This user’s guide describes the operation, and use of the TPS63802EVM evaluation module (EVM). The TPS63802EVM is designed to help the users easily evaluate and test the operation and functionality of the TPS63802 buck-boost converter. The TPS63802EVM has the output voltage set to 3.3 V. The EVM operates from 1.3 V to 5.5 V input voltage. Output current can go up to 2 A in buck mode and boost mode. This document includes setup instructions for the hardware, a schematic diagram, a bill of materials (BOM), and printed-circuit board (PCB) layout drawings for the evaluation module. Throughout this document, the abbreviations EVM, TPS63802EVM, and the term evaluation module are synonymous with the TPS63802, unless otherwise noted.

Figure 1. TPS63802 EVM Picture

Trademarks

All trademarks are the property of their respective owners.
1 Introduction

The Texas Instruments TPS63802 is a highly efficient, single-inductor, internally compensated, buck-boost converter in a 10-pin, 3-mm × 2-mm HotRod QFN package.

1.1 Background

The TPS63802EVM uses the TPS63802 integrated circuit (IC) and is set to a 3.3 V output and operates with an input voltage between 1.3 V and 5.5 V.

1.2 Performance Specification

Table 1 provides a summary of the TPS63802EVM performance specifications. All specifications are given for an ambient temperature of 25°C.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td></td>
<td>1.3</td>
<td>5.5</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Start-up input voltage</td>
<td></td>
<td>1.8</td>
<td>5.5</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Output voltage</td>
<td></td>
<td>1.8</td>
<td>5</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Output current</td>
<td>$V_{IN} \geq 2.2 , V, , V_{OUT} = 3.3 , V$</td>
<td>0</td>
<td>2</td>
<td>A</td>
<td></td>
</tr>
</tbody>
</table>

1.3 Modifications

The printed-circuit board (PCB) for this EVM is designed to accommodate the TPS63802. Extra positions are available for additional input and output capacitor and feed forward capacitor.

1.3.1 IC U1 Operation

U1 is configured for evaluation of the adjustable-output version. This EVM is set to 3.3 V. Resistors R1 and R2 can be used to set the output voltage between 1.8 V and 5 V. See the datasheet for recommended values.
2 Setup

This section describes how to properly use the TPS63802EVM.

2.1 Input/Output Connector and Header Descriptions

2.1.1 J1, Pin 1 and 2 – VIN
Positive input connection from the input supply for the EVM.

2.1.2 J1, Pin 3 and 4 – S+/S-
Input voltage sense connections. Measure the input voltage at this point.

2.1.3 J1, Pin 5 and 6 – GND
Vin GND return connection from the input supply for the EVM, common with J2, pin 5 and 6.

2.1.4 J2, Pin 1 and 2 – VOUT
Output voltage connection.

2.1.5 J2, Pin 3 and 4 – S+/S-
Vout Sense and GND Sense low-current sense lines for sampling the output voltage at the output capacitor.

2.1.6 J2, Pin 5 and 6 – GND
Vout GND return connection for the output voltage, common with J1 pin 5 and 6.

2.1.7 J5 – PG GND
Power Good (PG) test point and GND connection.

2.1.8 JP1 – MODE
Shorting jumper between the center pin MODE and PFM enables automatic transition to power-saving mode at light-load currents as described in the data sheet; shorting jumper between the center pin MODE and PWM enables forced PWM mode.

2.1.9 JP2 – ENABLE
Shorting jumper between the center pin EN and ON turns on the unit. Shorting jumper between the center pin EN and OFF turns the unit off.

2.2 Setup

To operate the EVM, connect an input supply with the positive lead to J1, pins 1 and 2 and negative lead to J1, pins 5 and 6; connect a load with the positive lead to J2, pins 1 and 2 and the negative lead to J2, pins 5 and 6; short EN and ON (pins 2 and 3) of JP2 with a shorting jumper.
3 Board Layout

This section provides the TPS63802EVM board layout and illustrations.

3.1 Layout

Figure 2 through Figure 5 show the board layout for the TPS63802EVM PCB.

![Figure 2. Assembly Layer](image-url)
Figure 3. Signal layer 1
Figure 4. Signal Layer 2
4 Schematic and Bill of Materials

This section provides the TPS63802EVM schematic and bill of materials.

4.1 Schematic

Figure 6. Schematic
### 4.2 Bill of Materials

Table 2. TPS63802EVM Bill of Materials

<table>
<thead>
<tr>
<th>Count</th>
<th>RefDes</th>
<th>Value</th>
<th>Description</th>
<th>Size</th>
<th>Part Number</th>
<th>MFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C1</td>
<td>10 µF</td>
<td>CAP, CERM, 10 µF, 6.3 V, +/- 20%, XSR, 0603</td>
<td>603</td>
<td>GRM188R60J106ME84</td>
<td>Murata</td>
</tr>
<tr>
<td>1</td>
<td>C5</td>
<td>150 µF</td>
<td>CAP, Tantalum Polymer, 150 µF, 10 V, +/- 20%, 0.005 ohm, 7343-31 SMD</td>
<td>7343-31</td>
<td>T530D157M010ATE005</td>
<td>Kemet</td>
</tr>
<tr>
<td>1</td>
<td>C6</td>
<td>22 µF</td>
<td>CAP, CERM, 22 µF, 6.3 V, +/- 20%, XSR, 0603</td>
<td>603</td>
<td>GRM188R60J226MEA0D</td>
<td>Murata</td>
</tr>
<tr>
<td>1</td>
<td>L1</td>
<td>0.47 µH</td>
<td>Inductor, Shielded, Composite, 470 nH, 3.5 A, 0.0076 ohm, SMD</td>
<td>4x4x1.5mm</td>
<td>XFL4015-471MEC</td>
<td>Coilcraft</td>
</tr>
<tr>
<td>1</td>
<td>R1</td>
<td>511 k</td>
<td>RES, 511 k, 1%, 0.1 W, 0402</td>
<td>402</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>1</td>
<td>R2</td>
<td>91.0 k</td>
<td>RES, 91.0 k, 1%, 0.1 W, 0402</td>
<td>402</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>2</td>
<td>R3, R5</td>
<td>1 M</td>
<td>RES, 1 M, 1%, 0.1 W, 0603</td>
<td>603</td>
<td>Std</td>
<td>Std</td>
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<tr>
<td>1</td>
<td>R4</td>
<td>100 k</td>
<td>RES, 100 k, 1%, 0.1 W, 0603</td>
<td>603</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>1</td>
<td>U1</td>
<td>-</td>
<td>IC, Single Inductor Buck-Boost Converter</td>
<td>3x2x1mm</td>
<td>TPS63802DLA</td>
<td>TI</td>
</tr>
</tbody>
</table>

**Revision History**

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

Changes from A Revision (February 2019) to B Revision

- Changed from: *Advanced Information* To: *Production data* ..................
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3.1 United States

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**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.

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- 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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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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4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

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