EVM3808-LE-00A

5.5V, 3A, Synchronous Step-Down Module Evaluation Board, AEC-Q100 Qualified

DESCRIPTION

The EVM3808-LE-00A evaluation board is designed to demonstrate the capabilities of the MPM3808, an easy-to-use, fully integrated, synchronous step-down power module with a built-in inductor and power MOSFETs. It can achieve up to 3A of continuous output current (I_{OUT}), with excellent load and line regulation.

The constant-on-time (COT) control scheme provides fast transient response and eases loop stabilization. Fault protections include cycle-by-cycle current limiting and thermal shutdown. An open-drain power good (PG) signal indicates when the output voltage (V_{OUT}) exceeds 90% of its nominal voltage.

The MPM3808 is ideal for a wide range of applications, including high-performance digital signal processors (DSPs), advanced driver-assistance system (ADAS) sensors, portable and mobile devices, and other low-power systems with size constraints.

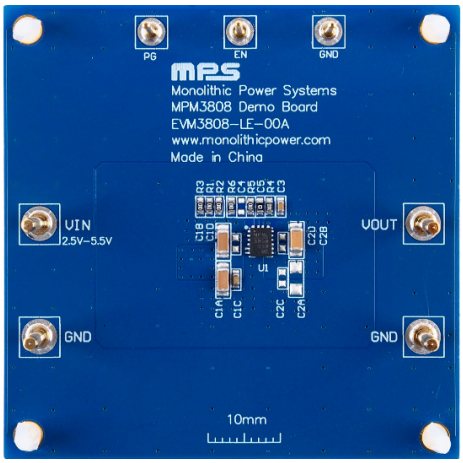
The EVM3808-LE-00A is fully assembled and tested. The MPM3808 is available in a small QFN-15 (3mmx4mmx1.6mm) package with wettable flanks, and requires a minimal number of readily available, standard external components.

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C, unless otherwise noted.

Parameters	Conditions	Value
Input voltage (V_{IN}) range		2.5V to 5.5V
Output voltage (V_{OUT})	V_{IN} = 2.5V to 5.5V, I_{OUT} = 0A to 3A	V_{OUT} = 1.2V
Maximum output current (I_{OUT})	V_{IN} = 2.5V to 5.5V	3A
Typical efficiency	V_{IN} = 3.3V, V_{OUT} = 1.2V, I_{OUT} = 3A	74.98%
Peak efficiency	V_{IN} = 2.5V, V_{OUT} = 1.2V, I_{OUT} = 300mA	90.29%
Switching frequency (f_{SW})		2.4MHz

EVM3808-LE-00A EVALUATION BOARD



LxWxH (6.3cmx6.3cmx1cm)

Board Number	MPS IC Number
EVM3808-LE-00A	MPM3808GLE-AEC1

QUICK START GUIDE

1. Preset the power supply (V_{IN}) between 2.5V and 5.5V, then turn the power supply off.
2. Set the load current between 0A and 3A. Electronic loads represent a negative impedance to the regulator, and setting a current too high can trigger over-current protection (OCP).
3. If longer cables (>0.5m total) are used between the source and the evaluation board, install a damping capacitor at the input terminals, especially when V_{IN} ≥ 5V.
4. Connect the power supply terminals to:
   a. Positive (+): VIN
   b. Negative (-): GND
5. Connect the load terminals to:
   a. Positive (+): VOUT
   b. Negative (-): GND
6. After making the connections, turn the power supply on.
7. To use the enable function, apply a digital input to the EN pin. Drive EN above 0.9V to turn the regulator on; drive EN below 0.65V to turn the regulator off. If the enable function is not used, connect EN directly to VIN.
8. To use the power good (PG) function, connect a probe between the PG and GND pins. PG pulls to GND before the soft start (SS) completes. If V_{FB} rises to be 90% of V_{REF}, PG pulls high through a 100kΩ resistor connected to VIN. If V_{FB} drops to 85% of V_{REF}, the PG pin's voltage (V_{PG}) pulls to GND to indicate an output failure. PG can also be connected to an external voltage source.
9. The external resistor divider sets the output voltage (V_{OUT}).

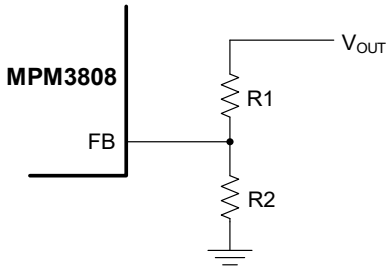


Figure 1: Feedback Divider Network with Adjustable Output

R1 is selected to be 100kΩ. Then R2 can be calculated with Equation (1):

$$R2 = \frac{R1}{\frac{V_{OUT}}{0.6} - 1} \quad (1)$$

Refer to the Application Information section in the MPM3808 datasheet to recalculate the output capacitance when V_{OUT} changes.

10. Figure 2 shows the measurement equipment set-up.

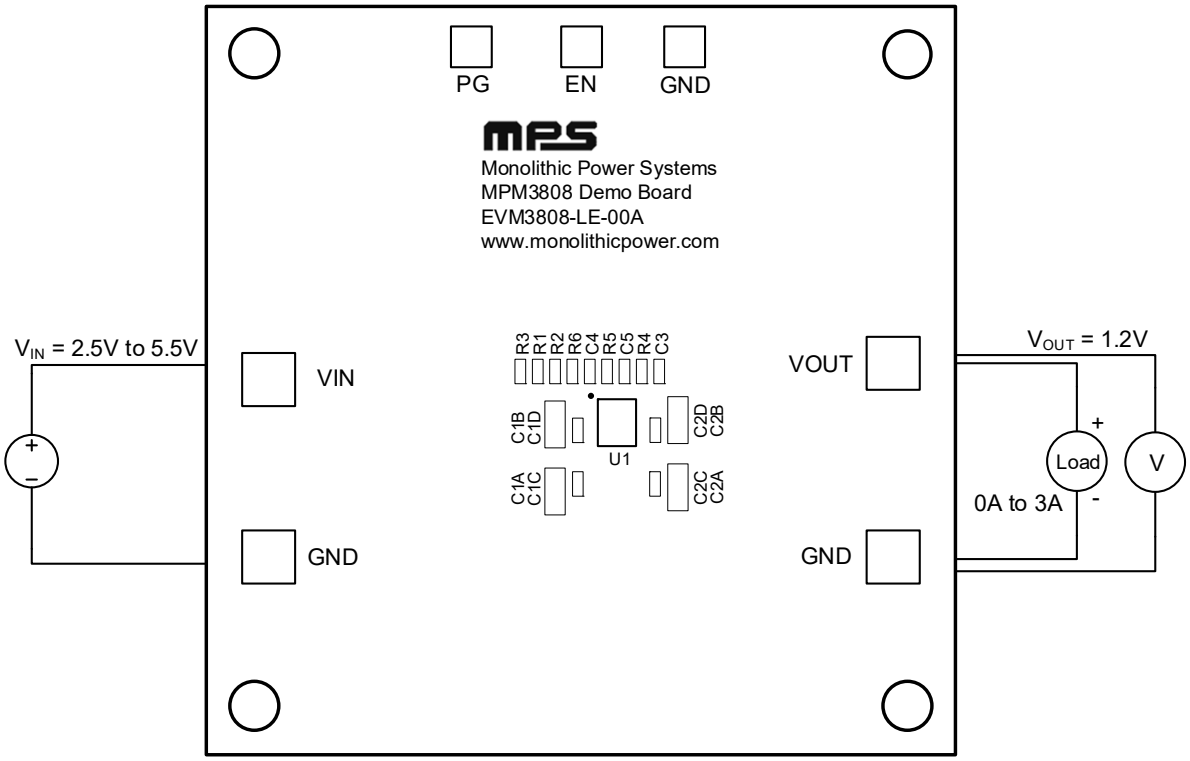
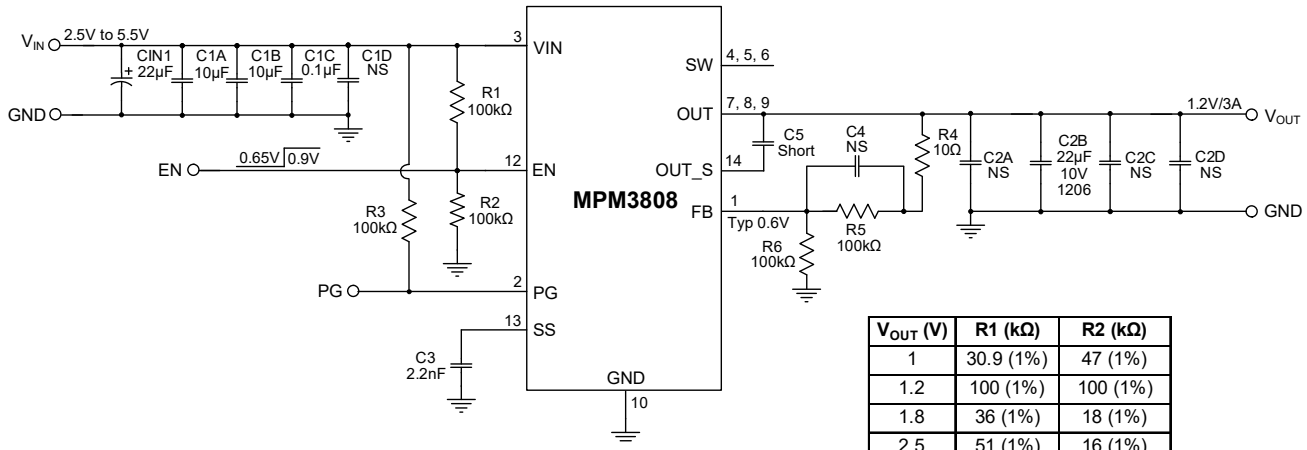


Figure 2: Measurement Equipment Set-Up

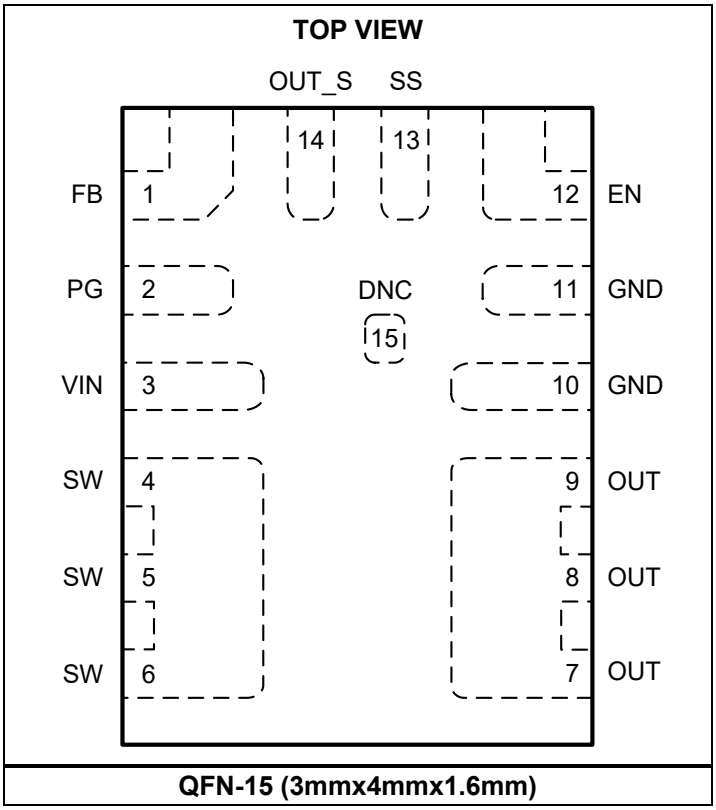
EVALUATION BOARD SCHEMATIC



V_{OUT} (V)	R1 (kΩ)	R2 (kΩ)
1	30.9 (1%)	47 (1%)
1.2	100 (1%)	100 (1%)
1.8	36 (1%)	18 (1%)
2.5	51 (1%)	16 (1%)
3.3	68 (1%)	15 (1%)

Figure 3: Evaluation Board Schematic

PACKAGE REFERENCE



QFN-15 (3mmx4mmx1.6mm)

EVM3808-LE-00A BILL OF MATERIALS

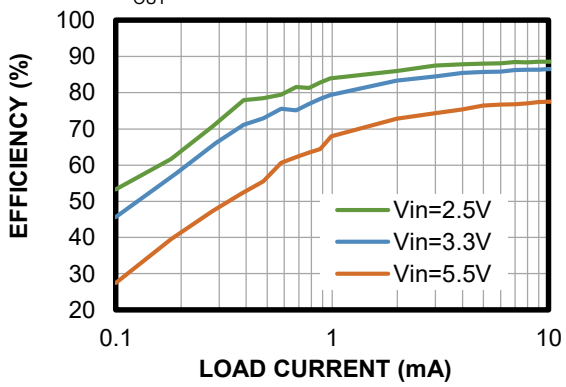
Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
0	C1D, C2A, C2C, C2D	NS				
1	CIN1	22µF	Electrical capacitor, 63V	SMD	Jianghai	VTD-63V22
0	C4	NS				
2	C1A, C1B	10µF	Ceramic capacitor, 35V, X7R	1206	TDK	C3216X7R1V106K
1	C1C	0.1µF	Ceramic capacitor,16V, X7R	0603	TDK	C1608X7R1C104K
1	C2B	22µF	Ceramic capacitor, 10V, X7R	1206	Murata	GRM32ER71A226KE20L
1	C3	2.2nF	Ceramic capacitor, 50V, X7R	0603	TDK	C1608X7R1H222K
1	C5	0Ω	Film resistor, 5%	0603	Yageo	RC0603JR-070RL
5	R1, R2, R3, R5, R6	100kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07100KL
1	R4	10Ω	Film resistor, 1%	0603	Yageo	RC0603FR-0710RL
1	U1	MPM3808	5.5V, 3A, synchronous step-down module, AEC-Q100	QFN-15 (3mmx 4mmx 1.6mm)	MPS	MPM3808GLE-AEC1

EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 3.3V, V_{OUT} = 1.2V, T_A = 25°C, unless otherwise noted.

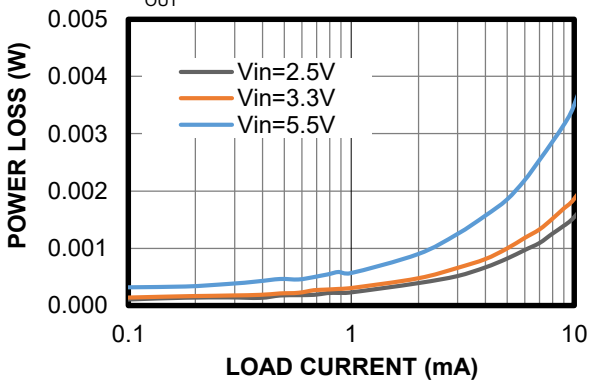
Efficiency vs. Load Current

V_{OUT} = 1.2V



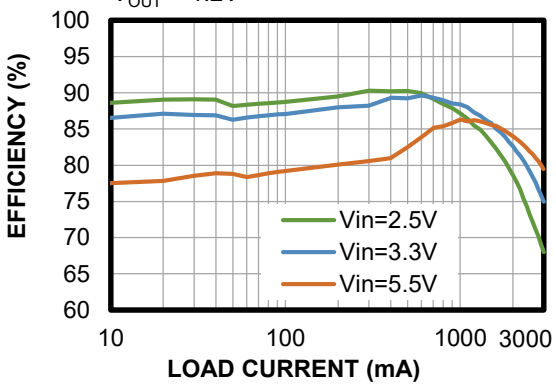
Power Loss vs. Load Current

V_{OUT} = 1.2V



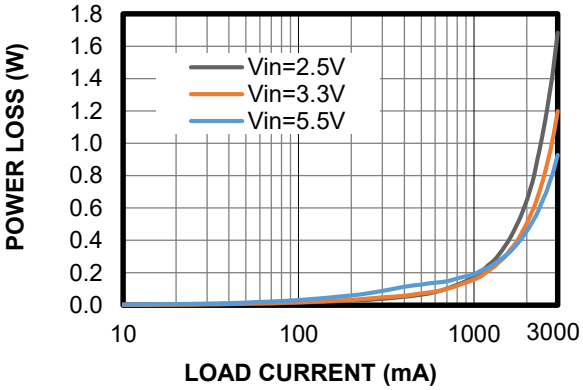
Efficiency vs. Load Current

V_{OUT} = 1.2V



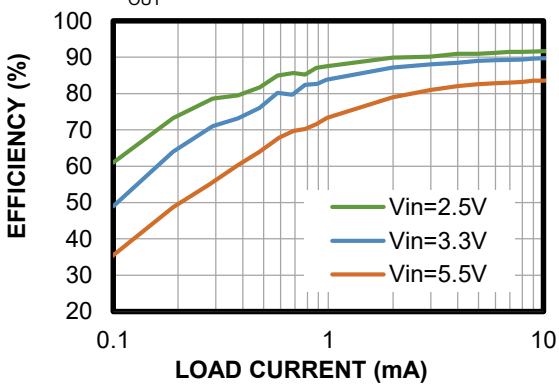
Power Loss vs. Load Current

V_{OUT} = 1.2V



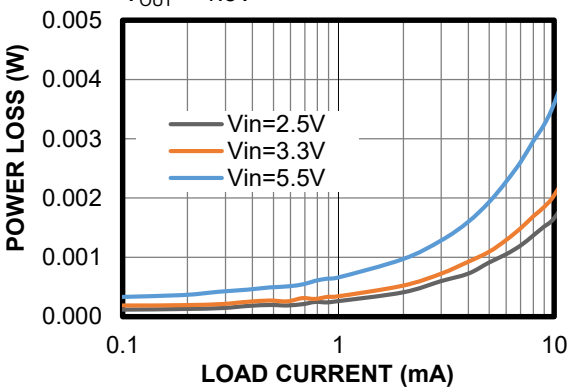
Efficiency vs. Load Current

V_{OUT} = 1.8V



Power Loss vs. Load Current

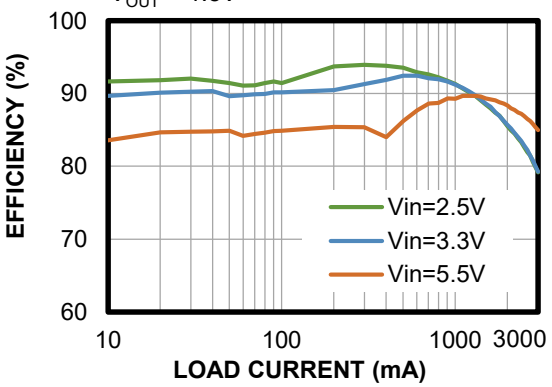
V_{OUT} = 1.8V



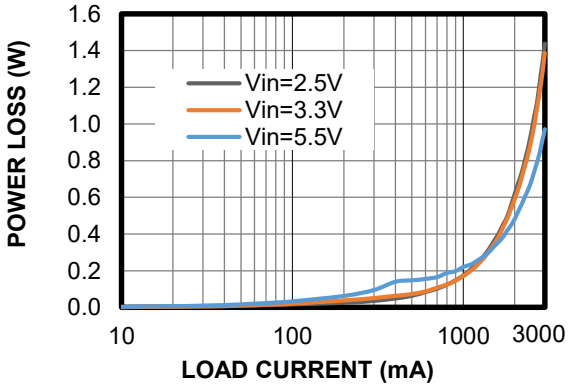
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 3.3V, V_{OUT} = 1.2V, T_A = 25°C, unless otherwise noted.

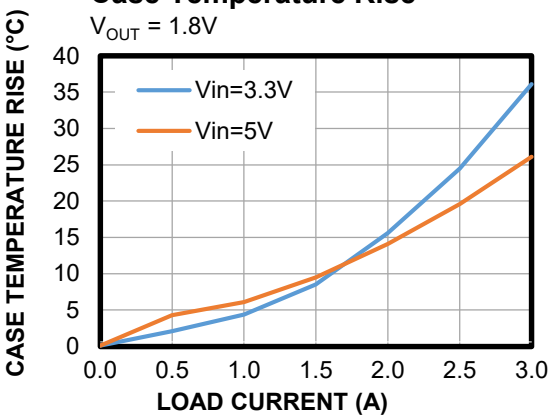
Efficiency vs. Load Current



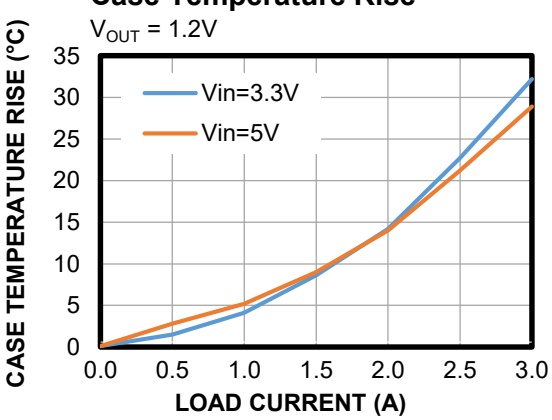
Power Loss vs. Load Current



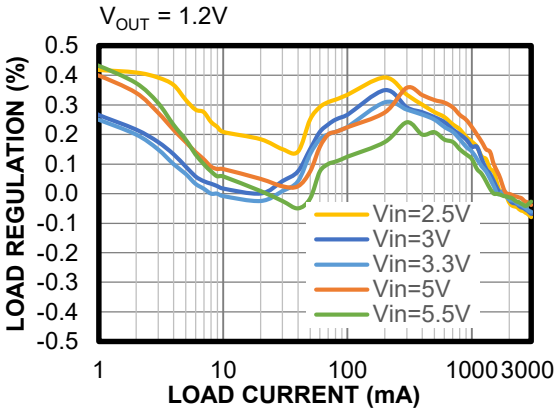
Case Temperature Rise



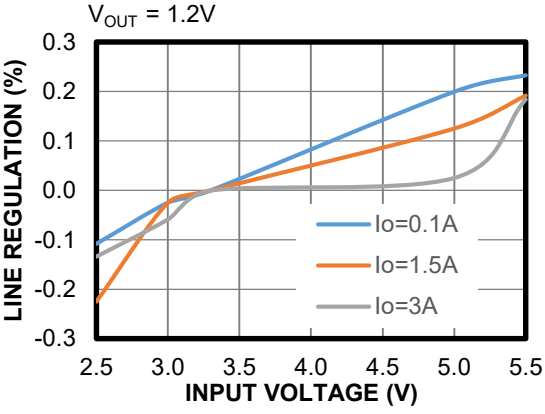
Case Temperature Rise



Load Regulation



Line Regulation

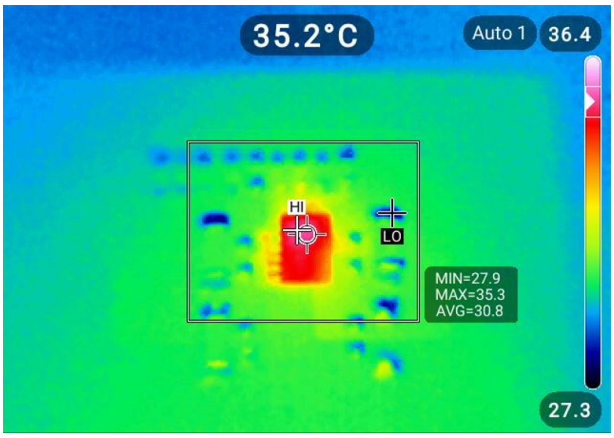


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 3.3V, V_{OUT} = 1.2V, T_A = 25°C, unless otherwise noted.

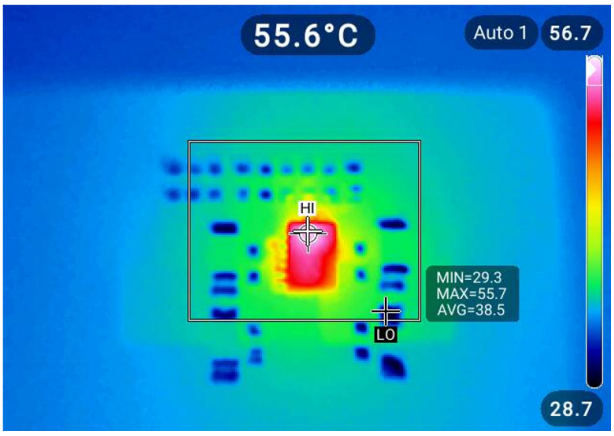
Thermal Performance

I_{OUT} = 1.5A, no forced airflow, T_{CASE} = 35.2°C



Thermal Performance

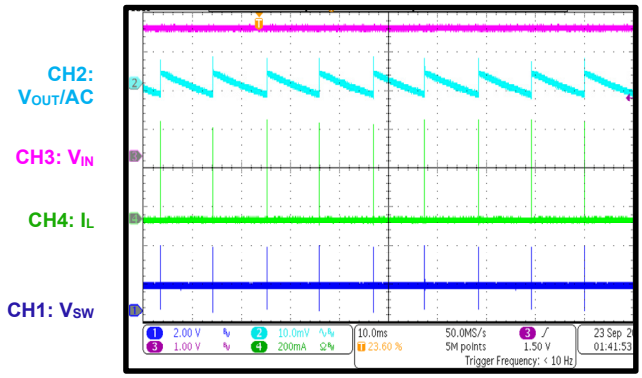
I_{OUT} = 3A, no forced airflow, T_{CASE} = 55.6°C



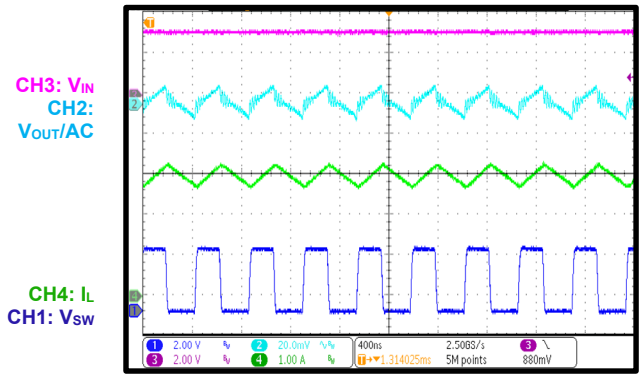
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 3.3V, V_{OUT} = 1.2V, T_A = 25°C, unless otherwise noted.

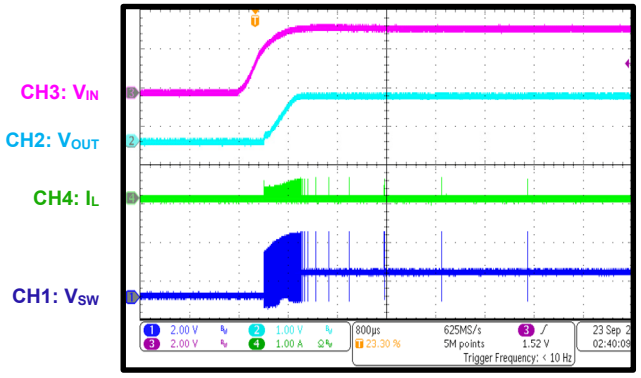
Steady State
I_{OUT} = 0A



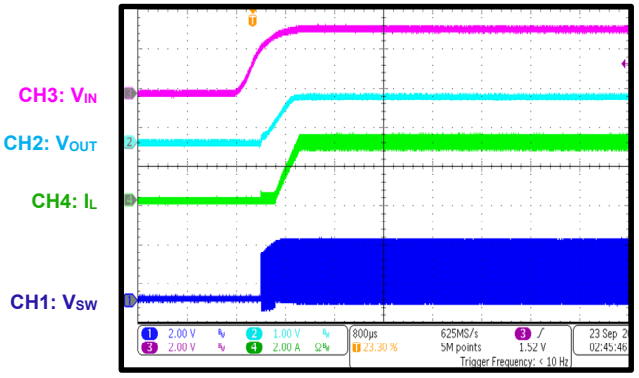
Steady State
I_{OUT} = 3A



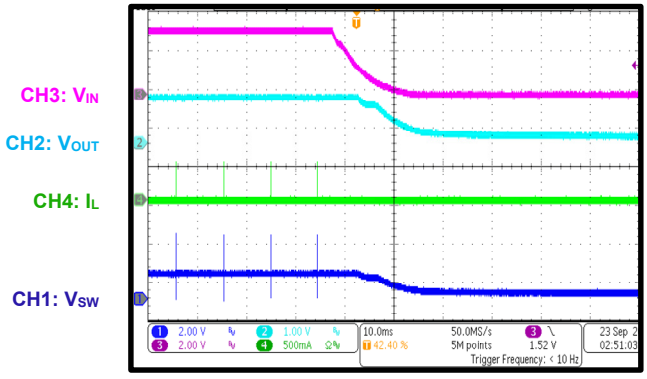
Start-Up through VIN
I_{OUT} = 0A



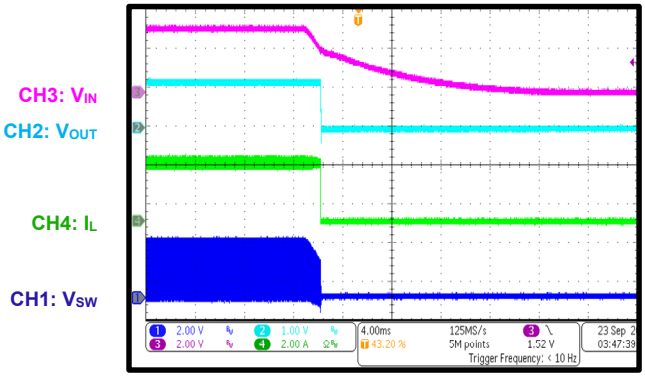
Start-Up through VIN
I_{OUT} = 3A



Shutdown through VIN
I_{OUT} = 0A



Shutdown through VIN
I_{OUT} = 3A

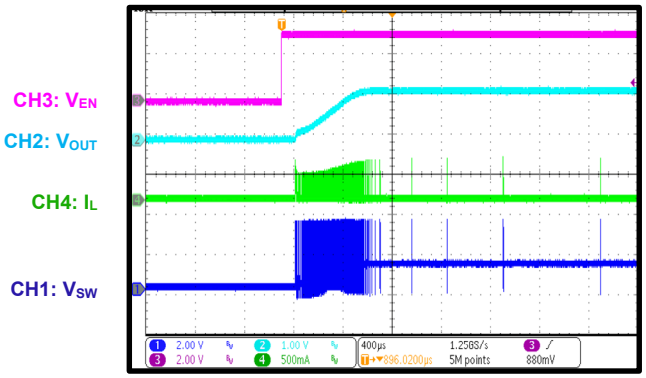


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 3.3V, V_{OUT} = 1.2V, T_A = 25°C, unless otherwise noted.

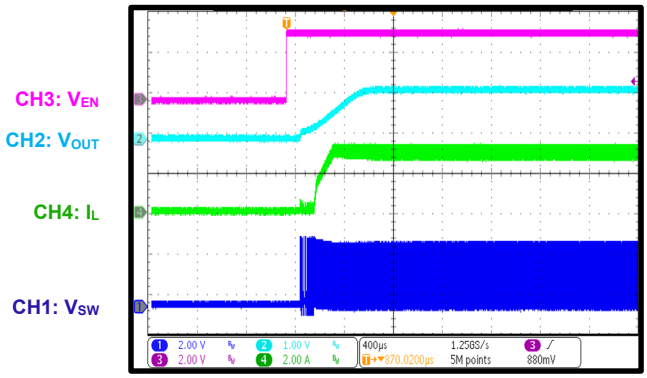
Start-Up through EN

I_{OUT} = 0A



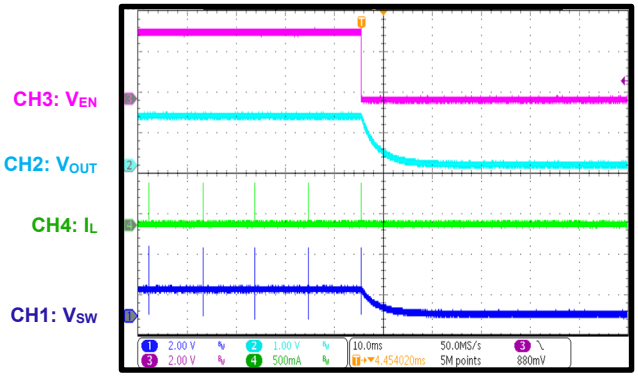
Start-Up through EN

I_{OUT} = 3A



Shutdown through EN

I_{OUT} = 0A



Shutdown through EN

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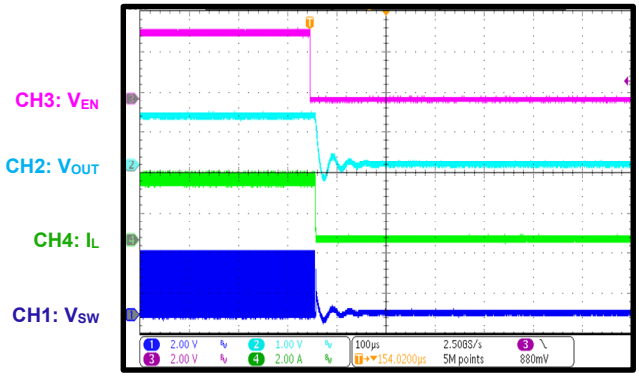
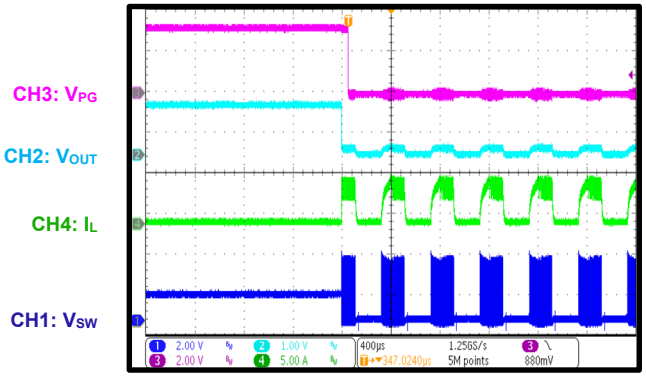


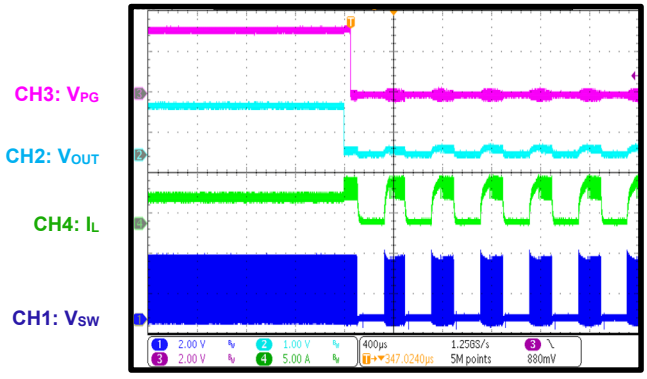
SCP Entry

I_{OUT} = 0A



SCP Entry

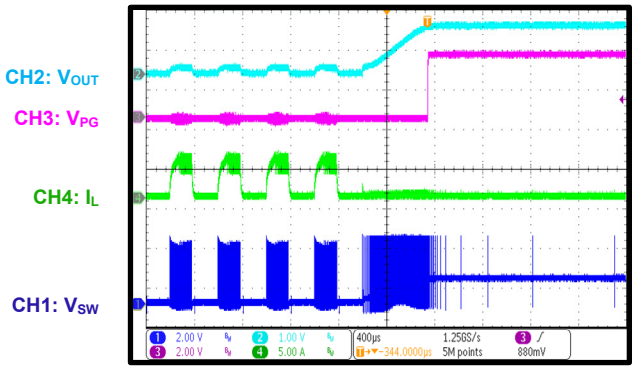
I_{OUT} = 3A



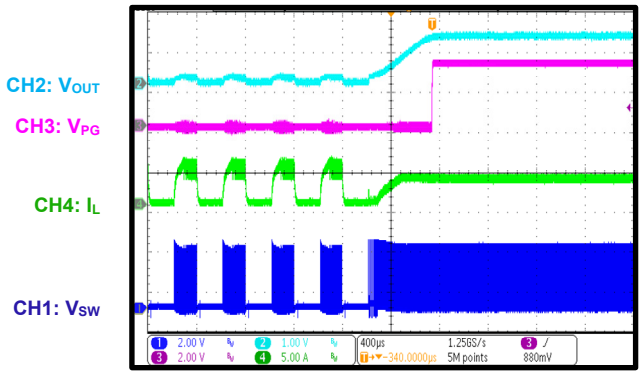
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 3.3V, V_{OUT} = 1.2V, T_A = 25°C, unless otherwise noted.

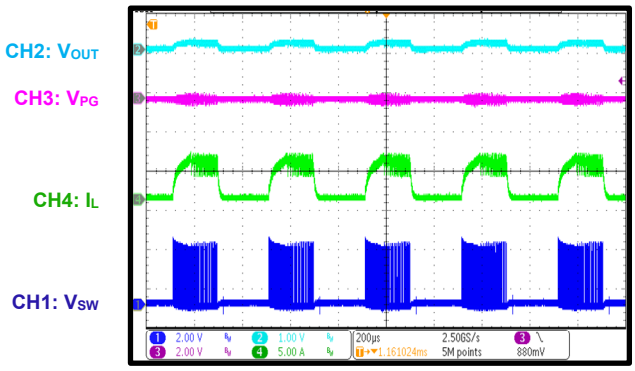
SCP Recovery
I_{OUT} = 0A



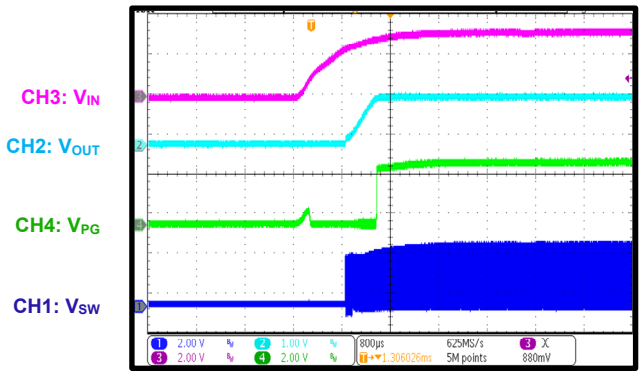
SCP Recovery
I_{OUT} = 3A



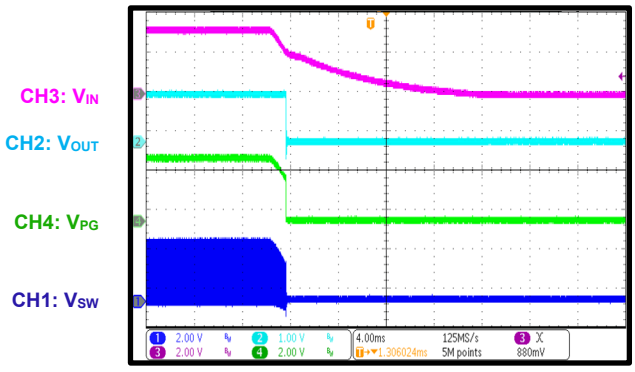
Short Circuit Protection



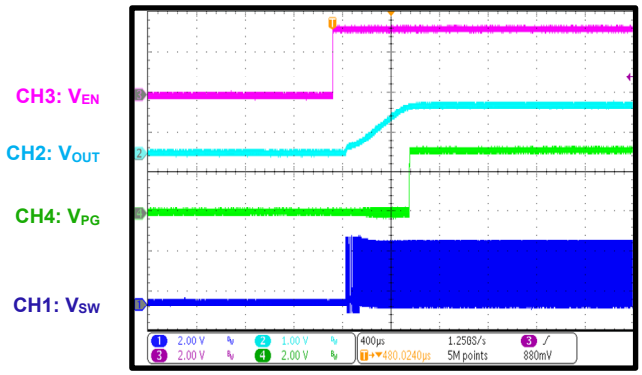
PG Start-Up through VIN
I_{OUT} = 3A



PG Shutdown through VIN
I_{OUT} = 3A



PG Start-Up through EN
I_{OUT} = 3A

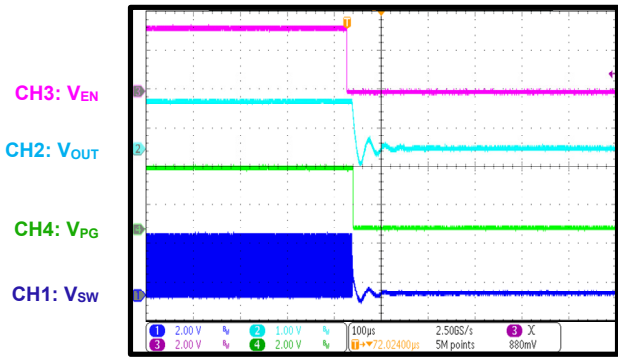


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 3.3V, V_{OUT} = 1.2V, T_A = 25°C, unless otherwise noted.

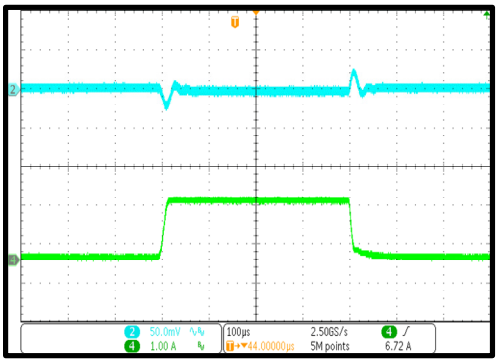
PG Shutdown through EN

I_{OUT} = 3A



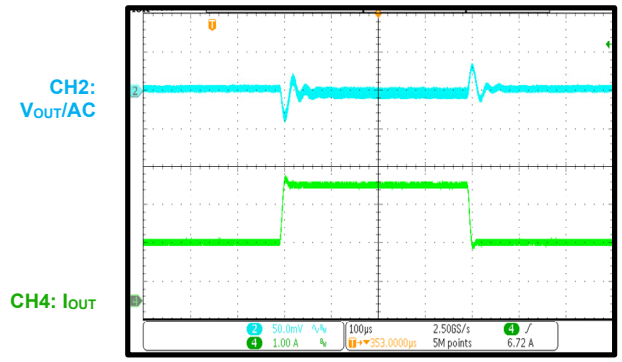
Load Transient

I_{OUT} = 0A to 1.5A, 1A/µs



Load Transient

I_{OUT} = 1.5A to 3A, 1A/µs



PCB LAYOUT (1)

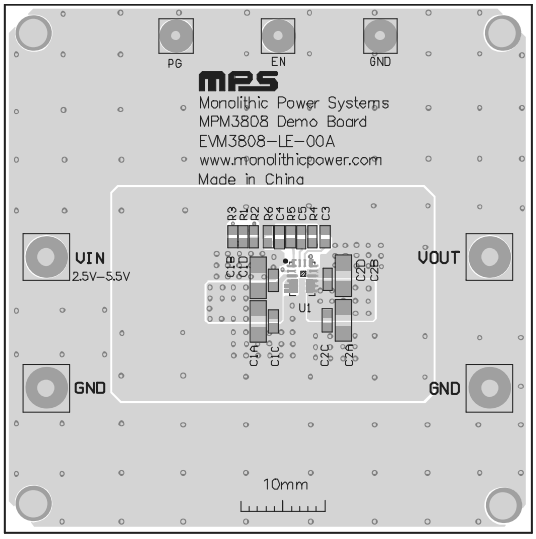


Figure 3: Top Silk and Top Layer

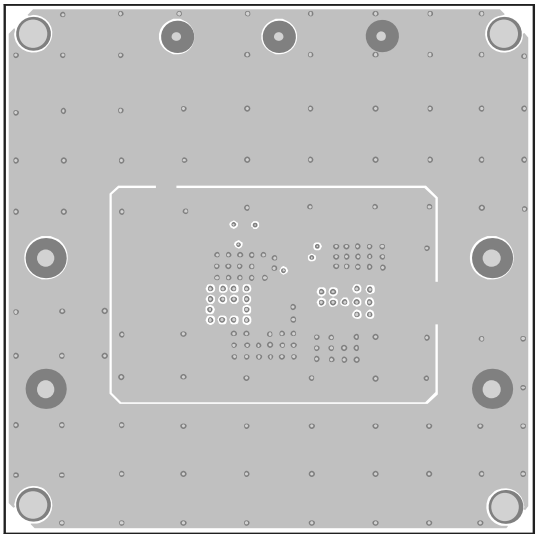


Figure 4: Mid-Layer 1

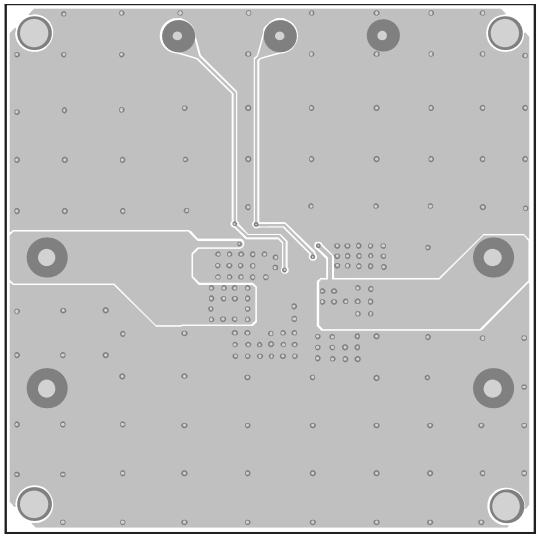


Figure 5: Mid-Layer 2

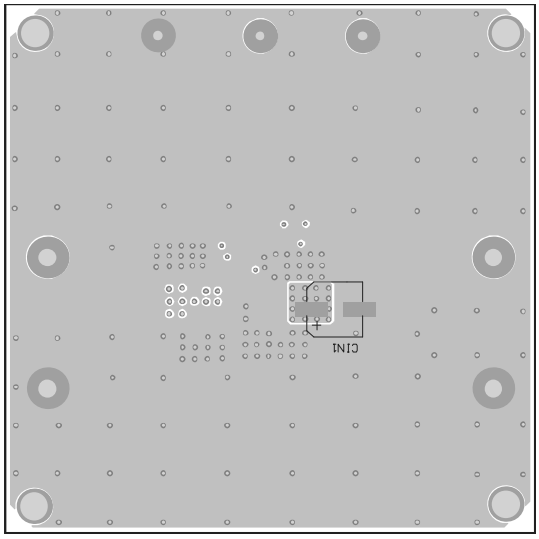


Figure 6: Bottom Layer and Bottom Silk

Note:

1) The copper thickness of all layers is 2oz.