

***TPS6101xEVM-157***  
***EVM User's Guide for High-Efficiency,  
Boost Converters***

*User's Guide*

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# Preface

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## ***About This Manual***

This user's guide describes the TPS6101xEVM-157 (SLVP157) evaluation module for high-efficiency boost converters.

## ***How to Use This Manual***

- Chapter 1 Introduction
- Chapter 2 Evaluation With the TPS6101xEVM-157
- Chapter 3 Printed Circuit Board (PCB) Layout

## ***Information About Cautions and Warnings***

This book may contain cautions and warnings.

**This is an example of a caution statement.**  
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**A warning statement describes a situation that could potentially cause harm to you.**

The information in a caution or a warning is provided for your protection. Please read each caution and warning carefully.

## ***Related Documentation From Texas Instruments***

- TPS6101x data sheet (literature number SLVS314)



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# Introduction

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The Texas Instruments TPS61010 to TPS61016 evaluation modules (EVM) helps designers evaluate the different operating modes and the performance of high-efficiency boost converters. Refer to Table 1–1 for the various EVMs available in this family.

If any other output voltage is to be evaluated, the TPS61010 adjustable version can be set up to provide an output voltage between 1.5 V and 3.3 V. Only the feedback resistor divider has to be adjusted. Also, other fixed output voltage versions of the devices can be easily evaluated using the EVM. Refer to the data sheet (SLVS314) for the various fixed output voltage options available in the TPS6101x device family.

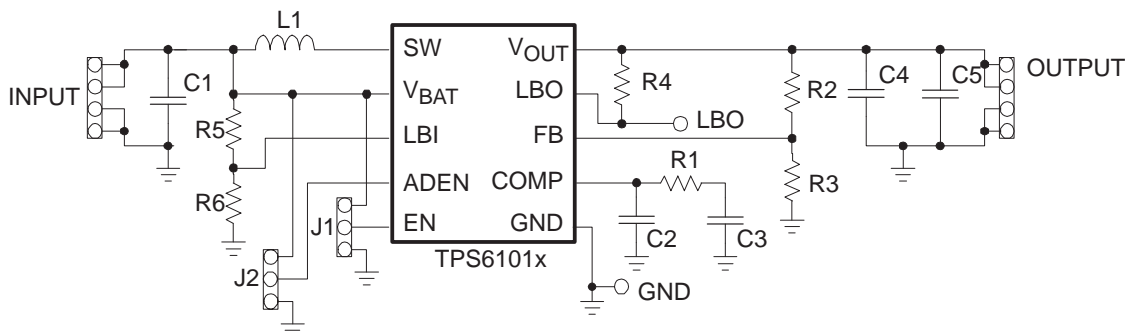
The TPS6101x has an input voltage range between 0.9 V and  $V_O$ . The maximum output current is at least 100 mA depending on the input voltage.

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## 1.1 SLVP157 EVM Schematic

Figure 1–1 shows the SLVP157 EVM schematic diagram.

Figure 1–1. SLVP157 EVM Schematic Diagram



## 1.2 SLVP157 EVMs Available

Table 1–1 lists the various EVMs available in the TPS6101xEVM-157 family.

Table 1–1. SLVP157 Orderable EVMs

EVM Number	Description
TPS61010EVM-157	Adjustable output voltage, set to 3.3 V
TPS61013EVM-157	2.5-V fixed output voltage
TPS61015EVM-157	3-V fixed output voltage
TPS61016EVM-157	3.3-V fixed output voltage



### 1.3 SLVP157 Bill of Materials

Table 1–2 lists materials required for the SLVP157 EVM. More details about the design and component selection for the dc-dc converter can be found in the data sheet (SLVS314).

Table 1–2. SLVP157 EVM Bill of Materials

Ref Des	Qty	Part Number	Description	MFG
C1	1	C3216X5R0J106	Capacitor, 10 $\mu$ F, X5R, 6.3 V, SMD 1206	TDK
C2	1		Capacitor, 10 pF, X7R, SMD 0805	
C3	1		Capacitor, 10 nF, X7R, SMD 0805	
C4	1	C4532X5R1A226M	Capacitor, 22 $\mu$ F, X5R, 6.3 V, SMD 1812	TDK
C5			Not Used	
J1, J2	1		Header 1 x 3, 0.1" pitch, with jumper	
L1	1	CDRH6D38-100	Coil	Sumida
R1	1		Resistor, 100 k $\Omega$ , 1%, SMD 0805	
R2	1		Resistor, 1 M $\Omega$ , 1%, SMD 0805 Not used with fixed output voltage versions	
R3	1		Resistor, 180 k $\Omega$ , 1%, SMD 0805 Not used with fixed output voltage versions	
R4	1		Resistor, 1 M $\Omega$ , 1%, SMD 0805	
R5	1		Resistor, 390 k $\Omega$ , 1%, SMD 0805	
R6	1		Resistor, 470 k $\Omega$ , 1%, SMD 0805	
GND, LBO	2		Test points	
INPUT, OUTPUT	2		Header 1 x 4, 0.1" pitch	
U1	1	TPS61010DGS	IC, high-efficiency boost converter, adjustable version, MSOP10	Texas Instruments
		TPS61013DGS	IC, high-efficiency boost converter, 2.5-V fixed output voltage version, MSOP10	Texas Instruments
		TPS61015DGS	IC, high-efficiency boost converter, 3-V fixed output voltage version, MSOP10	Texas Instruments
		TPS61016DGS	IC, high-efficiency boost converter, 3.3-V fixed output voltage version, MSOP10	Texas Instruments

## 1.4 Setup of the EVMs

It is important to establish all connections to the EVM before the power supply connected to the EVM is turned on.

- 1) Connect a power supply ( $0.9\text{ V}$  to  $V_O$ , depending on the output voltage of the EVM) to the INPUT header.
- 2) Connect a voltmeter to the OUTPUT header.
- 3) Verify that the jumper, J1, is set to EN.
- 4) Verify that the jumper, J2, is set to TBD.
- 5) Turn on the power supply and verify the output voltage.

# Evaluation With the TPS6101xEVM-157

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This chapter details the evaluation process and features of the EVM. For this evaluation, a load is connected to the output terminal in order to adjust the load current between 0 mA and 250 mA.

For accurate output voltage and input voltage measurements, it is important to measure the voltage on the input and output voltage terminals with kelvin contacts or with a voltmeter connected directly to the input voltage or output voltage terminals. This will eliminate any measurement errors related to voltage drops along the input and output terminal wires connected to the power supply or load.

The EVM has additional pins to allow the user to assemble an additional output capacitor, C5, onto the PCB for further evaluation purposes.

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## 2.1 Enable (EN) Jumper

This jumper is used to enable the device. Connecting the EN pin to  $V_{BAT}$  (i.e. setting jumper to EN) will enable the part.

## 2.2 Auto Discharge Enable (ADEN) Jumper

This jumper enables the device to discharge the output capacitor after the device is disabled by setting EN to GND. If ADEN is connected to  $V_{BAT}$  (jumper set to ADEN), the capacitors connected to  $V_{OUT}$  will be discharged by an internal switch with a resistance of  $300\ \Omega$ . The discharge time depends on the total output capacitance. The residual output voltage will be less than  $0.4\ V$  after auto discharge.

When disabling the auto discharge function with the jumper, the output capacitors will only be discharged by the load and/or by the leakage currents in every connected part.

## 2.3 LBI/LBO Comparator

The LBO terminal is an open drain output and has a pullup resistor, R4, connected to the output. The signal on this pin will go low as soon as the input voltage at LBI falls below the threshold of  $500\ mV$ . LBO will stay at high impedance when the input voltage at LBI is above the threshold. A resistor divider (R5, R6) is used on the EVM to monitor the supply voltage. As a default on the EVM, the LBO output will go low when the supply voltage falls below  $0.9\ V$ . More details about setting the low battery threshold voltage can be found in the data sheet (SLVS314).

# PCB Layout

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Just as for all switch mode power supplies, the PCB layout is a critical step in the power supply design process. The following figures show the layout for the adjustable and fixed output voltage EVMs. Refer to the data sheet (SLVS314) for further layout guidelines. The required board area for the complete dc-dc converter solution is less than 418 mm<sup>2</sup> (19 mm x 21 mm) on a double-sided PCB, as indicated by the rectangle on the component placement figure.

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### 3.1 PCB Layout of the TPS6101xEVM-157 (SLVP157)

Figure 3–1. Component Placement

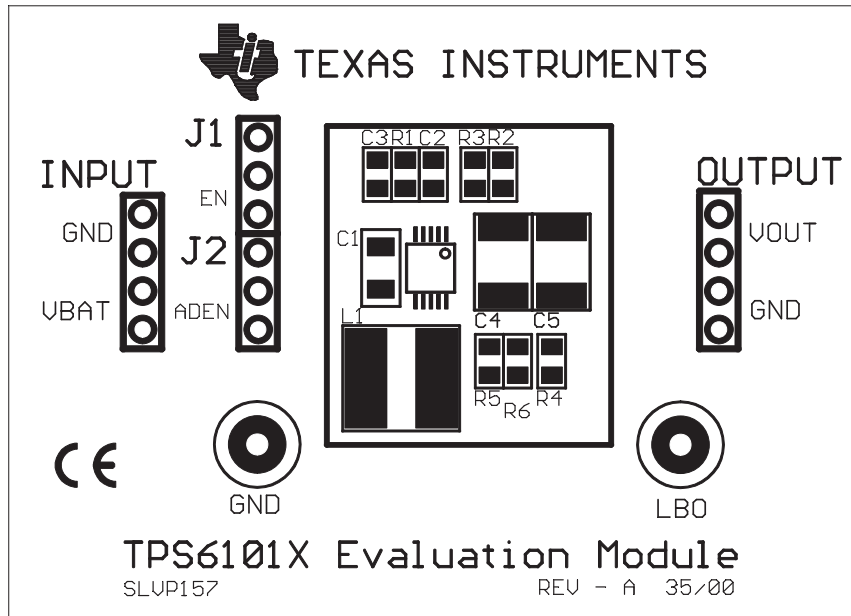


Figure 3–2. Top Layer

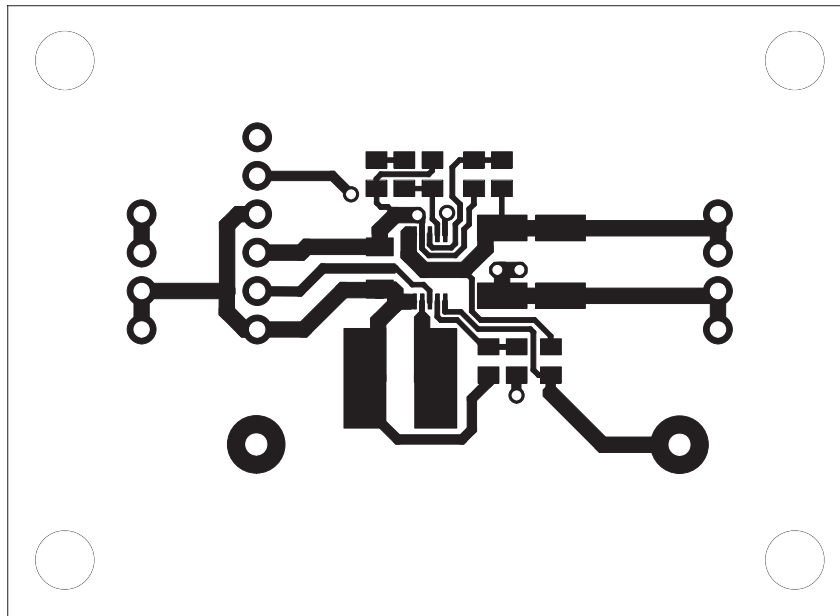


Figure 3–3. Bottom Layer

