EV2155-Q-00A

High-Efficiency, Single-Inductor, DC/DC Buck-Boost Converter Evaluation Board

The Future of Analog IC Technology

DESCRIPTION

The EV2155-Q-00A is an evaluation board designed to demonstrate the capabilities of the MP2155, a highly efficient, low quiescent current (I_Q), buck-boost converter. It can operate from an input voltage (V_{IN}) above, below, or equal to its output voltage (V_{OUT}). The device is ideal for products powered by a single-cell lithium-ion or multi-cell alkaline battery where the IC's V_{OUT} is within the battery voltage range.

The device operates from a 2V to 5.5V V_{IN} range, and has an adjustable 1.5V to 5V V_{OUT}.

The MP2155 and is available in a QFN-10 (3mmx3mm) package.

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Value	Units
Supply voltage	V_{IN}	2 to 5.5	V
Output voltage	V_{OUT}	3.3	V
Output current	I_{OUT}	0 to OCP	A

FEATURES

- 2V to 5.5V Input Voltage (V_{IN}) Range
- 1.5V to 5V Adjustable Output Voltage (V_{OUT})
- Up to 95% Efficiency
- Load Disconnect During Shutdown
- 1MHz Switching Frequency (f_{SW})
- Pulse-Skip Mode (PSM) during Light-Load Operations
- Low 80μA Quiescent Current (I_Q)
- Internal Loop Compensation for Fast Transient Response
- Internal Soft Start (SS)
- Short-Circuit Protection (SCP) with Hiccup Mode
- Over-Temperature Protection (OTP)
- Available in a QFN-10 (3mmx3mm) Package

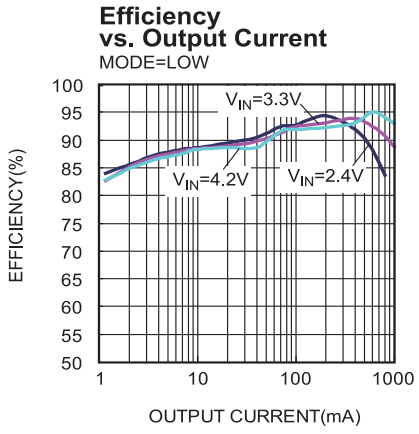
MPL Optimized Performance with MPS Inductor MPL-AL6050 Series

APPLICATIONS

- Point-of-Sale (POS) Systems
- Portable Instruments
- Wireless Handheld Devices
- Personal Digital Assistants (PDAs)
- MP3 Players

EV2155-Q-00A EVALUATION BOARD

Board Number	MPS IC Number	MPS Inductor
EV2155-Q-00A	MP2155GQ	MPL-AL6050-3R3



QUICK START GUIDE

1. Preset the load to the desired value (e.g. 0.5A). Note that if the board starts up with a heavy load due to the secondary current limit for inrush protection, then the MP2155 may enter short-circuit protection (SCP) hiccup mode during or after start-up.
2. Connect the load terminals to:
   a. Positive (+): VOUT
   b. Negative (-): GND
3. Preset the power supply between 2V and 5.5V.
4. Turn off the power supply.
5. Connect the power supply terminals to:
   a. Positive (+): VIN
   b. Negative (-): GND
6. Turn on the power supply. The board should start up automatically.
7. To use the enable (EN) function, disconnect the jumper (JP1) from the EN pin and apply a digital input to EN. Pull EN above 1.2V to turn the converter on; pull EN below 0.4V to turn it off.
8. To use the MODE pin to enable pulse-skip mode (PSM), turn off the input power and connect the jumper (JP2) to GND.
9. If a different output voltage (V_{OUT}) is required, V_{OUT} can be set by the resistors (R1 and R2). Set R1 between 100kΩ and 180kΩ, and V_{OUT} between 1.5V to 5V. Then R2 can be calculated with Equation (1):

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

Where V_{FB} is the feedback voltage (typically 0.496V).

EVALUATION BOARD SCHEMATIC

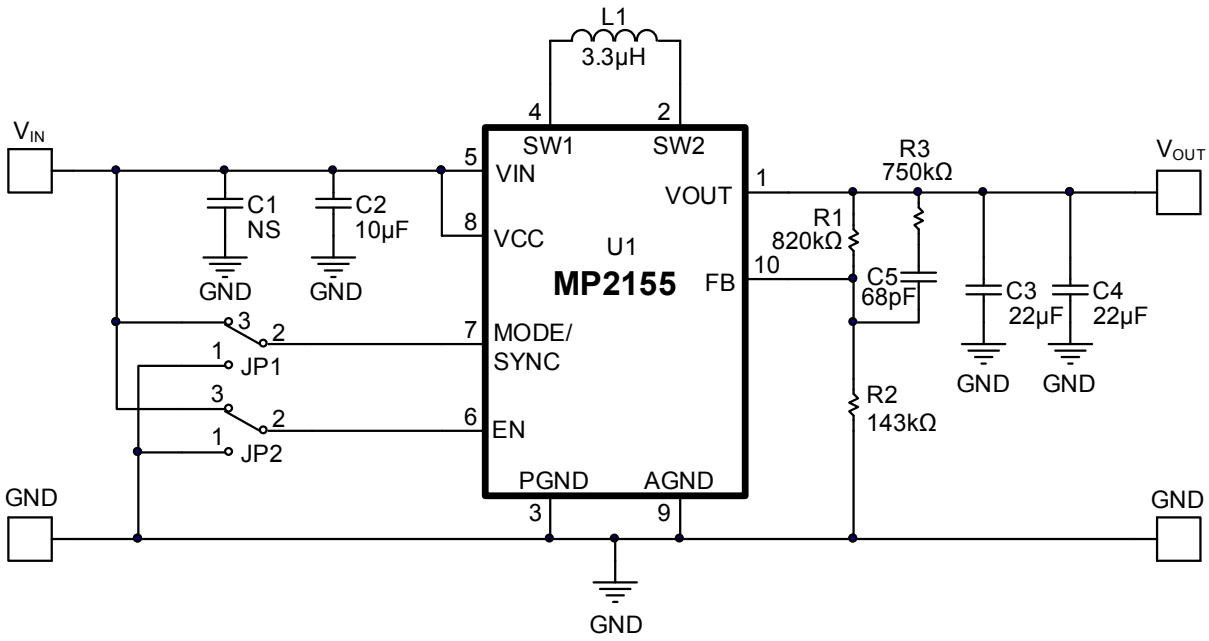


Figure 1: Evaluation Board Schematic

EV2155-Q-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
1	C1	NS				
1	C2	10µF	Ceramic capacitor, 6.3V, X7R	0805	Murata	GRM21BR60J106KE19D
2	C3, C4	22µF	Ceramic capacitor, 6.3V, X5R	0805	Murata	GRM21BR60J226ME39L
1	C5	68pF	Ceramic capacitor, 50V, X7R	0603	Murata	GRM188R71H680KL
2	JP1, JP2	2.54mm	3-pin header	DIP	Sullins	PCC02SAAN
1	L1 (1)	3.3µH	L = 3.3µH, I_{RATED} = 10.1A, RDC = 11.7mΩ	SMD	MPS	MPL-AL6050-3R3
			L = 3.3µH, I_{RATED} = 8A, RDC = 9mΩ	SMD	Wurth	744314330
1	R1	820k	Film resistor, 1%	0603	Yageo	RC0603FR-07820KL
1	R2	143k	Film resistor, 1%	0603	Yageo	RC0603FR-07143KL
1	R3	750k	Film resistor, 5%	0603	Yageo	RC0603JR-07750KL
1	U1	MP2155	Buck-boost converter, 5.5V, 2.3A	QFN-10 (3mmx3mm)	MPS	MP2155GQ

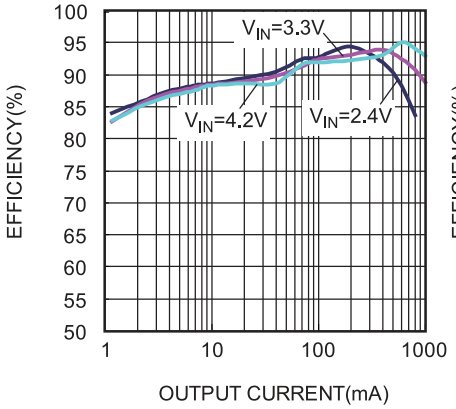
Note:

1) Older versions of the evaluation board include the Wurth inductor. Newer versions of the board include the MPS inductor.

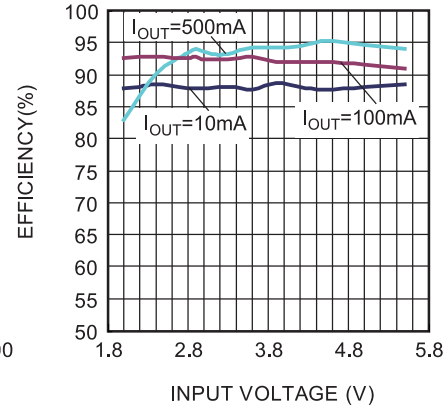
EVB TEST RESULTS

Performance waveforms are tested on the evaluation board. V_{IN} = 3.3V, V_{OUT} = 3.3V, L = 3.3µH, C_{OUT} = 2 x 22µF, T_A = 25°C, unless otherwise noted.

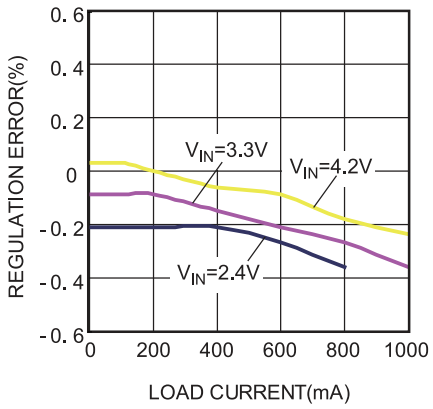
Efficiency vs. Output Current
MODE=LOW



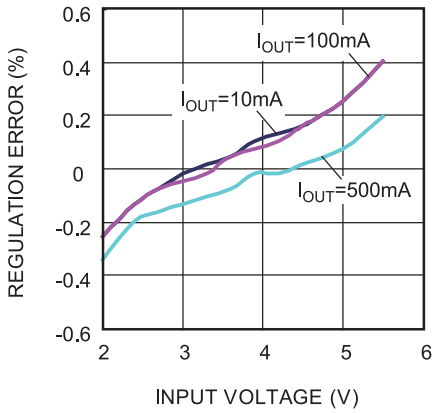
Efficiency vs. Input Voltage
MODE=LOW



Load Regulation
MODE=HIGH



Line Regulation
MODE=HIGH

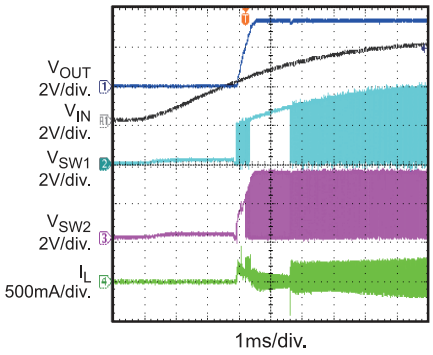


EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board. V_{IN} = 3.3V, V_{OUT} = 3.3V, L = 3.3µH, C_{OUT} = 2 x 22µF, T_A = 25°C, unless otherwise noted.

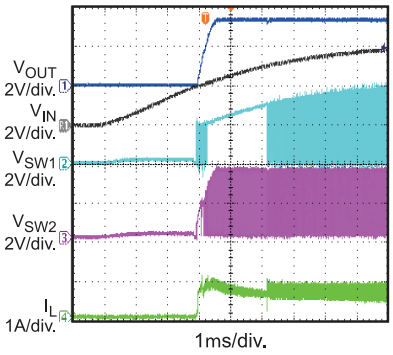
Power Up

V_{IN}=4.2V, I_{OUT}=0A, MODE=HIGH



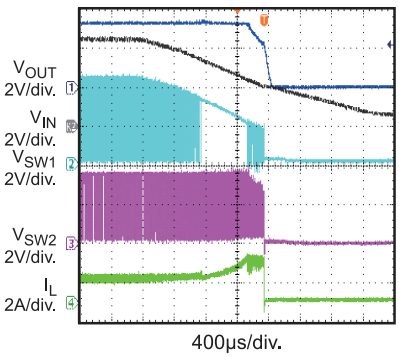
Power Up

V_{IN}=4.2V, I_{OUT}=0.5A, MODE=HIGH



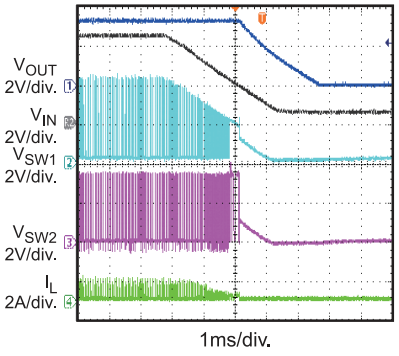
Power Off

V_{IN}=4.2V, I_{OUT}=1A, MODE=HIGH



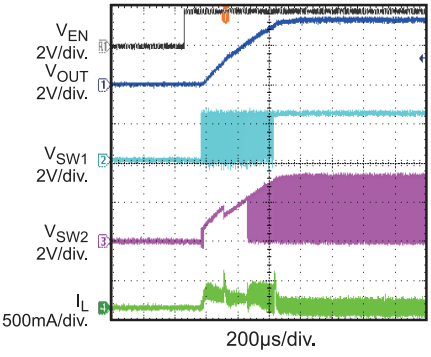
Power Off

V_{IN}=4.2V, I_{OUT}=0.05A, MODE=LOW



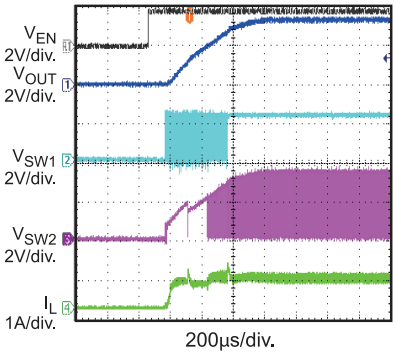
EN Start Up

V_{IN}=2.4V, I_{OUT}=0A, MODE=HIGH



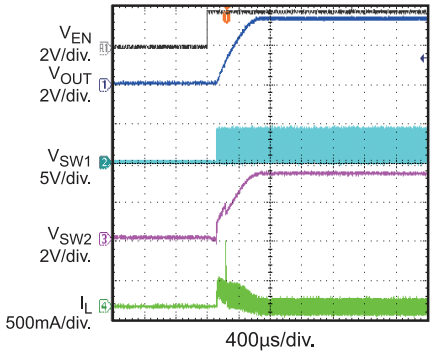
EN Start Up

V_{IN}=2.4V, I_{OUT}=0.5A, MODE=HIGH



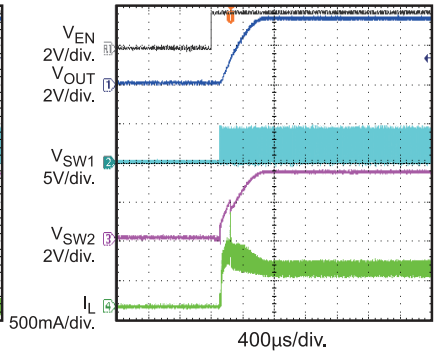
EN Start Up

V_{IN}=4.2V, I_{OUT}=0A, MODE=HIGH



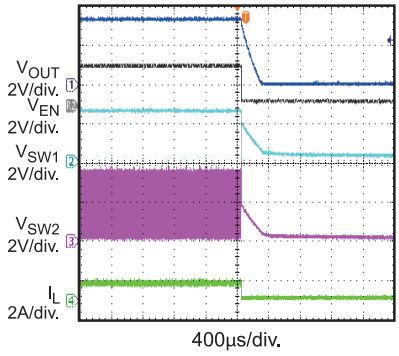
EN Start Up

V_{IN}=4.2V, I_{OUT}=0.5A, MODE=HIGH



EN Shutdown

V_{IN}=2.4V, I_{OUT}=0.5A, MODE=HIGH

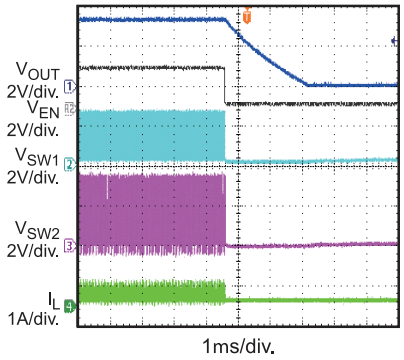


EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board. V_{IN} = 3.3V, V_{OUT} = 3.3V, L = 3.3µH, C_{OUT} = 2 x 22µF, T_A = 25°C, unless otherwise noted.

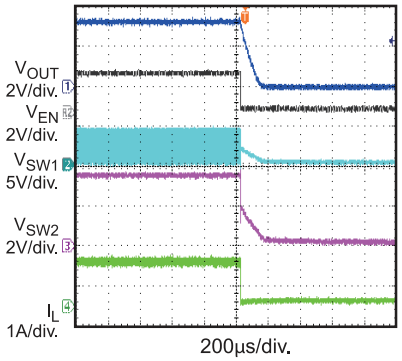
EN Shutdown

V_{IN}=2.4V, I_{OUT}=0.05A, MODE=LOW



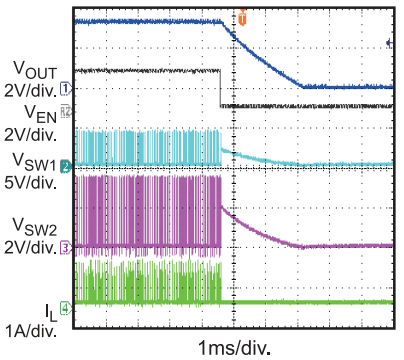
EN Shutdown

V_{IN}=4.2V, I_{OUT}=1A, MODE=HIGH



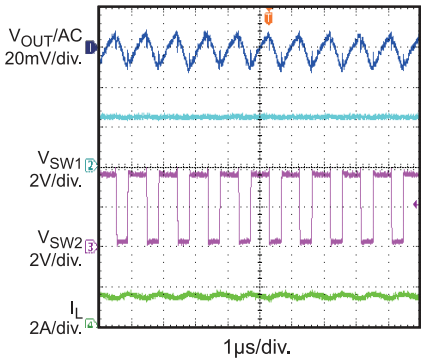
EN Shutdown

V_{IN}=4.2V, I_{OUT}=0.05A, MODE=LOW



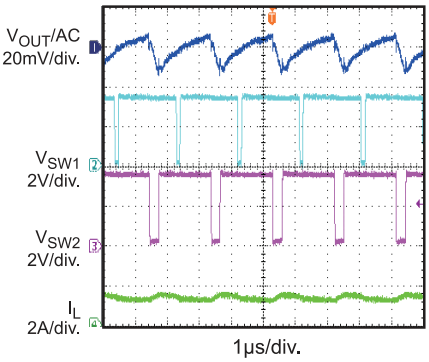
Steady State

V_{IN}=2.4V, I_{OUT}=0.8A, MODE=HIGH



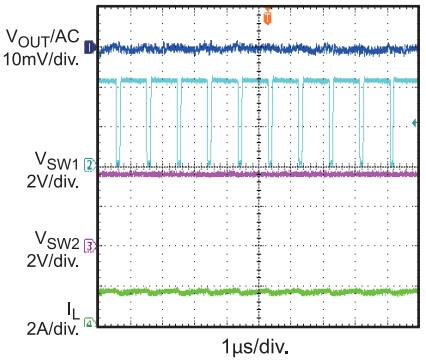
Steady State

V_{IN}=3.3V, I_{OUT}=1A, MODE=HIGH



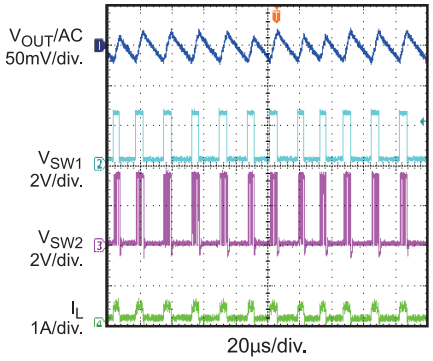
Steady State

V_{IN}=4.2V, I_{OUT}=1.5A, MODE=HIGH



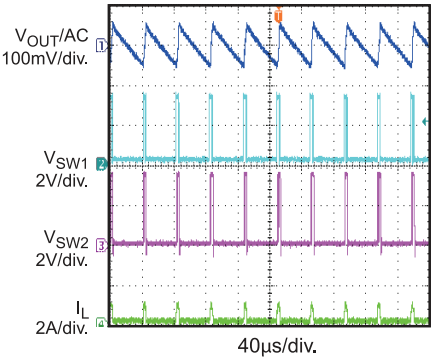
Steady State

V_{IN}=2.4V, I_{OUT}=0.05A, MODE=LOW



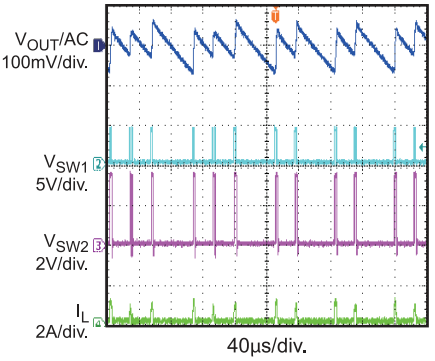
Steady State

V_{IN}=3.3V, I_{OUT}=0.05A, MODE=LOW



Steady State

V_{IN}=4.2V, I_{OUT}=0.05A, MODE=LOW

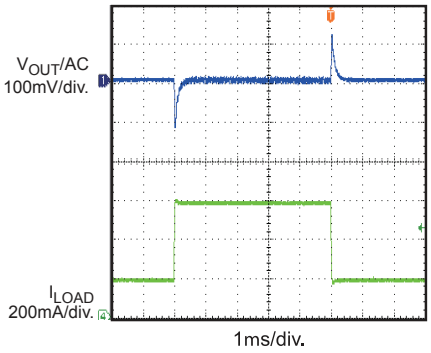


EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board. V_{IN} = 3.3V, V_{OUT} = 3.3V, L = 3.3µH, C_{OUT} = 2 x 22µF, T_A = 25°C, unless otherwise noted.

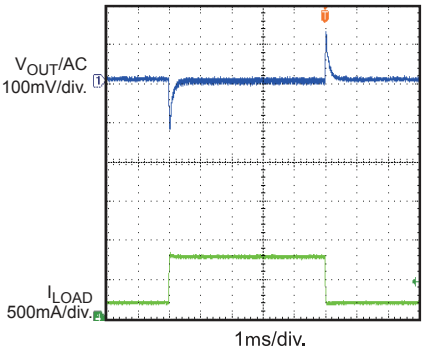
Load Transient Response

V_{IN}=2.4V, I_{OUT}=0.2-->0.6A@250mA/µs, MODE=HIGH



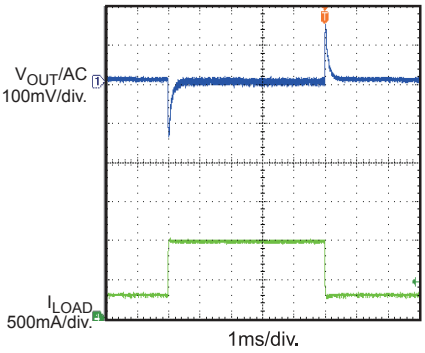
Load Transient Response

V_{IN}=3.3V, I_{OUT}=0.2-->0.8A@250mA/µs, MODE=HIGH



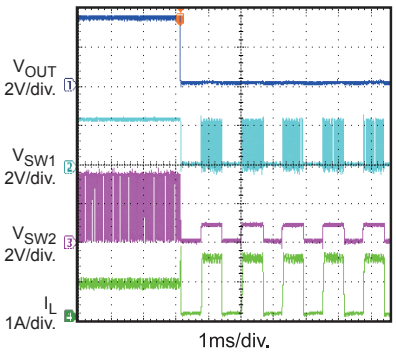
Load Transient Response

V_{IN}=4.2V, I_{OUT}=0.3-->1A@250mA/µs, MODE=HIGH



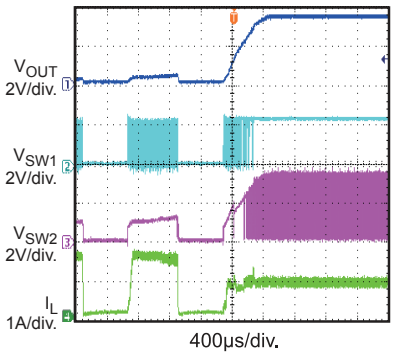
SCP Entry

V_{IN}=2.4V, I_{OUT}=0.5A, MODE=HIGH



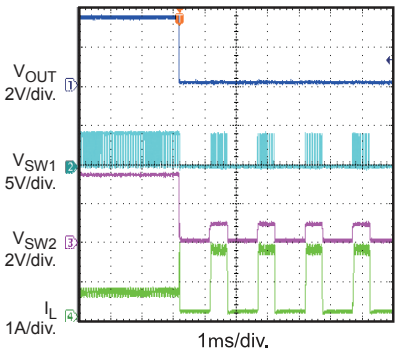
SCP Recovery

V_{IN}=2.4V, I_{OUT}=0.5A, MODE=HIGH



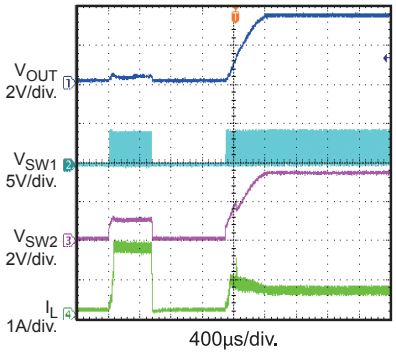
SCP Entry

V_{IN}=4.2V, I_{OUT}=0.5A, MODE=HIGH



SCP Recovery

V_{IN}=4.2V, I_{OUT}=0.5A, MODE=HIGH



PCB LAYOUT

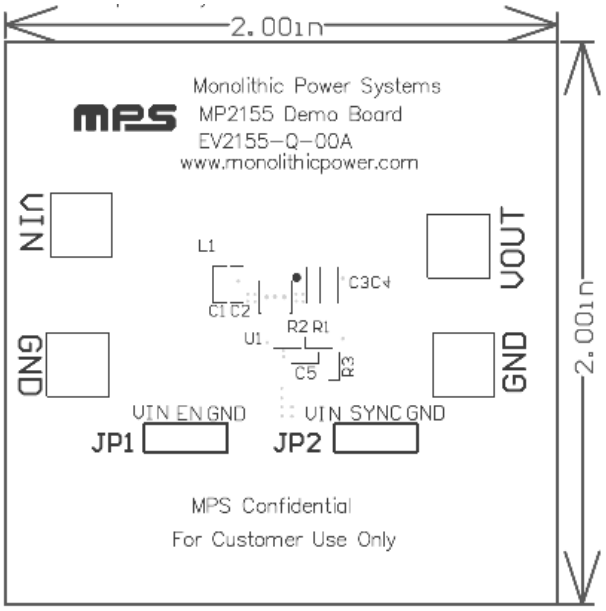


Figure 2: Top Silk

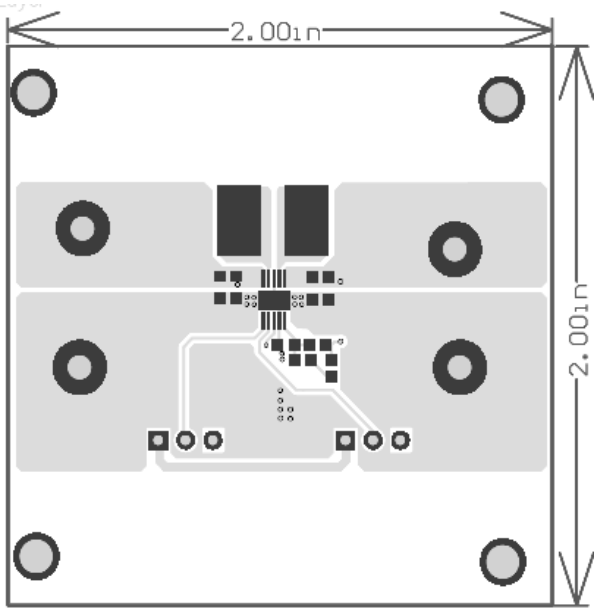


Figure 3: Top Layer

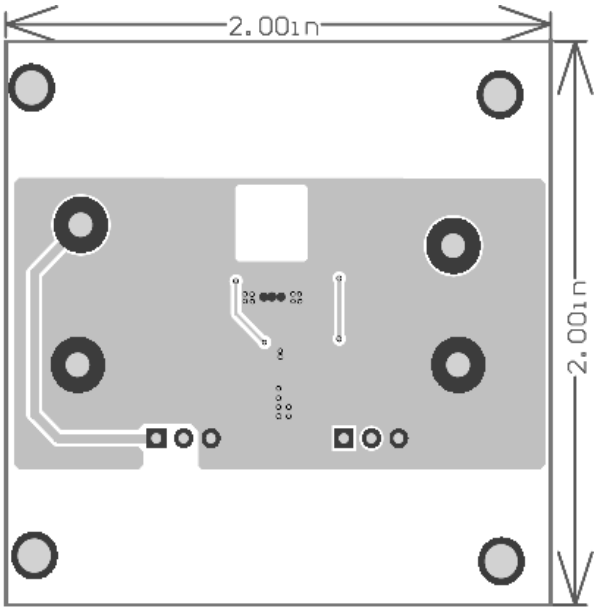


Figure 4: Bottom Silk

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	8/15/2013	Initial Release	-
1.1	6/24/2021	Updated the Description and Features sections; updated the footnote below the Applications section	1
		Updated the Quick Start Guide section	2
		Added the MPS inductor information to the EV2155-Q-00A Bill of Materials section; added Note 1	4
		Formatting, grammar, and clerical updates; updated figure titles; updated pagination; updated headers and footers	All