# EVM3690-30B-BF-00A

## 16V, 36A, High-Efficiency, Synchronous Step-Down Module Evaluation Board

## DESCRIPTION

The EVM3690-30B-BF-00A evaluation board is designed to demonstrate the capabilities of the MPM3690-30B, a fully integrated, high-efficiency, synchronous, 36A output current, step-down power module.

The MPM3690-30B adopts internally compensated constant-on-time (COT) control to provide fast transient response and ease loop stabilization. The operating frequency can be set between 400kHz and 1MHz by connecting a resistor between $f_{SET}$ and AGND. Refer to the MPM3690-30B datasheet for more detailed information.

It is recommended to read the datasheet for the MPM3690-30B prior to making any changes to the EVM3690-30B-BF-00A.

## PERFORMANCE SUMMARY (1)

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

| Parameters | Conditions | Value |
|---|---|---|
| Input voltage range ($V_{IN}$) | | 3.2V to 16V (2) |
| Output voltage ($V_{OUT}$) | $V_{IN}$ = 3.2V to 16V, $I_{OUT}$ = 0A to 36A | 1.2V |
| Maximum output current ($I_{OUT}$) | $V_{IN}$ = 3.2V to 16V, $V_{OUT}$ = 1.2V | 36A |
| Full load efficiency (3) | $V_{IN}$ = 12V, $V_{OUT}$ = 1.2V, $I_{OUT}$ = 36A, $f_{SW}$ = 500kHz | 91.2% |
| Peak efficiency (3) | $V_{IN}$ = 12V, $V_{OUT}$ = 1.2V, $I_{OUT}$ = 15A, $f_{SW}$ = 500kHz | 92.95% |
| Default switching frequency | | 500kHz |

**Notes:**

1) For different $V_{IN}$ and $V_{OUT}$ specifications with different output capacitors, the application circuit parameters may require changes.
2) If $V_{IN}$ < 4V, an external 3.3V $V_{CC}$ is required.


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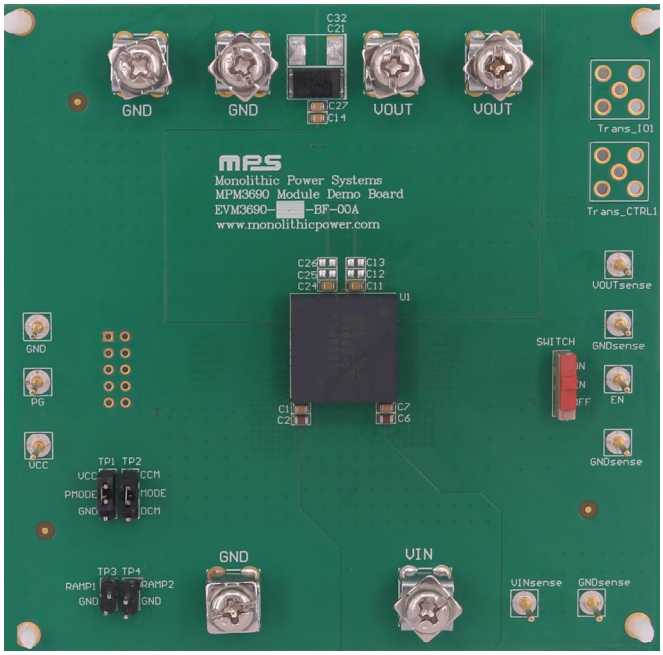
# EVALUATION BOARD




**(LxWxH) 10cmx10cmx1.5cm**

| Board Number | MPS IC Number |
|---|---|
| EVM3690-30B-BF-00A | MPM3690GBF-30B |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## QUICK START GUIDE

The EVM3690-30B-BF-00A evaluation board is easy to set up and use to evaluate the performance of the MPM3690-30B. See Figure 1 on page 4 for the proper measurement equipment set-up, and follow the procedure below:

1. Preset the power supply ($V_{IN}$) between 4V and 16V, then turn off the power supply. (4)
2. Connect the power supply terminals to:
   a. Positive (+): VIN
   b. Negative (-): GND
3. Connect the load terminals (no initial load) to:
   a. Positive (+): VOUT
   b. Negative (-): GND
4. After making the connections, turn on the power supply on. The board should automatically start up.
5. Check for the proper output voltage ($V_{OUT}$) between the VOSENSE and VOGNDSEN terminals.
6. Once the proper $V_{OUT}$ is established, adjust the load within the operating range and measure the efficiency, output ripple voltage, and other parameters. (5)
7. After completing all tests, adjust the load to 0A, then turn off the input power supply.

**Notes:**

3) Ensure that $V_{IN}$ does not exceed 16V.
4) When measuring the output or input voltage ripple, do not use the long ground lead on the oscilloscope probe.


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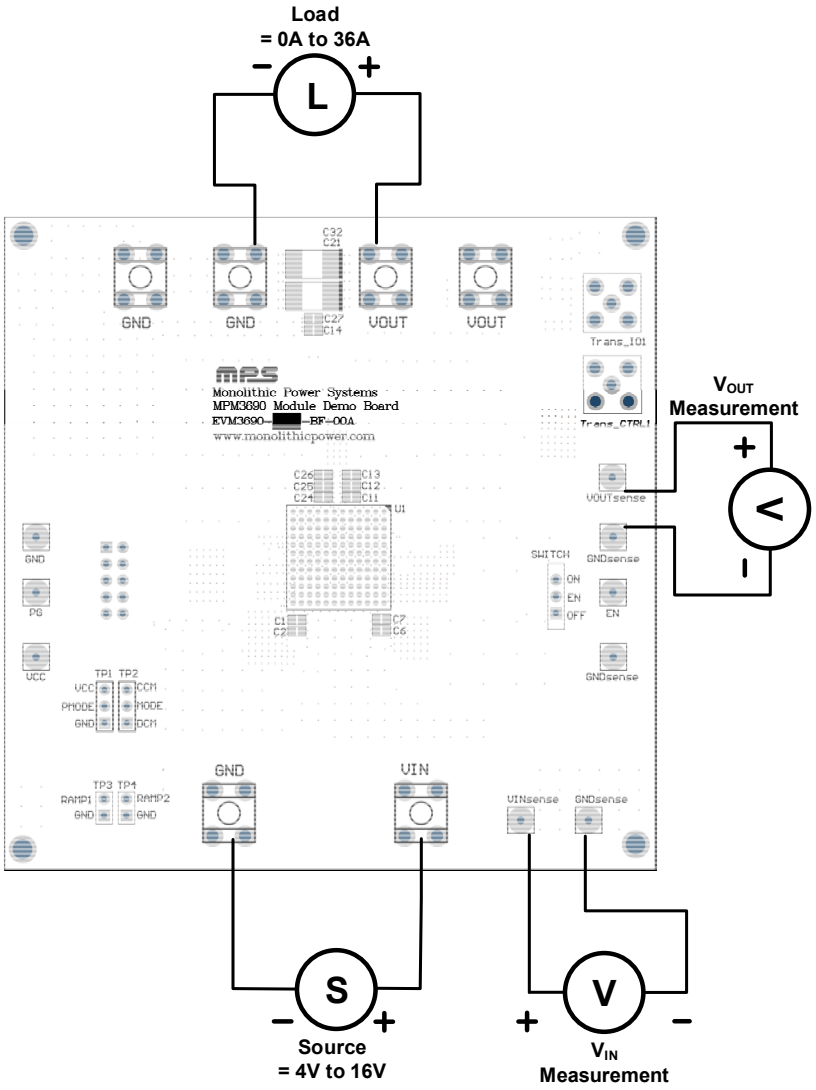


**Figure 1: Proper Measurement Equipment Set-Up**


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# EVALUATION BOARD SCHEMATIC

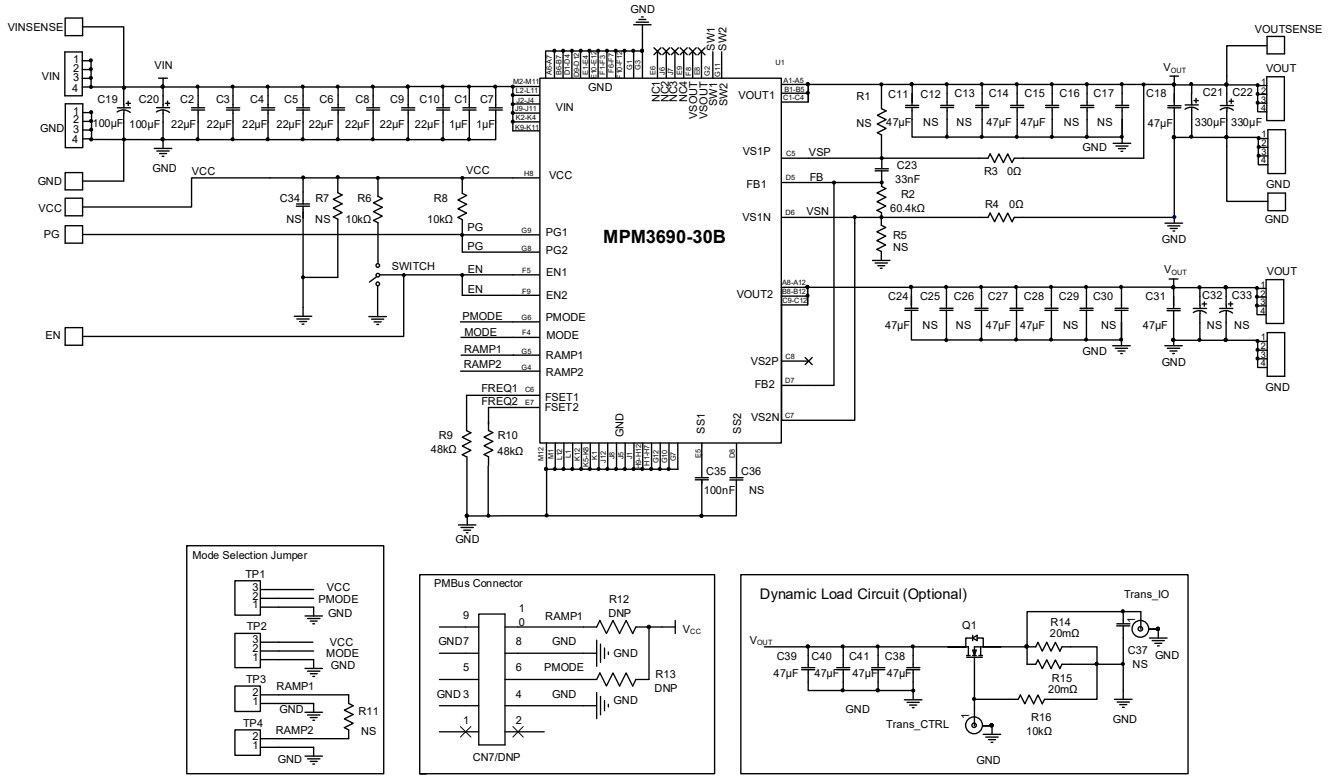


**Figure 2: Evaluation Board Schematic**


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## EVM3690-30B-BF-00A BILL OF MATERIALS

| Qty | Ref | Value | Description | Package | Manufacturer | Manufacturer PN |
|---|---|---|---|---|---|---|
| 2 | C19, C20 | 100µF | Surface-mount polymer aluminum capacitor, 25V | SMD | Panasonic | 25SVPF100M |
| 8 | C11, C14, C15, C18, C24, C27, C28, C31 | 47µF | Ceramic capacitor, 6.3V | 0805 | Murata | GRM21BR60J476 ME15L |
| 8 | C2, C3, C4, C5, C6, C8, C9, C10 | 22µF | Ceramic capacitor, 25V | 0805 | Murata | GRM21BR61E226 ME44L |
| 2 | C1, C7 | 1µF | Ceramic capacitor, 25V | 0805 | Murata | GRM219R71E105 KA88D |
| 2 | C35 | 100nF | Ceramic capacitor, 50V | 0603 | Murata | GRM188R71E104 KA01D |
| 1 | C23 | 33nF | Ceramic capacitor, 50V | 0603 | Wurth | 885012206092 |
| 2 | R3, R4 | 0Ω | Resistor, 1% | 0603 | Yageo | RC0603FR-070RL |
| 2 | R9, R10 | 48kΩ | Resistor, 1% | 0603 | Yageo | RC0603FR-0748KL |
| 2 | R6, R8 | 10kΩ | Resistor, 1% | 0603 | Yageo | RC0603FR-0710KL |
| 1 | R2 | 60.4kΩ | Resistor, 1% | 0603 | Yageo | RC0603FR-0760K4L |
| 1 | SWITCH | 500mA | Switch slide SPDT, 5V | 10mmx 2.5mm | Wurth | WE450301014042 |
| 2 | C21, C22 | 220µF | Tantalum capacitor, 6.3V, 15mΩ | SMD | Panasonic | EEFCX0J221R |
| 1 | U1 | MPM3690 -30B | 16V, 36A step-down power module | BGA (16mmx 16mmx 5.18mm) | MPS | MPM3690-30BGLE |


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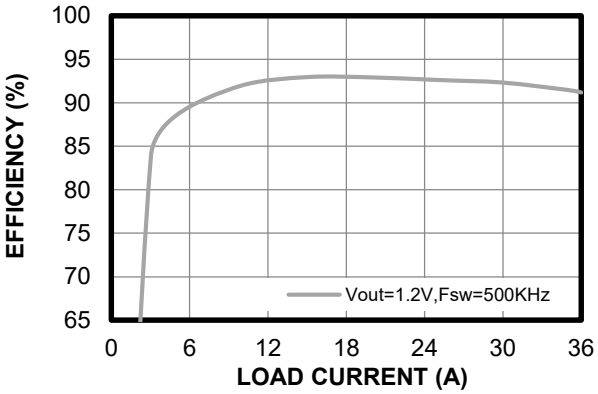
## EVB TEST RESULTS

**Performance curves and waveforms are tested on the evaluation board. $V_{IN}$ = 12V, $V_{OUT}$ = 1.2V, $f_{SW}$ = 500kHz, $T_A$ = 25°C, unless otherwise noted.**

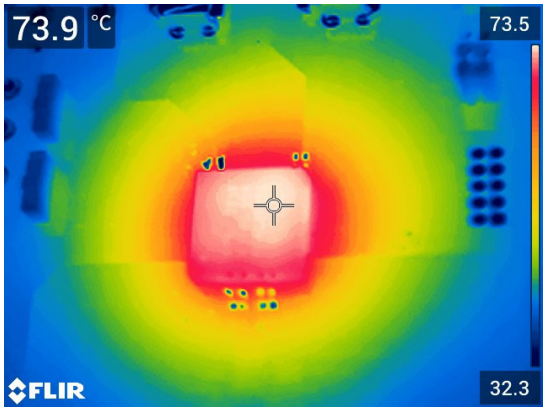
### Efficiency vs. Load Current

$V_{IN}$ = 12V, with external 3.3V VCC




### Thermal Performance

$I_{OUT}$ = 36A, no forced airflow, $T_A$ = 28°C,
$T_{CASE}$ = 73.9°C





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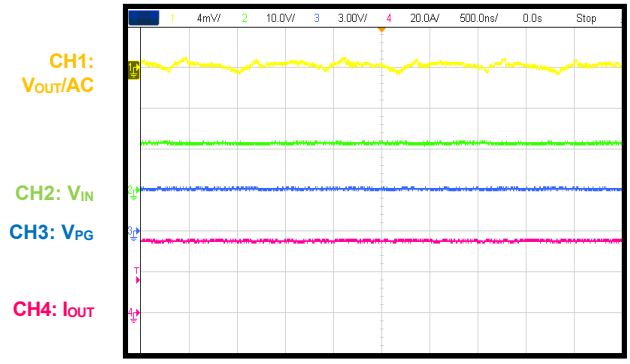
## EVB TEST RESULTS *(continued)*

**Performance curves and waveforms are tested on the evaluation board. $V_{IN}$ = 12V, $V_{OUT}$ = 1.2V, $f_{SW}$ = 500kHz, $T_A$ = 25°C, unless otherwise noted.**

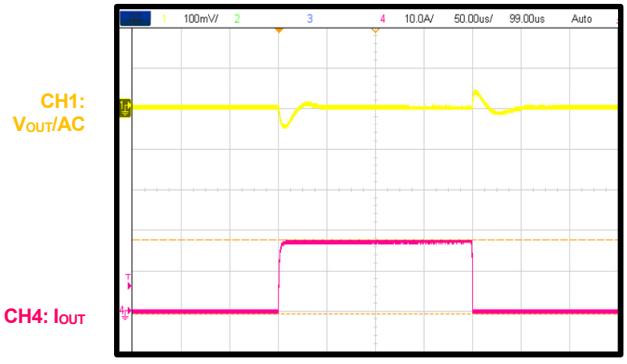
### Steady State

$I_{OUT}$ = 36A



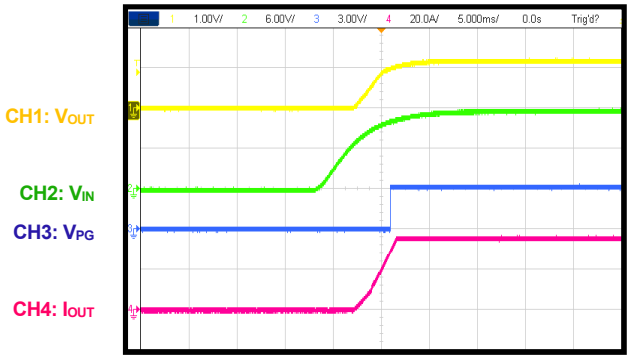

### Load Transient Ripple

$I_{OUT}$ = 0A to 18A, slew rate = 10A/μs



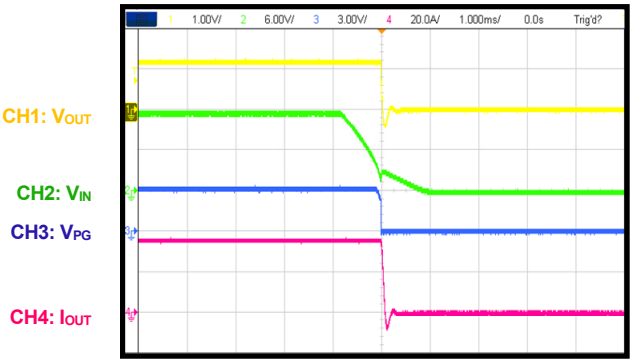

### Start-Up through VIN

$I_{OUT}$ = 36A



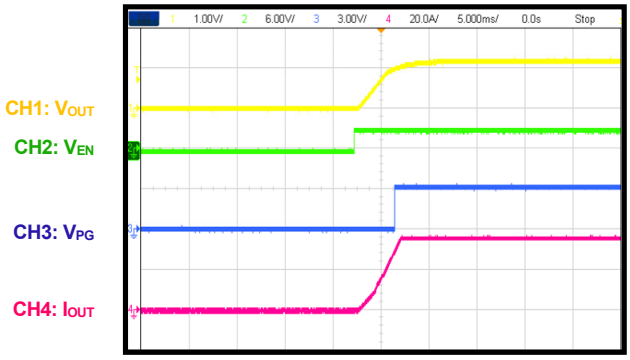

### Shutdown through VIN

$I_{OUT}$ = 36A



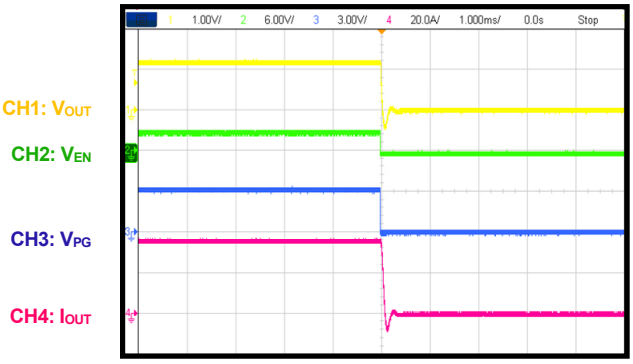

### Start-Up through EN

$I_{OUT}$ = 36A




### Shutdown through EN

$I_{OUT}$ = 36A





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# PCB LAYOUT

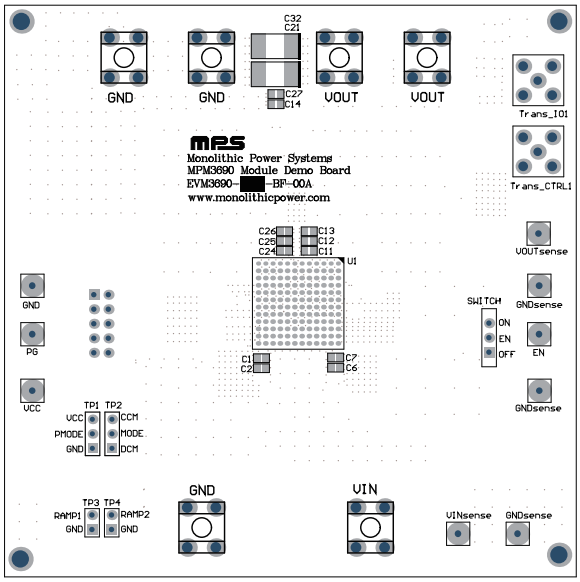


**Figure 3: Top Silk**

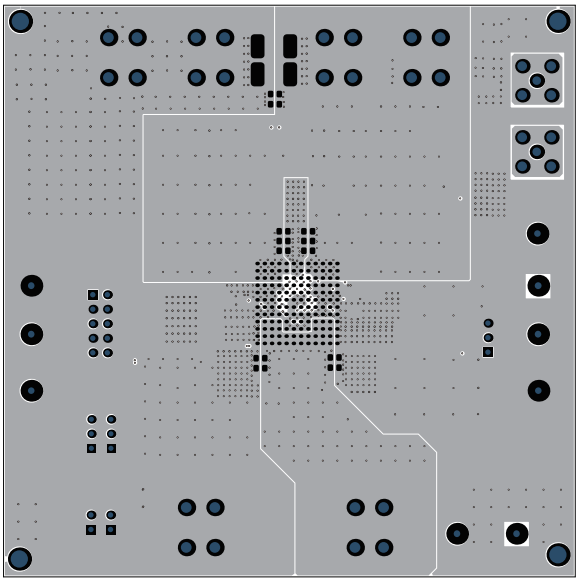

**Figure 4: Top Layer**

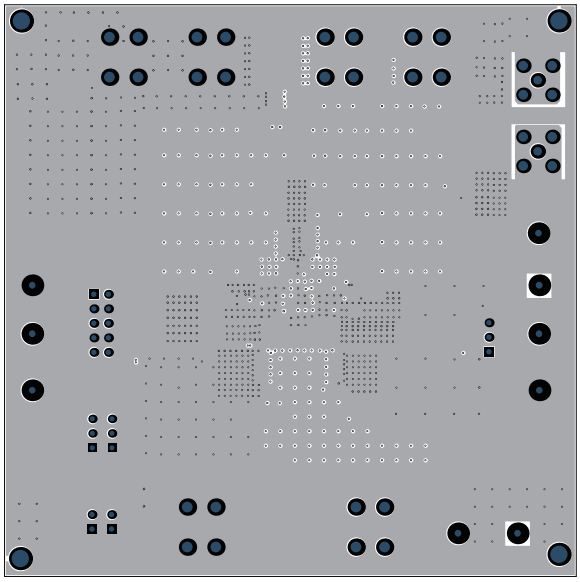

**Figure 5: Mid-Layer 1**

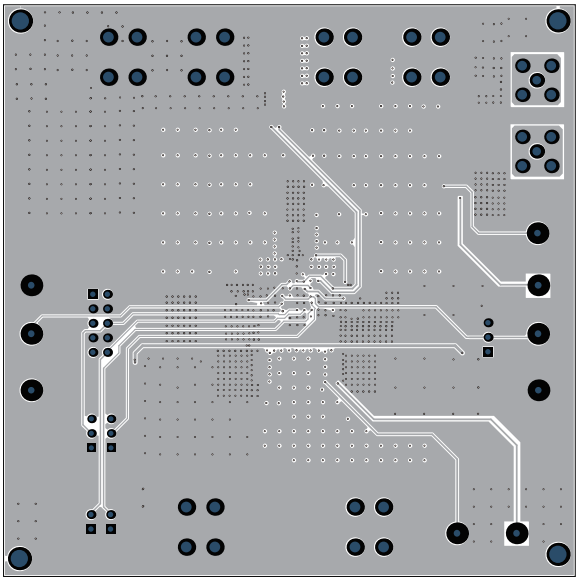

**Figure 6: Mid-Layer 2**


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## PCB LAYOUT *(continued)*

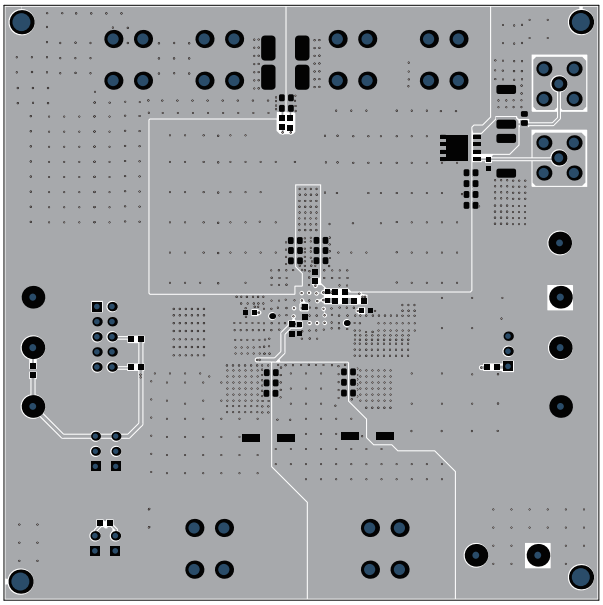

**Figure 7: Bottom Layer**

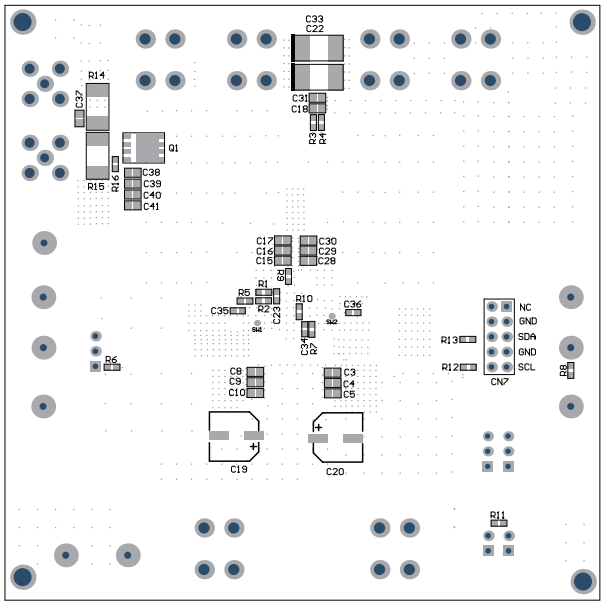


**Figure 8: Bottom Silk**


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## REVISION HISTORY

| Revision # | Revision Date | Description | Pages Updated |
|---|---|---|---|
| 1.0 | 08/19/2021 | Initial Release | - |

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