TPS63806EVM

This user's guide describes the operation, and use of the TPS63806EVM evaluation module (EVM). The TPS63806EVM is designed to help the users easily evaluate and test the operation and functionality of the TPS63806 buck-boost converter. The TPS63806EVM has the output voltage set to 3.3 V. The EVM operates from 1.3 V to 5.5 V input voltage. Output current can go up to 2 A in buck mode and boost mode. This document includes setup instructions for the hardware, a schematic diagram, a bill of materials (BOM), and printed-circuit board (PCB) layout drawings for the evaluation module. Throughout this document, the abbreviations EVM, TPS63806EVM, and the term evaluation module are synonymous with the TPS63806, unless otherwise noted.

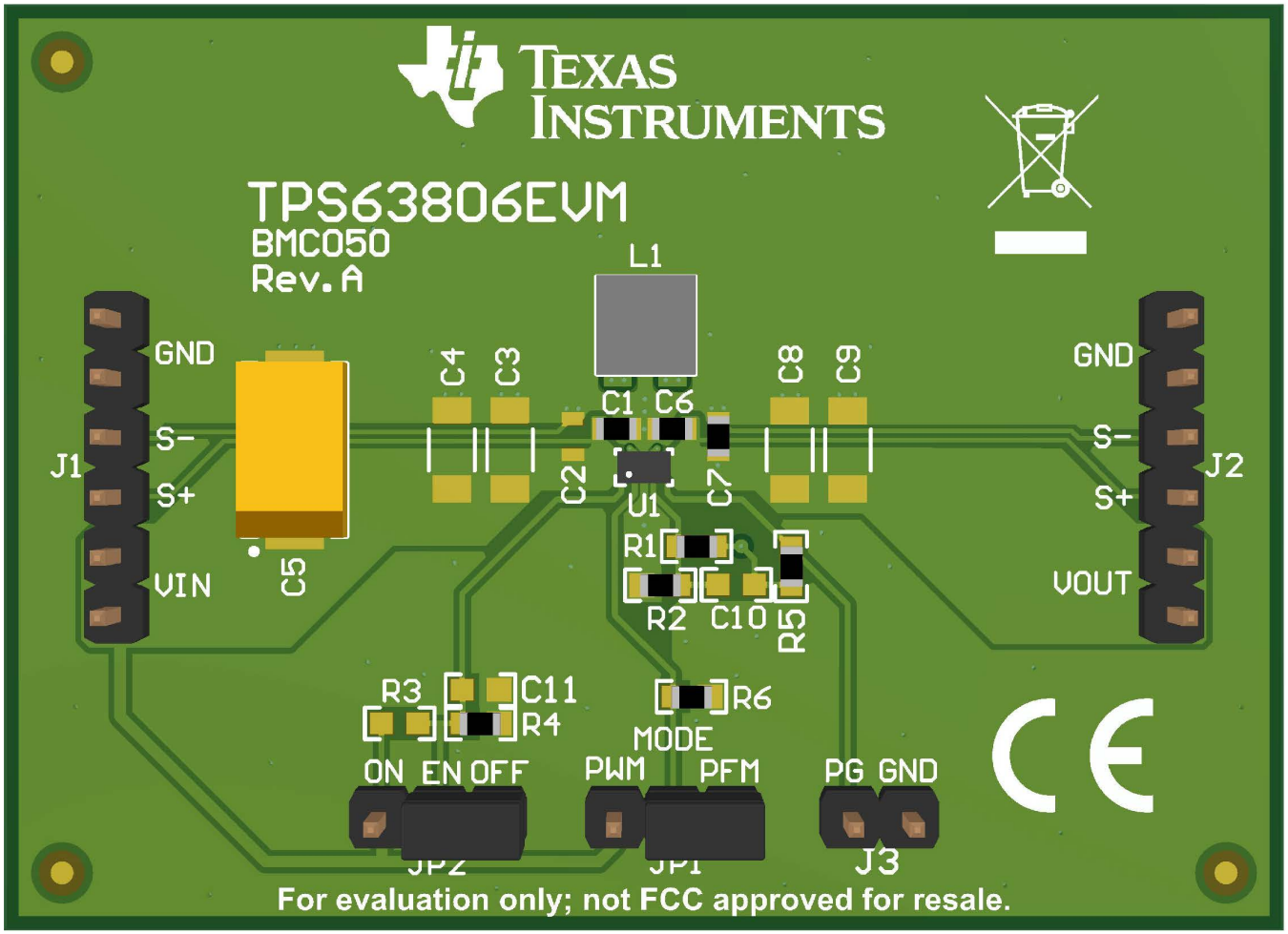

Figure 1. TPS63806 EVM Picture

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1 Introduction

The Texas Instruments TPS63806 is a highly efficient, single-inductor, internally compensated, buck-boost converter in a 15-pin, 2.3-mm × 1.4-mm BGA package.

1.1 Background

The TPS63806EVM uses the TPS63806 integrated circuit (IC) and is set to a 3.3 V output and operates with an input voltage between 1.3 V and 5.5 V.

1.2 Performance Specification

Table 1 provides a summary of the TPS63806EVM performance specifications. All specifications are given for an ambient temperature of 25°C.

Table 1. Performance Specification Summary

Specification	Test Conditions	Min	Typ	Max	Unit
Input voltage		1.3		5.5	V
Start-up input voltage		1.8		5.5	V
Output voltage		1.8		5.2	V
Output current	$V_I \geq 2.2$ V , $V_O = 3.3$ V	0		2	A

1.3 Modifications

The printed-circuit board (PCB) for this EVM is designed to accommodate the TPS63806. Extra positions are available for additional input and output capacitor and feed forward capacitor.

1.3.1 IC U1 Operation

U1 is configured for evaluation of the adjustable-output version. This EVM is set to 3.3 V. Resistors R1 and R2 can be used to set the output voltage between 1.8 V and 5.0 V. See the datasheet for recommended values.

2 Setup

This section describes how to properly use the TPS63806EVM.

2.1 Input/Output Connector and Header Descriptions

2.1.1 J1, Pin 1 and 2 – VIN

Positive input connection from the input supply for the EVM.

2.1.2 J1, Pin 3 and 4 – S+/S-

Input voltage sense connections. Measure the input voltage at this point.

2.1.3 J1, Pin 5 and 6 – GND

Vin GND return connection from the input supply for the EVM, common with J2, pin 5 and 6.

2.1.4 J2, Pin 1 and 2 – VOUT

Output voltage connection.

2.1.5 J2, Pin 3 and 4 – S+/S-

Vout Sense and GND Sense low-current sense lines for sampling the output voltage at the output capacitor.

2.1.6 J2, Pin 5 and 6 – GND

Vout GND return connection for the output voltage, common with J1 pin 5 and 6.

2.1.7 J3 – PG GND

Power Good (PG) test point and GND connection.

2.1.8 JP1 – MODE

Shorting jumper between the center pin MODE and PFM enables automatic transition to power-saving mode at light-load currents as described in the data sheet; shorting jumper between the center pin MODE and PWM enables forced PWM mode.

2.1.9 JP2 – ENABLE

Shorting jumper between the center pin EN and ON turns on the unit. Shorting jumper between the center pin EN and OFF turns the unit off.

2.2 Setup

To operate the EVM, connect an input supply with the positive lead to J1, pins 1 and 2 and negative lead to J1, pins 5 and 6; connect a load with the positive lead to J2, pins 1 and 2 and the negative lead to J2, pins 5 and 6; short EN and ON (pins 2 and 3) of JP2 with a shorting jumper.

3 Board Layout

This section provides the TPS63806EVM board layout and illustrations.

3.1 Layout

Figure 2 through Figure 6 show the board layout for the TPS63806EVM PCB.

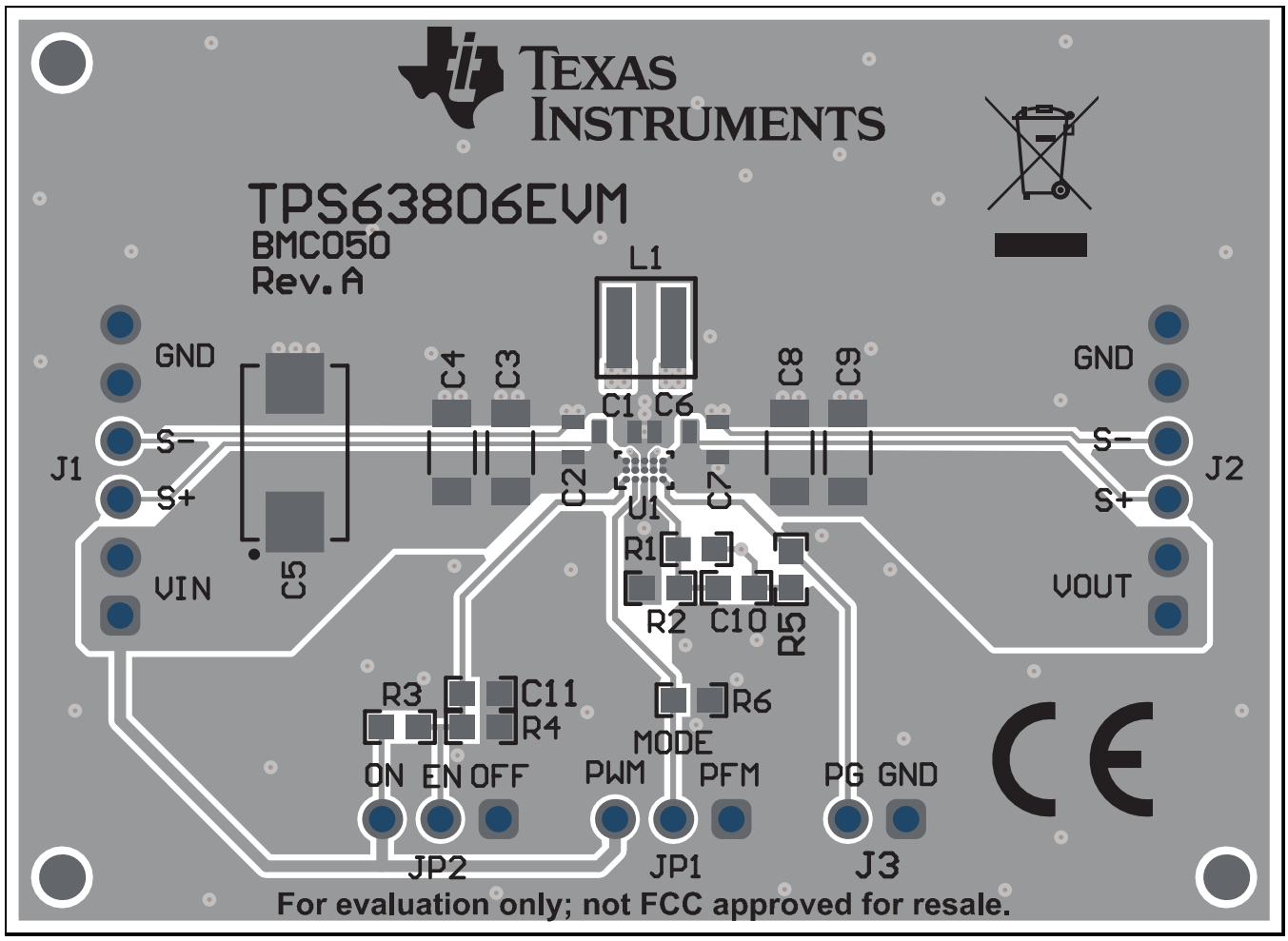

Figure 2. Assembly Layer

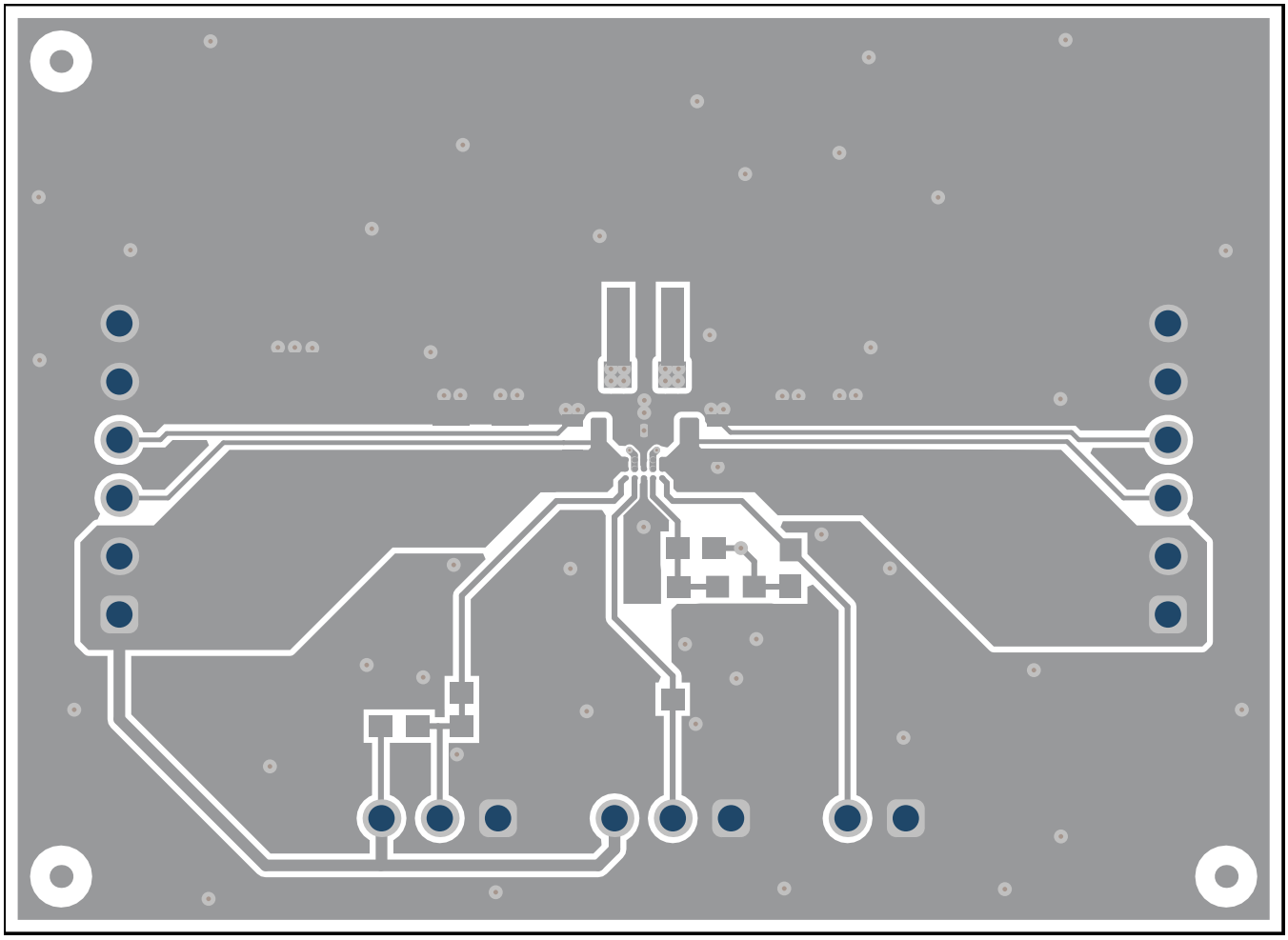

Figure 3. Top Layer Routing

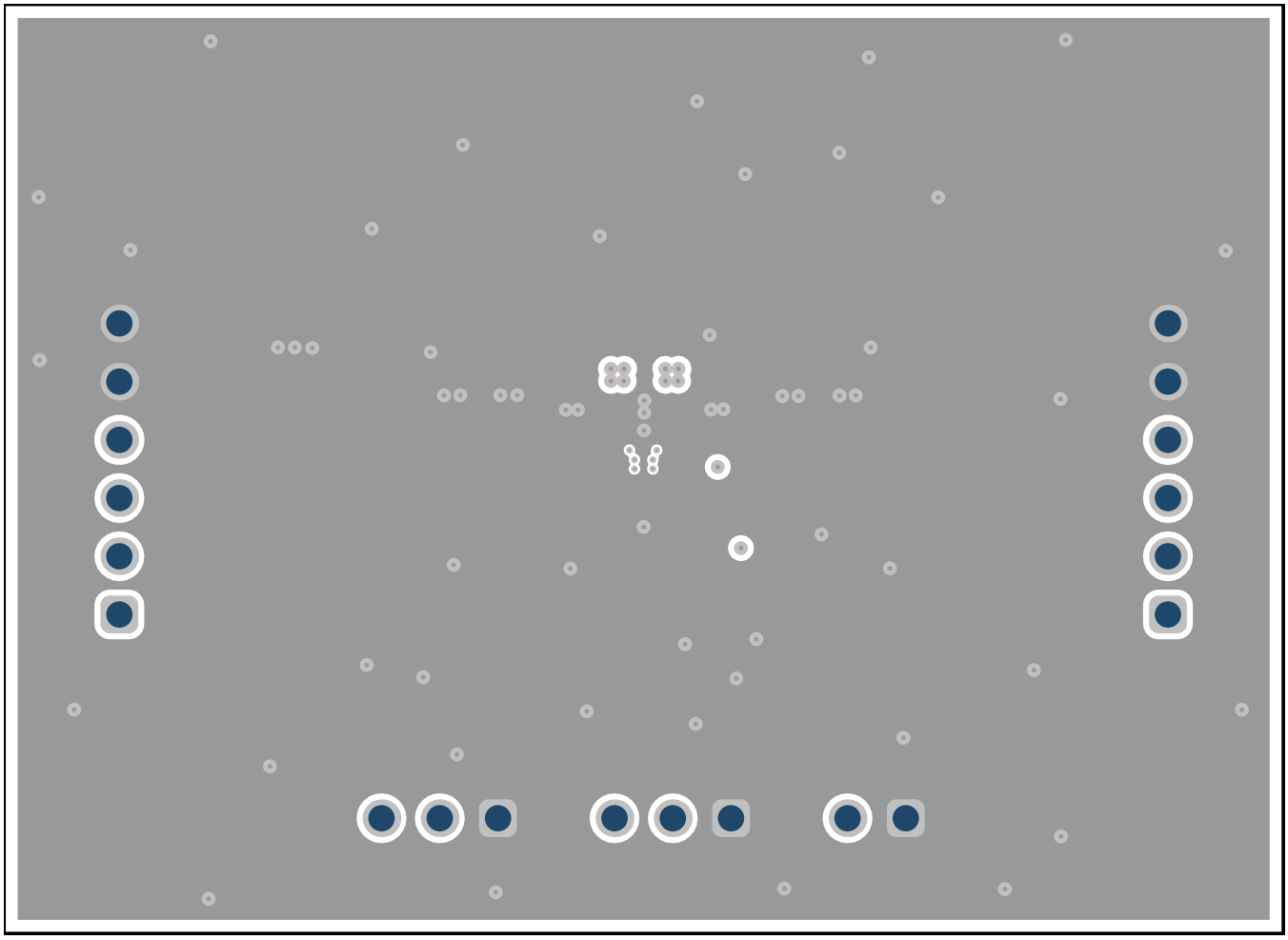

Figure 4. Signal layer 1

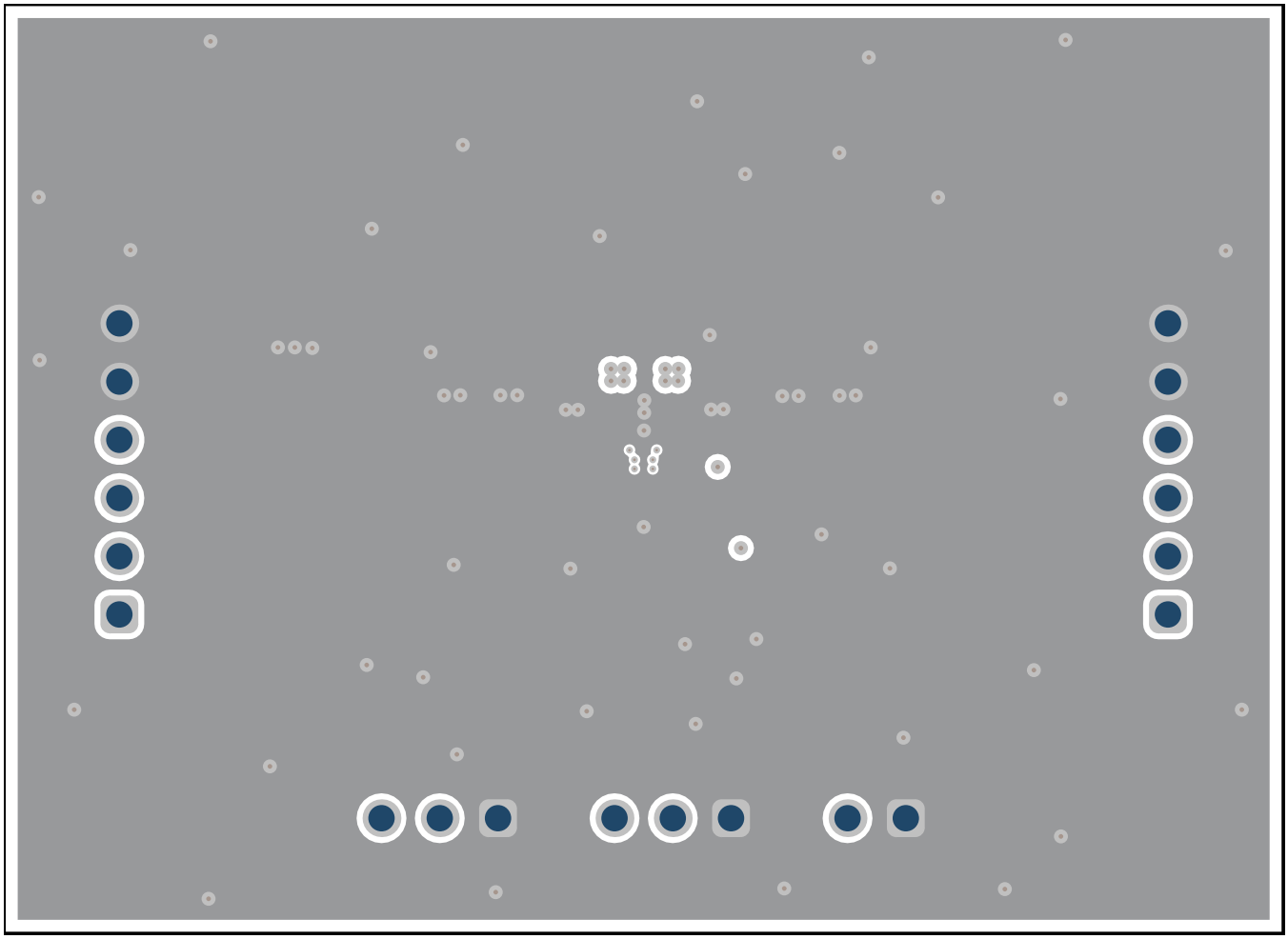

Figure 5. Signal Layer 2

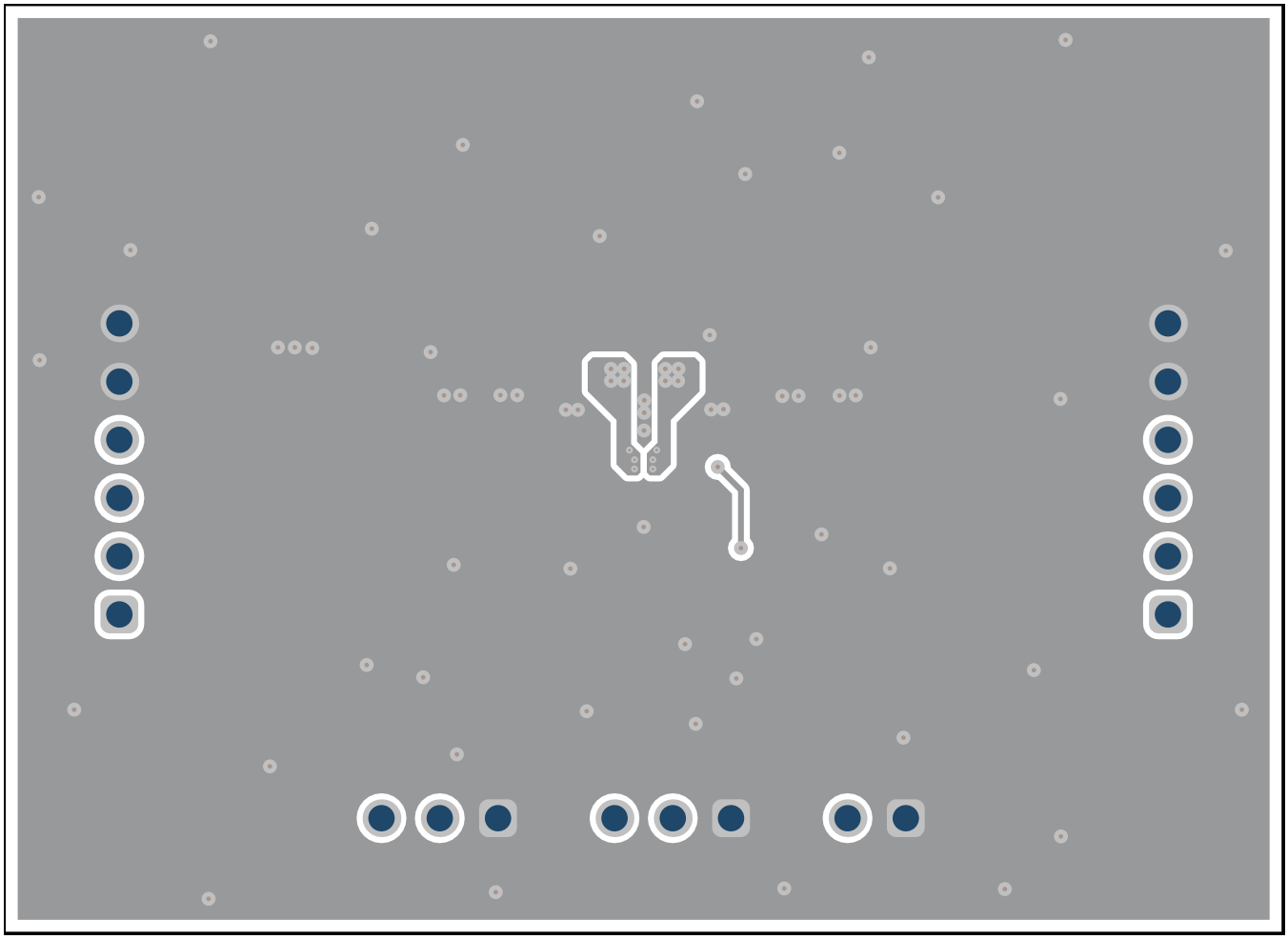

Figure 6. Bottom Layer Routing

4 Schematic and Bill of Materials

This section provides the TPS63806EVM schematic and bill of materials.

4.1 Schematic

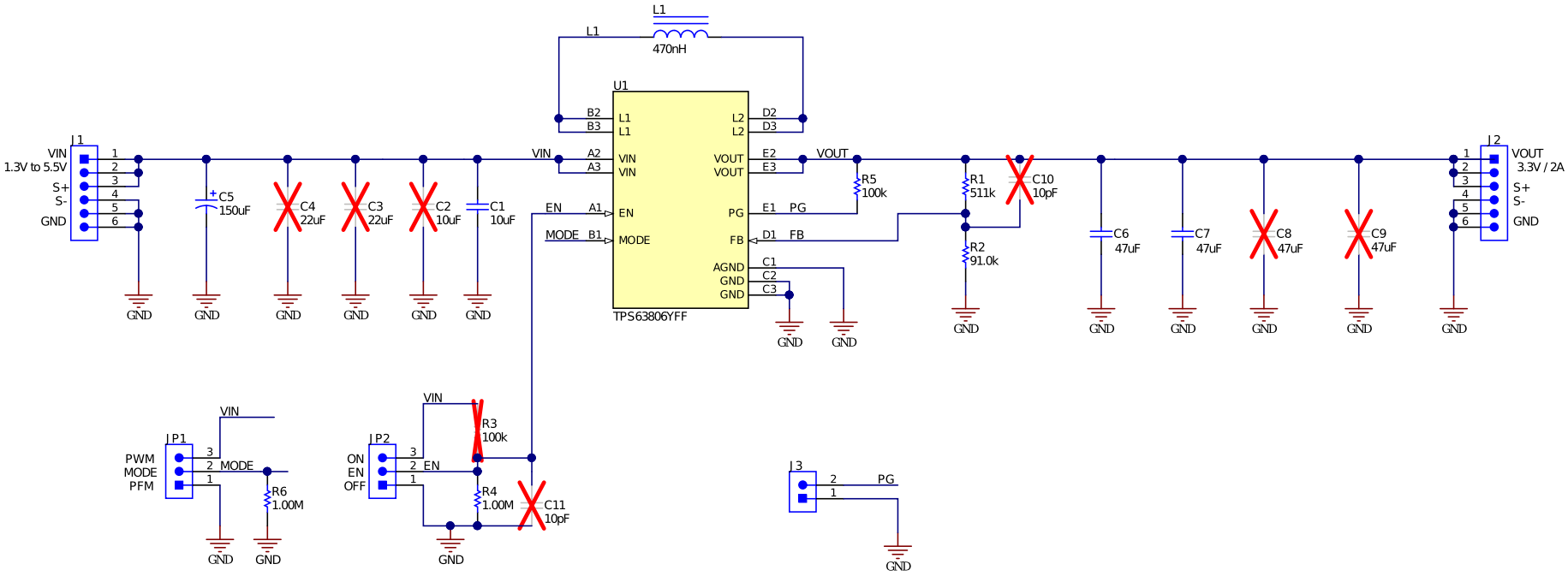

Figure 7. Schematic

4.2 Bill of Materials

Table 2. TPS63806EVM Bill of Materials

Count	RefDes	Value	Description	Size	Part Number	MFR
1	C1	10 µF	CAP, CERM, 10 µF, 6.3 V, +/- 20%, X5R, 0603	603	GRM188R60J106ME84	Murata
1	C5	150 µF	CAP, TA, 150 µF, 10 V, +/- 20%, 0.005ohm	7343-31	T530D157M010ATE005	Kemet
2	C6, C7	47 uF	CAP, CERM, 47 uF, 6.3 V, +/- 20%, X5R, 0603	603	GRM188R60J476ME15D	Murata
1	L1	470 nH	Inductor, Shielded, Composite, 470 nH, 3.5 A, 7.6 mOhm	4x4x1.5mm	XFL4015-471MEC	Coilcraft
1	R1	511 k	RES, 511 k, 1%, 0.1 W, 0603	603	Std	Std
1	R2	91.0 k	RES, 91.0 k, 1%, 0.1 W, 0603	603	Std	Std
1	R5	100 k	RES, 100 k, 1%, 0.1 W, 0603	603	Std	Std
2	R4, R6	1 M	RES, 1.00 M, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	603	Std	Std
1	U1	-	IC, Single Inductor Buck-Boost Converter	2.3x1.4x0.625mm	TPS63806YFF	TI

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NOTE:

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FCC NOTICE: 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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- *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 or RSS-247*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. 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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