

LMR33640EVM User's Guide

The Texas Instruments LMR33640EVM evaluation module (EVM) helps designers evaluate the operation and performance of the LMR33640 buck regulator. The LMR33640 is an easy-to-use synchronous step-down DC/DC converters capable of driving up to 4 A of load current from an input voltage of 3.8 V to 36 V. The LMR33640EVM features a selectable output voltage of 3.3 V or 5 V and a switching frequency of either 400 kHz. See the [LMR33640 SIMPLE SWITCHER 3.8-V to 36-V, 4-A Step-Down Converter Data Sheet](#) for additional features, detailed description, and available options.

Table 1 shows the EVM configuration.

Table 1. Device and Package Configurations

EVM	DEVICE	FREQUENCY/OUTPUT CURRENT
LMR33640EVM	LMR33640ADDA	400 kHz / 4 A

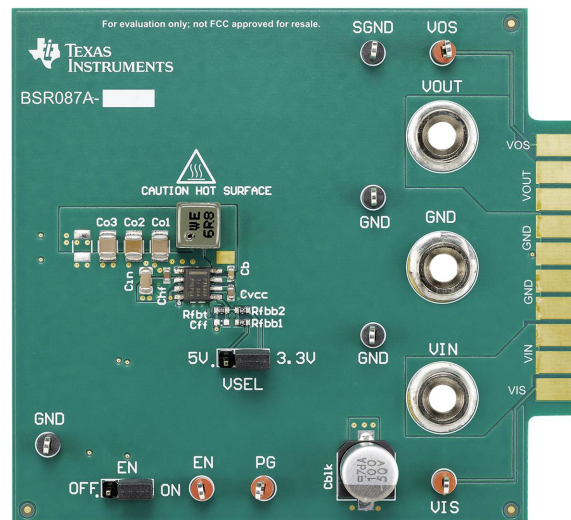


Figure 1. EVM Board Image

Contents

1	Setup	3
2	Operation	5
3	Performance Curves	6
4	Schematic.....	7
5	Board Layout	8
6	Bill of Materials	11

List of Figures

1	EVM Board Image	1
2	EVM Board Connections.....	3
3	EVM Card Edge Connections.....	4
4	Jumper Locations	4
5	FRA Setup	5
6	Efficiency: $V_{IN} = 12\text{ V}$, $V_{OUT} = 5\text{ V}$, $f_{SW} = 400\text{ KHz}$	6
7	Efficiency: $V_{IN} = 12\text{ V}$, $V_{OUT} = 3.3\text{V}$, $f_{SW} = 400\text{ kHz}$	6
8	LMR33640EVM Schematic.....	7
9	Top View of EVM	8
10	EVM Top Copper Layer.....	8
11	EVM Mid Layer One.....	9
12	EVM Mid Layer Two.....	9
13	EVM Bottom Copper Layer	10

List of Tables

1	Device and Package Configurations	1
2	BOM for LMR33640EVM.....	11

Trademarks

All trademarks are the property of their respective owners.

1 Setup

This section describes the test points and connectors on the EVM and how to properly connect, set up, and use the LMR33640EVM. Either the banana jacks and test points on the top of the board or the card edge connector can be used for connections. See [Figure 2](#) for the top of board connections and [Figure 3](#) for the card edge connections. The following are the functions of the connections:

- **VIN** - Input supply to EVM. Connect to a suitable input supply. See the [LMR33640 SIMPLE SWITCHER 3.8-V to 36-V, 4-A Step-Down Converter Data Sheet](#) for input supply requirements.
- **GND** - System ground
- **VOUT** - Output of EVM. Connect to desired load.
- **VOS** - Output voltage sense connection
- **VIS** - Input voltage sense connection
- **GNDS** - Ground sense point for analog measurements

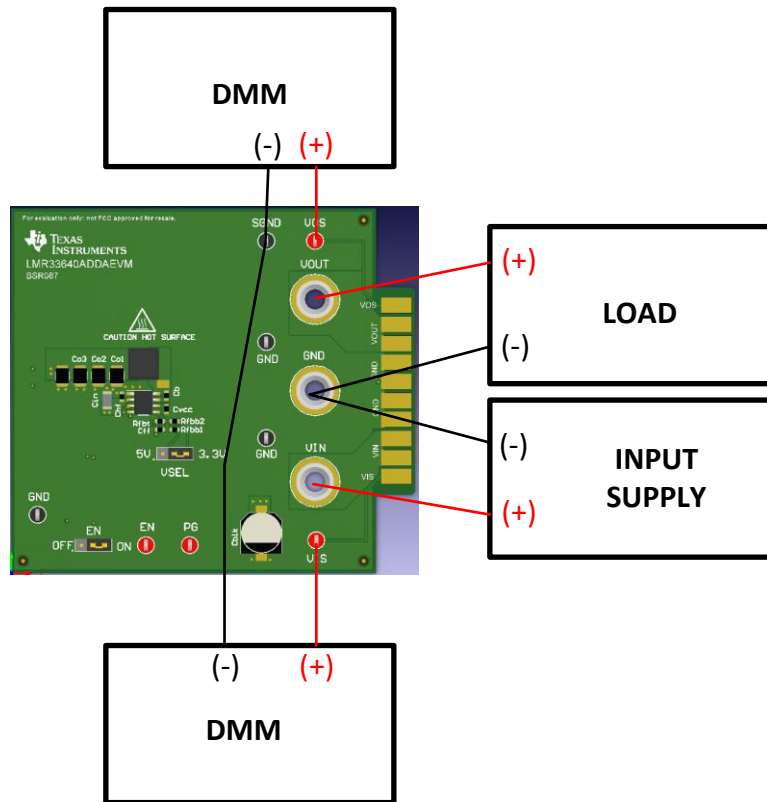
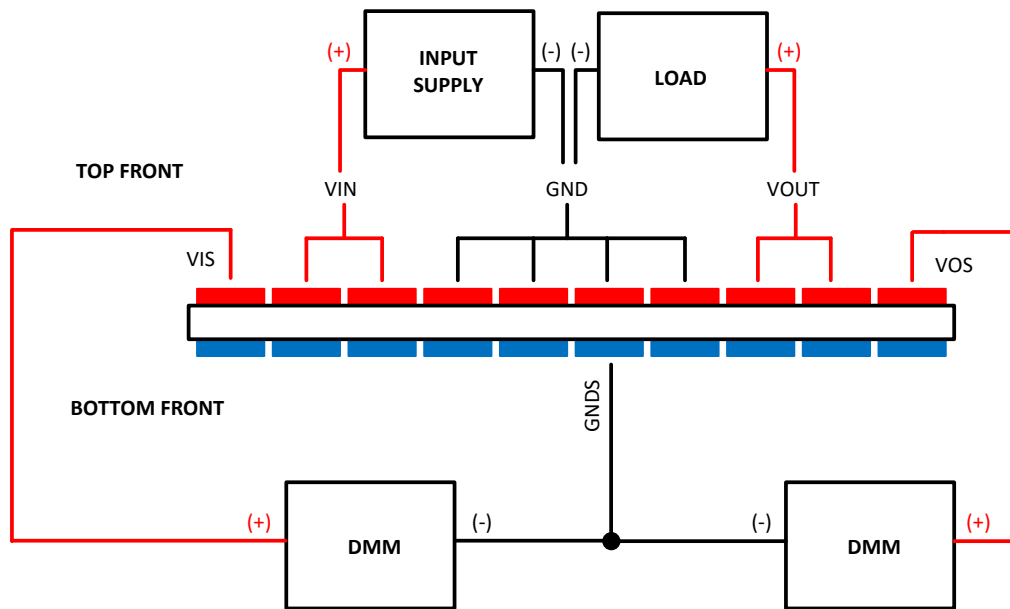


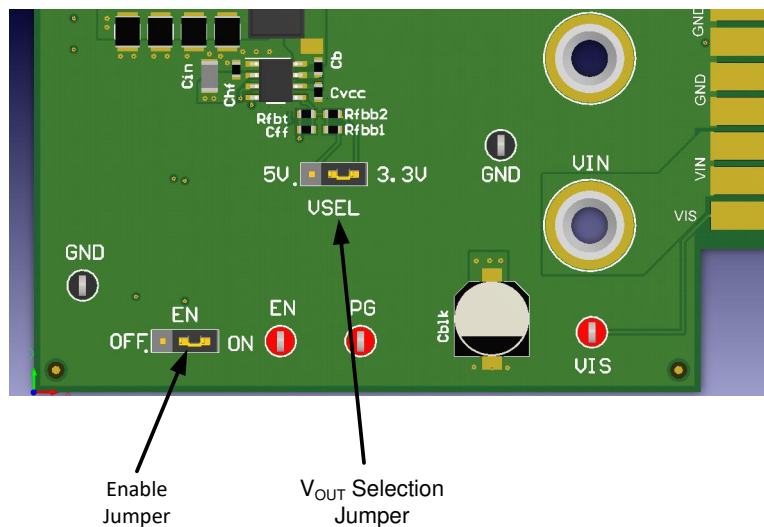
Figure 2. EVM Board Connections


Figure 3. EVM Card Edge Connections

1.1 Jumpers

See [Figure 4](#) for jumper locations.

- **EN** - This jumper allows the EN input to be connected to either ground (OFF) or VIN (ON). Remove this jumper to allow an external logic signal to control the EN function.
- **VOUT** - This jumper is used to select one of the two pre-defined output voltages. The "3.3V" position provides a 3.3 V output while the "5V" position provides a 5 V output.


Figure 4. Jumper Locations

1.2 Test Points

- **VIN** - Input supply to EVM. Connect to a suitable input supply. See the [LMR33640 SIMPLE SWITCHER 3.8-V to 36-V, 4-A Step-Down Converter Data Sheet](#) for input supply requirements.
- **GND** - System power ground

- **VOUT** - Power output of EVM. Connect to desired load.
- **VOS** - Output voltage sense connection. Connect to DMM. This is also used for frequency response analyzer connection.
- **VIS** - Input voltage sense connection. Connect to DMM.
- **GNDS** - Ground sense point for analog measurements. Connect to DMM.
- **VCC** - Test point to measure internal VCC of device; approximately 5 V. An on-board PGOOD pullup resistor is connected to VCC.
- **EN** - Connection for external EN logic input. Remove EN jumper and connect controlling logic to EN test point for external enable control.
- **PGOOD** - Power-good flag output. This test point is connected to VCC through a 20 k Ω resistor. The power good function can be monitored at this test point.
- **A** - Connection for frequency response analyzer (on bottom of board). See [Figure 5](#).

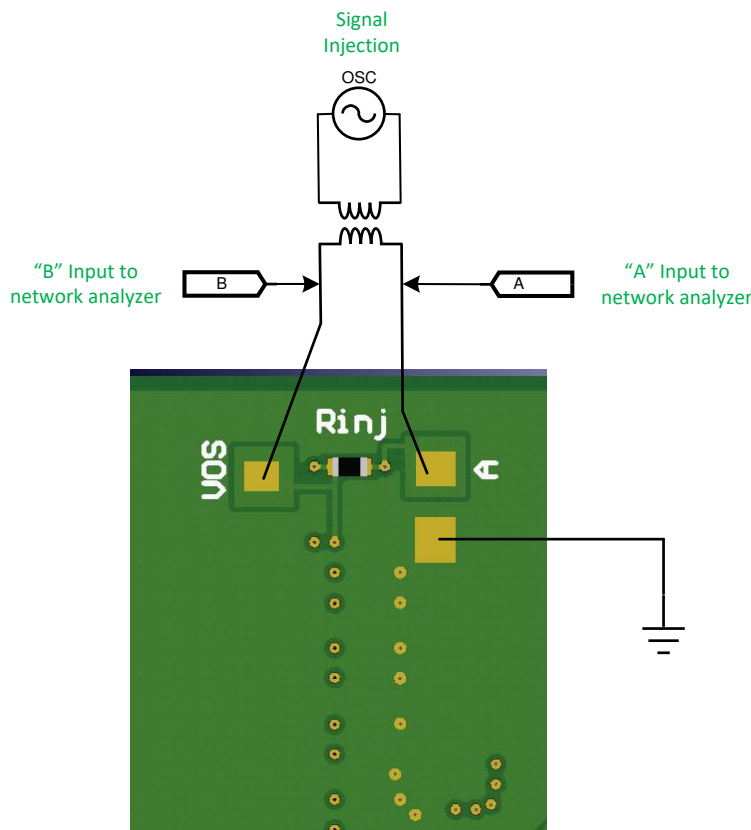


Figure 5. FRA Setup

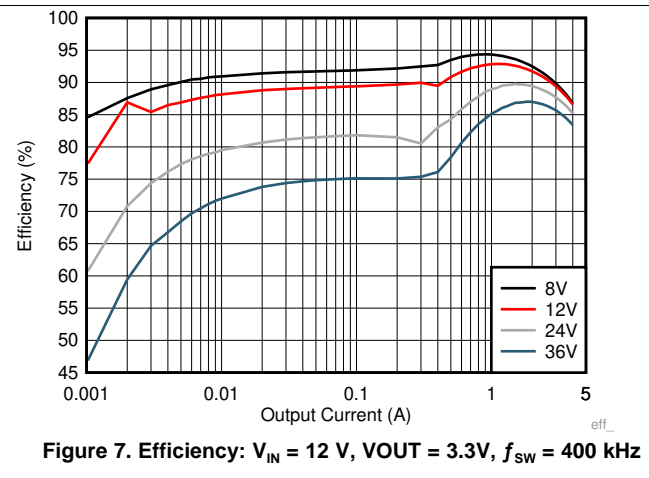
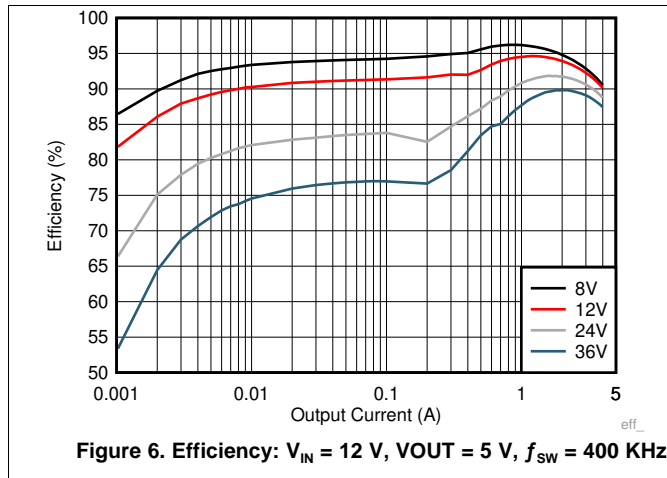
2 Operation

Once the previously described connections are made and the appropriate jumpers are set, the EVM is ready to use. If external control of the EN input is desired, remove the EN jumper and apply the external signal to the EN test point and GND. The PGOOD output is pulled up to VCC through a 20-k Ω resistor. This way, the PGOOD signal swings from 0 V to about 5 V to indicate when the output voltage is either outside or inside of the PGOOD window, respectively. If an external pullup and supply is desired for the PGOOD function, remove the 20-k Ω resistor and pull the PGOOD test point up to the desired voltage through an appropriate resistance. See the [LMR33640 SIMPLE SWITCHER 3.8-V to 36-V, 4-A Step-Down Converter Data Sheet](#) for more details.

The output voltage of the EVM can be selected by the VOUT jumper to either 3.3 V or 5 V. Other values of output voltage can be programmed by changing the value of R_{FBB} on the EVM. In addition, the values of the inductor and the output capacitance may also need to be changed. See the [LMR33640 SIMPLE SWITCHER 3.8-V to 36-V, 4-A Step-Down Converter Data Sheet](#) for more information.

The EVM has been designed for maximum flexibility regarding component selection. This allows the user to place preferred components, such as the inductor and capacitors, on the board and test the performance of the regulator. The power supply system can be tested before committing the design to production.

3 Performance Curves



4 Schematic

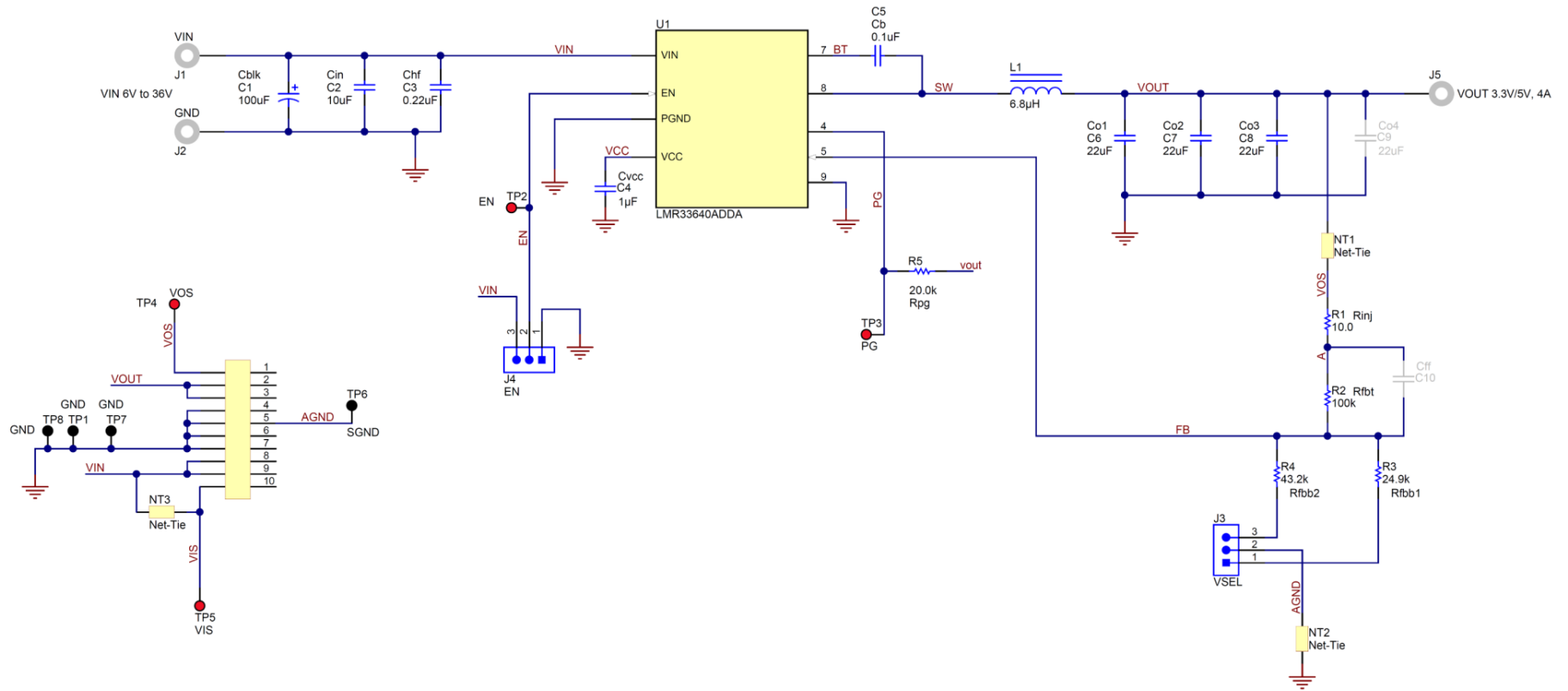


Figure 8. LMR33640EVM Schematic

5 Board Layout

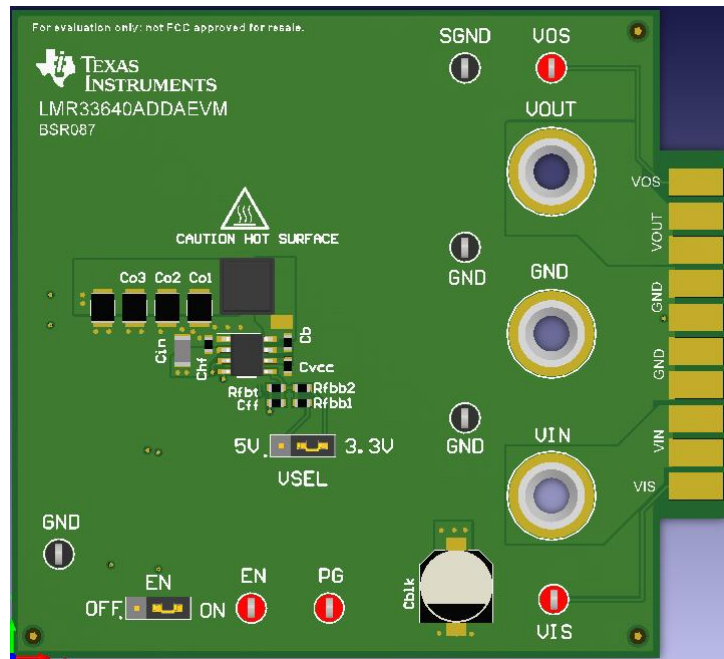


Figure 9. Top View of EVM

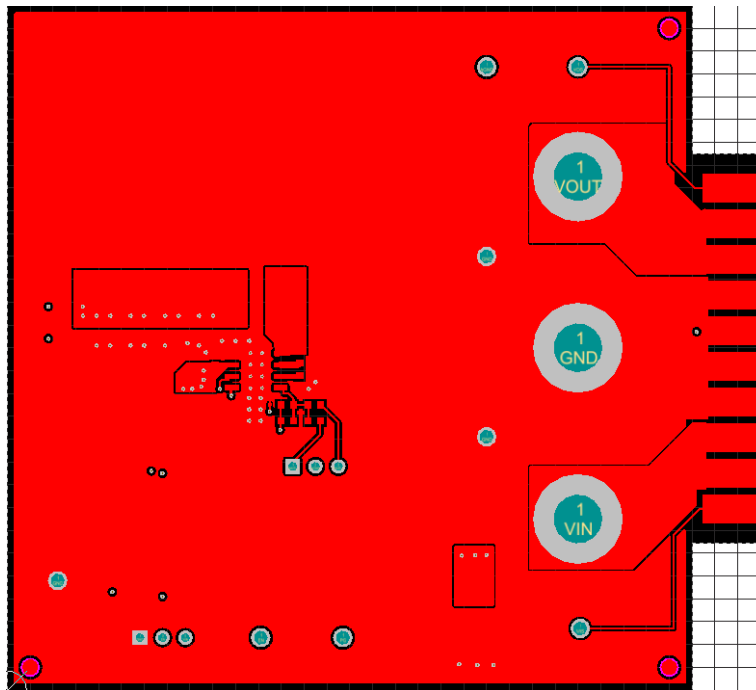


Figure 10. EVM Top Copper Layer

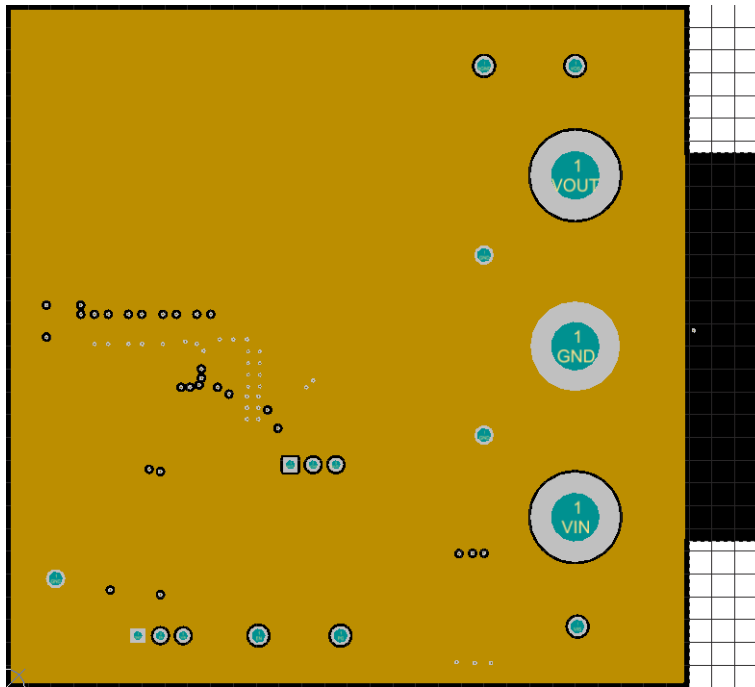


Figure 11. EVM Mid Layer One

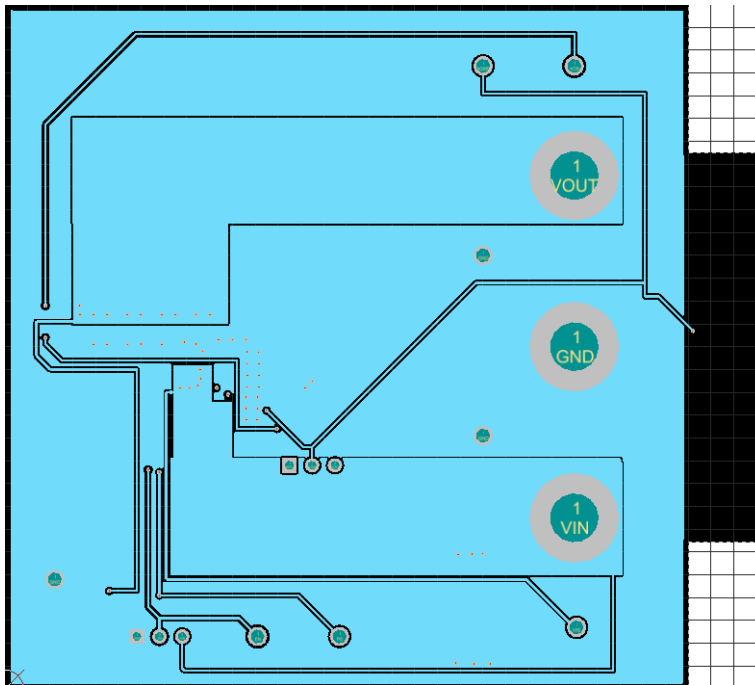


Figure 12. EVM Mid Layer Two

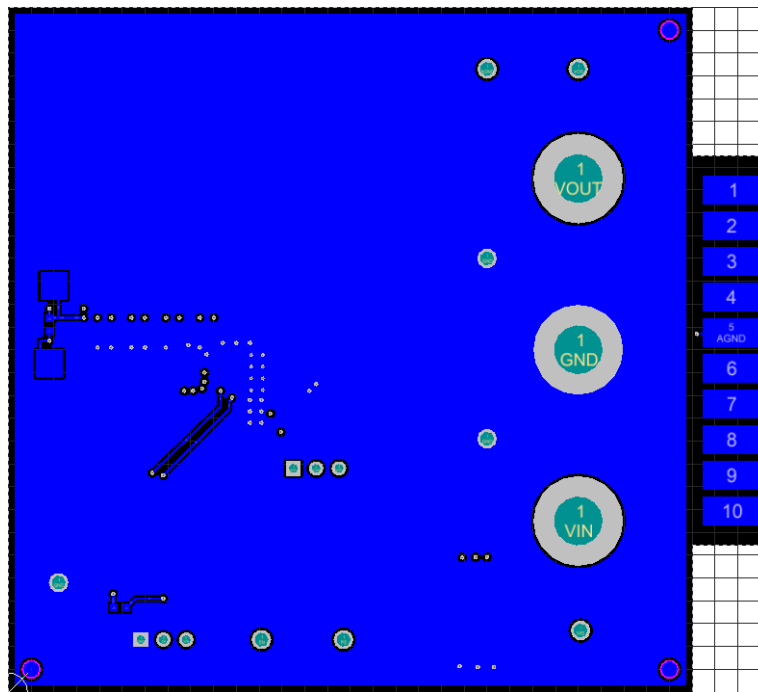


Figure 13. EVM Bottom Copper Layer

6 Bill of Materials

Table 2. BOM for LMR33640EVM

DESIGNATOR	IDENTIFIER	DESCRIPTION	MANUFACTURER	PART NUMBER	QTY
C1	Cblk	CAP, AL, 100 μ F, 50 V, \pm 20%, SMD	Chemi-Con	EMVA500ADA101MHA0G	1
C2	Cin	CAP, CERM, 10 μ F, 50 V, \pm 10%, X5R, 1206_190	Samsung	CL31A106KBHNNNE	1
C3	Chf	CAP, CERM, 0.22 μ F, 50 V, \pm 10%, X7R, 0603	MuRata	GRM188R71H224KAC4D	1
C4	Cvcc	CAP, CERM, 1 μ F, 16 V, \pm 20%, X7R, 0603	Samsung	CL10B105MO8NNWC	1
C5	Cb	CAP, CERM, 0.1 μ F, 25 V, \pm 10%, X7R, 0603	AVX	06033C104KAT2A	1
C6	Co1	CAP, CERM, 22 μ F, 16 V, \pm 20%, X7R, AEC-Q200 Grade 1, 1210	TDK	CGA6P1X7R1C226M250AC	1
C7	Co2	CAP, CERM, 22 μ F, 16 V, \pm 20%, X7R, AEC-Q200 Grade 1, 1210	TDK	CGA6P1X7R1C226M250AC	1
C8	Co3	CAP, CERM, 22 μ F, 16 V, \pm 20%, X7R, AEC-Q200 Grade 1, 1210	TDK	CGA6P1X7R1C226M250AC	1
C9	Co4	CAP, CERM, 22 μ F, 16 V, \pm 20%, X7R, AEC-Q200 Grade 1, 1210	TDK	CGA6P1X7R1C226M250AC	0
C10	Cff	CAP, CERM, 10 pF, 50 V, \pm 5%, C0G/NP0, 0603	TDK	CGA3E2NP01H100D080AA	0
J1	VIN	Standard Banana Jack, Uninsulated, 8.9 mm	Keystone	575-8	1
J2	GND	Standard Banana Jack, Uninsulated, 8.9 mm	Keystone	575-8	1
J5	VOUT	Standard Banana Jack, Uninsulated, 8.9 mm	Keystone	575-8	1
J3	VSEL	Header, 100 mil, 3x1, Gold, TH	Samtec	HTSW-103-07-G-S	1
J4	EN	Header, 100 mil, 3x1, Gold, TH	Samtec	HTSW-103-07-G-S	1
L1	L1	Inductor, Shielded, Hyperflux, 6.8 μ H, 6.5 A, 0.01936 Ω , SMD	Wurth Elektronik	74439346068	1
R1	Rinj	RES, 10.0, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	Vishay-Dale	CRCW060310R0FKEA	1
R2	Rfbt	RES, 100 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-07100KL	1
R3	Rfbb1	RES, 24.9 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-0724K9L	1
R4	Rfbb2	RES, 43.2 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-0743K2L	1
R5	Rpg	RES, 20.0 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-0720KL	1
SH-J1, SH-J2		Shunt, 100 mil, Gold plated, Black	3M	969102-0000-DA	2
TP-2, TP-3, TP-4, TP-5		Test Point, Multipurpose, Red, TH	Keystone	5010	4
TP-1, TP-6, TP-7, TP-8		Test Point, Multipurpose, Black, TH	Keystone	5011	4
U1		SIMPLE SWITCHER 3.8-V to 36-V, 4-A Synchronous Step-Down Converter	Texas Instruments	LMR33640ADDA	1

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2022, Texas Instruments Incorporated