TPS61097EVM-498

This user's guide describes the characteristics, operation, and use of the TPS61097EVM-498 evaluation module (EVM). This EVM demonstrates the Texas Instruments TPS61097 synchronous boost converter. The input voltage range of the TPS61097 is 0.9 V to 5.5 V, allowing the device to operate from one-cell to three-cell battery configurations in addition to a single-cell Li-ion battery. This user's guide includes setup instructions, schematic diagram, bill of materials, and printed-circuit board layout drawings for the EVM.

1 Introduction

The TPS61097EVM-498 evaluation module (EVM) helps designers evaluate the operation and performance of the TPS61097 boost converter. The TPS61097 comes in fixed output voltage versions described in Table 1. The board features the small 5-pin SOT-23 package for a small solution size.

Table 1. TPS61097 Fixed Output Options

EVM	Device	V_{OUT} (V)	
		Min	Max
HPA498-001	TPS61097-18DBVR	1.75	1.85
HPA498-002	TPS61097-27DBVR	2.62	2.78
HPA498-003	TPS61097-30DBVR	2.91	3.09
HPA498-004	TPS61097-33DBVR	3.2	3.4
HPA498-005	TPS61097-50DBVR	4.85	5.15

1.1 Related Documentation From Texas Instruments

TPS61097, Synchronous Boost Converter With Low Quiescent Current data sheet (SLVS872)

2 Setup

This section describes the jumpers and connectors on the EVM as well as how to properly connect, set up, and use the TPS61097EVM-498.

2.1 J1/J3 – Input Connections

This is the connection for the leads from the input source. Connect the positive connection to the VIN J1 and the negative connection to the GND J3.

2.2 J4/J6 – Output Connections

This is the connection for the output of the TPS61097EVM. Connect the positive connection of the load to the VOUT J4 and the negative connection to the GND J6.

2.3 JP1 – EN

This is the enable input for the device. Place a shorting jumper across the ON and EN pins of JP1 to enable the integrated circuit (IC). Place a shorting jumper across the OFF and EN pins of JP1 to disable the IC. A shorting jumper must be installed on JP1 in either the ON or OFF positions, and EN must not be left unconnected.

When the EN pin is placed in the OFF position, the device's internal bypass switch is enabled, providing a direct low-impedance connection from the input voltage (at the L pin) to the load (VOUT).

The EN pin can be set for low-voltage control of this bypass switch. First add jumpers on pin 1 to pin 2 and pin 3 to pin 4. By setting the desired ratio of R1 and R2, the TPS61097 can be set to switch on the bypass at a defined voltage level on VIN. See the *Adjustable Bypass Switching* section of the TPS61097 data sheet for details.

The board's adjustable switching configuration (R1 and R2) is set to switch the device OFF and, thus, enable the internal bypass switch when VIN ≤ 0.78 V .

2.4 J2/J5 – V_{IN} Sense and V_{OUT} Sense

The two connectors are not installed, but if very accurate measurements of input or output voltage are required, J2 or J4 can be installed for the measurements. Traces on the PCB connect to the input or output capacitor and run independent of the output and ground lines to the two connectors.

3 Operation

Connect the positive input power supply to the VIN J1 and GND J3. Typical input voltage is 0.9 V to 3 V for 3.3-V configuration of output voltage. The TPS61097EVM-498 has a maximum input voltage of 5.5 V.

Connect the desired load between the VOUT J4 and GND J6. The TPS61097 maximum output current depends on the conversion ratio between input and output along with VOUT; see the data sheet for additional information.

Configure jumper JP1 as required; the EN pin is not pulled up or down inside the device or on the EVM. JP1 must be installed for proper operation. ON is normal operation. In the OFF position, the device is shut down and switching has stopped.

When the IC is disabled by putting JP1 in the OFF position, the internal bypass switch is turned ON. This provides a direct low-impedance connection from the input voltage (at the L pin) to the load (VOUT). The voltage level at VIN is seen at VOUT, minus the voltage drop across the internal switch, whose ON resistance is 3.4 Ω (typical).

4 Test Results

See the *Typical Characteristics* section of the TPS61097 data sheet. This EVM uses the same inductors and capacitors as those used for characterization in the data sheet. Performance is consistent with that shown in the data sheet.

5 Board Layout, Schematic, and Bill of Materials

This section provides the TPS61097EVM-498 board layout, schematic, and bill of materials.

5.1 Board Layout

Board layout is critical for all high-frequency, switch-mode power supplies. If the layout is not done carefully, the regulator can show stability problems as well as EMI problems. Therefore, use wide and short traces for the main current path and for the power ground tracks. The input and output capacitor, as well as the inductor, must be placed as close as possible to the IC. Use a common ground node for power ground to minimize the effects of ground noise. Figure 1 through Figure 3 show the board layout for the TPS61097EVM-498 PCB.

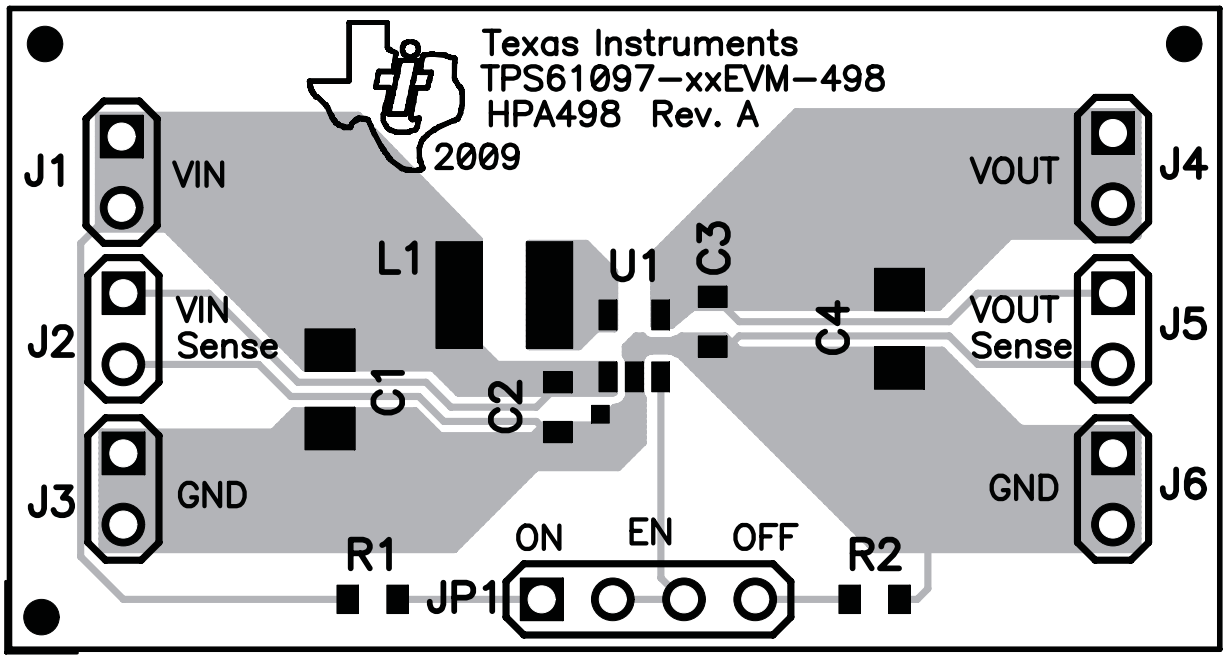


Figure 1. Top Assembly Layer

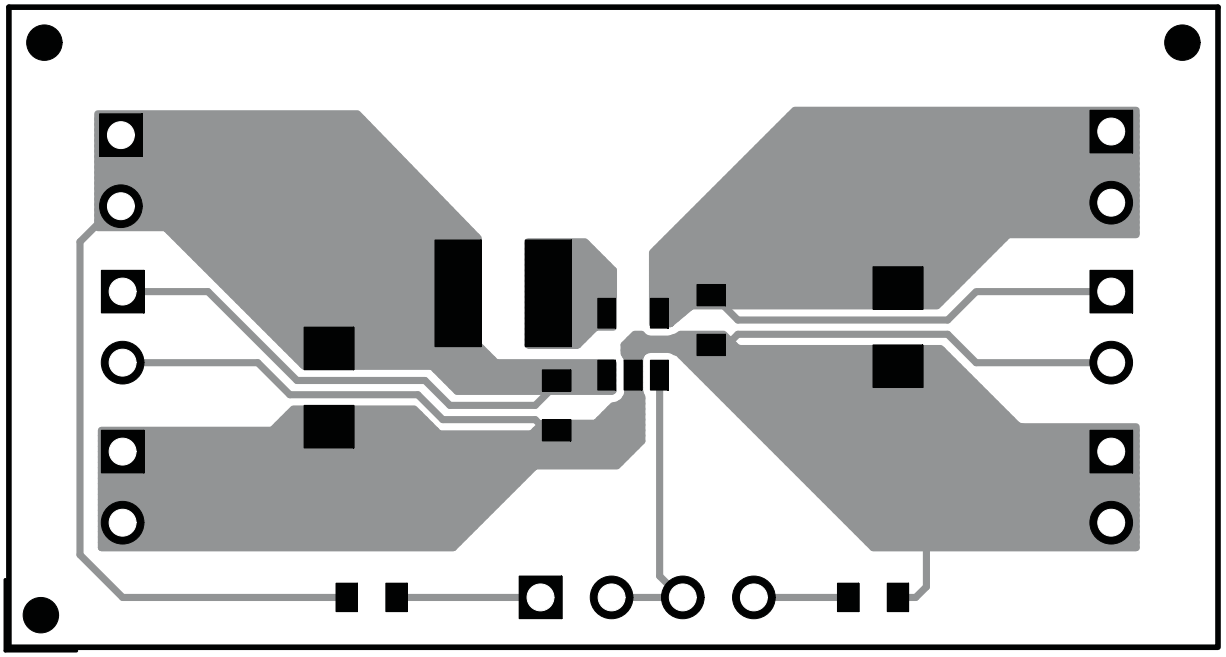


Figure 2. Top Layer

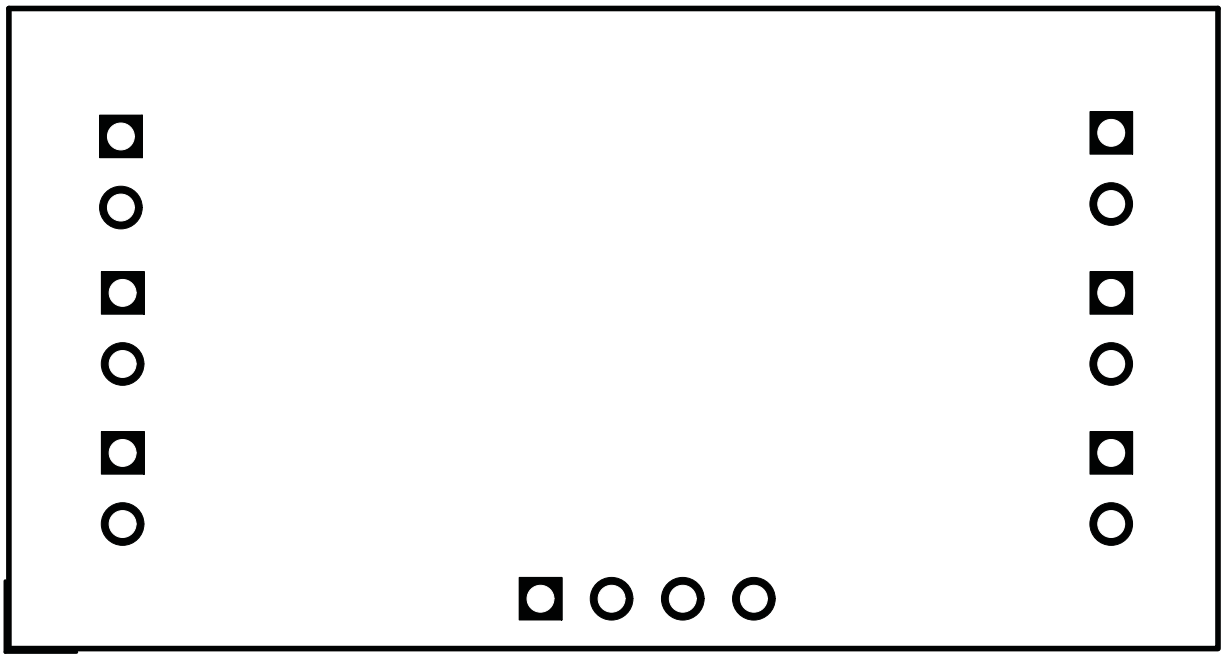


Figure 3. Bottom Layer

5.2 Schematic and Bill of Materials

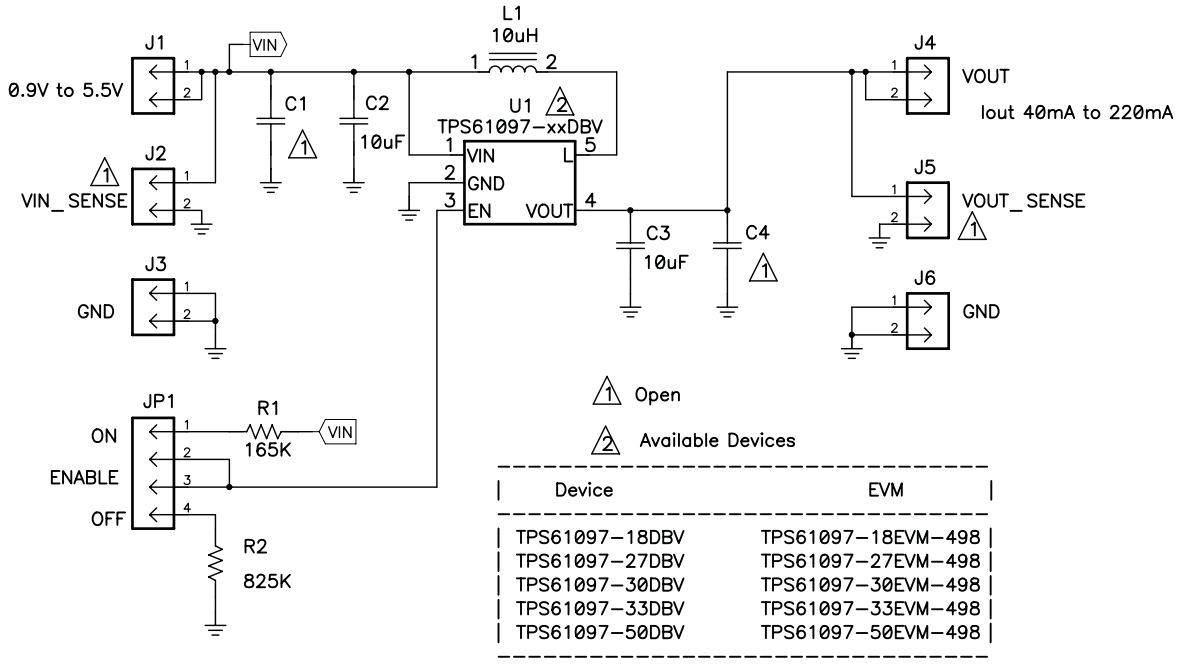


Figure 4. TPS61097EVM-498 Schematic

Table 2. Bill of Materials[1][2][3][4]

Count					RefDes	Value	Description	Size	Part Number	Manu-facturer
-001	-002	-003	-004	-005						
0	0	0	0	0	C1, C4	Open	Capacitor, ceramic, 6.3 V, X5R, 20%	1206	Std	Std
2	2	2	2	2	C2, C3	10 µF	Capacitor, ceramic, 10 µF, 6.3 V, X5R, 20%	603	GRM188R60J106ME 47D	MuRata
0	0	0	0	0	J2, J5	Open	Header, 2 pin, 100-mil spacing	0.100 in x 2	PEC02SAAN	Sullins
4	4	4	4	4	J1, J3, J4, J6	PEC02SAAN	Header, 2 pin, 100-mil spacing	0.100 in x 2	PEC02SAAN	Sullins
1	1	1	1	1	JP1	PEC04SAAN	Header, 4 pin, 100-mil spacing	0.100 in x 4	PEC04SAAN	Sullins
1	1	1	1	1	L1	10 µH	Inductor, SMT, 0.75A, 520 mΩ	0.138 x 0.138 in	DO3314-103MLC	Coilcraft
1	1	1	1	1	R1	165K	Resistor, chip, value, 1/10 W, 1%	603	Std	Std
1	1	1	1	1	R2	825K	Resistor, chip, value, 1/10 W, 1%	603	Std	Std
1	0	0	0	0	U1	TPS61097-18DBV	IC, low input voltage synchronous boost converter	5-pin SOT23 DBV	TPS61097-18DBV	TI
0	1	0	0	0	U1	TPS61097-27DBV	IC, low input voltage synchronous boost converter	5-pin SOT23 DBV	TPS61097-27DBV	TI
0	0	1	0	0	U1	TPS61097-30DBV	IC, low input voltage synchronous boost converter	5-pin SOT23 DBV	TPS61097-30DBV	TI
0	0	0	1	0	U1	TPS61097-33DBV	IC, low input voltage synchronous boost converter	5-pin SOT23 DBV	TPS61097-33DBV	TI
0	0	0	0	1	U1	TPS61097-50DBV	IC, low input voltage synchronous boost converter	5-pin SOT23 DBV	TPS61097-50DBV	TI
1	1	1	1	1			Shunt, 100-mil, black	0.100	929950-00	3M
4	4	4	4	4			Bumpon, hemisphere, .44 x .20, clear	.44 x .20 in	SJ-5303	3M
1	1	1	1	1		HPA498	PCB	0.9 x 1.7 x 0.062 in	HPA498	Any

(1) These assemblies are ESD sensitive, ESD precautions shall be observed.
(2) These assemblies must be clean and free from flux and all contaminants. Use of no clean flux is not acceptable.
(3) These assemblies must comply with workmanship standards IPC-A-610 Class 2.
(4) Ref designators marked with an asterisk (**) cannot be substituted. All other components can be substituted with equivalent components.

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 0.9 V to 5.5 V and the output voltage range of 1.8 V to 5 V.

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 50°C. The EVM is designed to operate properly with certain components above 60°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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