# EVL2194-TL-00A

## 5.5V, 4A, Synchronous Step-Down Converter in SOT583 Package Evaluation Board

## DESCRIPTION

The EVL2194-TL-00A evaluation board is designed to demonstrate the capabilities of the MP2194, a monolithic, step-down switch-mode converter with built-in internal power MOSFETs.

The MP2194 can achieve up to 4A of continuous output current ($I_{OUT}$) from a 2.4V to 5.5V input voltage ($V_{IN}$) range, with excellent load and line regulation. The output voltage ($V_{OUT}$) can be regulated to as low as 0.4V.

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

Full protection features include over-current protection (OCP), current limiting with hiccup mode, and thermal shutdown.

The MP2194 requires a minimal number of readily available, standard external components, and it is available in an ultra-small SOT583 package.

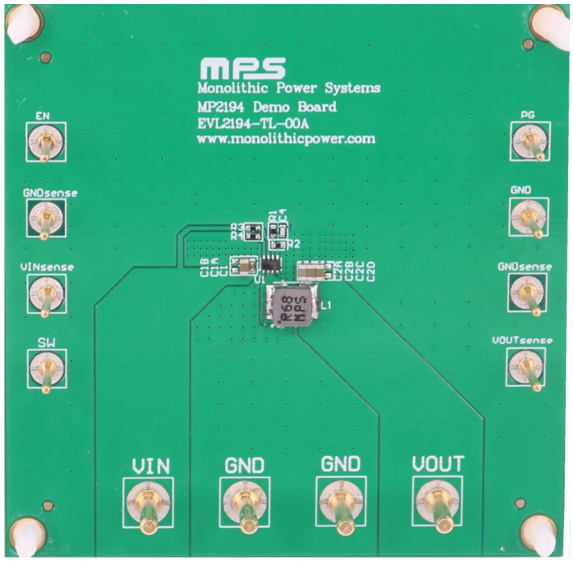
## PERFORMANCE SUMMARY

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

| Parameters | Conditions | Value |
|---|---|---|
| Input voltage ($V_{IN}$) range | | 2.4V to 5.5V |
| Output voltage ($V_{OUT}$) | $V_{IN}$ = 2.4V to 5.5V, $I_{OUT}$ = 0A to 4A | 1.2V |
| Maximum output current ($I_{OUT}$) | $V_{IN}$ = 2.4V to 5.5V | 4A |
| Typical efficiency | $V_{IN}$ = 5V, $V_{OUT}$ = 1.2V, $I_{OUT}$ = 4A | 89.9% |
| Peak efficiency | $V_{IN}$ = 5V, $V_{OUT}$ = 1.2V, $I_{OUT}$ = 1.5A | 93.2% |
| Switching frequency ($f_{SW}$) | | 1.2MHz |

MPL Optimized Performance with MPS Inductor MPL-AL4020 Series

## EVL2194-TL-00A EVALUATION BOARD




**LxWxH (6.35cmx6.35cmx1.8cm)**

| Board Number | MPS IC Number |
|---|---|
| EVL2194-TL-00A | MP2194GTL |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## QUICK START GUIDE

The EVL2194-TL-00A evaluation board is easy to set up and use to evaluate the performance of the MP2194. For proper measurement equipment set-up, refer to Figure 1 and follow the steps below:

1. Preset the power supply to 5V, 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 VOUTSENSE and GNDSENSE terminals.
6. Once the proper $V_{OUT}$ is established, adjust the load within the operating range and measure the efficiency, $V_{OUT}$ ripple, and other parameters. (2)
7. After completing all tests, adjust the load to 0A, then turn off the input power supply.

**Notes:**

1) Ensure that $V_{IN}$ does not exceed 5.5V.
2) When measuring the $V_{OUT}$ or $V_{IN}$ ripple, do not use the long ground lead on the oscilloscope probe.

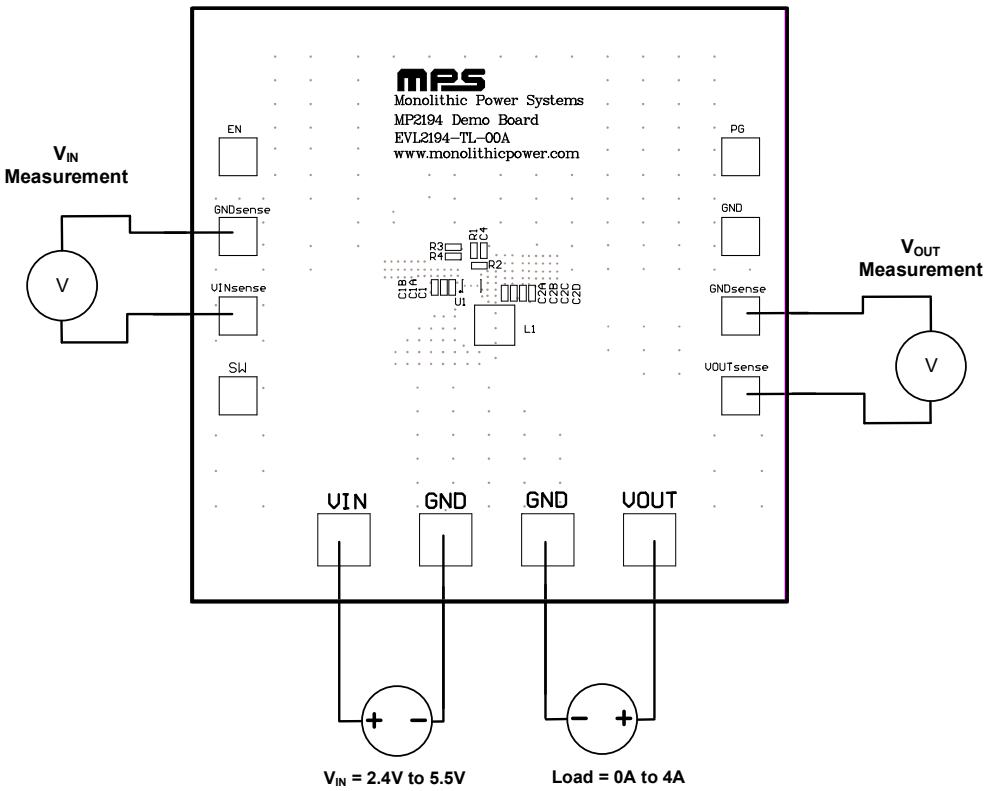


**Figure 1: Proper Measurement Equipment Set-Up**


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# EVALUATION BOARD SCHEMATIC

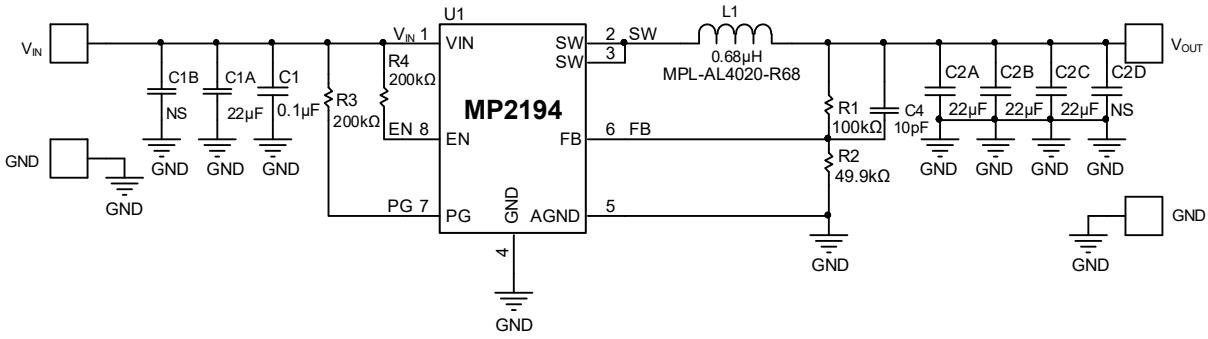


**Figure 2: Evaluation Board Schematic**

**Note:**

3) If $V_{IN}$ < 3.3V, additional input capacitance may be required.


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## EVL2194-TL-00A BILL OF MATERIALS

| Qty | Ref | Value | Description | Package | Manufacturer | Manufacturer PN |
|---|---|---|---|---|---|---|
| 1 | C1 | 0.1µF | Ceramic capacitor, 16V, X7R | 0402 | Murata | GRM155R71C104KA88D |
| 4 | C1A, C2A, C2B, C2C | 22µF | Ceramic capacitor, 16V, X7R | 0603 | Samsung | GRM188R61C226ME01D |
| 0 | C2D | NS | | | | |
| 1 | C4 | 10pF | Ceramic capacitor, 50V, X7R | 0402 | Wurth | 885012005040 |
| 1 | R1 | 100kΩ | Film resistor, 1% | 0402 | Yageo | RC0402FR-07100KL |
| 1 | R2 | 49.9kΩ | Film resistor, 1% | 0402 | Yageo | RC0402FR-0749K9L |
| 2 | R3, R4 | 200kΩ | Film resistor, 1% | 0402 | Yageo | RC0402FR-07200KL |
| 1 | L1 | 0.68µH | Inductor, $D_{CR}$ = 7.5mΩ, $I_{SAT}$ = 11A | 4.1mmx 4.1mmx 1.9mm | MPS | MPL-AL4020-R68 |
| 1 | U1 | MP2194 | 5.5V, 4A, synchronous step-down converter | SOT583 (1.6mmx 2.1mm) | MPS | MP2194GTL |


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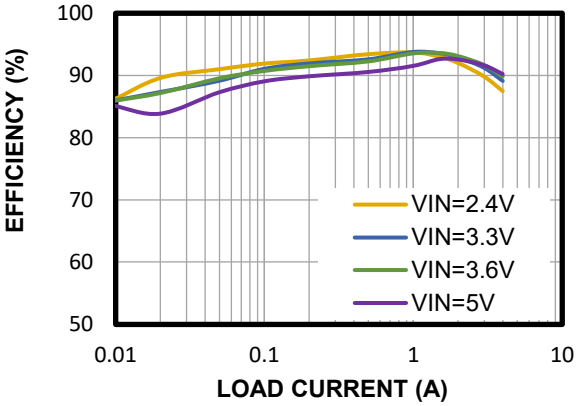
## EVB TEST RESULTS

**Performance curves and waveforms are tested on the evaluation board. $V_{IN}$ = 5V, $V_{OUT}$ = 1.2V, $T_A$ = 25°C, unless otherwise noted.**

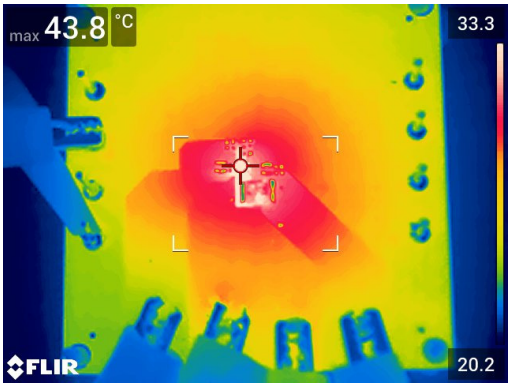
### Efficiency vs. Load Current

$V_{OUT}$ = 1.2V, L = 0.68µH, DCR = 7.5mΩ




### Thermal Performance

$I_{OUT}$ = 4A, no forced airflow, $T_{CASE}$ = 43.8°C





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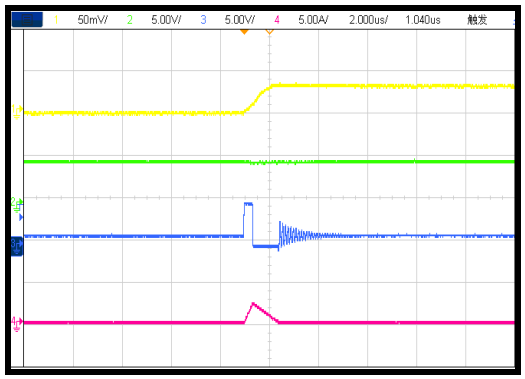
## EVB TEST RESULTS *(continued)*

**Performance curves and waveforms are tested on the evaluation board. $V_{IN}$ = 5V, $V_{OUT}$ = 1.2V, $T_A$ = 25°C, unless otherwise noted.**

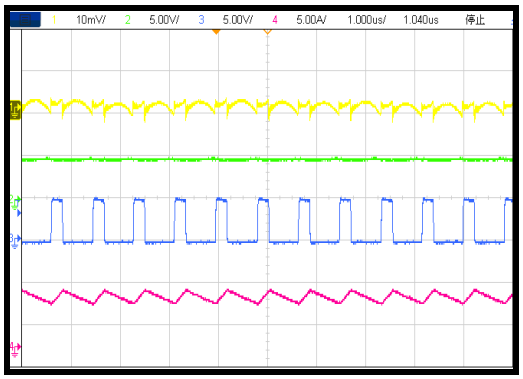
### Output Voltage Ripple

$V_{IN}$ = 5V, $V_{OUT}$ = 1.2V, $I_{OUT}$ = 0A



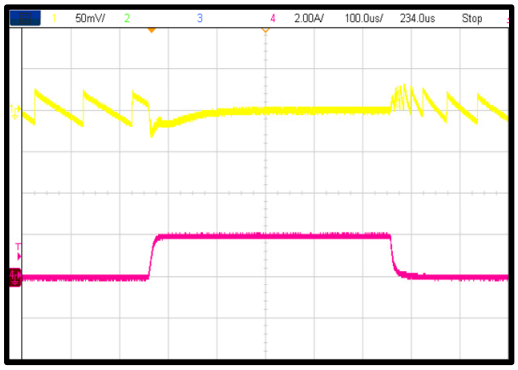

### Output Voltage Ripple

$V_{IN}$ = 5V, $V_{OUT}$ = 1.2V, $I_{OUT}$ = 4A



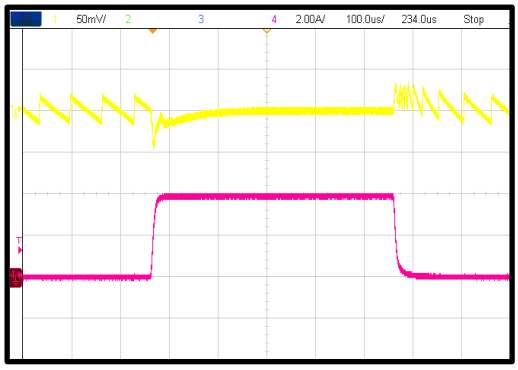

### Load Transient Response

$V_{IN}$ = 5V, $V_{OUT}$ = 1.2V, $I_{OUT}$ = 0A to 2A,
2.5A/µs with e-load



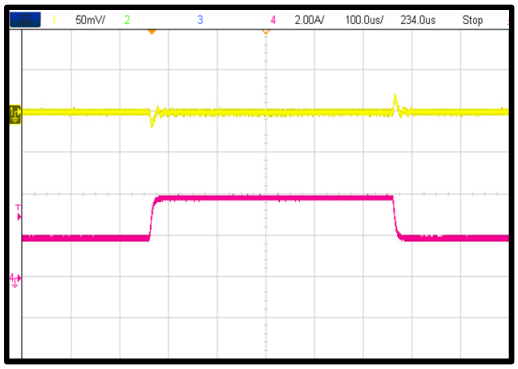

### Load Transient Response

$V_{IN}$ = 5V, $V_{OUT}$ = 1.2V, $I_{OUT}$ = 0A to 4A,
2.5A/µs with e-load




### Load Transient Response

$V_{IN}$ = 5V, $V_{OUT}$ = 1.2V, $I_{OUT}$ = 2A to 4A,
2.5A/µs with e-load





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# PCB LAYOUT

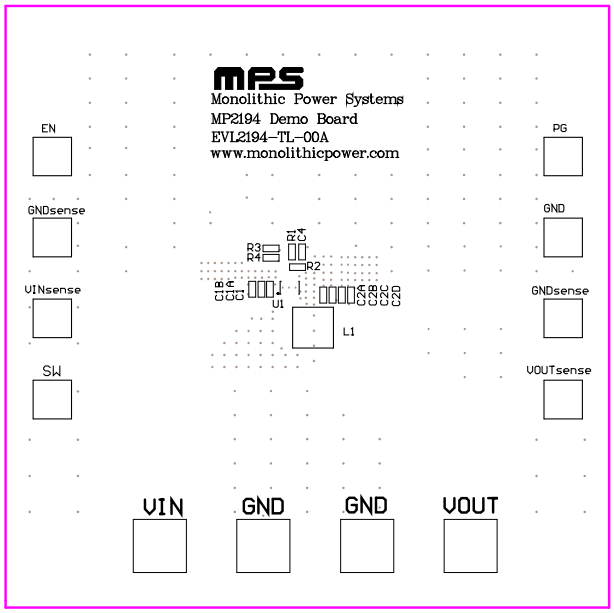


Figure 3: Top Silk

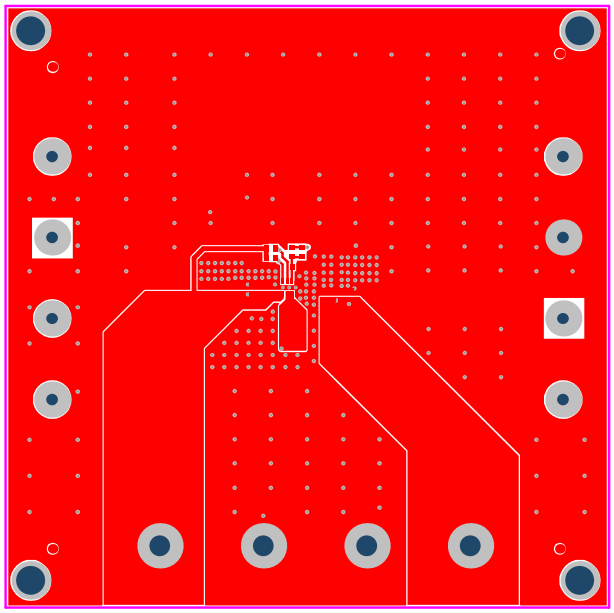

Figure 4: Top Layer

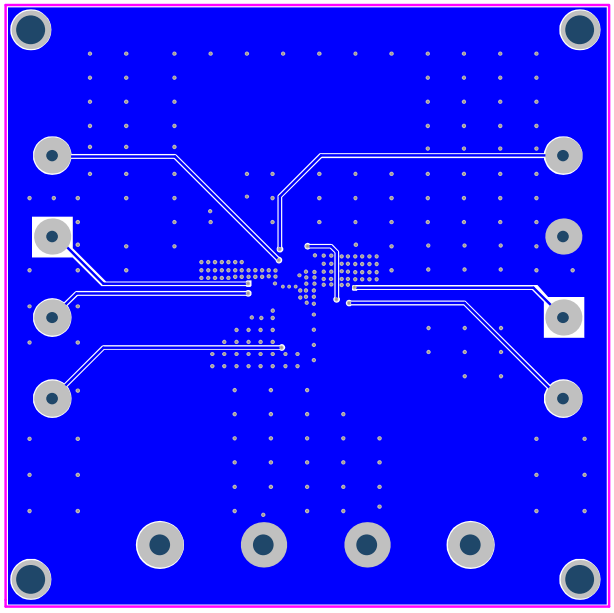

Figure 5: Bottom Layer


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## REVISION HISTORY

| Revision # | Revision Date | Description | Pages Updated |
|---|---|---|---|
| 1.0 | 10/11/2024 | Initial Release | - |

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