

# **TPS61236EVM-676 Evaluation Module**

This user's guide describes the characteristics, operation, and use of the TPS61236EVM-676 evaluation module (EVM). This EVM contains the adjustable version device TPS61236, of which the output voltage can be set by the feedback resistors.

The EVM can also be used to evaluate the fixed version device TPS61235RWL. In this case, the feedback resistors should be removed and the FB pin of the device should connect directly to the  $V_{OUT}$  pin.

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## **1 Introduction**

The section contains the background, electrical performance, and components selection of TPS61236EVM-676.

### **1.1 Description**

This TPS61236EVM-676 steps up the lithium-ion battery voltage to a 5-V output. The goal of the EVM is to facilitate evaluation of the TPS61236RWL power supply solution. The EVM uses the TPS61236RWL adjustable output boost converter, input and output capacitors, inductor, and the appropriate feedback resistor to provide 5 V.

## 1.2 Performance Specification

Table 1 provides a summary of the TPS61236EVM-676 performance specifications. All specifications are given for an ambient temperature of 25°C.

**Table 1. Performance Specification Summary**

Specification	Test Condition	Min	Typical	Max	Unit
Input voltage		2.3		4.4	V
Output voltage	$V_{IN} = 3.6\text{ V}, I_{OUT} < 3.5\text{ A}$		5.0		V
Output current	$V_{IN} = 3\text{ V}$		3		A

## 1.3 Modification

The printed-circuit board (PCB) for this EVM is designed to accommodate some modifications by the user. The external component can be changed according the real application.

### 1.3.1 Input Capacitor and Output Capacitor

A 150- $\mu\text{F}$  tantalum capacitor is added as the input capacitor in the EVM. The ESR of the tantalum capacitor is 0.1  $\Omega$ , which helps to damp the ringing in the input voltage when the EVM is powered by a power supply with a long cable. The capacitor is not required for proper operation and can be removed in a real application.

C9, C10, C11, C12, and C13 are provided for additional output capacitors. These capacitors are not required for proper operation but can be used to reduce the output voltage ripple and to improve the load transient response. The total output capacitance must remain within the recommended range in the data sheet for proper operation.

### 1.3.2 Current Limit Resistor and Capacitor

The output current of the device can be limited by a resistor CC pin. The output current limit value is defined by Equation 1 from datasheet. In the EVM, this resistor is set to zero, so the device current limit is determined by the internal valley current.

$$I_{OUT} = \frac{1.244}{R_{LIM}} \times 100000 \quad (1)$$

If a resistor higher than zero is used to limit the output current, a capacitor must be connected in parallel to average the CC pin voltage. Normally, a 10-nF capacitor is recommended.

### 1.3.3 Feedforward Capacitor

A feedforward capacitor, C5 in Figure 1, is used to improve the transient response of the boost converter. Refer to application note [SLVA289](#) for the method of optimizing this capacitor.

### 1.3.4 Snubber RC Circuit

R2 and C4 are to reduce the voltage spike and oscillation in the SW pin. The snubber circuit slows down the SW pin voltage transition rate and helps on the EMI performance. They are not installed in the EVM.

## 2 Setup

This section describes how to properly setup the TPS61236EVM-676. To operate the EVM, set jumpers J4 and J5 to the desired positions per [Section 2.1](#). Connect the input supply to J1 and J3 and connect the load to J6 and J8.

### 2.1 Input/Output Connector Descriptions

Input and output connector descriptions are provided in the following list:

<b>J1- <math>V_{IN}</math></b>	Positive input connection from the input supply for the EVM
<b>J2- S+/S-</b>	Input voltage sense connections. Measure the input voltage at this point.
<b>J3- GND</b>	Return connection from the input supply for the EVM
<b>J4- EN</b>	J4-EN Connect to the EN pin of the IC, short to J4-VIN to enable the IC; short to J4-GND to disable the IC.
<b>J5</b>	Pullup power for INACT pin, could be $V_{IN}$ or $V_{OUT}$
<b>TP1</b>	Test point of INACT pin
<b>J6- <math>V_{OUT}</math></b>	Output voltage connection
<b>J7- S+/S-</b>	Output voltage sense connections. Measure the output voltage at this point.
<b>J8- GND</b>	Output returns connection

## 3 Test Result

Refer to the TPS6123x datasheet ([SLVSCK4](#)), application performance curves for the test result.

## 4 Schematic, Bill of Materials, and PCB Layouts

This section provides the TPS61236EVM-676 schematic and bill of materials (BOM).

### 4.1 Schematic

Figure 1 illustrates the TPS61236EVM schematic.

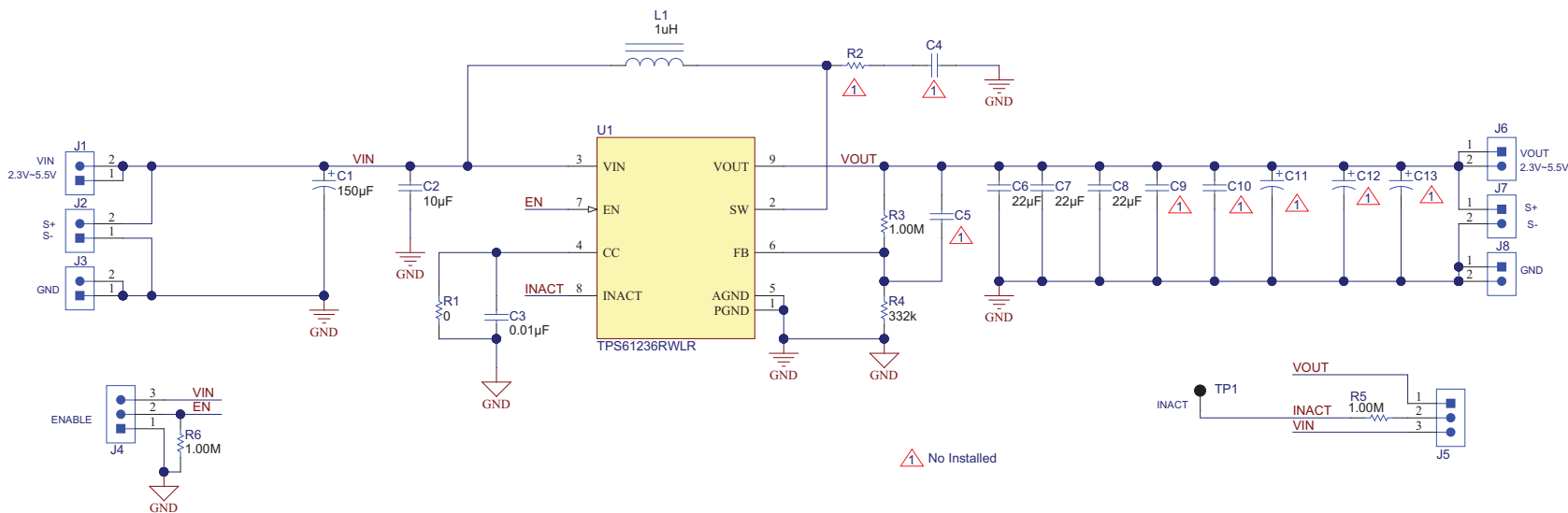


Figure 1. TPS61236EVM Schematic

## 4.2 Bill of Materials

Table 2 lists the TPS61236EVM BOM.

**Table 2. TPS61236EVM BOM**

Designator	Qty	Value	Description	Package Ref.	Part Number	Manufacturer
C1	1	150uF	CAP, TA, 150uF, 10V, +/-10%, 0.1 ohm, SMD	7343-31	T495D157K010ATE100	Kemet
C2	1	10uF	CAP, CERM, 10uF, 6.3V, +/-20%, X5R, 0603	0603	GRM188R60J106ME84	MuRata
C3	1	0.01uF	CAP, CERM, 0.01 uF, 50 V, +/- 10%, X5R, 0603	0603	GRM188R61H103KA01D	MuRata
C6, C7, C8	3	22uF	CAP, CERM, 22uF, 10V, +/-20%, X5R, 0805	0805	GRM21BR61A226ME44	MuRata
L1	1	1uH	Inductor, Shielded, Composite, 1uH, 21.8A, 0.00455 ohm, SMD	XAL7030	XAL7030-102MEB	Coilcraft
R1	1	0	RES, 0, 5%, 0.1 W, 0603	0603	RC0603JR-070RL	Yageo America
R3, R5, R6	3	1.00Meg	RES, 1.00 M, 1%, 0.1 W, 0603	0603	CRCW06031M00FKEA	Vishay-Dale
R4	1	332k	RES, 332 k, 0.5%, 0.1 W, 0603	0603	RT0603DRE07332KL	Yageo America
U1	1		7-A Synchronous Boost Converter with Programmable Output Current Limit	RWL0009A	TPS61236RWLR	Texas Instruments
J4, J5	2		Header, 100mil, 3x1, Gold, TH	3x1 Header	TSW-103-07-G-S	Samtec
J1, J2, J3, J6, J7, J8	6		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec
C4, C5, C9, C10, C11, C12, C13, R2	Null					

### 4.3 Board Layout

Figure 2 and Figure 3 illustrate the PCB layouts for this EVM.

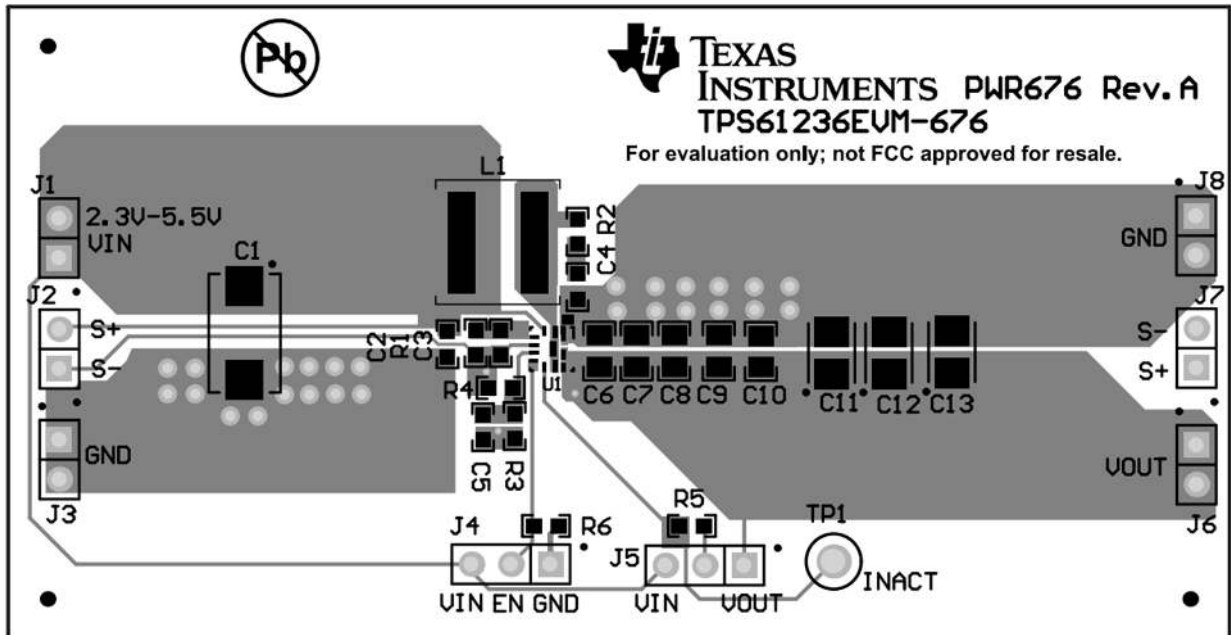


Figure 2. TPS61236EVM Silkscreen and Top Layer

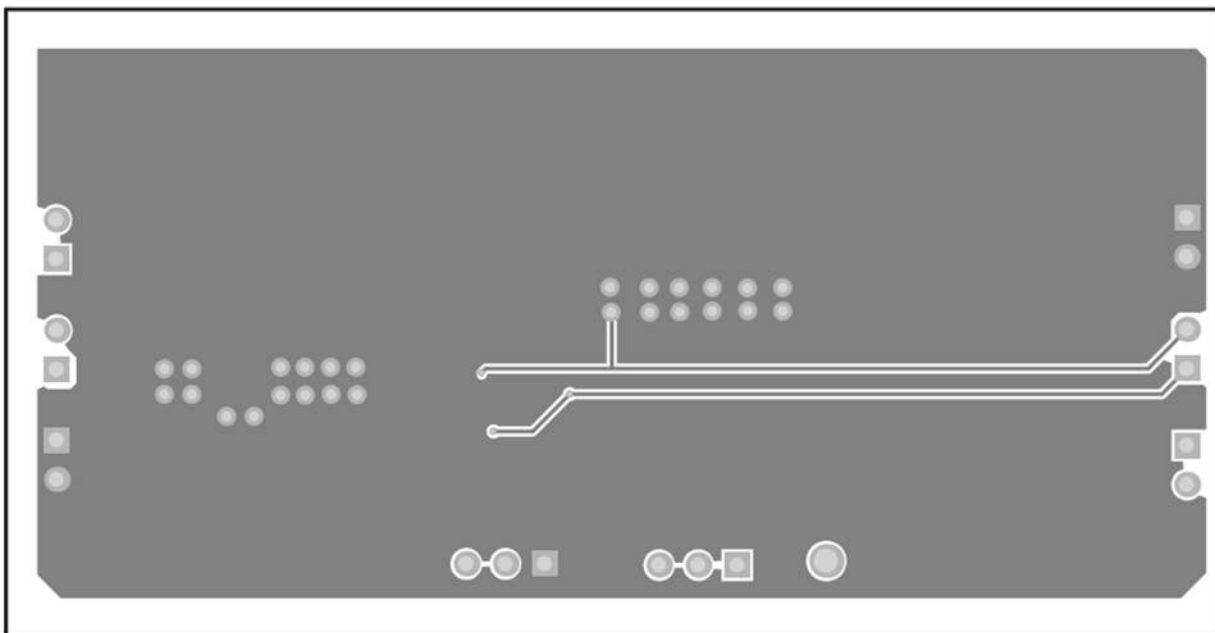


Figure 3. TPS61236EVM Bottom Layer

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## Revision History

<b>Changes from Original (March 2015) to A Revision</b>	<b>Page</b>
• Changed first paragraph in the <i>Description</i> section.....	1
• Changed input voltage <i>MAX</i> value to 4.4 in <i>Performance Specification Summary</i> table. ....	2

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

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- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
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