EVL3414E-J-00A

1.8A, 1MHz Synchronous Boost Converter Evaluation Board

DESCRIPTION

The EVL3414E-J-00A is an evaluation board for the MP3414E — a high-efficiency, synchronous, current-mode, step-up converter with output to input disconnect. The MP3414E can start up at an input voltage (V_{IN}) as low as 0.8V, and provides inrush current limiting and output short-circuit protection.

The output voltage (V_{OUT}) can be regulated when $V_{IN} > V_{OUT}$ and the MOSFET no longer acts as a low impedance switch.

The MP3414E is available in a small TSOT23-8 package.

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Value	Units
Input voltage	V_{IN}	0.6 to 4	V
Output voltage	V_{OUT}	3.3	V

FEATURES

- Start-Up Input Range: 0.8V to 4V
- Operation Input Range: 0.6V to 4V
- Output Range: 1.8V to 4V
- Up to 96% Efficiency
- Current-Mode Control with Internal Compensation
- Short-Circuit Protection (SCP)
- True Output Disconnect from Input
- $V_{IN} > V_{OUT}$ Down Mode Operation
- High Efficiency under Light-Load Conditions
- Inrush Current Limiting and Internal Soft Start (SS)
- 1MHz Fixed-Frequency Switching
- Ultra-Small External Components

MPL Optimized Performance with MPS Inductor MPL-AL4020 Series

APPLICATIONS

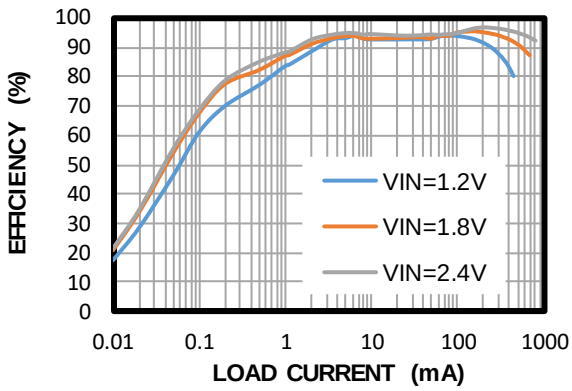
- Battery-Powered Products
- Personal Medical Devices
- Portable Media Players
- Wireless Peripherals
- Handheld Computers and Smartphones

EVL3414E-J-00A EVALUATION BOARD

(LxWxH) 6.35cmx6.35cmx0.6cm

Board Number	MPS IC Number	MPS Inductor
EVL3414E -J-00A	MP3414EGJ	MPL-AL4020 -3R3

Efficiency vs. Load Current



QUICK START GUIDE

The EV3414E-J-00A's V_{OUT} is set at 3.3V. The board layout accommodates most commonly used inductors and output capacitors.

1. Preset the power supply to 0.8V ≤ V_{IN} ≤ 4V.
2. Turn off the power supply.
3. Connect the power supply terminals to:
   a. Positive (+): VIN
   b. Negative (-): GND
4. Connect the load terminals to:
   a. Positive (+): VOUT
   b. Negative (-): GND
5. After making the connections, turn on the power supply. The board should automatically start up.
6. After start-up, the board operates in a 0.6V to 4V input range.
7. The board's V_{OUT} is set at 3.3V. V_{OUT} can be adjusted by changing the resistor (R2), which can be calculated with Equation (1):

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

Where V_{FB} = 1.21V, and R1 = 365kΩ.

For example, if V_{OUT} = 3.3V, then R2 can be calculated with Equation (2):

$$R2 = 365k\Omega \times \left(\frac{1.21}{3.3\text{-}1.21}\right) = 211.3k\Omega \quad (2)$$

Therefore, if V_{OUT} = 3.3V, use a 210kΩ resistor.

EVALUATION BOARD SCHEMATIC

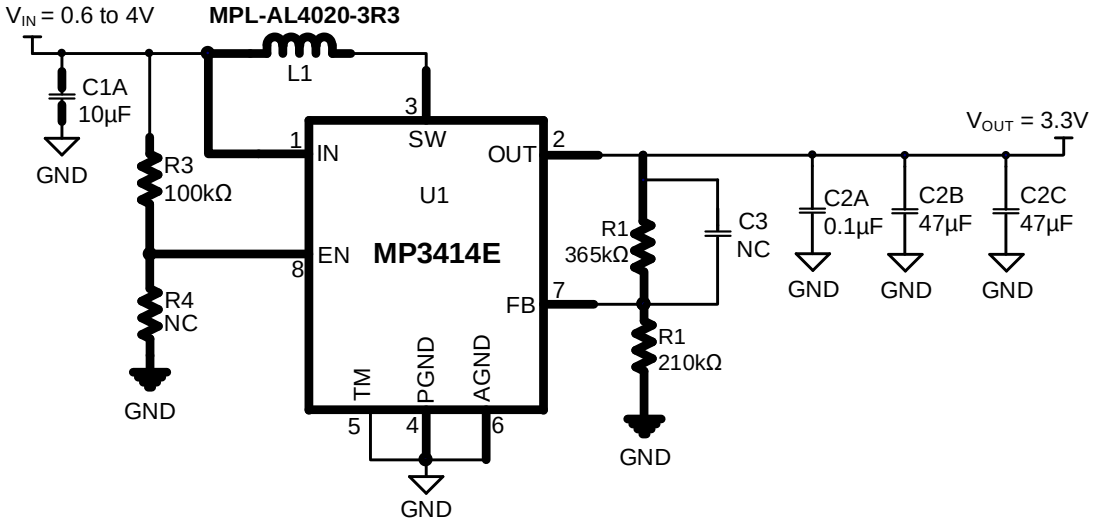


Figure 1: Evaluation Board Schematic

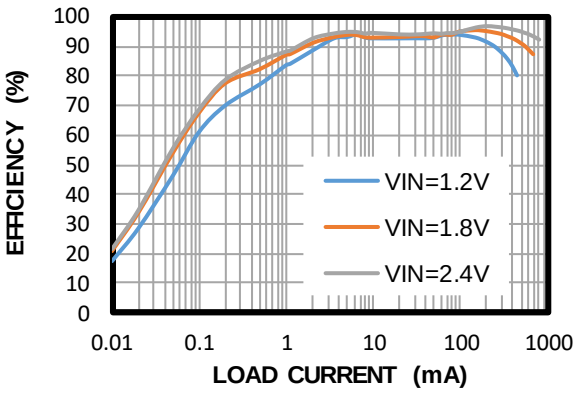
EVL3414E-J-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer P/N
1	L1	3.3µH	34.5mΩ DCR, 5.2A	SMD	MPS	MPL-AL4020-3R3
1	C1A	10µF	Ceramic capacitor, 10V, X7R	0805	Wurth	885012207026
1	C2A	0.1µF	Ceramic capacitor, 16V, X7R	0603	Wurth	885012206046
2	C2B, C2C	47µF	Ceramic capacitor, 10V, X5R	0805	Murata	GRM21BR61A476ME15L
1	R1	365kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07365KL
1	R2	210kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07210KL
1	R3	100kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07100KL
0	C3, R4	NC				
1	U1	MP3414E	Step-up converter	TSOT23-8	MPS	MP3414EGJ

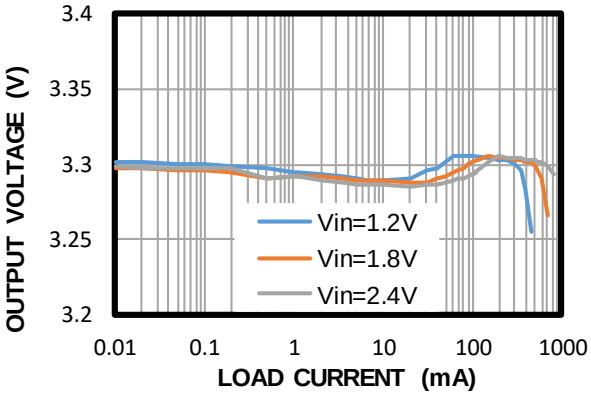
EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 1.8V, V_{OUT} = 3.3V, L = 3.3μH, T_A = 25°C, unless otherwise noted.

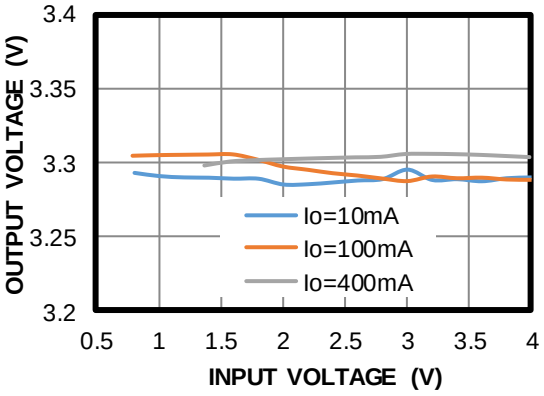
Efficiency vs. Load Current



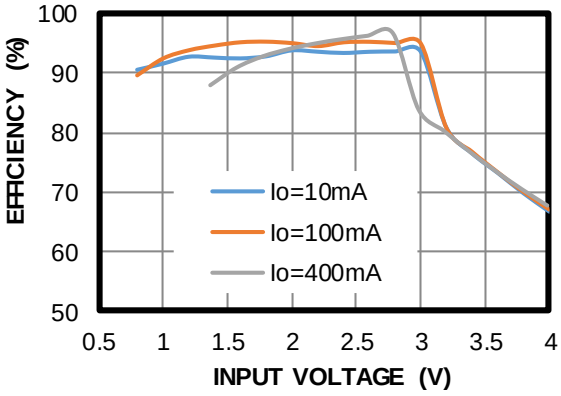
Load Regulation



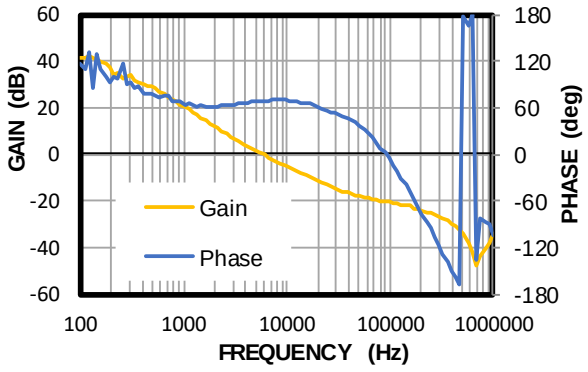
Line Regulation



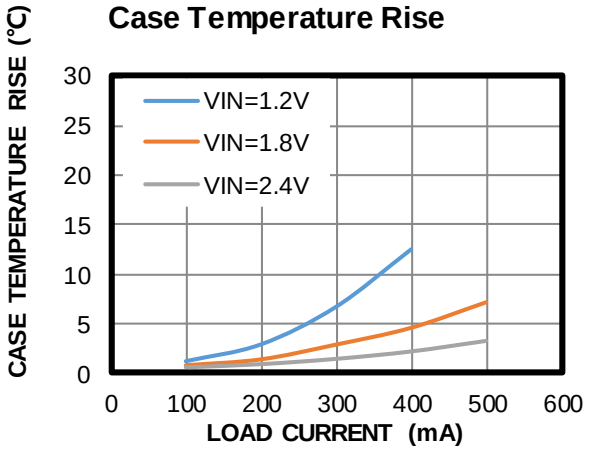
Efficiency vs. Input Voltage



Bode Plot



Case Temperature Rise

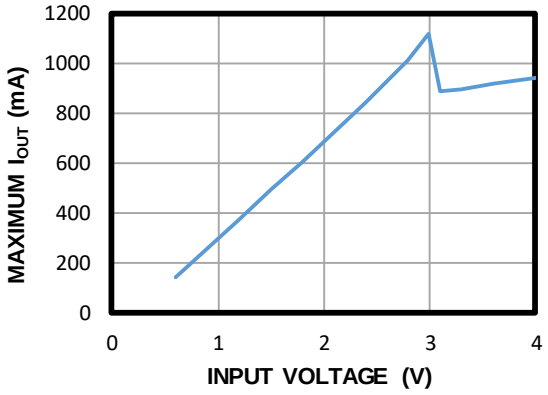


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 1.8V, V_{OUT} = 3.3V, L = 3.3µH, T_A = 25°C, unless otherwise noted.

Maximum Ouput Current vs. Input Voltage

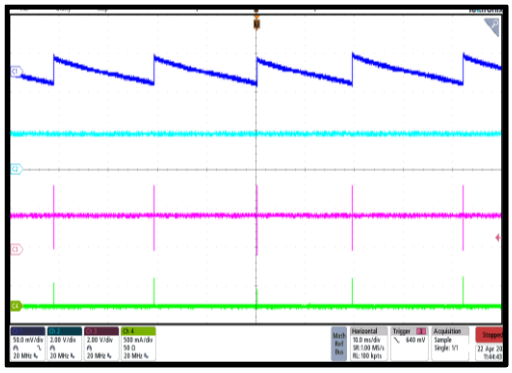
SW peak current = 1.5A



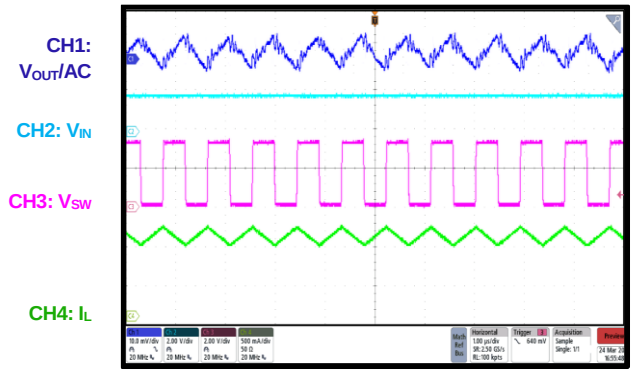
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 1.8V, V_{OUT} = 3.3V, L = 3.3µH, T_A = 25°C, unless otherwise noted.

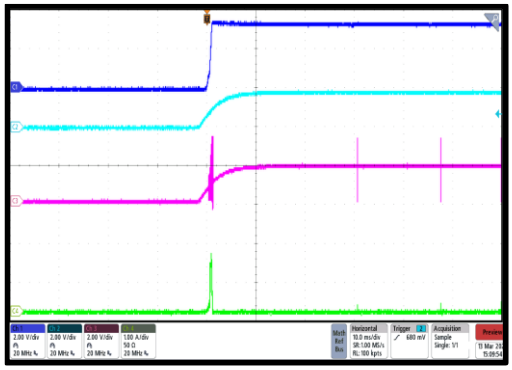
Steady State
I_{OUT} = 0A



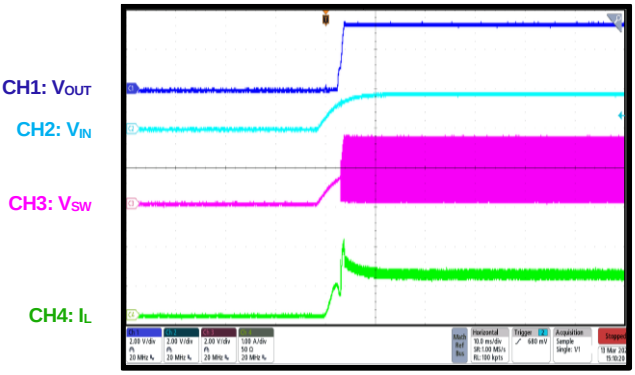
Steady State
I_{OUT} = 0.5A



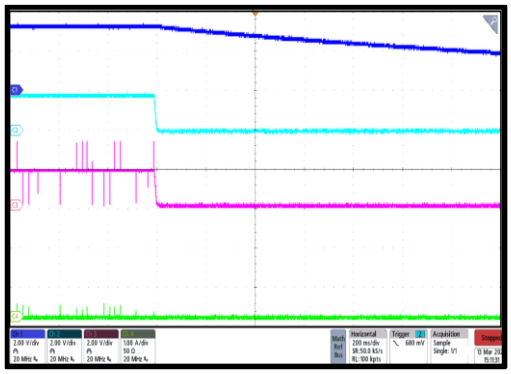
Start-Up through VIN
I_{OUT} = 0A



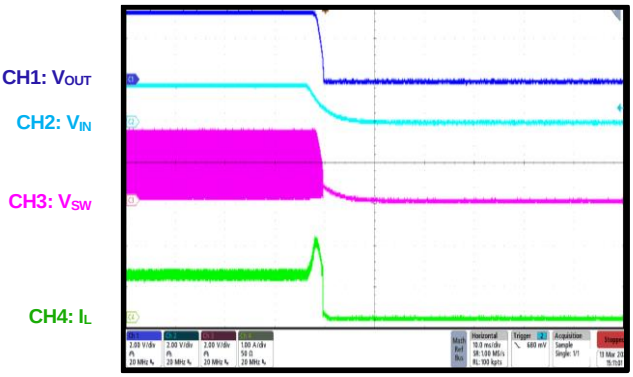
Start-Up through VIN
I_{OUT} = 0.5A



Shutdown through VIN
I_{OUT} = 0A



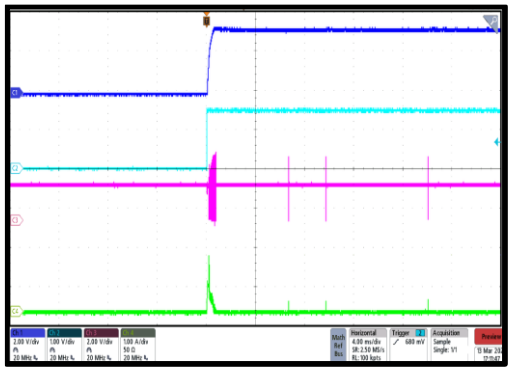
Shutdown through VIN
I_{OUT} = 0.5A



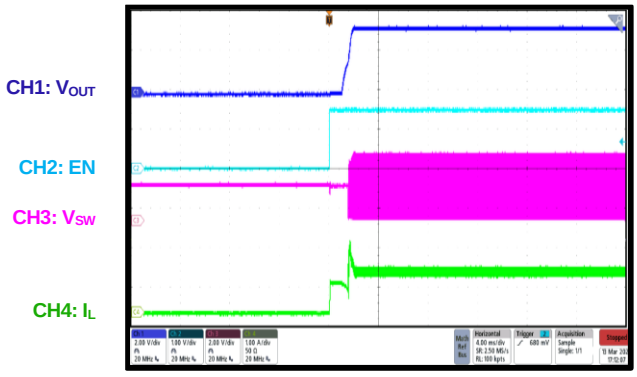
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 1.8V, V_{OUT} = 3.3V, L = 3.3µH, T_A = 25°C, unless otherwise noted.

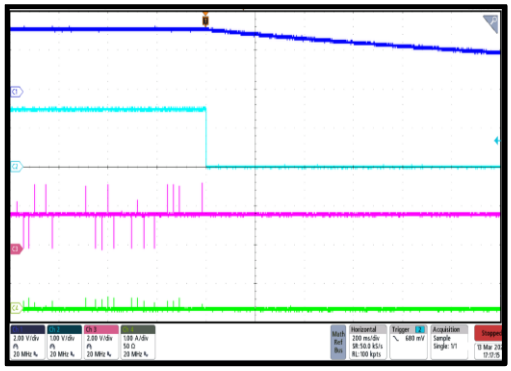
Start-Up through EN
I_{OUT} = 0A



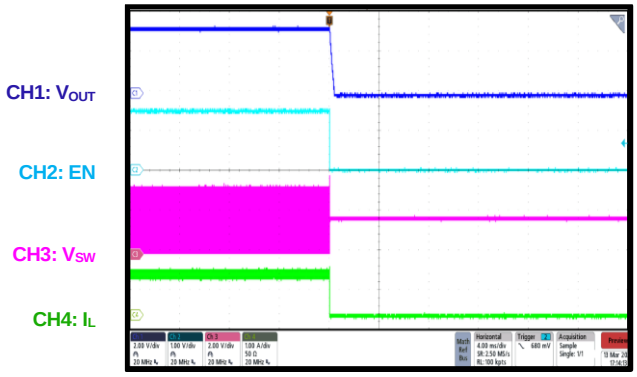
Start-Up through EN
I_{OUT} = 0.5A



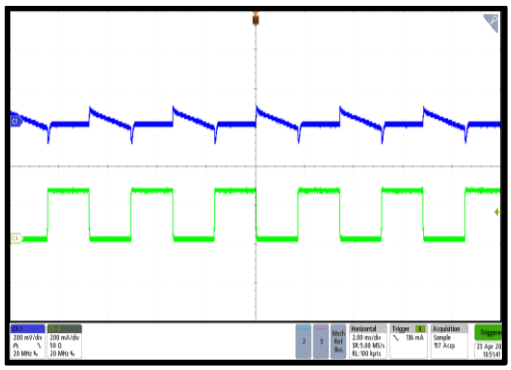
Shutdown through EN
I_{OUT} = 0A



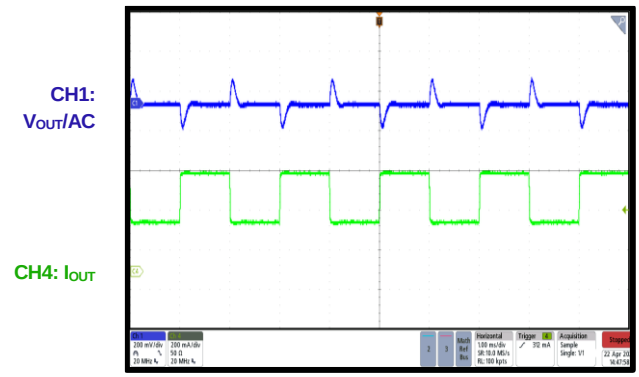
Shutdown through EN
I_{OUT} = 0.5A



Load Transient
I_{OUT} = 0A to 0.25A, I_{RAMP} = 25mA/µs



Load Transient
I_{OUT} = 0.25A to 0.5A, I_{RAMP} = 25mA/µs

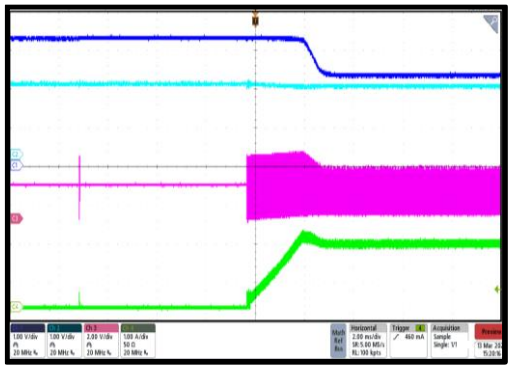


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 1.8V, V_{OUT} = 3.3V, L = 3.3µH, T_A = 25°C, unless otherwise noted.

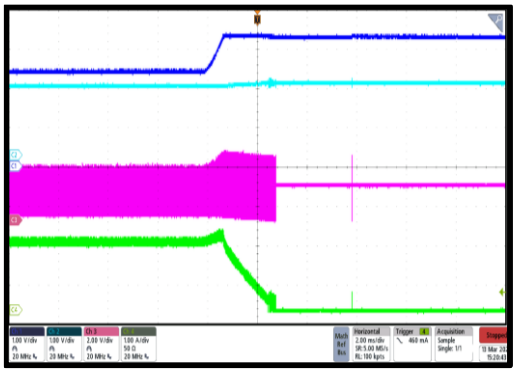
Over-Current Entry

I_{OUT} from 0A to 1A



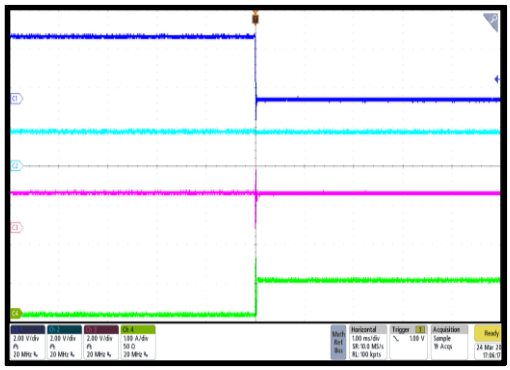
Over-Current Recovery

I_{OUT} from 1A to 0A



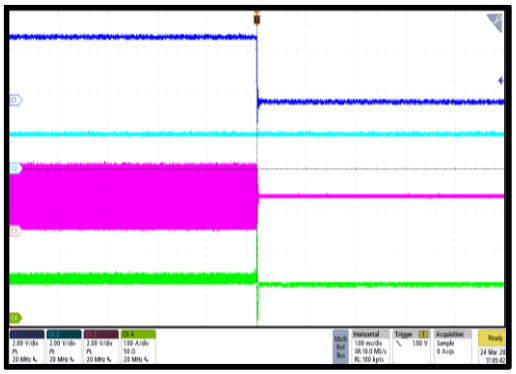
SCP Entry

I_{OUT} = 0A to short



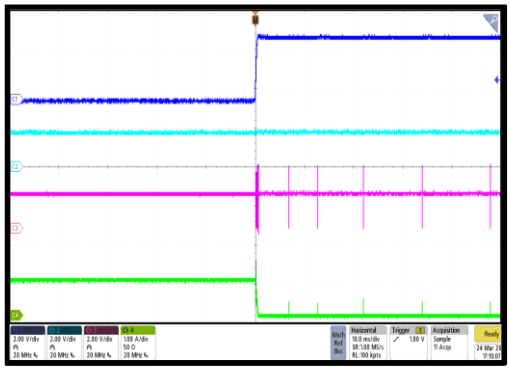
SCP Entry

I_{OUT} = 0.5A to short



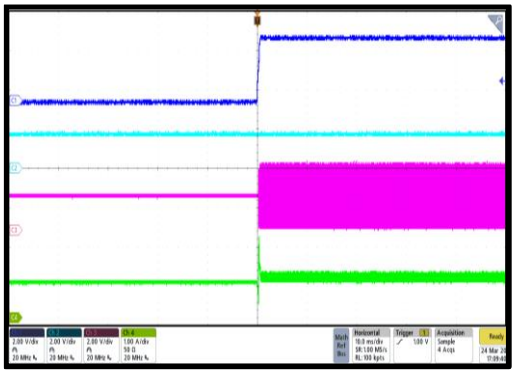
SCP Recovery

I_{OUT} = short to 0A



SCP Recovery

I_{OUT} = short to 0.5A



PCB LAYOUT

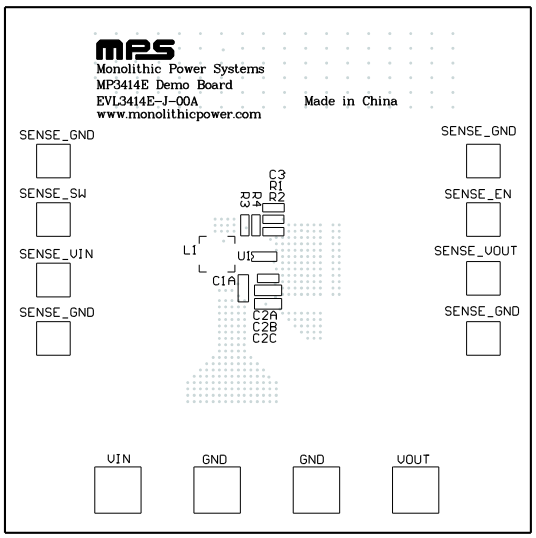


Figure 2: Top Silk Layer

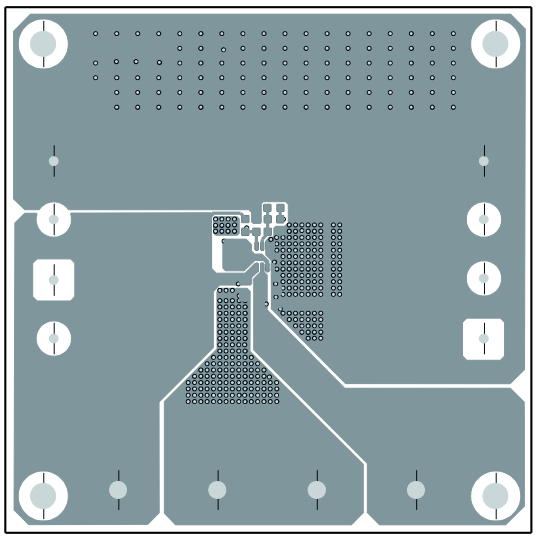


Figure 3: Top Layer

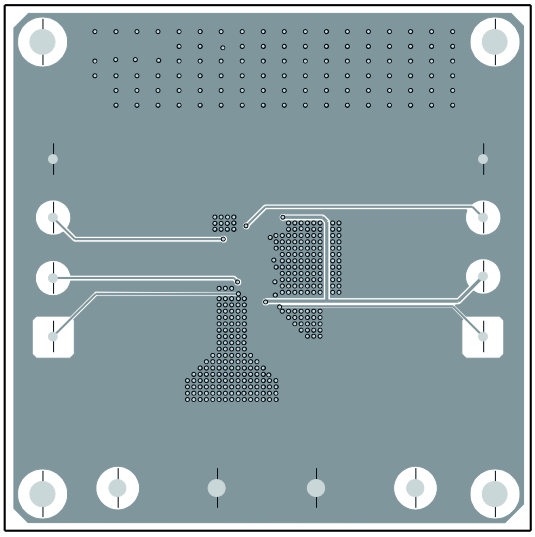


Figure 4: Bottom Layer

Revision History

Revision #	Revision Date	Description	Pages Updated
1.0	12/2/2020	Initial Release	-