

EVM User's Guide: LMR66430NEP-EVM

LMR66430-EP Evaluation Module



Description

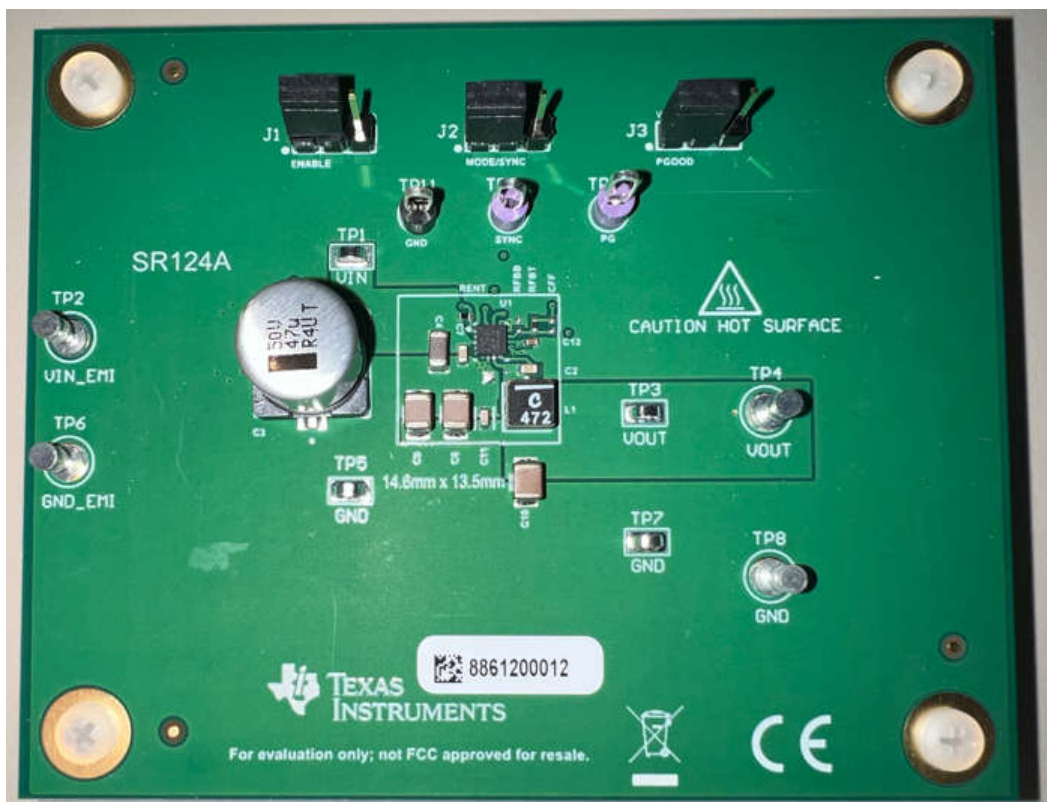
The LMR66430-EP is an easy-to-use, synchronous, step-down voltage converter. The EVM is capable of delivering up to 3A of load current from an input voltage of up to 36V. The LMR66430NEP-EVM features an output voltage of 3.3V and a switching frequency of 1MHz. By default, this EVM is populated with the LMR66430MB3RXBRNEP. The LMR66430NEP-EVM is capable of supporting the entire LMR66430-EP, LMR664x0-Q1, and LMQ664x0-Q1 family of devices by exchanging the default IC with other variants in the family including the non-automotive grade devices.

Features

- Wide input voltage range of 4.5V to 36V
- Fixed 3.3V output, with optional feedback divider footprints
- Fixed 1MHz switching frequency with external sync capability and mode select
- Input, differential EMI filter for compliance testing

Applications

- [Defense and aerospace applications](#)
- [Medical](#)
- [Test and measurement](#)
- [Motor drives](#)



LMR66430NEP-EVM Board

1 Evaluation Module Overview

1.1 Introduction

The Texas Instruments' LMR66430NEP-EVM evaluation module (EVM) helps designers evaluate the operation and performance of the LMR66430-EP, wide-input voltage, buck converter. The step-down EVM provides an automotive, 12V battery design. The EVM operates at 1MHz and is constructed on a 4-layer PCB.

	CAUTION	
	Caution	Hot surface. Contact can cause burns. Do not touch.

1.2 Kit Contents

The box includes the LMR66430NEP-EVM on nylon standoffs for evaluating on a lab bench. Contact the Texas Instruments Product Information Center nearest (or [E2E forum](#)) if any components are missing or the EVM is defective.

1.3 EVM Specifications

	MIN	TYP	MAX
VIN	4.5V	12V	36V
VOU		3.3V	
IOU	0		3A
FSW		1MHz	

1.4 Device Information

Table 1-1. Device and Package Configurations

EVM	U1	FREQUENCY	SPREAD SPECTRUM	CURRENT	PIN 13
LMR66430NEP-EVM	LMR66430MB3RXBRNEP	1MHz	Enabled	3A	MODE/SYNC

2 Hardware

2.1 Setup

This section describes the test points and connectors on the EVM and how to properly connect, set up, and use the LMR66430NEP-EVM.

2.1.1 Test Points

See [Figure 2-1](#) for typical test setup. The functions of the test point connections are:

- **VIN_EMI** — Input supply to EVM.
- **GND_EMI** — Ground connection for the input supply.
- **VIN** — Input supply to the IC. Can be connected to a digital multimeter to measure the input voltage after EMI filter.
- **VOU** — Output voltage test point of EVM. Can be connected to a desired load.
- **GND** — Ground test point.
- **PG** — This test point is connected to the PGOOD pin from the IC.
- **SYNC** — This test point can also be connected to an external clock to synchronize the IC.
- **GND** — This test point represents the analog ground test point and is connected to the ground plane.

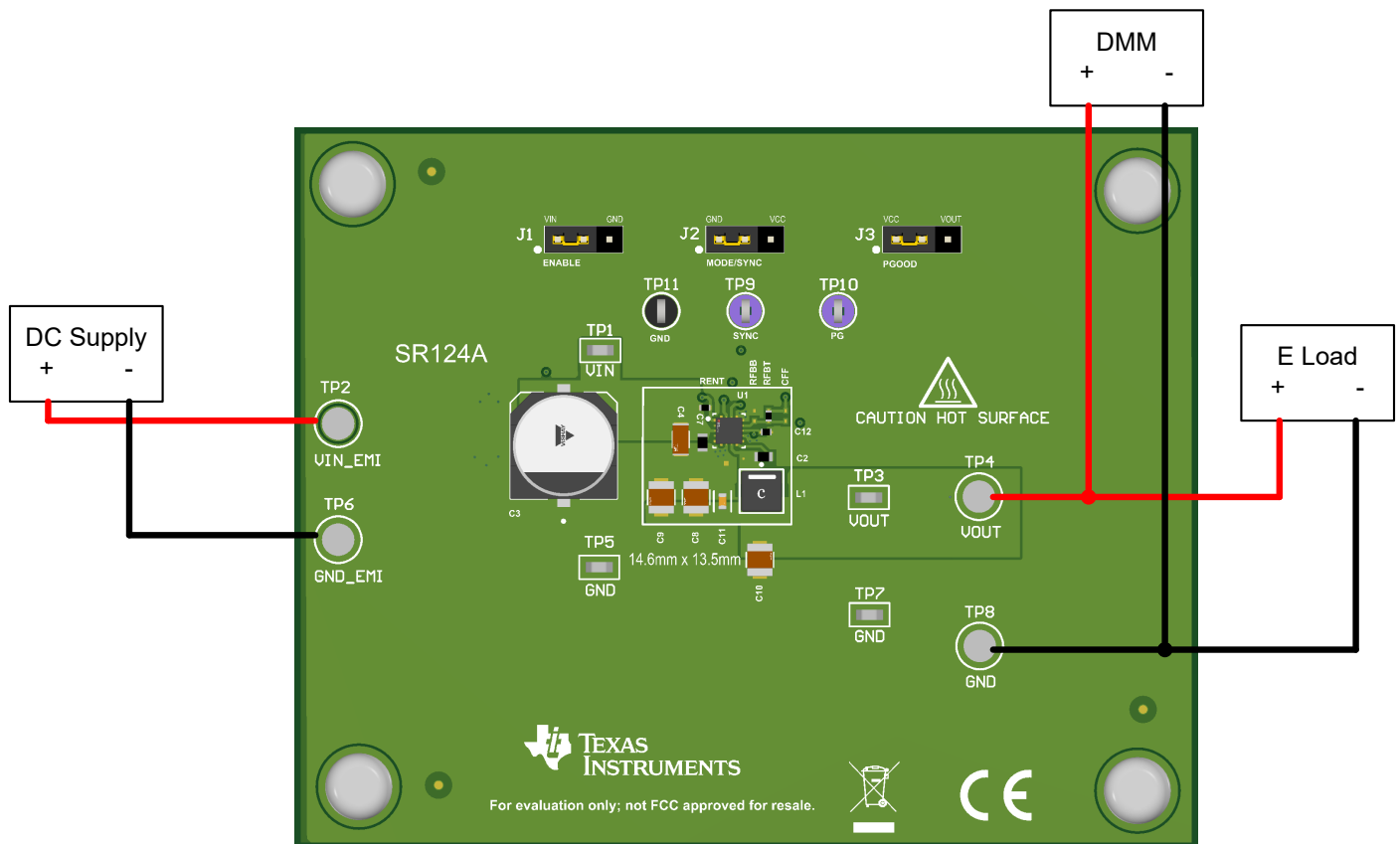


Figure 2-1. EVM Board Connections

2.1.2 Jumpers

- **J1** — Connect J1:1-2 to enable the device or J1:2-3 to disable the device. To evaluate a unique EN_UVLO, please use the equations provided in the data sheet for calculating R5, then populate on the EVM, and remove the J1 jumper.
- **J2**— Connect J2:1-2 to put the device in Auto mode or J2:2-3 for FPWM (fixed frequency). If synchronization to an external clock source is required, remove J2 jumper and hook-up clock to test point "SYNC."
- **J3** — PG is an open-drain, output signifying VOUT regulation. Connect J3:1-2 for VCC (3V) pull-up voltage, or, J3:2-3 for VOUT pullup voltage. Note the maximum voltage PG can sustain is 20V.

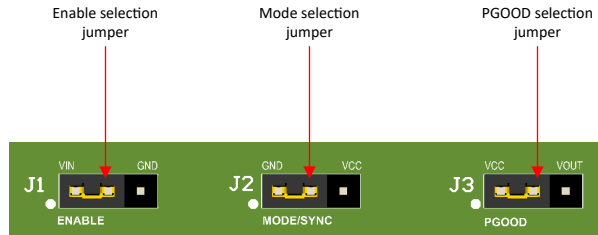


Figure 2-2. Jumper Locations

2.2 Operation: Quick Start

1. Connect the voltage supply between the VIN_EMI and GND_EMI supply connections.
2. Connect the load between the VOUT and GND test points.
3. Set the supply voltage at an appropriate level between 4.5V to 36V. Set the current limit of the supply to at least the maximum, evaluated load current.
4. Turn on the power supply. With the default configuration, the EVM powers up and provides $V_{OUT} = 3.3V$.
5. Monitor the output voltage. The maximum load current is rated at 3A with the LMR66430-EP device.

3 Implementation Results

3.1 LMR66430NEP-EVM Thermal Performance

The LMR66430NEP-EVM was evaluated with a 24V input with a resistive load. The following figures demonstrate the case temperature rise from room temperature (25°C) on the EVM. These figures give a good approximation of the junction temperature with the temperature gradient being very small across the thin case and junction.

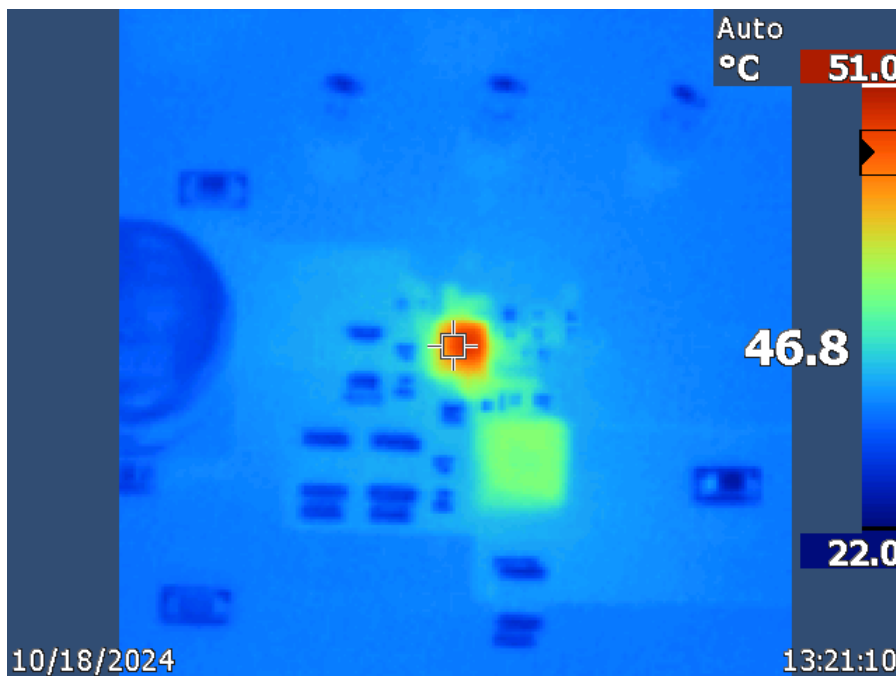


Figure 3-1. Thermal Capture, 24VIN, 3.3VOUT, 1MHz, 2A

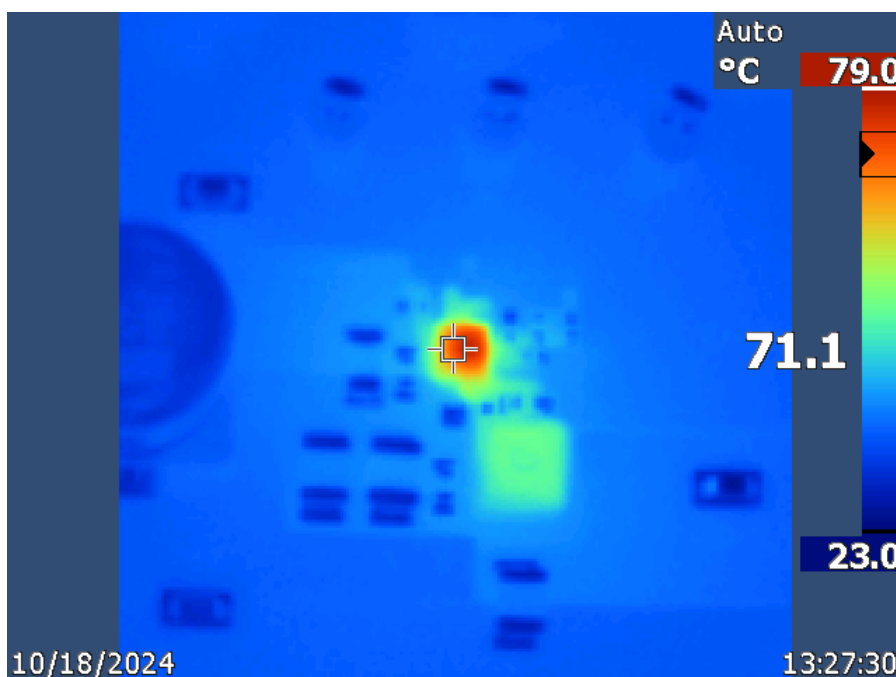


Figure 3-2. Thermal Capture, 24VIN, 3.3VOUT, 1MHz, 3A

4 Hardware Design Files

4.1 Schematic

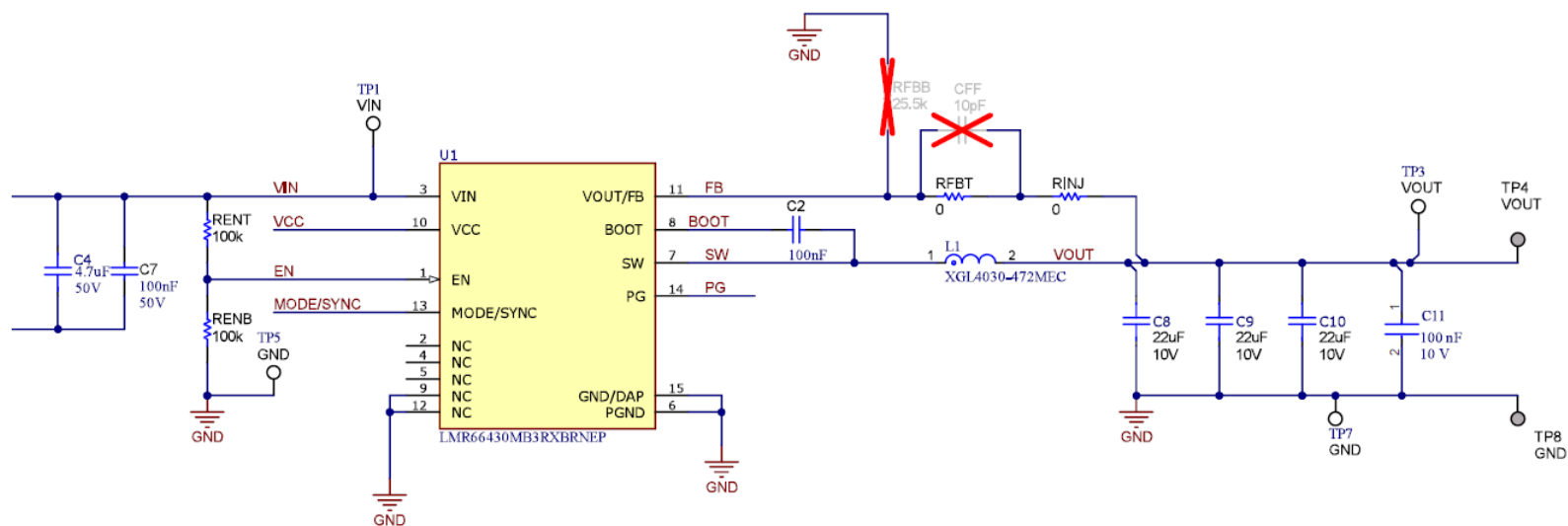


Figure 4-1. LMR66430NEP-EVM Schematic-Buck

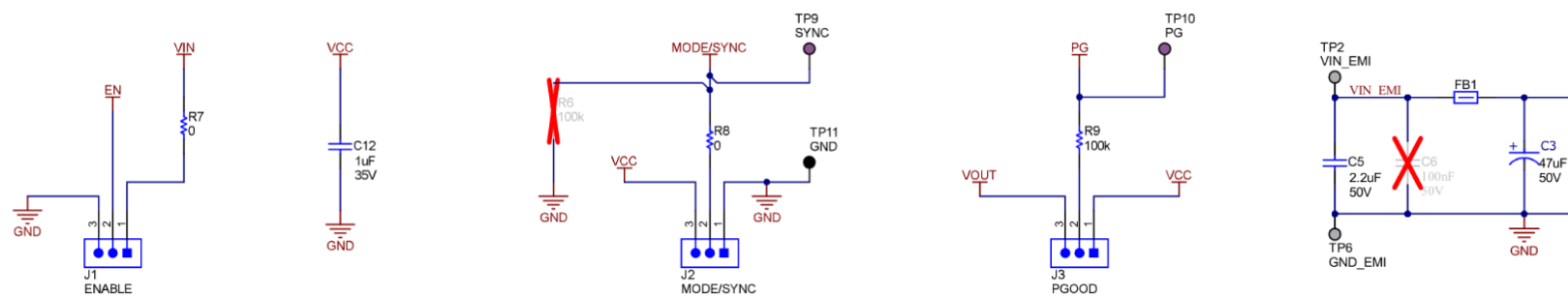


Figure 4-2. LMR66430NEP-EVM Schematic-Jumpers and Differential Filter

4.2 PCB Layout

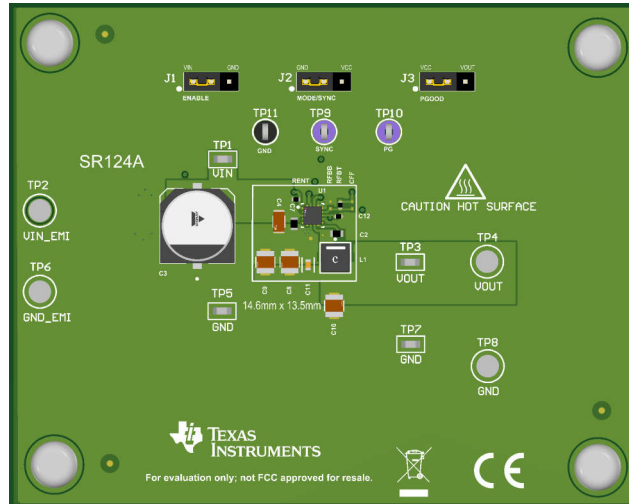


Figure 4-3. Top View of EVM

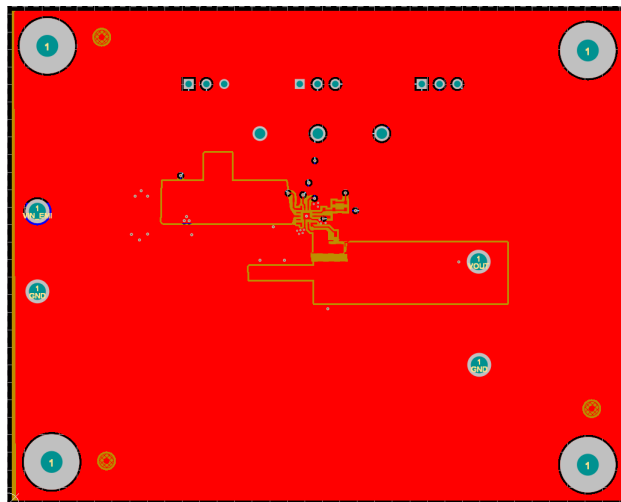


Figure 4-4. EVM Top Copper Layer

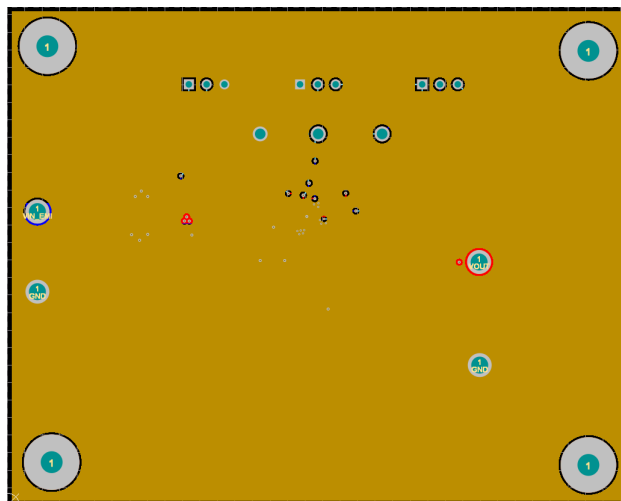


Figure 4-5. Mid-Layer One

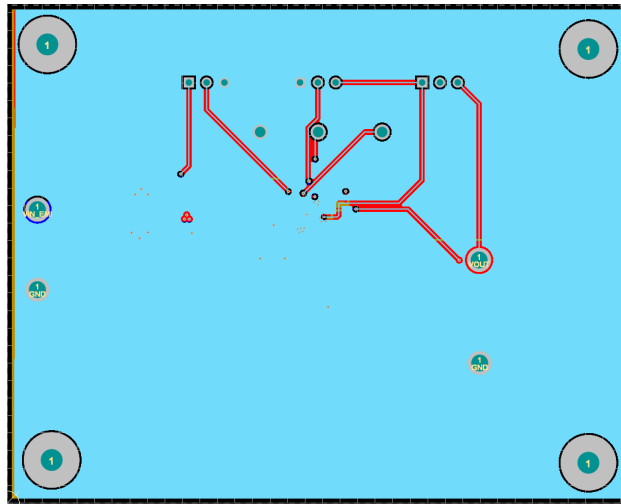


Figure 4-6. Mid-Layer Two

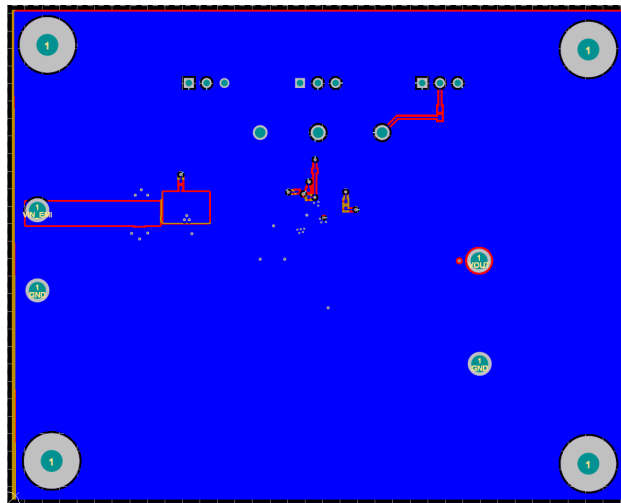


Figure 4-7. EVM Bottom Copper Layer

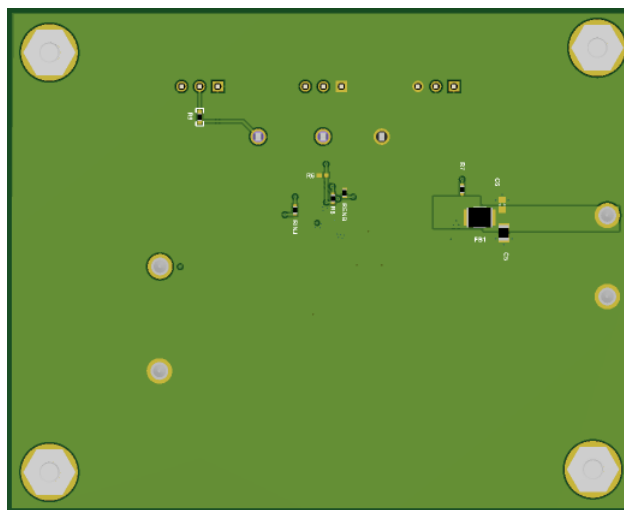


Figure 4-8. Bottom View of EVM

4.3 Bill of Materials

Table 4-1. Bill of Materials

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
C2, C7	2	0.1 μ F	CAP, CERM, 0.1 μ F, 50V, +/- 10%, X7R, 0603	0603	885012206095	Würth Elektronik
C3	1	47 μ F	47 μ F 50V Aluminum Electrolytic Capacitors Radial, Can - SMD 1500 Hrs at 125°C	RADIAL	MAL214699101E3	Vishay BC Components
C4	1	4.7 μ F	4.7 μ F \pm 10% 50V Ceramic Capacitor X7R 1206 (3216 Metric)	1206	885012208094	Würth Electronics
C5	1	2.2 μ F	CAP, CERM, 2.2 μ F, 50V, +/- 10%, X5R, 0805	0805	C2012X5R1H225K125AB	TDK
C8, C9, C10	3	22 μ F	Ceramic Capacitor for Automotive 22 μ F \pm 10% 10VDC X7R 1210 Embossed T/R	1210	GCM32ER71A226KE12L	Murata
C11	1	0.1 μ F	CAP CER 0.1UF 10V X7R 0603	0603	CC0603KRX7R6BB104	YAGEO
C12	1	1 μ F	CAP, CERM, 1 μ F, 35V, +/- 10%, X5R, 0402	0402	GRM155R6YA105KE11D	MuRata
FB1	1	600ohm	Ferrite Bead, 600 ohm at 100MHz, 3A, 1210	1210	FBMH3225HM601NT	Taiyo Yuden
H1, H2, H3, H4	4		Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	Screw	NY PMS 440 0025 PH	B&F Fastener Supply
H5, H6, H7, H8	4		Standoff, Hex, 0.5"L #4-40 Nylon	Standoff	1902C	Keystone
J1, J2, J3	3		Header, 100mil, 3x1, Tin, TH	Header, 3 Pin, 100 mil, Tin	PEC03SAAN	Sullins Connector Solutions
L1	1	4.7 μ H	Shielded Power Inductors	FP-XGL4030-MFG	XGL4030-472MEC	CoilCraft
R7, R8, RFBT, RINJ	4	0	RES, 0, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	RK73Z1ETTP	KOA Speer
R9	1	100kohm	RES, 100 k, 1%, 0.0625 W, AEC-Q200 Grade 0, 0402	0402	AC0402FR-07100KL	Yageo America
RENB, RENT	2	100kohm	RES, 100 k, 1%, 0.0625 W, AEC-Q200 Grade 0, 0402	0402	AC0402FR-07100KL	Yageo America
SH-J1, SH-J2, SH-J3	3	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec
TP1, TP3, TP5, TP7	4		Test Point, Miniature, SMT	Testpoint_Keystone_Miniature	5015	Keystone
TP2, TP4, TP6, TP8	4		Terminal, Turret, TH, Double	Keystone1502-2	1502-2	Keystone
TP9, TP10	2		Test Point, Multipurpose, Purple, TH	Keystone5129	5129	Keystone
TP11	1		Test Point, Multipurpose, Black, TH	Keystone5011	5011	Keystone
U1	1		36V, 3A, Ultra-Small, Synchronous Step-Down Converter	VQFN-FCRLF	LMR66430MB3RXBRNEP	Texas Instruments
C6	0	0.1 μ F	CAP, CERM, 0.1 μ F, 50V, +/- 10%, X7R, 0603	0603	885012206095	Würth Elektronik

Table 4-1. Bill of Materials (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
CFF	0	10pF	CAP, CERM, 10pF, 10V, +/- 2.5%, C0G/ NPO, 0402	0402	C0402C100C8GACTU	Kemet
R6	0	100kohm	RES, 100 k, 1%, 0.0625 W, AEC-Q200 Grade 0, 0402	0402	AC0402FR-07100KL	Yageo America
RFBB	0	25.5kohm	RES, 25.5 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW040225K5FKED	Vishay-Dale

5 Additional Information

5.1 Trademarks

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