TPS61230EVM-089 Evaluation Module

This user's guide describes the characteristics, operation, and use of TI's TPS61230 evaluation module (EVM). This EVM is designed to help the user easily evaluate and test the operation and functionality of the TPS61230. The EVM converts a 2.3-V to 5.5-V input voltage to a regulated 5-V output voltage. The TPS61230 is capable of delivering 2.1-A current while the input voltage is above 3.3 V. This user's guide includes setup instructions for the hardware, a printed-circuit board (PCB) layout for the EVM, a schematic diagram, a bill of materials (BOM), and test results for the EVM.

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1 Introduction

The TPS61230 is a 5-A switch current limit, synchronous, step-up converter in a 3 × 3-mm, 10-pin QFN package. The output voltage is adjustable.

1.1 Background

The TPS61230EVM-089 is set to a 5-V output. The EVM operates with full-rated performance with an input voltage between 3.3 V and 5.5 V. If Vin is below 3.3 V, the output current capability could be less than 2.1 A.

1.2 Performance Specification

Table 1 provides a summary of the TPS61230EVM-089 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		2.3	3.6	5.5	V
Output voltage	PWM mode	4.9	5.0	5.1	V
	PFM mode		5.035		
Output current	V_{IN} ≥ 3.3V	0		2100	mA
UVLO rising voltage	JP1 installed		3.0		V
UVLO falling voltage	JP1 installed		2.7		V

1.3 Modifications

Because the primary goal of the EVM is to demonstrate the small size of the TPS61230 power supply solution, capacitors and inductors with small footprints were chosen. These capacitors and inductors were carefully selected to maximize efficiency and minimize ripple, while minimizing overall solution size. Changing components could improve or degrade EVM performance.

1.3.1 Fixed Output Voltage Operation

U1 can be replaced with the fixed output-voltage version of the IC for evaluation. For fixed-voltage version operation, replace R7 with 0-Ω resistor and remove R5.

1.3.2 Feedforward Capacitor for Better Load Transient

C7 is provided as a feedforward capacitor for optimized load transient response, when needed.

2 Setup

This section describes how to properly use the TPS61230EVM-089.

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.

J7 – PG Power good connection for measurement

JP1 – UVLO Under voltage threshold and hysteresis program pin. Put the jumper across it to use a user defined value, pull off the jumper to use an internal value.

JP2 – 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.

2.2 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 TPS61230EVM-089 Test Results

The TPS61230EVM-089 was used to take the data in the TPS61230 datasheet. See the device data sheet for the performance of this EVM.

3.1 Loop Response Plot

The loop response of the TPS61230EVM-089 can be measured by injecting the ac signal across R6. The loop response bode plot under typical condition is shown in Figure 1.

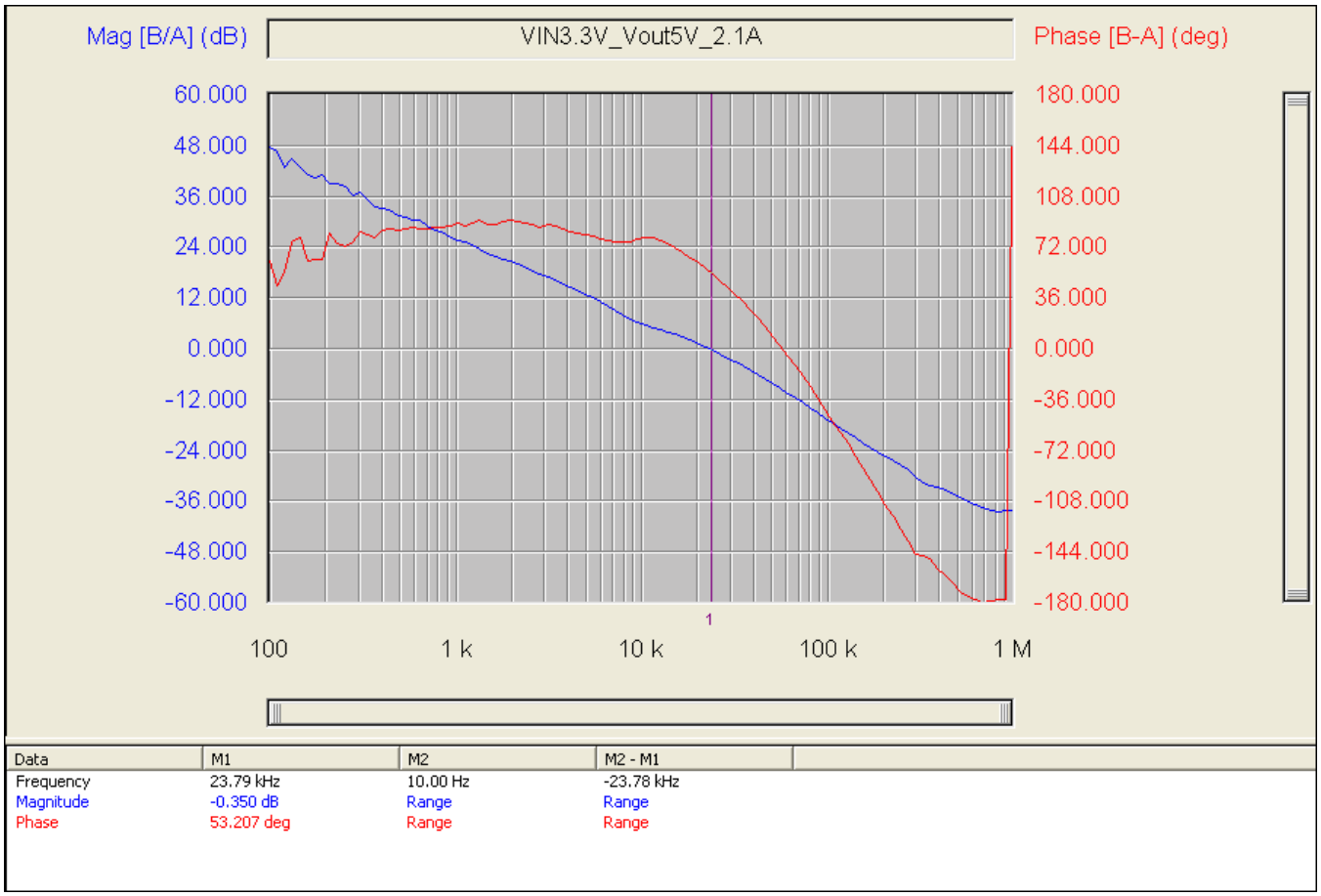

Figure 1. Bode Plot for V_{IN} = 3.3 V, V_{OUT} = 5 V, I_{OUT} = 2.1 A

4 Board Layout

Figure 2 through Figure 5 illustrate the TPS61230EVM-089 PCB layout. The gerbers are available on the EVM product page: TPS61230EVM-089.

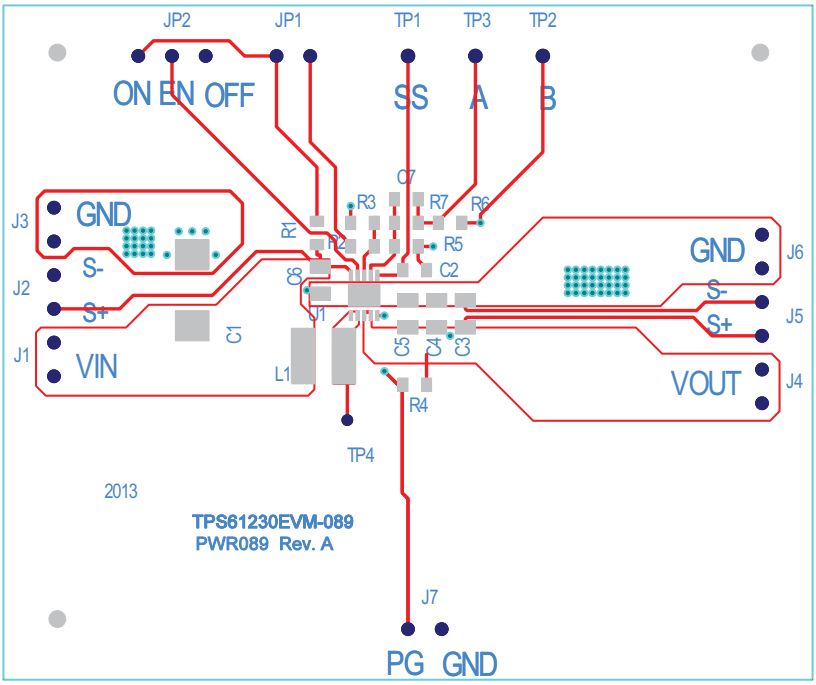

Figure 2. Assembly Layer

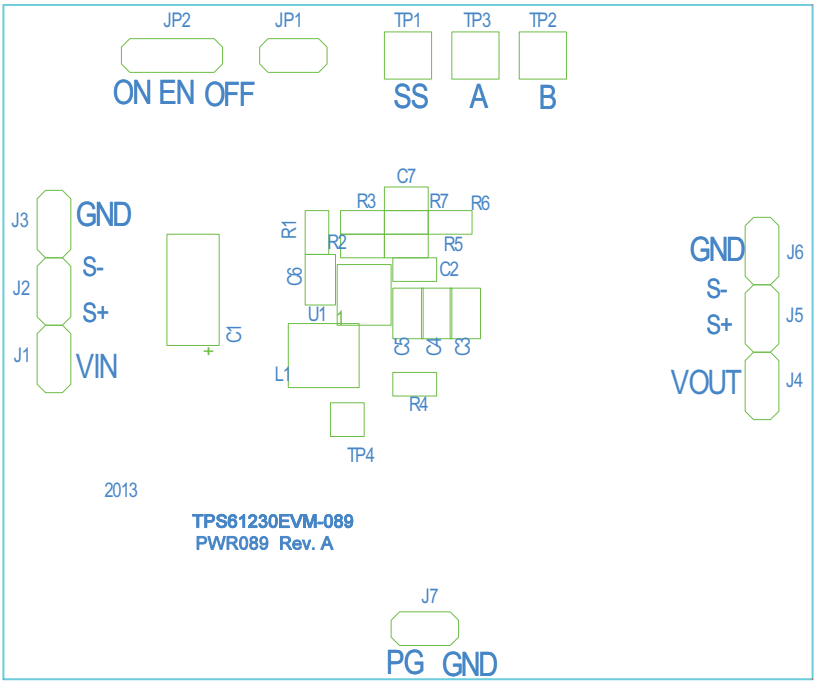

Figure 3. Top Silk Layer

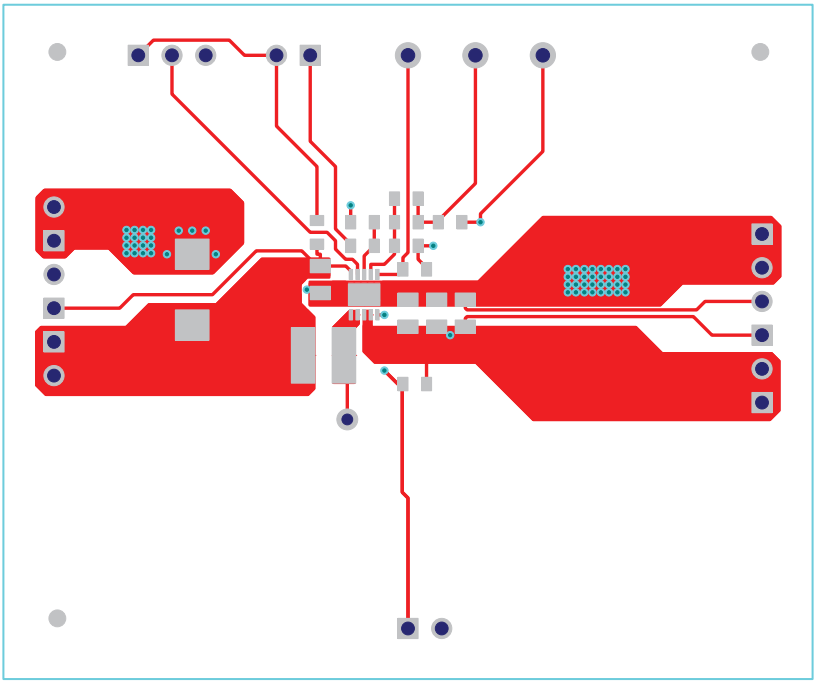

Figure 4. Top Layer

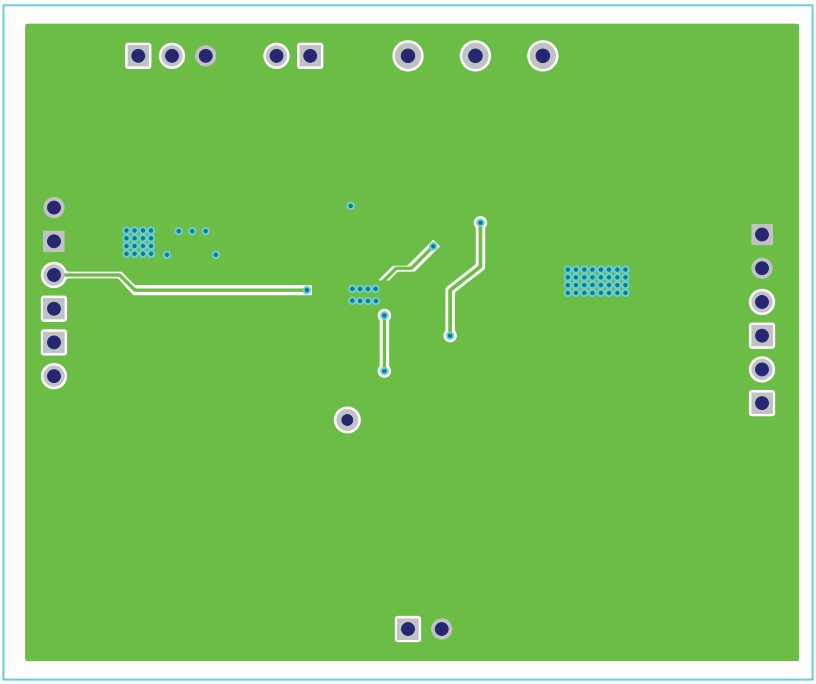

Figure 5. Bottom Layer

5 Schematic and Bill of Materials

This section provides the TPS61230EVM-089 schematic and BOM.

5.1 Schematic

Figure 6 illustrates the EVM schematic.

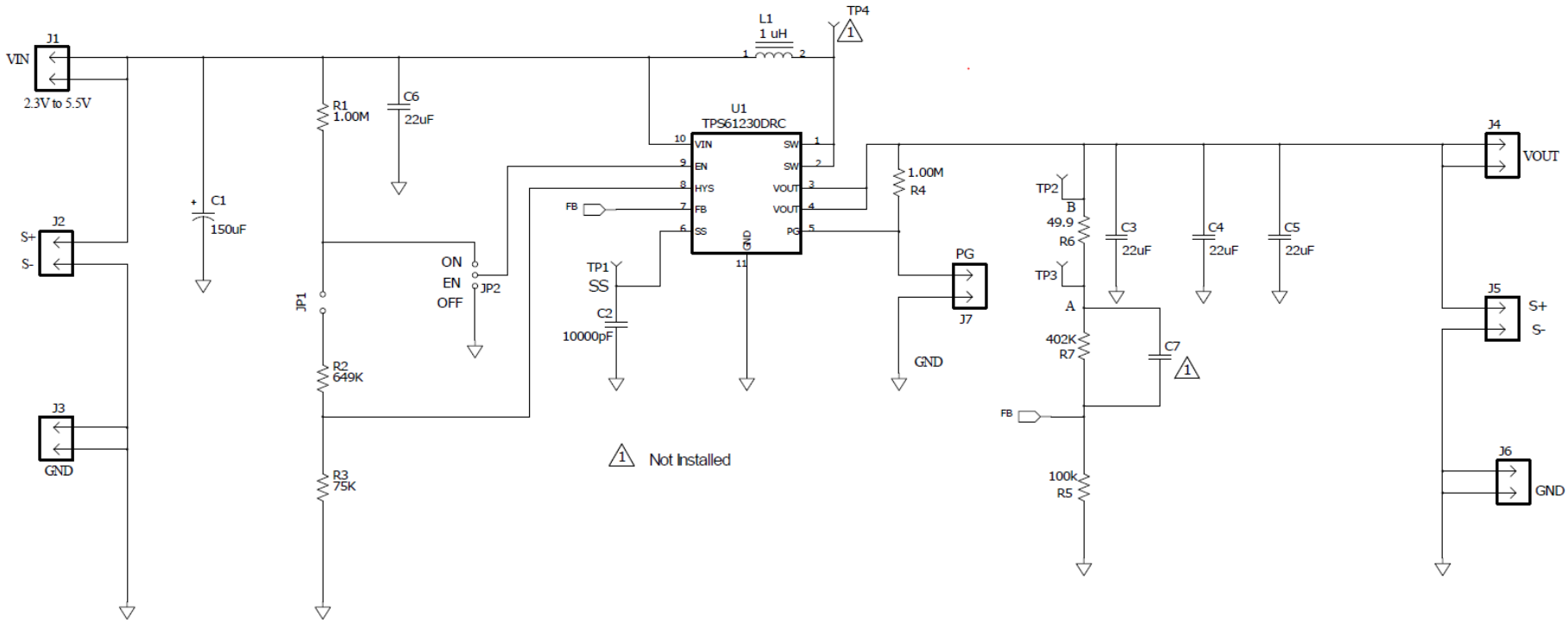

Figure 6. TPS61230EVM-089 Schematic

5.2 Bill of Materials

Table 2. TPS61230EVM-089 Bill of Materials

Qty	RefDes	Value	Description	Size	Part Number	MFR
1	C1	150uF	Capacitor, Tantal,10V,20%	6032 (C)	T520C157M010ATE055	KEMET
1	C2	10000pF	Capacitor, Ceramic, X7R,50V,10%	0603	GRM188R71H103KA01D	Murata
4	C3-C6	22uF	Capacitor, Ceramic Chip, X5R,10V, 20%	0805	LMK212BBJ226MG	YUDEN
1	L1	1uH	Inductor, Power, 5.4 A, 20%	0.157 x 0.157 inch	XFL4020-102ME	Coilcraft
2	R1 R4	1M	Resistor, Chip, 1/10W, 1%	0603	MCR03EZPFX1004	Rohm
1	R2	649k	Resistor, Chip, 1/10W, 1%	0603	MCR03ERTF6493	Rohm
1	R3	75k	Resistor, Chip, 1/10W, 1%	0603	MCR03ERTF7502	Rohm
1	R5	100k	Resistor, Chip, 1/10W, 1%	0603	MCR03ERTF1003	Rohm
1	R6	49.9	Resistor, Chip, 1/10W, 1%	0603	MCR03EZPFX4992	Rohm
1	R7	402k	Resistor, Chip, 1/10W, 1%	0603	MCR03EZPFX4023	Rohm
1	U1	TPS61230	IC, Synchronous Boost Converter with 5A Switch Current Limit	3 mm × 3 mm	TPS61230DRC	TI

The TPS61230EVM-089 may be populated with TPS61230 (U1) devices that do not contain the correct top side markings on the top of the device itself. These devices are still fully-tested TPS61230 devices and meet the specified electrical characteristics of the data sheet.

Revision History

Changes from Original (October 2013) to A Revision **Page**

- Deleted Thermal Performance section. 3
- Changed quantity column in C3-C6 row to 4. 7

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

Industry Canada Compliance (English)

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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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