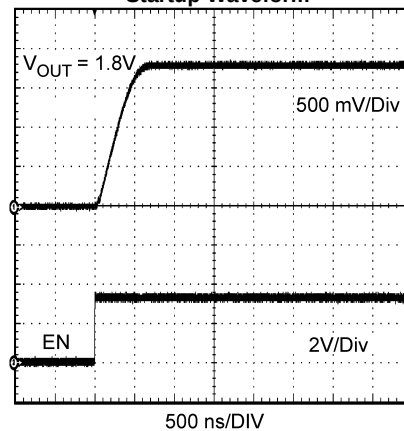
10 Typical Performance Characteristics



Switching Node and Output Voltage Waveforms



Startup Waveform



11 Layout

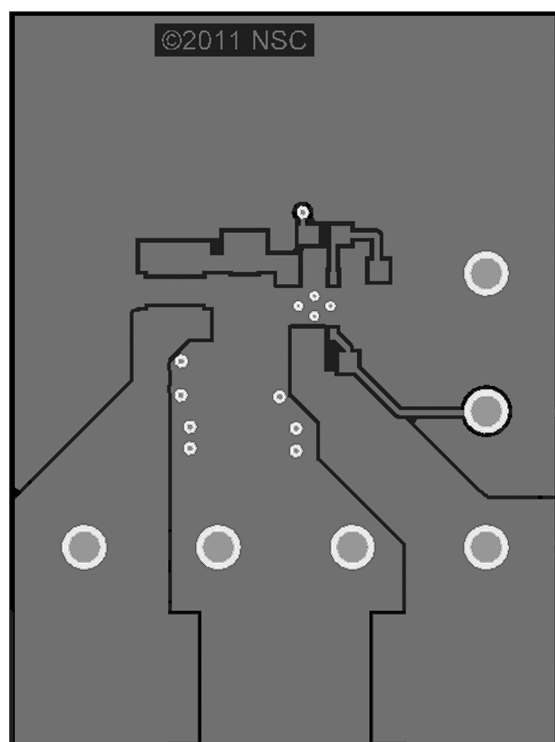


Figure 8. Top Layer

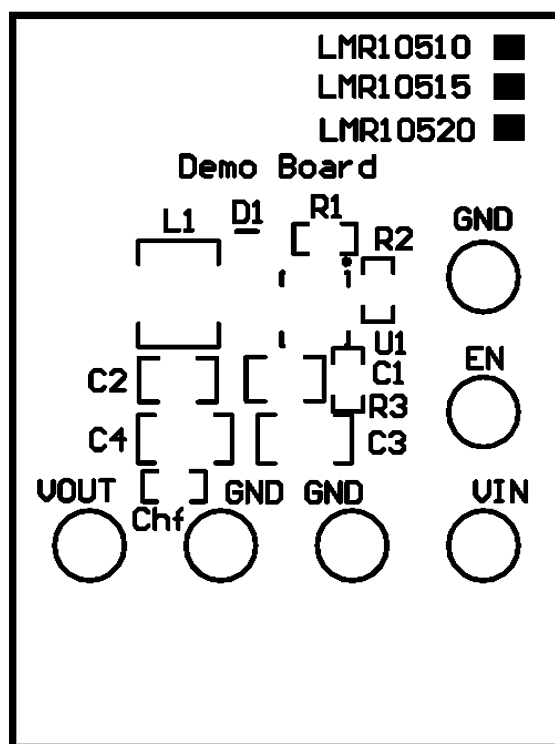


Figure 9. Top Overlay

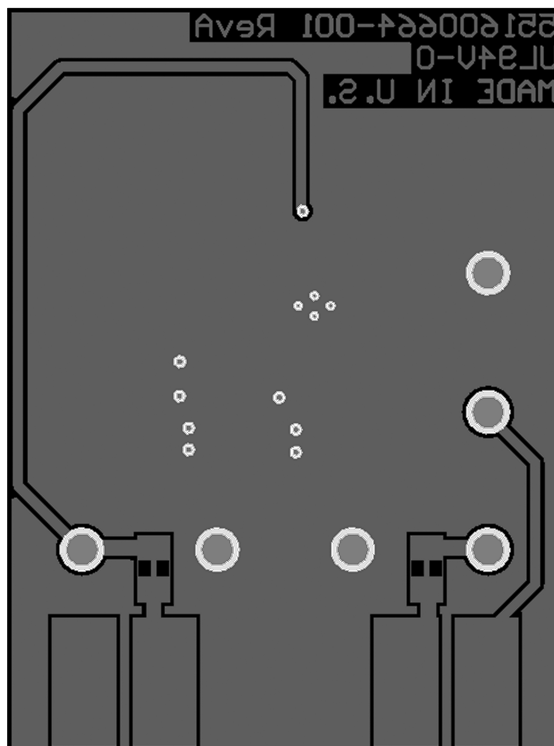


Figure 10. Bottom Layer



Figure 11. Bottom Overlay

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