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.

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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.

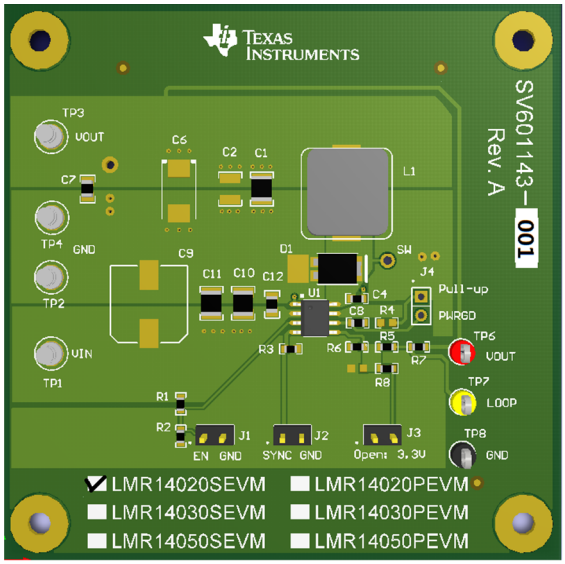


Figure 1. LMR14020SEVM Board

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.

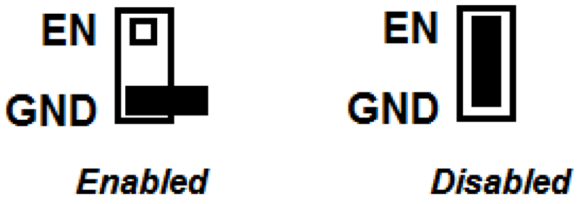


Figure 2. Enable Jumper Setting

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.

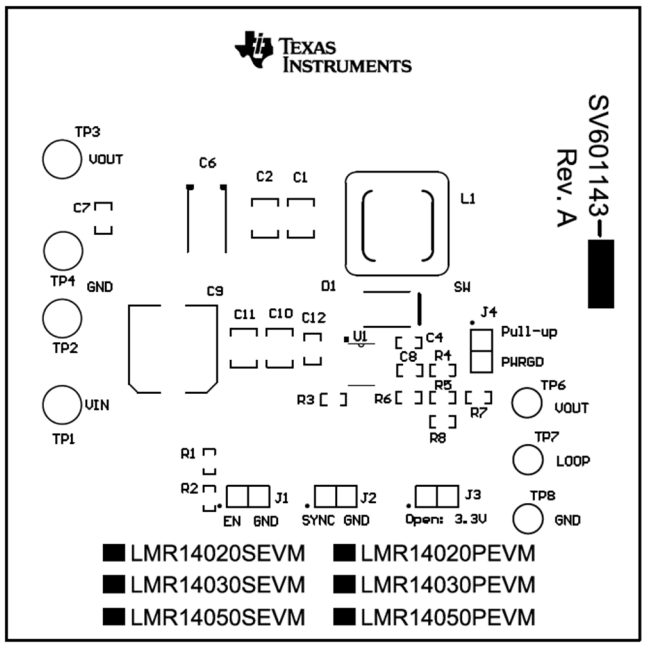


Figure 3. Top Layer

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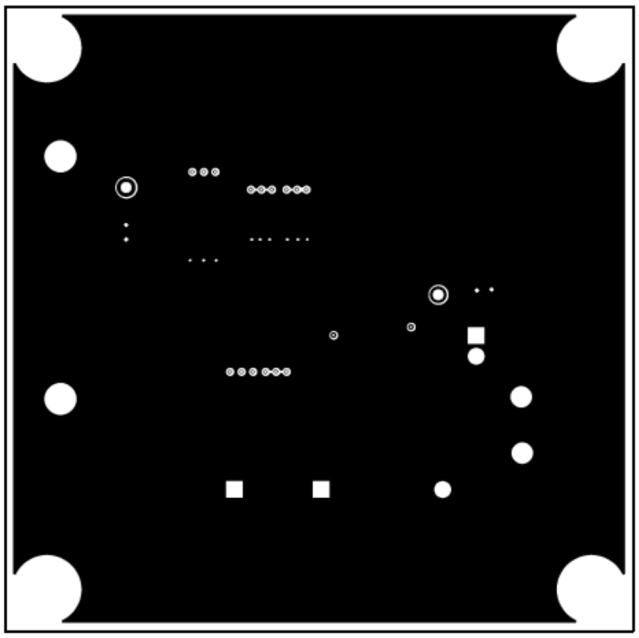


Figure 4. Middle Layer 1

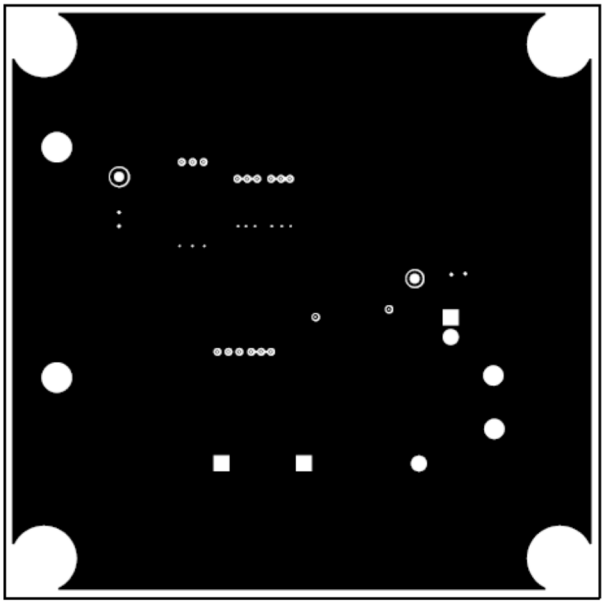


Figure 5. Middle Layer 2

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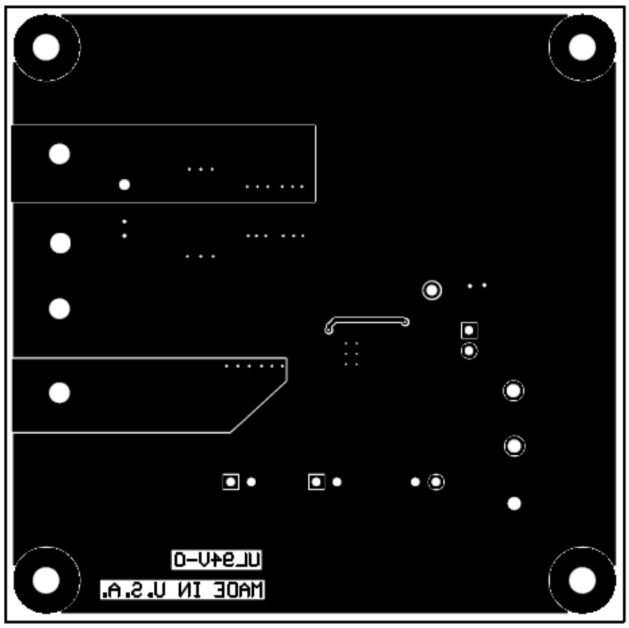


Figure 6. Bottom Layer

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4 Schematic and Bill of Materials

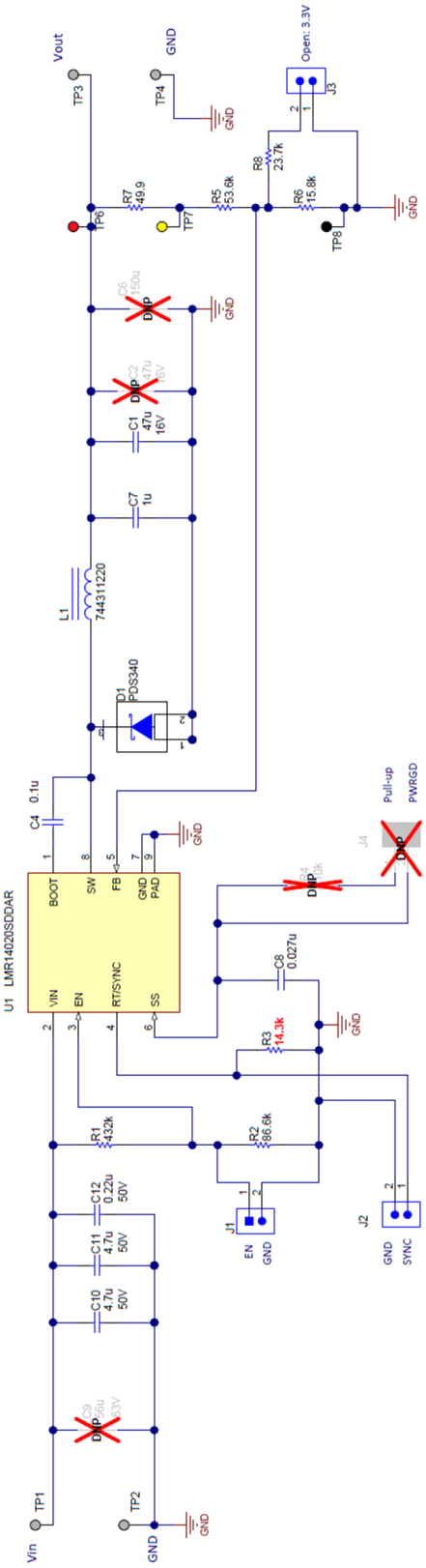


Figure 7. LMR14020SEVM Schematic

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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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