

How to Co-Layout Three Common SOT-563 Package Pinouts



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ABSTRACT

Buck converter applications commonly require co-layout between devices with different pinouts due to the design flexibility this provides. This application note focuses on how to co-layout among three types of SOT-563 packages. First, the pinout of TPS56x252/7, TPS56x242/7, TPS56x243/6 and TPS56x203/6 are compared. Next, the schematic design is introduced. Finally, this application design is verified based on experiments.

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1 Introduction

The TPS56x252/7, TPS56x242/7, TPS56x243/6 and TPS56x203/6 are all single output, adaptive on-time, D-CAP3™ control mode, synchronous buck converters that require very low external component count in SOT-563 packages. However, the pinout for each device is slightly different. This application note mainly discusses how to do co-layout among TPS56x252/7, TPS56x242/7, TPS56x243/6 and TPS56x203/6.

2 Comparison of Pinout

The TPS56x243/6 and TPS56x203/6 pinout with SOT-563 package is shown in [Figure 2-1](#). TPS56x243/6 and TPS56x203/6 pinout is quite common in the industry. The TPS56x242/7 pinout with SOT-563 package, which has been optimized is shown in [Figure 2-2](#). This pinout integrates BST capacitor and adds AGND for pin 4. The TPS56x252/7 pinout with SOT-563 package is shown in [Figure 2-3](#). This pinout integrates BST capacitor and add PG for pin 4. These three device families have the same pin functionality aside from pin 4 as shown in [Table 2-1](#). With compatible external circuitry, co-layout can be achieved for the three packages.

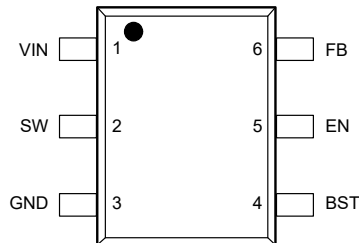


Figure 2-1. TPS56x243/6 and TPS56x203/6 Pinout

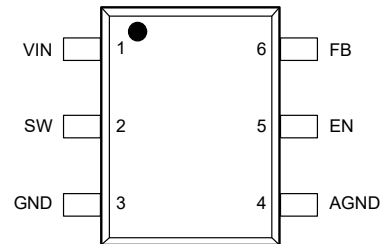


Figure 2-2. TPS56x242/7 Pinout

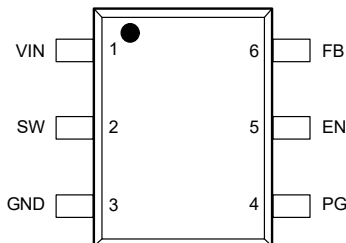


Figure 2-3. TPS56x252/7 Pinout

Table 2-1. Pin Functions

Pin		Description
No.	Name	
1	VIN	Input voltage supply pin. Connect the input decoupling capacitors between VIN and GND.
2	SW	Switch node pin. Connect the output inductor to this pin.
3	GND	GND pin source terminal of the low-side power NFET as well as the ground terminal for controller circuit.
4	PG	Open-drain power-good indicator.
	AGND	Ground of the internal analog circuitry. Connect AGND to the GND plane.
	BST	Supply input for the high-side NFET gate driver circuit. Connect 0.1- μ F capacitor between BST and SW pins.
5	EN	Enable input control. Driving EN high enables the converter.
6	FB	Converter feedback input. Connect to the output voltage with a feedback resistor divider.

3 Schematic Diagram

3.1 How to Co-layout Among Three Types of SOT-563

Since pin 4 definitions are different for TPS56x252/7, TPS56x242/7, and TPS56x203/6, the compatible schematic is designed to achieve co-lay. The co-lay schematic is shown in Figure 3-1. There are several differences for the BOM, also note that TPS56x203/6 allows EN pin to connect to Vin by only one pullup resistor. The solder information for different parts is shown in Table 3-1. The comparison of EN pin configuration is shown in Table 3-2.

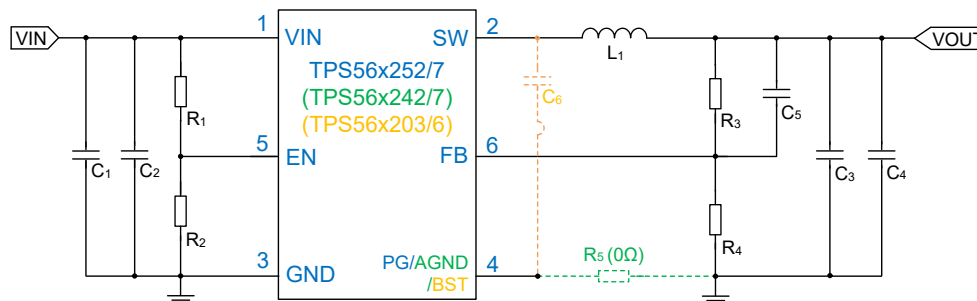


Figure 3-1. Co-layout Schematic Among Three Types of SOT-563

Table 3-1. Solder Information for Different Part

Part Number	Description
TPS56x252/7	<ol style="list-style-type: none"> If PG function is not needed, PG can be floating or connected with GND. PG tied to GND can get better thermal performance. C₆ needs to be floating. R₅ can be soldered or floating. EN pin max voltage is 6V, need two voltage divider resistors.
TPS56x242/7	<ol style="list-style-type: none"> R₅ needs to be soldered to connect AGND to GND. C₆ needs to be floating. EN pin max voltage is 6V, need two voltage divider resistors.
TPS56x203/6	<ol style="list-style-type: none"> C₆ needs to be tied to SW. R₅ needs to be floating. EN pin max voltage is 6V, allow two voltage resistors or one 100k pullup resistor.

Table 3-2. Comparison of EN Pin Configuration

Part Number	TPS56325x/TPS56425x	TPS562242	TPS56x203/6	TPS56x242/7
EN Default Status	Low	High	Low	Low
EN ABS Voltage	6V	6V	6V	6V
If Have A Zener Diode in Internal EN Pin	No	No	Yes	No
Support only 100k top resistor directly to Vin	No	No	Yes	No

3.2 How to Co-Layout Between TPS56x252/7 and TPS56x242/7

The co-lay schematic for TPS56x252/7 and TPS56x242/7 is shown in Figure 3-2. If PG function of TPS56x252/7 is not used, then PG of TPS56x252/7 can be directly connected with GND and TPS56x252/7 and TPS56x242/7 are exactly pin to pin.

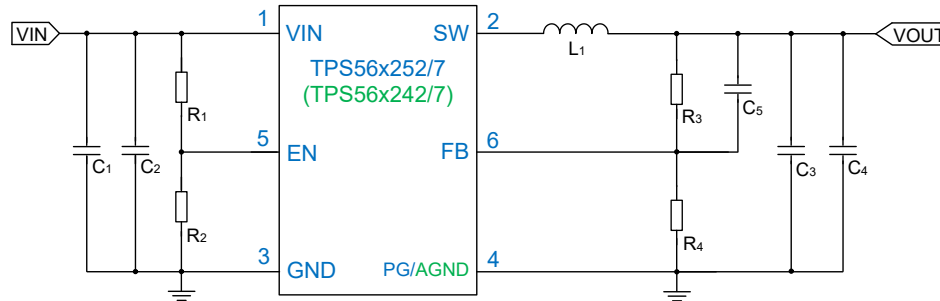


Figure 3-2. Co-Layout Schematic for TPS56x252/7 and TPS56x242/7

3.3 How to Co-layout Between TPS56x252/7 and TPS56x203/6

The co-lay schematic for TPS56x252/7 and TPS56x203/6 is shown in Figure 3-3. The solder information for TPS56x252/7 and TPS56x202/7 is shown in Table 3-3.

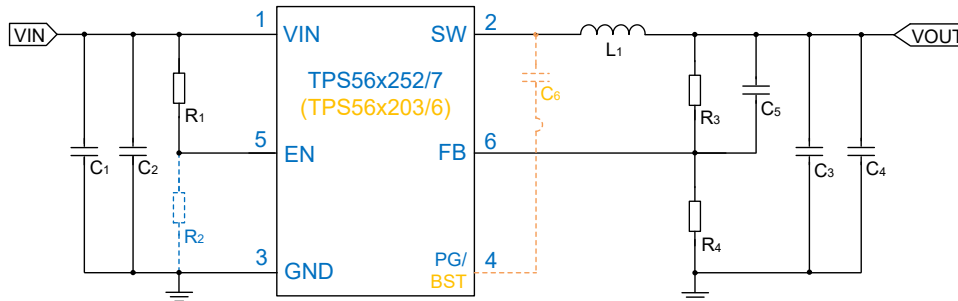


Figure 3-3. Co-layout Schematic for TPS56x252/7 and TPS56x203/6

Table 3-3. Solder Information for TPS56x252/7 and TPS56x203/6

Part Number	Description
TPS56x252/7	<ol style="list-style-type: none"> If PG function is not needed, PG can be floating or connected with GND. C₆ needs to be floating. EN pin max voltage is 6V, need two voltage divider resistors.
TPS56x203/6	<ol style="list-style-type: none"> C₆ needs to be tied to SW. EN pin max voltage is 6V, allow two voltage resistors or one 100k pullup resistor.

3.4 How to Co-Layout Between TPS56x242/7 and TPS56x203/6

The co-lay schematic for TPS56x242/7 and TPS56x203/6 is shown in Figure 3-4. The solder information for TPS56x242/7 and TPS56x203/6 is shown in Table 3-4.

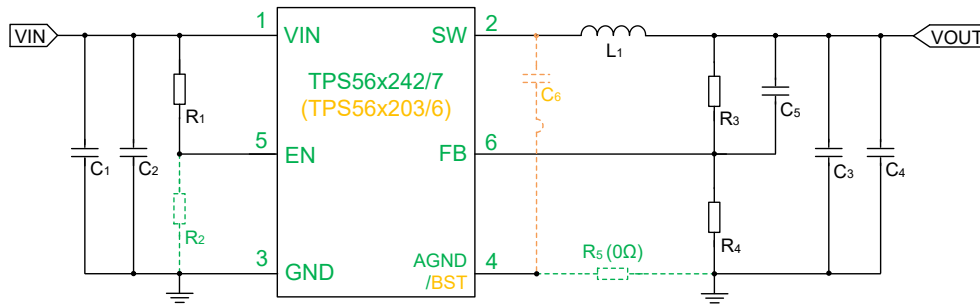


Figure 3-4. Co-Layout Schematic for TPS56x242/7 and TPS56x203/6

Table 3-4. Solder Information for TPS56x242/7 and TPS56x203/6

Part Number	Description
TPS56x242/7	<ol style="list-style-type: none"> 1. R₅ needs to be soldered to connect AGND to GND. 2. C₆ needs to be floating. 3. EN pin max voltage is 6V, need two voltage divider resistors.
TPS56x203/6	<ol style="list-style-type: none"> 1. C₆ needs to be tied to SW. 2. R₅ needs to be floating. 3. EN pin max voltage is 6V, allow two voltage resistors or one 100k pullup resistor.

4 Experimental Results

Figure 4-1, Figure 4-2, and Figure 4-3 are tested at 12V input voltage, 1.05V output voltage. All three devices work stably in steady state operation.

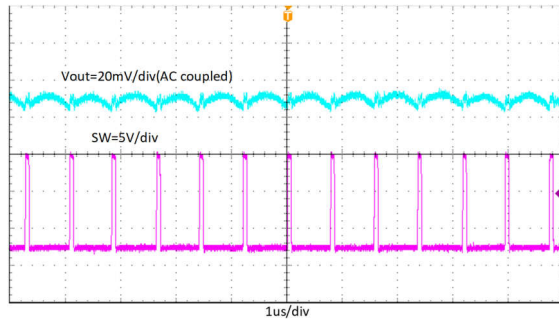


Figure 4-1. TPS564242 12V Input to 1.05V Output at 4A

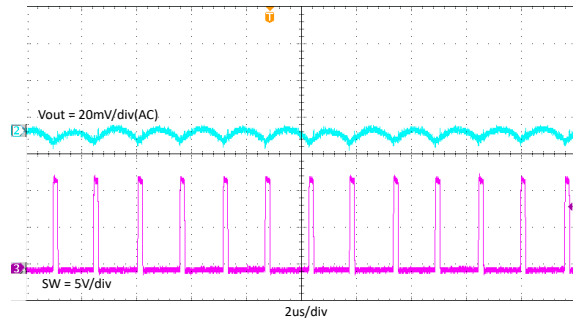


Figure 4-2. TPS563203 12V Input to 1.05V Output at 3A

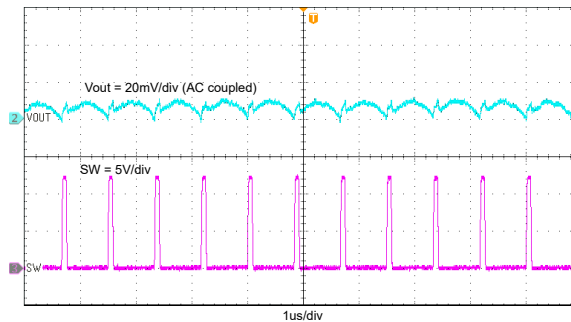


Figure 4-3. TPS563252 12V Input to 1.05V Output at 3A

5 Summary

This application note introduces how to co-layout among TPS56x252/7, TPS56x242/7, and TPS56x203/6 with SOT-563 package, which helps simplify the power design. Pinout is also compared and compatible schematic recommendations are given. Finally, the experiment verification results of the co-layout design proves all three devices can work stably in steady state operation.

6 References

- Texas Instruments, [TPS56325x 3V to 16V Input, 3A Synchronous Buck Converters in SOT-563 Package](#) data sheet.
- Texas Instruments, [TPS56524x 3V to 16V Input Voltage, 5A Synchronous Buck Converter in SOT-563 Package](#) data sheet.
- Texas Instruments, [TPS56424x 3V to 16V Input Voltage, 4A Synchronous Buck Converter in SOT-563 Package](#) data sheet.
- Texas Instruments, [TPS56320x 4.2V to 17V Input, 3A Synchronous Buck Converter in SOT563](#) data sheet.

7 Revision History

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

Changes from Revision A (January 2024) to Revision B (August 2024)	Page
• Added TPS56x243/6 throughout document.....	1

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