UG377: EFM8BB1LCK User's Guide

The EFM8BB1LCK is an excellent starting point to get familiar with the EFM8BB1 Busy Bee microcontrollers.

The kit contains an on-board USB debugger and break-out headers for the device's GPIOs, making it easy to use as a starting point for application development.

The kit includes the following:

- EFM8BB1 Busy Bee Low Cost Kit Board
- Getting Started card

KEY FEATURES

- EFM8BB10F8G MCU with 8 kB Flash, 512 bytes RAM, and 18 GPIO pins.
- 20-pin expansion header.
- Power sources include USB and external sources.
- 1 user button, 1 LED.
- 2.54 mm breakout pads to EFM8
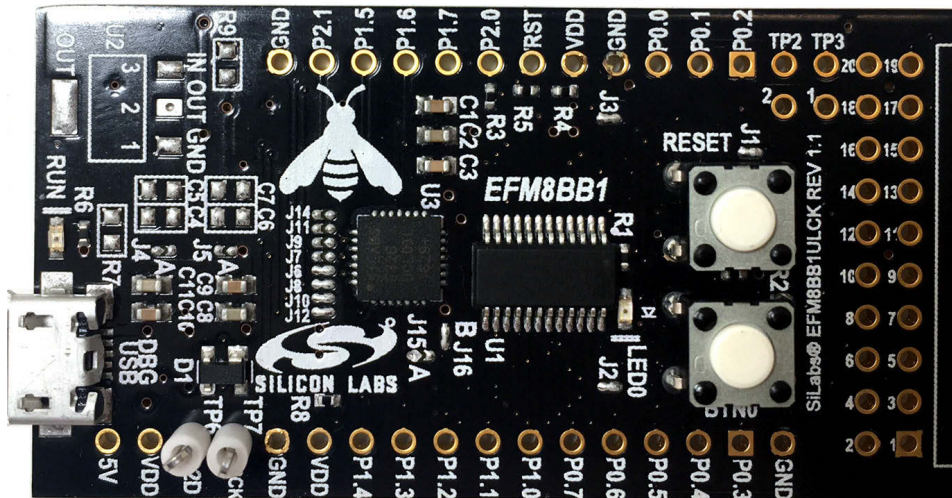
1. Getting Started

Hardware

To set up the hardware for the EFM8BB1LCK kit:

1. Provide power to the board by connecting the USB connector to the PC using a micro-B USB cable.
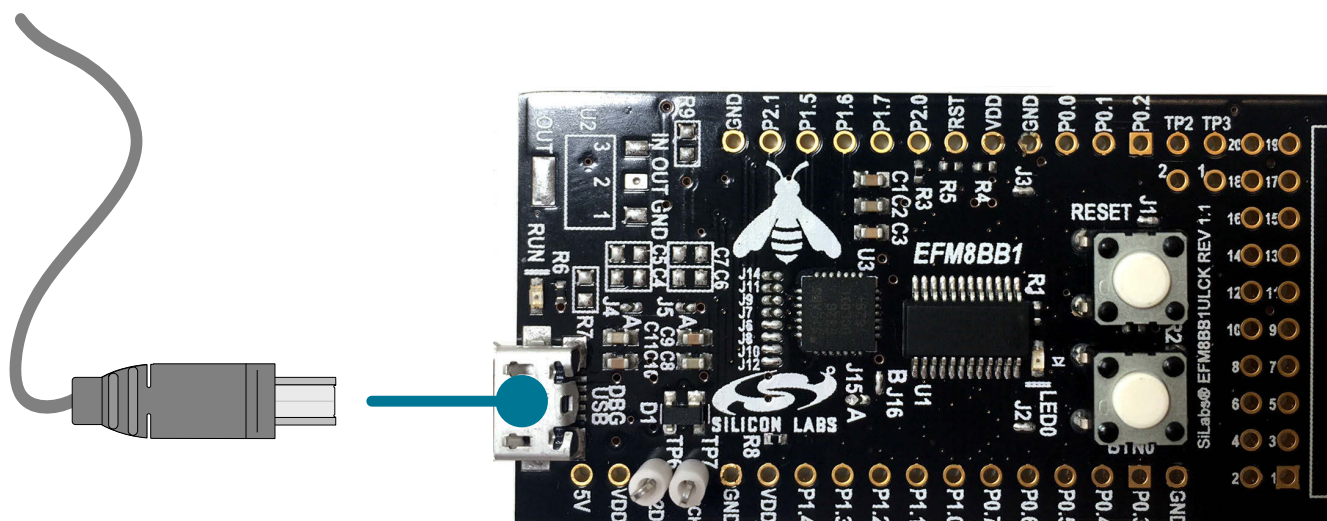

Figure 1.1. Hardware Setup

Software

The first step to get started with your new EFM8BB1LCK is to go to

http://www.silabs.com/simplicity

The Simplicity Studio software package contains all the tools, drivers, software examples and documentation needed to use the EFM8BB1 Low Cost Kit. The board comes pre-loaded with a default application, LED Pulse, to interact with while the software downloads.

After downloading the latest version of Simplicity Studio and installing:

1. Select the EFM8LCK debug adapater for the kit under [**Devices**].
2. Click one of the demos available under [**Getting Started**]>[**Demos**] or click the [**Getting Started**]>[**Demos**]>[**View All**] to view the entire list of available demos.
3. Click the [**Blinky**] demo and click [**Start**] to download and run the demo.

Additional demos showcasing the various features of the EFM8 are also available in Simplicity Studio.

2. Kit Block Diagram

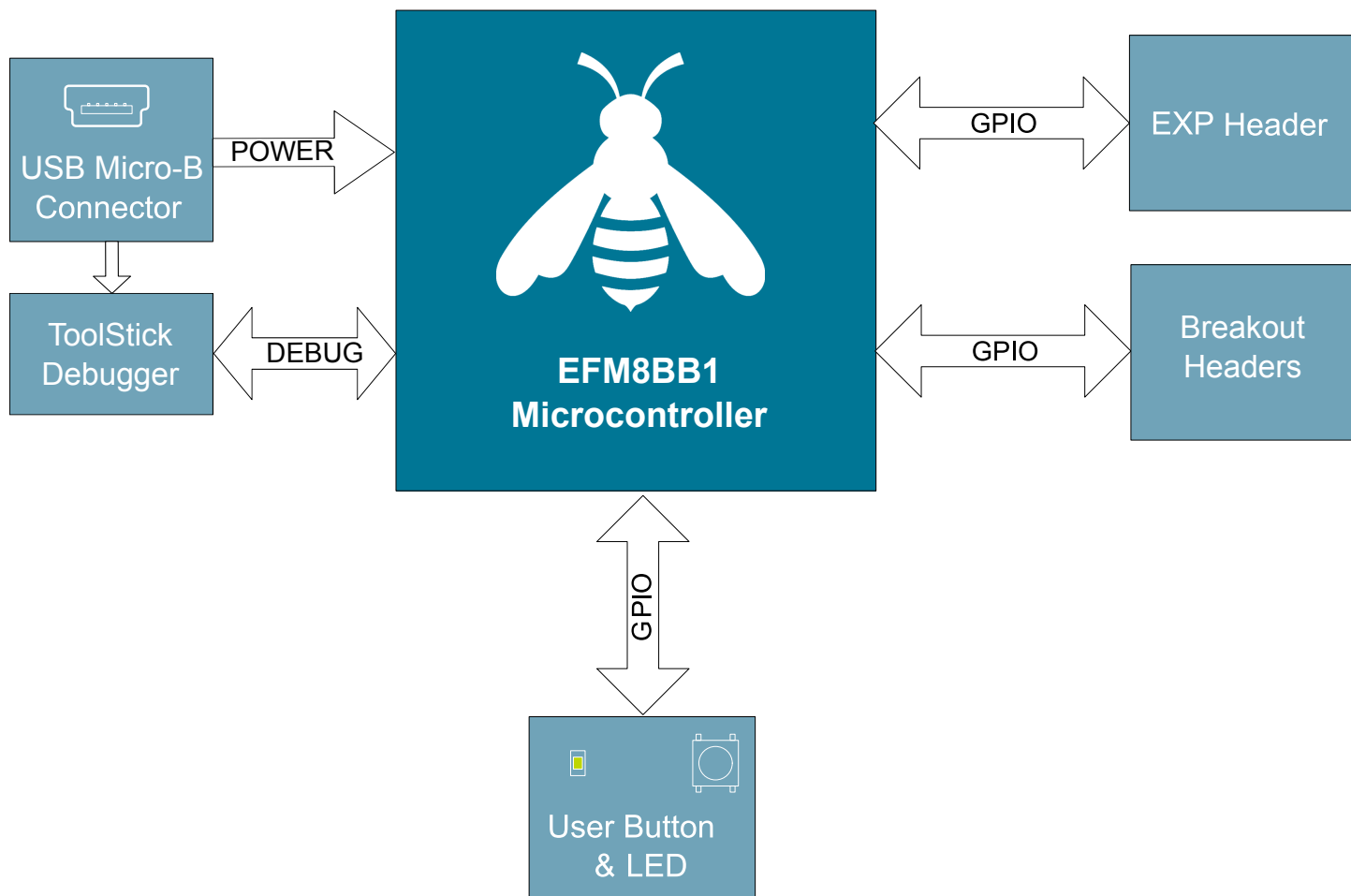An overview of the EFM8BB1 Low Cost Kit is shown in the figure below.

Figure 2.1. EFM8BB1LCK Block Diagram

3. Kit Hardware Layout

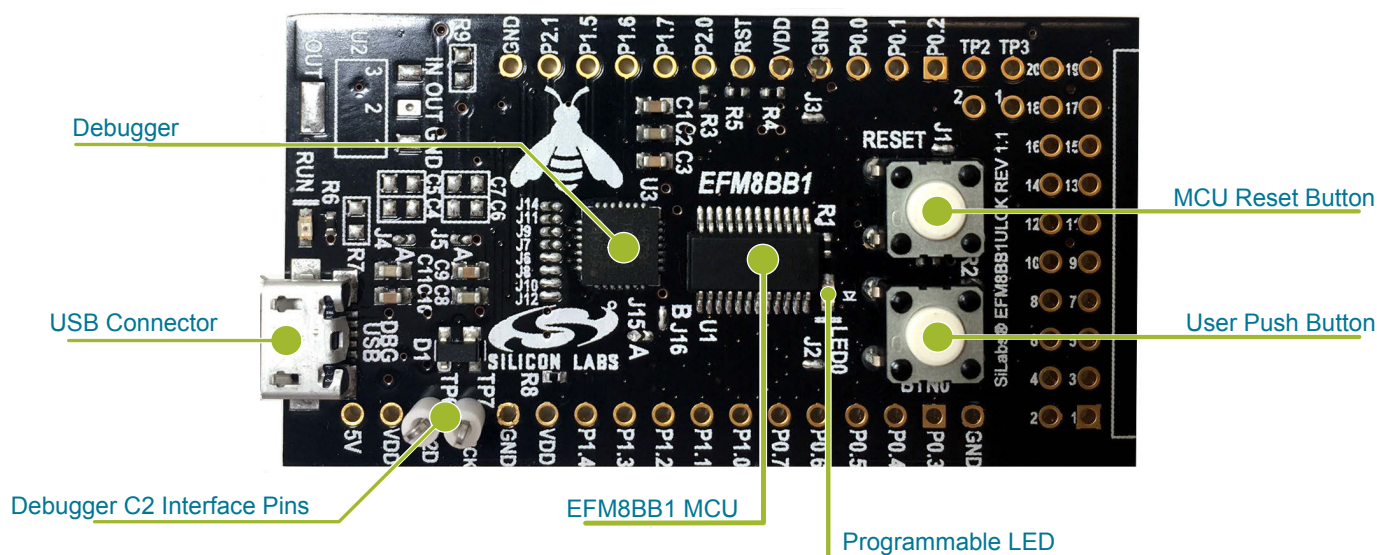The layout of the EFM8BB1 Low Cost Kit is shown below.

Figure 3.1. EFM8BB1LCK Hardware Layout

The EFM8 device on the kit is connected to several peripherals. The table below shows all of the external connections to the MCU.

Table 3.1. Kit MCU Connections

MCU Port Pin	Port Pin Assigned Function	Board Connection	Expansion Port Connection (EXP)
P0.0	GPIO		EXP3
P0.1	GPIO		
P0.2	Port Match Input	Push Button 0 (BTN0)	
P0.3	GPIO		
P0.4	UART0 TX		EXP12
P0.5	UART0 RX		EXP14
P0.6	GPIO		EXP8
P0.7	GPIO		EXP6
P1.0	GPIO		EXP4
P1.1	GPIO		EXP10
P1.2	GPIO		EXP16
P1.3	GPIO		EXP15
P1.4	PCA0 CEX0	LED0	EXP5
P1.5	GPIO		EXP7
P1.6	GPIO		EXP9

MCU Port Pin	Port Pin Assigned Function	Board Connection	Expansion Port Connection (EXP)
P1.7	GPIO		
P2.1	GPIO		
P2.0 / C2D	C2D		
RST / C2CK	Reset and C2CK		

4. Power Supply and Reset

4.1 MCU Power Selection

The EFM8BB1 Busy Bee MCU on the EFM8BB1LCK is designed to be powered by three different sources:

- Through the on-board debugger.
- Using an externally supplied power source from 2.2V to 3.6V.
- Using an on-board voltage regulator (not populated) to supply 2.2V to 3.6V from a source greater than 3.6V.
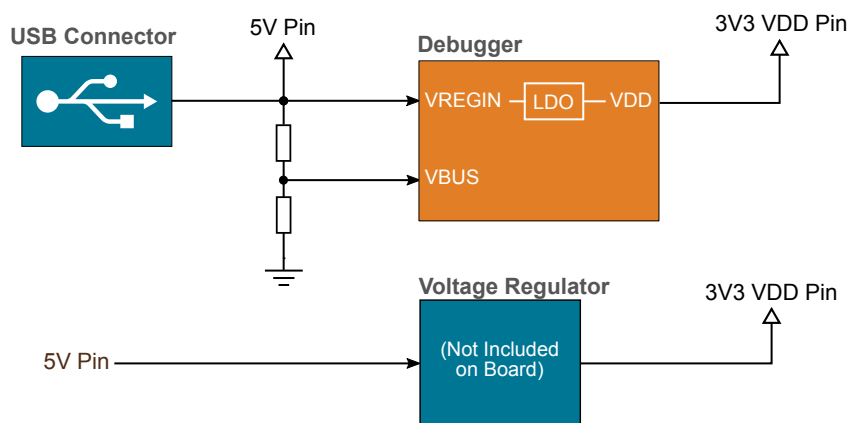
Figure 4.1. EFM8BB1LCK Power Options

When the USB debugger is connected, 3.3V will be supplied to the VDD rail to power the device. You can also power the device by disconnecting the USB debugger and applying 2.2V to 3.6V to a VDD pin. Alternatively, populate the regulator circuit on the board, and supply power to the 5V pin.

To use the regulator circuit
1. Populate the following:
   - U2: SOT223-4 footprint regulator (TLV1117-33CDCY for example)
   - C4, C6: 10uF capacitors, 0603 footprint
   - C5, C7: 0.1uF capacitors, 0603 footprint
2. Bridge solder jumpers J4, J5, and J15.
3. Open solder jumper J16.
4. Apply power to the 5V pin on the board.

The regulator output will be supplied to the VDD rail.

Note: With this configuration, power will no longer be supplied by USB when the debugger is connected.

4.2 MCU Reset

The EFM8 MCU can be reset by a few different sources:
- The RESET button.
- An external debugger by pulling the RSTb pin low.

5. Peripherals

The starter kit has a set of peripherals that showcase some of the features of the EFM8 EFM8BB1 Busy Bee microcontroller.

Be aware that most EFM8 I/O routed to peripherals are also routed to the breakout pads. This must be taken into consideration when using the breakout pads for your application.

5.1 Push Button and LED

The kit has one user push button. It is connected to the EFM8 to pin P0.2.

In addition to the push button, the kit also features an LED that is controlled by EFM8 GPIO. The LED is connected to pin P1.4 in an active-low configuration.
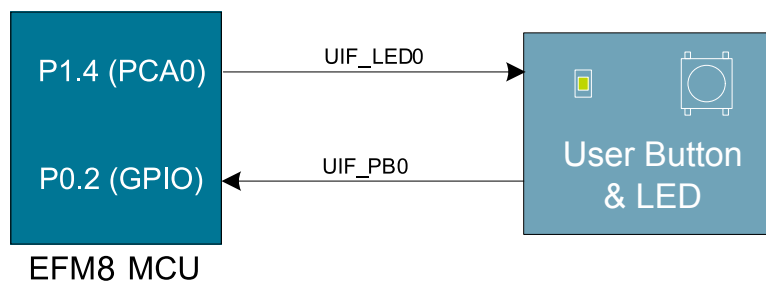

Figure 5.1. Button/LED

6. Connectors

6.1 Breakout Pads

Many of the EFM8's pins are routed out to "breakout pads" at the top and bottom edges of the kit. A 2.54 mm pitch pin header can be soldered in for easy access to these pins.

Note: Some of the breakout pads are shared by on-board EFM peripherals. The schematic must be consulted to make sure that it is acceptable to use a shared pin in your application.
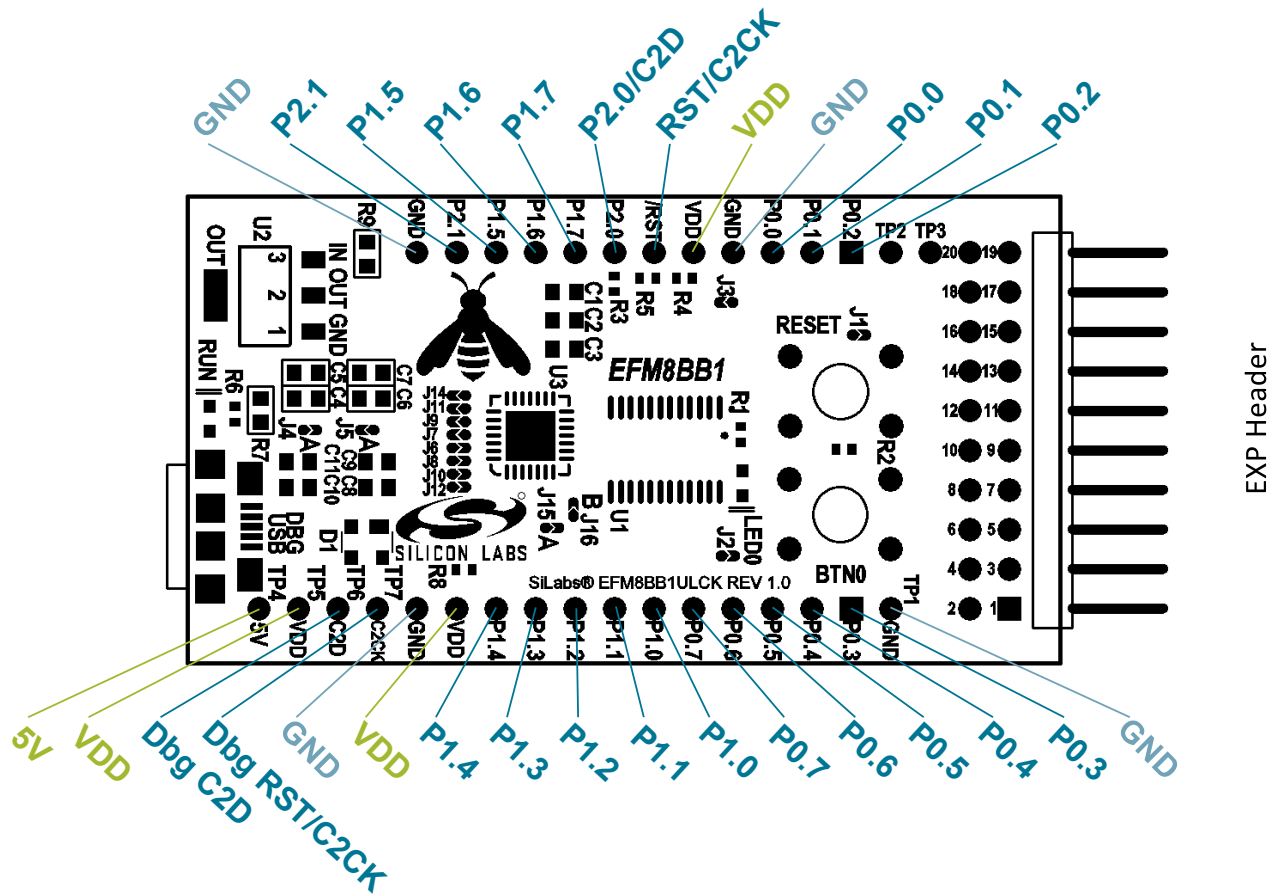

Figure 6.1. Breakout Pads and Expansion Header

6.2 Expansion Header

On the right hand side of the board an angled 20-pin expansion header can be soldered in to allow connection of peripherals or plugin boards. The connecter contains a number of I/O pins that can be used with most of the EFM8BB1 Busy Bee's features. Additionally, the VMCU, 3V3 and 5V power rails are also exported.

The figure below shows the pin assignment of the expansion header. With the exception of a few pins, most of the expansion header's pins are the same as those on the EFM32 Gecko or EFM32 Tiny Gecko starter kits.
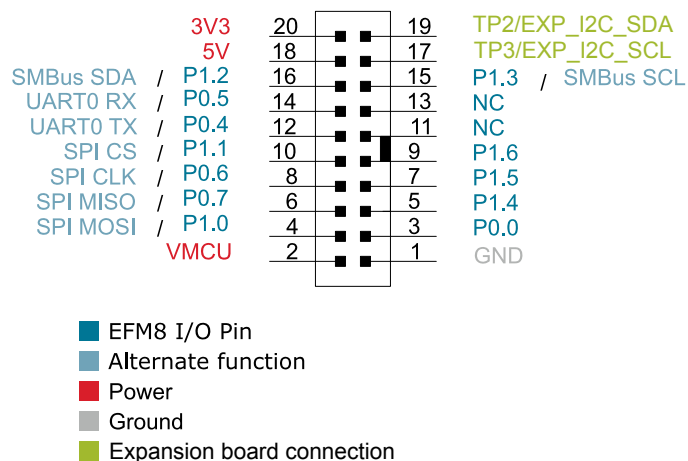

Figure 6.2. Expansion Header

Some of the chip peripheral functions that are available on the expansion header are listed in the table below.

Table 6.1. Some Peripheral Functions available on Expansion Header

Peripheral	Peripheral pin	MCU Pin	EXP Header pin number
UART0	UART0 TX	P0.4	12
	UART0 RX	P0.5	14
SPI0	SPI0 SCK	P0.6	8
	SPI0 MISO	P0.7	6
	SPI0 MOSI	P1.0	4
	SPI0 CS	P1.1	10
SMBus	SMBus0 SDA	P1.2	16
	SMBus0 SCL	P1.3	15
PCA0	PCA0 CEX0	P1.4	5
	PCA0 CEX1	P1.5	7
	PCA0 CEX2	P1.6	9
VREF	VREF	P0.0	3
ADC0	Input	Any supported pin (see Reference Manual for more information)	Multiple
	CNVSTR	P0.6	8
Comparator 0	CMP0P Positive Input	Any supported pin (see Reference Manual for more information)	Multiple
	CMP0N Negative Input	Any supported pin (see Reference Manual for more information)	Multiple

Peripheral	Peripheral pin	MCU Pin	EXP Header pin number
Comparator 1	CMP1P Positive Input	Any supported pin (see Reference Manual for more information)	Multiple
	CMP1N Negative Input	Any supported pin (see Reference Manual for more information)	Multiple

Note: This table only sums up some of the alternate functions available on the expansion header. Consult the EFM8BB10F8G data sheet for a complete list of alternate functions.
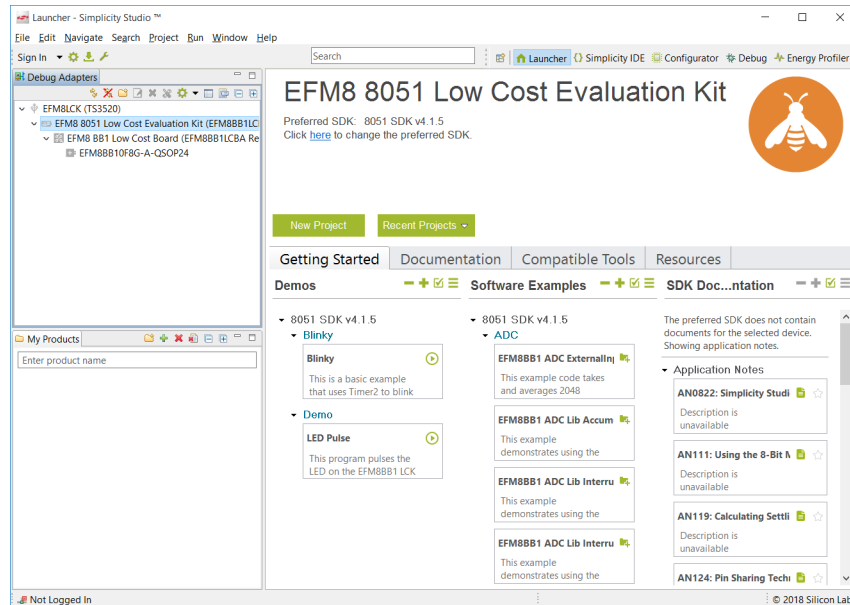
7. Integrated Development Environment

Figure 7.1. Simplicity Studio

Simplicity Studio includes various examples in source form to use with the Starter Kit. To run these examples:

1. Provide power to the board by connecting the DBG USB connector to the PC using the provided USB cable.
2. Select the EFM8LCK debug adapter for the kit under [**Devices**].
3. Click the [**Getting Started**]>[**New Project**] button.
4. In the wizard, ensure the EFM8BB1 Busy Bee Low Cost Kit Board kit and click [**Next**].
5. Select [**Example**] and click [**Next**].
6. Select the desired example or demo from the list and click [**Next**].
7. Click [**Finish**].
8. Click the [**Debug**] button in the IDE to build and download the code to the hardware.
9. Follow the instructions at the top of the main example file to set up the hardware as needed.
10. Click the [**Resume**] button to start running the example.

8. ToolStick Terminal
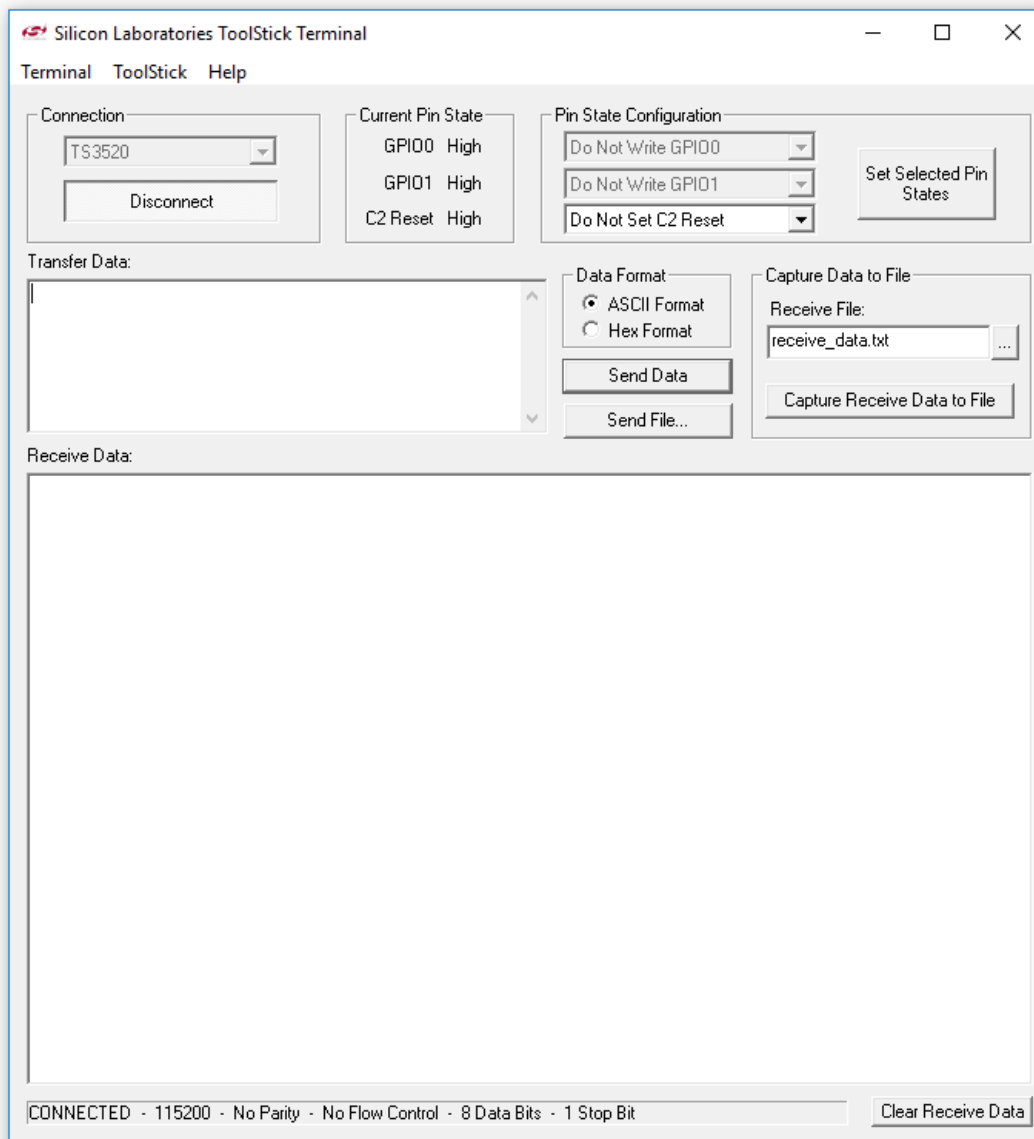
Figure 8.1. ToolStick Terminal Window

The ToolStick Terminal interfaces with the device's UART0 interface through USB connector. This allows for serial communication with the microcontroller. To connect the EFM8BB1 Busy Bee Low Cost Kit Board to the terminal:

1. Download and install the ToolStick Terminal application.
2. Connect UART0 to the debugger. To do this, connect jumpers J7 and J9 on the board.
3. Connect the DBG USB connector to the PC using the provided USB cable, open the ToolStick Terminal application, and press [**Connect**].

9. Schematics, Assembly Drawings, and BOM

The schematics, assembly drawings and bill of materials (BOM) for the EFM8BB1 Low Cost Kit board are available through Simplicity Studio when the kit documentation package has been installed. These files are also available from the links below.

- EFM8BB1 LCK BOM
- EFM8BB1 LCK Schematic

9.1 Board Revision History

- A00 — Initial production revision.

A00 Revision Boards

There are no known issues with the A00 boards.

10. Revision History

Revision 0.1

October, 2018

- Initial revision.

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