LM2596S-ADJEVM User's Guide

1 Introduction

The Texas Instruments LM2596S-ADJEVM evaluation module (EVM) helps designers evaluate the operation and performance of the LM2596 wide-input voltage Simple Switcher® buck regulator. The LM2596 is a simple to use DC-DC converter and it requires a minimum number of external components. Other features include fault protection and a fixed-frequency oscillator. The LM2596S-ADJEVM is configured for an output voltage of 5.0 V and a switching frequency of 150 kHz. Refer to the LM2596 datasheet for additional features, detailed description and available options.

The EVM contains one DC-DC converter (See Table 1).

Table 1. Device and Package Configurations

CONVERTER	IC	PACKAGE
U1	LM2596	TO-263 (5)

2 Setup

This section describes the test points and connectors on the EVM and how to properly connect, set up and use the LM2596S-ADJEVM. Please refer to Figure 1 for a top view of the EVM and relative placement of the different test points and edge connector.

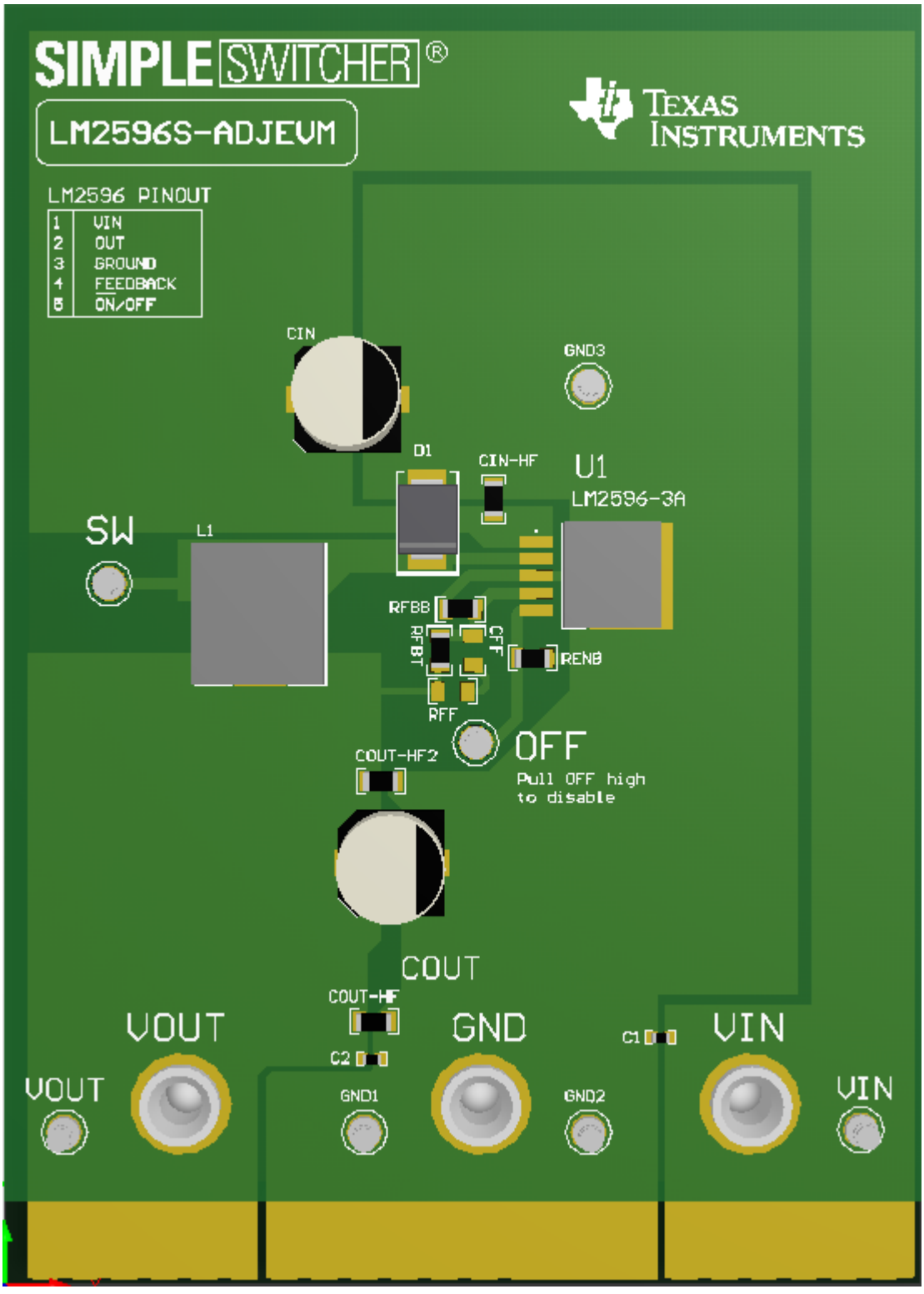

Figure 1. Top View of LM2596EVM

3 Input/Output (I/O) Connector Description

VIN – Terminal on JIN—is the power input terminal for the converter. The terminal edge connector also provides a power (VIN) and ground (GND) connection to allow the user to attach the EVM to a cable harness.

VOUT – Terminal on JOUT—is the regulated output voltage for the converter. The terminal edge connector also provides a power (VOUT) and ground (GND) connection to allow the user to attach the EVM to a cable harness.

GND – Terminal on JIN and JOUT—are the ground reference for the converter. The terminal edge connector also provides a GND connection for attaching the EVM to a cable harness.

OFF – Testpoint—is used to disable the converter by supplying a voltage greater than 1.3 V (typ).

SW – Testpoint—is used to monitor the voltage on the switch pin and the switching frequency of the voltage regulator. Remove this test point before making any electromagnetic interference (EMI) measurements.

4 Setup

Set the input voltage (VIN) range for the converter between the operating voltage range of 7 V to 40 V. If a load is driven, it should be applied to the VOUT terminal and should not exceed the maximum load current of 3 A.

5 Operation

For proper operation of the LM2596, VIN, GND, and VOUT should be properly configured as stated above. In this configuration, the device will start up when power is applied and the output voltage of the regulator (VOUT) will come up to the proper value. The default setting for output voltage of the LM2596S-ADJEVM is 5.0V. Other output voltages can be set by replacing the feedback pin resistor dividers RFBT and RFBB; please consult the datasheet for proper selection of these resistor values.

The default frequency for the LM2596S-ADJEVM is 150kHz.

6 Schematic

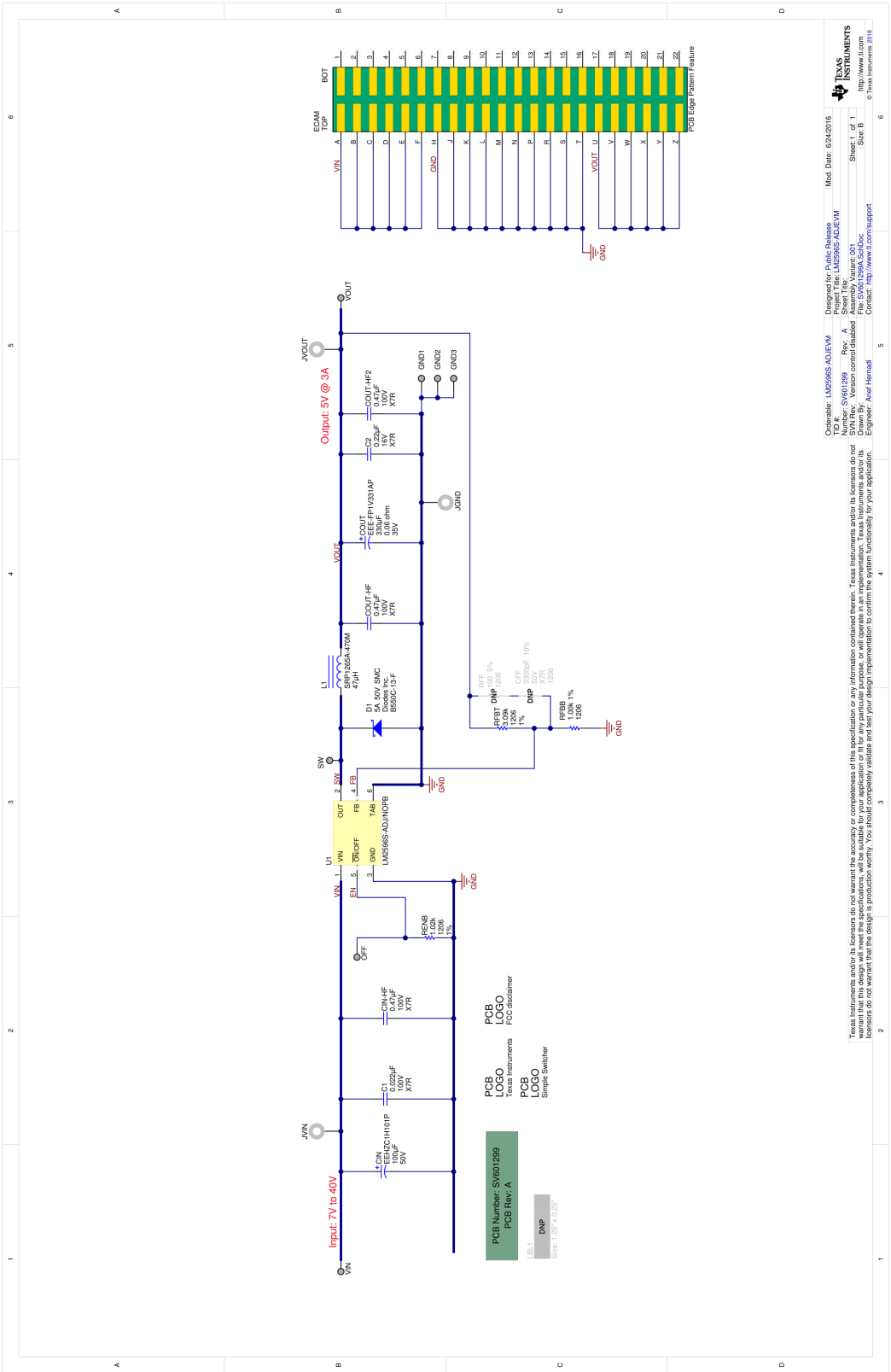

Figure 2. LM2596EVM Schematic

7 Board Layout

Figure 3 through Figure 5 show the board layout for the LM2596EVM. The EVM offers resistors, capacitors and test points to configure the output voltage, precision enable pin, set frequency and external clock synchronization.

The TO-263 package offers an exposed thermal pad which must be soldered to the copper landing on the PCB for optimal thermal performance. The PCB consists of a 2-layer design. The EVM use a 2-oz copper on the top and bottom layer and an array of thermal vias under the thermal pad to connect to both layers.

Test points have been provided for ease of use to connect the power supply, required load and to monitor critical signals.

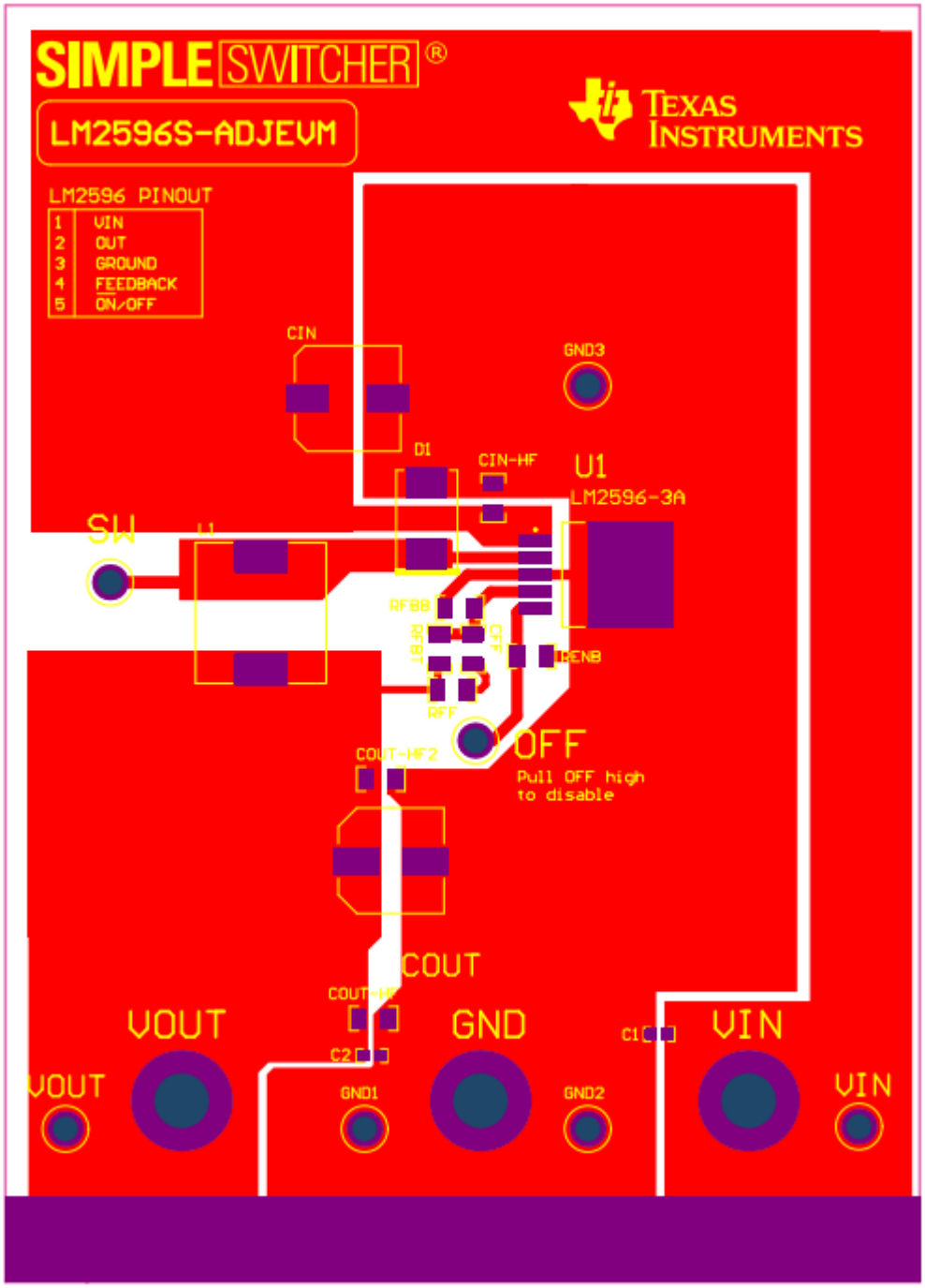

Figure 3. Top Assembly Layer

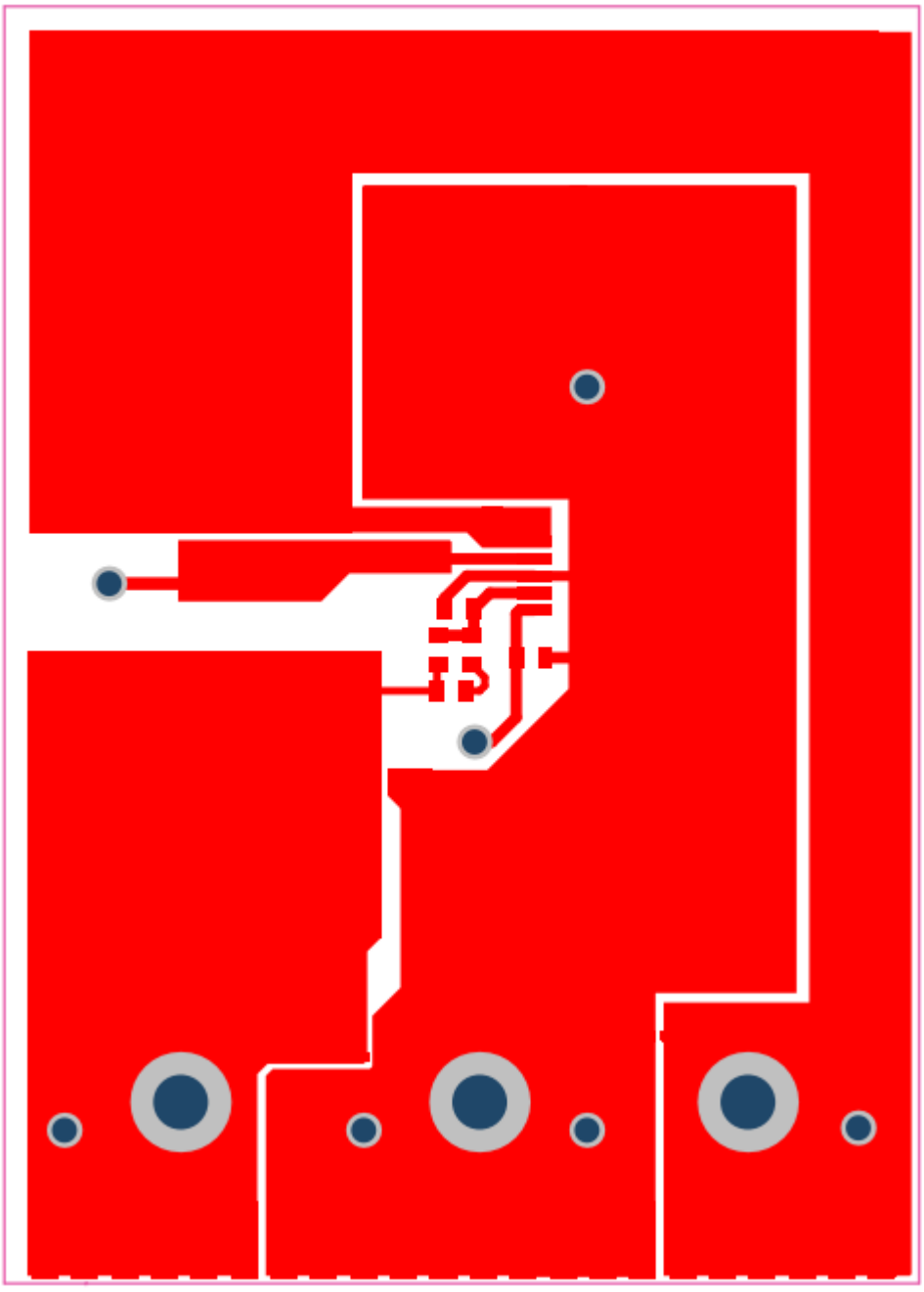

Figure 4. Top Layer Routing

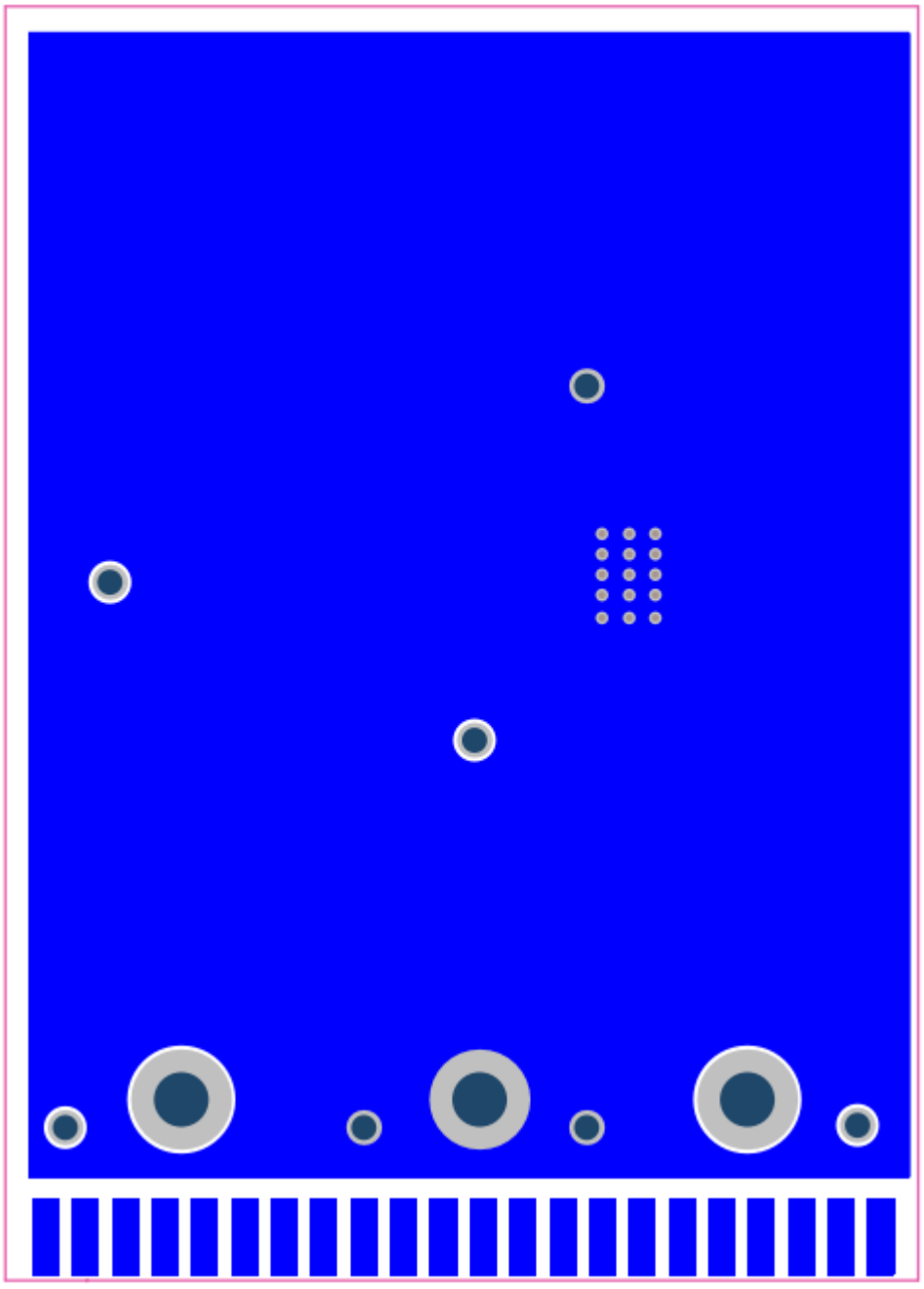

Figure 5. Bottom Layer Routing

Table 2. LM2596S-ADJEVM Bill of Materials (BOM)

Designator	Description	Manufacturer	PartNumber	Quantity
!PCB	Printed Circuit Board	Any	SV601299	1
C1	CAP, CERM, 0.022 µF, 100 V, +/- 10%, X7R, 0603	TDK	C1608X7R2A223K080AA	1
C2	CAP, CERM, 0.22 µF, 16 V, +/- 10%, X7R, 0603	TDK	C1608X7R1C224K080AC	1
CIN	CAP, Polymer Hybrid, 100 µF, 50 V, +/- 20%, 28 ohm, 10x10 SMD	Panasonic	EEHZC1H101P	1
CIN-HF, COUT-HF, COUT-HF2	CAP, CERM, 0.47 µF, 100 V, +/- 10%, X7R, 1206	TDK	C3216X7R2A474K160AA	3
COUT	CAP, AL, 330 µF, 35 V, +/- 20%, 0.06 ohm, SMD	Panasonic	EEE-FP1V331AP	1
D1	Diode, Schottky, 50 V, 5 A, SMC	Diodes Inc.	B550C-13-F	1
GND1, GND2, GND3, OFF, SW, VIN, VOUT	Terminal, Turret, TH, Double	Keystone	1502-2	7
JGND, JVIN, JVOUT	Standard Banana Jack, Uninsulated, 8.9mm	Keystone	575-8	3
L1	Inductor, Shielded, 47 µH, 6.5 A, 0.076 ohm, AEC-Q200 Grade 0, SMD	Bourns	SRP1265A-470M	1
RENB	RES, 1.02 k, 1%, 0.25 W, 1206	Vishay-Dale	CRCW12061K02FKEA	1
RFBB	RES, 1.00 k, 1%, 0.25 W, 1206	Panasonic	ERJ-8ENF1001V	1
RFBT	RES, 3.09 k, 1%, 0.25 W, 1206	Vishay-Dale	CRCW12063K09FKEA	1
U1	SIMPLE SWITCHER® Power Converter 150 KHz 3A Step-Down Voltage Regulator, 5-pin TO-263, Pb-Free	Texas Instruments	LM2596S-ADJ/NOPB	1
CFF	CAP, CERM, 3300 pF, 50 V, +/- 10%, X7R, 1206	AVX	12065C332KAT2A	0
LBL1	Thermal Transfer Printable Labels, 1.250" W x 0.250" H - 10,000 per roll	Brady	THT-13-457-10	0
RFF	RES, 100, 5%, 0.25 W, 1206	Vishay-Dale	CRCW1206100RJNEA	0

Revision History

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

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      3.1.1 *Notice applicable to EVMs not FCC-Approved:*

      This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

      3.1.2 *For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:*

      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.

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NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *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.*

3.2 *Canada*

3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (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.

Concerning EVMs Including Detachable Antennas:

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.

Concernant les EVMs avec antennes détachables

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/lsds/ti_ja/general/eStore/notice_01.page

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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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