ROHM Switching Regulator Solutions

Evaluation Board: Synchronous Boost DC/DC Converter

Introduction

This application note will provide the steps necessary to operate and evaluate ROHM's synchronous buck DC/DC converter using the BU33UV7NUX-EVK-101 evaluation board. Component selection, operating procedures, and application data are included.

Description

The BU33UV7NUX converter provides a power supply solution for products powered by two-cell alkaline, NiCd, NiMH, one-cell Li-ion, or Li-polymer batteries. Output currents can go as high as 500mA while using two alkaline, with discharge going down to 1.8V. The BU33UV7NUX includes a reset circuit. (Reset-Detect Voltage: 1.5V, Reset-Release Voltage: 1.9V) The output voltage is fixed by an internal resistor divider. When the VIN voltage is higher than 3.3V, Vout matches Vin.

Applications

Single-/Two-Cell Alkaline, NiCd/NiMH or Single-Cell Li Battery-Powered Products

IC Recorders

Wireless Mice

Portable Audio Players, PDAs

Cellular Phones

Personal Medical Products

Remote Control

Evaluation Board Operating Limits and Absolute Maximum Ratings

Parameter		Symbol	Limit			Unit	Conditions
			MIN	TYP	MAX		
Supply Voltage							
	BU33UV7NUX	V_{CC}	0.35	-	5.5	V	
Output Voltage / Current							
	BU33UV7NUX	V_{OUT}	-	3.3	-	V	
		I_{OUT}	-	-	0.1/0.5	A	Mode=L, Mode=H

Evaluation Board

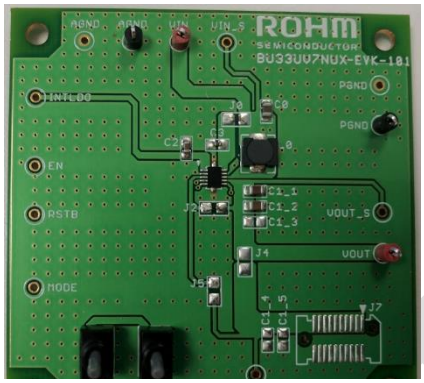


Fig 1: BU33UV7NUX Evaluation Board

Evaluation Board Schematic

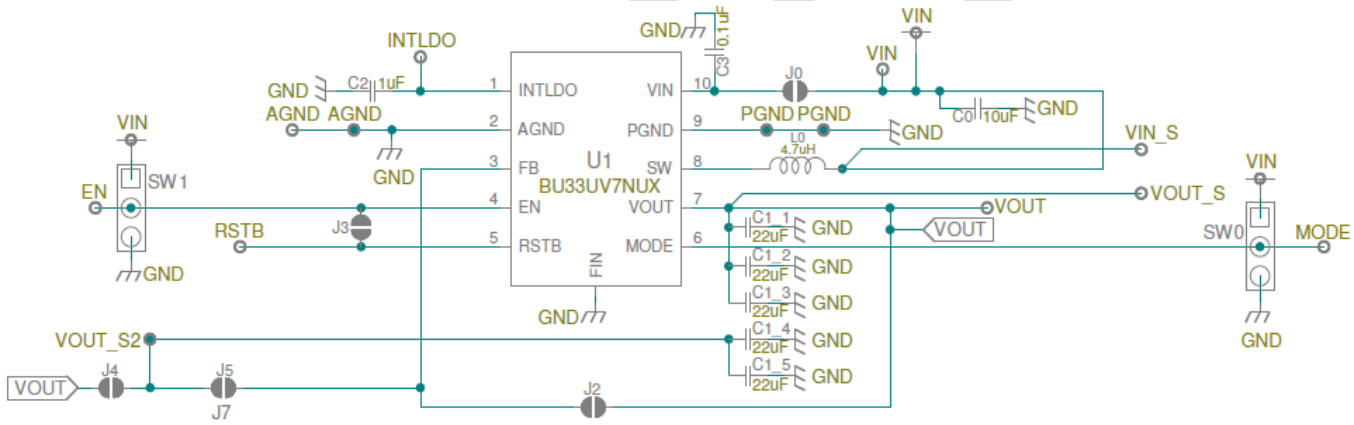
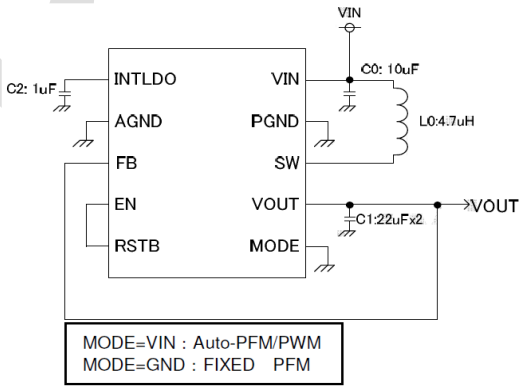


Fig 2: BU33UV7NUX Evaluation Board Schematic

Evaluation Board I/O

Below is a reference application circuit.



Evaluation Board Operating Procedure

1. Set the operating mode of the IC by the position of SW0. When the switch is moved to the bottom position (MODE -> VCC) the IC will be in PFM Only Mode and the output will be able to supply a maximum 100mA. When the switch is moved to the upper position (MODE -> GND) the IC will be in Auto PFM/PWM Mode and the output will supply a maximum of 500mA.
2. Disable the IC by setting SW1 to the upper position. When the switch is moved to the bottom position (EN -> VCC) the IC is enabled, while moving the switch to the upper position (EN -> GND) disables the IC.
3. Connect the power supply's GND terminal to the AGND test point on the evaluation board.
4. Connect the power supply's V_{CC} terminal to the V_{IN} test point on the evaluation board. This will provide V_{IN} to the IC. Please note that V_{CC} should be in range of 0.35V to 5.5V.
5. Connect the electronic load or voltmeter to P_{GND} and V_{OUT}. Do not connect when the load turned on.
6. Turn on the power supply and enable the IC by setting the position of SW1 to the lower position. The output voltage V_{OUT} (+3.3V) can be measured at the test point V_{OUT}. Now turn on the load. The load can be increased up to 0.1A/0.5A (max.) depending on the MODE setting used.

Reference Application Data

The following are graphs of the hot plugging test, quiescent current, efficiency, load response, output voltage ripple response.

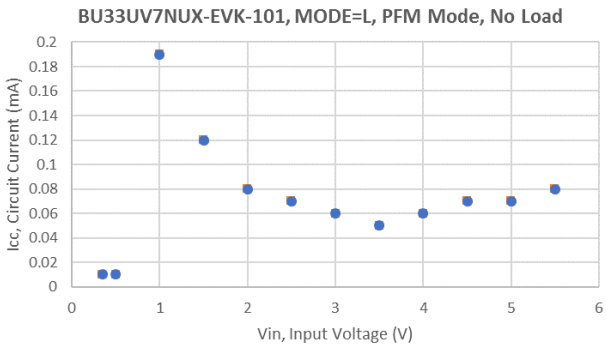


Fig 4: Circuit Current vs. Supply Voltage (Ta=25°C, MODE=L)

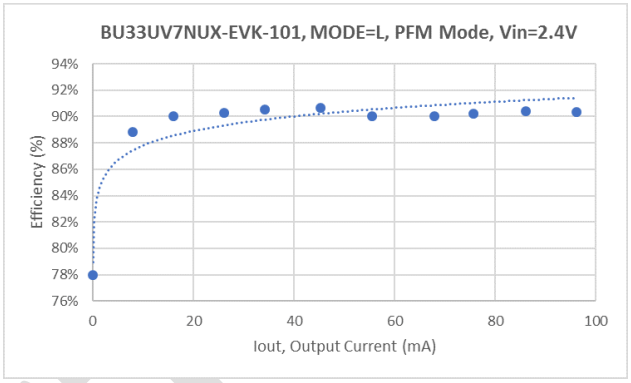


Fig 5: Electric Power Conversion Rate (Ta=25°C, MODE=L)

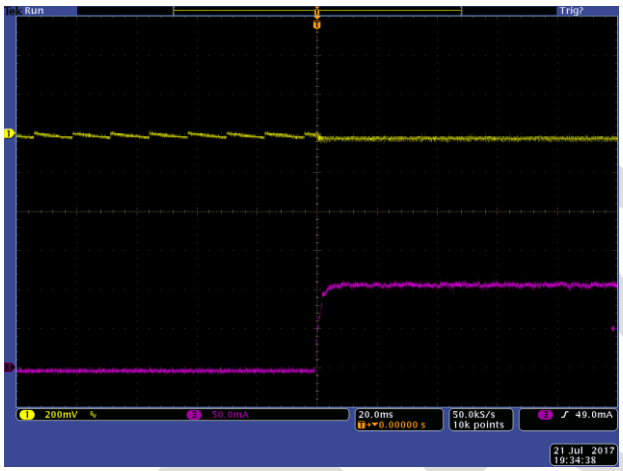


Fig 6: Load Response Characteristics
Yellow=VOUT, Purple=IOUT
(VIN=1.8V, VOUT=3.3V, IOUT=0 → 100mA, MODE=L)

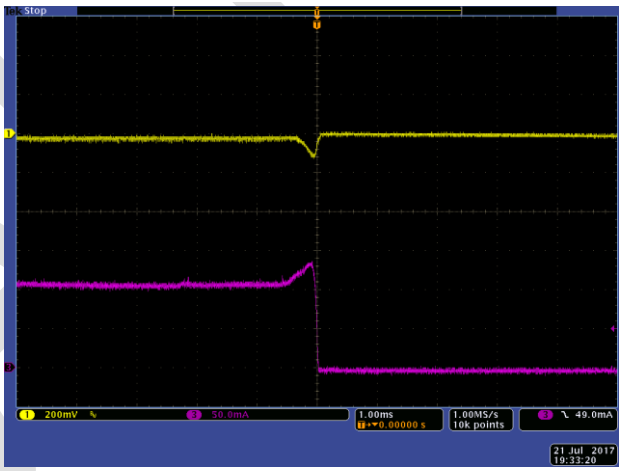


Fig 7: Load Response Characteristics
Yellow=VOUT, Purple=IOUT
(VIN=1.8V, VOUT=3.3V, IOUT=100mA → 0, MODE=L)

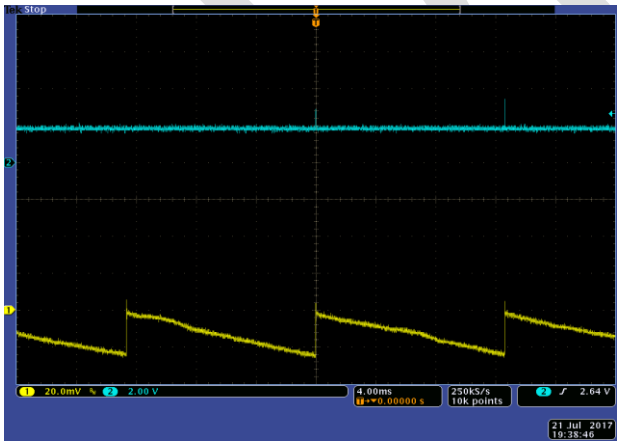


Fig 8: Output Voltage Ripple Response Characteristics
Yellow=VOUT, Blue=SW Node
(VIN=1.8V, VOUT=3.3V, IOUT=0, MODE=L)

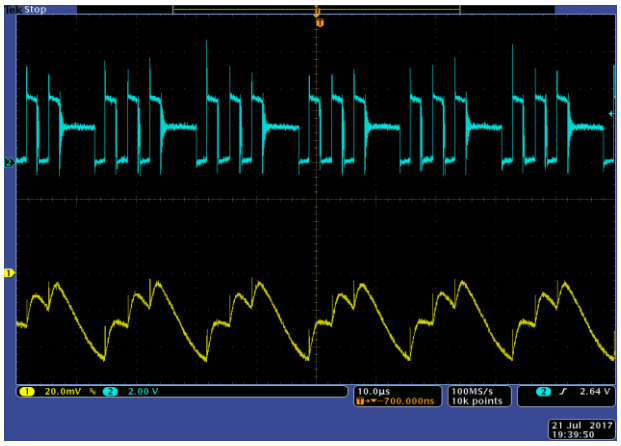


Fig 9: Output Voltage Ripple Response Characteristics
Yellow=VOUT, Blue=SW Node
(VIN=1.8V, VOUT=3.3V, IOUT=100mA, MODE=L)

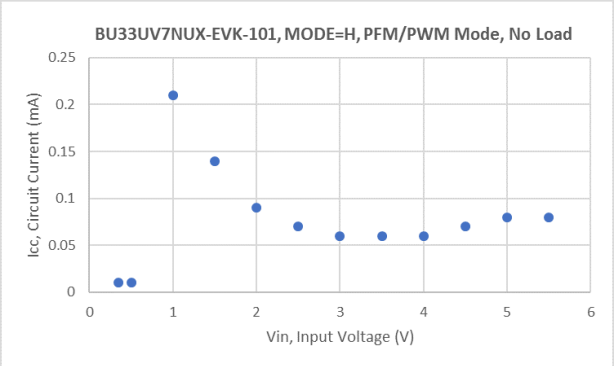


Fig 10: Circuit Current vs. Supply Voltage (Ta=25°C, MODE=H)

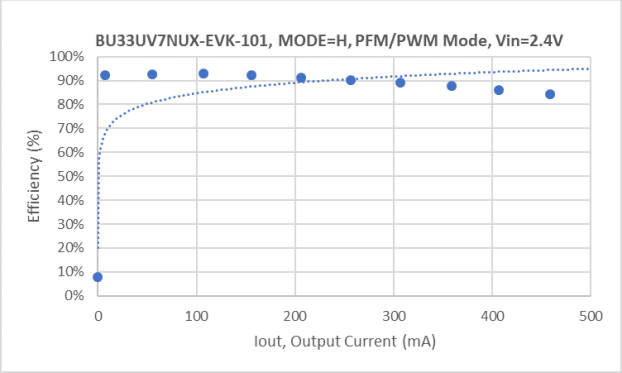


Fig 11: Electric Power Conversion Rate (Ta=25°C, MODE=H)

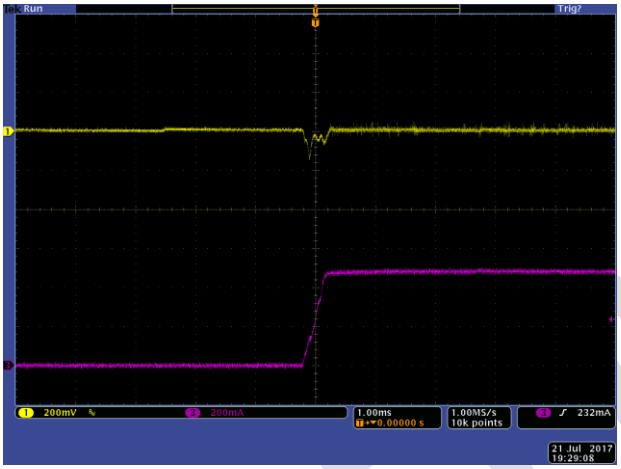


Fig 12: Load Response Characteristics
Yellow=VOUT, Purple=IOUT
(VIN=1.8V, VOUT=3.3V, IOUT=0 → 500mA, MODE=H)

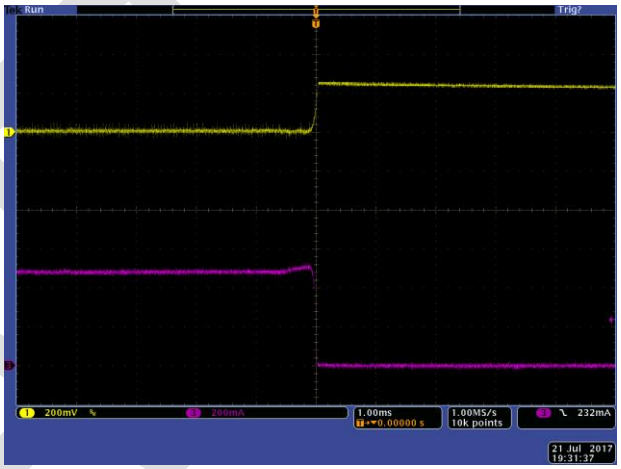


Fig 13: Load Response Characteristics
Yellow=VOUT, Purple=IOUT
(VIN=1.8V, VOUT=3.3V, IOUT=500mA → 0, MODE=H)

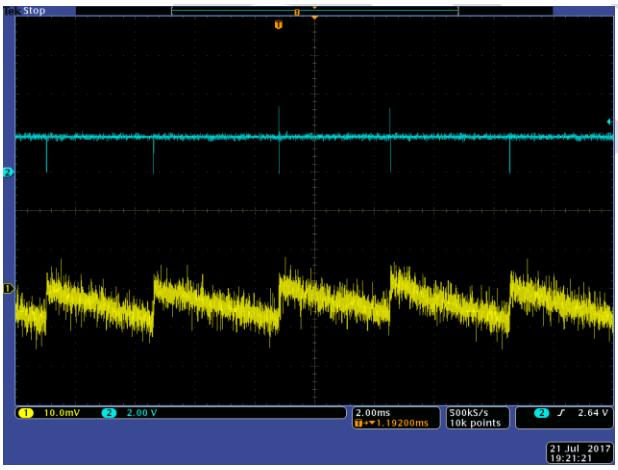


Fig 14: Output Voltage Ripple Response Characteristics
Yellow=VOUT, Blue=SW Node
(VIN=1.8V, VOUT=3.3V, IOUT=0, MODE=H)

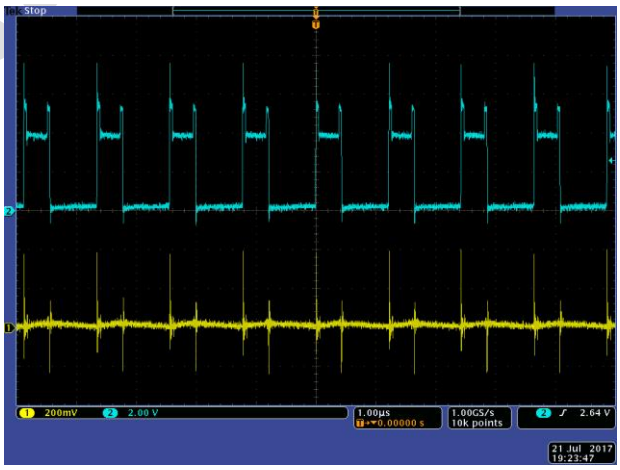


Fig 15: Output Voltage Ripple Response Characteristics
Yellow=VOUT, Blue=SW Node
(VIN=1.8V, VOUT=3.3V, IOUT=500mA, MODE=H)

Evaluation Board BOM

Below is a table showing the Bill of Materials. Part numbers and suppliers are included.

No.	Qty.	Reference	Description	Manufacturer	Part Number
1	1	U1	Boost Converter	ROHM	BU33UV7NUX
2	1	C2	1uF, 16V, X5R, 0603	TDK	C1608X5R1C105K
3	1	C3	0.1uF, 16V, X5R, 0402	TAIYO YUDEN	EMK105BJ104KV-F
4	1	C0	10uF, 16V, X5R, 0805	TAIYO YUDEN	EMK212ABJ106KD-T
5	2	C1_1, C1_2	22uF, 25V, X5R, 0805	Murata	GRM21BR61E226ME44L
6	3	C1_3, C1_4, C1_5	22uF, 25V, X5R, 0805	Murata	GRM21BR61E226ME44L
7	1	L0	4.7uH, 2.43A, 5mm*4mm*1.5mm	TDK	VLF504015MT-4R7M
8	2	J0, J2	N/A	N/A	Short
9	3	J3, J4, J5	N/A	N/A	Open
10	1	J7	N/A	N/A	Open
11	2	SW0, SW1	Switch	NKK	G13AP
12	13	INTLDO, AGND, EN, RSTB, MODE, VOUT, VOUT_S, VOUT_S2, PGND, VIN, VIN_S	TP	N/A	TP