EVM3805A-QB-00A

6V, 0.6A Peak Synchronous Step-Down Switcher Evaluation Board

DESCRIPTION

The EVM3805A-QB-00A is used for demonstrating the performance of MPS's MPM3805A a low voltage high switching frequency step-down switcher with built-in power MOSFETs and power inductor. MPM3805A provides up to 0.6A 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 and thermal shutdown TSD.

The EVM3805A-QB-00A 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}	0.6	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 0.6A 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

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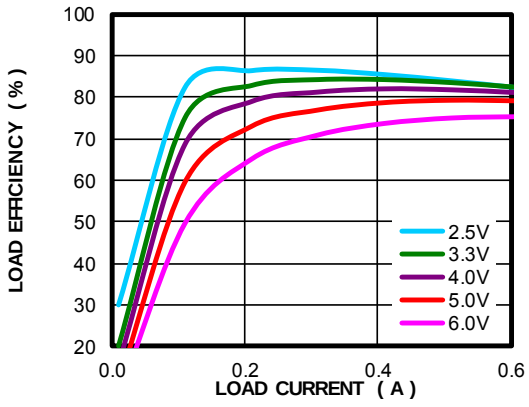
EVM3805A-QB-00A EVALUATION BOARD

Board Number	MPS IC Number
EVM3805A-QB-00A	MPM3805AGQB

Efficiency vs. Load

V_{OUT}=1.2V



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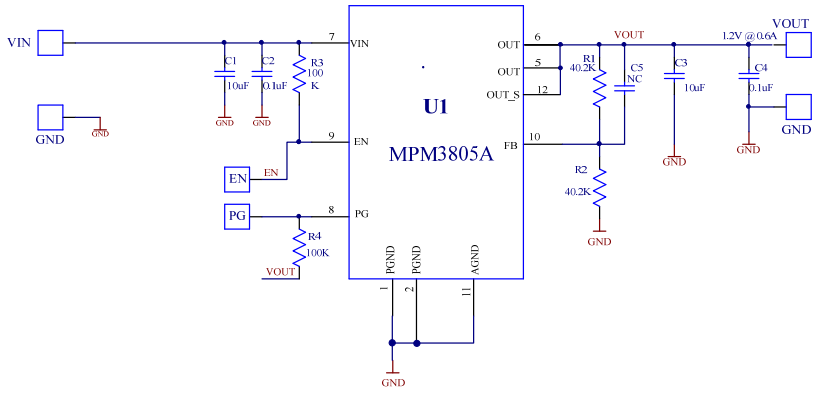
EVALUATION BOARD SCHEMATIC



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%)

EVM3805A-QB-00A BILL OF MATERIALS

Qty	RefDes	Value	Description	Package	Manufacturer	Manufactuer_P/N
2	C_1, C_3	10uF	Ceramic Capacitor;16V;X5R	0805	muRata	GRM21BR61C106KE15L
2	C_2, C_4	0.1uF	Ceramic Capacitor;16V;X7R	0603	muRata	GRM188R71C104KA01D
1	C_5	NS	Ceramic Capacitor;16V;X7R	0603		
2	R1, R2	40.2k	Film Res.,1%	0603	Any	
2	R3, R4	100k	Film Res.,1%	0603	Any	
1	U1	MPM3805A	COT Buck	QFN3.0*2.5	MPS	MPM3805A-GQB
2	PG, EN	Test Point	TP1mm	Any	HZ	
4	VIN, GND, VOUT, GND	Test Point	2.0 Golden Pin	Any	HZ	

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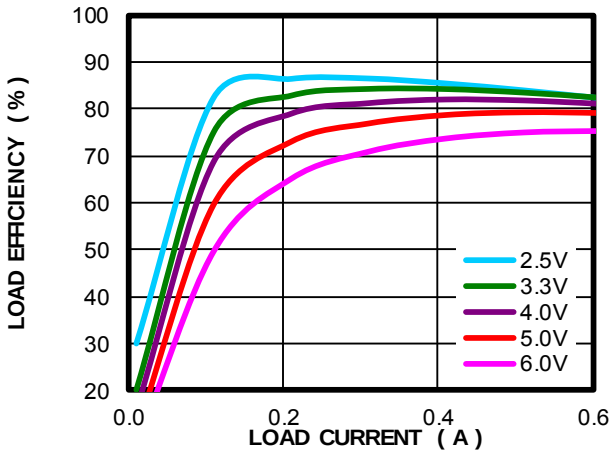
EVB TEST RESULTS

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

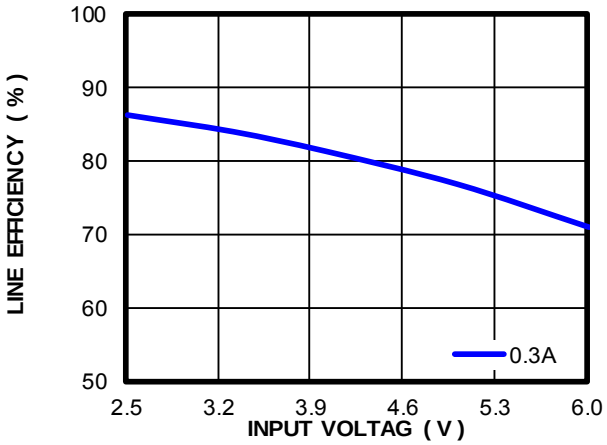
Efficiency vs. Load

V_{OUT}=1.2V



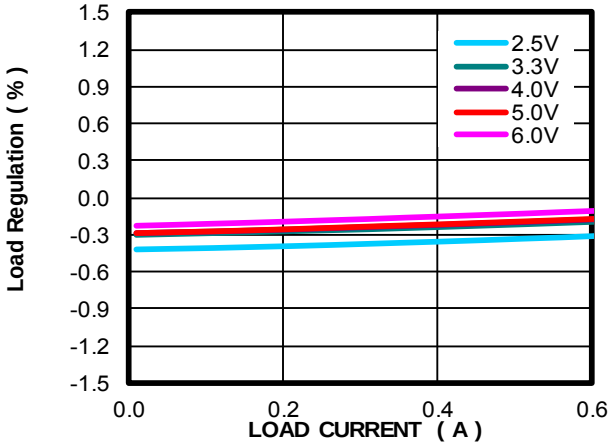
Efficiency vs. Input

V_{OUT}=1.2V



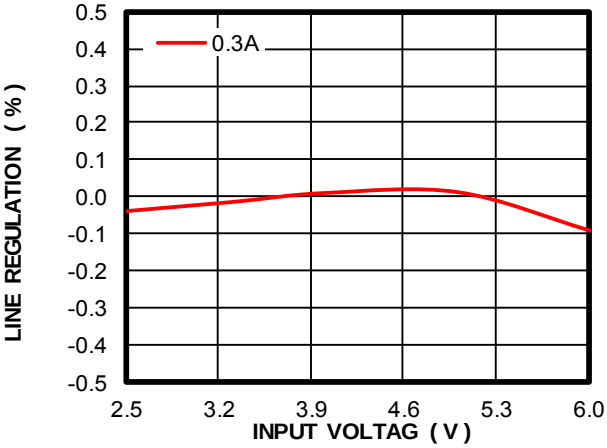
Load regulation

V_{OUT}=1.2V



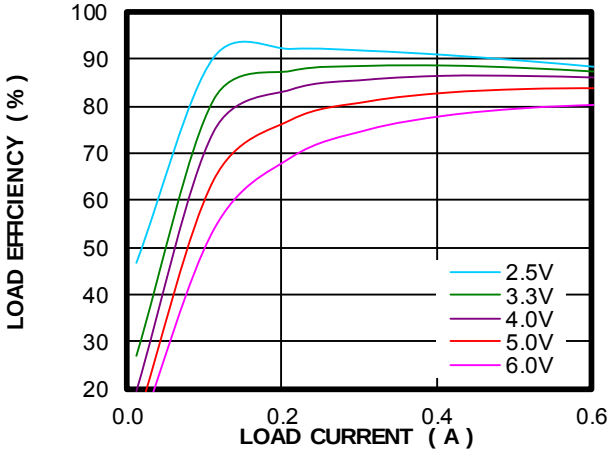
Line Regulation

V_{OUT}=1.2V



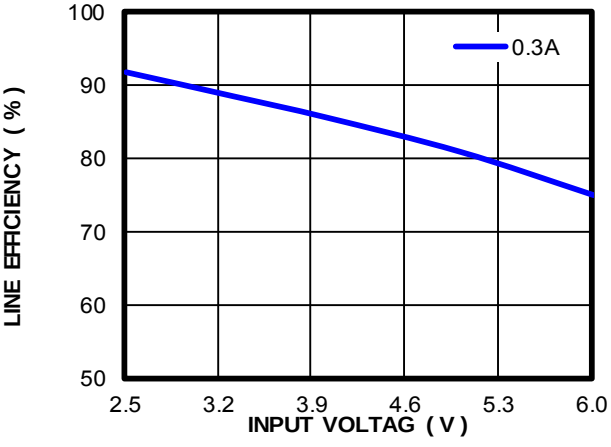
Efficiency vs. Load

V_{OUT}=1.8V



Efficiency vs. Input

V_{OUT}=1.8V



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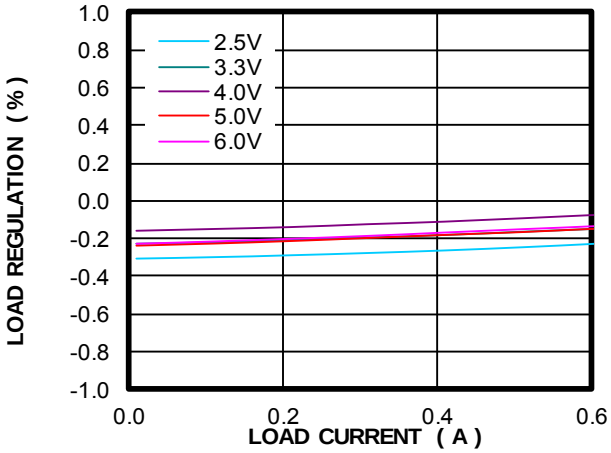
EVB TEST RESULTS

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

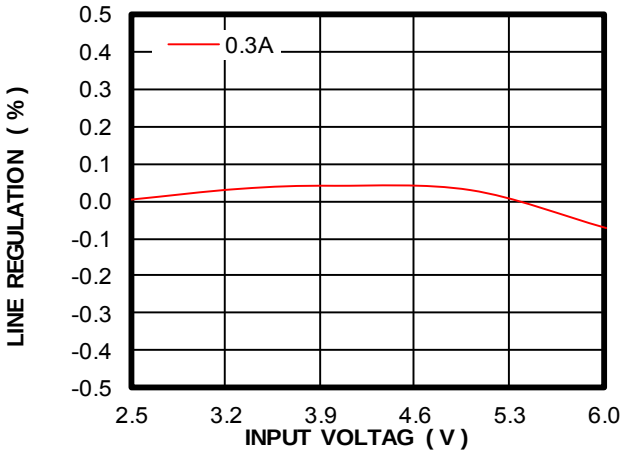
Load regulation

V_{OUT}=1.8V

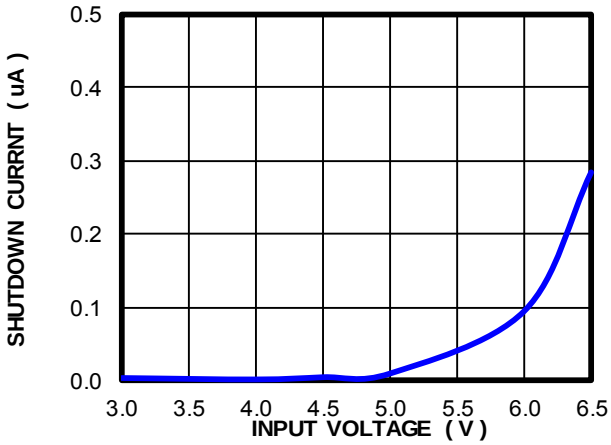


Line Regulation

V_{OUT}=1.8V



Shut Down Current vs. VIN



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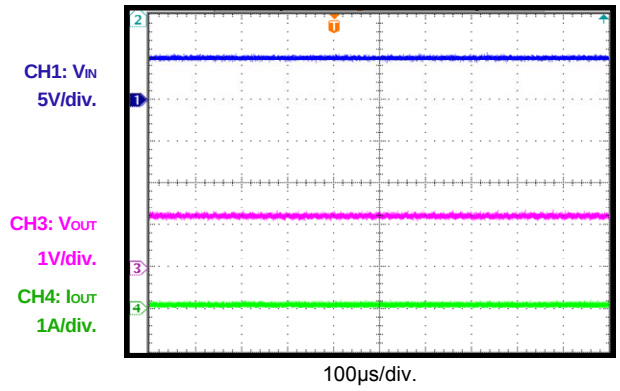
EVB TEST RESULTS

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

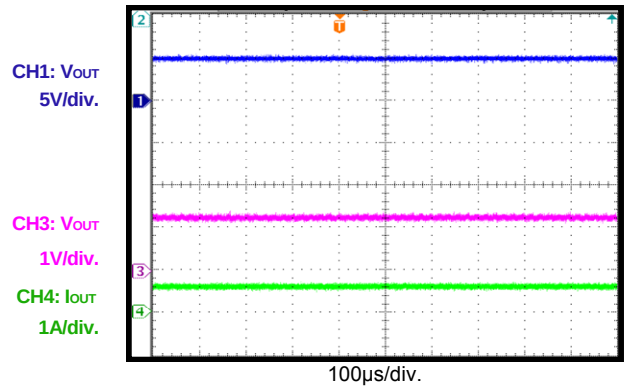
Steady State

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



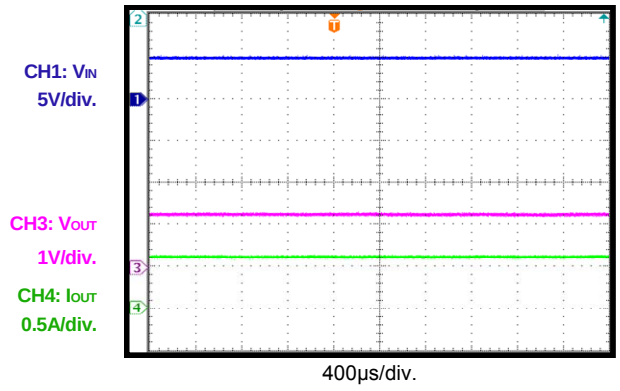
Steady State

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



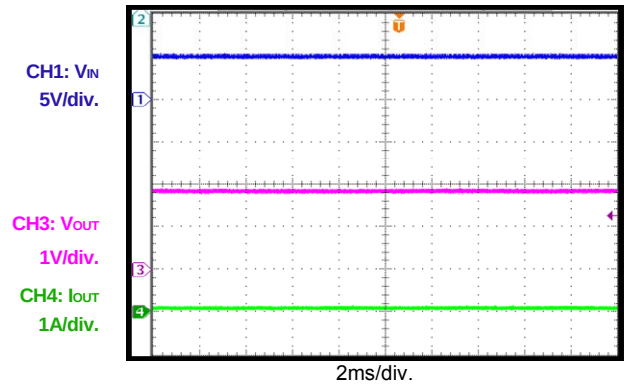
Steady State

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



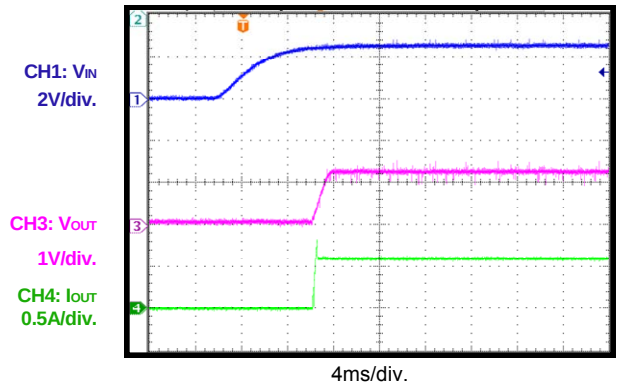
Steady State

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



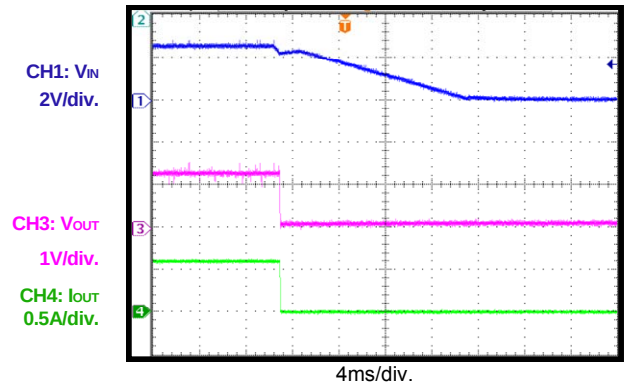
Power Up

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



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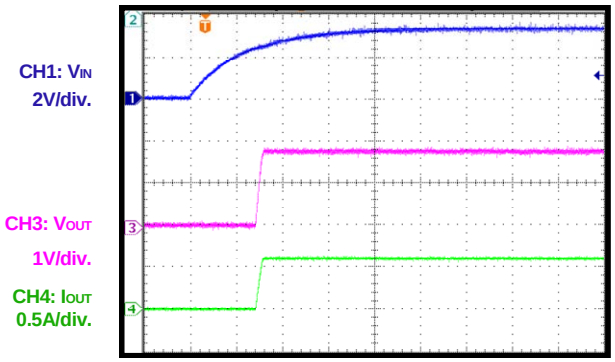
EVB TEST RESULTS *(continued)*

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

Power Up

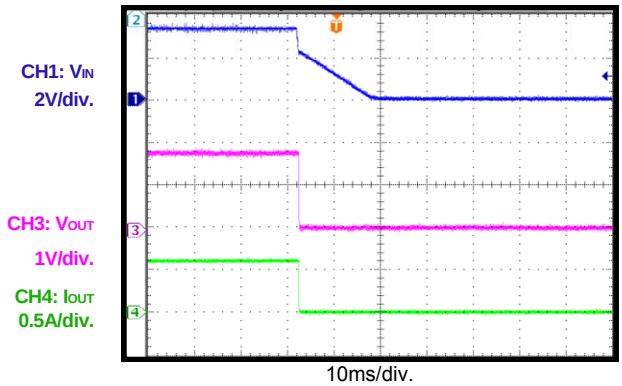
V_{IN}=3.3V, V_{OUT}=1.8V, I_{OUT}=0.6A



10ms/div.

Power Down

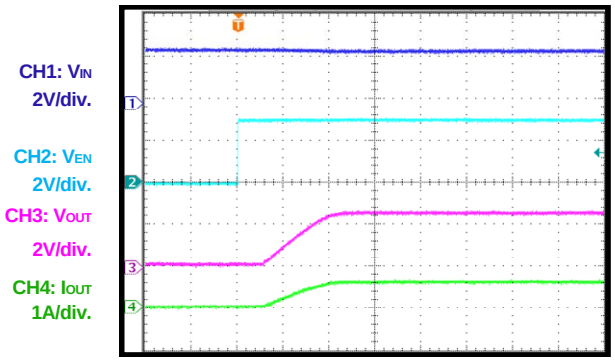
V_{IN}=3.3V, V_{OUT}=1.8V, I_{OUT}=0.6A



10ms/div.

Enable On

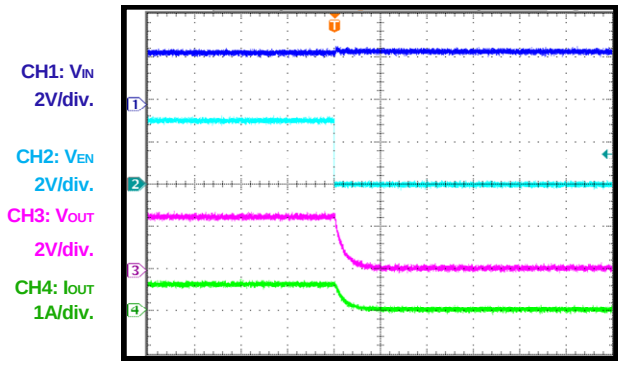
V_{IN}=2.5V, V_{OUT}=1.2V, I_{OUT}=0.6A



1ms/div.

Enable Off

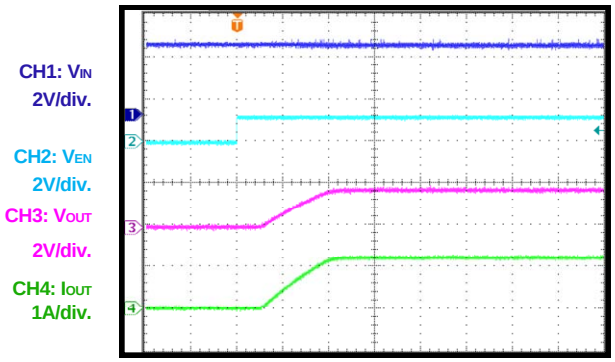
V_{IN}=2.5V, V_{OUT}=1.2V, I_{OUT}=0.6A



100µs/div.

Enable On

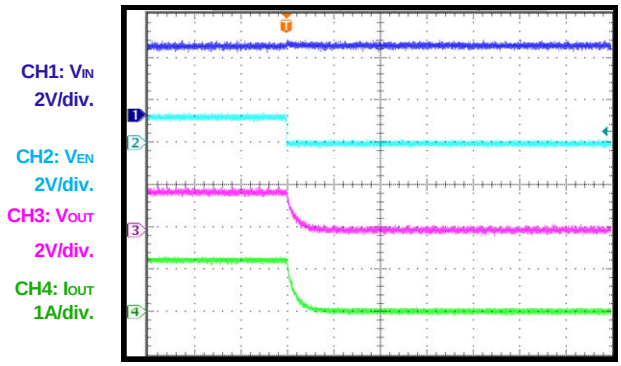
V_{IN}=3.3V, V_{OUT}=1.8V, I_{OUT}=0.6A



1ms/div.

Enable Off

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



200µs/div.

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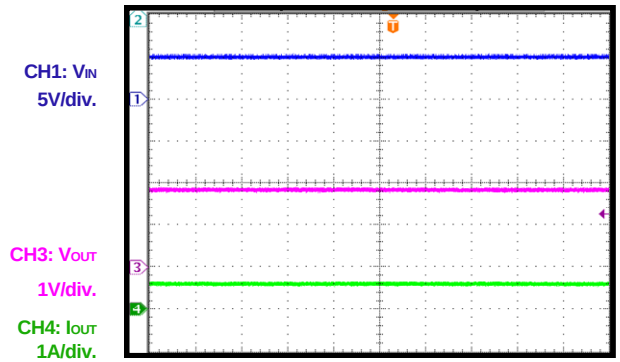
EVB TEST RESULTS *(continued)*

T_A = 25°C, unless otherwise noted.

Steady State

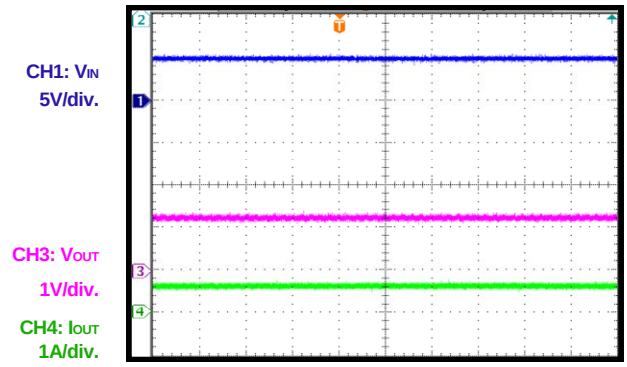
V_{IN}=5V, V_{OUT}=1.8V, I_{OUT}=0.6A



2ms/div.

Steady State

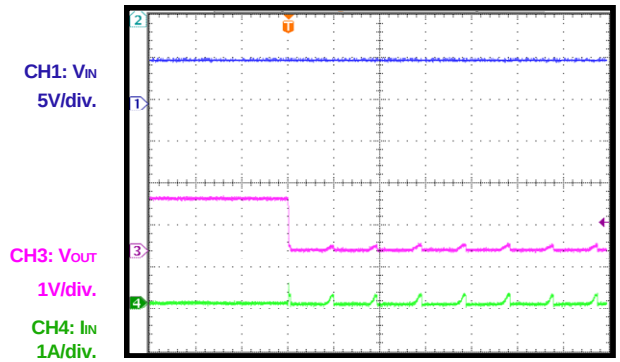
V_{IN}=5V, V_{OUT}=1.2V, I_{OUT}=0.6A



100µs/div.

Short Circuit

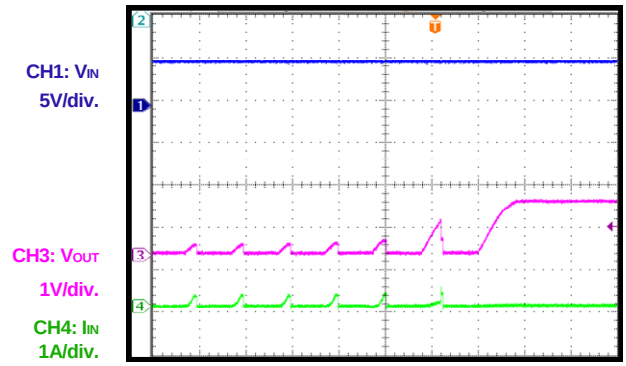
V_{IN}=5V, V_{OUT}=1.2V



2ms/div.

Short Circuit Recovery

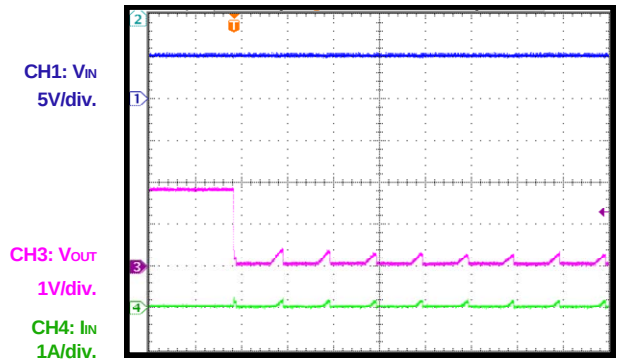
V_{IN}=5V, V_{OUT}=1.2V



2ms/div.

Short Circuit Entry

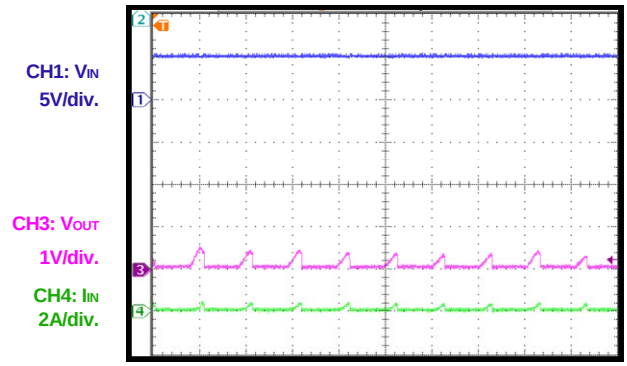
V_{IN}=5V, V_{OUT}=1.8V



2ms/div.

Short Circuit

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



2ms/div.

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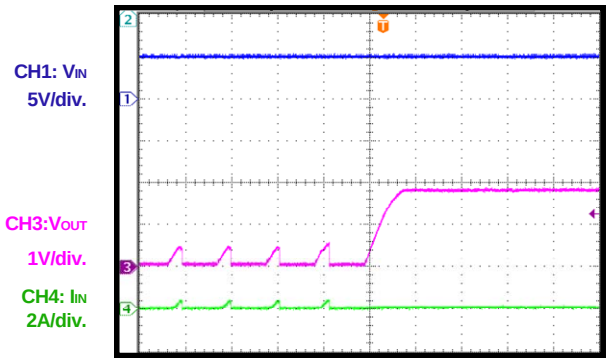
EVB TEST RESULTS *(continued)*

T_A = 25°C, unless otherwise noted.

Short Circuit Recovery

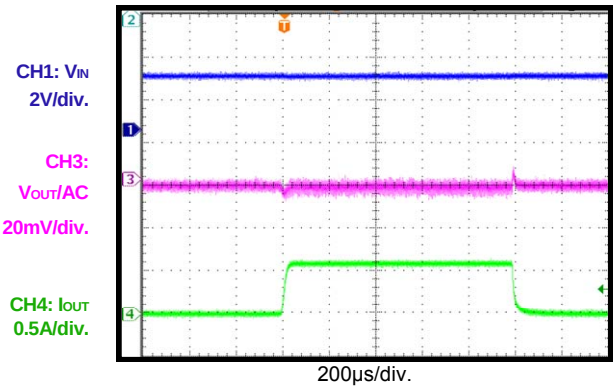
V_{IN}=5V, V_{OUT}=1.2V



2ms/div.

Transient Response

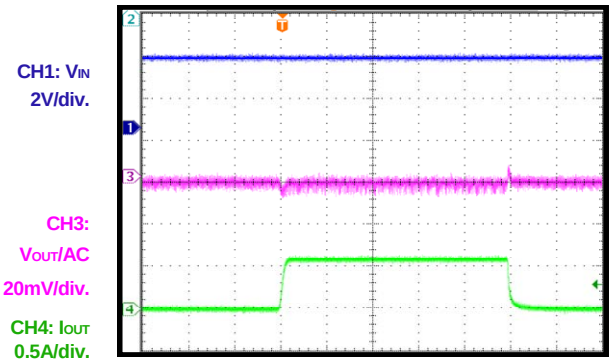
V_{IN}=2.5V, V_{OUT}=1.2V, I_{OUT}=0A-0.6A, 0.25A/us



200µs/div.

Transient Response

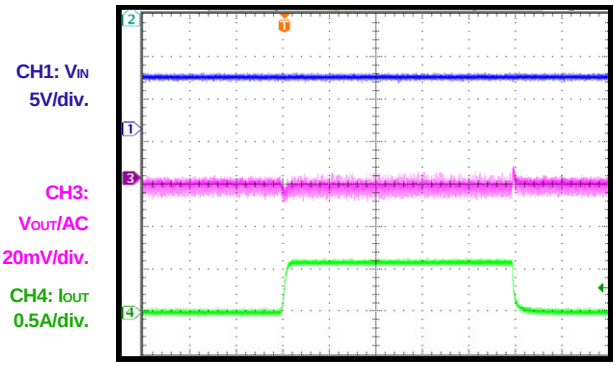
V_{IN}=3.3V, V_{OUT}=1.2V, I_{OUT}=0A-0.6A, 0.25A/us



200µs/div.

Transient Response

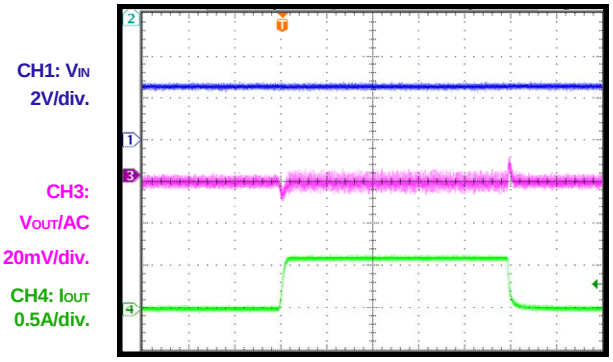
V_{IN}=6V, V_{OUT}=1.2V, I_{OUT}=0A-0.6A, 0.25A/us



200µs/div.

Transient Response

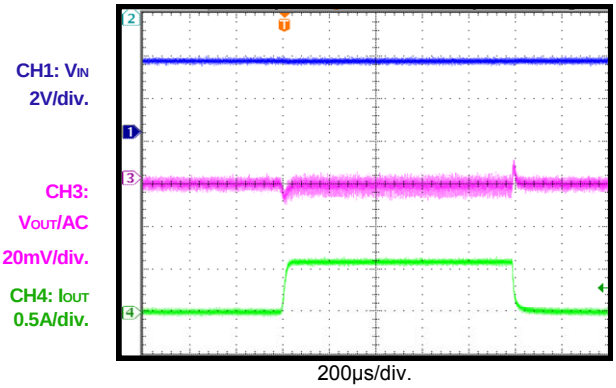
V_{IN}=2.5V, V_{OUT}=1.8V, I_{OUT}=0A-0.6A, 0.25A/us



200µs/div.

Transient Response

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



200µs/div.

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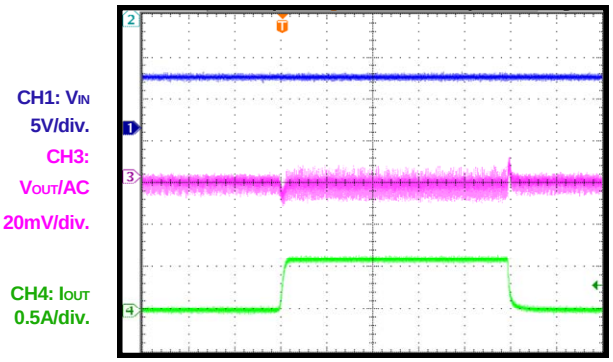
EVB TEST RESULTS *(continued)*

T_A = 25°C, unless otherwise noted.

Transient Response

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



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PRINTED CIRCUIT BOARD LAYER

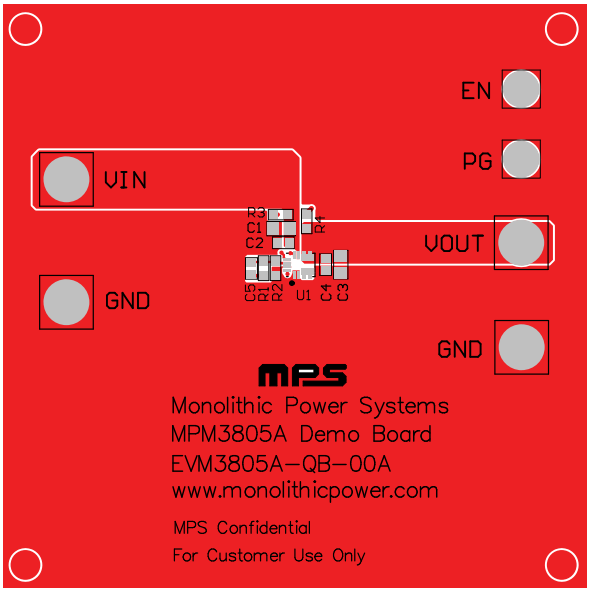

Figure 1: Top Silk Layer

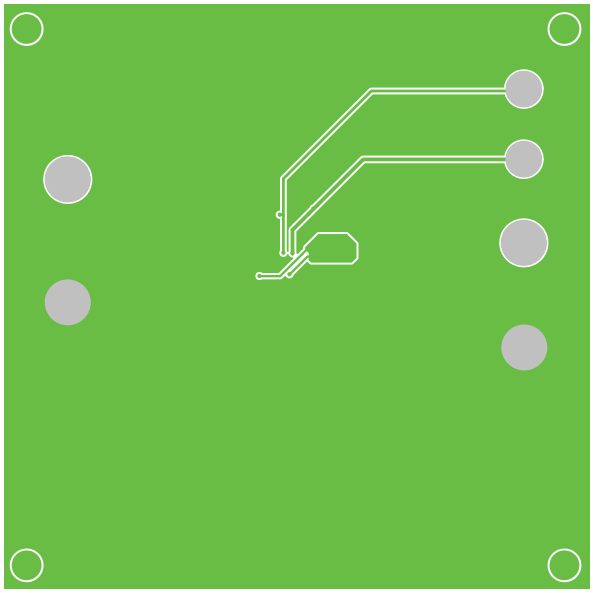

Figure 2: Bottom Layer

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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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