

LMR14030SEVM User's Guide

The Texas Instruments LMR14030SEVM evaluation module (EVM) helps designers evaluate the operation and performance of the LMR14030S 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 LMR14030S is a 40 V / 3.5 A step-down regulator with 40 μ A 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 LMR14030SEVM evaluation board is designed to provide the design engineer with a fully functional power converter based on the buck topology to evaluate the LMR14030 series operation and performance.

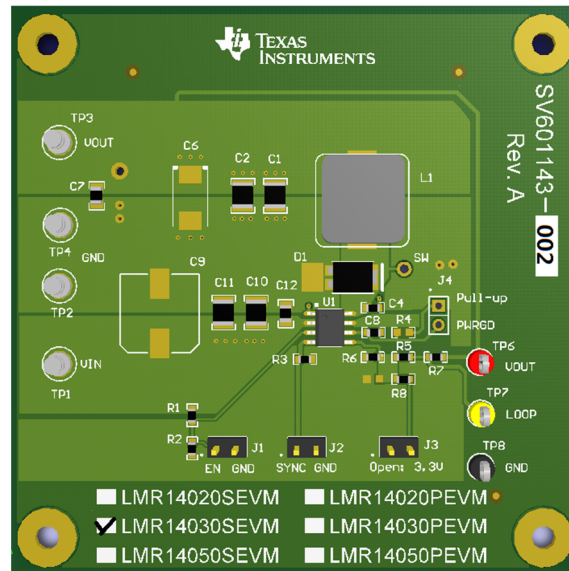


Figure 1. LMR14030SEVM Board

EVM Features

- 7 V to 40 V Input Voltage Range
- Jumper Selectable Output Options (5.0 V or 3.3 V)
- Up to 3.5 A Output Current
- Switching Frequency 600 kHz
- Internal Compensation

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

Table 1. Device and Package Configurations

CONVERTER	EVM	IC	PACKAGE
U1	LMR14030SEVM	LMR14030S	HSOIC-8

2 Setup

This section describes the jumpers and connectors on the EVM and how to properly connect, set up and use the LMR14030SEVM.

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.

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 LMR14030S 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 configured, then: open J3 and adjust the feedback resistors using the following equation.

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

Where V_{FB} is 0.75 V

3 Board Layout

Figure 3 to Figure 6 show the board layout for the LMR14030SEVM. 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.

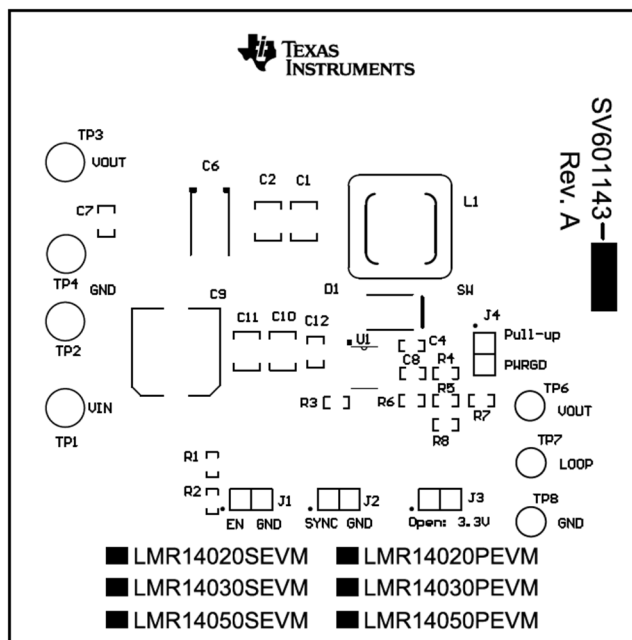


Figure 3. Top Layer

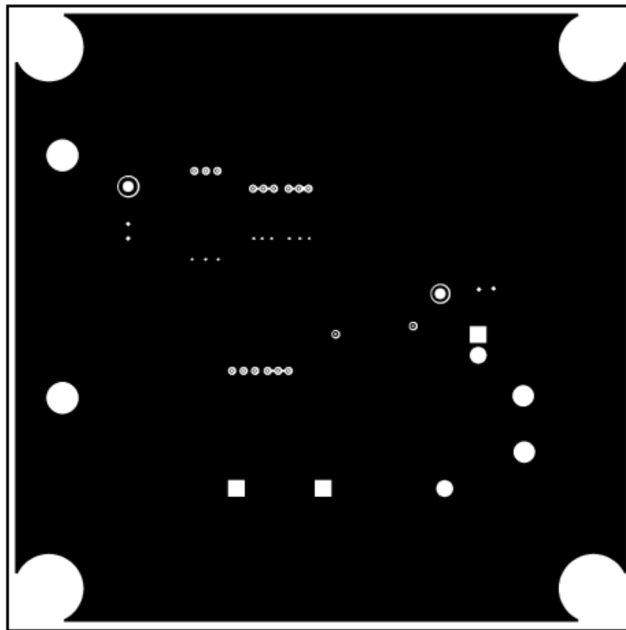


Figure 4. Middle Layer 1

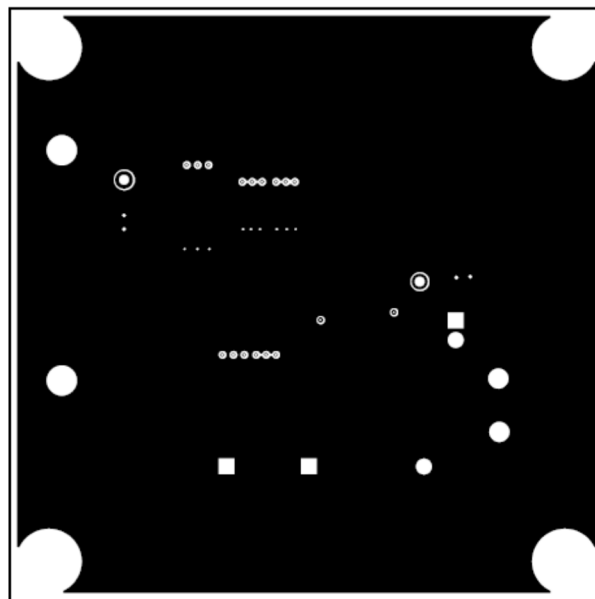


Figure 5. Middle Layer 2

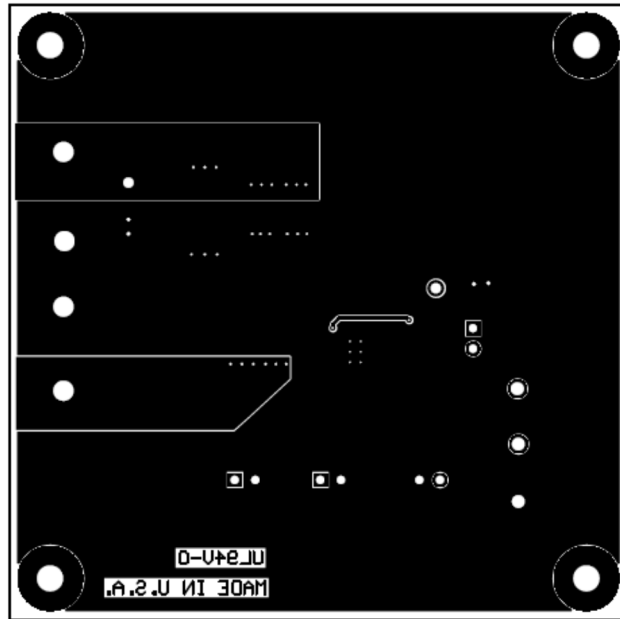


Figure 6. Bottom Layer

4 Schematic and Bill of Materials

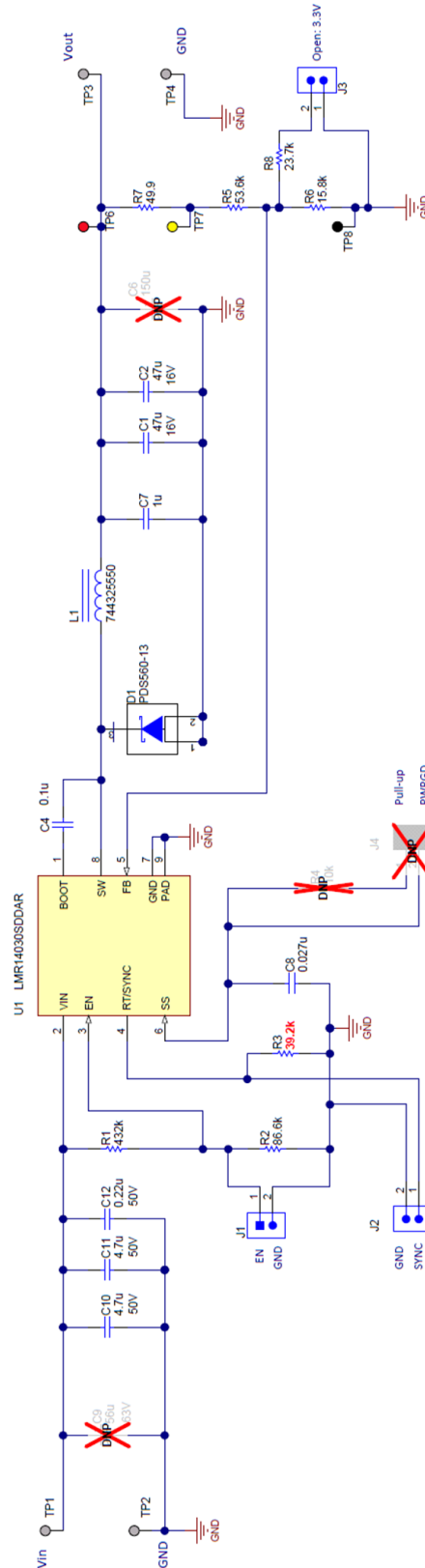


Figure 7. LMR14030SEVM Schematic

Table 2. LMR14030SEVM Bill of Materials (BOM)

Designator	Description	Part Number	Footprint	Quantity
C1, C2	CAP, CERM, 47 μ F, 16V, +/-20%, X5R, 1210	GRM32ER61C476ME15L	1210	2
C4	CAP, CERM, 0.1 μ F, 16 V, +/- 10%, X7R, 0603	GRM188R71C104KA01D	0603	1
C7	CAP, CERM, 1 μ F 25 V, +/- 10%, X7R, 0805	GRM21BR71E105KA99L	0805	1
C8	CAP, CERM, 0.027 μ F, 100 V, +/- 10%, X7R, 0603	C0603C273K1RACTU	0603	1
C10, C11	CAP, CERM, 4.7 uF, 50 V, +/-10%, X7R, 1210	GRM32ER71H475KA88L	1210	2
C12	CAP, CERM, 0.22 μ F, 50 V, +/- 10%, X7R, 0805	GRM21BR71H224KA01L	0805	1
D1	Diode, Schottky, 60 V, 5 A, PowerDI5	PDS560-13	PowerDI5	1
J1, J2, J3	Header, 100 mil, 2x1, Gold, TH	TSW-102-07-G-S	TSW-102-07-G-S	3
L1	Inductor, 5.5 uH, 10 A, 0.0103 ohm	744325550	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, 39.2 k, 1%, 0.1 W, 0603	CRCW060339K2FKEA	0603	1
R5	RES, 53.6k, 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	SPC02SYAN	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, 3.5 A, Low I _Q , Current Mode, Buck Regulator	LMR14030SDDAR	HSOIC-8	1
PCB	PCB, FR4, 4 Layers, Size 3000 x 3000 mil, Thickness 62 mil	SV601143		1

Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (February 2015) to A Revision	Page
• remove "PREVIEW" from page 1; this device is in production	1

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CAUTION

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

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- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

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Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

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http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_01.page

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If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

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