Application Note

How to do Co-Layout Among Three Types of SOT-563 Packages

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ABSTRACT

Co-layout is more and more required in Buck converters applications due to the advantage of design flexibility. This application note focuses on how to co-layout among three types of SOT-563 package. First, the pin-out of TPS56x252/7, TPS56x242/7, and TPS56x202/7 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 and TPS56x242/7 which use SOT-563 package are single, adaptive on-time, D-CAP3™ control mode, synchronous buck converter that requires a very low external component count. Last generation part TPS56x202/7 also uses SOT-563 package and its pin-out is quite common in industry. The pin-out of TPS56x252/7 and TPS56x242/7 has a little difference with TPS56x202/7. This application note mainly discusses how to do co-layout among TPS56x252/7, TPS56x242/7, and TPS56x202/7.

2 Comparison of Pin-out

Figure 2-1 shows TPS56x202/7 pin-out with SOT-563 package. TPS56x202/7 pin-out is quite common in the industry. Figure 2-2 shows TPS56x242/7 pin-out with SOT-563 package which has been optimized. It integrates BST capacitor and add AGND for pin 4. Figure 2-3 shows TPS56x252/7 pin-out with SOT-563 package. It integrates BST capacitor and add PG for pin 4. As shown in Table 2-1, for these three family devices, all pins are the same except pin 4. If adding compatible circuits, they can co-layout with each other.

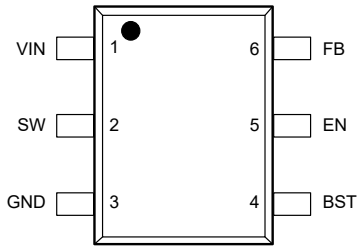

Figure 2-1. TPS56x202/7 Pin-out

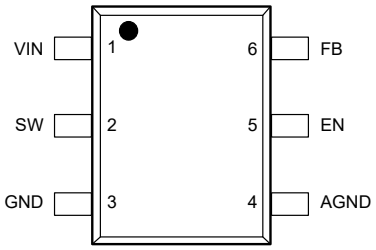

Figure 2-2. TPS56x242/7 Pin-out

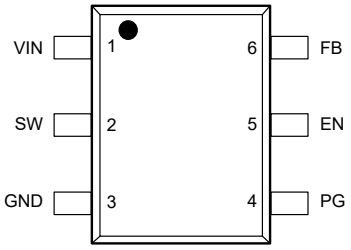

Figure 2-3. TPS56x252/7 Pin-out

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-uF capacitor between VBST 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 TPS56x202/7, the compatible schematic is designed to achieve co-lay. Figure 3-1 shows the co-lay schematic. There are several differences for the BOM. Table 3-1 shows solder information for different part.

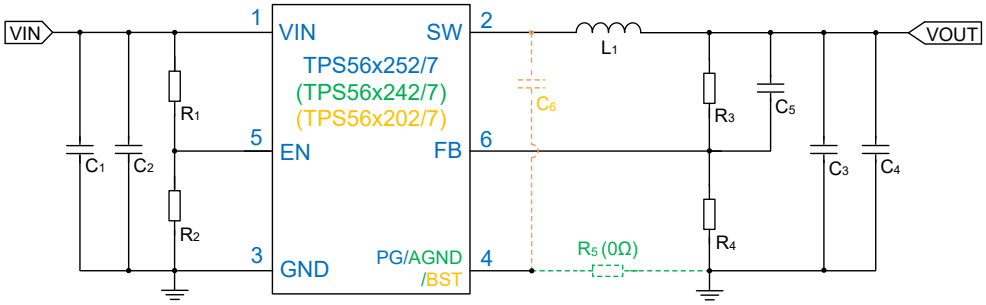

Figure 3-1. Co-layout Schematic Among Three Types of SOT-563

Table 3-1. Solder Information for Different Part

Part Number	Description
TPS56x252/7	1. If PG function is not needed, PG can be floating or connected with GND. PG tied to GND can get better thermal performance. 2. C_6 needs to be floating. R_5 can be soldered or floating. 3. EN pin max voltage is 6 V.
TPS56x242/7	1. R_5 needs to be soldered to connect AGND to GND. 2. C_6 needs to be floating. 3. EN pin max voltage is 6 V.
TPS56x202/7	1. C_6 needs to be tied to SW. 2. R_5 needs to be floating. 3. EN pin max voltage is 19 V.

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

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

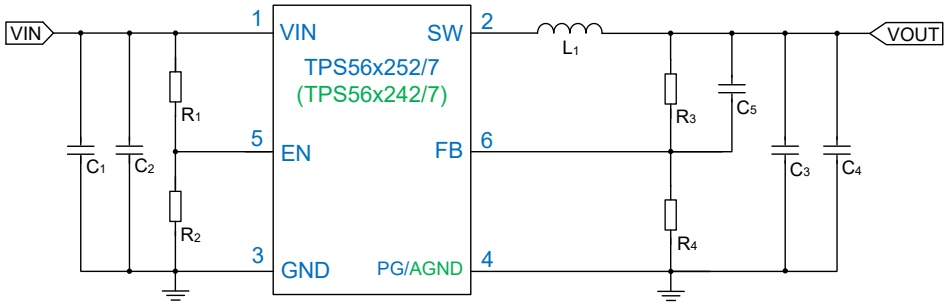

Figure 3-2. Co-layout Schematic for TPS56x252/7 and TPS56x242/7

3.3 How to Co-layout Between TPS56x252/7 and TPS56x202/7

Figure 3-3 shows the co-lay schematic for TPS56x252/7 and TPS56x202/7. Table 3-2 shows solder information for TPS56x252/7 and TPS56x202/7.

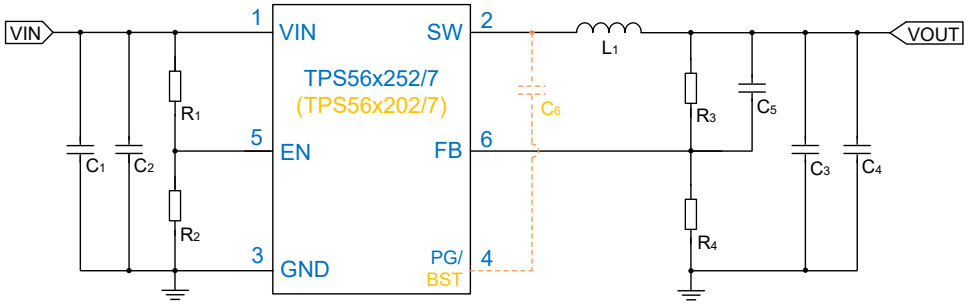

Figure 3-3. Co-layout Schematic for TPS56x252/7 and TPS56x202/7

Table 3-2. Solder Information for TPS56x252/7 and TPS56x202/7

Part Number	Description
TPS56x252/7	1. If PG function is not needed, PG can be floating or connected with GND. 2. C_6 needs to be floating. 3. EN pin max voltage is 6 V.
TPS56x202/7	1. C_6 needs to be tied to SW. 2. EN pin max voltage is 19 V.

3.4 How to Co-layout Between TPS56x242/7 and TPS56x202/7

Figure 3-4 shows the co-lay schematic for TPS56x242/7 and TPS56x202/7. Table 3-3 shows solder information for TPS56x242/7 and TPS56x202/7.

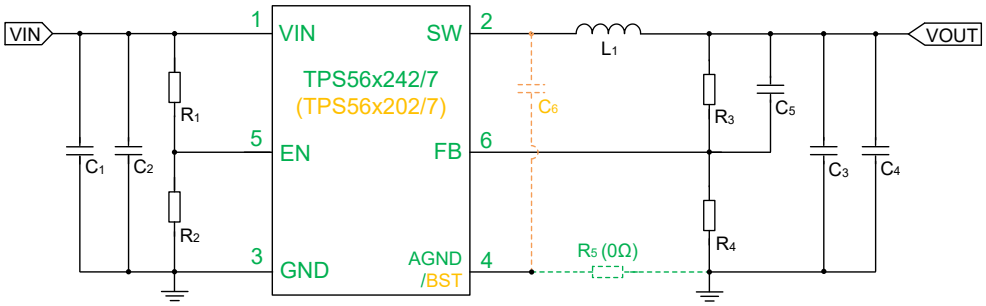

Figure 3-4. Co-layout Schematic for TPS56x242/7 and TPS56x202/7

Table 3-3. Solder Information for TPS56x242/7 and TPS56x202/7

Part Number	Description
TPS56x242/7	1. R_5 needs to be soldered to connect AGND to GND. 2. C_6 needs to be floating. 3. EN pin max voltage is 6 V.
TPS56x202/7	1. C_6 needs to be tied to SW. 2. R_5 needs to be floating. 3. EN pin max voltage is 19 V.

4 Experimental Results

Figure 4-1, Figure 4-2, and Figure 4-3 are tested at 12-V input voltage, 1.05-V output voltage. All three devices work very well.

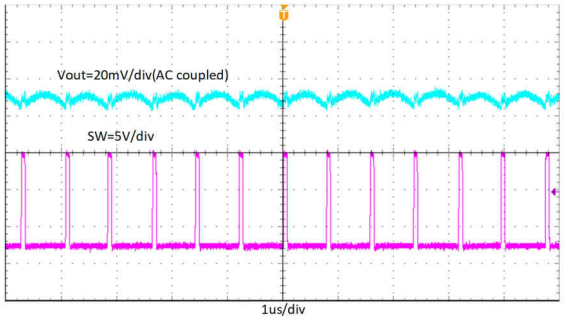

Figure 4-1. TPS564242 12-V Input to 1.05-V Output at 4-A

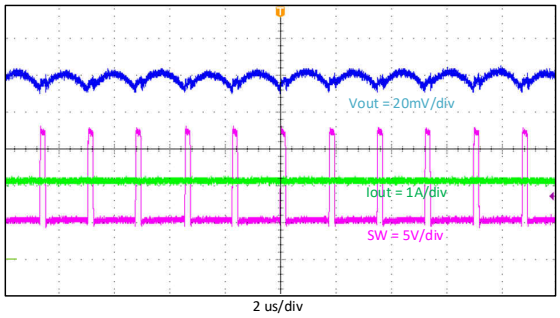

Figure 4-2. TPS563202 12-V Input to 1.05-V Output at 3-A

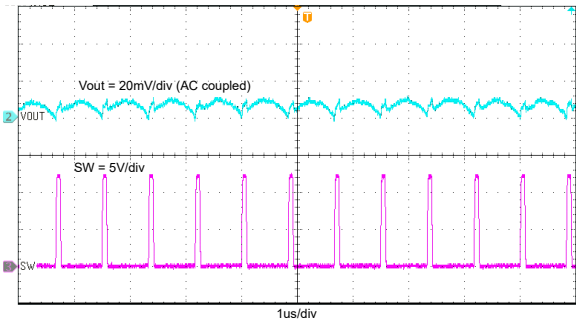

Figure 4-3. TPS563252 12-V Input to 1.05-V Output at 3-A

5 Summary

This application note introduces how to co-layout among TPS56x252/7, TPS56x242/7, and TPS56x202/7 with SOT-563 package. Pin-out is compared and compatible schematic recommendations are given. Finally, the application note shows the experiment verification results of the co-layout design. From the test results, all three devices can work well with co-layout design.

6 References

- Texas Instruments, *TPS56325x 3-V to 16-V Input, 3-A Synchronous Buck Converters in SOT-563 Package* data sheet.
- Texas Instruments, *TPS56524x 3-V to 16-V Input Voltage, 5-A Synchronous Buck Converter in SOT-563 Package* data sheet.
- Texas Instruments, *TPS56424x 3-V to 16-V Input Voltage, 4-A Synchronous Buck Converter in SOT-563 Package* data sheet.
- Texas Instruments, *TPS563202 4.3-V to 17-V Input, 3-A Synchronous Buck Converter in SOT563* data sheet.
- Texas Instruments, *TPS563207 4.3-V to 17-V Input, 3-A Synchronous Buck Converter in SOT563* data sheet.

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