EVM54524-CQ-00A

4V to 16V, 5A Quad-Output, Step-Down Power Module with an I²C Interface Evaluation Board

DESCRIPTION

The EVM54524-CQ-00A evaluation board is designed to demonstrate the capabilities of the MPM54524, a 5A quad-output, integrated power module with an I²C interface. The MPM54524 offers a complete power solution with built-in, on/off sequencing control, configurable soft start (SS), compensation, and various protection thresholds.

The MPM54524 offers configurable active voltage positioning (AVP) to generate a droop voltage that allows on-demand parallel operation, where four outputs, three outputs paralleled, or two outputs can operate in parallel in any combination without pre-setting the registers. The paralleled channels' current is inherently balanced by the AVP droop voltage. Full protection features include under-voltage lockout (UVLO), over-current protection (OCP), over-voltage protection (OVP), under-voltage protection (UVP), and thermal shutdown.

The MPM54524 is available in a compact ECLGA-51 (8mmx8mmx2.9mm) package. It is recommended to read the MPM54524 datasheet prior to making any changes to the EVM54524-CQ-00A.

PERFORMANCE SUMMARY

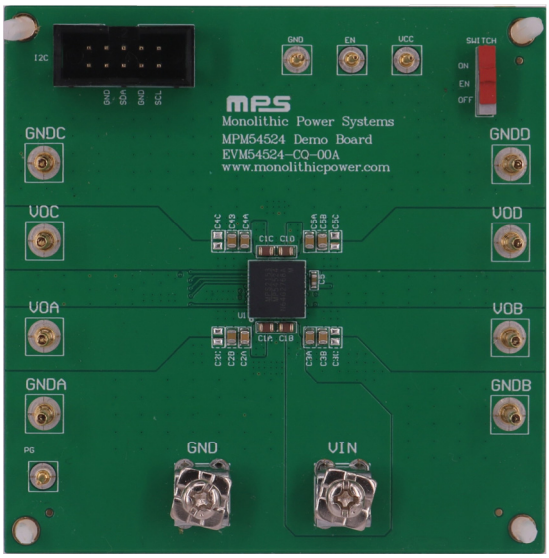
Specifications are at T_A = 25°C, unless otherwise noted.

Parameters	Conditions	Value
Input voltage (V_{IN}) range		4V to 16V
Output voltage (V_{OUT})	Default configuration	V_{OUT} = 3.34V
Maximum output current (I_{OUT})	V_{IN} = 4V to 16V	20A (1)
Typical efficiency	V_{IN} = 12V, V_{OUT} = 3.34V, I_{OUT} = 5A, f_{SW} = 1MHz, independent channel	92.20%
Peak efficiency	V_{IN} = 12V, V_{OUT} = 3.34V, I_{OUT} = 4A, f_{SW} = 1MHz, independent channel	92.43%
Switching frequency (f_{SW})	Default configuration	1MHz

Note:

1) The maximum I_{OUT} can reach 20A in 4-phase paralleled mode.

EVM54524-CQ-00A EVALUATION BOARD



LxWxH (8cmx8cmx1.6mm)

Board Number	MPS IC Number
EVM54524-CQ-00A	MPM54524GCQ

QUICK START GUIDE

The EVM54524-CQ-00A evaluation board is easy to set up and use to evaluate the MPM54524's performance. For the proper measurement equipment set-up, refer to Figure 1 and follow the steps below:

1. Preset the power supply (V_{IN}) between 4V and 16V, then turn off the power supply.
2. Connect the power supply terminals to:
   a. Positive (+): VIN
   b. Negative (-): GND
3. Connect the load terminals (no initial load) to:
   a. Positive (+): VOA, VOB, VOC, COD
   b. Negative (-): GNDA, GNDB, GNDC, GNDD
4. After making the connections, turn on the power supply. The board should automatically start up.
5. Once the proper output voltage (V_{OUT}) is established, adjust the load within the operating range and measure the efficiency, output ripple voltage, and other parameters.

Notes:

2) Ensure that V_{IN} does not exceed 16V.
3) When measuring the V_{OUT} or V_{IN} ripple, do not use the oscilloscope probe's long ground lead.

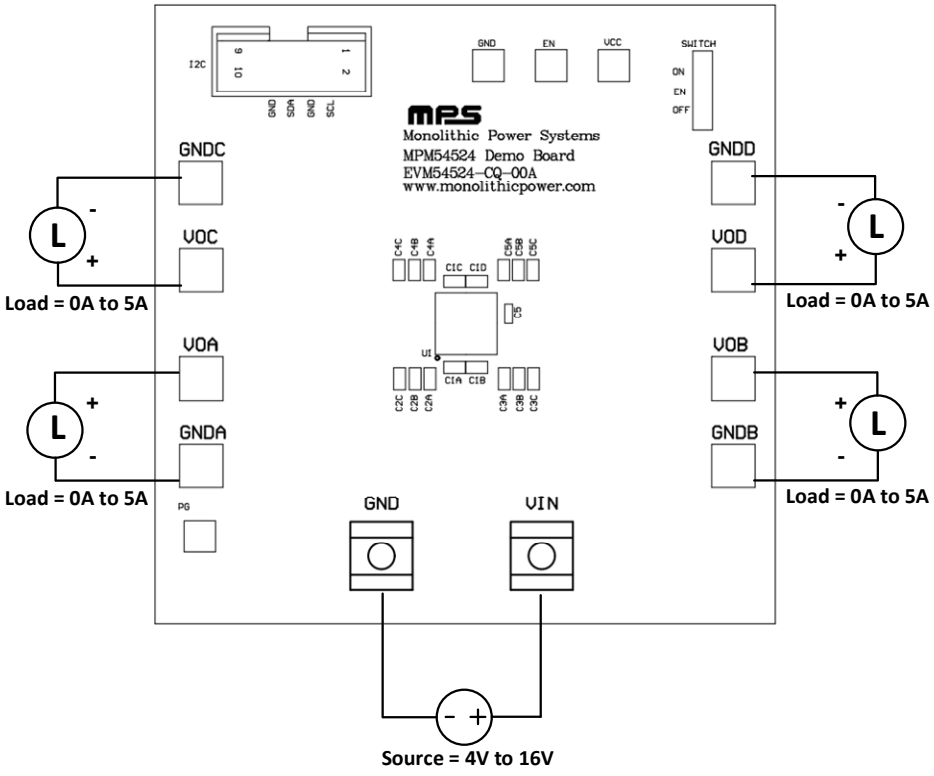


Figure 1: Proper Measurement Equipment Set-Up

EVALUATION BOARD SCHEMATIC

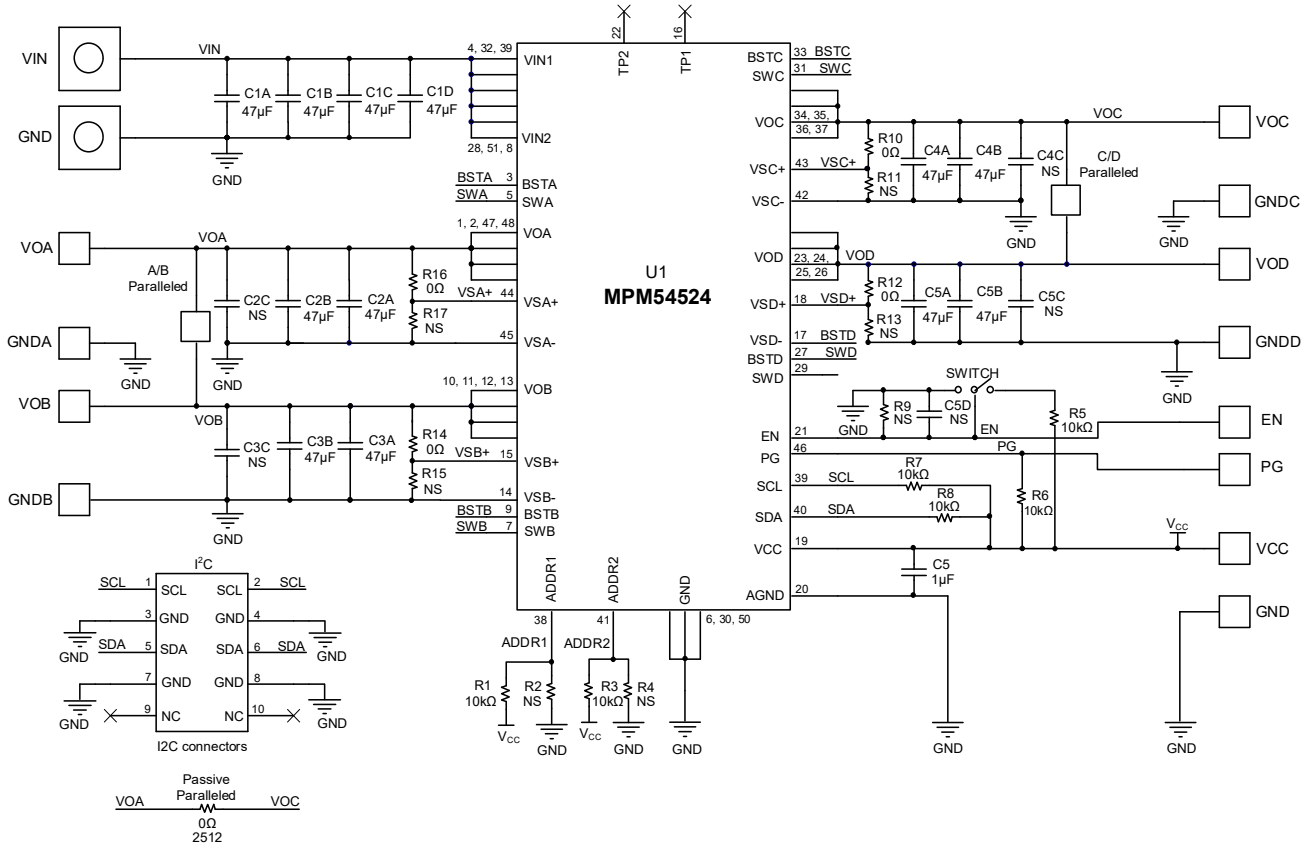


Figure 2: Evaluation Board Schematic

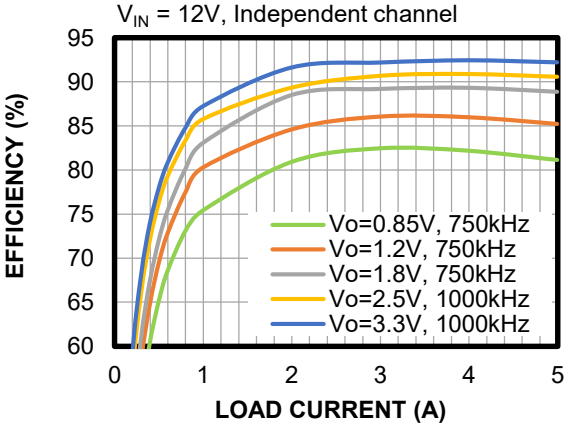
EVM54524-CQ-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
12	C1A, C1B, C1C, C1D, C2A, C2B, C3A, C3B, C4A, C4B, C5A, C5B	47µF	Ceramic capacitor, 10V, X5R	0805	Murata	GRM21BR61A476ME15L
1	C5	1µF	Ceramic capacitor, 16V, X5R	0603	Murata	GRM185R61C105KE44D
0	C2C, C3C, C4C, C5C, C5D	NS				
1	SWITCH	2.54mm	Slide switch, 3-pin	DIP	Wurth	450301014042
0	R2, R4	NS				
0	R11, R13, R15, R17	NS				
4	R10, R12, R14, R16	0Ω	Film resistor, 1%, 0603	0402	Yageo	RC0603FR-070RL
6	R1, R3, R5, R6, R7, R8	10kΩ	Film resistor, 1%, 0603	0402	Yageo	RC0603FR-0710KL
8	VOUTA, GNDA, VOUTB, GNDB, VOUTC, GNDC, VOUTD, GNDD	2mm	Copper pin, φ = 2mm	DIP	Any	Any
4	PG, EN, GND, VCC	1mm	Copper pin, φ = 1mm	DIP	Any	Any
1	I2C	2.54mm	Connector, 10-pin	DIP	Wurth	612010235121
2	VIN, GND	7.87mmx 7.87mmx 5.33mm	Power connector	DIP	Any	Any
1	U1	MPM54524	16V, quad 5A, step-down power module with I^2C	ECLGA-51 (8mmx 8mmx 2.9mm)	MPS	MPM54524

TYPICAL PERFORMANCE CHARACTERISTICS

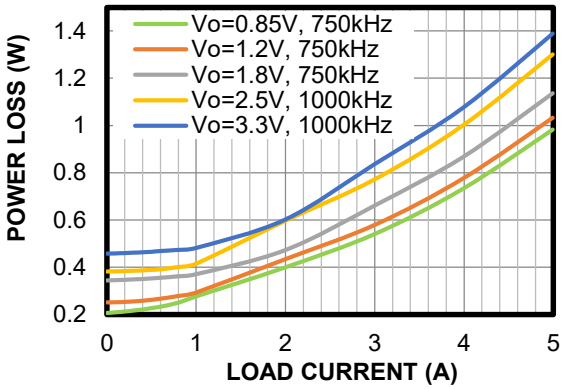
Efficiency vs. Load Current

V_{IN} = 12V, Independent channel



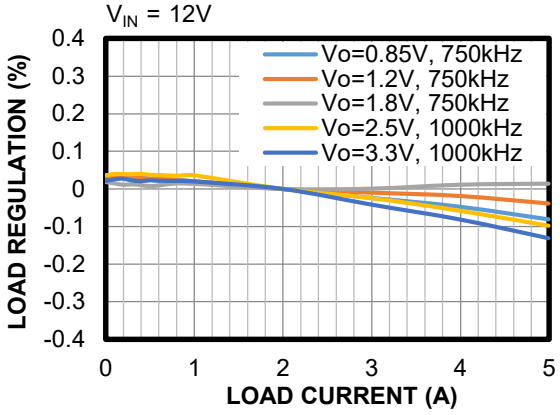
Power Loss vs. Load Current

V_{IN} = 12V



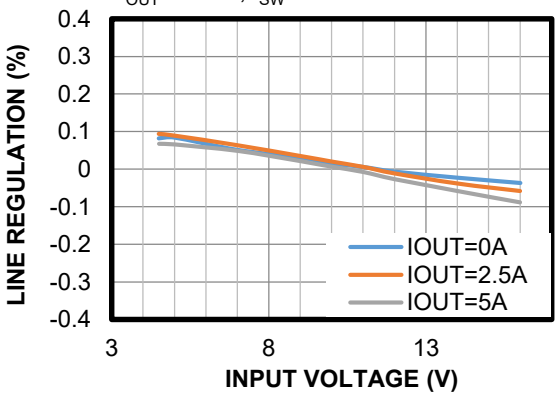
Load Regulation

V_{IN} = 12V



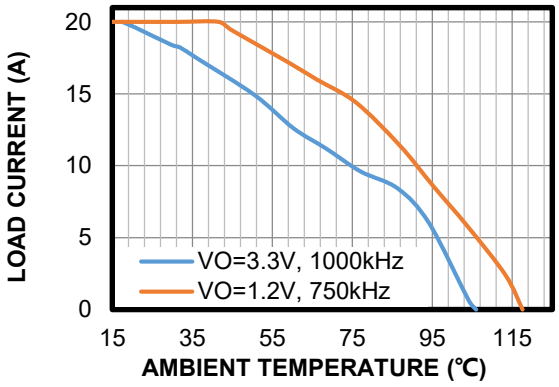
Line Regulation

V_{OUT} = 3.3V, f_{SW} = 1000kHz



Thermal Derating

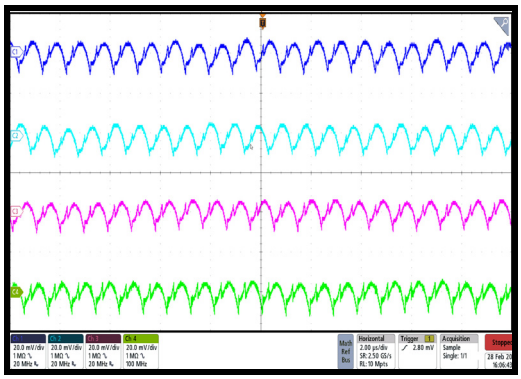
V_{IN} = 12V, f_{SW} = 750kHz



TYPICAL PERFORMANCE CHARACTERISTICS *(continued)*

Steady State

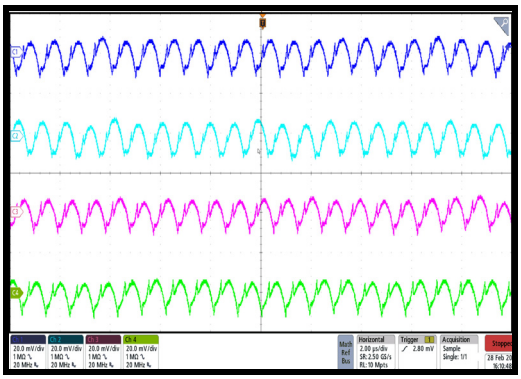
V_{IN} = 12V, V_{OUT} = 3.3V, f_{SW} = 1000kHz, I_{OUT} = 0A, independent channel



2µs/div.

Steady State

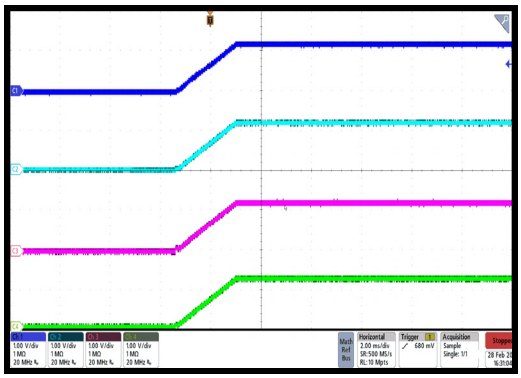
V_{IN} = 12V, V_{OUT} = 3.3V, f_{SW} = 1000kHz, I_{OUT} = 5A, independent channel



2µs/div.

Start-Up through EN

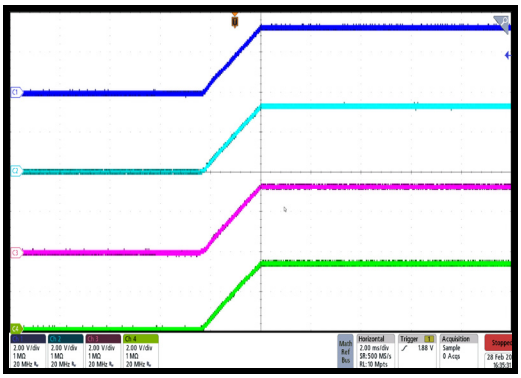
V_{IN} = 12V, V_{OUT} = 3.3V, f_{SW} = 1000kHz, I_{OUT} = 0A, independent channel



2ms/div.

Start-Up through EN

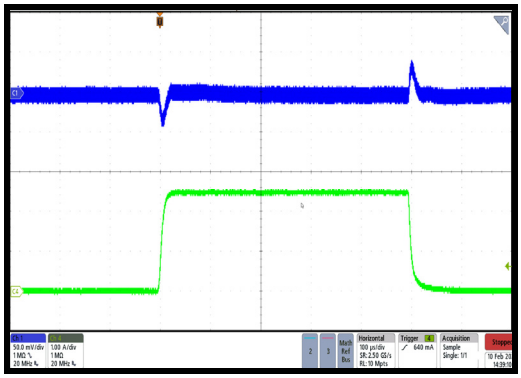
V_{IN} = 12V, V_{OUT} = 3.3V, f_{SW} = 1000kHz, I_{OUT} = 5A, independent channel



2ms/div.

Load Transient

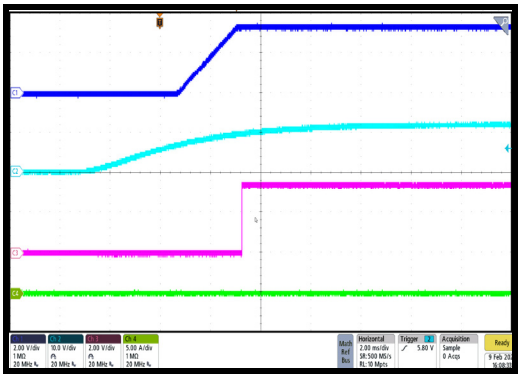
V_{IN} = 12V, V_{OUT} = 3.3V, f_{SW} = 1000kHz, I_{OUT} = 0A to 2.5A, 2.5A/µs e-load, independent channel



100µs/div.

Start-Up through VIN

V_{IN} = 12V, V_{OUT} = 3.3V, I_{OUT} = 0A, four phases paralleled



2ms/div.

PCB LAYOUT

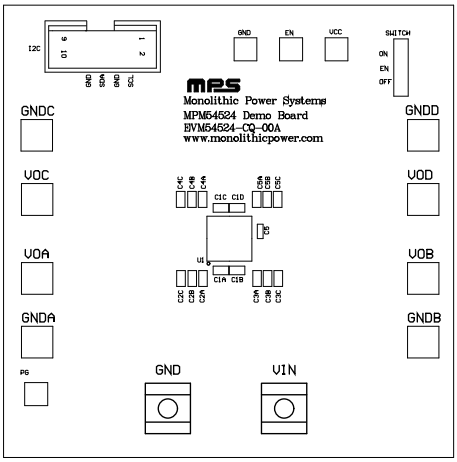


Figure 3: Top Silk

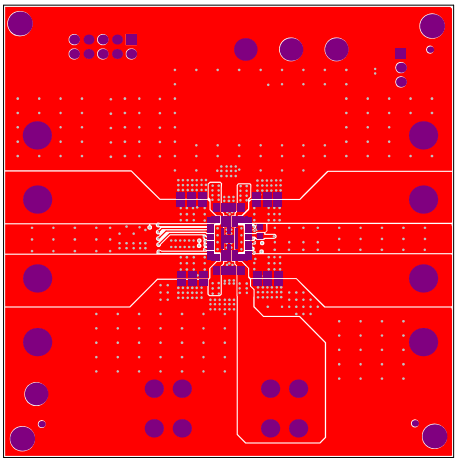


Figure 4: Top Layer

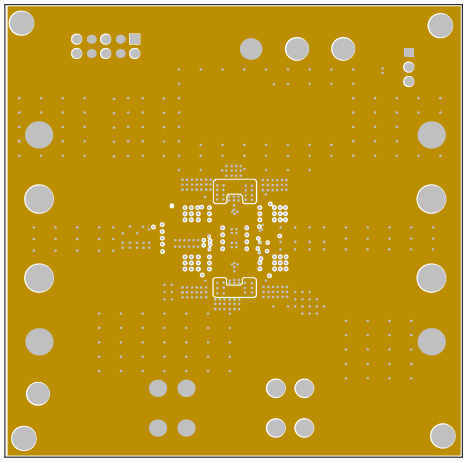


Figure 5: Mid-Layer 1

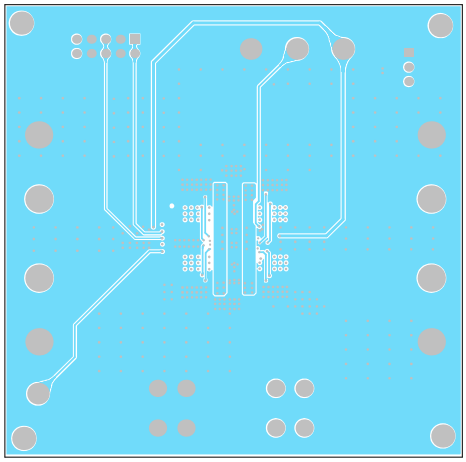


Figure 6: Mid-Layer 2

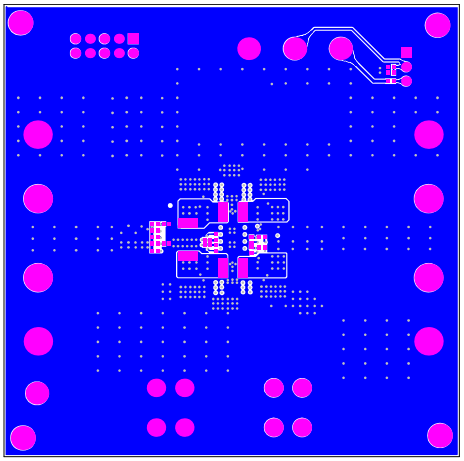


Figure 7: Bottom Layer

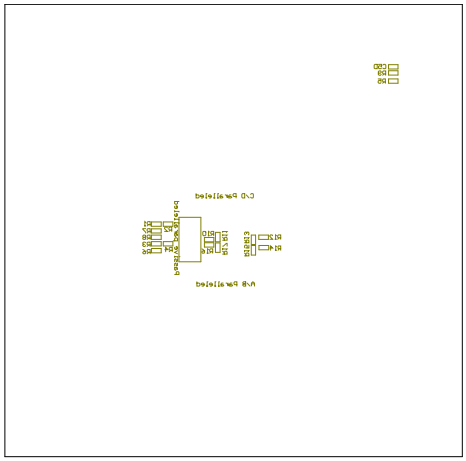


Figure 8: Bottom Silk

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	10/31/2022	Initial Release	-