# 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

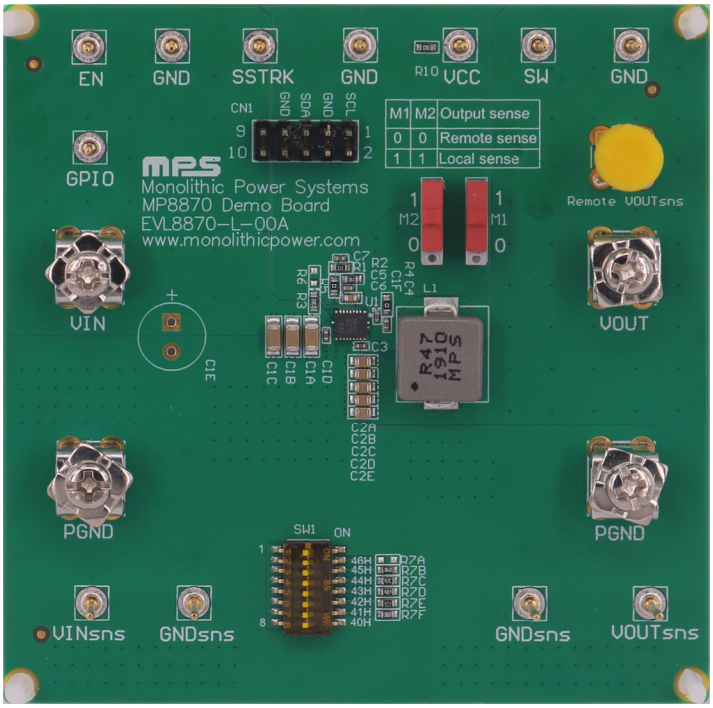
Specifications are at $T_A$ = 25°C, unless otherwise noted.

| 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


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## EVALUATION BOARD




**LxWxH (8.5cmx8.5cmx1.3cm)**

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


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## 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.

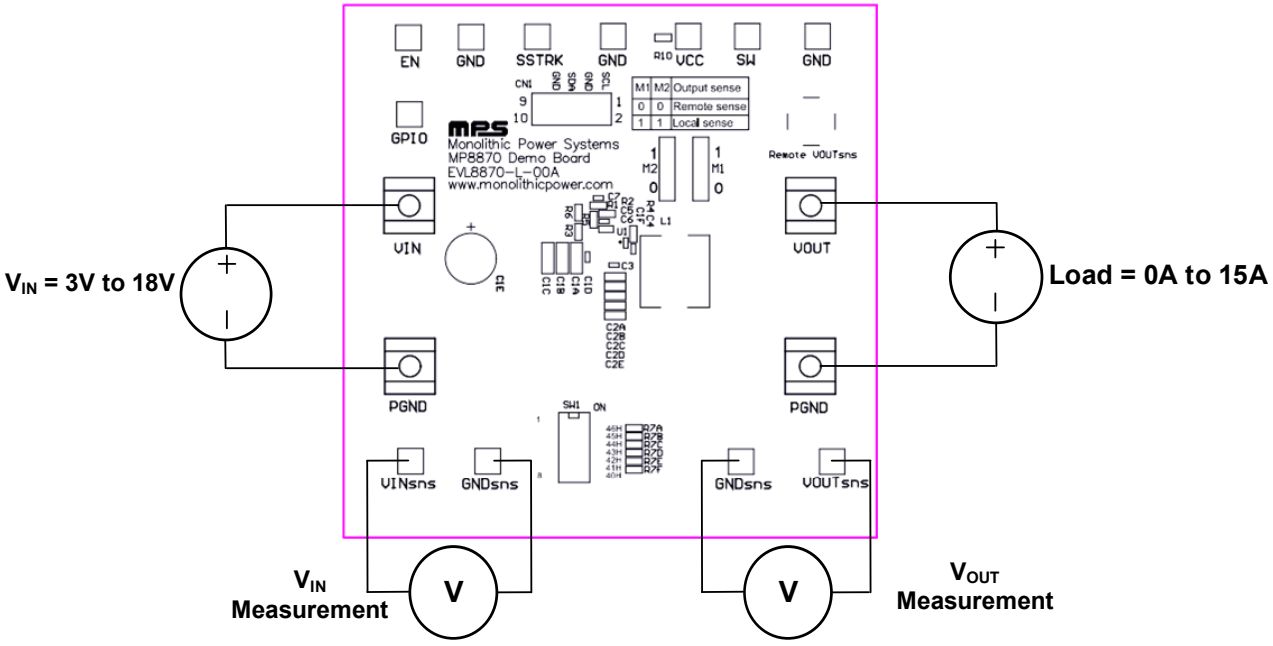



**Figure 1: Measurement Equipment Set-Up**


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# EVALUATION BOARD SCHEMATIC

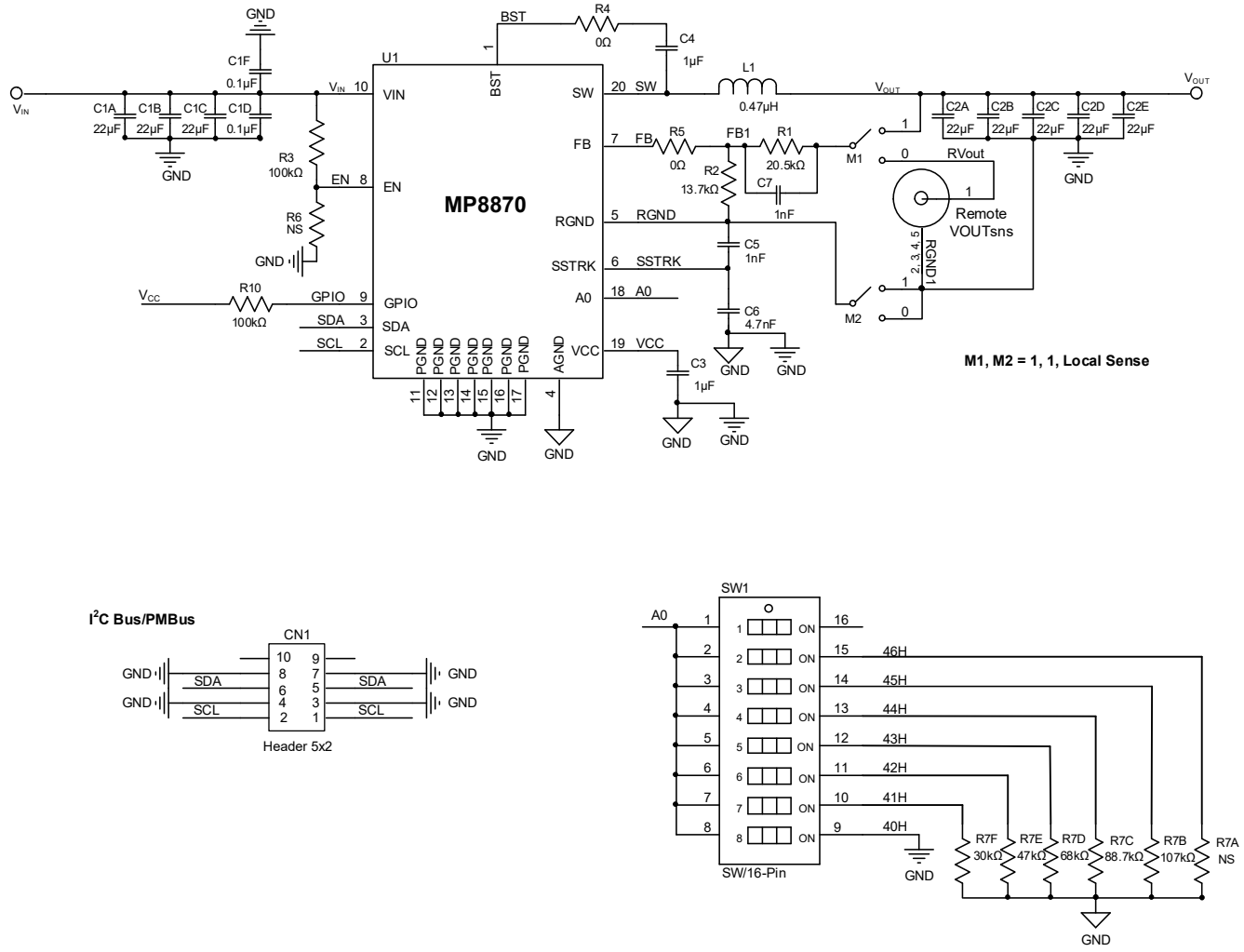









**Figure 2: Evaluation Board Schematic**


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## 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 |

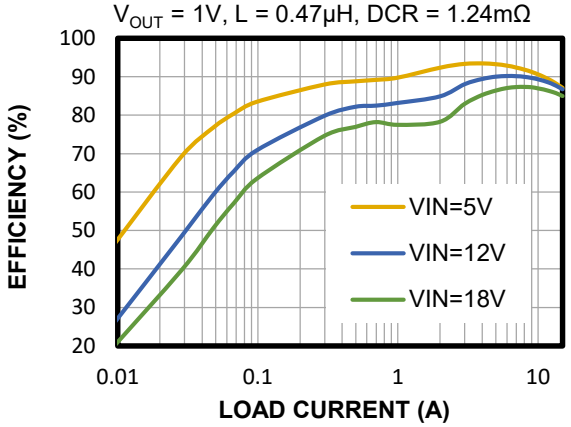

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## EVB TEST RESULTS

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

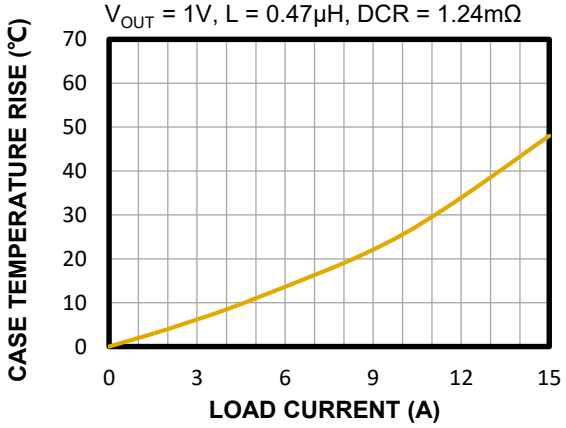
### Efficiency vs. Load Current

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



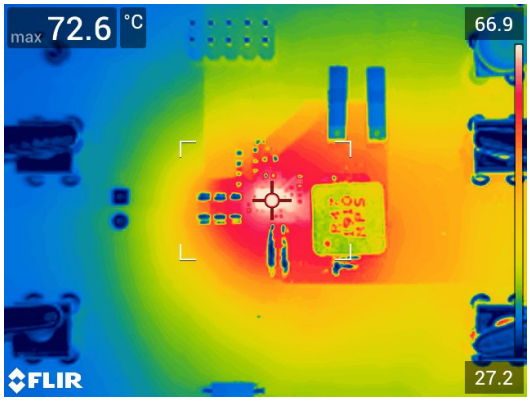

### Case Temperature Rise vs. Load Current

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




### Thermal Performance

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





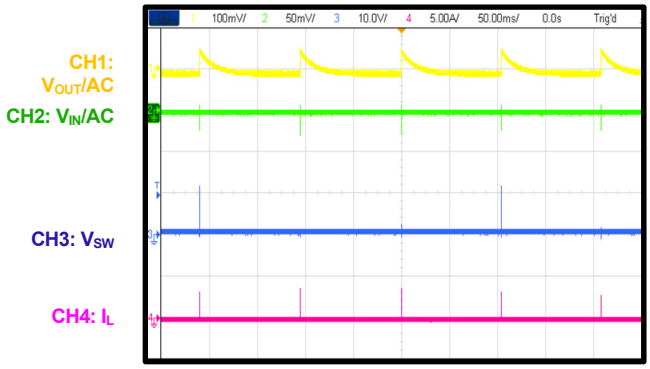
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## EVB TEST RESULTS *(continued)*

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

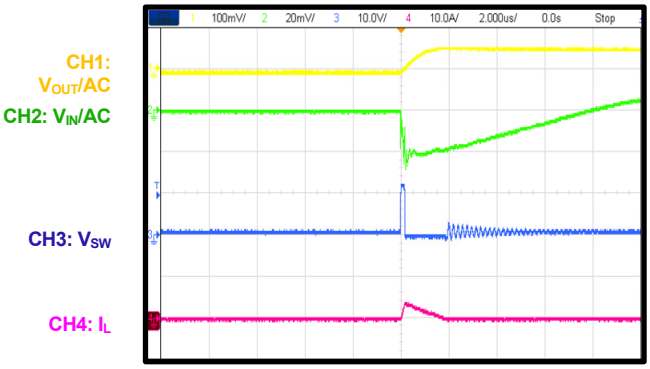
### Input and Output Voltage Ripple

$I_{OUT}$ = 0A



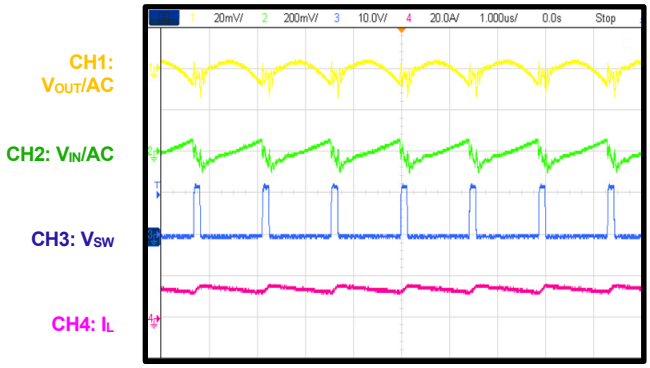

### Input and Output Voltage Ripple

$I_{OUT}$ = 0A



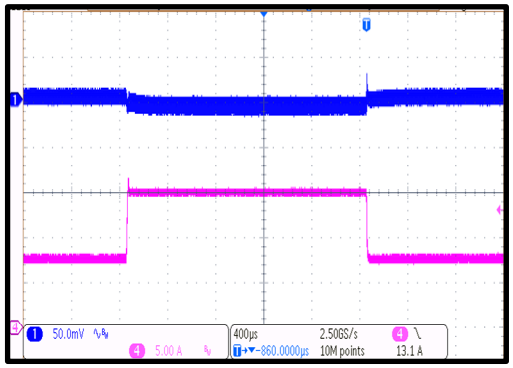

### Input and Output Voltage Ripple

$I_{OUT}$ = 15A




### Load Transient Response

7.5A to 15A, 2.5A/µs





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## PCB LAYOUT

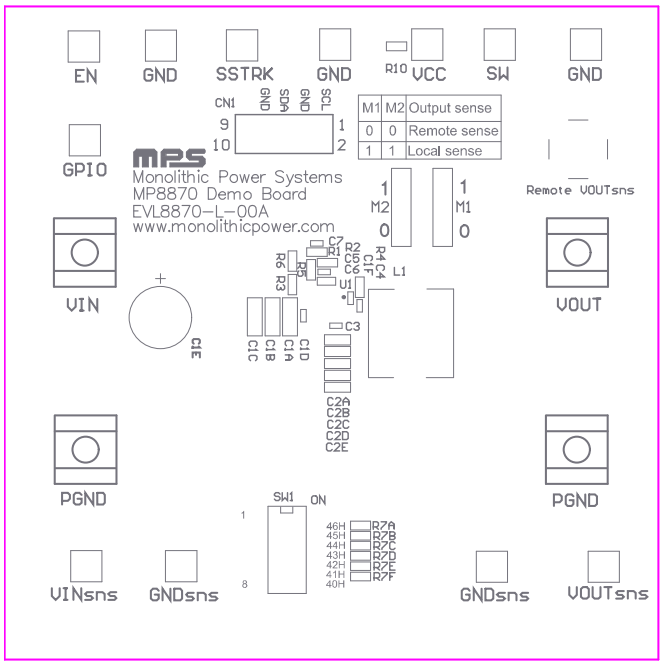



Figure 3: Top Silk

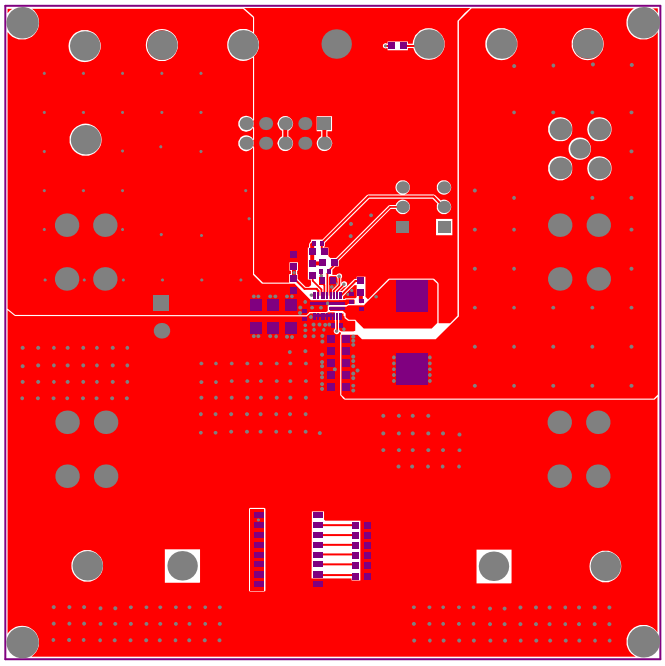


Figure 4: Top Layer

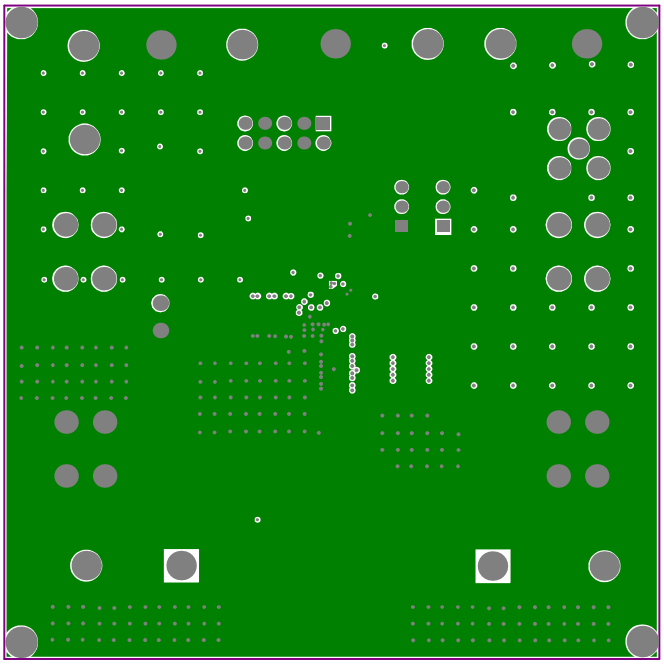


Figure 5: Mid-Layer 1

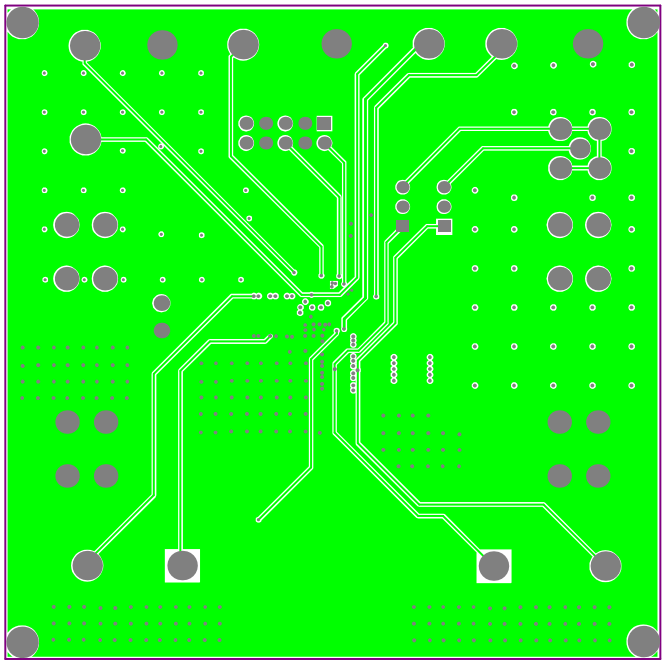


Figure 6: Mid-Layer 2


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## PCB LAYOUT *(continued)*

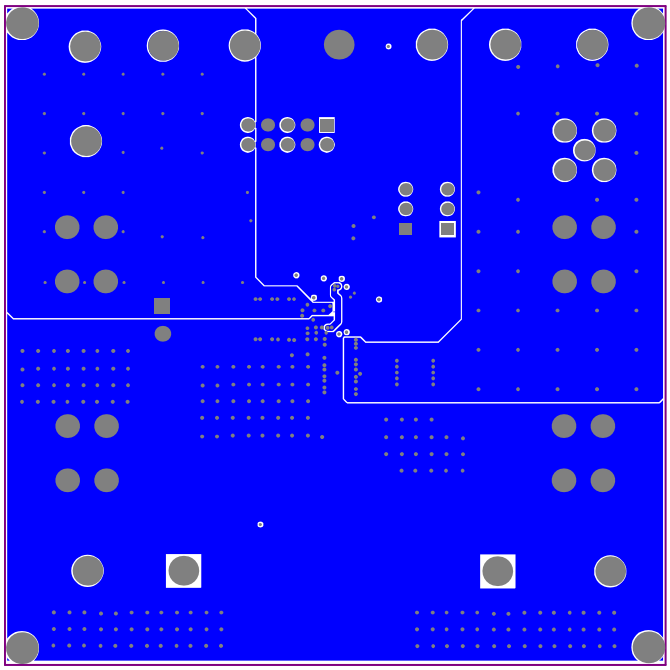


**Figure 7: Bottom Layer**


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## REVISION HISTORY

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

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