EVM3810A-QB-00A

6V, 1.2A Peak Synchronous Step-Down Switcher Evaluation Board

The Future of Analog IC Technology

DESCRIPTION

The EVM3810A-QB-00A is used for demonstrating the performance of MPS's MPM3810A a low voltage high switching frequency step-down switcher with built-in power MOSFETs and power inductor. MPM3810A provides up to 1.2A peak highly efficient output with constant-on-time control for fast loop response.

The constant-on-time control (COT) scheme provides fast, transient response loop stabilization. Fault condition protection includes cycle-by cycle current limiting andf thermal shutdone TSD).

The MPM3810A is available in QFN 3.0x2.5x0.9mm package.

ELECTRICAL SPECIFICATION

Parameter	Symbol	Value	Units
Input Voltage	V_{IN}	2.5– 6	V
Output Voltage	V_{OUT}	1.2	V
Output Current	I_{OUT}	1.2	A

FEATURES

- Wide 2.5V to 6V Operating Input Range
- Adjustable output from 0.6V
- 3mm x 2.5mm x 0.9mm QFN Package
- Total Solution Size 6mm x 3.8mm
- Up to 1.2A Peak Output Current
- 100% Duty Cycle in Dropout
- Force CCM Mode
- EN and Power Good for Power Sequencing
- Cycle-by-Cycle Over-Current Protection
- Short Circuit Protection with Hiccup Mode
- Adjustable Output Only Needs 4 External Components - 2 Ceramic Capacitors and FB Divider Resistors

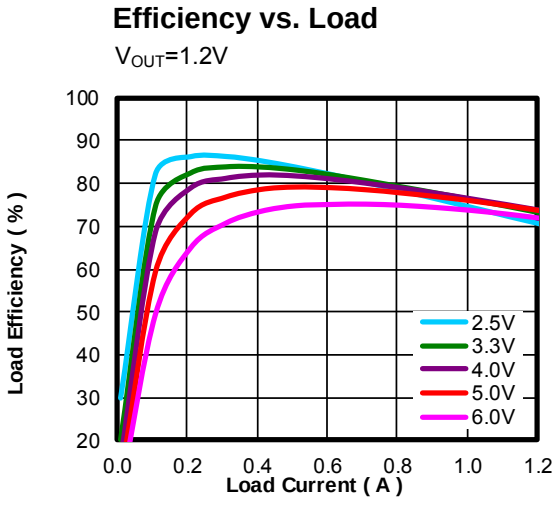
APPLICATIONS

- Automotive ECU
- Low Voltage I/O System Power
- LDO Replacement
- Power for Portable Products
- Telematics
- Space-limited Applications

All MPS parts are lead-free and adhere to the RoHS directive. For MPS green status, please visit MPS website under Quality Assurance. "MPS" and "The Future of Analog IC Technology", are Registered Trademarks of Monolithic Power Systems, Inc.

EVM3810A-QB-00A EVALUATION BOARD

Board Number	MPS IC Number
EVM3810A-QB-00A	MPM3810AGQB



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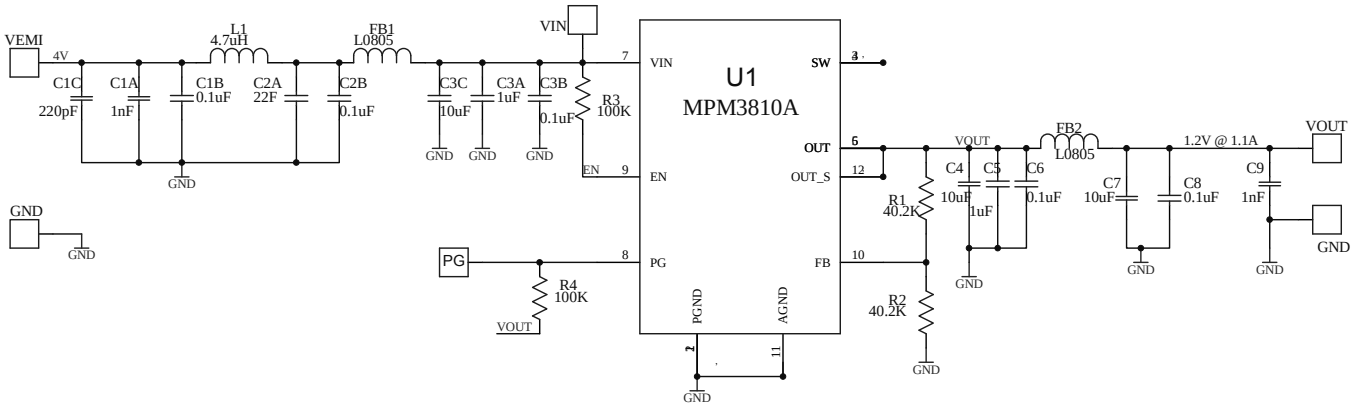
EVALUATION BOARD SCHEMATIC



V_{OUT} (V)	R1 (kΩ)	R2 (kΩ)
1.0	40(1%)	60(1%)
1.2	40(1%)	40(1%)
1.8	60(1%)	30(1%)
2.5	80(1%)	25(1%)
3.3	80(1%)	17.7(1%)

EVM3810A-QB-00A BILL OF MATERIALS

Qty	RefDes	Value	Description	Package	Manufacturer	Manufactuer_P/N
1	C1C	220pF	Ceramic Capacitor;50V;X7R	0402	muRata	GCM155R71H221KA37D
2	C1A, C9	1nF	Ceramic Capacitor;50V;X7R	0402	muRata	GRM155R71H102KA01D
5	C1B, C2B, C3B, C6, C8	0.1μF	Ceramic Capacitor;16V;X7R	0603	muRata	GRM188R71C104KA01D
1	C2A	22μF	Ceramic Capacitor;10V;X5R	0805	muRata	GRM219R61A226MEA0D
3	C3C, C4, C7	10μF	Ceramic Capacitor;16V;X5R	0805	muRata	GRM21BR61C106KE15L
2	C3A, C5,	1μF	Ceramic Capacitor;10V;X5R	0603	muRata	GRM188R61A105KA61D
1	L1	4.7μH	Inductor 2A, 0.2Ω (2.5 x 2.0)mm	1008	muRata	DFE252012P-4R7M=P2
2	FB1, FB2		Ferrite Beeds 3A, 60mΩ	0805	Wurth	742792063
2	R1, R2	40.2k	Film Res.,1%	0402	Any	
2	R3, R4	100K	Film Res.,1%	0402	Any	
1	U1	MPM3810A	COT Buck	QFN3.0*2.5	MPS	MPM3810A-GQB
1	PG	Test Point			HZ	
5	VIN, GND, VEMI, VOUT, GND	Test Point	2.0 Golden Pin		HZ	

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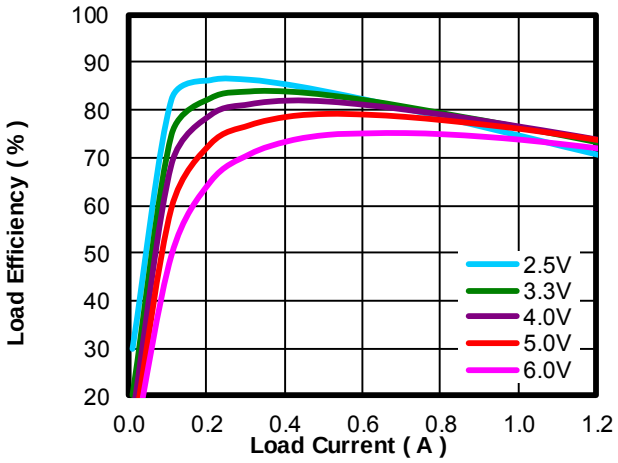
EVB TEST RESULTS

Performance waveforms are tested on the evaluation board. T_A = 25°C, unless otherwise noted.

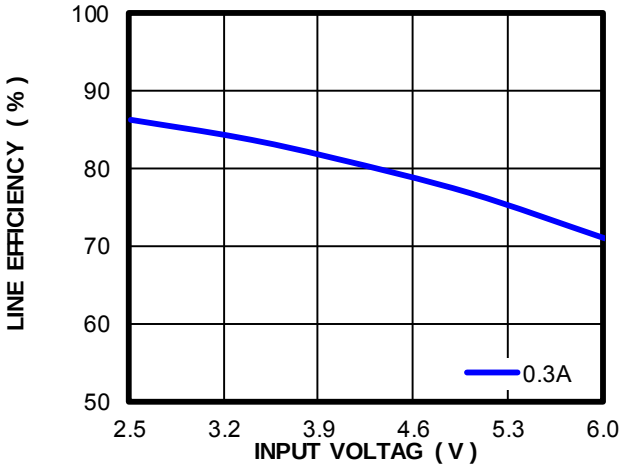
Efficiency vs. Load

V_{OUT}=1.2V



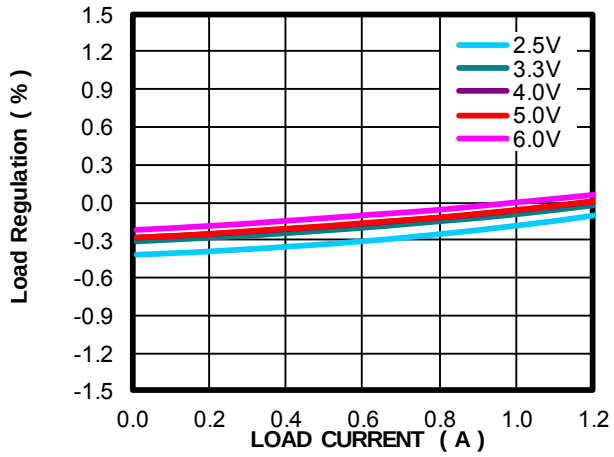
Efficiency vs. Input

V_{OUT}=1.2V



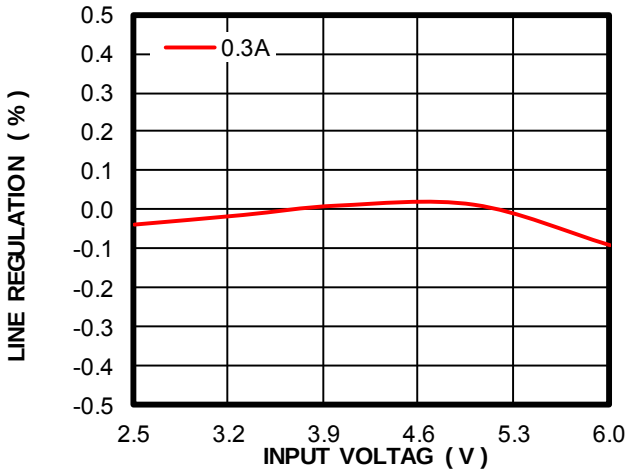
Load regulation

V_{OUT}=1.2V



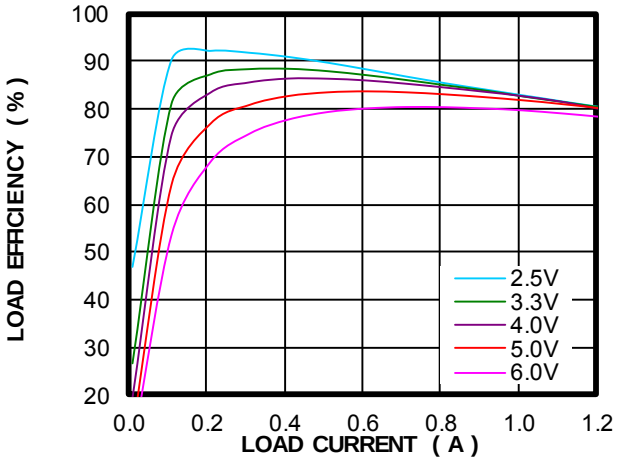
Line Regulation

V_{OUT}=1.2V



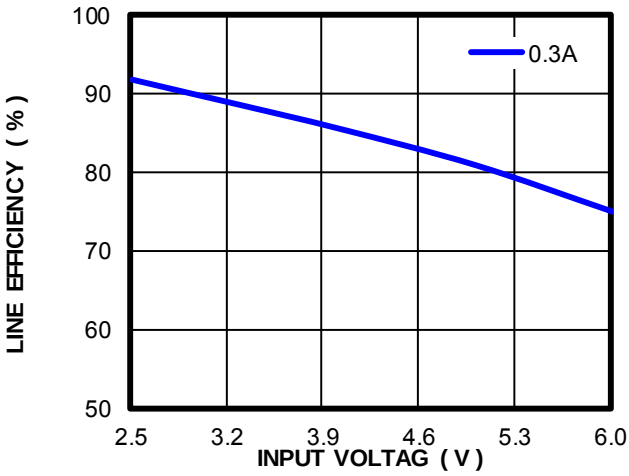
Efficiency vs. Load

V_{OUT}=1.8V



Efficiency vs. Input

V_{OUT}=1.8V



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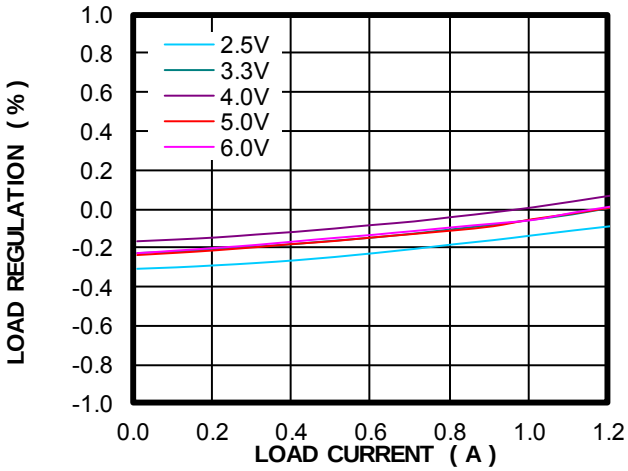
EVB TEST RESULTS

Performance waveforms are tested on the evaluation board. T_A = 25°C, unless otherwise noted.

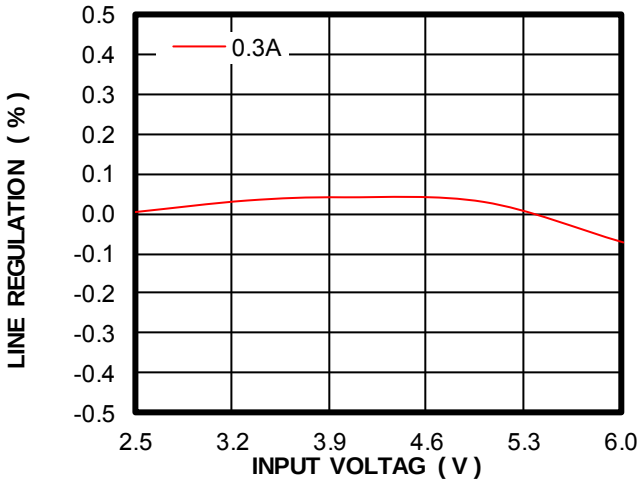
Load regulation

V_{OUT}=1.8V

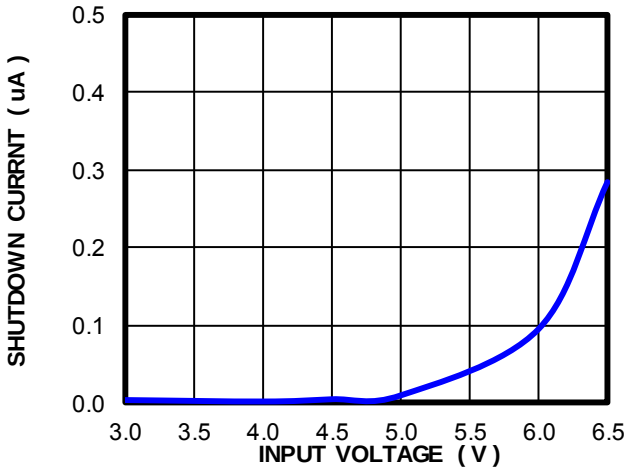


Line Regulation

V_{OUT}=1.8V



Shut Down Current vs. VIN



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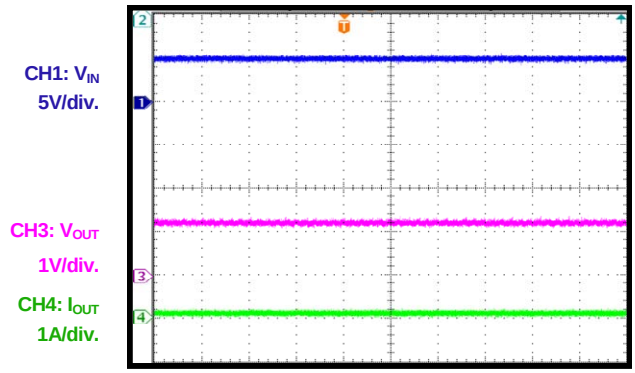
EVB TEST RESULTS

Performance waveforms are tested on the evaluation board. T_A = 25°C, unless otherwise noted.

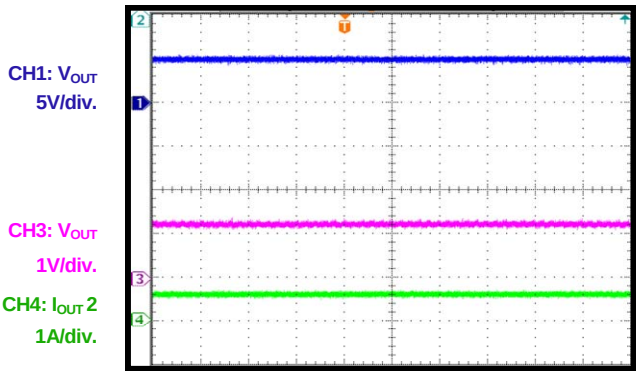
Steady State

V_{IN}=5V, V_{OUT}=1.2V, I_{OUT}=0.1A



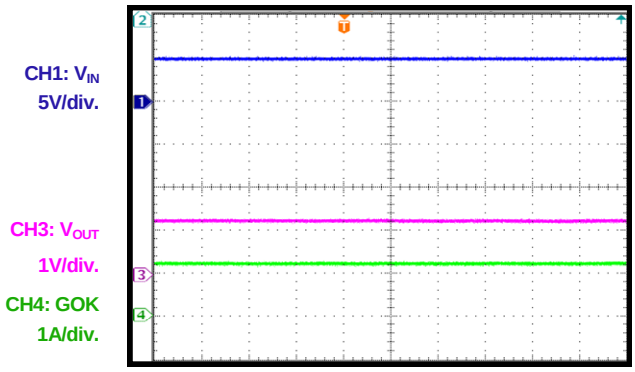
Steady State

V_{IN}=5V, V_{OUT}=1.2V, I_{OUT}=0.6A



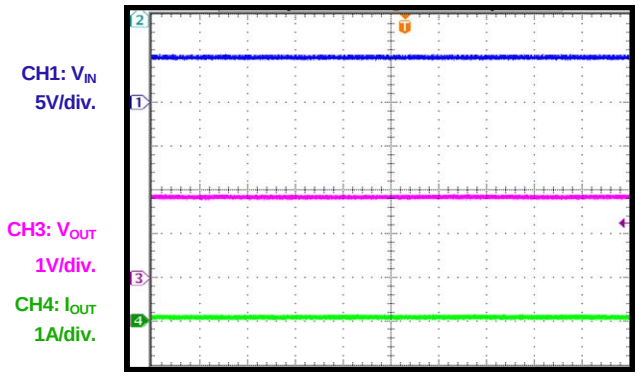
Steady State

V_{IN}=5V, V_{OUT}=1.8V, I_{OUT}=1.2A



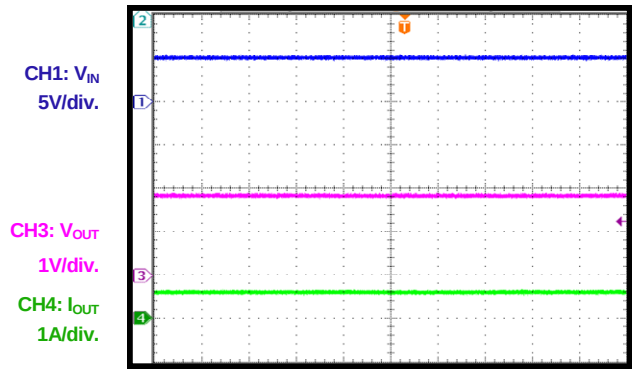
Steady State

V_{IN}=5V, V_{OUT}=1.8V, I_{OUT}=0.1A



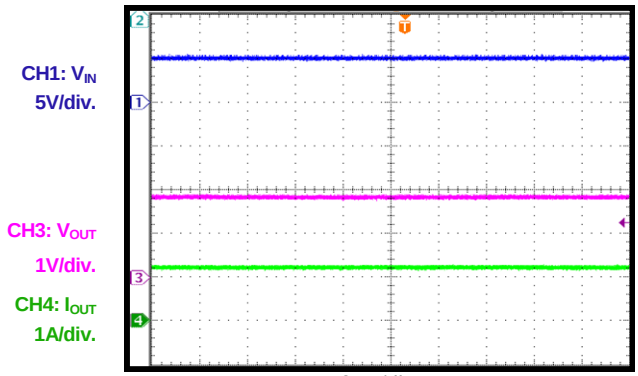
Steady State

V_{IN}=5V, V_{OUT}=1.8V, I_{OUT}=0.6A



Steady State

V_{IN}=5V, V_{OUT}=1.8V, I_{OUT}=1.2A



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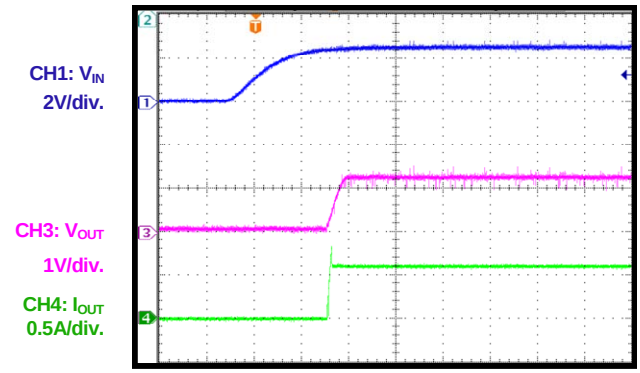
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board. T_A = 25°C, unless otherwise noted.

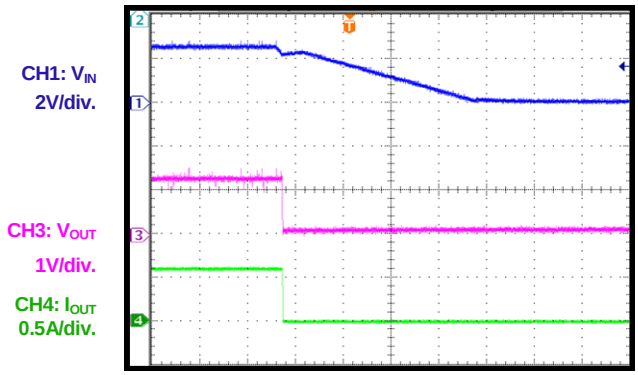
Power Up

V_{IN}=2.5V, V_{OUT}=1.2V, I_{OUT}=0.6A



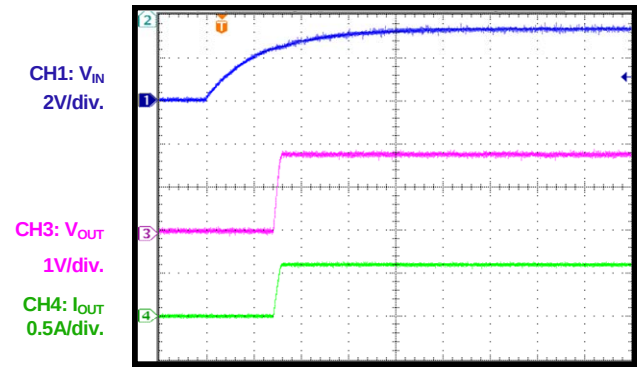
Power Down

V_{IN}=2.5V, V_{OUT}=1.2V, I_{OUT}=0.6A



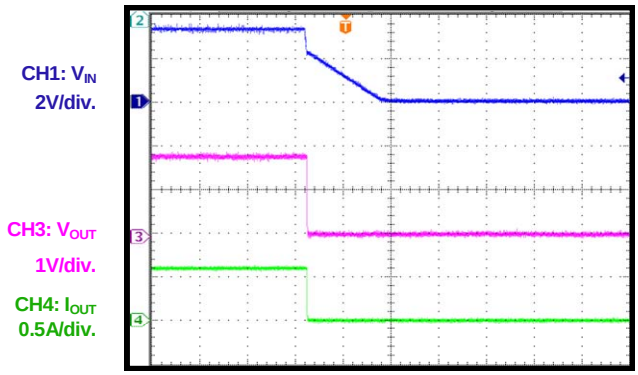
Power Up

V_{IN}=3.3V, V_{OUT}=1.8V, I_{OUT}=0.6A



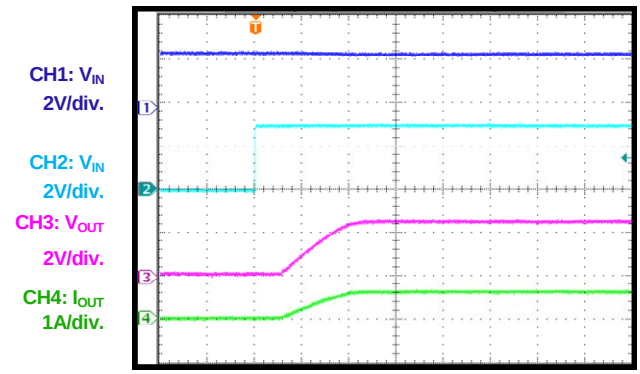
Power Down

V_{IN}=3.3V, V_{OUT}=1.8V, I_{OUT}=0.6A



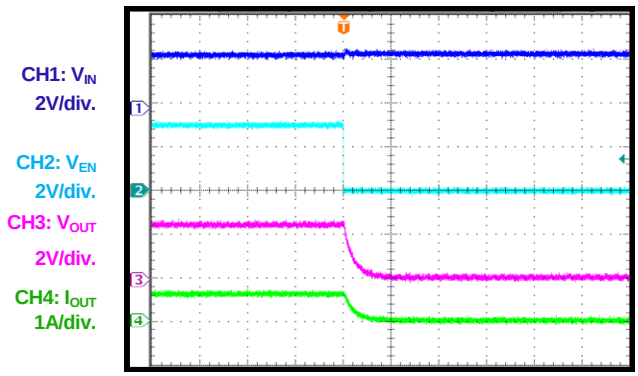
Enable On

V_{IN}=2.5V, V_{OUT}=1.2V, I_{OUT}=0.6A



Enable Off

V_{IN}=2.5V, V_{OUT}=1.2V, I_{OUT}=0.6A



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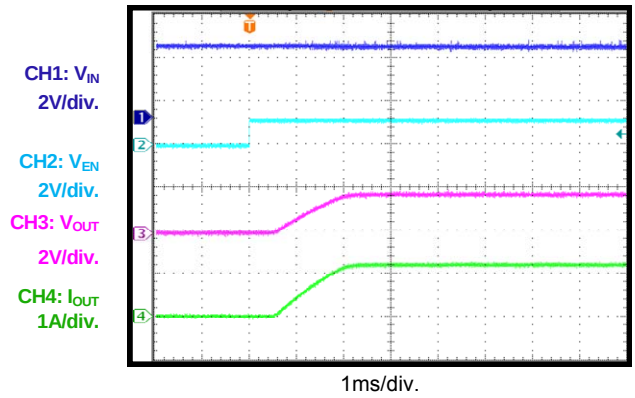
EVB TEST RESULTS *(continued)*

T_A = 25°C, unless otherwise noted.

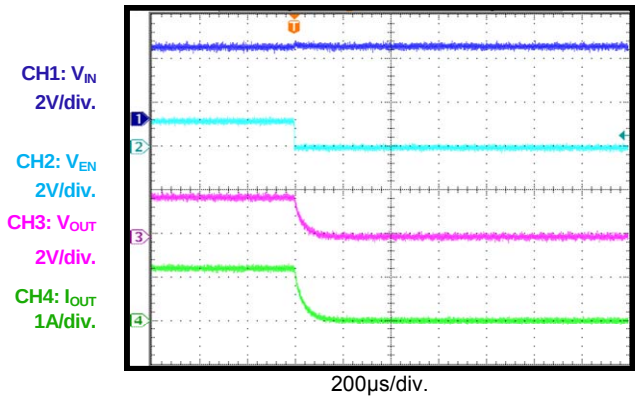
Enable On

V_{IN}=3.3V, V_{OUT}=1.8V, I_{OUT}=0.6A



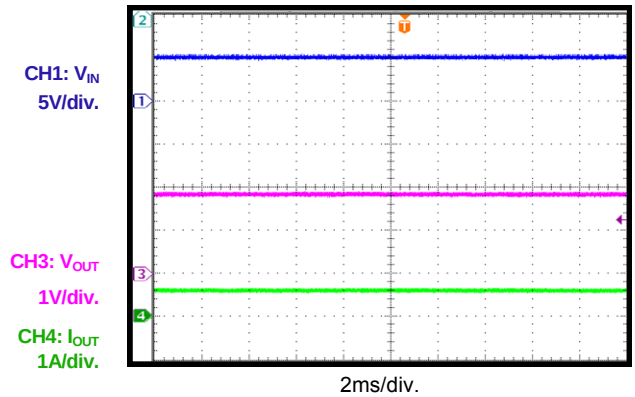
Enable Off

V_{IN}=3.3V, V_{OUT}=1.8V, I_{OUT}=0.6A



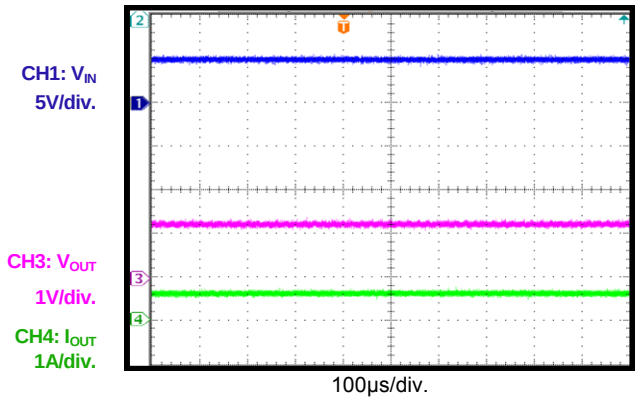
Steady State

V_{IN}=5V, V_{OUT}=1.8V, I_{OUT}=0.6A



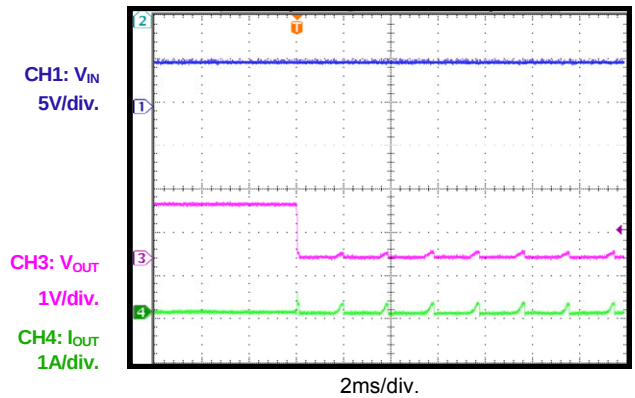
Steady State

V_{IN}=5V, V_{OUT}=1.2V, I_{OUT}=0.6A



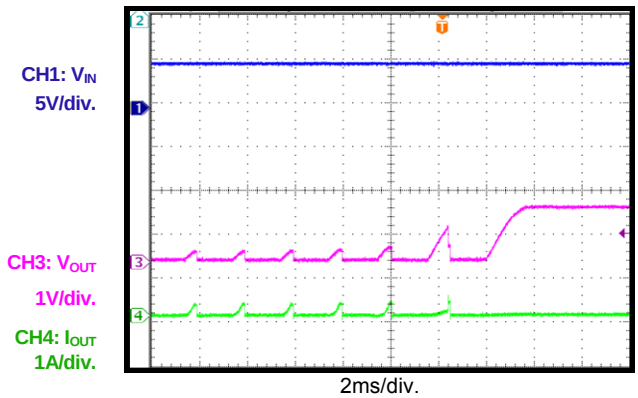
Short Circuit

V_{IN}=5V, V_{OUT}=1.2V



Short Circuit Recovery

V_{IN}=5V, V_{OUT}=1.2V



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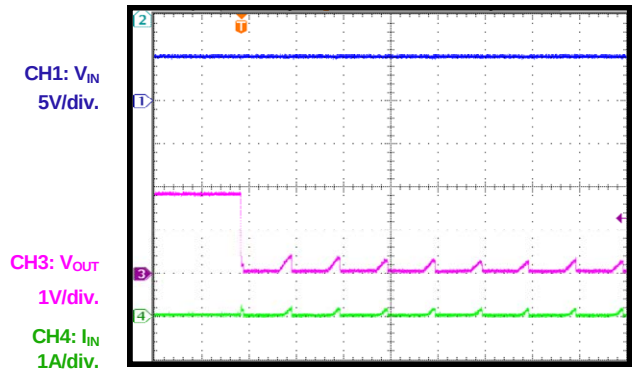
EVB TEST RESULTS *(continued)*

T_A = 25°C, unless otherwise noted.

Short Circuit Entry

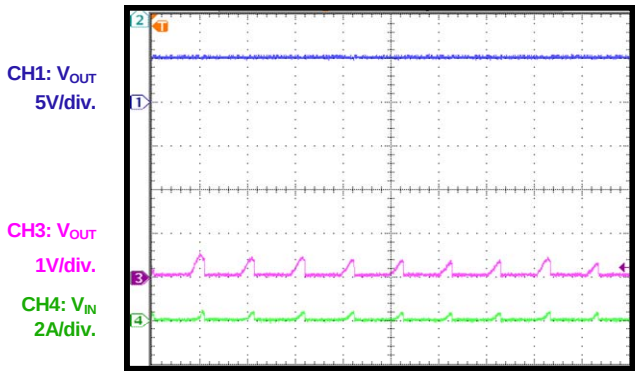
V_{IN}=5V, V_{OUT}=1.8V



2ms/div.

Short Circuit

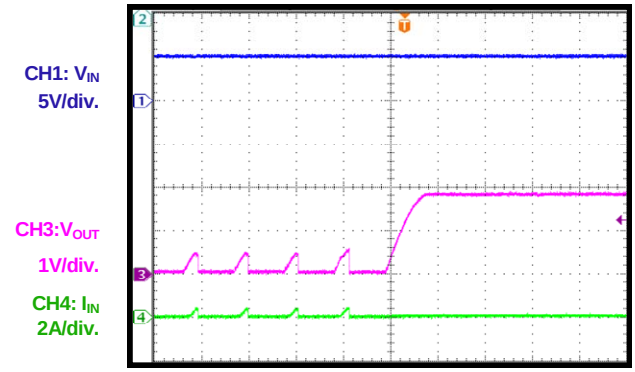
V_{IN}=5V, V_{OUT}=1.8V



2ms/div.

Short Circuit Recovery

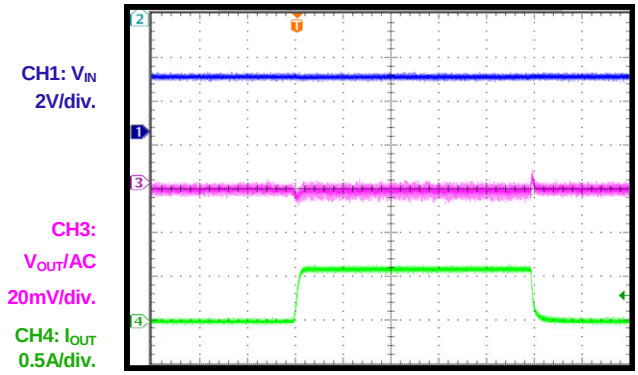
V_{IN}=5V, V_{OUT}=1.2V



2ms/div.

Transient Response

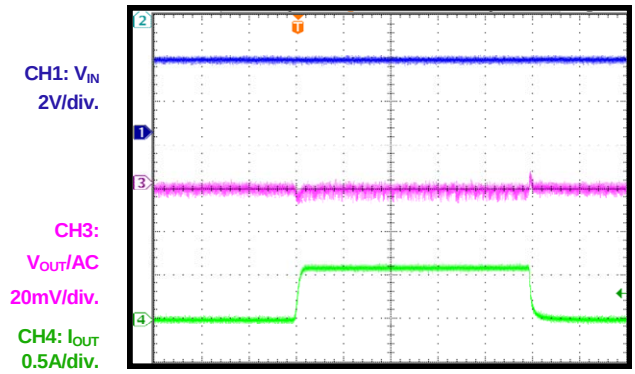
V_{IN}=2.5V, V_{OUT}=1.2V, I_{OUT}=0A-0.6A, 0.25A/us



200µs/div.

Transient Response

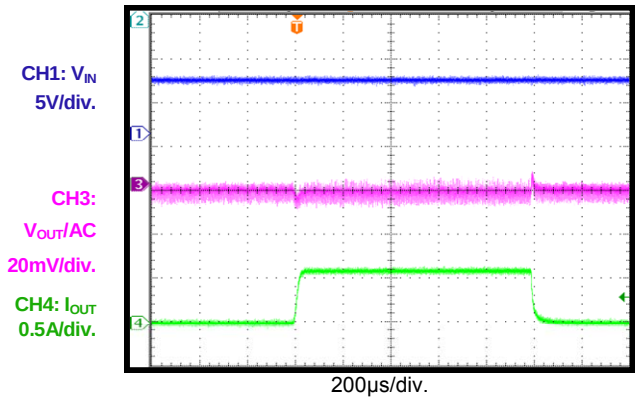
V_{IN}=3.3V, V_{OUT}=1.2V, I_{OUT}=0A-0.6A, 0.25A/us



200µs/div.

Transient Response

V_{IN}=6V, V_{OUT}=1.2V, I_{OUT}=0A-0.6A, 0.25A/us



200µs/div.

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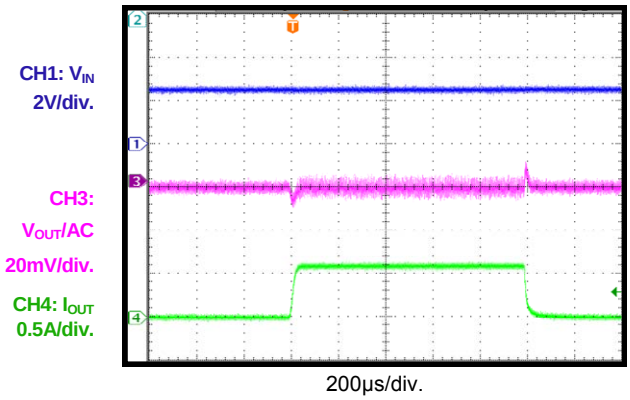
EVB TEST RESULTS *(continued)*

T_A = 25°C, unless otherwise noted.

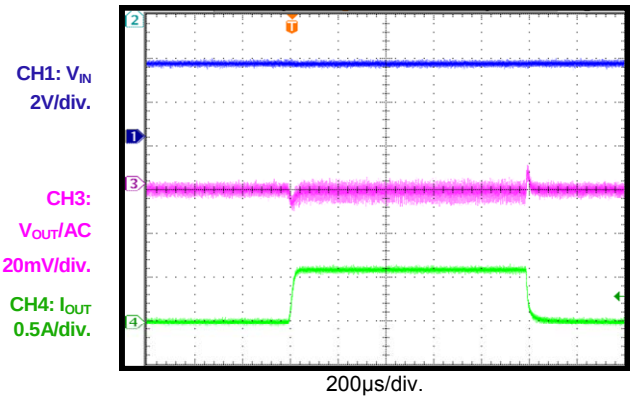
Transient Response

V_{IN}=2.5V, V_{OUT}=1.8V, I_{OUT}=0A-0.6A, 0.25A/us



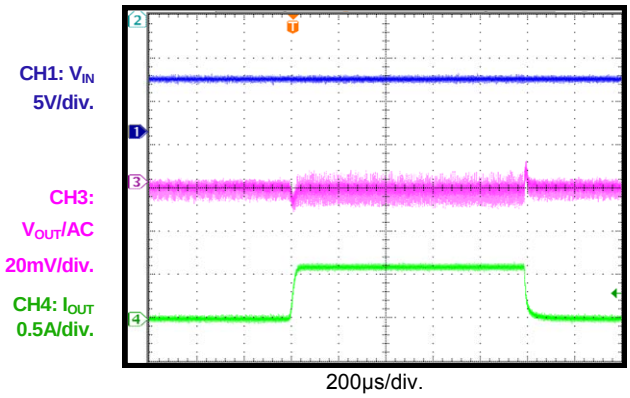
Transient Response

V_{IN}=3.3V, V_{OUT}=1.8V, I_{OUT}=0A-0.6A, 0.25A/us



Transient Response

V_{IN}=6V, V_{OUT}=1.8V, I_{OUT}=0A-0.6A, 0.25A/us



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PRINTED CIRCUIT BOARD LAYER

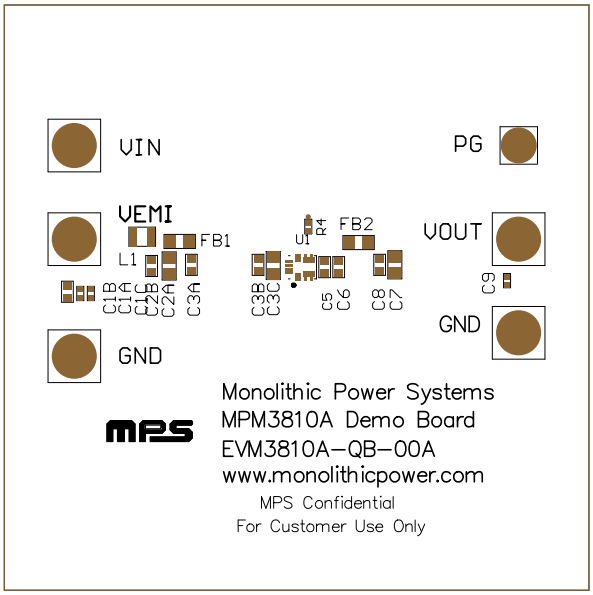

Figure 1: Top Silk Layer

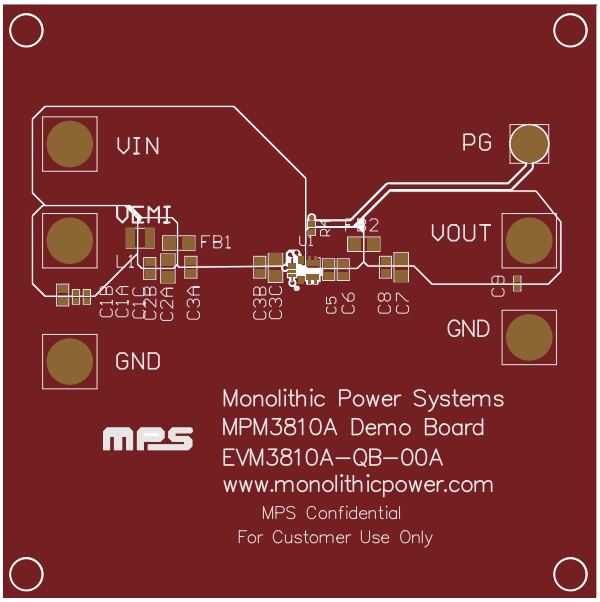

Figure 2: Top Layer

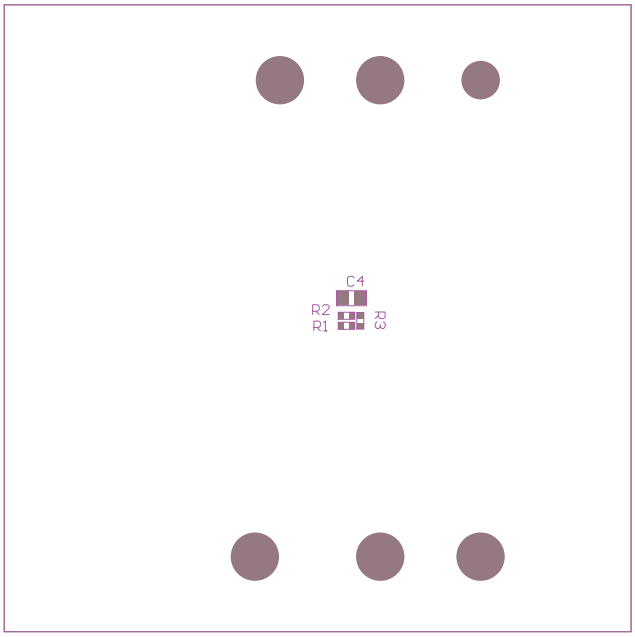

Figure 3: Bottom Silk Layer

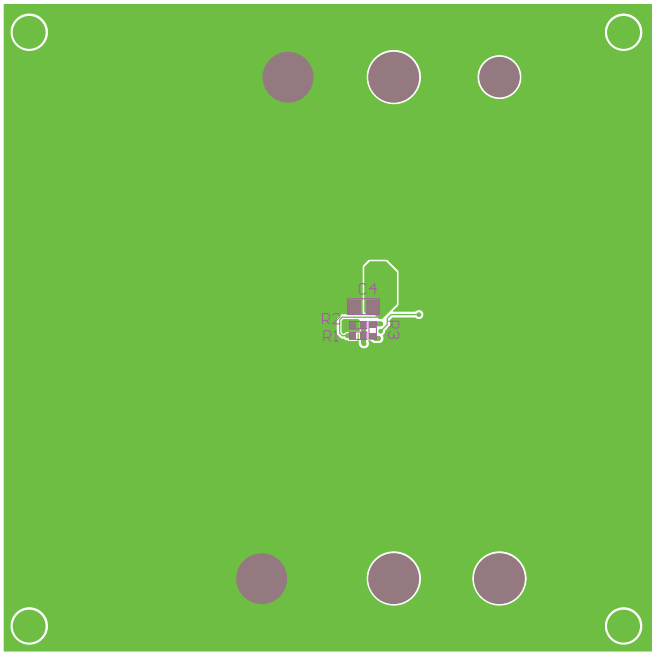

Figure 4: Bottom Layer

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QUICK START GUIDE

The output voltage of this board is set externally which can be regulated as low as 0.6V by operating from +2.5V to +6V. The default output voltage of this board is set to 1.2V.

1. Connect the positive and negative terminals of the load to the VOUT and GND pins, respectively.
2. Preset the power supply output between 2.5V and 6V, and then turn off the power supply.
3. Connect the positive and negative terminals of the power supply output to the VIN and GND pins, respectively.
4. Turn the power supply on. The board will automatically start up.
5. The Output Voltage V_{OUT} can be changed by varying R2. Choose R1 to be around 40kΩ to 80kΩ. R2 is then given by:

$$R2 = \frac{R1}{\frac{V_{out}}{0.6} - 1}$$

Example: For Vout= 1V, R1=40kΩ, R2=60kΩ.

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