EVL8870-L-00A

18V, 15A, Synchronous Step-Down Converter Evaluation Board

DESCRIPTION

The EVL8870-L-00A is an evaluation board designed to demonstrate the capabilities of the MP8870, a fully integrated, high-frequency, synchronous, buck converter with an I²C control interface. It offers a very compact solution that achieves up to 15A of output current (I_{OUT}), with excellent load and line regulation across a wide input supply range. The MP8870 operates at high efficiency across a wide I_{OUT} load range.

The output voltage (V_{OUT}) level can be controlled on the fly via the I²C serial interface. The reference voltage range can be adjusted from 0.3V to 1.536V, in 1.5mV steps. Voltage transition slew rate, frequency, current limit, hiccup/latch-off protection, enable, and power-saving mode are also selectable via the I²C.

The MP8870 adopts internally compensated constant-on-time (COT) control, which provides fast transient response and eases loop stabilization.

Full protection features include over-current protection (OCP), over-voltage protection (OVP), under-voltage protection (UVP), and over-temperature protection (OTP).

The MP8870 requires a minimal number of readily available, standard external components, and is available in a QFN-21 (3mmx4mm) package.

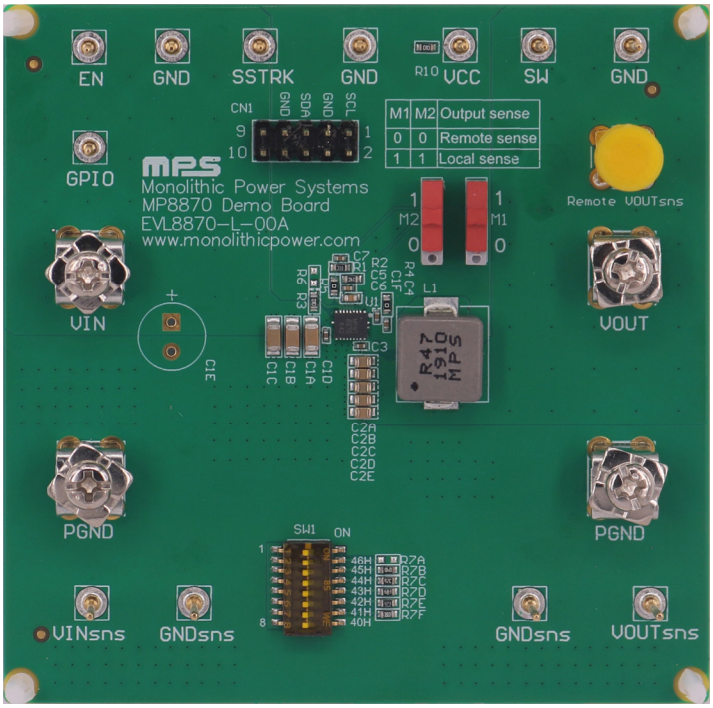
PERFORMANCE SUMMARY

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 15A	V_{OUT} = 1V
Maximum output current (I_{OUT})	V_{IN} = 3V to 18V	15A
Typical efficiency	V_{IN} = 12V, V_{OUT} = 1V, I_{OUT} = 15A	86.7%
Peak efficiency	V_{IN} = 12V, V_{OUT} = 1V, I_{OUT} = 6A	90.16%
Switching frequency		650kHz

MPL Optimized Performance with MPS Inductor MPL-AY1050 Series

EVALUATION BOARD



LxWxH (8.5cmx8.5cmx1.3cm)

Board Number	MPS IC Number
EVL8870-L-00A	MP8870GL-0001

QUICK START GUIDE

The EVL8870-L-00A evaluation board is easy to set up and use to evaluate the performance of the MP8870. 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 (-): PGND
3. Connect the load terminals to:
   a. Positive (+): VOUT
   b. Negative (-): PGND
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 VOUTSNS and GNDSNS 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.

Notes:

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

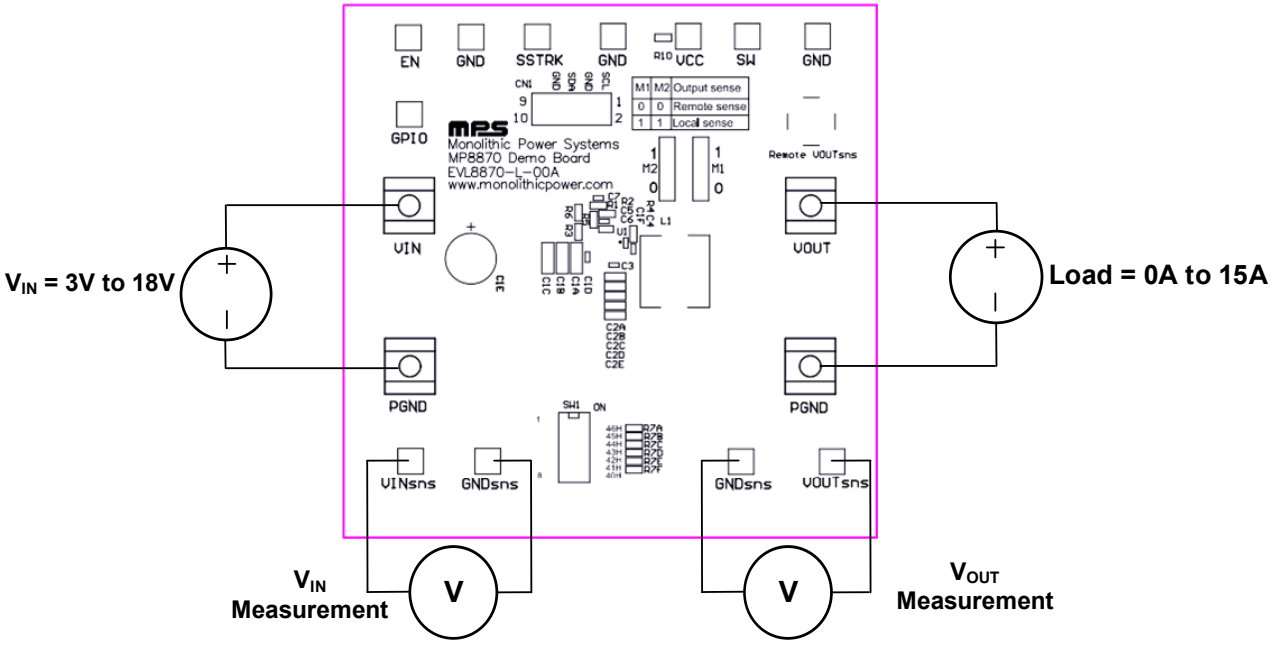


Figure 1: Measurement Equipment Set-Up

EVALUATION BOARD SCHEMATIC

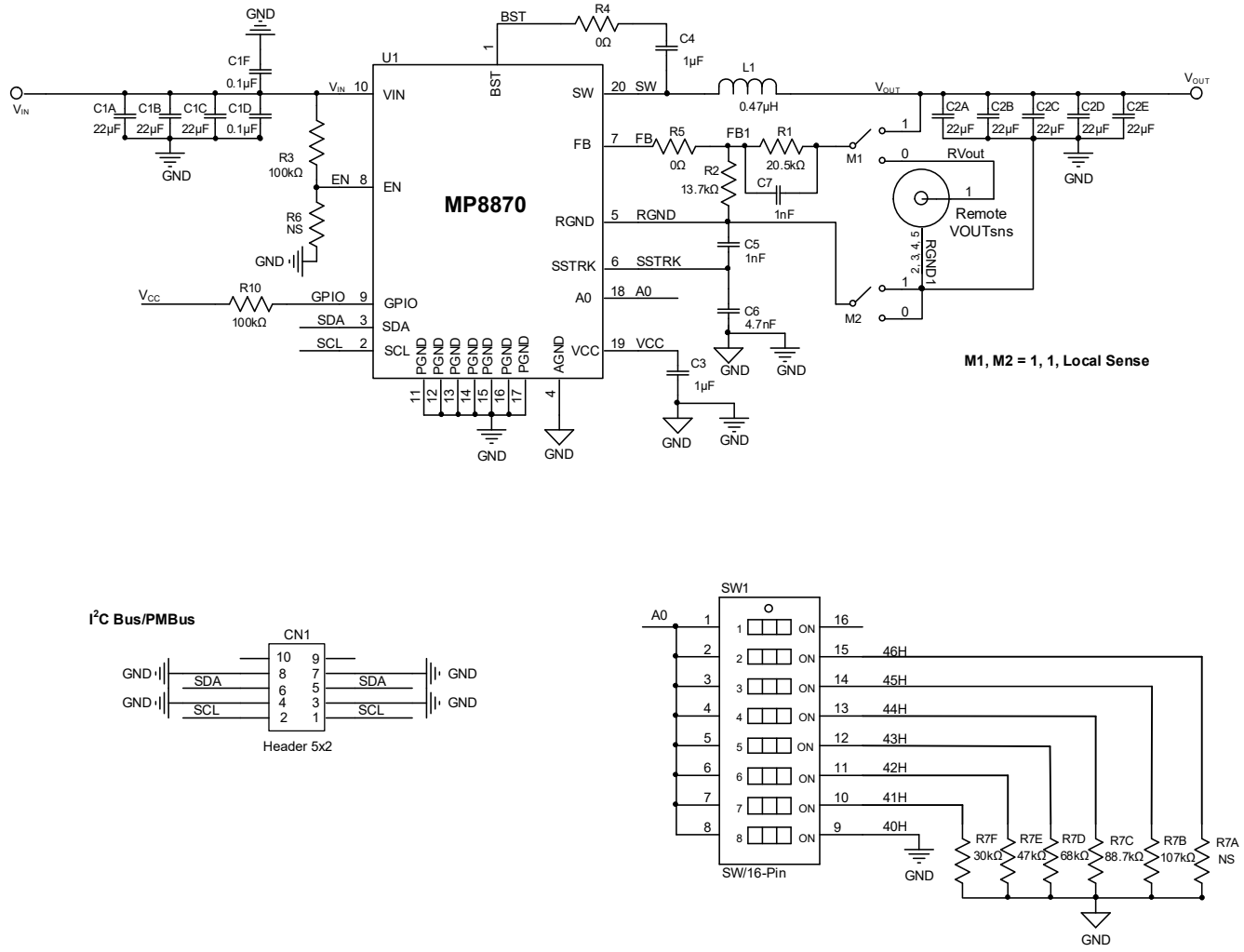


Figure 2: Evaluation Board Schematic

EVL8870-L-00A BILL OF MATERIALS

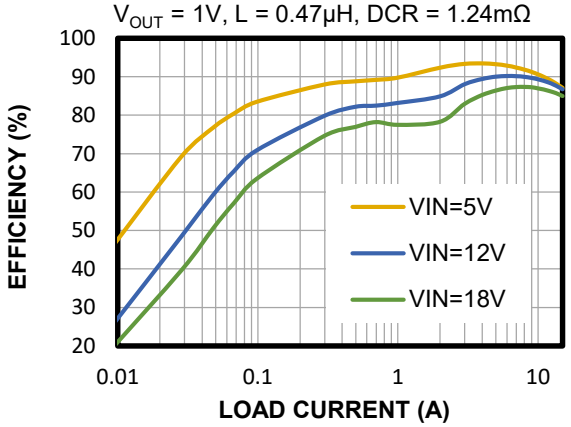
Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
3	C1A, C1B, C1C	22µF	Ceramic capacitor, 25V, X5R	1206	Murata	GRM31CR61E226KE15L
0	C1E	NS				
2	C1D, C1F	0.1µF	Ceramic capacitor, 25V, X7R	0402	Murata	GRM155C81E104KA12D
5	C2A, C2B, C2C, C2D, C2E	22µF	Ceramic capacitor, 16V, X5R	0805	Murata	GRM21BR61C226ME44L
2	C3, C4	1µF	Ceramic capacitor, 16V, X6S	0402	Murata	GRM155C81C105KE11D
1	C5	1nF	Ceramic capacitor, 50V, X7R	0402	Murata	GCM155R71H102KA37D
1	C6	4.7nF	Ceramic capacitor, 50V, X7R	0603	Wurth	885012206087
1	C7	1nF	Ceramic capacitor, 16V, X7R	0402	Murata	GRM155R71C102KA01D
1	R1	20.5kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0720K5L
1	R2	13.7kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0713K7L
2	R3, R10	100kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07100KL
2	R4, R5	0Ω	Film resistor, 1%	0603	Yageo	RC0603FR-070RL
0	R6, R7A	NS				
1	R7B	107kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07107KL
1	R7C	88.7kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0788K7L
1	R7D	68kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0768KL
1	R7E	47kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0747KL
1	R7F	30kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0730KL
1	L1	0.47µH	Inductor, I_{RMS} = 25A, DCR = 1.24mΩ	SMD, 11mmx 10mm	MPS	MPL-AY1050-R47
1	U1	MP8870	18V, 15A, synchronous step-down converter	QFN-21 (3mmx 4mm)	MPS	MP8870GL-0001

EVB TEST RESULTS

V_{IN} = 12V, V_{OUT} = 1V, L = 0.47µH, f_{SW} = 650kHz, T_A = 25°C, unless otherwise noted.

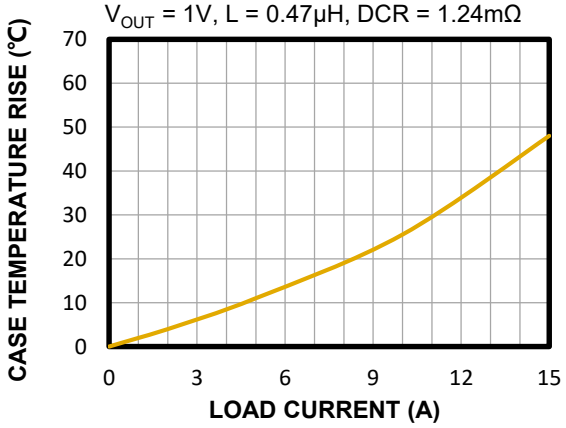
Efficiency vs. Load Current

V_{OUT} = 1V, L = 0.47µH, DCR = 1.24mΩ



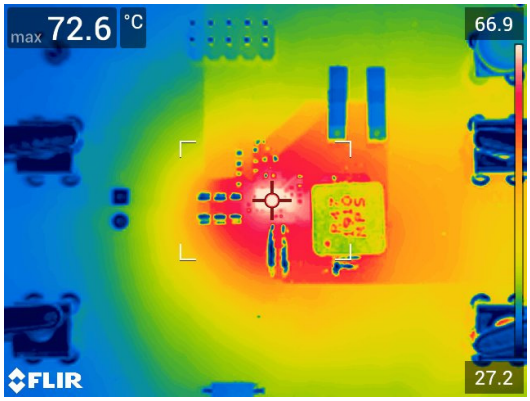
Case Temperature Rise vs. Load Current

V_{OUT} = 1V, L = 0.47µH, DCR = 1.24mΩ



Thermal Performance

I_{OUT} = 15A, no forced airflow, T_{CASE} = 72.6°C

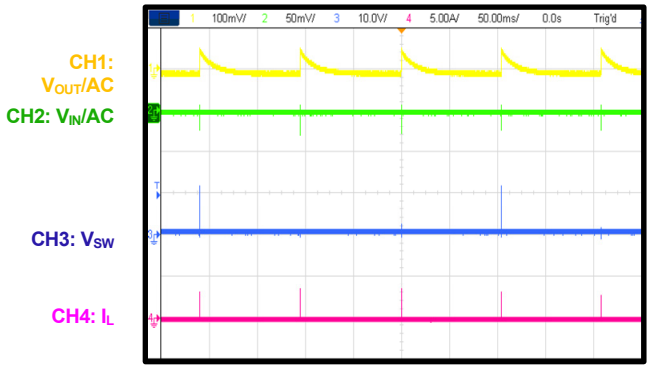


EVB TEST RESULTS *(continued)*

V_{IN} = 12V, V_{OUT} = 1V, L = 0.47µH, f_{SW} = 650kHz, T_A = 25°C, unless otherwise noted.

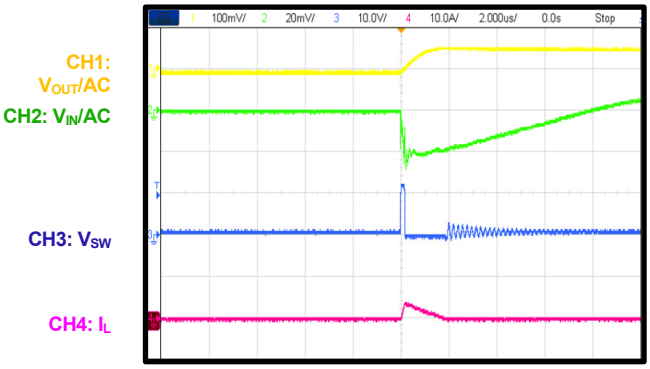
Input and Output Voltage Ripple

I_{OUT} = 0A



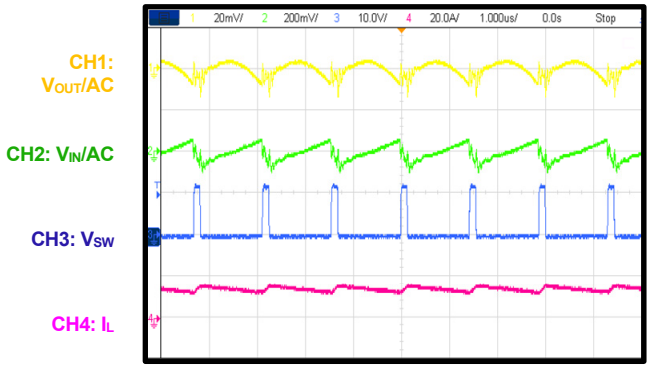
Input and Output Voltage Ripple

I_{OUT} = 0A



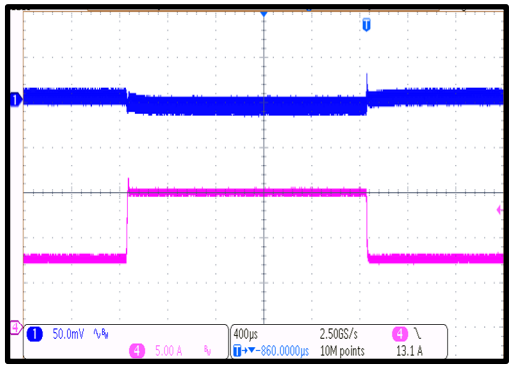
Input and Output Voltage Ripple

I_{OUT} = 15A



Load Transient Response

7.5A to 15A, 2.5A/µs



PCB LAYOUT

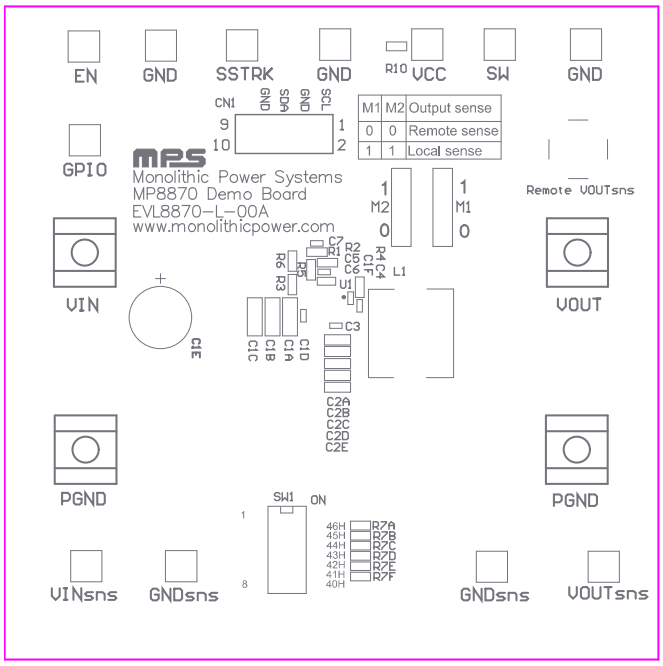


Figure 3: Top Silk

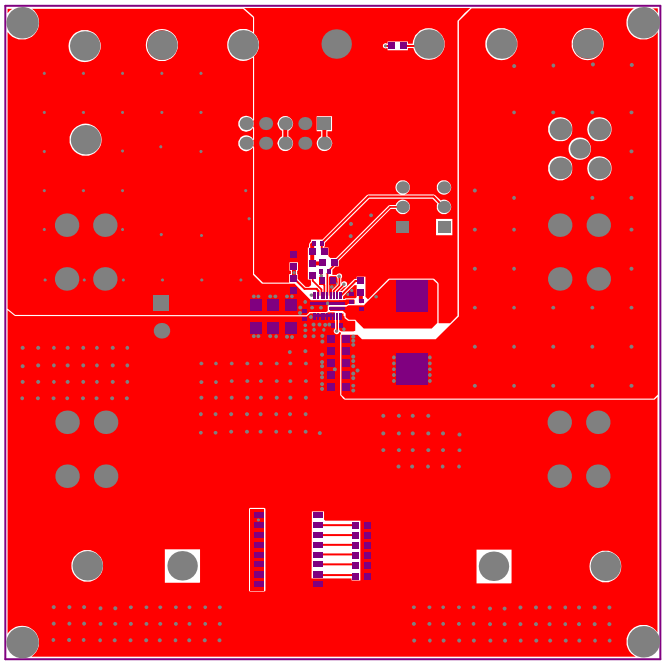


Figure 4: Top Layer

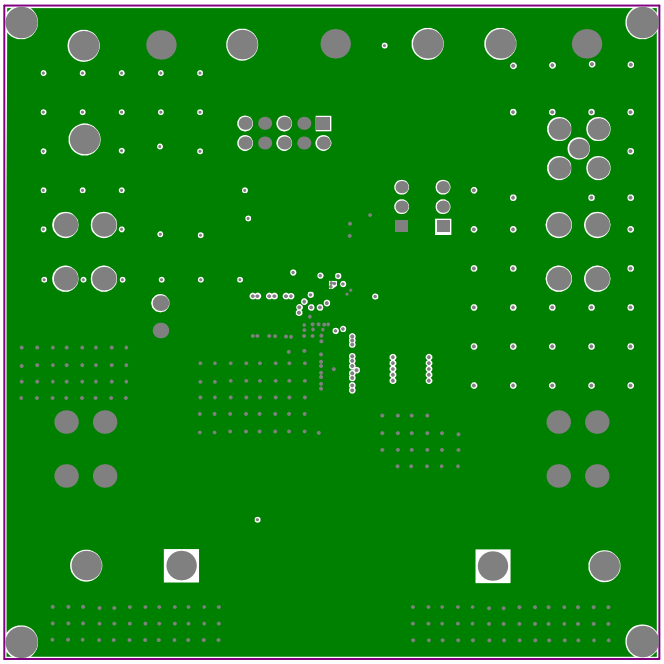


Figure 5: Mid-Layer 1

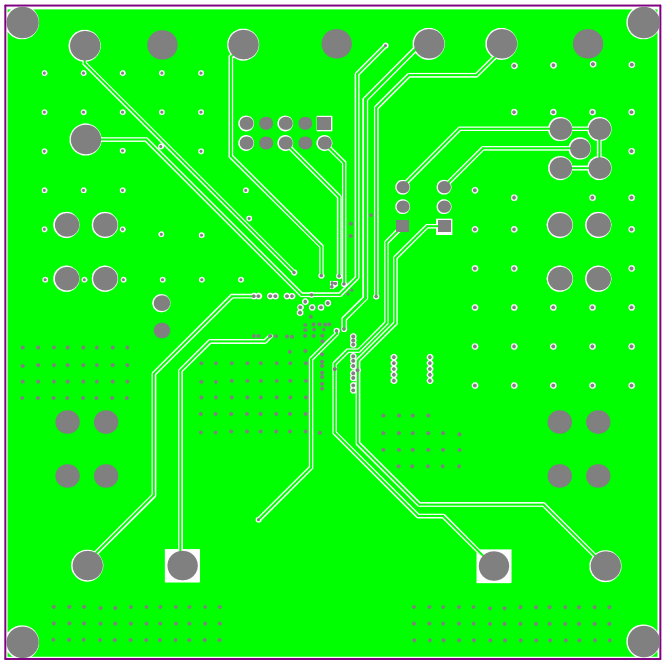


Figure 6: Mid-Layer 2

PCB LAYOUT *(continued)*

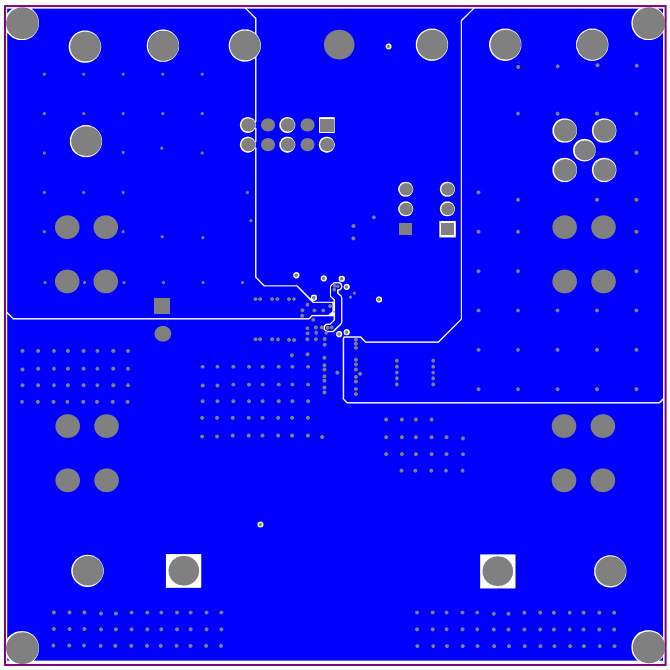


Figure 7: Bottom Layer

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	1/2/2024	Initial Release	-