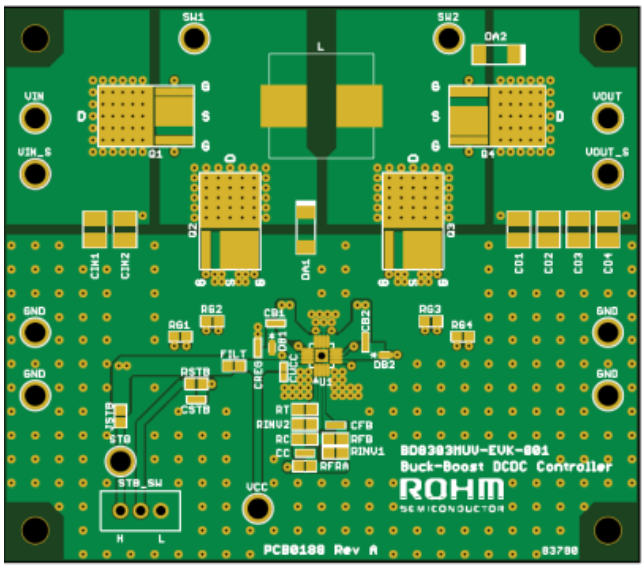
Contents [hide]

ROHM BD8303MUV EVK Synchronous Buck Boost Controller



Specifications

- **Input Voltage:** 4.0V – 7.4V
- **Output Voltage:** 12V
- **Output Current Range:** 0A – 1.5A
- **Operating Frequency:** Up to 400 kHz
- **Maximum Efficiency:** 92%

Product Usage Instructions

Operating Procedure

1. Turn off the power supply and connect its GND terminal to the EVK's GND terminal.
2. Connect the power supply's positive terminal to the VIN terminal of the EVK.
3. Ensure the electronic load is off, then connect it to the VOUT and GND terminals of the EVK.
4. Connect a voltmeter to the VOUT_S and GND terminals of the EVK.
5. Check that the shunt jumper of STB_SW is at position H.
6. Turn on the power supply and verify that the voltmeter reads 12V.
7. Turn on the electronic load.

Notes: Do not hot plug the board as it does not support hot plugging protection.

Operation State Settings

STB_SW state	BD8303MUV Condition
ON (short to VIN)	Enable
OFF (short to GND)	Shutdown

Switching Regulator Series

Synchronous Buck-Boost Controller BD8303MUV EVK

BD8303MUV-EVK-001 (7.4V → 12V, 1.5A)

Introduction

This user's guide will provide the steps necessary to operate the BD8303MUV-EVK-001 and evaluate ROHM's BD8303MUV synchronous buck-boost DC/DC controller. Component selection, operating procedures and application data are included.

Description

This EVK uses a synchronous rectifying buck-boost DC / DC controller IC BD8303MUV to output 12V from an input voltage of 4V to 14V. BD8303MUV accepts a power supply input range of 2.7V to 14V. The output voltage can be set from 1.8V to 12V with an external resistor. The operating frequency can be set from 200 kHz to 1 MHz with an external resistor. The IC implements an efficient buck-boost converter using one inductor and external channel FETs. It has a built-in soft start function for rush current countermeasures at startup, UVLO.
(Under Voltage Lock Out), TSD (Thermal Shutdown Detection) and SCP (Short Circuit Protection).

Application

General Portable Equipment such as:

- DVC (Digital Video Camera)
- Single-Lens Reflex Cameras
- Portable DVD player

- Laptop PCs

Operating Limits

Parameter	Min	Typ	Max	Units	Conditions
Input Voltage	4.0	7.4	14	V	*note 1
Output Voltage	12			V	RINV1=330kΩ RINV2 =30kΩ
Output Current Range	1.5			A	
Operating Frequency	400			kHz	RT=75kΩ
Maximum Efficiency	92			%	IOUT = 1.5A

Note.

(note 1) Although the IC operating range is up to 14V, this EVK is equipped with a 10V operating Zener diode D1 in front of the VCC pin to protect the IC. Therefore, please operate with an input voltage of 9V or less.

EVK

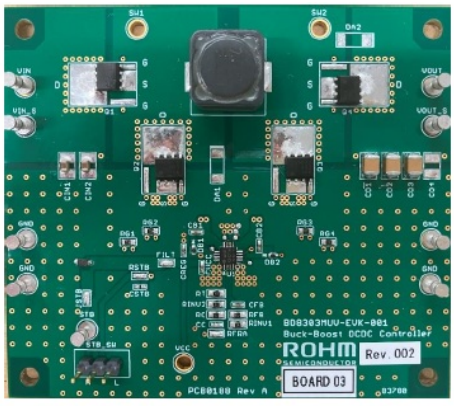


Figure 1. BD8303MUV-EVK-001(Top View)

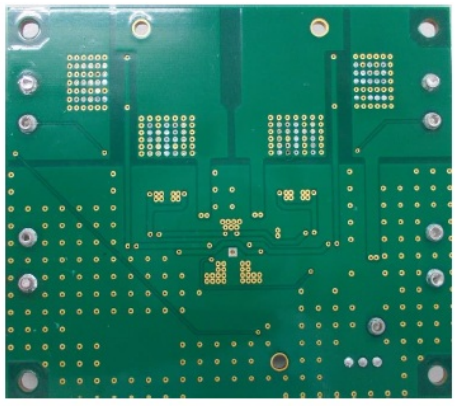


Figure 2. BD8303MUV-EVK-001(Bottom View)

EVK Schematic

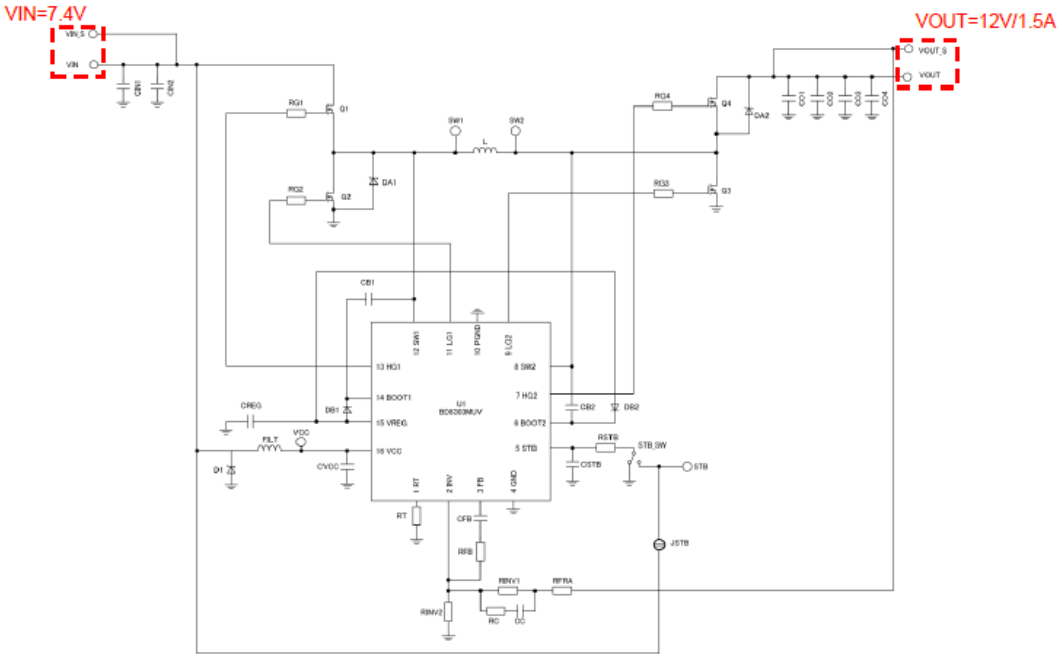


Figure 3. BD8303MUV-EVK-001 Schematic

Operating Procedure

Below is the procedure to operate the EVK.

1. Turn off the power supply and connect the power supply's GND terminal to the GND terminal of the EVK.
2. Connect the power supply's positive terminal to the VIN terminal of the EVK.
3. Check if the electronic load is turned off and connect the electronic load to the VOUT terminal and the GND terminal of the EVK.
4. Connect the voltmeter to the VOUT_S terminal and the GND terminal of the EVK.
5. Check if the shunt jumper of STB_SW is at position H.
6. Turn on the power supply and check if the measured value of the voltmeter is 12V.
7. Turn on the electronic load.

Notes:

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

Operation State Settings

Table 2 is the BD8303MUV condition using STB_SW.

Table 2. STB_SW Settings

STB_SW state	BD8303MUV Condition
ON (short to VIN)	Enable
OFF (short to GND)	Shutdown

BOM

Below is a table with the bill of materials.

Table 3. Bill of Materials

Count	Parts No.	Type	Value	Description	Part Number	Manufacturer	Configuration
							Inch(mm)
1	U1	IC	–	Buck-boost DC/DC Controller	BD8303MUV	ROHM	1111(3030)
2	CIN1, CIN2	Ceramic Capacitor	10µF	25V, B, ±10%	GRM21BB31E106MA73	MURATA	0805(2012)
3	CO1, CO2, CO3	Ceramic Capacitor	47µF	16V, B, ±20%	GRM32EB31C476ME15	MURATA	1210(3225)
1	CVCC	Ceramic Capacitor	0.1µF	50V, X7R, ±10%	GRM155R71H104KE14	MURATA	0402(1005)

1	CREG	Ceramic Capacitor	1µF	16V, B, ±10%	GRM155B31C105KA12	MURATA	0402(1005)
1	CFB	Ceramic Capacitor	0.022µF	50V, B, ±10%	GRM155B11E223KA61	MURATA	0402(1005)
1	CC	Ceramic Capacitor	68pF	50V, C0G, ±5%	885012005060	Wurth elektronik	0402(1005)
0	CSTB, CO4	Ceramic Capacitor	No mount	N/A	N/A	N/A	–
2	CB1, CB2	Ceramic Capacitor	0.1µF	50V, X7R, ±10%	GRM155R71H104KE14	MURATA	0402(1005)
1	RT	Resistor	75kΩ	50V, 0.1W, ±0.5%	MCR03EZPD7502	ROHM	0603(1608)
1	RFB	Resistor	7.5kΩ	50V, 0.1W, ±0.5%	MCR03EZPD7501	ROHM	0603(1608)
1	RINV1	Resistor	330kΩ	50V, 0.1W, ±0.5%	MCR03EZPD3303	ROHM	0603(1608)
1	RINV2	Resistor	30kΩ	50V, 0.1W, ±0.5%	MCR03EZPD3002	ROHM	0603(1608)

1	RC	Resistor	5.1kΩ	50V, 0.1W, ±0.5%	MCR03EZPD5101	ROHM	0603(1608)
4	RG1, RG2, RG3, RG4	Resistor	22Ω	50V, 0.1W, ±0.5%	MCR03EZPD22R0	ROHM	0603(1608)
0	RSTB, RFRA	Resistor	–	SHORT	N/A	N/A	–
4	Q1, Q2, Q3, Q4	FET	30V, 7A	Nch, VGS=4.5V, RDS(on)=25mΩ 5.8nC, SOP-8	RXH070N03	ROHM	2024(5060)
2	DB1, DB2	Diode	30V, 0.1A	VF(max)=0.35V, @IF=0.01A	RB521CM-30	ROHM	0403(1006)
0	DA1, DA2	Diode	No mount	N/A	N/A	N/A	–
1	D1 (*note 4)	Diode	10V	500mW	TFZV10B	ROHM	0.55 x 0.079 (1.4 x 2.0)
1	L	Inductor	4.7μH	8.5A, -40%-+20%	74477004	WURTH	0.47 x 0.47 (12 x 12)
0	FILT	Inductor	–	SHORT	N/A	N/A	–

0	STB_SW	–	–	SWITCH	–	–	–
0	JSTB	–	–	SHORT	N/A	N/A	–

Note.

- (*note 2) If the overshoot voltage exceeds the maximum rating of 15V for SW1 and SW2, adjust the gate resistance value. Be careful not to overlap the high side and low side gate voltages. As an alternative, add a resistor and capacitor snubber circuit between the SW1 terminal and GND, and between the SW2 terminal and GND.
- (*note3) Recommended parts are selected from those products and information available at the time this data sheet (Rev.001) was released. If supply conditions change and parts are not available, use similar parts.
- (*note 4) D1 TFZV10B has been added from EVK Rev.003.

Board Layout

EVK PCB information

Number of Layers	Material	Board Size	Copper Thickness
4	FR-4 High TG	80mm x 70mm x 1.6mmt	1oz (35µm)

following the layout of BD8303MUV-EVK-001

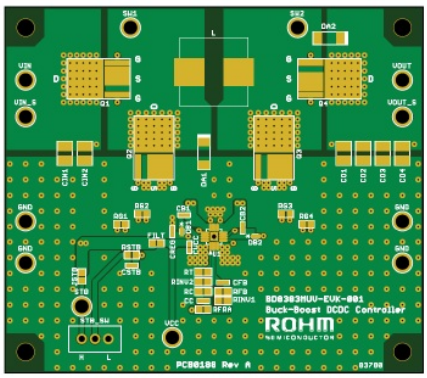


Figure 4. Top PCB image
(Top View)

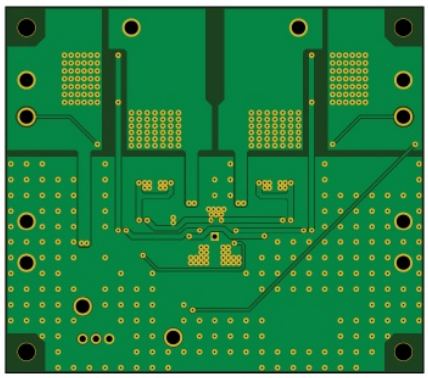


Figure 5. Bottom PCB image
(Top View)

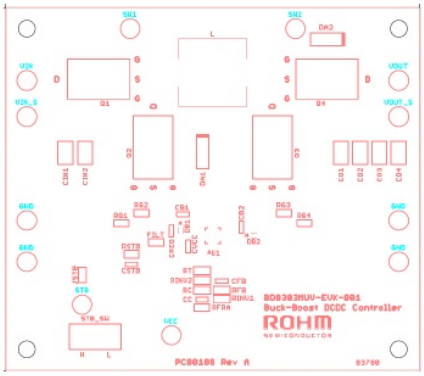


Figure 6. Top Layer Silkscreen layout
(Top View)

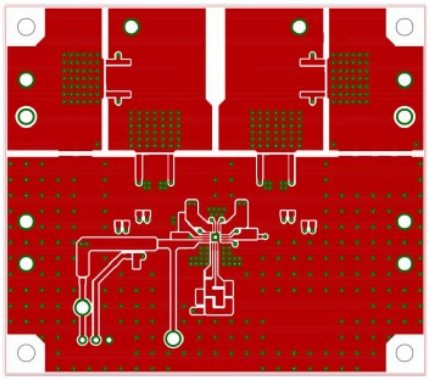


Figure 7. Top Layer layout
(Top View)

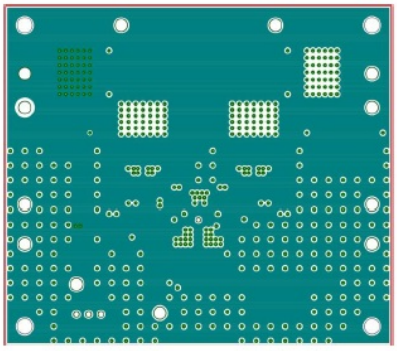


Figure 8. Middle1 Layer (VIN) layout
(Top View)

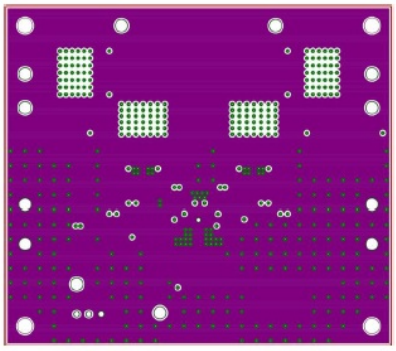


Figure 9. Middle2 Layer (GND) layout
(Top View)

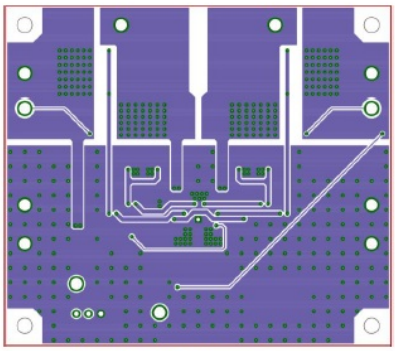


Figure 10. Bottom Layer layout
(Top View)

Reference Application Data

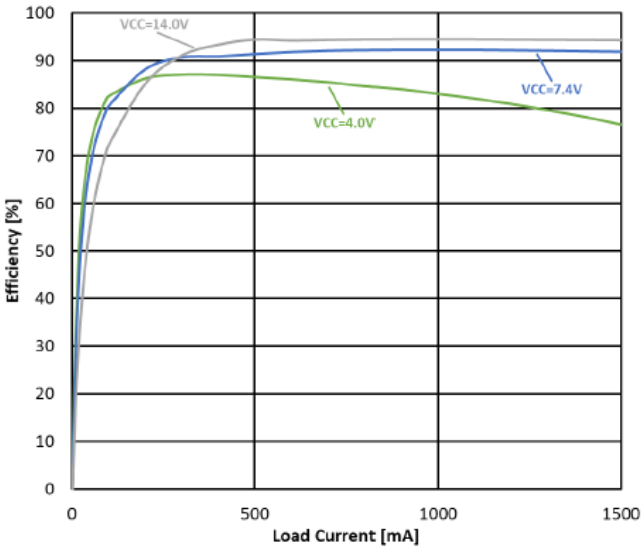


Figure 11. Efficiency vs Load Current (VCC=4V to 14V, VOUT=12V)

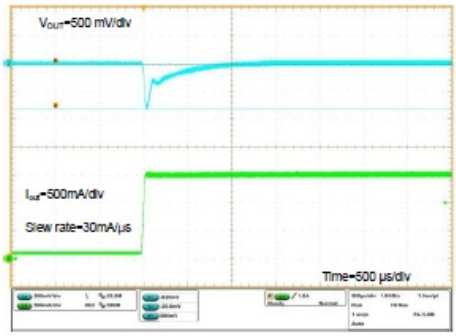


Figure 12. Transient Load Response
(VCC=7.4V, I_{out}=0.1A→1.5A)

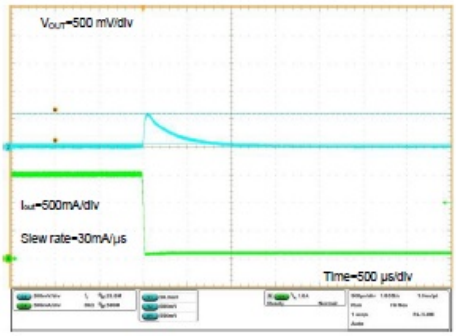


Figure 13. Transient Load Response
(VCC=7.4V, I_{out}=1.5A→0.1A)

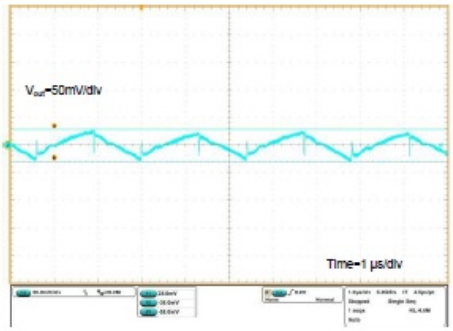


Figure 14. Output Ripple Voltage
(VCC=7.4V, I_{out}=1.5A)

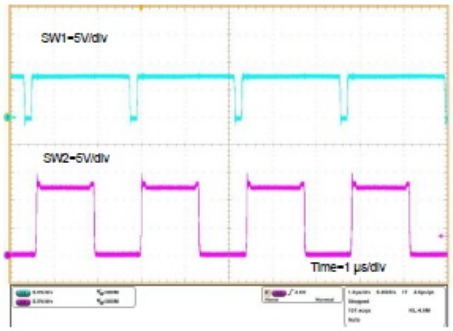


Figure 15. Output Ripple Voltage
(VCC=7.4V, I_{out}=1.5A)

Revision History

Date	Revision Number	Description
22. Feb. 2021	001	Initial release

18. Oct. 2023	002	p.2 Changed to a photo with RG1, RG2, RG3, and RG4 added in Figure.1. p.4 CC 68pF of TaTable is changed from GRM1552C1H680JA 01 to 885012005060. p.4 RFB ofTable .3 is changed from MCR03ECPD7501 to MC R03EZPD7501. p.4 Add comment. Recommended parts are selected from those products and information available at the time this user's guide (Rev.001) was released. If supply conditions change and parts are not available, use similar parts." p.5 Copper Thickness changed from 2oz to 1oz.
13. May. 2 024	003	Added D1 TFZV10B to the circuit diagram and parts list.

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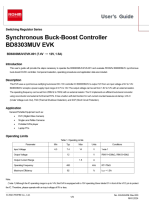
FAQ

Q: Can I operate the EVK with an input voltage higher than 9V?
A: Although the IC operating range is up to 14V, the EVK is equipped with a Zener diode to protect the IC, so it is recommended to operate with an input voltage of 9V or less.

Documents / Resources

	ROHM BD8303MUV EVK Synchronous Buck Boost Controller [pdf] User Guide BD8303MUV EVK, BD8303MUV-EVK-001, BD8303MUV EVK Synchronous Buck Boost Controller, BD8303MUV EVK, Synchronous Buck Boost Controller, Buck Boost Controller, Boost Controller, Controller

References

- User Manual

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BD8303MUV EVK, BD8303MUV EVK Synchronous Buck Boost Controller, BD8303MUV-EVK-001, Boost Controller, Buck-Boost Controller, controller, ROHM, Synchronous Buck Boost Controller

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