User's Guide

TPS6286x0EVM-109 Evaluation Module

Excel Regidor

ABSTRACT

TPS6286x0EVM-109 facilitates the evaluation of the TPS6286x0 family of 600-mA and 1.0-A, step-down converters with 2.3-µA I_Q in tiny 0.7-mm by 1.4-mm WCSP packages with 0.4-mm pitch. The EVM contains circuits to create output voltages between 0.4-V to 1.9875-V from higher input voltages between 1.8 V and 5.5 V. The TPS6286x0 is a highly-efficient and tiny solution for point-of-load (POL) converters for space-constrained applications, such as wearables and smart phones.

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1 Introduction

The TPS6286x0 is a synchronous, step-down converter in a 0.7-mm × 1.4-mm wafer chip-scale package (WCSP) with a 0.4-mm pitch. The BSR109 EVMs support different IC version of TPS62860 and TPS62861 families.

1.1 Background

The TPS628600EVM-109 is with the TPS628600 integrated circuit (IC) and with a default output voltage of 1.1-V. The TPS628610EVM-109 uses the TPS628610 integrated circuit (IC) and the output voltage set at 1.1-V. The output voltage can be adjusted after the start-up phase with its graphic user interface via the I2C communication protocol. The EVM operates with an input voltage between 1.8-V and 5.5-V.

1.2 Performance Specification

Table 1-1 provides a summary of the TPS6286x0EVM-109 performance specifications. All specifications are given for an ambient temperature of 25°C.

Table 1-1. Performance Specification Summary

SPECIFICATION	EVM BOARD / TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input voltage		1.8	3.6	5.5	V
Output voltage		0.4		1.9875	V
Output current	TPS628600EVM-109; V_{IN} ≥ 1.8 V			0.6	A
	TPS628610EVM-109; V_{IN} ≥ 1.8V			1.0	A

1.3 Modifications

The EVM can support variance of the TPS6286x0 IC family. Additional input and output capacitors can be added.

1.3.1 IC U1 Operation

The EVM requires an I2C interface, such as the TI USB2ANY and the graphic user interface, to configure the TPS6286x0 functions. The output voltage can be changed in an instant using the preset value on the VOUT Register 1 and VOUT Register 2 using an onboard jumper.

2 Setup

This section describes how to properly use the TPS6286x0EVM-109.

2.1 Input and Output Connector Description

2.1.1 J1, Pin 1 and 2 – VIN

Positive input voltage connection from the input power supply for the EVM.

2.1.2 J1, Pin 3 and 4 – S+/S-

Input voltage sense connections. Measure the input voltage at this point.

2.1.3 J1, Pin 5 and 6 – GND

Input voltage GND return connection from the input power supply for the EVM.

2.1.4 J2, Pin 1 and 2 – VOUT

Positive output voltage connection

2.1.5 J2, Pin 3 and 4 – S+/S-

Output voltage sense connections. Measure the output voltage at this point.

2.1.6 J2, Pin 5 and 6 – GND

Output voltage GND return connection.

2.1.7 J3 – I2C

10-pin header used to connect the USB2ANY adaptor to the EVM

2.1.8 JP1 – EN

EN pin input jumper. Place the jumper across ON and EN to turn on the IC. Place the jumper across OFF and EN to turn off the IC.

2.1.9 JP2 – VSEL

Placing a jumper across VSEL and High pins sets the output voltage to the value in VOUT1 register. Placing a jumper across VSEL and Low pins sets teh output voltage to the value in VOUT2 register.

2.2 Setup

Connect the input supply and the EVM by attaching the positive terminal to J1 (VIN pins), and the negative terminal to J1 (GND pins) to power the board. Link the positive terminal of the electronic load to J2 (VOUT pins) and the negative terminal to J2 (GND pins) of the EVM. Pull high the EN pin to turn on the device and pull low to disable the part.

3 Board Layout

This section provides the TPS6286x0EVM-109 board layout and illustrations.

3.1 Layout

Figure 3-1 through Figure 3-5 show the component placement and PCB layout of the TPS62861xEVM.

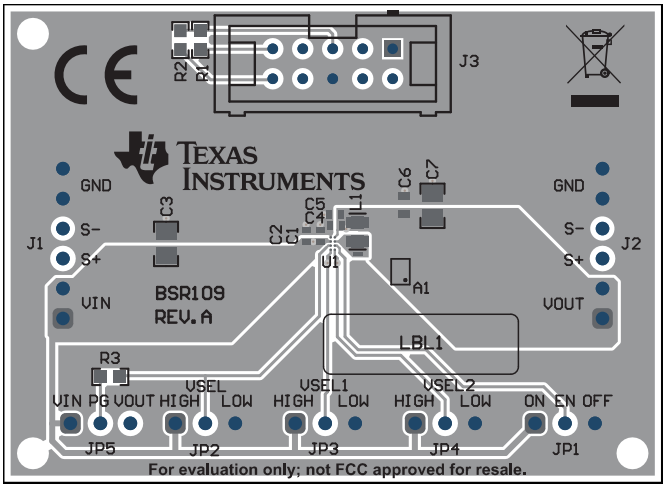

Figure 3-1. TPS6286x0EVM PCB - Assembly Layer

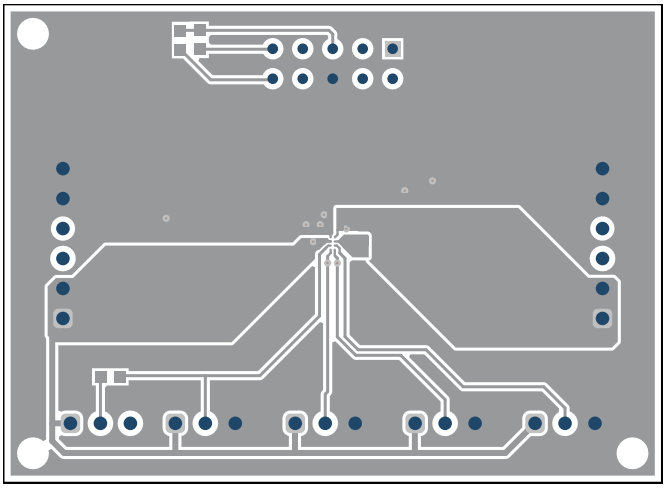

Figure 3-2. TPS6286x0EVM PCB - Top Layer

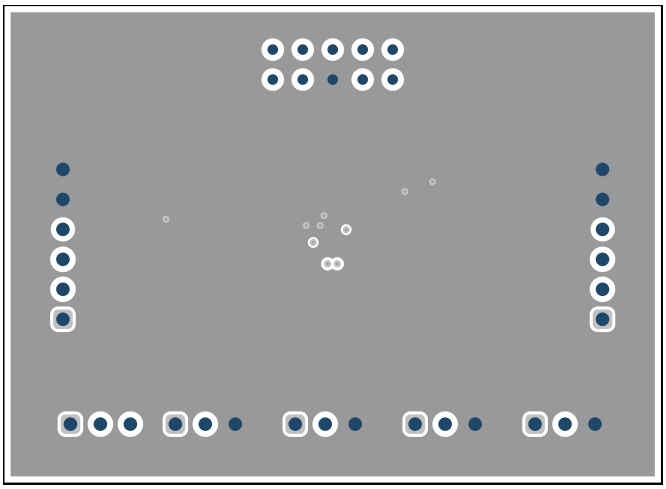

Figure 3-3. TPS6286x0EVM PCB - Signal Layer 1 (Top View)

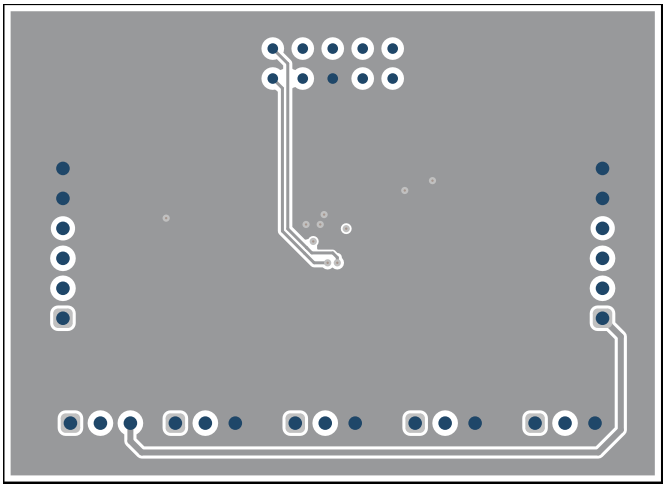

Figure 3-4. TPS6286x0EVM PCB - Signal Layer 2 (Top View)

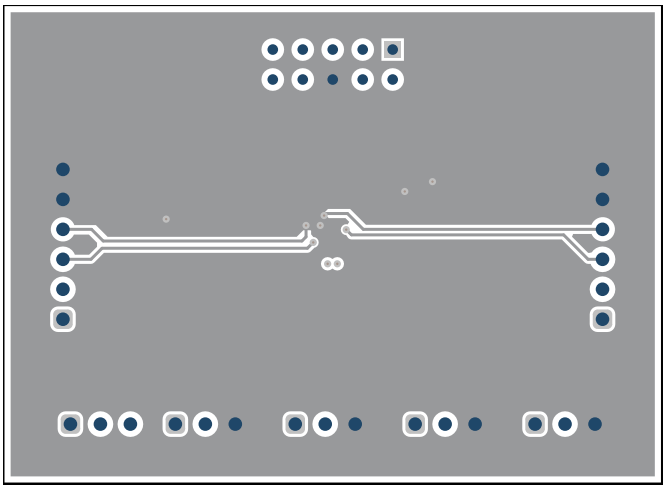

Figure 3-5. TPS6286x0EVM PCB - Bottom Layer (Top View)

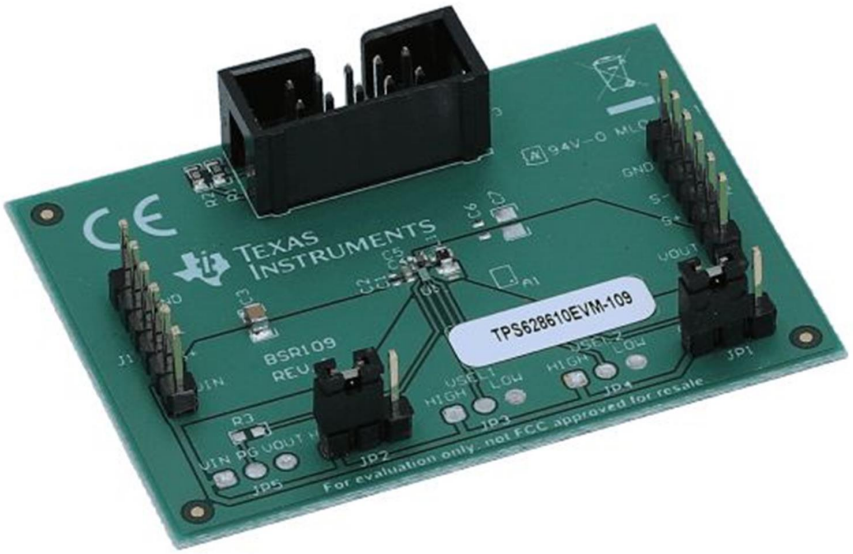

Figure 3-6. TPS628610EVM Angled View

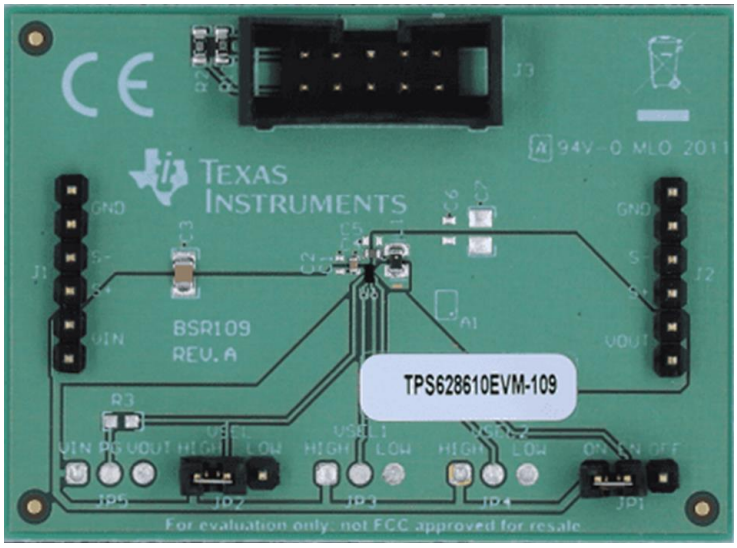

Figure 3-7. TPS628610EVM Overhead View

4 Schematic and Bill of Materials

This section provides the TPS62861xEVM schematic and bill of materials.

4.1 Schematic

Figure 4-1 illustrates the EVM schematic.

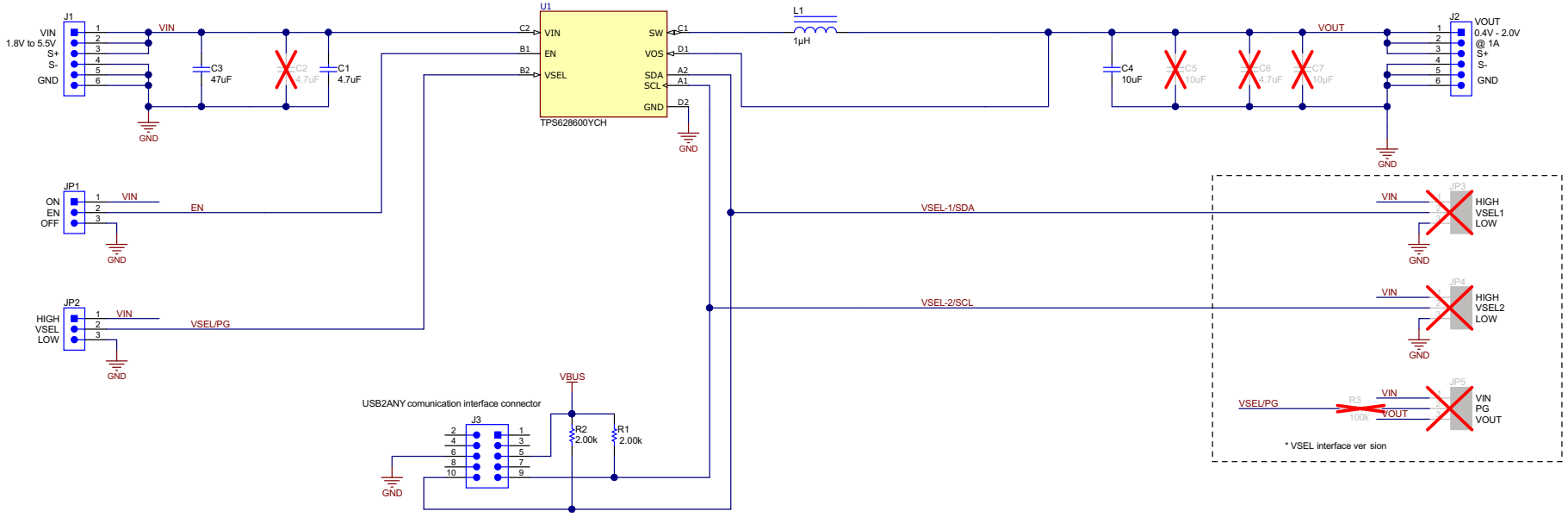

Figure 4-1. TPS628600EVM Schematic

Figure 4-2 illustrates the EVM schematic.

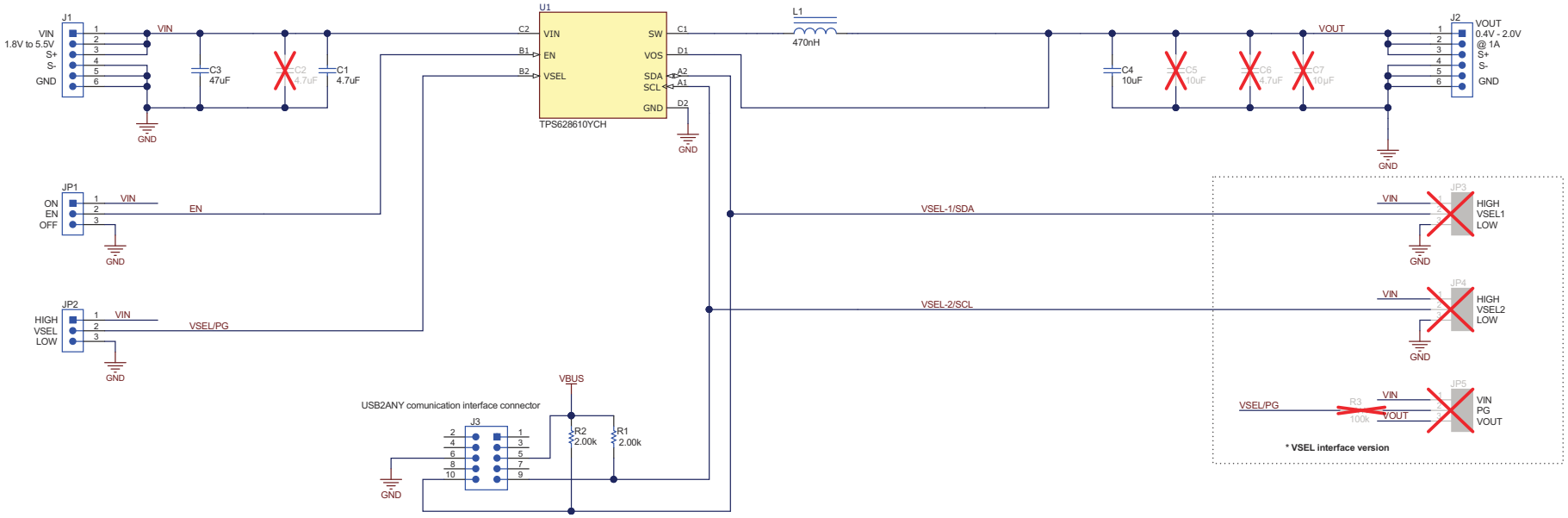

Figure 4-2. TPS628610EVM Schematic

4.2 Bill of Materials

Table 4-1 lists the EVM bill of materials.

Table 4-1. TPS628600EVM-109 BOM

Designator	Quantity	Value	Description	Package Reference	PartNumber	Manufacturer
C1	1	4.7uF	CAP, CERM, 4.7 uF, 6.3 V, +/- 20%, X5R, 0402	0402	GRM155R60J475ME47D	MuRata
C3	1	47uF	CAP, CERM, 47 uF, 6.3 V, +/- 20%, X5R, 0805	0805	GRM21BR60J476ME15L	MuRata
C4	1	10uF	CAP, CERM, 10 uF, 6.3 V, +/- 20%, X5R, 0402	0402	GRM155R60J106ME15D	MuRata
L1	1	1uH	Inductor, Shielded, Metal Composite, 1 µH, 2.7 A, 0.057 ohm, SMD	1.6x2mm	DFE201610E-1R0M=P2	MuRata
R1, R2	2	2.00k	RES, 2.00 k, 1%, 0.1 W, 0603	0603	RC0603FR-072KL	Yageo
U1	1		1.8-V to 5.5-V Input, 0.6-A Synchronous Step-Down Converter with I2C/VSEL Interface	DSBGA8	TPS628600YCH	Texas Instruments

Table 4-2 lists the EVM bill of materials.

Table 4-2. TPS628610EVM-109 BOM

Designator	Quantity	Value	Description	Package Reference	PartNumber	Manufacturer
C1	1	4.7uF	CAP, CERM, 4.7 uF, 6.3 V, +/- 20%, X5R, 0402	0402	GRM155R60J475ME47D	MuRata
C3	1	47uF	CAP, CERM, 47 uF, 6.3 V, +/- 20%, X5R, 0805	0805	GRM21BR60J476ME15L	MuRata
C4	1	10uF	CAP, CERM, 10 uF, 6.3 V, +/- 20%, X5R, 0402	0402	GRM155R60J106ME15D	MuRata
L1	1	470nH	Inductor, Shielded, Metal Composite, 470 nH, 2.6 A, 0.054 ohm, SMD	0603	DFE18SANR47MG0L	MuRata
R1, R2	2	2.00k	RES, 2.00 k, 1%, 0.1 W, 0603	0603	RC0603FR-072KL	Yageo
U1	1		1.8-V to 5.5-V Input, 1-A Synchronous Step-Down Converter with I2C/VSEL Interface in 0.7- mm x 1.4-mm WCSP Package	DSBGA8	TPS628610YCH	Texas Instruments

5 Software User Interface

5.1 Software Setup

A graphical user interface (GUI) is available from the TPS62861 tools and software page, which allows simple and convenient programming of the device through the TI USB2ANY (http://www.ti.com/tool/USB2ANY) interface board. Alternatively, you can use any I^2C-standardized programming tool or I^2C host to configure the device. Mind the I^2C pins specification, such as timing parameters and proper pullup resistors, specified in the *TPS62860, TPS62861 1.8-V to 5.5-V Input, 1-A Synchronous Step-Down Converter Data Sheet*.

5.2 Interface Hardware Setup

Connect the USB2ANY adapter to the PC using the supplied USB cable. Attach the EVM connector, J3 to the USB2ANY adapter using the supplied 10-pin ribbon cable. The ribbon cable connector is keyed to prevent incorrect installation..

Figure 5-1 shows a quick adapter connection overview.

USB Interface Adaptor Quick Connection Diagram

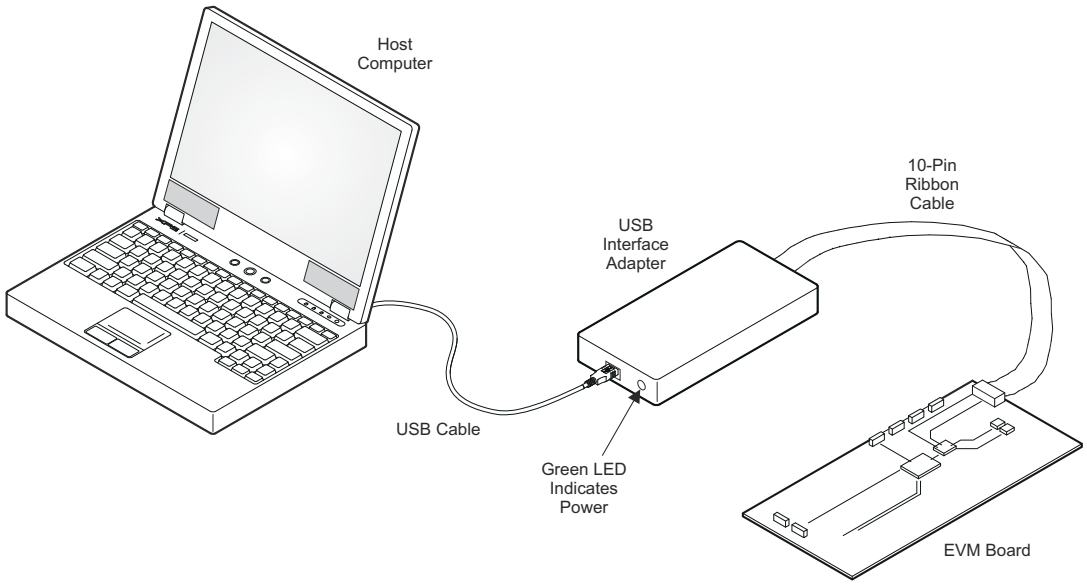

Figure 5-1. Quick Connection Overview

5.3 User Interface Operation

Upon start-up, the GUI automatically connects to the EVM. If not, then click on the "Connect" button in the lower-left corner of the GUI window. Ensure the I2C Slave Address is correct. The following sections give a short overview of the three main GUI screens.

5.3.1 Home Screen

The Home screen provides a short overview of the TPS6286x0 devices. To start evaluating the device, click the **Start** button. Click the **I2C Slave Address** button to change the address, and the default I2C address is 0x40. All the links related to the device are all indicated on the bottom portion of the window.

Figure 5-2. GUI Home Screen

5.3.2 Settings Screen

The Settings screen provides control over the VOUT and CONTROL Registers. The Status Register is available in this window as well. Real-time updates are possible if the Auto Read function is set to *As fast as possible* in the Register Map page.

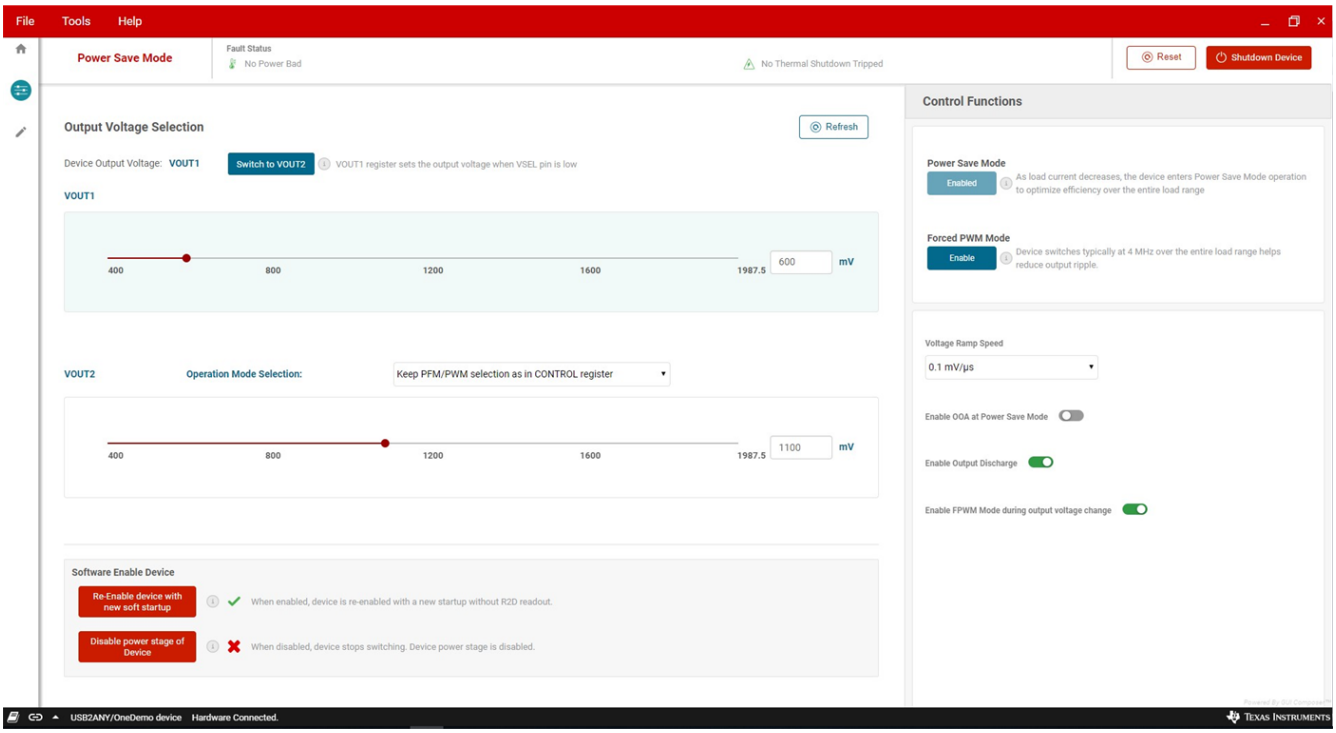

Figure 5-3. GUI Settings Screen

5.3.3 Register Map Screen

The Register Map screen shows bit values of all parameters. In this section, single registers can be read or written to the device (if applicable). Refer to the register map in the *TPS62860, TPS62861 1.8-V to 5.5-V Input, 1-A Synchronous Step-Down Converter Data Sheet* for a detailed description of the TPS6286x0 registers.

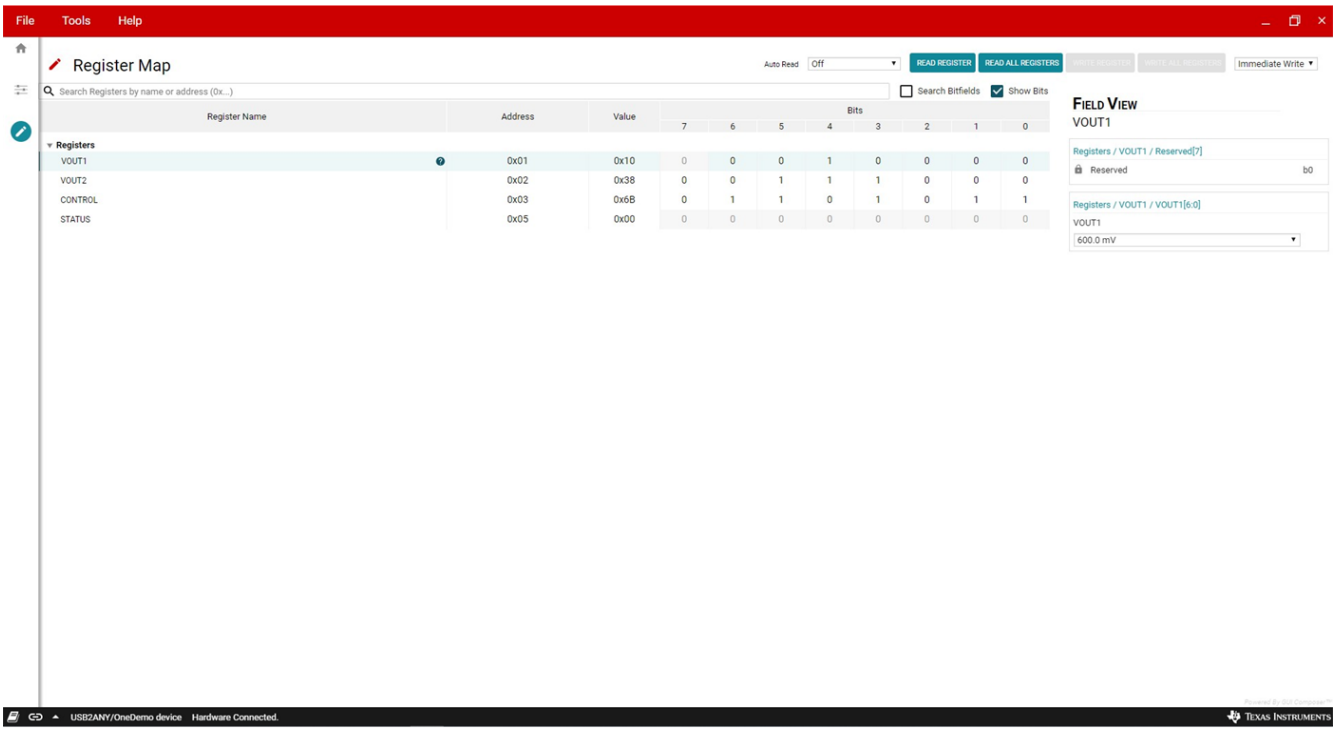

Figure 5-4. GUI Register Map Screen

Revision History

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

Changes from Revision A (June 2020) to Revision B (September 2020)	Page
• Changed title from *TPS62861xEVM-109 Evaluation Module* to *TPS62861x0EVM-109 Evaluation Module*	2
• Changed entire bill of materials	9

Changes from Revision * (April 2020) to Revision A (May 2020)	Page
• Removed pre-production note	2
• Edited Section 1	2
• Added "and EN pin voltage divider" to Section 1.3	2
• Changed entire schematic	7
• Changed entire bill of materials	9

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