



ABSTRACT

This user's guide describes the characteristics, operation, and use of TI's evaluation module (EVM) for the TPS62810-Q1, TPS62811-Q1, TPS62812-Q1, and TPS62813-Q1 devices. The TPS62810EVM-015 is designed to help the user easily evaluate and test the operation and functionality of the TPS6281x buck converters. The EVM converts a 2.7-V to 6.0-V input voltage to a regulated 1.8-V output voltage that delivers up to 4 A. This user's guide includes setup instructions for the hardware, a printed-circuit board (PCB) layout, a schematic diagram and a bill of materials (BOM).

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1 Introduction

The TPS6281x device is a high-frequency, synchronous, step-down converter optimized for a small solution size and high efficiency. The devices focus on high-efficiency, step-down conversion over a wide output current range. At medium to heavy loads, the converter operates in PWM mode and automatically enters *Power Save Mode* operation at light load to maintain high efficiency over the entire load-current range. The internal compensation circuit allows a compact solution and small external components. The device is available in a 3.0-mm × 2.0-mm, 9-pin VQFN package.

1.1 Performance Specification

Table 1-1 provides a summary of the TPS62810EVM-015 performance specifications.

Table 1-1. Performance Specification Summary

| Specification | | Test Conditions | MIN | TYP | MAX | Unit |
|-------------------------|-----------------|-----------------|-----|-----|-----|------|
| Input voltage | | | 2.7 | | 6.0 | V |
| Output voltage setpoint | | | | 1.8 | | V |
| Output current | TPS62810EVM-015 | | 0 | | 4.0 | A |

1.2 Modifications

The printed-circuit board (PCB) for this EVM is designed to accommodate the different adjustable output voltage versions of this integrated circuit (IC). On the EVM, additional input and output capacitors can be added, the soft-start time can be changed and the switching frequency can be modified.

1.2.1 Input and Output Capacitors

Footprints for an additional input capacitor (C22) as well as for additional output capacitors (C31, C32 and C33) are provided. These capacitors are not required for proper operation but can be used to reduce the input and output voltage ripple and to improve the load transient response. For proper operation the total output capacitance must remain within the recommended range described in the [TPS6281x-Q1 Low Input Voltage, Adjustable-Frequency Step-Down Converter data sheet](#).

1.2.2 Adjustable-Output IC U1 Operation

U1 is configured for evaluation of the adjustable-output version. This unit is set to 1.8 V. Resistors R1 and R2 can be used to set the output voltage between 0.6 V and 5.5 V. For recommended values, see the [TPS6281x-Q1 Low Input Voltage, Adjustable-Frequency Step-Down Converter data sheet](#).

1.2.3 Feedforward Capacitor

C5 is the feedforward capacitor. If the feedback divider (R1 and R2) has been modified it may be required to adjust the value of the feedforward capacitor as well. For recommended values, see the [TPS6281x-Q1 Low Input Voltage, Adjustable-Frequency Step-Down Converter data sheet](#).

1.2.4 Soft-Start Time

C4 controls the soft-start time of the output voltage. It can be changed for a faster or slower ramp up of the output voltage. For recommended capacitor values, see the [TPS6281x-Q1 Low Input Voltage, Adjustable-Frequency Step-Down Converter data sheet](#).

1.2.5 Tracking

A control voltage connected to J6 can be used to control the output voltage. For more details see the [TPS6281x-Q1 Low Input Voltage, Adjustable-Frequency Step-Down Converter data sheet](#).

1.2.6 Switching Frequency and Control Loop Compensation

R4 controls the switching frequency of the converter. It is also used to select a predefined control loop compensation setting. For recommended values, see the [TPS6281x-Q1 Low Input Voltage, Adjustable-Frequency Step-Down Converter data sheet](#).

2 Setup

This section describes how to correctly use the TPS62810EVM-015.

2.1 Connector Descriptions

| | |
|--------------------------------|--|
| J1, Pin 1 and 2 – VIN | Positive input voltage connection from the input supply for the EVM |
| J1, Pin 3 and 4 – S+/S– | Input voltage sense connections, measure the input voltage at this point |
| J1, Pin 5 and 6 – GND | Input return connection from the input supply for the EVM |
| J2, Pin 1 and 2 – VOUT | Positive output voltage connection |
| J2, Pin 3 and 4 – S+/S– | Output voltage sense connections, measure the output voltage at this point |
| J2, Pin 5 and 6 – GND | Output return connection |
| J3 – EN | EN pin 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. |
| J4 – MODE/SYNC | MODE/SYNC pin jumper. Place the supplied jumper across VIN and MODE/SYNC to force the device in fixed frequency PWM operation at all load currents. Place the jumper across MODE/SYNC and GND to enable power save mode. Connect a clock signal to MODE/SYNC referenced to GND to synchronize the switching frequency to the clock signal. |
| J5 – PG | The PG output appears on pin 1 of this header with a convenient ground on pin 2. |
| J6 – SS/TR | SS/TR input, a voltage connected on pin 1 of this header referenced to GND on pin 2 can be used to control the output voltage (tracking). |

2.2 Hardware Setup

To operate the EVM, set jumpers J3 and J4 to the desired positions using the [Section 2.1](#). Connect the input supply to J1, between VIN and GND and connect the load to J2 between VOUT and GND.

3 TPS62810EVM-015 Test Results

The TPS62810EVM-015 was used to take the typical characteristics data in the TPS62810-Q1 data sheet. See [TPS6281x-Q1 Low Input Voltage, Adjustable-Frequency Step-Down Converter data sheet](#) for the performance of this EVM.

4 Board Layout

This section provides the TPS62810EVM-015 board layout. The Gerber files are available on the [TPS62810EVM-015](#) tool page

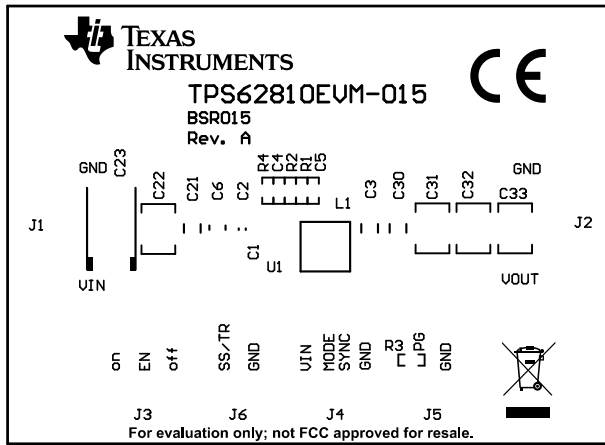


Figure 4-1. Top Silk

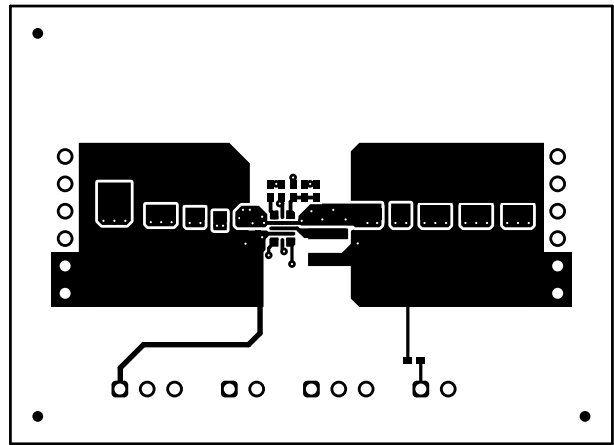


Figure 4-2. Top Layer

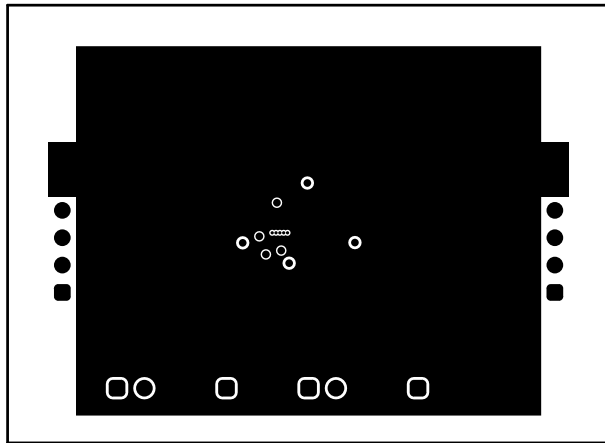


Figure 4-3. Layer 2

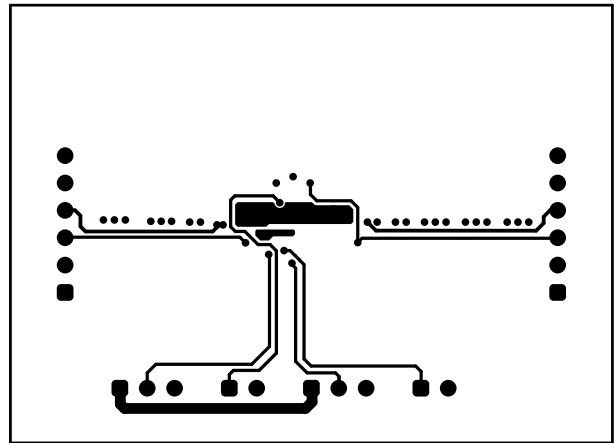


Figure 4-4. Layer 3

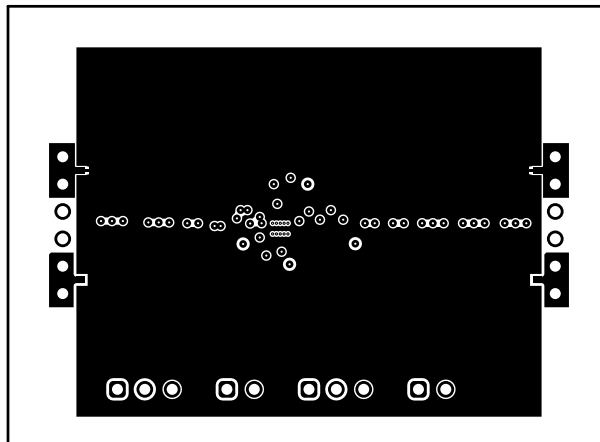


Figure 4-5. Bottom Layer

5 Schematic

Figure 5-1 shows the TPS62810EVM-015 EVM schematic.

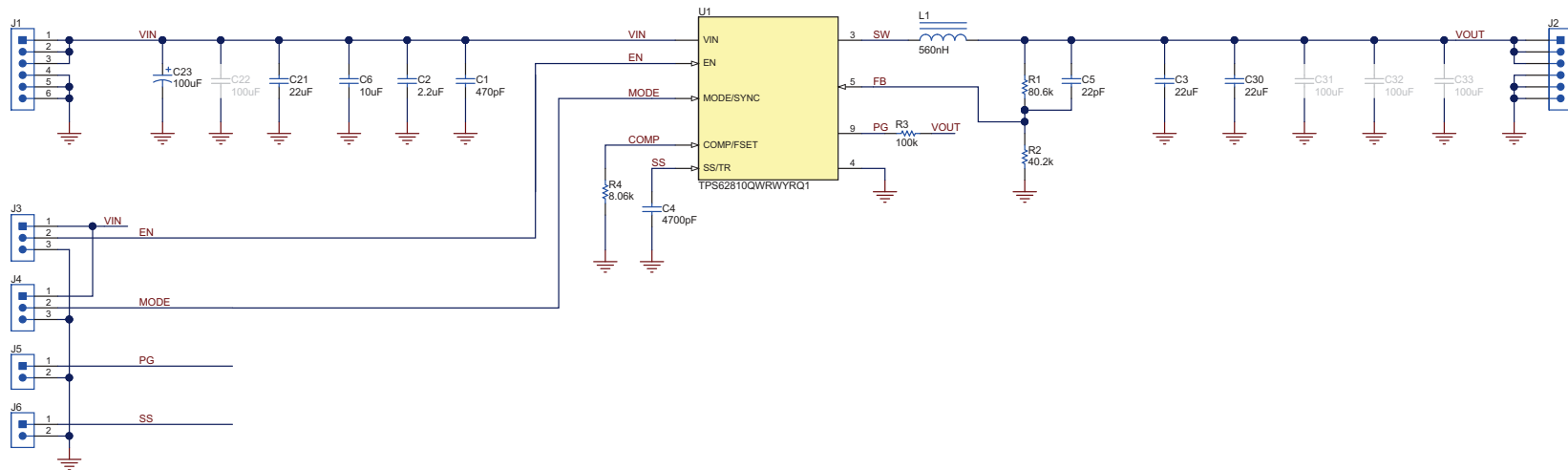


Figure 5-1. TPS62810EVM-015 Schematic

6 Bill of Materials

Table 6-1 lists the BOM for TPS62810EVM-015 EVM.

Table 6-1. TPS62810EVM-015 BOM

| Qty | Ref Des | Value | Description | Size | Part Number | MFR |
|-----|-----------------|-----------------|---|--------------------|----------------------|-------------------|
| 1 | C1 | 470 pF | Ceramic Capacitor, 50V, X7R | 0402 | | any |
| 1 | C2 | 2.2 μ F | Ceramic Capacitor, 10V, X7S | 0603 | CGA3E3X7S1A225K080AB | TDK |
| 3 | C3, C21, C30 | 22 μ F | Ceramic Capacitor, 10V, X7R | 1206 | GCM31CR71A226KE02 | MuRata |
| 1 | C4 | 4700 pF | Ceramic Capacitor, 50V, X7R | 0402 | | any |
| 1 | C5 | 22pF | Ceramic Capacitor, 50V, COG/NPO | 0402 | | any |
| 1 | C6 | 10 μ F | Ceramic Capacitor, 10V, X7R | 0805 | GCM21BR71A106KE22 | MuRata |
| 1 | C23 | 100 μ F | Polymer Capacitor, 20V | 7.3x4.3mm | 20TQC100MYF | Panasonic |
| 1 | L1 | 560 nH | Inductor | 4.0 x 4.0 x 2.0 mm | XEL4020-561MEB | Coilcraft |
| 1 | R1 | 80.6 k Ω | Resistor 1%, 0.1 W | 0402 | | any |
| 1 | R2 | 40.2 k Ω | Resistor 1%, 0.1 W | 0402 | | any |
| 1 | R3 | 100 k Ω | Resistor 1%, 0.1 W | 0402 | | any |
| 1 | R4 | 8.06 k Ω | Resistor 1%, 0.1 W | 0402 | | any |
| 1 | U1 | | Low Input Voltage, Adjustable-Frequency Step-down Converter | VQFN-HR-9 | TPS62810QWRWYRQ1 | Texas Instruments |

7 Revision History

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

| Changes from Revision * (July 2018) to Revision A (March 2021) | Page |
|--|------|
| • Updated Schematic..... | 5 |

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