



The Future of Analog IC Technology®

# EV2155-Q-00A

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

### 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 80 $\mu$ A 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



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

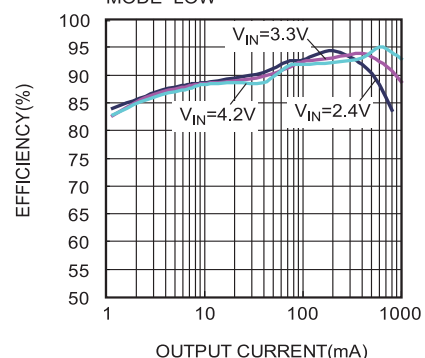
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## EV2155-Q-00A EVALUATION BOARD



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

Efficiency  
vs. Output Current  
MODE=LOW



## 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 100k $\Omega$  and 180k $\Omega$ , 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

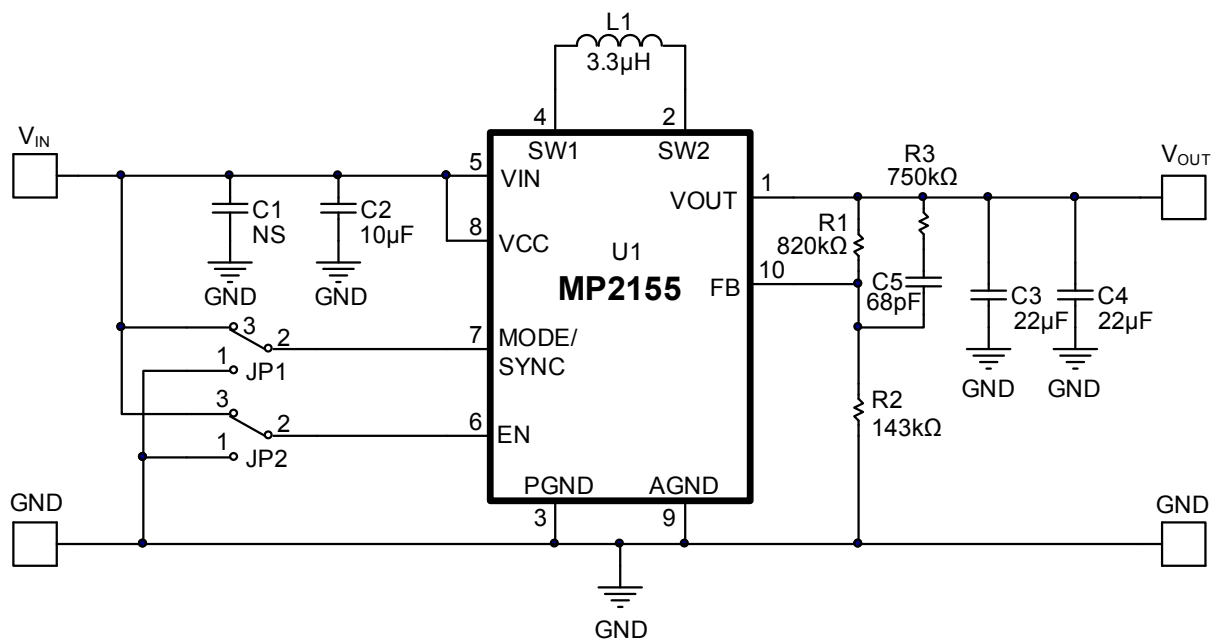


Figure 1: Evaluation Board Schematic

## EV2155-Q-00A BILL OF MATERIALS

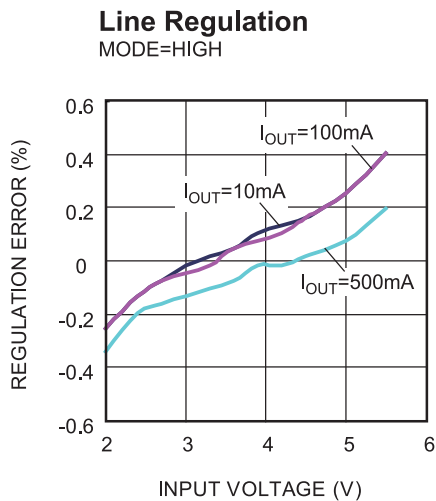
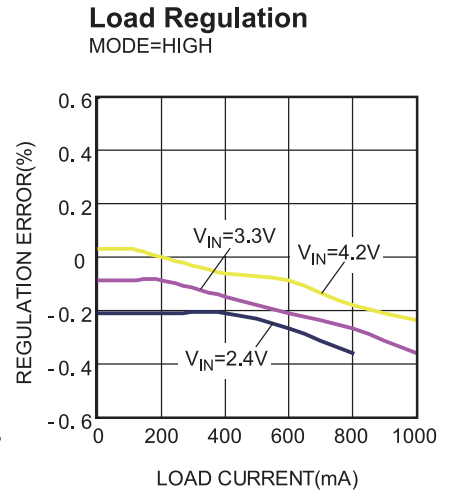
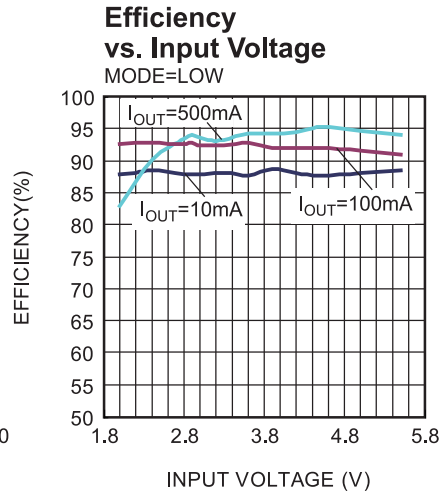
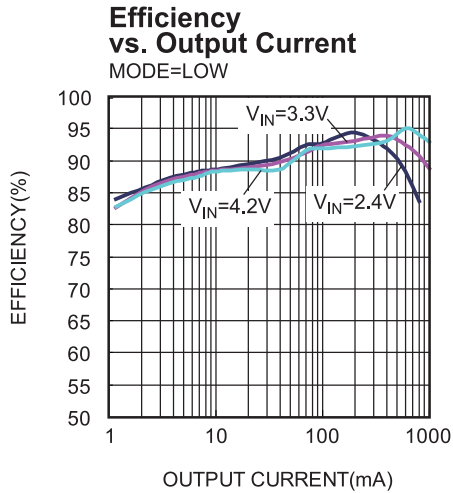
Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
1	C1	NS				
1	C2	10 $\mu$ F	Ceramic capacitor, 6.3V, X7R	0805	Murata	GRM21BR60J106KE19D
2	C3, C4	22 $\mu$ F	Ceramic capacitor, 6.3V, X5R	0805	Murata	GRM21BR60J226ME39L
1	C5	68pF	Ceramic capacitor, 50V, X7R	0603	Murata	GRM188R71H680KL
2	JP1, JP2	2.54mm	3-pin header	DIP	Sullins	PCC02SAAN
1	L1 <sup>(1)</sup>	3.3 $\mu$ H	L = 3.3 $\mu$ H, I <sub>RATED</sub> = 10.1A, RDC = 11.7m $\Omega$	SMD	MPS	MPL-AL6050-3R3
			L = 3.3 $\mu$ H, I <sub>RATED</sub> = 8A, RDC = 9m $\Omega$	SMD	Würth	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 Würth inductor. Newer versions of the board include the MPS inductor.

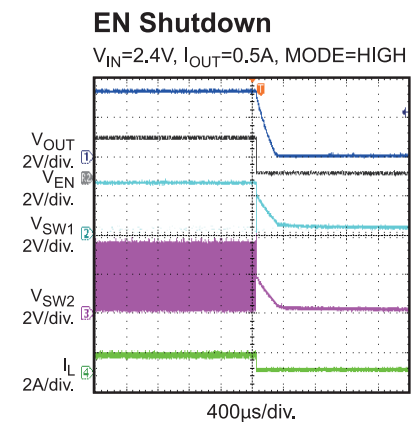
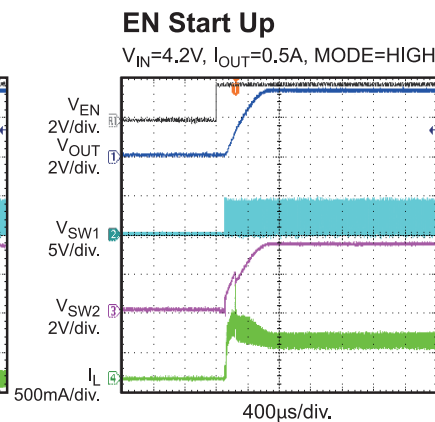
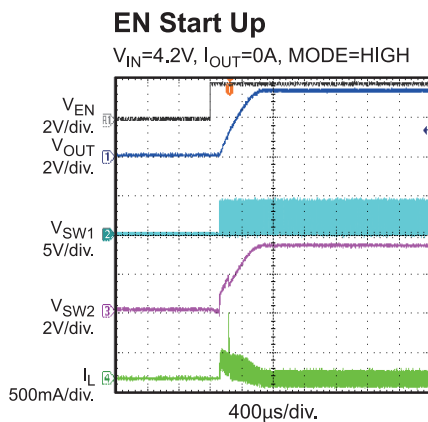
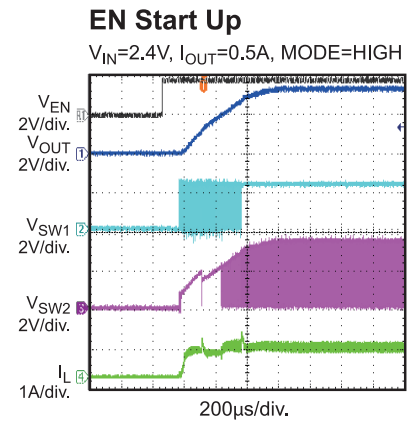
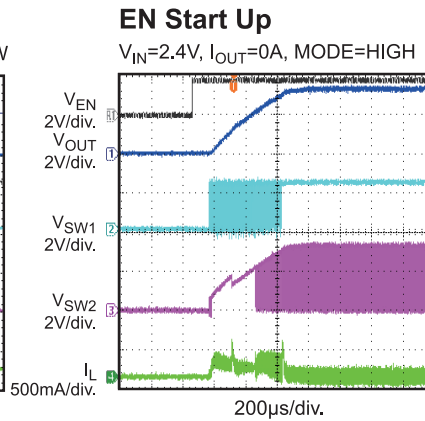
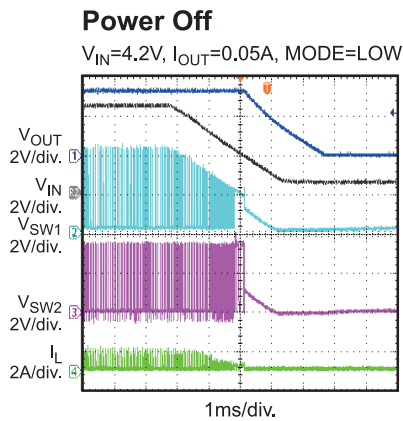
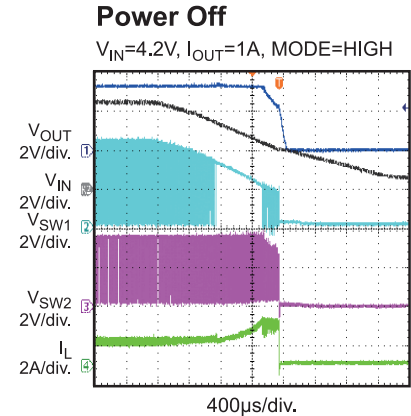
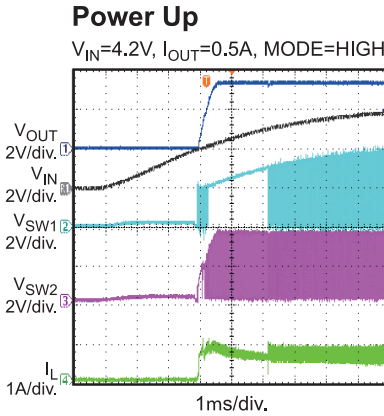
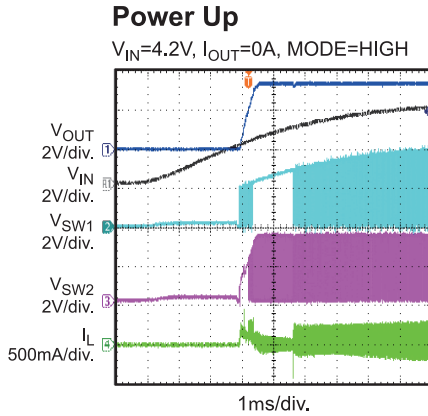
## EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.  $V_{IN} = 3.3V$ ,  $V_{OUT} = 3.3V$ ,  $L = 3.3\mu H$ ,  $C_{OUT} = 2 \times 22\mu F$ ,  $T_A = 25^\circ C$ , unless otherwise noted.



## EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.  $V_{IN} = 3.3V$ ,  $V_{OUT} = 3.3V$ ,  $L = 3.3\mu H$ ,  $C_{OUT} = 2 \times 22\mu F$ ,  $T_A = 25^\circ C$ , unless otherwise noted.

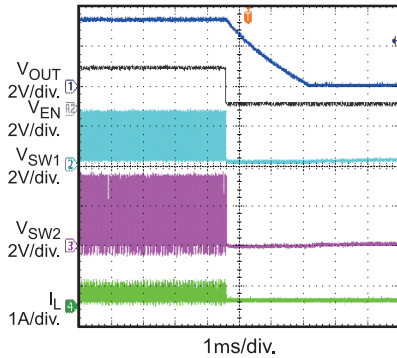


## EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.  $V_{IN} = 3.3V$ ,  $V_{OUT} = 3.3V$ ,  $L = 3.3\mu H$ ,  $C_{OUT} = 2 \times 22\mu F$ ,  $T_A = 25^\circ C$ , unless otherwise noted.

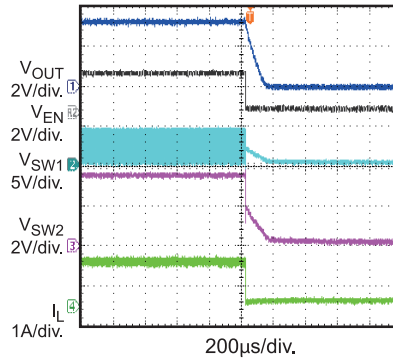
### EN Shutdown

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



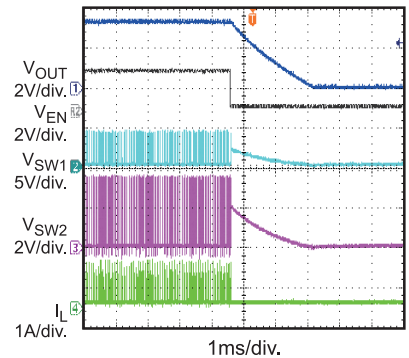
### EN Shutdown

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



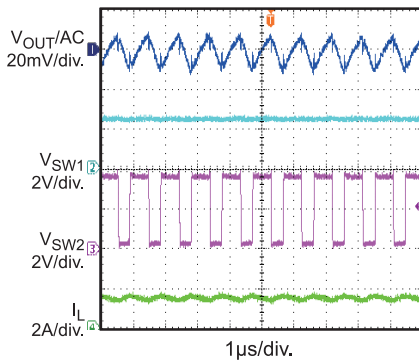
### EN Shutdown

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



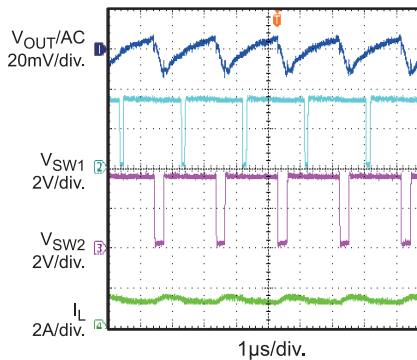
### Steady State

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



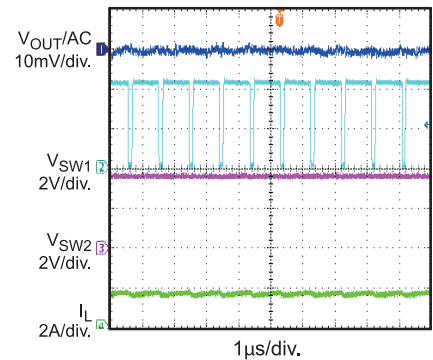
### Steady State

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



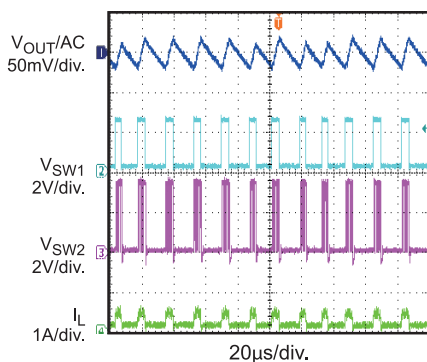
### Steady State

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



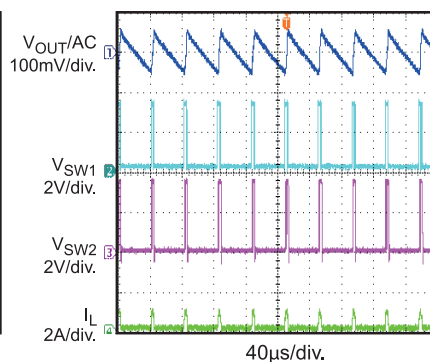
### Steady State

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



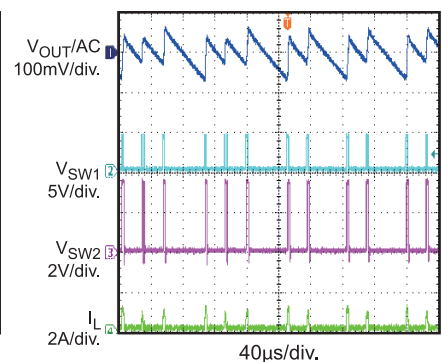
### Steady State

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



### Steady State

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

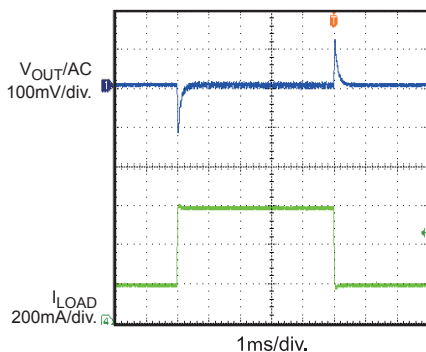


## EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.  $V_{IN} = 3.3V$ ,  $V_{OUT} = 3.3V$ ,  $L = 3.3\mu H$ ,  $C_{OUT} = 2 \times 22\mu F$ ,  $T_A = 25^\circ C$ , unless otherwise noted.

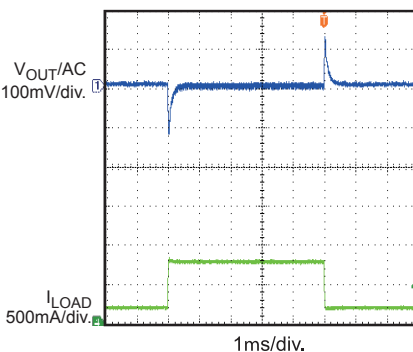
### Load Transient Response

$V_{IN}=2.4V$ ,  $I_{OUT}=0.2 \rightarrow 0.6A@250mA/\mu s$ ,  
MODE=HIGH



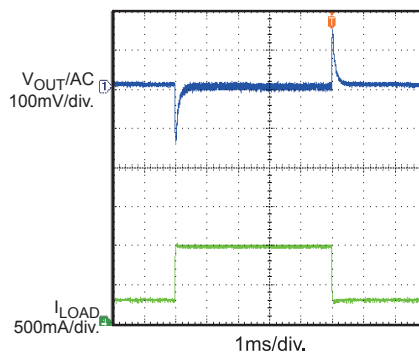
### Load Transient Response

$V_{IN}=3.3V$ ,  $I_{OUT}=0.2 \rightarrow 0.8A@250mA/\mu s$ ,  
MODE=HIGH



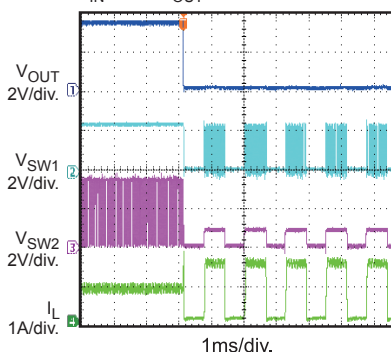
### Load Transient Response

$V_{IN}=4.2V$ ,  $I_{OUT}=0.3 \rightarrow 1A@250mA/\mu s$ ,  
MODE=HIGH



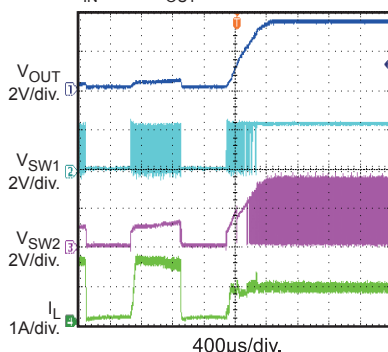
### SCP Entry

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



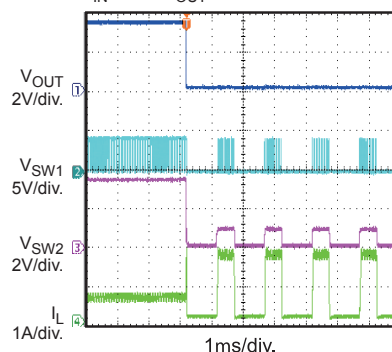
### SCP Recovery

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



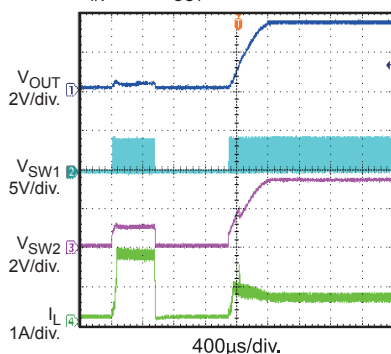
### SCP Entry

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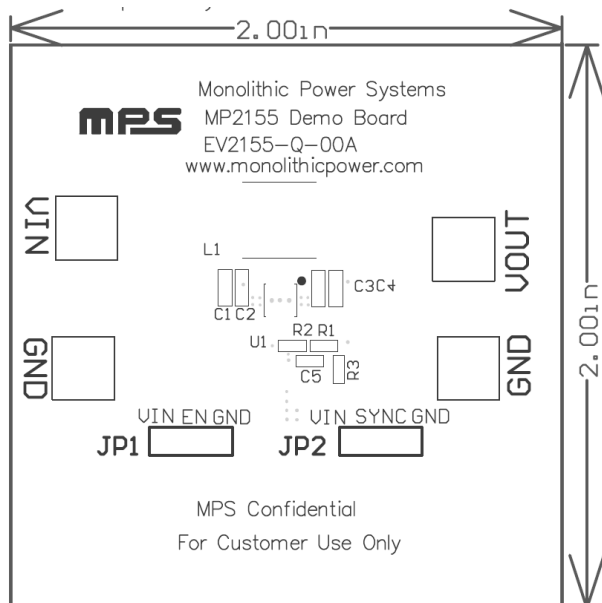
### SCP Recovery

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

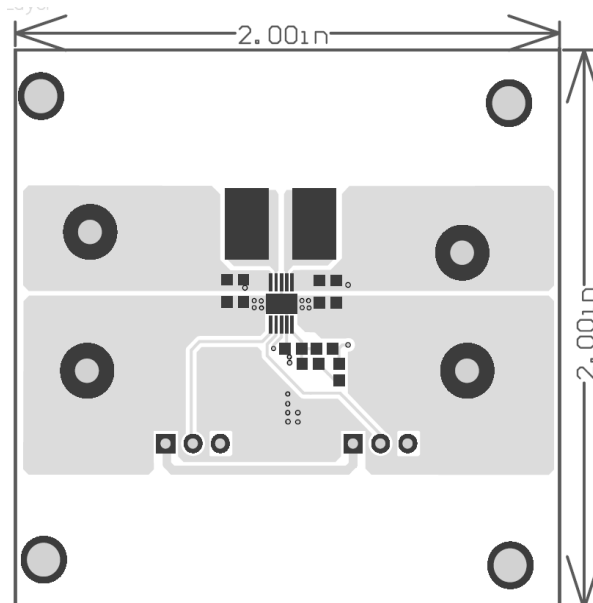




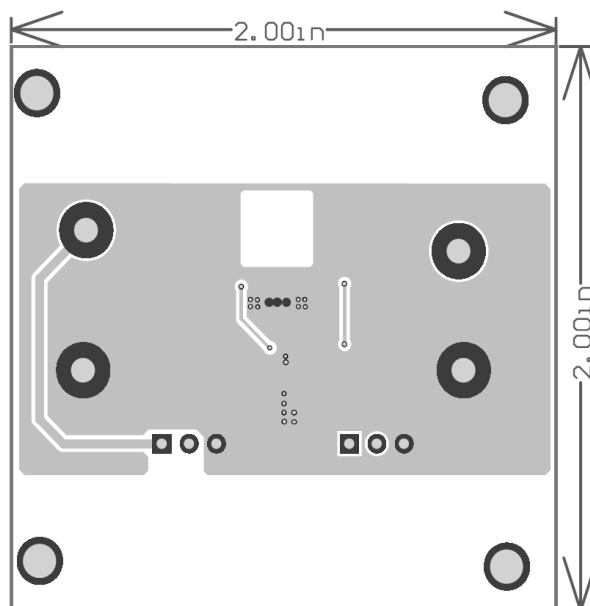
## PCB LAYOUT



**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

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