Application Note

DA9217/DA9220/DA9121/DA9122 - Adjusting VOUT above 1.9 V

AN-PM-140

Abstract

The application note illustrates using external resistors and capacitors to realize output voltage higher than 1.9V for DA9217/DA9220/DA9121/DA9122.

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1 Terms and Definitions

MOSFET	Metal oxide semiconductor field effect transistor
IC	Integrated circuit
PCB	Printed circuit board

2 References

[1] DA9217, Datasheet, Dialog Semiconductor.
[2] DA9220, Datasheet, Dialog Semiconductor
[3] DA9121, Datasheet, Dialog Semiconductor
[4] DA9122, Datasheet, Dialog Semiconductor

3 Introduction

Dialog Semiconductor's DA9217/DA9220 and DA9121/DA9122 are power management ICs with integrated Power MOSFETs, see [1] [2] [3] [4]. DA9217/DA9220 operates as a single-channel, dual-phase buck converter. DA9121/DA9122 operates as a dual-channel, single-phase buck converter. The 2.5 V to 5.5 V input voltage range is suitable for a wide variety of low voltage systems. The output voltage is configurable in the range from 0.3 V to 1.9 V. The recommended components and connections for DA9217/DA9121 are shown in Figure 1. DA9220/DA9122's recommended components and connections are shown in Figure 2.

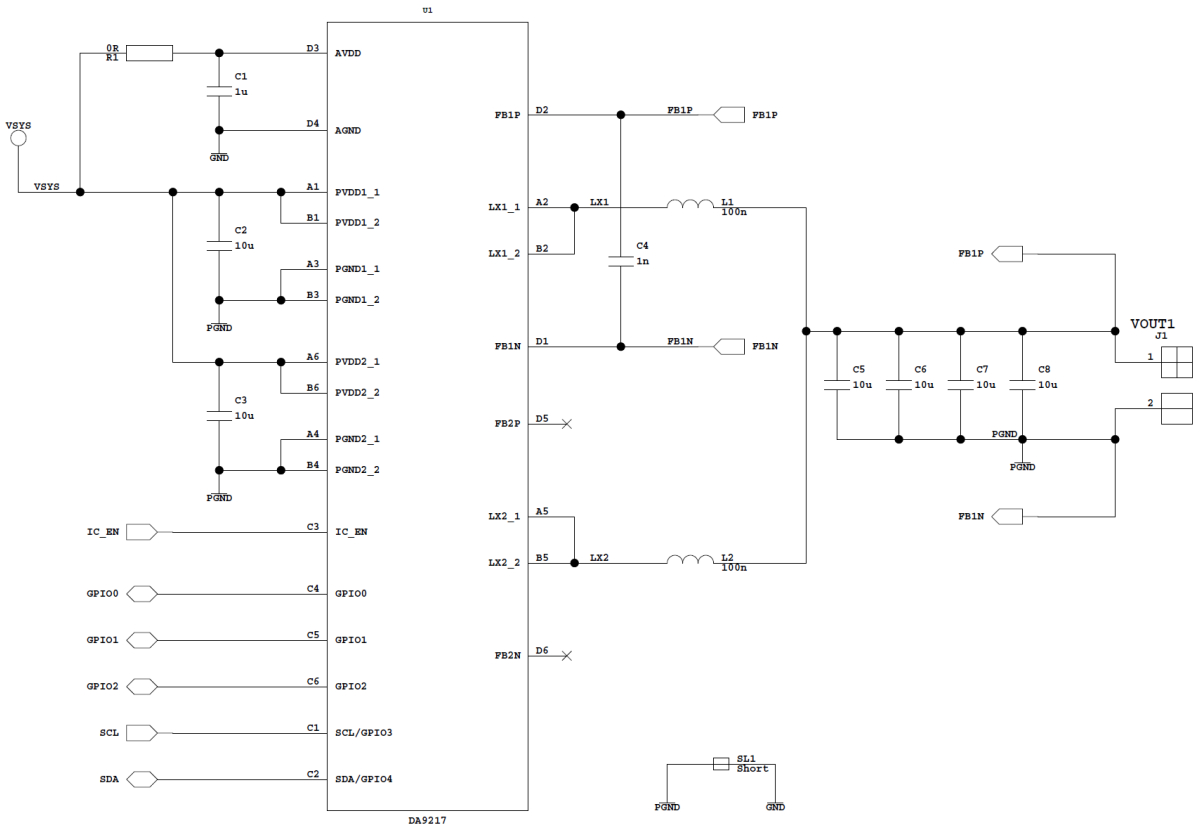

Figure 1: DA9217/DA9121 Recommended Components and Connections

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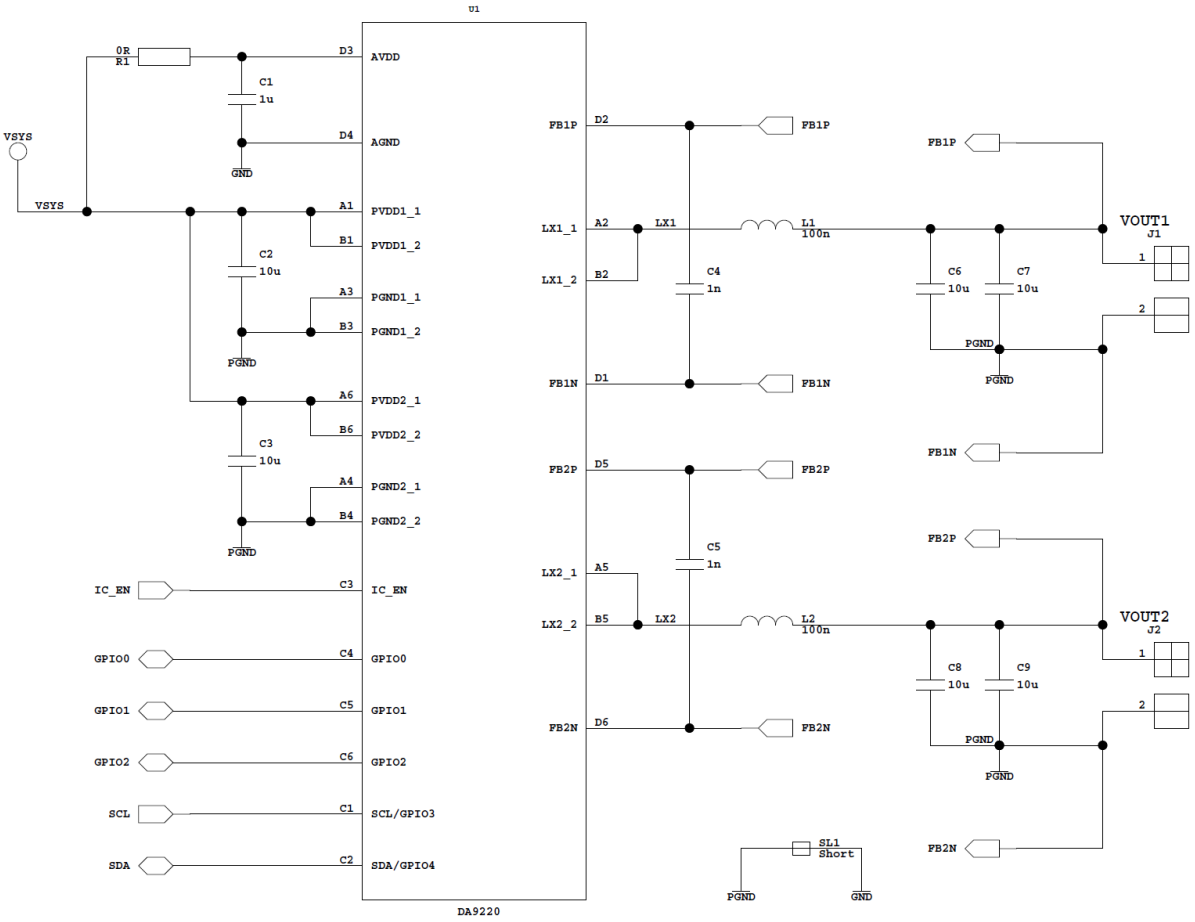

Figure 2: DA9220/DA9122 Recommended Components and Connections

4 Output Voltage Programming

Use the GUI software to set up the output voltage in the range of 0.3 V to 1.9 V. DA9217/DA9121/DA9220/DA9122 can support output voltages higher than 1.9 V using an external resistive divider shown in Figure 3. To calculate the output voltage with an external divider, use the following equation:

$$V_{OUT} = V_{REF} \times \left(1 + \frac{R1}{R2}\right)$$

V_{REF} is the device buck output voltage setting, see Figure 4.

Use resistors for R1+R2 below 40 kΩ.

NOTE
The resistors need to be properly selected since the output voltage accuracy will be directly affected by any errors on the resistors. The voltage across FB1P and FB1N (V_{REF}) is guaranteed, but not the output voltage accuracy.

To operate the circuit properly, a feedforward capacitor (C_{FF}) in parallel with R1 is required. Use capacitances for C_{FF} in the range of 1 nF to 4.7 nF.

Examples:

1. To regulate a 3.3 V output voltage from a 5 V input voltage, use a 10 kΩ resistor on both R1 and R2, with V_{REF} set to 1.65 V and C_{FF} =2.2 nF.
2. To regulate a 2.5 V output voltage from a 5 V input voltage, use a 10 kΩ resistor on both R1 and R2, with V_{REF} set to 1.25 V and C_{FF} =2.2nF.

When using an external resistive divider to program the buck converter output voltage, a minimum difference of 1.2 V between V_{IN} and V_{OUT} is required. This is due to a maximum controllable on-time limitation. For example, to regulate a 3.3 V output voltage, the minimum input voltage should be 4.5 V.

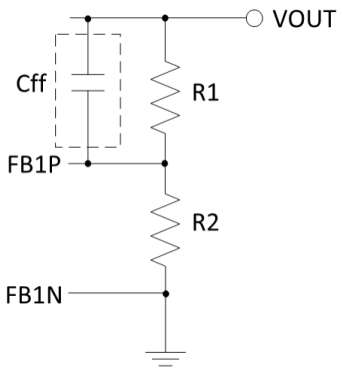

Figure 3: Resistive Divider Diagram

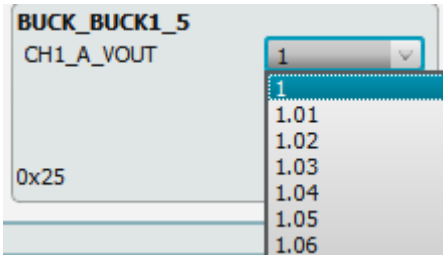

Figure 4: Register of Buck Output Setting

4.1 Waveform Results

Figure 5. to Figure 8 show the output voltage higher than 1.9 V using DA9217; R1 = R2 = 20 kΩ, C_{FF} = 2.2 nF.

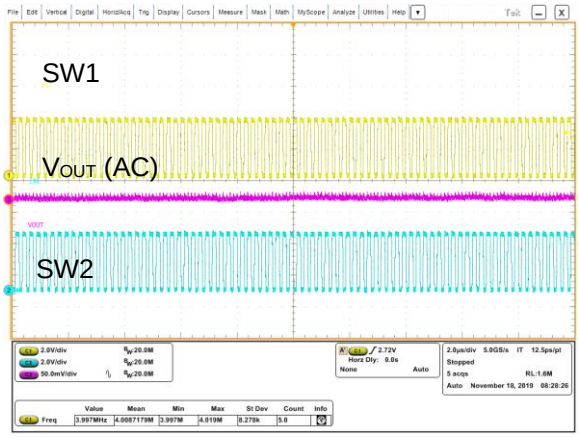

Figure 5: V_{IN} = 3.7 V, V_{OUT} = 2 V, I_{OUT} = 3 A, C_{FF} = 2.2 nF

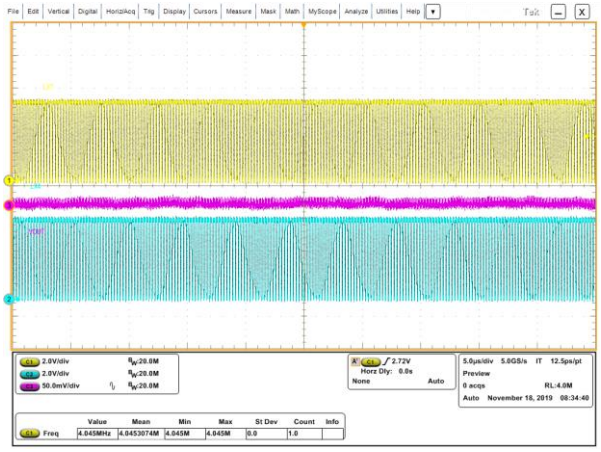

Figure 6: V_{IN} = 5 V, V_{OUT} 3.3 V, I_{OUT} = 3 A, C_{FF} = 2.2 nF

5 Conclusions

DA9217/DA9121/DA9220/DA9122 allow output voltages in the range from 0.3 V to 1.9 V by internal setting. These devices also support output voltages above 1.9 V by using an external resistive divider and a capacitor. The application note describes how to choose the required component values to realize this higher output voltage.

Revision History

Revision	Date	Description
1	23-Jan-2020	Initial version.
1.1	15-Feb-2022	Rebranded to Renesas.

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Status Definitions

Status	Definition
DRAFT	The content of this document is under review and subject to formal approval, which may result in modifications or additions.
APPROVED or unmarked	The content of this document has been approved for publication.

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(Rev.1.0 Mar 2020)

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