

TPS61020EVM

High-Efficiency Synchronous Boost Converters

User's Guide

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 0.9 V to 6 V and output voltage range of 1.8 V to 5.5 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 user's guide describes the operation of the TPS61020EVM low-power, dc–dc evaluation module (EVM) for a high-efficiency, boost converter. The guide includes setup instructions for the hardware, a schematic diagram, a bill of materials (BOM), and PCB layout drawings for the evaluation module.

How to Use This Manual

This document contains the following chapters:

- ☐ Chapter 1—Introduction
- ☐ Chapter 2—Evaluation with the TPS61020EVM
- ☐ Chapter 3—Schematic, BOM, and PCB layout

Related Documentation From Texas Instruments

TPS61020 data sheet (SLVS451)

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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Introduction

The Texas Instruments TPS61020 evaluation module (EVM) for low-power, high-efficiency, boost converter helps designers evaluate the TPS61020 device. The EVM makes it possible to evaluate different device modes as well as the device performance.

The TPS61020EVM is set to 3.3 V. The TPS61020EVM can be easily set up to provide any output voltage between 1.8 V and 5.5 V by adjusting the external resistor divider. Refer to the datasheet (SLVS451) for the output voltage calculation. The TPS61020 has an input voltage range between 0.9 V and 6.5 V.

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1.1 EVM Ordering Information

Table 1–1. EVM Ordering Information

EVM Number	Description
TPS61020EVM-025	Adjustable output voltage version set to 3.3 V.

Evaluation With the TPS61020EVM

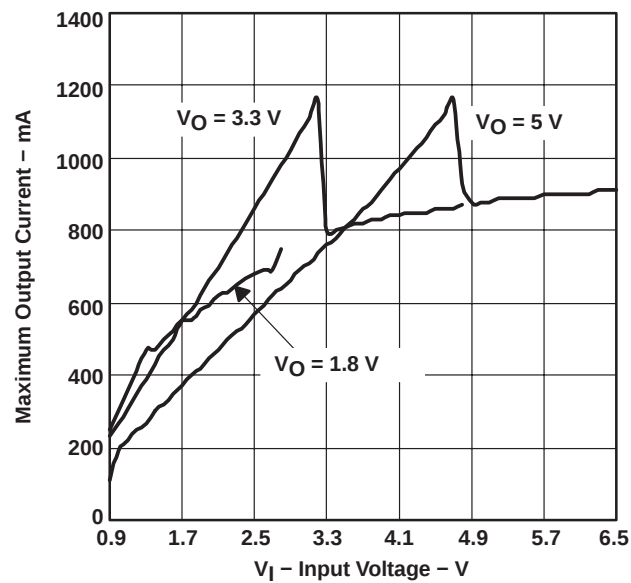
This chapter details the evaluation process and features of the EVM. For this purpose, a load is connected to the output pins Vout and GND, allowing the load current to be adjusted between 0 A and the maximum current shown in Figure 2–1.

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.

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2.1 Maximum Output Current

Figure 2–1. Maximum Output Current vs Input Voltage



2.2 Enable (EN) Jumper

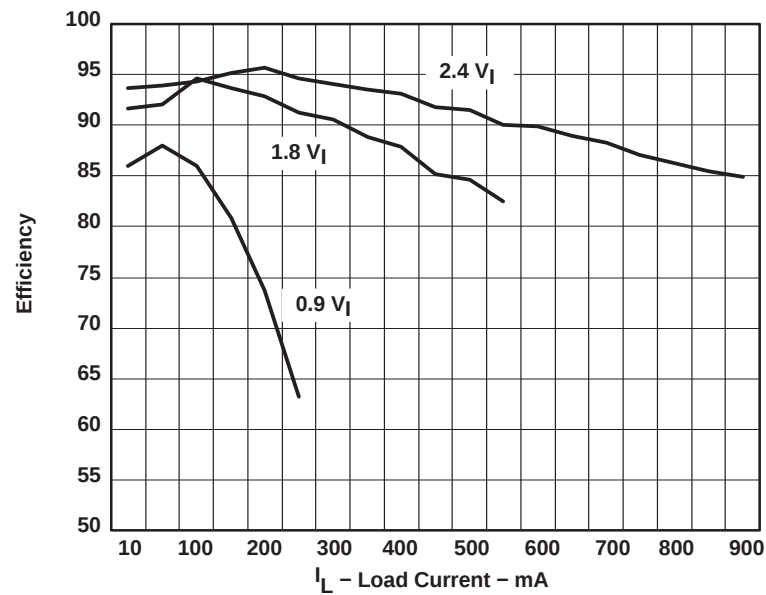
This jumper is used to enable the device. Connecting the EN pin to ENABLE enables the part. Connecting the EN pin to DISABLE disables the device.

2.3 Mode Selection Jumper (PS)

This jumper is used to choose between PWM and PWR SAV modes of operation. Setting the jumper across PWM forces the device into the low noise fixed frequency pulse width modulation (PWM) mode. Setting the jumper across PWR SAV 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.

2.4 Efficiency of TPS61020EVM

Figure 2-2. Efficiency for 3.3 V_{OUT}



Physically smaller inductors can be used to save board space, or reduce height at the expense of lower efficiency. Conversely, physically larger inductors give better efficiency.

Schematic, BOM, and PCB Layout

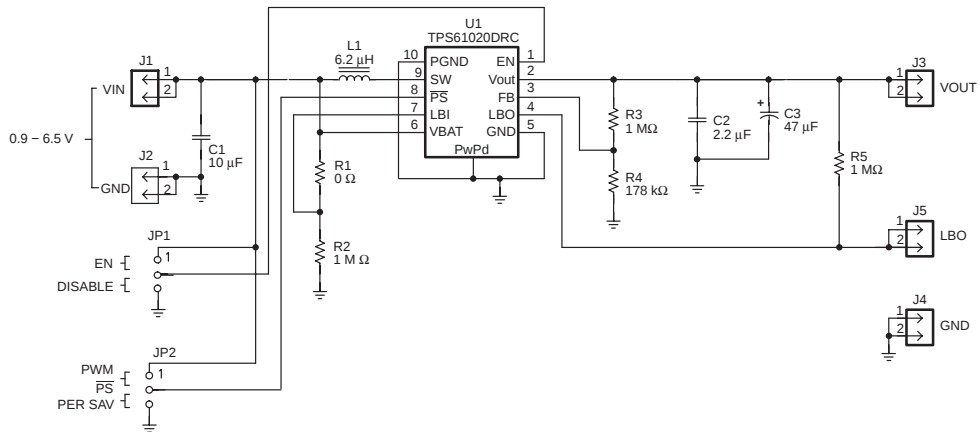
This chapter includes the schematic shown in Figure 3–1, bill of materials table, and layout for the EVM.

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3.1 HPA025 EVM Schematic

Figure 3–1 shows the HPA025 EVM schematic diagram. The bill of materials for the TPS61020EVM is shown in Table 3–1. More details about the design and component selection for the dc-dc converter can be found in the data sheet.

Figure 3–1. TPS61020EVM (HPA025) Schematic



3.2 Bill of Materials

Table 3–1. TPS61020EVM (HPA025) Bill of Materials

Count	Ref Des	Description	Size	MFR	Part Number
1	C1	Capacitor, ceramic, 10 µF, 10 V, X5R, ±10%	805	Murata	GRM21BR61A106KE19L
1	C2	Capacitor, ceramic, 2.2 µF, 16-V, X5R, ±10%	805	TDK	C2012X5R1C225KT
1	C3	Capacitor, tantalum, 47 µF, 16 V, 110 mΩ, 20%	6032 (C)	Vishay	594D476X0016C2T
5	J1–J5	Header, 2 pin, 100 mil spacing, (36-pin strip)	0.100 x 2	Sullins	PTC36SAAN
2	JP1, JP2	Header, 3-pin, 100 mil spacing, (36-pin strip)	0.100 x 3	Sullins	PTC36SAAN
1	L1	Inductor, SM Toroid, 6.2 µH, 1.8 A, 43 mΩ	74480	Sumida	CDRH5D28–6R2
1	R1	Resistor, Chip, 0 Ω, 1/10 W, 1%	805	Std	Std
3	R2, R3, R5	Resistor, Chip, 1.00 MΩ, 1/10 W, 1%	805	Std	Std
1	R4	Resistor, Chip, 178 kΩ, 1/10 W, 1%	805	Std	Std
1	U1	IC, synchronous boost converter, adjustable voltage	DRC10	TI	TPS61020DRC
1	—	PCB, 1.8 In x 1.5 In x 0.062 In		Any	HPA025
2	—	Shunt, 100 mil, black	0.100	3M	929950–00

3.3 PCB Layout of the TPS61020EVM

The figures below show the layout for the EVM.

Figure 3–2. Component Placement

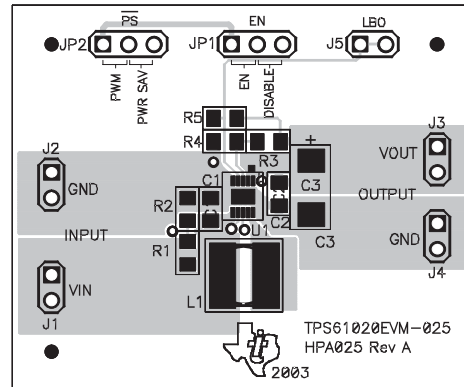


Figure 3–3. Top Layer

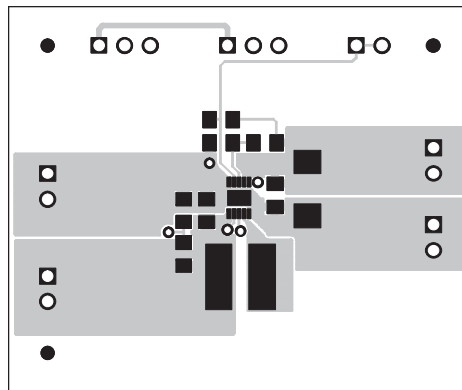


Figure 3–4. Bottom Layer

