

RTKA211820DE0000BU

The RTKA211820DE0000BU board demonstrates and quickly evaluates the [RAA211820](#) (QFN version), a DC/DC synchronous step-down regulator with programmable switching frequency.

The RAA211820 supports a wide input voltage range (from 4.5V to 75V) and adjustable output voltage. It delivers up to a continuous 2A output current with premium load regulation and line regulation performance.

Features

- Simple and flexible design
- 4.5V to 75V V_{IN} range
- Convenient power conversion

Specifications

The following are the design specifications for the RTKA211820DE0000BU:

- Input voltage (V_{IN}): 4.5V to 75V
- Output voltage (V_{OUT}): 3.3V
- Maximum output current: 2A

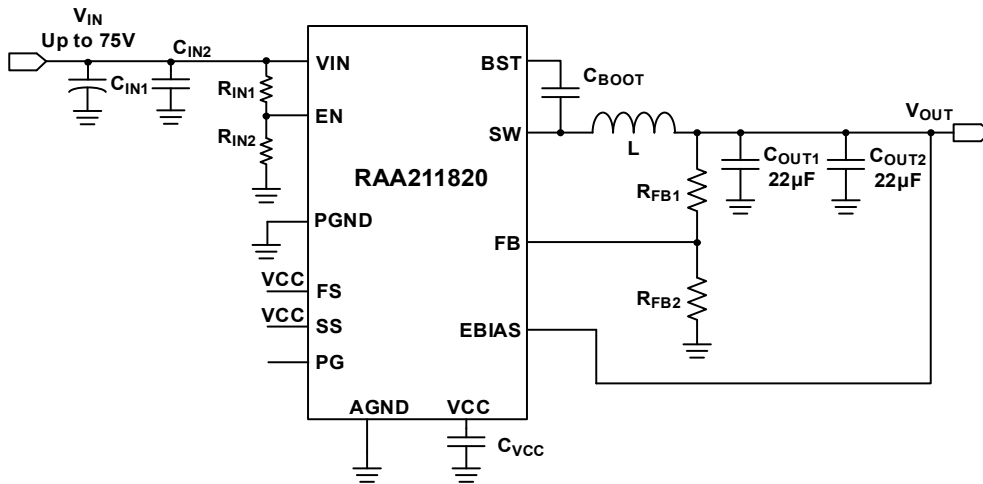


Figure 1. Block Diagram

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1. Functional Description

The RAA211820 (QFN version) is an easy-to-use synchronous Buck switching regulator with an integrated 215mΩ/115mΩ high-side/low-side MOSFETs. The RTKA211820DE0000BU board demonstrates the operations of RAA211820 (QFN version). The board allows you to evaluate the performance of the part with different application circuits, and it provides you with a reference for a board layout.

1.1 Operational Characteristics

The board input voltage range is from 4.5V to 75V. The output voltage is set to 3.3V by default and can be changed by R₉ and R₁₀, as shown in Equation 1:

$$(EQ. 1) \quad R_9 = R_{10} \cdot \frac{V_{OUT} - 0.8}{0.8}$$

Renesas recommends using a 20kΩ resistor for R₁₀ and choose R₉ based on Equation 1.

1.2 Setup and Configuration

1. Populate a jumper on JP1(VIN shorted to EN).
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). Make sure 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 J1.

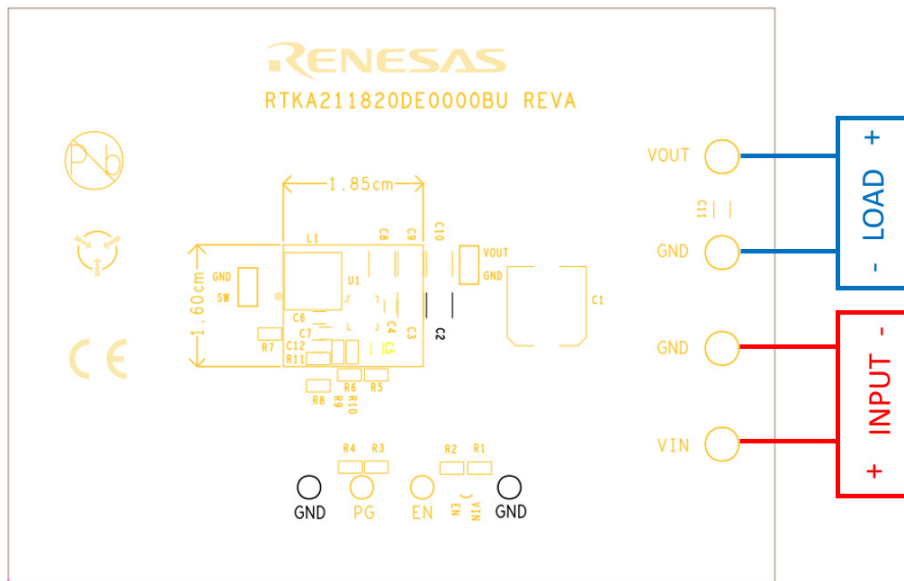


Figure 2. RTKA211820DE0000BU Board Setup

2. Board Design

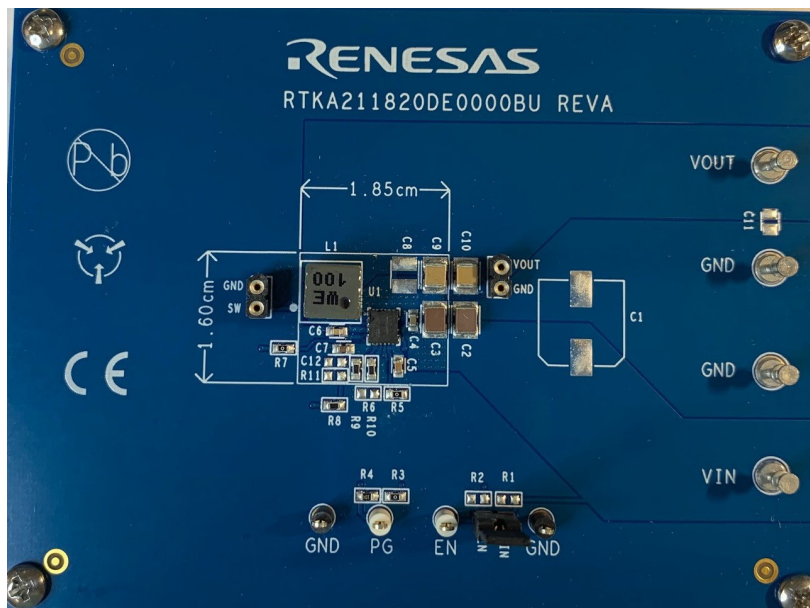


Figure 3. RTKA211820DE0000BU Evaluation Board (Top)

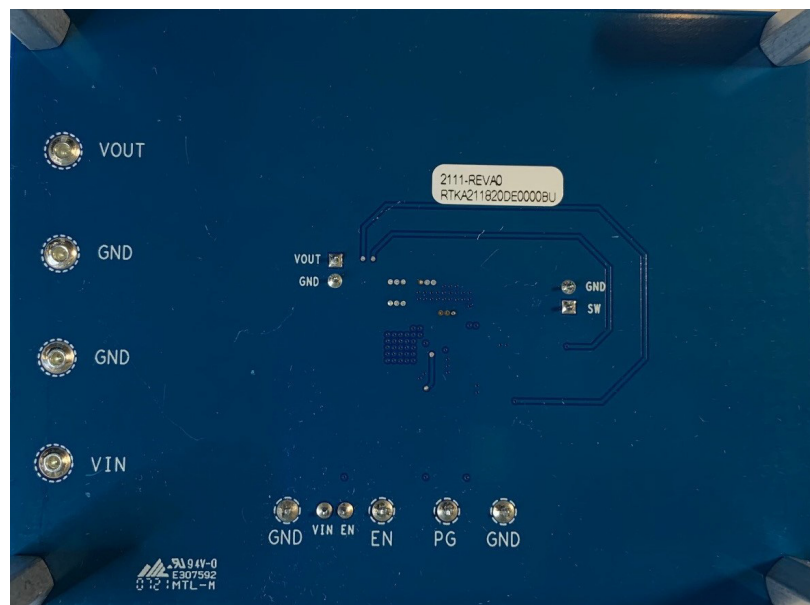


Figure 4. RTKA211820DE0000BU Evaluation Board (Bottom)

2.1 Layout Guidelines

For detailed layout guidelines, reference the Layout Guidelines section in the *RAA211820 Datasheet*.

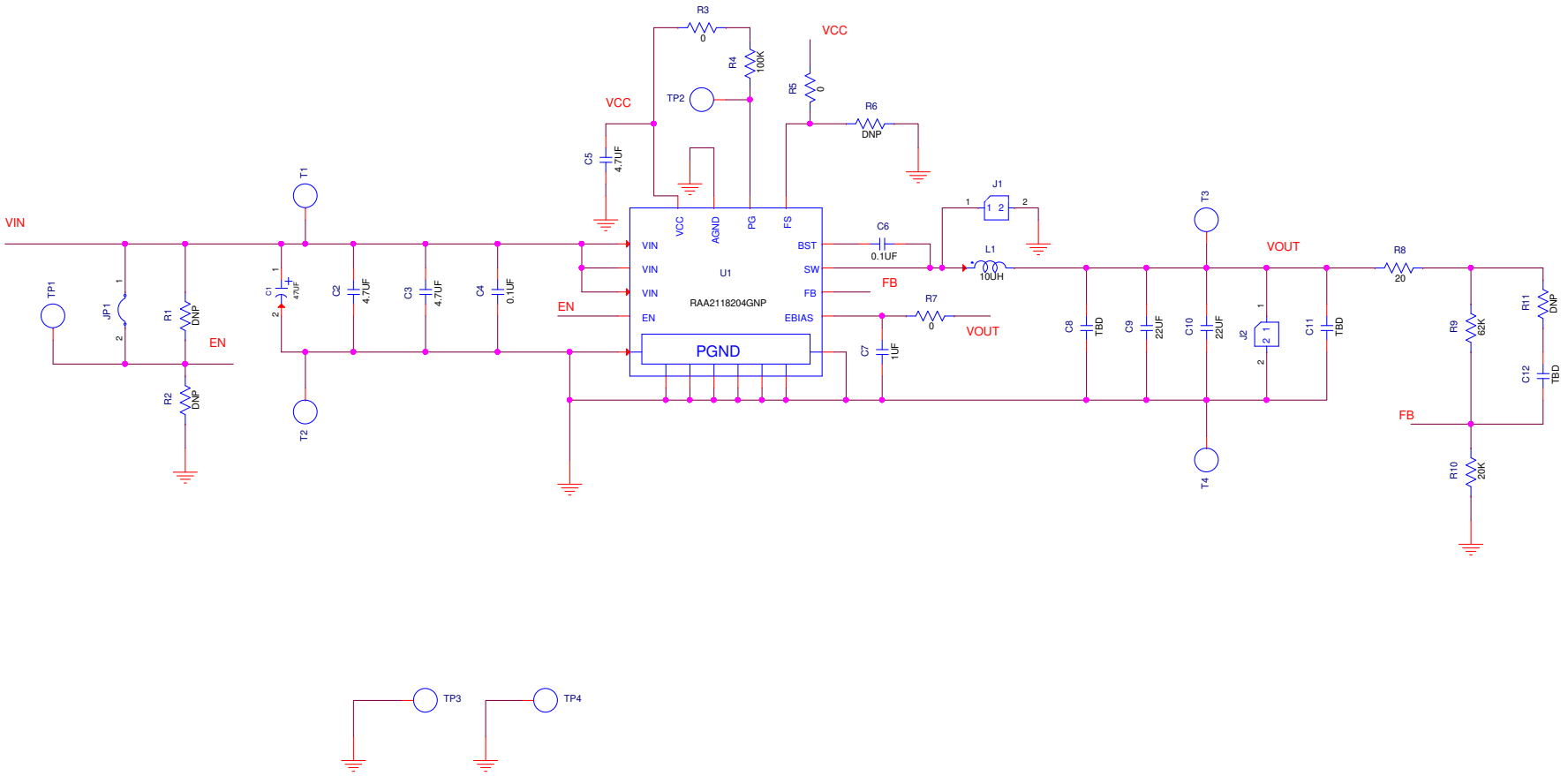


Figure 5. RTKA211820DE0000BU Schematic

2.2 Schematic Diagram

2.3 Bill of Materials

| Qty | Reference Designator | Description | Manufacturer | Manufacturer Part Number |
|-----|-------------------------------|--|-------------------|--------------------------|
| 2 | C9, C10 | CAP, SMD, 1210, 22 μ F, 16V, 10%, X7R, RoHS | Murata | GRM32ER71C226KE18L |
| 1 | C7 | CAP, SMD, 0603, 1.0 μ F, 16V, 10%, X7R, RoHS | TDK | C1608X7R1C105K |
| 1 | C6 | CAP, SMD, 0603, 0.1 μ F, 16V, 10%, X7R, RoHS | Murata | GCM188R71C104KA37D |
| 1 | C5 | CAP, SMD, 0603, 4.7 μ F, 10V, 10%, X7S, RoHS | Murata | GRM188C71A475KE11D |
| 1 | C4 | CAP, SMD, 0603, 0.1 μ F, 100V, 10%, X7R, RoHS | Murata | GRM188R72A104KA35J |
| 2 | C2, C3 | CAP-AEC-Q200, SMD, 1210, 4.7 μ F, 100V, 10%, X7R, RoHS | TDK | CNA6P1X7R2A475K250AE |
| 1 | L1 | COIL-PWR INDUCTOR, SMD, 6.6 \times 6.4mm, 10 μ H, 20%, 7.6A, RoHS | Würth Electronics | 74439346100 |
| 4 | T1, T2, T3, T4 | CONN-DBL TURRET, TH, 0.218 \times 0.078 PCB MNT, TIN/BRASS, RoHS | Keystone | 1502-1 |
| 2 | J1, J2 | CONN-BRD-BRD, 1 \times 2, TH, SOCKET, 1 \times 64 STRIP, 2.54mm, ST | Mill-Max | 310-43-164-41-001000 |
| 2 | TP3, TP4 | CONN-MINI TEST PT, VERTICAL, BLK, RoHS | Keystone | 5001 |
| 2 | TP1, TP2 | CONN-MINI TEST POINT, VERTICAL, WHITE, RoHS | Keystone | 5002 |
| 1 | JP1 | CONN-HEADER, 1 \times 2, RETENTIVE, 2.54mm, 0.230 \times 0.120, RoHS | BERG/FCI | 69190-202HLF |
| 1 | R10 | RES, SMD, 0603, 20k Ω , 1/10W, 1%, TF, RoHS | Various | Various |
| 1 | R9 | RES-AEC-Q200, SMD, 0603, 62K, 1/10W, 1%, RoHS | Panasonic | ERJ-3EKF6202V |
| 1 | R8 | RES-AEC-Q200, SMD, 0603, 20 Ω , 1/10W, 1%, TF, RoHS | Panasonic | ERJ-3EKF20R0V |
| 3 | R3, R5, R7 | RES, SMD, 0603, 0 Ω , 1/10W, TF, RoHS | Various | Various |
| 1 | R4 | RES, SMD, 0603, 100k Ω , 1/10W, 1%, TF, RoHS | Various | Various |
| 1 | U1 | IC-80V 2A PWM SWITCHING REGULATOR, 16P, QFN, RoHS | Renesas | RAA211820GNP#HA0 |
| 0 | C1 | CAP, SMD, 12 \times 10, 47 μ F, 100V, 20%, ALUM.ELEC., RoHS | Vishay | MAL214699904E3 |
| 0 | C8, C11, C12, R1, R2, R6, R11 | Do Not Populate | N/A | N/A |

2.4 Board Layout

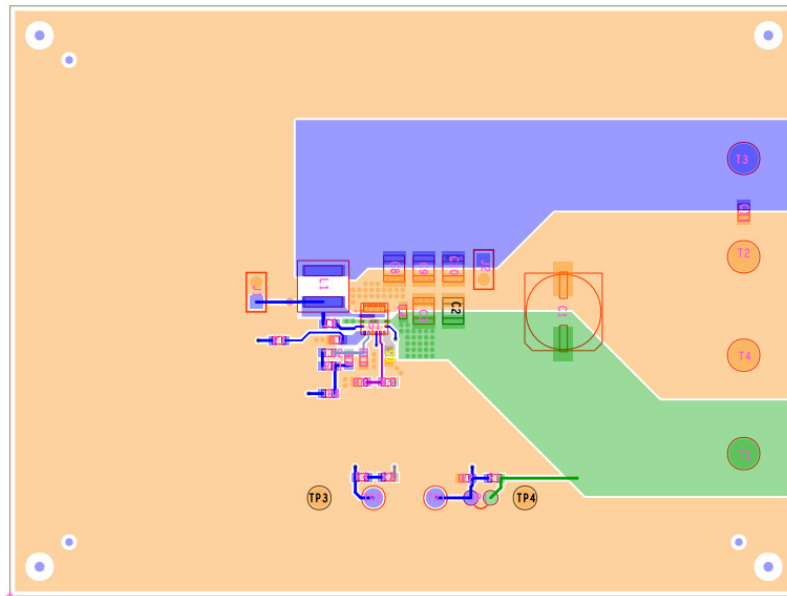


Figure 6. Top Layer

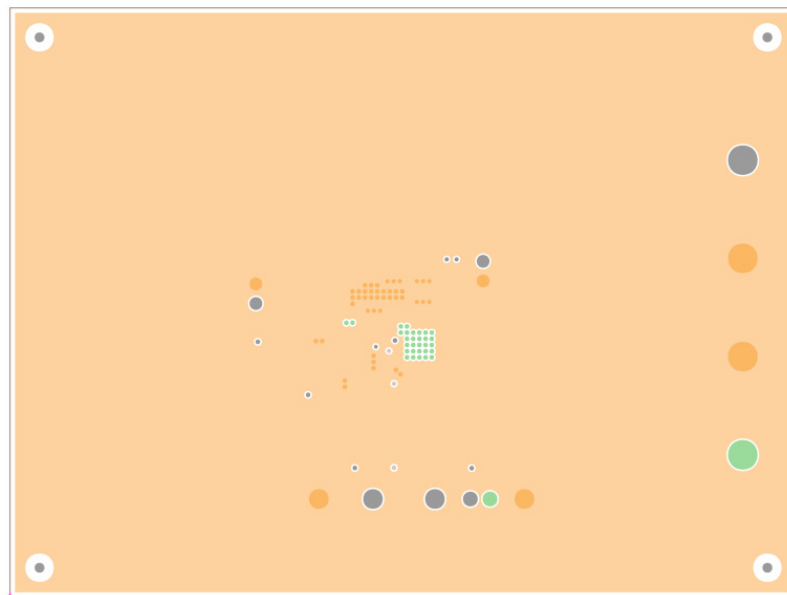


Figure 7. Second Layer

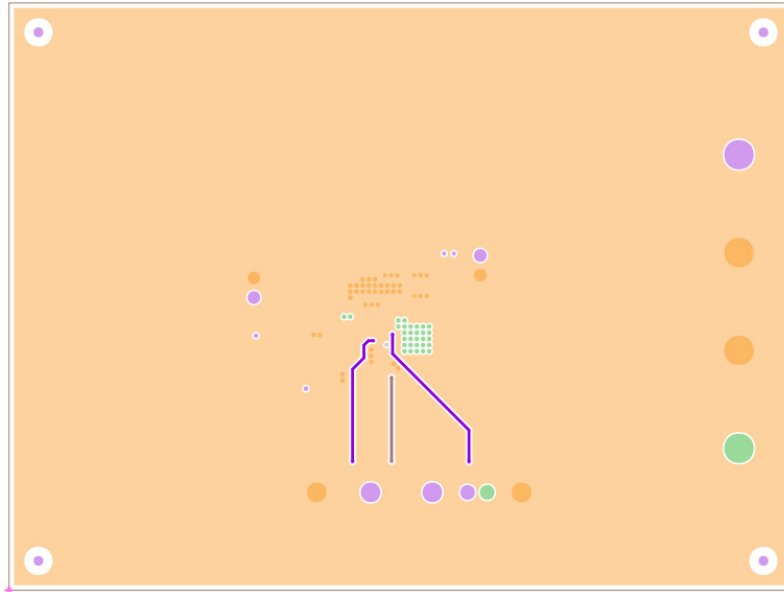


Figure 8. Third Layer

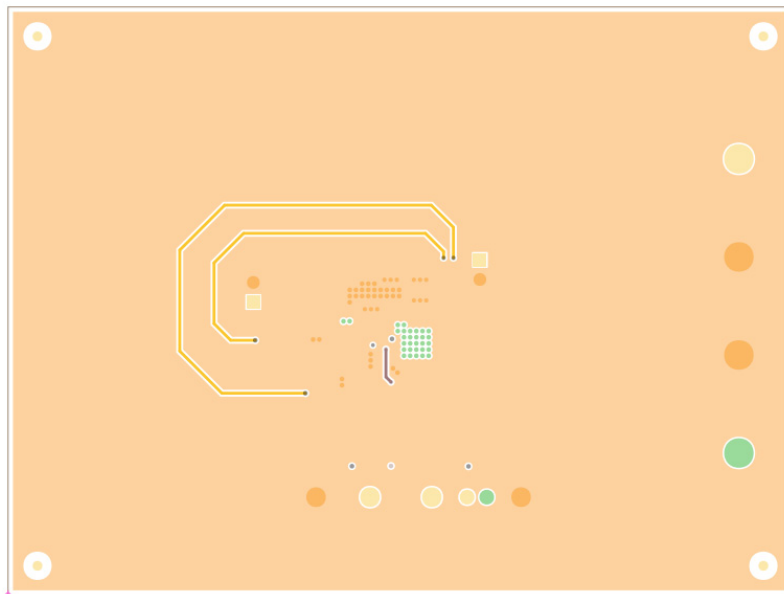


Figure 9. Bottom Layer

3. Typical Performance Graphs

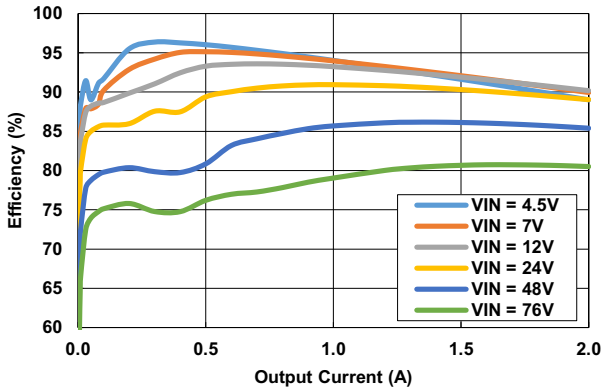


Figure 10. Efficiency vs Load

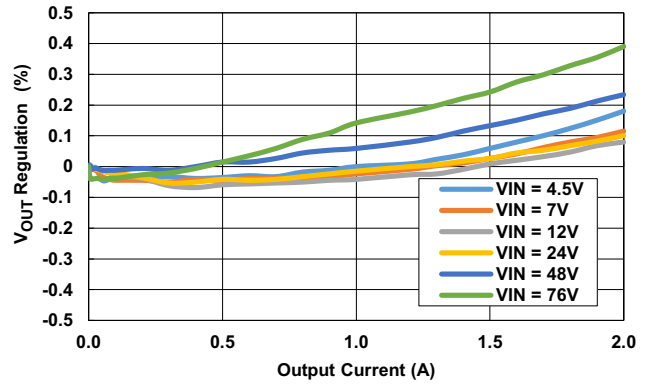


Figure 11. Load Regulation

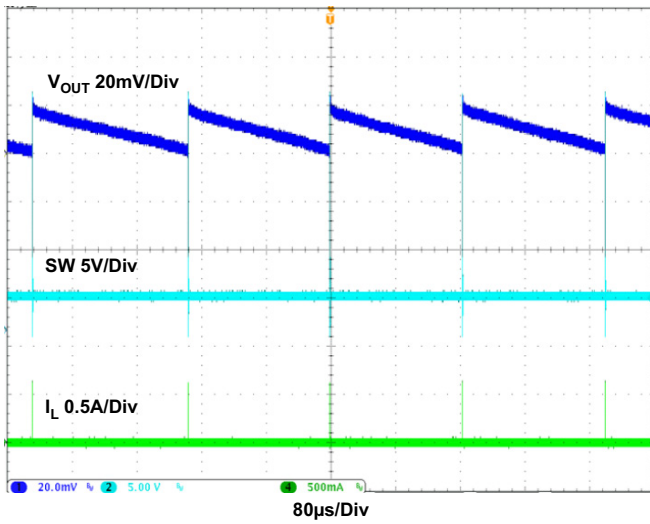


Figure 12. Output Ripple at No Load

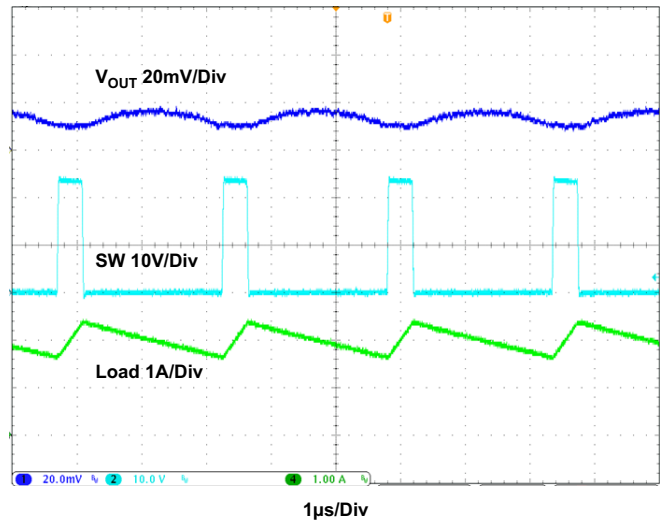


Figure 13. Output Ripple at 2A Load

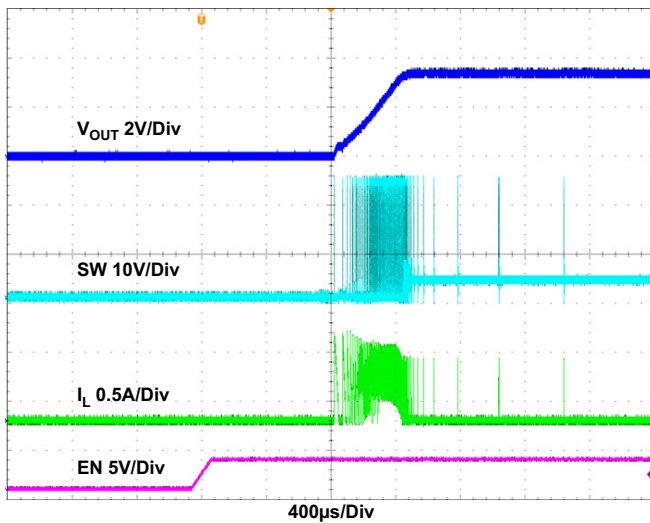


Figure 14. Startup by EN with No Load

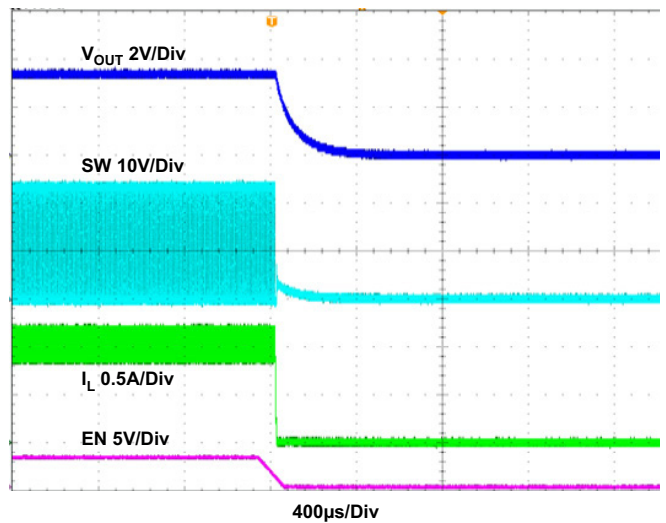


Figure 15. Shutdown by EN with 2A Load

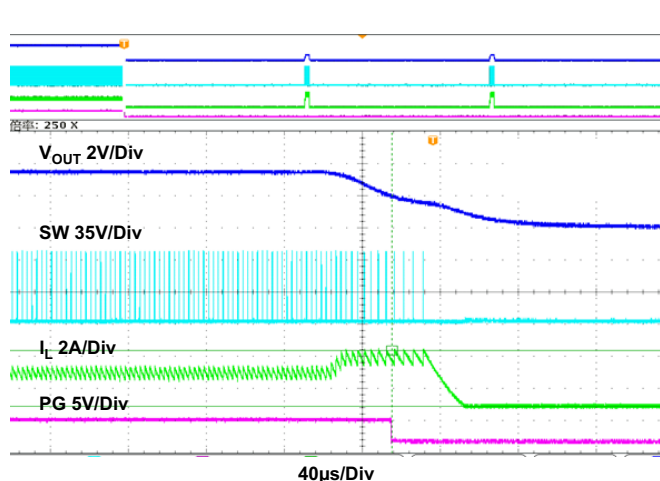


Figure 16. Overcurrent Protection

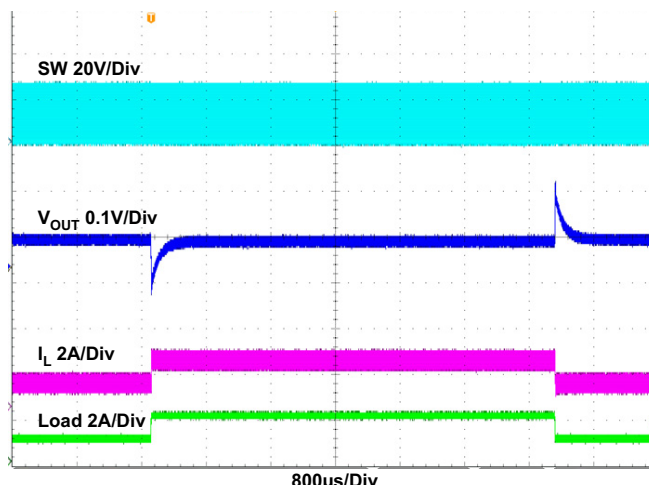


Figure 17. Load Transient 1A to 2A to 1A

4. Ordering Information

| Part Number | Description |
|--------------------|--|
| RTKA211820DE0000BU | RAA211820 (QFN version) evaluation board |

5. Revision History

| Revision | Date | Description |
|----------|-------------|-----------------|
| 1.00 | Jul 1, 2022 | Initial release |

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