This document describes the characteristics, operation, and use of the TPS61099 evaluation module (EVM). The TPS61099 provides an ultra-low quiescent power supply solution for products powered by either a single-cell or two-cell alkaline, one-cell coin cell battery. The EVM only consumes 800-nA quiescent current under light-load conditions and can achieve up to 80% efficiency at a 10-µA load. It also supports the true shutdown function when disabled.

This EVM is also compatible for TPS61099x, which is a fixed \( V_{\text{OUT}} \) version. In this case, remove the feedback resistors and short the FB pin to GND.

### 1 Introduction

#### 1.1 Performance Specification

The TPS61099 EVM helps designers evaluate the operation and performance of the TPS61099x boost converter. The TPS61099 is an adjustable output version and the TPS61099x family is a fixed output version. See Table 1 for detailed information of each version. To achieve better performance, use a 1.0-\( \mu \text{H} \) inductor when output voltage is less than 3 V. Note that a 9-\( \mu \text{F} \) effective output capacitor is required for stability.

#### Table 1. Available Device Version

<table>
<thead>
<tr>
<th>Part Number</th>
<th>( V_{\text{OUT}} ) (V)</th>
<th>( L ) (( \mu \text{H} ))</th>
<th>( C_{\text{OUT}} ) (( \mu \text{F}, \text{Effective} ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPS61099</td>
<td>Adjustable</td>
<td>2.2&lt;sup&gt;(1)&lt;/sup&gt;</td>
<td>9</td>
</tr>
<tr>
<td>TPS610994</td>
<td>3.3</td>
<td>2.2</td>
<td>9</td>
</tr>
<tr>
<td>TPS610997</td>
<td>5.0</td>
<td>2.2</td>
<td>9</td>
</tr>
</tbody>
</table>

<sup>(1)</sup> When adjusting output voltage to less than 3 V, use a 1.0-\( \mu \text{H} \) inductor for better performance.
1.2 Application

This EVM is used in the following applications:

1. Memory LCD bias
2. Optical heart rate monitor LED bias
3. Wearable applications
4. Low-power wireless applications
5. Portable consumer or medical products
6. Battery-powered systems

2 Setup

This section describes how to properly use the TPS61099.

2.1 I/O Connector Descriptions

The following list describes the I/O connections:

- J1/J3 VIN / GND: Positive input connection from the input supply for the EVM
- J2 S+ / S–: Input voltage sense connections. Measure the input voltage at this point
- J4/J6 V_{OUT} / GND: Output connection of boost converter for the EVM
- J5 S+ / S–: V_{OUT} output voltage sense connection, measure the output voltage
- S+ / S– EN: EN connection of IC. Short to Vin enables IC. Short to GND disables IC.
3 Schematic and Bill of Materials

This section provides the TPS61099 schematic and bill of materials (BOM).

3.1 Schematic

Figure 1 illustrates the EVM schematic.

![Figure 1. TPS61099 Schematic](image-url)
3.2 TPS61099 Bill of Materials

Table 2 lists the TPS61099 BOM.

<table>
<thead>
<tr>
<th>Designator</th>
<th>Footprint</th>
<th>PartNumber</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>0603</td>
<td>GRM188R61E106MA73</td>
<td>CAP, CERM, 10 µF, 25 V, ±20%, X5R, 0603</td>
<td>10 µF</td>
</tr>
<tr>
<td>C2</td>
<td>0603</td>
<td>GRM188R61E106MA73</td>
<td>CAP, CERM, 10 µF, 25 V, ±20%, X5R, 0603</td>
<td>10 µF</td>
</tr>
<tr>
<td>C3</td>
<td>0603</td>
<td>GRM188R61E106MA73</td>
<td>CAP, CERM, 10 µF, 25 V, ±20%, X5R, 0603</td>
<td>10 µF</td>
</tr>
<tr>
<td>C4</td>
<td>0402</td>
<td>GRM1555C1H1000A001D</td>
<td>CAP, CERM, 10 pF, 50 V, ±5%, C0G/NP0, 0402</td>
<td>10 pF</td>
</tr>
<tr>
<td>C5</td>
<td>0603</td>
<td>GRM188R61E106MA73</td>
<td>CAP, CERM, 10 µF, 25 V, ±20%, X5R, 0603</td>
<td>10 µF</td>
</tr>
<tr>
<td>C6</td>
<td>7343-28</td>
<td>16TCQ150MYF</td>
<td>CAP, TA, 150 µF, 16V, +/-20%, 0.05 ohm, SMD</td>
<td>150 µF</td>
</tr>
<tr>
<td>C7</td>
<td>0805_HV</td>
<td>GRM21BR61A226ME44</td>
<td>CAP, CERM, 22 µF, 10 V, ±20%, X5R, 0805</td>
<td>22 µF</td>
</tr>
<tr>
<td>L1</td>
<td>1008</td>
<td>DFE252012P-2R2M-P2</td>
<td>Inductor, Shielded, 2.2 µH, 2.6 A, 0.07 ohm, SMD</td>
<td>2.2 µH</td>
</tr>
<tr>
<td>R1</td>
<td>0402</td>
<td>CRCW04021M00JNED</td>
<td>RES, 1.0 M, 5%, 0.063 W, 0402</td>
<td>1.0 Meg</td>
</tr>
<tr>
<td>R2</td>
<td>0402</td>
<td>CRCW0402249KFKED</td>
<td>RES, 249 k, 1%, 0.063 W, 0402</td>
<td>249 kΩ</td>
</tr>
<tr>
<td>U1</td>
<td>YFF0006AFAD</td>
<td>TPS61099YFFR</td>
<td>TPS61099, YFF0006AFAD</td>
<td></td>
</tr>
</tbody>
</table>

3.3 Modification With Different Versions

In case of an adjustable version, a 1.0-µH inductor is recommended for $V_{OUT} < 3$-V applications and a 2.2-µH inductor is recommended for other $V_{OUT}$ cases.

In the case of fixed versions of TPS610994 and TPS610997, remove divider resistor R1 and R2 and connect FB pin to GND.

3.4 Board Layout

Figure 2 through Figure 4 show the design of the TPS61099 EVM PCB layout. It is designed using a 2-layer PCB. Poor layout could lead to stability problems as well as EMI problems. Place the input and output capacitor, as well as the inductor, as close as to the IC as possible.
Revision History

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

Changes from Original (July 2016) to A Revision

- Changed L1 row in the TPS61099 Bill of Materials.

Page

4
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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.

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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:

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(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:

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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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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
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