CY8CKIT-005 MiniProg4 Program and Debug Kit guide

About this document

Scope and purpose

This document serves as a guide for using the CY8CKIT-005 MiniProg4 Program and Debug Kit. The document explains about the kit operation and technical description of the board.

Intended audience

For people who are interested to explore the functionality of MiniProg4.

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Table 1 Safety precautions

	**Caution:** *The evaluation or reference board contains parts and assemblies sensitive to electrostatic discharge (ESD). Electrostatic control precautions are required when installing, testing, servicing or repairing the assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with electrostatic control procedures, refer to the applicable ESD protection handbooks and guidelines.*

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1 Introduction

The MiniProg4 Program and Debug Kit is an all-in-one programmer and debugger for PSoC™ 4, PSoC™ 5LP, and PSoC™ 6 MCU devices. MiniProg4 also provides USB-I^{2}C, USB-SPI and USB-UART bridging functionality. The MiniProg4 provides a special feature enabling users to write their own custom firmware through the custom application mode.

Note: The JTAG protocol for programming and debugging is supported only in CY8CKIT-005-A revision of Miniprog4.



Figure 1 MiniProg4

1.1 Kit contents

The CY8CKIT-005 PSoC™ MiniProg4 Program and Debug Kit includes:

- MiniProg4 programmer/debugger
- 10-pin ribbon cable
- USB Type-A to Type-C cable
- Quick Start Guide

1.2 Programming and Debugging

The MiniProg4 programmer/debugger provides the flexibility to work with the SWD or JTAG programming and debugging interface. MiniProg4 supports 32-bit Arm® Cortex®-M0/M0+/M3/M4 PSoC™ devices.

The MiniProg4 debugger is supported by the software tools **PSoC™ Creator**, **ModusToolbox™ software**, **ModusToolbox™ Programming tools**, and **PSoC™ Programmer**.

1.3 Bridging

MiniProg4 supports USB-I^{2}C, USB-UART and USB-SPI as standard bridging protocols for any device. The MiniProg4 bridging capabilities are used by PSoC™ Creator, ModusToolbox™ software, ModusToolbox™ Programming tools, PSoC™ Programmer, Bridge Control Panel, and other applications. Tuning software tools such as the CAPSENSE™ tuner provided by Infineon also use these capabilities.

1.4 Documentation conventions

Table 1 Document conventions for user guides

Convention	Usage
`Courier New`	Displays file locations, user-entered text, and source code: `C:\...cd\icc\`
Italics	Displays file names and reference documentation: Read about the *sourcefile.hex* file in the *PSoC™ Designer User Guide*.
[**Bracketed, Bold**]	Displays keyboard commands in procedures: [**Enter**] or [**Ctrl**] [**C**]
File > Open	Represents menu paths: **File > Open > New Project**
Bold	Displays commands, menu paths, and icon names in procedures: Click the **File** menu, and then click **Open**.
Times New Roman	Displays an equation: 2 + 2 = 4
Text in gray boxes	Describes cautions or unique functionality of the product.

2 Installing MiniProg4

This chapter shows how to install MiniProg4 and its associated PC software.

2.1 MiniProg4

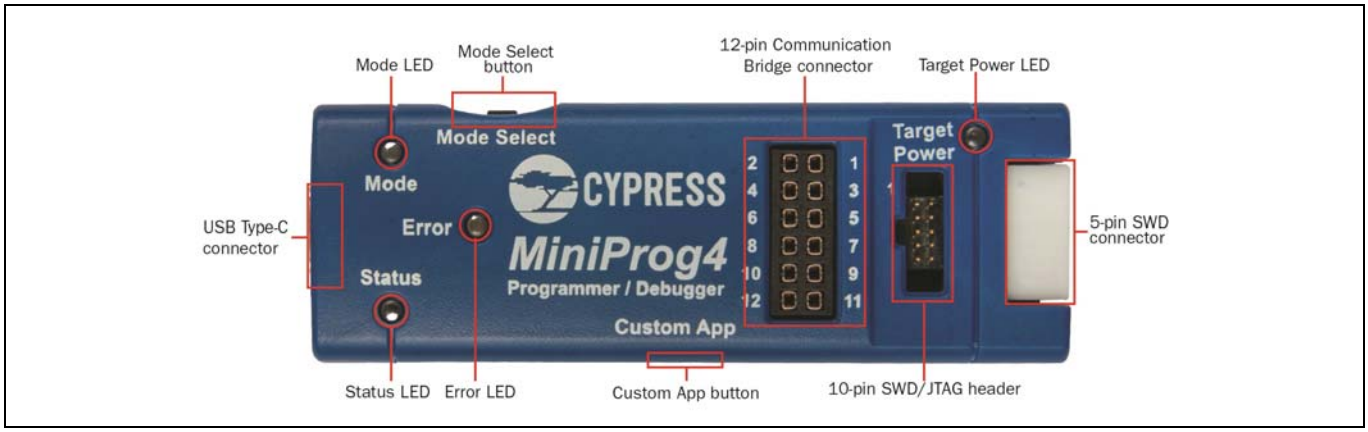


Figure 2 Top view

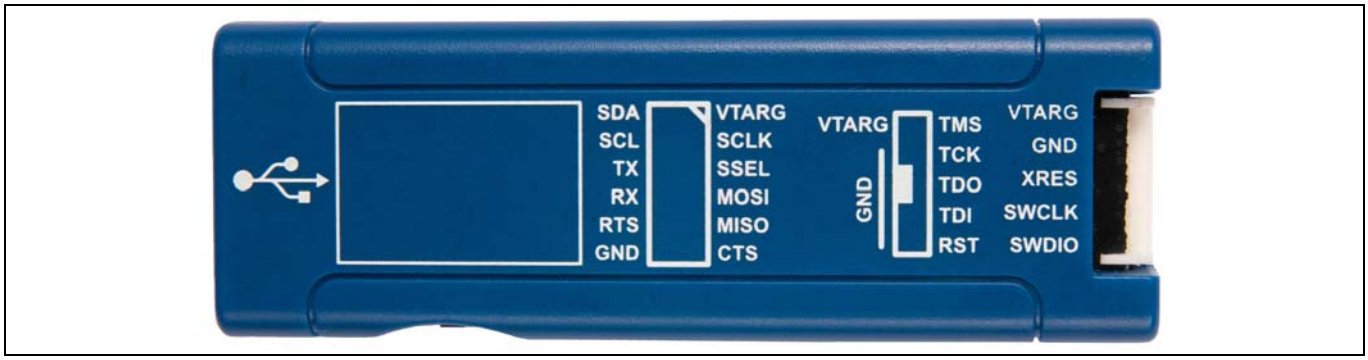


Figure 3 Bottom view

2.2 MiniProg4 installation

The MiniProg4 programmer/debugger is supported by PSoC™ Programmer, ModusToolbox™ software, ModusToolbox™ Programming tools, and PSoC™ Creator. Other software, such as Bridge Control Panel, use the PSoC™ Programmer COM layer to support MiniProg4 functionality.

Note: PSoC™ Programmer is compatible only with the Windows Operating System however, ModusToolbox™ Programming tools is compatible with Windows, macOS, and Linux. To understand the differences between PSoC™ Programmer and ModusToolbox™ Programming tools, please see the CYPRESS™ Programming Solutions page at **https://www.infineon.com/**.

1. Download and install **PSoC™ Programmer** or **ModusToolbox™ Programming tools**. Follow the on-screen instructions to install the software.
   Each programming tool supports a subset of Infineon devices. See respective tool documentation for which device each supports.
2. Launch the PSoC™ Programmer or ModusToolbox™ Programming tools and connect the MiniProg4 to computer's USB port using the provided USB cable. When properly connected, and drivers have been installed, the Mode LED either turns ON or will be ramping (slowly increasing and decreasing brightness) depending on the mode.
   Note that the MiniProg4 drivers are automatically installed.

Installing MiniProg4

3. In PSoC™ Programmer, to connect to the port, in the Port Selection pane, click the MiniProg4 device. Click on **Connect/Disconnect** button as shown in **Figure 4**.
   If the connection is successful, a status indicator in the lower-right corner of the PSoC™ Programmer window turns green and shows “Connected”.
   You can now use MiniProg4 to program the target device by clicking the **Program** button.

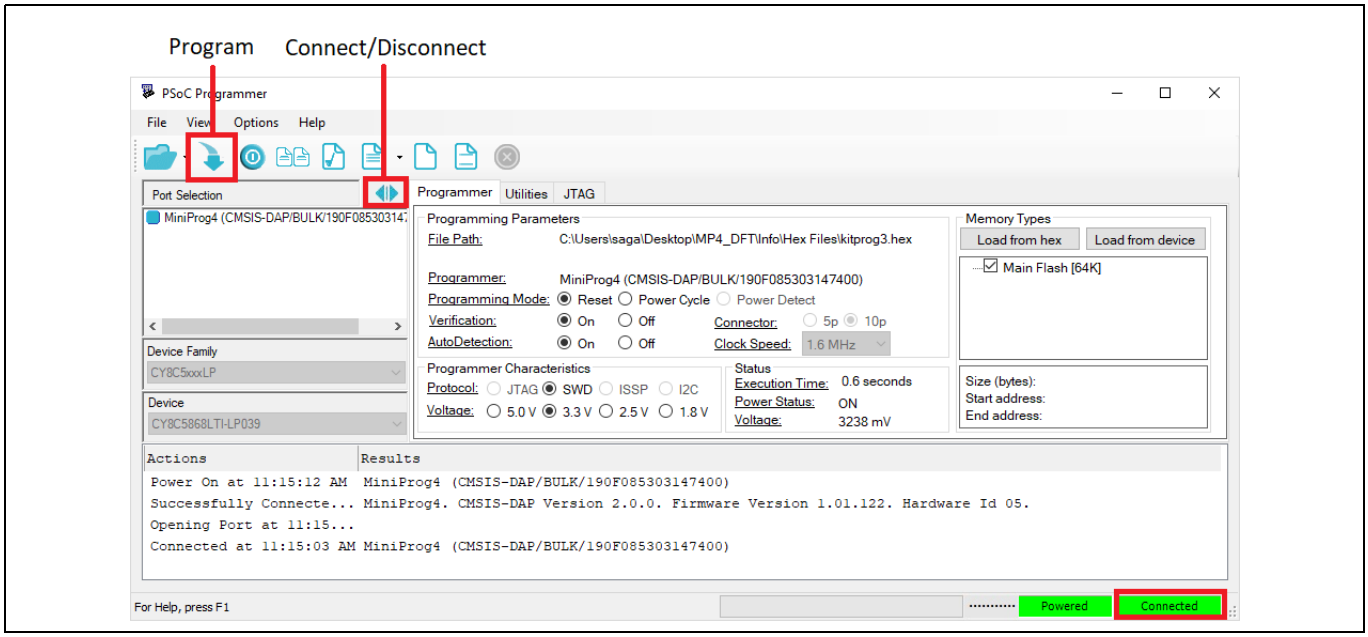


Figure 4 PSoC™ Programmer: MiniProg4 Connect/Disconnect and Program

For more information on PSoC™ Programmer, see **Help Topics** under the **Help** menu in PSoC™ Programmer or press **[F1]**.

Installing MiniProg4

In ModusToolbox™ Programming tools, to connect to the MiniProg4 probe, click **Connect/Disconnect** button as shown in **Figure 5**.

If the connection is successful, a status indicator in the lower-right corner of the ModusToolbox™ Programming tools window turns green and shows “Connected”.

MiniProg4 can be used to program the target device by clicking the **Program** button.

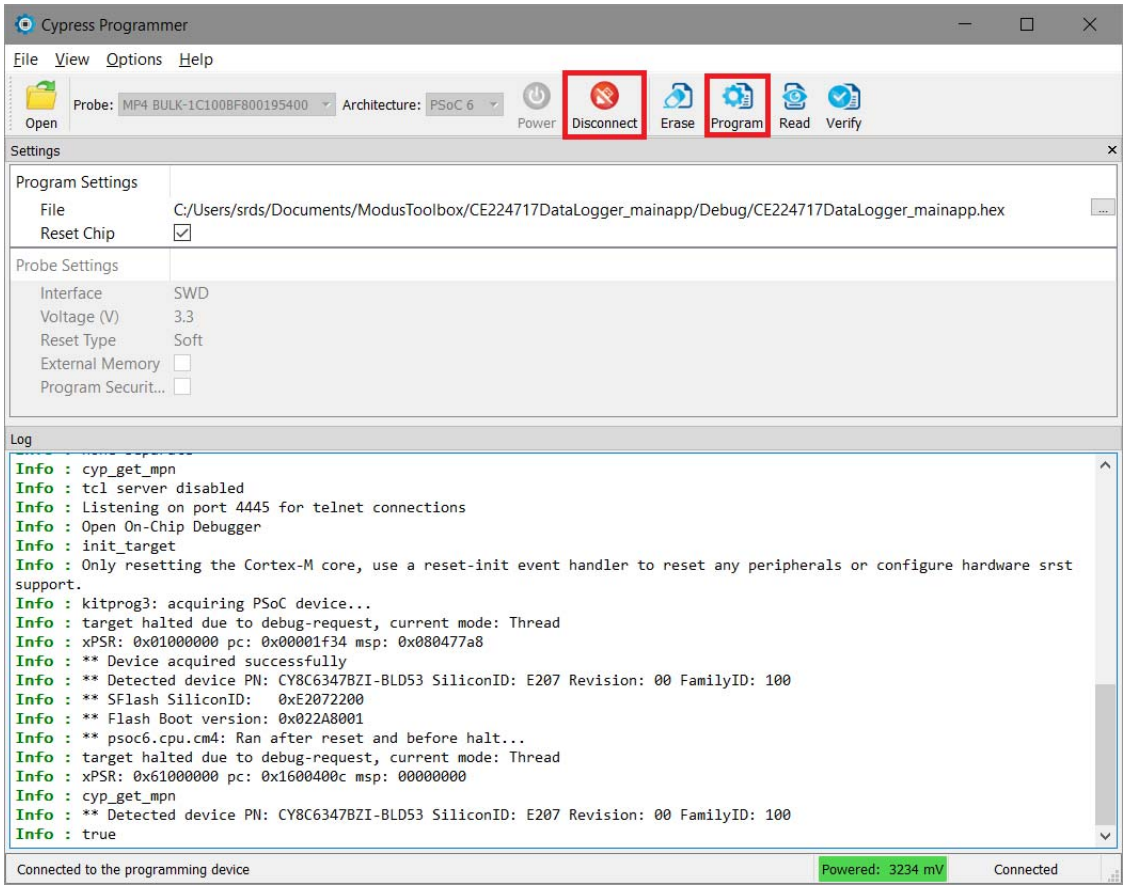


Figure 5 MiniProg4 Connect/Disconnect and program

For more information on ModusToolbox™ Programming tools, see **View Help** under the **Help** menu in ModusToolbox™ Programming tools or press **[F1]**.

2.3 MiniProg4 LEDs

MiniProg4 has three indicator LEDs - Mode (Amber), Status (Green), and Error (Red) as shown in **Figure 6**. **Table 2** indicates the behavior of these LEDs for various operations.

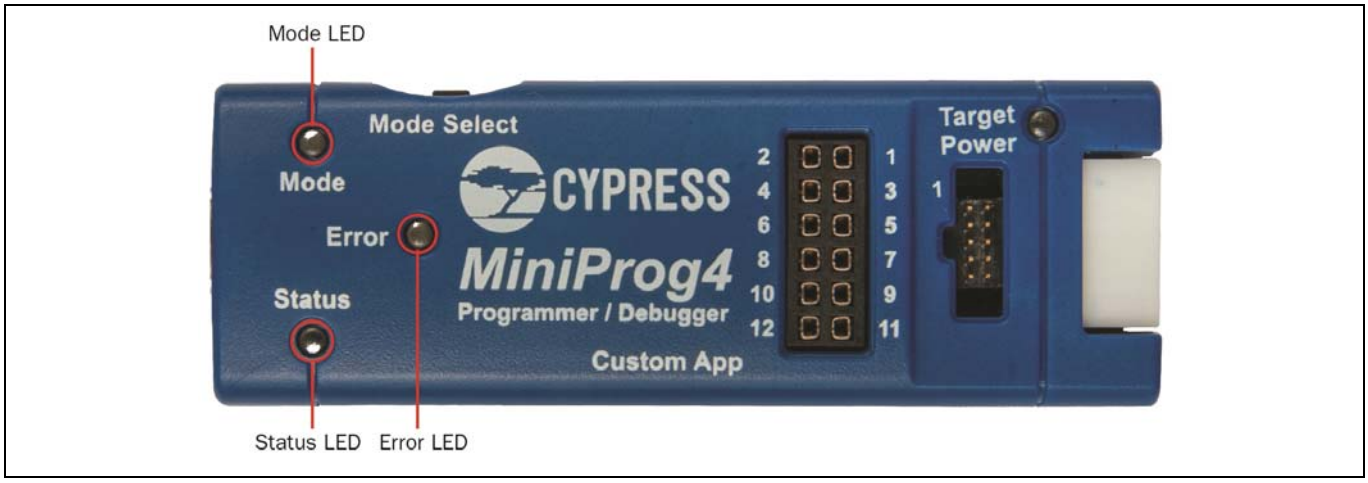


Figure 6 MiniProg4 LEDs

Table 2 LED representation for various operations of MiniProg4

Programming mode	Programming status	Three LEDs		
		Mode indicator (Amber LED)	Status indicator 1 (Green LED)	Status indicator 2 (Red LED)
CMSIS-DAP HID	Programming	Ramping (1 Hz)	8 Hz	OFF
	Success		ON	OFF
	Error		OFF	ON
	Idle		OFF	OFF
CMSIS-DAP Bulk	Programming	ON	8 Hz	OFF
	Success		ON	OFF
	Error		OFF	ON
	Idle		OFF	OFF
Bootloader	N/A	1 Hz	OFF	OFF
Custom application	N/A	8 Hz	ON	ON

2.4 MiniProg4 buttons

MiniProg4 has two buttons that enable switching between various operating modes. **Figure 7** shows the location of the buttons. In order to understand switching MiniProg4 modes, see **Figure 8**.

On power-up, MiniProg4 is in CMSIS-DAP/BULK mode by default. If the Mode Select button is pressed, MiniProg4 enters CMSIS-DAP/HID mode. If the Custom App button is pressed, MiniProg4 enters the custom application mode, where a user can run their own custom applications on the MCU contained in the MiniProg4, see **Figure 8**.

For details on LED indications of various modes of MiniProg4, see **Table 2**.

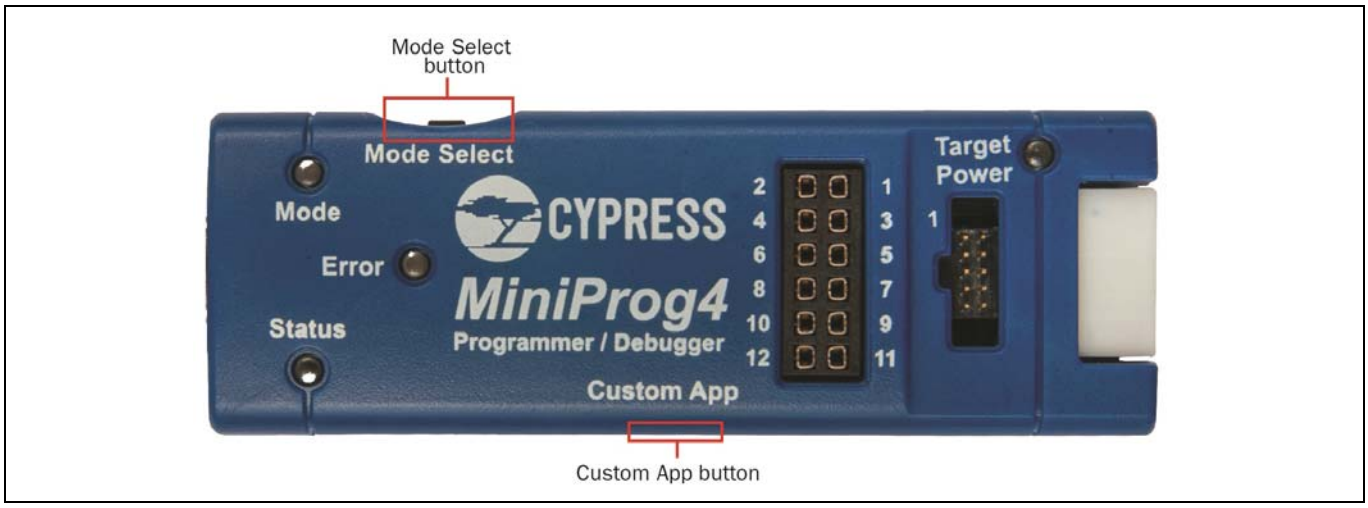


Figure 7 MiniProg4 buttons

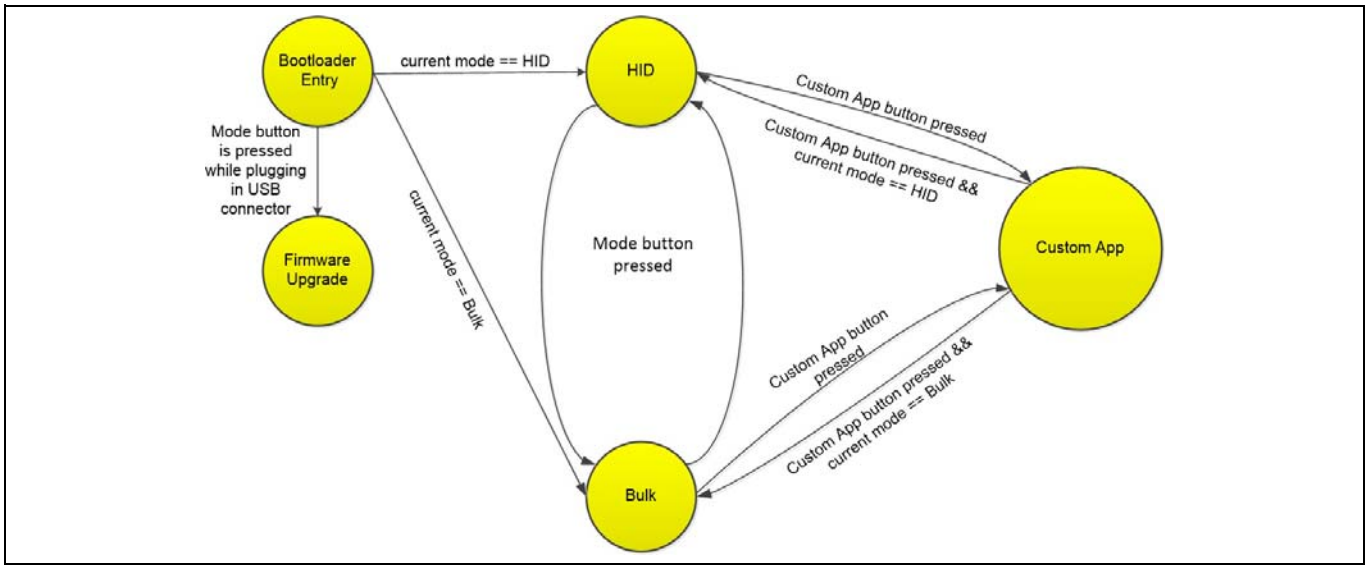


Figure 8 Various MiniProg4 button modes

3 Technical description

MiniProg4 is a protocol translation device. With MiniProg4, the PC host software can communicate through a USB port to the target device to be programmed or debugged, as shown in **Figure 9**. **Table 3** lists the protocols that are supported by each connector. MiniProg4 enables communication with the target devices using I/O voltage levels from 1.5 V to 5 V.

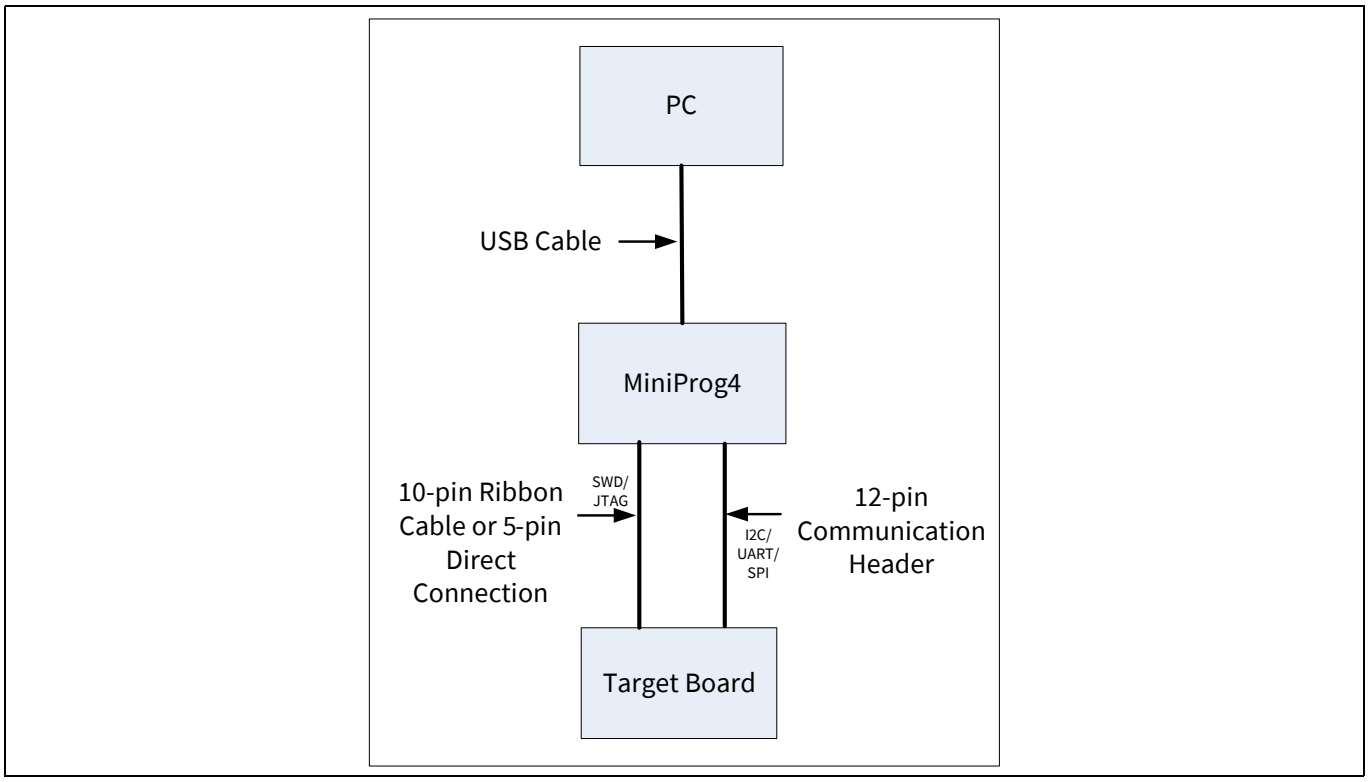


Figure 9 System block diagram

Table 3 Connectors / Communication Protocol support

Connector	SWD	JTAG[a)]	I²C	SPI	UART (with and without flow control)
5-pin	Supported	N/A	N/A	N/A	N/A
10-pin	Supported	Supported	N/A	N/A	N/A
6x2 header	N/A	N/A	Supported	Supported	Supported

a) JTAG is supported only in CY8CKIT-005-A.

3.1 Interfaces

3.1.1 SWD/JTAG

Arm®-based devices support the Serial Wire Debug (SWD) and JTAG protocols. The PSoC™ 4, PSoC™ 5LP, and PSoC™ 6 MCU device families implement these standards, which offers programming and debugging functions. MiniProg4 supports programming and debugging of PSoC™ 4, PSoC™ 5LP, and PSoC™ 6 devices using SWD and JTAG through the 5-pin or 10-pin connector.

Before programming a PSoC™ 4, PSoC™ 5LP, or PSoC™ 6 MCU device, the electrical connection requirements in the respective device datasheet are reviewed or in the PSoC™ 4, PSoC™ 5LP, and PSoC™ 6 MCU device programming specifications. The list of datasheets and programming specifications are as follows:

www.infineon.com/PSoC4
www.infineon.com/PSoC5LP
www.infineon.com/PSoC6

3.1.2 I^2C

I^2C is a common serial interface standard. It is mainly used for communication between microcontrollers and other ICs on the same board but can also be used for intersystem communications. MiniProg4 uses an I^2C multimaster host controller that allows the tool to exchange data with I^2C-enabled devices on the target board. For example, this feature may be used to tune CAPSENSE™ designs.

MiniProg4 serves as a USB-I^2C bridge (acts as I^2C master) that can be used to communicate with a I^2C slave devices through the Bridge Control Panel software. For I^2C connections use the 6×2 connector. MiniProg4 has internal pull-up resistors and supports I^2C speed up to 1 MHz.

3.1.3 SPI

The serial peripheral interface (SPI) is a synchronous serial communication interface specification used for short distance communication, primarily in embedded systems. SPI devices communicate in full duplex mode using a master-slave architecture with a single master.

MiniProg4 serves as a USB-SPI bridge (acts as SPI master) that can be used to communicate with a SPI slave devices through the Bridge Control Panel software. For SPI connections, use the 6×2 connector. MiniProg4 supports SPI speed up to 6 MHz.

3.1.4 UART with and without flow control

UART is another common serial interface standard. MiniProg4 supports UART, which allows the tool to receive data from UART enabled devices on the target board. MiniProg4 provides UART communication both with and without hardware flow control. In order to enable flow control, RTS and CTS pins are provided in the 6x2 I/O header. If flow control is not required, CTS and RTS pins can be left floating. Terminal emulators such as Tera Term or PuTTY can be used to communicate with the target PSoC™ device. MiniProg4 supports UART speed up to 115200 Baud Rate.

3.1.5 Reference

For more information on the PSoC™ 4, PSoC™ 5LP, and PSoC™ 6 MCU's JTAG, SWD, and I^2C interfaces, see the **PSoC™ 4, PSoC™ 5LP, and PSoC™ 6 Technical Reference Manuals**.

For more details on MiniProg4 with Bridge Control Panel, refer to the Bridge Control Panel Help document.

3.2 Connectors

3.2.1 5-pin connector

The 5-pin connector is configured as a single row with a 100-mil pitch. Suggested mating connector part number is Molex Connector Corporation 22-23-2051.

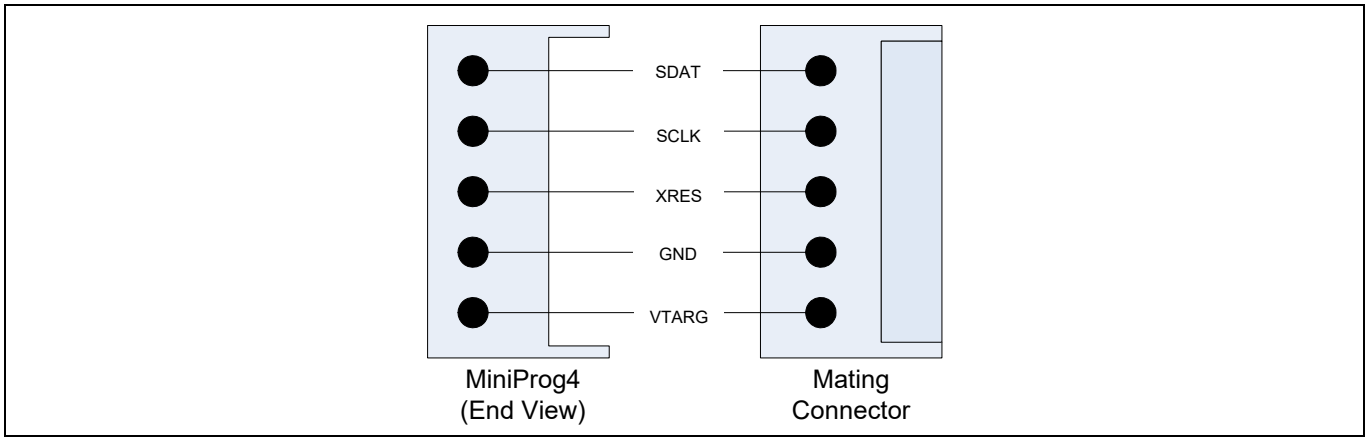


Figure 10 5-pin connector with pin assignments

Note: If the design requires MiniProg4 to be directly plugged to the target board with a 5-pin header, adequate mechanical clearance shall be provided near the 5-pin header on the target board. The width and height of MiniProg4 (5-pin header area) is 25 mm × 13 mm. If the design cannot meet the required mechanical clearance, use a stackable header (such as Proto-PIC 20690).

3.2.2 10-pin connector

The 10-pin connector is configured as a dual row with 50-mil pitch. It is used with a ribbon cable (provided) to mate to a similar connector on the target board. The signal assignment is shown in **Figure 11**. Suggested mating connector part number is CNC Tech 3220-10-0300-00 or Samtec Inc. FTSH-105-01-F-DV-K-TR.

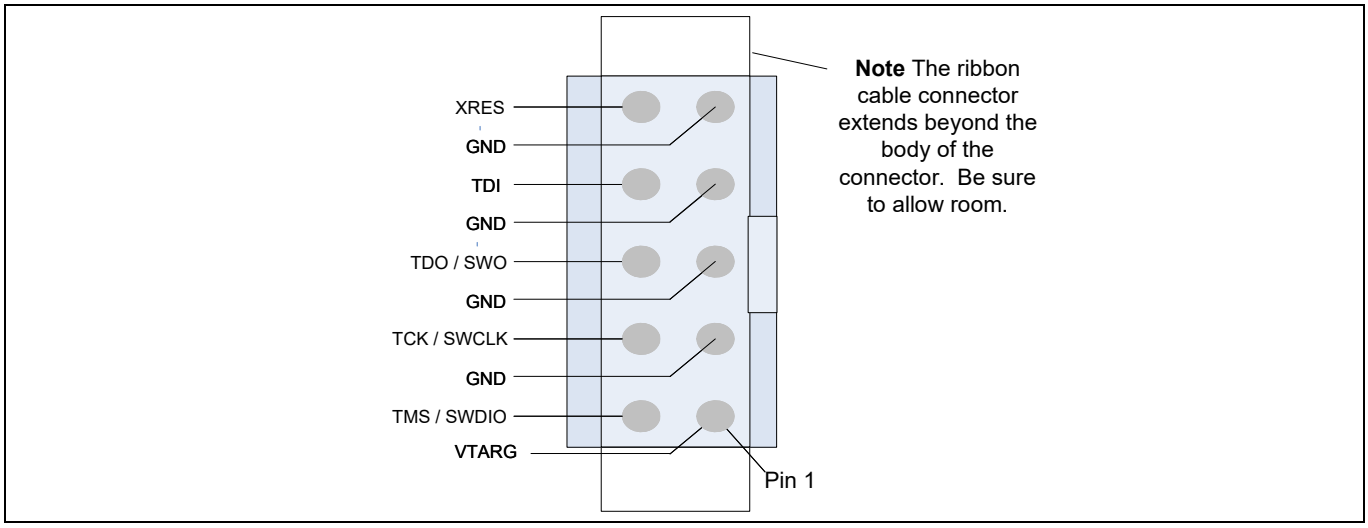


Figure 11 10-pin connector with pin assignments

Table 4 shows the summary of the protocols and related pin assignments. The pin mapping is also shown on the back of the MiniProg4 case.

Table 4 Communication protocol pin assignments

Protocol	Signal	5-pin	10-pin
SWD	SDIO	5	2
	SCK	4	4
	XRES	3	10
JTAG[a)]	TMS	N/A	2
	TCK	N/A	4
	TDO	N/A	6
	TDI	N/A	8
	XRES	N/A	10

a) JTAG is supported only in CY8CKIT-005-A.

3.2.3 6×2 connector

This connector supports all the communication protocols like I^2C, SPI, UART (with or without flow control supported by MiniProg4). Figure 12 shows the pin assignments. They are also shown on the back of the MiniProg4 case.

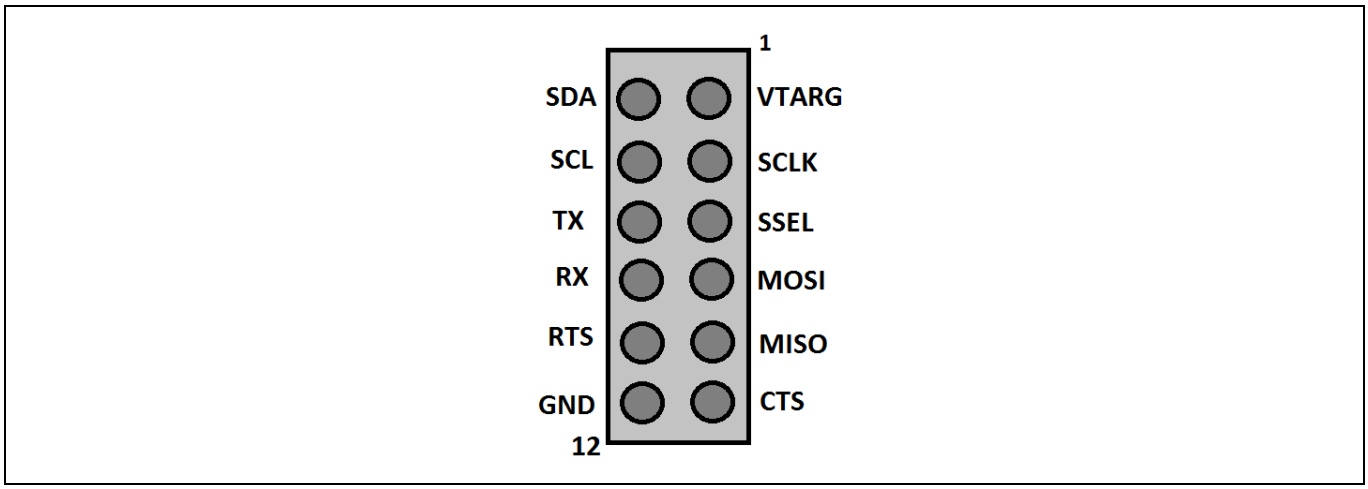


Figure 12 6×2 connector pin assignments

3.3 Power

MiniProg4 can be powered using the USB interface.

On kits/boards where there is a single power supply for the entire board, MiniProg4 can supply power to the board. However, this supply is limited to approximately 200 mA, and is protected against excess current draw. You can select 1.8 V, 2.5 V, 3.3 V, or 5 V from PSoC™ Programmer. The 5 V supply may vary between 4.25 V–5.5 V, because it is supplied directly from the USB port. The maximum deviation for other voltages is ±5%.

Note: Some PSoC™ device families do not support 5 V operation. Refer to the respective device datasheet for supported voltage selection.



Voltage stress beyond acceptable limits can permanently damage MiniProg4. Programming signals can withstand over-voltage up to maximum 12 V and minimum up to –5 V. Communication bridge signals (I2C, UART & SPI) can withstand over-voltage only up to maximum 6 V and minimum up to –1 V.

Appendix

A Regulatory Compliance information

The CY8KCIT-005 MiniProg4 Program and Debug Kit complies with the CE-Low Voltage Directive 2006/95/EC (Europe) safety requirement. It has been tested and verified to comply with the following electromagnetic compatibility (EMC) regulations.

- CISPR 22 - Emissions
- EN 55022 Class A - Immunity (Europe)
- CE - EMC Directive 2004/108/EC
- CE Declaration of Conformity

Revision history

Document version	Date of release	Description of changes
**	2018-10-31	New kit guide.
*A	2018-11-08	Updated **“Installing MiniProg4” on Page 7**: Updated **“MiniProg4 installation” on Page 7**: Updated description. Updated **Figure 4**.
*B	2019-05-24	Updated Copyright information.
*C	2023-07-28	Updated **“Introduction” on Page 5**: Updated description. Updated **“Programming and Debugging” on Page 5**: Updated description. Updated **“Technical description” on Page 12**: Updated **Figure 9**. Updated **Table 3**. Updated **“Interfaces” on Page 13**: Updated **“SWD/JTAG” on Page 13**: Replaced “SWD” with “SWD/JTAG” in heading. Updated description. Updated **“Connectors” on Page 14**: Updated **“10-pin connector” on Page 14**: Updated **Table 4**.
*D	2023-10-18	Updated hyperlinks across the document. Replaced “CYPRESS™ Programmer” with “ModusToolbox™ Programming tool” in all instances across the document. Updated **“Installing MiniProg4” on Page 7**: Updated **“MiniProg4 installation” on Page 7**: Updated description. Updated **Figure 5** (Updated caption only). Updated **“MiniProg4 buttons” on Page 11**: Updated description. Updated **“Technical description” on Page 12**: Updated **“Interfaces” on Page 13**: Updated **“SWD/JTAG” on Page 13**: Updated description. Updated **“Reference” on Page 13**: Updated description. Updated **“Power” on Page 16**: Updated description. Migrated to Infineon template. Completing Sunset Review.

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Edition 2023-10-18
Published by

Infineon Technologies AG
81726 Munich, Germany

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Document reference
002-19782 Rev. *D

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