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MxL76502

18V 720kHz 2A Fast-PWM Synchronous Step-Down Converter

EVK User Manual

Revision History

Document No.	Release Date	Change Description
037-76502URM01	August 8, 2025	**Updated:** ■ "MxL76502 EVK Simplified Block Diagram" figure. ■ "Recommended Values of Components" table. ■ "EVK Schematic"figure. ■ "EVK PCB Layers" section. ■ "EVK Bill of Materials" table.
037-76502UMR00	April 11, 2025	Initial release.

Table of Contents

List of Figures

List of Tables

Introduction

The MxL76502 evaluation kit (EVK) provides a platform to evaluate the features and performance of the MxL76502 synchronous step-down constant on-time (COT) buck converter. The MxL76502 provides a maximum load current rating of 2A with an input voltage range of 4.5V to 18V. It is packaged in a 6-pin SOT23-6L.

This document provides the EVK schematic (see "EVK Schematic" on page 6), PCB layout (see "EVK PCB Layers" on page 7), and bill of materials (see "EVK Bill of Materials" on page 10). They can help you with your design.

For more information, refer to the *MxL76502 Data Sheet* (285-76502DS). It includes a complete list of the device features, pinout, pin descriptions, typical performance characteristics, and external component calculations. This user manual is intended to be used in conjunction with the data sheet.

Quick EVK Set-Up and Start-Up

Factory Settings

The EVK has been set up with the following factory default configurations for quick set-up and operation:

- V_{IN} = 4.5V to 18V, optimized for a 12V input rail.
- V_{OUT} = 3.3V. For a different V_{OUT} selection, see "V_{OUT} Selection" on page 3.
- Maximum continuous I_{OUT} of 2A.
- Switching frequency of 720kHz.
- Forced continuous conduction mode (FCCM) or pulse-frequency modulation (PFM) mode. See "Ordering Information" on page 2.
- Built-in internal soft-start time of 1.2ms (typical).

Note: Do not exceed the device maximum load current rating.

Quick Start-Up

To quickly see the regulator in operation:

1. Use the factory settings and default configuration. If you wish to change any settings or components, do so before proceeding with the following steps. For more information, see "System Set-Up" on page 3.
2. Connect a turned-off power supply that is within the V_{IN} specification (from 4.5V to 18V, 12V typically) to the VIN pillar and to the GND pillar with short/thick leads. See the locations in "Test Set-Up and Result" on page 4.
3. Initially set to 0A, connect an electronic load not exceeding the maximum I_{OUT} (2A) to the VOUT pillar and to the GND pillar with short/thick leads. See the locations in "Test Set-Up and Result" on page 4.
4. Turn on the power supply and check V_{OUT}. The EVK should power up and regulate the output at 3.3V (factory setting).
5. Set or vary the load (do not exceed the maximum I_{OUT}) and check V_{OUT} and other desired performance levels, such as regulation and efficiency. For the result, see "Test Set-Up and Result" on page 4.

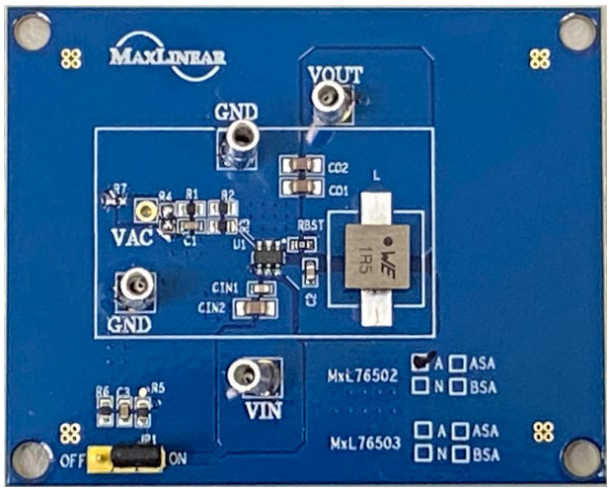

Figure 1: Top View of the MxL76502 EVK

Ordering Information

The following table lists the ordering part numbers for the evaluation kit.

Table 1: EVK Ordering Part Numbers

EVK Part Number	Maximum I_{OUT}	Default Output Voltage	Description
MXL76502A-EVK-1	2A	3.3V	EVK 2A step-down converter in FCCM mode
MXL76502N-EVK-1	2A	3.3V	EVK 2A step-down converter in PFM mode

Note: For the most up-to-date ordering information and additional information on environmental rating, go to www.maxlinear.com/MxL76502.

Evaluation Kit Overview

The following figure shows the EVK options for adjusting or testing.

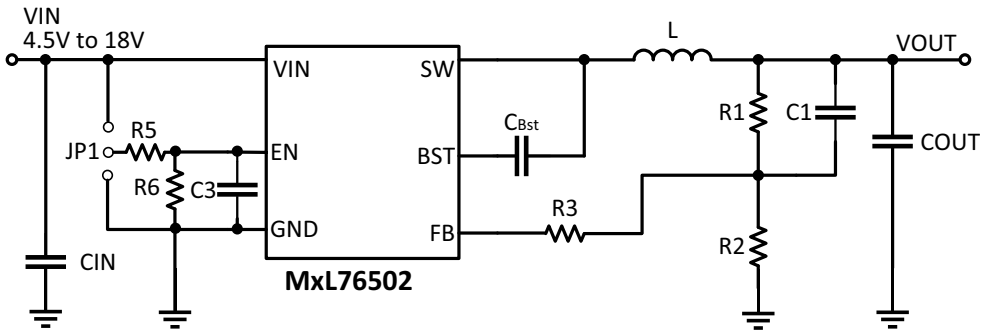

Figure 2: MxL76502 EVK Simplified Block Diagram

System Set-Up

EN Options

The following table lists the three options that the EN pin has reserved via JP1.

Table 2: Jumper JP1 Options for the EN Pin

Jumper Options	Description
Jumper 1-2	The enable (EN) pin is tied to GND, permanently disabling the channel.
Jumper 2-3 (default)	The EN pin is tied to V_{IN} and the channel is enabled at power-up
No jumper	The jumper is open, allowing EN to be controlled outside the EVK.

If you set the EN jumper JP1 as a *no jumper*, an external control signal is connected. Make sure that the EN threshold specification can be met for the external control signal.

Table 3: EN Threshold Specification

EN Pin Threshold		Condition	Minimum	Typical	Maximum
V_EN_VIH	Turn-on threshold	Rising	-	1.21V	-
V_EN_VIL	Turn-off threshold	Falling	-	1.11V	-

V_{OUT} Selection

The factory installed configuration of V_{OUT} is 3.3V. You can modify V_{OUT} by changing the low-side resistor (R2) of the feedback resistor divider according to:

$$R2 \equiv \left(\frac{R1 \times 0.6}{V_{OUT} - 0.6}\right)$$

Where R1 is the high-side resistor of the feedback resistor divider, which has a nominal value of 100kΩ.

Changing the output voltage also affects loop stability. For proper loop compensation, MaxLinear recommends also modifying the inductance (L) and feed-forward capacitance (C1) values as listed in the following table, and using 1% resistors to maintain output voltage accuracy.

Table 4: Recommended Values of Components

V_{OUT}	L	R1	R2	R3	C1
5.0V	4.7µH	100kΩ	13.7kΩ	499Ω–510Ω	100pF–150pF
3.3V	3.3µH	100kΩ	22.1kΩ	499Ω–510Ω	100pF–180pF
1.8V	2.2µH	100kΩ	50.0kΩ	499Ω–510Ω	100pF–220pF
1.2V	1.5µH	100kΩ	100.0kΩ	499Ω–510Ω	100pF–220pF
1.0V	1.5µH	100kΩ	150.0kΩ	499Ω–510Ω	100pF–220pF
0.9V	1.5µH	100kΩ	200.0kΩ	499Ω–510Ω	150pF–220pF

Test Set-Up and Result

Input and Output Connections

MaxLinear recommends using a power supply of 3A and connect it to the VIN and GND pillars of the MxL76502 EVK via a pair of 21-AWG wires. Connect the output port at the VOUT and GND pillars to an electronic load or another load via a pair of 21-AWG wires, as shown in Figure 3. The connecting wire should be as short as possible to reduce losses.

Note: Do not exceed the maximum output current capabilty of 2A.

For the V_{IN} and V_{OUT} test points, MaxLinear recommends measuring both input and output capacitance.

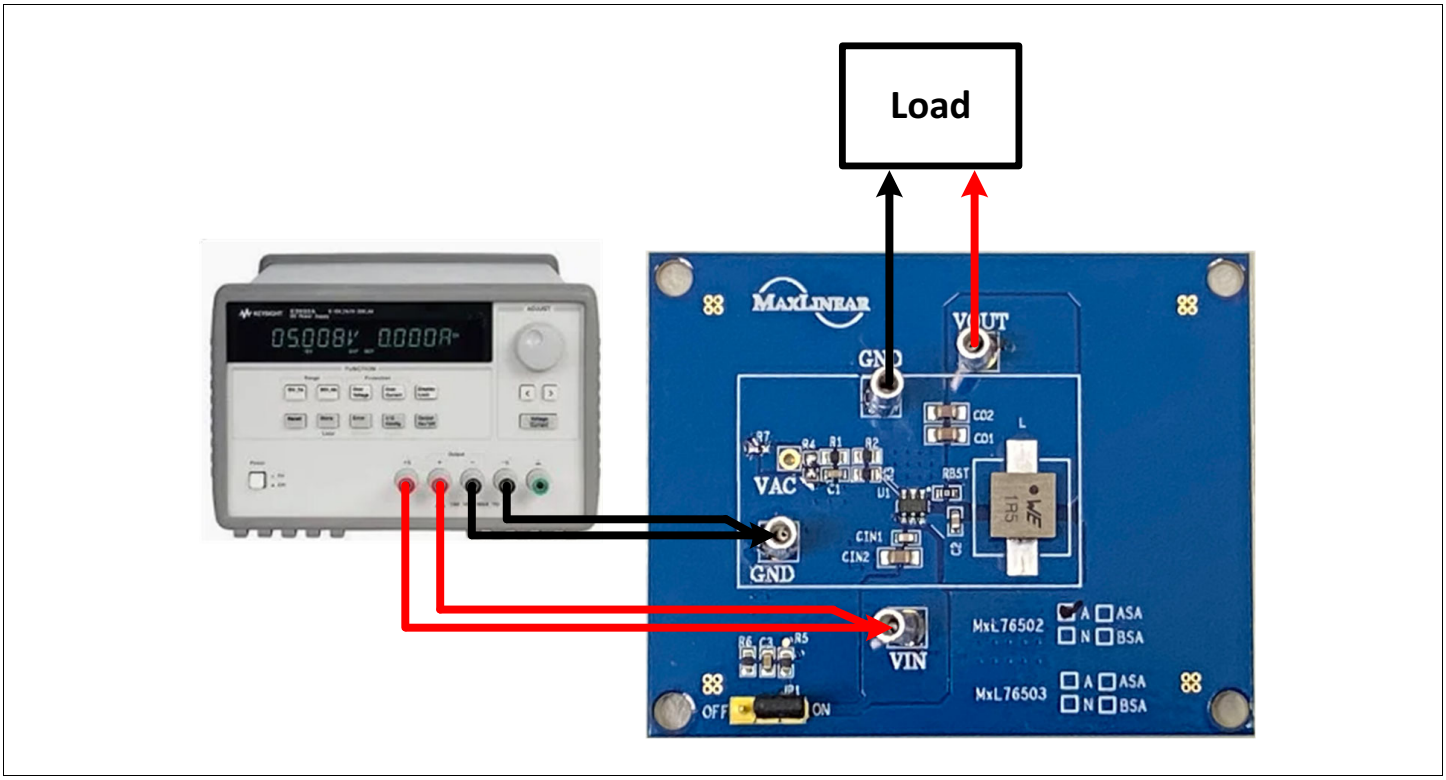

Figure 3: V_{IN} and V_{OUT} Connections of the MxL76502 EVK

Start-Up Procedure

1. Make sure that the pins 2 and 3 of the jumper JP1 are covered by the jumper.
2. Apply the appropriate V_{IN} (typically 12V) to the EVK's VIN and GND pillars.
3. Verify that V_{OUT} is within the output regulation.

Start-Up

The start-up waveform of the MxL76502 is initiated by V_{IN}, as shown in the following figure.

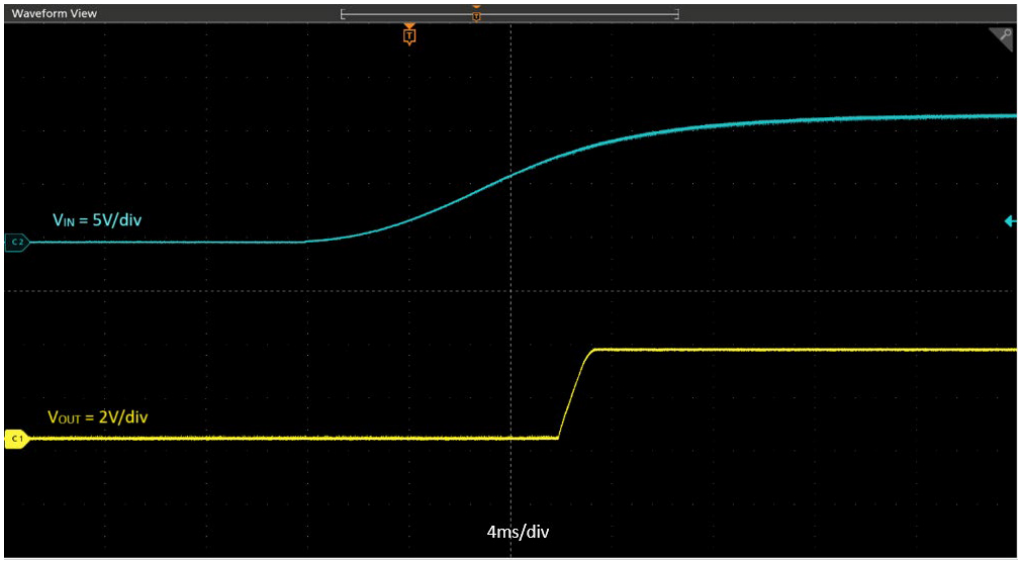

Figure 4: MxL76502 Start-Up with a 2A Load

Shutdown

The shutdown waveform of the MxL76502 is initiated by V_{IN}, as shown in the following figure.

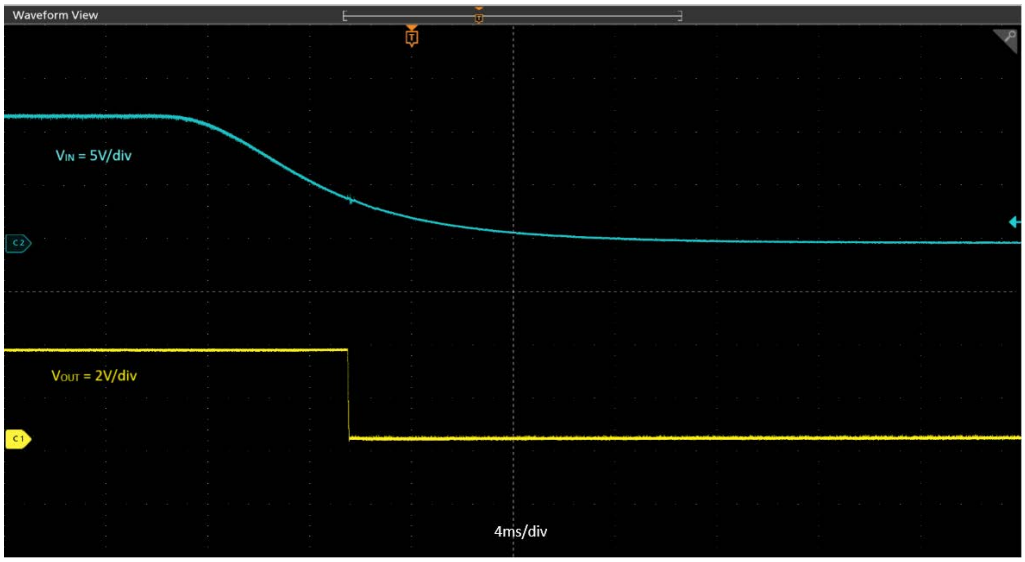

Figure 5: MxL76502 Shutdown with a 2A Load

EVK Schematic

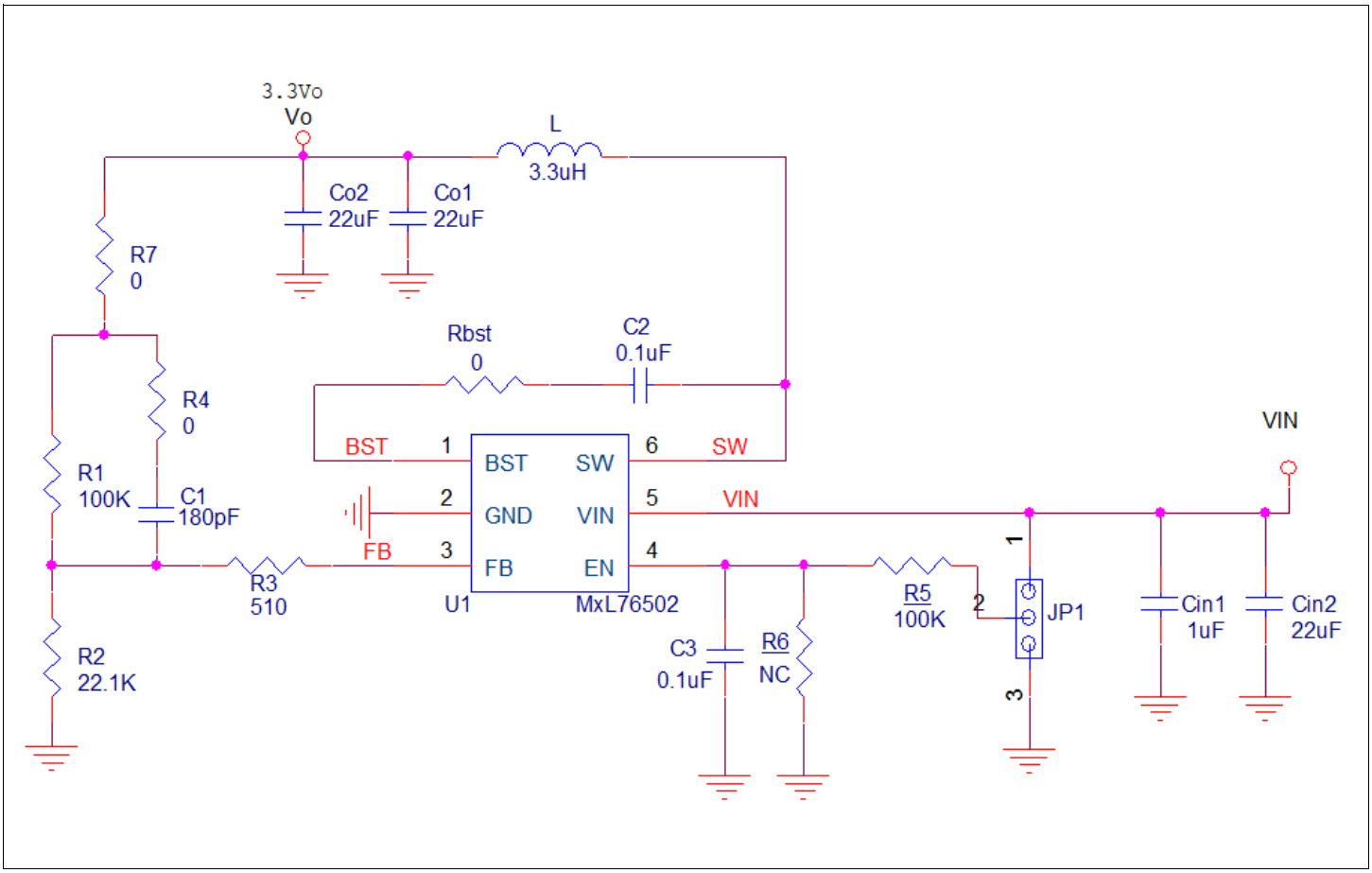

Figure 6: EVK Schematic

EVK PCB Layers

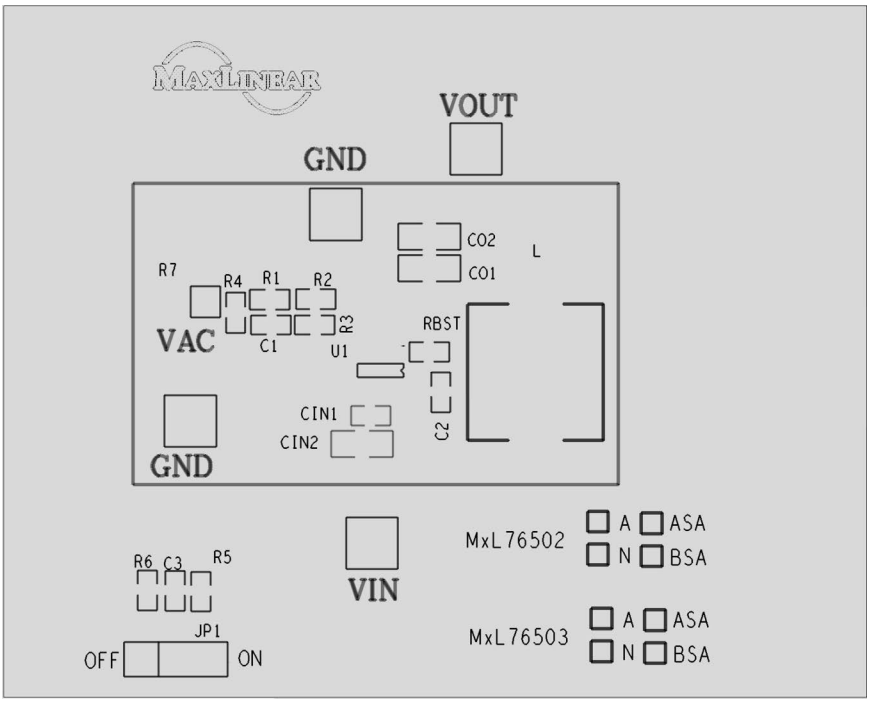

Figure 7: EVK PCB Silkscreen Top

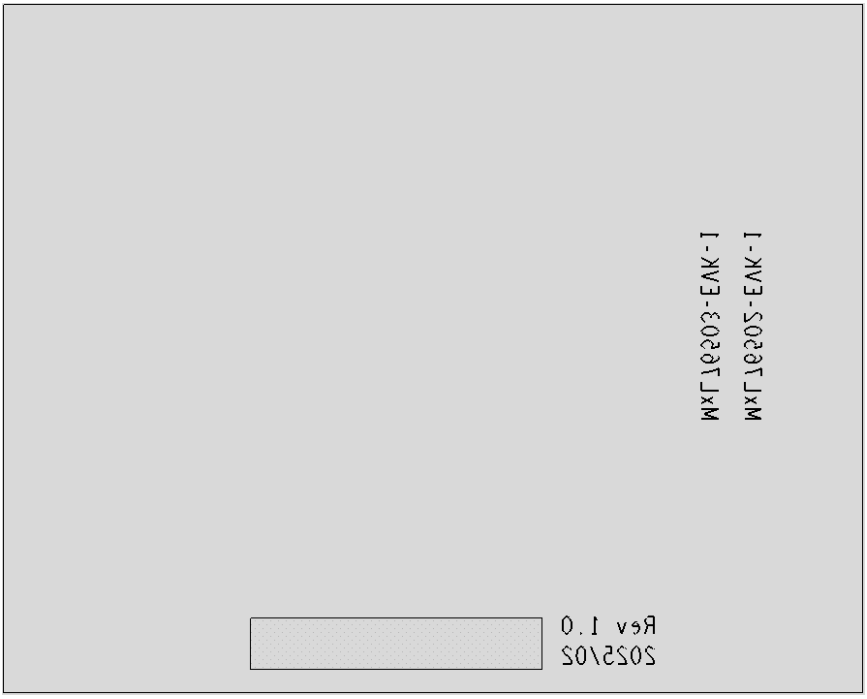

Figure 8: EVK PCB Silkscreen Bottom

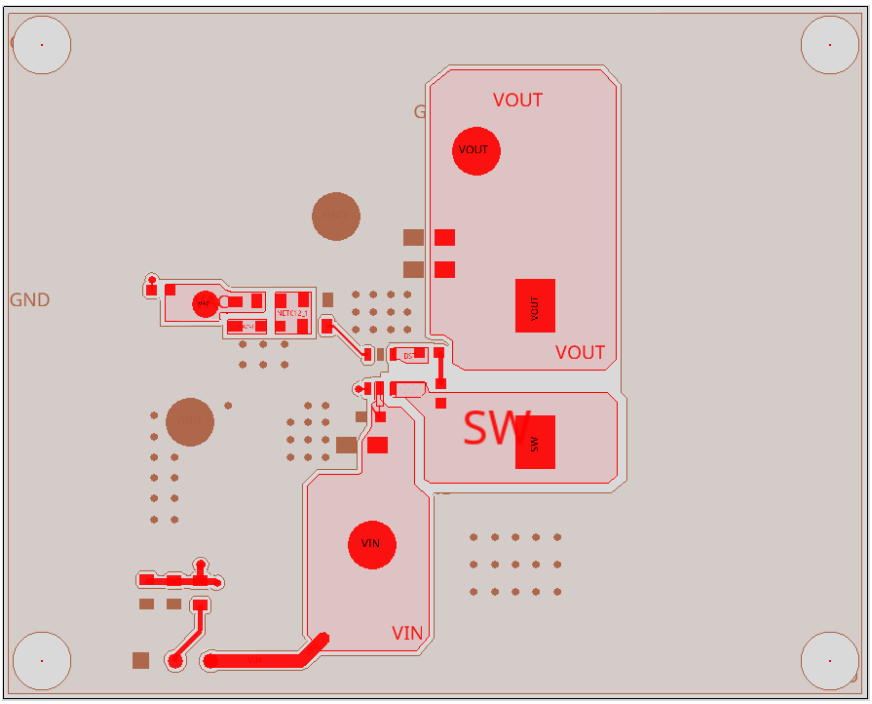

Figure 9: EVK PCB Top Layer

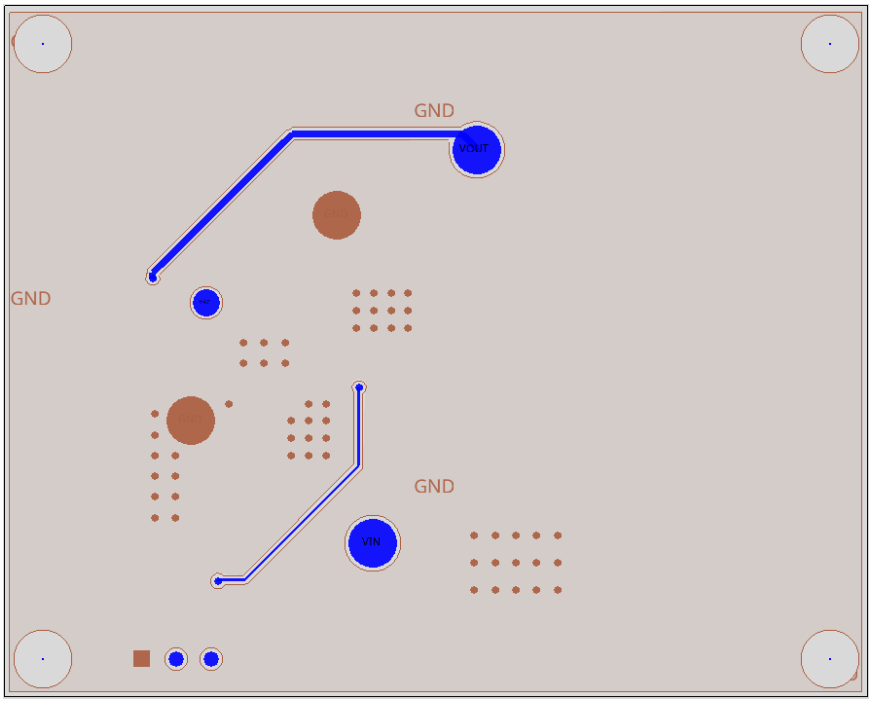

Figure 10: EVK PCB Bottom Layer

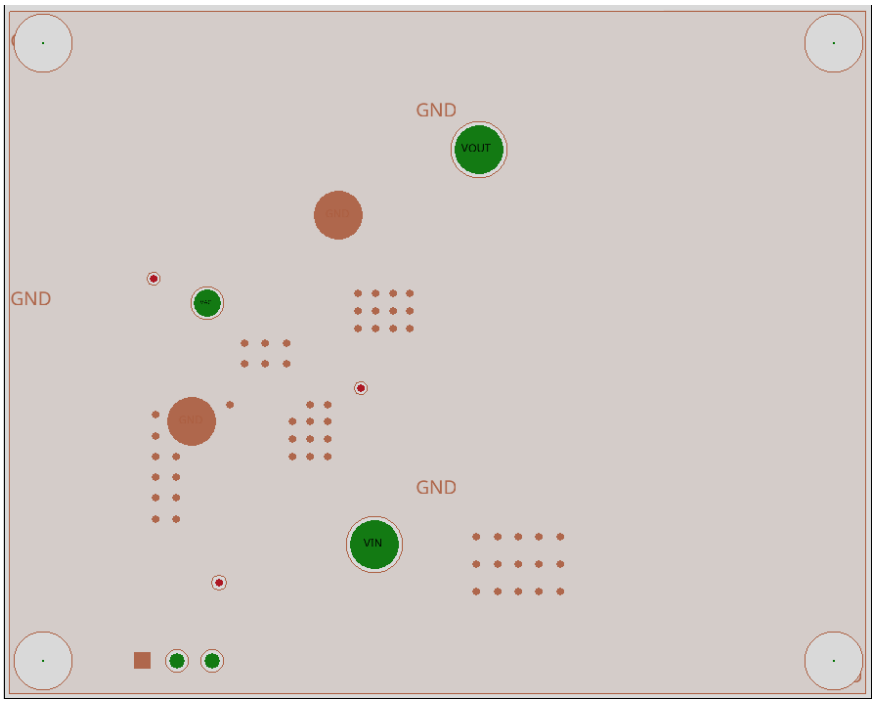

Figure 11: EVK PCB Layer 2

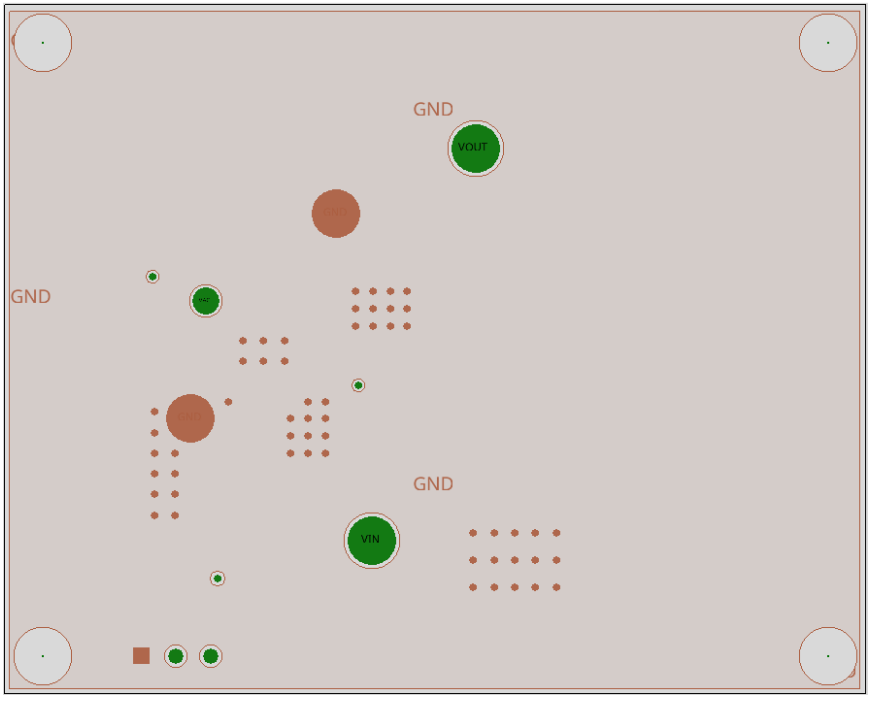

Figure 12: EVK PCB Layer 3

EVK Bill of Materials

Table 5: EVK Bill of Materials

Item	Qty	Reference Designator	Value	Description	Package
1	1	CIN1	1μF	Ceramic capacitor, 25V, X5R	0603
2	1	C3	0.1μF	Ceramic capacitor, 25V, X5R	0603
3	3	CIN2, CO1, CO2	22μF	Ceramic capacitor, 25V, X5R	0805
4	1	C2	100nF	Ceramic capacitor, 10V, X5R	0603
5	1	L	3.3μH	Wurth 7443845030033	6.65*6.45
6	1	R1	100kΩ	Resistor, ±1%	0603
7	1	R2	22.1kΩ	Resistor, ±1%	0603
8	1	C1	180pF	Ceramic capacitor, 25V, X5R	0603
9	1	R3	510Ω	Resistor, ±1%	0603
10	1	R5	100kΩ	Resistor, ±1%	0603
11	4	VIN, GND, VOUT	-	Pin header	-
12	1	JP1	2.54mm*3	Connector	2.54mm*3
13	1	R6	NC	-	0603
14	1	RBST	0Ω	Resistor	0603
15	1	Power IC	MXL76502N-ASA-R	Step-down DC/DC converter	SOT23-6L

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