EV8795-LE-00A

16V, 15A, High-Efficiency, Synchronous, Step-Down Converter Evaluation Board

DESCRIPTION

The EV8795-LE-00A is an evaluation board designed to demonstrate the capabilities of the MP8795, a high-efficiency, monolithic, synchronous, step-down converter.

The MP8795 can deliver up to 15A of continuous output current (I_{OUT}) across a wide input voltage (V_{IN}) range, and is highly efficient across a wide output current range (up to 15A).

Internally compensated constant-on-time (COT) control provides fast transient response and eases loop stabilization.

The remote enable (EN) input referenced to ground turns the part on and off. This input is compatible with most popular logic devices.

The MP8795 is available in a QFN-21 (3mmx4mm) Package.

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Value	Units
Input voltage	V_{IN}	8 to 16	V
Output voltage	V_{OUT}	1	V
Output current	I_{OUT}	15	A

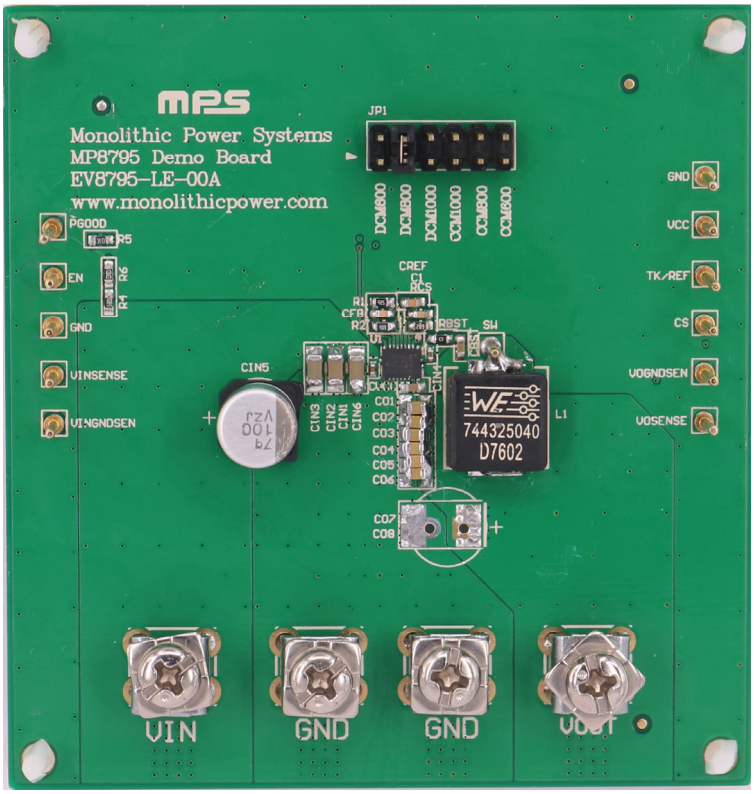
FEATURES

- Wide Input Voltage (V_{IN}) Range:
  - 2.7V to 16V V_{IN} Range with External 3.3V V_{CC} Bias
  - 4V to 16V V_{IN} Range with Internal V_{CC} Bias or External 3.3V V_{CC} Bias
- Up to 15A Continuous Output Current (I_{OUT})
- Differential V_{OUT} Remote Sense
- Configurable Accurate Current Limit
- Low $R_{DS(ON)}$, Integrated Power MOSFETs
- Proprietary Switching Loss Reduction
- Adaptive Constant-On-Time (COT) Control for Fast Transient Response
- Stable with Zero-ESR Output Capacitors
- Reference Voltage (V_{REF}):
  - 0.5% V_{REF} from 0°C to 70°C Junction Temperature (T_J)
  - 1% V_{REF} from -40°C to +125°C T_J
- Selectable Pulse-Skip Mode (PSM) and Forced Continuous Conduction Mode (FCCM)
- 600kHz, 800kHz, and 1000kHz Selectable Switching Frequency (f_{SW})
- Up to 5.5V Adjustable Output from 0.6V to 90% x V_{IN}
- Excellent Load Regulation
- V_{OUT} Tracking and V_{OUT} Discharge
- Power Good (PG) Clamps Active Low during Power Failure
- Configurable Soft-Start Time (t_{SS}) from 1ms
- Pre-Bias Start-Up
- Non-Latch OCP, UVP, and UVLO
- Latch-Off OVP
- Thermal Shutdown
- Available in a QFN-21 (3mmx4mm) Package

APPLICATIONS

- Telecommunication Systems
- Networking Systems
- Servers
- Base Stations

EV8795-LE-00A EVALUATION BOARD



LxWxH (81.3mmx77.5mmx6mm)

Board Number	MPS IC Number
EV8795-LE-00A	MP8795GLE

QUICK START GUIDE

The EV8795-LE-00A has an 8V to 16V input voltage (V_{IN}) range. The enable (EN) signal derived from V_{IN} via a resistor divider (R4 and R6) limits the 8V minimum V_{IN}. V_{IN} can be set as low as 2.7V by adjusting the resistor divider values (R4 and R6), or by adding an external EN signal. Follow the steps below to turn on the evaluation board:

1. Preset the power supply between 8V and 16V, then turn off the power supply.
2. Connect the load terminals to:
   a. Positive (+): VOUT
   b. Negative (-): GND
3. Connect the power supply terminals to:
   a. Positive (+): VIN
   b. Negative (-): GND
4. Ensure that the power supply has a high enough current limit to supply the power.
5. Turn on the power supply. The board should start up automatically.
6. To use the EN function, apply a digital input to the EN pin. Drive EN above 1.5V to turn the converter on; drive EN below 1V to turn it off.
7. Use R1 and R2 to set the output voltage (V_{OUT}) with V_{FB} = 0.6V. (1)
8. JP1 selects the switching frequency (f_{SW}), as well as the operation mode under light-load conditions. f_{SW} can be set to 600kHz, 800kHz, or 1000kHz. During light-load operation, JP1 determines whether the device operates in pulse-skip mode (PSM) or forced continuous conduction mode (FCCM).

Note:

1) Refer to the MP8795 datasheet to select the proper values for R1, R2, L1, and the output capacitors.

EVALUATION BOARD SCHEMATIC

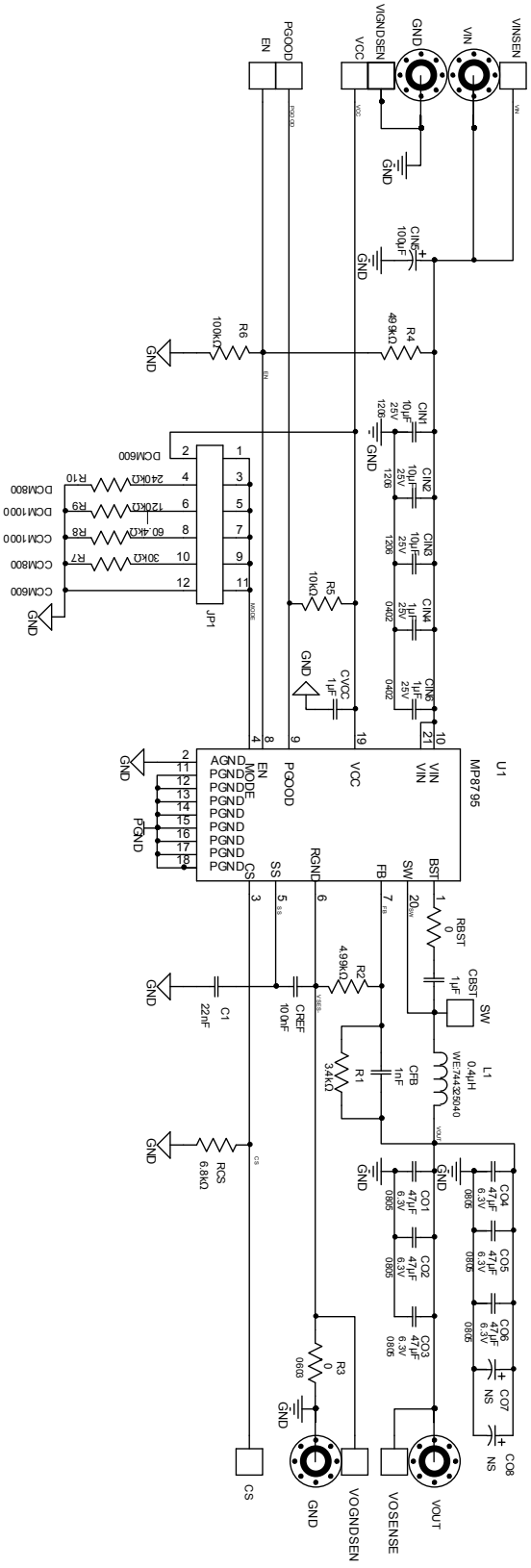


Figure 1: Evaluation Board Schematic

EV8795-LE-00A BILL OF MATERIALS

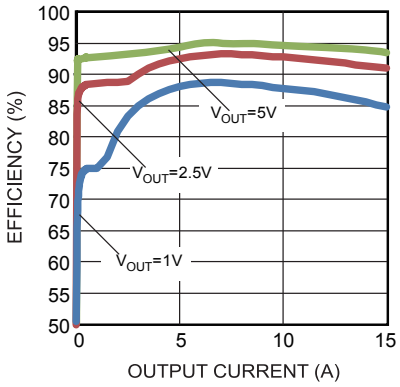
Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
1	C1	22nF	Ceramic capacitor, 25V, X7R	0603	Wurth	885012206067
2	CBST, CVCC	1µF	Ceramic capacitor, 50V, X7R	0603	Wurth	885012206090
1	CFB	1nF	Ceramic capacitor, 50V, X7R	0603	Wurth	885012206083
3	CIN1, CIN2, CIN3	10µF	Ceramic capacitor, 25V, X5R	1206	Murata	GRM188R61E106MA73L
2	CIN4, CIN6	1µF	Ceramic capacitor, 25V, X5R	0402	Murata	GRM155R61E105KA12D
1	CIN5	100µF	Electrolytic capacitor, 25V, ±20%	DIP	Chemi-Con	EMZJ350ARA101MHA0G
6	CO1, CO2, CO3, CO4, CO5, CO6	47µF	Ceramic capacitor, 6.3V, X5R	0805	Wurth	885012107006
0	CO7, CO8	NS				
1	CREF	100nF	Ceramic capacitor, 25V, X7R	0603	Wurth	885012206071
1	R1	3.4kΩ	Film resolution, 1%	0603	Yageo	RC0603FR-073K4L
1	R2	4.99kΩ	Film resolution, 1%	0603	Yageo	RC0603FR-074K99L
2	R3, RBST	0Ω	Film resolution, 1%	0603	Yageo	RC0603FR-070RL
1	R4	499kΩ	Film resolution, 1%	0603	Yageo	RC0603FR-07499KL
1	R5	10kΩ	Film resolution, 1%	0603	Yageo	RC0603FR-0710KL
1	R6	100kΩ	Film resolution, 1%	0603	Yageo	RC0603FR-07100KL
1	R7	30kΩ	Film resolution, 1%	0603	Yageo	RC0603FR-0730KL
1	R8	60.4kΩ	Film resolution, 1%	0603	Yageo	RC0603FR-0760K4L
1	R9	120kΩ	Film resolution, 1%	0603	Yageo	RC0603FR-07120KL
1	R10	240kΩ	Film resolution, 1%	0603	Yageo	RC0603FR-07240KL
1	RCS	6.8kΩ	Film resolution, 1%	0603	Yageo	RC0603FR-076K8L
1	L1	0.4µH	Inductor DCR = 0.67mΩ, I_{SAT} = 37A	1050	Wurth	744325040
1	U1	MP8795	Synchronous, step-down converter, 16V, 15A	QFN-21 (3mmx 4mm)	MPS	MP8795GLE

EVB TEST RESULTS

Performance waveforms are tested on the EV8795-LE-00A evaluation board. V_{IN} = 12V, V_{OUT} = 1V, L = 400nH, T_A = 25°C, unless otherwise noted.

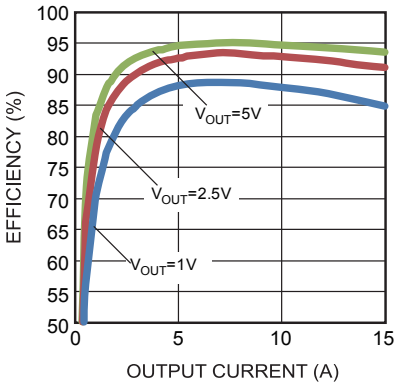
Efficiency

Pulse Skip, 0.4µH, 800kHz



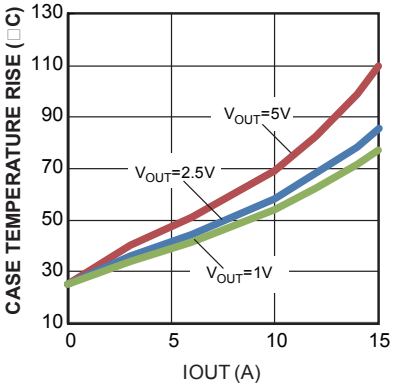
Efficiency

Forced CCM, 0.4µH, 800kHz



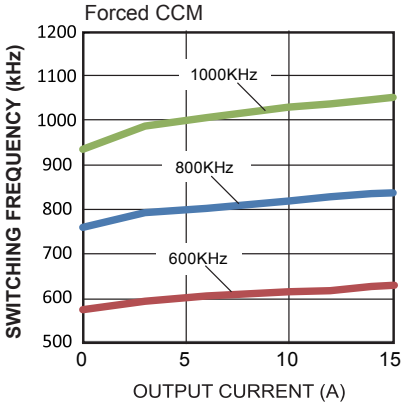
Case Temperature Rise

800kHz

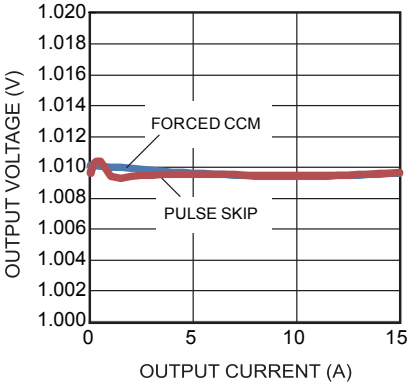


Switching Frequency vs. Output Current

Forced CCM



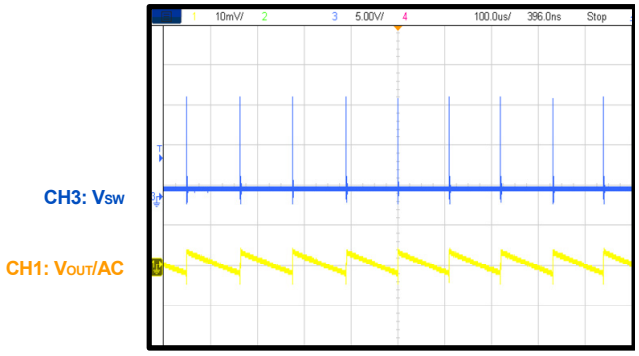
Load Regulation



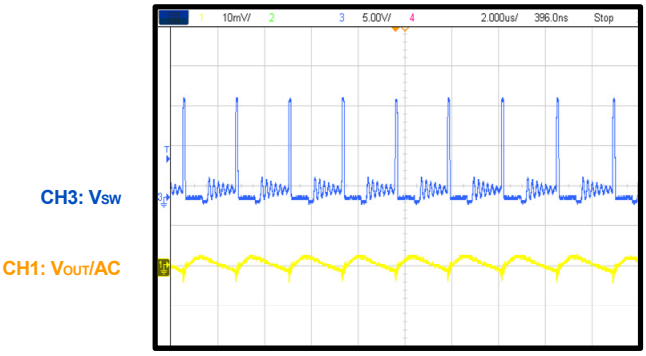
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the EV8795-LE-00A evaluation board. V_{IN} = 12V, V_{OUT} = 1V, L = 400nH, T_A = 25°C, unless otherwise noted.

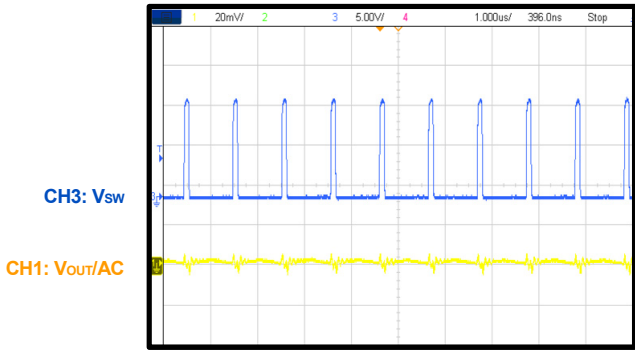
Steady State
I_{OUT} = 0A, Pulse Skip



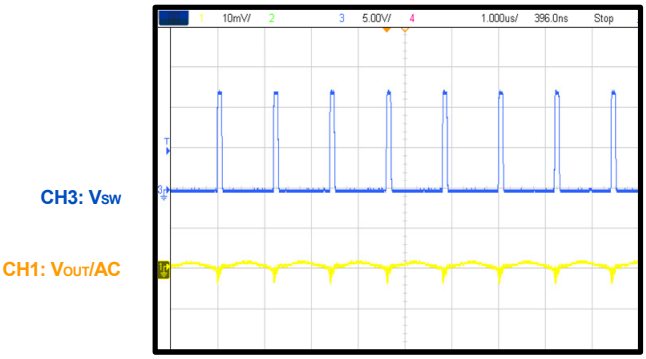
Steady State
I_{OUT} = 0.5A, Pulse Skip



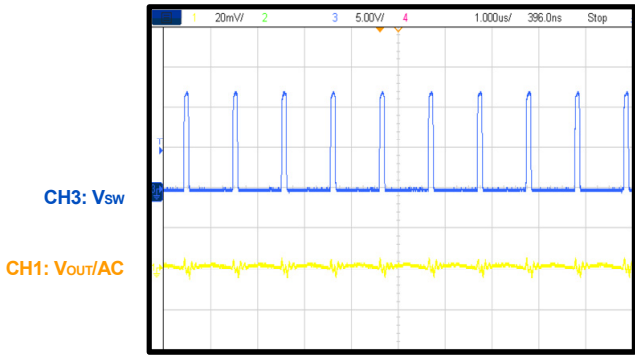
Steady State
I_{OUT} = 15A, Pulse Skip



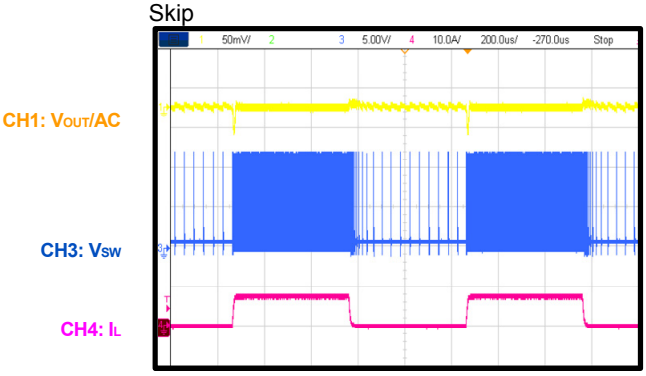
Steady State
I_{OUT} = 0A, Forced CCM



Steady State
I_{OUT} = 15A, Forced CCM



Load Transient
I_{OUT} = 0A~7.5A, 2.5A/μs with E-load, Pulse Skip

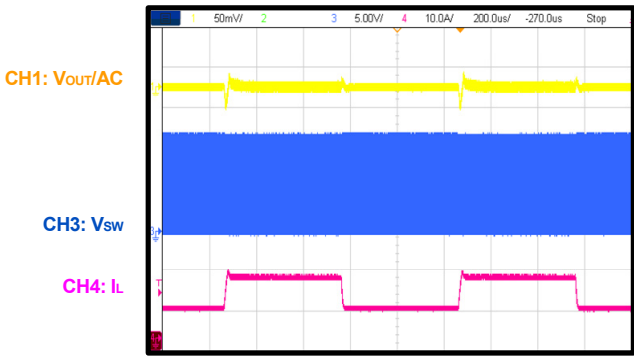


EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the EV8795-LE-00A evaluation board. V_{IN} = 12V, V_{OUT} = 1V, L = 400nH, T_A = 25°C, unless otherwise noted.

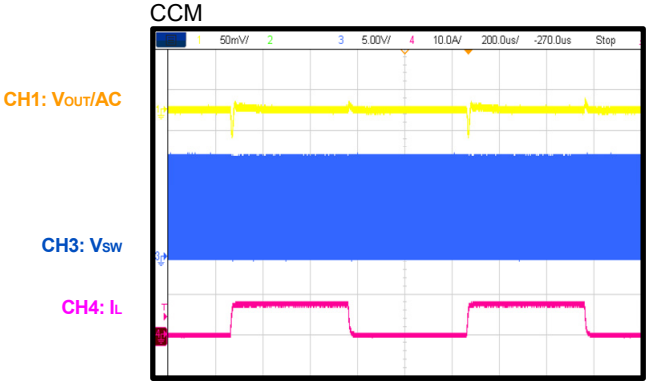
Load Transient

I_{OUT} = 7.5A~15A, 2.5A/μs with E-load



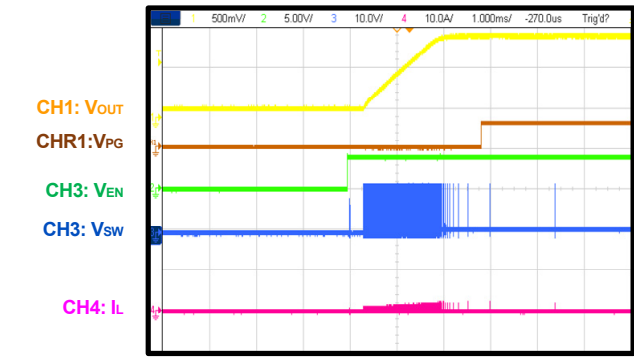
Load Transient

I_{OUT} = 0A~7.5A, 2.5A/μs with E-load, Forced CCM



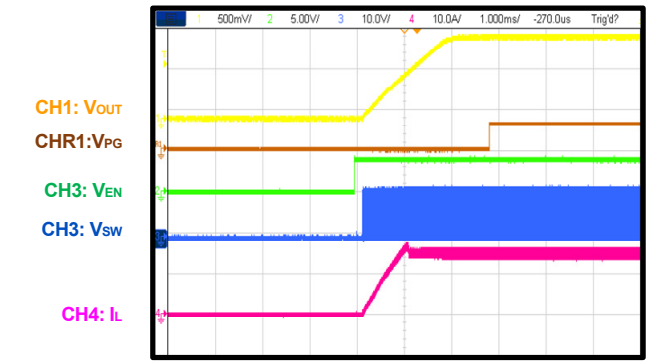
Power Up through EN

I_{OUT} = 0A, Pulse Skip



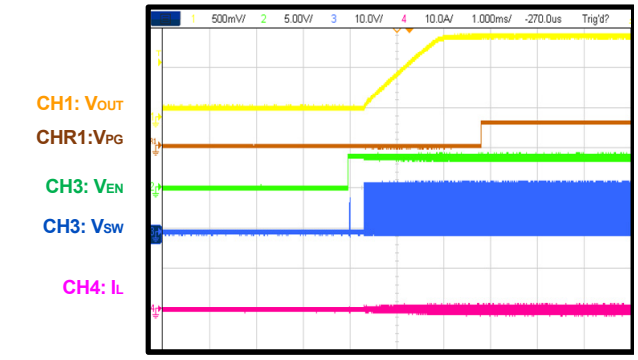
Power Up through EN

I_{OUT} = 15A, Pulse Skip



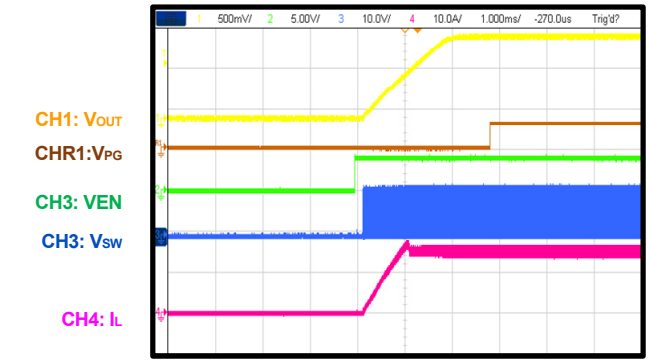
Power Up through EN

I_{OUT} = 0A, Forced CCM



Power Up through EN

I_{OUT} = 15A, Forced CCM

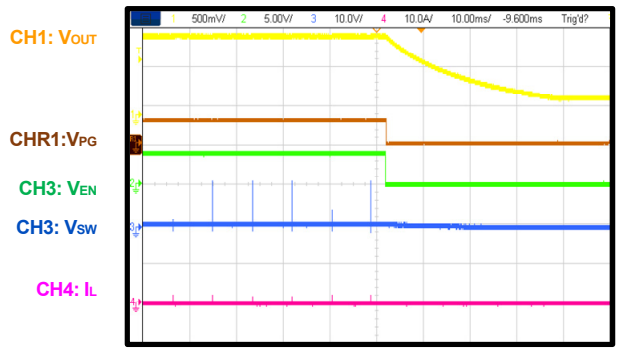


EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the EV8795-LE-00A evaluation board. V_{IN} = 12V, V_{OUT} = 1V, L = 400nH, T_A = 25°C, unless otherwise noted.

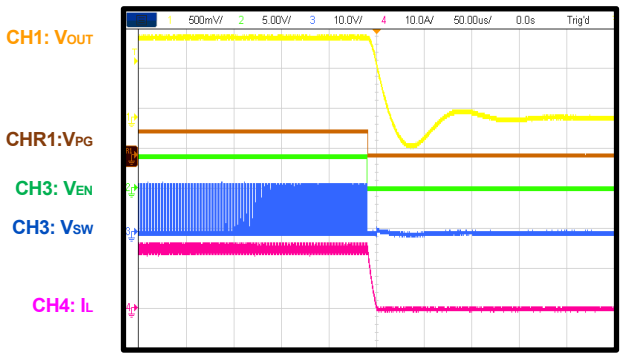
Power Down through EN

I_{OUT} = 0A, Pulse Skip



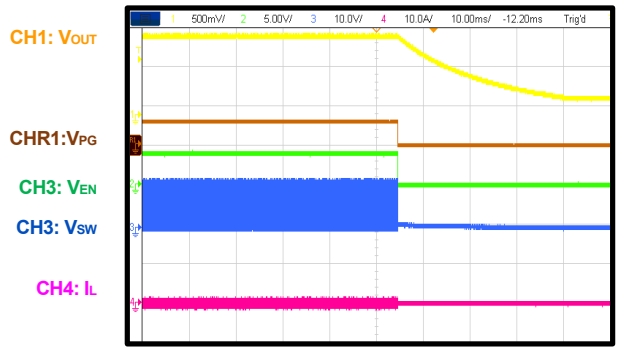
Power Down through EN

I_{OUT} = 15A, Pulse Skip



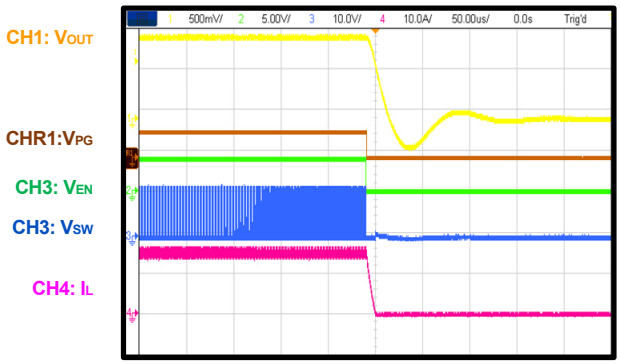
Power Down through EN

I_{OUT} = 0A, Forced CCM



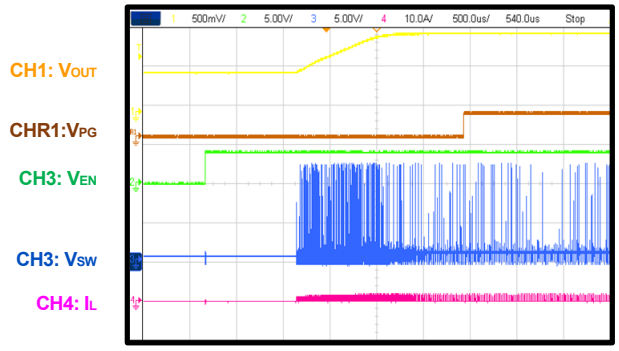
Power Down through EN

I_{OUT} = 15A, Forced CCM



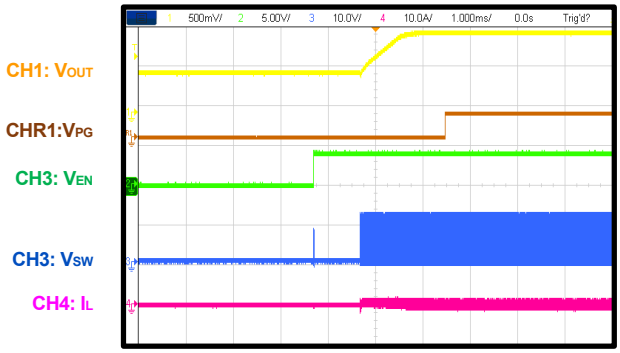
Pre-Biased Start-Up

Pulse skip



Pre-Biased Start-Up

Forced CCM



PCB LAYOUT

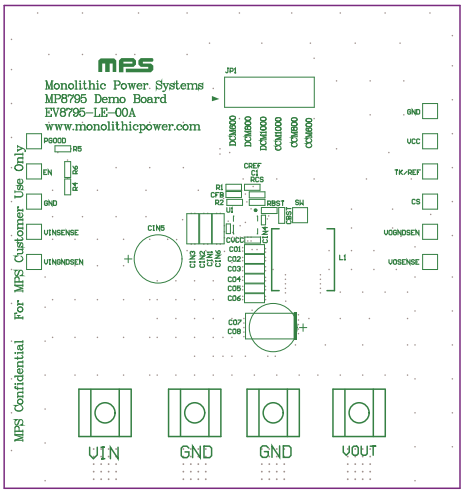


Figure 2: Top Silk

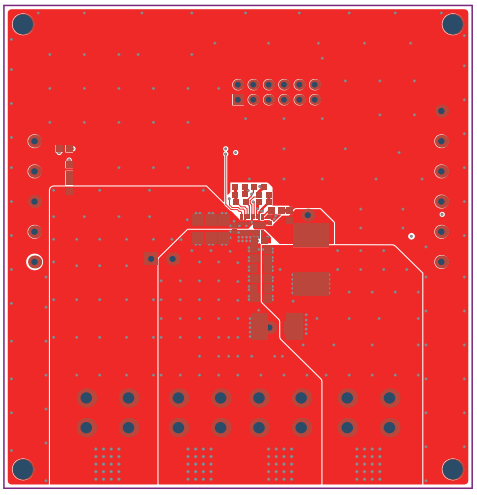


Figure 3: Top Layer

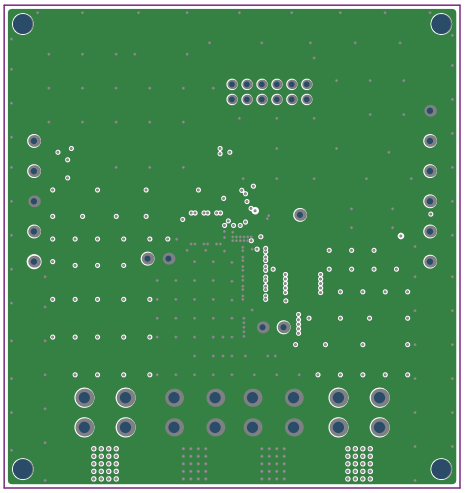


Figure 4: Mid-Layer 1

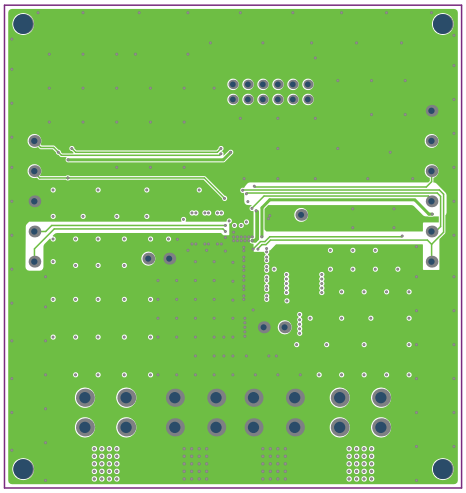


Figure 5: Mid-Layer 2

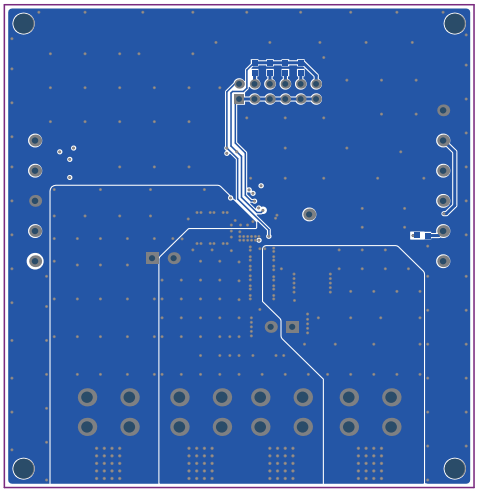


Figure 6: Bottom Layer

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	5/7/2018	Initial Release	-
1.2	11/4/2021	Updated the CIN5 description and L1 package information in the EV8795-LE-00A Bill of Materials section	5
		Updated the EVB Test Results section	6–8
		Formatting updates and clerical updates; updated figure titles	All