



EV4541-N-00A

80V, 0.8A, Synchronous Buck Converter Evaluation Board

DESCRIPTION

The EV4541-N-00A is an evaluation board designed to demonstrate the capabilities of MPS's MP4541, a high-efficiency, synchronous step-down converter with integrated high-side and low-side MOSFETs. The MP4541 provides 0.8A of output current in a buck topology from up to an 80V input power supply.

The MP4541 supports high-efficiency pulse-skip mode (PSM) under light-load conditions. Valley current limit circuits protect against overload and short circuit conditions.

The MP4541 is available in an SOIC-8EP package.

ELECTRICAL SPECIFICATIONS

| Parameter | Symbol | Value | Units |
|----------------|------------------|----------|-------|
| Input voltage | V _{IN} | 8 to 80 | V |
| Output voltage | V _{OUT} | 5 | V |
| Output current | I _{OUT} | 0 to 0.8 | A |

FEATURES

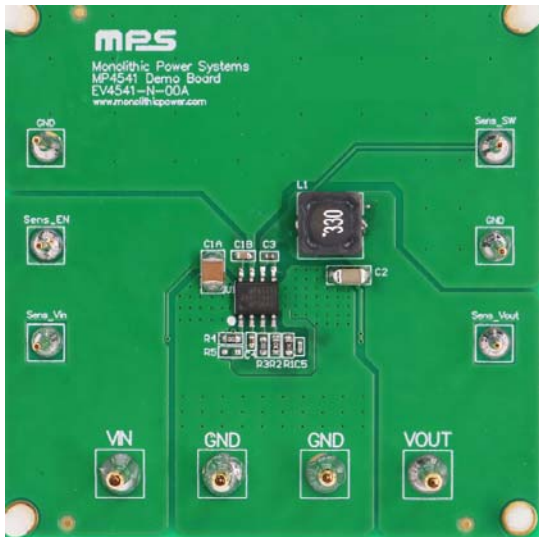
- 8V to 80V Input Voltage
- 1V to 30V Output Voltage
- 90% Maximum Operation Duty Cycle
- 625mΩ/380mΩ Internal MOSFETs
- Constant-On-Time Control Mode
- Configurable 100kHz to 1MHz Frequency
- Internal Soft Start and Loop Compensation
- Over-Current Protection (OCP) and Short-Circuit Protection (SCP) with Hiccup Mode
- High-Efficiency PSM at Light-Load
- Available in an SOIC-8EP Package

APPLICATIONS

- High-Voltage Battery Packs
- Industrial Power Supplies
- Printer Power Boards

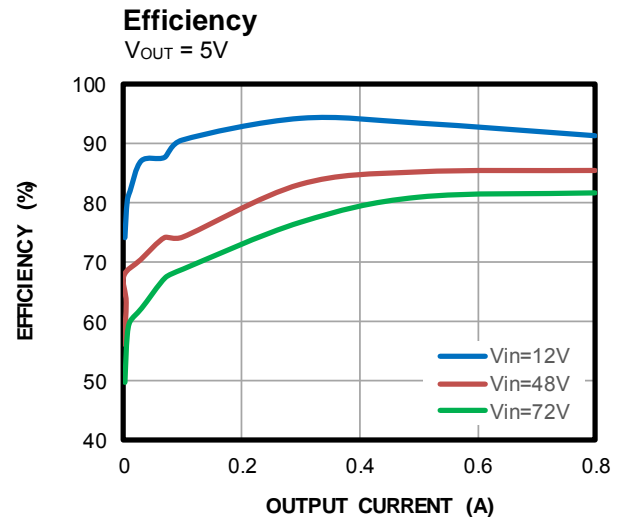
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EVALUATION BOARD



(LxWxH) 6.35cmx6.35cmx0.6cm

| Board Number | MPS IC Number |
|--------------|---------------|
| EV4541-N-00A | MP4541GN |



QUICK START GUIDE

The output voltage of this board is set to 5V. The board layout accommodates most commonly used components. Follow the steps below to quick start the EV4541-N-00A:

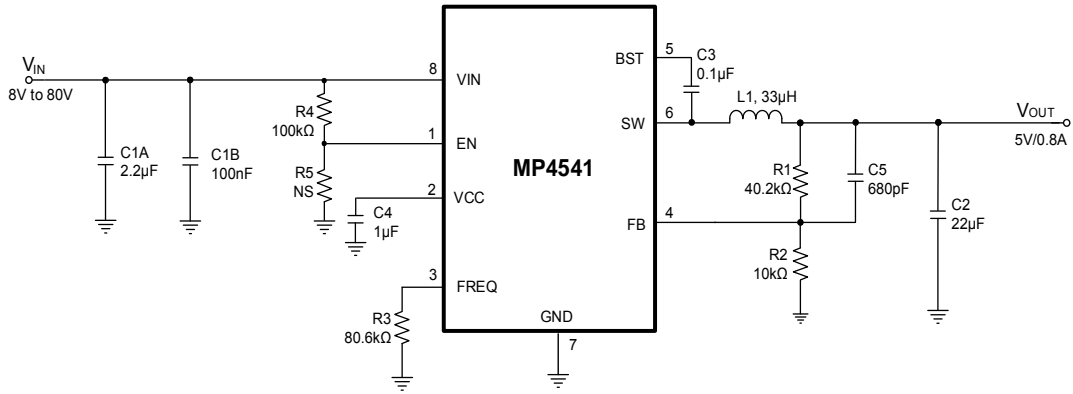
1. Preset the power supply (V_{IN}) between 8V and 80V.
2. Turn the power supply off.
3. Connect the power supply terminals to:
 - a. Positive (+): VIN
 - b. Negative (-): GND
4. Connect the load to:
 - a. Positive (+): VOUT
 - b. Negative (-): GND
5. Turn the power supply on after making the connections.
6. The MP4541 is enabled on the evaluation board once V_{IN} is applied.
7. The output voltage (V_{OUT}) can be adjusted by changing R1 and R2. Calculate V_{OUT} with Equation (1):

$$V_{OUT} = V_{FB} \times \left(1 + \frac{R1}{R2}\right) \quad (1)$$

Where $V_{FB} = 1V$.

8. To use the enable function, apply a digital input to the EN pin. Drive EN above 1.35V to turn on the EV4541-N-00A; drive it below 0.4V to turn the device off.

EVALUATION BOARD SCHEMATIC



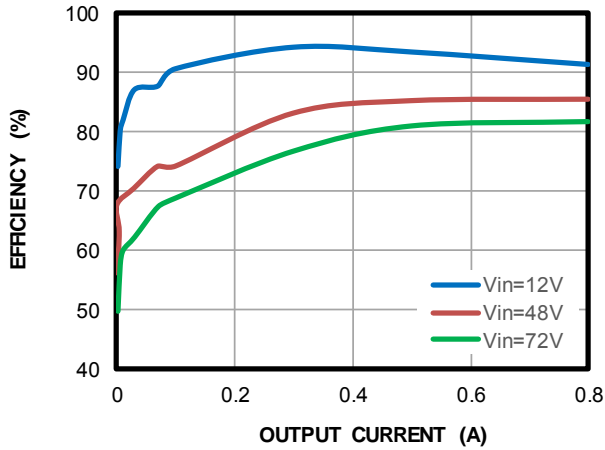
BILL OF MATERIALS

| Qty | Ref | Value | Description | Package | Manufacturer | Manufacturer PN |
|-----|-----|----------------|--|----------|--------------|--------------------|
| 1 | C1A | 2.2 μ F | Ceramic capacitor, 100V, X7R | 1210 | muRata | GRM32ER72A225KA35L |
| 1 | C1B | 100nF | Ceramic capacitor, 100V, X7R | 0603 | muRata | GRM188R72A104KA35D |
| 1 | C2 | 22 μ F | Ceramic capacitor, 16V, X7S | 1206 | muRata | GRM31CC71C226ME11L |
| 1 | C3 | 100nF | Ceramic capacitor, 16V, X7R | 0402 | muRata | GRM155R71C104KA88D |
| 1 | C4 | 1 μ F | Ceramic capacitor, 10V, X7S | 0402 | muRata | GRM155C71A105KE11D |
| 1 | C5 | 680pF | Ceramic capacitor, 16V, X7R | 0402 | WE | 885012205024 |
| 1 | R1 | 40.2k Ω | Film resistor, 1% | 0603 | YAGEO | RC0603FR-0740K2L |
| 1 | R2 | 10k Ω | Film resistor, 1% | 0603 | YAGEO | RC0603FR-0710KL |
| 1 | R3 | 80.6k Ω | Film resistor, 1% | 0603 | YAGEO | RC0603FR-0780K6L |
| 1 | R4 | 100k Ω | Film resistor, 1% | 0603 | YAGEO | RC0603FR-07100KL |
| 0 | R5 | NS | | | | |
| 1 | L1 | 33 μ H | I _{SAT} = 1.4A, 140m Ω inductor | SMD | WE | 7447779133 |
| 1 | U1 | MP4541 | 80V, 0.8A, synchronous buck | SOIC-8EP | MPS | MP4541GN |

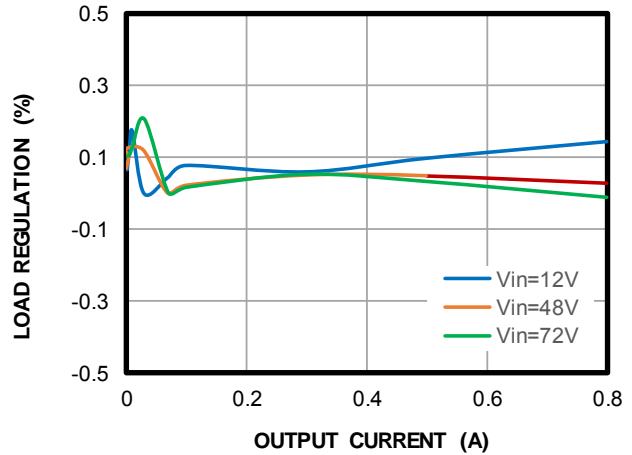
EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. $V_{IN} = 48V$, $V_{OUT} = 5V$, $L = 33\mu H$, $T_A = 25^\circ C$, unless otherwise noted.

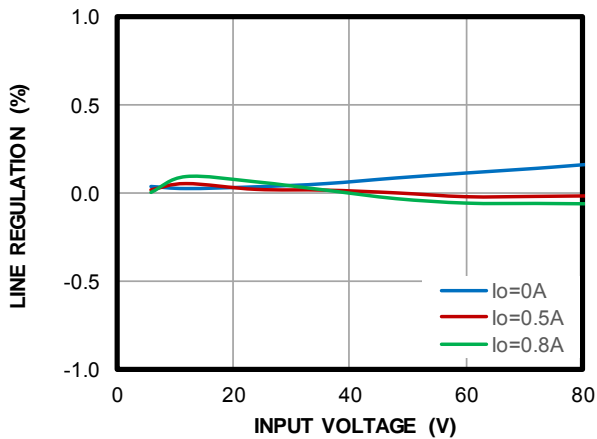
Efficiency vs. I_o



Load Regulation

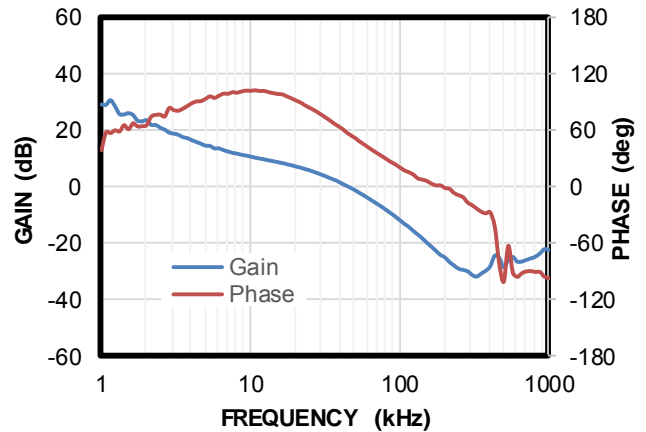


Line Regulation

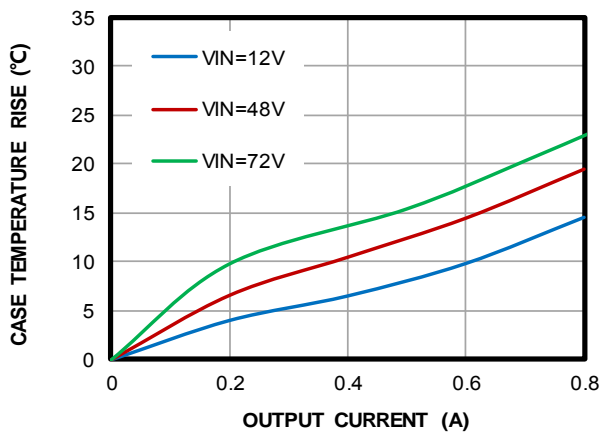


Bode Plot

$I_{OUT} = 0.8A$



Case Temperature Rise vs. Output Current

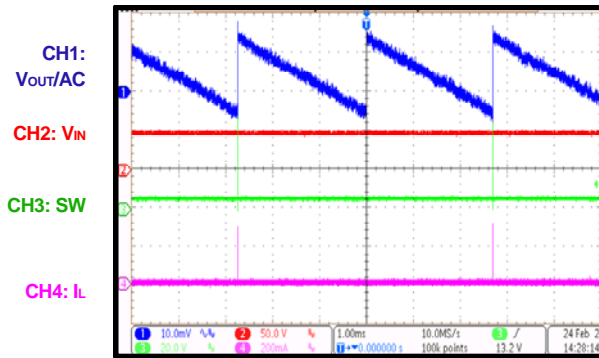


EVB TEST RESULTS (continued)

Performance curves and waveforms are tested on the evaluation board. $V_{IN} = 48V$, $V_{OUT} = 5V$, $L = 33\mu H$, $T_A = 25^\circ C$, unless otherwise noted.

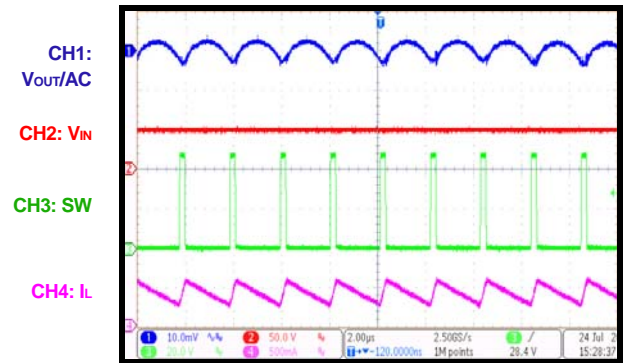
Steady State

$I_{OUT} = 0A$



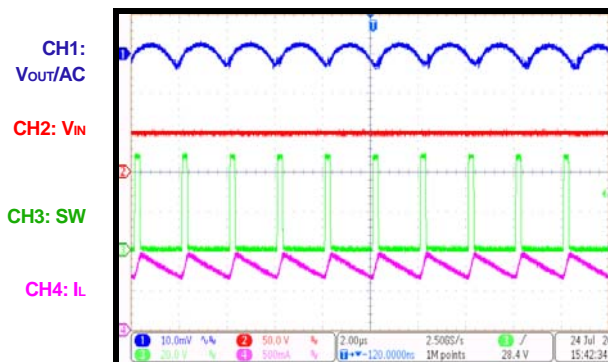
Steady State

$I_{OUT} = 0.4A$



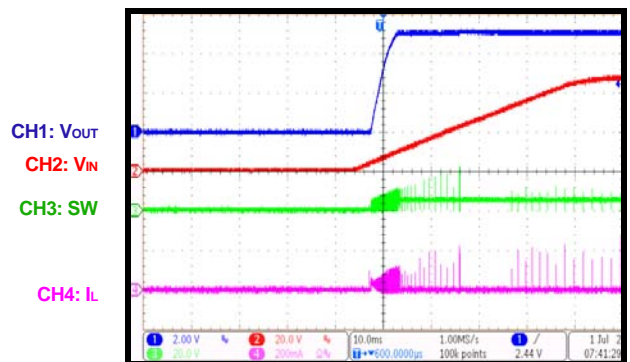
Steady State

$I_{OUT} = 0.8A$



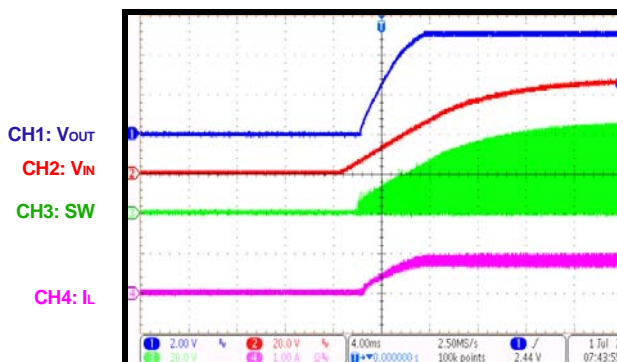
VIN Start-Up

$I_{OUT} = 0A$



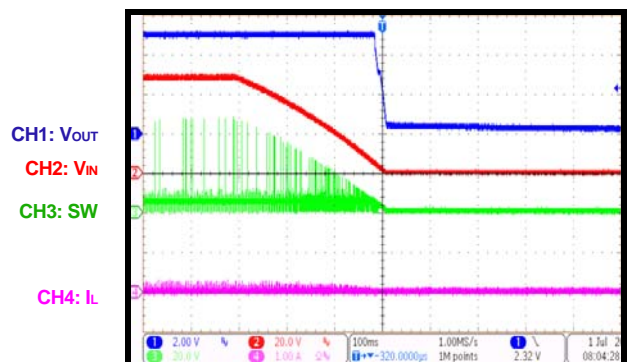
VIN Start-Up

$I_{OUT} = 0.8A$



VIN Shutdown

$I_{OUT} = 0A$

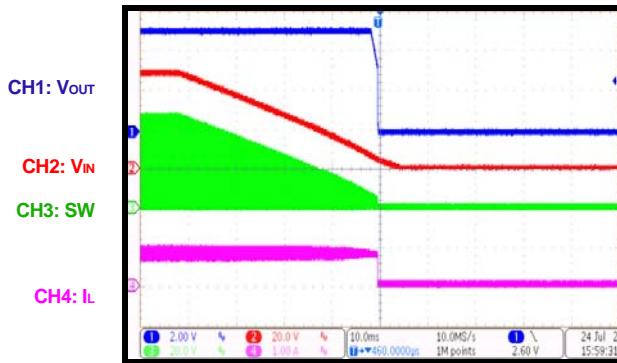


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. $V_{IN} = 48V$, $V_{OUT} = 5V$, $L = 33\mu H$, $T_A = 25^\circ C$, unless otherwise noted.

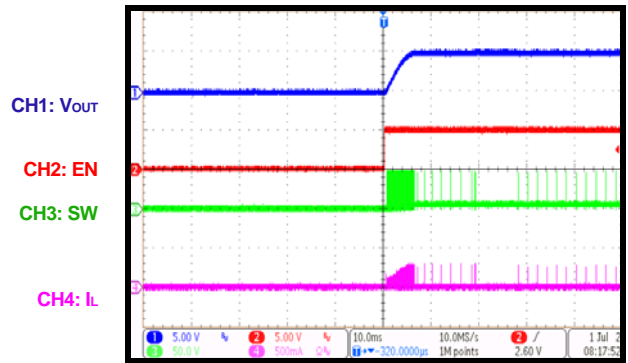
VIN Shutdown

$I_{OUT} = 0.8A$



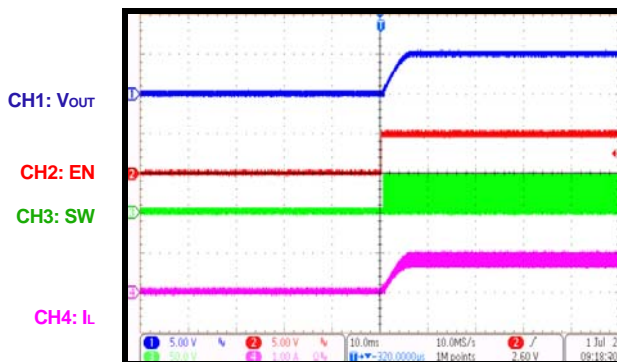
EN On

$I_{OUT} = 0A$



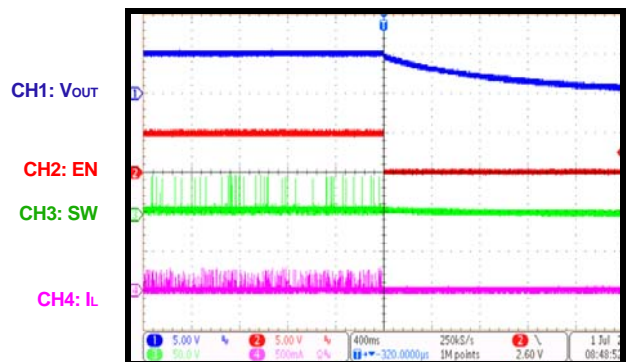
EN On

$I_{OUT} = 0.8A$



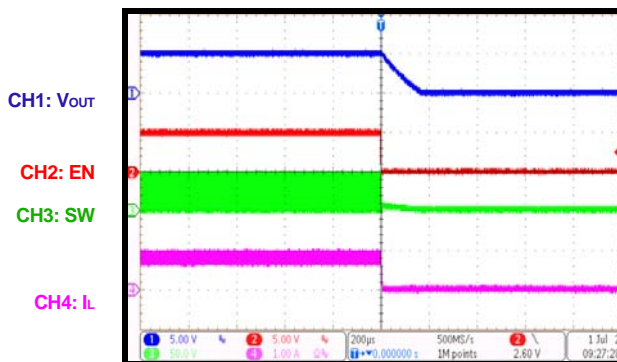
EN Off

$I_{OUT} = 0A$



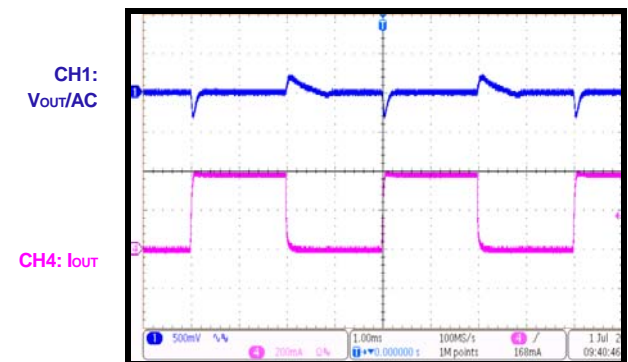
EN Off

$I_{OUT} = 0.8A$



Load Transient

$I_{OUT} = 0A$ to $0.4A$

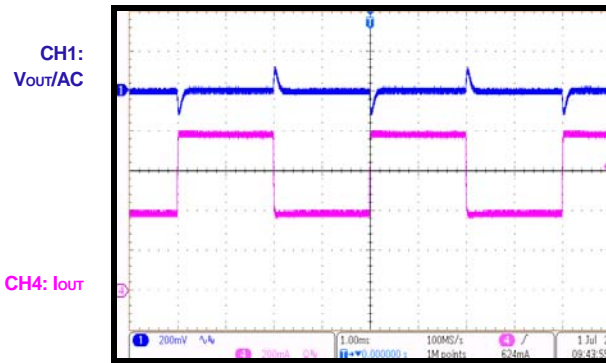


EVB TEST RESULTS *(continued)*

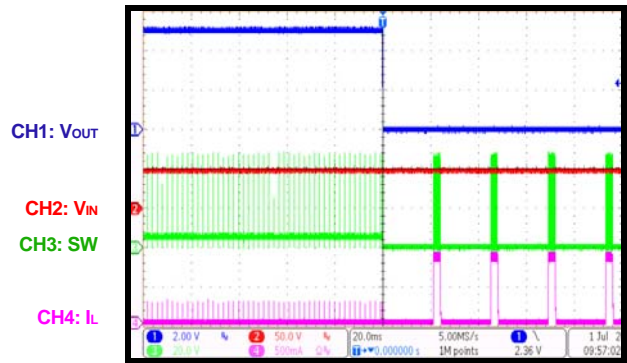
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Load Transient

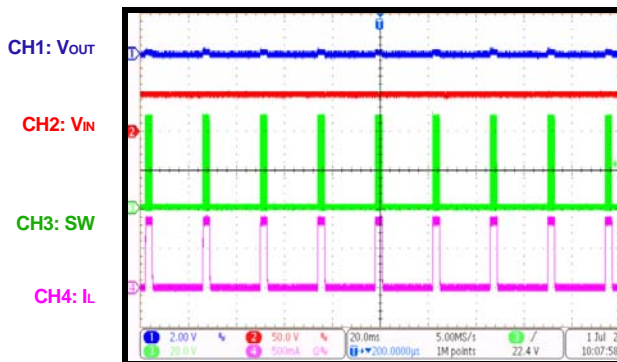
$I_{OUT} = 0.4A$ to $0.8A$



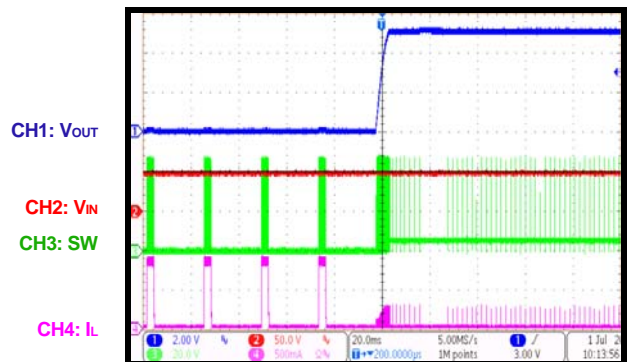
SCP Entry



SCP Steady State



SCP Recovery



PCB LAYOUT

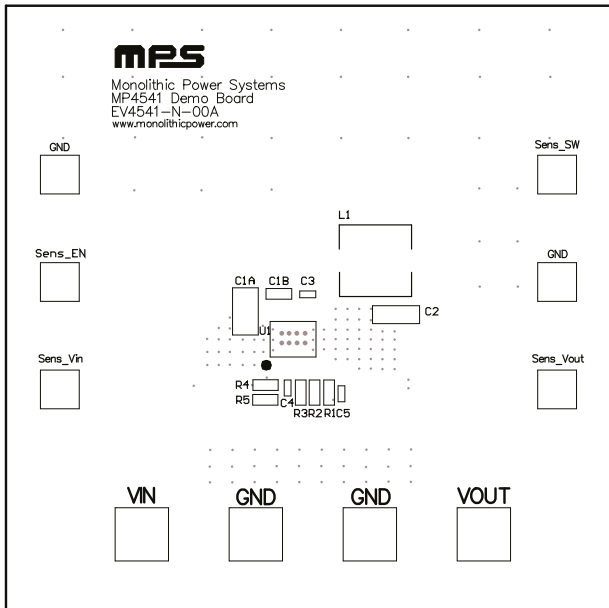


Figure 1: Top Silkscreen Layer

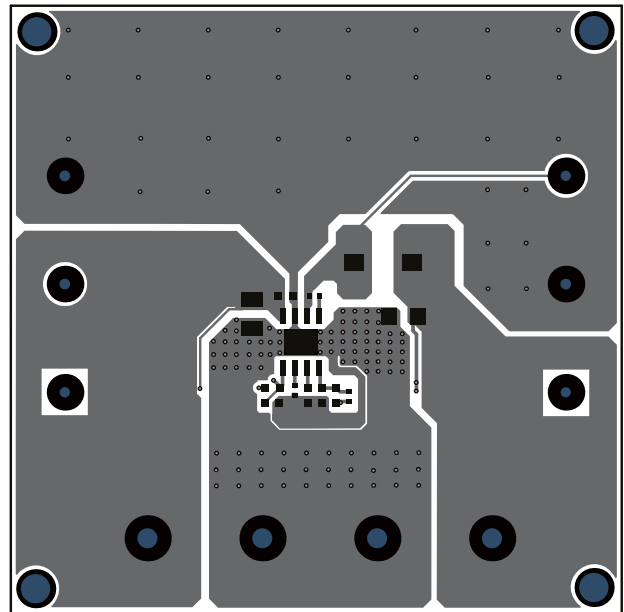


Figure 2: Top Layer

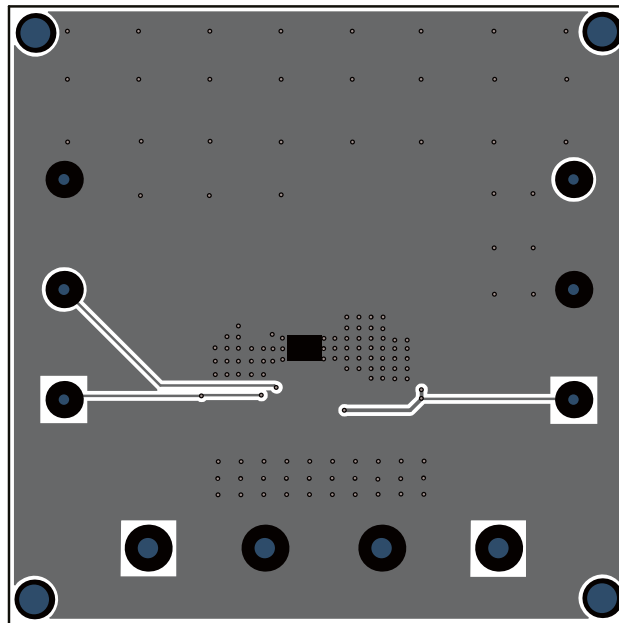


Figure 3: Bottom Layer

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