Texas Instruments

TPS6204xEVM

1.2 A High-Efficiency Step-Down Converters

User's Guide

July 2003

PMP Portable Power

SLVU089

Following are URLs where you can obtain information on other Texas Instruments products & application solutions:

Products		**Applications**	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Secruity	www.ti.com/security
		Telephony	www.ti.com/telephony
		Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

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 and the output voltage range of 0.7 V and 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 xxx°C. The EVM is designed to operate properly with certain components above xxx°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

Preface

Read This First

About This Manual

This user's guide describes the operation of the TPS6204xEVM low-power dc-dc evaluation module for high-efficiency, step-down converters.

How to Use This Manual

This document contains the following chapters:

- Chapter 1—Introduction
- Chapter 2—Evaluation With the TPS6204xEVM
- Chapter 3—PCB Layout, BOM, and Schematic

Related Documentation From Texas Instruments

- TPS6204x data sheet (SLVS463)

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

Chapter 1

Introduction

The Texas Instruments TPS62040 and TPS62046 evaluation modules (EVM) for low-power, high-efficiency, step-down converters help designers evaluate these devices. The EVMs make it possible to evaluate different modes of the devices as well as the device performance.

The TPS6204xEVMs are available as the TPS62040 adjustable version set to 1.8 V and the TPS62046 3.3-V fixed version.

The TPS62040EVM is easily set up to provide any output voltage between 0.7 V to 6 V (or V_I) by adjusting the external resistor divider. Refer to the data sheet (SLVS463) for various fixed voltage options available for the TPS6204x. The TPS6204x has an input voltage range between 2.5 V and 6 V with an output current up to 1.2 A.

Any version of the TPS6204x is evaluated by removing and replacing the IC on the EVM.

Topic **Page**

1.1 EVM Ordering Information

Table 1−1. EVM Ordering Information

EVM Number	Description
TPS62040EVM−229	Adjustable output voltage version set to 1.8 V
TPS62046EVM−229	3.3-V fixed output voltage version

Chapter 2

Evaluation With the TPS6204xEVM

This chapter details the evaluation process and features of the EVM. For this purpose, a load is connected to the output pins V_O and GND, which allows the load current to be adjusted between 0 A and 1.2 A.

For accurate output voltage and input voltage measurements, it is important to measure the voltage on the input and output voltage terminals with a voltmeter connected directly to the input voltage or output voltage terminals. This eliminates any measurement errors related to voltage drops along the input and output terminal wires connected to the power supply or load.

Topic **Page**

2.1 Enable (EN) Jumper

This jumper is used to enable the device. Connecting the EN pin to ENABLE enables the part. Connecting the EN pin to DISABLE disables the device.

2.2 Mode Selection Jumper

This jumper is used to choose between PWM and PFM/PWM modes of operation. Setting the jumper across FIXED FREQ forces the device into the low noise fixed frequency pulse width modulation (PWM) mode. Setting the jumper across PWR SAVE enables the power save mode where the device enters a pulse frequency modulation mode (PFM) at light to medium load currents, which reduces quiescent current and switching frequency to a minimum to achieve highest efficiency over the entire load current range.

Chapter 3

PCB Layout, BOM, and Schematic

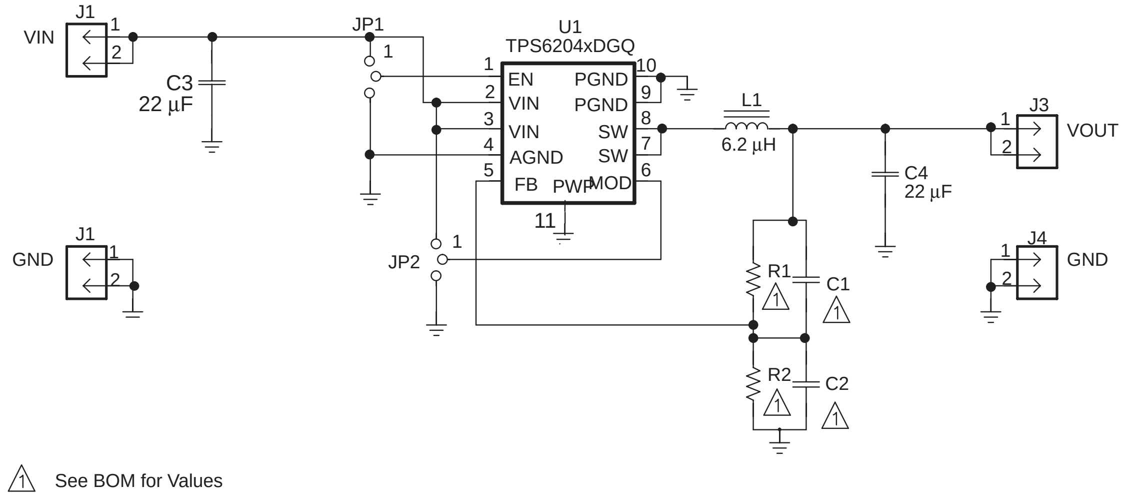
As for all switch mode power supplies, the PCB layout is a very important step in the power supply design process. The following figures show the layout for the adjustable and fixed output voltage EVMs. A bill of materials and a schematic are provided.

Topic **Page**

3.1 SLVP229EVM Schematic

Figure 3−1 shows the SLVP229 EVM schematic diagram. The bill of materials for the TPS62040EVM and TPS62046EVM is shown in Table 3−1. More details about the design and component selection for the dc-dc converter are found in the data sheet.

Figure 3−1. TPS62040EVM and TPS62046EVM (SLVP229) Schematic



3.2 TPS62040EVM and TPS62046EVM (SLVP229) Bill of Materials

Table 3−1. TPS62040EVM and TPS62046EVM (SLVP229) Bill of Materials

QUANTITY		Ref Des	DESCRIPTION	SIZE	MFR	PART NUMBER
TPS62040	TPS62046					
2	2	C3, C4	Capacitor, ceramic, 22 µF, 6.3 V, X5R, 10%	1210	Murata	GRM32DR60J226KA01
1		C1	Capacitor, ceramic, 33−pF, 50 V, C0G, 5%	805	Murata	GRM2165C1H330JZ01
	Open		Capacitor, ceramic, xxx µF, vv−V	805		
1		C2	Capacitor, ceramic, 120 pF, 50 V, C0G, 5%	805	Murata	GRM2165C1H121JZ01
	Open		Capacitor, ceramic, xxx µF, vv−V	805		
4	4	J1−J4	Header, 2 pin, 100 mil spacing, (36-=pin strip)	0.100 × 2	Sullins	PTC36SAAN
2	2	JP1, JP2	Header, 3 pin, 100 mil spacing, (36-pin strip)	0.100 × 3	Sullins	PTC36SAAN
1	1	L1	Inductor, SM toroid, 6.2 µH, 1.8 A, 45 mΩ	0.224	Sumida	CDRH5D28−6R2
1		R1	Resistor, chip, 475 kΩ, 1/10−W, 1%	805	Std	Std
	1		Resistor, chip, 0 Ω, 1/10 W, 5%	805	Std	Std
1		R2	Resistor, chip, 182 kΩ, 1/10 W, 1%	805	Std	Std
	Open		Resistor, chip, xx Ω,, 1/10 W, 1%	805	Std	Std
1		U1	IC, high-effficiency step-down dc-dc converter, adj V	DGS10	TI	TPS62040DGQ
	1		IC, high-effficiency step-down dc-dc converter, 3.3 V	DGS10	TI	TPS62046DGQ
1	1	−−	PCB, 1.75 In × 1 In × 0.062 In		Any	SLVP229
2	2	−−	Shunt, 100 mil, black	0.100	3M	929950−00

3.3 PCB Layout of the TPS62040EVM and TPS62046EVM

Figure 3−2, Figure 3−3, and Figure 3−4 show the layout for the adjustable and fixed output voltage EVMs.

Figure 3−2. Component Placement

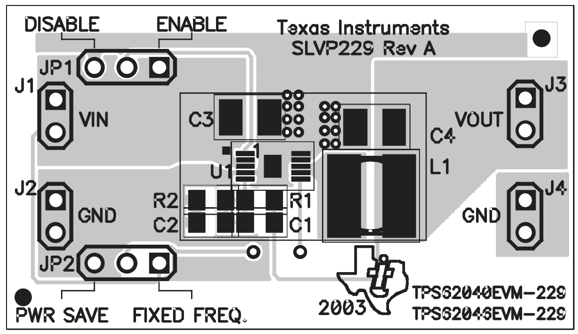


Figure 3−3. Top Layer

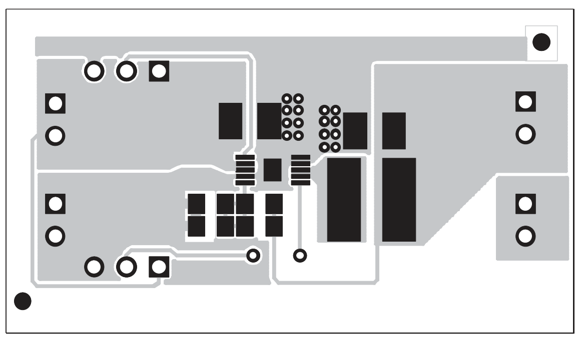


Figure 3−4. Bottom Layer