

## RTKA211835DE0000BU

The RTKA211835DE0000BU board demonstrates and quickly evaluates the [RAA211835](#) (QFN version), a DC/DC asynchronous step-down regulator with programmable switching frequency.

The RAA211835 supports a wide input voltage range (from 4.5V to 75V) and adjustable output voltage. It can deliver up to continuous 3A output current with premium load regulation and line regulation performance.

### Specifications

The design specifications of the RTKA211835DE0000BU are shown below:

- Input voltage ( $V_{IN}$ ): 4.5V to 75V
- Output voltage ( $V_{OUT}$ ): 3.3V
- Maximum output current: 3A

### Features

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

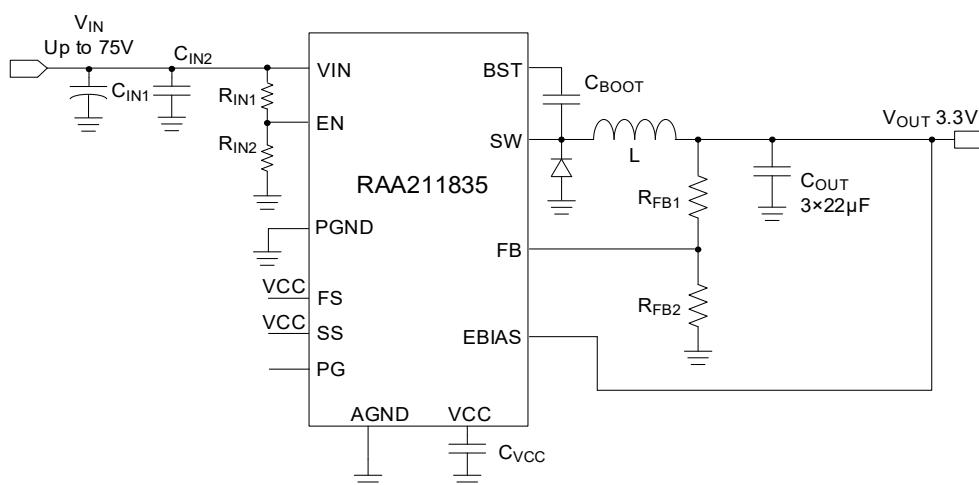


Figure 1. RAA211835 Typical Application

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# 1. Functional Description

The RAA211835 (QFN version) is an easy-to-use asynchronous Buck switching regulator with an integrated 155mΩ high-side MOSFETs. The RTKA211835DE0000BU board demonstrates the operations of RAA211835 (QFN version). It allows the user to evaluate the performance of the device with different application circuits and provides the user 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  $R_9$  and  $R_{10}$ , as shown in [Equation 1](#):

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

Renesas recommends to use a 20kΩ resistor for  $R_{10}$  and choose  $R_9$  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.

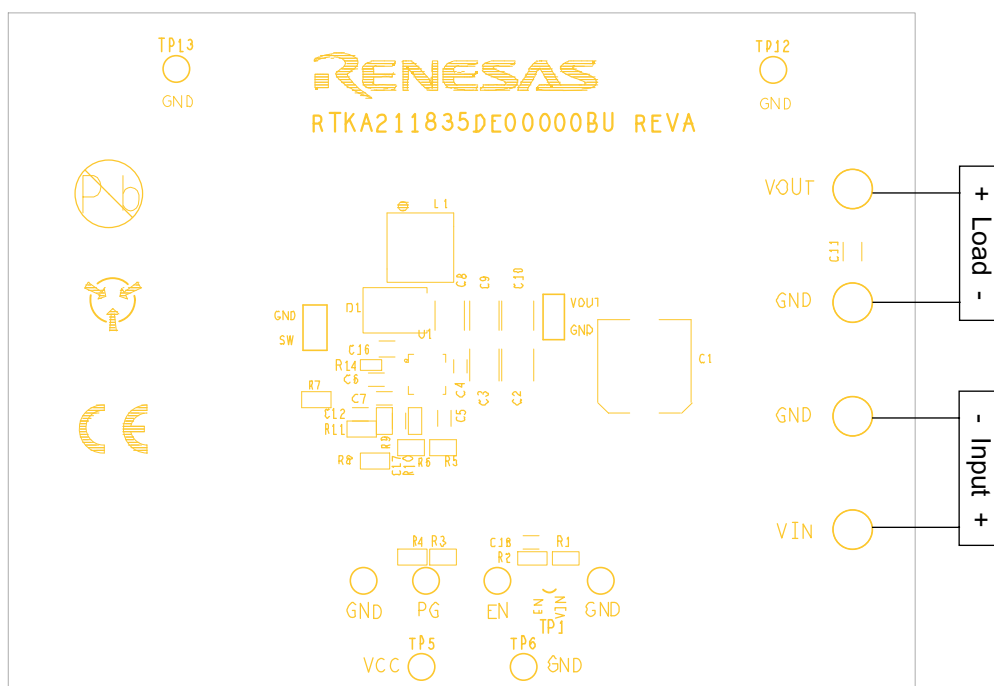


Figure 2. RTKA211835DE0000BU Board Setup

## 2. Board Design

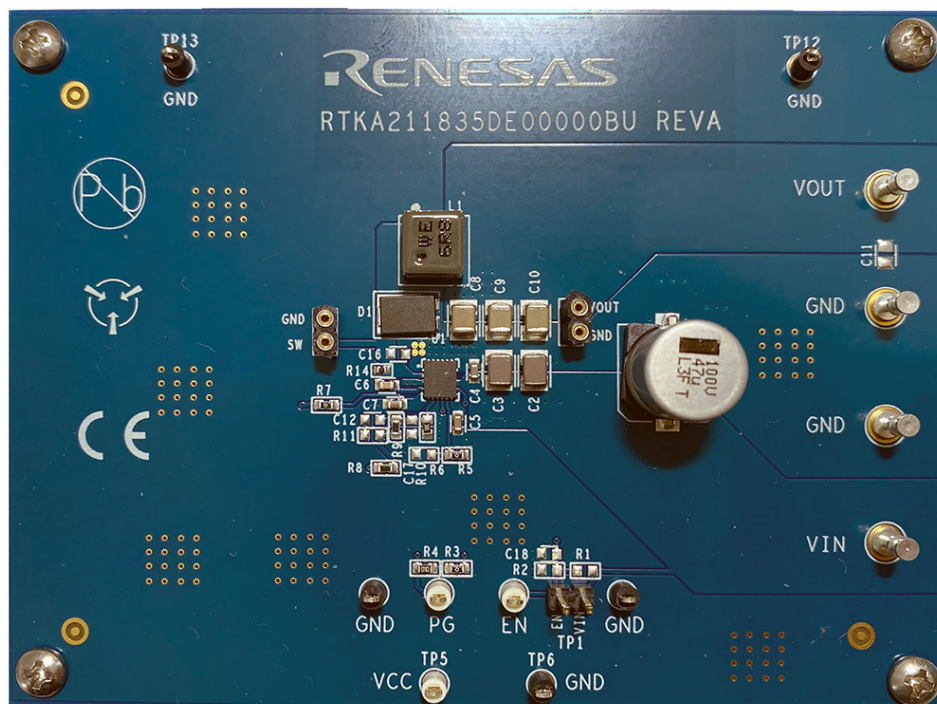


Figure 3. RTKA211835DE0000BU Evaluation Board (Top)

### 2.1 Layout Guidelines

For detailed layout guidelines reference the Layout Guidelines section in the *RAA211835 Datasheet*.

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## 2.3 Bill of Materials

| Qty | Reference Designator                                    | Description                                                                  | Manufacturer      | Manufacturer Part Number |
|-----|---------------------------------------------------------|------------------------------------------------------------------------------|-------------------|--------------------------|
| 3   | C8, C9, C10                                             | CAP, SMD, 1210, 22 $\mu$ F, 16V, 10%, X7R, ROHS                              | Murata            | GRM32ER71C226KE18L       |
| 1   | C7                                                      | CAP, SMD, 0603, 1.0 $\mu$ F, 16V, 10%, X7R, ROHS                             | TDK               | C1608X7R1C105K           |
| 1   | C6                                                      | CAP, SMD, 0603, 0.1 $\mu$ F, 16V, 10%, X7R, ROHS                             | Murata            | GCM188R71C104KA37D       |
| 1   | C5                                                      | CAP, SMD, 0603, 4.7 $\mu$ F, 10V, 10%, X7S, ROHS                             | Murata            | GRM188C71A475KE11D       |
| 1   | C4                                                      | CAP, SMD, 0603, 0.1 $\mu$ F, 100V, 10%, X7R, ROHS                            | Murata            | GRM188R72A104KA35J       |
| 2   | C2, C3                                                  | CAP-AEC-Q200, SMD, 1210, 4.7 $\mu$ F, 100V, 10%, X7R, ROHS                   | TDK               | CNA6P1X7R2A475K250AE     |
| 1   | C13                                                     | CAP, SMD, 0603, 0.039 $\mu$ F, 25V, 10%, X7R, ROHS                           | Panasonic         | ECJ-1VB1E393K            |
| 1   | L1                                                      | COIL-PWR INDUCTOR, SMD, 6.6 $\times$ 6.4mm, 6.8 $\mu$ H, 20%, 6.5A, ROHS     | Würth Electronics | 74439346068              |
| 4   | T1, T2, T3, T4                                          | CONN-DBL TURRET, TH, 0.218 $\times$ 0.07 $\times$ 8 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     |
| 5   | TP3, TP4, TP6, TP12, TP13                               | CONN-MINI TEST PT, VERTICAL, BLK, ROHS                                       | Keystone          | 5001                     |
| 3   | TP1, TP2, TP5                                           | CONN-MINI TEST POINT, VERTICAL, WHITE, ROHS                                  | Keystone          | 5002                     |
| 1   | JP1                                                     | CONN-HEADER, 12, RETENTIVE, 2.54mm, 0.230 $\times$ 0.120, ROHS               | Berg/FCI          | 69190-202HLF             |
| 1   | R10                                                     | RES, SMD, 0603, 20k $\Omega$ , 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 $\Omega$ , 1/10W, 1%, TF, ROHS                   | Panasonic         | ERJ-3EKF20R0V            |
| 4   | R3, R5, R7, R12                                         | RES, SMD, 0603, 0 $\Omega$ , 1/10W, TF, ROHS                                 | Various           | VARIOUS                  |
| 1   | R14                                                     | RES, SMD, 0402, 0 $\Omega$ , 1/10W, TF, ROHS                                 | Various           | VARIOUS                  |
| 1   | R4                                                      | RES, SMD, 0603, 100k $\Omega$ , 1/10W, 1%, TF, ROHS                          | Various           | VARIOUS                  |
| 1   | U1                                                      | IC-75V 3A PWM SWITCHING REGULATOR, 16P, QFN, ROHS                            | Renesas           | RAA211835GNP#HA0         |
| 1   | C1                                                      | CAP, SMD, 12 $\times$ 10, 47 $\mu$ F, 100V, 20%, ALUM.ELEC., ROHS            | Vishay            | MAL214699904E3           |
| 1   | D1                                                      | DIODE SCHOTTKY 100V 10A TO277-3                                              | OnSemi            | FSV10100V                |
| 0   | C11, C12, C14, C15, C16, C17, C18, R1, R2, R6, R11, R13 | Do Not Populate                                                              | N/A               | N/A                      |

## 2.4 Board Layout

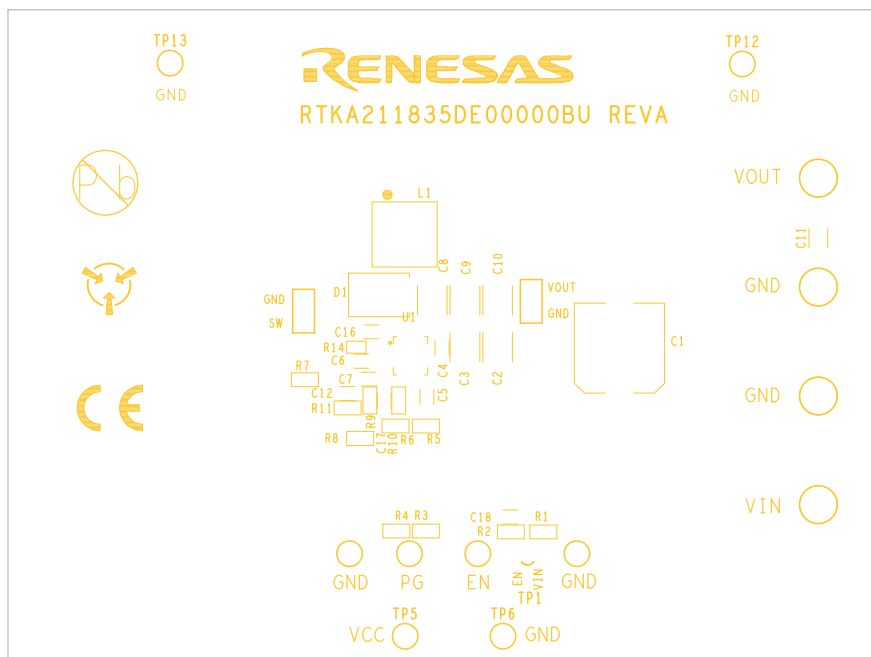


Figure 5. Silkscreen Top Layer

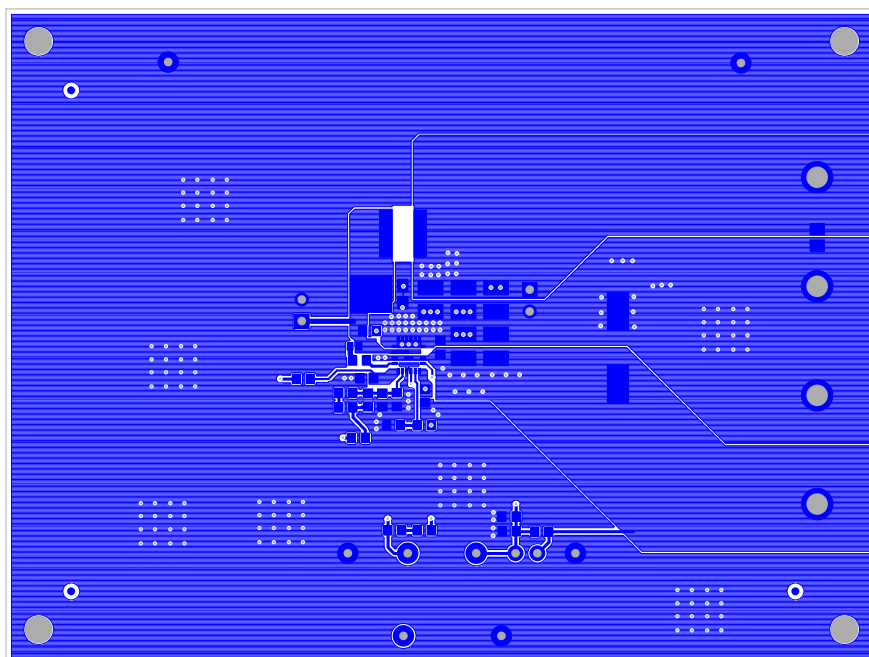


Figure 6. Top Layer

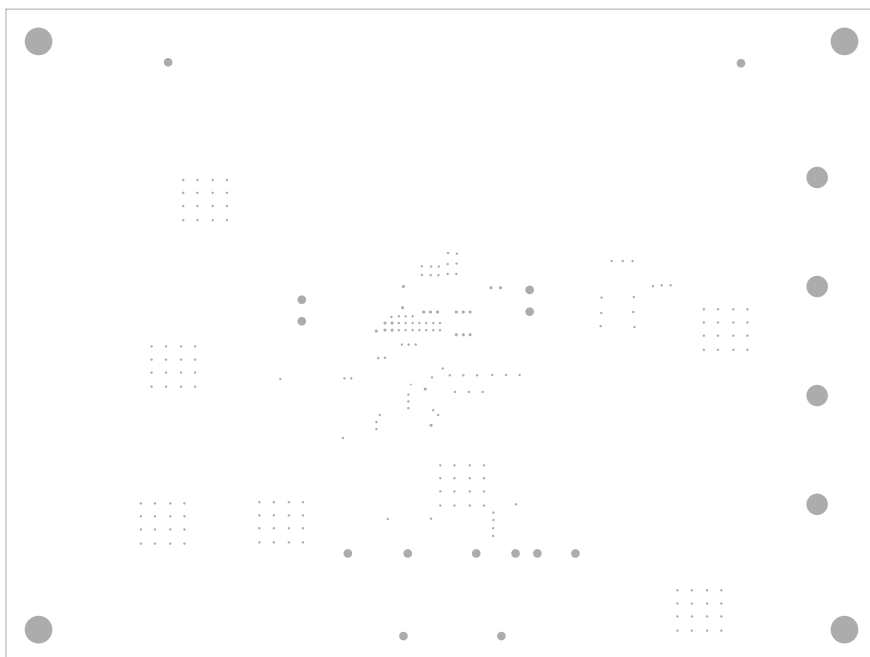


Figure 7. Second Layer

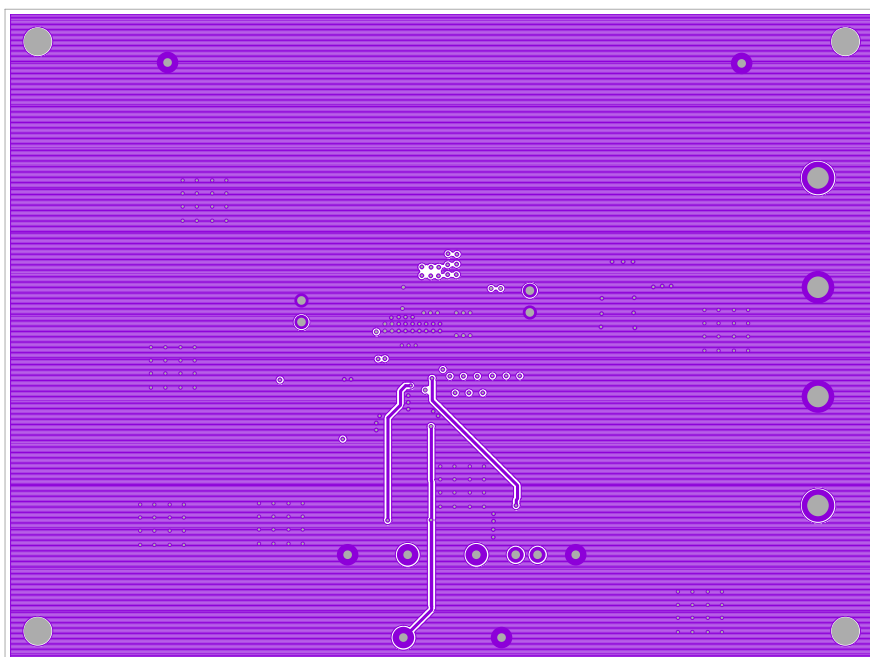


Figure 8. Third Layer



Figure 9. Bottom Layer

### 3. Typical Performance Graphs

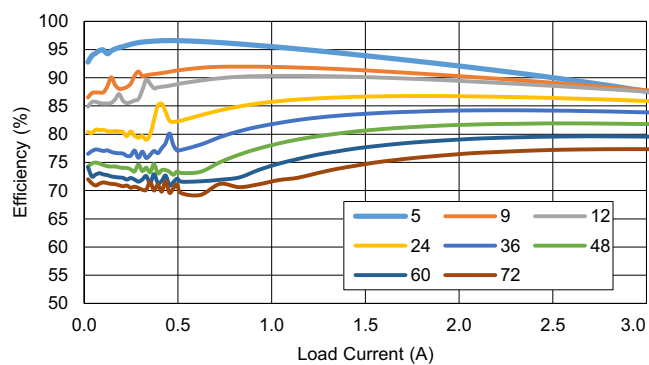


Figure 10. Efficiency vs Load

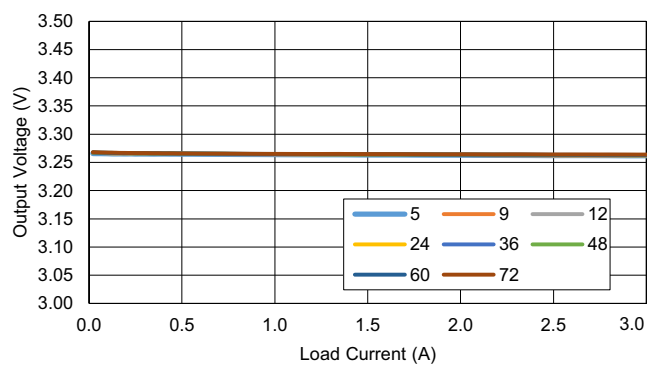


Figure 11. Load Regulation

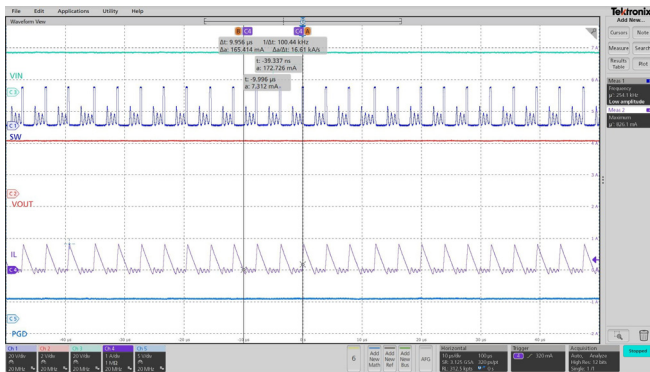


Figure 12. Steady State at 0.2A Load

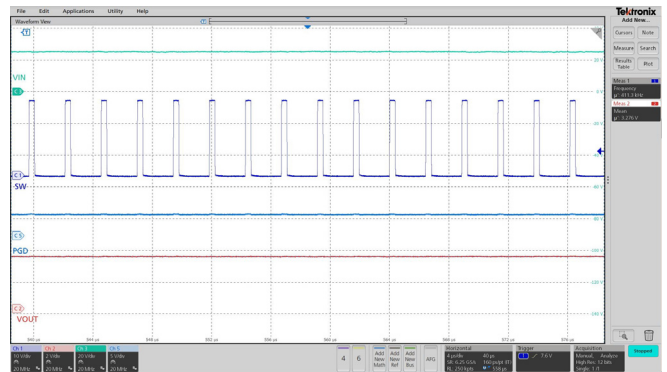


Figure 13. Steady State at 2A Load

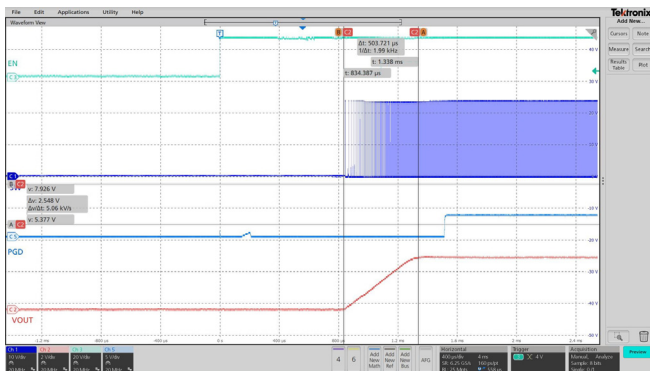


Figure 14. Startup by EN at 1A Load

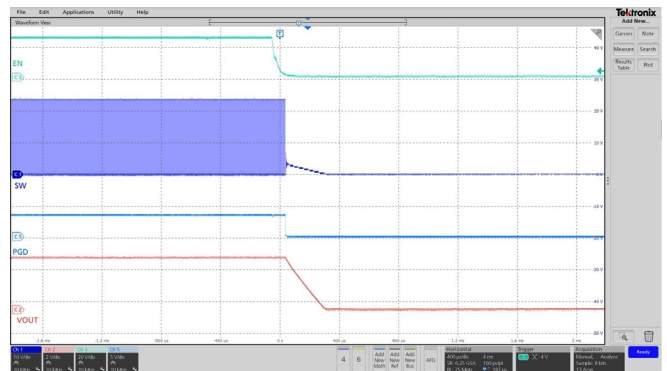


Figure 16. Shutdown by EN at 1A Load

Figure 15.

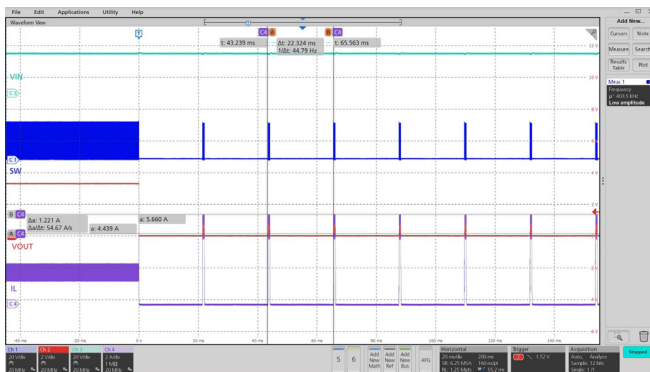


Figure 17. Overcurrent Protection

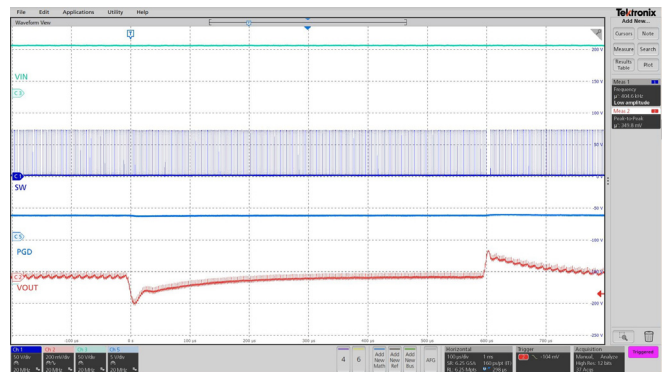


Figure 18. Load Transient 1A to 3A to 1A

## 4. Ordering Information

| Part Number        | Description                              |
|--------------------|------------------------------------------|
| RTKA211835DE0000BU | RAA211835 (QFN version) evaluation board |

## 5. Revision History

| Revision | Date        | Description     |
|----------|-------------|-----------------|
| 1.00     | Nov 4, 2022 | Initial release |

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