

# ForgeFPGA

## SLG7SC4 Socket Card #4

### Description

ForgeFPGA™ Socket Card #4 is designed for emulation and prototyping of ForgeFPGA integrated circuits.

### Specifications

The ForgeFPGA Socket Card #4 provides a connection between the pins of a ForgeFPGA and a development board. This board can be used for design prototyping with various boot modes. The Socket Card supports the PMOD standard, allowing the connection of different PMOD adapters.

### Features

- QFN-40 package compatibility
- Programming and emulation
- Standalone boot option
- Onboard 4-Mbit SPI flash
- PMOD connectors
- Clock generator from 2.5kHz to 200MHz
- Standalone power connectors

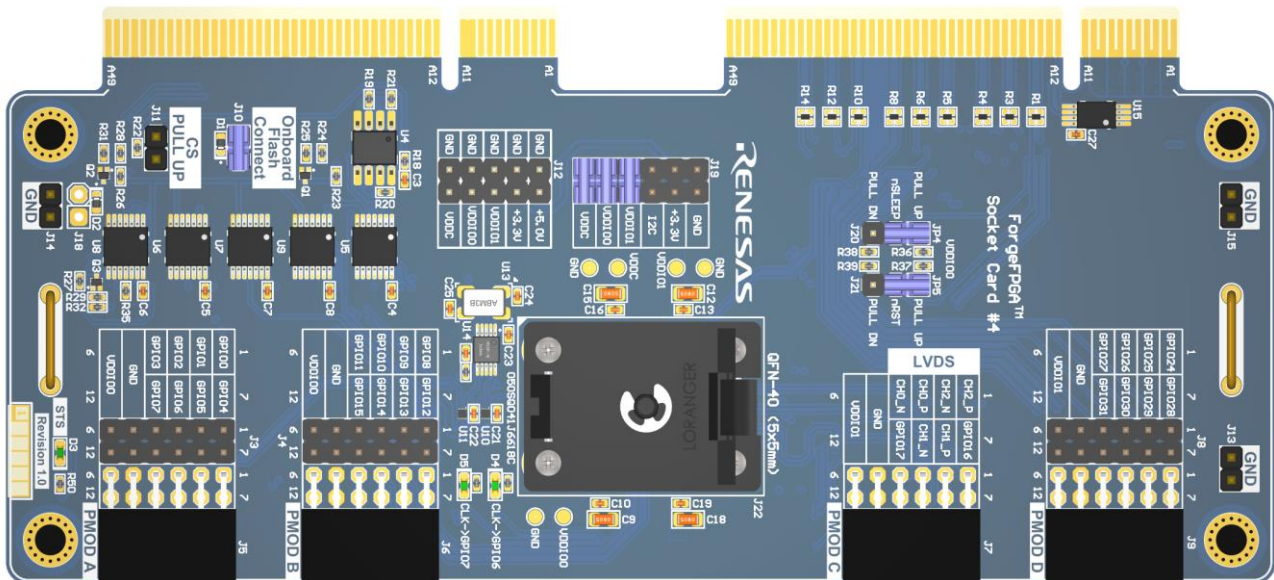


Figure 1. ForgeFPGA Socket Card #4

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# 1. Functional Description

**Figure 2** shows the board view and identifies its main components. This board can be used in conjunction with the Go Configure Development Board using the Dual Interaction Connector to transmit and process signals. It can also operate as a standalone unit. The chip can be powered either by the development board or through the External Power connector, and signals on the GPIO are accessible through the 12-pin GPIO connectors or PMOD connectors.

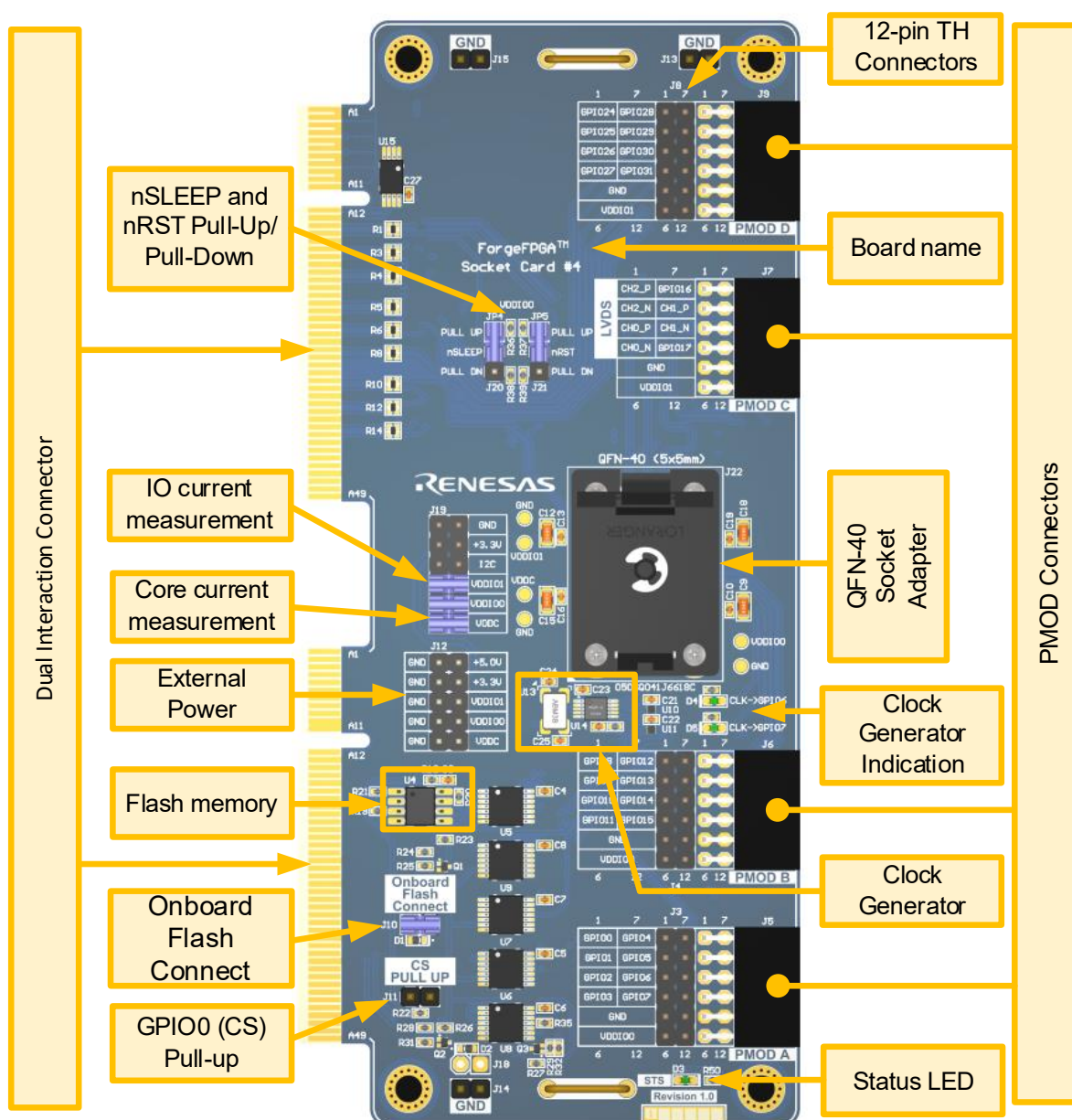


Figure 2. ForgeFPGA Socket Card #4 Components

## 1.1 PMOD and GPIO Connectors

Access to the socket pins is provided through the GPIO and PMOD connectors, both of which share the same pinout. *Note:* Programming signals from the Interaction Connector to the GPIO/PMOD are gated during programming and emulation entry sequences.

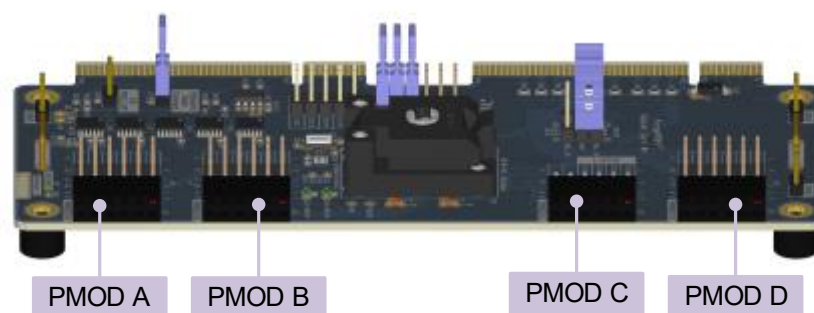


Figure 3. PMOD and GPIO Connector

Table 1 and Table 2 show the PMOD and external connectors pinout and characteristics.

Table 1. PMOD A-D and External Connectors Pinout

| PMOD PIN # | PIN Name    |             |                 |             |
|------------|-------------|-------------|-----------------|-------------|
|            | GPIO/PMOD A | GPIO/PMOD B | GPIO/PMOD C     | GPIO/PMOD D |
| 1          | GPIO0       | GPIO8       | LVDS_2_P/GPIO23 | GPIO24      |
| 2          | GPIO1       | GPIO9       | LVDS_2_N/GPIO22 | GPIO25      |
| 3          | GPIO2       | GPIO10      | LVDS_0_P/GPIO19 | GPIO26      |
| 4          | GPIO3       | GPIO11      | LVDS_0_N/GPIO18 | GPIO27      |
| 5          | GND         | GND         | GND             | GND         |
| 6          | VDDIO0      | VDDIO0      | VDDIO1          | VDDIO1      |
| 7          | GPIO4       | GPIO12      | GPIO16          | GPIO28      |
| 8          | GPIO5       | GPIO13      | LVDS_1_P/GPIO21 | GPIO29      |
| 9          | GPIO6       | GPIO14      | LVDS_1_N/GPIO20 | GPIO30      |
| 10         | GPIO7       | GPIO15      | GPIO17          | GPIO31      |
| 11         | GND         | GND         | GND             | GND         |
| 12         | VDDIO0      | VDDIO0      | VDDIO1          | VDDIO1      |

Table 2. GPIO and PMOD Connector Characteristics

| Parameter | Description                  | Min  | Typ | Max   | Unit     |
|-----------|------------------------------|------|-----|-------|----------|
| $I_L$     | Input leakage current        | -    | 2   | -     | $\mu A$  |
| $C_{IO}$  | Input-Output Pin Capacitance | -    | 7   | -     | pF       |
| $R_{ON}$  | Series Resistance            | -    | 25  | 52    | $\Omega$ |
| $V_{IN}$  | Input Voltage                | -0.5 | -   | VDDIO | V        |

## 1.2 ForgeFPGA Current Measuring

ForgeFPGA Socket Card #4 also includes an option for measuring IC power consumption. To perform this measurement, remove the jumpers (as shown on Figure 4) and connect a current meter in their place. The

typical load should not exceed 200mA. Under normal operation, when current measurement is not required, the jumpers should remain installed on the board.

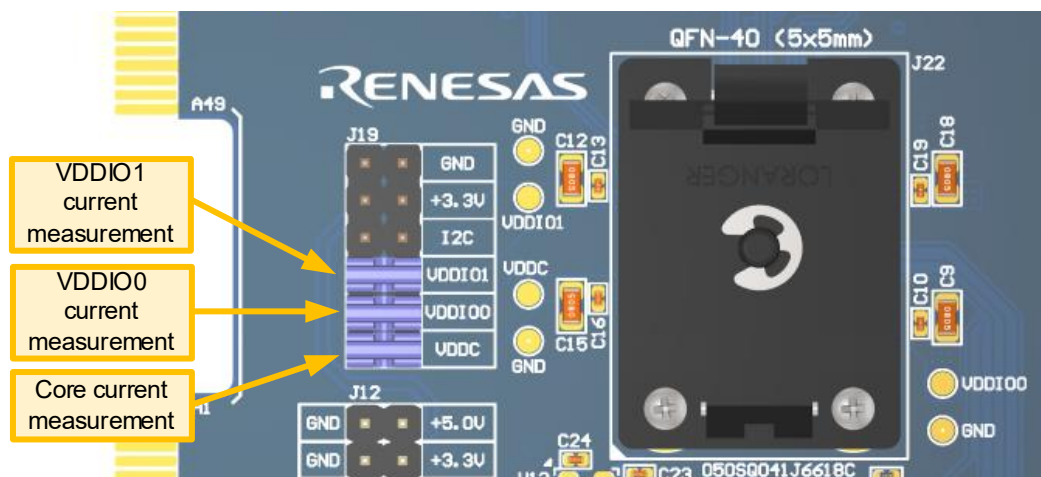


Figure 4. ForgeFPGA Current Measurement Setup

## 1.3 SPI Interface between ForgeFPGA and Flash Memory

Figure 5 shows the SPI flash interface connection between ForgeFPGA IC and Flash Memory.

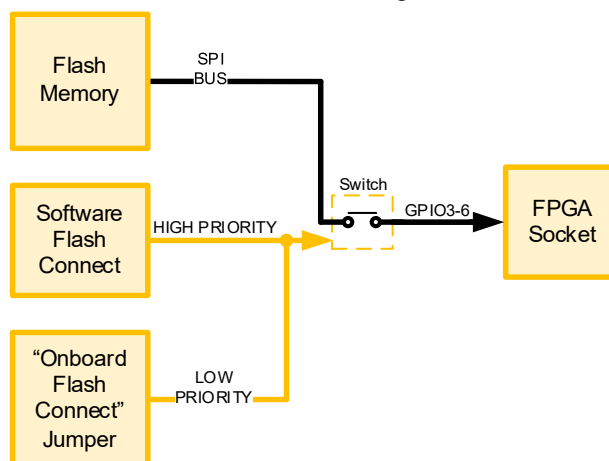
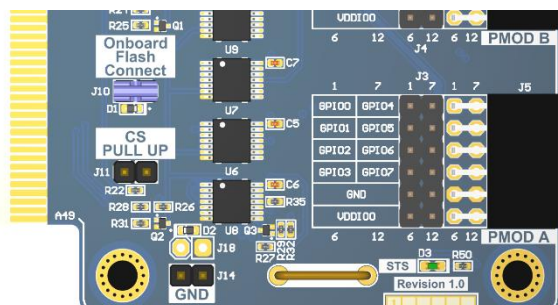


Figure 5. SPI interface Connection

The Onboard Flash Connect and CS PULL UP jumpers should be installed when using the board with the development board. *Note:* Jumper removal or configuration changes are overridden and controlled by the development board. The table in Figure 6 shows the correct jumper setup for standalone operation.



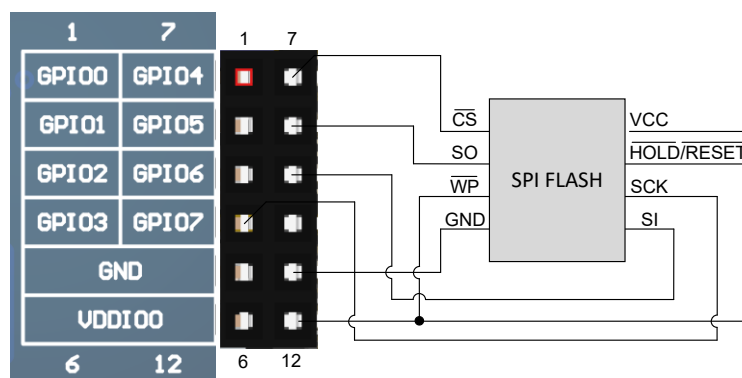


Figure 7. Connection of External Flash Memory to PMOD A

## 1.4 External Power Connector

ForgeFPGA Socket Card #4 can also operate with an external power supply. In this case, four separate power supply channels must be connected to the External Power (J14) connector (shown in **Figure 8**). The voltage and current levels for VDDIO0, VDDIO1, and VDDC must comply with the ForgeFPGA IC specifications. The 5.0V terminal should be supplied with 5.0V to power the commutation switches. The external power supply option can only be used when the Socket Card is not connected to the Go Configure Development Board.

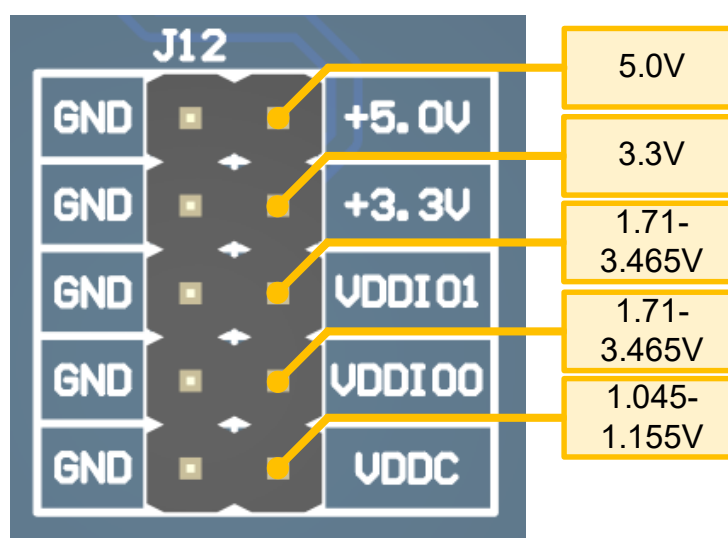


Figure 8. External Power Connector Pinout

## 1.5 Clock Generator

ForgeFPGA Socket Card #4 has I<sup>2</sup>C Programmable CMOS Clock Generator – Si5351A-B-GTR.

It is used to drive PLL input of ForgeFPGA – GPIO6 and GPIO7.

**Table 3** shows the main characteristics of the Clock Generator.

Table 3. Main Characteristics of Clock Generator

| Parameter        | Description                               | Min    | Typ   | Max | Unit      |
|------------------|-------------------------------------------|--------|-------|-----|-----------|
| F <sub>CLK</sub> | Frequency Range                           | 0.0025 | -     | 200 | MHz       |
| J <sub>PER</sub> | Period Jitter                             | -      | 70    | 155 | ps, pk-pk |
| V <sub>DDX</sub> | Output Buffer Voltage                     | -      | VDDIO | -   | V         |
| I <sub>DDX</sub> | Output Buffer Supply Current (Per Output) | -      | 2.2   | 5.6 | mA        |

## 1.6 Status LED

The status LED indicates the current operation being performed on the chip (see **Table 4**).

**Table 4. Status LED Description**

| Chip Standard Operations | Flash Operations |
|--------------------------|------------------|
| Read                     | Read             |
| Program                  | Program          |
| Emulation                | Erase            |
| Test Mode                | Test Mode        |

The position of the Status LED (D1) is shown on **Figure 9**.



**Figure 9. Status LED**

## 2. Working with ForgeFPGA Products

To start working with ForgeFPGA products using the Socket Card, two methodologies are available:

- Using the Go Configure Development Board.
- In standalone mode, where the ForgeFPGA configuration is downloaded from the onboard SPI flash.

### 2.1 Standalone Working Mode

As previously described, ForgeFPGA can boot from onboard flash as an SPI host. There are two ways of programming onboard flash: program with the development board or program the flash IC manually. The programming pins for the flash chip are accessible through the PMOD A connector. To program manually, the Socket Card must be powered using the EXT Power connector. If the VDDIO voltage is equal to or greater than 3.0V, the 5V and VDDIO pins can be powered from the same source.

During this operation, the ForgeFPGA must be disabled by applying logic LOW to the nRST pin. Additionally, the Onboard Flash Connect and CS PULL UP jumpers must be installed. If the SPI flash is programmed correctly, setting logic HIGH to both the nRST and nSLEEP pins allows the ForgeFPGA to boot from the SPI flash.

### 2.2 Configuration with Go Configure Development Board

To begin working with ForgeFPGA products, connect the platform to a PC using a USB Type-C cable and apply power.

**Important:** Connect the USB cable directly to the PC. Avoid using USB hubs or docking stations. Ensure the Socket Card is properly connected to the Go Configure Development Board as shown on **Figure 10**.

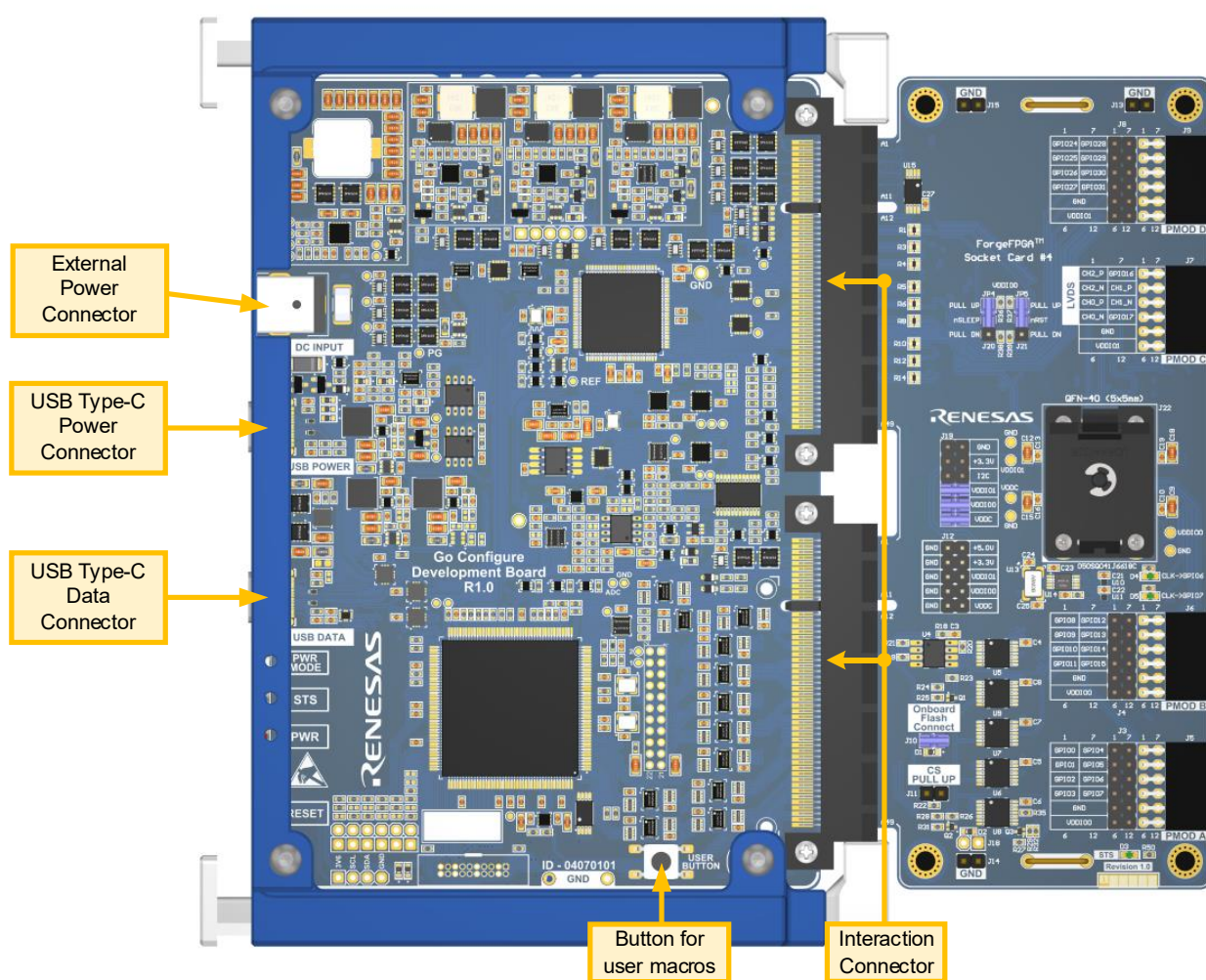


Figure 10. Development Kit

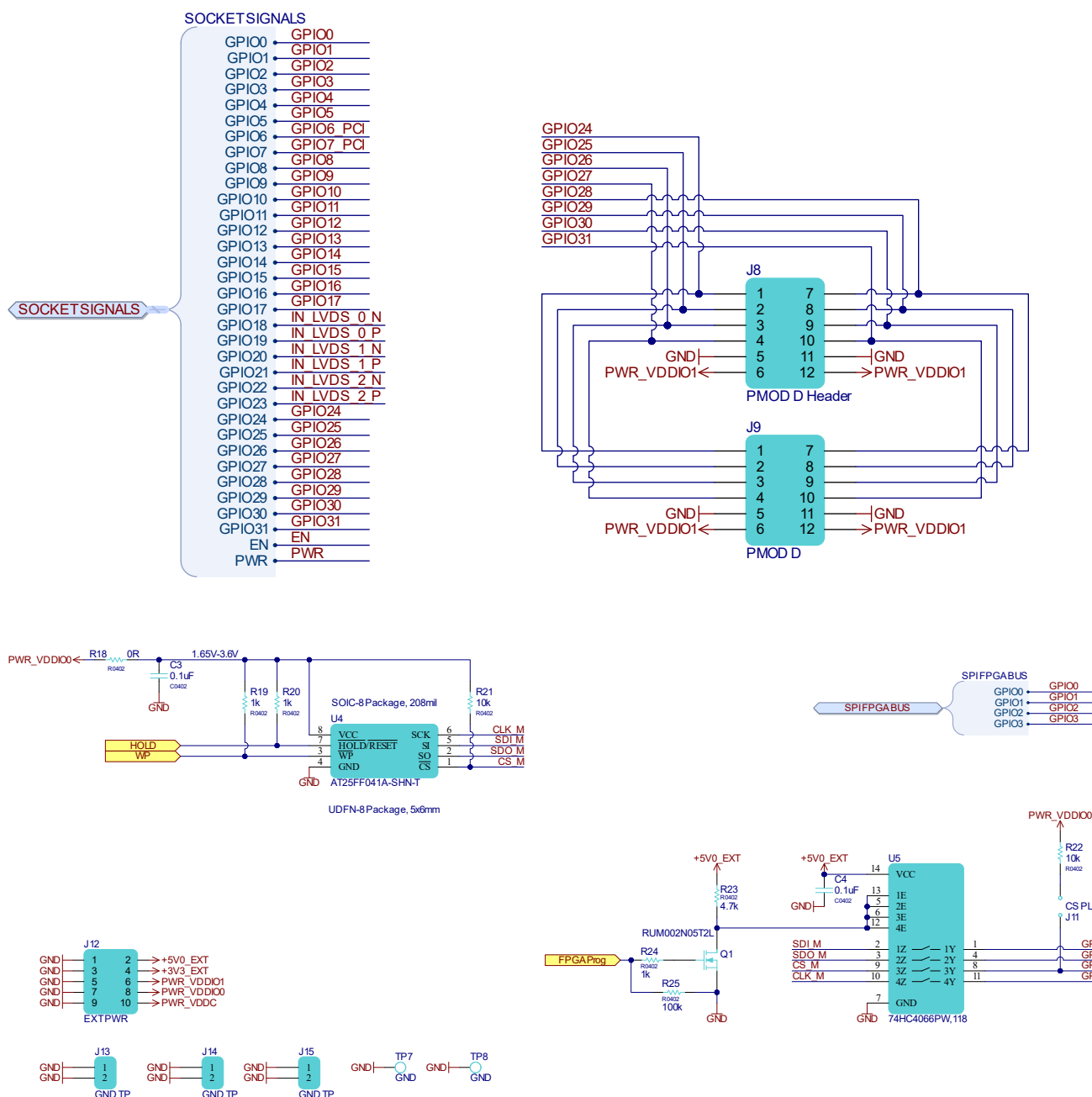
If all the connections are correct, the red LED (PWR) automatically turn on. After selecting **Go Configure Development Board** in Go Configure **Debug** tab, the blue LED blinks several times, and the HW-FW version appear in the bottom-left corner of the debugging control window.

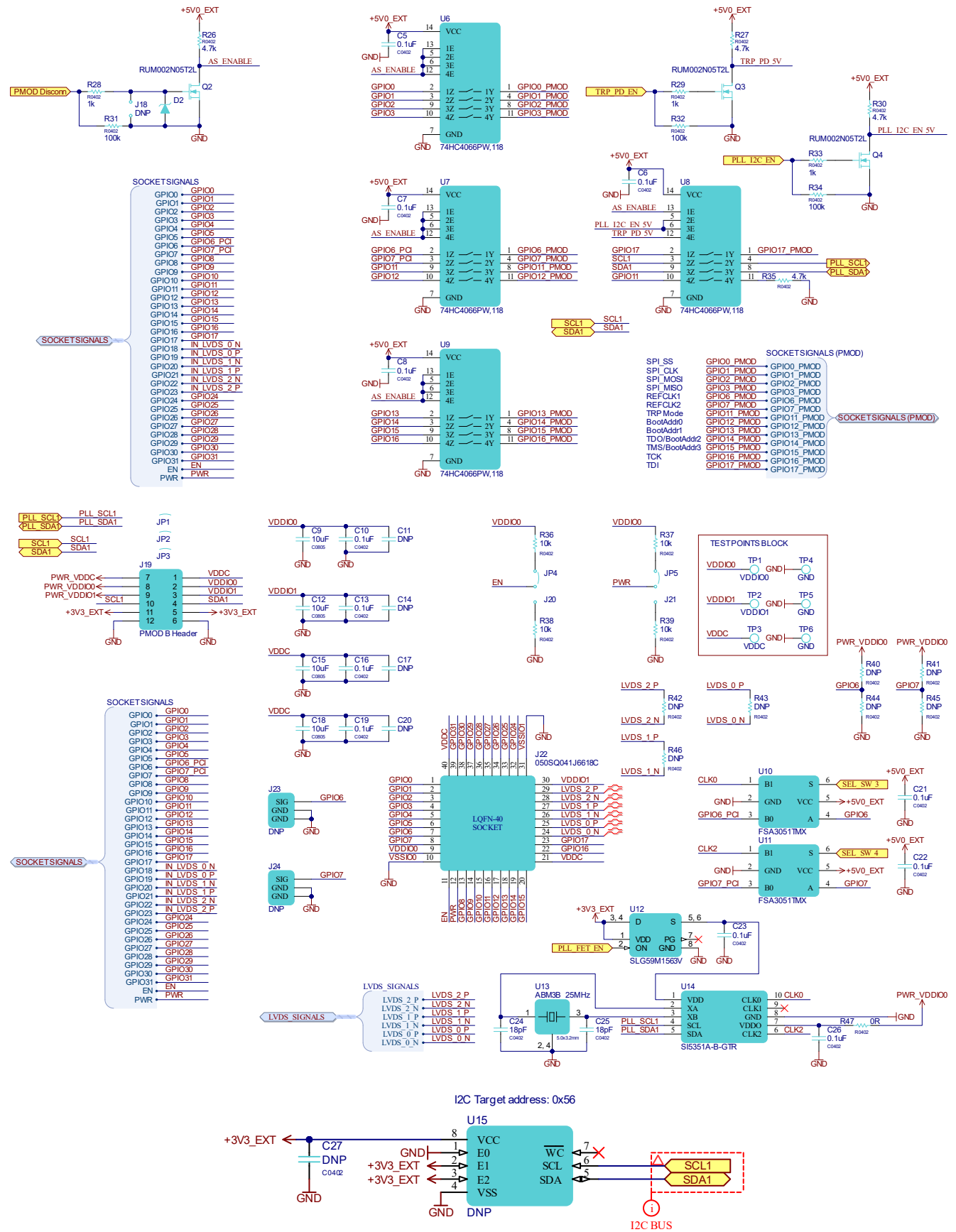
The following debug options are available:

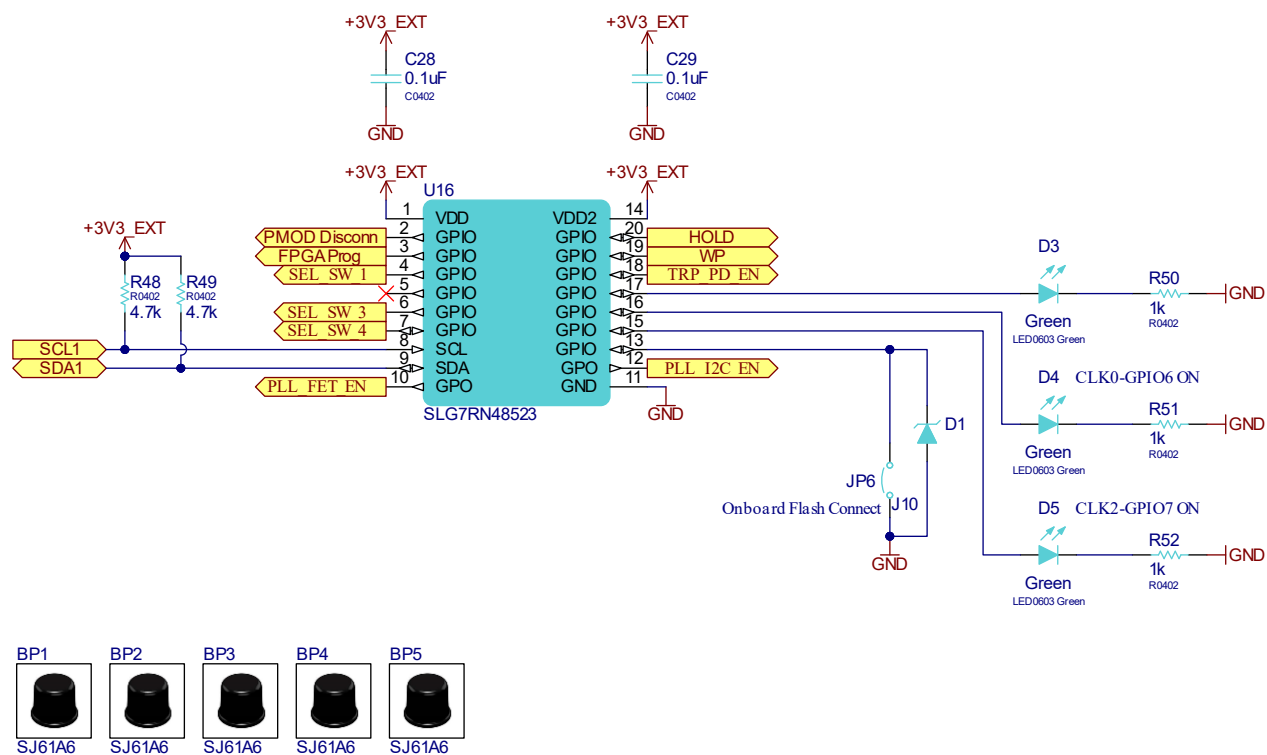
- Emulation – allows debugging of the current project. This mode is available only after synthesis and bitstream generation in the FPGA Editor.
- Test Mode – enables debugging of a programmed project.
- Test Mode\* – used to debug a project loaded from SPI Flash.
- Read – reads the configuration from the programmed chip and opens the project in a new software instance or in the Project Data window of the current instance.
- Program – programs the chip with the current project.
- TP Map – displays the test point map in the workspace, reflecting the physical test points on the development platform.

More detailed information about Go Configure software can be found in [Go Configure™ Software Hub User Guide](#).









## 4. Bill Of Materials

| #  | Designator                                        | Manufacturer Part Number | Manufacturer                    | Quantity |
|----|---------------------------------------------------|--------------------------|---------------------------------|----------|
| 1  | BP1, BP2, BP3, BP4, BP5                           | SJ61A6                   | 3M                              | 5        |
| 2  | C1, C2                                            | GCM155R71C104KA55D       | Murata                          | 2        |
| 3  | C3-C8, C10, C13, C16, C19, C21-C23, C26, C28, C29 | GCM155R71C104KA55D       | Murata                          | 16       |
| 4  | C9, C12, C15, C18                                 | GRM21BR61C106KE15L       | Murata                          | 4        |
| 5  | C11, C14, C17, C20, C27                           | DNP                      | DNP                             | 5        |
| 6  | C24, C25                                          | CL05C180JB5NNNC          | Samsung                         | 2        |
| 7  | D1, D2                                            | DESD5V0U1BB-7            | Diodes                          | 2        |
| 8  | D3, D4, D5                                        | 150060GS75000            | Wurth Electronics               | 3        |
| 9  | J3, J4, J8, J19                                   | 67996-212HLF             | Amphenol ICC / FCI              | 4        |
| 10 | J5, J6, J7, J9                                    | PPPC062LJBN-RC           | Sullins                         | 4        |
| 11 | J10, J11                                          | 68000102HLF              | Amphenol ICC / FCI              | 2        |
| 12 | J12                                               | 67997210HLF              | Amphenol ICC / FCI              | 1        |
| 13 | J13, J14, J15                                     | 68000102HLF              | Amphenol ICC / FCI              | 3        |
| 14 | J18                                               | DNP                      | DNP                             | 1        |
| 15 | J20, J21                                          | HTSW-103-07-T-S          | Samtec                          | 2        |
| 16 | J22                                               | 050SQ041J6618C           | Renesas Electronics             | 1        |
| 17 | J23, J24                                          | DNP                      | DNP                             | 2        |
| 18 | JP1, JP2, JP3, JP4, JP5, JP6                      | NPC02SXON-RC             | Sullins                         | 6        |
| 19 | Q1, Q2, Q3, Q4                                    | RUM002N05T2L             | Rohm                            | 4        |
| 20 | Q5                                                | RUM002N05T2L             | Rohm                            | 1        |
| 21 | R1-R14                                            | S41X043470JP             | CTS                             | 14       |
| 22 | R15                                               | RC0402JR-074K7L          | Yageo                           | 1        |
| 23 | R16                                               | RC0402JR-071KL           | Yageo                           | 1        |
| 24 | R17                                               | RC0402JR-07100KL         | Yageo                           | 1        |
| 25 | R18, R47                                          | RC0402JR-070RL           | Yageo                           | 2        |
| 26 | R19, R20, R24, R28, R29, R33, R50, R51, R52       | RC0402JR-071KL           | Yageo                           | 9        |
| 27 | R21, R22, R36, R37, R38, R39                      | RC0402JR-0710KL          | Yageo                           | 6        |
| 28 | R23, R26, R27, R30, R35, R48, R49                 | RC0402JR-074K7L          | Yageo                           | 7        |
| 29 | R25, R31, R32, R34                                | RC0402JR-07100KL         | Yageo                           | 4        |
| 30 | R40-R46                                           | DNP                      | DNP                             | 7        |
| 31 | U1, U2, U3                                        | 74LVC4066BQ,115          | Nexperia                        | 3        |
| 32 | U4                                                | AT25FF041A-SHN-T         | Renesas                         | 1        |
| 33 | U5, U6, U7, U8, U9                                | 74HC4066PW,118           | Nexperia                        | 5        |
| 34 | U10, U11                                          | FSA3051TMX               | ON Semiconductor / Fairchild    | 2        |
| 35 | U12                                               | SLG59M1563V              | Renesas Electronics America Inc | 1        |
| 36 | U13                                               | ABM3B-25.000MHZ-D2Y-T    | Abracon                         | 1        |
| 37 | U14                                               | SI5351A-B-GTR            | Skyworks Solutions              | 1        |
| 38 | U15                                               | DNP                      | DNP                             | 1        |
| 39 | U16                                               | SLG7RN48523              | Renesas Electronics America Inc | 1        |

## 5. Revision History

| Revision | Date        | Description      |
|----------|-------------|------------------|
| 1.00     | Dec 9, 2025 | Initial release. |