EVM54522-PC-00A

16V, Dual 6A, Single 12A Power Module Evaluation Board

DESCRIPTION

The EVM54522-PC-00A evaluation board is designed to demonstrate the capabilities of the MPM54522, a dual 6A power module that integrates a high-efficiency step-down DC/DC converter IC, two inductors, and select passive components into a single over-molded package.

The MPM54522's two outputs can be paralleled for up to 12A of output current (I_{OUT}). It offers active current balancing, which allows for equal current sharing of the outputs in parallel operation. The MPM54522 offers a dedicated, configurable low-dropout regulator (LDO) with up to 500mA of I_{OUT} to provide ultra-low noise output. The MPM54522 also adopts a constant-on-time (COT) control scheme to provide fast transient response and minimize the required output capacitance (C_{OUT}).

It is recommended to read the datasheet for the MPM54522 prior to making any changes to the EVM54522-PC-00A.

PERFORMANCE SUMMARY (1)

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

Parameters	Conditions	Value
Input voltage (V_{IN}) range		3V to 16V
Output voltage (V_{OUT}) (2)	V_{IN} = 3V to 16V, independent mode, V_{OUT1} = V_{OUT2}	1.2V
Maximum output current (I_{OUT}) (3)	V_{IN} = 3V to 16V, independent mode, V_{OUT1} = V_{OUT2}	6A
Typical efficiency	V_{IN} = 12V, V_{OUT} = 1.2V, independent mode, I_{OUT1} = I_{OUT2} = 6A, f_{SW} = 1000kHz	83.92%
Peak efficiency	V_{IN} = 12V, V_{OUT} = 1.2V, independent mode, I_{OUT1} = I_{OUT2} = 3A, f_{SW} = 1000kHz	87%
Operation mode (3)		MODE3, independent mode, 1000kHz

Notes:

1) For different V_{IN} and V_{OUT} specifications with different output capacitors/inductors, the application circuit parameters may require changes.
2) V_{OUT} can be adjusted by changing the feedback (FB) resistors.
3) The operation mode can be changed to MODE1 to make the device function in parallel, in which case VOUT1 must be shorted to VOUT2.

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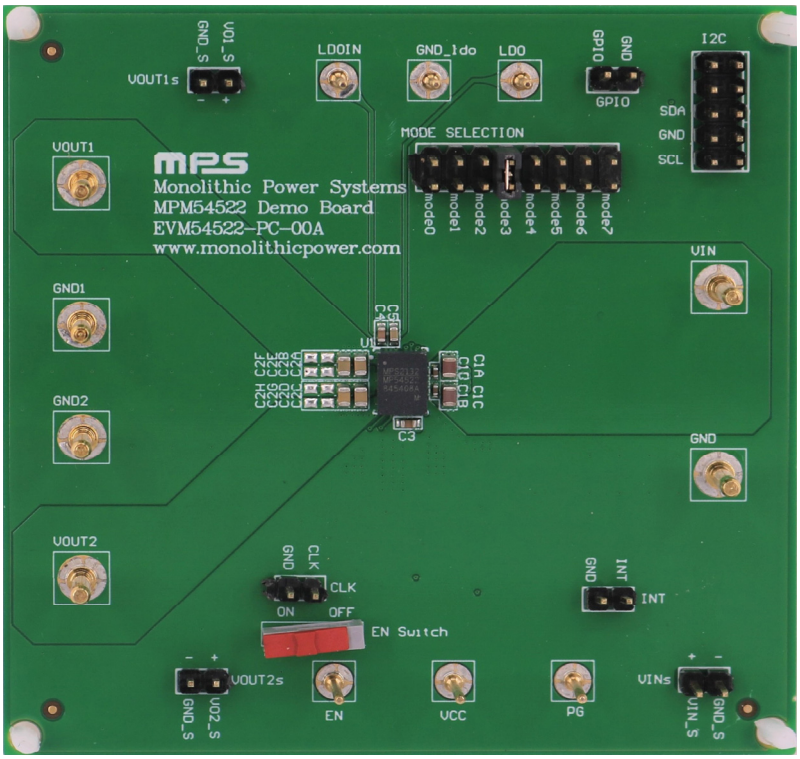
EVALUATION BOARD



LxWxH (8cmx8cmx1.6mm)

Board Number	MPS IC Number
EVM54522-PC-00A	MPM54522GPC-0000

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QUICK START GUIDE

The EVM54522-PC-00A evaluation board is easy to set up and use to evaluate the performance of the MPM54522. For proper measurement equipment set-up, refer to Figure 1 and follow the steps below:

1. For multi-phase output, connect VOUT1 and VOUT2 together, then connect the load terminals as shown below. For independent output, connect the load terminals to:
   a. Positive (+): VOUT1, VOUT2
   b. Negative (-): GND1, GND2
2. Preset the power supply output between 3V and 16V, then turn the power supply off.
3. Connect the power supply terminals to:
   a. Positive (+): VIN (4)
   b. Negative (-): GND
4. Turn on the power supply, and set the EN switch to on. The board should automatically start up. (5)

Notes:

4) Make sure that the input voltage does not exceed 16V.
5) When measuring the output or input voltage ripple, do not use the long ground lead on the oscilloscope probe.

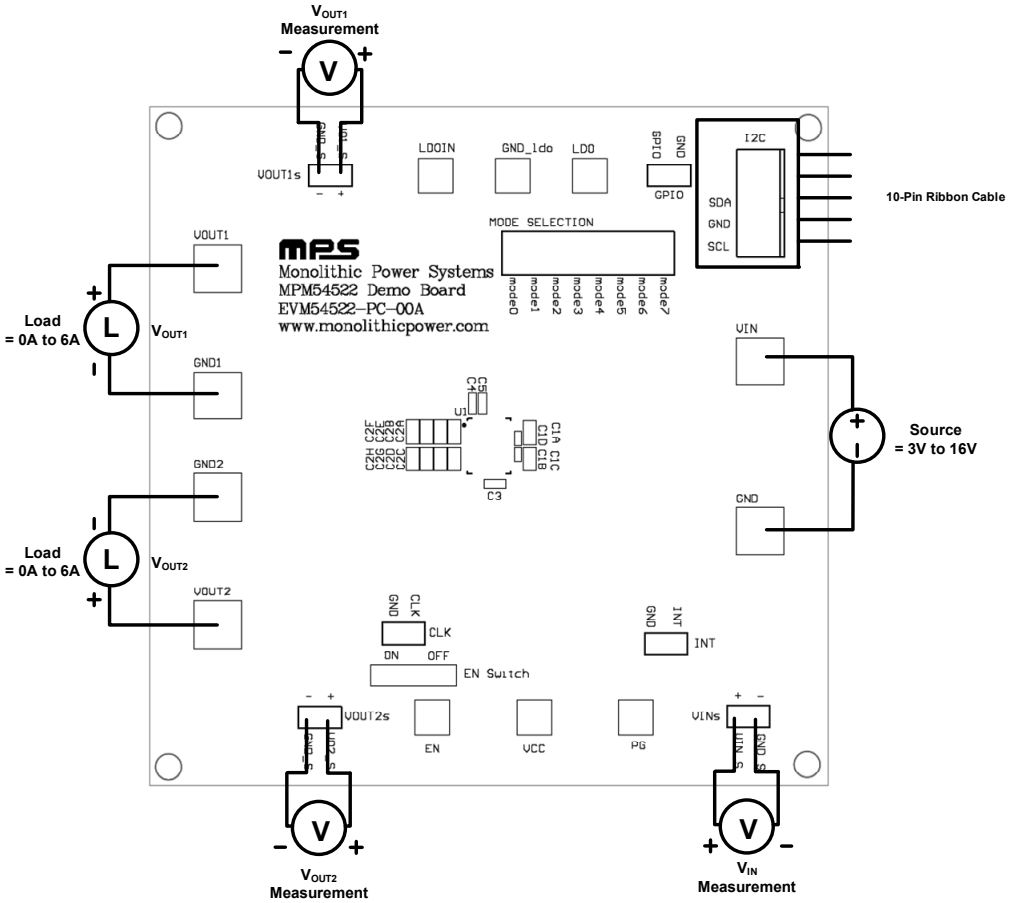

Figure 1: Measurement Equipment Set-Up

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EVALUATION BOARD SCHEMATIC

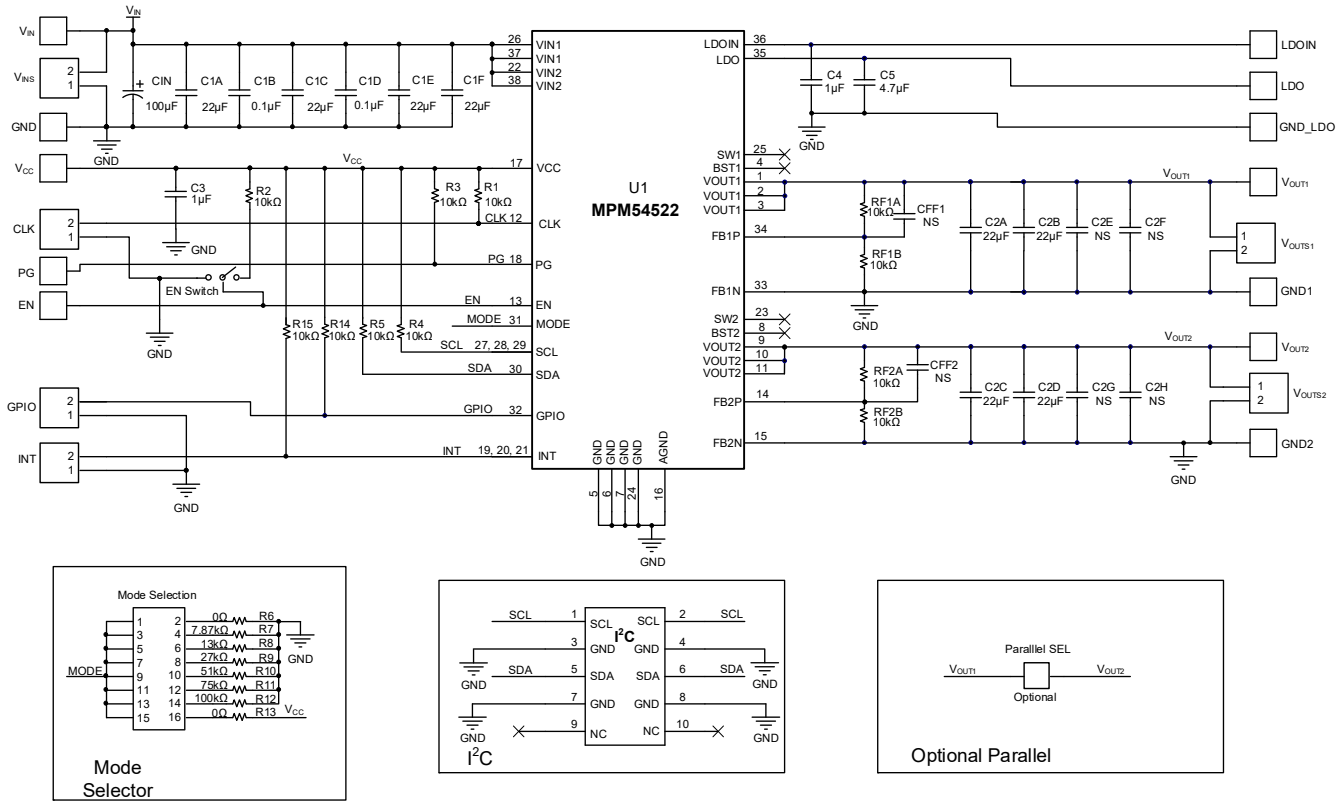

Figure 2: Evaluation Board Schematic

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EVM54522-PC-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
4	C1A, C1C, C1E, C1F	22µF	Ceramic capacitor, 25V	0805	Murata	GRM21BR61E226ME44L
2	C1B, C1D	0.1µF	Ceramic capacitor, 25V	0402	Murata	GRM155R71E104KE14D
4	C2A, C2B, C2C, C2D	22µF	Ceramic capacitor, 10V	0805	Murata	GRM21BR61A226ME15L
2	C3, C4	1µF	Ceramic capacitor, 10V	0603	Murata	GRM185D71A105KE36D
1	C5	4.7µF	Ceramic capacitor, 10V	0603	Wurth	885012106012
0	CFF1, CFF2	NS				
1	CIN	100µF	25/OSCON E7, 25V capacitor	SMD	Wurth	865080449011
6	CLK, GPIO, INT, VINs, VOUTS1, VOUTS2	2 pins	2-pin header	SIP	Wurth	61300211121
1	EN Switch	12V	SPDT switch	SIP	Wurth	450301014042
6	EN, LDO, GND_LDO, LDOIN, PG, VCC	1mm	1mm copper pin	THT	Custom (6)	
6	GND, GND1, GND2, VIN, VOUT1, VOUT2	2mm	2mm copper pin	THT	Custom (6)	
1	I2C	10-pin	10-pin, THT straight box header	DIP	Wurth	612010235121
1	MODE SELECTION	16-pin	16-pin, double-row straight header	DIP	Wurth	61301621121
2	R6, R13	0Ω	Film resistor, ±1%	0402	Yageo	RC0402FR-070RL
11	R1, R2, R3, R4, RF1A, RF2A, RF1B, RF2B, R5, R14, R15	10kΩ	Film resistor, ±1%	0402	Yageo	RC0402FR-0710KL
1	R7	7.87kΩ	Film resistor, ±1%	0402	Yageo	RC0402FR-077K87L
1	R8	13kΩ	Film resistor, ±1%	0402	Yageo	RC0402FR-0713KL
1	R9	27kΩ	Film resistor, ±1%	0402	Yageo	RC0402FR-0727KL
1	R10	51kΩ	Film resistor, ±1%	0402	Yageo	RC0402FR-0751KL
1	R11	75kΩ	Film resistor, ±1%	0402	Yageo	RC0402FR-0775KL
1	R12	100kΩ	Film resistor, ±1%	0402	Yageo	RC0402FR-07100KL
1	U1	MPM54522	16V, dual 6A step-down module	ECLGA (5mmx 6.5mm)	MPS	MPM54522GPC-0000

Note:

6) MPS custom-produces these pins. Contact an MPS FAE for more information.

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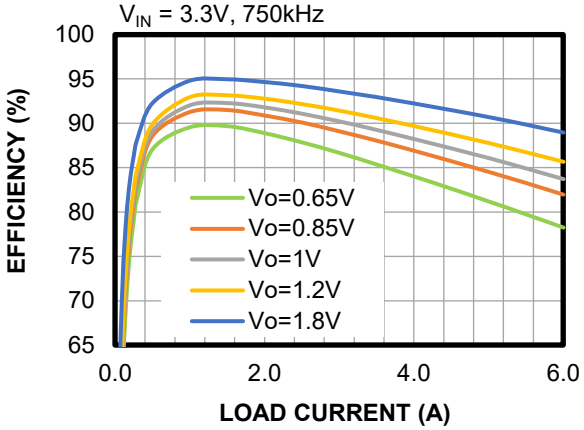
EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 12V, independent mode, V_{OUT1} = V_{OUT2} = 1.2V, C_{OUT1} = C_{OUT2} = 2 x 22µF, T_A = 25°C, unless otherwise noted.

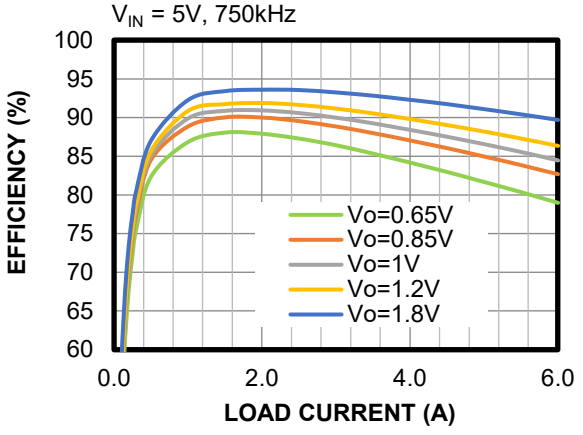
Efficiency vs. Load Current

V_{IN} = 3.3V, 750kHz



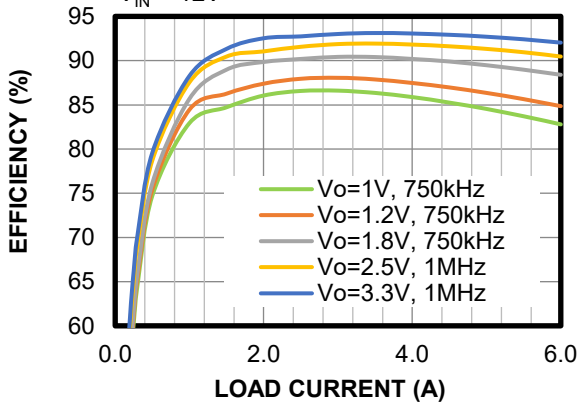
Efficiency vs. Load Current

V_{IN} = 5V, 750kHz



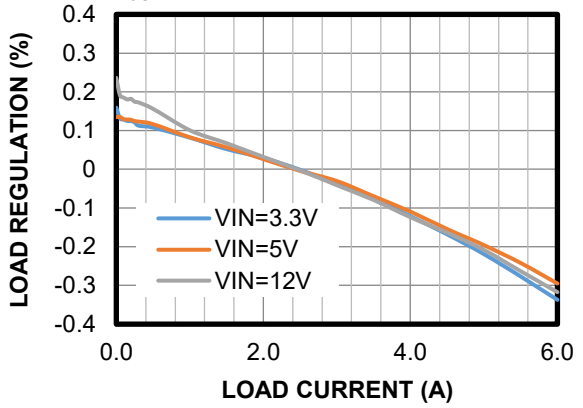
Efficiency vs. Load Current

V_{IN} = 12V



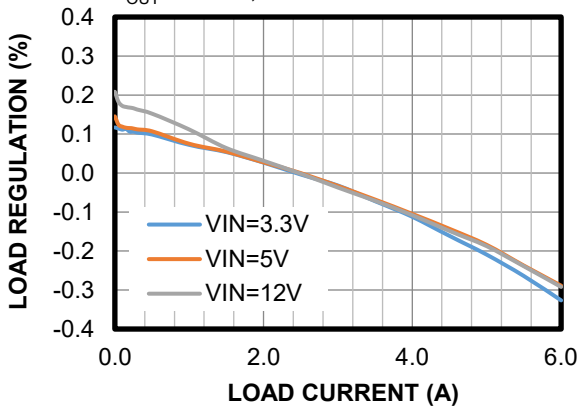
Load Regulation

V_{OUT} = 0.65V, 750kHz



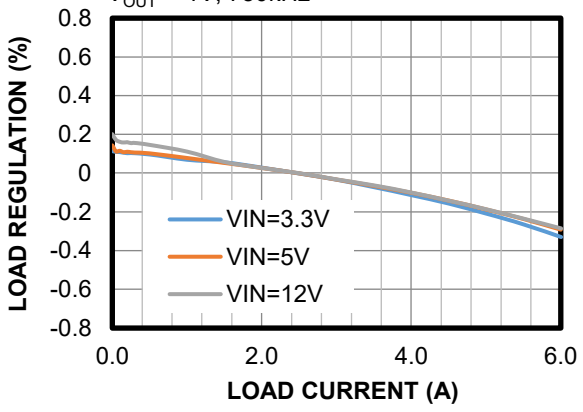
Load Regulation

V_{OUT} = 0.85V, 750kHz



Load Regulation

V_{OUT} = 1V, 750kHz



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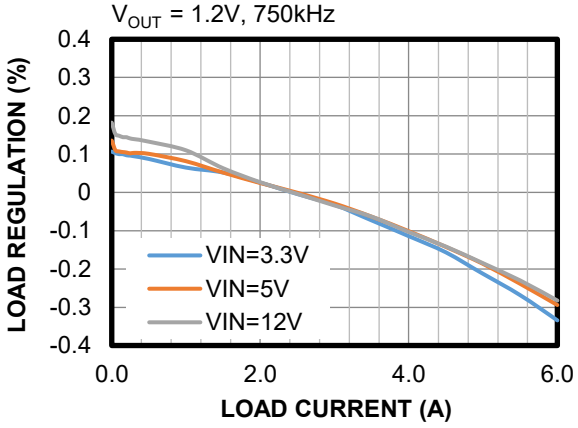
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 12V, independent mode, V_{OUT1} = V_{OUT2} = 1.2V, C_{OUT1} = C_{OUT2} = 2 x 22µF, T_A = 25°C, unless otherwise noted.

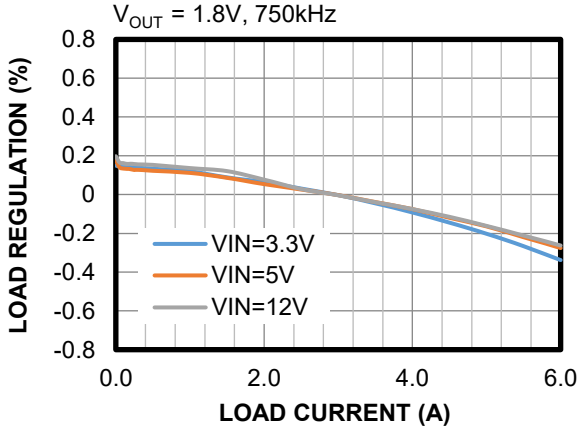
Load Regulation

V_{OUT} = 1.2V, 750kHz



Load Regulation

V_{OUT} = 1.8V, 750kHz



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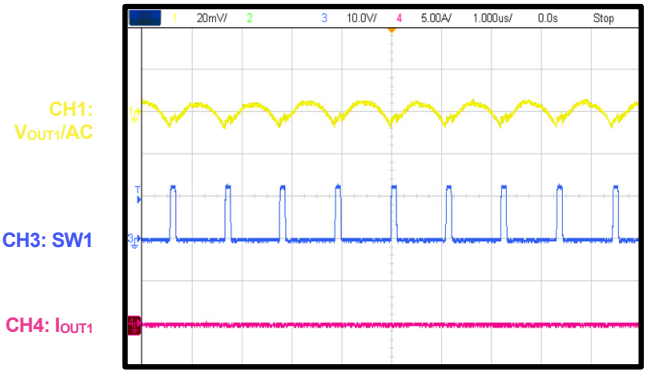
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 12V, independent mode, V_{OUT1} = V_{OUT2} = 1.2V, C_{OUT1} = C_{OUT2} = 2 x 22µF, T_A = 25°C, unless otherwise noted.

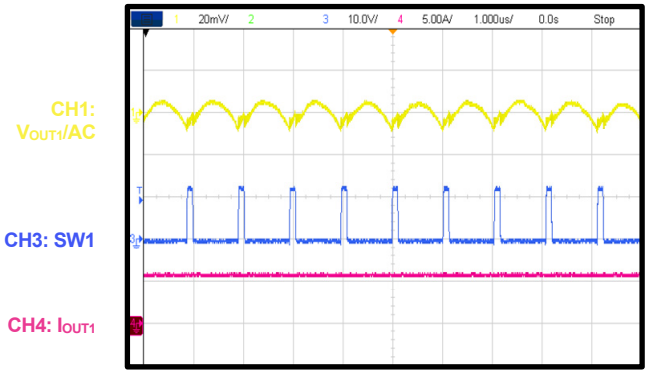
Steady State

I_{OUT1} = 0A



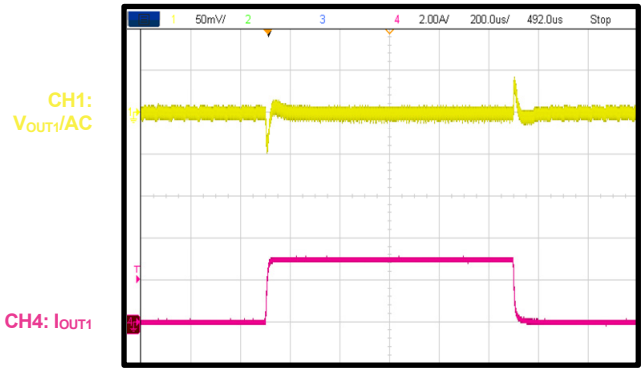
Steady State

I_{OUT1} = 6A



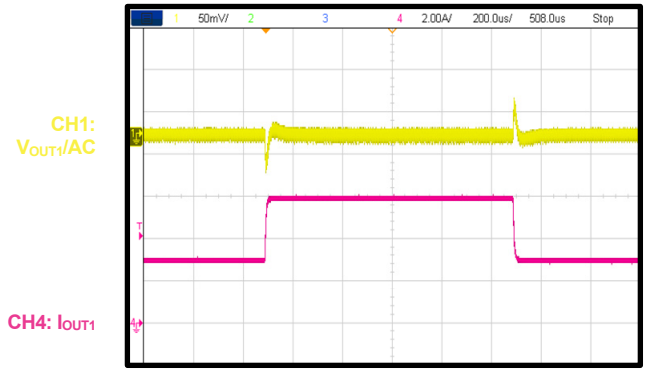
Load Transient

I_{OUT1} = 0A to 3A, 2.5A/µs e-load



Load Transient

I_{OUT1} = 3A to 6A, 2.5A/µs e-load



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PCB LAYOUT

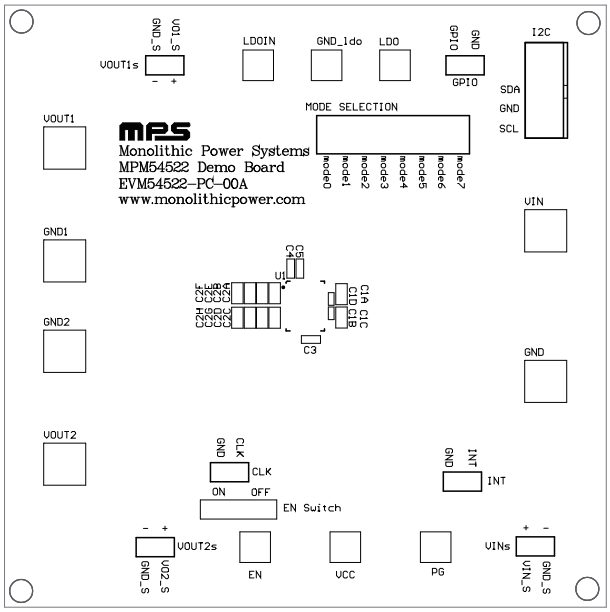

Figure 3: Top Silk

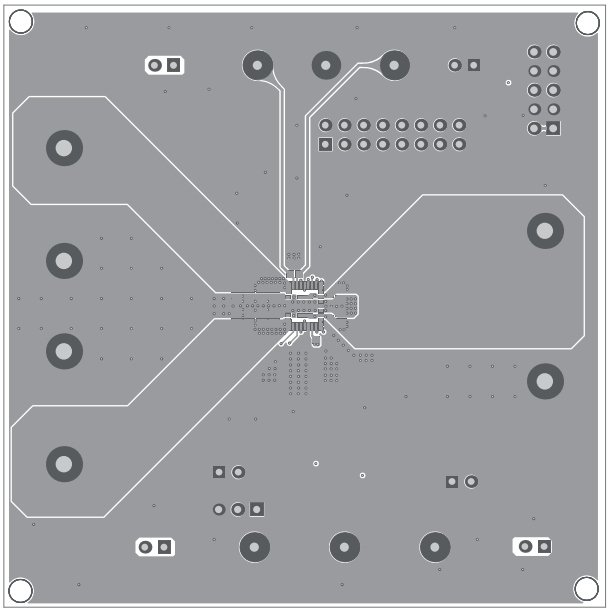

Figure 4: Top Layer

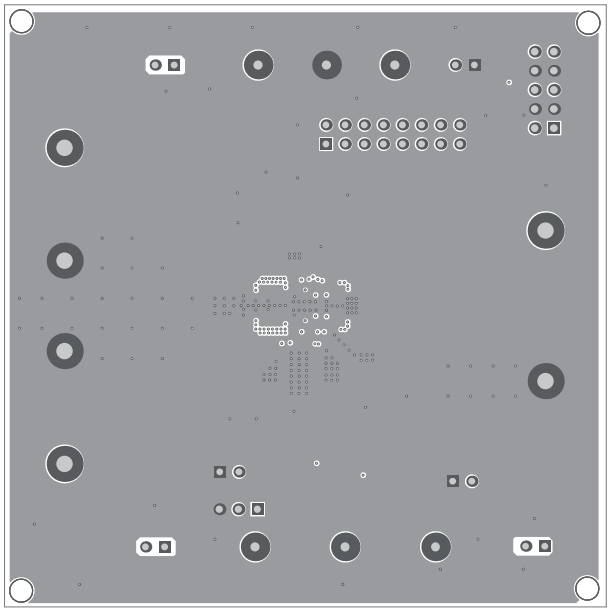

Figure 5: Mid-Layer 1

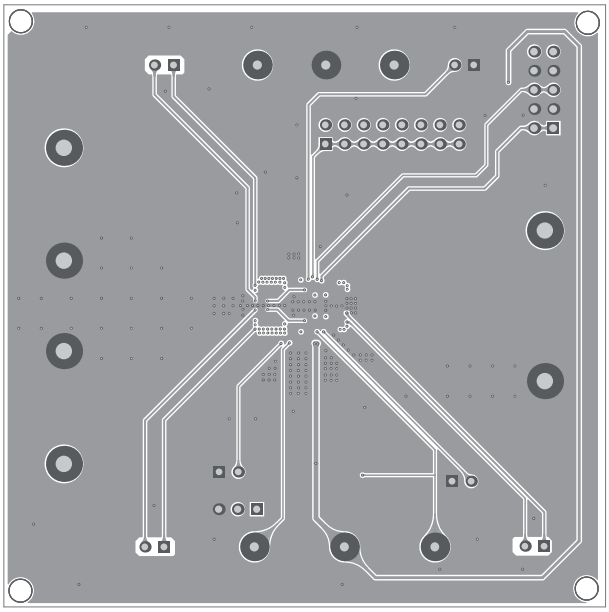

Figure 6: Mid-Layer 2

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PCB LAYOUT *(continued)*

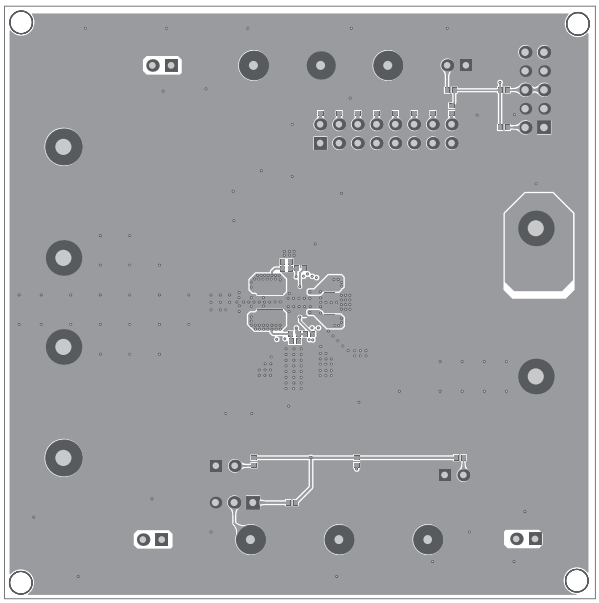

Figure 7: Bottom Layer

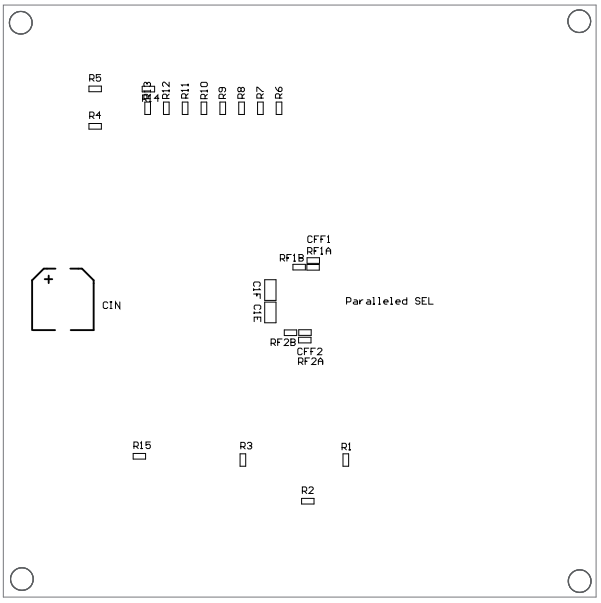

Figure 8: Bottom Silk

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REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	2/23/2024	Initial Release	-

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