

ISL91110IIN-EVZ, ISL91110II2A-EVZ, ISL91110IIA-EVZ

Evaluation Boards

AN1912
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Description

The ISL91110 is a high-current buck-boost switching regulator for systems using new battery chemistries. It uses Intersil's proprietary buck-boost algorithm to maintain voltage regulation, while providing excellent efficiency and very low output voltage ripple when the input voltage is close to the output voltage. The ISL91110IIN-EVZ, ISL91110II2A-EVZ and ISL91110IIA-EVZ platforms allow quick evaluation of the high performance features of the ISL91110 buck-boost regulator series.

Specifications

The boards are designed to operate at the following operating conditions:

- Input voltage rating from 1.8V to 5.5V
- Resistor programmable output voltage on the ISL91110IIA-EVZ
- Fixed 3.3V output voltage on the ISL91110IIN-EVZ
- Fixed 3.5V output voltage on the ISL91110II2A-EVZ
- Up to 2A output current (P_{VIN} = 2.5V, V_{OUT} = 3.3V)
- 2.5MHz switching frequency
- Operating temperature range: -40 °C to +85 °C

Key Board Features

- Small, compact design
- Jumper selectable EN (enabled/disabled)
- Jumper selectable MODE (auto-PFM/forced-PWM)
- Connectors, test points, and jumpers for easy probing

References

- [ISL91110](#) Data Sheet.

Ordering Information

| PART NUMBER | DESCRIPTION |
|------------------|------------------------------------|
| ISL91110IIN-EVZ | Evaluation Board for ISL91110IINZ |
| ISL91110II2A-EVZ | Evaluation Board for ISL91110II2AZ |
| ISL91110IIA-EVZ | Evaluation Board for ISL91110IIAZ |

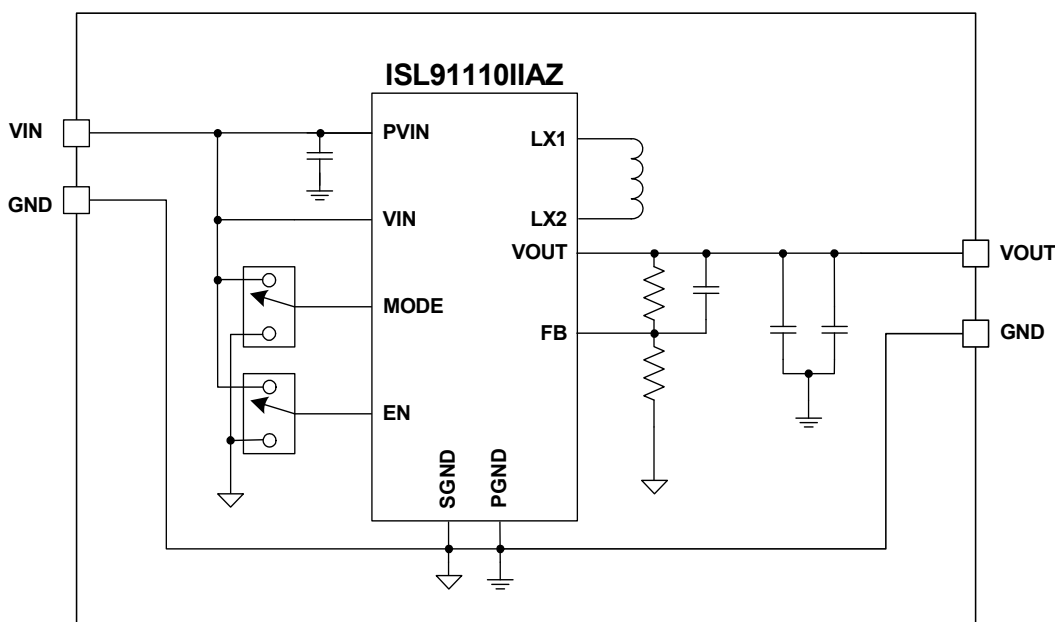


FIGURE 1. ISL91110IIA-EVZ BLOCK DIAGRAM

Functional description

The ISL91110IIN-EVZ, ISL91110I2A-EVZ and ISL91110IIA-EVZ provides simple platforms to demonstrate the feature of the ISL91110 buck-boost regulator. The ISL91110IIN-EVZ is for the fixed 3.3V output IC ISL91110IINZ. The ISL91110I2A-EVZ is for the fixed 3.5V output IC ISL91110I2AZ and the ISL91110IIA-EVZ is for the adjustable output IC ISL91110IIAZ. The Evaluation boards have been functionally optimized for best performance of the ISL91110 IC series. The input power and load connections are provided through multi-pin connectors for high current operations.

The ISL91110IIA-EVZ evaluation board is shown in Figures 4 and 5. The board's enable function is controlled by the on-board jumper header J3. Similarly the Mode function is controlled by the on-board jumper header J4.

The schematic of the ISL91110IIA-EVZ evaluation board is shown in Figure 6. The schematic for the ISL91110IIN-EVZ and ISL91110I2A-EVZ is shown in Figure 7. The PCB layout images for all layers are shown in Figures 8 and 11. The bill of materials of the ISL91110IIA-EVZ is shown in Table 2. The bill of materials of the ISL91110IIN-EVZ and ISL91110I2A-EVZ is shown in Table 3.

Operating Range

The V_{IN} range of the boards is 1.8V to 5.5V. The V_{OUT} range for the ISL91110IIA-EVZ is 2V to 5V. The I_{OUT} range of the boards is 0 to 2A. The operating ambient temperature range is -40°C to +85°C.

Quick Start Guide

For the ISL91110IIA-EVZ board, the default output voltage is set at 3.3V. Should other output voltages are desired, resistor R2 can be changed to set to a desired voltage as shown in Table 1 (use a resistor with 1% accuracy).

Refer to the following Quick Setup Guide to configure and power-up the board for proper operation. During the power-on process, the expected waveforms are shown in Figures 2 and 3.

Quick Setup Guide

1. Install jumper on J3, shorting EN to V_{IN} .
2. Install jumper on J4, shorting MODE to V_{IN} .
3. Connect power supply to J1, with voltage setting between 1.8V and 5.5V.
4. Connect electronic load to J2.
5. Place scope probes on the V_{OUT} test point, and other test points of interest.
6. Turn on the power supply.
7. Monitor the output voltage start-up sequence on the scope. The waveforms will look similar to that shown in Figures 2 and 3.
8. Turn on the electronic load.
9. Measure the output voltage with the voltmeter. The voltage should regulate within datasheet spec limits.
10. To determine efficiency, measure input and output voltages at the Kelvin sense test points (S+ and S-), which are part of J1 and J2 headers. The bench power supply can be connected to the PVIN and GND headers on J1. The electronic load can

be connected to the V_{OUT} and GND headers on J2. Measure the input and output currents. Calculate efficiency based on these measurements.

11. To test external sync, remove the jumper at J4, then apply an external clock between 2.75MHz and 3.25MHz on the MODE input (the center pin of header J4).

TABLE 1. OUTPUT VOLTAGE PROGRAMMING For ISL91110IIA-EVZ

| DESIRED OUTPUT VOLTAGE (V) | R2 RESISTOR VALUE (kΩ) |
|----------------------------|------------------------|
| 2.0 | 665 |
| 2.5 | 470 |
| 3.0 | 365 |
| 3.3 | 324 |
| 3.4 | 309 |
| 4.0 | 249 |
| 4.5 | 215 |
| 5.0 | 191 |

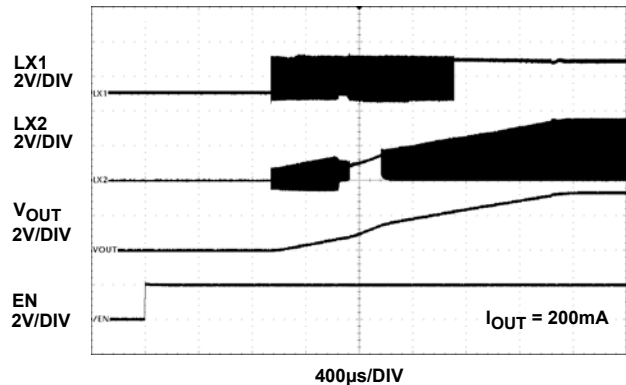


FIGURE 2. ISL91110 START-UP WITH $V_{IN} = 2V$ and $V_{OUT} = 3.3V$

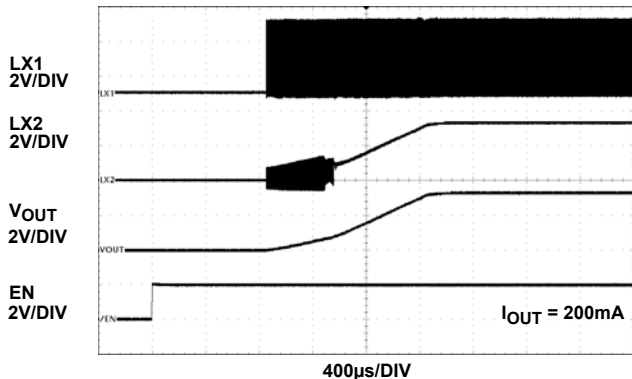


FIGURE 3. ISL91110 START-UP WITH $V_{IN} = 4V$ and $V_{OUT} = 3.3V$

ISL91110IIA-EVZ Evaluation Board

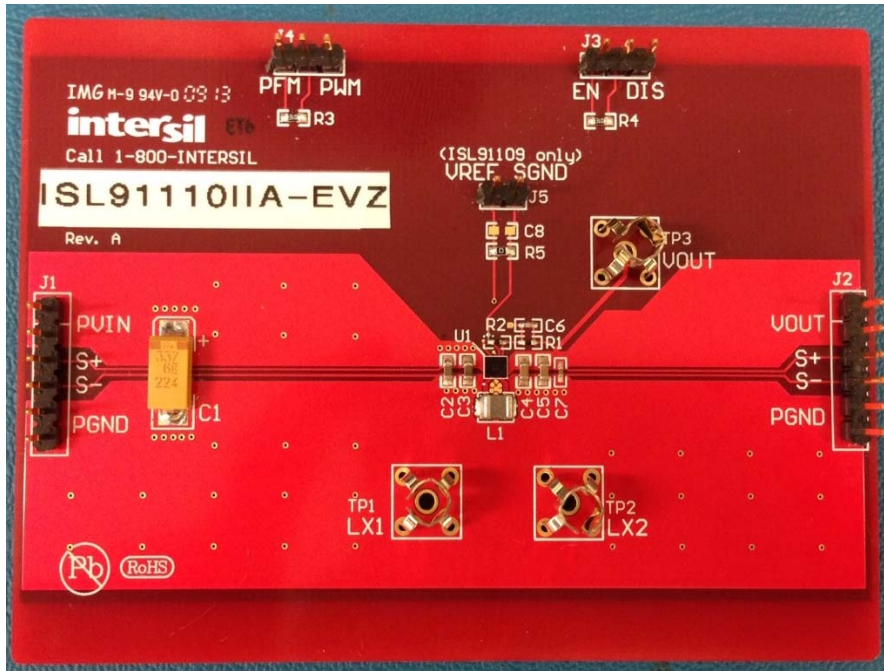


FIGURE 4. ISL91110IIA-EVZ TOP VIEW



FIGURE 5. ISL91110IIA-EVZ BOTTOM VIEW

ISL91110IIA-EVZ Evaluation Board Schematic

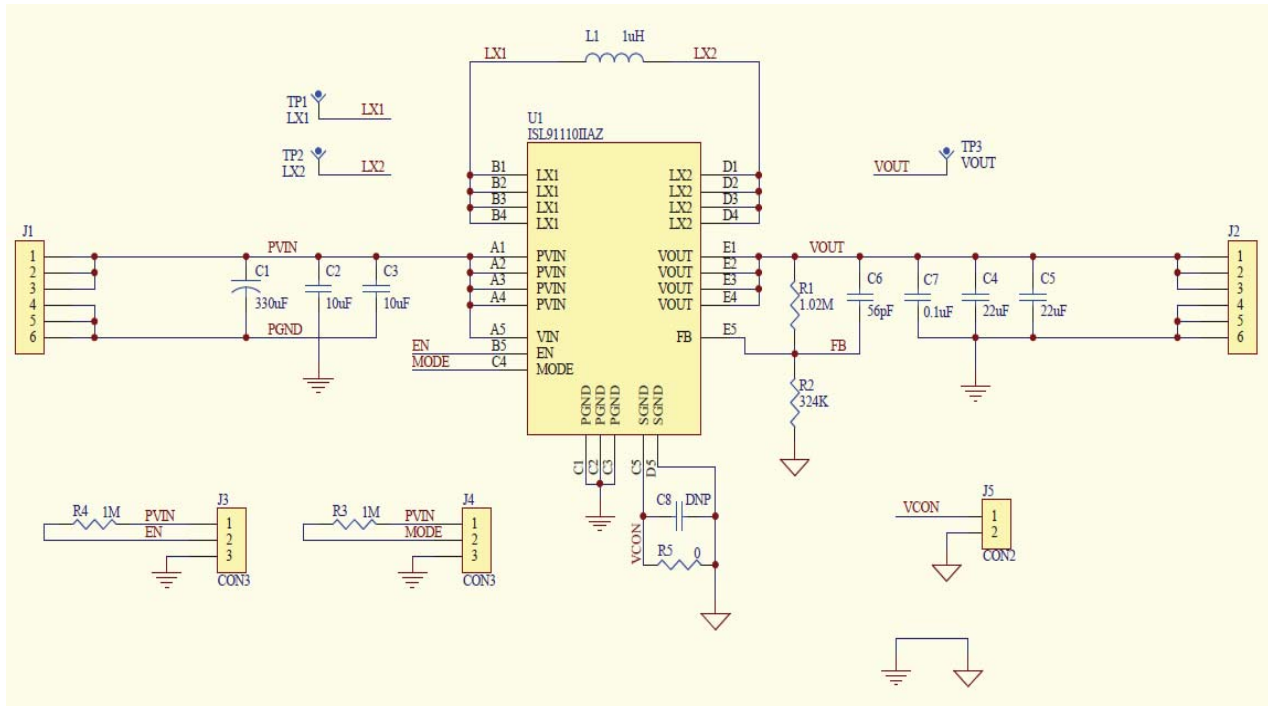


FIGURE 6. ISL91110IIA-EVZ EVALUATION BOARD SCHEMATIC

TABLE 2. ISL91110IIA-EVZ EVALUATION BOARD BILL OF MATERIALS

| ITEM# | QTY | DESIGNATORS | PART TYPE | FOOTPRINT | DESCRIPTION | VENDORS |
|-------|-----|---------------|--------------|-------------------|---|-----------|
| 1 | 1 | U1 | ISL91110IIAZ | W4x5.20; WLCSP | Intersil ISL91110 Buck-Boost Regulator with Adjustable Output Voltage | INTERSIL |
| 2 | 1 | L1 | 1µH | 3.2mmx2.5mmx1.2mm | Power Inductor Toko DFE322512C series, 4.6A (typ), 34mΩ (typ) | TOKO |
| 3 | 1 | C1 | 330µF | 7343 | Capacitor, Tantalum | ANY |
| 4 | 2 | C2, C3 | 10µF/16V/X5R | 0603 | Capacitor, Generic | ANY |
| 5 | 2 | C4, C5 | 22µF/10V/X5R | 0603 | Capacitor, Generic | ANY |
| 6 | 1 | C6 | 56pF | 0402 | Capacitor, 56pF 50V 5% NPO 0402 | ANY |
| 7 | 1 | C7 | 0.1µF | 0402 | Capacitor, Generic | ANY |
| 8 | 1 | R1 | 1.02MΩ, 1% | 0402 | Resistor, Generic | ANY |
| 9 | 1 | R2 | 324kΩ, 1% | 0402 | Resistor, Generic | ANY |
| 10 | 2 | R3, R4 | 1MΩ, 5% | 0603 | Resistor, Generic | ANY |
| 11 | 2 | J1, J2 | HDR-6 | HDR-6 | Vert. Pin Header, 6-Pin, 0.1" Spacing, Generic | ANY |
| 12 | 2 | J3, J4 | HDR-3 | HDR-3 | Vert. Pin Header, 3-Pin, 0.1" Spacing, Generic | ANY |
| 13 | 3 | TP1, TP2, TP3 | SCOPE PROBE | SCOPE PROBE | Test Point, Scope Probe 131-5031-00 | TEKTRONIX |

ISL91110IIN-EVZ, ISL91110II2A-EVZ Evaluation Board Schematic

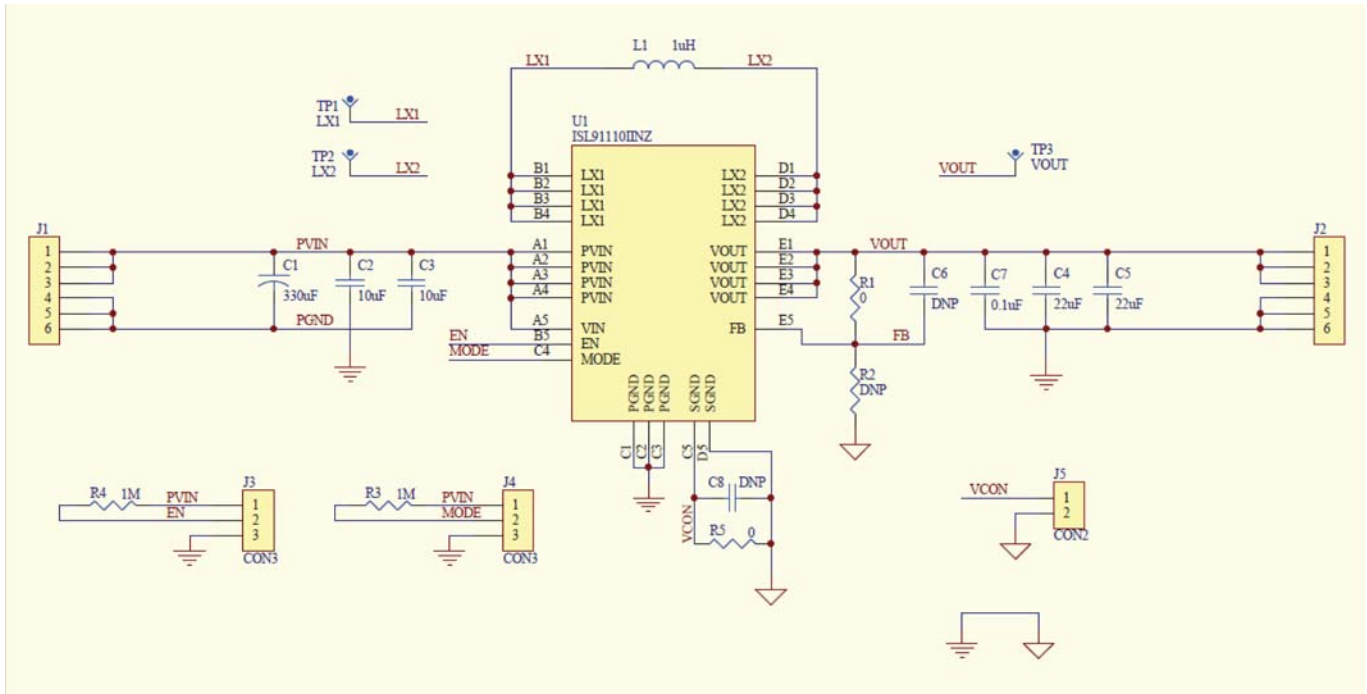


FIGURE 7. ISL91110IIN-EVZ, ISL91110II2A-EVZ EVALUATION BOARD SCHEMATIC

TABLE 3. ISL91110IIN-EVZ, ISL91110II2A-EVZ EVALUATION BOARD BILL OF MATERIALS

| ITEM# | QTY | DESIGNATORS | PART TYPE | FOOTPRINT | DESCRIPTION | VENDORS |
|-------|-----|---------------|--------------------------------|-------------------|---|-----------|
| 1 | 1 | U1 | ISL91110IINZ, ISL91110II2AZ | W4x5.20; WLCSP | Intersil ISL91110 Buck-Boost Regulator | INTERSIL |
| 2 | 1 | L1 | 1µH | 3.2mmx2.5mmx1.2mm | Power Inductor Toko DFE322512C series, 4.6A (typ), 34mΩ (typ) | TOKO |
| 3 | 1 | C1 | 330µF | 7343 | Capacitor, Tantalum | ANY |
| 4 | 2 | C2, C3 | 10µF/16V/X5R | 0603 | Capacitor, Generic | ANY |
| 5 | 2 | C4, C5 | 22µF/10V/X5R | 0603 | Capacitor, Generic | ANY |
| 6 | 1 | C6 | DNP | 0402 | | ANY |
| 7 | 1 | C7 | 0.1µF | 0402 | Capacitor, Generic | ANY |
| 8 | 1 | R1 | 0Ω | 0402 | Resistor, Generic | ANY |
| 9 | 1 | R2 | DNP | 0402 | | ANY |
| 10 | 2 | R3, R4 | 1MΩ, 5% | 0603 | Resistor, Generic | ANY |
| 11 | 2 | J1, J2 | HDR-6 | HDR-6 | Vert. Pin Header, 6-Pin, 0.1" Spacing, Generic | ANY |
| 12 | 2 | J3, J4 | HDR-3 | HDR-3 | Vert. Pin Header, 3-Pin, 0.1" Spacing, Generic | ANY |
| 13 | 3 | TP1, TP2, TP3 | SCOPE PROBE | SCOPE PROBE | Test Point, Scope Probe 131-5031-00 | TEKTRONIX |

PCB Layout

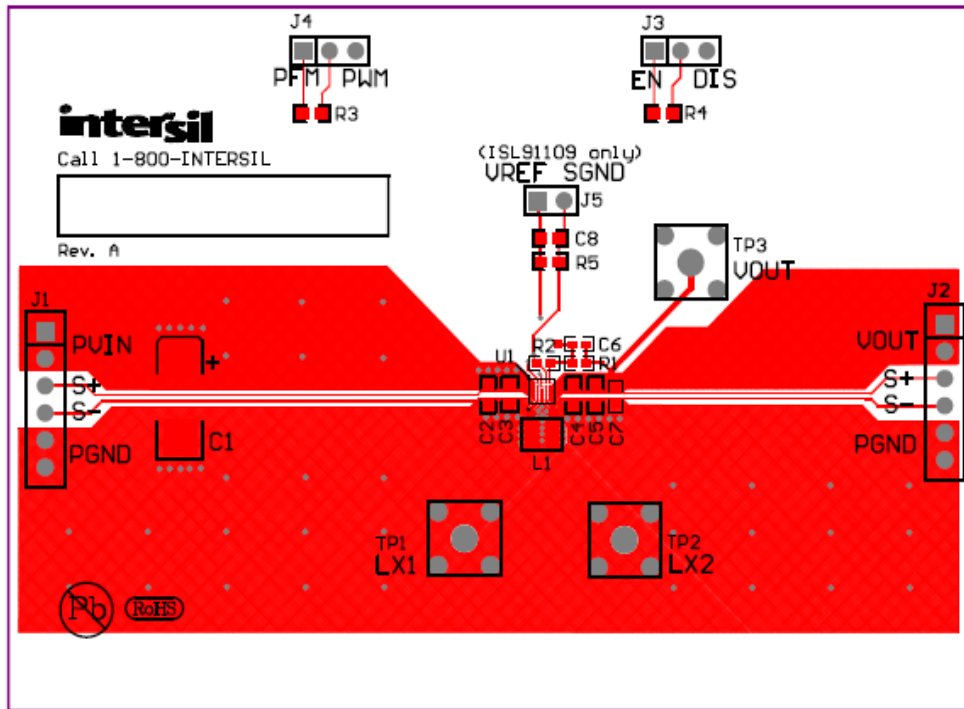


FIGURE 8. TOP LAYER

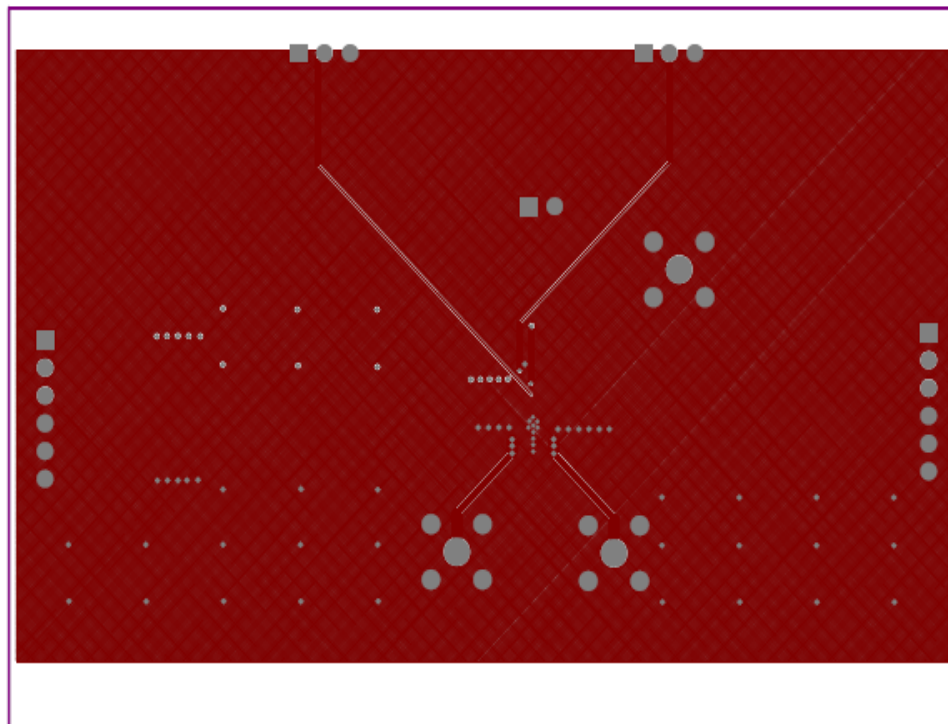


FIGURE 9. INNER LAYER 1

PCB Layout (Continued)

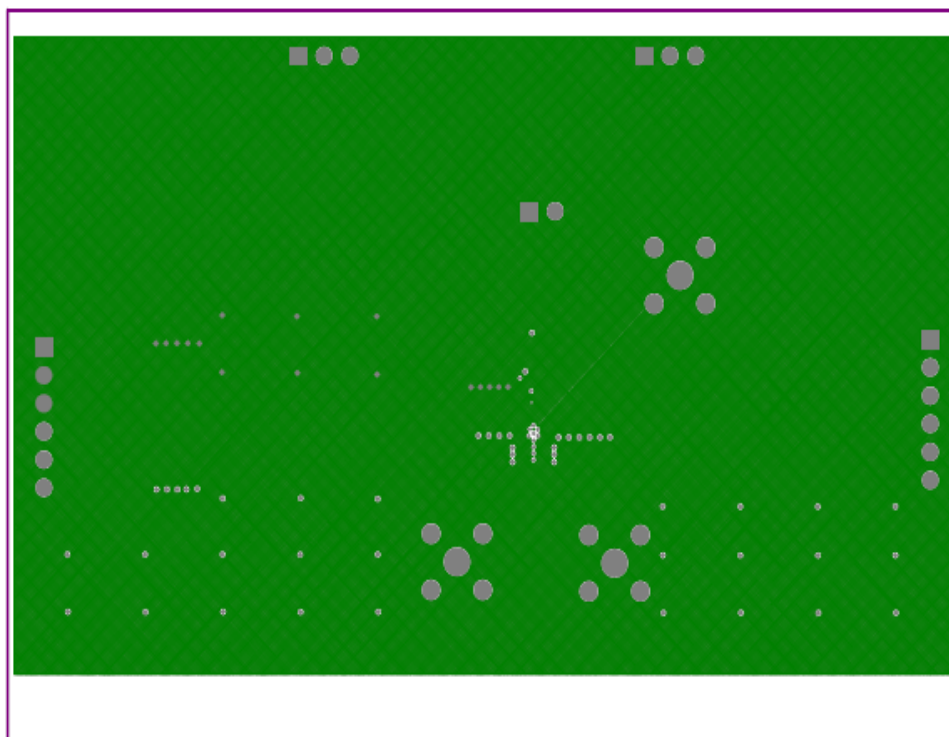


FIGURE 10. INNER LAYER 2

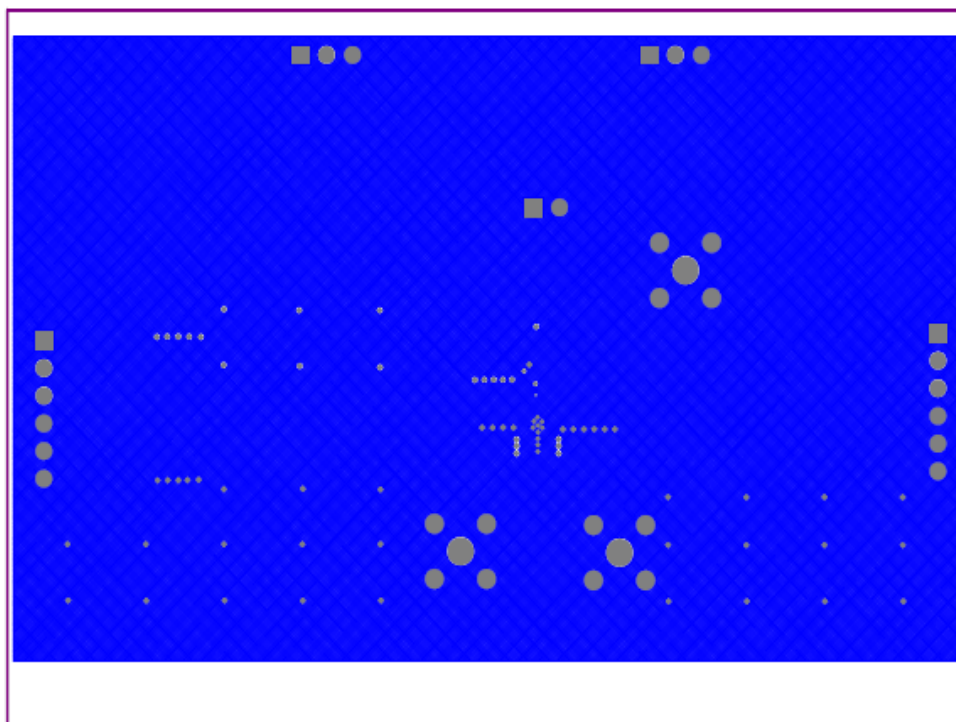


FIGURE 11. BOTTOM LAYER

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