User's Guide

TPS62050 and TPS62052 Buck Converter Evaluation Module User's Guide

Table of Contents

Trademarks

1 Introduction

The Texas Instruments TPS62050 and TPS62052 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 TPS6205xEVM is available as the TPS62050 adjustable version set to 3.3 V and the TPS62052 1.5-V fixed version.

The TPS62050EVM can be easily set up to provide any output voltage between 0.7 V to 6 V (or Vin) by adjusting the external resistor divider. Refer to the data sheet (SLVS432) for various fixed voltage options available for the TPS6205x. The TPS6205x has an input voltage range between 2.7 V and 10 Vwith an output current up to 800 mA.

Any version of the TPS6205x can be evaluated by removing and replacing the IC on the EVM.

Table 1-1. EVM Ordering Information

EVM NUMBER	DESCRIPTION
TPS62050EVM–234	Adjustable output voltage version set to 3.3 V
TPS62052EVM–234	1.5-V fixed output voltage version

2 Evalulation with the TPS6205xEVM

This section details the evaluation process and features of the EVM. For this purpose, a load is connected to the output pins Vout and GND, which allows the load current to be adjusted between 0 mA and 800 mA.

For accurate output voltage and input voltage measurements, it is important to measure the voltage on the input and output voltage terminals with avoltmeter 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.

2.1 Enable (EN) Jumper

This jumper is used to enable the device. Connecting the EN pin to ON enables the part. Connecting the EN pin to OFF disables the device.

2.2 Synchronization (SYNC) Jumper

This jumper is used to choose between PWM and PFM/PWM 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 PWM/PFM enables the power save mode where the device enters apulse 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.

Additionally an external clock between 600 kHz and 1200 kHz can be applied to pin 2 of J2 (SYNC) in order to synchronize the converter to an external clock.

2.3 Power Good (PG)

The PG pin is an open drain output capable of sinking typically 1 mA. A pullup resistor is required to use the PG. The pullup resistor should be placed between the Vout and PG. The PG pin becomes active high when the output voltage exceeds typically 98.5% of its nominal value. Leave the PG pin unconnected when not used.

2.4 Low Battery Out (LBO)

The LBO pin is an open drain output which goes low when the voltage at the low battery input (LBI) falls below the trip point of 1.21 V. An external pullup resistor which is placed between LBO and Vout is required to use the LBO.

3 PCB Layout

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.

3.1 SLVP234 EVM Schematic and Bill of Materials

Figure 3-1 shows the SLVP234 EVM schematic diagram. The bill of materials for the TPS62050EVM and TPS62052EVM 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.

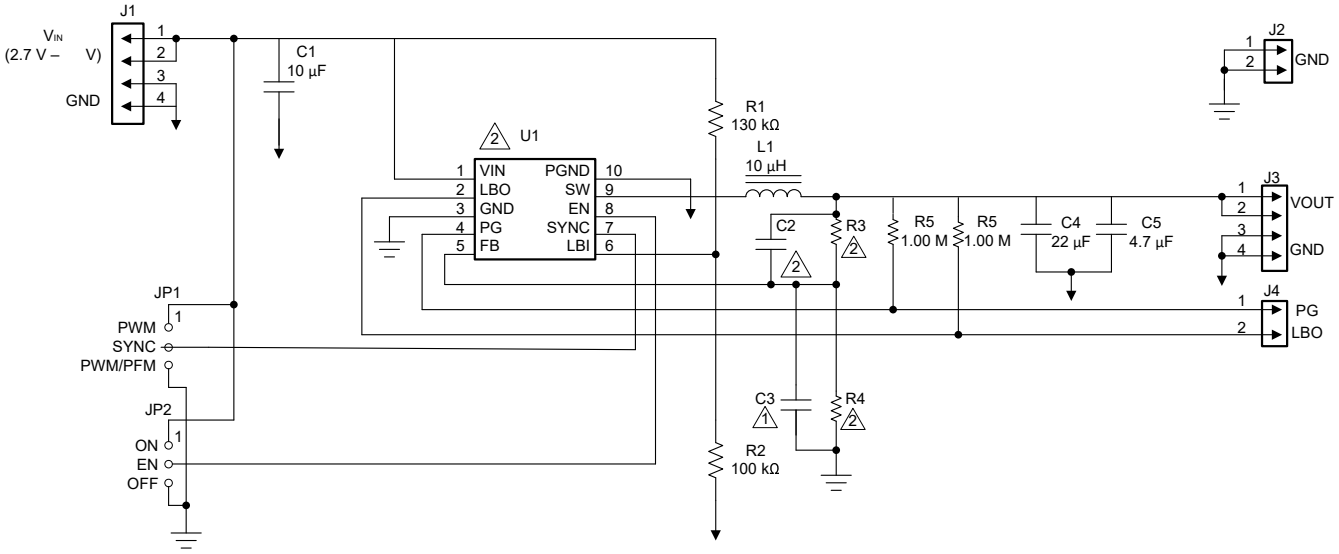

Figure 3-1. TPS6205xEVM Schematic

Table 3-1. TPS62050 and TPS62052 EVMs (SLVP234) Bill of Materials

COUNT		REF DES	DESCRIPTION	SIZE	MFR	PART NUMBER
TPS62050	TPS62052					
1	1	C1	Capacitor,Ceramic, 10 mF,16 V, X5R, 10%	1210	Murata	GRM32ER61C106KC31
1	open	C2	Capacitor,ceramic, 22 pF, 50 V, C0G, 5%	603	Murata	GRM1885C1H220JZ01
open	open	C3	Capacitor,ceramic, xx mF,xx mV	603		
1	1	C4	Capacitor, ceramic, 22 mF, 6.3–V, X5R,10%	1210	Murata	GRM32DR60J226KA01
1	1	C5	Capacitor,ceramic, 4.7 mF,6.3 V, X5R,10%	805	Murata	GRM219R60J475KE11
2	2	J1,J3	Header,4 pin, 100 mil spacing, (36-pin strip)	0.12	Sullins	PTC36SAAN
2	2	J2,J4	Header,2 pin, 100 mil spacing, (36-pin strip)	0.12	Sullins	PTC36SAAN
2	2	JP1,JP2	Jumper,3 pin, 100 mil spacing, (36-pin strip)	0.12	Sullins	PTC36SAAN

Table 3-1. TPS62050 and TPS62052 EVMs (SLVP234) Bill of Materials (continued)

COUNT		REF DES	DESCRIPTION	SIZE	MFR	PART NUMBER
TPS62050	TPS62052					
1	1	L1	Inductor,SMT, 10 mH,1.4 A, 63.6 mW	0.276sq	TDK	SLF7032T–100M1R4
1	1	R1	Resistor,chip, 130 kW,1/16 W, 1%	603	Std	Std
1	1	R2	Resistor,chip, 100 kW,1/16 W, 1%	603	Std	Std
1		R3	Resistor,chip, 562 kW,1/16 W, 1%	603	Std	Std
	1		Resistor,chip, 0 W,1/16 W, 5%	603	Std	Std
1	open	R4	Resistor,chip, 100 kW,1/16 W, 1%	603	Std	Std
1	1	R5	Resistor,chip, 1.00 MW,1/16 W, 1%	603	Std	Std
1	1	R6	Resistor,chip, 1.00 MW,1/16 W, 1%	603	Std	Std
1		U1	IC, high-efficiencystep-down converter, Adj V	DGS10	TI	TPS62050DGS
	1		IC, high-efficiencystep-down converter, 1.5 V	DGS10	TI	TPS62052DGS
1	1	—	PCB,1.6 In ´ 1.255In ´ 0.062In		Any	SLVP234
2	2	—	Shunt,100 mil, black	0.100	3M	929950–00

3.2 PCB Layout of the TPS62050EVM and TPS62052EVM

The following figures show the layout for the adjustable and fixed output voltage EVMS.

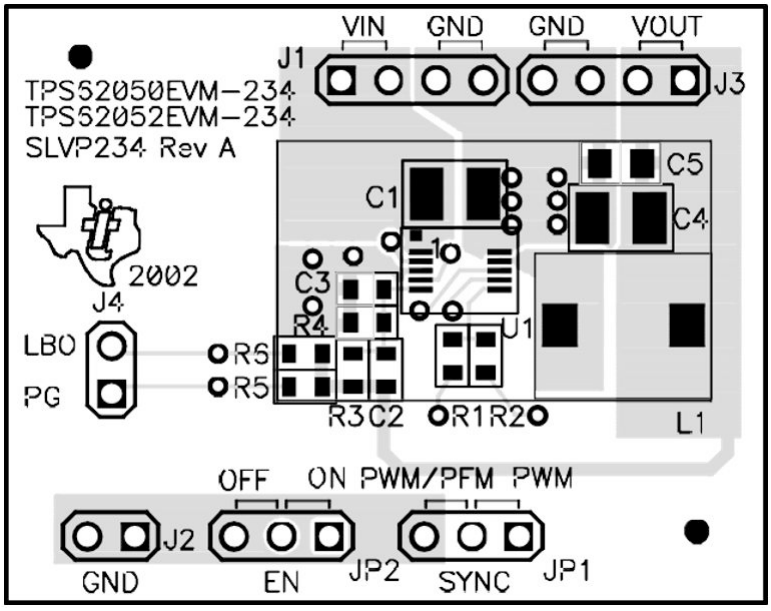

Figure 3-2. Component Placement

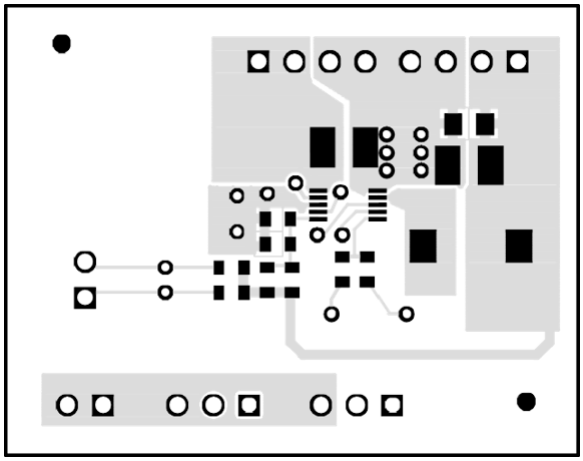

Figure 3-3. Top Layer

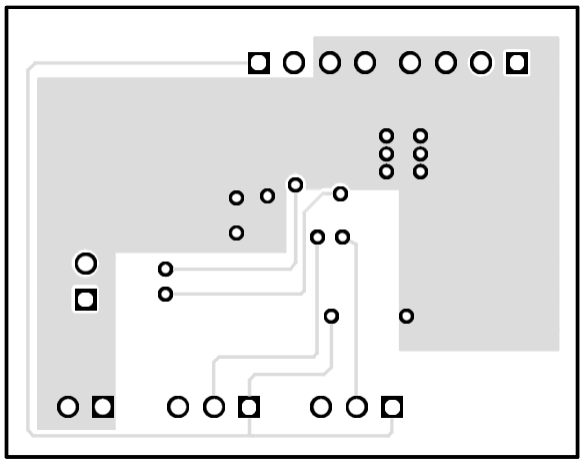

Figure 3-4. Bottom Layer

4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision * (February 2003) to Revision A (July 2021)	Page
• Updated the numbering format for tables, figures, and cross-references throughout the document.	2
• Updated user's guide title	2

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NOTE:

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FCC NOTICE: This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

3.1.2 *For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:*

CAUTION

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

3.2 *Canada*

3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

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http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

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1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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