![Texas Instruments logo] TEXAS INSTRUMENTS

TPS62203EVM-211, TPS62200EVM-211

User's Guide

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third–party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265

EVM IMPORTANT NOTICE

Texas Instruments (TI) provides the enclosed product(s) under the following conditions:

This evaluation kit being sold by TI is intended for use for **ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY** and is not considered by TI to be fit for commercial use. As such, the goods being provided may not be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety measures typically found in the end product incorporating the goods. As a prototype, this product does not fall within the scope of the European Union directive on electromagnetic compatibility and therefore may not meet the technical requirements of the directive.

Should this evaluation kit not meet the specifications indicated in the EVM User's Guide, the kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods. Please be aware that the products received may not be regulatory compliant or agency certified (FCC, UL, CE, etc.). Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge.

EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

TI currently deals with a variety of customers for products, and therefore our arrangement with the user **is not exclusive**.

TI assumes **no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein**.

Please read the EVM User's Guide and, specifically, the EVM Warnings and Restrictions notice in the EVM User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact the TI application engineer.

Persons handling the product must have electronics training and observe good laboratory practice standards.

No license is granted under any patent right or other intellectual property right of TI covering or relating to any machine, process, or combination in which such TI products or services might be or are used.

Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265

EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 2.5 V to 6 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 125°C. The EVM is designed to operate properly with certain components above 125°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.

Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265

Read This First

About This Manual

This users guide describes the characteristics, operation, and use of the TPS62200EVM-211 and TPS62203EVM-211 evaluation modules (EVM). These EVMs contain Texas Instruments high-efficiency buck converters that are configured to provide a regulated 3.3-V and 1.8-V output voltage and up to 300 mA of current. The users guide includes a schematic diagram, bill of materials (BOM), and test data.

How to Use This Manual

This document contains the following chapters:

❑ Chapter 1 – Introduction

❑ Chapter 2 – Setup

❑ Chapter 3 – Board Layout

❑ Chapter 4 – Bill of Materials and Schematics

Related Documentation From Texas Instruments

SLVS417 – TPS6220x data sheet

If you need Assistance

Contact your local TI sales representative.

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.

Contents

Figures

Tables

Introduction

This chapter contains background information for the TPS62200EVM–211 and TPS62203EVM–211 evaluation modules.

1.1 Background

This TPS6220XEVM uses a TPS6220X buck converter to step down 2.5-V or higher input voltages. This EVM operates over an input voltage range of 2.5 V to 6 V. The goal of the EVM is to demonstrate the small size of the TPS6220X power supply solution and provide flexibility in interchanging the supporting passive components.

The TPS62203EVM uses a TPS62203 fixed 3.3-V output buck converter. The TPS62200EVM uses a TPS62200 adjustable output buck converter and the appropriate feedback components to provide 1.8-V. Both EVMs include an enable jumper that allows the user to disable the device.

1.2 Performance Specification Summary

Table 1–1 provides a summary of the TPS6220XEVM performance specifications. All specifications are given for an ambient temperature of 25°C.

Table 1–1. Performance Specification Summary

Specification	Test Conditions	Min	Typ	Max	Unit
Input voltage range	TPS62200EVM	2.5		6	V
	TPS62203EVM	3.3		6	
Output voltage	TPS62200EVM		1.8		V
	TPS62203EVM		3.3		
Output current		0		300	mA

1.3 Modifications

Because the primary goal of the EVM was to demonstrate the small size of the TPS6220X power supply solution, capacitors and inductors with small footprints were chosen. These capacitors and inductors were carefully selected to maximize efficiency and minimize ripple. Changing components could improve or degrade EVM performance.

Setup and Test Results

This chapter describes how to properly connect, setup, and use the TPS6220XEVM.

2.1 Input/Output Connect

Figure 2–1 highlights the key connection points of the TPS6220XEVM. These connection points are described in the following paragraphs.

2.1.1 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.

2.1.2 J2–GND

This is the return connection to the input power supply.

2.1.3 JP1–Enable

This is the enable pin of the device. The enable pin is pulled up to Vin by an onboard pullup resistor. Placing a jumper across pins 2–3 of J1 shorts the enable pin to GND; thereby disabling the device. Placing a jumper across pins 1–2 of J1 connects the enable pin to Vin and enables the device.

### 2.1.4 J3–Vout

This is the positive output for the device.

2.1.5 J4–GND

This is the return connection for the load.

2.2 EVM Operation

As shown in Figure 2–1, an input power supply and a load must be connected to the appropriate EVM connectors in order for the EVM to operate. The absolute maximum input voltage is 7 V. The TPS6220X is designed to operate with a maximum input voltage of 6 V. Short pins 1–2 on jumper J1 (labeled ON) to enable the device. Connect a load not to exceed 300 mA to the output of the EVM.

Figure 2–1. Connection Diagram
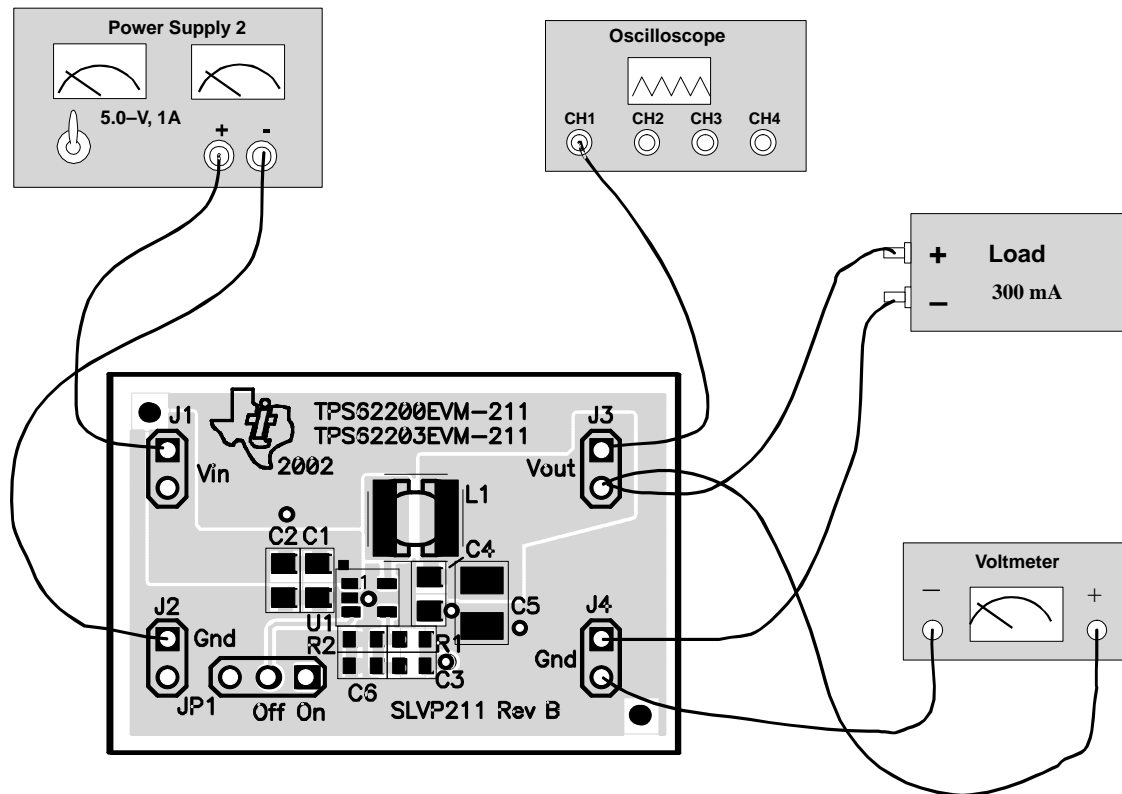
Board Layout

This chapter provides the TPS6220XEVM board layout and illustrations.

3.1 Layout

Board layout is critical for all switch mode power supplies. Figures 3–1, 3–2, and 3–3 show the board layout for the SLVP211 PWB. The switching nodes with high frequency noise are isolated from the noise sensitive feedback circuitry and careful attention has been given to the routing of high frequency current loops. Refer to the data sheet for specific layout guidelines.
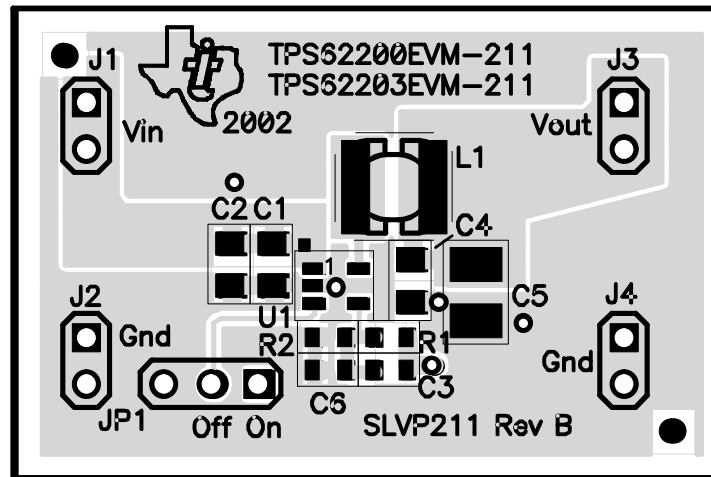
Figure 3–1. Top Assembly Layer
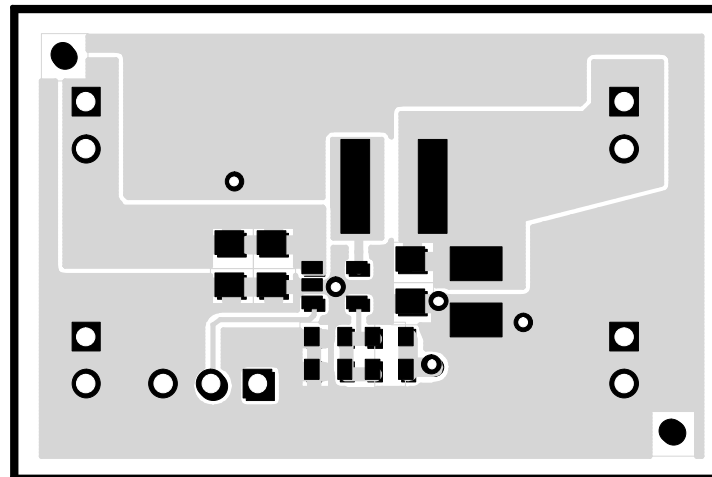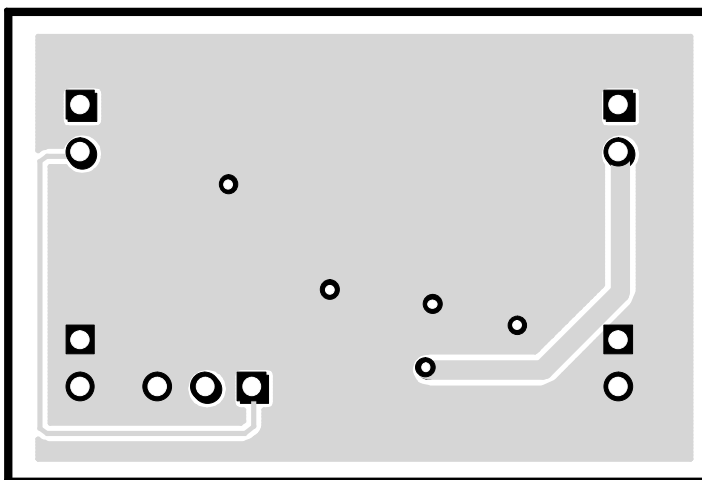

Figure 3–2. Top Layer Routing

Figure 3–3. Bottom Layer Routing

Bill of Materials and Schematics

This chapter provides the TPS6220XEVM-211 bill of materials and schematics.

Topic   **Page**

4.1 Bill of Materials

Table 6–1. Bill of Materials

–001	–002	RefDes	Description	Size	MFR	Part Number
1	1	C1	Capacitor, ceramic, 4.7 µF, 6.3 V, X5R, 20%	805	Murata	GRM21BR60J475KA11
0	0	C2	Open	805		
1		C3	Capacitor, ceramic, 33 pF, 50 V, C0G, 5%	603	Murata	GRM1885C1H330CZ01
	0		Open	603		
1	1	C4	Capacitor, ceramic, 10 µF, 6.3 V, X5R, 20%	805	TDK	C2012X5R0J106M
0	0	C5	Open	1210		
1		C6	Capacitor, ceramic, 100 pF, 50 V, C0G, 5%	603	Murata	GRM1885C1H101CZ01
	0		Open			
4	4	J1, J2, J3, J4	Header, 2 pin, 100 mil spacing, (36-pin strip)	0.100 x 2"	Sullins	PTC36SAAN
1	1	JP1	Header, 3 pin, 100 mil spacing, (36-pin strip)	0.100 x 3"	Sullins	PTC36SAAN
1	1	L1	Inductor, SMT, 10 µH, 1 A, 128.3 mΩ	0.185x0.185	Sumida	CDRH4D28–100
	1	R1	Resistor, chip, 0 Ω, 1/16 W, 1%	603	Std	Std
1			Resistor, chip, 475 kΩ, 1/16 W, 1%	603	Std	Std
	0	R2	Open	603		
1			Resistor, Chip, 182 kΩ, 1/16 W, 1%	603	Std	Std
1		U1	IC, switching buck converter, Adj.–V, 300 mA	SOT23–5	Texas Instruments	TPS62200DBV
	1		IC, switching buck converter, 3.3 V, 300 mA	SOT23–5	Texas Instruments	TPS62203DBV
1	1	—	PCB, 1.5 In x 1 In x .062 In		Any	SLVP211
1	1	—	Shunt, 100 mil, black	0.100	3M	929950–00

4.2 Schematics

Figure 4–1. TPS62200 Schematic

⚠1 User Defined
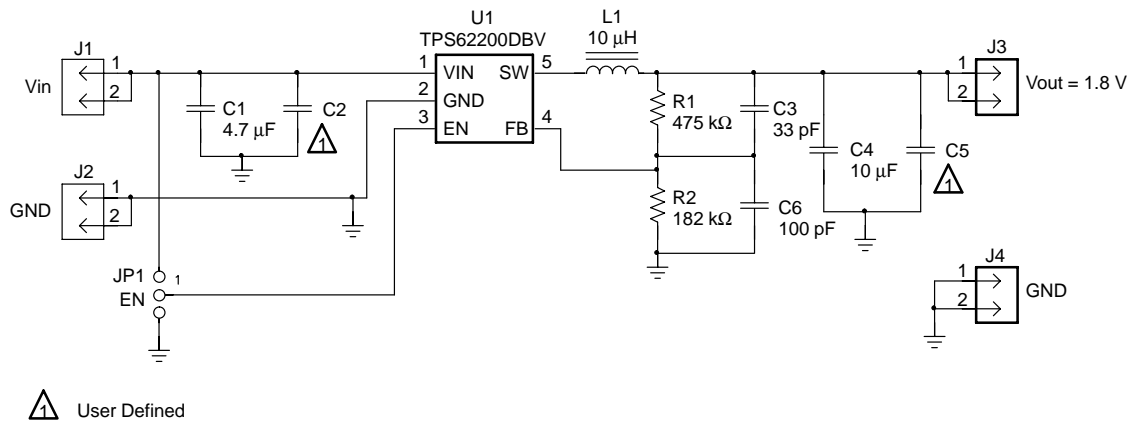
Figure 4–2. TPS62203 Schematic

⚠1 User Defined

⚠2 Open