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

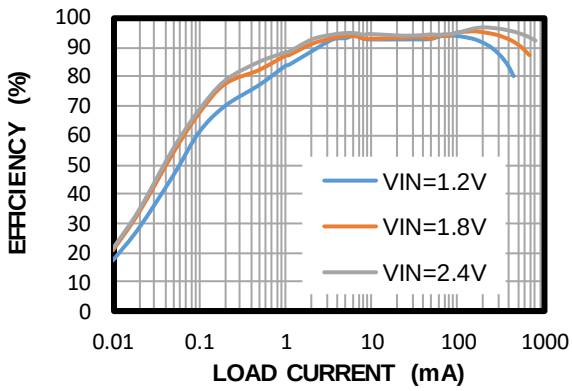
All MPS parts are lead-free, halogen-free, and adhere to the RoHS directive. For MPS green status, please visit the MPS website under Quality Assurance. “MPS”, the MPS logo, and “Simple, Easy Solutions” are trademarks of Monolithic Power Systems, Inc. or its subsidiaries.

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



MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2020 MPS. All Rights Reserved.

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.

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2020 MPS. All Rights Reserved.

EVALUATION BOARD SCHEMATIC

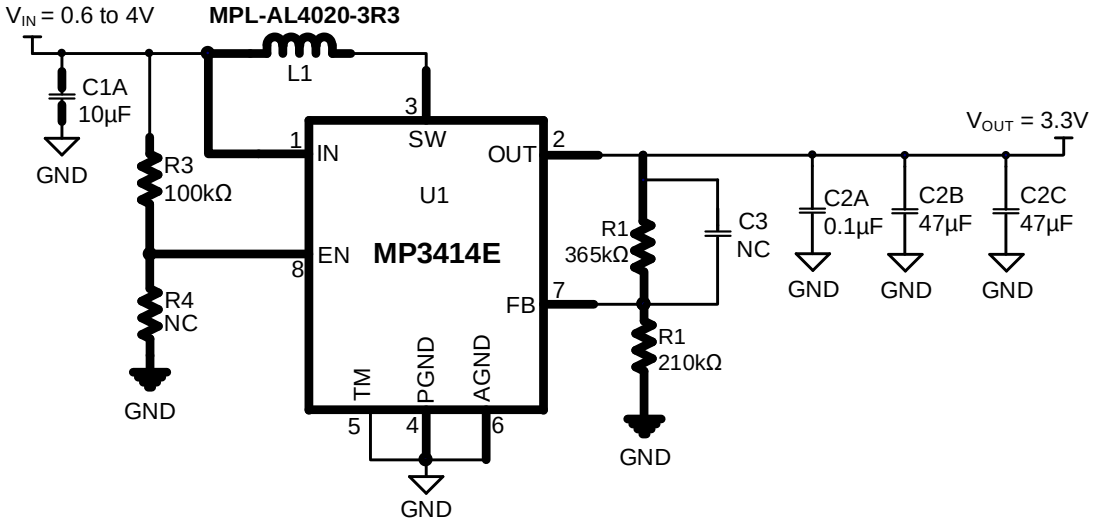


Figure 1: Evaluation Board Schematic

EVL3414E-J-00A BILL OF MATERIALS

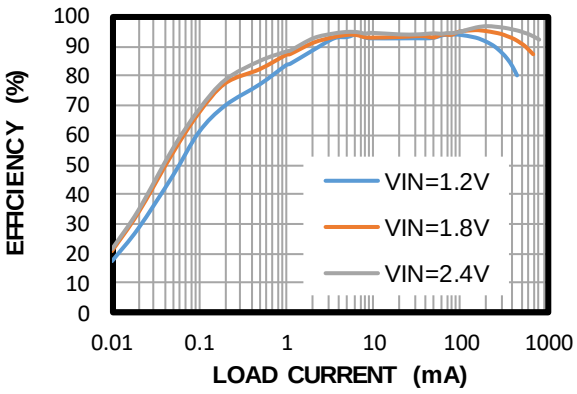
Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer P/N
1	L1	3.3µH	34.5mΩ DCR, 5.2A	SMD	MPS	MPL-AL4020-3R3
1	C1A	10µF	Ceramic capacitor, 10V, X7R	0805	Wurth	885012207026
1	C2A	0.1µF	Ceramic capacitor, 16V, X7R	0603	Wurth	885012206046
2	C2B, C2C	47µF	Ceramic capacitor, 10V, X5R	0805	Murata	GRM21BR61A476ME15L
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

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2020 MPS. All Rights Reserved.

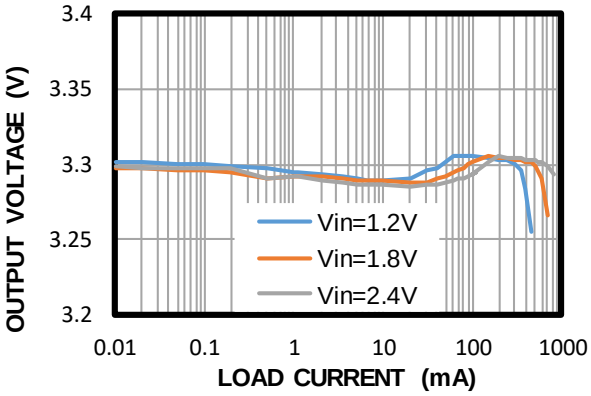
EVB TEST RESULTS

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.

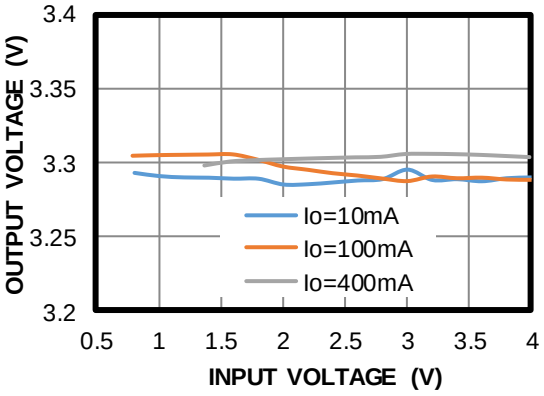
Efficiency vs. Load Current



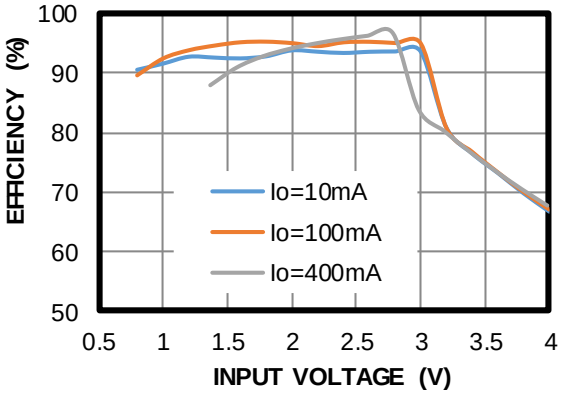
Load Regulation



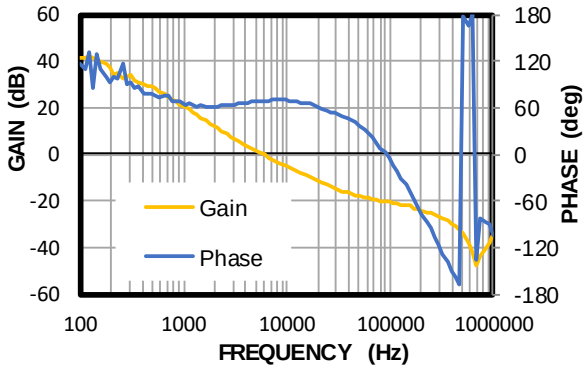
Line Regulation



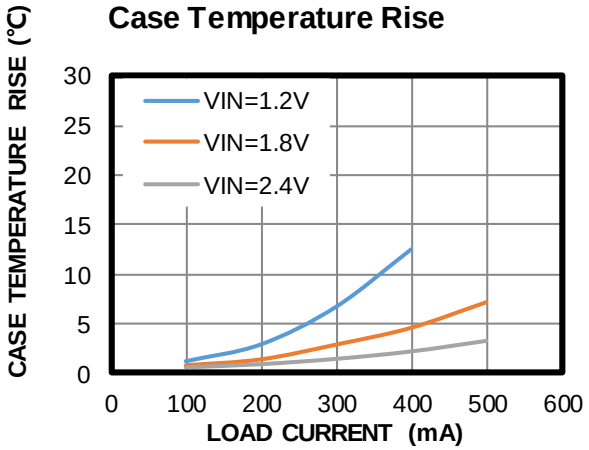
Efficiency vs. Input Voltage



Bode Plot



Case Temperature Rise



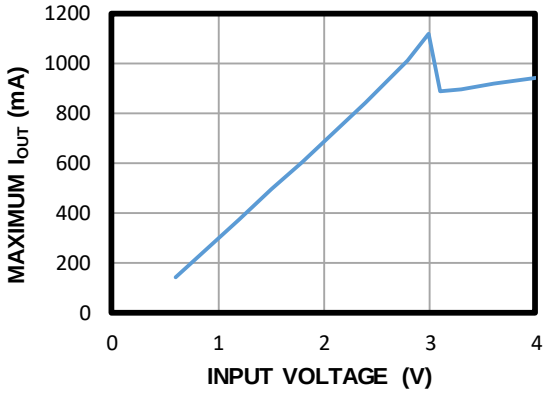
MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2020 MPS. All Rights Reserved.

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

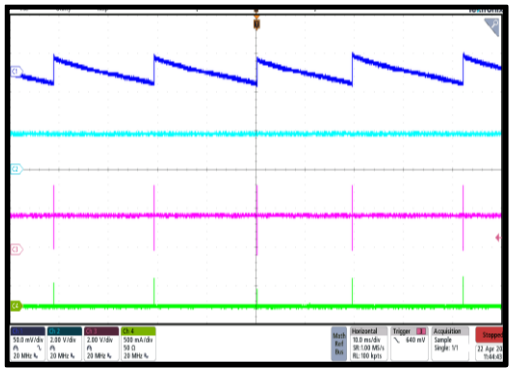


MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2020 MPS. All Rights Reserved.

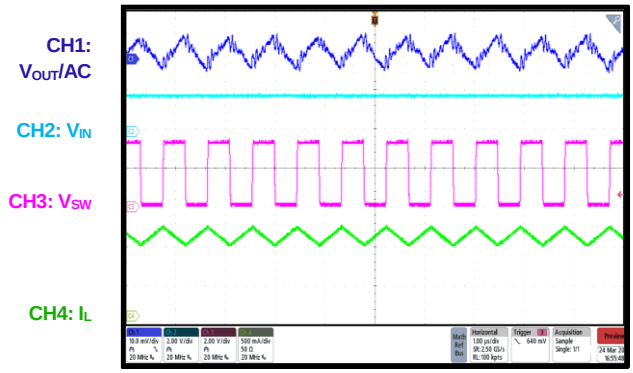
EVB TEST RESULTS *(continued)*

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.

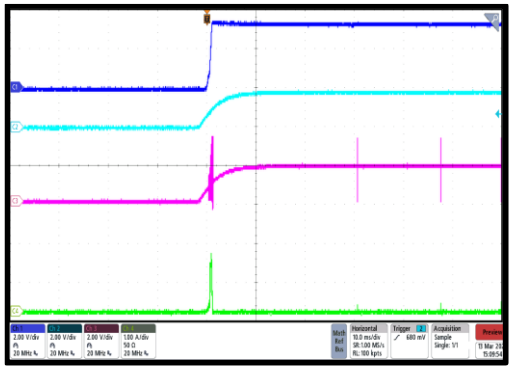
Steady State
I_{OUT} = 0A



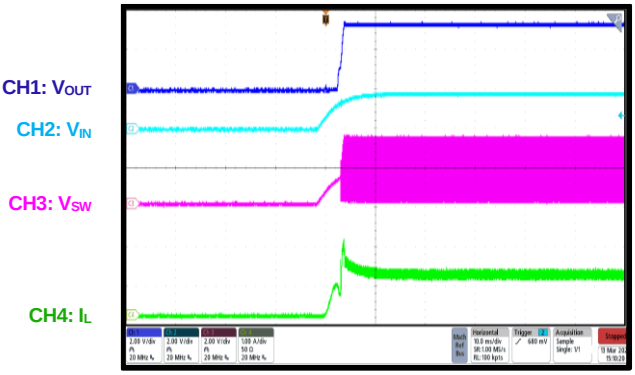
Steady State
I_{OUT} = 0.5A



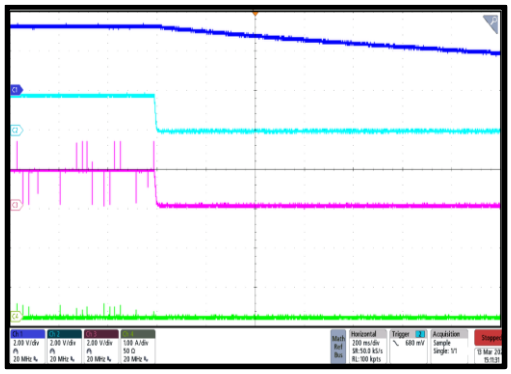
Start-Up through VIN
I_{OUT} = 0A



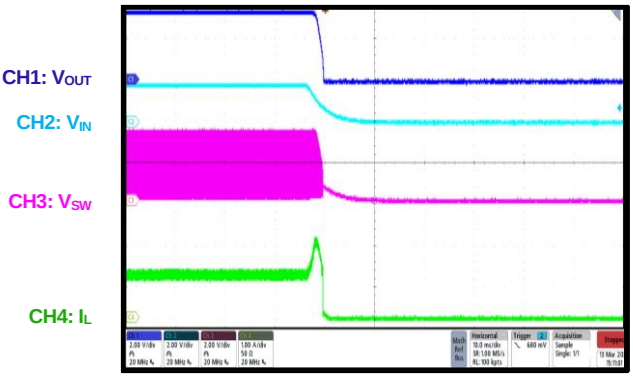
Start-Up through VIN
I_{OUT} = 0.5A



Shutdown through VIN
I_{OUT} = 0A



Shutdown through VIN
I_{OUT} = 0.5A

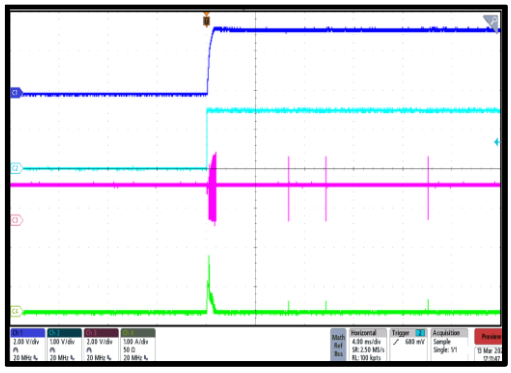


MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2020 MPS. All Rights Reserved.

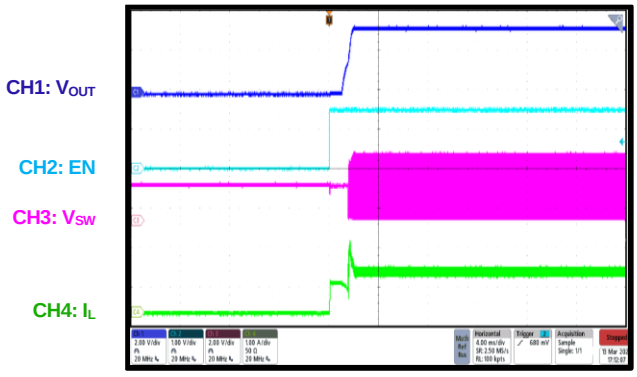
EVB TEST RESULTS *(continued)*

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.

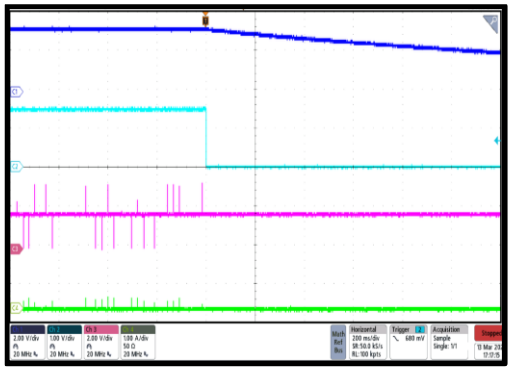
Start-Up through EN
I_{OUT} = 0A



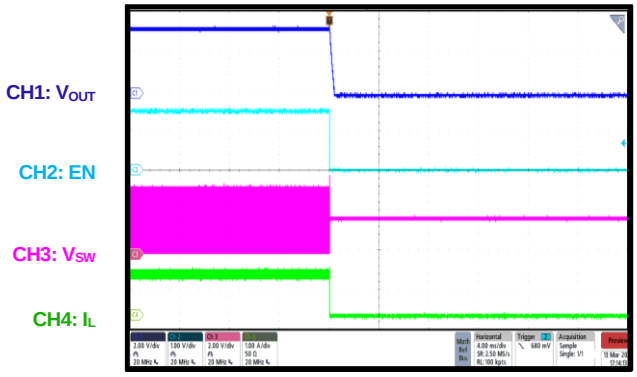
Start-Up through EN
I_{OUT} = 0.5A



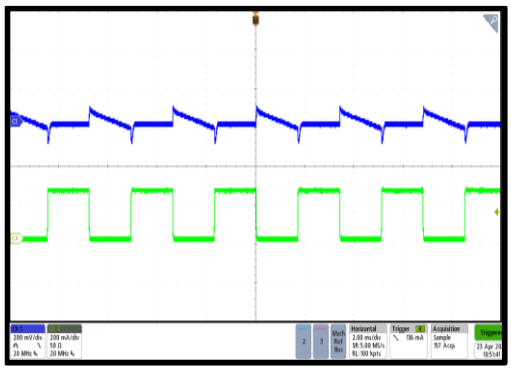
Shutdown through EN
I_{OUT} = 0A



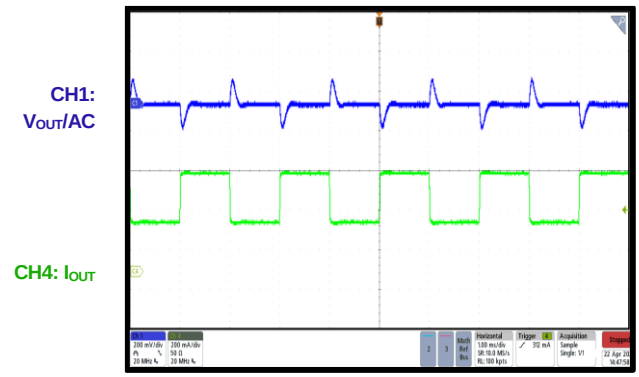
Shutdown through EN
I_{OUT} = 0.5A



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



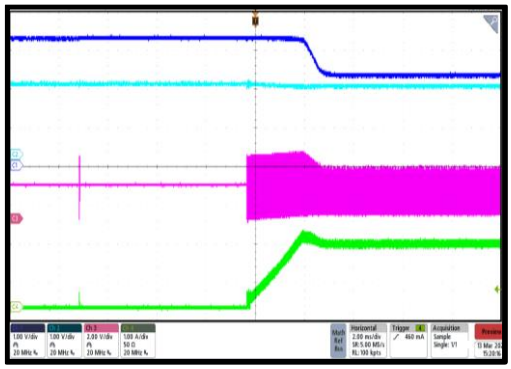
MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2020 MPS. All Rights Reserved.

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.

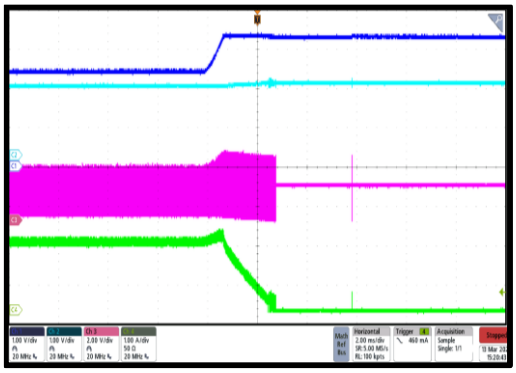
Over-Current Entry

I_{OUT} from 0A to 1A



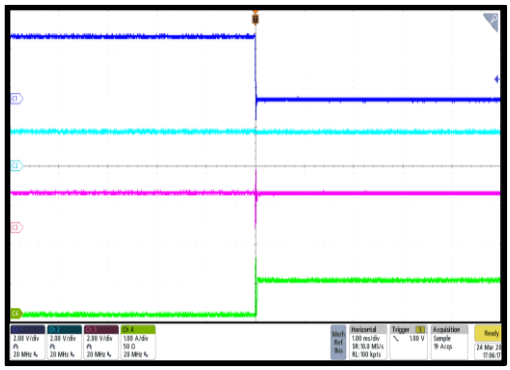
Over-Current Recovery

I_{OUT} from 1A to 0A



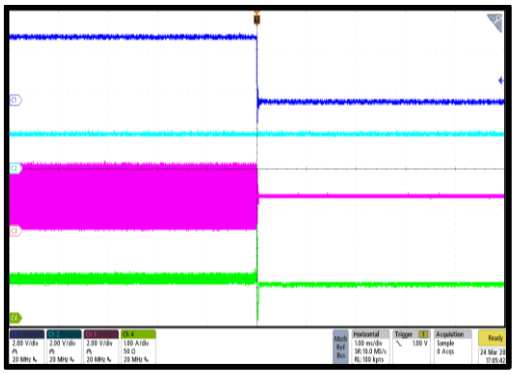
SCP Entry

I_{OUT} = 0A to short



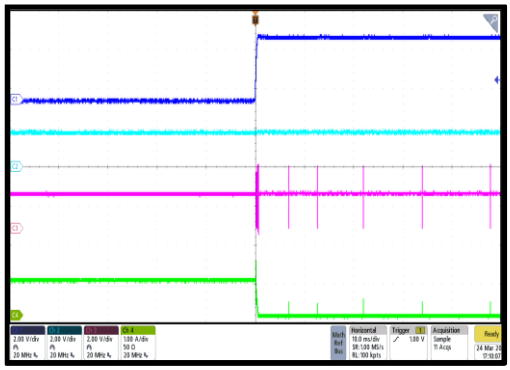
SCP Entry

I_{OUT} = 0.5A to short



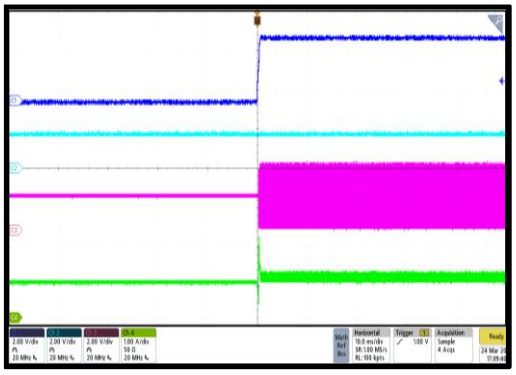
SCP Recovery

I_{OUT} = short to 0A



SCP Recovery

I_{OUT} = short to 0.5A



MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2020 MPS. All Rights Reserved.

PCB LAYOUT

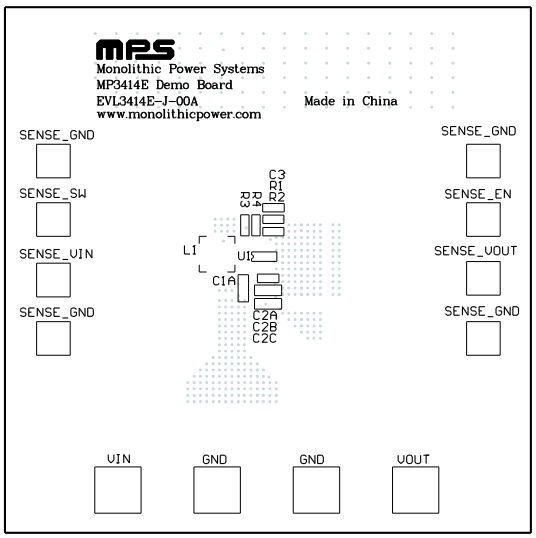


Figure 2: Top Silk Layer

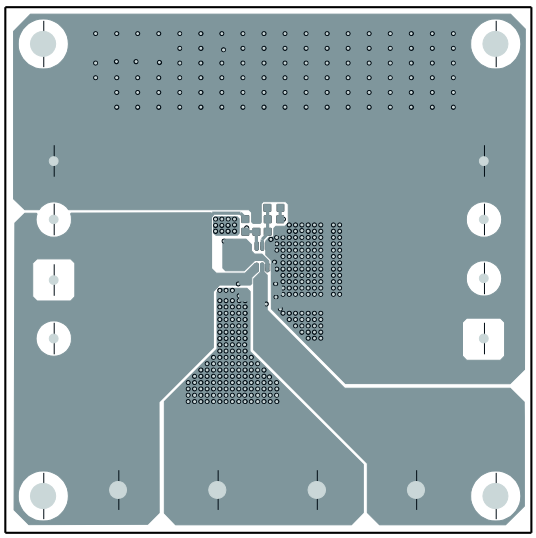


Figure 3: Top Layer

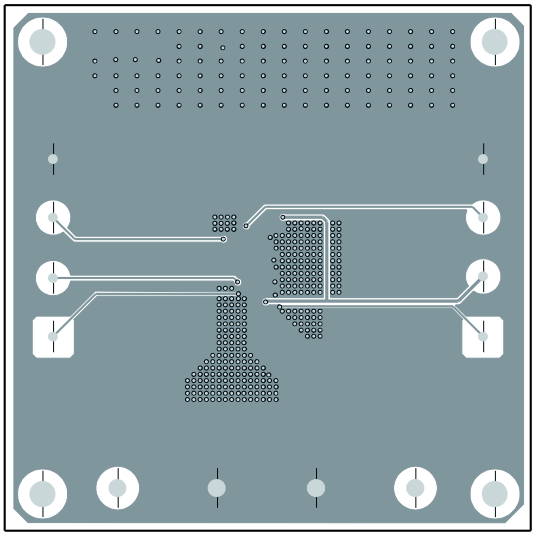


Figure 4: Bottom Layer

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2020 MPS. All Rights Reserved.

Revision History

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

Notice: The information in this document is subject to change without notice. Please contact MPS for current specifications. Users should warrant and guarantee that third-party Intellectual Property rights are not infringed upon when integrating MPS products into any application. MPS will not assume any legal responsibility for any said applications.

MPS Proprietary Information. Patent Protected. Unauthorized Photocopy and Duplication Prohibited.
© 2020 MPS. All Rights Reserved.