

TPS62020EVM

0.6-A High-Efficiency Step-Down Converters

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.

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	Security	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

Copyright © 2003, Texas Instruments Incorporated

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 to VIN.

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 85°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.

Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265

Read This First

About This Manual

This user's guide describes the operation of the TPS62020EVM low-power, dc-dc evaluation module for high-efficiency, step-down converters.

How to Use This Manual

- ❑ Chapter 1: Introduction
- ❑ Chapter 2: Evaluation with the TPS62020EVM
- ❑ Chapter 3: Schematic, BOM, and PCB layout

Related Documentation From Texas Instruments

- ❑ TPS62020 Data Sheet (SLVS076)

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

Read This First	v
About This Manual.....	v
How to Use This Manual.....	v
Related Documentation From Texas Instruments.....	v
FCC Warning.....	v
Contents	vi
Figures	vi
Tables	vi
Introduction	1-1
1.1 EVM Ordering Information	1-2
Evaluation With the TPS62020EVM	2-1
2.1 Enable (EN) Jumper	2-2
2.2 Mode Selection Jumper	2-2
Schematic, BOM, and PCB Layout	3-1
3.1 Schematic and Bill of Materials	3-2
3.2 PCB Layout of the TPS62020EVM	3-3

Figures

Figure 3-1. TPS62020EVM (HPA019) Schematic	3-2
Figure 3-2. Component Placement	3-3
Figure 3-3. Top Layer	3-3
Figure 3-4. Bottom Layer	3-3

Tables

Table 1-1. EVM Ordering Information	1-2
Table 3-2. TPS62020EVM (HPA019) Bill of Materials	3-2

Introduction

The Texas Instruments TPS62020 evaluation module (EVM) for low-power, high-efficiency, step-down converters helps designers evaluate this device. The EVM enables evaluation of different device modes and device performance.

The TPS62020EVM is set to 1.5 V. The TPS62020EVM can be easily set up to provide any output voltage between 0.7 V and 6 V (or V_{in}) by adjusting the external resistor divider. See the TPS62020 data sheet (SLVS076) for the output voltage calculation. The TPS62020 has an input voltage range between 2.5 V and 6 V with an output current up to 0.6 A.

Topic	Page
1.1 EVM Ordering Information	1-2

1.1 EVM Ordering Information

Table 1-1 provides EVM ordering information.

Table 1-1. EVM Ordering Information

EVM Number	Description
TPS62020EVM-019	Adjustable output voltage version set to 1.5 V

Evaluation With the TPS62020EVM

This chapter details the EVM evaluation process and features. A load is connected to the output pins Vout and GND, which allows the load current to be adjusted between 0 A and 0.6 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	2-1
2.2 Mode Selection Jumper	2-2

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.

Schematic, BOM, and PCB Layout

This chapter illustrates the EVM schematic, bill of materials (BOM), and PCB layout.

Topic	Page
3.1 Schematic and Bill of Materials	3-2
3.2 PCB Layout of the TPS62020EVM	3-3

3.1 Schematic and Bill of Materials

Figure 3-1 shows the TPS62020EVM (HPA019) schematic diagram. The bill of materials for the TPS62020EVM is shown in Table 3-2. More details about the design and component selection for the dc-dc converter can be found in the datasheet.

Figure 3-1. TPS62020EVM (HPA019) Schematic

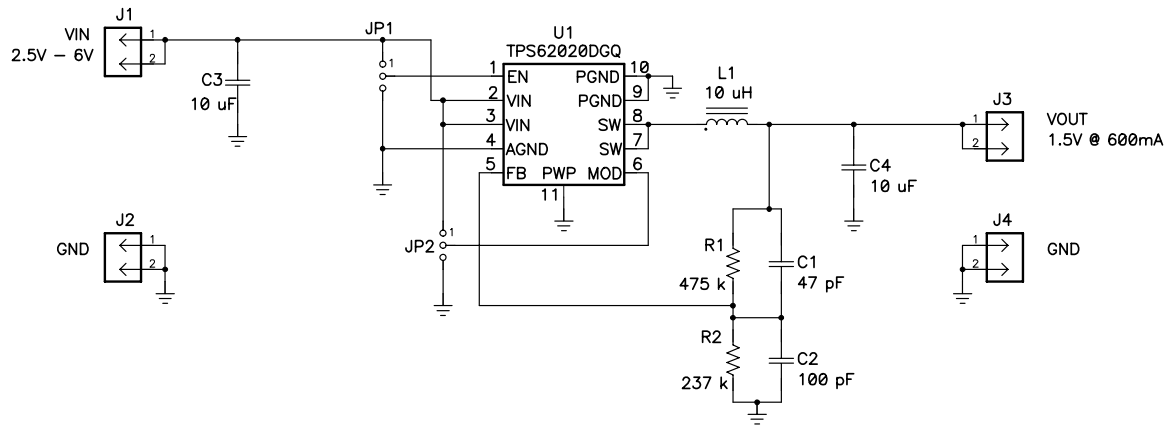


Table 3-2 lists the bill of materials.

Table 3-2. TPS62020EVM (HPA019) Bill of Materials

Count	RefDes	Description	Size	MFR	Part Number
1	C1	Capacitor, Ceramic, 47-pF, 50-V, C0G, 5%	805	TDK	C2012C0G1H470JT
1	C2	Capacitor, Ceramic, 100-pF, 50-V, C0G, 5%	805	TDK	C2012C0G1H100JT
1	C3	Capacitor, Ceramic, 10-uF, 6.3-V, X5R, 10%	805	TDK	C2012X5R0J106KT
1	C4	Capacitor, Ceramic, 10-uF, 6.3-V, X5R, +/-10%	1206	TDK	C3216X5R0J106KT
4	J1, J2, J3, J4	Header, 2-pin, 100mil spacing, (36-pin strip)	0.100 x 2	Sullins	PTC36SAAN
2	JP1, JP2	Header, 3-pin, 100mil spacing, (36-pin strip)	0.100 x 3"	Sullins	PTC36SAAN
1	L1	Inductor, SMT, 10-uH, 64-milliohms, ±20%	0.248" X 0.236"	TOKO	A920CY-100M
1	R1	Resistor, Chip, 475k-Ohms, 1/10-W, 1%	805	Std	Std
1	R2	Resistor, Chip, 237k-Ohms, 1/10-W, 1%	805	Std	Std
1	U1	IC, High-Efficiency Step-down low power DC-DC converter, Adj V	DGS10	TI	TPS62020DGQ
1	--	PCB, 1.75 ln x 1 ln x .062 ln		Any	HPA019
2	--	Shunt, 100-mil, black	0.100	3M	929950-00

3.2 PCB Layout of the TPS62020EVM

Figure 3-2 shows the PCB layout component placement

Figure 3-2. Component Placement

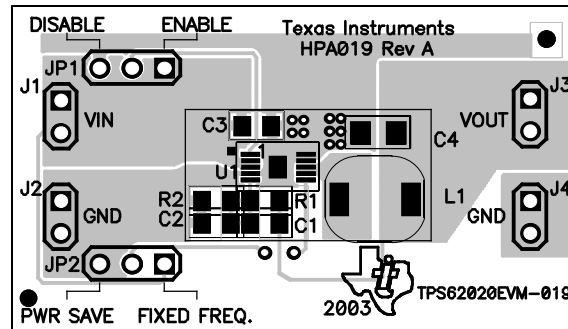


Figure 3-3 shows the PCB layout top layer

Figure 3-3. Top Layer

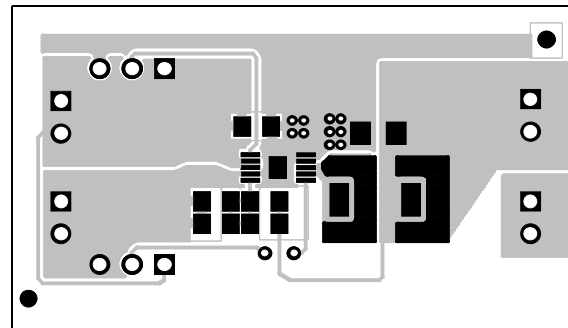


Figure 3-4 shows the PCB layout bottom layer

Figure 3-4. Bottom Layer

