

EVM User's Guide: TPS62A02NEVM-084, TPS62A02NAEVM-084
TPS62A02N and TPS62A02NA Step-Down Converter
Evaluation Module



Description

The TPS62A02NxEVM-084 facilitates the evaluation of the TPS62A02N or TPS62A02NA, a 2A synchronous step-down DC/DC converter in a 1.6mm × 1.6mm SOT563 package. The TPS62A02NxEVM-084 evaluation module (EVM) is simple and easy-to-use. The EVM regulates the output voltage to 1.8V with the input voltage from 2.5V to 5.5V. However, the output voltage on the EVM can be adjusted from 0.6V to Vin.

Get Started

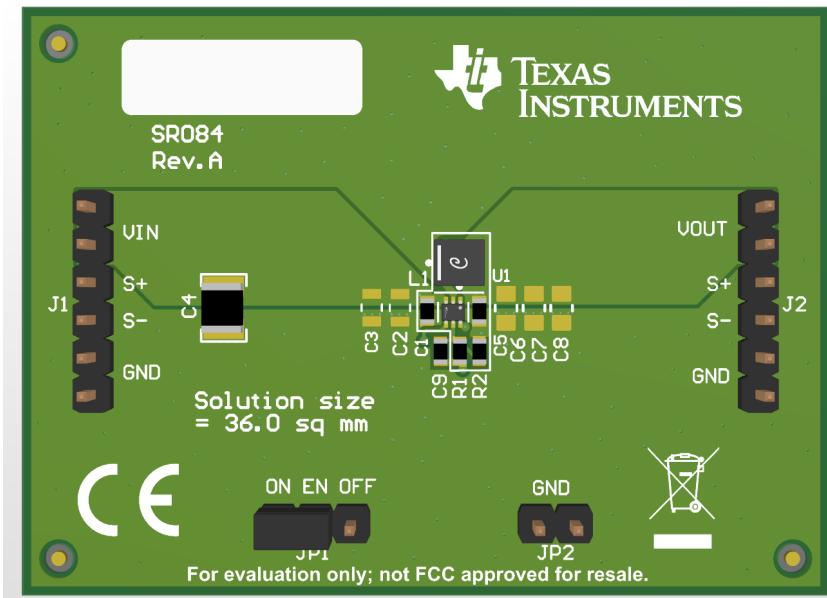
1. Order the EVM from the [TPS62A02NAEVM-084](#) and [TPS62A02NEVM-084](#) product pages.
2. Download the data sheet from the [TPS62A02 product page](#).
3. Use data sheet or WEBENCH® to modify the output voltage and to change the input or output capacitors.

Features

- 2.5V to 5.5V input voltage range
- 0.6V to VIN adjustable output voltage range
- 1% feedback accuracy (0°C to 125°C)
- 100% mode operation
- 2.4MHz switching frequency
- Power save mode or PWM option available
- Short-circuit protection (HICCUP)
- Internal soft start-up
- Active output discharge
- Thermal shutdown protection

Applications

- Set top box, TV applications
- IP network camera
- Multifunctional printer
- Wireless router
- Solid state drive
- Battery-powered applications
- General purpose point-of-load supply



TPS62A02NxEVM-084 (Top View)

1 Evaluation Module Overview

1.1 Introduction

This user's guide describes the characteristics, operation, and use of TI's TPS62A02N and TPS62A02NA evaluation modules (EVM). These EVMs are designed to help the user easily evaluate and test the operation and functionality of the TPS62A02N and TPS62A02NA buck converters. The EVMs convert a 2.5V to 5.5V input voltage to a regulated 1.8V output voltage that delivers up to 2A maximum. This user's guide includes setup instructions for the following:

- A printed-circuit board (PCB) layout
- Complete schematic diagram
- Bill of materials (BOM)

1.2 Kit Contents

Table 1-1. TPS62A02NxEVM-084 Kit Contents

Item	Description	Quantity
TPS62A02NEVM-084 or TPS62A02NAEVM-084	PCB	1

1.3 Specification

Table 1-2 provides a summary of the TPS62A02N and TPS62A02NA performance specifications.

Table 1-2. Performance Specification Summary

Specification	Test Conditions	MIN	TYP	MAX	Unit
Input voltage		2.5	5.5		V
Output voltage setpoint			1.8		V
Output current	TPS62A02NEVM-084		0	2	A
	TPS62A02NAEVM-084		0	2	A

1.4 Device Information

The TPS62A02N and TPS62A02NA are synchronous step-down DC-DC converters optimized for high efficiency and compact solution size. The TPS62A02N and TPS62A02NA delivers an output current up to 2A and comes in a 1.6mm × 1.6mm SOT563 package. The TPS62A02N operates in Power Save Mode (PSM) at light load and in PWM mode at medium to heavy loads. Whereas, the TPS62A02NA variant operates in forced PWM mode (FPWM) across the whole load current range. Other features like overcurrent protection, thermal shutdown protection, and power good (optional) are built-in. TPS62A02x variants of this family comes with a PG pin instead of the OUT pin.

2 Hardware

2.1 Setup

This section describes how to properly use the TPS62A02NEVM-084 and TPS62A02NAEVM-084.

2.1.1 Connector Descriptions

J1, Pin 1 and 2 – VIN	Positive input voltage connection from the input supply for the EVM
J1, Pin 3 and 4 – S+/S-	Input voltage sense connections, measure the input voltage at this point
J1, Pin 5 and 6 – GND	Input return connection from the input supply for the EVM
J2, Pin 1 and 2 – VOUT	Positive output voltage connection
J2, Pin 3 and 4 – S+/S-	Output voltage sense connections, measure the output voltage at this point
J2, Pin 5 and 6 – GND	Output return connection
JP1 – EN	EN pin jumper. Place the supplied jumper across ON and EN to turn on the IC. Place the jumper across OFF and EN to turn off the IC.

2.1.2 Hardware Setup

To operate the EVM, set jumper JP1 to the desired positions per [Section 2.1.1](#). Connect the input supply to J1 and connect the load to J2.

3 Hardware Design Files

3.1 Schematic

[Figure 3-1](#) illustrates the EVM schematic of TPS62A02NEVM-084, which is also valid for the TPS62A02NAEVM-084 variant.

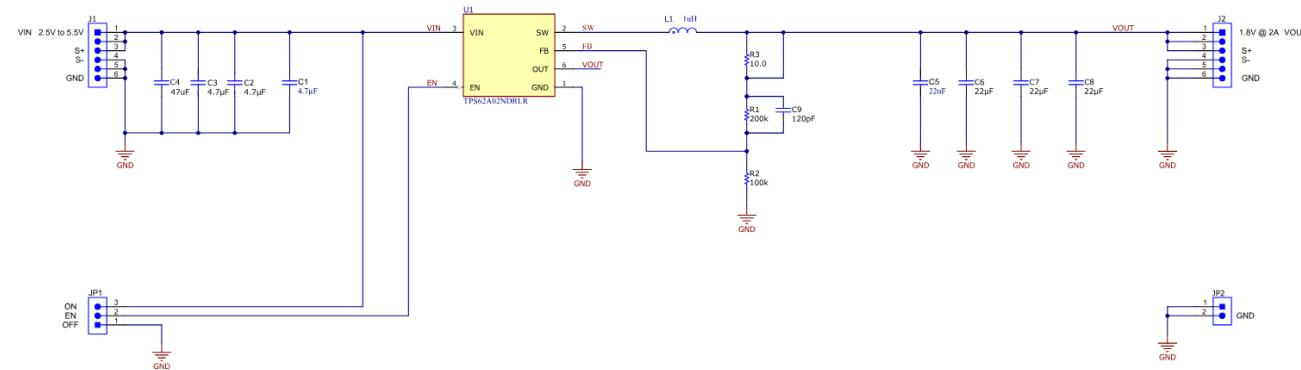


Figure 3-1. TPS62A02NEVM-084 Schematic

3.2 Board Layout

This section provides the board layout and illustrations of the TPS62A02NEVM-084, which is valid for variant TPS62A02NAEVM-084 as well.

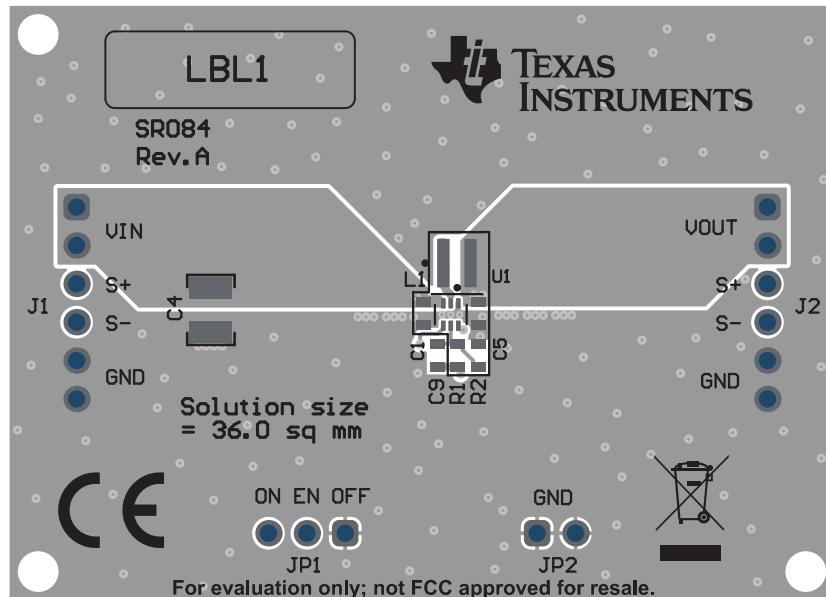


Figure 3-2. Top View

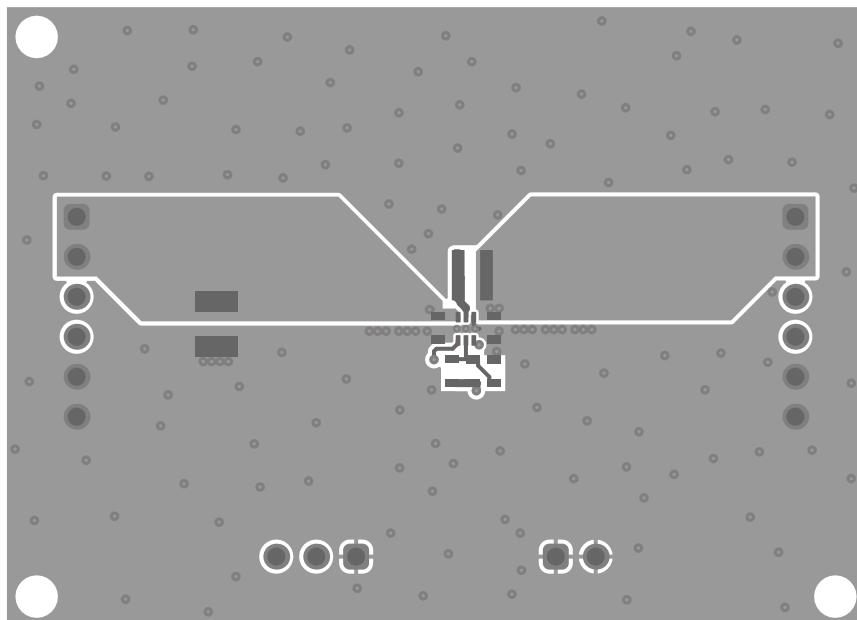


Figure 3-3. Top Layer

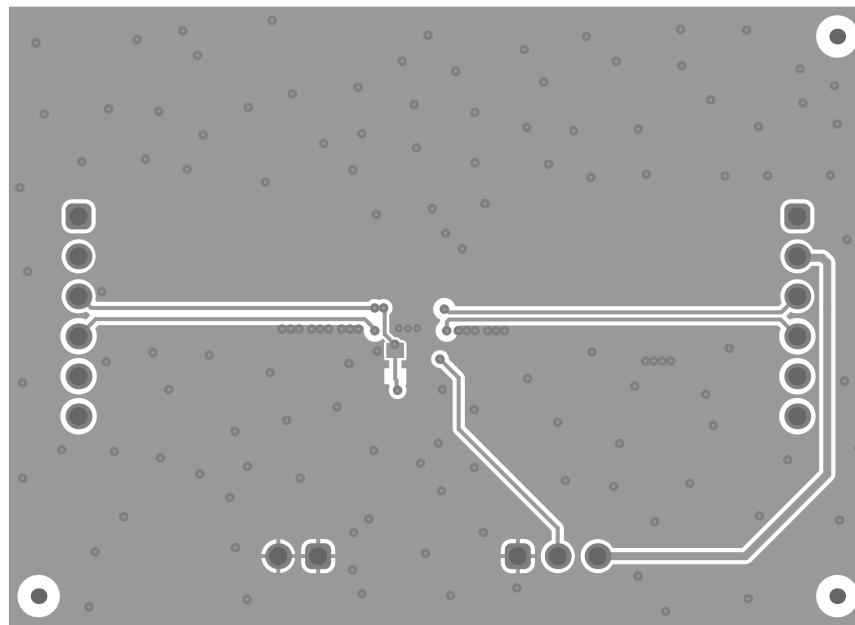


Figure 3-4. Bottom Layer

3.2.1 Modifications

The PCB for this EVM is designed such that the output voltage can be adjusted from 0.6V to Vin by changing R1 & R2. On the EVM, additional input and output capacitors and a feedforward capacitor can also be added.

3.2.1.1 Input and Output Capacitors

C2, and C3 are provided for additional input capacitors if needed. For most applications, a $4.7\mu\text{F}$ input capacitor is sufficient; a larger value reduces input voltage ripple.

C6, C7, and C8 are provided for additional output capacitors if needed. These capacitors are not required for proper operation but can be used to reduce the output voltage ripple and to improve the load transient response. The output capacitance must remain within the recommended range in the device data sheet for proper operation.

3.2.1.2 Feedforward Capacitor

C9 is a feedforward capacitor. This capacitor is not required for proper operation but can be added to reduce the output ripple in PSM and to improve the load transient response. A 120pF capacitor is good for the 1.8V output typical application.

3.3 Bill of Materials

Table 3-1 lists the BOM for this EVM.

Table 3-1. TPS62A02NxEVM-084 Bill of Materials

Quantity		Ref Des	Value	Description	Size	Part Number	MFR
TPS62A02NEVM-084	TPS62A02NAEVM-084						
1	1	C1	4.7 μ F	Capacitor, Ceramic, 16V, X7R, $\pm 10\%$	0603	GRM188Z71C475KE21D	Murata
1	1	C5	22 μ F	Capacitor, Ceramic, 10V, X5R, $\pm 20\%$	0603	GRM188R61A226ME15D	Murata
1	1	C4	47 μ F	Capacitor, Ceramic, 10V, X7R, $\pm 20\%$	1210	GRM32ER71A476ME15L	Murata
1	1	C9 ⁽¹⁾	120pF	Capacitor, Ceramic, 50V, C0G/NP0, $\pm 5\%$	0603	GRM1885C1H121JA01D	Murata
1	1	L1	1 μ H	Inductor, Shielded, 7.9A, 0.0213 Ω	3.2 \times 3.5 \times 1.5mm	XGL3515-102MEC	Coilcraft
1	1	R1	200 k	Resistor, Chip, 0.1 W, 1%	0603	Std	Std
1	1	R2	100 k	Resistor, Chip, 0.1 W, 1%	0603	Std	Std
1	0	U1	TPS62A02N	IC, 5.5V, 2A Step-Down Converter	1.6 \times 1.6 mm	TPS62A02NDRLR	TI
0	1	U1	TPS62A02NA	IC, 5.5V, 2A Step-Down Converter with forced PWM operation	1.6 \times 1.6mm	TPS62A02NADRLR	TI

(1) C9 is feedforward capacitor, which is optional. The device is fully functional without C9.

4 Additional Information

4.1 Trademarks

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5 Related Documentation

Texas Instruments, [TPS62A0x](#), [TPS62A0xA](#), and [TPS62A02Nx](#) 1A, 2A, High-Efficiency, Synchronous Buck Converters in a SOT-563 and a SOT-23 Package data sheet

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User shall operate the Evaluation Kit within TI's recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI's recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI's instructions for electrical ratings of interface circuits such as input, output and electrical loads.

NOTE:

EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGRADATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.

3 Regulatory Notices:

3.1 United States

3.1.1 Notice applicable to EVMs not FCC-Approved:

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 isotope 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

3.3 Japan

3.3.1 *Notice for EVMs delivered in Japan:* Please see http://www.tij.co.jp/lsts/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。

<https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-delivered-in-japan.html>

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If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

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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This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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- 4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.
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