EVQ18913-D-01A

30V, 0.5A, High-Frequency Transformer Driver Evaluation Board, AEC-Q100 Qualified

DESCRIPTION

The EVQ18913-D-01A is an evaluation board designed to demonstrate the capabilities of the MPQ18913, a high-frequency, half-bridge transformer driver that is ideal for primary-side switchers used in isolated power supplies.

The MPQ18913 features an adjustable switching frequency (f_{SW}) with a wide range, which is particularly useful in resonant topologies such as LLC converters. It also offers input over-voltage protection (OVP), over-current protection (OCP), and fault indication, as well as built-in soft start (SS) to control the inrush current.

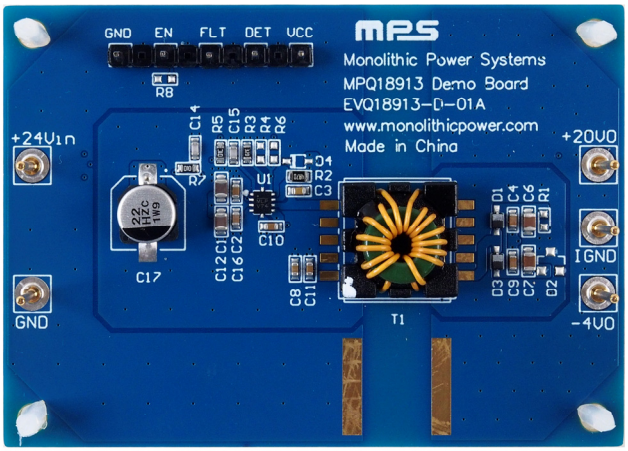
The MPQ18913 is available in a QFN-10 (2mmx2.5mm) package with wettable flanks, and is available in AEC-Q100 Grade 1. It is recommended to read the MPQ18913 datasheet prior to making any changes to the EVQ18913-D-01A.

PERFORMANCE SUMMARY

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

Parameters	Conditions	Value
Input voltage (V_{IN}) range		12V to 24V
Output voltage (V_{OUT})	V_{IN} = 22V, I_{OUT} = 0.025A to 0.25A	23.5V to 24.6V
Maximum output current (I_{OUT})	V_{IN} = 12V to 24V	0.25A
Typical efficiency	V_{IN} = 22V, V_{OUT} = 23.51V, I_{OUT} = 0.25A	89.05%
Peak efficiency	V_{IN} = 22V, V_{OUT} = 23.63V, I_{OUT} = 0.225A	89.08%
Switching frequency (f_{SW})		500kHz

EVALUATION BOARD



LxWxH (7cmx5cmx1cm)

Board Number	MPS IC Number
EVQ18913-D-01A	MPQ18913GRPE-AEC1

QUICK START GUIDE

1. Preset the power supply (V_{IN}) between 12V and 24V, then turn off the power supply (see Figure 1).
2. Connect the power supply terminals to:
   a. Positive (+): +24V_{IN}
   b. Negative (-): GND
3. Connect the load terminals to:
   a. Positive (+): +20V_{OUT}
   b. Negative (-): -4V_{OUT}
4. After making the connections, turn on the power supply. The default switching frequency (f_{SW}) is 500kHz.
5. To use the enable function, remove R7 and apply a digital input to the EN pin. Drive EN above 2V to turn the converter on; drive EN below 0.8V to turn it off.
6. To use the SYNC function, remove R7 and C14 and change R3 based on the required clock scale factor. Then apply a clock signal to the EN pin and turn on the power supply.

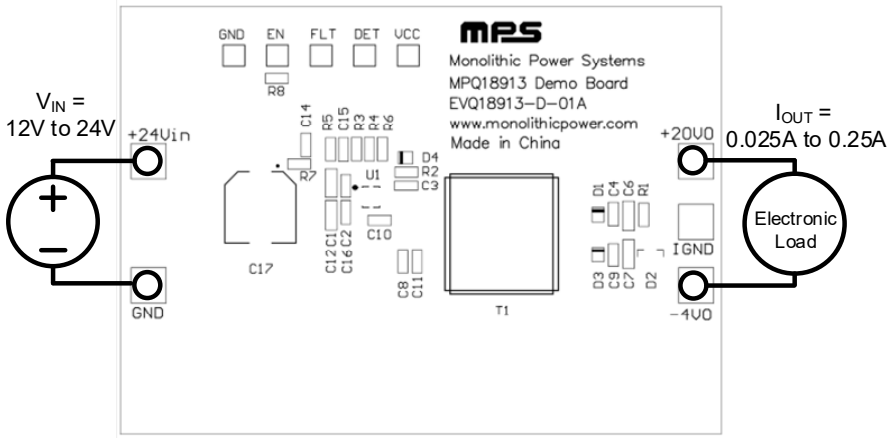


Figure 1: Measurement Equipment Set-Up

EVALUATION BOARD SCHEMATIC

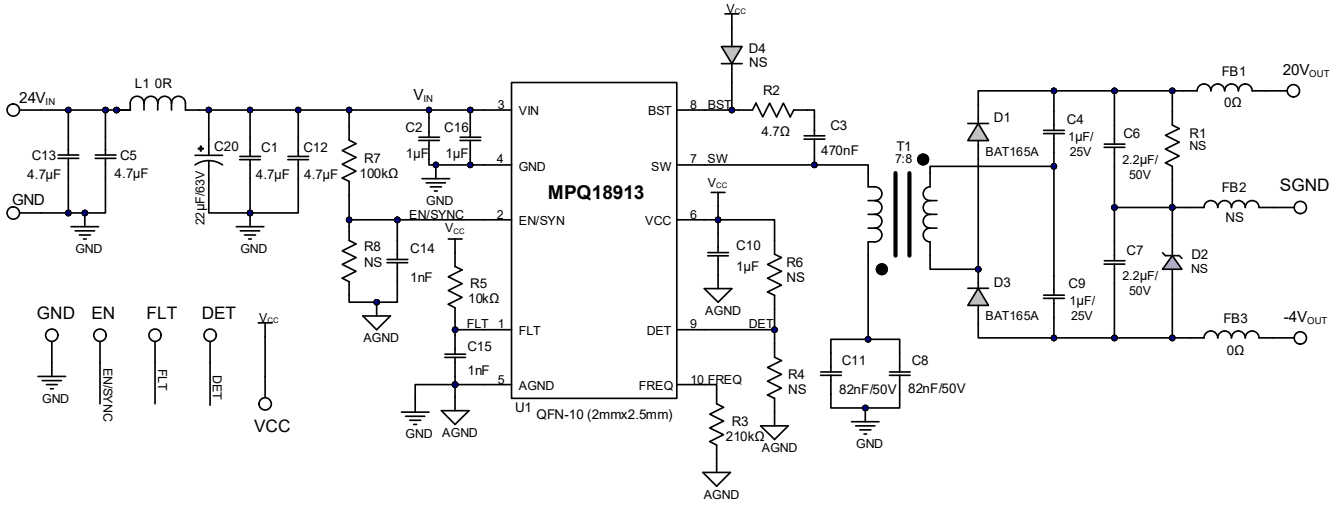


Figure 2: Evaluation Board Schematic

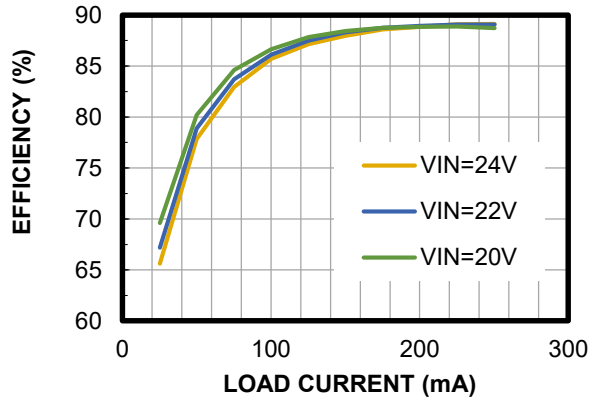
EVQ18913-D-01A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
4	C1, C5, C12, C13	4.7µF	Ceramic capacitor, 50V, X7S	0805	Murata	GRM21BC71H475KE11L
3	C2, C10, C16	1µF	Ceramic capacitor, 50V, X5R	0603	Murata	GRM188R61H105KAAL
1	C3	470nF	Ceramic capacitor, 50V, X7R	0603	TDK	C1608X7R1H474K
2	C4, C9	1µF	Ceramic capacitor, 25V, X7R	0603	TDK	C1608X7R1E105K
2	C6, C7	2.2µF	Ceramic capacitor, 50V, X7R	0805	TDK	C2012X7R1H225K
2	C8, C11	82nF	Ceramic capacitor, 50V, X7R	0603	TDK	CC0603KRX7R9BB823
2	C14, C15	1nF	Ceramic capacitor, 50V, C0G	0603	TDK	GRM1885C1H102JA01D
1	C17	22µF	Electrolytic capacitor, 63V		Panasonic	EEE-HA1J220P
2	D1, D3	40V	Schottky diode, 0.75A	SOD-323	NXP	BAT165A
2	D2, D4	NS				
1	FB1	NS				
3	L1, FB1, FB3	0R	Film resistor, 1%	0805	Yageo	RC0805JR-070RL
4	R1, R4, R6, R8	NS				
1	R2	4R7	Film resistor, 1%	0805	Yageo	RC0805FR-074R7L
1	R3	210kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07210KL
1	R5	10kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0710KL
1	R7	100KΩ	Film resistor, 1%	0603	Yageo	RC0603FR-07100KL
1	T1	26µH	5kV$_{RMS}$, 7:8 isolation transformer	DIP	MPS	FX0639
5	+24V$_{IN}$, GND, +20V$_{OUT}$, GND, -4V$_{OUT}$	1mm	Connector	DIP	Any	
1	GND, EN, FLT, DET,VCC	2.54mm	Through-hole pin header	2.54mm	Any	
1	U1	MPQ18913	30V, 0.5A high-frequency transformer driver	QFN-10 (2mmx 2.5mm)	MPS	MPQ18913GRPE-AEC1

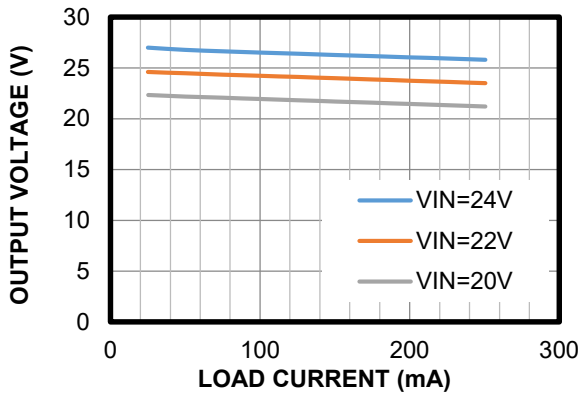
EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 20V, I_{OUT} = 0.25A, T_A = 25°C, unless otherwise noted.

Efficiency vs. Load Current

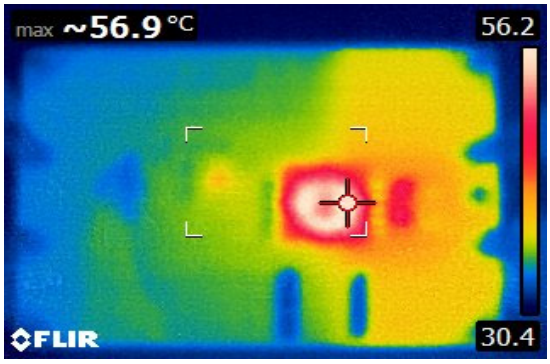


Load Regulation



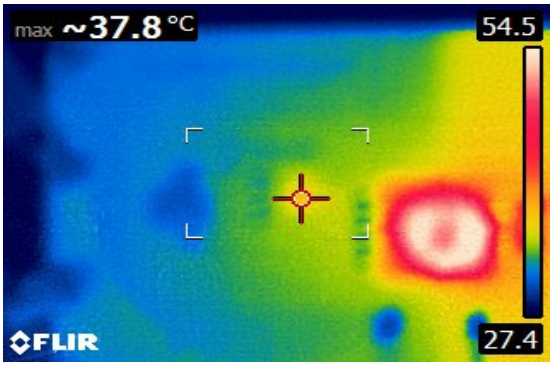
Thermal Performance

V_{IN} = 24V, no forced airflow,
T_{CASE} = 56.9°C, transformer



Thermal Performance

V_{IN} = 24V, no forced airflow,
T_{CASE} = 37.8°C, MPQ18913

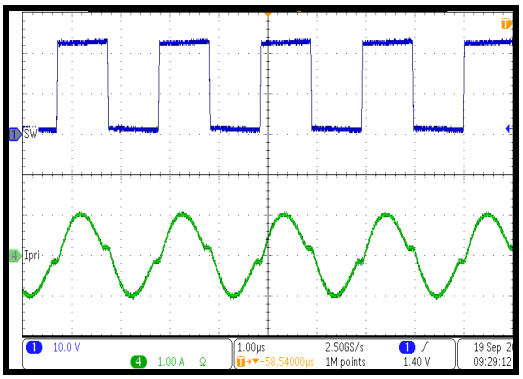


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 20V, I_{OUT} = 0.25A, T_A = 25°C, unless otherwise noted.

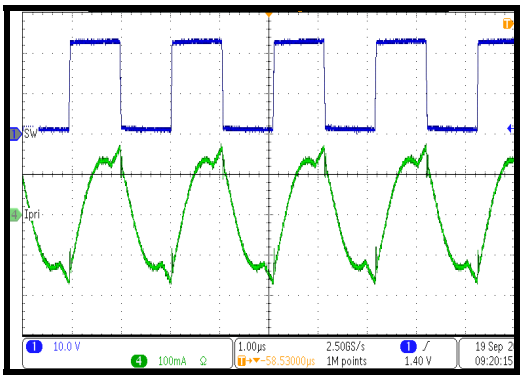
Steady State

V_{IN} = 24V, I_{OUT} = 0.25A

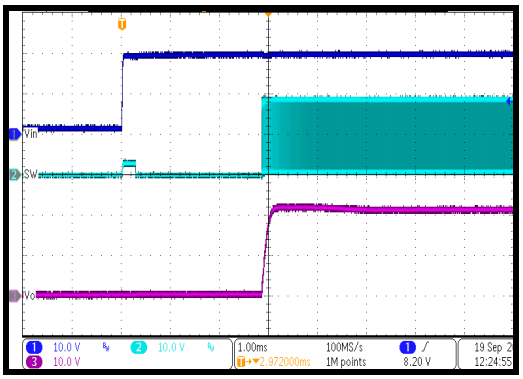


Steady State

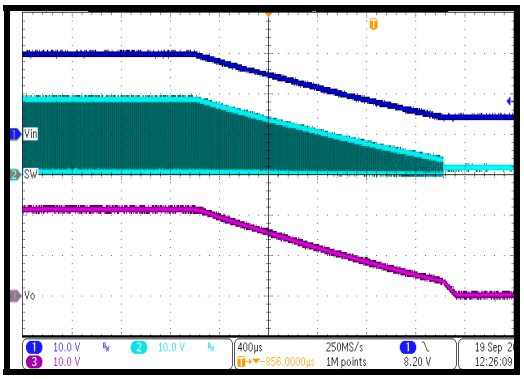
V_{IN} = 24V, I_{OUT} = 0.025A



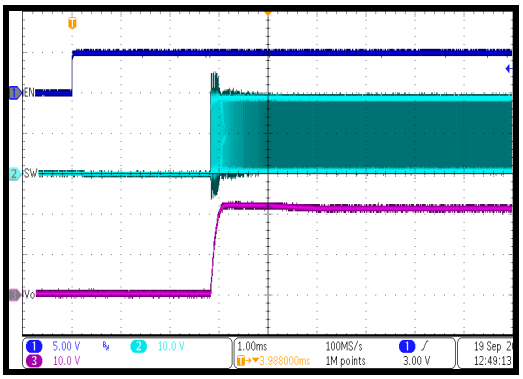
Start-Up through VIN



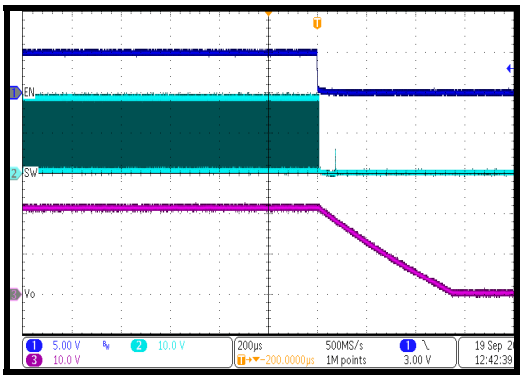
Shutdown through VIN



Start-Up through EN



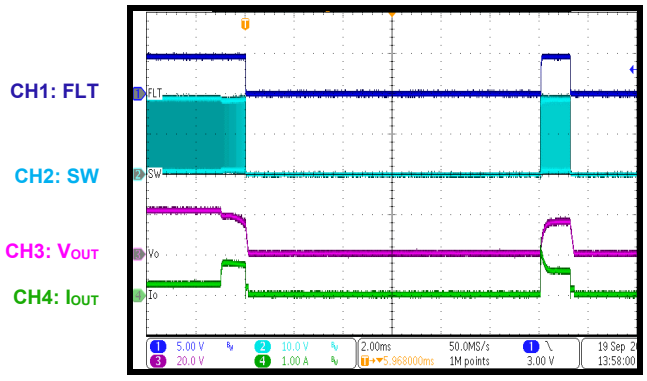
Shutdown through EN



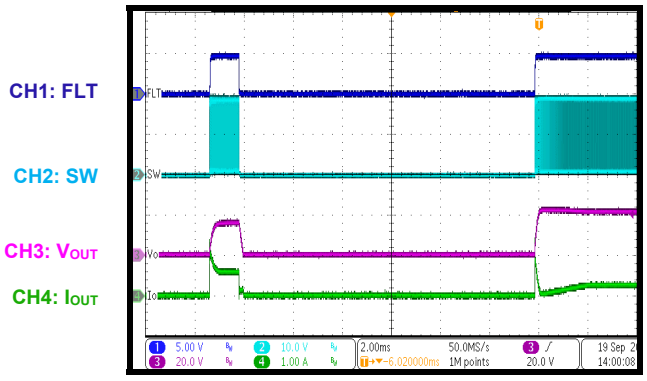
EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 20V, I_{OUT} = 0.25mA, T_A = 25°C, unless otherwise noted.

Output Short



Output Short Recovery



PCB LAYOUT

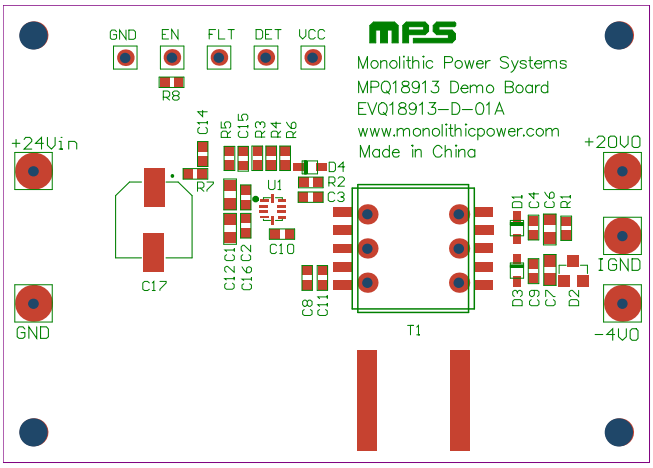


Figure 3: Top Silk

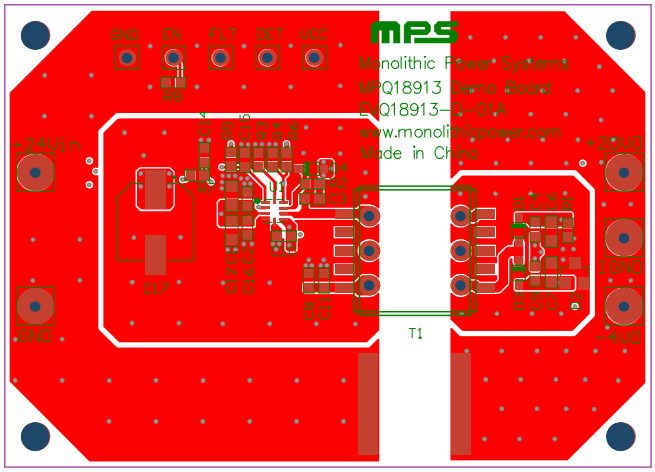


Figure 4: Top Layer

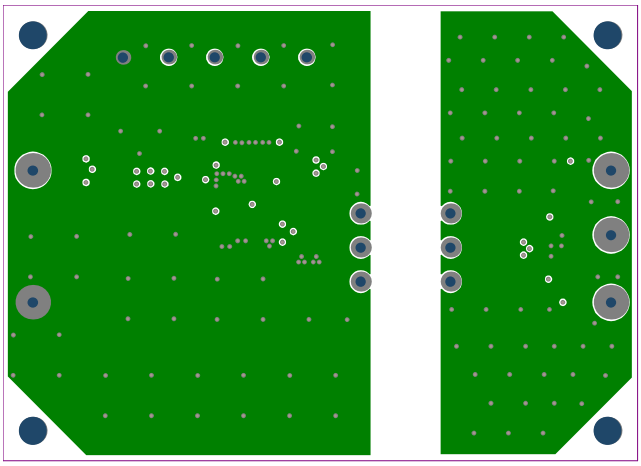


Figure 5: Mid-Layer 1

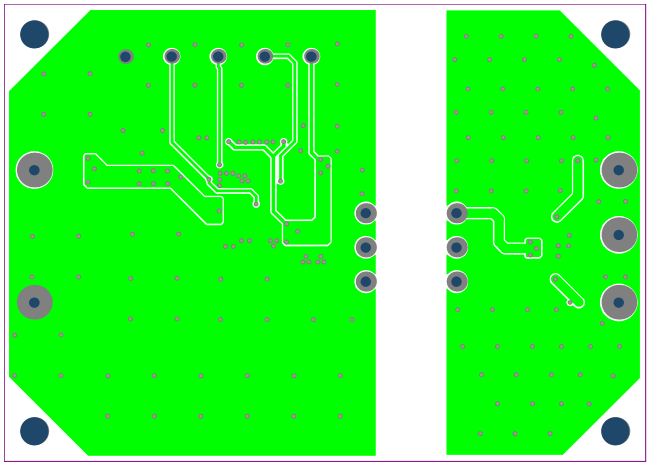


Figure 6: Mid-Layer 2

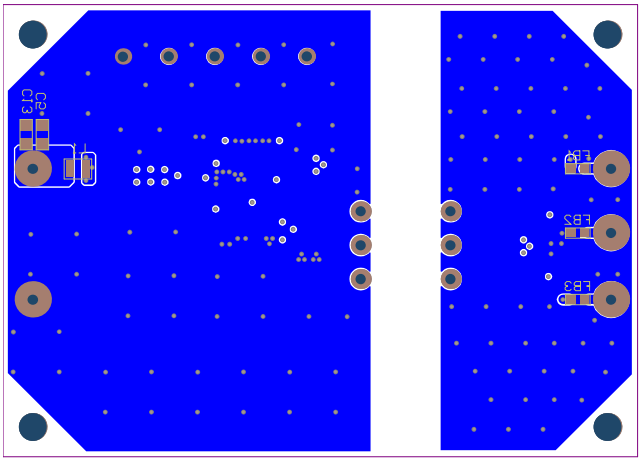


Figure 7: Bottom Layer

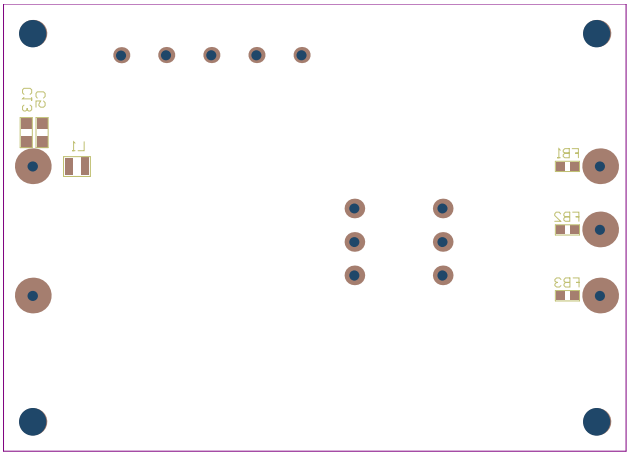


Figure 8: Bottom Silk

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	3/24/2023	Initial Release	-