EVM54322-PB-00A

16V, Dual 3A, Power Module with I²C Evaluation Board

DESCRIPTION

The EVM54322-PB-00A evaluation board is designed to demonstrate the capabilities of MPS's MPM54322, a dual 3A power module that integrates a high-efficiency step-down DC/DC converter IC, two inductors, and selected passive components into a single over-molded package.

The two outputs of the MPM54322 can be paralleled for up to 6A of output current (I_{OUT}). The power module offers an active current balancing function that allows equal current sharing between the outputs in parallel operation.

The MPM54322 offers a dedicated, configurable low-dropout (LDO) regulator with up to 500mA of I_{OUT} to provide an ultra-low noise output. The MPM54322 adopts the constant-on-time (COT) control to provide a fast transient response and minimize the required output capacitance.

It is recommended to read the datasheet for the MPM54322 prior to making any changes to the EVM54322-PB-00A.

PERFORMANCE SUMMARY (1)

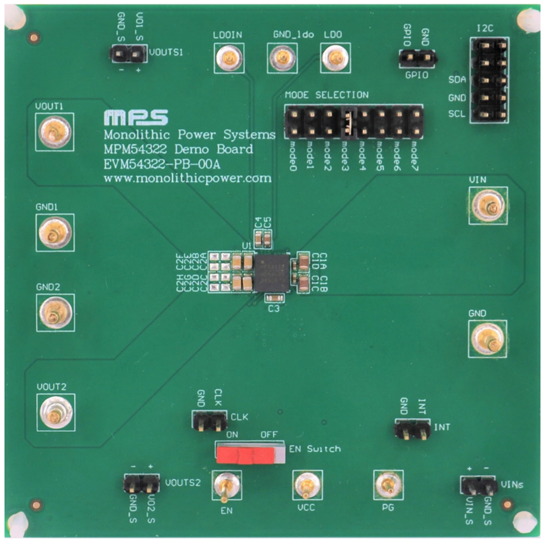
Specifications are at T_A = 25°C, unless otherwise noted.

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, I_{OUT1} = I_{OUT2}	3A
Typical efficiency	V_{IN} = 12V, V_{OUT} = 1.2V, independent mode, I_{OUT1} = I_{OUT2} = 3A, f_{SW} = 1000kHz	83.74%
Peak efficiency	V_{IN} = 12V, V_{OUT} = 1.2V, independent mode, I_{OUT1} = I_{OUT2} = 2A, f_{SW} = 1000kHz	84.5%
Operation mode (3)		MODE3, independent mode, 1000kHz

Notes:

1) For different input/output voltage specifications with different output capacitance/inductance, 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 mode 1 for paralleled mode. In paralleled mode, VOUT1 must be shorted to VOUT2.

EVALUATION BOARD



LxWxH (8cmx8cmx1.6mm)

Board Number	MPS IC Number
EVM54322-PB-00A	MPM54322GPB-0000

QUICK START GUIDE

The EVM54322-PB-00A is easy to set up to evaluate the performance of the MPM54322. Refer to Figure 1 for the proper measurement equipment set-up and follow the instructions below.

1. Connect the load terminals to:
    a. Positive (+):VOx (where x = 1 or 2)
    b. Negative (-): GND

    Make this connection for an independent output. For a multi-phase output, short VOUT1 and VOUT2 together first.
2. Preset the power supply output between 3V and 16V, and then turn the power supply off.
3. Connect the power supply output terminals to:
    a. Positive (+): VIN
    b. Negative (-): GND
4. Turn the power supply on and turn the EN switch on. The board should automatically start up. Figure 1 shows the proper measurement equipment set-up.

Notes:

4) Ensure that V_{IN} does not exceed 16V.
5) When measuring the output or input voltage ripple, do not use the long ground lead on the oscilloscope probe.

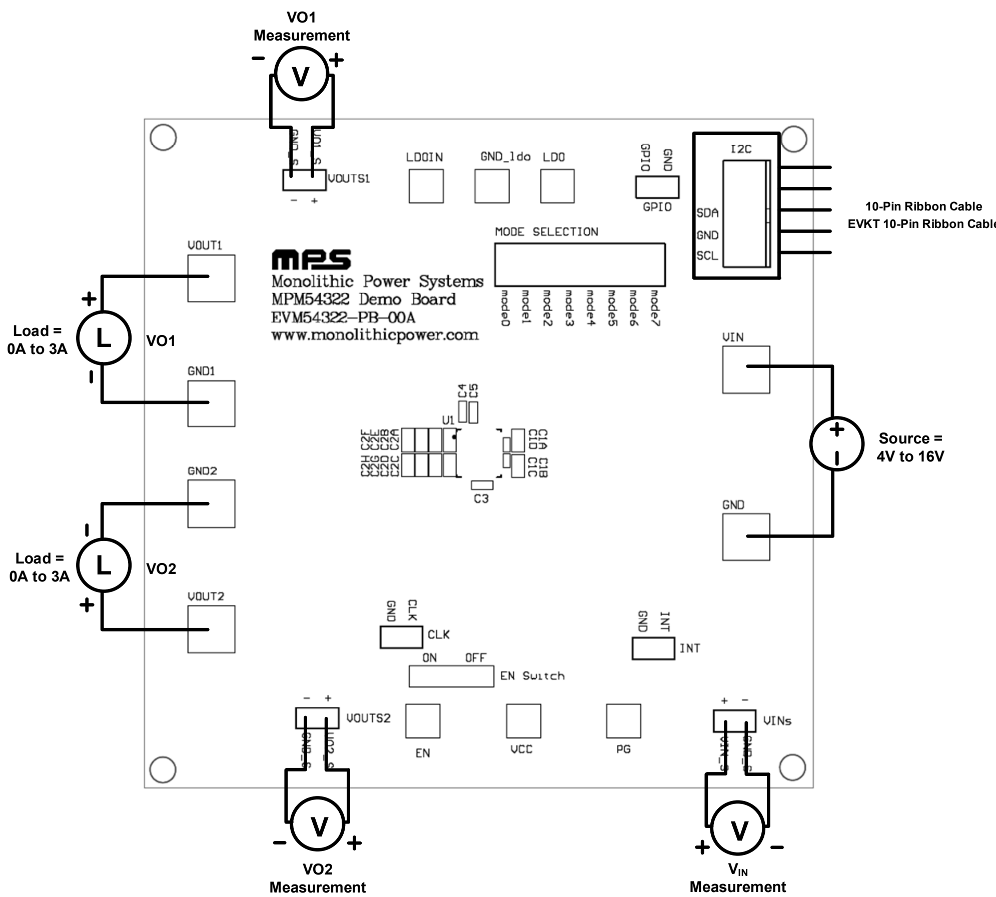


Figure 1: Measurement Equipment Set-Up

EVALUATION BOARD SCHEMATIC

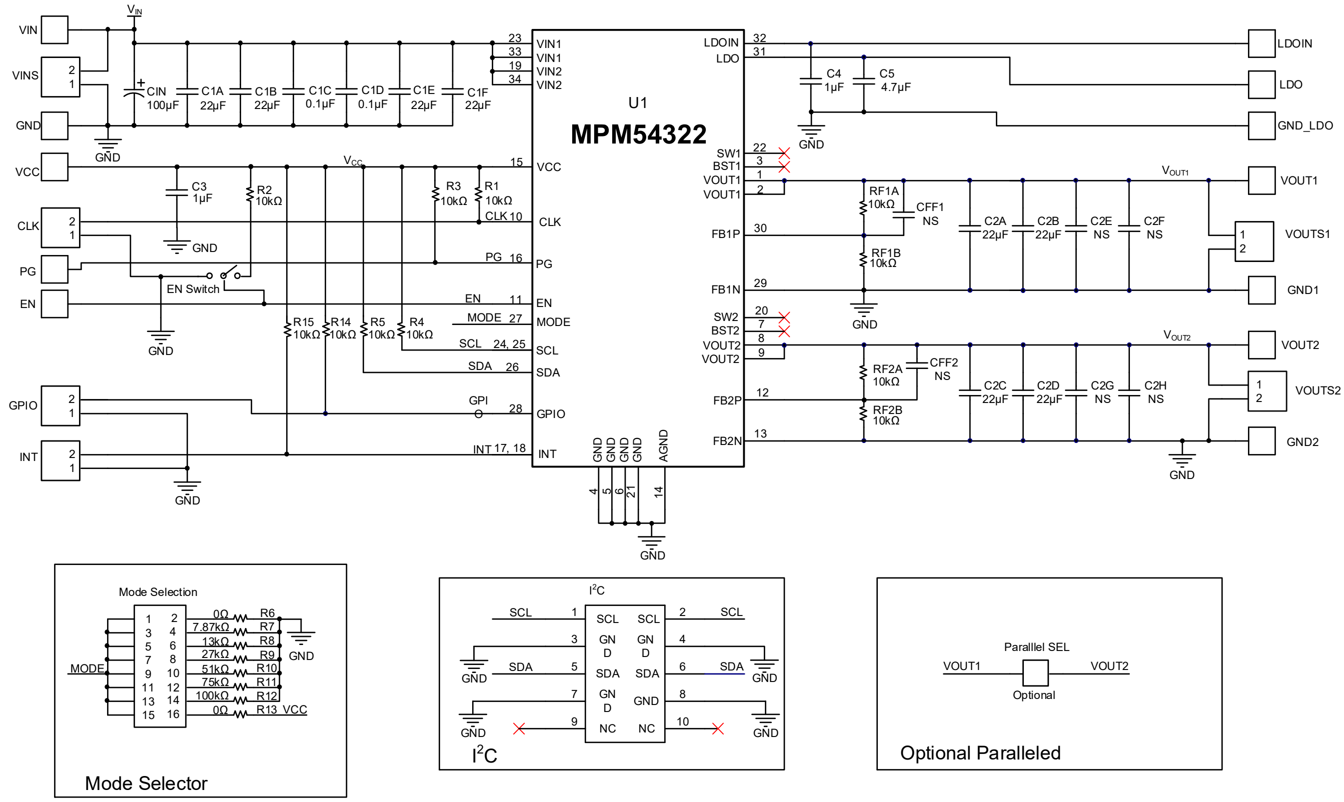


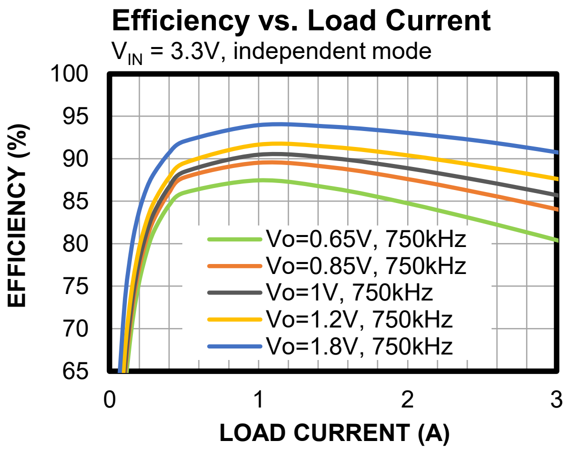
Figure 2: Evaluation Board Schematic

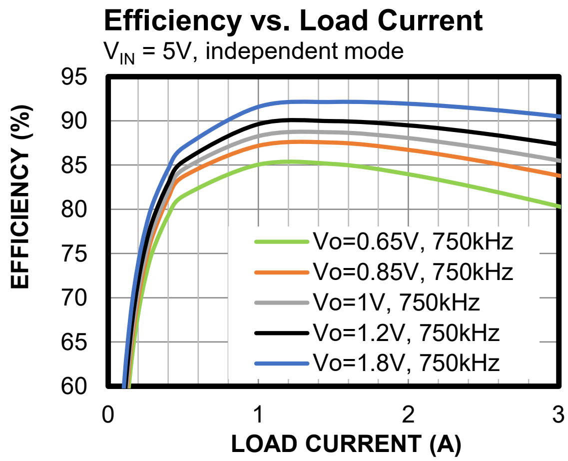
EVM54322-PB-00A BILL OF MATERIALS

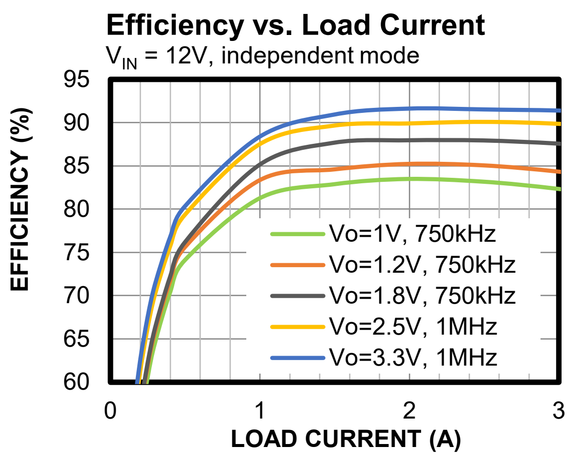
Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
4	C1A, C1B, C1E, C1F	22µF	Ceramic capacitor, 25V	0805	Murata	GRM21BR61E226ME44L
2	C1C, C1D	0.1µF	Ceramic capacitor, 25V	0402	Murata	GRM155R71E104KE14D
4	C2A, C2B, C2C, C2D	22µF	Ceramic capacitor, 10V	0805	Murata	GRM21BR61A226ME15L
2	C3, C4	1µF	Ceramic capacitor, 10V	0603	Murata	GRM185D71A105KE36D
1	C5	4.7µF	Ceramic capacitor, 10V	0603	Wurth	885012106012
1	CIN	100µF	100µF, OSCON E7, 25V	SMD	Wurth	865080449011
6	CLK, GPIO, INT, VINs, VOUTS1, VOUTS2	2-pin	Header, 2-pin	SIP	Wurth	61300211121
1	EN Switch	Switch	SPDT switch	SIP	Wurth	450301014042
6	EN, GND_ldo, LDO, LDOIN, PG, VCC	Φ1.0	Φ1.0 copper pin	THT	Custom	
6	GND, GND1, GND2, VIN, VOUT1, VOUT2	Φ2.0	Φ2.0 copper pin	THT	Custom	
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, RF1B, RF2A, 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	MPM54322	16V, dual 3A, step-down module	ECLGA-34 (5mmx 5.5mm)	MPS	MPM54322GPB-0000

EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 12V, V_{OUT} = 1.2V, T_A = 25°C, unless otherwise noted.

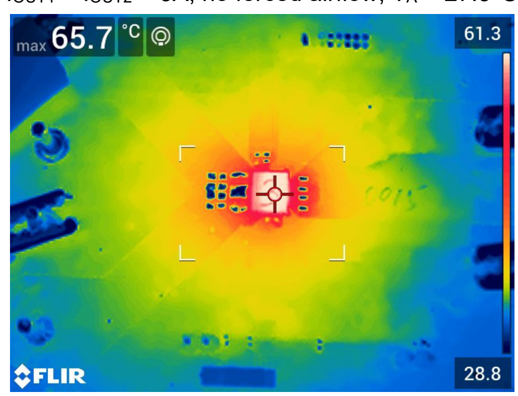






Thermal Performance

I_{OUT1} = I_{OUT2} = 3A, no forced airflow, T_A = 27.3°C

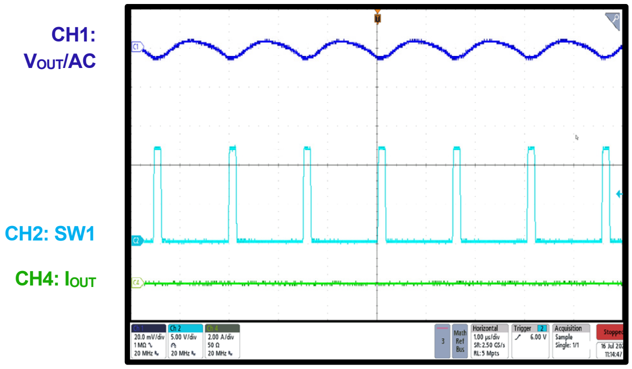


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 12V, V_{OUT} = 1.2V, C_{IN} = 4 x 22µF, C_{OUT1} = C_{OUT2} = 2 x 22µF, T_A = 25°C, unless otherwise noted.

Steady State

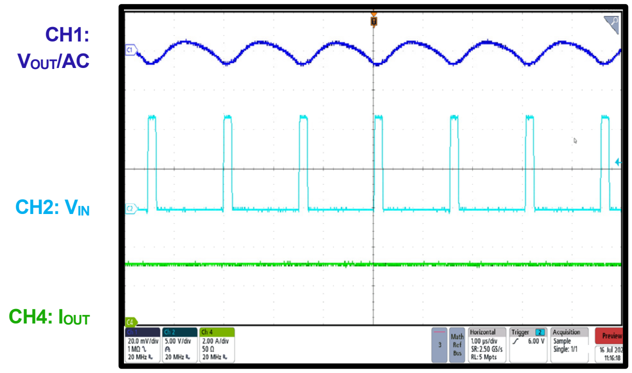
I_{OUT} = 0A, f_{SW} = 750kHz, independent mode, V_{OUT}/AC = 10.4mV



1µs/div.

Steady State

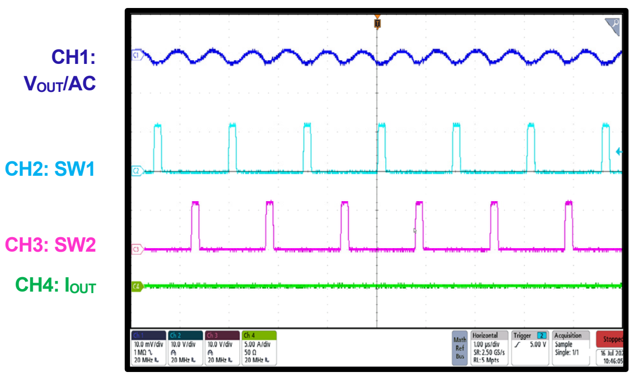
I_{OUT} = 3A, f_{SW} = 750kHz, independent mode, V_{OUT}/AC = 13.6mV



1µs/div.

Steady State

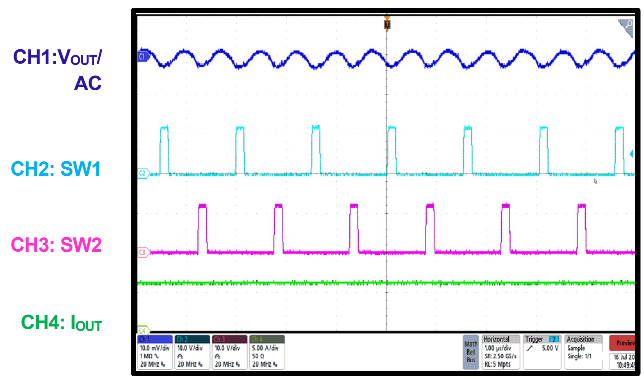
I_{OUT} = 0A, f_{SW} = 750kHz, paralleled mode, V_{OUT}/AC = 3.8mV



1µs/div.

Steady State

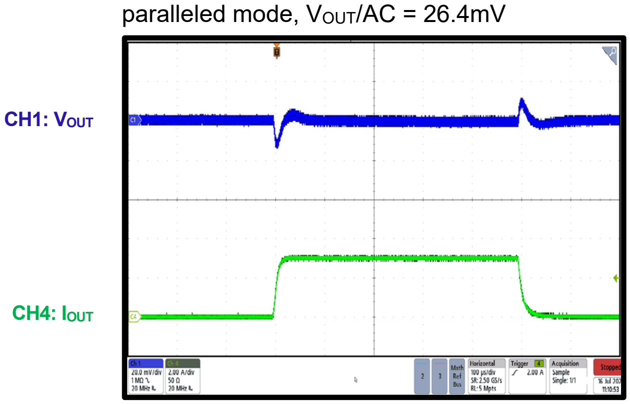
I_{OUT} = 6A, f_{SW} = 750kHz, paralleled mode, V_{OUT}/AC = 4.6mV



1µs/div.

Load Transient Response

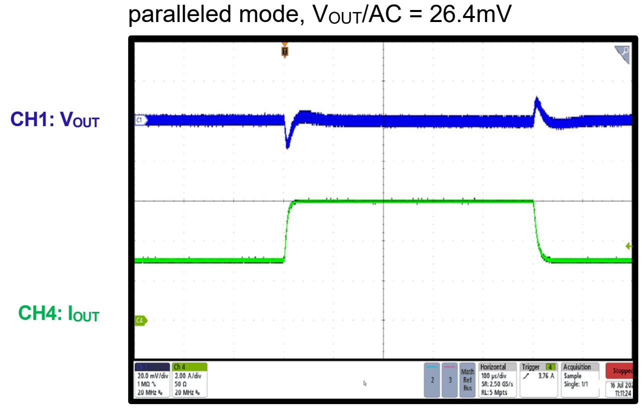
I_{OUT} = 0A to 3A, slew rate = 2.5A/µs e-load, paralleled mode, V_{OUT}/AC = 26.4mV



100µs/div.

Load Transient Response

I_{OUT} = 3A to 6A, slew rate = 2.5A/µs e-load, paralleled mode, V_{OUT}/AC = 26.4mV



100µs/div.

EVB TEST RESULTS *(continued)*

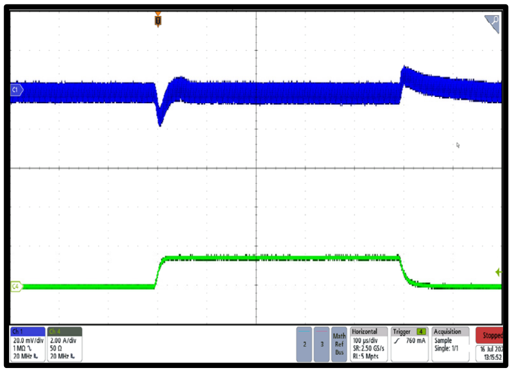
Performance curves and waveforms are tested on the evaluation board. V_{IN} = 12V, V_{OUT} = 1.2V, C_{IN} = 4 x 22µF, C_{OUT1} = C_{OUT2} = 2 x 22µF, T_A = 25°C, unless otherwise noted.

Load Transient Response

I_{OUT} = 0A to 1.5A, slew rate = 2.5A/µs e-load, independent mode, V_{OUT}/AC = 31.2mV

CH1: V_{OUT}/AC

CH4: I_{OUT}



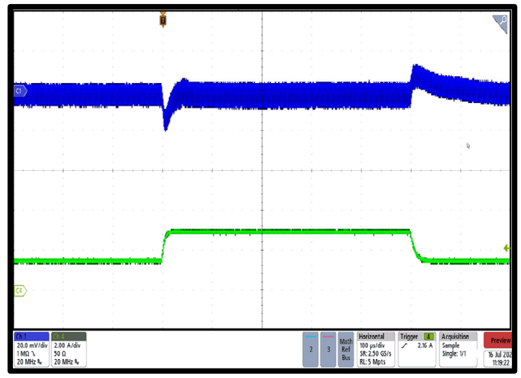
100µs/div.

Load Transient Response

I_{OUT}=1.5A to 3A, slew rate = 2.5A/µs e-load, independent mode, V_{OUT}/AC = 33.6mV

CH1: V_{OUT}/AC

CH4: I_{OUT}



100µs/div.

PCB LAYOUT

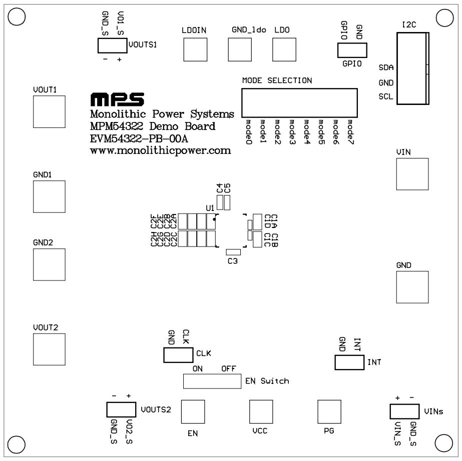


Figure 3: Top Silk

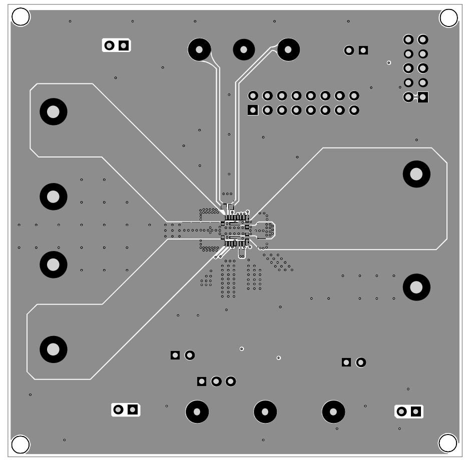


Figure 4: Top Layer

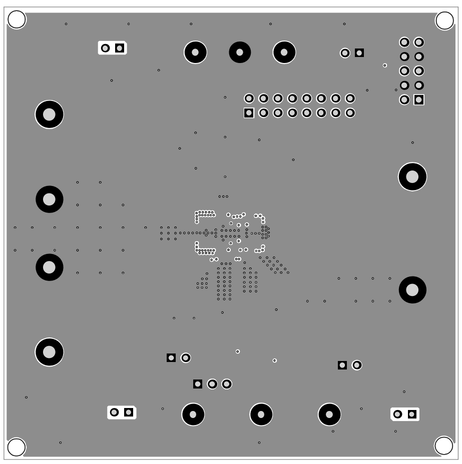


Figure 5: Mid-Layer 1

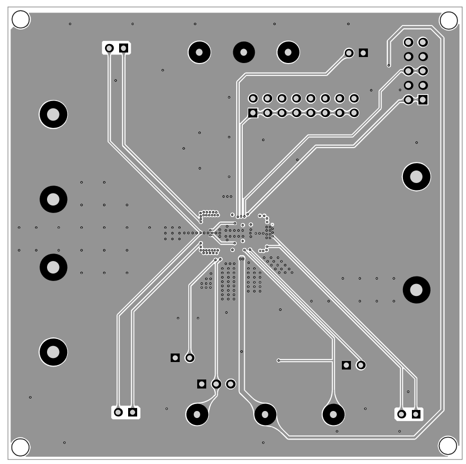


Figure 6: Mid-Layer 2

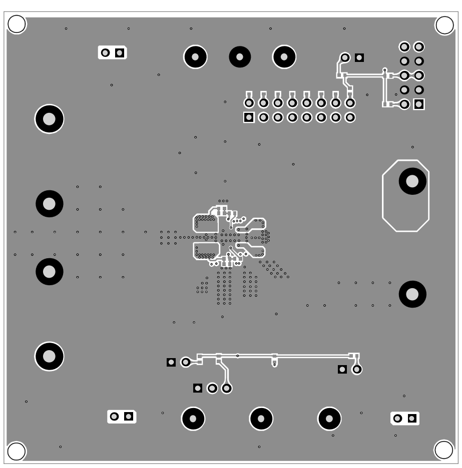


Figure 7: Bottom Layer

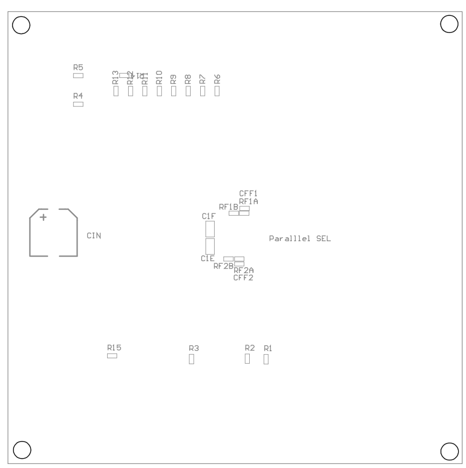


Figure 8: Bottom Silk

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	10/20/2023	Initial Release	-