RTKA211605DR0000BU

The RTKA211605DR0000BU board is designed to demonstrate and quickly evaluate the RAA211605, a DC/DC step-down regulator with 450kHz switching frequency.

The RAA211605 supports a wide input voltage range (from 4.5V to 60V) and adjustable output voltage. It can deliver up to 0.5A continuous output current with premium load regulation and line regulation performance.

Features

- Simple and flexible design
- 4.5V to 60V V_{IN} range
- Convenient power conversion

Specifications

The following are the design specifications for the RTKA211605DR0000BU:

- Input voltage (V_{IN}): 4.5V to 60V
- Output voltage (V_{OUT}): 3.3V
- Max. output current: 0.5A

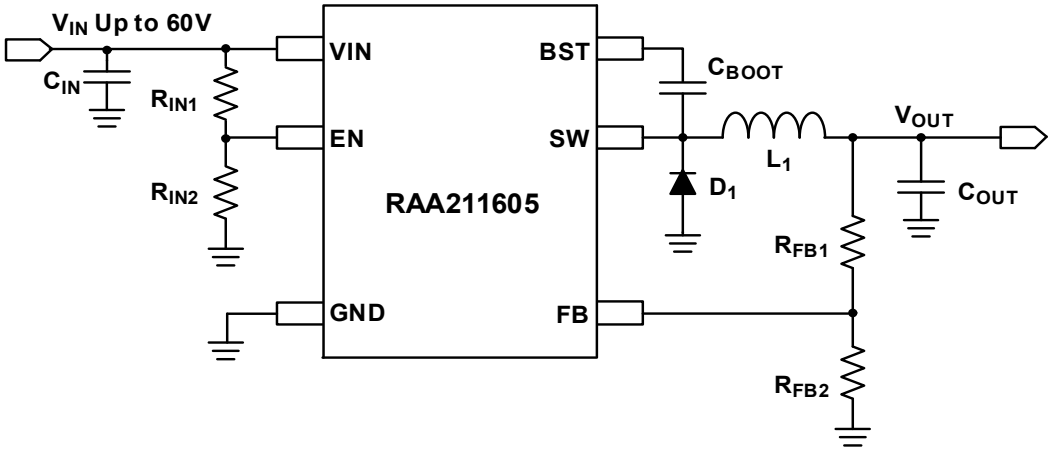

Figure 1. Block Diagram

Contents

1. Functional Description

The RAA211605 is an easy-to-use Buck switching regulator with an integrated 600mΩ high-side MOSFET. The RTKA211605DR0000BU board demonstrates the operations of RAA211605. It allows you to evaluate the performance of the part with different application circuits. It also provides you a reference for board layout.

The schematic is shown in Figure 4 and the PCB layers for reference are show in Figure 6 and Figure 7. Figure 8 through Figure 15 show the performance data and waveforms take from the evaluation board.

1.1 Operating Range

The board input voltage range is from 4.5V to 60V. The output voltage is set to 3.3V by default and can be changed by R_4 and R_5, as shown in Equation 1:

(EQ. 1) $$R_4 = R_5 \bullet \frac{V_{out} - 0.8}{0.8}$$

For applications where the V_{IN} - V_{OUT} is larger than 3V, Renesas recommends using a 20kΩ resistor for R_5 and choose R_4 based on Equation 1. For applications where V_{IN} - V_{OUT} is less than 3V, Renesas recommends using smaller R_4 and R_5 such that there is larger than 50mA load at V_{OUT}.

1.2 Quick Test Setup

1. Populate a jumper on J1.
2. Connect the power supply to the input terminals VIN(T1) and GND(T2). Connect the load to the output terminals VOUT(T3) and GND(T4). Ensure the setup is correctly connected before applying any power or load to the board.
3. Turn on the power supply and the part should start operating.
4. Verify that the output voltage is 3.3V and phase node waveforms can be monitored at J2.

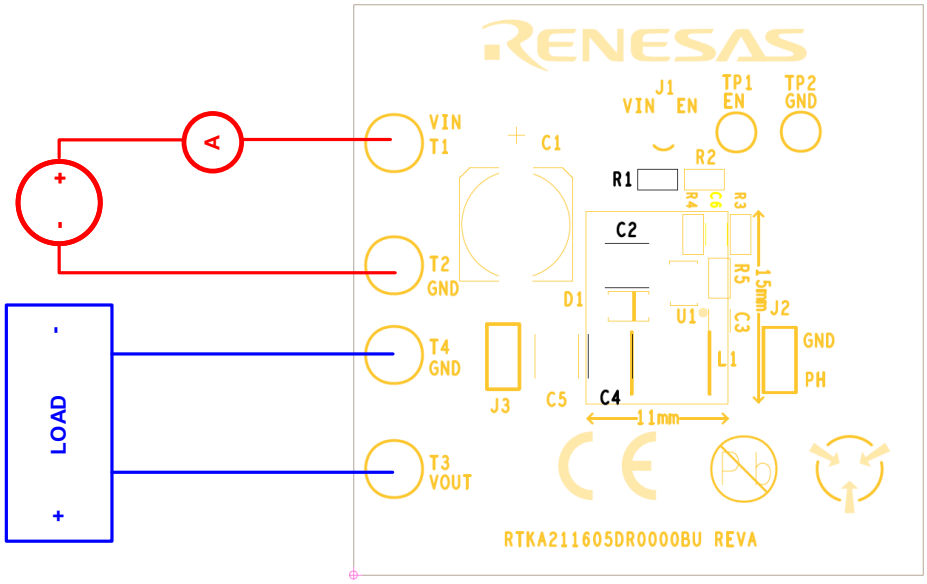

Figure 2. RTKA211605DR0000BU Board Setup

2. Board Design

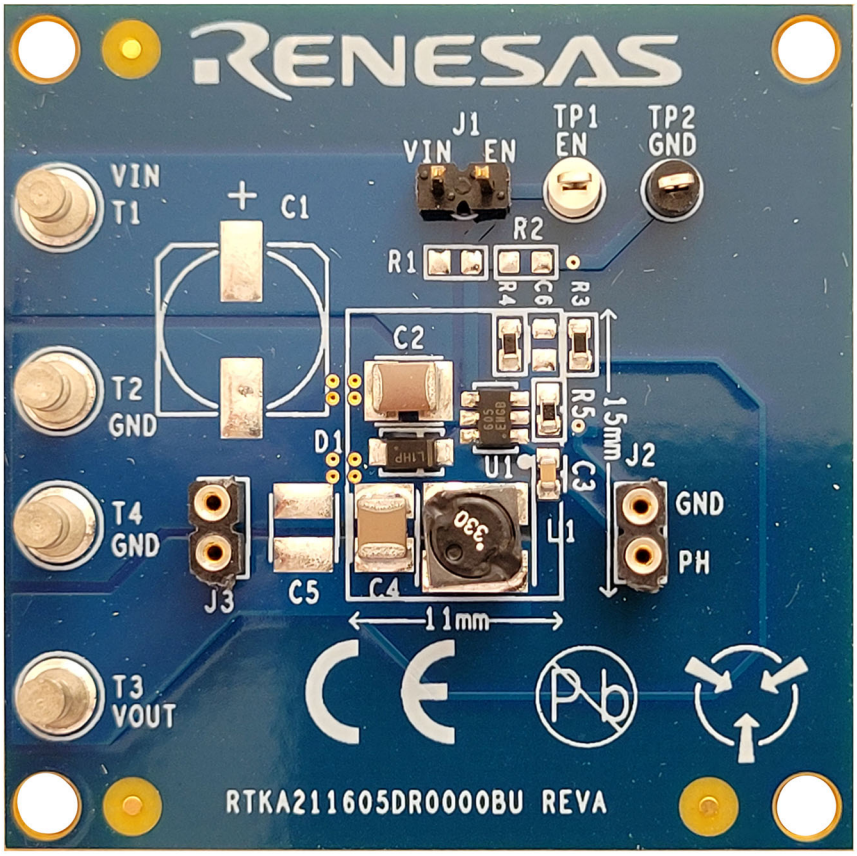

Figure 3. RTKA211605DR0000BU Top View

2.1 Circuit Schematic

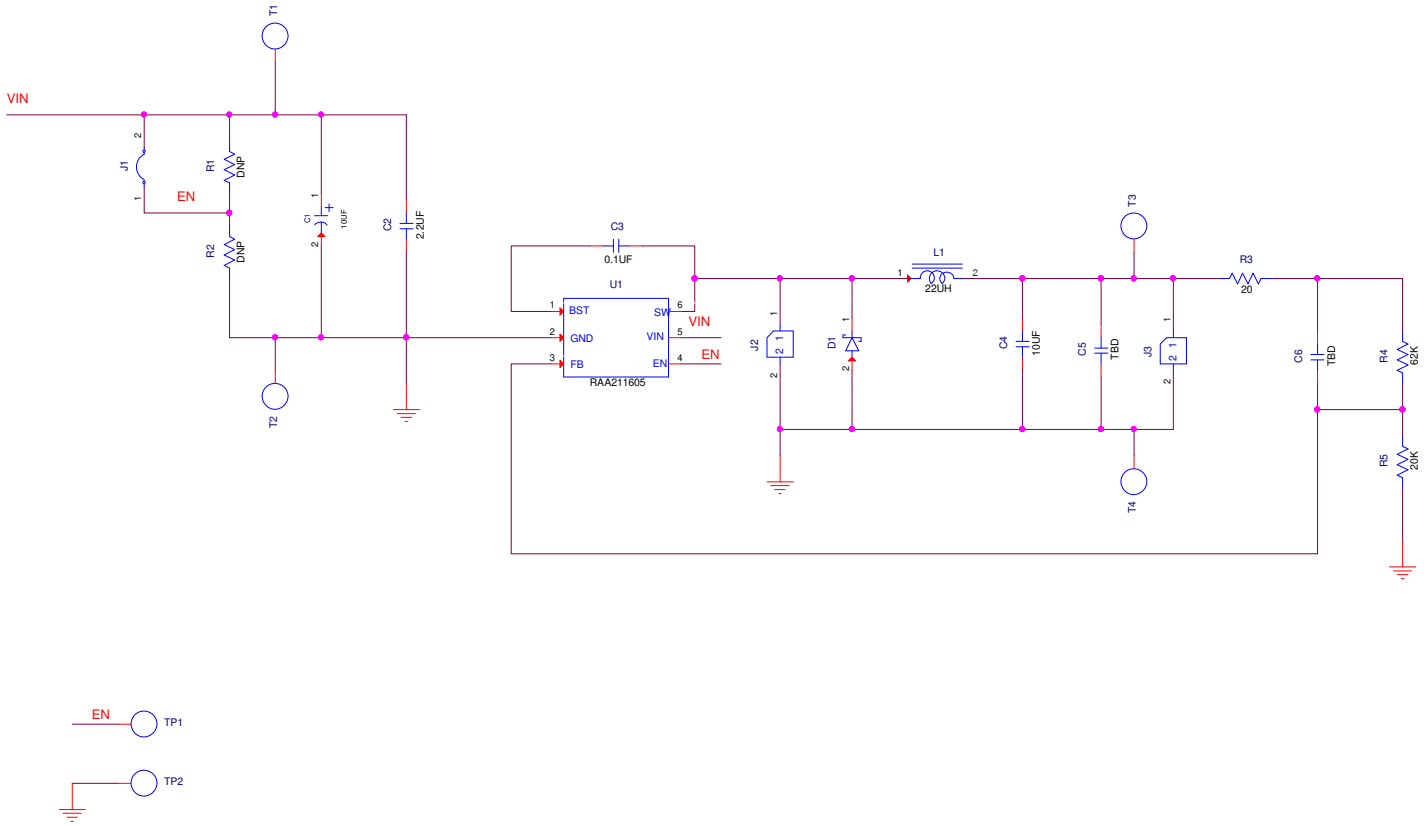

Figure 4. RTKA211605DR0000BU Schematic

2.2 Bill of Materials

Qty	Ref Des	Description	Manufacturer	Part Number
1	C4	CAP, SMD, 1210, 10µF, 16V, 10%, X7R, ROHS	Murata	GRM32DR71C106KA01L
1	C3	CAP, SMD, 0603, 0.1µF, 16V, 10%, X7R, ROHS	Murata	GCM188R71C104KA37D
1	C2	CAP, SMD, 1210, 2.2µF, 100V, 10%, X7R, ROHS	Murata	GRM32ER72A225KA35L
1	L1	COIL-PWR INDUCTOR, SM, 4.8mm, 33µH, 20%, 1.2A, ROHS	Wurth Electronics	74408943330
4	T1, T2, T3, T4	CONN-DBL TURRET, TH, 0.218x0.078 PCB MNT, TIN/BRASS, ROHS	Keystone	1502-1
2	J2, J3	CONN-BRD-BRD, 1x2, TH, SOCKET, 1x64 STRIP, 2.54mm, ST	Mill-max	310-93-164-41-001000
1	TP2	CONN-MINI TEST PT, VERTICAL, BLK, ROHS	Keystone	5001
1	TP1	CONN-MINI TEST POINT, VERTICAL, WHITE, ROHS	Keystone	5002
1	J1	CONN-HEADER, 1x2, RETENTIVE, 2.54mm, 0.230x 0.120, ROHS	BERG/FCI	69190-202HLF
1	D1	DIODE-RECTIFIER, SMD, 2P, S0D-123FL, 100V, 1A, ROHS	On Semiconductor	MBR1H100SFT3G
1	R3	RES, SMD, 0603, 20Ω,1/10W, 1%, ROHS	Various	Generic
1	R4	RES, SMD, 0603, 62kΩ,1/10W, 1%, ROHS	Various	Generic
1	R5	RES, SMD, 0603, 20kΩ, 1/10W, 1%, ROHS	Various	Generic
1	U1	IC-SWITCHING REGULATOR, 6P, TSOT-23, ROHS	Renesas	RAA2116054GP3
0	C1	CAP, SMD, 8.3x8.3, 10µF, 100V, 20%, ALUM.ELEC., ROHS	Panasonic	EEE-TG2A100P
0	C6, C5, R1, R2	DO NOT POPULATE	N/A	N/A

2.3 Board Layout

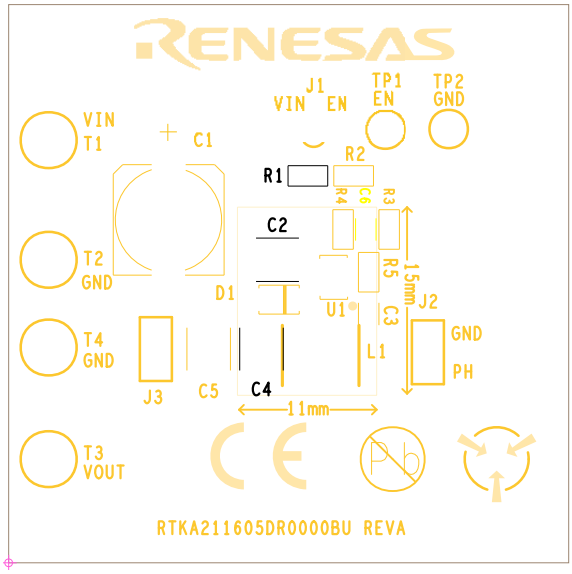

Figure 5. Silkscreen Top

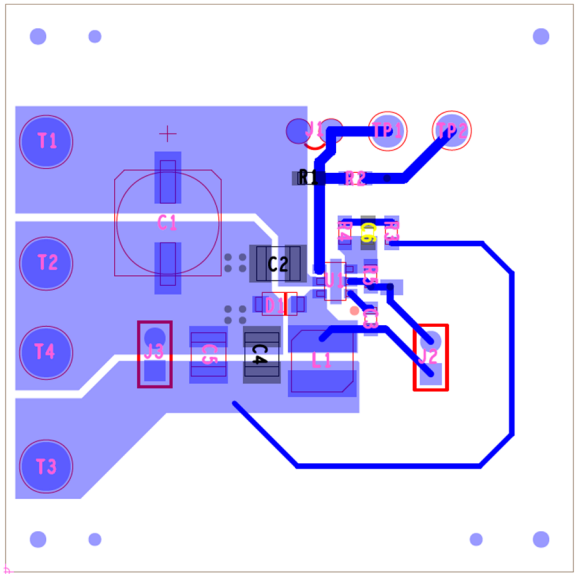

Figure 6. Top Layer

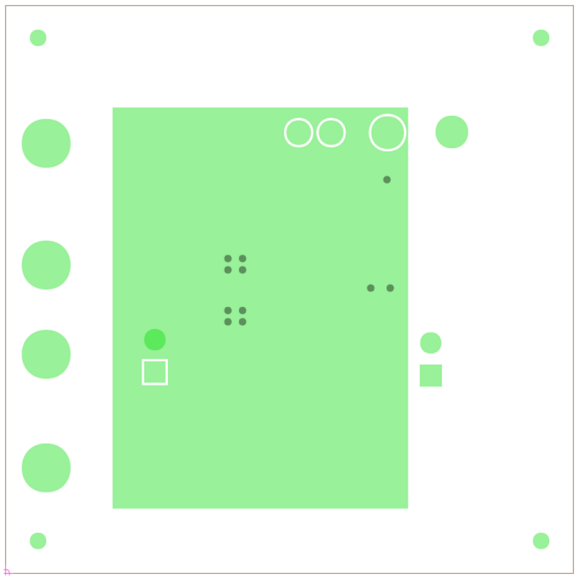

Figure 7. Bottom Layer

3. Typical Performance Curves

V_{IN} = 24V, V_{OUT} = 3.3V, T_A = +25°C, unless otherwise noted.

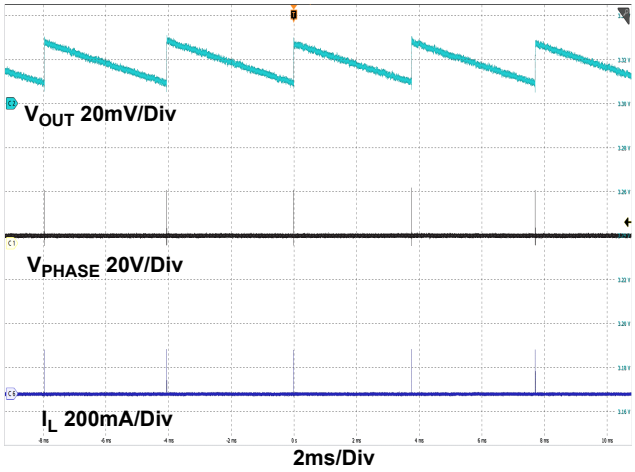

Figure 8. Output Ripple at No Load

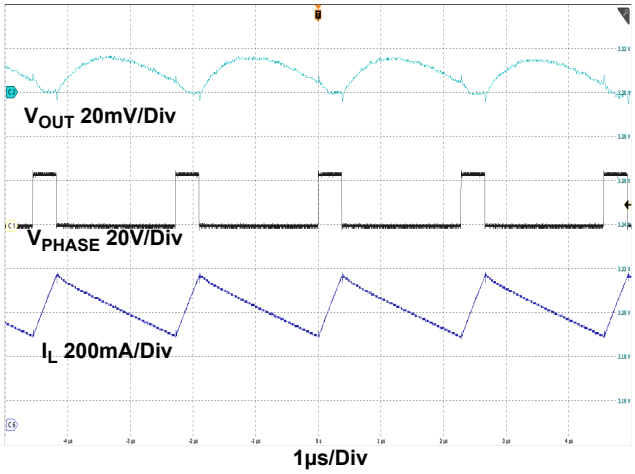

Figure 9. Output Ripple at Full Load

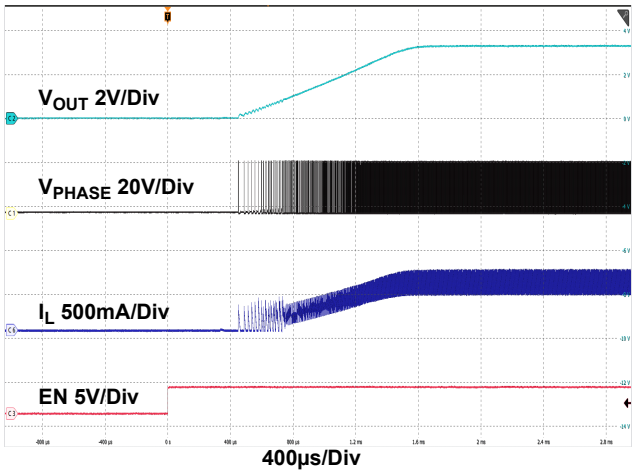

Figure 10. Enable On at Full Load

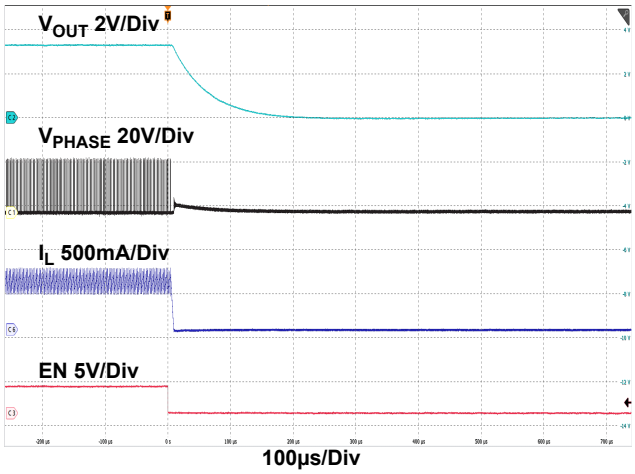

Figure 11. Enable Off at Full Load

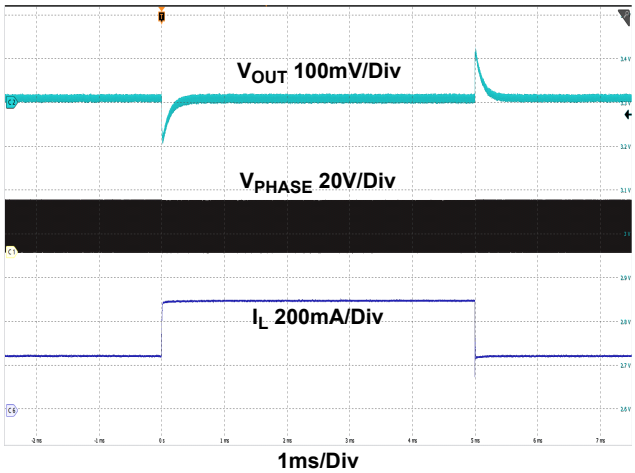

Figure 12. Load Transient between 0.25A and 0.5A

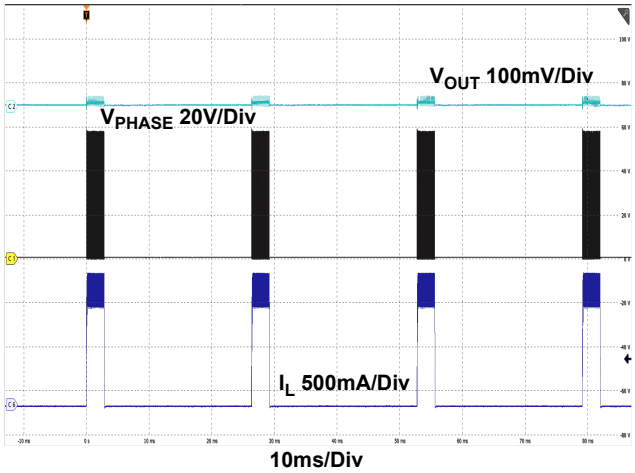

Figure 13. V_{OUT} UVP (V_{IN} = 60V)

V_{IN} = 24V, V_{OUT} = 3.3V, T_A = +25°C, unless otherwise noted. (Cont.)

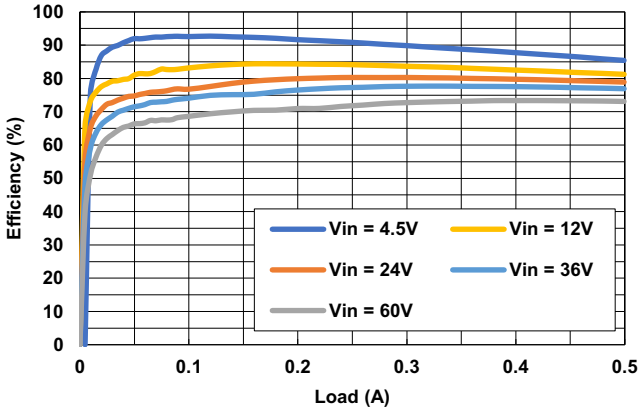

Figure 14. Efficiency vs Load

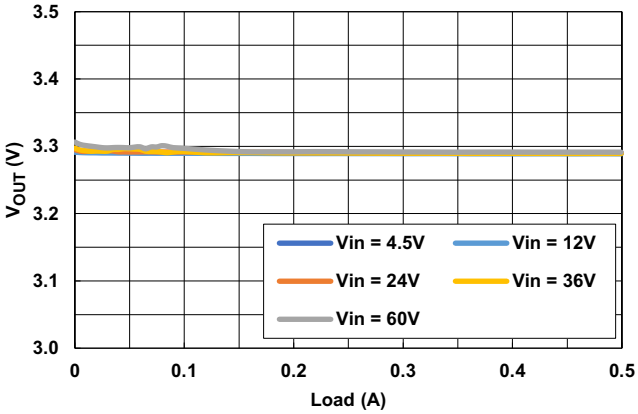

Figure 15. Load Regulation vs Input Voltage

4. Ordering Information

Part Number	Description
RTKA211605DR0000BU	RAA211605 Demonstration Board

5. Revision History

Revision	Date	Description
1.0	Jul 13, 2021	Initial release

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