LTM4608: Low V_{IN}, 8A DC/DC µModule® with Tracking, Margining and Frequency Synchronization

DESCRIPTION

Demonstration circuit DC1181B features the LTM®4608EV, the high efficiency, high density switch mode step-down power module. The input voltage range is from 2.7V to 5.5V. The output voltage is jumper selectable from 0.596V to 3.3V; refer to step down ratio curve in the LTM4608 data sheet. The rated load current is 8A, while de-rating is necessary for certain V_{IN}, V_{OUT} and thermal conditions. Integrated input and output filters enable a simple PCB layout. Only bulk input and output capacitors are needed externally. The LTM4608 allows the user to program output ramp-up and ramp-down through the TRACK/SS pin. The output can be set to coincidentally or ratiometrically track to another voltage rail. Margining function is provided for the user who wants to stress their systems by varying supply voltages during testing; refer to data sheet for Functional Diagram.

Design files for this circuit board are available at http://www.linear.com/demo

Table 1. Performance Summary (T_A = 25°C)

PARAMETER	CONDITION	VALUE
Minimum Input Voltage		2.7V
Maximum Input Voltage		5.5V
Output Voltage V_{OUT}	Jumper selectable (open for 0.596V)	1.2V, 1.5V, 1.8V, 2.5V, 3.3V; ± 2%
Maximum Continuous Output Current	De-rating is necessary for certain V_{IN}, V_{OUT}, and thermal conditions	$8A_{DC}$
Default Operating Frequency		1.5MHz
Efficiency	V_{IN} = 5V, V_{OUT} = 1.5V, I_{OUT} = 8A	77%, See Figure 4 for more information
Load Transient	V_{IN} = 3.3V, V_{OUT} = 1.2V	See Figure 3 for details

QUICK START PROCEDURE

Demonstration circuit DC1181B is easy to set up to evaluate the performance of the LTM4608EV. Please refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. Place jumpers in the following positions for a typical 1.2V_{OUT} application:

V_{OUT} SELECT	RUN	TRACK	MARGINING
1.2V	ON	OFF	NO

2. With power off, connect the input power supply, load and meters as shown in Figure 1. Preset the load to 0A and V_{IN} supply to be less than 5.5V.
3. Turn on the power at the input. The output voltage should be 1.2V ±2%.
4. Once the proper output voltage is established, adjust the load within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters
5. To measure input and output ripple, please refer to Figure 2 for proper setup.
6. For optional load transient test, apply adjustable pulse signal between IOSTEP CLK and GND pins. Pulse amplitude sets the current step. The pulse signal should have very small duty cycle (<5%) to limit the thermal stress on the transient load circuit. The output transient current can be monitored at BNC connector J5 (10mV/A), the output voltage can be monitored at BNC connector J6.
7. If V_{OUT} is set to 2.5V or 3.3V, and the margining function is not desired, then the MGN pin should not be connected to V_{OUT} anymore. Instead, add a voltage divider from V_{IN} to GND with the center point tied to the MGN pin to disable margining. Each resistor should be close to 50k. For lower outputs (≤1.8V), no change is necessary.

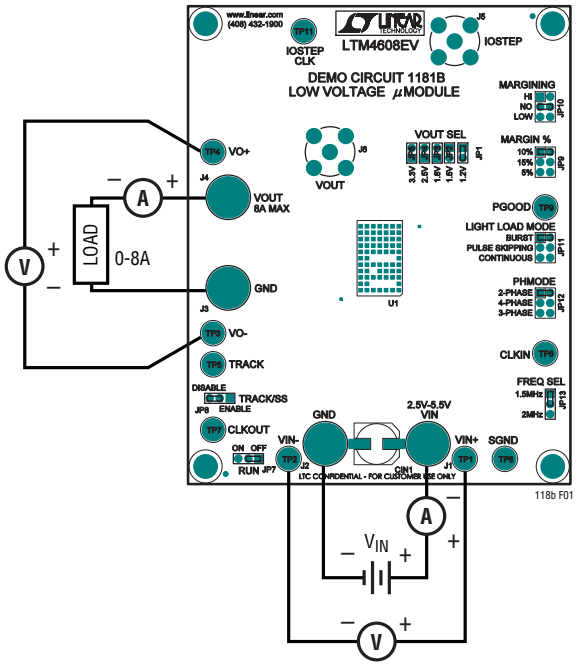


Figure 1. Test Setup of DC1181B

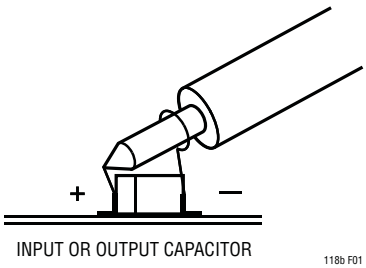
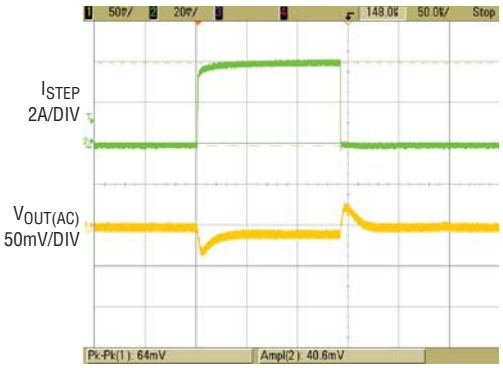


Figure 2. Scope Probe Placement for Measuring Input or Output Ripple

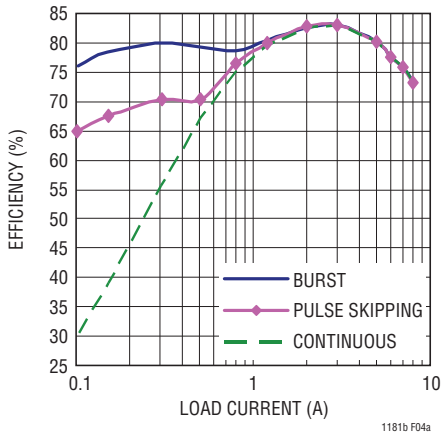


V_{IN} = 3.3V
V_{OUT} = 1.2V
2A to 6A LOAD STEP
C_{OUT} = 1 × 22µF CERAMIC (1206, X5R, 6.3V),
2 × 100µF CERAMIC (1812, X5R, 6.3V)
C_{FF} = 47µF

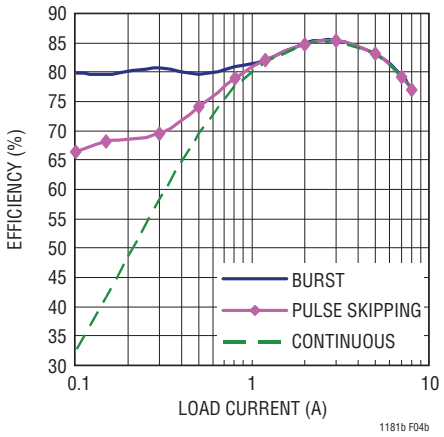
Figure 3. Measured Load Transient Response (4A Step, 25% to 75%)

QUICK START PROCEDURE

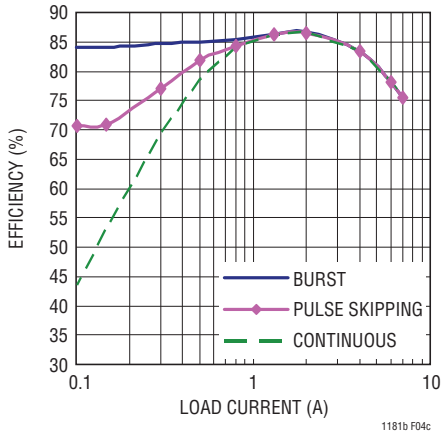
Efficiency vs Load Current with $5V_{IN}$ $1.2V_{OUT}$



Efficiency vs Load Current with $5V_{IN}$ $1.5V_{OUT}$



Efficiency vs Load Current with $3.3V_{IN}$ $1.2V_{OUT}$



Efficiency vs Load Current with $3.3V_{IN}$ $1.5V_{OUT}$

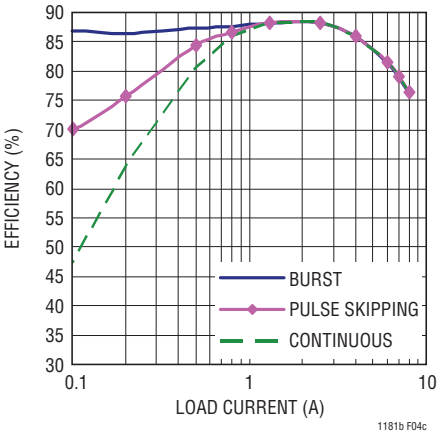
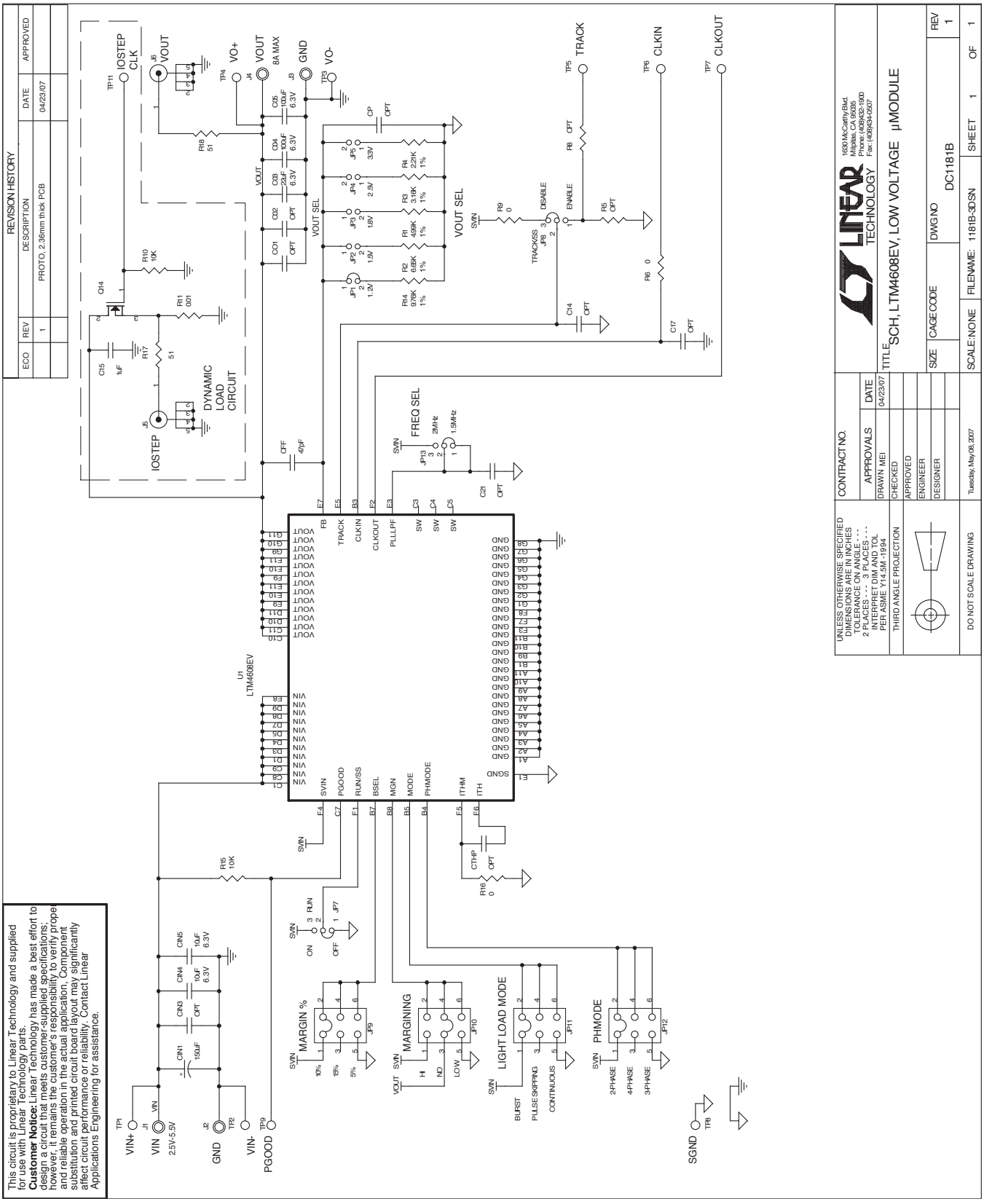


Figure 4. Measured Supply Efficiency with Different V_{IN} and V_{OUT}

PARTS LIST

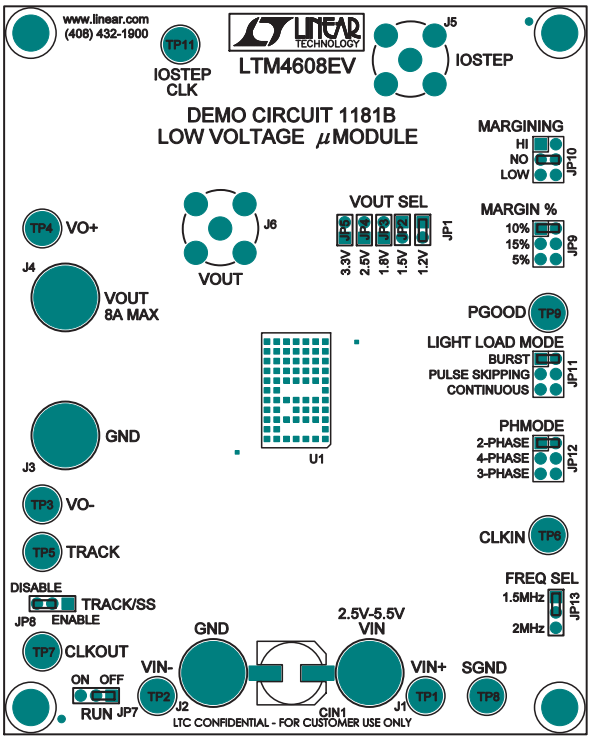
ITEM	QUANTITY	REFERENCE-DESCRIPTION	DESCRIPTION	MANUFACTURERS PART NUMBER
			REQUIRED CIRCUIT COMPONENTS:	
1	1	CFF	CAP, 0603 47pF 10% 25V NPO	AVX 06033A470KAT
2	1	CIN1	CAP, 150uF 20% 10V ELEC	SANYO 10SVPA150MAA
3	2	CIN5, CIN4	CAP, 0805 10uF 10% 6.3V X5R	AVX 08056D106KAT2A
4	1	C03	CAP, 1206 22uF 20% 6.3V X5R	AVX 12066D266MAT2A
5	2	C05, C04	CAP, 1812 100uF 20% 6.3V X5R	TDK C4532X5R0J107MZ
6	1	R14	RES, 0603 9.76K OHMS 1% 1/10W	VISHAY CRCW06039K76FKEA
7	1	U1	IC, LOW VOLTAGE POWER MODULE	LINEAR TECH. LTM4608EV

SCHEMATIC DIAGRAM

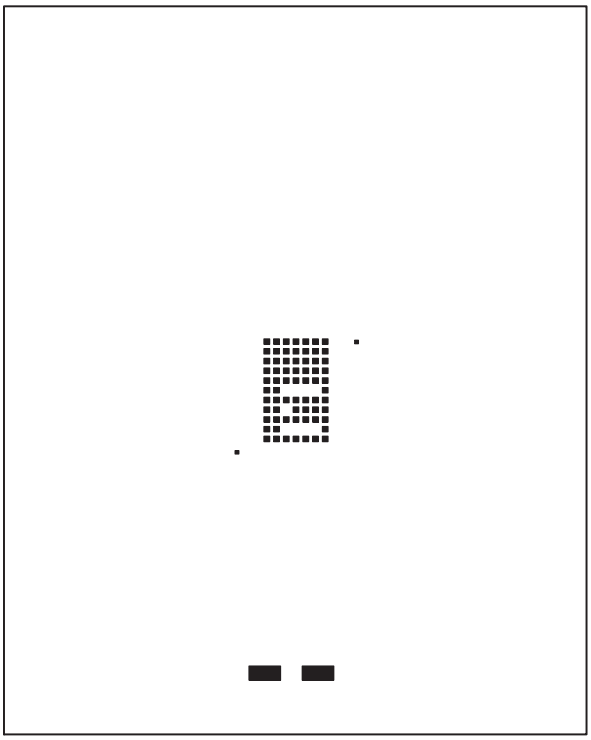


PCB LAYOUT AND FILM

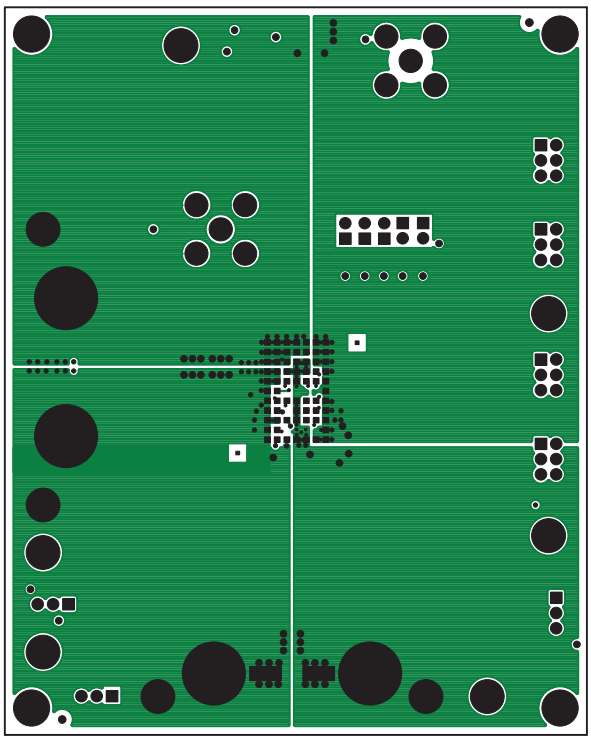
Top Silkscreen



Top Paste

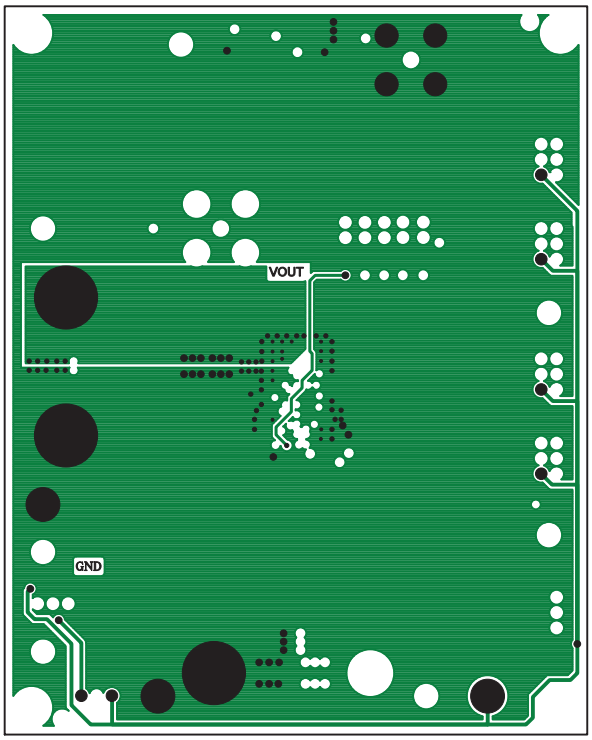


Component Side

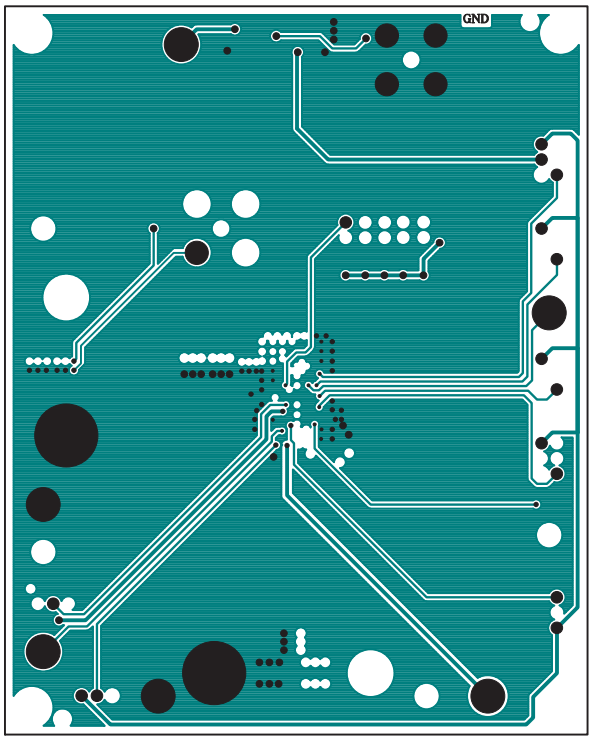


PCB LAYOUT AND FILM

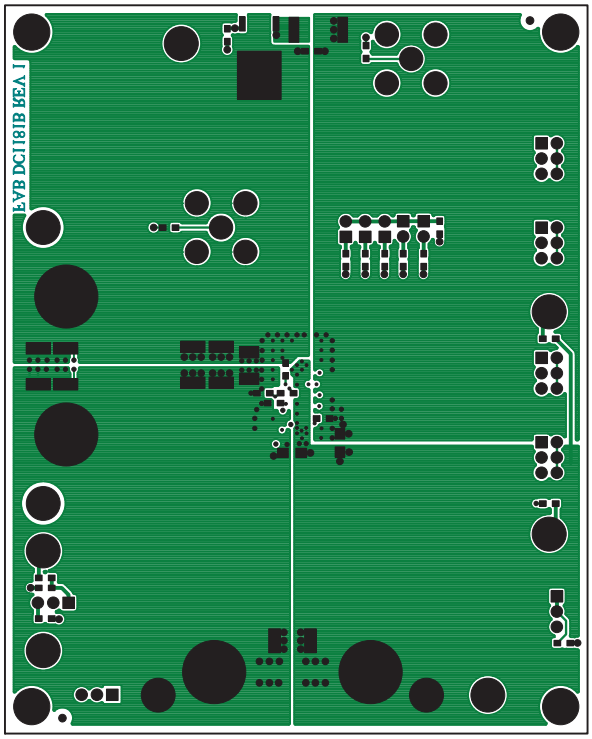
GND Layer



GND Layer



Bottom Layer



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