Switching Regulator Series

Buck Converter with Integrated FET BD9D300MUV EVK

BD9D300MUV-EVK-001 (12V → 5V, 3A)

Introduction

This user's guide will provide the necessary steps to operate the EVK of ROHM's BD9D300MUV 1channel Buck DC/DC converter. This include the external parts, operating procedures and application data.

Description

BD9D300MUV-EVK-001 Evaluation board delivers an output 5.0 volts from an input 7.4 to 15 volts using BD9D300MUV, a synchronous rectification step-down DC/DC converter integrated circuit. It has original on-time control system which can operate low power consumption in light load condition. It has a variable soft start function to prevent rush current at startup, UVLO (under voltage lock out), TSD (thermal shutdown detection), OCP (over current protection) and OVP (over voltage protection) protection functions. It also has a power-good terminal that can supply the output stabilization timing of this IC to the later device.

Application

Step-down Power Supply for SoC, FPGA, Microprocessor

Laptop PC/Tablet PC/Server

LCD TV

Printers and OA equipment

Distributed Power Supply, Secondary Power Supply

Operating Limits

These are representative values, and it is not a guaranteed against the characteristics.

Parameter	Min	Typ	Max	Units	Conditions
Input Voltage	7.4	12.0	15.0	V	
Output Voltage		5.0		V	
Output Current Range			3	A	
Operating Frequency		1.25		MHz	
Maximum Efficiency		93		%	V_{IN}=12V, I_{OUT}=1A

No. 63UG037E Rev.001
JUL.2020

EVK

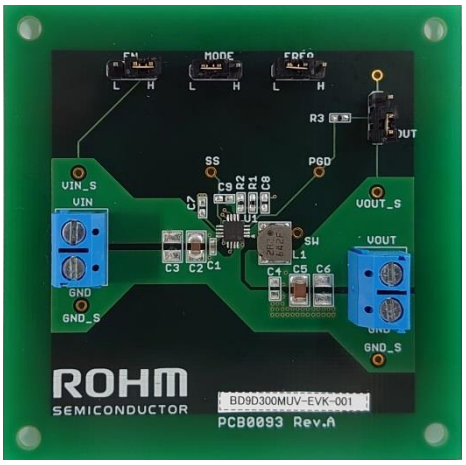

Figure 1. BD9D300MUV-EVK-001(Top View)

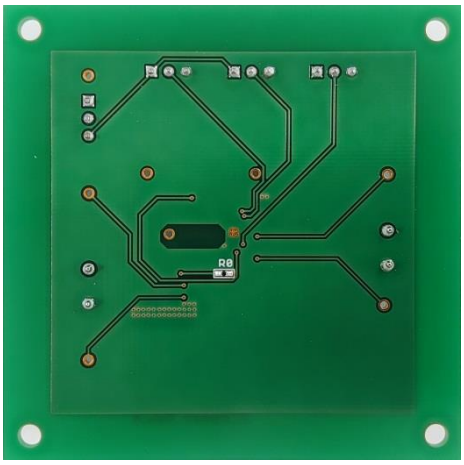

Figure 2. BD9D300MUV-EVK-001(Bottom View)

EVK Schematic

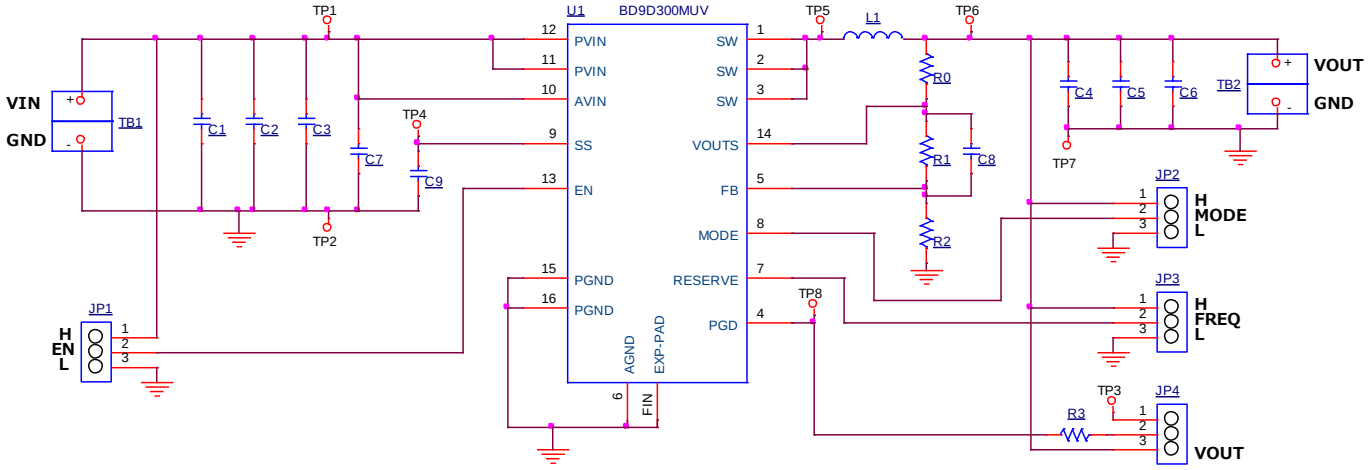

Figure 3. BD9D300MUV-EVK-001 Schematic

Operating Procedure

Below is the procedure to operate the EVK.

1. Turn off the power supply and connect power supply's GND pin to the GND pin of the EVK.
2. Connect the power supply's VCC pin to the VIN pin of the EVK.
3. Check if the shunt jumper of JP1 is at position ON (EN terminal connect to H-side terminal, the EN pin of IC is pulled high)
4. Check if the shunt jumper of JP4 is at position Low (FREQ terminal connect to L-side terminal, the RESERVE pin of IC is GND)
5. Check if the electronic load is turned off and connect the electronic load to the VOUT pin and the GND pin of the EVK.
6. Connect the voltmeter to the VOUT pin and the GND pin of the EVK.
7. Turn on the power supply and check if the measured value of the voltmeter is 5V.
8. Turn on the electronic load.

Notes:

The board does not support hot plugging protection. Do not perform hot plugging on this board.

EVK Pin Descriptions

JP1: Enable pin. Standby-mode is enabled by shorting Jumper-pin of JP1 between EN terminal and L-side terminal and normal-mode operation by shorting between EN terminal and H-side terminal.

JP2: Pin for setting switching control mode. Shorting Jumper-pin of JP2 between MODE terminal and H-side terminal forces the device to operate in the Pulse Width Modulation (PWM) mode control. Shorting Jumper-pin of JP2 between MODE terminal and L-side terminal, the mode is automatically switched between the Light Load mode control and PWM mode control. Do not change the mode control during operation.

JP3: Shorting Jumper-pin of JP3 between FREQ terminal and L-side terminal.

JP4: Pin for setting Power Good. This pin is an open drain output that requires a pull-up resistor to the VOUT by shorting Jumper-pin of JP4. If not used, this pin can be left floating.

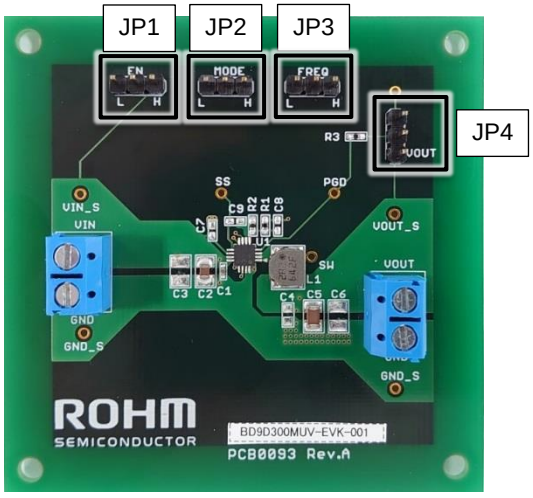

Figure 4. BD9D300MUV-EVK-001 EVK Pin Description

Bill of Materials

Table 1. Bill of Materials

Reference Designator	Type	Value	Description	Part Number	Manufacturer	Configuration (mm)
C1	Ceramic Capacitor	0.1µF	50V	-	-	1005
C2	Ceramic Capacitor	10µF	35V	-	-	2012
C3	Ceramic Capacitor	-	Not installed	-	-	-
C4	Ceramic Capacitor	-	Not installed	-	-	-
C5	Ceramic Capacitor	47µF	16V	-	-	3216
C6	Ceramic Capacitor	-	Not installed	-	-	-
C7	Ceramic Capacitor	-	Not installed	-	-	-
C8	Ceramic Capacitor	-	Not installed	-	-	-
C9	Ceramic Capacitor	-	Not installed	-	-	-
L1	Inductor	2.2µH	±20%, DCR=40mΩmax, 5.4A	FDSD0518-H-2R2M	MURATA	5249
R0	Resistor	0Ω	Jumper	-	-	1005
R1	Resistor	270kΩ	1/16W, ±1%	-	-	1005
R2	Resistor	51kΩ	1/16W, ±1%	-	-	1005
R3	Resistor	100kΩ	1/16W, ±1%	-	-	1005
JP1,JP2,JP3,JP4	Pin header	-	2.54mm × 3 contacts	61300311121	Wurth Elektronik	-
U1	IC	-	Buck DC/DC Converter	BD9D300MUV-LB	ROHM	VQFN016V3030
TB1,TB2	Terminal Block	-	2 contacts, 15A, 14 to 22AWG	691102710002	Wurth Elektronik	-
-	Jumper	-	Jumper pin for JP1 to JP4	60900213421	Wurth Elektronik	-

Board Layout

EVK PCB information

Number of Layers	Material	Board Size	Copper Thickness
4	FR-4	67.5mm x 67.5mm x 1.6mmt	1oz (35µm)

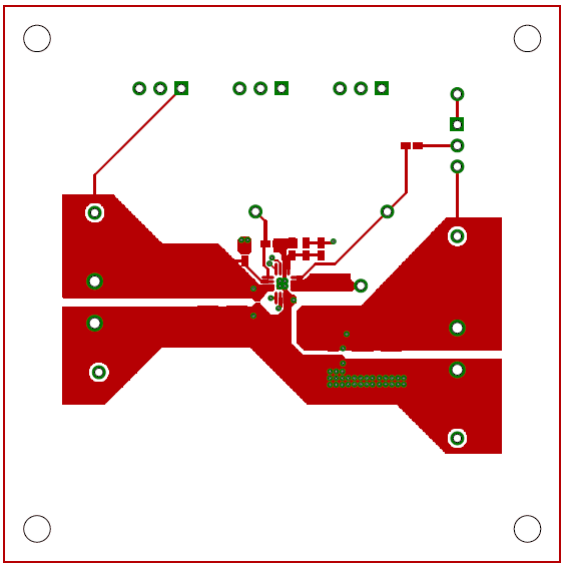

Figure 5. Top Layer Layout
(Top View)

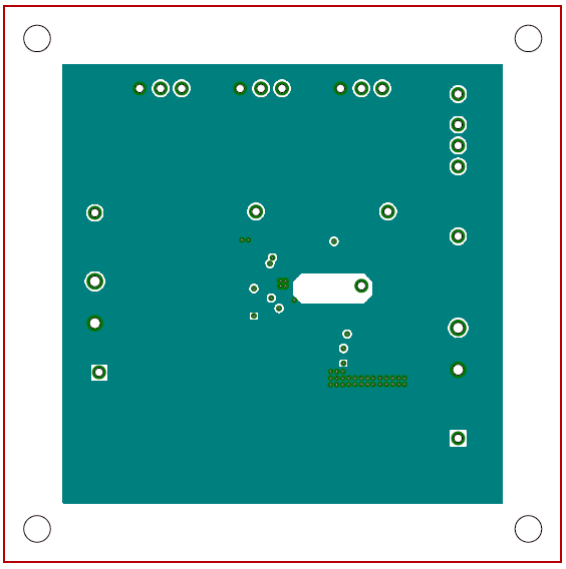

Figure 6. Middle1 Layer Layout
(Top View)

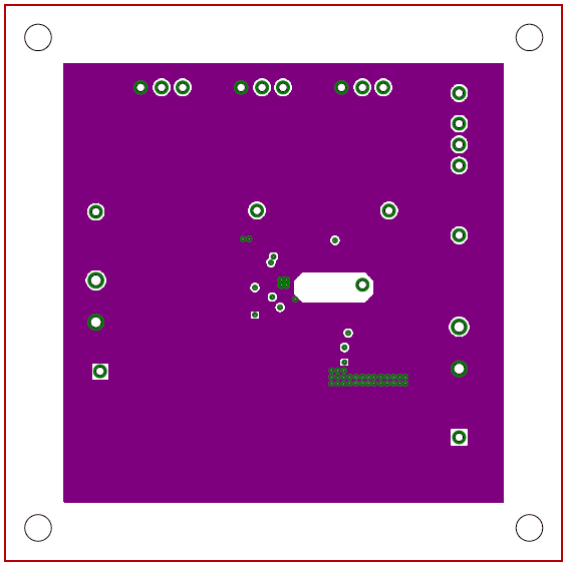

Figure 7. Middle2 Layer Layout
(Top View)

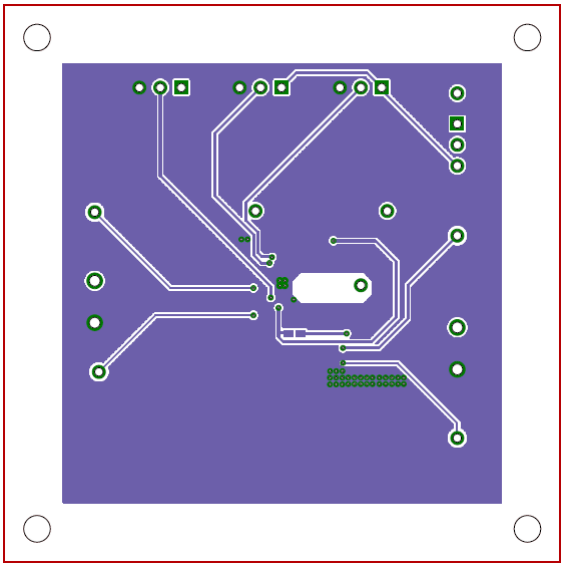

Figure 8. Bottom Layer Layout
(Top View)

Reference Application Data

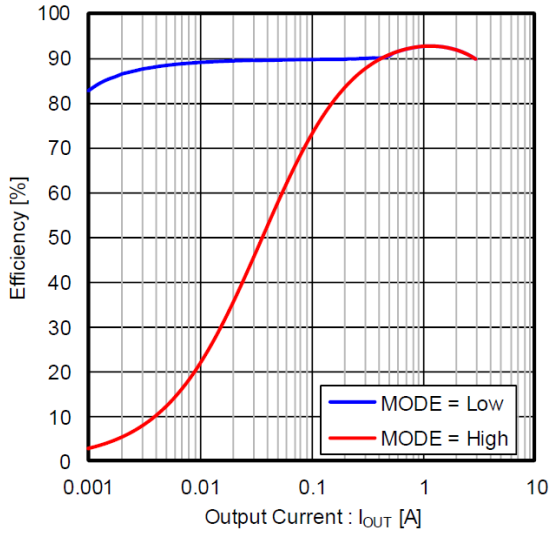

Figure 9. Efficiency vs Output Current

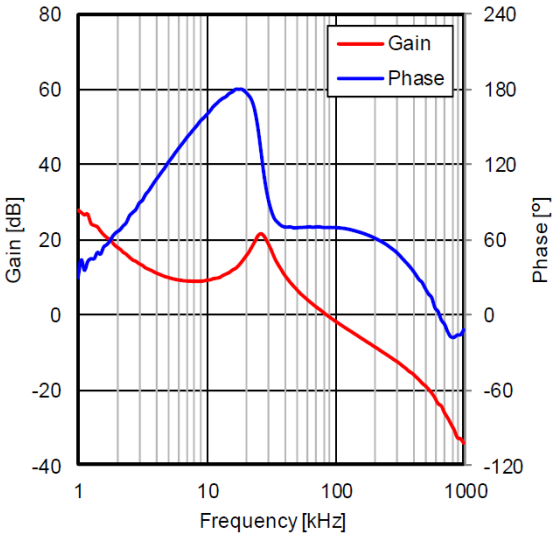

Figure 10. Frequency Characteristics I_{OUT}=2.0A

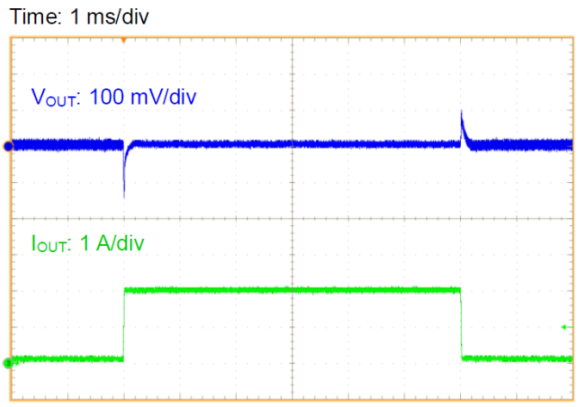

Figure 11. Transient Load Response I_{OUT}=0.1A - 2.0A

(MODE=Low)

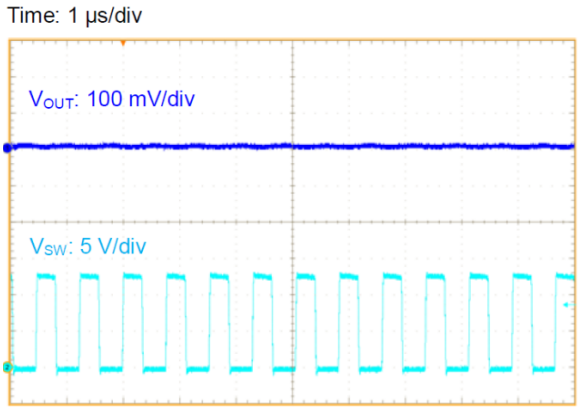

Figure 12. Output Ripple Voltage I_{OUT}=3.0A

(MODE=High)

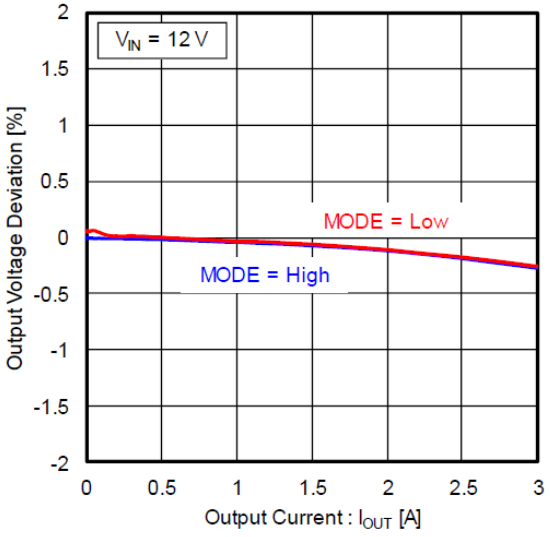

Figure 13. Load Regulation

(V_{IN}=12V, V_{OUT}=5.0V)

Revision History

Date	Revision Number	Description
7. Jul. 2020	001	Initial release

Notes

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