EV8774C-Q-00A

12A, Wide-Input 3V to 18V, 1.4MHz, Synchronous Step-Down Converter with FCCM Evaluation Board

DESCRIPTION

The EV8774C-Q-00A is an evaluation board designed to demonstrate the capabilities of the MP8774C, a fully integrated, high-frequency, synchronous, rectified, step-down switch-mode converter with internal power MOSFETs.

The MP8774C offers a very compact solution that can achieve up to 12A of continuous output current (I_{OUT}) across a wide input voltage (V_{IN}) range, with excellent load and line regulation. The MP8774C employs synchronous mode for higher efficiency across the entire I_{OUT} load range.

Constant-on-time (COT) control provides very fast transient response, easy loop design, and very tight output regulation.

Full protection features include short-circuit protection (SCP), over-current protection (OCP), under-voltage protection (UVP), and thermal shutdown.

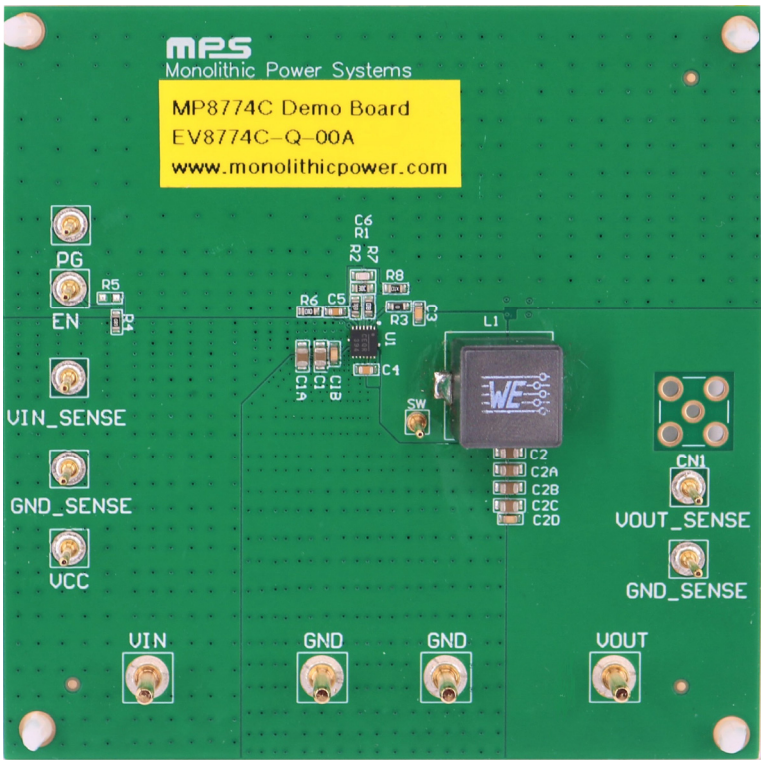
The MP8774C requires a minimal number of readily available, standard external components, and is available in a space-saving QFN-16 (3mmx3mm) package.

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C, unless otherwise noted.

Parameters	Conditions	Value
Input voltage (V_{IN}) range		3V to 18V
Output voltage (V_{OUT})	V_{IN} = 3V to 18V, I_{OUT} = 0A to 12A	V_{OUT} = 1V
Maximum output current (I_{OUT})	V_{IN} = 3V to 18V	12A
Typical efficiency	V_{IN} = 12V, V_{OUT} = 1V, I_{OUT} = 12A	81.1%
Peak efficiency	V_{IN} = 5V, V_{OUT} = 1V, I_{OUT} = 2A	91.3%
Switching frequency (f_{SW})		1.4MHz

EVALUATION BOARD



LxWxH (8.5cmx8.5cmx1.3cm)

Board Number	MPS IC Number
EV8774C-Q-00A	MP8774CGQ

QUICK START GUIDE

The EV8774C-Q-00A evaluation board is easy to set up and use to evaluate the performance of the MP8774C. For proper measurement equipment set-up, refer to Figure 1 and follow the steps below:

1. Preset the power supply to 12V, then turn off the power supply. (1)
2. Connect the power supply terminals to:
   a. Positive (+): VIN
   b. Negative (-): GND
3. Connect the load terminals to:
   a. Positive (+): VOUT
   b. Negative (-): GND
4. After making the connections, turn on the power supply. The board should automatically start up.
5. Check for the proper output voltage (V_{OUT}) between the VOUT_SENSE and GND_SENSE terminals. Once the proper V_{OUT} is established, adjust the load within the operating range and measure the efficiency, output ripple voltage, and other parameters.

Note:

1) Ensure that V_{IN} does not exceed 18V.

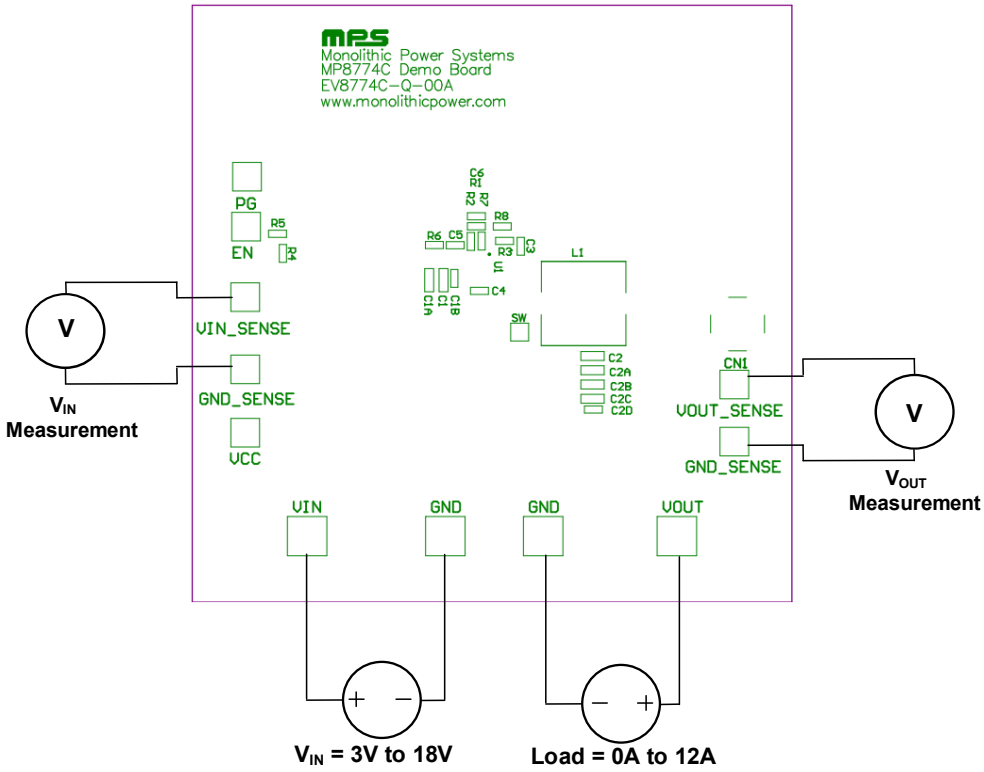


Figure 1: Measurement Equipment Set-Up

EVALUATION BOARD SCHEMATIC

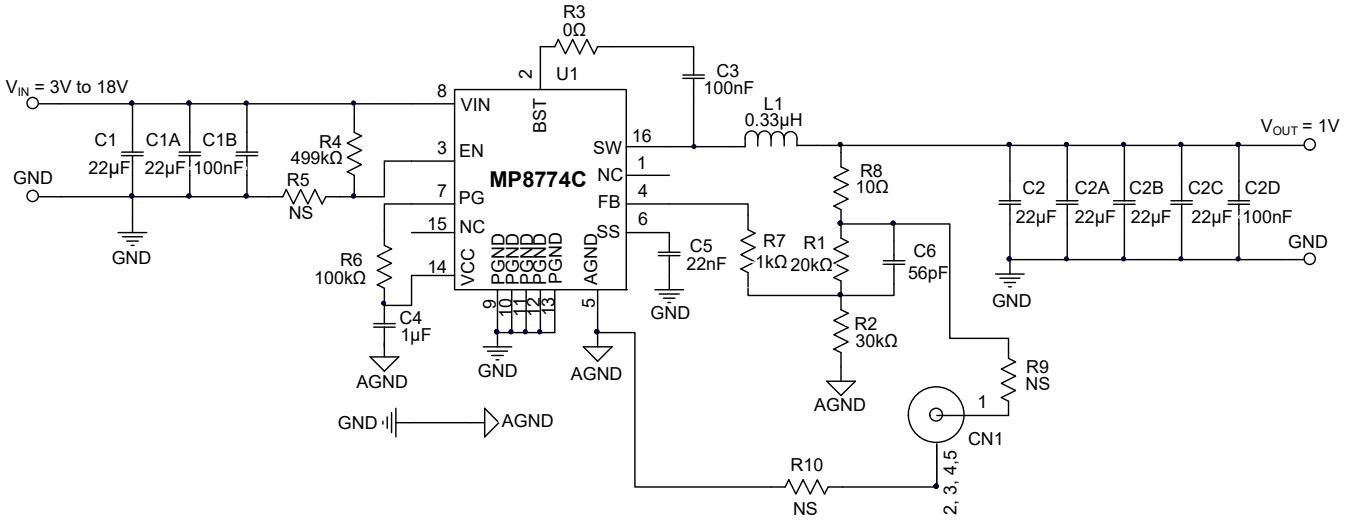


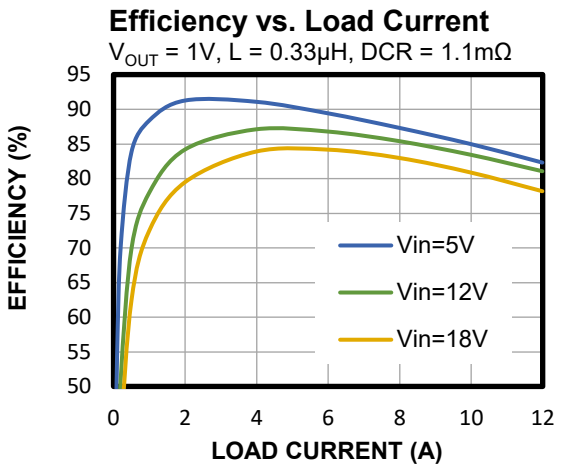
Figure 2: Evaluation Board Schematic

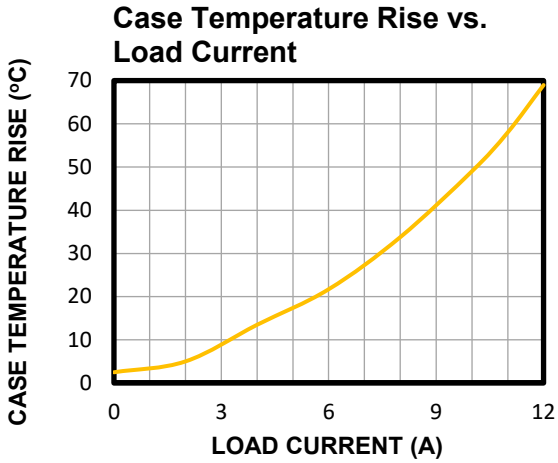
EV8774C-Q-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Part Number
6	C1, C1A, C2, C2A, C2B, C2C	22µF	Ceramic capacitor, 25V, X5R	0805	Murata	GRM21BR61E226ME44L
3	C1B, C2D, C3	0.1µF	Ceramic capacitor, 25V, X7R	0603	Murata	GRM188R71E104KA01D
1	C4	1µF	Ceramic capacitor, 25V, X7R	0603	Murata	GRM188R71E105KA12D
1	C5	22nF	Ceramic capacitor, 16V, X7R	0603	Murata	GRM188R71C223KA01D
1	C6	56pF	Ceramic capacitor, 50V, C0G	0603	Murata	GRM1885C1H560JA01D
1	R1	20kΩ	Thick film resistor, 1%	0603	Yageo	RC0603FR-0720KL
1	R2	30kΩ	Thick film resistor, 1%	0603	Yageo	RC0603FR-0730KL
1	R3	0Ω	Thick film resistor, 1%	0603	Yageo	RC0603FR-070RL
1	R4	499kΩ	Thick film resistor, 1%	0603	Yageo	RC0603FR-07499KL
0	R5, R9, R10	NS		0603		
1	R6	100kΩ	Thick film resistor, 1%	0603	Yageo	RC0603FR-07100KL
1	R7	1kΩ	Thick film resistor, 1%	0603	Yageo	RC0603FR-071KL
1	R8	10Ω	Thick film resistor, 1%	0603	Yageo	RC0603JR-0710RL
1	L1	0.33µH	Inductor, DCR = 1.1mΩ, I_{SAT} = 55A	SMD	Wurth	7443320033
1	U1	MP8774C	Synchronous step-down converter	QFN-16 (3mmx 3mm)	MPS	MP8774CGQ

EVB TEST RESULTS

V_{IN} = 12V, V_{OUT} = 1V, L = 0.33µH, f_{SW} = 1.4MHz, T_A = 25°C, unless otherwise noted.

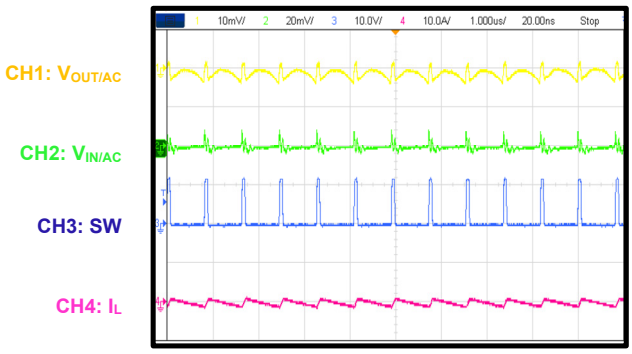




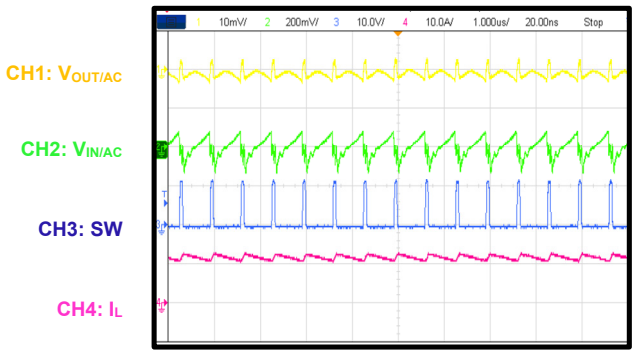
EVB TEST RESULTS *(continued)*

V_{IN} = 12V, V_{OUT} = 1V, L = 0.33µH, f_{SW} = 1.4MHz, T_A = 25°C, unless otherwise noted.

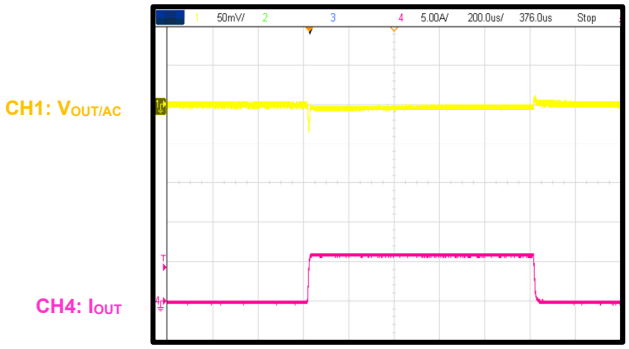
Input/Output Ripple
I_{OUT} = 0A



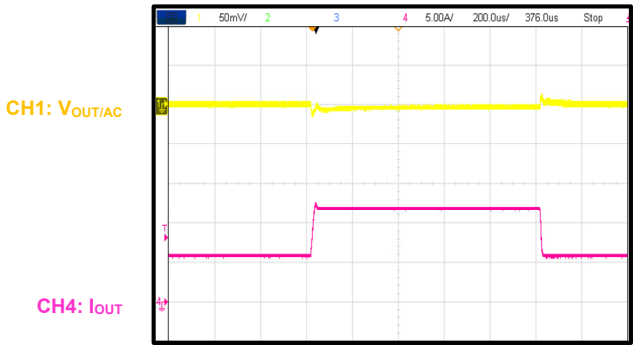
Input/Output Ripple
I_{OUT} = 12A



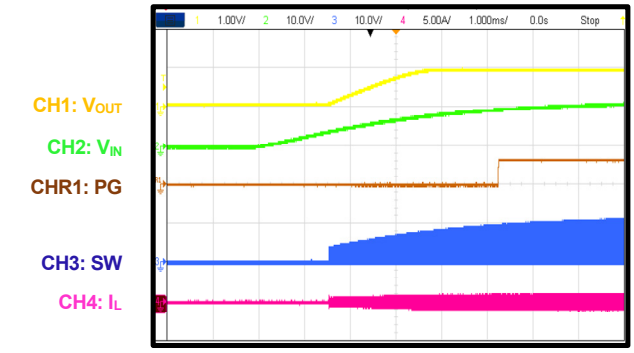
Load Transient
0A to 6A, 0.8A/µs



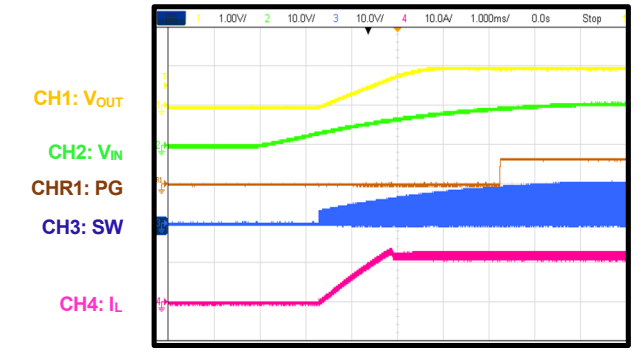
Load Transient
6A to 12A, 0.8A/µs



Start-up through VIN
I_{OUT} = 0A



Start-Up through VIN
I_{OUT} = 12A

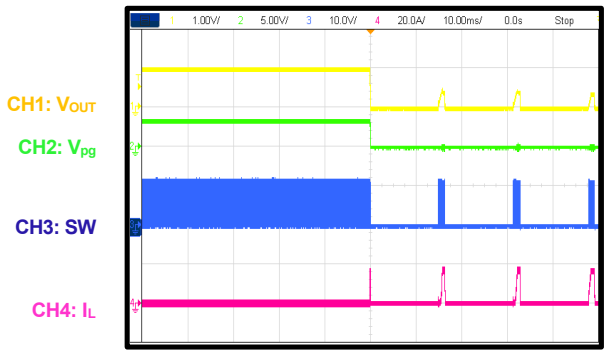


EVB TEST RESULTS *(continued)*

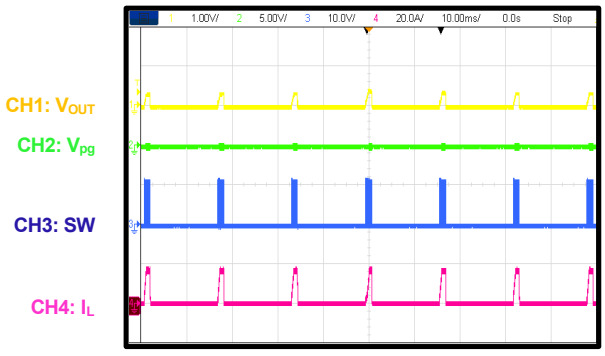
V_{IN} = 12V, V_{OUT} = 1V, L = 0.33µH, f_{SW} = 1.4MHz, T_A = 25°C, unless otherwise noted.

SCP Entry

I_{OUT} = 0A

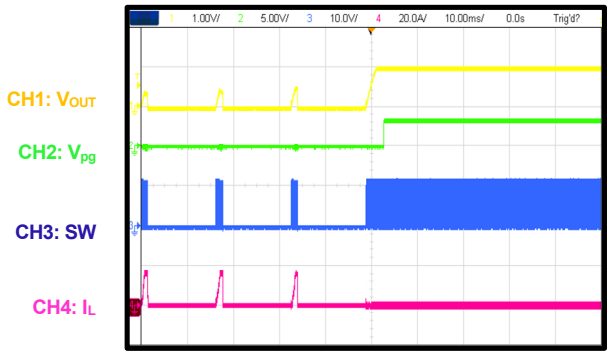


SCP Steady State



SCP Recovery

I_{OUT} = 0A



PCB LAYOUT

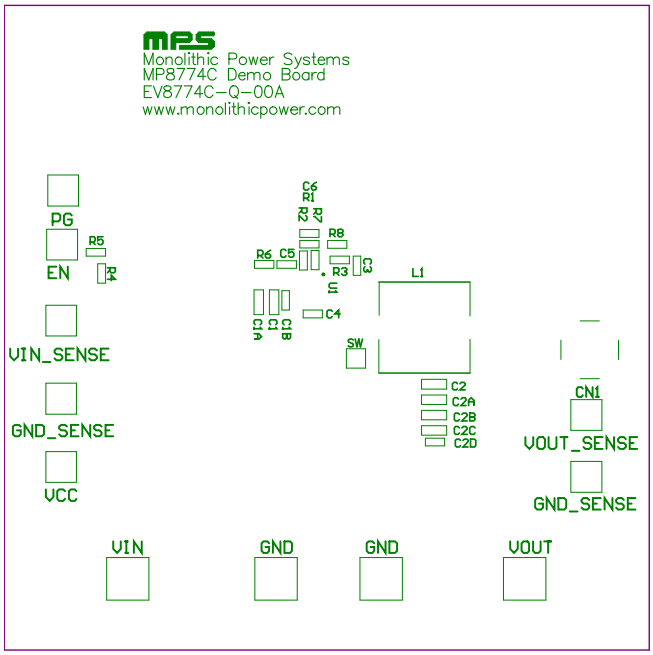


Figure 3: Top Silk

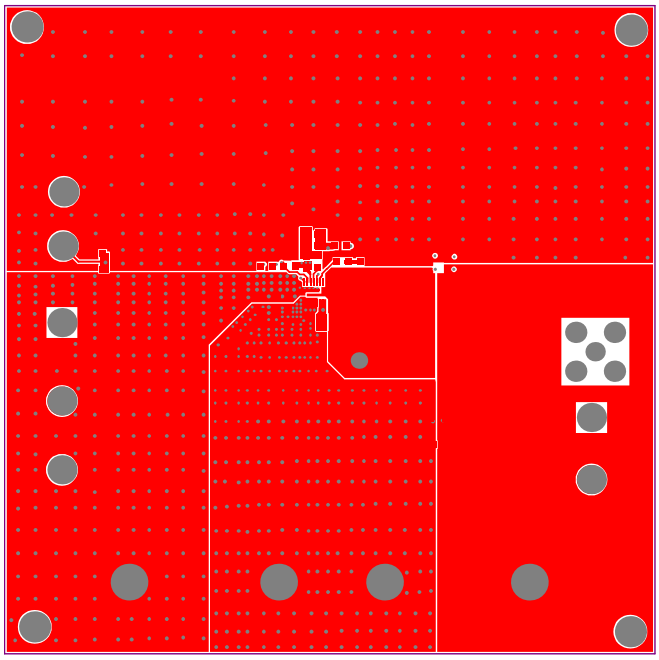


Figure 4: Top Layer

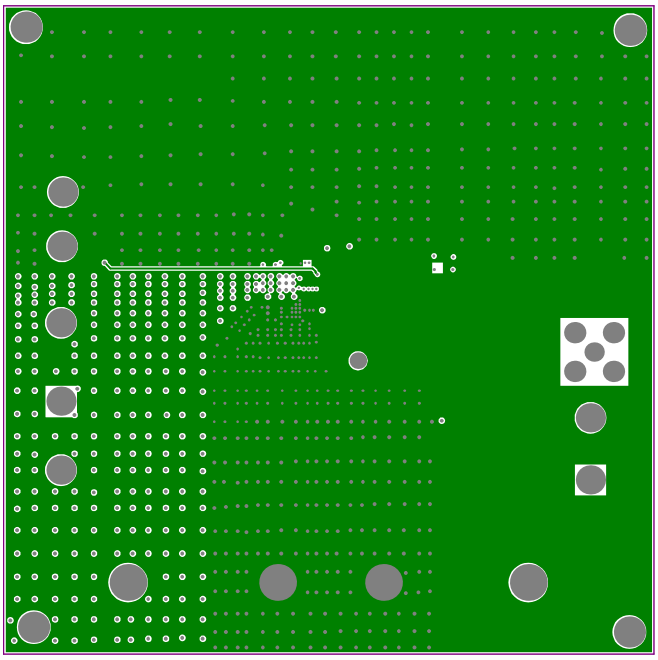


Figure 5: Mid-Layer 1

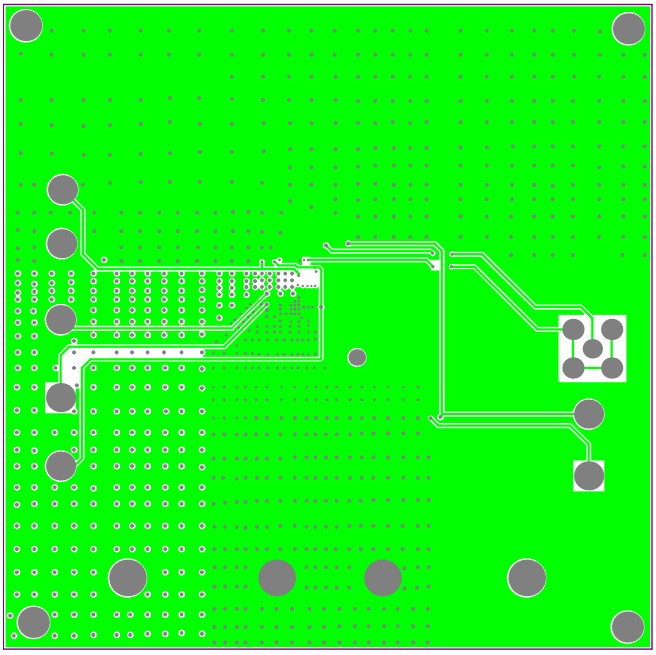


Figure 6: Mid-Layer 2

PCB LAYOUT *(continued)*

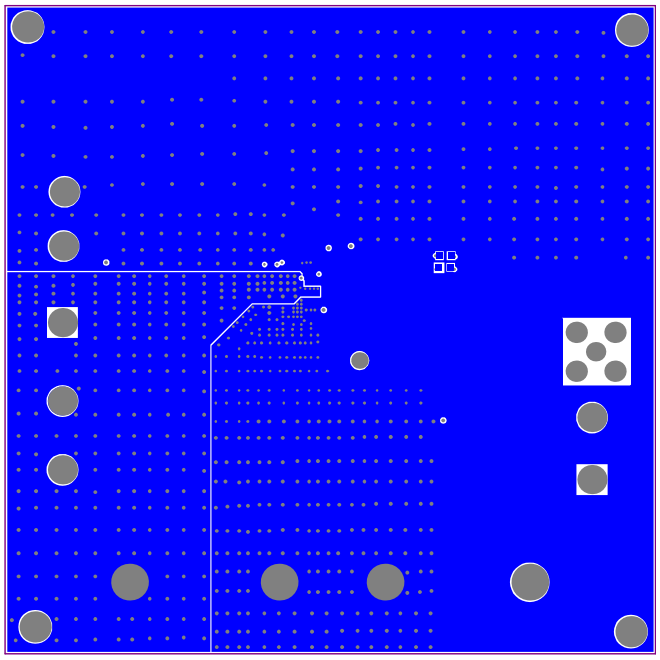


Figure 7: Bottom Layer

Figure 8: Bottom Silk

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	4/8/2024	Initial Release	-