TPS826xxEVM

This user's guide describes the characteristics, operation, and use of the TPS826xxEVM-646 evaluation module (EVM). The TPS826xxEVM-646 is a fully assembled and tested platform for evaluating the performance of the TPS82671, TPS82675, TPS82690 and TPS82695 high-frequency, synchronous, step-down dc-dc converters optimized for battery-powered portable applications. This document includes schematic diagrams, a printed circuit board (PCB) layout, bill of materials, and test data. Throughout this document, the abbreviations *EVM* and *TPS826xxEVM* and the term *evaluation module* are synonymous with the TPS826xxEVM-646 unless otherwise noted.

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1 Introduction

The TPS82671, TPS82675, TPS82690 and TPS82695 devices are series of high-frequency, synchronous, step-down dc-dc converters optimized for battery-powered portable applications. Intended for low-power applications, the TPS8267x support up to 600-mA load current and the TPS8269 support up to 500-mA and all allow the use of low-cost chip inductors and capacitors. With a wide input voltage range of 2.3 V to 4.8 V, the devices support applications powered by lithium-ion (Li-Ion) batteries with extended voltage ranges. Different fixed voltage output versions of the TPS826xx are available. These converters operate at a regulated 5.5-MHz (TPS8267x) and 4-MHz (TPS8269x) switching frequency and enter a power-save mode operation under light load currents in order to maintain high efficiency over the entire load current range. A PFM mode extends the battery life by reducing the quiescent current to 17 µA (typ) during light load operation.

1.1 Features

- Input voltage range: 2.3 V up to 4.8 V
- Fixed output voltages
- Up to 600-mA output current (TPS8267x)
- Up to 500-mA output current (TPS8269x)
- 5.5-MHz regulated frequency operation (TPS8267x)
- 4-MHz regulated frequency operation (TPS8269x)
- Output capacitor discharge (optional)
- Total solution size: < 6.7 mm^2

1.2 Applications

- Cell phones, smart phones
- WLAN, GPS, and Bluetooth® applications
- DTV tuners
- Point-of-Load (PoL) applications

1.3 EVM Ordering Options

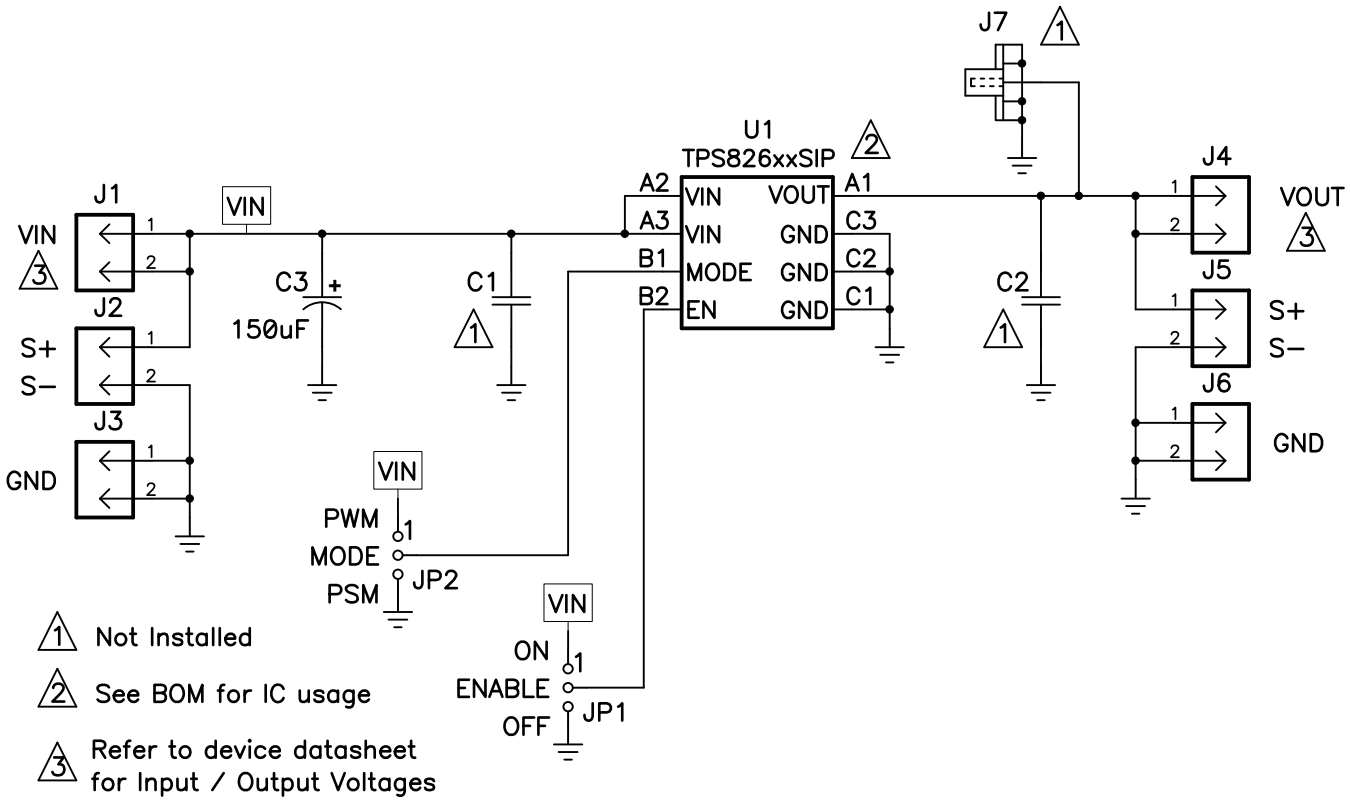
Table 1 provides the ordering information for the various EVM options.

Table 1. Ordering Information

Orderable EVM Number	Device Part Number	Output Voltage	Maximum Output Current
TPS82671EVM-646	TPS82671	1.8 V	600 mA
TPS82675EVM-646	TPS82675	1.2 V	600 mA
TPS82690EVM-646	TPS82690	2.8 V	500 mA
TPS82695EVM-646	TPS82695	2.5 V	500 mA

2 TPS826xxEVM Schematic

Figure 1 illustrates the TPS826xxEVM-646 schematic.



NOTE: For reference only; see Table 2 for specific values.

Figure 1. TPS826xxEVM Schematic

3 Connector and Test Point Descriptions

3.1 Input / Output Connectors: TPS826xxEVM

3.1.1 J1 VIN

This header is the positive connection to the input power supply. The power supply must be connected between J1 and J3 (GND). The leads to the input supply should be twisted and kept as short as possible. The input voltage must be between 2.3 V and 4.8 V.

3.1.2 J2 S+/S–

J2 S+/S– are the sense connection for the input of the converter. Connect a voltmeter, sense connection of a power supply, or oscilloscope to this header.

3.1.3 J3 GND

This header is the return connection to the input power supply. Connect the power supply between J3 and J1 (VIN). The leads to the input supply should be twisted and kept as short as possible. The input voltage must be between 2.3 V and 4.8 V.

Capacitor C3 compensates for parasitic inductance as a result of the wires from the dc power supply to the EVM. It is not required in an actual application circuit.

3.1.4 J4 VOUT

This header is the positive output of the step-down converter. The output voltage of the devices in the TPS826xx families have fixed output voltages; refer to the specific device data sheet for detailed information on the device output voltage.

3.1.5 J5 S+/S–

J5 S+/S– are the sense connection for the output of the converter. Connect a voltmeter, sense connection of an electronic load, or oscilloscope to this header.

3.1.6 J6 GND

J6 is the return connection of the converter. A load can be connected between J6 and J4 (VOUT).

3.2 Jumpers and Switches

3.2.1 JP1 ENABLE

This jumper enables/disables the converter on the EVM. Placing a shorting bar between ENABLE and ON turns on the converter. Placing a shorting bar between ENABLE and OFF disables the converter.

3.2.2 JP2 MODE

This jumper enables/disables the power-saving mode under light loads. Placing a shorting bar between MODE and PWM disables the power-saving mode. If the power-save mode is disabled, the converter operates in forced PWM mode over the entire load current range.

Placing a shorting bar between MODE and PSM enables the power-saving mode. The device operates in power-saving mode under light load conditions. See the specific device data sheet for detailed information.

4 Test Configuration

4.1 Hardware Setup

Figure 2 illustrates a typical hardware test configuration.

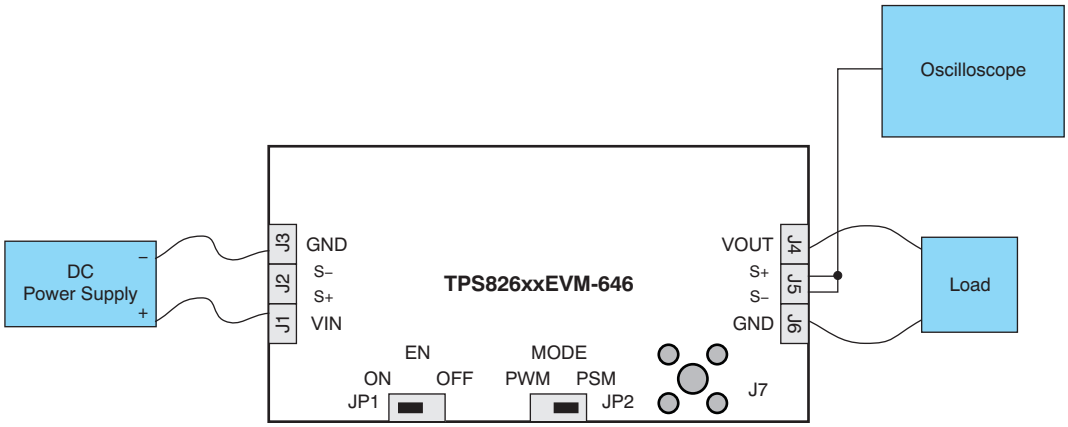


Figure 2. Hardware Board Connection

4.2 Procedure

Follow these procedures when configuring the EVM for testing.

CAUTION

Many of the components on the TPS826xxEVM-646 are susceptible to damage by electrostatic discharge (ESD). Customers are advised to observe proper ESD handling precautions when unpacking and handling the EVM, including the use of a grounded wrist strap, bootstraps, or mats at an approved ESD workstation. An electrostatic smock and safety glasses should also be worn.

1. Work at an ESD workstation. Make sure that any wrist straps, bootstraps, or mats are connected and reference the user to earth ground before power is applied to the EVM. Electrostatic smocks and safety glasses should also be worn.
2. Connect a dc power supply between J1 and J2 on the TPS826xxEVM. Note that the input voltage should range from 2.3 V to 4.8 V. Keep the wires from the input power supply to EVM as short as possible and twisted.
3. Connect a dc voltmeter or oscilloscope to the output sense connection of the EVM.
4. A load can be connected between J4 and J6 on the TPS826xxEVM.
5. To enable the converter, connect the shorting bar on JP1 between ENABLE and ON on the TPS826xxEVM.
6. The TPS826xxEVM has a feature that allows users to switch between Power-Save Mode under light loads and forced PWM mode, with jumper JP2.

5 TPS826xxEVM Test Data

This section presents typical performance data for the TPS826xxEVM. Actual performance data can be affected by measurement techniques and environmental variables; therefore, these results are presented for reference and may differ from actual results obtained by some users.

5.1 Thermal Performance

Figure 3 and Figure 4 show the typical thermal performance for the TPS826xx for both the top side and the bottom side, respectively.

5.1.1 Top Side

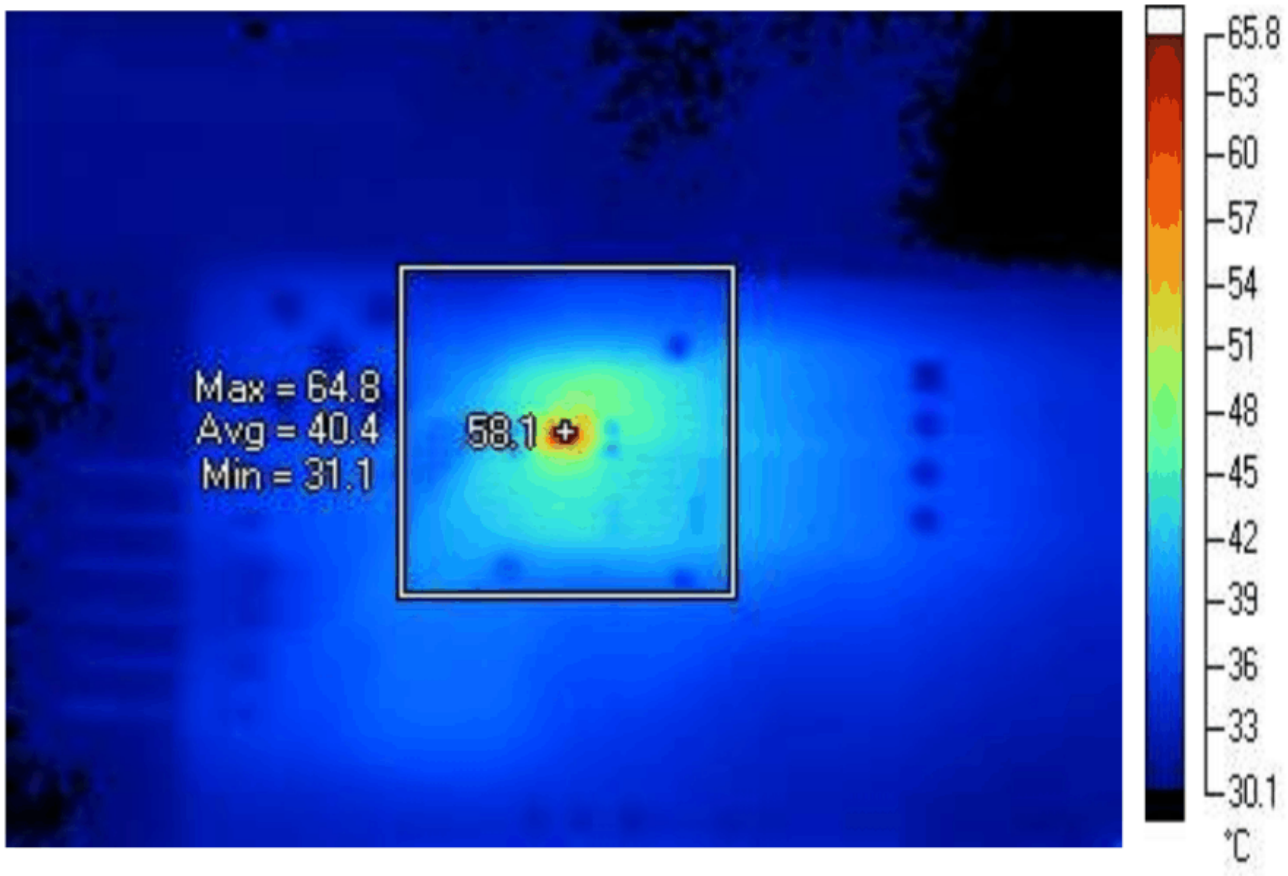


Figure 3. Top Side Thermal Measurement

5.1.2 Bottom Side

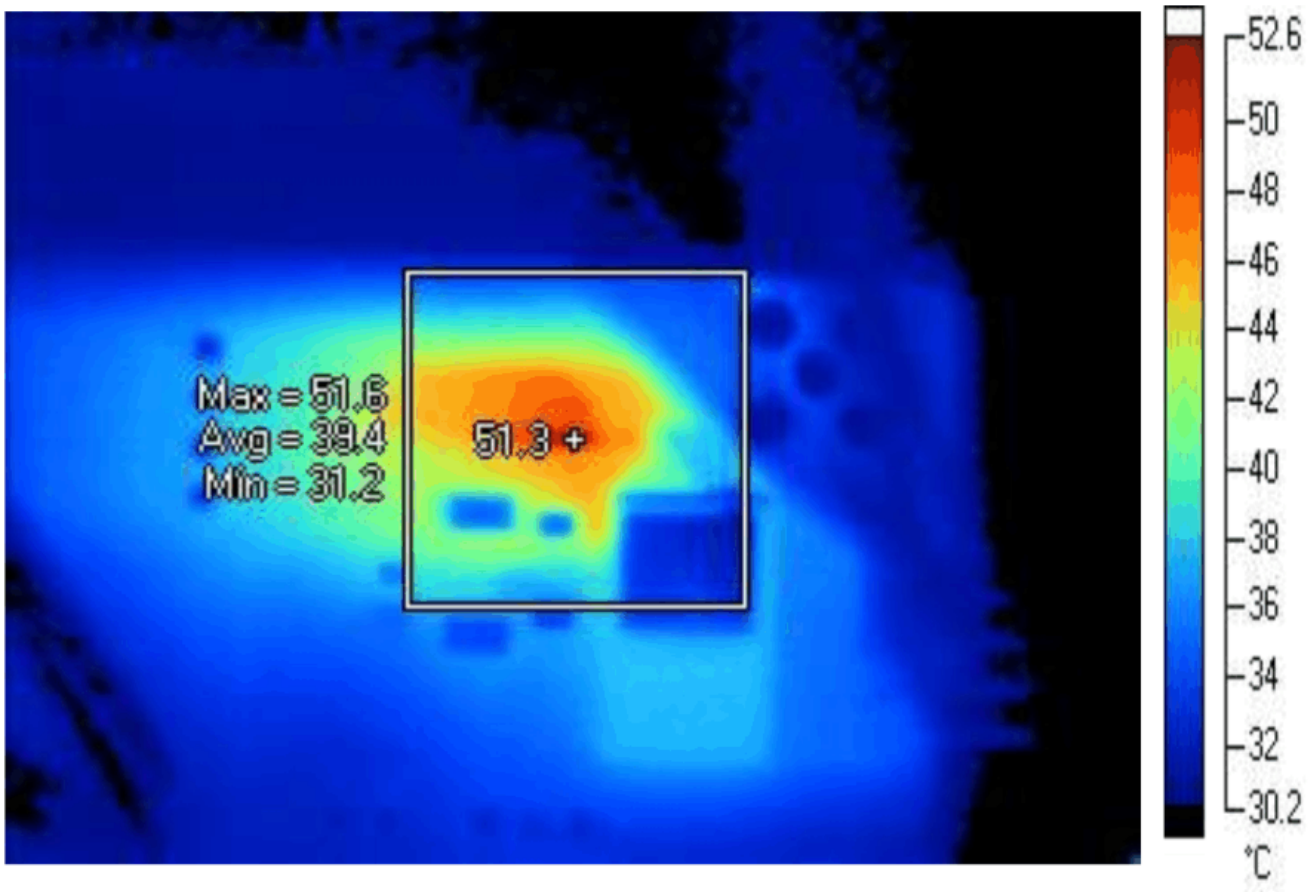


Figure 4. Bottom Side Thermal Measurement

6 TPS826xxEVM Assembly Drawings and Layout

Figure 5 through Figure 7 show the design of the show the design of the TPS826xxEVM-646 printed circuit boards. The EVM has been designed using a two-layer, 1-ounce copper-clad PCB with all components in an active area on the top side of the board. Moving components to both sides of the PCB or using additional internal layers can offer additional size reduction for space-constrained systems.

NOTE: Board layouts are not to scale. These figures are intended to show how the board is laid out; they are not intended to be used for manufacturing TPS826xxEVM-646 PCBs.

Note the connection of the TPS8267x feedback (FB) pin. It is recommended to connect the FB pin directly to the inductor, not directly on the V_{OUT} connection of the output capacitor. The connection to the inductor is recommended because it provides better transient response performance.

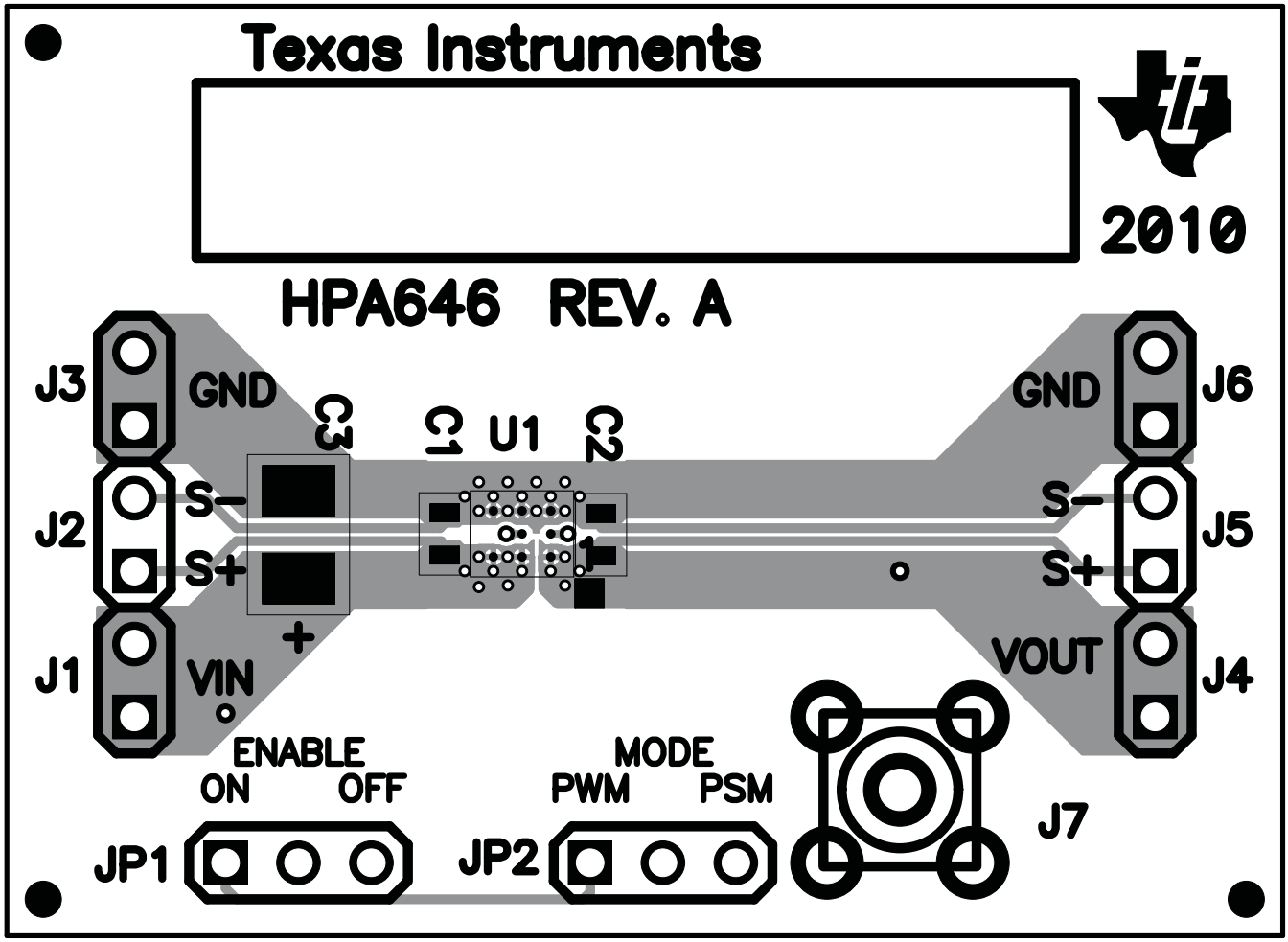


Figure 5. TPS826xxEVM Component Placement (Top View)

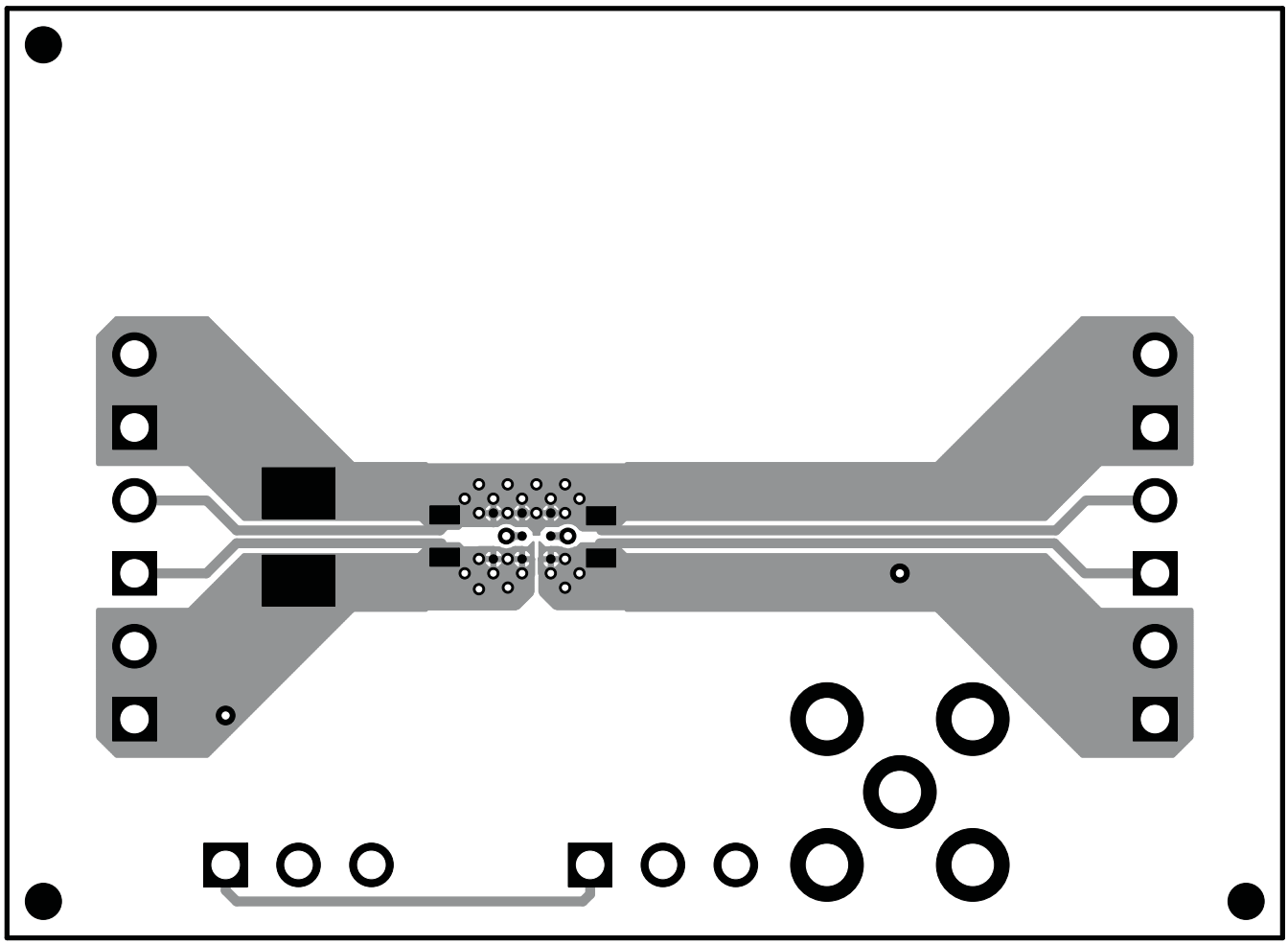


Figure 6. TPS826xxEVM Top-Side Copper (Top View)

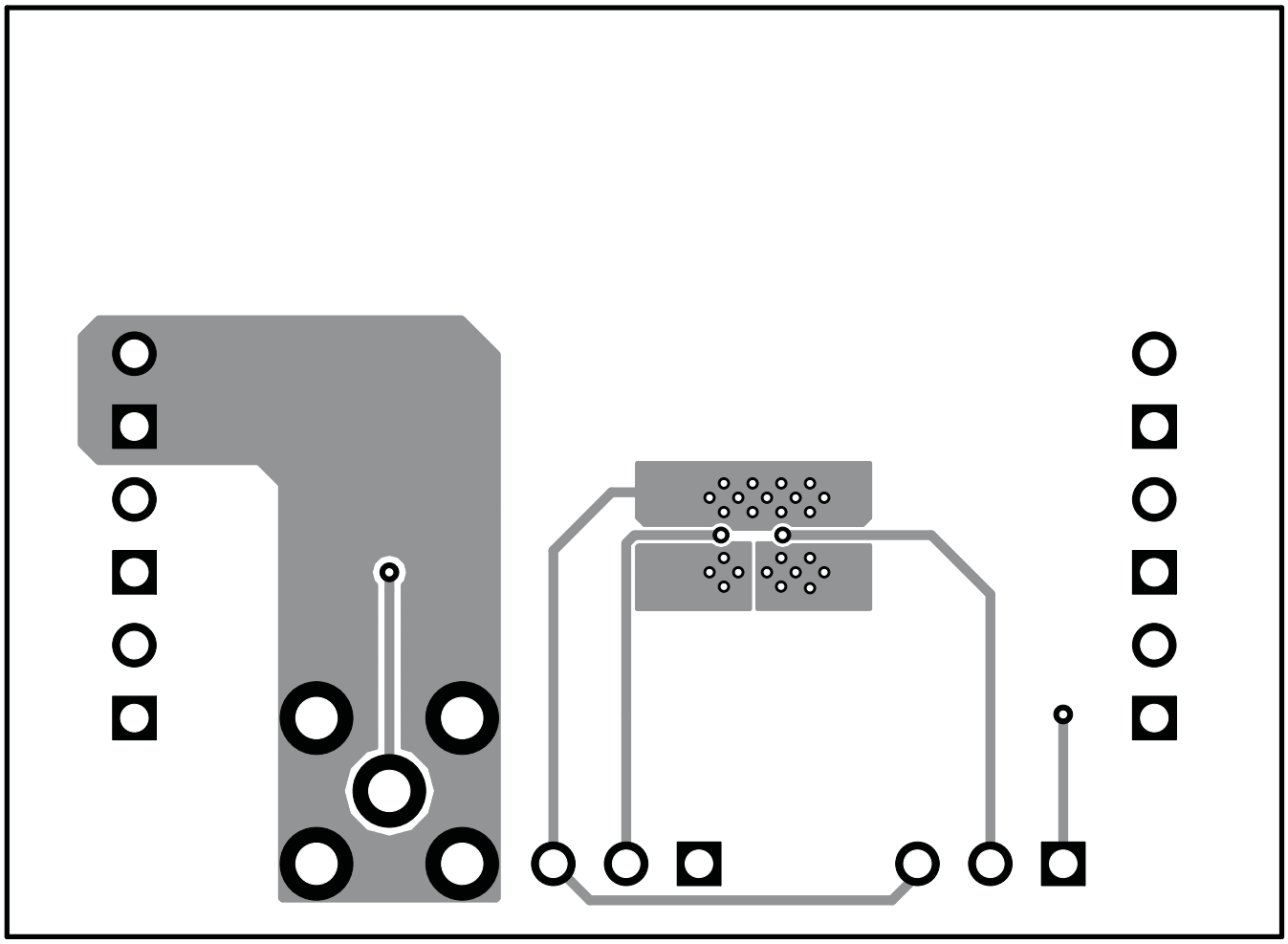


Figure 7. TPS826xxEVM Bottom-Side Copper (Bottom View)

7 Bill of Materials

Table 2 lists the bill of materials for the TPS826xxEVM.

Table 2. TPS826xxEVM-646 Bill of Materials

EVM Device Option: Count				RefDes	Value	Description	Size	Part Number	Mfr
-001	-002	-003	-004						
0	0	0	0	C1, C2	Open	Capacitor, Ceramic	0603	Std	Std
1	1	1	1	C3	150 µF	Capacitor, Tantalum, 6.3 V, 70 mΩ, 20%	3528(B)	T520B157M006ATE070	Kemet
0	0	0	0	J7	Open	Connector, SMA , Straight, PC mount	0.210 in^2	901-144-8RFX	AMP
1	0	0	0	U1	TPS82671SIP	IC, 600-mA, High-Freq µModule Step-Down Converter	SIP-8	TPS82671SIP	TI
0	1	0	0	U1	TPS82675SIP	IC, 600-mA, High-Freq µModule Step-Down Converter	SIP-8	TPS82675SIP	TI
0	0	1	0	U1	TPS82690SIP	IC, 500-mA, High-Freq µModule Step-Down Converter	SIP-8	TPS82690SIP	TI
0	0	0	1	U1	TPS82695SIP	IC, 500-mA, High-Freq µModule Step-Down Converter	SIP-8	TPS82695SIP	TI

8 Marking Information

Table 3 provides the marking information for this EVM.

Table 3. Marking Information

Assembly Number	Marking Text
HPA646-001	TPS82671EVM-646
HPA646-002	TPS82675EVM-646
HPA646-003	TPS82690EVM-646
HPA646-004	TPS82695EVM-646

Revision History

Changes from B Revision (June, 2011) to C Revision **Page**

- Updated introduction paragraph 2
- Revised Features list 2
- Revised Figure 1 3
- Updated Table 2 11

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

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EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of 1.8 V to 4.8 V and the output voltage range of 1.2 V to 1.8 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 +60°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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