

RC21214/RC21213

This document describes the following topics about the RC21214/RC21213 programmer board:

- Basic hardware and GUI setup
- Instructions to burn OTP memory of a device from the GUI

Computer Requirements

- USB 2.0 or USB 3.0 Interface
- Processor: Minimum 1GHz
- Memory:
 - Minimum: 512MB
 - Recommended: 1GB
- Available disk space:
 - Minimum: 600MB (1.5GB 64-bit)
 - Recommended: 1GB (2GB 64-bit)

Features

- USB power supply
- Specialized device socket
- Access to two differential input clocks
- Test points for twelve differential output clocks
- XIN terminal can use a laboratory signal generator or OCXO/TCXO/XO evaluation board
- Serial port for configuration and register read out

Board Contents

- RC21214/RC21213 programmer board (this is the same programmer board that is used for the VersaClock® 7 RC21008 and RC31008.)
- Programmer board manual
- Configuration software (Renesas IC Toolbox)
- Board schematic and BOM

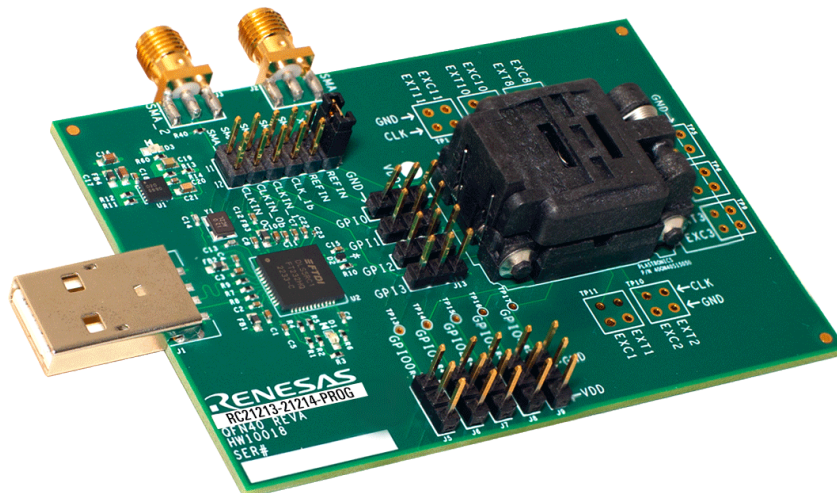


Figure 1. RC21214/RC21213 Programmer Board

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1. Functional Description

This programmer board is used to program blank RC21214/RC21213 devices with on-board USB interface and the RICBox GUI (for more information about RICBox, see the [RICBox](#) product page). The kit can also be used to test general device configuration output frequency and GPI/GPIO settings.

Note: The RC21214/RC21213 programmer board is not intended to evaluate device performance. For information about the device evaluation kit, visit the [RC21214 EVB](#) product page.

1.1 Operational Characteristics

The RC21214/RC21213 programmer board is equipped with a single on-board LDO that takes voltage in from USB and supplies 3.3V to all device power domains. The board is designed to plug directly into any PC and be ready for use with the RICBox GUI and blank part.

A 25MHz crystal is mounted onto the board for testing without external clock input (the 25MHz crystal mounted on the board may be replaced by rework with a crystal better suited to the customer application.) Up to two input clocks can be configured for use through selection jumpers (J4). A 48-pin socket is mounted to the top of the board for easy replacement of blank devices.

The RC21214/RC21213 programmer board is compatible with most 48-pin variants of the RC21214/RC21213.

Note: It is recommended to use a high-speed USB interface to allow for higher current draw.

Note: Use proper grounding to avoid ESD damage to the devices and the programmer board.

1.2 Hardware Setup and Configuration

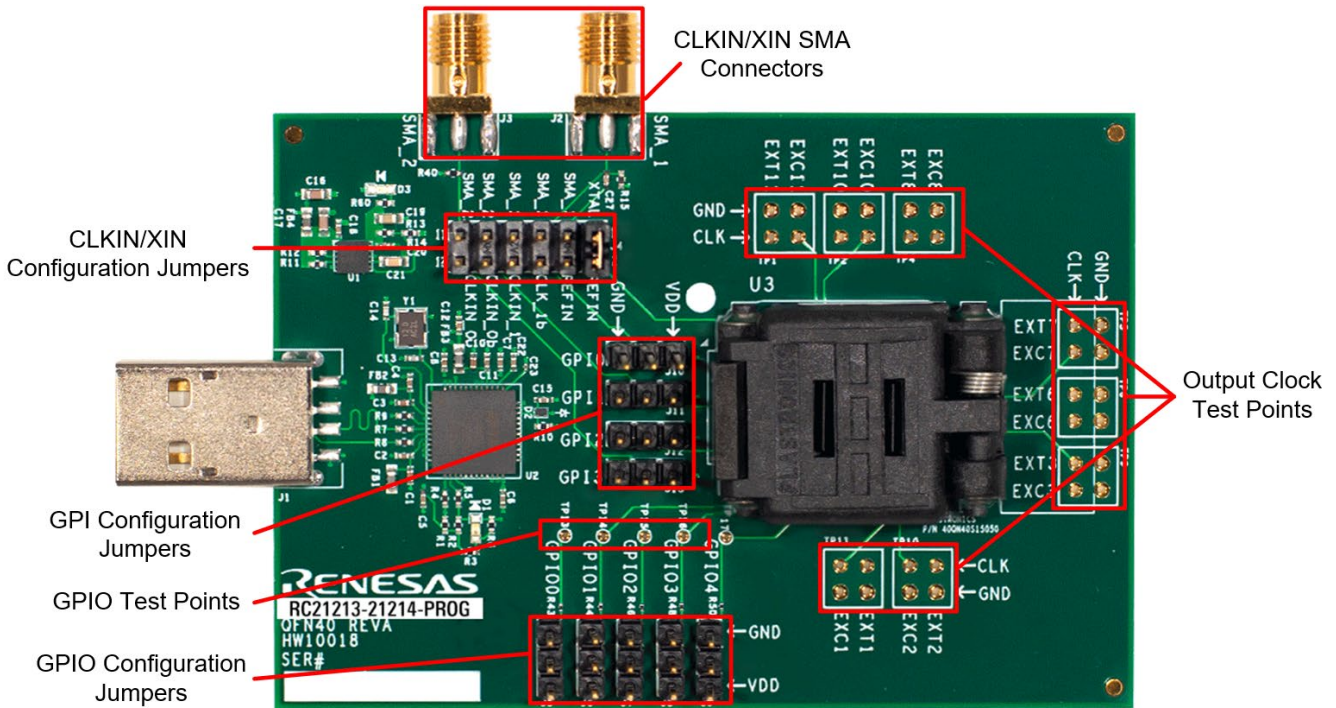


Figure 2. Programmer Board with Labels

1.2.1. Part Placement

Part placement should follow the first pin marked on both the programmer board socket and blank part. Ensure both markings match before placing the part into the socket.

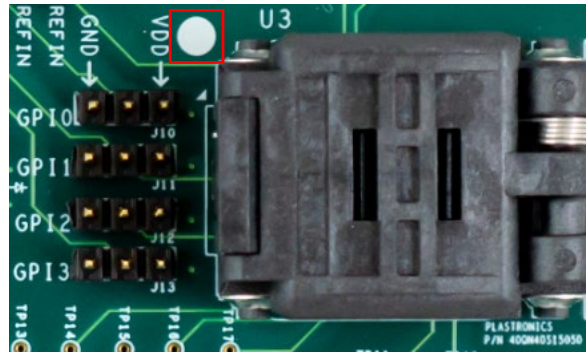


Figure 3. Pin 1 Location

Note: It is *critical* to ensure that pin 1 markings match between the board and device; otherwise, this may cause electrical shorting and possible damage/harm!

The socket opens by gently pushing in the small tab on the front side of the socket to release lid.

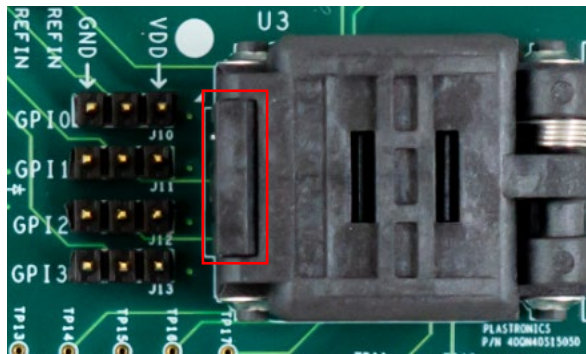


Figure 4. Socket Open Tab

To close, align the top of the socket with the bottom and press down until the socket clicks in place.

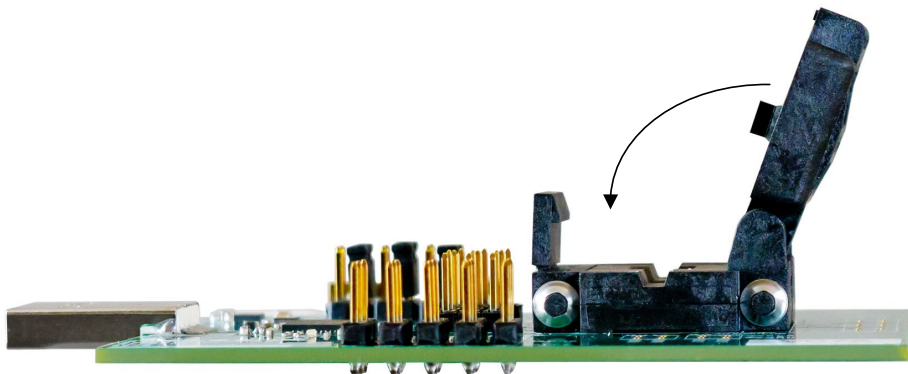


Figure 5. Closing Socket

Note: Do not force the socket lid down onto a part. This may damage the part or the socket itself.

1.2.2. Jumper Selection

The RC21214/RC21213 programmer board is equipped with five GPIO selection jumpers (J5-J9), four GPI selection jumpers (J10-J13), and a jumper strip for XIN/CLKIN trace paths (J4).

The GPIO and GPI jumpers can be pulled high or low by placing a jumper shunt between the center pin and VDD, or GND accordingly.

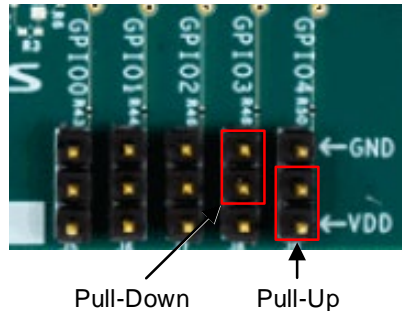


Figure 6. GPIO Jumper Settings

Jumper pins at J4 can configure CLKIN and XIN traces to the socket pins. Table 1 shows the different orientations for J4. CLKIN traces can be directed to GPIO.

Table 1. J4 Jumper Selection

| Pins | Description |
|-------|--|
| 1/2 | Connect the onboard crystal to pin 2 (XIN_REFIN) |
| 3/4 | Connect J2 (SMA_1_IN) to pin 2 (XIN_REFIN) |
| 5/6 | Connect J2 (SMA_1_IN) to pin 5 (CLKIN0_GPIO) |
| 7/8 | Connect J2 (SMA_1_IN) to pin 8 (CLKIN1_GPIO2) |
| 9/10 | Connect J3 (SMA_2_IN) to pin 6 (CLKIN0B_GPIO1) |
| 11/12 | Connect J3 (SMA_2_IN) to pin 9 (CLKIN1B_GPIO3) |

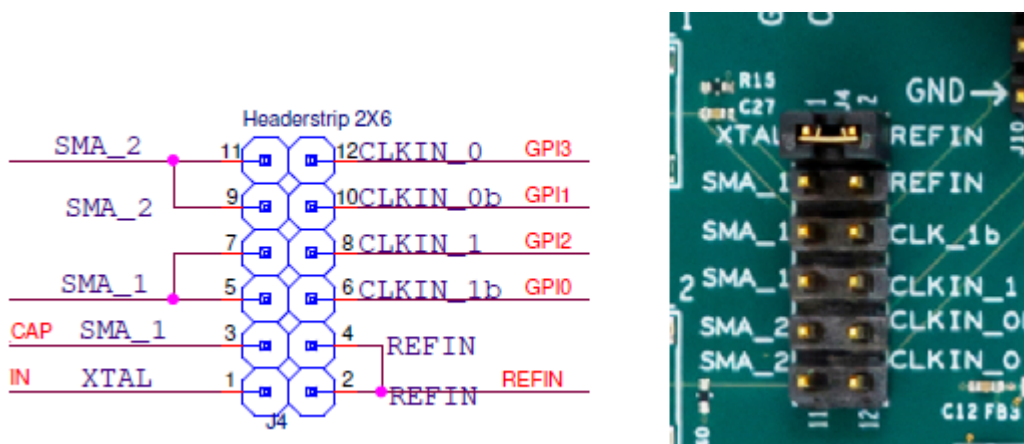


Figure 7. J4 Side-by-Side View

1.3 Software Setup and Configuration

1.3.1. Software Installation

The RC21214/RC21213 programmer board is compatible with the RICBox AutoClock plugin. The plugin can be used to interface with the device via register read/writes. For instructions regarding installation of RICBox or any of the device plug-ins, see the [RICBox](#) product page.

Note: Be sure to update to the latest version of the RICBox GUI and AutoClock plug-in before interfacing with the RC21214/RC21213 programmer board.

1.3.2. Programming OTP Memory

Programming OTP memory can be done easily inside the RICBox GUI. The RC21214/RC21213 can program up to 27 configurations into OTP memory. To ensure that OTP memory is programmed correctly, complete the following procedure:

1. Place a device in the socket and connect the programmer board to a PC, with RICBox and the AutoClock plug-in installed, via the USB connector.
2. Open RICBox and navigate to an existing RC21214 or RC21213 settings file or create a new configuration. Ensure that the correct XIN and CLKIN settings are set based on J4, and the signals are driven in the programmer board depending on the configuration loaded.
3. Once a configuration is open, go to the block diagram view.
4. Click on the OTP/EEPROM button in the lower left corner to view the OTP/EEPROM pop-up.

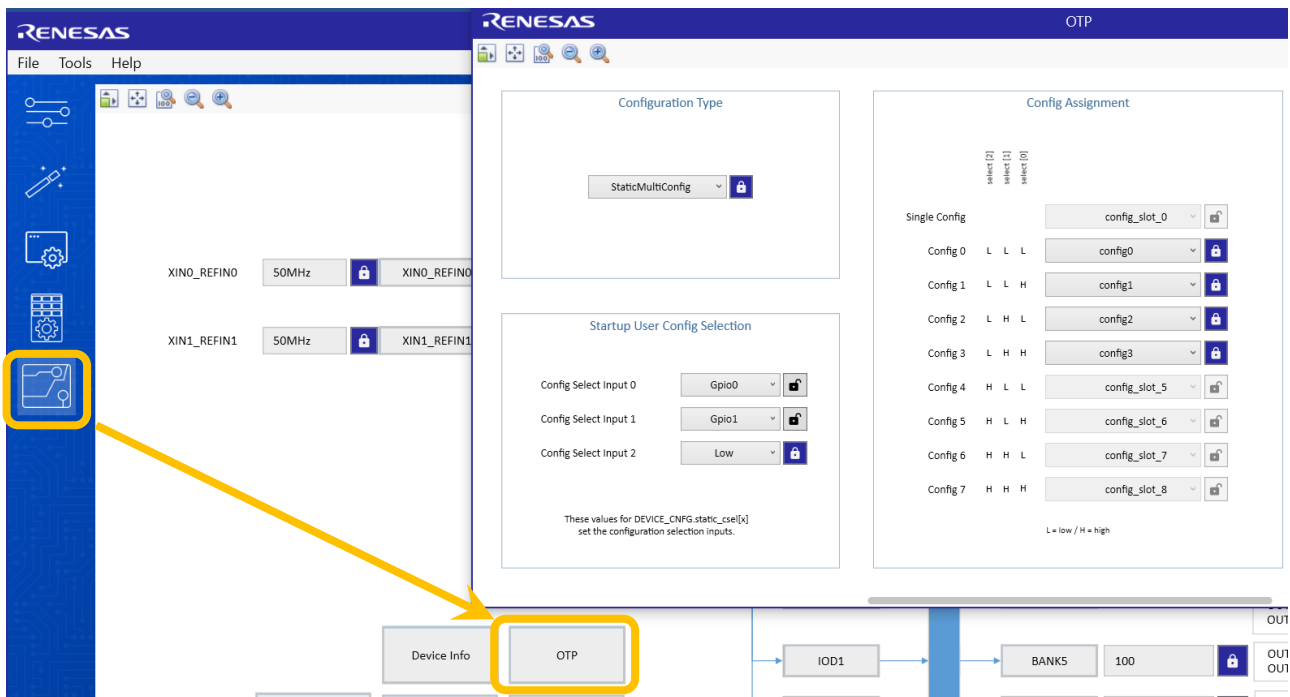


Figure 8. OTP Pop-up Page

5. Use the Configuration Type drop-down menu to select between the following:
 - NoConfig – Nothing will be programmed to OTP memory.
 - SingleConfig – Program a single configuration into the OTP common configuration.
 - StaticMultiConfig – Program multiple configurations into a device that can be selectable at device start-up.

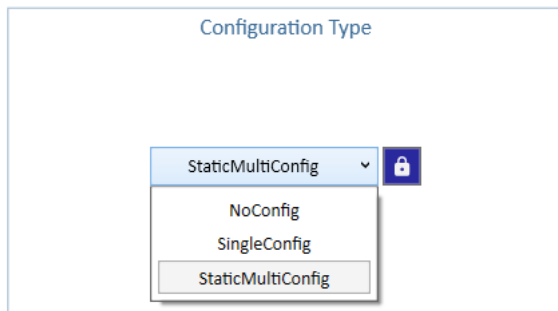


Figure 9. Configuration Type Menu

6. If *StaticMultiConfig* is selected in the configuration type menu, the Startup User Config Selection section can now be used to set configuration selection bits. Bits can either be hard coded to a low, middle, or high values, or bits can be selected through GPIO at start-up.

Select the setting that best matches how the configuration selection bits should be arranged for this application.

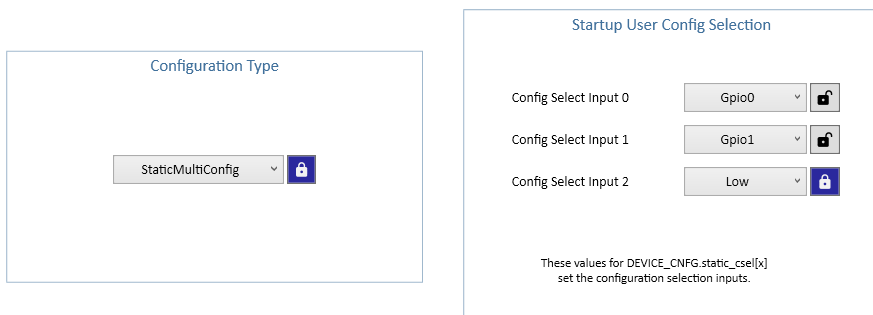


Figure 10. StaticMultiConfig Menu

7. Select the configs to load into OTP from RICBox.
 - Default setting is for the current working configuration.
 - Ensure all necessary configs are selected and all warnings/errors are cleared.

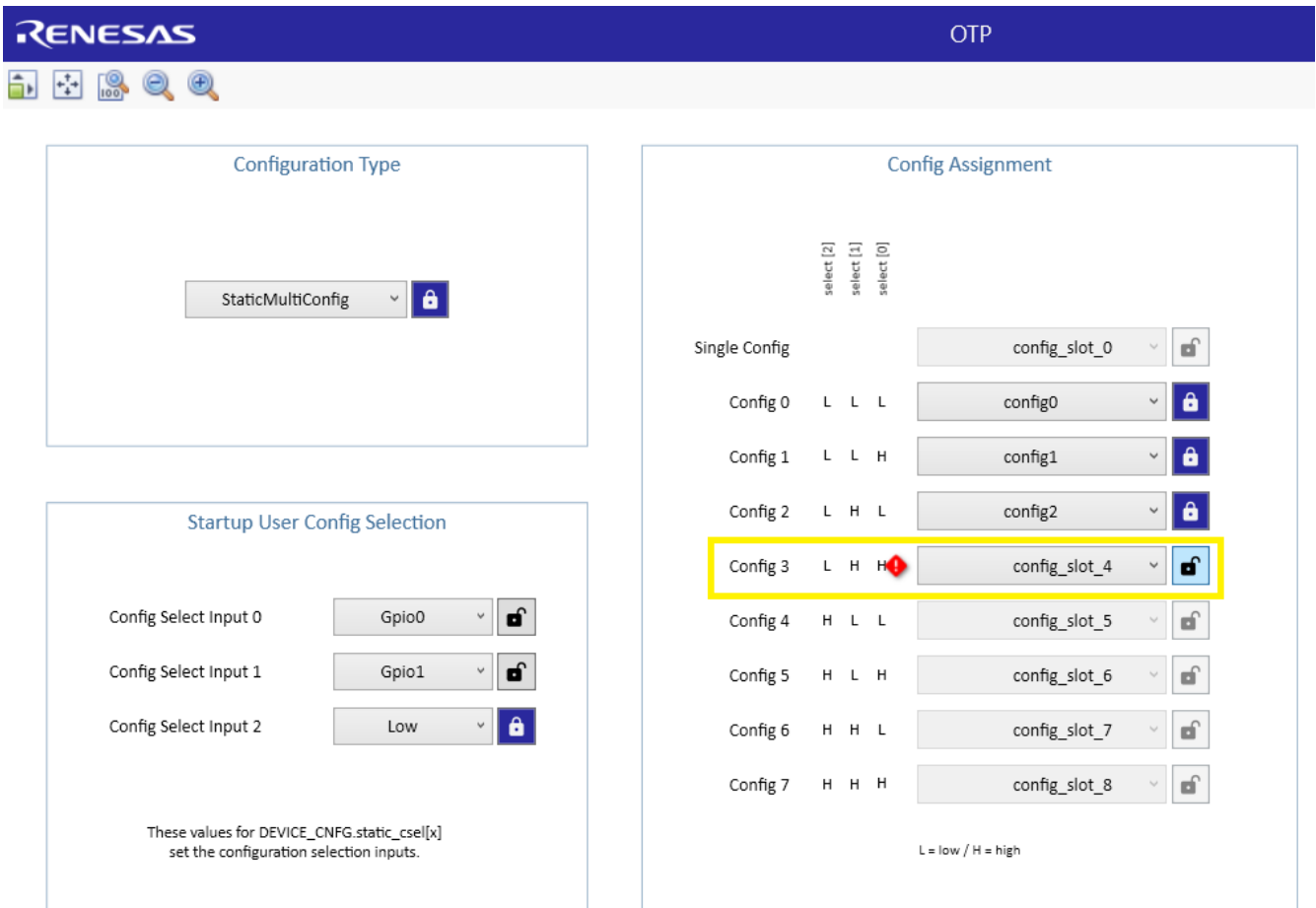


Figure 11. Config Selection Options

8. Establish a connection to the device in socket.



Figure 12. Device Connection

9. Press the "Program OTP" button on the OTP/EEPROM page.

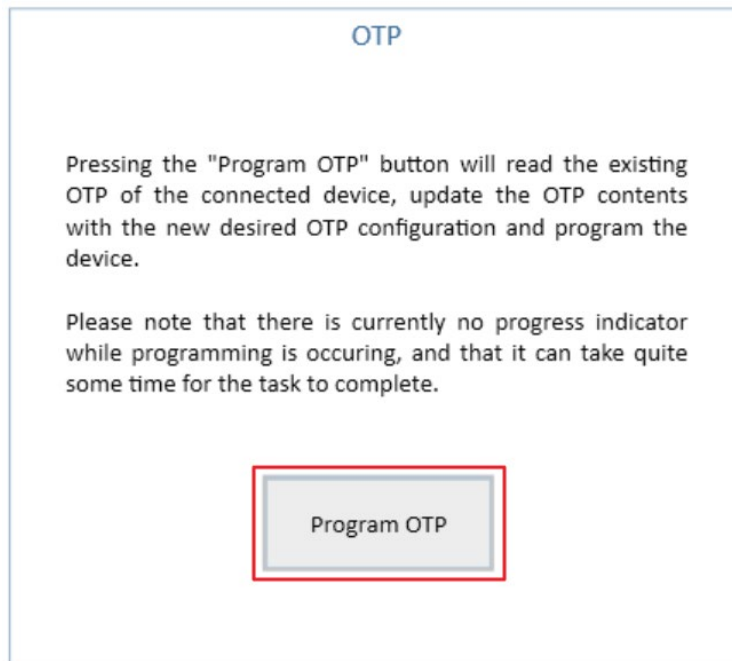


Figure 13. Program OTP

2. Board Design

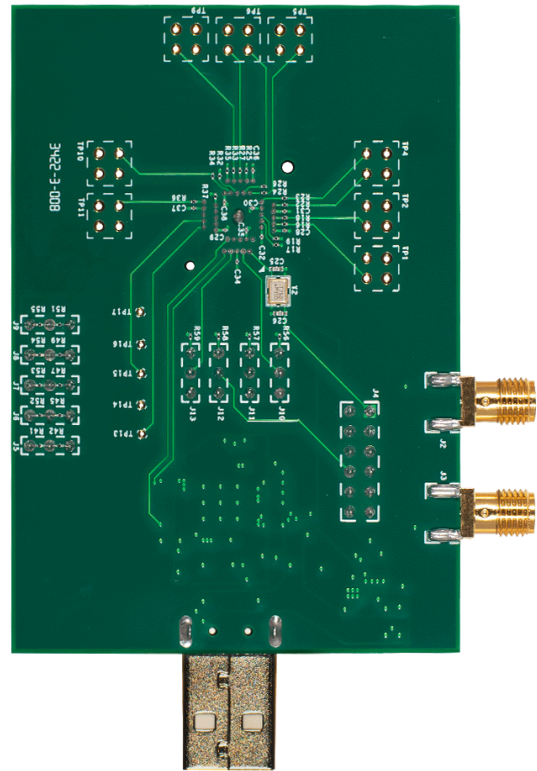
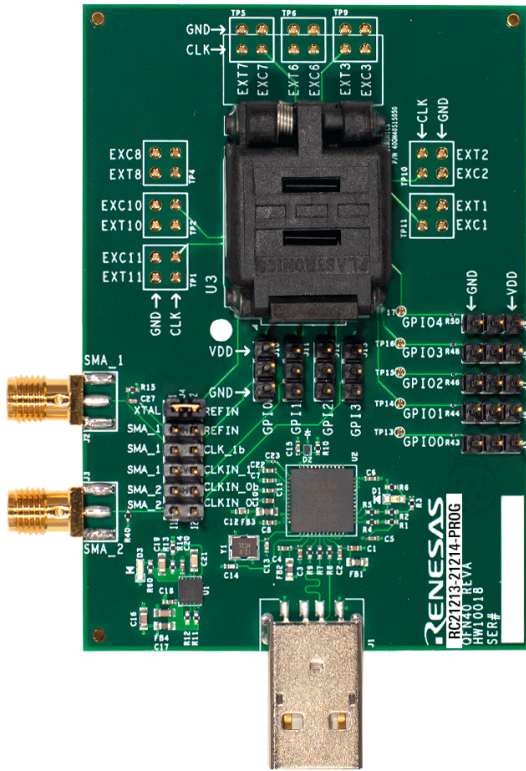


Figure 14. RC21214/RC21213 Evaluation Board (Top)

Figure 15. RC21214/RC21213 Evaluation Board (Bottom)

2.1 Schematic Diagrams

The RC21214/RC21213 schematic diagrams are located at the end of this document.

2.2 Bill of Materials

Table 2. Bill of Materials

| Qty. | Reference Designator | Description | Manufacturer | Part Number |
|------|--|-----------------------------|--------------------|--------------------|
| 3 | C1 C3 C10 | X5R Surface Mount Capacitor | Murata Electronics | ZRB15XR61A475ME01 |
| 11 | C2 C4 C5 C6 C7 C8 C11 C15 C18 C20 C22 | X7R Surface Mount Capacitor | Murata Electronics | GRM155R71C104KA88D |
| 1 | C12 | COG Surface Mount Capacitor | Murata Electronics | GRM155R71E103J |
| 2 | C13 C14 | COG Surface Mount Capacitor | Murata Electronics | GRM1555C1E270J |
| 2 | C16 C17 | X7T Surface Mount Capacitor | Murata Electronics | GRM188D70J106MA73D |
| 1 | C19 | X5R Surface Mount Capacitor | Murata Electronics | GRM188R60J226M |
| 1 | C21 | X7R Surface Mount Capacitor | Murata Electronics | GCM188R71E105KA64D |
| 11 | C23 C28 C29 C30 C31 C32 C34 C35 C36 C37 C38 | X6S Surface Mount Capacitor | Kemet | C0603X6S1C104K030 |

| Qty. | Reference Designator | Description | Manufacturer | Part Number |
|------|---|--|---------------------|--------------------|
| 2 | C25 C26 | COG Surface Mount Capacitor | Murata Electronics | GCM1555C1H6R8BA16D |
| 1 | C27 | X7R Surface Mount Capacitor | Murata Electronics | GRM155R71H102KA01D |
| 1 | D1 | OSRAM: LED Green Diffused 0603 | OSRAM | LG L29K-G2J1-24-Z |
| 1 | D2 | Surface Mount Fast Switching Diode: $I_o = 95\text{mA}$, $V_r = 80\text{V}$, $t_{rr} = 4\text{ns}$ | Diodes Incorporated | 1N4448HLP |
| 1 | D3 | OSRAM: LED Red Diffused 0603 | OSRAM | LS L29K-H1J2-1-Z |
| 4 | FB1 FB2 FB3 FB4 | MURATA: Ferrite Bead 600 Ohm 0603 | Murata | BLM18AG601SN1D |
| 1 | J1 | TE: USB-A (USB TYPE-A) USB 2.0 Plug Connector 4 Position Surface Mount, Right Angle; Through Hole | TE Connectivity | 1734028-1 |
| 2 | J2 J3 | Samtec: SMA JACK STR 50 OHM EDGE MNT, Fits 0.062" board | Samtec | SMA-J-P-H-ST-EM1 |
| 1 | J4 | Molex C-Grid Header Dual, Gold, Unshrouded, Breakaway, 100mil pitch | Molex | 10-89-7120 |
| 9 | J5 J6 J7 J8 J9 J10 J11 J12 J13 | Molex: Header, Gold, Unshrouded, Breakaway, 100mil pitch, 0.240 inch contact mating length | Molex | 22-28-4033 |
| 7 | R1 R2 R6 R10 R11 R12 R14 | Surface Mount Resistor | Yageo | RC0402JR-0710KL |
| 2 | R3 R60 | Surface Mount Resistor | Yageo | RC0402JR-071KL |
| 4 | R4 R5 R7 R8 | Surface Mount Resistor | Panasonic | ERJ-2GEJ100X |
| 1 | R9 | Surface Mount Resistor | Panasonic | ERJ-2GEJ123X |
| 1 | R13 | Surface Mount Resistor | Vishay | CRCW040227K0FK |
| 2 | R15 R40 | Surface Mount Resistor | Panasonic | ERA-2AEB49R9X |
| 16 | R16 R17 R18 R19 R22 R23 R24 R25 R26 R27 R32 R33 R34 R35 R36 R37 | Surface Mount Resistor | Panasonic | ERJ-1GEJ330C |
| 19 | R41 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R58 R59 | Surface Mount Resistor | Yageo | RC0201JR-0710KL |
| 1 | U1 | Renesas: Low noise, high PSRR, low dropout voltage regulator. It accepts a input voltage range of 2.7V to 5.5V | Renesas | RAA214020 |

| Qty. | Reference Designator | Description | Manufacturer | Part Number |
|------|----------------------|--|--------------|-----------------|
| 1 | U2 | FTDI: Single Channel Hi-Speed USB to Multipurpose UART/FIFO IC | FTDI | FT232HQ-REEL |
| 1 | Y2 | TXC: 25MHz ±30ppm Crystal 8pF 60 Ohms 4-SMD, No Lead | TXC | 7M-25.000MAHV-T |
| 1 | U3 | QFN Thru-Hole Socket 41 Contacts, 0.40 Pitch, 5 x 5 Body Size | Plastronics | 40QN40S15050 |

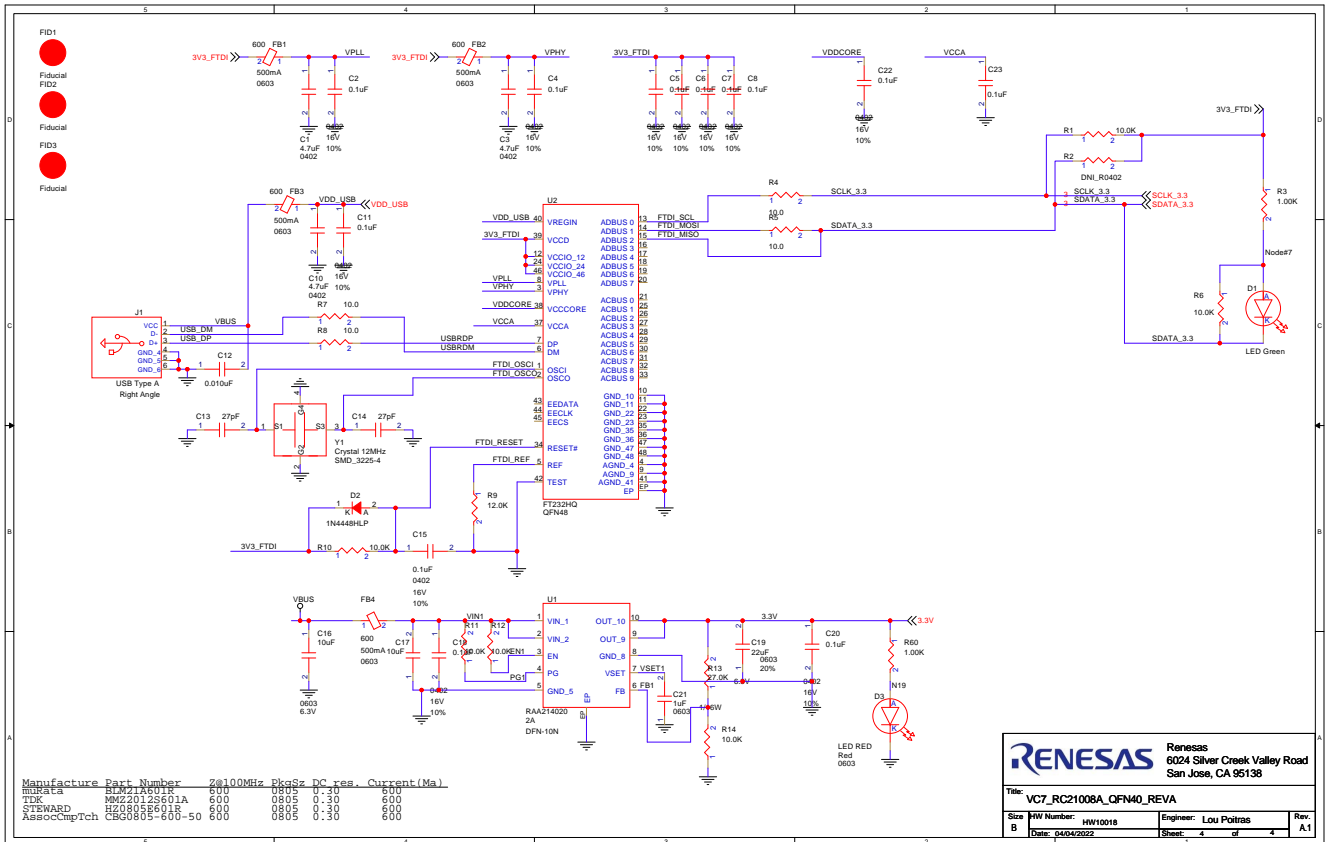
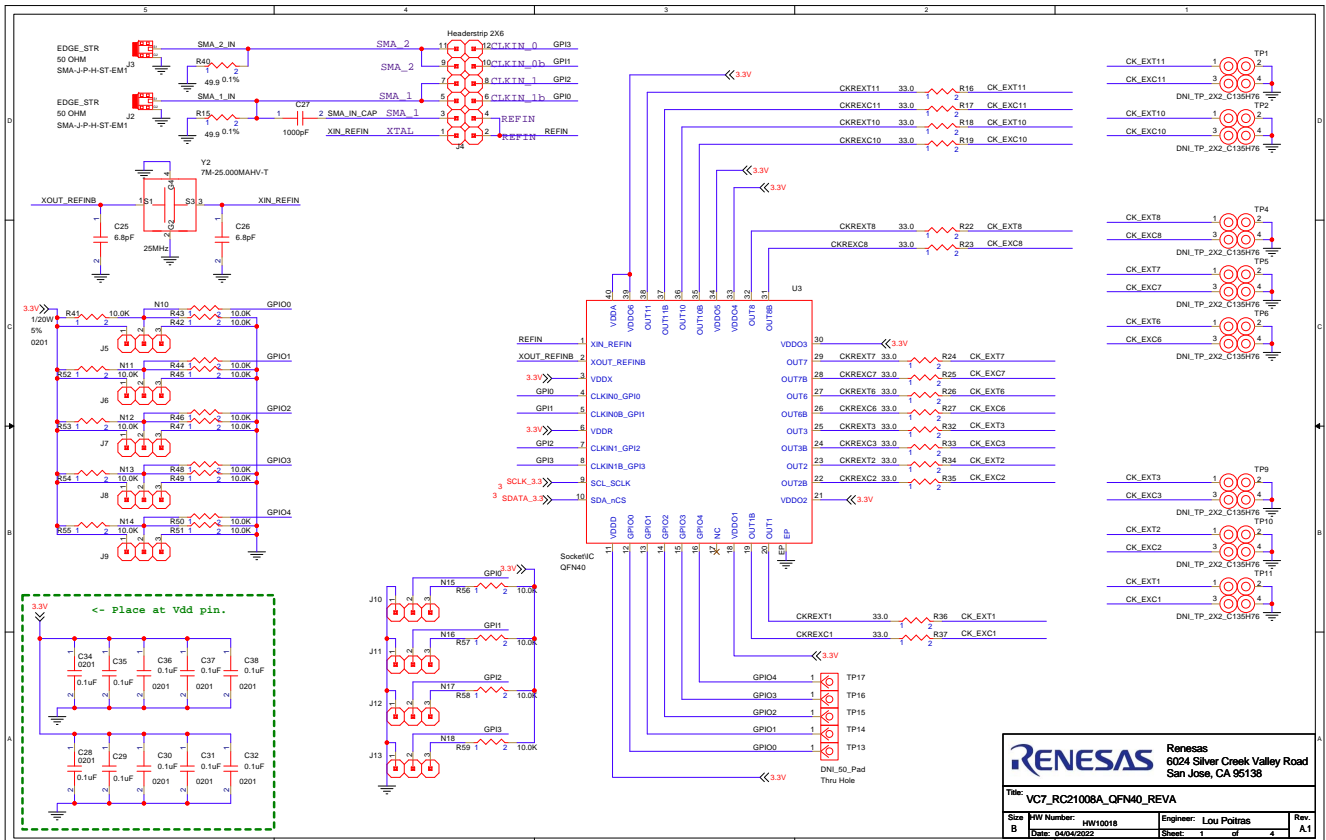
3. Ordering Information

| Part Number | Description |
|--------------------|----------------------------------|
| RC21008_31008-PROG | RC21214/RC21213 Programmer Board |

4. Revision History

| Revision | Date | Description |
|----------|--------------|-----------------------------------|
| 1.01 | Apr 29, 2024 | Updated figures 1, 2, 14, and 15. |
| 1.00 | Apr 23, 2024 | Initial release. |

RC21214/RC21213 Programmer Board Manual



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