# LMR16010PEVM User's Guide

The Texas Instruments LMR16010PEVM evaluation module (EVM) helps designers evaluate the operation and performance of the LMR16010 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 LMR16010 is a 60 V, 1 A step-down regulator with 40 µA quiescent current. With a wide-input range from 4.3 V to 60 V, it is suitable for a wide range of applications from automotive to industry for power conditioning from unregulated sources. The LMR16010PEVM evaluation board is designed to provide the design engineer with a fully functional power converter based on the buck topology to evaluate the LMR16010 series operation and performance.

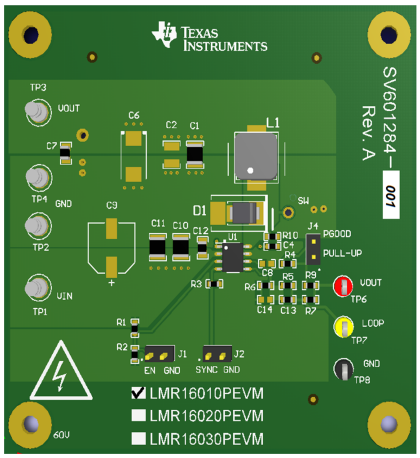


**Figure 1. LMR16010PEVM Board**

### EVM Features

- 7 V to 60 V Input Voltage Range
- 5 V Output Voltage
- Up to 1 A Output Current
- Switching Frequency 700 kHz
- Power Good Flag Output
- Internal Compensation

**NOTE: Risk of Electric Shock for Voltage Exceeding 50 VDC**

**Table 1. Device and Package Configurations**

| CONVERTER | EVM | IC | PACKAGE |
|---|---|---|---|
| U1 | LMR16010PEVM | LMR16010PDDAR | SO-8 |

# 2 Setup

This section describes the jumpers and connectors on the EVM and how to properly connect, set up and use the LMR16010PEVM.

## 2.1 Input/Output Connector Description

**VIN — Terminal TP1** – 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 TP3** – is the regulated output voltage for the converter. Adjacent to it is the GND reference ground.

**GND — Terminal TP2, TP4** – 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. EN turn on trip point also can be programmed by changing R1 or R2. Refer to LMR16010 datasheet for enable and adjustable under-voltage lockout.

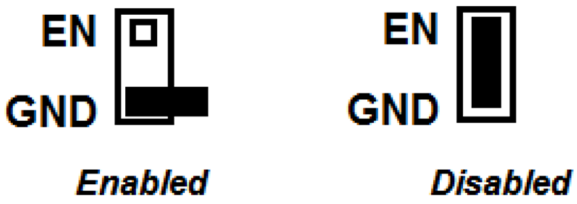


**Figure 2. Enable Jumper Setting**

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

**PGOOD — Jumper J4** – is used to monitor the Power-Good flag. This flag indicates whether the outputvoltage has reached its regulation point. The U1 PGOOD pin is an open-drain output that requires a pullup resistor to the appropriate logic voltage (any voltage less than 7 V). A pre-installed resistor R4 of 10.2 kΩ is tied to the PGOOD pin and R9 of 49.9 Ω brought out to J4 PULL-UP pin.

**Testpoint — TP6, TP7, TP8** – these are test points used for loop response measurements.

## 2.2 Adjusting the Output Voltage

The default setting output voltage is 5.0 V.

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

$$V_{OUT} = V_{FB} ( 1 + ( R5 / R6 ) ) \quad (1)$$

Where $V_{FB}$ is 0.75 V

CAUTION: R9 must be removed if the output voltage is changed higher than 7 V.

# 3 Board Layout

Figure 3 to Figure 6 show the board layout for the LMR16010PEVM. 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.

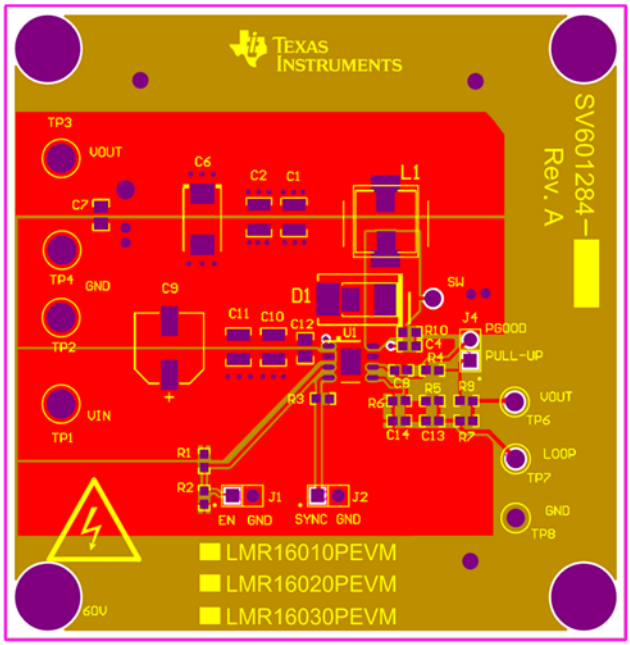


**Figure 3. Top Layer**

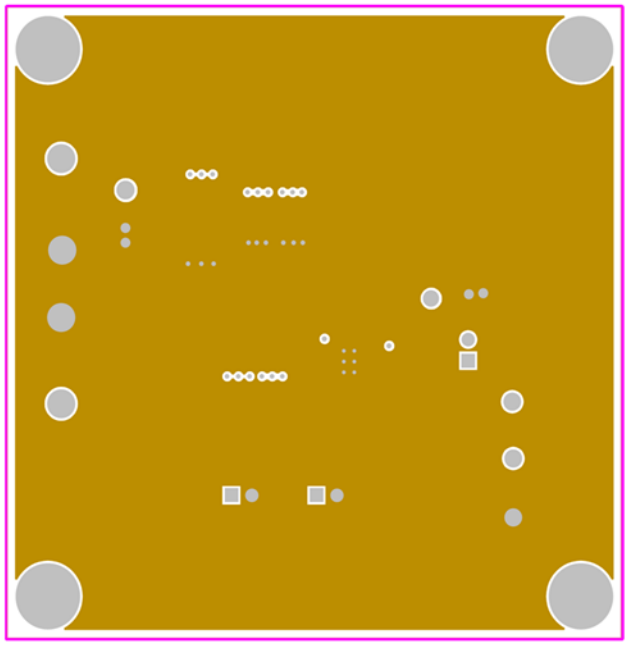

**Figure 4. Middle Layer 1**

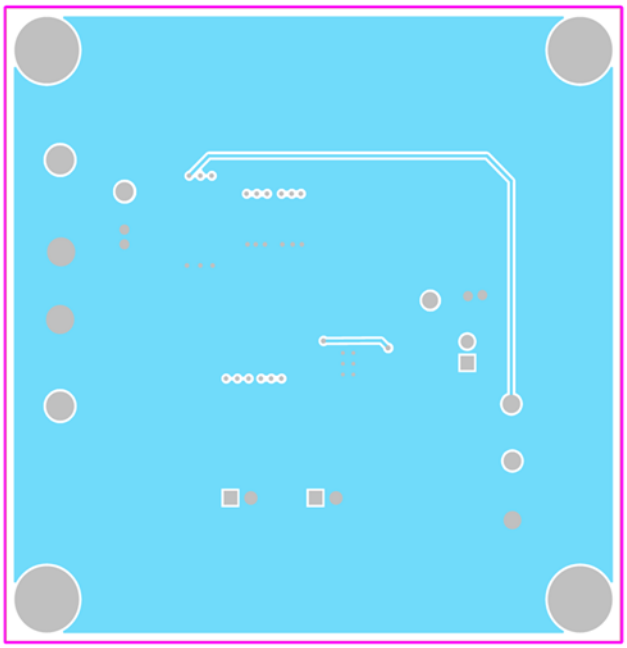

**Figure 5. Middle Layer 2**

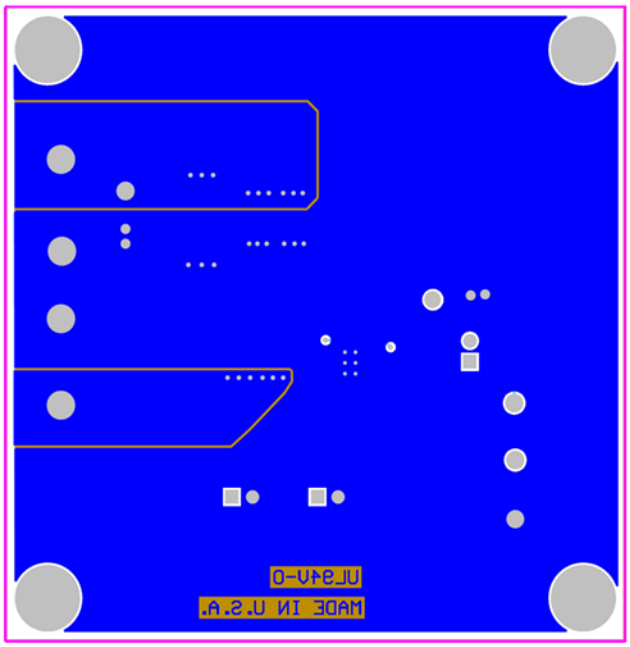

**Figure 6. Bottom Layer**

# 4 Schematic and Bill of Materials

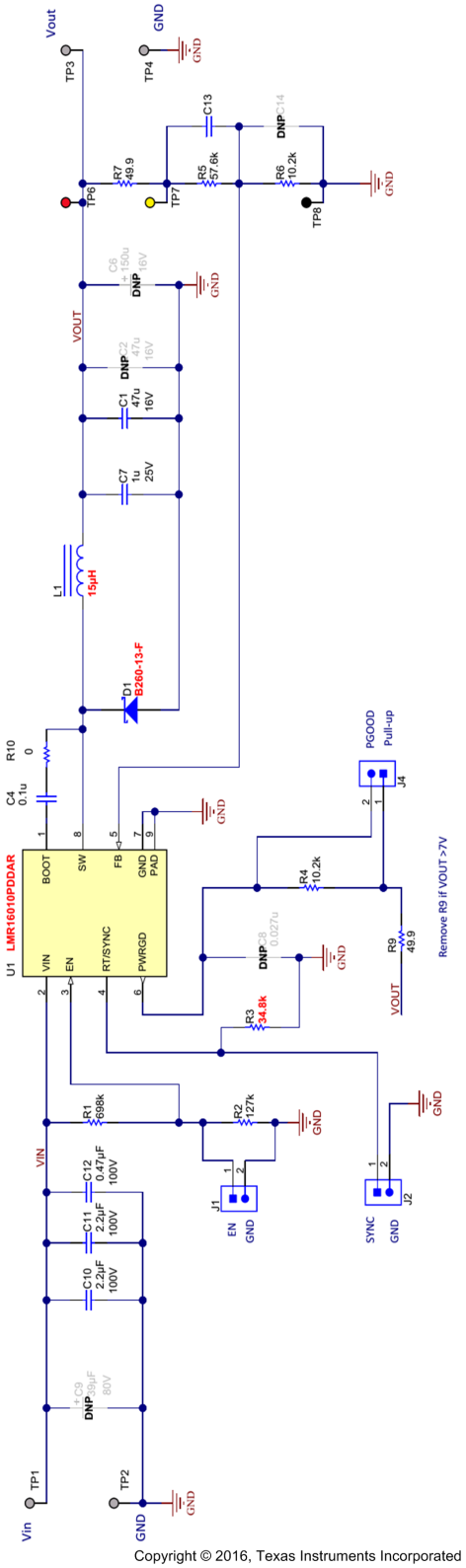


**Figure 7. LMR16010PEVM Schematic**

**Table 2. LMR16010PEVM Bill of Materials (BOM)**

| Designator | Description | Part Number | Footprint | Quantity |
|---|---|---|---|---|
| C1 | CAP, CERM, 47 µF, 16V, +/-20%, X5R, 1210 | GRM32ER61C476ME15L | 1210 | 1 |
| C4 | CAP, CERM, 0.1 µF, 16 V, +/- 10%, X7R, 0603 | GRM188R71C104KA01D | 0603 | 1 |
| C7 | CAP, CERM, 1 µF 25 V, +/- 10%, X7R, 0805 | GRM21BR71E105KA99L | 0805 | 1 |
| C10, C11 | CAP, CERM, 2.2 uF, 100 V, +/-10%, X7R, 1210 | GRM32ER72A225KA35L | 1210 | 2 |
| C12 | CAP, CERM, 0.47 µF, 100 V, +/- 10%, X7R, 0805 | GRM21BR72A474KA73L | 0805 | 1 |
| C13 | CAP, CERM, 33 pF, 50 V, +/- 5%, C0G/NP0, 0603 | C0603C330J5GACTU | 0603 | 1 |
| D1 | Diode, Schottky, 60 V, 2 A, SMB | B260-13-F | SMB | 1 |
| J1, J2, J4 | Header, 100 mil, 2x1, Gold, TH | TSW-102-07-G-S | TSW-102-07-G-S | 3 |
| L1 | Inductor, 15 uH, 1.6 A, 0.07 ohm | 7447779115 | WE-PD-M | 1 |
| R1 | RES, 698 k, 1%, 0.1 W, 0603 | CRCW0603698KFKEA | 0603 | 1 |
| R2 | RES, 127 k, 1%, 0.1 W, 0603 | CRCW0603127KFKEA | 0603 | 1 |
| R3 | RES, 34.8 k, 1%, 0.1 W, 0603 | CRCW060334K8FKEA | 0603 | 1 |
| R5 | RES, 57.6k, 1%, 0.1W, 0603 | CRCW060357K6FKEA | 0603 | 1 |
| R4, R6 | RES, 10.2 k, 1%, 0.1 W, 0603 | CRCW060310K2FKEA | 0603 | 2 |
| R7, R9 | RES, 49.9 ohm, 1%, 0.1W, 0603 | CRCW060349R9FKEA | 0603 | 2 |
| R10 | RES, 0 ohm, 5%, 0.1 W, 0603 | CRCW06030000Z0EA | 0603 | 1 |
| SH-J1 | Shunt, 100 mil, Flash Gold, Black | SPC02SYAN | SPC02SYAN | 1 |
| TP1, TP2, TP3, TP4 | Terminal, Turret, TH, Double | 1502-2 | Keystone1502-2 | 4 |
| TP6 | Test Point, TH, Multipurpose, Red | 5010 | Keystone5010 | 1 |
| TP7 | Test Point, TH, Multipurpose, Yellow | 5014 | Keystone5014 | 1 |
| TP8 | Test Point, TH, Multipurpose, Black | 5011 | Keystone5011 | 1 |
| U1 | IC, 60 V, 1 A, Low $I_Q$, Current Mode, Buck Regulator | LMR16010PDDAR | SO-8 | 1 |
| PCB | PCB, FR4, 4 Layers, Size 3000 x 3000 mil, Thickness 62 mil | SV601284A | | 1 |

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- *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.*
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**Concernant les EVMs avec antennes détachables**

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