

## RC31309A

VersaClock® 8 Programmer Board Kit

### Description

The RC31309A Programmer Boards (PRB) are designed to support users programming and burning OTP configuration. This document will go over basic hardware and software GUI setup and instructions on how to burn OTP from the GUI.

### Computer Requirements

- USB 2.0 or higher
- Processor
  - Minimum 1GHz
- Memory
  - Minimum 512MB
  - Recommended 1GB
- Available disk space
  - Minimum 1.5GB
  - Recommended 2GB

### Features

- USB powered
- Specialized device socket
- Access to CLKIN differential input clocks
- Test points for output clocks
- On board crystal or crystal overdrive (REFIN) via SMA
- Onboard I<sup>2</sup>C and SPI communications

### Board Contents

Items shipped with the programmer kit:

- Programmer board
- Blank unit

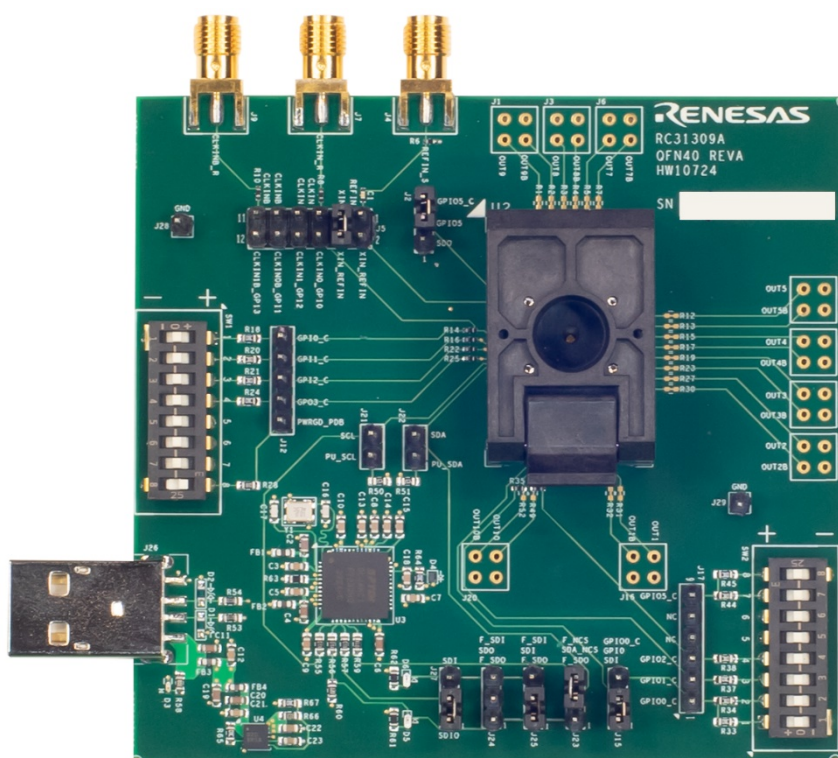


Figure 1. RC31309A Programmer Board

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## 1. Functional Description

This programmer board is used to program blank RC31309A 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 device configuration output frequency and GPI/GPIO settings.

*Note:* The programmer board is not intended to evaluate device performance. For information about the device evaluation kit, visit the RC31309A EVK product page.

### 1.1 Operational Characteristics

The RC31309A programmer board is equipped with a single on-board LDO that takes voltage in from USB and supplies 3.3V to all device domains. The board is designed to plug directly into any PC and be ready for use with the RICBox GUI and blank part. A 50MHz crystal is mounted onto the board for testing without external clock input. Up to two input clocks can be configured for use through selection jumpers (J5). A socket is mounted to the top of the board for easy replacement of blank devices. The RC31309A programmer board is compatible with RC31309AQ.

*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

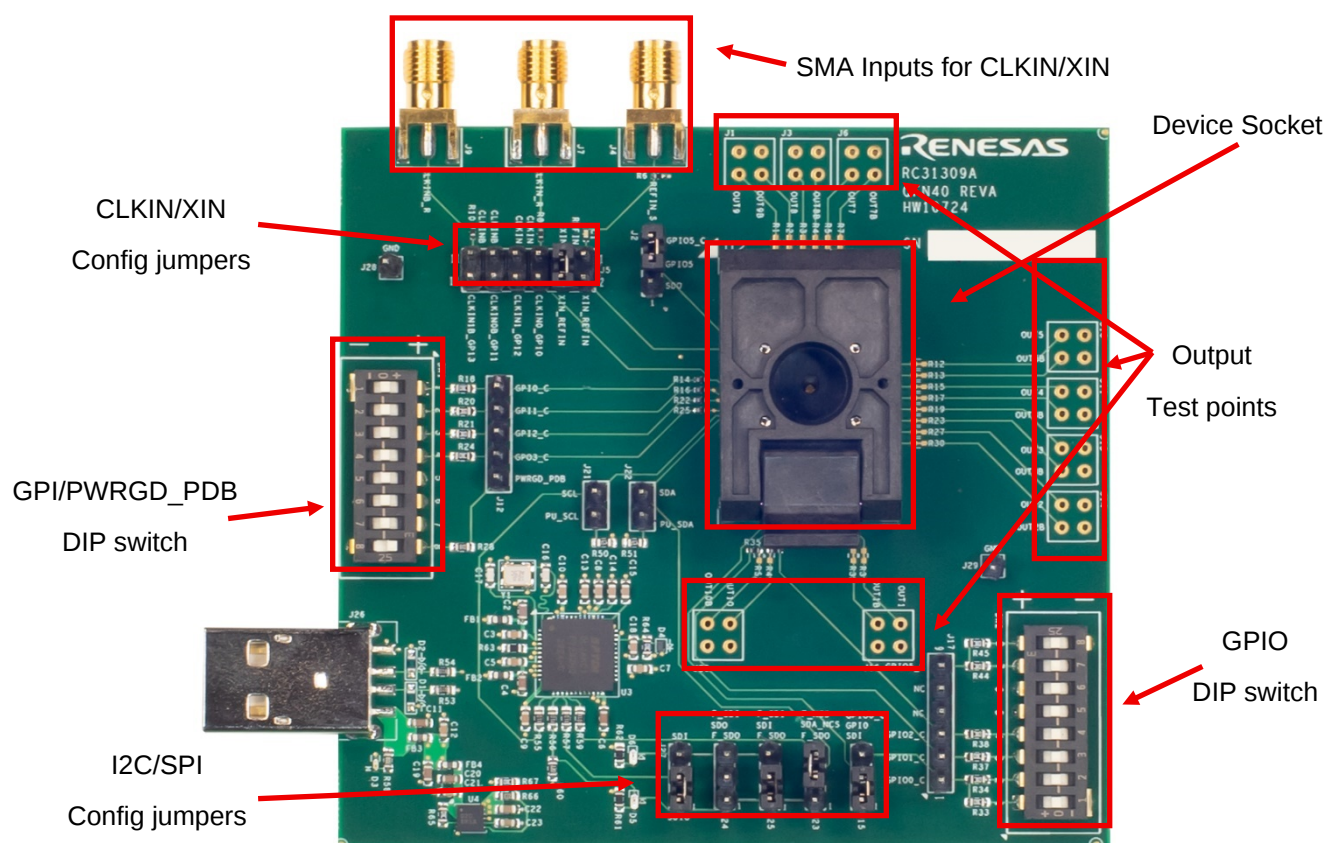


Figure 2. Programmer Board with Labels

#### 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.

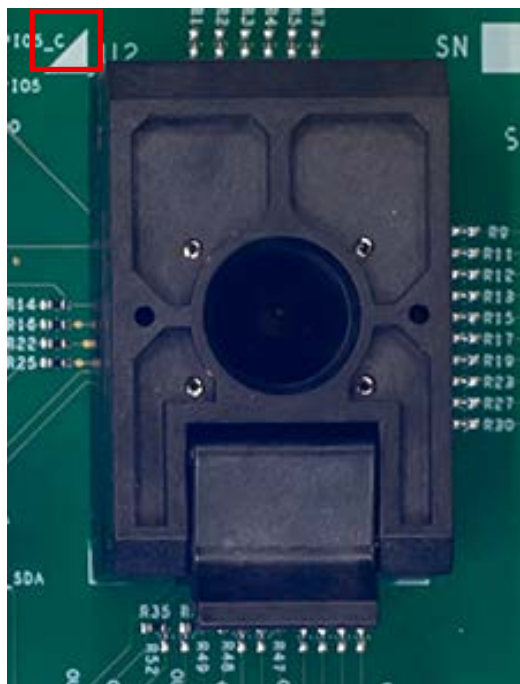


Figure 3. Pin 1 Location

*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.

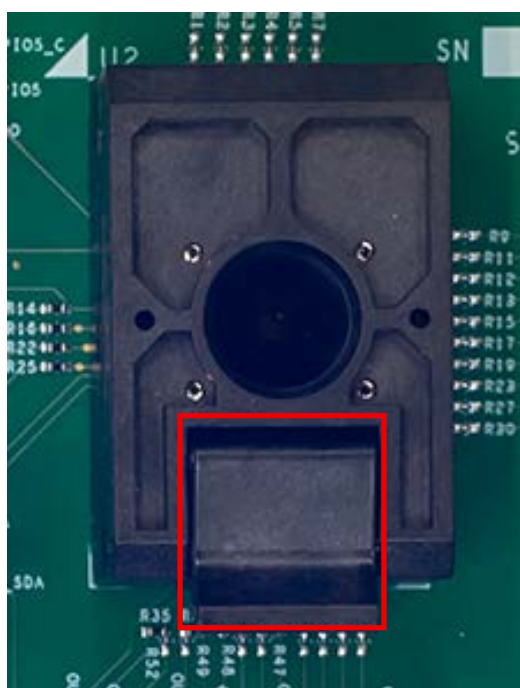


Figure 4. Socket Open Tab

The part can then be installed before closing the top.

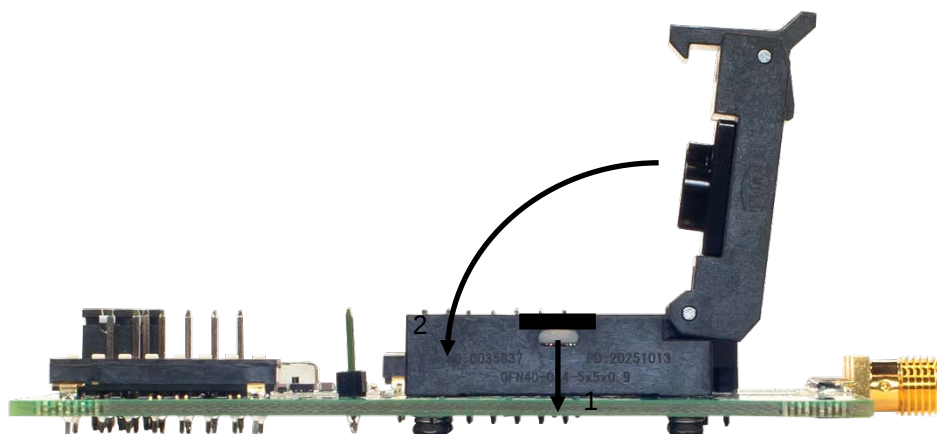


Figure 5. Part Placement and Installation

### 1.2.2 GPI/GPIO DIP Selection

The programmer board is equipped with 4 x GPI connected to DIP switch SW1 and 6 x GPIO connected to DIP switch SW2 for pulling high or low. Slide the switch to the “+” to pull high and “-” to pull low. GPIO0 and GPIO5 have 2 switches connected to the signal. This allows for mid voltage by pulling a switch high and the other low. J12 and J17 can be used to monitor voltage levels or to inject externally.

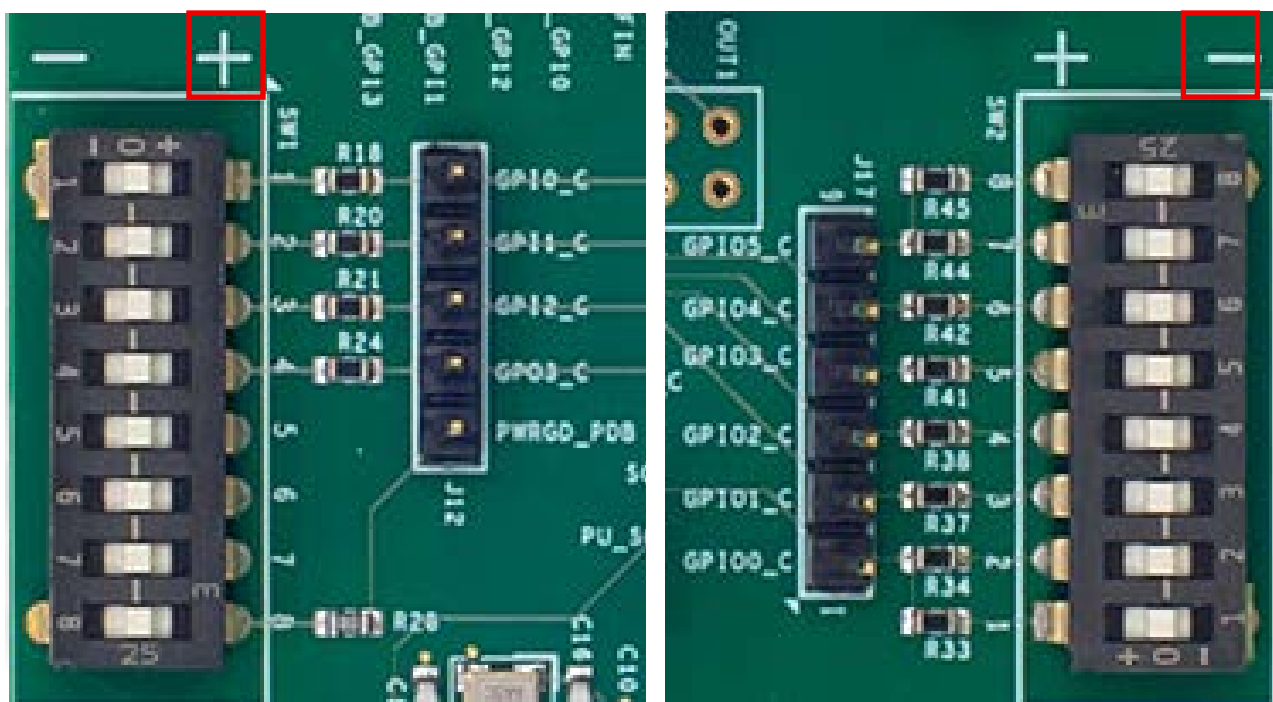


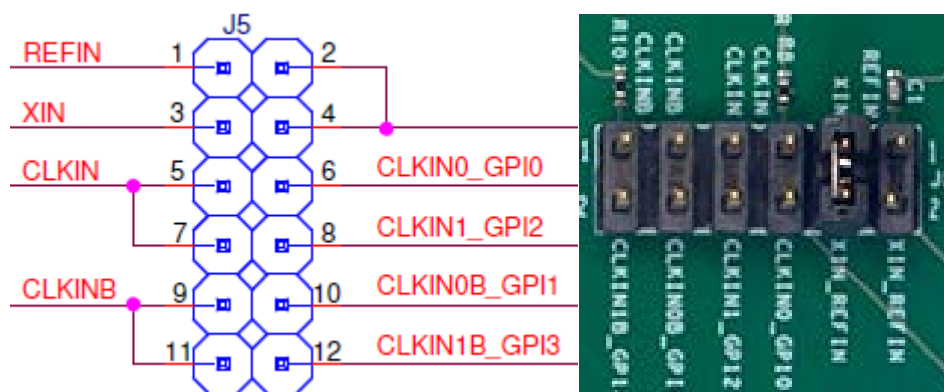
Figure 6. GPI/GPIO DIP Switches

### 1.2.3 XIN/CLKIN Jumper Selection

Jumper J5 can configure CLKIN and XIN traces to the socket pins. Table 1 shows the different orientations for J5. CLKIN traces can be directed to GPIO.

**Table 1. J5 Jumper Selection**

| Pins  | Description               |
|-------|---------------------------|
| 1-2   | Connect SMA J4 to XIN pin |
| 3-4   | Connect 50 MHz to XIN pin |
| 5-6   | Connect SMA J7 to CLKIN0  |
| 7-8   | Connect SMA J7 to CLKIN1  |
| 9-10  | Connect SMA J9 to CLKIN0B |
| 11-12 | Connect SMA J9 to CLKIN1B |



**Figure 7. J5 Side-by-Side View**

### 1.2.4 Serial Connection

The PRB can be configured for I2C, SPI 3W, and SPI 4W. Figure 7 shows the jumper configurations as outlined by the red rectangles for I2C (left), SPW 3W with GPIO0 as SDIO (center), and SPI 4W with GPIO0 as SDO and GPIO5 as SDI (right). GPIO0/5 can be switched for SPI functionality in the GPI/GPIO config sub diagram. The serial mode can be configured in the Serial Interface sub diagram

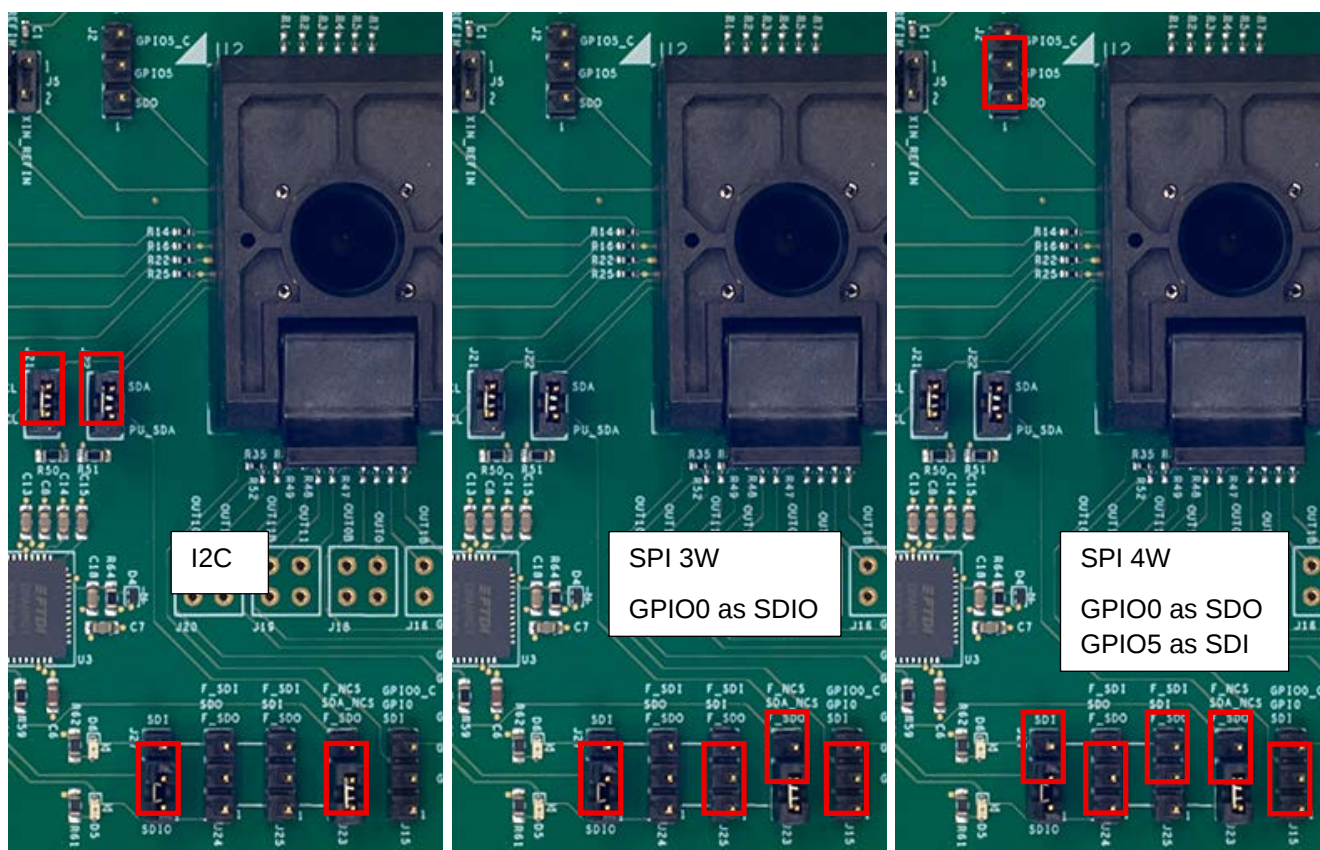


Figure 8. I2C, SPI 3W, SPI 4W

## 1.3 Software Setup and Configuration

### 1.3.1 Software Installation

The PRB is compatible with Renesas Integrated Circuit Toolbox (RICBox) software and the VersaClock 8 plugin. The plugin can be used to interface with the device via register read/writes. RICBox provides a user-friendly interface to support programming configurations into the VC8 PRB. For more information about RICBox, see the [Renesas IC Toolbox User Guide](#).

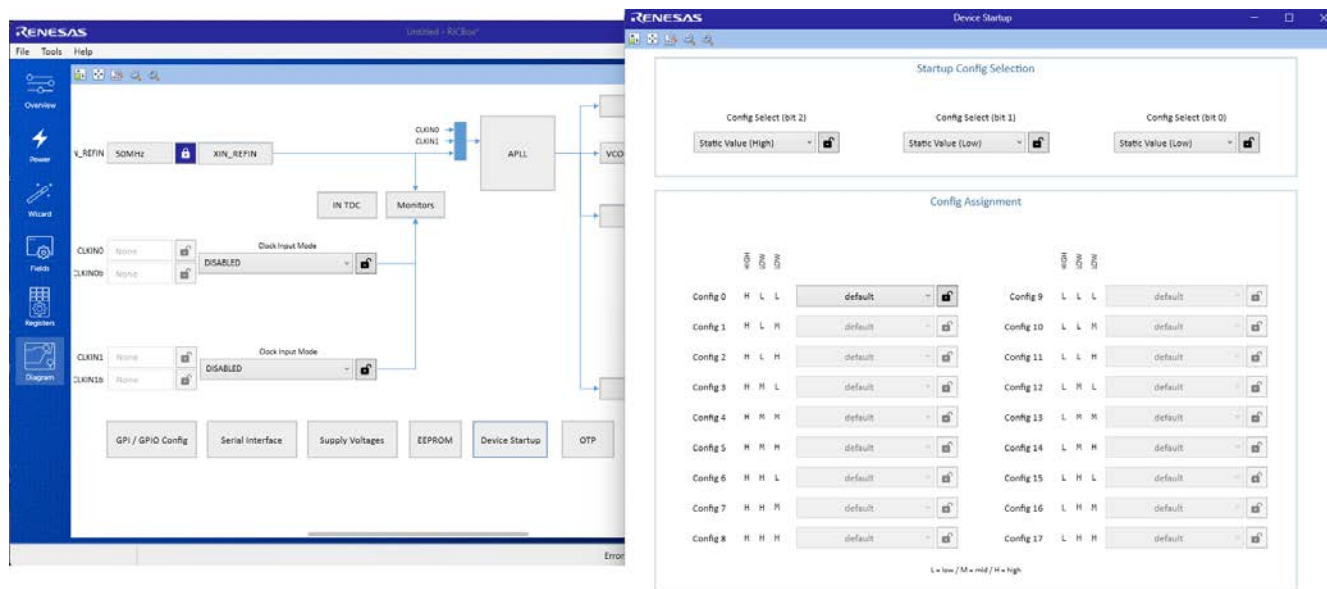
*Note:* be sure to update to the latest version of the RICBox GUI and VersaClock 8 plugin before interfacing with the PRB.

### 1.3.2 Programming OTP Memory

Programming OTP memory can be done easily using the RICBox GUI. VC8 can program up to 18 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 VersaClock 8 plug-in installed, via the USB connector.
2. Open RICBox and navigate to an existing RC313xxA .RBS file or create a new configuration.
  - a. Ensure that the correct XIN and CLKIN settings are set based on J5, and the signals are driven in the programmer board depending on the configuration loaded.
  - b. Create more than one configuration.
3. Once a configuration is open, go to the Diagram view.

4. Click on the Device Startup button in the lower left corner to view Startup Config Selection and Config Assignment.
  - a. Config Select 2 is PWRGD\_PDB pin, Config Select 1 is GPIO5 pin, and Config Select 0 is GPIO0 pin
  - b. Config Select 2 can be forced high or low or monitored continuously.
  - c. Config Select 1-0 can be forced high, mid, or low, or latched at startup as tri level, or continuously Bi/Tri level.



**Figure 9. Device Startup Sub-Diagram**

5. Pick which Config Select pins will be used for loading.
  - a. HLL for Config Select 2,1,0 is default for single config.
  - b. Set Config Select 0 to continuously monitor Low/High.
  - c. As a result, config 0 and config 2 slots need to be defined.

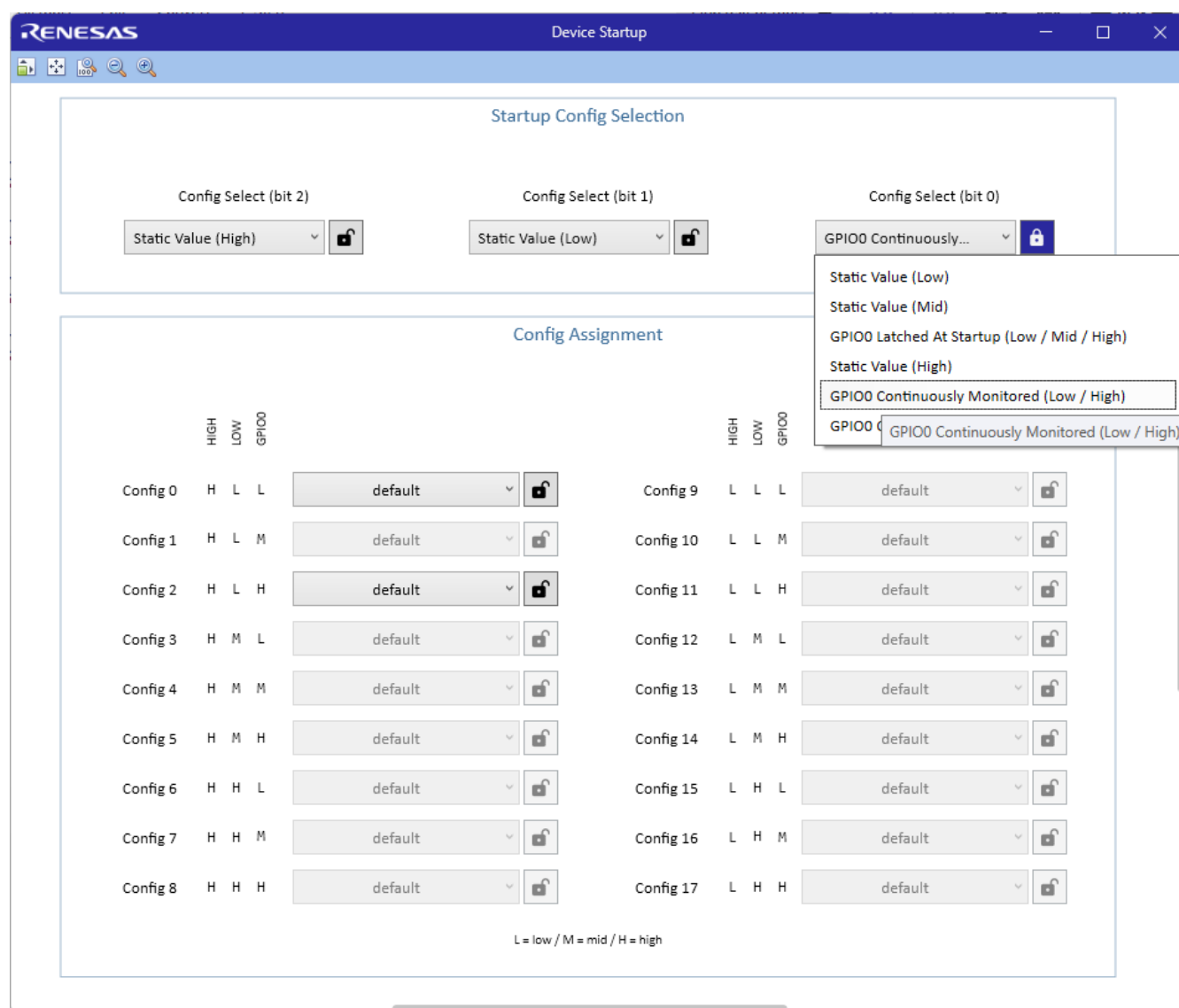


Figure 10. Config Selection Options

6. When all configs are in their correct slots, go back to the main Diagram and push the OTP button to bring up the OTP Programmer sub diagram. Push Burn OTP but to burn your config into the OTP space of the blank unit.

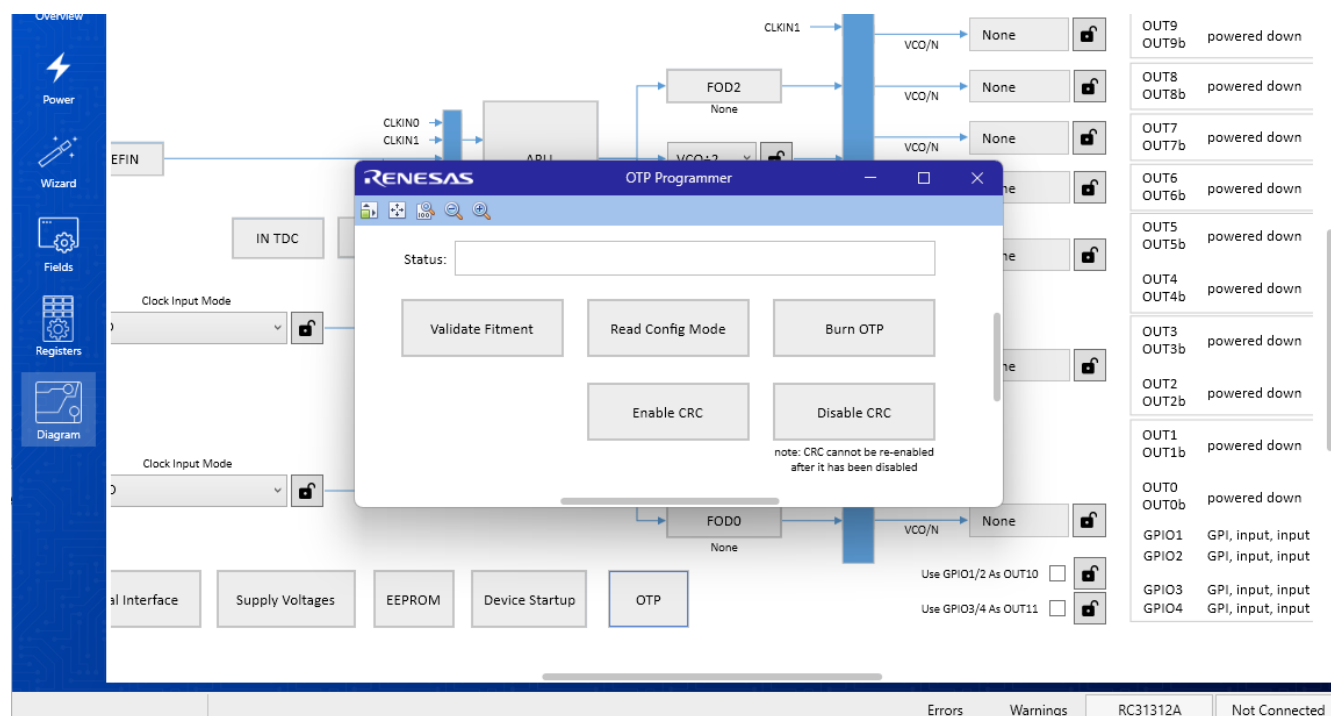


Figure 11. Program OTP

## 2. Programmer Board (PRB)

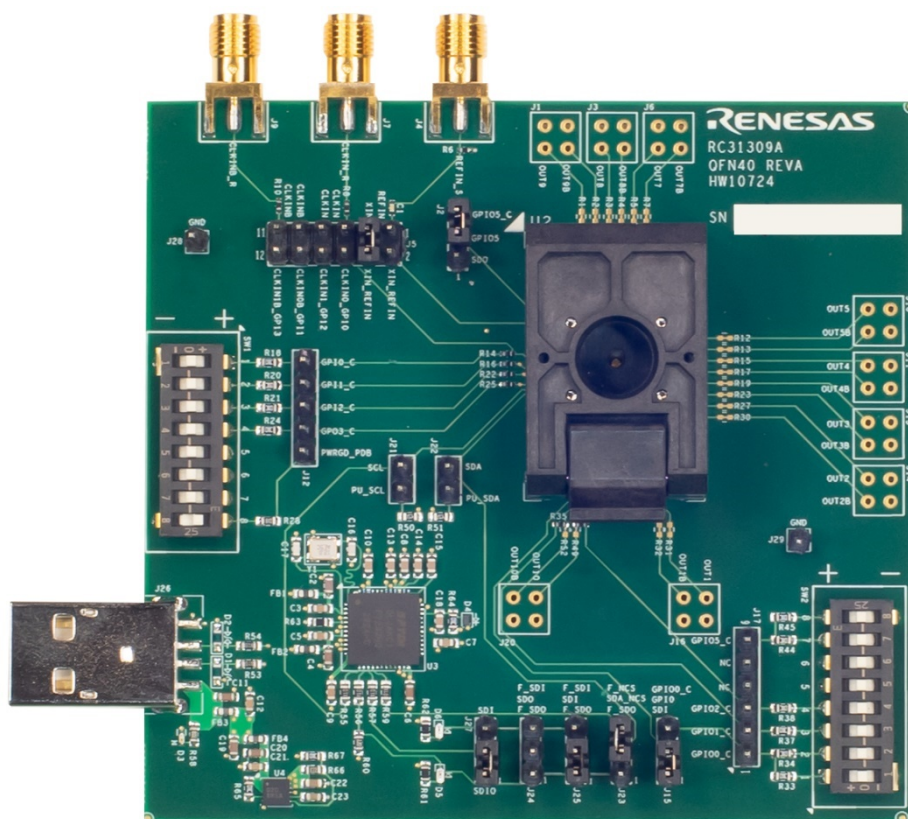


Figure 12. RC31309A Programmer Board (Top)

### 2.1 Schematic

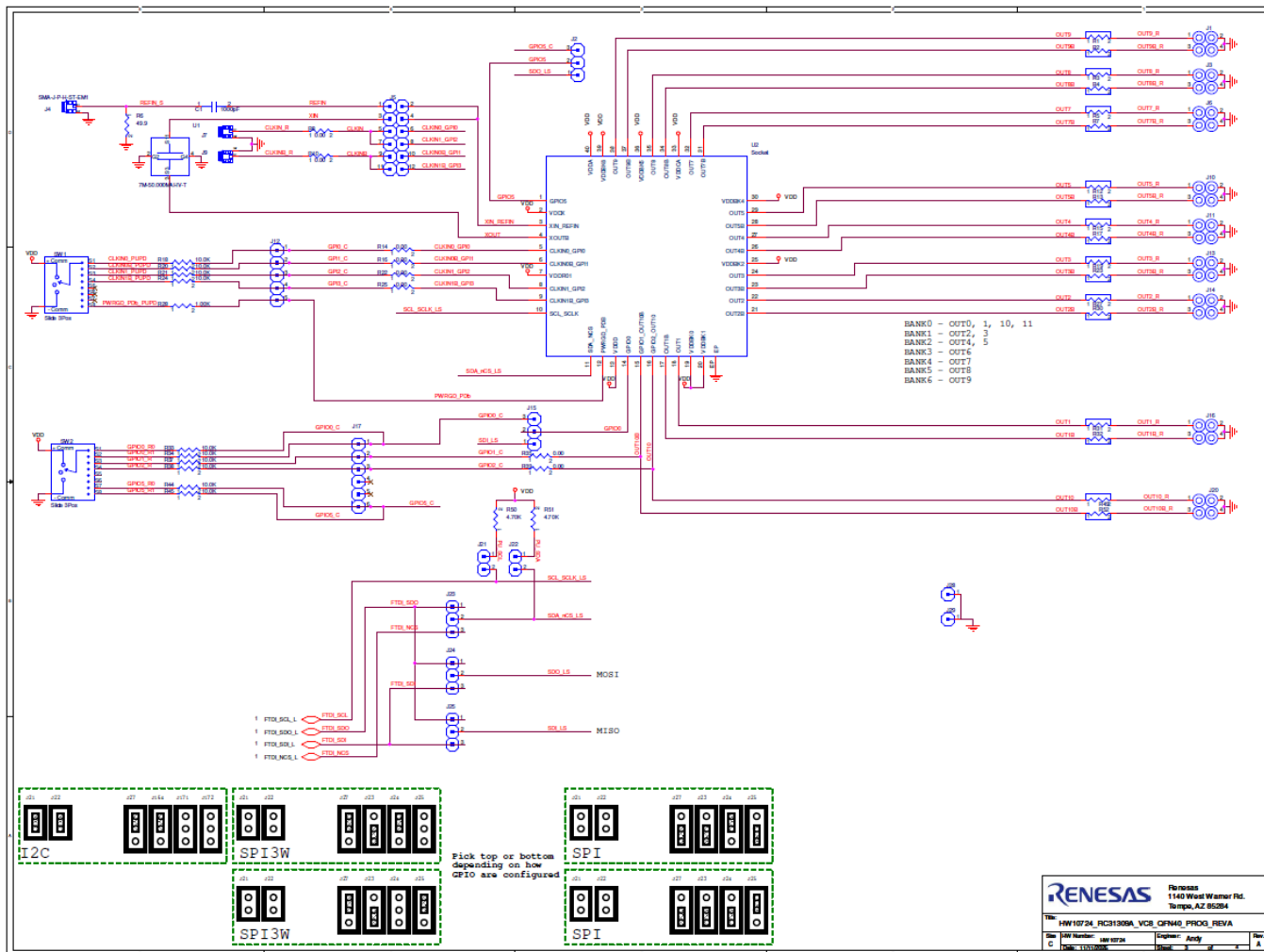
Can be found at the end of this document.

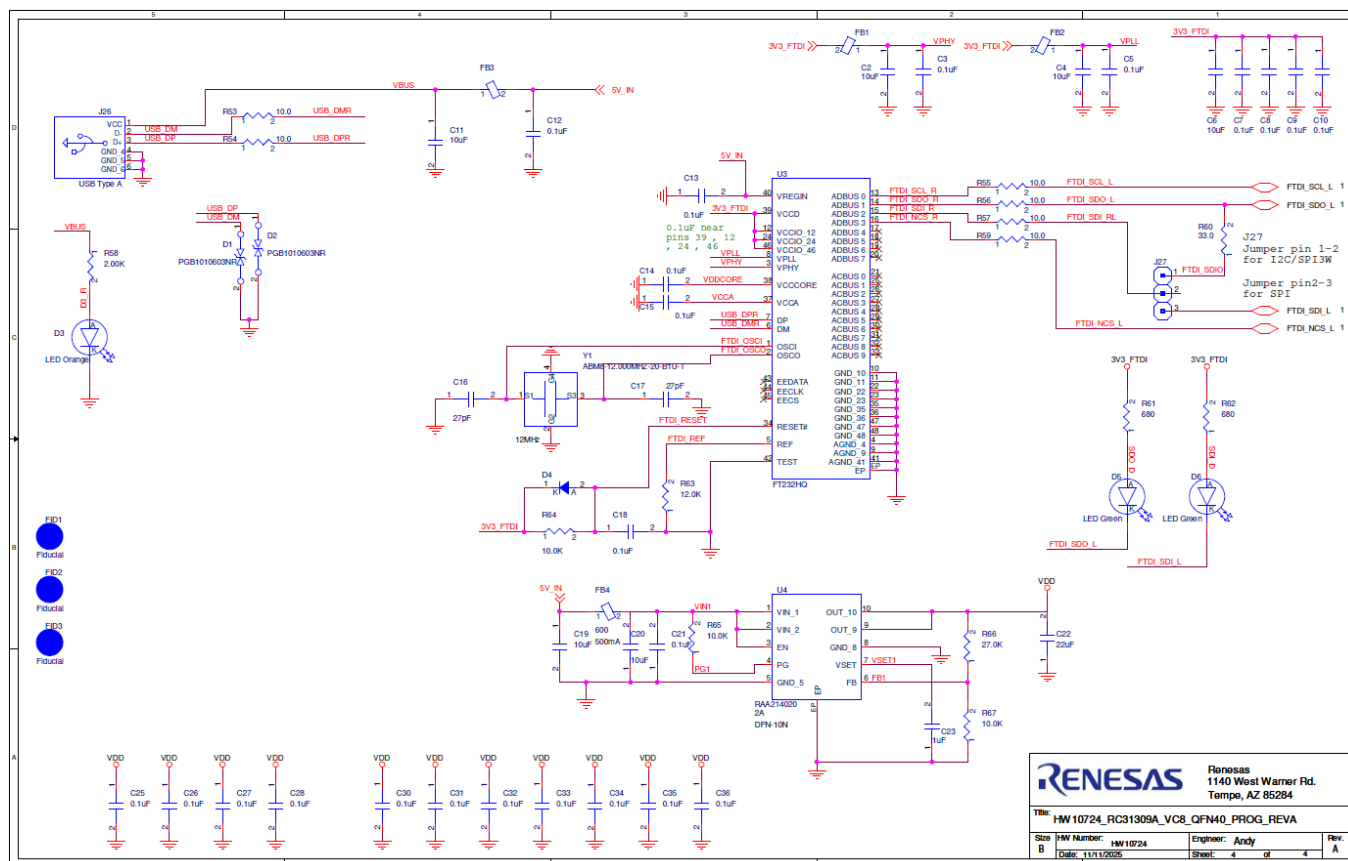
### 2.2 Bill of Materials

| Qty | Part Reference                              | Description                 | Manufacturer       | Part Number        |
|-----|---------------------------------------------|-----------------------------|--------------------|--------------------|
| 1   | C1                                          | COG Surface Mount Capacitor | Murata Electronics | GRM1555C1E102JA01D |
| 6   | C2,C4,C6,C11,C19,C20                        | X7R Surface Mount Capacitor | Murata Electronics | GRM188Z71A106KA73D |
| 12  | C3,C5,C7,C8,C9,C10,C12,C13,C14,C15,C18,C21  | X7R Surface Mount Capacitor | Murata Electronics | GCM188R71E104KA57D |
| 2   | C16,C17                                     | COG Surface Mount Capacitor | Murata Electronics | GRM1885C1H270J     |
| 1   | C22                                         | X5R Surface Mount Capacitor | Samsung            | CL10A226MO7JZNC    |
| 1   | C23                                         | X5R Surface Mount Capacitor | Murata Electronics | GRM188R61E105K     |
| 11  | C25,C26,C27,C28,C30,C31,C32,C33,C34,C35,C36 | X7R Surface Mount Capacitor | Murata Electronics | GCM155R71E104KE02D |

| Qty | Part Reference                                                        | Description                                                                                                    | Manufacturer           | Part Number                |
|-----|-----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|------------------------|----------------------------|
| 2   | D1,D2                                                                 | Littelfuse: 150V (Typ)<br>Clamp Ipp Tvs Diode<br>Surface Mount 0603<br>(1608 Metric)                           | Littelfuse             | PGB1010603NR               |
| 1   | D3                                                                    | Kingbright: Orange 0402                                                                                        | Kingbright             | APHHS1005LSECK/J4-PF       |
| 1   | D4                                                                    | Surface Mount Fast<br>Switching Diode:<br>Io=95mA, Vr=80V, trr=4ns                                             | Diodes<br>Incorporated | 1N4448HLP                  |
| 2   | D5,D6                                                                 | OSRAM: Green 570nm<br>LED Indication - Discrete<br>1.8V 2-SMD, Flat Lead                                       | OSRAM                  | KG DELLS1.22-JGKH-24-0-2-S |
| 4   | FB1,FB2,FB3,FB4                                                       | MURATA: Ferrite Bead<br>600 Ohm 0603                                                                           | Murata                 | BLM18AG601SN1D             |
| 9   | J1,J3,J6,J10,J11,J13,J14,J16,J20                                      | Test Point : 2x2,<br>C152H76, 4 position<br>100Mils (2.54mm)                                                   |                        | DNI                        |
| 6   | J2,J15,J23,J24,J25,J27                                                | Molex: Header, Gold,<br>Unshrouded, Breakaway,<br>100mil pitch, 0.240 inch<br>contact mating length            | Molex                  | 22-28-4033                 |
| 3   | J4,J7,J9                                                              | Samtec: SMA JACK STR<br>50 OHM EDGE MNT, Fits<br>0.062" board                                                  | Samtec                 | SMA-J-P-H-ST-EM1           |
| 1   | J5                                                                    | Molex C-Grid Header<br>Dual, Gold, Unshrouded,<br>Breakaway, 100mil pitch                                      | Molex                  | 10-89-7120                 |
| 1   | J12                                                                   | Molex: Header, Gold,<br>Unshrouded, Breakaway,<br>100mil pitch, 0.240 inch<br>contact mating length            | Molex                  | 22-28-4053                 |
| 1   | J17                                                                   | Molex: Header, Gold,<br>Unshrouded, Breakaway,<br>100mil pitch, 0.240 inch<br>contact mating length            | Molex                  | 22-28-4064                 |
| 2   | J21,J22                                                               | Molex: Header, Gold,<br>Unshrouded, Breakaway,<br>100mil pitch, 0.240 inch<br>contact mating length            | Molex                  | 22-28-4023                 |
| 1   | J26                                                                   | TE: USB-A (USB TYPE-<br>A) USB 2.0 Plug<br>Connector 4 Position<br>Surface Mount, Right<br>Angle; Through Hole | TE Connectivity        | 1734028-1                  |
| 2   | J28,J29                                                               | Amphenol: Connector<br>Header Through Hole 1<br>position                                                       | Amphenol               | 68000-401HLF               |
| 18  | R1,R2,R3,R4,R5,R7,R12,R13,R15,R17,R19,R<br>23,R27,R30,R31,R32,R49,R52 | Surface Mount Resistor<br>Shorted                                                                              |                        | DNI                        |
| 1   | R6                                                                    | Surface Mount Resistor                                                                                         | Panasonic              | ERA-2AEB49R9X              |
| 8   | R8,R10,R14,R16,R22,R25,R35,R39                                        | Surface Mount Resistor                                                                                         | Panasonic              | ERJ-2GE0R00X               |

| Qty | Part Reference                                      | Description                                                                                                                | Manufacturer | Part Number             |
|-----|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|--------------|-------------------------|
| 13  | R18,R20,R21,R24,R33,R34,R37,R38,R44,R45,R64,R65,R67 | Surface Mount Resistor                                                                                                     | Vishay       | CRCW060310K0FKEA        |
| 1   | R28                                                 | Surface Mount Resistor                                                                                                     | Vishay       | CRCW06031K00FKTA        |
| 2   | R50,R51                                             | Surface Mount Resistor                                                                                                     | Vishay       | CRCW06034K70FK          |
| 6   | R53,R54,R55,R56,R57,R59                             | Surface Mount Resistor                                                                                                     | Vishay       | CRCW060310R0FK          |
| 1   | R58                                                 | Surface Mount Resistor                                                                                                     | Vishay       | CRCW06032K00FK          |
| 1   | R60                                                 | Surface Mount Resistor                                                                                                     | Vishay       | CRCW060333R0FK          |
| 2   | R61,R62                                             | Surface Mount Resistor                                                                                                     | Vishay       | CRCW0603680RFKEA        |
| 1   | R63                                                 | Surface Mount Resistor                                                                                                     | Vishay       | CRCW060312K0FK          |
| 1   | R66                                                 | Surface Mount Resistor                                                                                                     | Vishay       | CRCW060327K0FK          |
| 2   | SW1,SW2                                             | E-Switch: Dip Switch<br>SPST 8 Position Through<br>Hole Slide (Standard)<br>Actuator 100mA 50VDC                           | E-Switch     | KAD08LHGT               |
| 1   | U1                                                  | TXC: 50 MHz $\pm 30$ ppm<br>Crystal 8pF 60 Ohms 4-<br>SMD, No Lead                                                         | TXC          | 7M-50.000MAHV-T         |
| 1   | U2                                                  | HMILU: LGA40-P0.4-<br>5X5X0.9                                                                                              | HMILU        | DNI                     |
| 1   | U3                                                  | FTDI: Single Channel Hi-<br>Speed USB to<br>Multipurpose UART/FIFO<br>IC                                                   | FTDI         | FT232HQ-REEL            |
| 1   | U4                                                  | Renesas: Low noise, high<br>PSRR, low dropout<br>voltage regulator. It<br>accepts a input voltage<br>range of 2.7V to 5.5V | Renesas      | RAA214020               |
| 1   | Y1                                                  | Abracon: 12MHz $\pm 10$ ppm<br>Crystal 20pF 120 Ohms<br>4-SMD, No Lead                                                     | Abracon      | ABM8-12.000MHZ-20-B1U-T |





### 3. Ordering Information

| Part Number  | Description               |
|--------------|---------------------------|
| RC31309-PROG | RC31309A Programmer Board |

## 4. Revision History

| Revision | Date         | Description      |
|----------|--------------|------------------|
| 1.00     | Jul 28, 2026 | Initial release. |

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