User's Guide

TPS65261-1 Buck Converter Evaluation Module User's Guide

ABSTRACT

This document presents the information required to operate the TPS65261/TPS65261-1 PMIC as well as the support documentation including schematic, layout, hardware setup and bill of materials.

Table of Contents

List of Figures

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1 Background

The TPS65261/TPS65261-1 PMIC is a triple 3-A/2-A/2-A output current, synchronous step-down (buck) converter with an operational range of 4.5 V to 18 V. The TPS65261/TPS65261-1 features an automatic power sequence with connecting MODE pin to V7V and configuring EN1/2/3 pins. The device also features an open drain RESET signal to monitor power down. The TPS65261 operates in pulse skipping mode (PSM) and the TPS65261-1 operates in force continuous current mode (FCC) at light load.

As there are many possible options to set the converters, Table 1-1 presents the performance specification summary for the EVM.

Table 1-1. Summary of Performance

Test Conditions	Performance
VIN = 4.5 V to 18 V f_{SW} = 600 kHz (25°C ambient)	BUCK1, 1.2 V, up to 3 A BUCK2, 3.3 V, up to 2 A BUCK3, 1.8 V, up to 2 A RESET, pull low when VDIV lower than 1.23 V

This evaluation module is designed to provide access to the features of the TPS65261/TPS65261-1. Some modifications can be made to this module to test performance at different input and output voltages, current and frequency operation. Contact TI Field Applications Group for advice on these matters.

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2 Board Layout

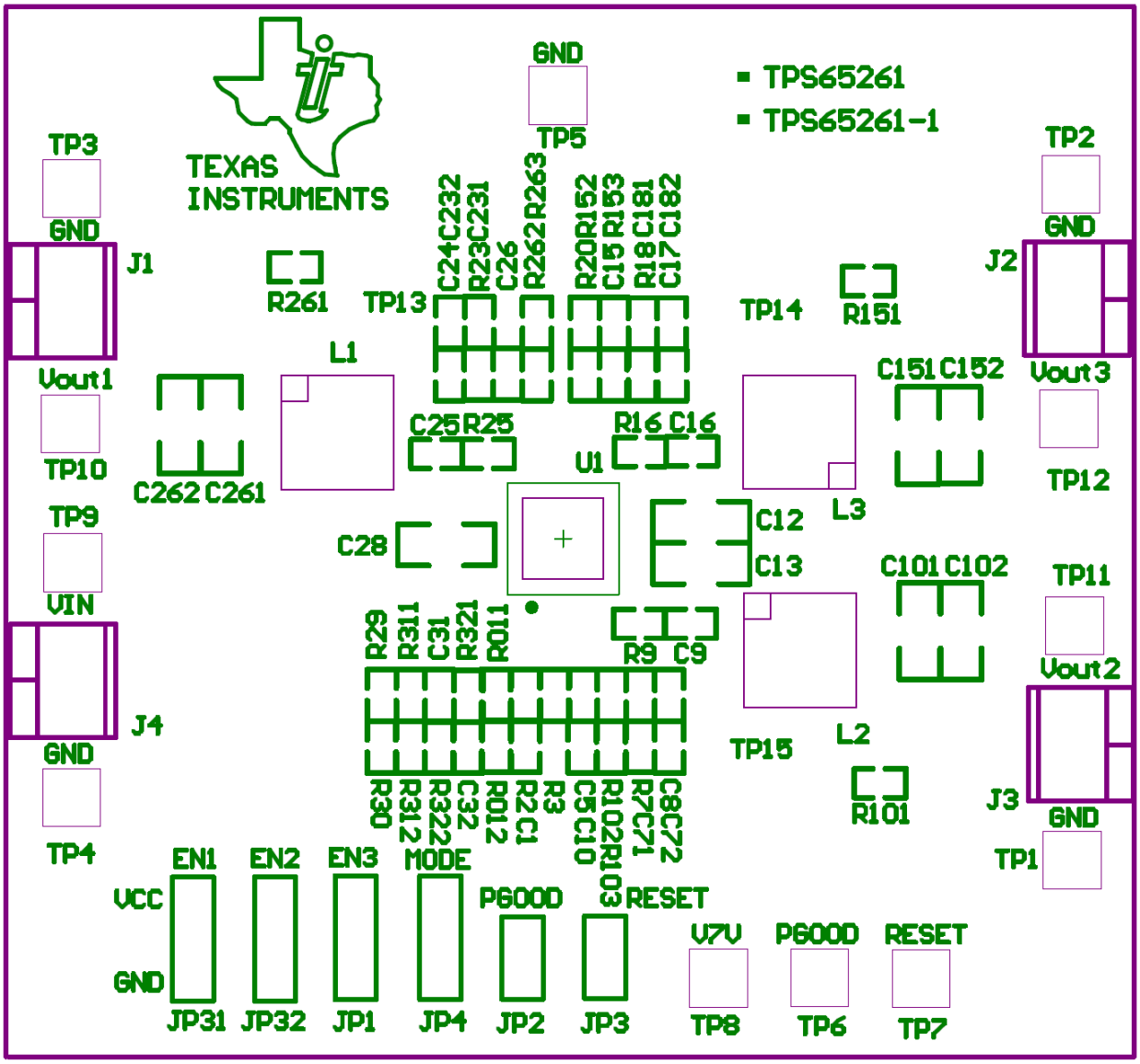

Figure 2-1. Placement

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2.1 EVM Layout

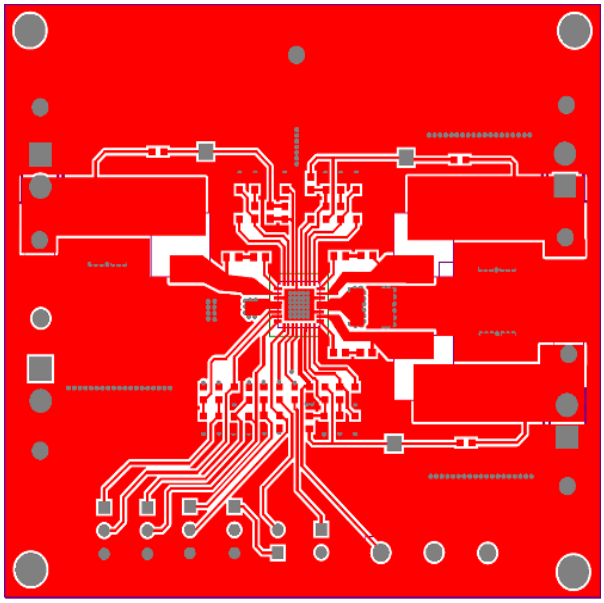

Figure 2-2. Board Layout (Top Layer)

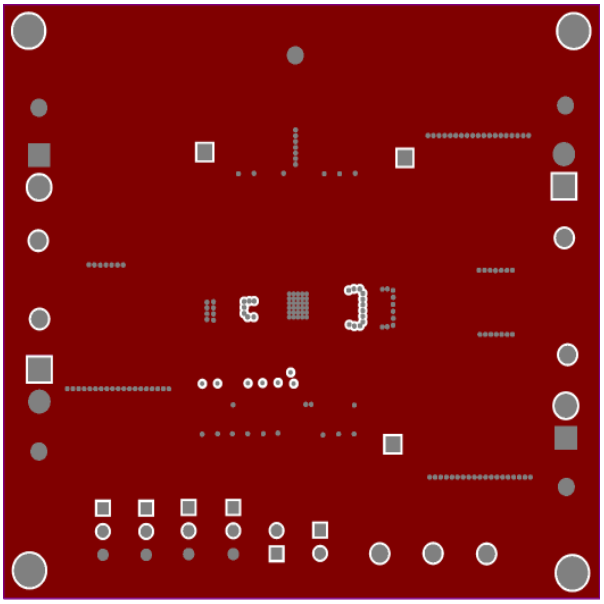

Figure 2-3. Board Layout (Second Layer)

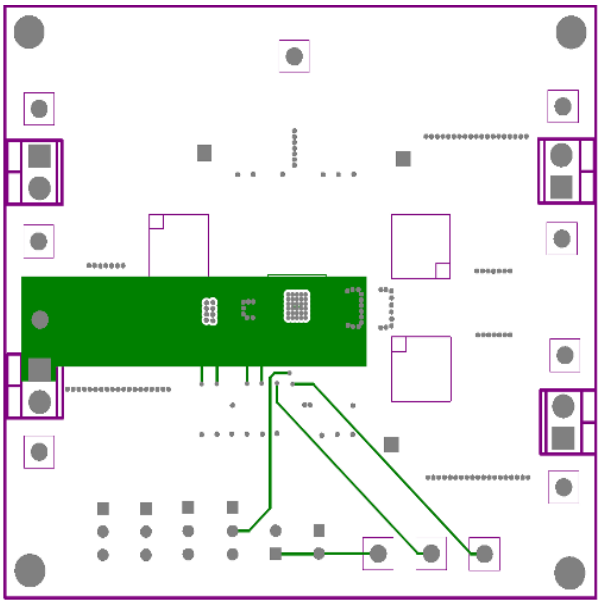

Figure 2-4. Board Layout (Third Layer)

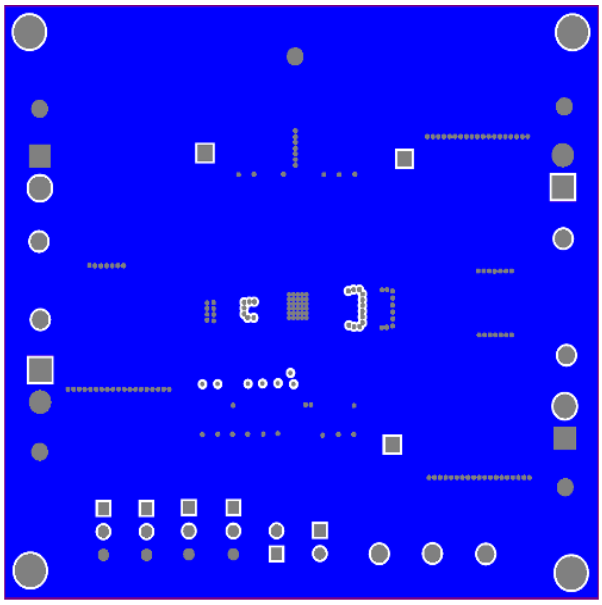

Figure 2-5. Board Layout (Bottom Layer)

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3 Bench Test Setup Conditions

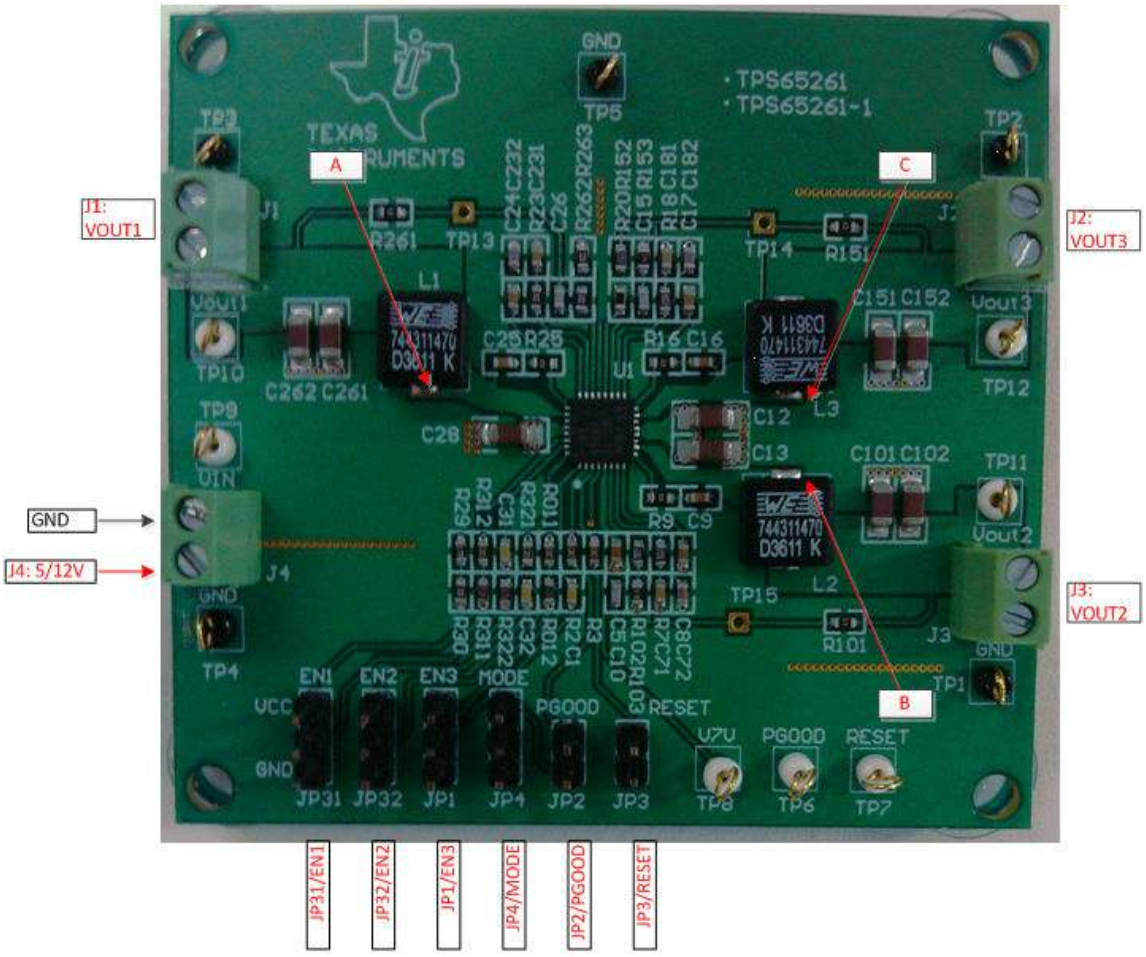

Figure 3-1. Headers Description and Jumper Placement

Test points:

A: LX of VOUT1

B: LX of VOUT2

C: LX of VOUT3

VOUT1, VOUT2, VOUT3, VIN, PGOOD, RESET, V7V

Table 3-1. Input/Output Connection

Number	Function	Description
J1	BUCK1 connector	Output of BUCK1
J2	BUCK2 connector	Output of BUCK2
J3	BUCK3 connector	Output of BUCK3
J4	VIN connector	Apply power supply to this connector.

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3.1 Jumpers and Switches

Number	Function	Placement	Comment
JP1	BUCK3 enable (EN3)	Connect EN3 to GND to disable VOUT3, connect EN3 to VIN through a 100-kΩ resistor to enable VOUT3; Leave open to enable VOUT3.	
JP2	PGOOD pull-up	PGOOD pull-up resistor connected to the V7V; Leave the two pins un-connected set the pull-up voltage open; short the two pins set the pull-up voltage to be V7V.	On board V7V is 6.3 V when VIN is 12 V
JP3	RESET pull-up	RESET pull-up resistor connected to the V7V; Leave the two pins un-connected set the pull-up voltage open; short the two pins set the pull-up voltage to be V7V.	On board V7V is 6.3 V when VIN is 12 V
JP4	Mode	Power sequencing mode control pin. Connect this pin to GND to set power sequence with dedicated enable pin; Connect this pin to V7V set the power sequence with the pre-defined power up and power down sequence.	
JP31	BUCK1 enable (EN1)	Connect EN1 to GND to disable VOUT1, connect EN1 to VIN through a 100-kΩ resistor to enable VOUT1; Leave open to enable VOUT1.	
JP32	BUCK2 enable (EN2)	Connect EN2 to GND to disable VOUT2, connect EN2 to VIN through a 100-kΩ resistor to enable VOUT2; Leave open to enable VOUT2.	

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4 Power-Up Procedure

Power sequence with dedicated enable pin:

1. Connect JP4 to GND.
2. Apply 4.5 V - 18 V to J4.
3. Toggle JP31, JP32 or JP1 to enable VOUT1, VOUT2 and VOUT3 respectively.
4. Apply loads to the output connectors.

Power sequence with the pre-defined power up and power down sequence:

1. Connect JP4 to V7V.
2. Connect JP31 to High (or Low), JP32 to High (or Low)
3. Apply 4.5 V - 18 V to J4.
4. Toggle JP1 to enable VOUT1, VOUT2 and VOUT3.
5. Apply loads to the output connectors.

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5 Schematic

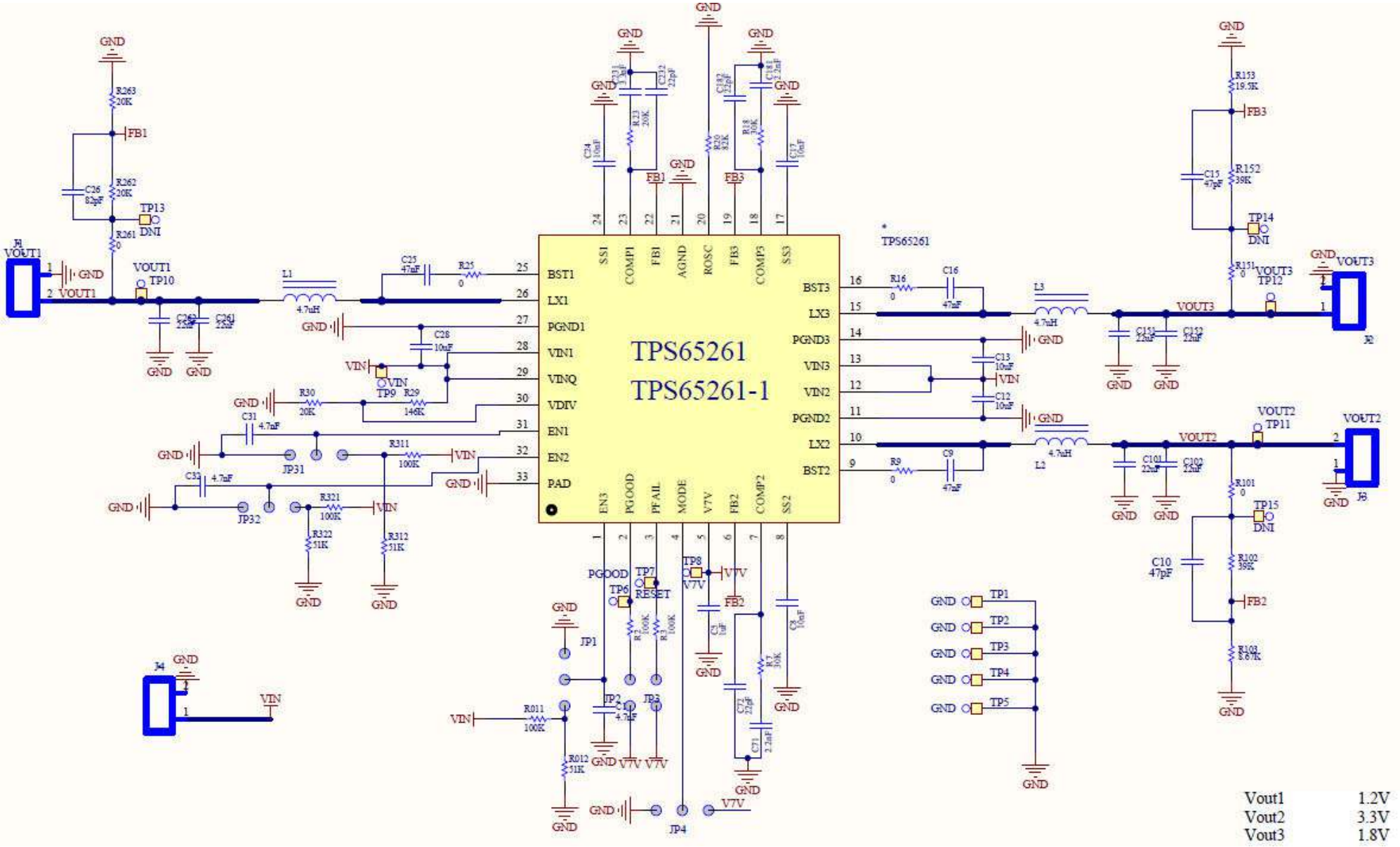

Figure 5-1. TPS65261/TPS65261-1 Schematic

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6 Bill of Materials

No.	Designator	Value	Quantity	Footprint	Manufacturer	Part Number	Description
1	C1, C31, C32	4.7nF	3	0603	Generic		CAP 4.7nF 50V CERAMIC X7R 0603
2	C9, C16, C25	47nF	3	0603	Generic		CAP 47nF 50V CERAMIC X7R 0603
3	C231	3.3nF	1	0603	Generic		CAP 3.3nF 50V CERAMIC X7R 0603
4	C71, C181	2.2nF	2	0603	Generic		CAP 2.2nF 50V CERAMIC X7R 0603
5	C101, C102, C151, C152, C161, C162	22uF	6	1206	Generic		CAP 22uF 16V CERAMIC X5R 1206
6	C72, C182, C232	22pF	3	0603	Generic		CAP 22pF 50V CERAMIC X7R 0603
7	C10, C15	47pF	2	0603	Generic		CAP 47pF 50V CERAMIC X7R 0603
8	C12, C13, C28	10uF	3	1206	Generic		CAP 10uF 25V CERAMIC X5R 0603
9	C26	82pF	1	0603	Generic		CAP 82pF 50V CERAMIC X7R 0603
10	C8, C17, C24	10nF	3	0603	Generic		CAP 10nF 50V CERAMIC X7R 0603
11	C5	1uF	1	0603	Generic		CAP 1uF 50V CERAMIC X5R 0603
12	R011, R312, R322	51K	3	0603	Generic		RES 51k OHM 1/10W 1% 0603 SMD
13	R011, R2, R3, R311, R321	100K	5	0603	Generic		RES 100k OHM 1/10W 1% 0603 SMD
14	R29	146K	1	0603	Generic		RES 146k OHM 1/10W 1% 0603 SMD
15	R23, R30, R262, R263	20K	4	0603	Generic		RES 20k OHM 1/10W 1% 0603 SMD
16	R7, R18	30K	2	0603	Generic		RES 30k OHM 1/10W 1% 0603 SMD
17	R20	73.2K	1	0603	Generic		RES 73.2k OHM 1/10W 1% 0603 SMD
18	R9, R16, R25, R101, R151, R261	0	6	0603	Generic		RES 0 OHM 1/10W 1% 0603 SMD
19	R102, R152	39K	2	0603	Generic		RES 39k OHM 1/10W 1% 0603 SMD
20	R153	19.5K	1	0603	Generic		RES 19.5k OHM 1/10W 1% 0603 SMD
21	R103	8.67K	1	0603	Generic		RES 8.67k OHM 1/10W 1% 0603 SMD
22	L1, L2, L3	4.7uH	3	IND_744311470	Wurth Electronics Inc	744311470	SMT power inductor
23(1)	JP1, JP4, JP31, JP32	HEADER 3 PIN	4	JMP0.3	Mil-Max	800-10-064-10-001 000	Three Pin Header, Break SIPs into groups of 3
24(2)	JP2, JP3	HEADER 2 PIN	2	JMP0.2	Mil-Max	800-10-064-10-001 000	Two Pin Header, Break SIPs into groups of 2
25	J1, J2, J3, J4	ED500/2DS	4	TB_2X5.0MM	OnShore Technology Inc	ED500/2DS	Terminal Block, 2-pin, 15-A, 5.0mm
26	TP6, TP7, TP8, TP9, TP10, TP11, TP12	Test Point White	7	TP	Keystone	5002	TEST POINT PC MINI .040"D WHITE
27	TP1, TP2, TP3, TP4, TP5	Test Point Black	5	TP	Keystone	5001	TEST POINT PC MINI .040"D BLACK
28	TP13, TP14, TP15	Test Point White	DNI	TP	Keystone	5002	TEST POINT PC MINI .040"D WHITE
29			6				Jumper, 2.54mm, open top, Applied on item 23, 24
30(3)			4		3M	SJ-5303 (CLEAR)	BUMPON HEMISPHERE .44X.20 CLEAR
31(4)	U1		1	RHB	Texas Instruments	TPS65261RHBR	
32(4)	U1		1	RHB	Texas Instruments	TPS65261-1RHBR	

(1) Item 23: split into 3 pins.
(2) Item 24: split into 2 pins.
(3) Install item 25 on bottom at corners.
(4) Select item 31 (TPS65261RHBR) or item 32 (TPS65261-1RHBR) according to product target.

7 Revision History

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

Changes from Revision * (December 2013) to Revision A (May 2021) **Page**

- Updated user's guide title..... 2

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- Updated the numbering format for tables, figures, and cross-references throughout the document. 2

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