# LMR14020SEVM User's Guide

The Texas Instruments LMR14020SEVM evaluation module (EVM) helps designers evaluate the operation and performance of the LMR14020S wide-input Simple Switcher® buck regulator. This document describes the setup and the input / output connections of the EVM. Included are the board layout, schematic, and bill of materials.

**Contents**



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# 1 Introduction

The LMR14020S is a 40-V, 2-A step-down regulator with 40-µA quiescent current. With a wide-input range from 4 V to 40 V, it is suitable for a wide range of applications from automotive to industry for power conditioning from unregulated sources. The LMR14020SEVM evaluation board is designed to provide the design engineer with a fully functional power converter based on the buck topology to evaluate the LMR14020 series operation and performance.

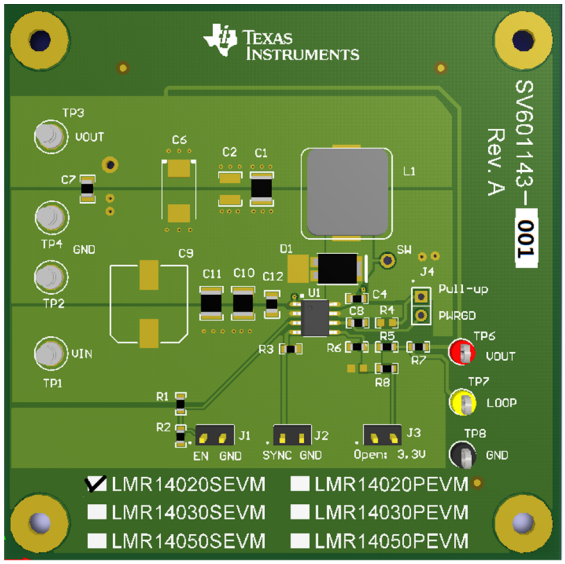


**Figure 1. LMR14020SEVM Board**

### EVM Features

- 7 V to 30 V Input Voltage Range
- Jumper Selectable Output Options (5.0 V or 3.3 V)
- Up to 2 A Output Current
- Switching Frequency 1.6 MHz
- Internal Compensation

The EVM contains one DC / DC converter (See Table 1)

**Table 1. Device and Package Configurations**

| CONVERTER | EVM | IC | PACKAGE |
|---|---|---|---|
| U1 | LMR14020SEVM | LMR14020S | HSOIC-8 |

# 2 Setup

This section describes the jumpers and connectors on the EVM and how to properly connect, set up and use the LMR14020SEVM .

## *2.1 Input/Output Connector Description*

**VIN — Terminal TP1** – is the power input terminal for the converter. Adjacent to it is the GND reference ground. Use this terminal to attach the EVM to a cable harness.

**VOUT — Terminal TP3** – is the regulated output voltage for the converter. Adjacent to it is the GND reference ground.

**GND — Terminal TP2, TP4** – are the ground reference for the converter. Use these terminals to attach the EVM to a cable harness.



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**EN — Jumper J1** – is used to enable the switch-mode converter. The device will be enabled when the respective jumper is high or floating, and disabled when low. EN turn off trip point also can be programmed by changing R1 or R2. Refer to LMR14020S datasheet for enable and adjustable under-voltage lockout.

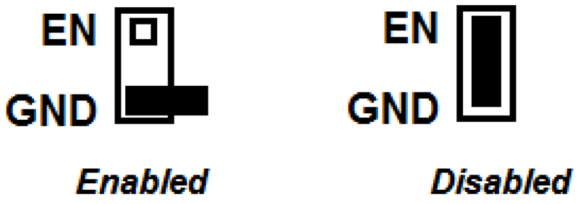


**Figure 2. Enable Jumper Setting**

**SYNC — Jumper J2** – is used to synchronize the switching frequency to external clock. Refer to data sheet for detail application information.

**Testpoint — TP6, TP7, TP8** – these are test points used for loop response measurements.

### 2.2 Adjusting the Output Voltage

The default setting output voltage is 5.0 V. Open J3 will change output voltage from 5.0 V to 3.3 V.

If other outputs need to be configureg, then: open J3 and adjust the feedback resistors using the following equation.

$$V_{OUT} = V_{FB} ( 1 + ( R5 / R6 ) ) \quad (1)$$

Where $V_{FB}$ is 0.75 V

## 3 Board Layout

Figure 3 to Figure 6 show the board layout for the LMR14020SEVM. The PCB consists of a 4-layer design. 2-oz copper planes are applied on all four layers to dissipate heat with an array of thermal vias under the thermal pad to connect to all four layers.

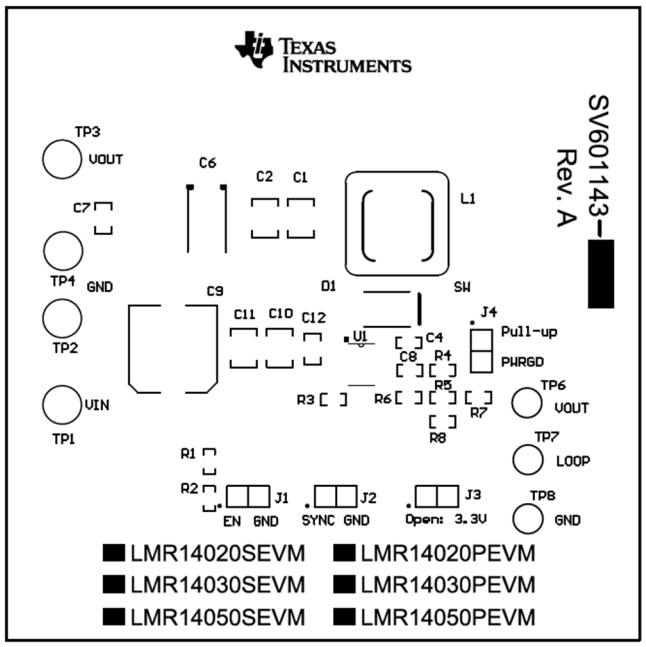


**Figure 3. Top Layer**


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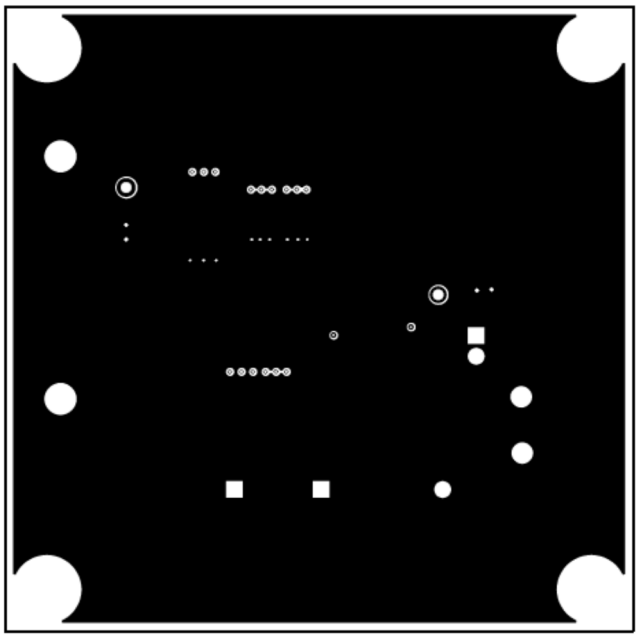

**Figure 4. Middle Layer 1**

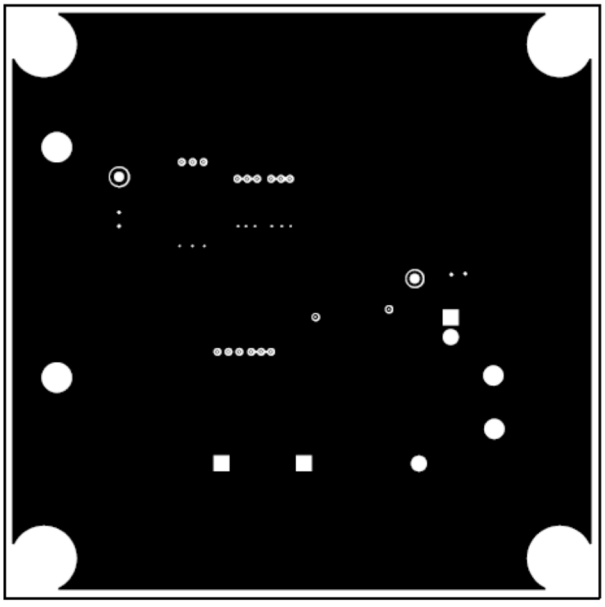

**Figure 5. Middle Layer 2**



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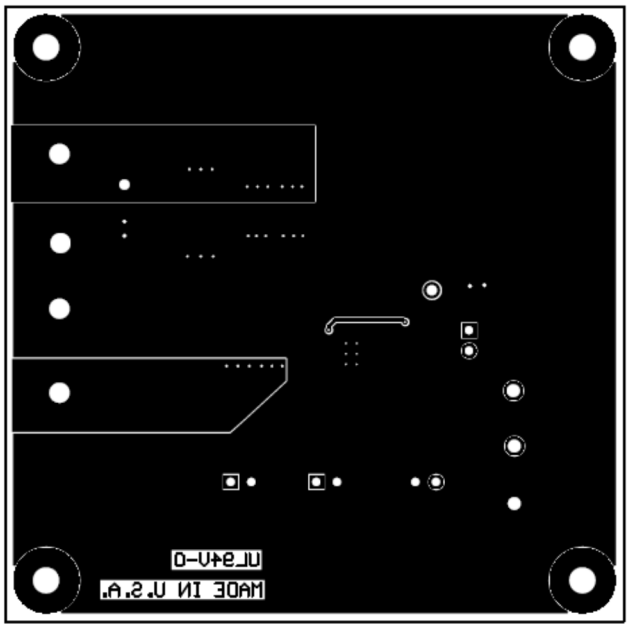

**Figure 6. Bottom Layer**


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# 4 Schematic and Bill of Materials

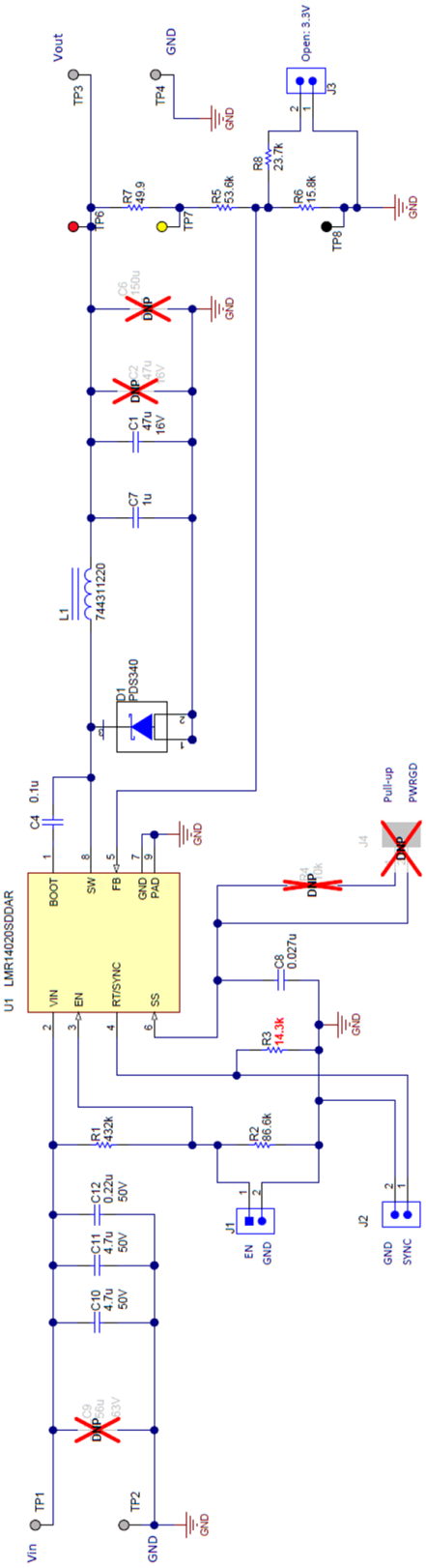


**Figure 7. LMR14020SEVM Schematic**



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**Table 2. LMR14020SEVM Bill of Materials (BOM)**

| Designator | Description | Part Number | Footprint | Quantity |
|---|---|---|---|---|
| C1 | CAP, CERM, 47 µF, 16 V, +/-20%, X5R, 1210 | GRM32ER61C476ME15L | 1210 | 2 |
| C4 | CAP, CERM, 0.1 µF, 16 V, +/- 10%, X7R, 0603 | GRM188R71C104KA01D | 0603 | 1 |
| C7 | CAP, CERM, 1 µF 25 V, +/- 10%, X7R, 0805 | GRM21BR71E105KA99L | 0805 | 1 |
| C8 | CAP, CERM, 0.027 µF, 100 V, +/- 10%, X7R, 0603 | C0603C273K1RACTU | 0603 | 1 |
| C10, C11 | CAP, CERM, 4.7 µF, 50 V, +/-10%, X7R, 1210 | GRM32ER71H475KA88L | 1210 | 2 |
| C12 | CAP, CERM, 0.22 µF, 50 V, +/- 10%, X7R, 0805 | GRM21BR71H224KA01L | 0805 | 1 |
| D1 | Diode, Schottky, 40 V, 3 A, PowerDI5 | PDS340-13 | PowerDI5 | 1 |
| J1, J2, J3 | Header, 100 mil, 2 x 1, Gold, TH | TSW-102-07-G-S | TSW-102-07-G-S | 3 |
| L1 | Inductor, 2.2 µH, 9 A, 0.0115 ohm | 744311220 | WE-HCI | 1 |
| R1 | RES, 432 k, 1%, 0.1 W, 0603 | CRCW0603432KFKEA | 0603 | 1 |
| R2 | RES, 86.6 k, 1%, 0.1 W, 0603 | CRCW060386K6FKEA | 0603 | 1 |
| R3 | RES, 14.3 k, 1%, 0.1 W, 0603 | CRCW060314K3FKEA | 0603 | 1 |
| R5 | RES, 53.6 k, 1%, 0.1W, 0603 | CRCW060353K6FKEA | 0603 | 1 |
| R6 | RES, 15.8 k, 1%, 0.1 W, 0603 | CRCW060315K8FKEA | 0603 | 1 |
| R7 | RES, 49.9 ohm, 1%, 0.1W, 0603 | CRCW060349R9FKEA | 0603 | 1 |
| R8 | RES, 23.7 k, 1%, 0.1 W, 0603 | CRCW060323K7FKEA | 0603 | 1 |
| SH-J1, SH-J3 | Shunt, 100 mil, Flash Gold, Black | SPC02SYAN | TSW-102-07-G-S | 2 |
| TP1, TP2, TP3, TP4 | Terminal, Turret, TH, Double | 1502-2 | Keystone1502-2 | 4 |
| TP6 | Test Point, TH, Multipurpose, Red | 5010 | Keystone5010 | 1 |
| TP7 | Test Point, TH, Multipurpose, Yellow | 5014 | Keystone5014 | 1 |
| TP8 | Test Point, TH, Multipurpose, Black | 5011 | Keystone5011 | 1 |
| U1 | IC, 40 V, 2 A, Low $I_Q$, Current Mode, Buck Regulator | LMR14020SDDAR | HSOIC-8 | 1 |
| PCB | PCB, FR4, 4 Layers, Size 3000 x 3000 mil, Thickness 62 mil | SV601143 | | 1 |


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