TPS61291EVM-569 Evaluation Module

The TPS61291EVM-569 (PWR569-001) facilitates the evaluation of the TPS61291 Low I_Q Boost Converter with Bypass Mode device. The device outputs a user-selectable output voltage of 2.5 V, 3 V, or 3.3 V. Available output current depends on the input voltage and output voltage but is generally around 200 mA for most applications.

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1 Introduction

The TPS61291 is a synchronous, step-up converter in a 2 x 2-mm, 6-pin SON package. The output voltage is fixed inside the device to 2.5 V, 3 V, or 3.3 V by the connection of the VSEL pin at startup.

1.1 Performance Specification

Table 1 provides a summary of the TPS61291EVM-569 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
Input Voltage	After startup	0.9	1.8	5	V
Output Voltage Setpoint	VSEL = Low before startup		3.3		V
	VSEL = Floating before startup		2.5		V
	VSEL = High (V_{OUT}) before startup		3		V
Output Current	V_{IN} = 1.8 V, V_{OUT} = 3.3 V	0	200		mA

1.2 Bypass Mode Operation

When the EN pin is pulled low, the IC enters a low current consumption bypass mode of operation. In this mode, the output voltage follows the input voltage minus any drops in the internal switch. The output voltage is not regulated in this mode and can go higher or lower than the setpoint.

1.3 Modifications

The printed-circuit board (PCB) for this EVM is designed to accommodate some modifications by the user. Additional input and output capacitors can be added and the output voltage can be changed.

1.3.1 Input and Output Capacitors

C6 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.

C3 and C4 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 Changing the Output Voltage

The output voltage is fixed inside the TPS61291 to one of these 3 values: 2.5 V, 3 V, or 3.3 V. A specific value is selected through the VSEL pin setting, per Table 1. Once the device is enabled, the VSEL pin setting is latched and further changes to the VSEL pin have no effect on the output voltage. To adjust the output voltage, it is necessary to change the VSEL setting while the device is disabled.

1.3.3 EN Pin Pull-up Resistor

Any pull-up or pull-down resistor can draw significant current and affect the measured efficiency. This is especially true in bypass mode, where the TPS61291 consumes typically 15 nA. For example, if the EN pin were pulled up to the input voltage with a 1-MΩ resistor and the pin were tied low through JP1, this would draw an extra 1.8 µA from the input source at a 1.8-V input voltage. This would greatly affect the measured efficiency in bypass mode. For this reason, no pull-up or pull-down resistors have been used on the TPS61291EVM-569. The final application circuit should ensure that the EN pin input to the TPS61291 is terminated either high or low and not left floating, per the device data sheet.

2 Setup

This section describes how to properly use the TPS61291EVM-569.

2.1 Input/Output Connector Descriptions

J1 – VIN	Positive input connection from the input supply for the EVM
J2 – S+/S–	Input voltage sense connections. Measure the input voltage at this point
J3 – GND	Return connection from the input supply for the EVM
J4 – VOUT	Output voltage connection
J5 – S+/S–	Output voltage sense connections. Measure the output voltage at this point.
J6 – GND	Output return connection
JP1 – EN	EN pin input jumper. Place the supplied jumper across ON and EN/BYP to turn on the IC. Place the jumper across BYP and EN/BYP to turn off the IC and enable bypass mode. The input voltage appears at the output in bypass mode.
JP2 – VSEL	VSEL pin input jumper. Place the supplied jumper across HIGH and VSEL to select the 3-V output voltage. Place the jumper across LOW and VSEL to select the 3.3-V output voltage. Remove the jumper and leave JP2 floating to select the 2.5-V output voltage. This jumper must be set before the device is enabled. To change the output voltage, it is required to disable the device and then re-enable it with the new VSEL setting.

2.2 Setup

To operate the EVM, set jumpers JP1 and JP2 to the desired positions per Section 2.1. Connect the input supply to J1 and J3 and connect the load to J4 and J6.

3 TPS61291EVM-569 Test Results

The TPS61291EVM-569 was used to take most of the data in the TPS61291 data sheet, SLVSBX9. The only difference is the inductor used. This EVM uses a smaller inductor than the data sheet.

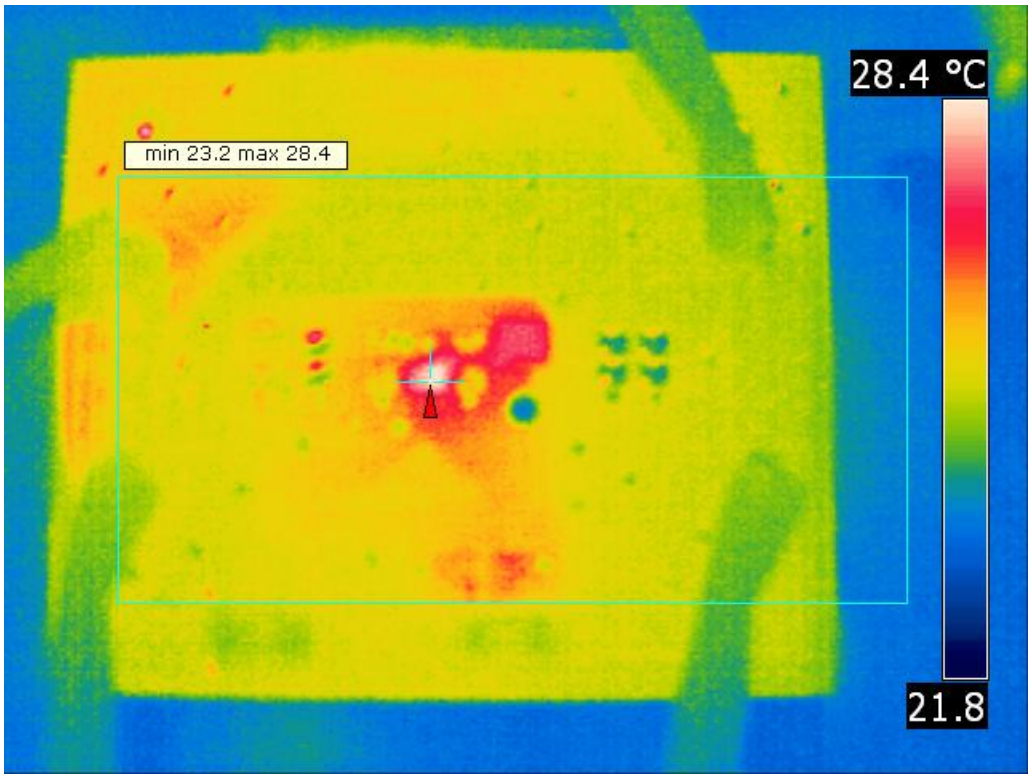

Figure 1. Thermal Performance (V_{IN} = 1.8 V, V_{OUT} = 3.3 V, I_{OUT} = 200 mA)

4 Board Layout

This section provides the TPS61291EVM-569 board layout and illustrations in Figure 2 through Figure 4. The Gerbers are available on the EVM product page: TPS61291EVM-569. Rev. B of the PCB just edited the silkscreen. No copper changes were made from Rev. A.

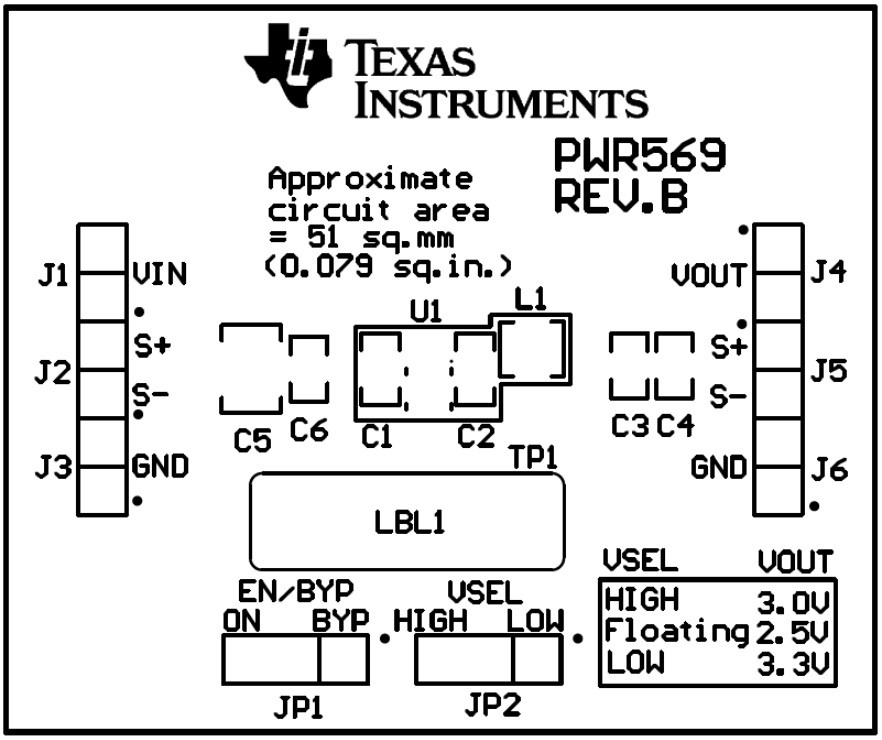

Figure 2. Top Silkscreen Layer

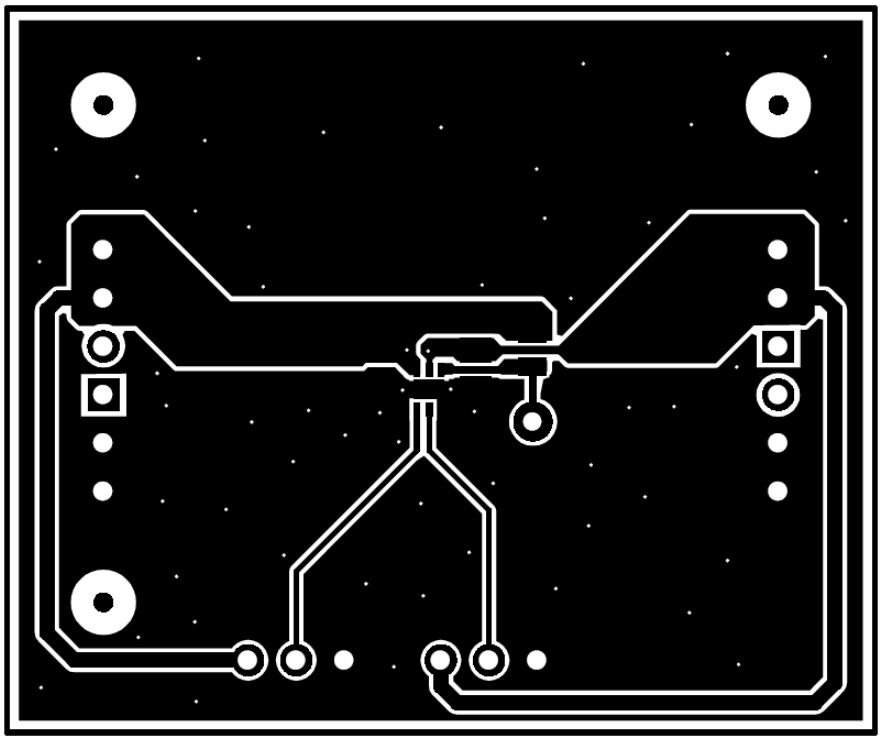

Figure 3. Top Copper Layer

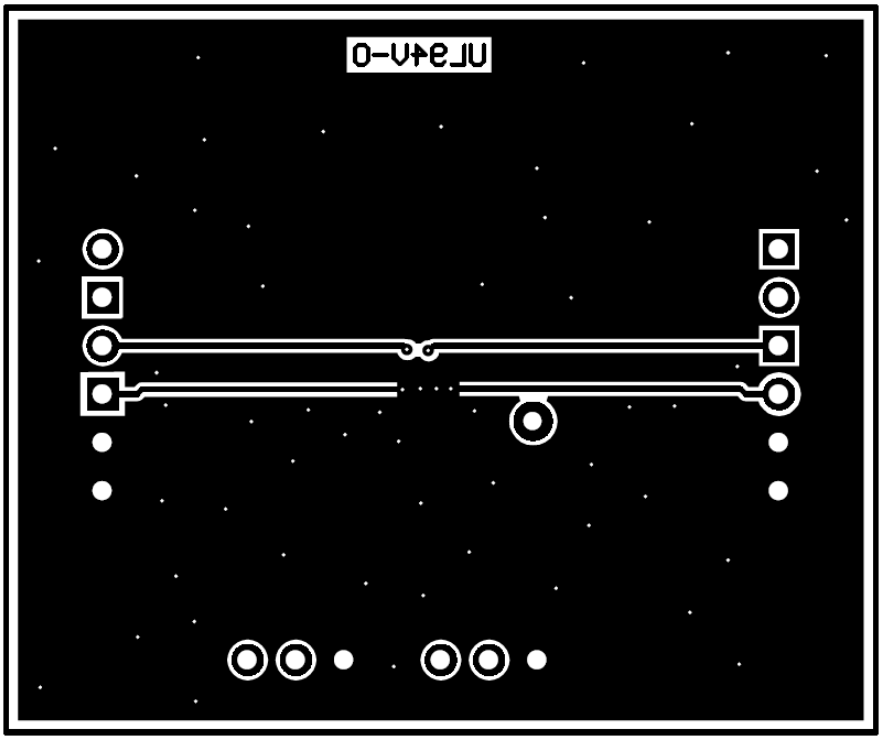

Figure 4. Bottom Copper Layer

5 Schematic and Bill of Materials

This section provides the TPS61291EVM-569 schematic and bill of materials (BOM).

5.1 Schematic

Figure 5 illustrates the EVM schematic.

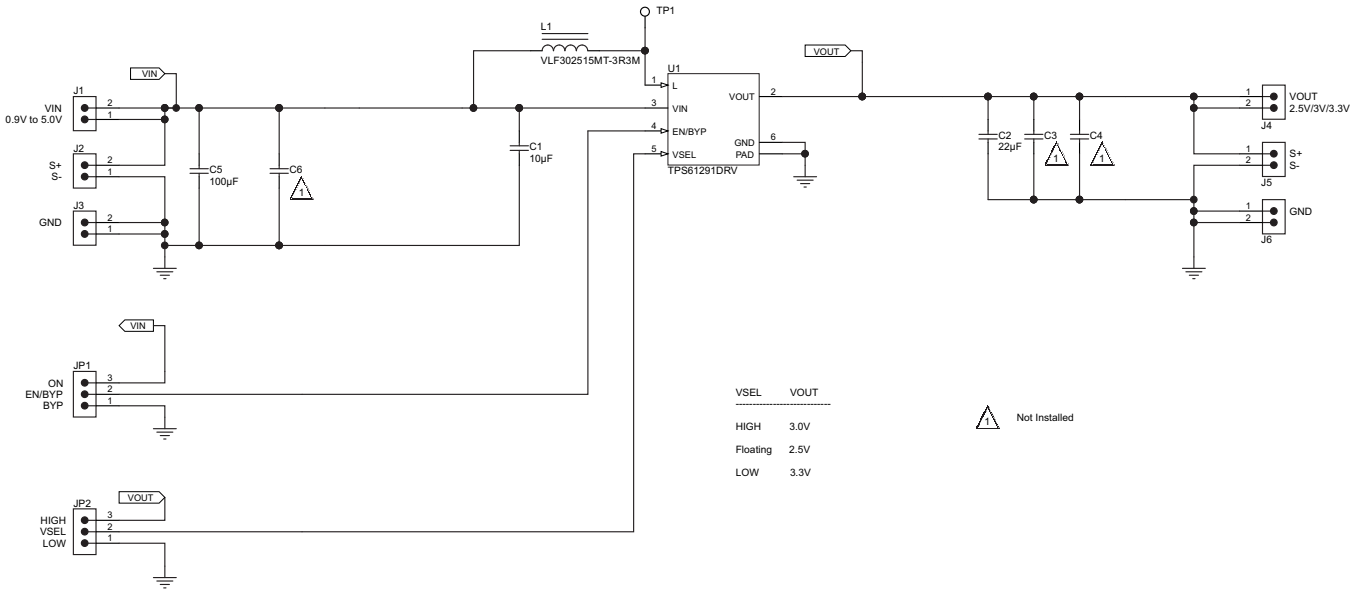

Figure 5. TPS61291EVM-569 Schematic

5.2 Bill of Materials

Table 2 lists the BOM for this EVM.

Table 2. TPS61291EVM-569 Bill of Materials

Count	RefDes	Value	Description	Size	Part Number	MFR
1	C1	10uF	Capacitor, Ceramic, X5R, 10V, 10%	0805	GRM219R61A106KE44D	Murata
1	C2	22uF	Capacitor, Ceramic, X5R, 6.3V, 20%	0805	GRM21BR60J226ME39L	Murata
1	C5	100uF	Capacitor, Ceramic, X5R, 6.3V, 20%	1210	GRM32ER60J107ME20L	Murata
1	L1	3.3uH	Inductor, SMT, 1.23A, 60-mΩ	3 mm x 2.5 mm	VLF302515MT-3R3M	TDK
1	U1	TPS61291	IC, Low I_Q Boost Converter with Bypass Operation	2 mm x 2 mm	TPS61291DRV	TI

The TPS61291EVM-569 may be populated with TPS61291 (U1) devices that do not contain the correct top side markings on the top of the device itself. These devices are still fully-tested TPS61291 devices.

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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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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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