

# TPS62097EVM-651 Evaluation Module

The TPS62097EVM-651 facilitates the evaluation of the TPS62097. The EVM outputs a 1.2-V output voltage at up to 2-A of output current from input voltages between 2.5 V and 6 V.

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## 1 Introduction

The TPS62097 is a synchronous, step-down converter in a 2- x 2- x 1-mm package. It contains a selectable switching frequency and has a forced PWM mode option for low noise applications.

### 1.1 Performance Specification

Table 1 provides a summary of the TPS62097EVM-651 performance specifications.

**Table 1. Performance Specification Summary**

Specification	Test Conditions	Min	Typ	Max	Unit
Input voltage		2.5	5	6	V
Output voltage setpoint			1.2		V
Output current		0		2000	mA

## 1.2 Modifications

The printed-circuit board (PCB) for this EVM is designed to accommodate both the fixed and adjustable voltage versions of this integrated circuit (IC). Additional input and output capacitors can also be added. Finally, the loop response of the IC can be measured, the soft start time can be changed, and the switching frequency can be selected.

### 1.2.1 Fixed Output Voltage Operation

U1 can be replaced with the fixed output voltage version of the IC for evaluation. For fixed output voltage version operation, replace R2 with a 0- $\Omega$  resistor and remove R1.

### 1.2.2 Input and Output Capacitors

C5 is provided for an additional input capacitor. This capacitor is not required for proper operation but can be used to reduce the input voltage ripple.

C6, C7, and C8 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.

### 1.2.3 Loop Response Measurement

The loop response of the TPS62097EVM-651 can be measured with two simple changes to the circuitry. First, install a 1- $\Omega$  resistor across the pads in the middle of the back of the PCB. The pads are spaced to allow installation of an 0603-sized resistor. Second, cut the short section of trace between pin 3 and the via. This change is shown in [Figure 1](#). With these changes, an ac signal (10-mV, peak-to-peak amplitude recommended) can be injected into the control loop across the added resistor. Details of measuring the control loop of DCS-Control devices are found in [SLVA465](#). The results of this test are shown in [Figure 3](#).



**Figure 1. Loop Response Measurement Modification**

### 1.2.4 Soft Start Capacitor

C3 sets a soft start time of about 1 msec. This capacitor can be changed to set other soft start times. See the device data sheet for details.

### 1.2.5 MODE Resistor

R4 selects a switching frequency of about 1.5 MHz when the MODE jumper is connected between MODE and PWM. This resistor can be changed to select other switching frequencies. See the device data sheet for details.

## 2 Setup

This section describes how to properly use the TPS62097EVM-651.

### 2.1 Input/Output Connector Descriptions

<b>J1 – VIN</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 – VOUT</b>	Output voltage connection
<b>J5 – S+/S-</b>	Output voltage sense connections. Measure the output voltage at this point.
<b>J6 – GND</b>	Output return connection
<b>J7 – PG/GND</b>	The PG output appears on pin 1 of this header with a convenient ground on pin 2
<b>JP1 – EN</b>	EN pin input jumper. Place the supplied jumper across ON and EN to turn on the IC. Place the jumper across OFF and EN to turn off the IC.
<b>JP2 – MODE</b>	MODE pin jumper. This jumper selects the switching frequency and operating mode per <a href="#">Table 2</a> . Set this jumper before the device is enabled. Unless the jumper is installed across MODE and PFM/PWM initially, changes to the jumper position during operation have no effect. If the jumper is installed across MODE and PFM/PWM at startup, a function generator can be installed on MODE (to emulate a GPIO pin in the final application) and drive the pin high to enable forced PWM mode.
<b>JP3 – PG Pullup Voltage</b>	PG pin pullup voltage jumper. Place the supplied jumper on JP2 to connect the PG pin pullup resistor to Vin. Alternatively, the jumper can be removed and a different voltage can be supplied on pin 2 to pull up the PG pin to a different level. This externally applied voltage must remain below 6 V.

**Table 2. Jumper JP2 Settings**

JP2 Setting before being Enabled	Nominal Switching Frequency (MHz)	Operating Mode
Between MODE and PWM	1.5 (selectable with R4 value)	Forced PWM
Open	2.5	Forced PWM
Between MODE and PFM/PWM	2.0	Auto Power Save Mode
MODE driven to a logic high with an external function generator, after being installed between MODE and PFM/PWM at enable	2.0	Forced PWM

**NOTE:** Changes to JP2 during operation have no effect unless JP2 was installed between MODE and PFM/PWM at startup. Only this setting of JP2 allows the user to change between forced PWM and auto power save mode during operation. To achieve a different switching frequency, it is required to disable and re-enable the device.

## 2.2 Setup

To operate the EVM, set jumpers JP1 through JP3 to the desired position per [Section 2.1](#). Connect the input supply to J1 and J3 and connect the load to J4 and J6.

### 3 TPS62097EVM-651 Test Results

The TPS62097EVM-651 was used to take all the data in the TPS62097 data sheet ([SLVSCD6](#)). See the device data sheet for the performance of this EVM.

Figure 2 shows the thermal performance of the EVM.

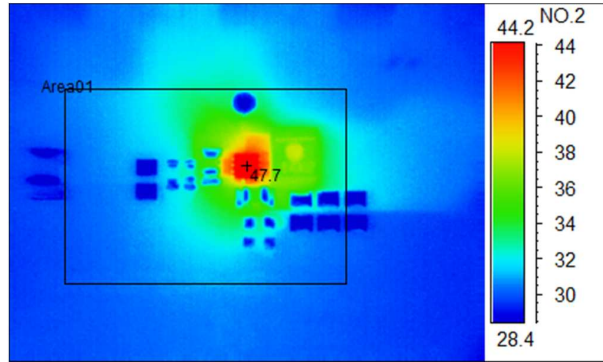


Figure 2. Thermal Performance ( $V_{IN} = 5\text{ V}$ ,  $I_{OUT} = 2000\text{ mA}$ , MODE = PFM/PWM)

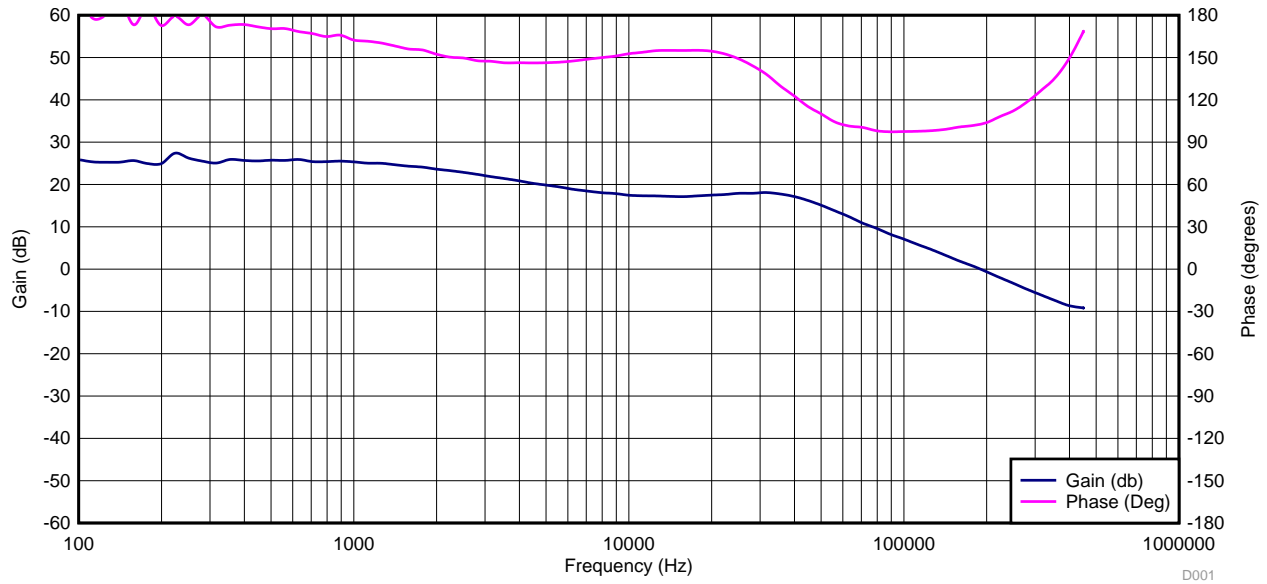


Figure 3. Loop Response Measurement ( $V_{IN} = 5\text{ V}$ , Load = 2000 mA, Mode = PFM/PWM)

## 4 Board Layout

This section provides the TPS62097EVM-651 board layout and illustrations in Figure 4 through Figure 7. The Gerbers are available on the EVM product page: [TPS62097EVM-651](https://www.ti.com/product/TPS62097EVM-651). Rev C of the PCB just corrected typos in the A and B versions.

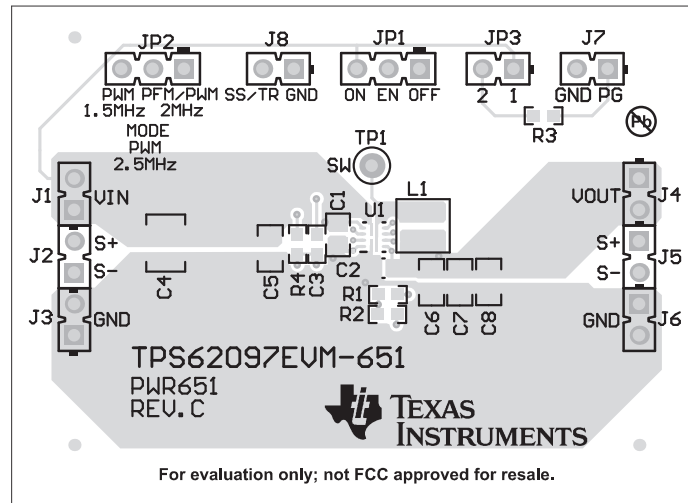


Figure 4. Top Assembly

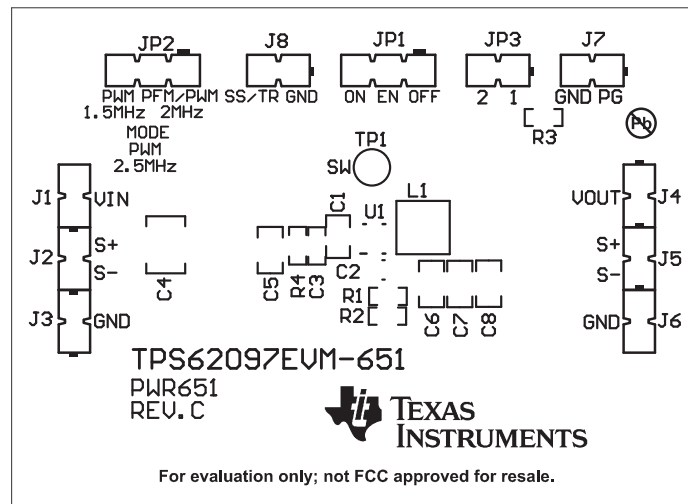
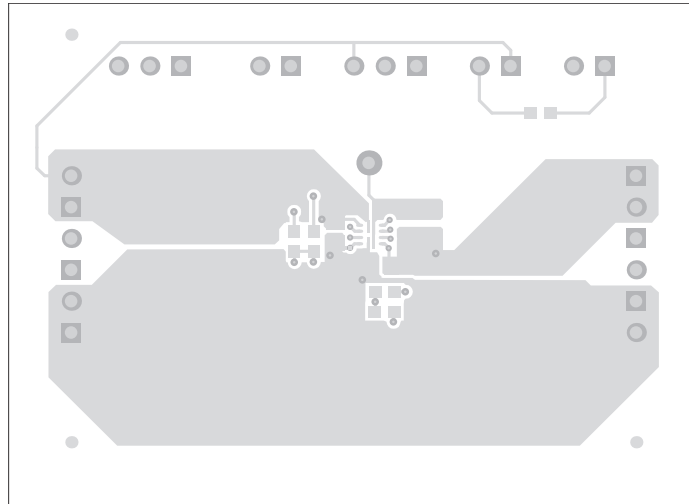
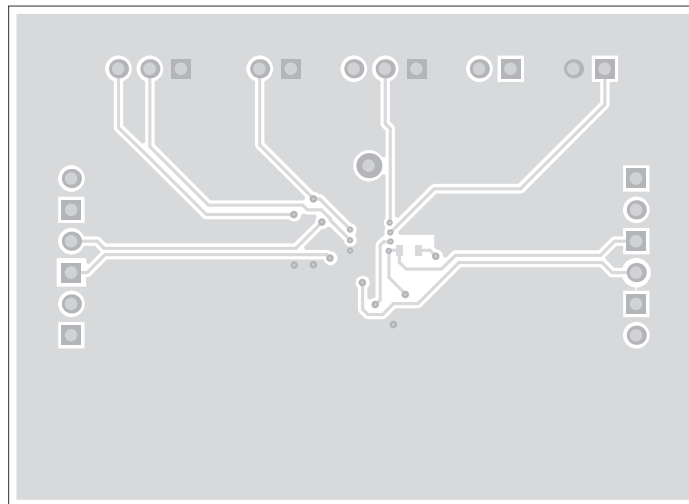


Figure 5. Top Overlay



**Figure 6. Top Layer**



**Figure 7. Bottom Layer**

## 5 Schematic and Bill of Materials

This section provides the TPS62097EVM-651 schematic and bill of materials (BOM).

### 5.1 Schematic

Figure 8 illustrates the EVM schematic.

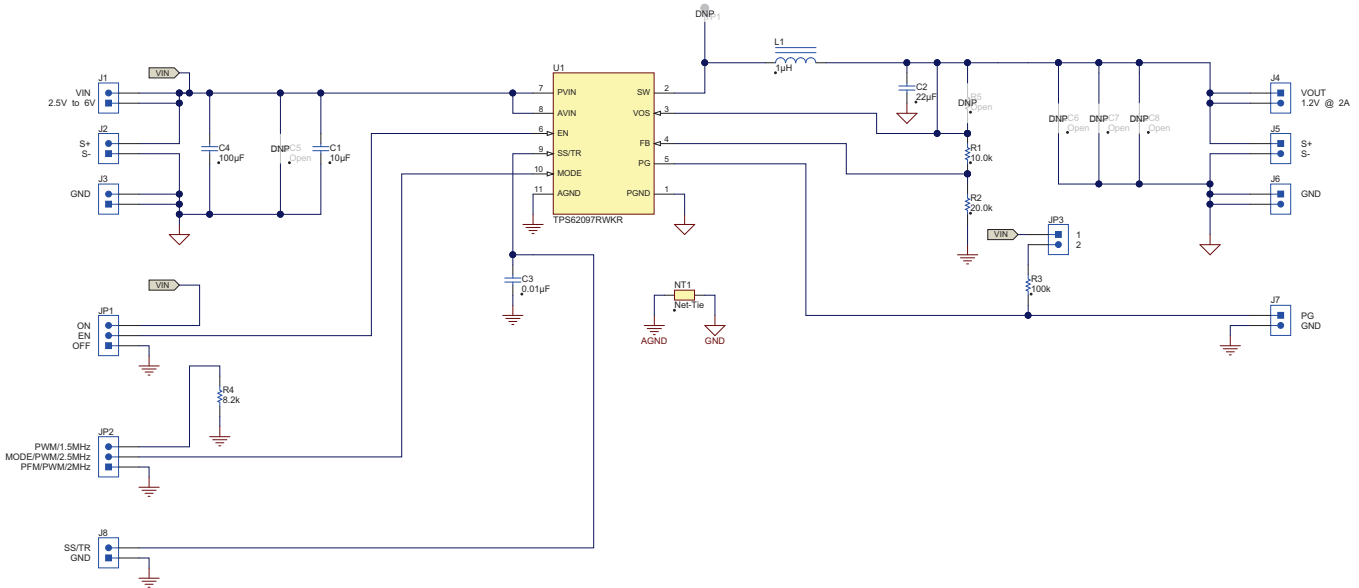


Figure 8. TPS62097EVM-651 Schematic

### 5.2 Bill of Materials

Table 3 lists the BOM for this EVM.

Table 3. TPS62097EVM-651 Bill of Materials

Ref Des	Qty	Value	Description	Size	Part Number	Manufacturer
C1	1	10uF	CAP, CERM, 10 µF, 6.3 V, +/- 20%, X7R	0805	C2012X7R0J106M125AB	TDK
C2	1	22uF	CAP, CERM, 22 µF, 10V, +/- 20%, X7S	0805	C2012X7S1A226M125AC	TDK
C3	1	0.01uF	CAP, CERM, 0.01 µF, 6.3 V, +/- 10%, X7R	0603	GRM188R70J103KA01D	Murata
C4	1	100uF	CAP, CERM, 100 µF, 6.3V, +/- 20%, X5R	1210	GRM32ER60J107ME20L	Murata
L1	1	1uH	Inductor, Shielded, Composite, 1uH, 5.4A, 0.01 ohm, SMD	4x4 mm	XFL4020-102MEB	Coilcraft
R1	1	10.0k	RES, 10.0 k, 1%, 0.1 W, 0603	0603	Std	Std
R2	1	20.0k	RES, 20.0 k, 1%, 0.1 W, 0603	0603	Std	Std
R3	1	100k	RES, 100 k, 1%, 0.1 W, 0603	0603	Std	Std
R4	1	8.2k	RES, 8.2 k, 5%, 0.1 W, 0603	0603	Std	Std
U1	1	TPS62097	2A, High Efficiency Step-Down Converter with iDCS-Control, Forced PWM Mode and Selectable Switching Frequency	2 x 2 mm	TPS62097RWK	Texas Instruments



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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.

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#### 3.2.1 For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210

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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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