User's Guide
SLVU144–January 2007

TPS6108xEVM-147

This user's guide describes the characteristics, operation, and use of the TPS61081EVM-147 evaluation module (EVM). This EVM contains the Texas Instruments high-efficiency boost converter that is configured to provide a regulated 12-V output voltage from a Li-ion battery, 3.3-V or 5-V input power supply. The user's guide includes a schematic diagram, bill of materials (BOM), and test data.

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1 Introduction

This section contains background information for the TPS61080EVM-147 and TPS61081EVM-147 evaluation modules.

1.1 Background

This TPS6108xEVM-147 uses either a TPS61080 or TPS61081 boost converter to step up 2.5-V to 6-V input voltages to 12 V. The goal of the EVM is to facilitate evaluation of the TPS61081 power supply solution. The EVM uses the TPS61080 or TPS61081 adjustable output boost converter and the appropriate feedback components to provide 12 V.

1.2 Performance Specification Summary

Table 1 provides a summary of the TPS6108xEVM performance specifications. All specifications are given for an ambient temperature of 25°C.

Table 1. Performance Specification Summary

SPECIFICATION	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{IN}		2.5		6	V
V_{OUT} [(1)]	TPS61080EVM, V_{IN} = 3.6 V +/- 5%, I_{OUT} < 55 mA, f_{SW} = 1.2 MHz	11.66	12	12.58	V
	TPS61081EVM, V_{IN} = 3.6 V +/- 5%, I_{OUT} < 250 mA, f_{SW} = 1.2 MHz	11.66	12	12.58	V

(1) Min and Max values include 1% resistor tolerance as well as IC reference tolerance.

1.3 Modifications

Because the primary goal of the EVM is to demonstrate the small size of the TPS6108x power supply solution, capacitors and inductors with small footprints were chosen. These capacitors and inductors were carefully selected to maximize efficiency and minimize ripple while minimizing overall solution size. Changing components could improve or degrade EVM performance.

This EVM can be used to power an external WLED string. The user should connect the string between jumpers J3 and J5, populate resistor R7 with a 0-Ω resistor, remove resistor R1 and capacitor C2, and properly size resistors R2 and R5 as explained in the data sheet. In addition, components R6, R8, and C6 can be used to implement analog dimming as explained in the data sheet.

2 Setup and Test Results

This section describes how to properly connect, set up, and use the TPS6108xEVM.

2.1 Input/Output Connections

The connection points are described in the following paragraphs.

2.1.1 J1-VIN

This header is the positive connection to the input power supply. The leads to the input supply should be twisted and kept as short as possible.

2.1.2 J2-GND

This header is the return connection to the input power supply.

2.1.3 J3-VOUT

This header is the positive output for the device.

2.1.4 J4-GND

This header is the return connection for the load.

2.1.5 J5-FB

This header connects to pin 5, FB, on the IC through resistors R4 and R7. Resistor R7 should only be populated with a 0-Ω resistor when connecting white light LEDs.

2.1.6 J6-DIM

If components R6, R8, and C6 are properly sized, an external dc voltage source or function generator can be connected to this header and ground to provide analog dimming.

2.1.7 JP1-ENable

Installing this jumper ties the EN pin to V_{IN}, thereby enabling the device. Removing the jumper allows the internal pulldown resistor to pull EN to ground, thereby disabling the device.

2.1.8 JP2-FSW

The middle pin of this jumper connects to the FSW pin of the IC. Placing this jumper across pins 1 and 2 ties the FSW pin to V_{IN}, thereby implementing a 1.2-MHz switching frequency. Placing this jumper across pins 2 and 3 ties the FSW pin to ground, thereby implementing a 600-kHz switching frequency.

2.2 EVM Operation

The user must connect an input power supply set between 2.5 V and 6 V between headers J1 and J2 in order for the EVM to operate. The absolute maximum input voltage is 7 V. The user can connect a load resistance between headers J3 and J4. Alternatively, the user can connect a WLED string between jumpers J3 and J5, populate resistor R7 with a 0-Ω resistor, remove resistor R1 and capacitor C2, and properly size resistors R2 and R5 as explained in the datasheet. Short jumper JP1 to enable the device.

2.3 Test Results

Figure 1 shows the test results using this EVM.

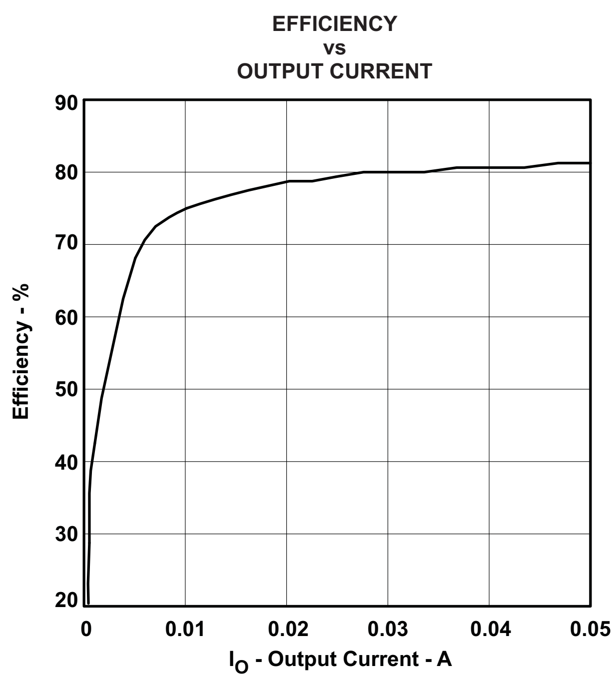

Figure 1. TPS61080 Efficiency With V_{IN} = 3.6 V and CDRH4D16NP-4R7 Inductor

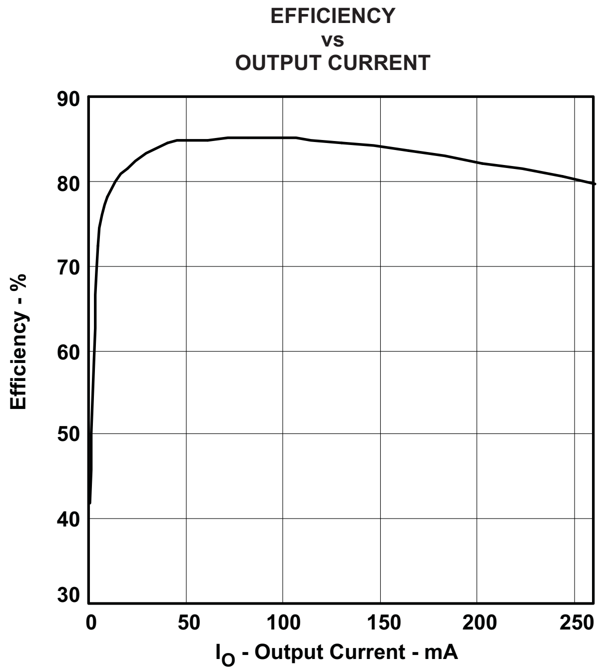

Figure 2. TPS61081 Efficiency With V_{IN} = 3.6 V and VLCF5020T-4R7N1R7-1 Inductor

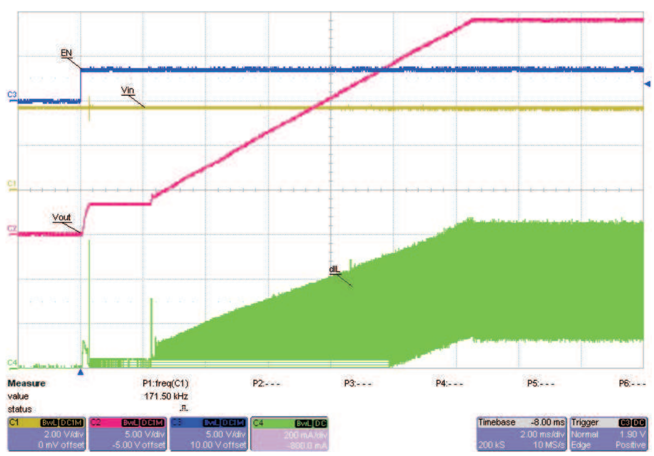

Figure 3. TPS61080 Start-Up With V_{IN} = 3.6 V and I_{OUT} = 50 mA

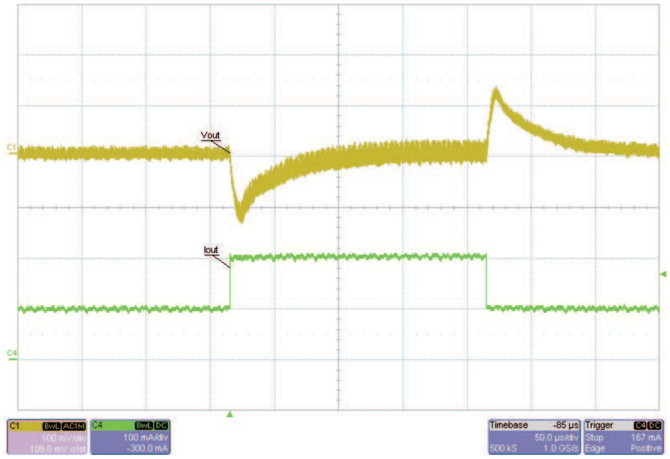

Figure 4. Load Transient Response From 100 mA to 200 mA With C4 = 10 µF and C3 = 82 pF

3 Board Layout

This section provides the TPS6108xEVM board layout and illustrations.

3.1 Layout

Board layout is critical for all switch-mode power supplies. Figure 5, Figure 6, and Figure 7 show the board layout for the HPA147 PWB. The switching nodes with high-frequency noise are isolated from the noise-sensitive feedback circuitry, and careful attention has been given to the routing of high-frequency current loops. See the data sheet for further layout guidelines.

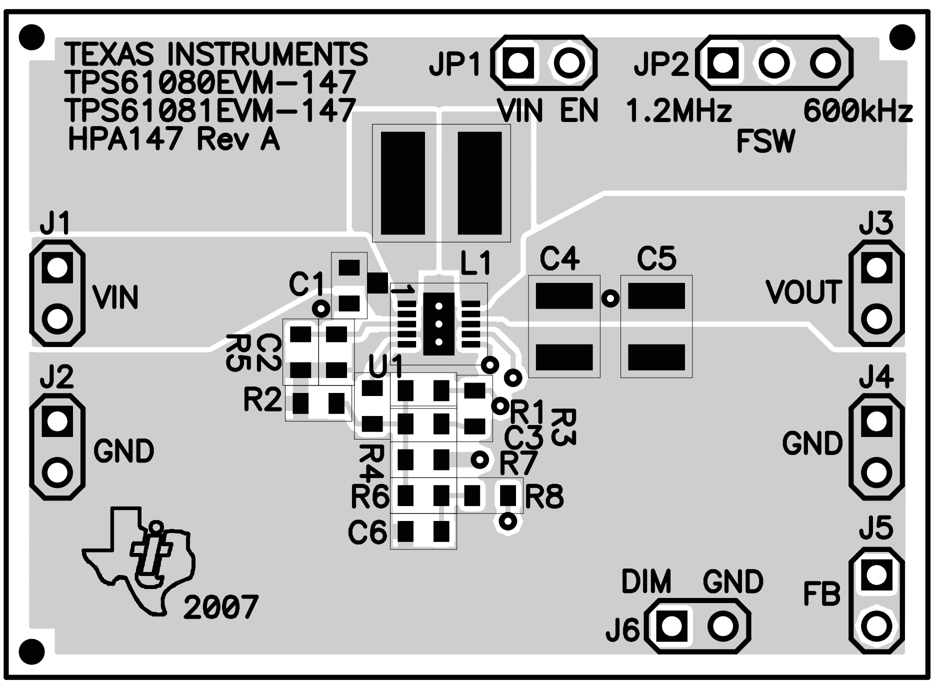

Figure 5. Top Assembly Layer

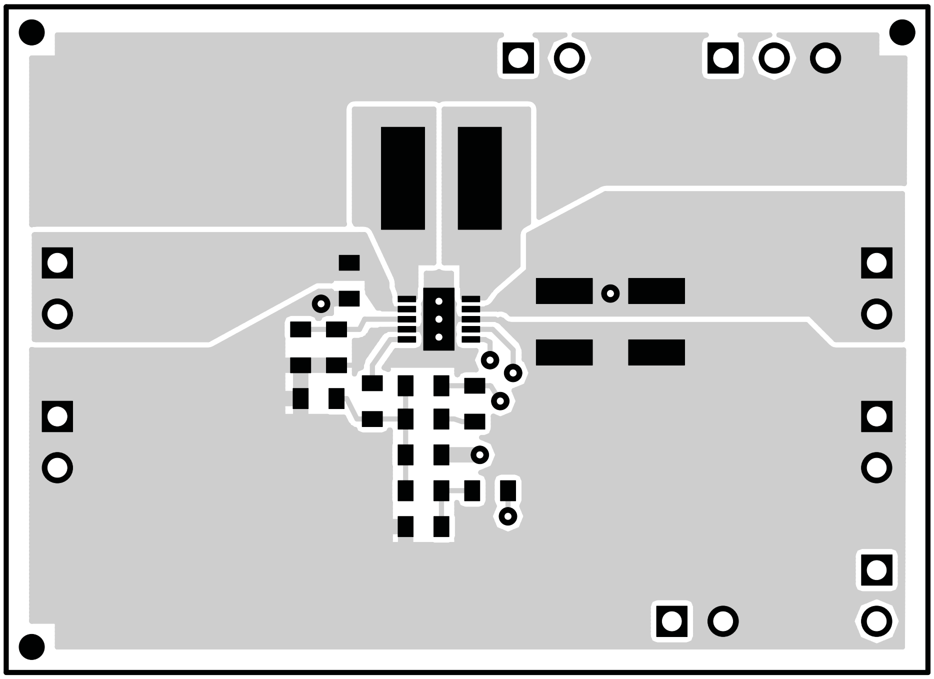

Figure 6. Top Layer Routing

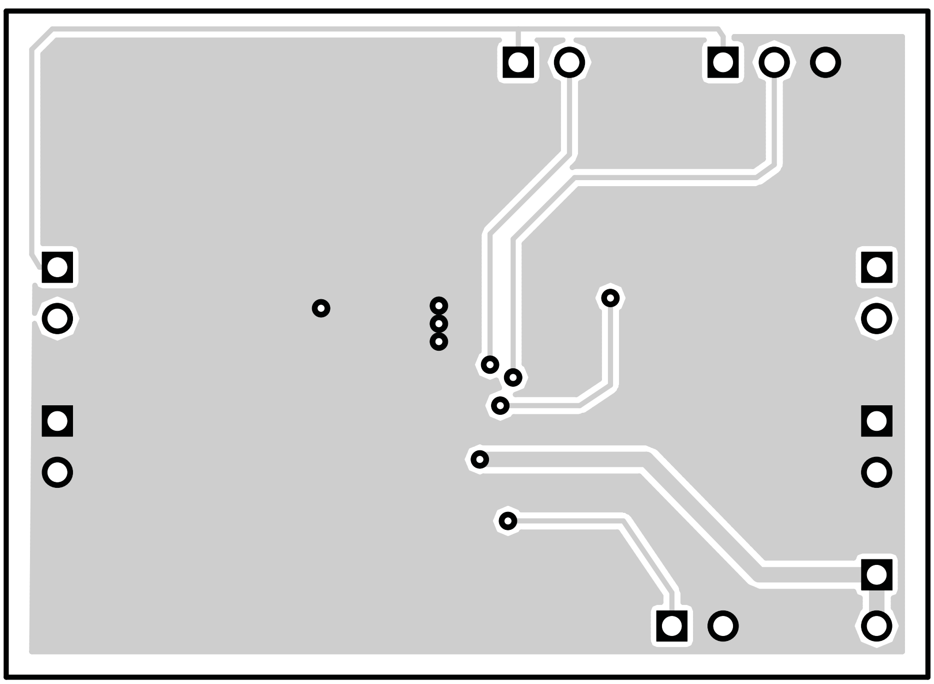

Figure 7. Bottom Layer Routing

4 Bill of Materials and Schematic

This section provides the TPS6108xEVM-147 bill of materials and schematics.

4.1 Bill of Materials

Table 2. Bill of Materials

HPA147A BOM							
Count							
-001	-002	RefDes	Value	Description	Size	Part Number	Mfr
1	1	C1	4.7	Capacitor, Ceramic, 6.3V, X5R, 20%	0603	C1608X5R0J475M	TDK
1	1	C2	0.047µF	Capacitor, Ceramic, 50V, X5R, 10%	0603	C1608X5R1H473KT	TDK
1	1	C3	33pF	Capacitor, Ceramic, 50V,C0G, 5%	0603	C1608C0G1H330JT	TDK
1	1	C4	4.7µF	Capacitor, Ceramic, 50V, X7R, 10%	1210	GRM32ER71H475K A88L	Murata
0	0	C5	Open	Capacitor, Ceramic	1210		
0	0	C6	Open	Capacitor, Ceramic	0603		
6	6	J1-J6		Header, 2 pin, 100mil spacing, (36-pin strip)	0.100 x 2	PTC36SAAN	Sullins
1	1	JP1		Header, 2 pin, 100mil spacing, (36-pin strip)	0.100 x 2	PTC36SAAN	Sullins
1	1	JP2		Header, 3 pin, 100mil spacing, (36-pin strip)	0.100 x 3	PTC36SAAN	Sullins
1	0	L1	4.7µH	Inductor, SMT, 0.95A, 125 milliohm	4.8mm x 4.8mm	CDRH4D16NP-4R7	Sumida
0	1	L1	4.7µH	Inductor, SMT, 1.7A, 122 milliohm	0.157 x 0.157	VLCF5020T-4R7N1R7-1	TDK
1	1	R1	442k	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	1	R2	49.9k	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	1	R3	0	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	1	R4	100	Resistor, Chip, 1/16W, 1%	0603	Std	Std
0	0	R5-R8	Open	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	0	U1		IC, 1.2MHz/600kHz High Voltage DC/DC Boost Converter, 0.5A Integrated Switch	DRC10	TPS61080DRC	TI
0	1	U1		IC, 1.2MHz/600kHz High Voltage DC/DC Boost Converter, 1.2A Integrated Switch	DRC10	TPS61081DRC	TI
1	1	–		PCB, 1.8 in. x 1.1 in. x 0.062 in.		HPA147	Any
2	2	–		Shunt, 100mil, Black	0.100	929950-00	3M

4.2 Schematic

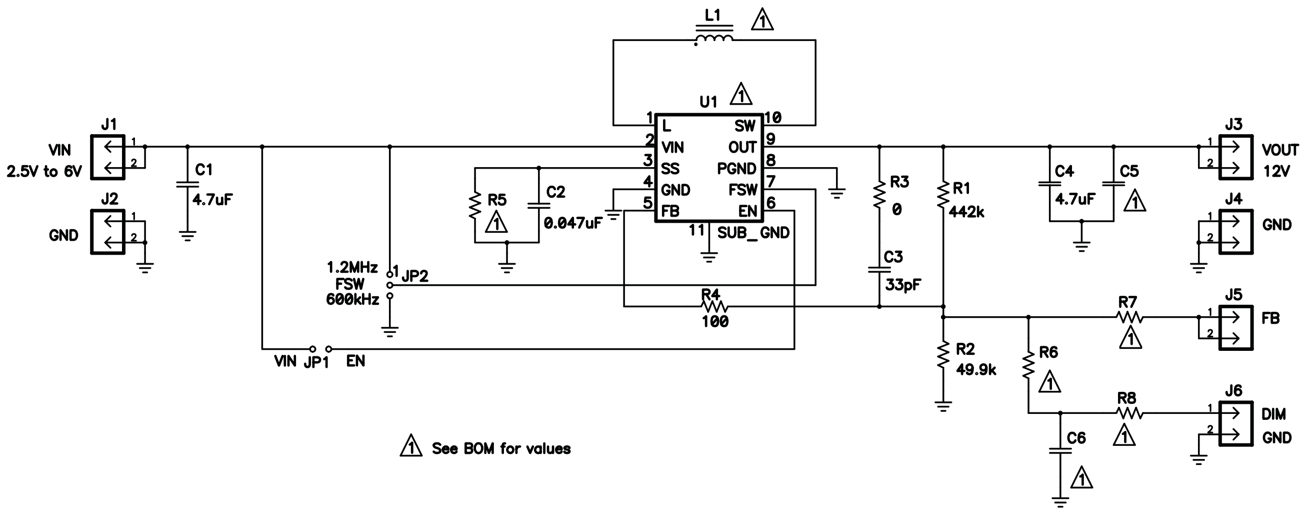

Figure 8. TPS6108xEVM-147 Schematic

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 2.5 V to 6 V and the output voltage range of up to 27 V, but 12 V as configured.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than 125° C. The EVM is designed to operate properly with certain components above 85° C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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