Switching Regulator Series

Buck Converter with Integrated FET BD9B333GWZ EVK

BD9B333GWZ-EVK-001 (3.3V → 0.9V, 3.0A)

Introduction

This user's guide will provide the necessary steps to operate the EVK of ROHM's BD9B333GWZ 1channel Buck DC/DC converter. This include the external parts, operating procedures and application data.

Description

This EVK was developed for ROHM's synchronous buck DC/DC converter BD9B333GWZ. The BD9B333GWZ accepts a power supply input range of 2.7V to 5.5V, and generates an output voltage from 0.6V to 0.8 x V_{IN} using external resistors. It has a built-in 23mΩ N-channel MOSFET on both upper and lower sides that is operating frequency is 1.3MHz. It adopts a Deep-SLLM compliant fixed on-time control method that consumes low current at light loads, making it ideal for equipment that wants to reduce standby power consumption. It has a variable soft start function to prevent rush current at startup, UVLO (under voltage lock out), TSD (thermal shutdown detection), and OCP (over current 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 DSP, FPGA, microprocessor, etc.
Laptop PC/Tablet PC/Server
LCD TV
Storage device (HDD/SSD)
Printers and OA equipment
Distribution power supply, secondary power supply

Operating Limits

Parameter	Min	Typ	Max	Units	Conditions
Input Voltage	2.7	3.3	5.5	V	
Output Voltage		0.9		V	
Output Current Range			3.0	A	
Operating Frequency		1.3		MHz	
Maximum Efficiency		85		%	I_O = 1A
UVLO Detect Voltage		2.450		V	VIN sweep down
UVLO Release Voltage		2.550		V	VIN sweep up

No. 63UG026E Rev.001
JUN.2020

EVK

Figure 1. BD9B333GWZ-EVK-001(Top View)

EVK Schematic

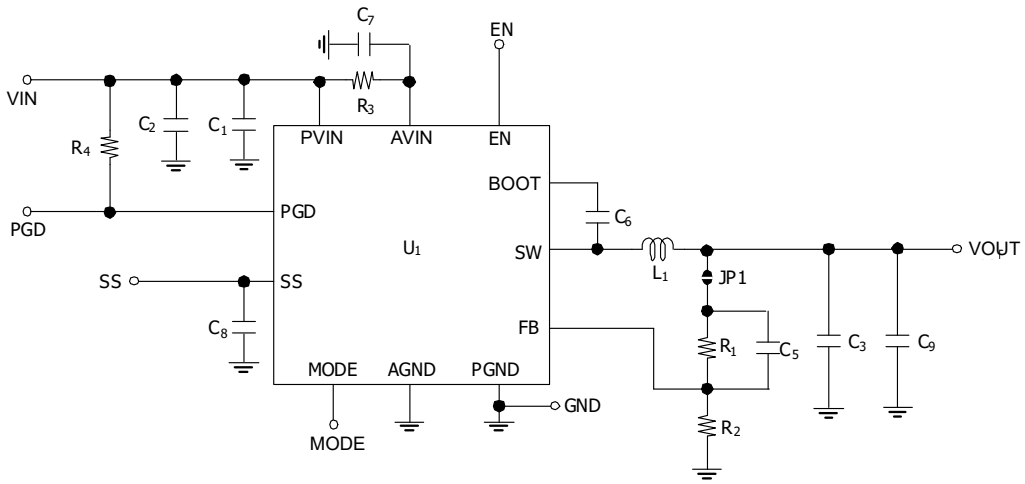

Figure 2. BD9B333GWZ-EVK-001 Circuit Diagram

Operating Procedure

1. Turn off the DC power supply and connect the GND terminal of the power supply to the GND terminal of EVK.
2. Connect VCC pin of DC power supply to the VIN pin of the EVK.
3. Connect the load to the EVK's VOUT and GND terminals. When using an electronic load, connect with the load turned off.
4. Connect a voltmeter to the EVK's VOUT and GND terminals.
5. Connect the MODE terminal of the EVK to the GND terminal of the EVK. (when use with Deep-SLLM control)
6. Connect the EN terminal of the EVK to the VIN terminal of the EVK.
7. Turn on the DC power supply. Make sure the voltmeter shows 0.9V.
8. Turn on the electronic load.

(Caution) This EVK does not support hot plug. Do not perform hot plug test.

Operation State Settings

Below is a table of BD9B333GWZ condition selectable using EN terminal.

Table 1. EN Pin Settings

EN terminal	BD9B333GWZ Condition
HIGH (≥ 1.5 V)	Enable
LOW (≤ 0.5 V)	Shutdown

Operation Mode Settings

Below is a table of BD9B333GWZ operation modes selectable using MODE terminal.

Table 2. RES Pin Settings

RES terminal	BD9B333GWZ Operation Mode
HIGH (short to AVIN)	Forced PWM
LOW (short to GND)	Automatic switching between Deep-SLLM and PWM

Parts list

Table 3. Parts list

Part No.	Value	Manufacturer	Part name	Size[Unit: mm(inch)]
IC				
U1	-	ROHM	BD9B333GWZ	1.98 x 1.80
Inductor				
L1	1.0μH	TOKO	DFE252012F-1R0M	2520(1008)
Capacitor				
C1	22μF	MURATA	GRM21 Series, 10V	2012(0805)
C2	No mount	-	-	-
C3	22μF	MURATA	GRM188 Series, 6.3V	1608(0603)
C5	100pF	MURATA	GRM188 Series, 6.3V	1608(0603)
C6	0.1μF	MURATA	GRM188 Series, 10V	1608(0603)
C7	1000pF	MURATA	GRM188 Series, 10V	1608(0603)
C8	No mount	-	-	-
C9	No mount	-	-	-
Resistor				
R1	100kΩ	ROHM	MCR03 Series	1608(0603)
R2	200kΩ	ROHM	MCR03 Series	1608(0603)
R3	Short	-	-	-
R4	100kΩ	ROHM	MCR03 Series	1608(0603)
Jumper				
JP1	Short	-	-	-
Contact pin				
EN,GND,PGD, RES,SS,VIN,VOUT	Test pins			

Board Layout

EVK PCB information

Number of Layers	Material	Board Size	Copper Thickness
4	FR-4	50mm x 40mm x 1.6mmt	1oz (35µm)

The layout of BD9B333GWZ-EVK-001 is shown below.

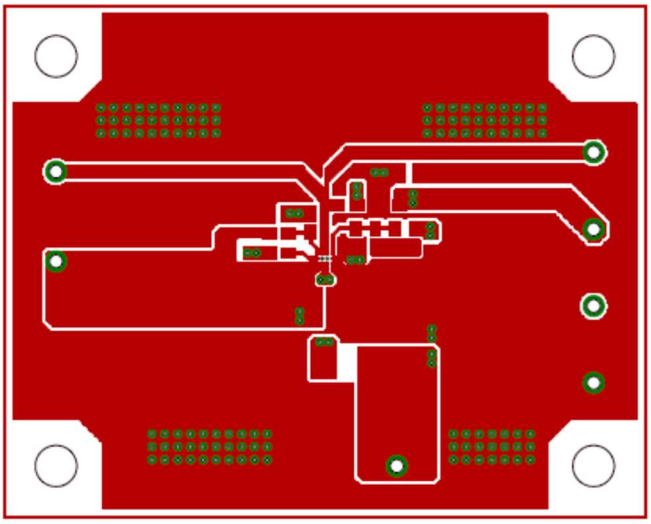

Figure 3. Top Layer Layout
(Top View)

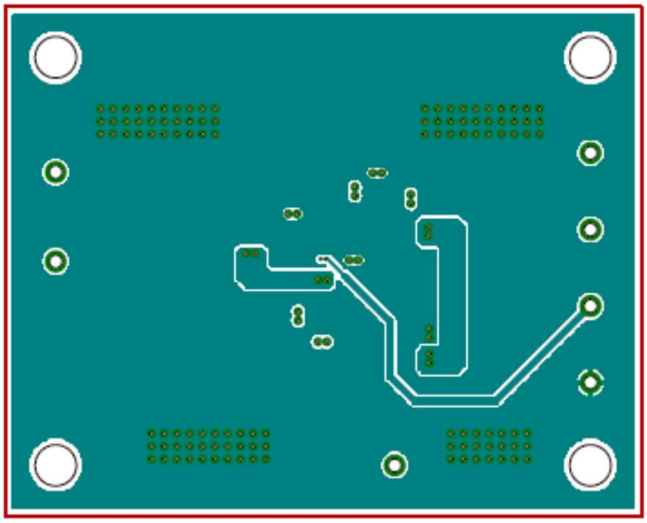

Figure 4. Middle1 Layer Layout
(Top View)

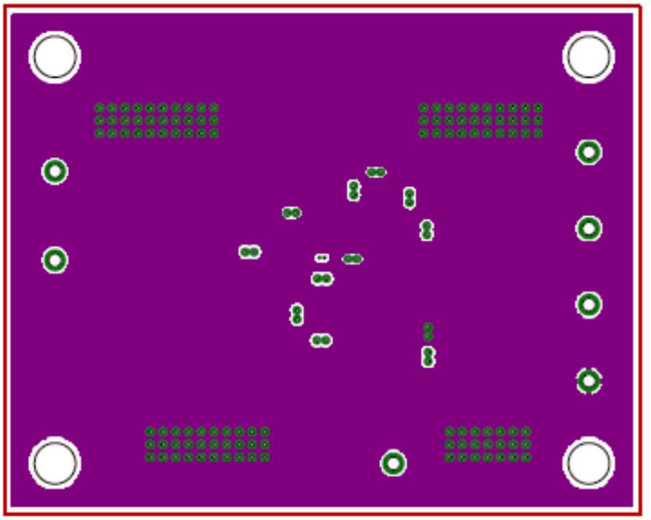

Figure 5. Middle2 Layer Layout
(Top View)

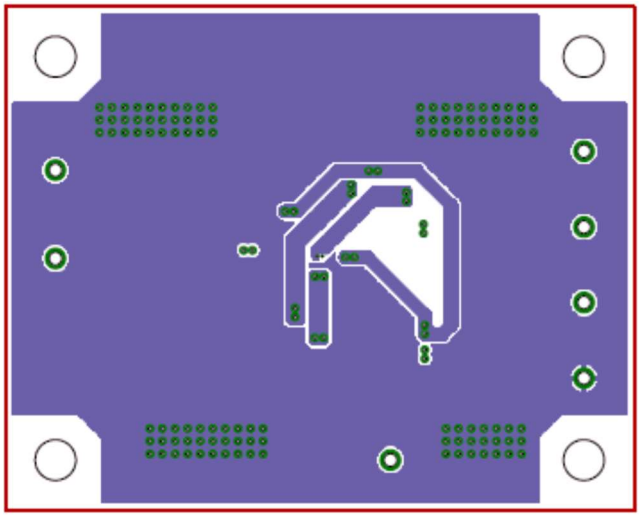

Figure 6. Bottom Layer Layout
(Top View)

Reference application data

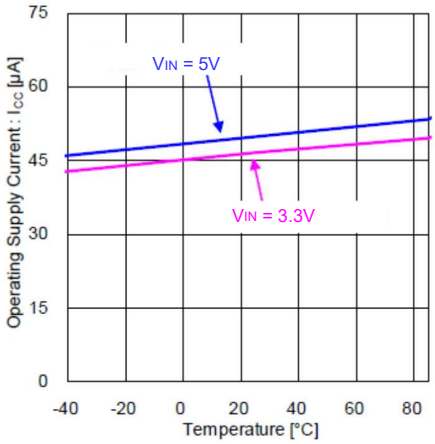

Figure 7. Operating quiescent current vs temperature

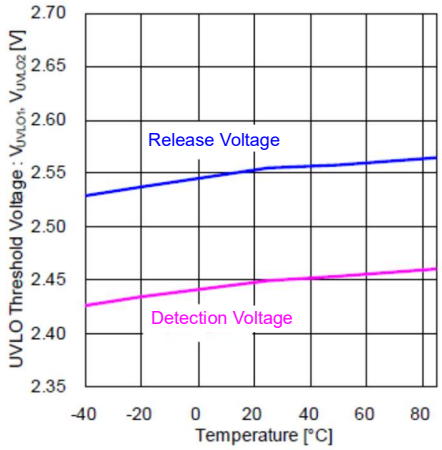

Figure 8. UVLO threshold voltage vs temperature

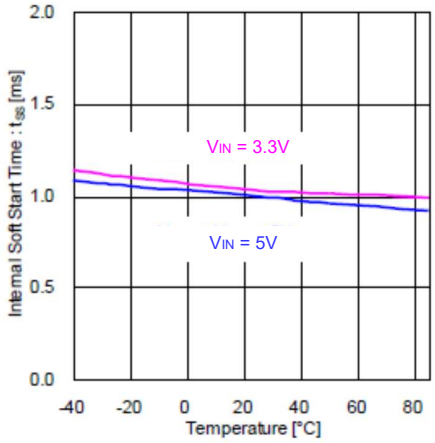

Figure 9. Built-in soft start time vs temperature (Css=OPEN)

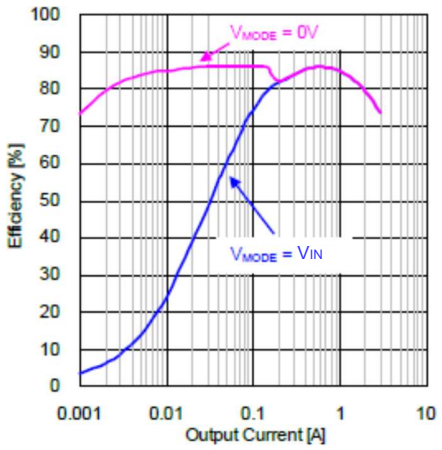

Figure 10. Efficiency vs output current

(VIN=3.3V, VOUT=0.9V, L=1.0μH)

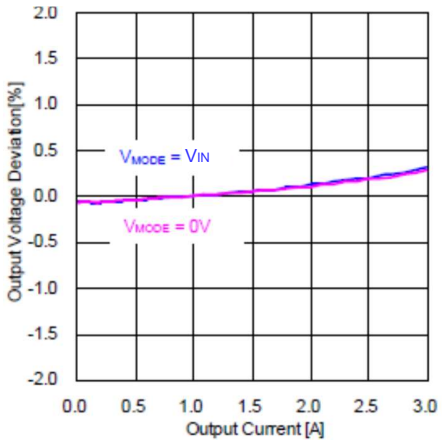

Figure 11. Road regulation

(VIN=3.3V, VOUT=0.9V)

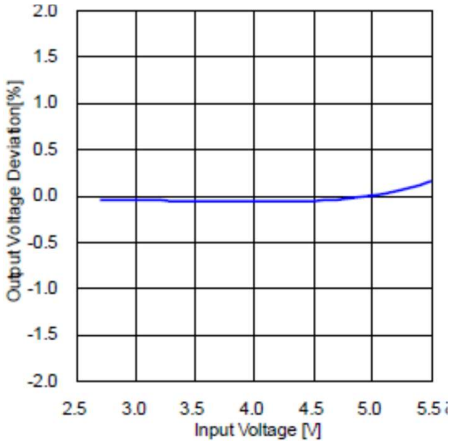

Figure 12. Line regulation

(VOUT=0.9V, VMODE=0V, IOUT=1A)

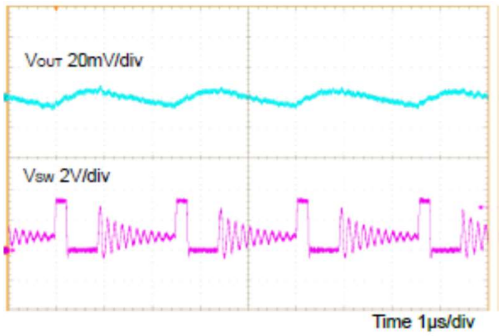

Figure 13 Switching waveform
(VIN=3.3V, VOUT=0.9V, VMODE=0V, IOUT=0.1A)

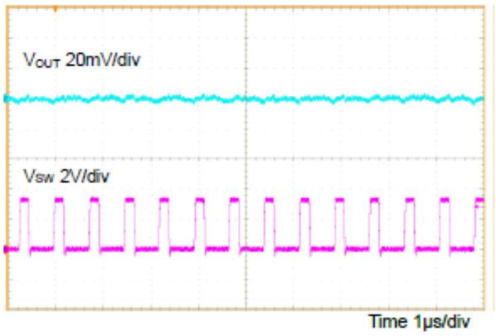

Figure 14. Switching waveform
(VIN=3.3V, VOUT=0.9V, VMODE=VIN, IOUT=0.1A)

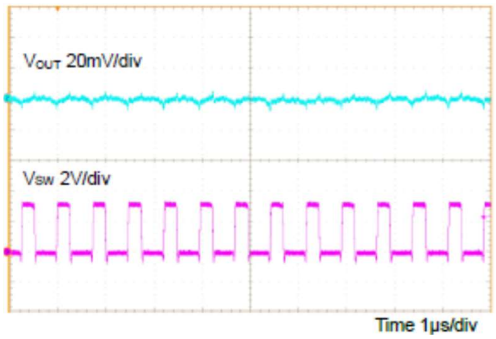

Figure 15. Switching waveform
(VIN=3.3V, VOUT=0.9V, VMODE=0V, IOUT=3A)

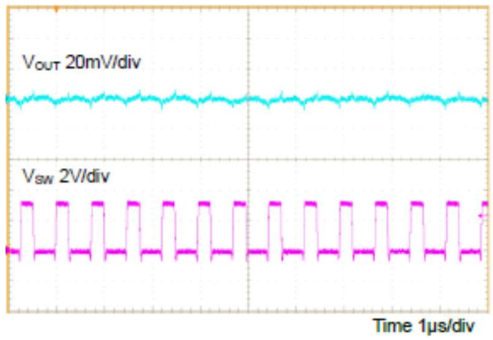

Figure 16. Switching waveform
(VIN=3.3V, VOUT=0.9V, VMODE=VIN, IOUT=3A)

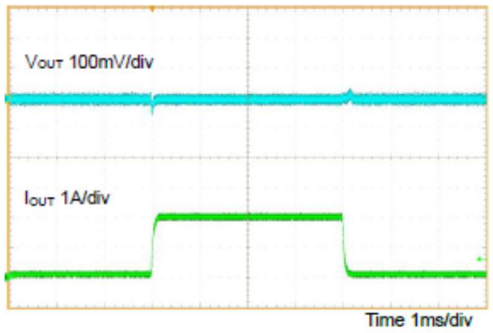

Figure 17. Load response waveform (IOUT=0.1A-2A)
(VIN=3.3V, VOUT=0.9V, VMODE=0V, COUT=22µF)

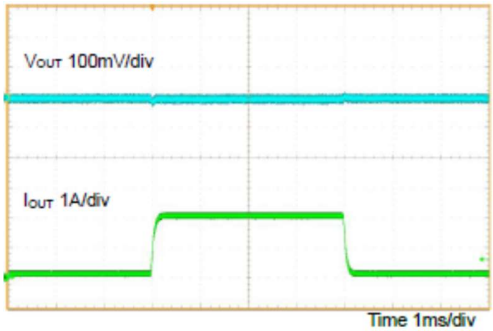

Figure 18. Load response waveform (IOUT=0.1A-2A)
(VIN=3.3V, VOUT=0.9V, VMODE=VIN, COUT=22µF)

Revision History

Date	Revision Number	Description
30. Jun. 2020	001	Initial release

Notes

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