TEXAS INSTRUMENTS

TPS61045EVM-231

Adjustable LCD Boost Converter Evaluation Module

User's Guide

January 2003 *PMP EVMs*

SLVU082

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 1.8 V – 6 V, and the output voltage range of 16.20 V and 17.54 V. The input voltage must never exceed 7 V.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than 60°C. The EVM is designed to operate properly with certain components above 60°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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Preface

Read This First

About This Manual

This users guide describes the characteristics, operation, and use of the TPS61045EVM-231 adjustable LDC boost converter evaluation module (EVM). This EVM is a Texas Instruments high-efficiency, digitally adjustable, boost converter that is configured to deliver an 18 V LCD bias supply. This user's guide includes a schematic diagram and bill of materials (BOM).

How to Use This Manual

This document contains the following chapters:

- ❏ Chapter 1—Introduction
- ❏ Chapter 2—Setup
- ❏ Chapter 3—Board Layout
- ❏ Chapter 4—Schematic and Bill of Materials

Related Documentation From Texas Instruments

TPS61045 data sheet (SLVS440)

FCC Warning

This equipment is intended for use in a laboratory test environment only. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to subpart J of part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

If You Need Assistance. . .

Contact your local TI sales representative.

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Chapter 1

Introduction

The Texas Instruments TPS61045EVM evaluation module (EVM) helps designers evaluate the operation and performance of this device. The TPS61045EVM uses the TPS61045 boost converter to provide a high efficiency, digitally adjustable, 18 V output for LCD bias supplies. This EVM may be modified to supply higher or lower output voltages. Refer to the data sheet for more information on adjusting the output voltage. Information about output voltage and current ratings of TPS61045 can also be found in the data sheet, SLVS440.

In order to facilitate ease of testing and evaluation of this circuit, the EVM contains support circuitry that allows the user to manually adjust the output voltage. This adjustment is accomplished by using one of two switches: one for stepping the voltage up, and one for stepping the voltage down. The supply may also be adjusted using a digital control signal.

Although the TPS61045 operates over an input range of 1.8 V to 6 V, the EVM contains two parts, a 74LS123 (dual one-shot) and a 74LVC1G02 (single NOR gate) that have recommended input operating ranges of 2 V to 5.5 V and 1.65 V to 5.5 V, respectively. It should be noted that these two parts and their associated circuitry are only support circuitry, and included solely to aid in the evaluation of the TPS61045. The support circuitry debounces two push-button switches and provides a digital signal that steps the power supply voltage either up or down. This support circuitry is not necessary for the proper operation of the TPS61045. For evaluation purposes, the EVM has been operated and tested over a 1.8-V to 6-V input range. This voltage range is within the absolute maximum input range of the support circuitry. Users are cautioned to evaluate their specific operating conditions and choose components with the appropriate voltage ratings before designing this support circuitry into a final product.

Chapter 2

Setup

This chapter describes the jumpers, buttons, and connectors on the EVM as well as how to properly connect, set up, and use the TPS61045EVM-231.

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2.1 J1–VIN

This is the positive connection to the input power supply. The leads to the input supply should be twisted and kept as short as possible.

2.2 J2–GND

This is the return connection for the input power supply.

2.3 J3–VOUT

This is the positive connection from the output of the power supply. Connect this pin to the positive input of the load.

2.4 J4–GND

This is the negative connection from the output of the power supply. Connect this pin to the negative input of the load.

2.5 JP1–CTRL

This jumper has several purposes. To enable the supply, connect the shorting jumper between JP1–1 and JP1–2 (shorting the ON and CTRL pins). The supply can also be enabled by completely removing the shorting jumper. To disable the supply, connect the shorting jumper between JP–2 and JP–3 (shorting the CTRL and OFF pins). An external digital control signal from a processor or microcontroller can be used to adjust the output voltage of the supply by connecting this signal to JP1–2 (CTRL).

2.6 S1–UP

This push-button switch allows the user to step the output voltage up one voltage increment each time the button is pushed. This signal is debounced and conditioned to provide a 12 μs negative going signal to the CTRL pin of the TPS61045. Each time the UP button is pushed, the output voltage increases 43.2 mV.

2.7 S2–Down

This push-button switch allows the user to step the output voltage down one voltage increment each time the button is pushed. This signal is debounced and conditioned to provide a 210 μs negative going signal to the CTRL pin of the TPS61045. Each time the DOWN button is pushed, the output voltage decreases 43.2 mV.

2.8 Setup

Connect an input supply between J1 and J2. Connect a load between J3 and J4.

2.9 Operation

The EVM has been optimized to provide 17.54 V at 10 mA from a Li-Ion battery input voltage range (3 V to 4.2 V). Higher or lower output voltages and currents can be obtained by following the design guidelines provided in the TPS61045 data sheet.

The EVM operates with an input voltage between 1.8 V and 6 V. The user must ensure that the input voltage never exceeds 7 V. Applying an input voltage greater than 7 V may permanently damage the device.

To enable the supply, either remove the jumper on JP1 or move it so that the CTRL pin is connected to the ON pin.

The preset output voltage is 17.54 V, which is centered in the middle of the 64 step programming range. Pressing the UP or DOWN switch moves the output voltage one incremental voltage step of 43.2 mV. The full programmable voltage range of the EVM is 16.20 V to 18.93 V.

Chapter 3

Board Layout

This chapter provides the TPS61045EVM-231 board layout and illustrations.

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3.1 Layout

Board layout is critical for all switch mode power supplies. Figure 3–1, Figure 3–2, and Figure 3–3 show the board layout for the TPS61045EVM-231 PWB. The nodes with a high switching frequency are short and are isolated from the noise sensitive feedback circuitry. Careful attention has been given to the routing of high frequency current loops. Refer to the data sheet for specific layout guidelines.

Figure 3–1. Assembly Layer

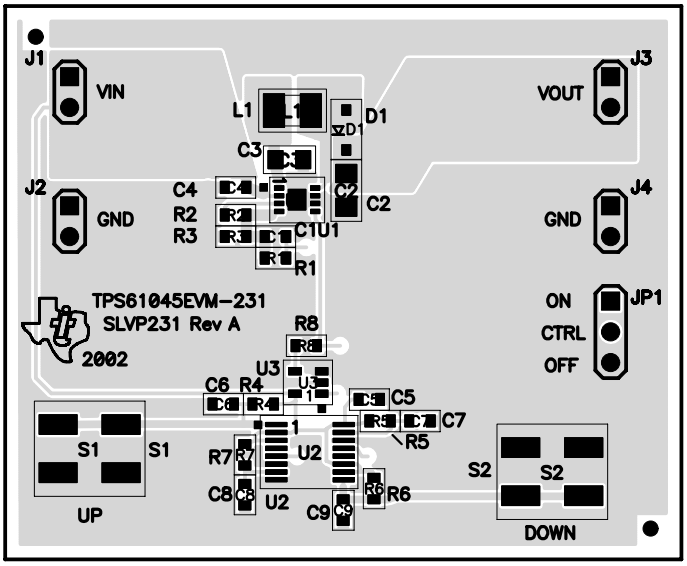


Figure 3–2. Top Layer Routing

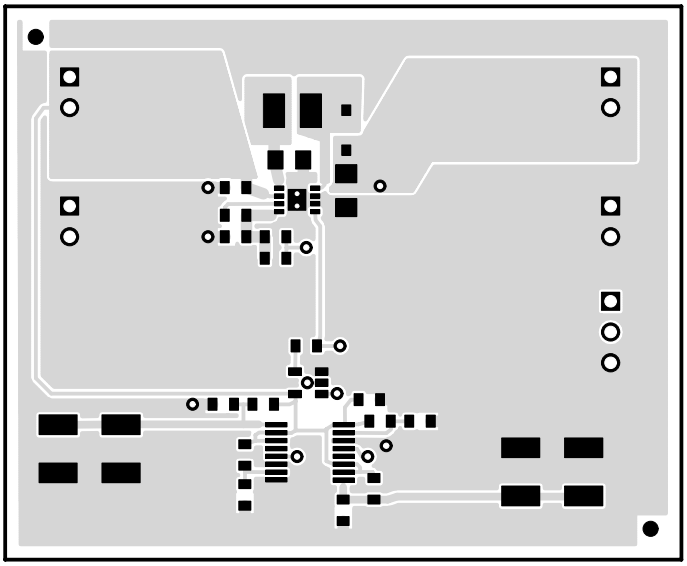
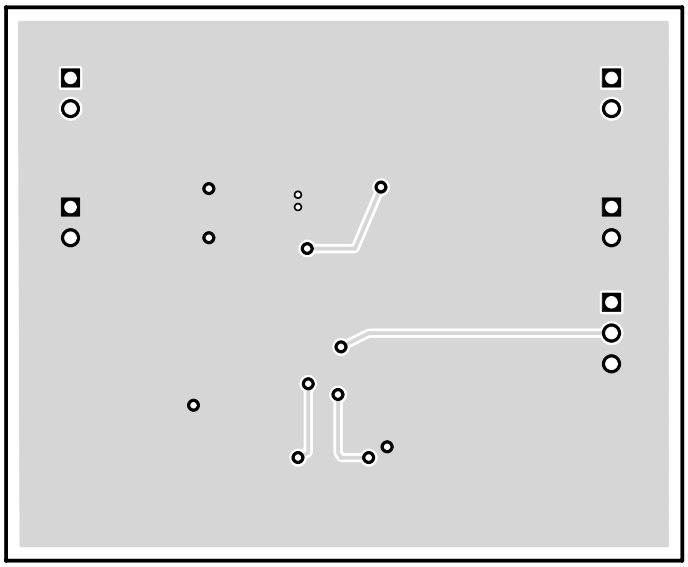


Figure 3–3. Bottom Layer Routing



Chapter 4

Schematic and Bill of Materials

This chapter provides the TPS61045EVM-231 schematic and bill of materials.

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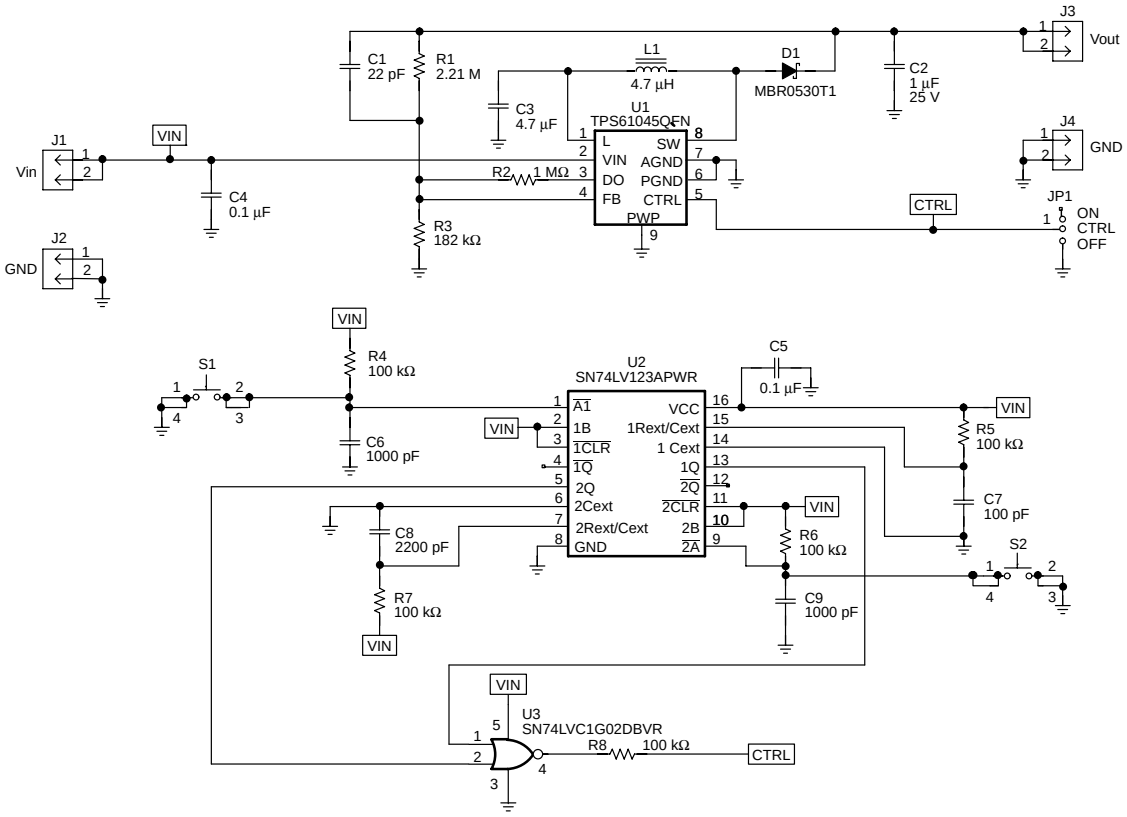
4.1 Schematic

Figure 4–1. TPS61045EVM-231 Schematic



4.2 Bill of Materials

Table 4–1. TPS61045EVM-231 Bill of Materials

QTY	Ref Des	Description	Size	MFR	Part Number
1	C1	Capacitor, ceramic, 22 pF, 50 V, C0G, 5%	603	Murata	GRM1885C1H220JZ01
1	C2	Capacitor, ceramic, 1.0 μF, 25 V, X7R, 20%	1206	Murata	GRM31MR71E105KC01
1	C3	Capacitor, ceramic, 4.7 μF, 6.3 V, X5R, 10%	805	Murata	GRM219R60J475KE11
2	C4, C5	Capacitor, ceramic, 0.1 μF, 16 V, X7R, 20%	603	Murata	GRM188R71C104KA01
2	C6, C9	Capacitor, ceramic, 1000 pF, 50 V, X7R, 20%	603	Murata	GRM188R71H102KA01
1	C7	Capacitor, ceramic, 100 pF, 50 V, C0G, 5%	603	Murata	GRM1885C1H101JA01
1	C8	Capacitor, ceramic, 2200 pF, 50 V, X7R, 20%	603	Murata	GRM188R71H222KA01
1	D1	Diode Schottky, 0.5 A, 30 V	SOD-123	On Semiconductor	MBR0530T1
4	J1–J4	Header, 2 pin, 100 mil spacing, (36-pin strip)	0.100 × 2	Sullins	PTC36SAAN
1	JP1	Header, 3 pin, 100 mil spacing, (36-pin strip)	0.100 × 3	Sullins	PTC36SAAN
1	L1	Industor, SMT, 4.7 μH, 650 mA, 150 mΩ	0.120 × 0.100	Murata	LQH32CN4R7M33
1	R1	Resistor, chip, 2.21 MΩ, 1/16 W, 1%	603	Std	Std
1	R2	Resistor, chip, 1.00 MΩ, 1/16 W, 1%	603	Std	Std
1	R3	Resistor, chip, 182 kΩ, 1/16 W, 1%	603	Std	Std
5	R4–R8	Resistor, chip, 100 kΩ, 1/16 W, 1%	603	Std	Std
2	S1, S2	Switch, SPST, PB momentary, sealed washable	0.245 × 0.251	C & K	KT11P2JM
1	U1	IC, adjustable LCD boost converter	QFN-8P	TI	TPS61045QFN
1	U2	IC, dual retriggerable monostable multivibrator with Schmitt-Trigger	PW16	TI	SN74LV123APWR
1	U3	IC, single 2-input positive-NOR gate	SOT23-5	TI	SN74LVC1G02DBVR
1	–	PCB, 2.2 in × 1.8 in × 0.62 in		Any	SLVP231
1	–	Shunt, 100 mil, black	0.100	3M	929950-00