The Texas Instruments LMR23630AEVM evaluation module (EVM) helps designers evaluate the operation and performance of the LMR23630A wide-input Simple Switcher® buck regulator. This document describes the setup and the input / output connections of the EVM. Included are the board layout, schematic, and bill of materials.

1 Introduction

The LMR23630 is a 36 V, 3 A step-down synchronous regulator with 75 µA quiescent current. With a wide input range from 4.5 V to 36 V, it is suitable for a wide range of applications from automotive to industry for power conditioning from unregulated sources. The LMR23630AEVM evaluation board is designed to provide the design engineer to evaluate the LMR23630 series operation and performance.

![Figure 1. LMR23630AEVM Board](image)

**EVM Features**

- 4.5 V to 36 V Input Voltage Range
- Jumper Selectable Output Options (5 V or 3.3 V)
- Up to 3 A Output Current
- Switching Frequency 400 kHz
- Frequency Synchronization to External Clock
- Hiccup Mode Short Current Protection

The EVM contains one DC-DC converter (See Table 1)

<table>
<thead>
<tr>
<th>CONVERTER</th>
<th>EVM</th>
<th>IC</th>
<th>PACKAGE</th>
</tr>
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<tr>
<td>U1</td>
<td>LMR23630AEVM</td>
<td>LMR23630A</td>
<td>HSOIC-8</td>
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Table 1. Device and Package Configurations
2 Setup

This section describes the jumpers and connectors on the EVM and how to properly connect, set up and use the LMR23630AEVM.

2.1 Input/Output Connector Description

VIN — Terminal TP6 – is the power input terminal for the converter. Adjacent to it is the GND reference ground. Use this terminal to attach the EVM to a cable harness.

VOUT — Terminal TP1 – is the regulated output voltage for the converter. Adjacent to it is the GND reference ground.

GND — Terminal TP4, TP7 – are the ground reference for the converter. Use these terminals to attach the EVM to a cable harness.

EN — Jumper J1 – is used to enable the switch-mode converter. The device will be enabled when the respective jumper is high or floating, and disabled when low. The EVM default system UVLO is 6.2 V (typical), it also can be programmed by changing R3 or R6. Refer to LMR23630A datasheet for enable and adjustable undervoltage lockout.

![Figure 2. Enable Jumper Setting](image)

SYNC — Jumper J2 – is used to synchronize the switching frequency to external clock. Refer to datasheet for detail application information.

Testpoint — TP2, TP3, TP5, TP8, TP9, TP10, TP11 – these are test points used for input/output voltage measurements and loop response measurements.

2.2 Adjusting the Output Voltage

The default setting output voltage is 5.0 V. Open J3 will change output voltage from 5 V to 3.3 V.

If other outputs need to be configured, then: open J3 and adjust the feedback resistors using the following equation.

\[
V_{\text{OUT}} = V_{\text{REF}} \times (1 + \left( \frac{R4}{R5} \right))
\]

where

- \(V_{\text{REF}}\) is 1 V

(1)

3 Board Layout

Figure 3 to Figure 6 show the board layout for the LMR23630AEVM. The PCB consists of a 4-layer design. 2-oz copper planes are applied on all four layers to dissipate heat with an array of thermal vias under the thermal pad to connect to all four layers.
Figure 3. Top Layer

Figure 4. Middle Layer 1
Figure 5. Middle Layer 2

Figure 6. Bottom Layer
Figure 7. LMR23630AEVM Schematic
<table>
<thead>
<tr>
<th>Designator</th>
<th>Description</th>
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Revision History

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

Changes from Original (June 2016) to A Revision

- Changed the minimum input voltage spec from 4V to 4.5V as required through the document. ........................................ 1
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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

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSS standard(s). 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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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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