EVM54304-MN-00A

4V to 16V Input, Quad-Output Power Module with I²C and MTP Evaluation Board

DESCRIPTION

The EVM54304-MN-00A is an evaluation board for the MPM54304, which integrates four high-efficiency, step-down DC/DC converters, inductors, and a flexible logic interface.

The evaluation board can deliver 3A max per output (channels 1 and 2) and 2A per output (channels 3 and 4). Channels 1 and 2 can be paralleled to provide up to 6A of current, and channels 3 and 4 can be paralleled to provide up to 4A of current. The MPM54304 employs constant-on-time (COT) control, which provides ultra-fast load transient response.

The output voltage can be adjusted through the I²C bus or preset by the two-time programmable MTP (multi-time programmable) e-fuse. It can also be adjusted by the external divider; in this condition, the soft-start time is the same from each channel. The power-on/power-off sequence is also configurable via the MTP.

The MPM54304 requires a minimal number of external components, and is available in space-saving LGA (7mmx7mmx2mm) package.

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Value	Units
Input voltage	V_{IN}	4 to 16	V
Output voltage (channel 1 to channel 4)	V_{OUT}	1/3.3/1.8/ 1.5 (1)	V
Output current (channel 1 to channel 4)	I_{OUT}	3/3/1/1 (2)	A

Notes:

1) EVB default voltage value. Can be configured by the I²C.
2) The output current can also be set to 3A/2A/2A2A.

FEATURES

- 4V to 16V Operating Input Range
- Wide Output Voltage:
  - I²C Programmable: 0.55V to 5.4V
  - External Resistor Divider: 0.6V to 7V or V_{IN} * D_{MAX} if V_{IN} < 7V
- Channel 1 and 2: 3A Continuous Current
  Channel 3 and 4: 2A Continuous Current
- Interleaved Operation
- Configurable, Multi-Functional GPIO Pin
- I²C and Configurable Parameters:
  - Paralleling Channel 1 and 2
  - Paralleling Channel 3 and 4
  - Switching Frequency
  - Output Voltage
  - Over-Current and Over-Voltage Protection Threshold
  - Power-On and Power-Off Sequencing
  - Forced PWM or Auto-PWM/PFM
- Preset to MPM54304GMN-0000 Configuration

APPLICATIONS

- FPGA Power Supplies
- Multi-Rail Power Systems
- MCU/DSP Power Supplies

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ADAM (Analog Digital Adaptive Modulation), AAM (….) are Trademarks of Monolithic Power Systems, Inc.

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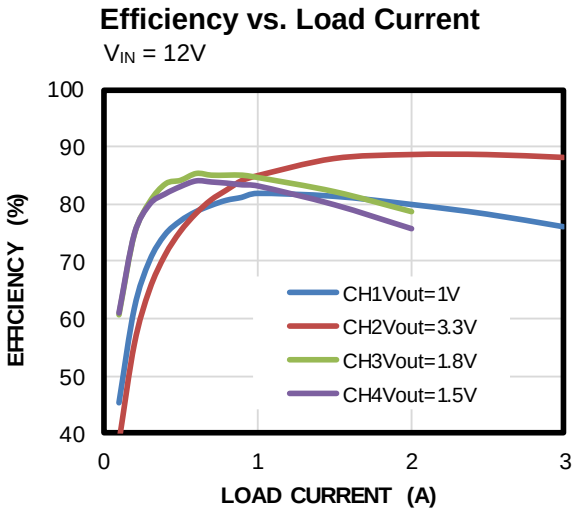
EVM54304-MN-00A EVALUATION BOARD

(LxW) 63.5mmx63.5mm	
Board Number	**MPS IC Number**
EVM54304-MN-00A	MPM54304GMN-0000



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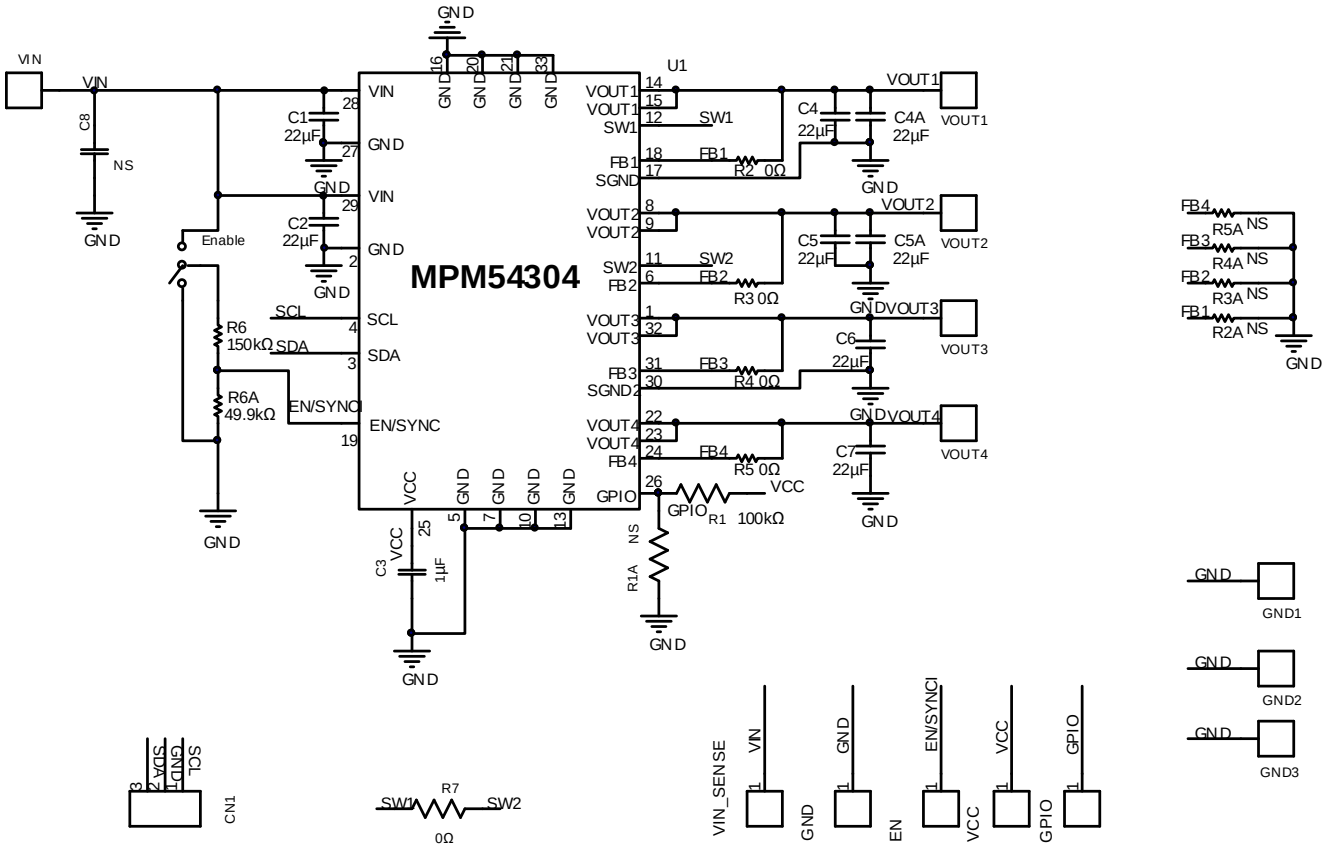
EVALUATION BOARD SCHEMATIC



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EVM54304-MN-00A BILL OF MATERIALS

Item	Qty	Ref. Des.	Value	Description	Package	Manufacturer	Manufactuer P/N
1	8	C1, C2, C4, C5, C6, C7, C4A, C5A	22µF	Ceramic capacitor, 25V, X5R	0805	Murata	GRM21BR61E226ME44L
2	1	C3	1µF	Ceramic capacitor, 16V, X6S	0402	Murata	GRM155C81C105KE11D
3	1	R6	150kΩ	Film res., 1%, 0603, 150kΩ	0603	YAGEO	RC0603FR-07150KL
4	1	R6A	49K9	Film res., 1%, 0603, 49K9	0603	YAGEO	RC0603FR-0749K9L
5	4	R2, R3, R4, R5	0R	Film res., 1%, 0603, 0R	0603	YAGEO	RC0603FR-070RL
6	1	R1	100kΩ	Film res., 1%, 0402, 100kΩ	0402	YAGEO	RC0402FR-07100KL
7	1	PMBUS	3PINS	3 pins, 1 row, straight	DIP	WE	61300311121
8	1	SWITCH	SWITCH	Tact switch, on-on, vertical type, THT, bulk	DIP	WE	450301014042
9	1	U1	MPM54304	PMIC module	LGA	MPS	MPM54304

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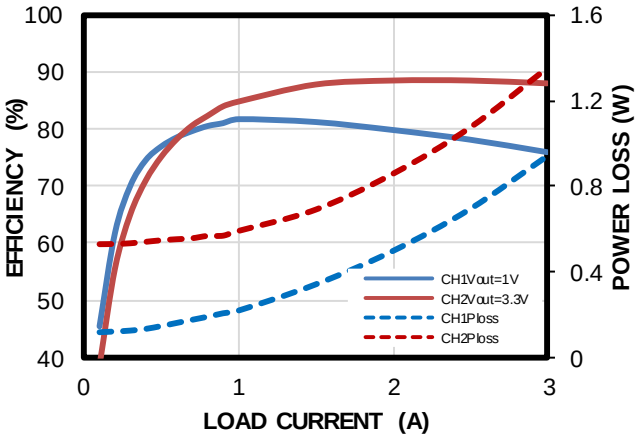
EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 12V, $V_{OUT1/2/3/4}$ = 1V/3.3V/1.8V/1.5V, f_{SW} = 800kHz,T_A = 25°C, CCM mode, unless otherwise noted.

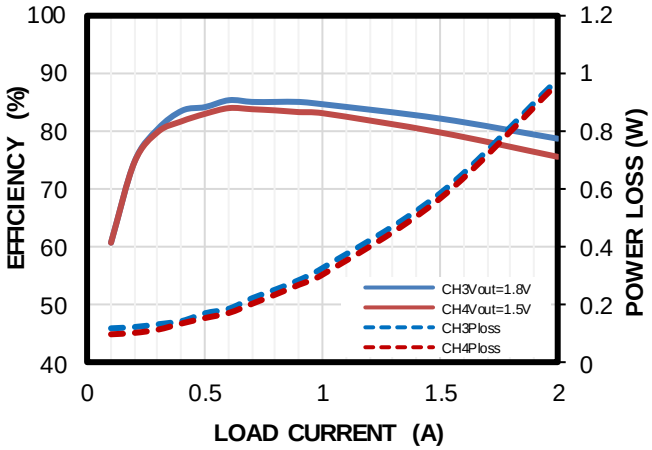
Efficiency vs. Load Current

V_{IN} = 12V



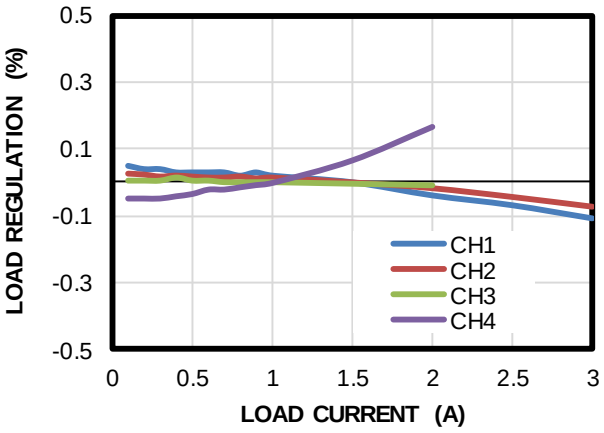
Efficiency vs. Load Current

V_{IN} = 12V

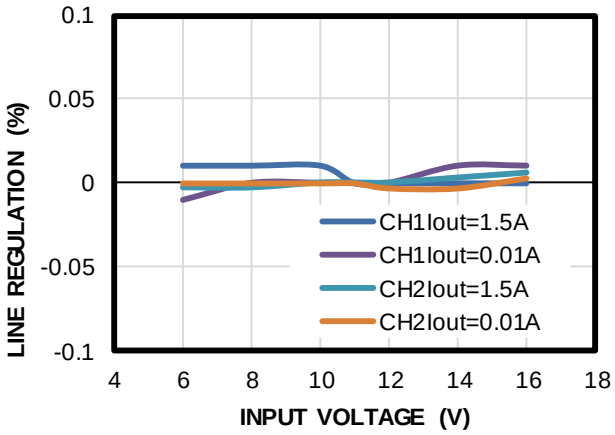


Load Regulation vs. Load Current

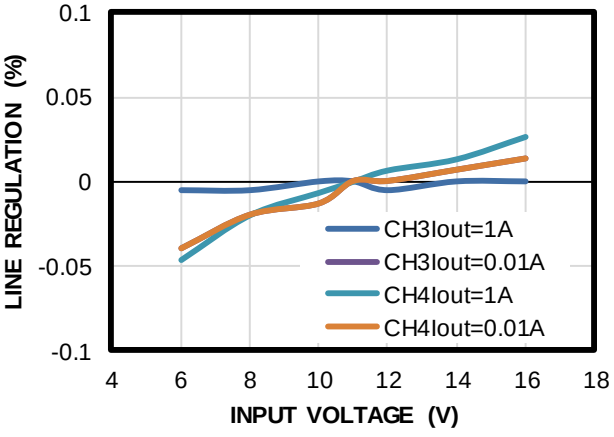
V_{IN} = 12V



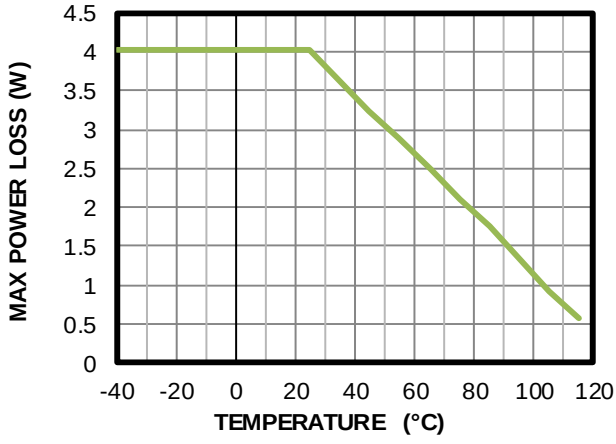
Line Regulation vs. Input Voltage



Line Regulation vs. Input Voltage



Max Power Loss vs. Temperature



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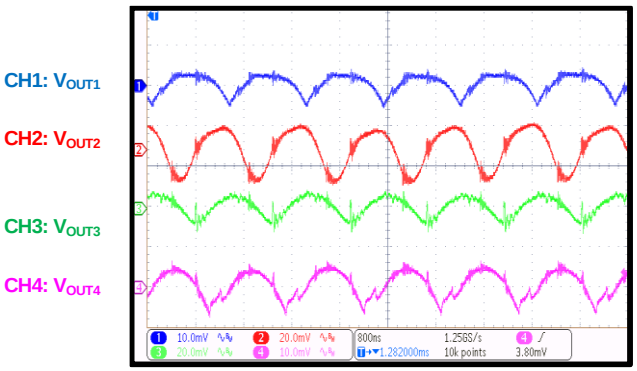
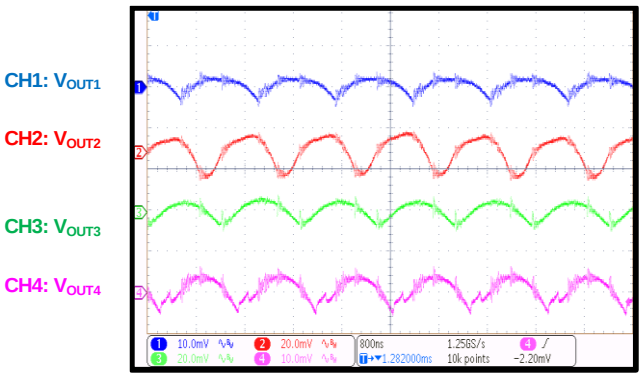
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 12V, $V_{OUT1/2/3/4}$ = 1V/3.3V/1.8V/1.5V, f_{SW} = 800kHz, T_A = 25°C, CCM mode, unless otherwise noted.

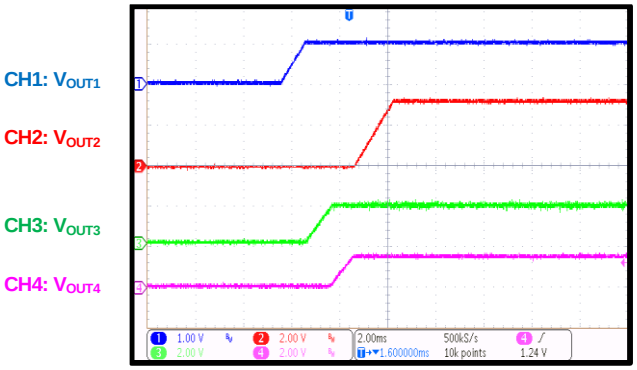
Steady State with Full Load



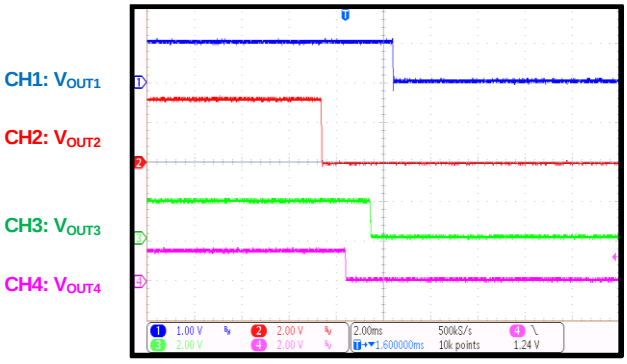
Steady State with No Load



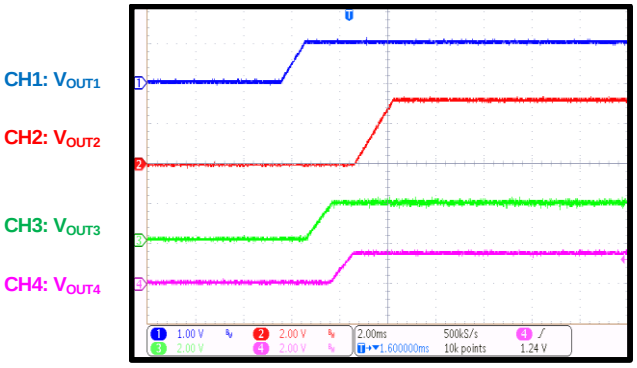
EN On with Full Load



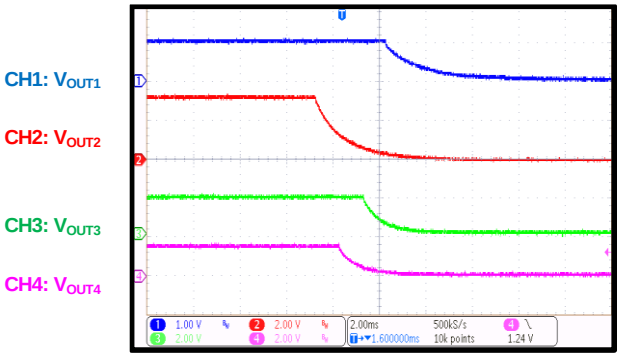
EN Off with Full Load



En On without Load



En Off without Load



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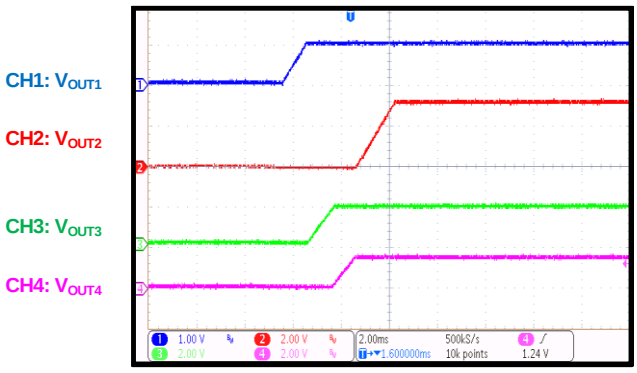
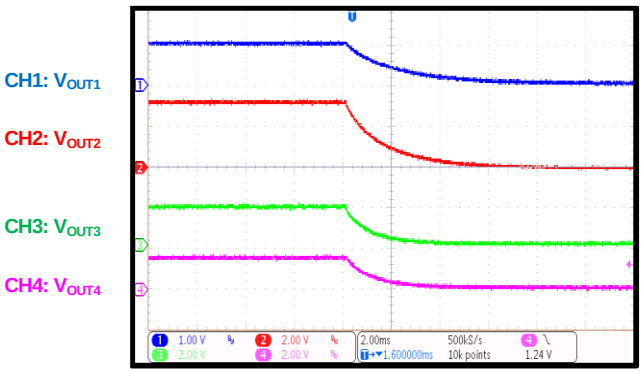
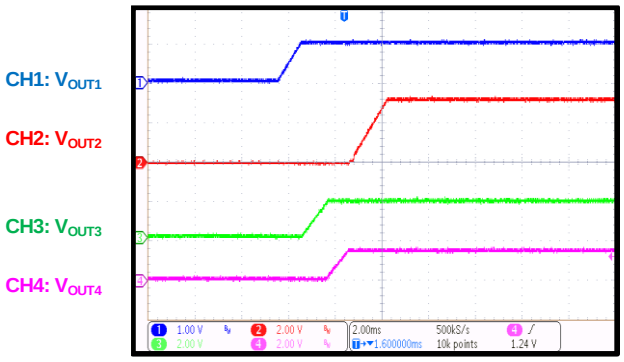
V_{IN} On without Load



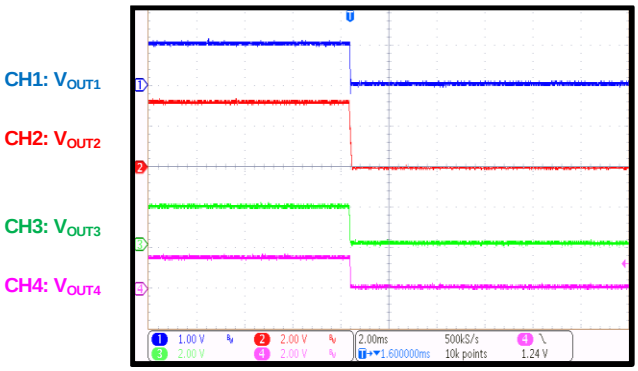
V_{IN} Off without Load



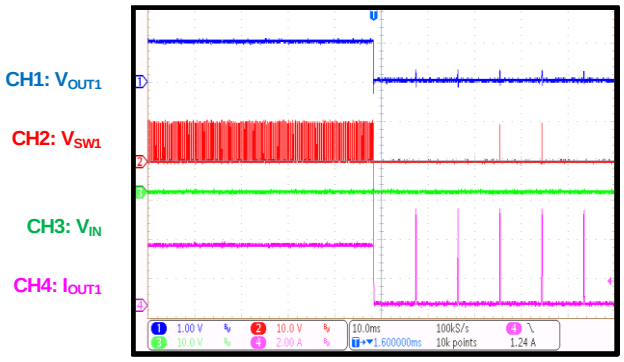
V_{IN} On with Load



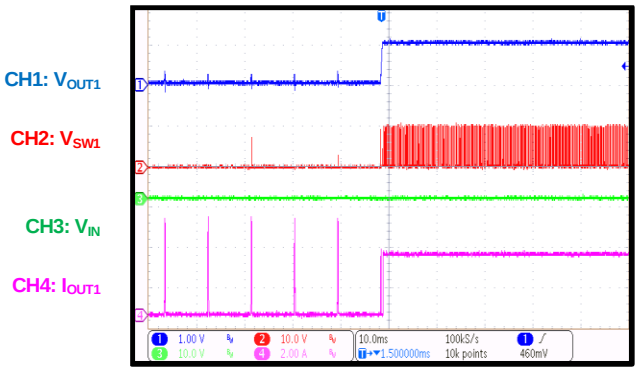
V_{IN} Off with Load



SCP Entry with Full Load



SCP Recovery with Full Load



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EVB TEST RESULTS *(continued)*

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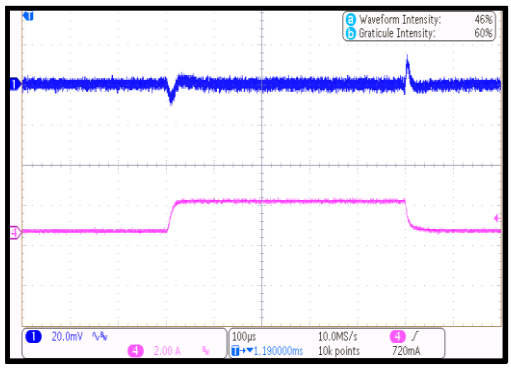
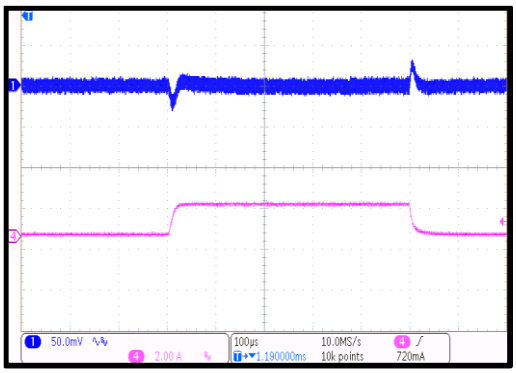
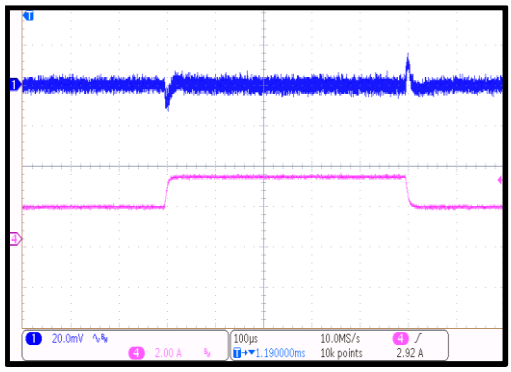
Load Transient 0A to 1.5A



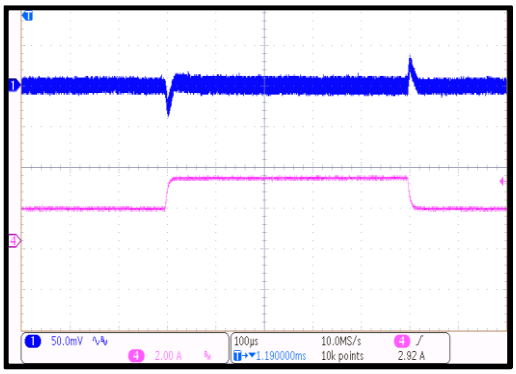
Load Transient 0A to 1.5A



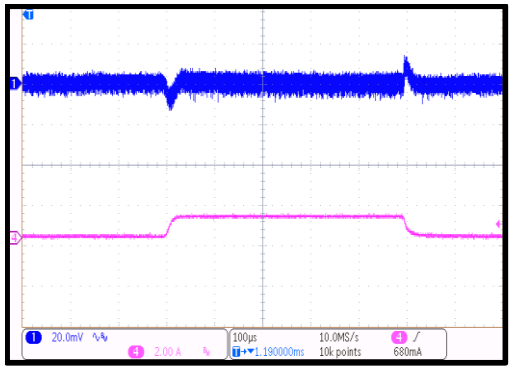
Load Transient 1.5A to 3A



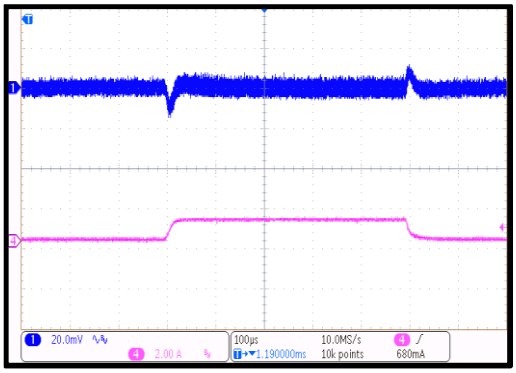
Load Transient 1.5A to 3A



Load Transient 0A to 1A



Load Transient 0A to 1A



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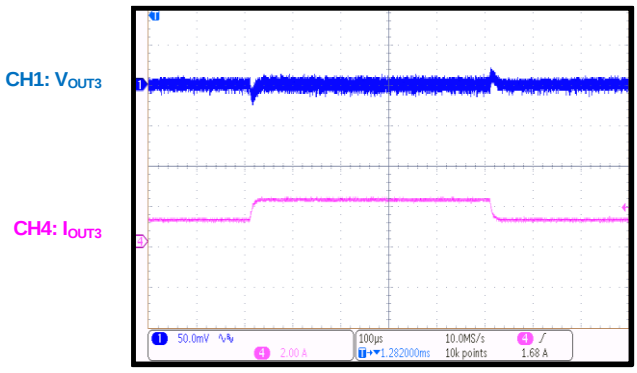
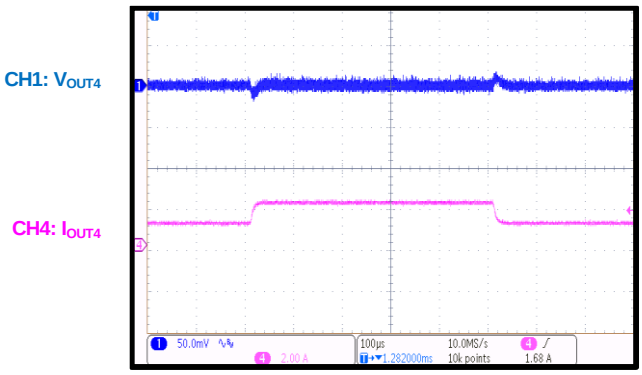
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 12V, $V_{OUT1/2/3/4}$ = 1V/3.3V/1.8V/1.5V, f_{SW} = 800kHz, T_A = 25°C, CCM mode, unless otherwise noted.

Load Transient 1A to 2A



Load Transient 1A to 2A



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PCB LAYOUT

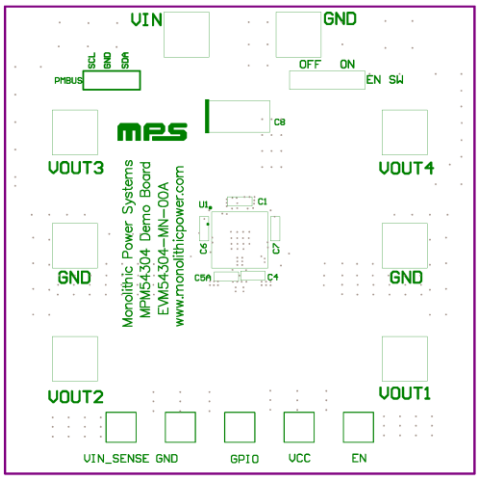

Figure 1: Top Silk Layer

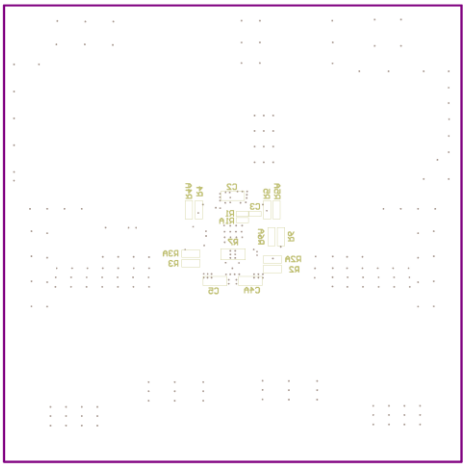

Figure 2: Bottom Silk Layer

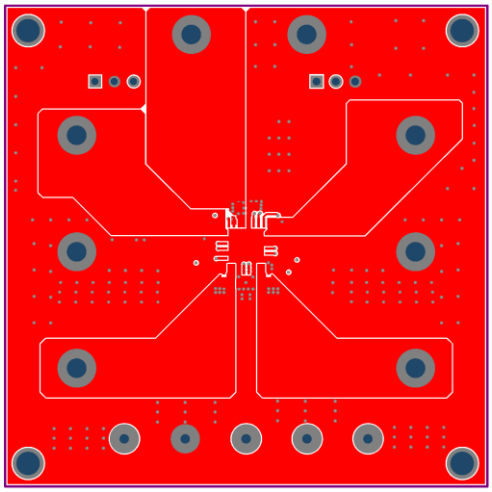

Figure 3: Top Layer

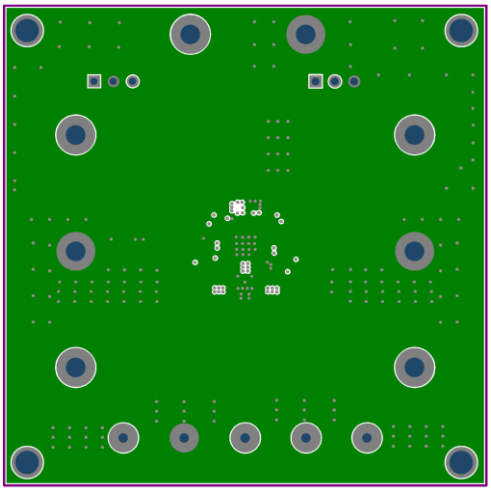

Figure 4: Mid-Layer 1

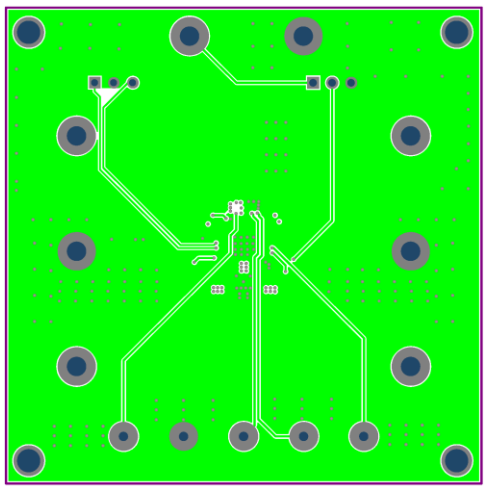

Figure 5: Mid-Layer 2

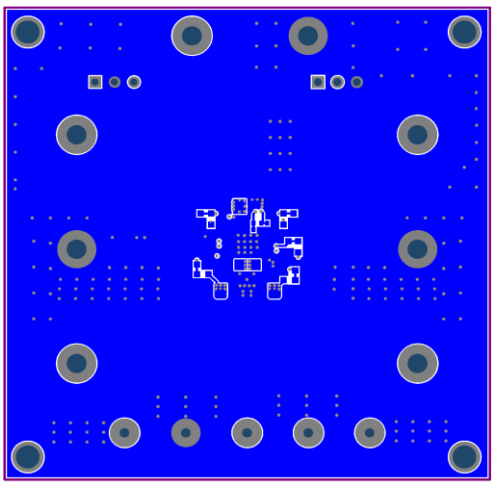

Figure 6: Bottom Layer

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QUICK START GUIDE

1. Preset the power supply to 4V ≤ V_{IN} ≤16V.
2. Turn the power supply off.
3. Connect the power supply terminals to:
    a. Positive (+): VIN
    b. Negative (–): GND
4. Choose which channels (1 to 4) to connect the load to:
    a. Positive (+): VOUT
    b. Negative (–): GND
5. Turn the power supply and EN switch on after making the connections. The board should automatically start up.
6. To program the I²C function, connect SCL, SDA, and GND to the I²C start kit board. Connect the I²C start kit board to a PC, then run the MPM54304 GUI software to program the MPM54304 I²C register. The GUI software can be downloaded from the MPS website.

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