CY8CKIT-002

MiniProg3 User Guide

Doc. # 001-59350 Rev. *E

Copyrights

Flash Code Protection

Cypress products meet the specifications contained in their particular Cypress PSoC Data Sheets. Cypress believes that its family of PSoC products is one of the most secure families of its kind on the market today, regardless of how they are used. There may be methods, unknown to Cypress, that can breach the code protection features. Any of these methods, to our knowledge, would be dishonest and possibly illegal. Neither Cypress nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Cypress is willing to work with the customer who is concerned about the integrity of their code. Code protection is constantly evolving. We at Cypress are committed to continuously improving the code protection features of our products.

Contents

Safety Information

Regulatory Compliance

CY8CKIT-002 is used as a development platform for hardware or software in a laboratory. In a domestic environment, this product may cause radio interference; adequate prevention measures should be taken.

CY8CKIT-002, as shipped from the factory, is verified to meet with requirements of CE as a Class A product.

The CY8CKIT-002 boards are sensitive to electrostatic discharge (ESD). Electrostatic charges accumulate on the human body and on other equipment. Devices that are subjected to high-energy discharges can suffer permanent damage. Proper ESD precautions are recommended to prevent loss of functionality. Store unused CY8CKIT-002 boards in the protective shipping package.

General Safety Instructions

ESD Protection

ESD can damage boards and associated components. Cypress recommends that you work on the board at an ESD workstation, if available. Otherwise, use appropriate ESD protection, such as an antistatic wrist strap attached to a ground, when handling parts.

CY8CKIT-002 MiniProg3 User Guide, Doc. # 001-59350 Rev. *E

1   Introduction

PSoC® MiniProg3 is an all-in-one programmer for PSoC 1, PSoC 3, PSoC 4, and PSoC 5LP architectures, a debug tool for PSoC 3, PSoC 4, and PSoC 5LP architectures, and an USB-I^{2}C Bridge for debugging I^{2}C serial connections and communicating with PSoC devices.

Designed as a low-cost aid for developers to use in building their own systems around Cypress 8-bit and 32-bit PSoC devices, the MiniProg3 is included in the CY8CKIT-001 development kit and sold as a standalone kit, CY8CKIT-002. These kits are available through the Cypress Online Store or through our distributors.

Figure 1-1. MiniProg3

1.1   CY8CKIT-002 Contents

The CY8CKIT-002 MiniProg3 kit includes:
- MiniProg3 programmer/debugger
- 10-pin ribbon cable
- USB cable
- Software CD
- Quick start guide

The CY8CKIT-002 CD installs critical information, such as the kit documentation, which includes the user guide and release notes, in the following project directory:
```
[Install path]\Cypress\CY8CKIT-002 MiniProg3
```

1.2   Programming

The MiniProg3 programmer/debugger provides the flexibility to work with different programming and debugging interfaces, such as JTAG, SWD, ISSP, and I^{2}C. MiniProg3 supports all 8-bit and 32-bit PSoC devices. When programming, MiniProg3 enables communication with target devices using I/O voltage levels from 1.5 V to 5.5 V. In addition, MiniProg3 can supply power to a simple target board at one of four voltage levels: 1.8 V, 2.5 V, 3.3 V, or 5 V.

1.3 Debugging

MiniProg3 supports the following debugging protocols for 8-bit and 32-bit PSoC devices:

■ SWD (PSoC 3, PSoC 4, PSoC 5LP)

■ JTAG (PSoC 3, PSoC 5LP)

■ I^{2}C (limited PSoC 1 devices)

The MiniProg3 debugger is supported by the software tools PSoC Creator and PSoC Designer.

1.4 Bridging

MiniProg3 supports USB-I^{2}C bridging protocols. These protocols are used for debugging certain PSoC 1 devices that support serial communication debugging, tuning, and configuration of fixed function devices. The MiniProg3 bridging capabilities are used by PSoC Designer, PSoC Creator, PSoC Programmer, Bridge Control Panel, and other applications. Tuning software tools also use these capabilities.

Note If you want to develop your custom USB-I^{2}C applications using MiniProg3, see the PSoC Programmer COM guide and examples of the custom USB-I^{2}C applications.

1.5 Document Revision History

Table 1-1. Revision History

Revision	PDF Creation Date	Origin of Change	Description of Change
**	09/19/11	WBZ/RAVG	Initial Release.
*A	11/01/11	WBZ/RAVG	Safety Information section added. Appendix A Troubleshooting guide updated
*B	5/10/12	ANDI/LRDK	Information about accuracy and resolution of measured voltage added to Power section
*C	08/28/12	AESA	Updated template and changed installation path
*D	10/10/12	RRAM	Reorganized the Appendix section
*E	03/25/13	SASH	Updated Table 2-1 on page 11. Added PSoC 4 and PSoC 5LP device

1.6 Documentation Conventions

Table 1-2. 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**]

Table 1-2. Document Conventions for User Guides

Convention	Usage
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.

CY8CKIT-002 MiniProg3 User Guide, Doc. # 001-59350 Rev. *E

2. Installing MiniProg3

This chapter shows how to install MiniProg3 and its associated PC software.

2.1   System Requirements

Make certain that your computer meets all of the requirements to connect to the MiniProg3 and its associated software.

Table 2-1. Computer Requirements

Computer Requirements	Recommended
Processor speed	2 GHz
RAM	3 GB
Hard disk free space	1 GB
Screen resolution	1024x768
CD-ROM drive	Yes
USB port (or powered USB hub)	USB2 High Speed
Microsoft Windows XP (SP1, SP2, SP3), Vista (32-bit, 64-bit), or Win 7 (32-bit, 64-bit)	Yes
Microsoft Windows .NET framework 2.0 SP1, 32-bit, or 64-bit	Yes
Microsoft Internet Explorer 7.0 or greater (SP1)	Yes
Adobe Reader (to view.PDF documents)	Yes

2.2   MiniProg3

Figure 2-1. Top View
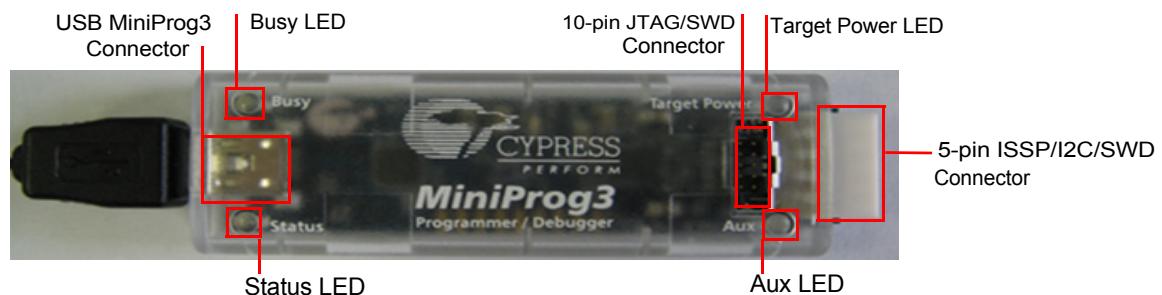
Figure 2-2. Bottom View

2.3   MiniProg3 Installation

The MiniProg3 programmer and debugger are supported by PSoC Programmer, PSoC Designer, and PSoC Creator. Secondary software, such as Bridge Control Panel and Clock Programmer, use the programmer COM hardware layer to support MiniProg3 functionality.

1. Download and install PSoC Programmer. Follow the instructions to install the software.

2. Connect the MiniProg3 to your computer's USB port using the USB cable. When properly connected, the four LEDs on the MiniProg3 flicker.

   The first two MiniProg3 drivers are automatically installed.

   Note Remove the warning sticker before using MiniProg3.

3. Run PSoC Programmer: Select **Start > All Programs > Cypress > PSoC Programmer**.

   The second MiniProg3 driver is automatically installed.

4. In PSoC Programmer, select **View** > **Modern**.

Figure 2-3. PSoC Programmer in Modern View Mode: MiniProg3 Selected and Connected
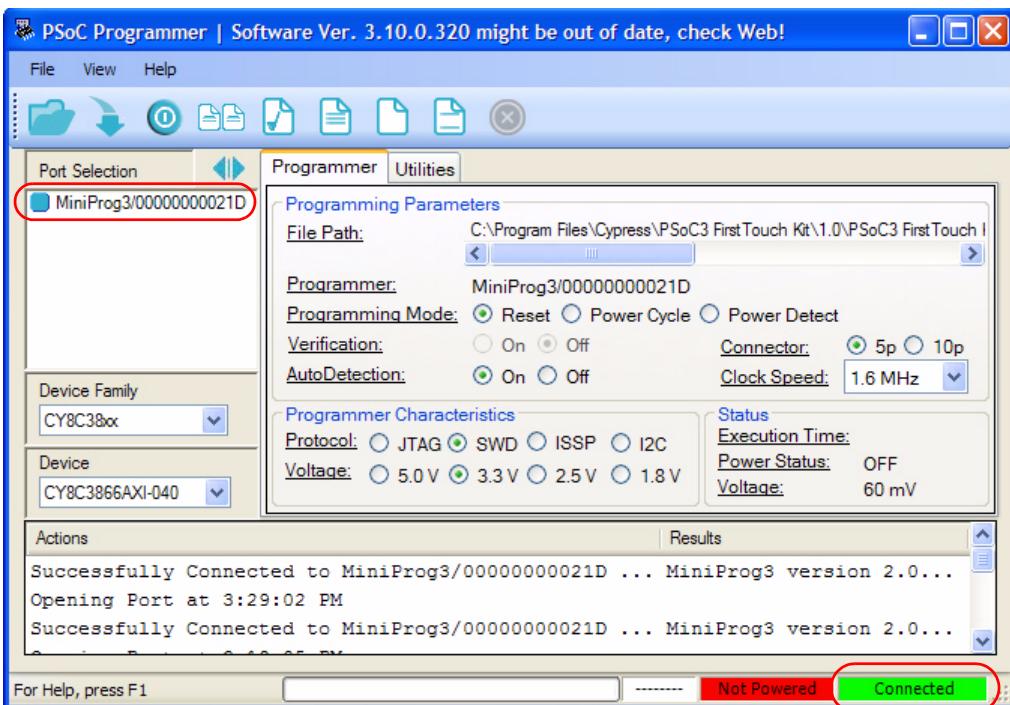
5. To connect to the port, in the port selection window, click the MiniProg3 device. You can also click **Connect/Disconnect**.

   If the connection is successful, the green status LEDs on MiniProg3 light up and a blue dot appears next to MiniProg3 in the **Port Selection** box. Also, the indicator in the lower-right corner of the PSoC Programmer window turns green and shows **Connected**.

   You can now use MiniProg3 and the functions it supports.

For more information on how to use PSoC Programmer, see the PSoC Programmer User Guide.

2.4   Example Projects

MiniProg3 is supported by PSoC Programmer, a simple GUI that connects to programming hardware to program and configure PSoC devices, and to develop custom applications.

Example projects and documentation are included in the PSoC Programmer installation and are available in the PSoC Programmer root installation folder:

```
[Install path]\Cypress\Programmer\[Programmer Version]\Examples
```

The PSoC Programmer root installation folder also includes documentation on how to use the programming interface:

```
[Install path]\Cypress\Programmer\[Programmer Version]\Documents
```

2.5   MiniProg3 LEDs

MiniProg3 has five indicator LEDs that, when lit, indicate the following:

- **Upper Left - Busy** (Red): An operation (such as programming or debugging) is in progress.

- **Lower Left - Status** (Green): The device is enumerated on the USB bus. When flashing, this LED indicates that MiniProg3 has received USB traffic.

- **Upper Right - Target Power** (Red): MiniProg3 is supplying power to the target connectors. This LED does not light up if power to target connectors is supplied by a source other than MiniProg3.

- **Lower Right - Aux** (Yellow): Reserved for future use.

- **Middle - No Label** (Yellow): Flashes briefly during the initial configuration of the device. If it stays lit, this LED indicates that a configuration error has occurred. If this happens, disconnect the MiniProg3 from the USB port and then reconnect it.

3.   Technical Description

MiniProg3 is a protocol translation device. With MiniProg3, the PC host software can communicate through a high-speed USB to the target device to be programmed or debugged, as shown in Figure 3-1. The device-side communication protocol can be one of the several standards and can occur over either of the two connectors. Table 3-1 lists the protocols that are supported by each connector. MiniProg3 enables communication with the target devices using I/O voltage levels from 1.5 V to 5.5 V. In addition, MiniProg3 can provide power to a simple target board, at one of four voltage levels: 0.8 V, 2.5 V, 3.3 V, or 5 V.

Figure 3-1. System Block Diagram
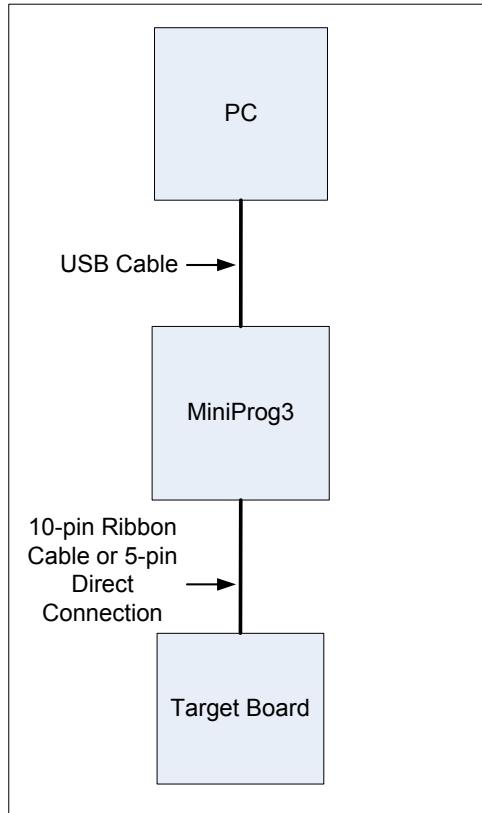
Table 3-1. Connectors / Communication Protocol Support

Connector	ISSP	JTAG	SWD and SWV[a]	I^{2}C
5-pin	Supported	N/A	SWD	Supported
10-pin	N/A	Supported	SWD and SWV	N/A

a. SWV trace is available only with SWD debugging.

3.1 Interfaces

3.1.1 ISSP

In-System Serial Programming (ISSP) is a Cypress legacy interface used to program the PSoC 1 family of microcontrollers. MiniProg3 supports programming PSoC 1 devices through the 5-pin connector only.

For more information about the ISSP interface, see the *PSoC 1 Technical Reference Manual*.

3.1.2 JTAG

The Joint Test Action Group (JTAG) standard interface is supported by many high-end microcontrollers, including the PSoC 3 and PSoC 5LP families. This interface allows a daisy chain bus of multiple JTAG devices. The MiniProg3 supports programming and debugging the PSoC 3 and PSoC 5LP devices using JTAG, through the 10-pin connector only.

3.1.3 SWD/SWV

Recent ARM-based devices have introduced a new serial debugging standard called Serial Wire Debug (SWD). The PSoC 3, PSoC 4, and PSoC 5LP family implements this standard, which offers the same programming and debugging functions as JTAG except the boundary scan and daisy chain. SWD uses fewer pins of the device than the JTAG. MiniProg3 supports programming and debugging PSoC 3, PSoC 4, and PSoC 5LP devices, using SWD, through the 5-pin or 10-pin connector.

The Single Wire Viewer (SWV) interface, also introduced by ARM, is used for program and data monitoring, where the firmware may output data in a method similar to "printf" debugging on PCs, using a single pin. MiniProg3 supports monitoring of PSoC 3 and PSoC 5LP firmware, using SWV, through the 10-pin connector and in conjunction with SWD only.

The PSoC 3, PSoC 4, and PSoC 5LP devices support the SWD programming through both the SWD and USB SWD lines. Before programming a PSoC 3, PSoC 4, or PSoC 5LP device, make sure you review the electrical connection requirements in the respective device datasheet or in the PSoC 3, PSoC 4, and PSoC 5LP device programming specifications. You can find the datasheets and programming specifications here:

http://www.cypress.com/go/psoc3

http://www.cypress.com/go/psoc5lp

http://www.cypress.com/go/programming

3.1.4 I^2C

A common serial interface standard is the I^2C standard. It is mainly used for communication between microcontrollers and other ICs on the same board, but can also be used for intersystem communications. MiniProg3 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 the CapSense® designs.

When MiniProg3 is configured to I^2C protocol mode, MiniProg3 enables internal 5.6-K pull-up resistors on the SDA and SCL lines.

3.1.5   Reference

For more information on the PSoC 3 and PSoC 5LP JTAG, SWD, and I²C interfaces, see the PSoC 3 and PSoC 5LP Technical Reference Manuals. For more information on PSoC 1 interfaces, see the PSoC 1 Technical Reference Manual.

3.2   Connectors

3.2.1   5-Pin Connector

The 5-pin connector is configured as a single row with 100-mil pitch. It is designed to mate with a Molex model 22-23-2051 (straight) or 22-05-3051 (right angle) male header with a key tab.

Figure 3-2. 5-Pin Connector with Pin Assignments
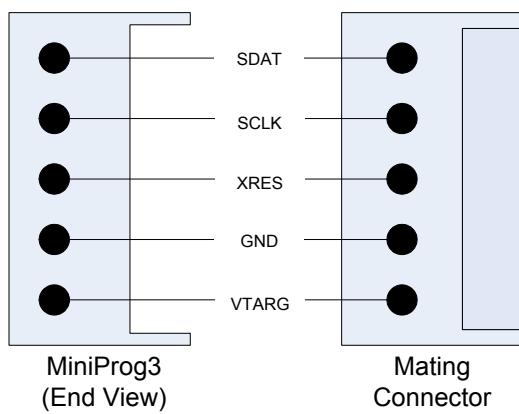
3.2.2   10-Pin Connector

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 recommended mating connectors are the Samtec FTSH-105-01-L-DV-K (surface mount) and the FTSH-105-01-L-D-K (through hole) or similar connectors available from other vendors. The signal assignment is shown in Figure 3-3.

When programming JTAG devices, note that MiniProg3 does not support nTRST pins.

Figure 3-3. 10-Pin Connector with Pin Assignments
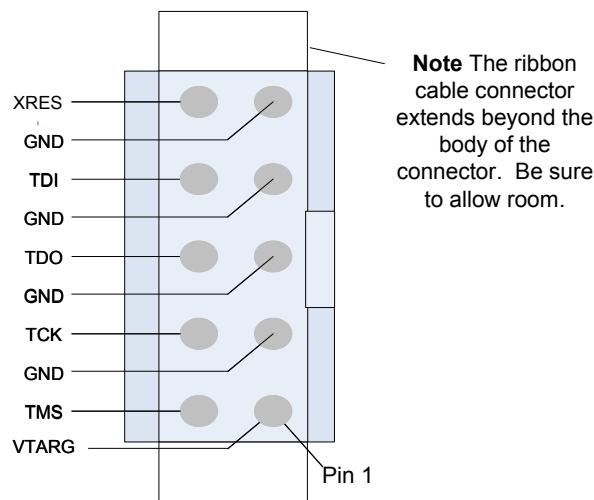
Here is a summary of the protocols and related pin assignments.

Table 3-2. Communication Protocol Pin Assignments

Protocol	Signal	5-Pin	10-Pin
ISSP	SCLK	4	
	SDAT	5	
	XRES	3	
JTAG	TMS		2
	TCK		4
	TDO		6
	TDI		8
	XRES		10
SWD / SWV	SDIO	5	2
	SCK	4	4
	SWV[a]		6
	XRES	3	10
I^{2}C	SCK	4	
	SDA	5	

a. SWV trace is only available in conjunction with SWD debugging.

3.3   Power

The MiniProg3 requires a connection to the Vddio supply of the target device to set the voltage level used for communication. This is required regardless of the communication protocol and the port selected. One of the connector's VTARG pins must be connected to the Vddio supply of the target device. For PSoC 3 and PSoC 5LP, this is the Vddio1 supply because this supply is used to drive the debug pins. If you do not connect the VTARG or you connect it to the wrong supply, MiniProg3 cannot communicate with the target device.

On boards where there is a single power supply for the entire board, MiniProg3 can, in some cases, supply power to the board. 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 for the power supply voltage. The 5 V supply may be as low as 4.25 V or as high as 5.5 V, because it is supplied directly from the USB port.

In addition to supplying power, MiniProg3 can also measure voltage on its VTARG line. The PSoC Programmer GUI displays the VTARG voltage in the **Status** group box (shown in Figure 2-3 on page 12). The accuracy of the measurement is 80–100 mV in the VTARG range $0 \leq U \leq 4.0$ V, and a maximum of 200 mV in the range $4.0 \leq U \leq 5.0$.

Note Although ADC resolution in MiniProg3 is 20 mV, the actual accuracy is approximately 200 mV.

3.3.1   Voltage Detection

MiniProg3 can detect voltages in the range of 0 V to 5 V. Many of the Cypress software tools, such as PSoC Programmer and Bridge Control Panel, display this detected voltage in the application GUI.

A.   Appendix

A.1   Troubleshooting

If you experience difficulty with your MiniProg3, see the following table to correct the problem.

Table A-1. Troubleshooting Guide

Problem	Try
LED does not blink upon power on.	Make sure the MiniProg3 USB cable is properly attached to both MiniProg3 and the computer. If you are using a hub, make sure that the hub is properly attached to both MiniProg3 and the computer. If you are using a self-powered hub, the power must be properly connected. Bus-powered hubs are not recommended.
No Windows USB plug-in sound.	Make sure that your computer's sound is properly configured. If you are using a hub, try to disconnect and reconnect the hub into the computer. If it is a powered hub, disconnect the power and reconnect it while the hub's USB cable is disconnected from the computer.
Yellow light in the center of MiniProg3 stays on after connecting MiniProg3 and after launching PSoC Programmer or PSoC Creator.	This indicates a configuration error. Run PSoC Creator or PSoC Programmer and try to disconnect and reconnect MiniProg3. If the yellow light persists, verify that the USB cable is in good condition, and that it is a high-speed certified cable. If the condition still persists, call technical support.
Intermittent programming or debugging failures.	Try reducing the serial clock rate. Verify that the USB cable is in good condition, and that it is a high-speed certified cable. If the condition still persists, call technical support.
MiniProg3 is plugged in and the LED lights have flashed but nothing is happening.	Launch one of the development tools, such as PSoC Programmer, PSoC Creator, or PSoC Designer.
MiniProg3 is the *A version and the 5-pin and 10-pin connectors are connected to the device.	There is a known issue with the *A version of MiniProg3 that was fixed in the *B revision. If you have a *A programmer, then connect to the device individually when programming. (The MiniProg3 revision, either *A or *B, is shown on the sticker on the back of the device.)

A.2   Regulatory Compliance Information

The CY8CKIT-002 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