Texas Instruments

TPS62220EVM-014, TPS62221EVM-014

User's Guide

January 2004

PMP Portable Power

SLVU092

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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.

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Preface

Read This First

About This Manual

This users guide describes the characteristics, operation, and use of the TPS62220EVM-014 and TPS62221EVM-014 evaluation modules (EVM). These EVMs contain Texas Instruments high-efficiency buck converters that are configured to provide a regulated 1.8-V and 1.5-V output voltage and up to 400 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 and Test Results
- Chapter 3 – Board Layout
- Chapter 4 – Bill of Materials and Schematic

Related Documentation From Texas Instruments

SLVS491 − TPS6222x 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.

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Figures

Tables

Chapter 1

Introduction

This chapter contains background information for the TPS62220EVM−014 and TPS62221EVM−014 evaluation modules.

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1.1 Background

This TPS6222xEVM uses a TPS6222X 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 TPS62221EVM uses a TPS62221 fixed 1.5-V output buck converter. The TPS62220EVM uses a TPS62220 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 TPS6222xEVM 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	TPS62220EVM	2.5		6	V
	TPS62221EVM	2.5		6	
Output voltage	TPS62220EVM		1.8		V
	TPS62221EVM		1.5		
Output current		0		400	mA

1.3 Modifications

Because the primary goal of the EVM is to demonstrate the small size of the TPS6222x power supply solution, capacitors and inductors with small footprints were chosen. These capacitors and inductors were carefully selected to maximize efficiency and minimize ripple while minimizing overall solution size. Changing components could improve or degrade EVM performance.

Chapter 2

Setup and Test Results

This chapter describes how to properly connect, setup, and use the TPS6222xEVM.

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2.1 Input/Output Connections

The 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.

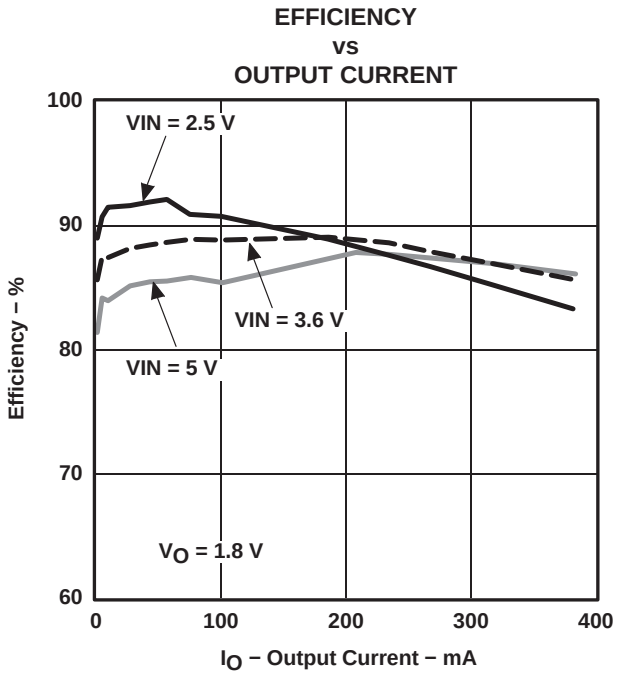
2.2 EVM Operation

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 TPS6222x 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 400 mA to the output of the EVM.

2.3 Test Results

Below are the test results using this EVM.

Figure 2−1. TPS62220 Efficiency With CDRH2D18/HP−4.7-μH Inductor



Chapter 3

Board Layout

This chapter provides the TPS6222xEVM board layout and illustrations.

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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 HPA014 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

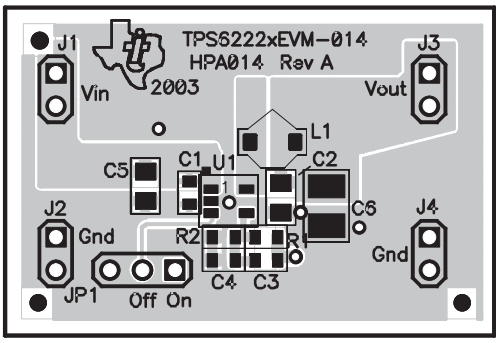


Figure 3−2. Top Layer Routing

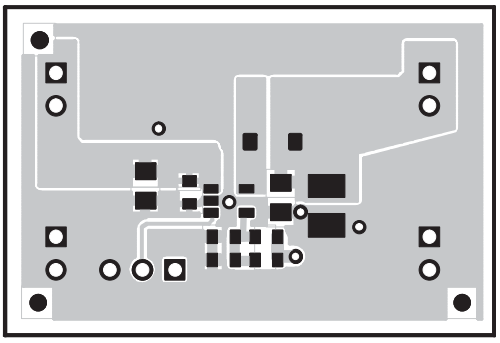
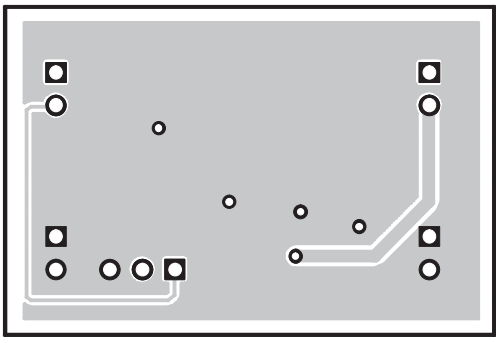


Figure 3−3. Bottom Layer Routing



Chapter 4

Bill of Materials and Schematic

This chapter provides the TPS6222xEVM-014 bill of materials and schematics.

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4.1 Bill of Materials

Table 4−1. Bill of Materials

’20	’21	RefDes	Description	Size	MFR	Part Number
1	1	C1	Capacitor, ceramic, 4.7 µF, 6.3 V, X5R, ±20%	603	TDK	C1608X5R0J475M
1		C2	Capacitor, ceramic, 10 µF, 6.3 V, X5R, 20%	805	TDK	C2012X5R0J106M
	1		Capacitor, ceramic, 22 µF, 6.3 V, X5R, 20%	805	TDK	C2012X5R0J226M
1		C3	Capacitor, ceramic, 15 pF, 50 V, C0G, 10%	603	TDK	C1608C0G1H150JT
	0		Capacitor, ceramic, xxx µF, vv V	603		
1		C4	Capacitor, ceramic, 100 pF, 50 V, C0G, ±5%	603	TDK	C1608C0G1H101JT
	0		Capacitor, ceramic, xxx µF, vv V	603		
0	0	C5	Capacitor, ceramic, xxx µF, vv V	805		
0	0	C6	Capacitor, ceramic, xxx µF, vv V	1210		
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, 4.7 µH, 1.2 A, 140 mΩ	0.126x0.126	Sumida	CDRH2D18/HP−4R7
1		R1	Resistor, chip, 475 kΩ, 1/16 W, 1%	603	Std	Std
	1		Resistor, chip, 0 Ω, 1/16 W, 1%	603	Std	Std
1	0	R2	Resistor, chip, 182 kΩ, 1/16 W, 1%	603	Std	Std
1		U1	IC, step-down converter, 1.8-V, 400 mA	SOT23−5	Texas Instruments	TPS62220DDC
	1		IC, step-down converter, 1.5-V, 400 mA	SOT23−5	Texas Instruments	TPS62221DDC
1	1	—	PCB, 1.5 In x 1 In x .062 In		Any	HPA014
1	1	—	Shunt, 100 mil, black	0.100	3M	929950−00

4.2 Schematic

Figure 4−1. TPS6222x Schematic