TPS63070EVM-693

This user's guide describes the characteristics, operation, and use of the TPS63070EVM evaluation module (EVM). The TPS63070EVM-693 is designed to help the users easily evaluate and test the operation and functionality of the TPS63070 Buck-Boost Converter. The TPS63070EVM-693 uses the TPS63070 adjustable version, the output voltage is set to 3.3V/5.0V.The user can select the output voltage with the VSEL pin. The EVM operates from 2.0V to 16V input voltage. Output currents can go up to 2A 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, TPS63070EVM-693, and the term evaluation module are synonymous with the TPS63070, unless otherwise noted.

Contents

1 Introduction

The Texas Instruments TPS63070 is a highly efficient, single-inductor, internally compensated, buck-boost converter in a 15-pin, 2.5-mm × 3-mm HotRod package. Both fixed and adjustable output voltage units are available.

1.1 Background

The TPS63070EVM-693 uses the TPS63070 adjustable-output voltage version of the integrated circuit (IC) and is set to a 3.3V / 5.0V output. The fixed-output version(s) can be evaluated on this EVM with minor modification as stated in section titled, *Fixed Output Operation*. The EVM operates with an input voltage between 2.0 V and 16 V.

1.2 Performance Specification

Table 1 provides a summary of the TPS63070EVM-693 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		2		16	V
Output voltage		2.5	5	9	V
Output current	during operation VIN ≥ 4.5V	0		2000	mA
	during operation VOUT≥4.5 and boost factor (VOUT/VIN)≤1	0		2000	mA
Operating frequency			2400		kHz

1.3 Modifications

The printed-circuit board (PCB) for this EVM is designed to accommodate both the fixed and adjustable versions of this IC. If the fixed version is installed, R1 and R3 are replaced with a 0-Ω resistor and R2 is open. Extra positions are available for additional input and output capacitors.

1.3.1 Adjustable-Output IC U1 Operation

U1 is configured for evaluation of the adjustable-output version. This unit is set to 5 V. Resistors R1, R2 and R3 can be used to set the output voltage between 2.0 V and 9.0 V. See the data sheet for recommended values.

1.3.2 Fixed-Output Operation

U1 can be replaced with the fixed version for evaluation. With the fixed version, R1 and R3 need to be replaced with a 0-Ω resistor; R2 position is open.

2 Setup

This section describes how to properly use the TPS63070EVM-693.

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 J5 – PG GND

Power Good (PG) test point and GND connection.

2.1.8 JP1 – ENABLE

Shorting jumper between the center pin EN and HIGH turns on the unit. Shorting jumper between the center pin EN and LOW turns the unit off.

2.1.9 JP2 – VSEL

Shorting jumper between the center pin VSEL and HIGH sets the output voltage to 5V. Shorting jumper between the center pin VSEL and LOW sets the output voltage to 3.3V.

2.1.10 JP3 – PWR Save

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

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 HIGH (pins 2 and 3) of JP1 with a shorting jumper.

3 Board Layout

This section provides the TPS63070EVM-693 board layout and illustrations.

3.1 Layout

Figure 1 through Figure 3 show the board layout for the TPS63070EVM-693 PCB.

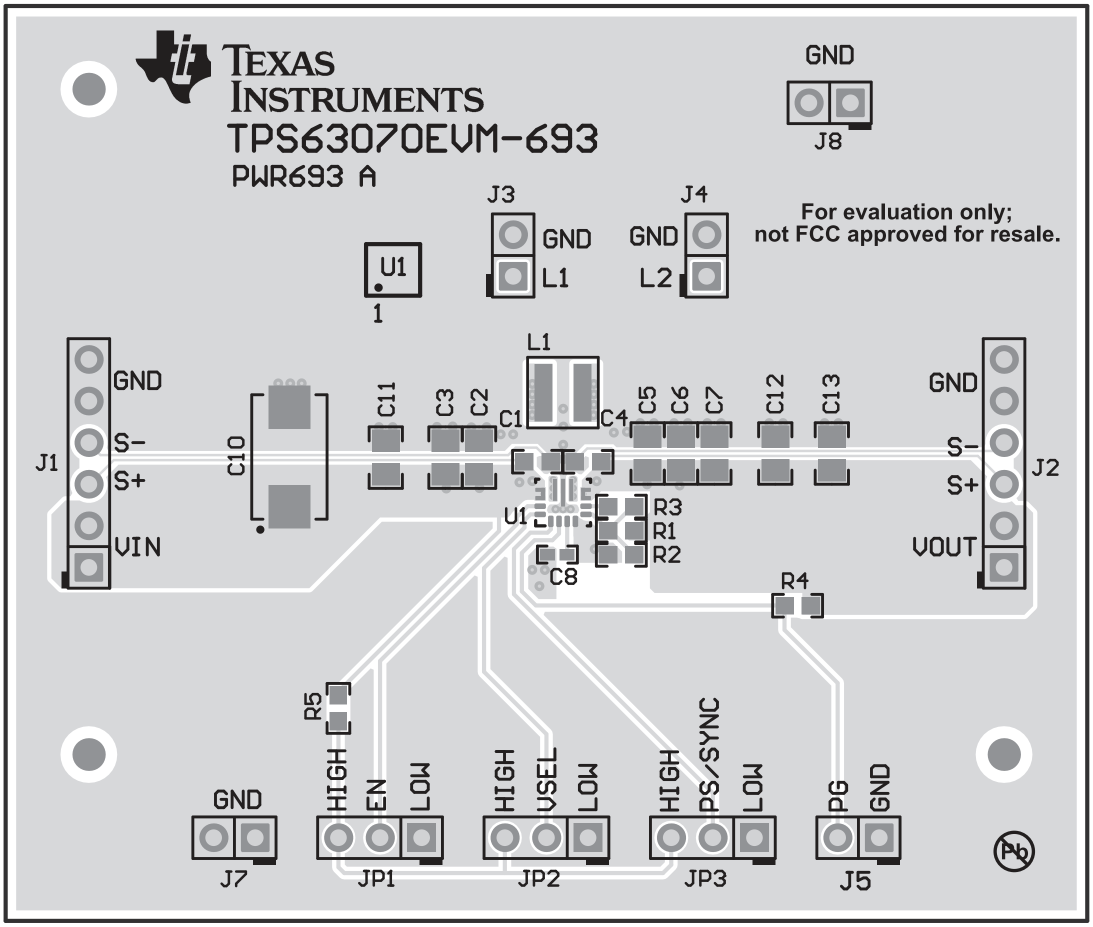

Figure 1. Assembly Layer

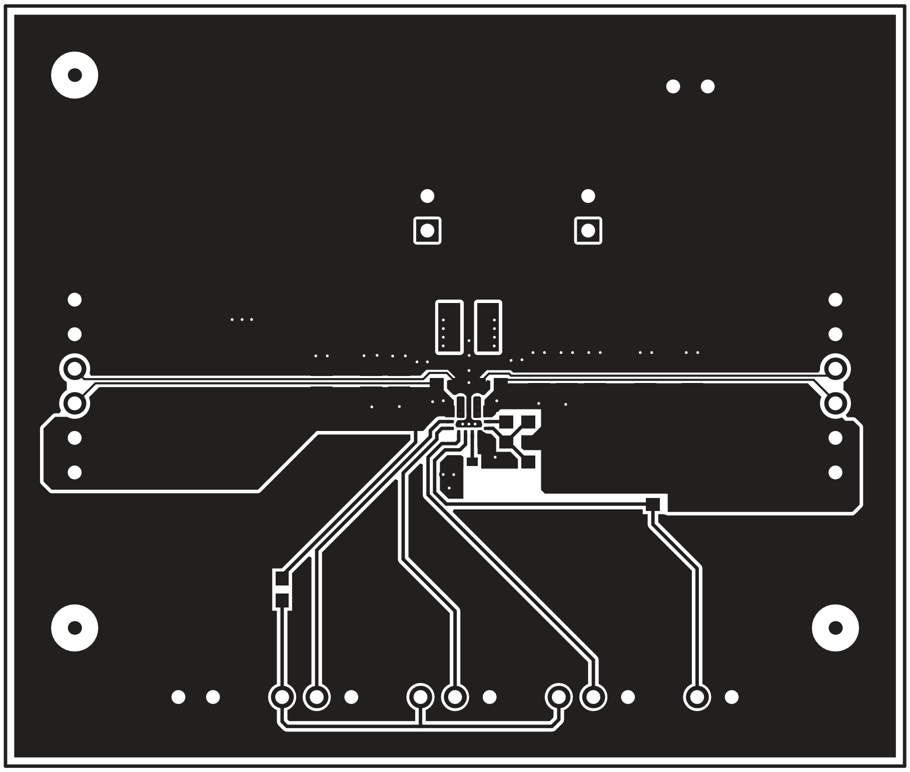

Figure 2. Top Layer Routing

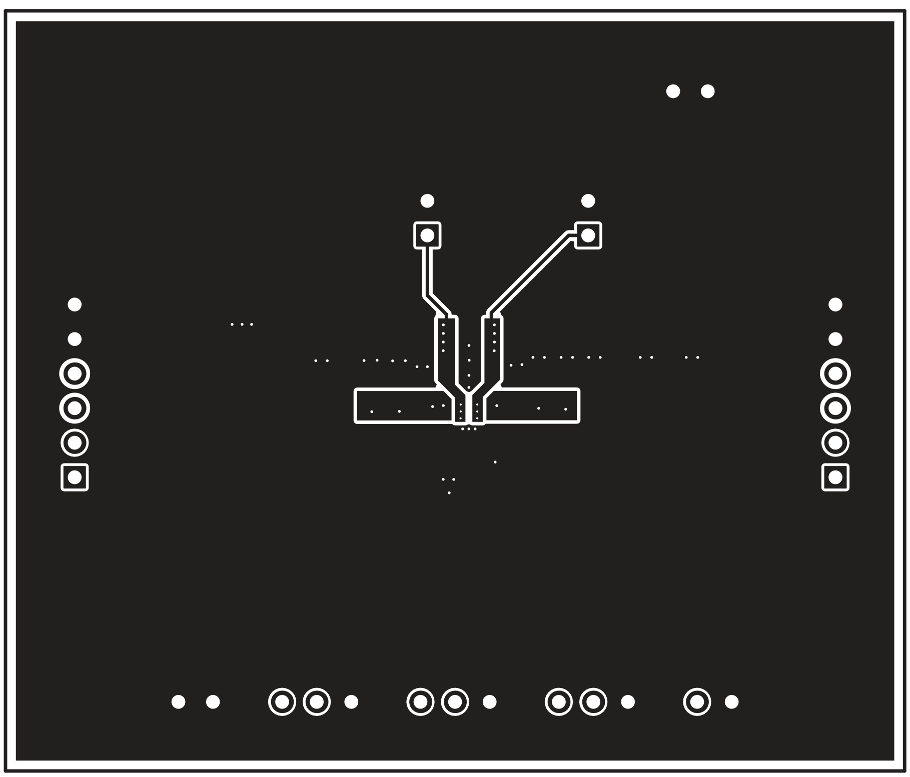

Figure 3. Bottom Layer Routing

4 Schematic and Bill of Materials

This section provides the TPS63070EVM-693 schematic and bill of materials.

4.1 Schematic

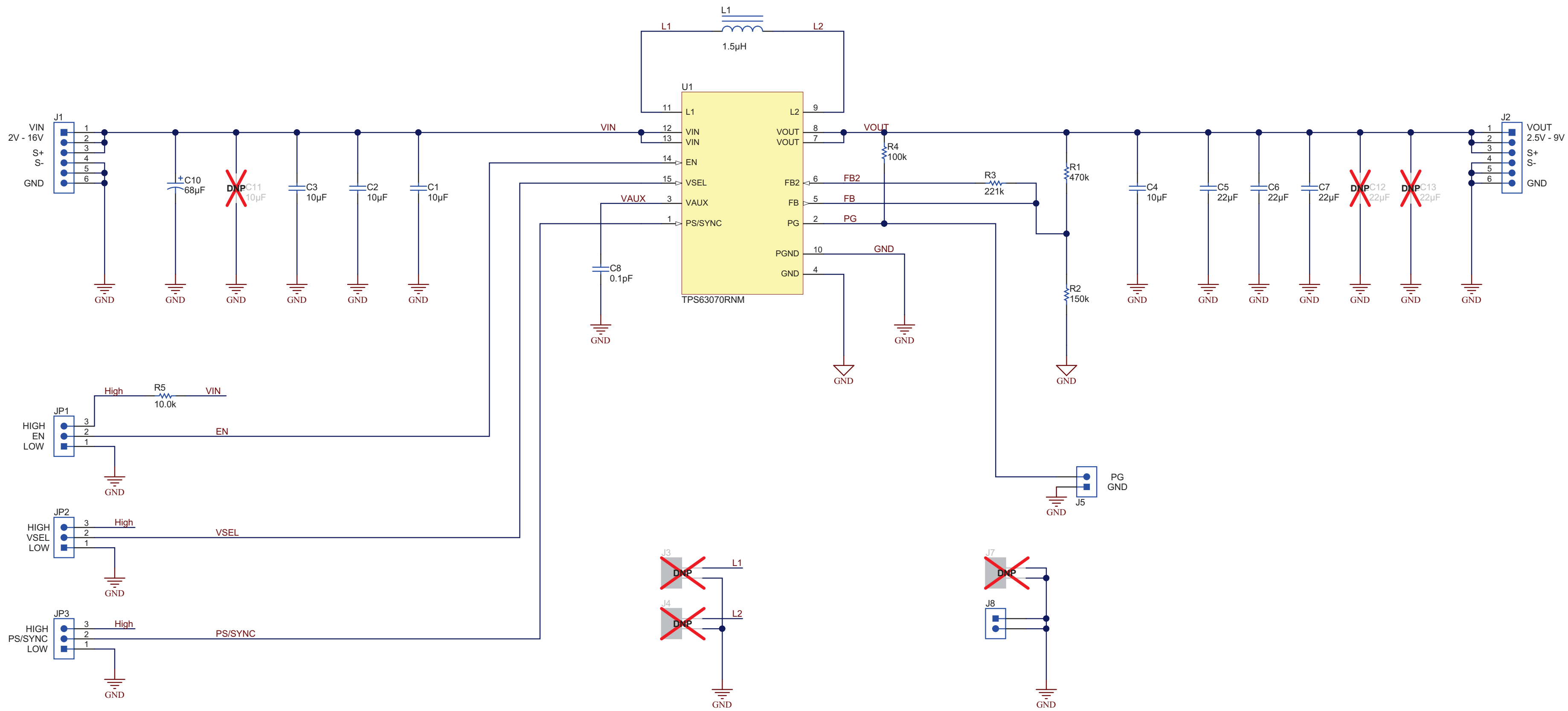

Figure 4. Schematic

4.2 Bill of Materials

Table 2. TPS63070EVM-693 Bill of Materials

Count	RefDes	Value	Description	Size	Part Number	MFR
2	C1,C4	10uF	CAP, CERM, 10 µF, 25 V, +/- 20%, X5R, 0603	603	GRM188R61E106MA73	Murata
2	C2,C3	10uF	CAP, CERM, 10 µF, 25 V, +/- 20%, X7S, 0805	805	GRM21BC71E106ME11L	Murata
3	C5, C6, C7	22uF	CAP, CERM, 22 µF, 16 V, +/- 20%, X6S, 0805	805	GRM21BC81C226ME44L	Murata
1	C8	0.1pF	CAP, CERM, 0.1 µF, 25 V, +/- 10%, X7R, 0402	402	GRM155R71E104KE14D	Murata
1	C10	68uF	CAP, TA, 68 µF, 20 V, +/- 10%, 0.15 ohm, SMD	7343-31	T495D686K020ATE150	Kemet
1	L1	1.5uF	Inductor, Shielded, Composite, 1.5 µH, 4.6 A	4x2x4mm	'XFL4020-152MEB	Coilcreaft
1	R1	470k	RES, 470 k, 1%, 0.1 W, 0603	603	Std	Std
1	R2	150k	RES, 150 k, 1%, 0.1 W, 0603	603	Std	Std
1	R3	221k	RES, 221 k, 1%, 0.1 W, 0603	603	Std	Std
1	R4	100k	RES, 100 k, 1%, 0.1 W, 0603	603	Std	Std
1	R5	10.0k	RES, 10.0 k, 1%, 0.1 W, 0603	603	Std	Std
1	U1	-	IC, High Input Voltage Single Inductor Buck-Boost Converter	RNM0015A	TPS63070RNM	TI

1 Trademarks

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Revision History

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

Changes from Original (June 2016) to A Revision **Page**

- Reversed FB and FB2 names on the device block in Figure 4. EVM FB circuit line connects to Pin 5 of the device, and EVM FB2 circuit line connects to Pin 6 on the device. Changed C8 value from 0.1µF to 0.1pF. 6

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    CAUTION

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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*

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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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