

# TPSM8282xEVM-080 and TPSM8282xAEVM-127 Evaluation Modules



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## 1 TPSM8282xEVM-080 and TPSM8282xAEVM-127 Evaluation Modules

The TPSM82821EVM-080, TPSM82822EVM-080, and TPSM82823EVM-080 are at revision B, the newer revision with better thermal performance, smaller solution size, and complies with CISPR 11 class B.

The TPSM8282xEVM-080 and the TPSM8282xAEVM-127 facilitates the evaluation of the TPSM82821x, TPSM82822x, and TPSM82823x 1-A, 2-A, and 3-A pin-to-pin compatible step-down modules with DCS-Control in a 2-mm × 2.5-mm uSiL package. The TPSM82821A, TPSM82822A, and TPSM82823A modules are the forced PWM versions of the TPSM82821, TPSM82822, and TPSM82823 modules, respectively. The EVMs have a 1.8-V output voltage with 1% accuracy for input voltages from 2.4 V to 5.5 V with a maximum solution height of 1.1 mm. The TPSM82821x, TPSM82822x, and TPSM82823x are highly efficient and small solutions for point-of-load (POL) modules in applications, such as optical modules, embedded camera systems, and other space-limited applications.

## 2 Introduction

The TPSM8282x and the TPSM8282xA are high efficiency synchronous, step-down converter power modules in a small 2-mm × 2.5-mm uSiL package. The device family consists of 1 A, 2 A, or 3 A output current modules and comes in both automatic power save mode and forced PWM mode versions.

### 2.1 Performance Specification

[Table 2-1](#) provides a summary of the TPSM8282xEVM-080 and the TPSM8282xAEVM-127 performance specifications.

**Table 2-1. Performance Specification Summary**

SPECIFICATION	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input voltage		2.4	5	5.5	V
Output voltage setpoint			1.8		V
Output current	TPSM82821EVM-080	0		1	A
	TPSM82822EVM-080	0		2	A
	TPSM82823EVM-080	0		3	A
	TPSM82821AEVM-127	0		1	A
	TPSM82822AEVM-127	0		2	A
	TPSM82823AEVM-127	0		3	A

### 2.2 Modifications

The printed-circuit board (PCB) for this EVM is designed to accommodate both the fixed and the adjustable output voltage versions of this device family. Additional input and output capacitors can also be added. The board layout, schematic, bill of materials, and the setup for both the TPSM8282xEVM-080 and the TPSM8282xAEVM-127 remains the same. Therefore, either of the EVMs can be used to evaluate any device variant from this family.

#### 2.2.1 Input and Output Capacitors

C5, shown in [Figure 7-1](#), 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.

C6 and C7 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.

## 3 Setup

This section describes how to properly use the TPSM8282xEVM-080 Rev.B and the TPSM8282xAEVM-127 Rev.A.

### 3.1 Setup

To operate the EVM, set jumper JP1 between ON and EN to turn on the device as shown in [Section 3.2](#). Connect the input supply to J1 and connect the load to J2.

### 3.2 Input/Output Connector Descriptions

<b>J1, Pin 1 and 2 – VIN</b>	Positive input connection from the input supply for the EVM.
<b>J1, Pin 3 and 4 – S+/S–</b>	Input voltage sense connections. Measure the input voltage at this point.
<b>J1, Pin 5 and 6 – GND</b>	Input return connection from the input supply for the EVM.
<b>J2, Pin 1 and 2 – VOUT</b>	Output voltage connection
<b>J2, Pin 3 and 4 – S+/S–</b>	Output voltage sense connections. Measure the output voltage at this point.
<b>J2, Pin 5 and 6 – GND</b>	Output return connection
<b>J3 – PG/GND</b>	The PG output appears on pin 1 of this header with ground on pin 2.
<b>JP1 – EN</b>	EN pin input jumper. Place the supplied jumper across ON and EN to turn on the module. Place the jumper across OFF and EN to turn off the IC.

## 4 Safety Instructions

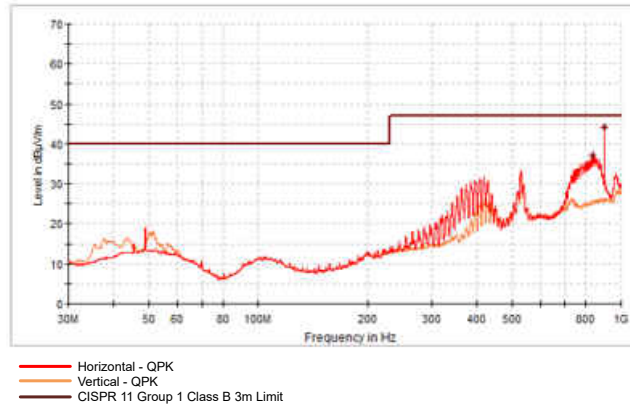
### WARNING



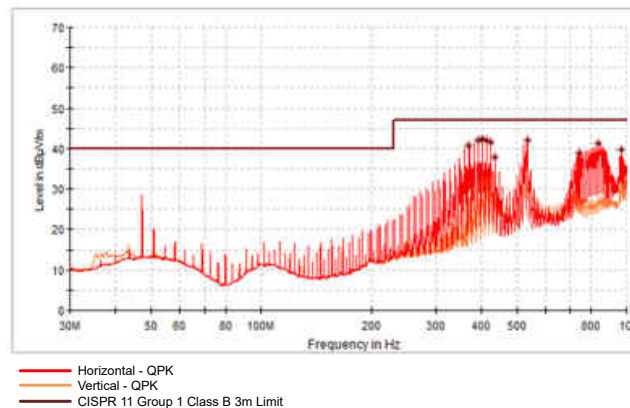
Hot surface. Contact may cause burns. Do not touch.

## 5 TPSM8282xEVM-080 Test Results

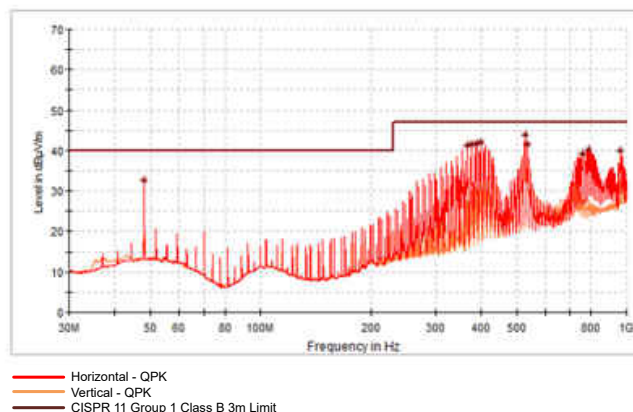
This section provides test results for the TPSM8282xEVM-080. The TPSM8282xEVM-080 was used to take all the data in the [TPSM8282x 1-A, 2-A, and 3-A High Efficiency Step-Down Converter MicroSiP™ Power Module with Integrated Inductor Data Sheet](#). See the device data sheet for the performance of this EVM. The following EMI measurements were made for  $V_{IN} = 5.5\text{ V}$  and  $V_{OUT} = 1.8\text{ V}$ . The TPSM82821EVM-080 had a resistive load of  $2.2\ \Omega$ , which results in an output current  $I_{OUT} = 0.82\text{ A}$ . The TPSM82822EVM-080 had a resistive load of  $1\ \Omega$ , which results in an output current  $I_{OUT} = 1.8\text{ A}$ . The TPSM82823EVM-080 had a resistive load of  $0.68\ \Omega$ , which results in an output current  $I_{OUT} = 2.65\text{ A}$ .



**Figure 5-1. TPSM82821EVM-080 Radiated EMI**



**Figure 5-2. TPSM82822EVM-080 Radiated EMI**



**Figure 5-3. TPSM82823EVM-080 Radiated EMI**

## 6 Board Layout

This section provides the TPSM8282xEVM-080 board layout and illustrations in [Figure 6-1](#) through [Figure 6-5](#). The Gerbers are available on the [TPSM8282xEVM-080 product page](#). In this section, the TPSM8282xEVM-080 is used as an example. The board layout for the TPSM8282xAEVM-127 remains the same. The Gerbers for the TPSM8282xAEVM-127 are also available on the respective product pages.

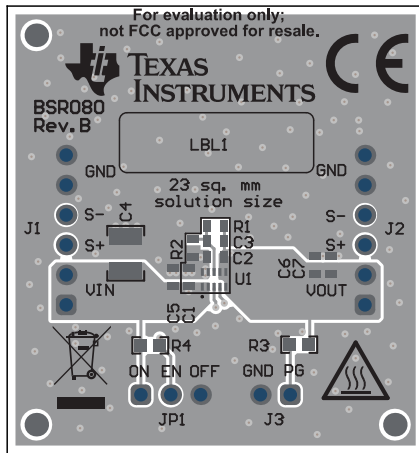


Figure 6-1. Top Assembly

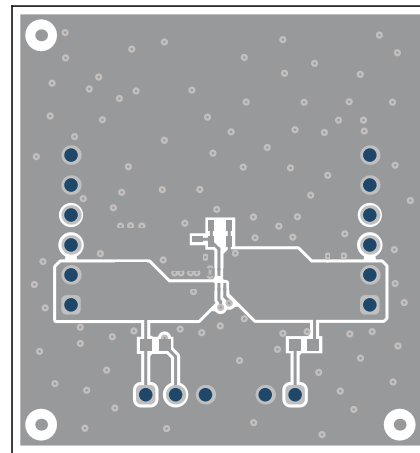


Figure 6-2. Top Layer

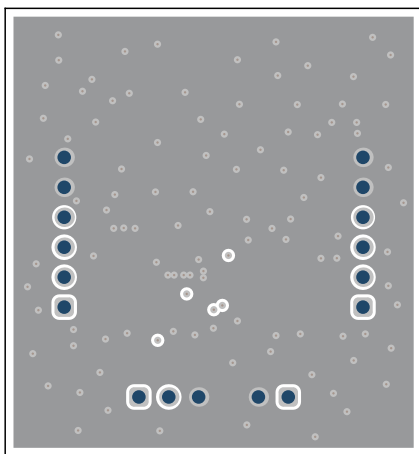


Figure 6-3. Signal Layer 1

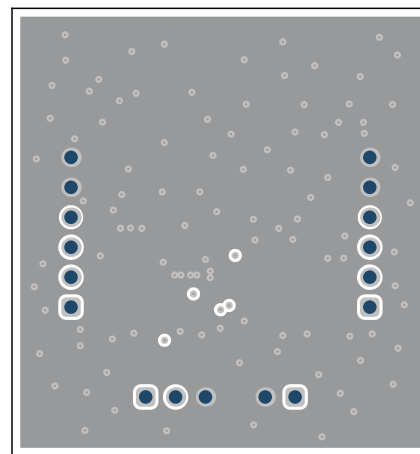


Figure 6-4. Signal Layer 2

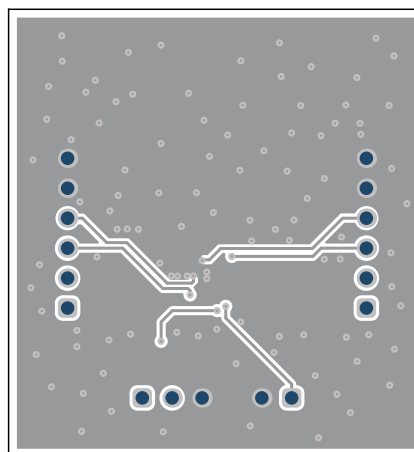


Figure 6-5. Bottom Layer

## 7 Schematic and Bill of Materials

This section provides the TPSM8282xEVM-080 schematic and bill of materials (BOM). The schematic and BOM for TPSM8282xAEVM-127 remains the same.

### 7.1 Schematic

Figure 7-1 illustrates the EVM schematic. In this subsection, the TPSM8282xEVM-080 is used as an example.

- The TPSM82821EVM-080 uses the TPSM82821 IC.
- The TPSM82822EVM-080 uses the TPSM82822 IC.
- The TPSM82823EVM-080 uses the TPSM82823 IC.
- The TPSM82821AEVM-127 uses the TPSM82821A IC.
- The TPSM82822AEVM-127 uses the TPSM82822A IC.
- The TPSM82823AEVM-127 uses the TPSM82823A IC.

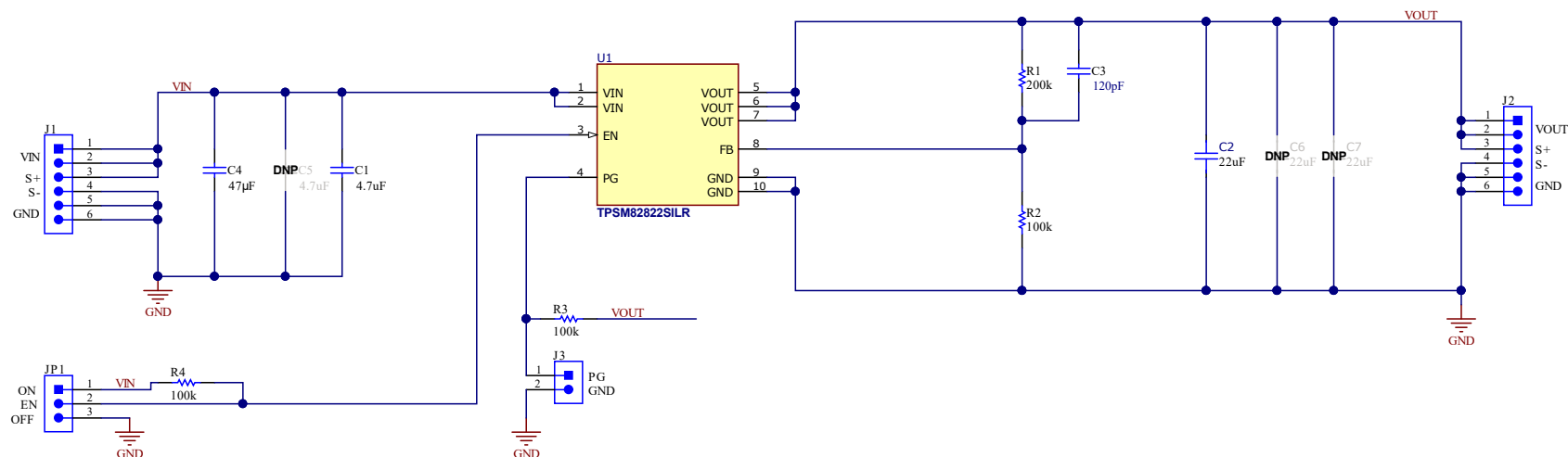


Figure 7-1. TPSM8282xEVM-080 Schematic

## 7.2 Bill of Materials

Section 7.2 lists the BOM for this EVM.

**Table 7-1. TPSM8282xEVM-080 and TPSM8282xAEVM-127 Bill of Materials**

COUNT			DESIGNATOR	VALUE	DESCRIPTION	SIZE	PART NUMBER	MANUFACTURER
-001	-002	-003						
1	1	1	C1	4.7 $\mu$ F	CAP, CERM, 4.7 $\mu$ F, 6.3 V, $\pm$ 10%, X7R, 0603	0603	JMK107BB7475MA-T	Taiyo Yuden
1	1	1	C2	22 $\mu$ F	CAP, CERM, 22 $\mu$ F, 6.3V, $\pm$ 20%, X6S, 0603	0603	JMK107BC6226MA-T	Taiyo Yuden
1	1	1	C3	120 pF	CAP, CERM, 120 pF, 50 V, $\pm$ 5%, C0G/NP0, 0603	0603	06035A121JAT2A	AVX
1	1	1	C4	47 $\mu$ F	CAP, CERM, 47 $\mu$ F, 10 V, $\pm$ 20%, X7R, 1210	1210	LMK325B7476MM-PR	Taiyo Yuden
1	1	1	R1	200 k	RES, 200 k, 1%, 0.1 W, 0603	0603	RC0603FR-07200KL	Yageo
2	2	2	R2, R3, R4	100 k	RES, 100 k, 1%, 0.1 W, 0603	0603	RC0603FR-07100KL	Yageo
1	0	0	U1		1-A Step-Down Module with 1% Output Accuracy in 2-mm $\times$ 2.5-mm uSip	2 mm $\times$ 2.5 mm	TPSM82821SILR or TPSM82821ASILR	Texas Instruments
0	1	0	U1		2-A Step-Down Module with 1% Output Accuracy in 2-mm $\times$ 2.5-mm uSip	2 mm $\times$ 2.5 mm	TPSM82822SILR or TPSM82822ASILR	Texas Instruments
0	0	1	U1		3-A Step-Down Module with 1% Output Accuracy in 2-mm $\times$ 2.5-mm uSip	2 mm $\times$ 2.5 mm	TPSM82823SILR or TPSM82823ASILR	Texas Instruments

## A Appendix - Rev.A EVM

### A.1 Rev.A - Input and Output Capacitors

This appendix contains the information about the original Revision A TPSM82821EVM-080 and TPSM82822EVM-080 EVMs, which are now Revision B. The Revision A EVMs are no longer available for purchase.

C3, shown in [Figure A-6](#), 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.

C8 is provided for additional output capacitors. This capacitor is 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.



## A.2 Rev.A - Setup

This section describes how to properly use the TPSM8282xEVM-080 Rev.A.

### A.2.1 Rev.A - Setup

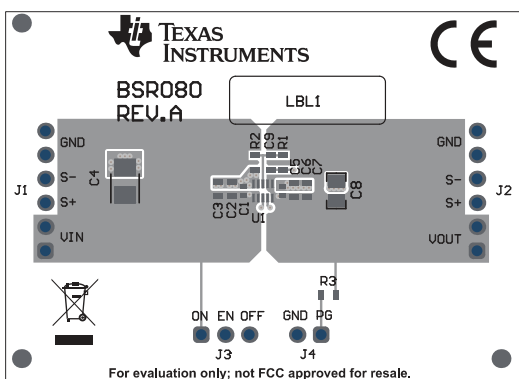
To operate the EVM, set jumper J3 between ON and EN to turn on the device as shown in [Appendix A.2.2](#). Connect the input supply to J1 and connect the load to J2.

### A.2.2 Rev.A - Input/Output Connector Descriptions

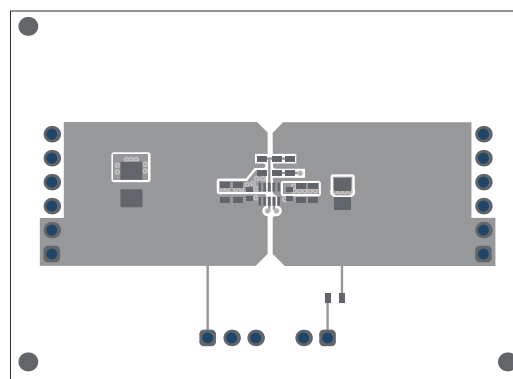
<b>J1, Pin 1 and 2 – VIN</b>	Positive input connection from the input supply for the EVM.
<b>J1, Pin 3 and 4 – S+/S–</b>	Input voltage sense connections. Measure the input voltage at this point.
<b>J1, Pin 5 and 6 – GND</b>	Input return connection from the input supply for the EVM.
<b>J2, Pin 1 and 2 – VOUT</b>	Output voltage connection
<b>J2, Pin 3 and 4 – S+/S–</b>	Output voltage sense connections. Measure the output voltage at this point.
<b>J2, Pin 5 and 6 – GND</b>	Output return connection
<b>J3 – EN</b>	EN pin input jumper. Place the supplied jumper across ON and EN to turn on the module. Place the jumper across OFF and EN to turn off the IC.
<b>J4 – PG/GND</b>	The PG output appears on pin 1 of this header with ground on pin 2.

## A.3 Rev.A - Board Layout

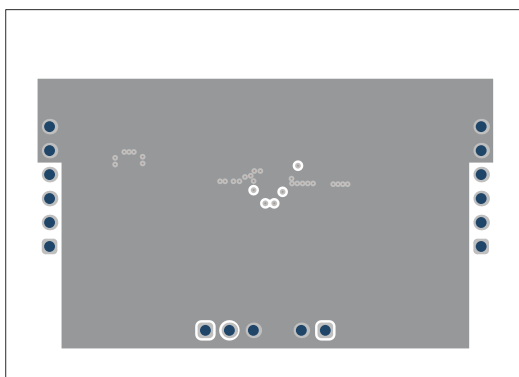
This section provides the TPSM8282xEVM-080 Revision A board layout and illustrations in [Figure A-1](#) through [Figure A-5](#).



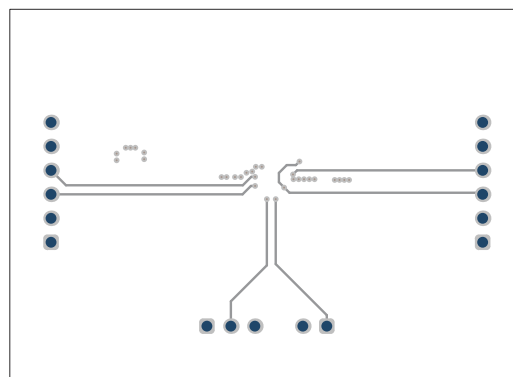
**Figure A-1. Rev.A - Top Assembly**



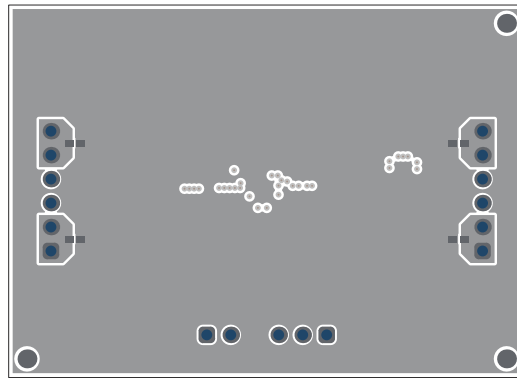
**Figure A-2. Rev.A - Top Layer**



**Figure A-3. Rev.A - Signal Layer 1**



**Figure A-4. Rev.A - Signal Layer 2**



**Figure A-5. Rev.A - Bottom Layer**

## A.4 Rev.A - Schematic and Bill of Materials

This section provides the TPSM8282xEVM-080 schematic and bill of materials (BOM).

### A.4.1 Rev.A - Schematic

Figure A-6 illustrates the EVM schematic.

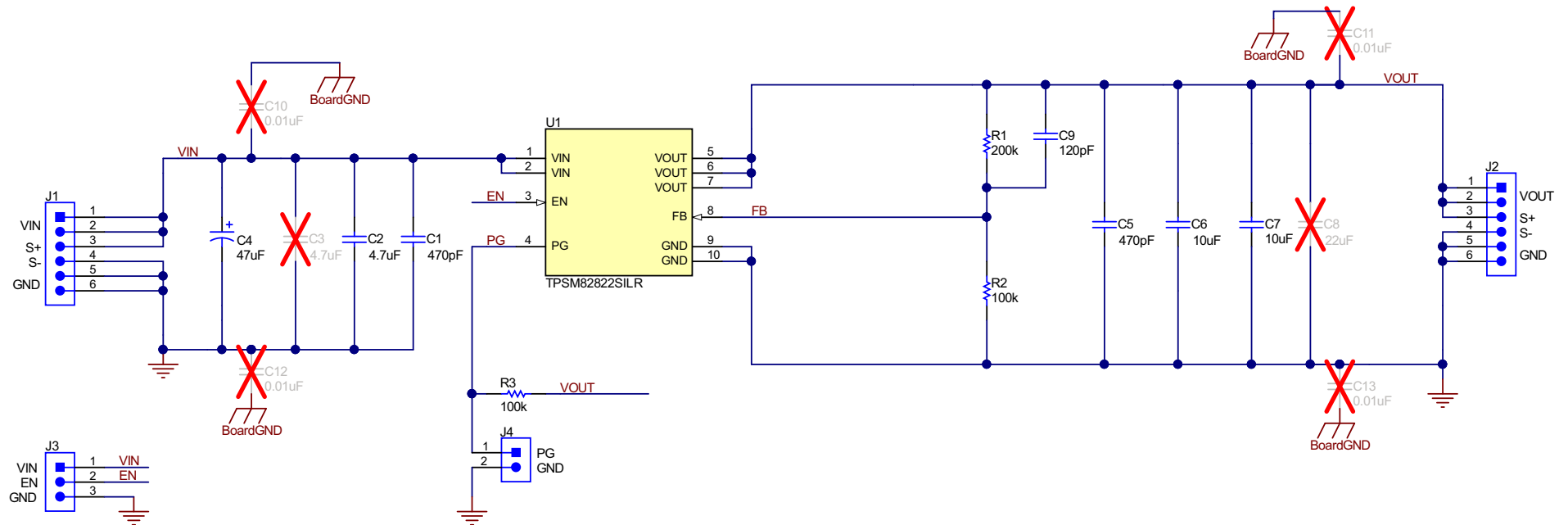


Figure A-6. TPSM8282xEVM-080 Revision A Schematic

## A.4.2 Rev.A - Bill of Materials

Table A-1 lists the BOM for this EVM.

**Table A-1. TPSM8282xEVM-080 Revision A Bill of Materials**

COUNT		DESIGNATOR	VALUE	DESCRIPTION	SIZE	PART NUMBER	MANUFACTURER
-001	-002						
2	2	C1, C5	470 pF	CAP, CERM, 470 pF, 50 V, ±10%, X7R, 0402	0402	GCM155R71H471 KA37D	MuRata
2	2	C2	4.7 µF	CAP, CERM, 4.7 µF, 6.3 V, ±10%, X7R, 0603	0603	JMK107BB7475MA -T	Taiyo Yuden
1	1	C4	47 µF	CAP, TA, 47 µF, 10 V, ±10%, 0.25 Ω, SMD	3528-21	TPSB476K010R02 50	AVX
2	2	C6, C7	10 µF	CAP, CERM, 10 µF, 10 V, ±20%, X7R, 0603	0603	GRM188Z71A106 MA73D	Murata
1	1	C9	120 pF	CAP, CERM, 120 pF, 50 V, ±5%, C0G/NP0, 0603	0603	GRM1885C1H121J A01D	Murata
1	1	R1	200 k	RES, 200 k, 1%, 0.1 W, 0603	0603	Std	Std
2	2	R2, R3	100 k	RES, 100 k, 1%, 0.1 W, 0603	0603	Std	Std
1	0	U1		1-A Step-Down Module with 1% Output Accuracy in 2-mm × 2.5-mm uSip	2 mm × 2.5 mm	TPSM82821SILR	Texas Instruments
0	1	U1		2-A Step-Down Module with 1% Output Accuracy in 2-mm × 2.5-mm uSip	2 mm × 2.5 mm	TPSM82822SILR	Texas Instruments

## B Revision History

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

Changes from Revision C (April 2021) to Revision D (November 2021)	Page
• Added TPSM8282xAEVM-127 evaluation modules to the user's guide.....	2
• Updated <a href="#">Section 2</a> .....	2
• Added TPSM8282xAEVM-127 to <a href="#">Table 2-1</a> .....	2
• Updated <a href="#">Section 2.2</a> .....	2
• Added TPSM8282xAEVM-127 Rev.A to <a href="#">Section 3</a> .....	3
• Added TPSM8282xAEVM-127 to <a href="#">Section 6</a> .....	5
• Added TPSM8282xAEVM-127 to <a href="#">Section 7.1</a> .....	6
• Added the TPSM8282xASILR forced PWM versions to <a href="#">Table 7-1</a> .....	7
Changes from Revision B (December 2019) to Revision C (April 2021)	Page
• Revised TPSM82821EVM-080 and TPSM82822EVM-080 from Rev.A to Rev.B.....	2
• Added TPSM82823EVM-080 Rev.B .....	2
• Added Radiated EMI Measurement Results of Rev.B EVM.....	4
• Moved Rev. A files to Appendix.....	8

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